Central Queensland Coal Project

Appendix 11a – Biodiversity Offset Strategy

Central Queensland Coal

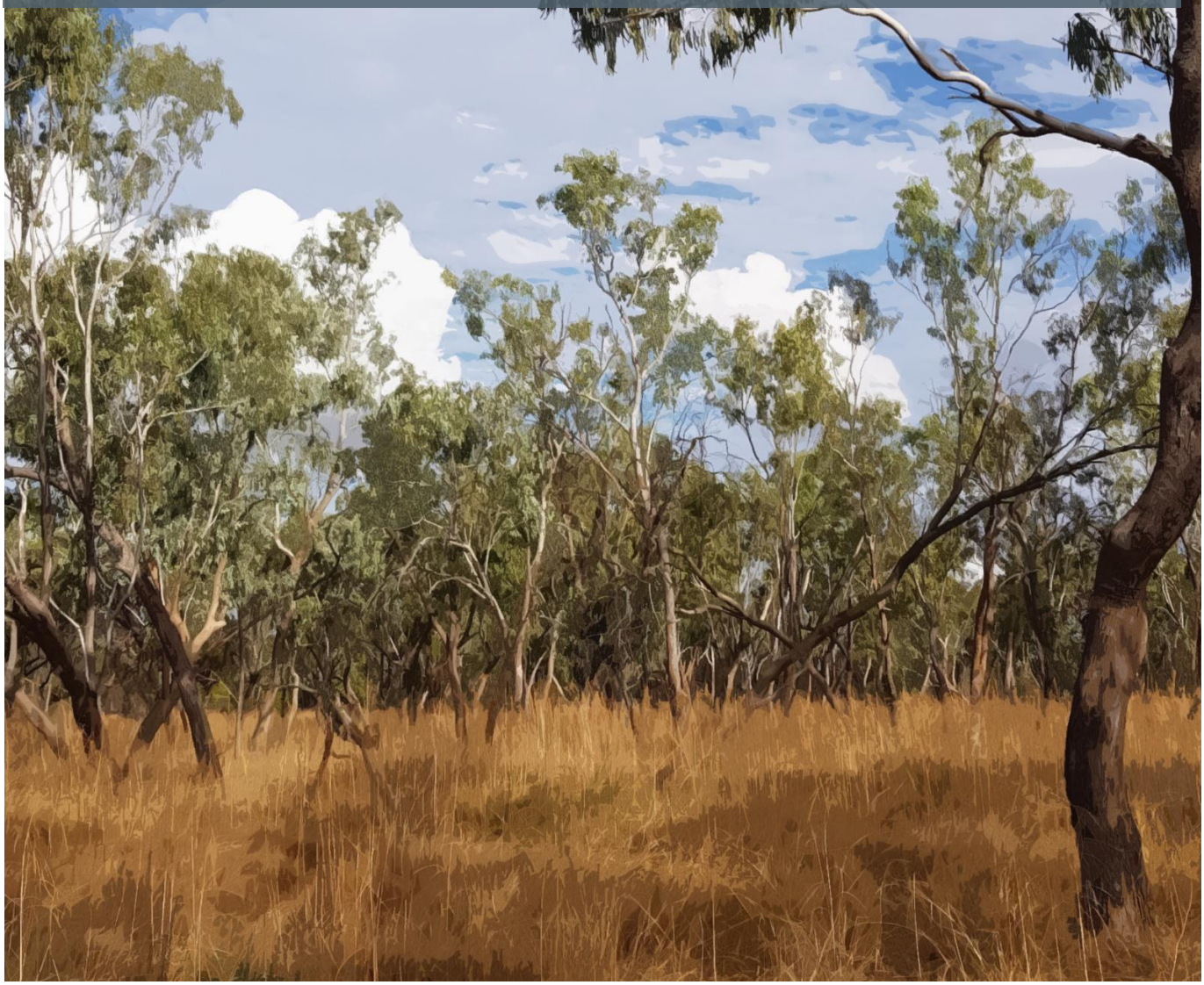
CQC SEIS, Version 3

October 2020

Biodiversity Offset Strategy

Central Queensland Coal Project

August 2020



APPROVALS

Rev	Date	Description
0	29 July 2020	Draft issued for review
1	25 August 2020	Final issued for submission

EXECUTIVE SUMMARY

Central Queensland Coal Pty Ltd (CQC) and Fairway Coal Pty Ltd (Fairway Coal) (the joint proponents) propose to develop the Central Queensland Coal Project (the Project) located in the south of the Styx Basin, approximately 130 km north-west of Rockhampton in Central Queensland. As CQC is the senior proponent, CQC is referred to as the proponent for this Project, which involves the extraction of up to ten million tonnes per annum (Mtpa) of product coal for the export market over a life of 20 years. The Project's development is proposed within two Mining Lease Application (ML) areas, ML 80187 and ML 700022, which are adjacent to Mineral Development Licence (MDL) 468 and Exploration Permit for Coal (EPC) 1029, held by the joint proponents.

Comprehensive ecological field surveys and technical studies have been undertaken for the Project throughout the evolution of the Environmental Impact Statement (EIS), supplementary EIS Version 1 (SEIS v1), SEIS Version 2 (SEIS v2), and now SEIS Version 3 (SEIS v3). These surveys and studies have identified that the Project has the potential to impact on Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES).

CQC is committed to minimising the impacts of the Project on MNES and MSES. The Project's proposed avoidance, mitigation, management and monitoring measures are described in full in the *Central Queensland Coal Project SEIS Version 3 (August 2020)* (CQC 2020). The Project measures to avoid and reduce impacts to MNES and MSES are based on the following hierarchy:

1. Avoid direct and indirect adverse impacts to MNES and MSES
2. Mitigate and manage any unavoidable direct and indirect adverse impacts to MNES and MSES
3. Monitor potential impacts to MNES and MSES
4. Implement remediation and rehabilitation of impacted areas to promote long-term recovery of MNES and MSES, and for any significant residual impacts provide offsets.

Significant residual impacts of the Project on MNES and MSES that cannot be avoided or minimised will be counterbalanced by biodiversity offsets. This Biodiversity Offset Strategy (BOS) has been prepared to provide a detailed account of how the Project's anticipated offset requirements will be acquitted and CQC's approach to delivering these offsets.

An offset package has been developed to acquit the Project's total significant residual impacts on MNES and MSES, in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (Cth; EPBC Act) Environmental Offsets Policy and the Queensland Environmental Offset Policy. The proposed offset delivery approach is a combination of direct land-based offsets and a financial settlement offset (MSES only), as summarised in Table ES1. Two properties will be used to deliver direct offsets for the project:

- A 2,803 ha area on Mamelon (comprised of Lot 9 MC496, Lot 10 MC493 and Lot 11 MC23). Mamelon is a 6,259 ha cattle grazing property and also the proposed site for the Project (noting all offset areas are outside the Project's direct impact areas and unlikely to be affected by any indirect impacts).
- A 227 ha offset area on [redacted] (comprised of [redacted]). [redacted] is a [redacted] cattle grazing property [redacted].

Table ES2 provides a summary of the proposed offset areas to be secured on Mamelon and [redacted] to acquit the Project's MNES and MSES offset requirements.

Financial settlement offsets are proposed for the remaining MSES offsets which are unable to be secured on Mamelon and [redacted]. These two MSES are:

- Watercourse RE 11.3.25 (BVG 16a) (only part of impact remaining to be offset, 33.95 ha)
- Waterway providing for fish passage (all of impact remaining to be offset, 8.35 ha).

In accordance with the Queensland Environmental Offsets Policy, the financial settlement offset calculator has been used to calculate the cost of this financial settlement offset. Using a separate section for each of the two distinct matter area impacts listed above, a combined total cost of $874,585.65 has been calculated.

CQC will deliver offsets in accordance with the proposed tasks and timeframes in Table ES3. These tasks and timeframes are subject to change due to variables, including regulatory (Commonwealth and Queensland Government) approval, regulatory requirements, climatic conditions, stakeholder inactivity and other unexpected delays.

Table ES-1: The Project's significant residual impacts and proposed offset delivery method

Protected Matter	EPBC Act status	Status under Qld legislation	Significant residual impact area (ha)			Offset delivery		
			Direct	Indirect	Total	Offset required?	Offset provided?	Type of offset
MNES								
Listed threatened species and ecological communities								
Greater glider (*Petauroides volans*)	V	V	115.7	165.2	281.0	Yes	Yes	Direct (land based) offset under EPBC Act
Koala (*Phascolarctos cinereus*)	V	V	159.4	165.2	324.6	Yes	Yes	
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	V	141.4	165.2	306.6	Yes	Yes	
Ornamental snake (*Denisonia maculata*)	V	V	18.8	0	18.8	Yes	Yes	
MSES								
Regulated vegetation[#]								
RE 11.3.4 (BVG 16c)	-	OC	1.4	39.3	40.7	Yes	Yes	Direct (land based) offset under Queensland Environmental Offset Framework
RE 11.4.2 (BVG 17a)	-	OC	110.8	0	110.8	Yes	Yes	
Watercourse vegetation RE 11.3.4 (BVG 16c)	-	OC	0.5	3.8	4.3	Yes	Yes	Direct (land based) offset under Queensland Environmental Offset Framework
Watercourse vegetation RE 11.3.25 (BVG 16a)	-	LC	10.7	68.1	78.8	Yes	Yes	Combination of direct (land based) offset and financial settlement offset under Queensland Environmental Offset Framework
Essential habitat for greater glider	-	-	0	15.0	15.0	No*	Yes	Direct (land based) offset under EPBC Act
Essential habitat for koala	-	-	96.1	14.3	110.4	No*	Yes	

Protected Matter	EPBC Act status	Status under Qld legislation	Significant residual impact area (ha)			Offset delivery		
			Direct	Indirect	Total	Offset required?	Offset provided?	Type of offset
Essential habitat for squatter pigeon	-	-	14.6	14.3	28.9	No*	Yes	
Protected wildlife habitat^								
Greater glider	V	V	115.7	165.2	281.0	No*	Yes	Direct (land based) offset under EPBC Act
Koala	V	V	159.4	165.2	324.6	No*	Yes	
Squatter pigeon	V	V	141.4	165.2	306.6	No*	Yes	
Ornamental snake	V	V	18.8	0	18.8	No*	Yes	
Waterway fish passage								
Waterway providing for fish passage	-	-	8.35+	-	8.35	Yes	Yes	Financial settlement offset under Queensland Environmental Offset Framework

Vegetation Management Act 1999 status.
* An offset is already being provided for these species as MNES. The State cannot impose an offset condition for a prescribed activity that has the 'same, or substantially the same' impact on the 'same, or substantially the same' matter as the MNES, if it has already been assessed as a 'controlled action' under the EPBC Act.
^ *Nature Conservation Act 1992* status.
+ Based on an impact to 8.35 km of waterway providing for fish passage with an average width of 10 m.

Table ES-2: Proposed offset acquittal

Protected Matter	Total significant residual impact (ha)	Mamelon		[redacted]		Remaining MSES impact to be offset as financial settlement offset (ha)
		Offset area to be secured (ha)	Acquittal (%)^ /minimum offset area required (ha)#	Offset area to be secured (ha)	Acquittal (%)^ /minimum offset area required (ha)#	
MNES						
Greater glider	281.0	2,428.4	100.03%	-	-	-
Koala	324.6	2,803.4	100.10%	-	-	-
Squatter pigeon	306.6	2,667.1	100.80%	-	-	-
Ornamental snake	18.8	-	-	121.1	102.37%	-
MSES						
RE 11.3.4 (BVG 16c)	40.7	14.8	162.8	148.2	162.8	-
RE 11.4.2 (BVG 17a)	110.8	443.2	443.2	-	-	-
Watercourse RE 11.3.4 (BVG 16c)	4.3	14.8	17.2	2.4	17.2	-
Watercourse RE 11.3.25 (BVG 16a)	78.8	100.8	315.2	78.6	315.2	33.95
Essential habitat - greater glider	15.0	As per MNES*	-	-	-	-
Essential habitat - koala	110.4	As per MNES*	-	-	-	
Essential habitat - squatter pigeon	28.9	As per MNES*	-	-	-	-
Protected wildlife habitat - greater glider	281.0	As per MNES*	-	-	-	-
Protected wildlife habitat - koala	324.6	As per MNES*	-	-	-	-
Protected wildlife habitat - squatter pigeon	306.6	As per MNES*	-	-	-	-
Protected wildlife habitat - ornamental snake	18.8	-	-	As per MNES*	-	-

Protected Matter	Total significant residual impact (ha)	Mamelon		[redacted]		Remaining MSES impact to be offset as financial settlement offset (ha)
		Offset area to be secured (ha)	Acquittal (%)^ /minimum offset area required (ha)#	Offset area to be secured (ha)	Acquittal (%)^ /minimum offset area required (ha)#	
Waterway for fish passage	8.35+	-	-	-	-	8.35

^ Acquittal (%) calculated in accordance with the EPBC Act Environmental Offsets Policy and associated offsets assessment guide.
# Minimum offset area (ha) calculated in accordance with the Queensland Environmental Offsets Policy and associated land-based offset multiplier calculator.
* To be offset as an MNES protected matter, noting that the State cannot impose an offset condition for a prescribed activity that has the 'same, or substantially the same' impact on the 'same, or substantially the same' matter as the MNES, if it has already been assessed as a 'controlled action' under the EPBC Act.
+ Based on an impact to 8.35 km of waterway providing for fish passage with an average width of 10 m.

Table ES-3: Proposed offset delivery timeframes

Description	Target date for completion
Negotiate on and gain endorsement of final BOS, including offsets assessment guides, and ODP with regulators	Q4 2020
Australian and Queensland government approval granted for the project	Q4 2020
Commence construction	Q1 2021
Execute [redacted] Landholder Agreement	Q1 2021
Finalise OAMPs and submit to regulators	Q2 2021
Regulator review and anticipated approval of OAMPs	Q2 2021
Implement approved OAMPs	Q3 2021
Legally secure offset areas	Q3 2021
Five years post approval of the BOS, review and reconcile actual impacts with offsets and submit report to regulators	Q4 2025

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FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

BfMP	Bushfire Management Plan
BOS	Biodiversity Offset Strategy
BPA	Biodiversity Planning Assessments
BVG	Broad vegetation group
CQC	Central Queensland Coal Pty Ltd
DES	Department of Environment and Science
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EN	Endangered
EP Act	Environmental Protection Act 1994
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPC	Exploration Permit for Coal
ESCP	Erosion and Sediment Control Plan
ESD	ecologically sustainable development
Fairway Coal	Fairway Coal Pty Ltd
GDE	ground water dependent ecosystem
GDEMMP	Groundwater Dependent Ecosystem Monitoring and Management Plan
ha	hectares
LC	Least Concern
LFC	Landscape Fragmentation and Connectivity tool
LUMP	Land Use Management Plan
MDL	Mineral Development Licence
ML	Mining Lease
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
Mtpa	million tonnes per annum
NC Act	*Nature Conservation Act 1992*
OAMP	Offset area management plan
OC	Of Concern
ODP	Offset Delivery Plan
PRCP	Progressive Rehabilitation and Closure Plan

RE	Regional ecosystem
REMP	Receiving Environment Monitoring Program
SEIS	Supplementary Environmental Impact Statement
SEVT	semi evergreen vine thicket
SOIC	Strategic Offset Investment Corridor
SSMP	Significant Species Management Plan
the joint proponents	Central Queensland Coal Pty Ltd and Fairway Coal Pty Ltd
the Project	Central Queensland Coal Project
TLF	train loadout facility
VM Act	*Vegetation Management Act 1999*
WPMP	Weed and Pest Management Plan

1 INTRODUCTION

1.1 BACKGROUND

Central Queensland Coal Pty Ltd (CQC) and Fairway Coal Pty Ltd (Fairway Coal) (the joint proponents) propose to develop the Central Queensland Coal Project (the Project) located in the south of the Styx Basin, approximately 130 km north-west of Rockhampton in Central Queensland (Figure 1). As CQC is the senior proponent, CQC is referred to as the proponent for this Project, which involves the extraction of up to ten million tonnes per annum (Mtpa) of product coal for the export market over a life of 20 years.

The Project's proposed development is largely within two Mining Lease Application (ML) areas, ML 80187 and adjacent ML 700022. The majority of the Project's mining and processing activities are proposed to occur within ML 80187, located on the Mamelon property (comprising Lot 9 MC496, Lot 10 MC493 and Lot 11 MC23). ML 700022 covers part of Mamelon and part of a neighbouring property to the east, Strathmuir (Lot 9 MC230), where the train loadout facility (TLF) is proposed to connect to the existing Queensland Rail North Coast Rail Line. A small section of haul road to the TLF is proposed on Brussels property (Lot 85 SP164785). The Mount Bison Road realignment is located on Mamelon, outside of the ML, and connects to the Bruce Highway.

The Queensland Government approved CQC's application to voluntarily prepare an Environmental Impact Statement (EIS) for the Project under the *Environmental Protection Act 1994* (Qld: EP Act) in January 2017, and in February 2017 the Project was determined to be a controlled action (EPBC 2016/7851) under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth: EPBC Act). The Project is being assessed under the bilateral agreement between the Commonwealth of Australia and the State of Queensland (section 45 of the EPBC Act) through the EIS process being completed under the EP Act.

An EIS (November 2017), a Supplementary EIS (SEIS) (Version 1; May 2018), and an amended SEIS (Version 2; December 2018) have previously been prepared for the Project. To adequately address regulator comments received in June 2019 on SEIS v2, further technical studies and assessments needed to be undertaken. In turn, an updated SEIS (Version 3; August 2020) has been prepared. The SEIS v3 has determined the Project is likely to have direct and indirect significant residual impacts on matters of national environmental significance (MNES) and matters of state environmental significance (MSES).

1.2 PURPOSE

CQC is committed to providing biodiversity offsets to compensate for direct and indirect significant residual impacts on MNES under the EPBC Act Environmental Offsets Policy (DSEWPC 2012) and MSES under the Queensland Environmental Offsets Policy (Version 1.8; DES 2020). Accordingly, this Biodiversity Offset Strategy (BOS) has been prepared to provide a detailed account of how the Project's anticipated offset requirements will be acquitted and CQC's approach to delivering these offsets.

1.3 SCOPE

The scope of the BOS includes:

- background information regarding a description of the Project and impact assessment undertaken
- information on the relevant Commonwealth and State offset policy/framework context
- a summary of the Project's avoidance and mitigation measures
- the Project's direct and indirect significant residual impacts on MNES and MSES requiring offsets

- details of the Project's offsets to acquit these requirements including:
  - the land-based offsets proposed for MNES and MSES
  - an overview of the properties, landholders, offset arrangement and acquisition status
  - description of the ecological surveys undertaken, environmental values present and the offset areas proposed
  - inputs, justifications and results of the offsets assessment guides
  - results of MSES land-based offsets multiplier calculator
  - the financial settlement offset proposed (MSES only)
  - how the proposed offsets as a package meet the requirements of the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offsets Policy
- a plan for offset delivery, implementation and review including:
  - finalisation of agreements with landholders for the offset areas
  - finalisation and approval of the Offset Area Management Plans (OAMPs), as well as summary of proposed management and monitoring actions to be implemented
  - process for legal security of the offset areas
  - process for reviewing and reporting on actual significant residual impacts offset, and updating the BOS accordingly if any additional offsets are required
- the Project's Offset Delivery Plan (ODP)
- the Project's draft OAMPs (attached to the ODP as appendices).

149°30'0"E 149°40'0"E 149°50'0"E 150°0'0"E 150°10'0"E 150°20'0"E 150°30'0"E

22°20'0"S 22°30'0"S 22°40'0"S 22°50'0"S 23°0'0"S 23°10'0"S 23°20'0"S 23°30'0"S

St Lawrence
Styx River
Herbert Creek Inlet
Shoalwater Bay
Stanage
Ogmore
Marlborough
Mount Gardiner
Kunwarara
Shoalwater
Canal Creek
Canoona
Glenroy
Garnant
Morinish
Etna Creek
Goodedulla National Park
Ridgelands
Alto-a-Downs
Norman Gardens
Pink Lily
Frenchville
Dalma
Rockhampton
Allenstown
Nine Mile
The Range
Gracemere
Kabra
Stanwell
Morinish South
Balcomba

Central Queensland Coal

Figure 1:
CQC Project context map

Mamelon
Mining leases (ML700022 and ML80187)
Road

Location diagram

Queensland

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Mining leases
- Roads

0 5 10 15 20
Kilometres

N

CO2 Australia

Date: 7/29/2020 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:400,000@A3

2 BACKGROUND

2.1 PROJECT DESCRIPTION

The Project is proposed on a greenfield site and comprises the construction, operation and decommissioning of the following major components:

- Two open cut operations, associated mining activities and mining infrastructure
- TLF to load coal onto trains and provide a new connection to the existing North Coast Rail Line
- Transport corridor to transport coal from the mine to the TLF.

The Project will be largely located within ML 80187 and ML 70002, which are adjacent to Mineral Development Licence (MDL) 468 and Exploration Permit for Coal (EPC) 1029, held by the joint proponents (Figure 2). It is intended that all aspects of the Project will be authorised by a site-specific Environmental Authority (EA). The proposed Project will involve mining a maximum combined tonnage of 10 Mtpa of semi-soft coking coal and high-grade thermal coal across the two open cut operations.

Development of the Project will commence in 2021 with initial early construction works and extend operationally for approximately 19 years (2039) until the depletion of the current reserve, with rehabilitation and mine closure activities completed by 2044. The Project estimates employing a peak workforce of approximately 222 people during construction, between 100 (2021) to 500 (2032) during operation, reducing to 20 during decommissioning, with CQC managing construction and ongoing operations with the assistance of contractors (CQC 2020).

2.2 IMPACT ASSESSMENT

Comprehensive ecological field surveys have been undertaken for the Project throughout the evolution of the EIS, SEIS v1, SEIS v2, and SEIS v3. The Project's impact assessment process, including field surveys, is described in full in the *Central Queensland Coal Project SEIS Version 3 (August 2020)* (CQC 2020). A summary of field surveys completed to date in relation to the impact assessment is provided below (field surveys completed to date in relation to the offset assessment are detailed in sections 6.2 and 6.3).

Flora surveys including:

- Summer (wet season) flora survey of EPC 1029 (five days) 21 to 25 March 2011, by Oberonia Botanical Services
- Spring (dry season) flora survey of EPC 1029 (five days) 25 to 29 September 2011, by Oberonia Botanical Services
- Summer (wet season) flora survey of ML 80187 and immediate surrounds (three days) 8 to 10 February 2017, by CDM Smith and Terrestria (led by Dr Andrew Daniel)
- Vegetation mapping and habitat quality assessments within ML 80187 in July and August 2018, by 3D Environmental (led by David Stanton)
- Vegetation mapping and habitat quality assessments within ML 70002 and Mount Bison Road in November 2019, by 3D Environmental (led by David Stanton)
- Ground-truthing of regional ecosystems (RE) listed under the *Vegetation Management Act 1999* (Qld: VM Act), vegetation mapping and BioCondition assessments within ML 80187, including Deep Creek, throughout October 2019 to June 2020, by CO2 Australia (led by Dr Jarrad Cousin).

Fauna surveys including:

- Summer (wet season) fauna survey of EPC 1029 (five days) 21 to 25 March 2011, by ecological consultant Ed Meyer and Oberonia Botanical Services
- Spring (dry season) fauna survey of EPC 1029 (five days) 25 to 29 September 2011, by ecological consultant Ed Meyer and Oberonia Botanical Services
- Targeted threatened fauna survey for species listed under the *Nature Conservation Act 1992* (Qld: NC Act) and/or EPBC Act of EPC 1029 (four days) 7 to 10 February 2012, by Ed Meyer
- Summer (wet season) fauna survey of ML 80187 and immediate surrounds (six days) 8 to 13 February 2017, by CDM Smith (led by Brett Taylor)
- Supplementary fauna data obtained during water quality sampling events on ML 80187 and the wider surrounds, including remote camera surveys, bird surveys/nest searches, herpetofauna searches and spotlight throughout May 2017 to June 2018, by CDM Smith
- A series of surveys targeting koala, greater glider, threatened microbats, and other relevant threatened fauna species within the eastern part of the Project area, and particularly Deep Creek, during November 2019, by Austecology (led by Lindsay Agnew (Austecology 2020b)
- Habitat suitability assessments and target species surveys within the western part of the Project area, during December 2019, by Austecology (led by Lindsay Agnew) (Austecology 2020a)
- Assessments along a tributary of Deep Creek located within ML 80187 and in the north of Mamelon, to support preparation of habitat condition impact assessments for ornamental snake, including three nights of spotlighting in May 2020, by CO2 Australia (led by Dr Jarrad Cousin).

Aquatic surveys including:

- Winter (dry season) aquatic ecology survey of EPC 1029 (six days) 1 to 6 June 2011, by ALS Water Sciences
- Yeats (2012) contracted GHD Water Sciences to carry out two targeted seasonal surveys of local and Project associated groundwater bores for the presence of stygofauna from 21 to 24 November 2011 and 15 to 18 March 2012
- Summer (wet season) aquatic ecology survey of ML 80187 and immediate surrounds (three days) 11 to 13 February 2017, by CDM Smith (led by Brett Taylor)
- A general assessment of groundwater dependant ecosystems (GDE) associated with the Project area during February 2018, by CDM Smith
- Targeted assessment of GDEs including stable isotope sampling and leaf water potential measurements on vegetation communities potentially impacted by groundwater drawdown in August 2018, by 3D Environmental (led by David Stanton)
- Surveys of freshwater turtles at Deep Creek and Tooloombah Creek waterholes carried out by CDM Smith in June and September 2017.
- A targeted vegetation assessment of the wetland flora values of two mapped wetlands located within the ML carried out by CDM Smith in January 2018.
- Analysis of water samples collected by CDM Smith personnel in Deep Creek and Tooloombah Creek in July 2018 for radon isotopes and the stable isotopes of water to better understand the relationship between surface water and groundwater.

- New technical studies completed from 2019 to 2020, as summarised in *Technical Report – Groundwater Dependent Ecosystems, Aquatic Ecology, Marine Ecology and the Great Barrier Reef* prepared for CQC by Eco Logical Australia (ELA 2020).

3 RELEVANT OFFSET POLICIES

3.1 EPBC ACT ENVIRONMENTAL OFFSETS POLICY

The EPBC Act Environmental Offsets Policy (DSEWPC 2012) outlines the Commonwealth Government's requirements for the provision of environmental offsets under the EPBC Act to compensate for residual adverse impacts on MNES. Under the EPBC Act Environmental Offsets Policy, offsets are only required for MNES where the 'residual impacts' (i.e. impacts that remain after avoidance and mitigation measures have been applied) are assessed as 'significant' in accordance with the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoE 2013).

The offsets assessment guide has been developed to support application of the EPBC Act Environmental Offsets Policy to determine the suitability and quantification of offsets to compensate for significant residual impacts on MNES.

The EPBC Act Environmental Offsets Policy requires that offsets must deliver an overall conservation gain that compensates for the significant residual impacts associated with the development. A suitable offset must:

- deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action
- be built around direct offsets but may include other compensatory measures
- be in proportion to the level of statutory protection that applies to the protected matter
- be of a size and scale proportionate to the residual impacts on the protected matter
- effectively account for and manage the risks of the offset not succeeding
- be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs
- be efficient, effective, timely, transparent, scientifically robust and reasonable
- have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

3.1.1 Offset Delivery Options

Under the EPBC Act Environmental Offsets Policy, offsets can comprise direct offsets and other compensatory measures. In addition, CQC may also choose to provide advanced direct offsets for future use.

Direct offsets

Direct offsets are those actions that provide a measurable 'conservation gain' for an impacted protected matter. A conservation gain is a benefit which maintains or increases a MNES' viability or reduces any threats of damage, destruction or extinction to the MNES. Direct offsets may involve:

- acquisition of good or better-quality land for enduring protection through inclusion in the conservation estate (including covenanting arrangement on private land)

- maintenance or improvement of land targeted toward the impacted value, including rehabilitation of existing vegetation in poor condition or revegetation of environmentally degraded land
- rehabilitation and protection of regrowth vegetation.

Under the EPBC Act Environmental Offsets Policy, direct offsets must account for a minimum of 90% of the offset package, except where:

- greater benefit can be demonstrated for the MNES through other compensatory measures, or
- scientific uncertainty is so high that direct offsetting is not possible.

Other compensatory measures

Under the EPBC Act Environmental Offsets Policy, offset packages must be built around direct offsets but may include up to 10% other compensatory measures. Other compensatory measures are actions that do not directly offset the impacts on the MNES but are anticipated to lead to benefits for the impacted MNES, for example, funding for research or education programs.

A suitable research or education program must:

- endeavour to improve the viability of the impacted MNES value
- be targeted toward key research/education activities as outlined in relevant Commonwealth Government approved recovery plan, threat abatement plan, conservation advice, ecological description, management plan or listing advice. If this information is unavailable for the MNES value additional relevant State information sources or peer reviewed scientific literature will be considered by the department.
- be undertaken in a transparent, scientifically robust and timely manner
- be undertaken by a suitably qualified individual or organisation approved by the department
- consider best practice research approaches.

3.2 QUEENSLAND ENVIRONMENTAL OFFSET FRAMEWORK

The Queensland Environmental Offset Framework comprises the:

- Environmental Offsets Act 2014
- Environmental Offsets Regulation 2014
- Queensland Environmental Offsets Policy, Version 1.8 (DES 2020).

Offsets may only be required under the Queensland Environmental Offset Framework where a proposed activity is likely to result in a significant residual impact on a MSES listed in Schedule 2 of the Environmental Offsets Regulation 2014.

The Queensland Environmental Offset Framework currently does not apply to impacts on MNES and it remains the responsibility of the Commonwealth Government to assess if offsets are required for a controlled action under the EPBC Act. However, where the Commonwealth Government has assessed an activity as a controlled action and determined that an offset is, or is not, required, the Queensland Government Department of Environment and Science (DES) cannot impose an offset condition for an impact on the same, or similar, matter.

Offsets under the Queensland Environmental Offset Framework may be delivered as land-based offsets, financial settlement offsets, staged offsets or advanced offsets and those relevant to this Project are described further in the sections that follow.

3.2.1 Land-Based Offset

A land-based offset:

- may be provided in areas that contain remnant or non-remnant RE
- has a maximum requirement of four times the area of impact on each MSES (i.e. the maximum offset ratio for a matter is 1:4)
- must provide a gain in habitat quality suitable to compensate for the loss of habitat quality at the impact site, to achieve a conservation outcome for the impacted MSES. Habitat quality is assessed using a combination of indicators that measure the overall viability of the site and its capacity to support a prescribed environmental matter.

The Guide to Determining Terrestrial Habitat Quality, Version 1.2 (DEHP 2017) has been developed to measure the habitat quality at the impact site and offset site in order to adequately assess the suitability of the proposed offset to provide a conservation outcome. Habitat quality is identified as a score between 1 and 10 based on an assessment of three key indicators:

- site condition, the general condition of the vegetation compared to a benchmark or reference site
- site context, an analysis of the site in relation to the surrounding environment
- species habitat index, ability of the site to support a species.

Once the relevant habitat quality scores for the impact and proposed offset areas has been calculated, the land-based offsets multiplier calculator is then used to assist in determining the relevant offset ratio by comparing the habitat quality of an impact site and offset site to ensure a habitat quality gain can be met.

3.2.2 Financial Settlement Offset

A financial settlement offset is a payment for a significant residual impact on a MSES. It must be calculated in accordance with the Financial Settlement Offset Calculation Methodology, which has been incorporated into a web-based calculator, the Financial Settlement Offset Calculator. The financial settlement amount must be agreed with the administering agency as part of the agreed delivery arrangement, and the agreed financial settlement must be paid in full to the offset account that is administered by DES. A project's offset requirements are met on payment in full of the agreed financial settlement amount into the relevant offset account. It is important to note that Queensland financial settlement offsets cannot be used to acquit offset requirements for MNES.

4 AVOIDANCE AND MITIGATION MEASURES

The Project measures to avoid and reduce impacts to MNES and MSES are based on the following hierarchy:

1. Avoid direct and indirect adverse impacts to MNES and MSES
2. Mitigate and manage any unavoidable direct and indirect adverse impacts to MNES and MSES
3. Monitor potential impacts to MNES and MSES
4. Implement remediation and rehabilitation of impacted areas to promote long-term recovery of MNES and MSES, and for any significant residual impacts provide offsets.

The Project's proposed impacts, avoidance, mitigation, management and monitoring measures are described in detail in the *Central Queensland Coal Project SEIS Version 3 (August 2020)* (CQC 2020).

4.1 AVOID DIRECT AND INDIRECT IMPACTS

An options analysis was undertaken to evaluate the relative social, economic and environmental advantages and disadvantages of different Project scenarios. The analysis included consideration of a range of environmental factors such as:

- the location of protected or declared environmental areas
- mapped areas of biodiversity significance
- the presence of matters of national and state environmental significance (MNES and MSES) including, but not limited to, remnant vegetation, wetlands and fauna habitat
- the location of surface water features
- maximising the use of existing infrastructure such as power supply, telecommunications infrastructure and transportation options, including proximity of mine site to existing ports.

The outcomes of this analysis were used to select the final Project location in the context of the location of coal deposits within EPC 1029, MDL 468 and later ML 80187. The final Project Site is located in close proximity to both the Bruce Highway and the North Coast Rail Line, which the Project will utilise to transport coal to the existing Dalrymple Bay Coal Terminal at the Port of Hay Point. It also has direct access to a 22kv powerline and telecommunications cabling located within the Bruce Highway road corridor.

At the site level, Project infrastructure has been preferentially sited to avoid impacts on threatened ecological communities, environmentally sensitive areas, wildlife corridors and mapped wetlands, and to minimise impacts to regulated and riparian vegetation. Existing disturbed areas (such as farm access tracks or clearings) have been used to site infrastructure and reduce impacts to MNES and MSES to the greatest extent possible. Of the total Disturbance Area (1,372.50 ha) approximately 90% is located within non-remnant vegetation which has been previously cleared for cattle grazing (1,231.13 ha) (Figure 2).

Through the EIS and SEIS process, refinement of Project design has sought to further avoid and minimise impacts on environmental values. Since the finalisation of SEIS v2, additional changes made to avoid impacts on environmental values include:

- excising 349 ha from the southern extent of ML 80187 to reduce the overall size of the Project Site
- complete removal of Dam 2 to avoid impacts on least concern RE 11.3.27 (freshwater wetlands) and of concern RE 11.4.2

- relocating Environmental Dam 2D from within an area of concern RE 11.3.4 into non-remnant areas adjacent to the Haul Road
- retracting the Open Cut 2 pit northern end wall by 40 m to the south to increase the buffer between the mine and endangered RE 11.3.11
- redesigning, reconfiguring or removing the Waste Rock Stockpiles in order to reduce the stockpile slopes and locating them out of the flood zone to the greatest extent possible
- consolidating water storages and increasing the size of Dam 1 within areas of non-remnant vegetation to increase storage capacity and reduce the potential for controlled and uncontrolled releases to the receiving environment.

In addition to the location and design of Project infrastructure, the technology used in mining processes can greatly influence the level of environmental impact of an activity and ensure operations are conducted as efficiently as possible. This efficiency can translate to a smaller footprint (the amount of surface area disturbed), less waste generated and cleaner and safer operations. Technologies that have been factored in to the Project design to reduce impacts on the environment include:

- designing and constructing the final rehabilitated landform to integrate with the surrounding environment, with no final void to remain
- the avoidance of tailings storages through the implementation of paste thickeners and filter pressing technology, allowing process water to be recycled (approximately 60%), reducing water losses, process chemical losses, seepage and reducing processing plant water demand, as well as eliminating the risk of potential leaks or releases to the receiving environment from tailings storages
- installing an overhead bin and train loading facility from the start of the operations to minimise coal dust and the potential loss of coal during train transit.

149°36'0"E
149°38'0"E
149°40'0"E
149°42'0"E
22°40'0"S
22°42'0"S
22°44'0"S
22°46'0"S

EPC 1029
ML700022
ML80187
MDL 468
EPC 2128
ML700022
ML80187

Mamelon
Project MLs
Exploration Permit - Coal
Mineral Development Licence

Central Queensland Coal

Figure 2:
Project disturbance area and areas considered for offsets

Mamelon
Project MLs
Excised ML80187 area
Project footprint (direct impact area)
Indirect impact area
Area considered for offsets

Mapped vegetation status
Remnant
Non-remnant

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Exploration Permit - Coal
- Mineral Development Licence
The following datasets were provided by CQC
- Project MLs (amended)
- Project footprint and indirect impact area

Date: 8/11/2020 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:47,500@A3

0 0.5 1 1.5 2
Kilometres

N

CO2 Australia

Location diagram

Queensland
Brisbane

4.2 MITIGATE AND MANAGE UNAVOIDABLE DIRECT AND INDIRECT IMPACTS

Measures and strategies to mitigate and manage unavoidable direct and indirect impacts are included in the following Project management plans:

- **Environmental Management Plan** (EMP) - which includes – Land Use Management Plan (LUMP), Noise and Vibration Management Plan, Waste Management Plan, Water Management Plan, and Groundwater Management and Monitoring Plan. The LUMP consists of the following: Biodiversity Management Strategies, Weed and Pest Management Plan (WPMP), and Bushfire Management Plan (BfMP).
- **Significant Species Management Plan** (SSMP) - The purpose of the SSMP is to reduce the environmental impacts of the Project on listed species and communities, through the development of mitigation and monitoring measures for implementation prior to construction, during construction, during operations and as part of the decommissioning process.
- **Groundwater Dependent Ecosystem Monitoring and Management Plan** (GDEMMP) - which describes the program for monitoring and management for GDEs, including stygofauna, groundwater fed pools and associated aquatic habitats, riparian vegetation, and their associated groundwater resources. Triggers are outlined which will be evaluated, with corrective actions identified for implementation in response to the monitoring results.
- **Receiving Environment Monitoring Program** (REMP) – monitoring the health of wetlands, streams and riparian vegetation adjacent to the Project for indirect impacts such as water level reductions (in permanent waterholes), dust and surface water contamination
- **Progressive Rehabilitation and Closure Plan** (PRCP) – detailing all aspects of the progressive rehabilitation of the Project's mining areas including landforms, rehabilitation schedule, plant species selections, goals and objectives, and rehabilitation monitoring;
- **Erosion and Sediment Control Plan** (ESCP) – detailing CQC's approach to managing erosive soils and potential water quality contamination resulting from exposed soils during construction and operation of the Project.

As per the Project's EMP and SSMP, Project wide mitigation and management measures for implementation prior to construction, during construction, during operation and during decommissioning are summarised in Table 1, with these measures relevant to all MNES and MSES within the Project area. Fauna-specific mitigation and management measures for MNES and MSES addressed in this BOS in the Project area are outlined in the following section (4.2.1).

Table 1: Project wide mitigation and management measures for MNES and MSES (OE 2020)

Potential impacts	Mitigation and management measures
Vegetation clearing, land degradation and habitat fragmentation	Pre-clearing: ▶ No remnant vegetation clearing until relevant approvals obtained. ▶ Clearing boundaries delineated on all drawings and in field to define extent of authorized/permitted clearing. ▶ Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions. ▶ Installation of vegetation clearance markers (e.g. high visibility poly-web fencing) prior to commencement of remnant vegetation clearing to identify and protect remnant vegetation for retention. ▶ Clearly define all areas not directly affected by construction/mining activities to delineate limits of disturbance, with no unauthorised disturbances occurring outside defined disturbance areas. ▶ Pre-clearing surveys are to be undertaken by suitably experienced and licensed spotter/catchers in advance of remnant vegetation clearing and pre-empting such operations with suitable lead times to ensure specific management and mitigation measures can be implemented. ▶ Timing of vegetation clearing (particularly areas of remnant vegetation) selected in order to minimise impacts (direct and indirect disturbances) to affected fauna habitats during optimum breeding periods. ▶ No clearing is to commence without the presence of a suitably experienced and licensed spotter/catcher. ▶ Suitable buffer distances for sensitive locations established and clearly marked as 'no go zone' until spotter/catcher authorises clearing in area can commence/continue. ▶ Habitat trees are to be identified in field and by plan prior to commencement of clearing operations.
	During clearing: ▶ Marked habitat trees are to be dismantled using a cherry picker and a suitably qualified arborist and spotter/catcher. Hollows containing fauna shall be blocked, removed from tree and gently lowered to ground, with species relocated to a pre-identified, suitable site. Areas inaccessible to cherry picker requiring hollow removal shall use a hydraulic grabber to remove and gently lower to ground. ▶ No remnant vegetation clearing is to be conducted between the 1700hrs and 0500 hours unless subject to area-specific exemptions identified in the management plan. ▶ Conduct clearing in a sequential manner, with the direction of sequential clearing away from disturbance area and towards any retained vegetation or habitat links. ▶ Along the interface between clearing precincts and retained remnant habitat, trees are to be felled towards the clearing precinct to avoid damage to adjacent retained remnant habitat. ▶ To ensure the seed bank in removed soil is preserved as much as practical, stockpiling of topsoil will be undertaken in accordance with best practice storage guidelines.
	Post-clearing: ▶ Cleared vegetation is to be stockpiled so as not to impede wildlife, surface drainage and avoid damage to adjacent retained vegetation. ▶ Cleared material should not be deposited in or adjacent to watercourses, with setbacks to waterways as defined by approval permits enforced. ▶ Wherever practicable, all remnant vegetation removed should be reused, either within the offset areas and/or within the rehabilitation areas. Logs and large rocks should be placed in nearby vegetation or adjacent to such vegetation to create shelter habitat for terrestrial fauna species. These 'stock piles' may then be used during later operations to create artificial habitats within rehabilitation areas. ▶ Post-disturbance reconstructed landforms to be contoured to resemble the original local topography as far as practical.
	Access related clearing/degradation/fragmentation: ▶ Avoiding additional clearing of remnant vegetation for construction vehicle access tracks, truck turning areas and extra workspaces, etc., with a track plan developed for areas of retained habitat and rehabilitation, and site protocols established to restrict authorised area access to the approved track network identified in plan. ▶ Off-road driving will be prohibited unless otherwise authorised by Site Manager. ▶ Temporary access tracks are to be contained within the Project operational footprint where possible, with tracks outside this area agreed with the Environment Manager prior and to be maximum of three metres in width, or required vehicle width plus one metre.
Fauna mortality and injury	▶ Wildlife assessment/rescue services are to be engaged prior to vegetation clearing, to assess appropriate site clearing approaches to minimise deleterious impacts to fauna. Spotter/catcher services (wildlife handlers) are to be employed during vegetation clearing activities. ▶ Spotter/catcher services (wildlife handlers) must only be undertaken by those identified on a current site-specific Damage Mitigation Permit (Removal and Relocation of Wildlife) from Queensland Department of Environment and Science and appropriate Animal Ethics Permit from the Department of Employment, Economic Development and Innovation. ▶ Where badly injured fauna requires euthanasia, only personnel suitably licensed shall undertake such actions. The Australian National Health and Medical Research Council's Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (2004) are to be followed when dealing with injured fauna. Alternatively, any injured fauna should be taken to the nearest veterinary clinic. ▶ Development and implementation of protocols for the relocation of any displaced fauna must be prepared prior to clearing operations. ▶ A register of fauna incidents/interactions needs to be maintained daily during clearing operations. ▶ Fauna shall not be fed and direct contact with fauna is to be avoided. This includes both native and introduced species. ▶ Identify barriers to safe fauna movement and remove or modify these barriers where possible (external to the open cut mine and infrastructure operational areas). ▶ Implement measures to reduce fauna mortality on roads. ▶ Vehicle speed limits will be imposed and enforced on Project roads. ▶ All fauna mortalities and injuries will be reported to the Site Manager within 24 hours and recorded within the incident reporting system. ▶ Establishment of fauna exclusion fences to prevent fauna inadvertently re-entering the open cut mine operational areas. ▶ Monitoring of the movements of, and any incidents involving, the fauna populations will identify if there is the need for erection of fauna exclusion fencing around active quarry. If required, fencing should be designed and located with the assistance of an ecologist.

Potential impacts	Mitigation and management measures
	▶ The use of barbed wire should be avoided and used only where essential to exclude stock from adjoining pastoral activities. Where the use of barbed wire cannot be avoided, the fence design should incorporate alternate strands of plain wire and barbed wire, e.g. top strand plain wire, middle strand barbed wire and bottom strand plain wire. ▶ Existing boundary fences associated with any offset areas should be retrofitted to meet the above recommendations (assuming there is no conflict with existing/approved rights of use). ▶ All personnel shall attend environmental training prior to entering the work site. As part of this training, all personnel will be briefed about their obligations to protect fauna. ▶ Awareness training will identify conservation significant fauna and habitat and discuss relevant management measures, personnel/contractor responsibilities, and incident reporting requirements (i.e. reporting of fauna observations and/or incidents).
Pest animals	▶ The proposed development will not deliberately introduce any invasive species. ▶ Companion animals (e.g. dogs) are to be banned from all construction and operational areas. ▶ Feral animal control strategies to be developed and implemented including, but not be limited to, the design and implementation of an ongoing eradication program which targets pest animals (especially cats, dogs and foxes) and an ongoing systematic monitoring program to detect the occurrence of feral animals and to assess the success of the control/eradication program. ▶ All sightings of non-indigenous fauna and conservation significant fauna will be reported to the Site Manager. ▶ Implementation of a program to ensure strict litter/waste control throughout the construction and operational works on site, supported by: site-wide signage; an adequate number of litter bins (which by design exclude birds and vermin); bin clearance on a regular basis; daily maintenance of crib rooms to ensure cleanliness; educational signage within crib rooms on the linkage between poor waste management practices, increases in pest animal populations and subsequent impacts to native fauna. ▶ Implementation of design features for permanent structures and temporary site facilities (e.g. construction site offices. etc.) which minimise harbourage or roost opportunities for vermin and animal pests.
Weeds	▶ A weed management plan will be implemented during both construction and operational phases, with control strategies to be developed and implemented including, but not be limited to, design and implementation of an ongoing eradication program which targets environmental weeds and an ongoing systematic monitoring program to detect the occurrence of environmental weeds and to assess the success of the control/eradication program. ▶ Prior to commencement of clearing operations, a survey of weed species is to be undertaken in order to identify areas requiring treatment. ▶ All weed infestations within the construction area are to be treated and/or removed where practical from the clearing precinct prior to clearing. ▶ All construction machinery entering the site shall be free of soil, weeds, soil pathogens and pest species. ▶ Designated wash down points for vehicles and plant entering the site will be established and plant will be inspected prior to mobilisation and demobilisation. A register of vehicle approval certification is to be developed and maintained. ▶ It will be mandatory that vehicles and equipment to be used within areas of retained habitat are subject to a separate, more detailed and comprehensive wash-down before entering such areas. The remainder of the workforce vehicles/equipment will be required to stay on Project/site approved roads and designated works areas to minimise contact with weeds.
Fire	▶ The risk of high-intensity fires within retained vegetation/habitat and rehabilitation will be addressed through adoption of Bushfire Management Plan implemented for life of the Project, with management strategies to mitigate fire impacts on vegetation/habitat consistent with best practice and regional approaches.
Noise	▶ Mine blasting and piling will only occur during daylight hours during the construction and operation phase of the Project.
Dust	▶ Key measures to prevent dust include through planning and sequencing of exposed soils; stockpile design and stabilisation; suppression activities for coal stockpiles and haul roads, access tracks and work areas; and progressive rehabilitation of disturbed areas. ▶ Dust generation will be monitored visually and corrective actions applied where train loading is generating dust or dust lift off is travelling beyond the lease boundary. ▶ A comprehensive suite of dust suppression techniques will be implemented to minimise impacts to areas of retained vegetation/habitat and rehabilitation which are in proximity to operational areas, including: ▶ availability of water trucks to provide dust suppression on haul and light vehicle roads ▶ water sprays on stacker/reclaimer units ▶ maintaining high moisture content of product coal and reject material as they leave the CHPP ▶ train loadout to incorporate veneering.
Lighting	▶ Any proposed site lighting will be designed to ensure that leakage of artificial light onto adjoining retained habitat is avoided.
Surface hydrology, sedimentation and pollutants	▶ Preparation and implementation of the REMP prior to construction activities on site will ensure changes to surface water quality and hydrology are minimised by control of erosion and sediment (through land management and stock removal, engineered erosion and sediment controls), control of pollutants and contaminants, monitoring for seepage, ongoing water quality management and monitoring.
Groundwater drawdown	▶ The GDEMMP will ensure ongoing monitoring and management of GDEs within and surrounding the Project Area.

4.2.1 Fauna-specific mitigation and management measures

As part of the Project's SSMP, management plans have been developed to manage key issues during the construction and operation of the project. The aim of these management plans is to ensure that native fauna continue to use existing habitat, notwithstanding the ongoing changes occurring to their habitats and surrounds. These management plans are based on an adaptive management approach where management actions are regularly reviewed and, if necessary, modified based on monitored changes in environmental condition and/or changes in base knowledge which underpins the original management approach.

Management plans have been developed for the following key issues:

- Pre-clearing Planning and Surveys for Threatened Fauna Habitat
- Vegetation Clearing Operations within Threatened Fauna Habitat
- Animal Welfare
- Management and Control of Introduced Fauna
- Management and Control of Invasive Weeds
- Vehicle Interactions with Fauna
- Road Design and Fauna Crossing Treatments, and
- Artificial Lighting Impacts on Retained Habitat.

Each management plan is presented in a standardised format to identify / address the following elements:

- Objective
- Implementation Requirements
- Performance Indicators
- Responsible Persons and Key Actions
- Auditing and Reporting
- Corrective Action, and
- Timing.

In accordance with the Project's SSMP, the following fauna-specific mitigation and management measures are proposed in order to reduce the scale and intensity of the Project's potential direct impacts on the key fauna species of relevant to this BOS – greater glider, koala, squatter pigeon and ornamental snake.

Greater glider

- Vegetation clearing is to be undertaken in a sequential manner that ensures greater glider within the area being cleared have enough time to move out of the clearing site without human intervention.

- Strict adherence to protocols for activities involving the removal of any hollow-bearing habitat tree within greater glider habitat including, under the supervision of an ecologist, strategies for pre-clearing, pre-felling[1], felling[2], and post-felling[3].
- No clearing of mapped greater glider habitat is to commence without the presence of a suitably qualified and experienced ecologist.
- Design a suite of dedicated road crossing treatments to be implemented where the proposed access road transects the Deep Creek riparian habitats. Treatments to include installation of wooden poles of sufficient height and located along the full extent of the riparian habitat edge on either side of the clearing for the road crossing.
- To reduce the impact of project night lighting on habitat:
  - In working areas adjacent to habitat, lights should be shielded beyond full cut-off to ensure that light falls only on the intended surfaces, and minimise direct light above the horizontal and minimise light spill (e.g. < 8 Lux) along habitat edges.
  - Lighting adjacent to habitat is to be designed to avoid the use of ultraviolet light and adjacent short wavelengths. LED lights have no ultraviolet emissions, *c.f.* mercury vapour lamps, though also metal halide. Where full-spectrum lighting is an essential requirement, then the lowest possible colour temperature should be employed.
  - Design of lighting for the road crossing over Deep Creek and roads within remnant habitat on the western side of the project area should be restricted to the minimum necessary to meet safety standards (e.g. <50 Lux). Within these areas, consideration should be given to the use of red light as it appears to have the least effect on other nocturnal mammals.
  - Lighting design to minimise impact to greater glider s and their habitat should be consistent with best practice and best available technology (e.g. Longcore and Rich 2016; ISDA 2018; DEE 2020).
- Implementation of a fire management plan to minimise the risk of high-intensity fires within retained greater glider habitat for the life of the Project.
- Implementation of invasive weed control to manage invasive weed infestations through an integrated approach that uses a variety of methods to maximise control of lantana infestations, e.g. herbicides, mechanical removal, fire, biological control and revegetation.
- Specific hygiene procedures will be designed to prevent the introduction and spread of *Phytophthora cinnamomi* within remnant vegetation areas retained outside the project disturbance area (e.g. vehicle washdown stations, and footwear cleaning stations) and consistent with best practice guidelines (e.g. DEE 2014).
- All new fencing within or adjacent to retained habitats should exclude barbed wire. In places where existing fences are required for stock control, as a minimum, the top one or two strands should be replaced with high tensile plain wire. For short sections of existing barbed wire fencing, particularly in

[1] e.g. tree to be mechanically shaken or agitated prior to felling to encourage any remaining animals to either leave the tree or show themselves and subsequently be removed prior to felling.

[2] e.g. felling should involve gently pushing the tree and lowering or felling using a forestry harvester (or similar, though not a bulldozer) to avoid sudden falling as this is likely to injure wildlife.

[3] e.g. felled habitat trees are to be left overnight (in an adjacent habitat area if required) to allow any undetected individuals further opportunity to escape.

entanglement 'hot spots', interim alternatives are either to make the fence more obvious is by installing metal tags at 30 cm intervals along the top wire strand, or cover barbs of the top strand with lengths of split poly pipe.

Koala

- Vegetation clearing will be undertaken in a sequential manner that ensures koalas within the area being cleared have enough time to move out of the clearing site without human intervention. This procedure, and others associated with habitat clearing (e.g. pre-clearance surveys) are to be consistent with *Nature Conservation (Koala) Conservation Plan 2017*[4].
- No clearing of mapped Koala habitat is to commence without the presence of a suitably qualified koala spotter.
- To reduce the risk of vehicle strike:
  - Establish enforceable maximum vehicle speed limits
  - Establish road signage to increase awareness of koalas in the area
  - Design a suite of dedicated road crossing treatments to be implemented where the proposed access road transects the Deep Creek riparian habitats. Treatments to include grade-separated crossings with dedicated fauna movement underpasses (including underpass 'furniture') and specific roadside treatments (e.g. Koala directional and exclusion fencing, refuge poles, and kerb-side vegetation management).
- To reduce the risk of dog attack:
  - domestic dogs will be prohibited within the project area during both construction and operational phases.
  - Wild dog control is to be incorporated within the suite of feral animal management strategies to be implemented within the project area during both construction and operational phases.
- Implementation of a fire management plan to minimise the risk of high-intensity fires within retained koala habitat for the life of the Project.
- Implementation of invasive weed control to manage invasive weed infestations through an integrated approach that uses a variety of methods to maximise control of lantana infestations, e.g. herbicides, mechanical removal, fire, biological control and revegetation.
- Specific hygiene procedures will be designed to prevent the introduction and spread of *Phytophthora cinnamomi* within remnant vegetation areas retained outside the project disturbance area (e.g. vehicle washdown stations, and footwear cleaning stations) and consistent with best practice guidelines (e.g. DoE 2014b).
- Where fencing is required within or adjacent to retained habitats, it will be designed to allow koalas to move through it, excluding those instances where fenced areas seek to protect fauna from threats (e.g. koala exclusion fencing).

Squatter pigeon

- Vegetation clearing is to be undertaken in a sequential manner that ensures squatter pigeons within the area being cleared have enough time to move out of the clearing site without human intervention.

[4] Part 3 Clearing in particular areas. Nature Conservation (Koala) Conservation Plan 2017. Current as at 7 February 2020.

- No clearing of mapped potentially suitable breeding habitat is to commence without a targeted pre-clearing survey being completed, and throughout clearing operations, the presence of a suitably qualified and experienced ecologist.
- Implementation of a fire management plan to minimise the risk of high-intensity fires within retained squatter pigeon habitat for the life of the Project.
- Implementation of invasive weed control to manage invasive exotic grasses and woody weeds through an integrated approach that uses a variety of methods to maximise control of lantana infestations, e.g. herbicides, mechanical removal, fire, biological control and revegetation.
- The implementation of controlled livestock grazing regimes could encourage suppression of exotic pasture grasses, assist in fuel management to avoid high intensity bushfires, and assist natural regeneration of foraging trees and prevent further degradation of habitat. The strategy of including controlled livestock grazing will need to be considered as part of the balance of benefits for all threatened fauna species which may use the same habitat.
- Specific hygiene procedures will be designed to prevent the introduction and spread of *Phytophthora cinnamomi* within remnant vegetation areas retained outside the project disturbance area (e.g. vehicle washdown stations, and footwear cleaning stations) and consistent with best practice guidelines (e.g. DoE 2014b).
- All new fencing within or adjacent to retained habitats should exclude barbed wire. In places where existing fences are required for stock control, as a minimum, the top one or two strands should be replaced with high tensile plain wire.
- Feral cat, fox, and pig controls will be incorporated within the suite of feral animal management strategies to be implemented within the project area during both construction and operational phases.

Ornamental snake

During the Project's pre-construction phase:

- Site preparation -
  - Specific nocturnal (spotlighting) searches for ornamental snake to be conducted within designated vegetation clearing areas prior to vegetation clearing (remnant or non-remnant) where it occurs within mapped 'potential habitat' within the site. Also daytime searches to look for individuals under debris on the ground (e.g. fallen timber, man-made debris).
  - Where possible searches to be carried out during favourable conditions as per the Department's survey guidelines (September to March - warm and not too dry with days warmer than 25 degrees).
  - Individuals to be relocated to a predetermined site comprising similar habitat located outside of the overall Project footprint within the Mamelon property, or adjacent lands where permission is obtained.
  - Locations of any individuals to be recorded by the Environmental Officer on a dedicated fauna register.

During the Project's construction and operation phase:

- Vegetation clearing -

- Specific searches for ornamental snake to be conducted within designated vegetation clearing areas (remnant or non-remnant and prior to clearing occurring) where it occurs within mapped 'potential habitat' within the site. Searches to look for individuals under debris on the ground (e.g. fallen timber, manmade debris).
- Individuals to be relocated to a predetermined site comprising similar habitat located outside of the overall Project footprint within the Mamelon property, or adjacent lands where permission is obtained.
- Locations of any individuals to be recorded by the Environmental Officer on a dedicated fauna register,

- Earthworks –
  - Where trenching is carried out on site as part of Project construction activities – a fauna spotter will inspect open trenches for fauna prior to any activity being carried out each morning
- Road mortality –
  - General measures to be applied across the site are considered sufficient to manage risk on Ornamental Snake individuals (refer to LUMP).

During the Project's post-operation and decommissioning phase:

- No specific measures are recommended, refer to Project wide mitigation and management measures (Table 1) under:
  - Vegetation clearing, land degradation and habitat fragmentation
  - Fauna mortality and injury
  - Pest animals
  - Weeds.

4.2.2 Revegetation and rehabilitation of the riparian corridor

Potential indirect impacts on riparian vegetation will be mitigated through the active management of areas of Deep Creek, located within Mamelon, and which are likely to be affected by groundwater drawdown (referred to as the riparian corridor). This will involve revegetation and rehabilitation of the riparian corridor with the aim of building ecological resilience. Revegetation will include expansion of the existing riparian corridor by a width of 10 m. A revegetation program will be designed and implemented to ensure the planting of drought tolerant species of similar ecological function as those with the potential to be impacted.

4.3 IMPLEMENT PROGRESSIVE REHABILITATION AND OFFSETS

Central Queensland Coal will implement a PRCP. The PRCP will be prepared to outline the specific operational activities required to complete the rehabilitation and decommissioning of the Project. The PRCP will include monitoring and management of:

- Wastewater collection and treatment systems
- Groundwater quality and levels
- Surface water quality and flows
- Seepage rates
- Erosion rates

- Integrity and stability of the final landform slopes and associated drainage lines
- Health and resilience of vegetation cover.

CQC will seek to achieve the following overarching rehabilitation and decommissioning goals to address the general rehabilitation goals as nominated in the Queensland Government's Guideline(s) by:

- Providing final landforms with similar land use capabilities and / or suitability as those which existed prior to the disturbance, unless other beneficial land uses are pre-determined and agreed with key stakeholders throughout the mining operations (post-mining landowners, managers and relevant regulators);
- Rehabilitation of disturbed land as soon as practicably available so that it presents a negligible safety or environmental risk in terms of stability;
- Providing land that is self-sustaining to agriculture and/or ecosystem processes where maintenance requirements are negligible and consistent with an agreed post-mining land use; and
- Maintaining the water quality and quantity acceptable for existing and future users within or surrounding the site.

These overarching goals will provide for a post-mining site that is physically safe to human and animals, geotechnically stable, non-polluting and capable of sustaining the agreed post-mining land uses. These goals are consistent with the principles of ecologically sustainable development (ESD) as required by the EP Act.

The above overarching rehabilitation goals can be defined into short-term and long-term goals as outlined in the following below.

Short-term rehabilitation goals for the mine are to:

- Minimise clearing and vegetation disturbance consistent with operational requirements;
- Schedule operations including overburden and interburden emplacement and shaping, and revegetation (including temporary rehabilitation activities) to minimise visual exposure;
- Rehabilitate areas of disturbance not required for active mining operations or no longer required for mining related operations;
- Apply soil (topsoil / subsoil) and other available growth mediums (such as suitable weathered (regolith) materials) to the final landform based on material characterisation and availability to achieve the intended post-mining land use;
- Conduct rehabilitation monitoring and management to ensure that rehabilitation progress is trending towards the relevant final landform completion criteria;
- Design, construct and stabilise all earthworks, drainage lines and disturbed areas to minimise erosion and sedimentation; and
- Control vermin, feral animals and noxious weeds.

The overall long-term goal is to rehabilitate the land to a low maintenance, stable and safe landform that blends with the surrounding topography and maximises the return of agricultural land suitability comparable to pre-mining conditions. These long-term goals include:

- Post-mining rehabilitated landform to be suitable for low intensity cattle grazing land-use, with surrounding land being retained for managed natural regeneration, with a small section in the southern section of Mamelon set aside wholly for grazing land-use;

- Preservation of downstream water quality for ecological and existing beneficial uses;
- Establishment of a low maintenance, geotechnically stable landform commensurate with low-intensity grazing land-use;
- Design and construct the final rehabilitated landform to integrate with the surrounding environment, with no final void to remain within the rehabilitated landform; and
- Monitoring rehabilitation success in terms of physical and biological parameters.

For significant residual impacts on MNES and MSES associated with the Project, offsets will be provided to compensate in accordance with the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offset Framework.

5 SIGNIFICANT RESIDUAL IMPACTS AND OFFSETS

The Project is anticipated to have direct and indirect residual impacts on MNES and MSES based on the results of the detailed impact assessment work undertaken for the EIS and SEIS (section 2.2). The Project's anticipated residual impacts were subsequently assessed in accordance with the following guidelines to determine if a significant residual impact is likely to occur:

- Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoE 2013)
- EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoE 2015)
- EPBC Act referral guideline for the vulnerable Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DoE 2014a)
- Queensland Environmental Offsets Policy Significant Residual Impact Guideline (DEHP 2014).

The assessment concluded that despite the avoidance, mitigation and remediation measures proposed to be implemented (Section 4), the Project is likely to have significant residual impacts on a number of MNES and MSES for which offsets are required under the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offsets Policy, respectively.

A separate significant residual impact assessment for connectivity (a MSES) was undertaken using the Queensland Government's Landscape Fragmentation and Connectivity (LFC) tool. The results of this assessment determined that any Project impact on connectivity areas was not significant on account of there being no significant reduction in core remnant at the local scale nor any significant change from core to non-core remnant at the site scale (see Appendix A).

Table 2 provides a summary of the Project's significant residual impacts on MNES and MSES including CQC's proposed offset delivery method under the EPBC Act and the Queensland Environmental Offset Framework.

Table 2: Significant residual impacts and offset delivery under EPBC Act and Queensland Environmental Offset Framework

Protected Matter	EPBC Act status	Status under Qld legislation	Significant residual impact area (ha)			Offset delivery		
			Direct	Indirect	Total	Offset required?	Offset provided?	Type of offset
MNES								
Listed threatened species and ecological communities								
Greater glider (*Petauroides volans*)	V	V	115.7	165.2	281.0	Yes	Yes	Direct (land-based) offset under EPBC Act
Koala (*Phascolarctos cinereus*)	V	V	159.4	165.2	324.6	Yes	Yes	Direct (land-based) offset under EPBC Act
Squatter pigeon (southern) (*Geophaps scripta scripta*)	V	V	141.4	165.2	306.6	Yes	Yes	Direct (land-based) offset under EPBC Act
Ornamental snake (*Denisonia maculata*)	V	V	18.8	0	18.8	Yes	Yes	Direct (land-based) offset under EPBC Act
MSES								
Regulated vegetation[#]								
RE 11.3.4 (BVG 16c)	-	OC	1.4	39.3	40.7	Yes	Yes	Direct (land-based) offset under Queensland Environmental Offset Framework
RE 11.4.2 (BVG 17a)	-	OC	110.8	0	110.8	Yes	Yes	
Watercourse vegetation RE 11.3.4 (BVG 16c)	-	OC	0.5	3.8	4.3	Yes	Yes	Direct (land based) offset under Queensland Environmental Offset Framework
Watercourse vegetation RE 11.3.25 (BVG 16a)	-	LC	10.7	68.1	78.8	Yes	Yes	Combination of direct (land based) offset and financial settlement offset under Queensland Environmental Offset Framework
Essential habitat for greater glider	-	-	0	15.0	15.0	No*	Yes	Direct (land-based) offset under EPBC Act
Essential habitat for koala	-	-	96.1	14.3	110.4	No*	Yes	
Essential habitat for squatter pigeon	-	-	14.6	14.3	28.9	No*	Yes	
Protected wildlife habitat[^]								
Greater glider	V	V	115.7	165.2	281.0	No*	Yes	Direct (land-based) offset under EPBC Act
Koala	V	V	159.4	165.2	324.6	No*	Yes	
Squatter pigeon	V	V	141.4	165.2	306.6	No*	Yes	
Ornamental snake	V	V	18.8	0	18.8	No*	Yes	
Waterway fish passage								
Waterway providing for fish passage	-	-	8.35[+]	-	8.35	Yes	Yes	Financial settlement offset under Queensland Environmental Offset Framework

[#] VM Act status.
* An offset is already being provided for these species as MNES. The State cannot impose an offset condition for a prescribed activity that has the 'same, or substantially the same' impact on the 'same, or substantially the same' matter as the MNES, if it has already been assessed as a 'controlled action' under the EPBC Act.
[^] NC Act status.
+ Based on an impact to 8.35 km of waterway providing for fish passage with an average width of 10 m.

5.1 HABITAT QUALITY SCORES FOR SIGNIFICANT RESIDUAL IMPACTS

5.1.1 MNES offsets assessment guide

Under the EPBC Act Environmental Offsets Policy, the offsets assessment guide is a tool used to determine the suitability of an offset to acquit a significant residual impact on a MNES. The suitability of the offset is measured by the percent the offset area can acquit the impact on a matter, where 100% means the offset requirement is fully acquitted. It is important to note that under the EPBC Act Environmental Offsets Policy a direct offset must form a minimum of 90 % of the offset requirement and other compensatory measures may satisfy up to a maximum of 10 % of the total offset requirement.

The offsets assessment guide utilises a balance sheet approach with specific inputs required for both the impact and offset areas relating to habitat quality, time over which loss is averted, time until ecological benefit, risk of loss (%) and confidence in result (%). For each MNES required to be offset, the offsets assessment guide requires inputs for the area of significant residual impact and the habitat quality of the impact area scored out of 10.

Impact habitat quality score for MNES

Based on the results of the ecological assessments undertaken within the Project impact area (section 2.2), specifically BioCondition assessments completed in 2018, 2019 and 2020, the habitat quality score for MNES for which a significant residual impact is likely to occur was calculated. Appendix B presents the method used to quantify the habitat quality score for those MNES prepared generally in accordance with the Guide to Determining Terrestrial Habitat Quality, Version 1.2 (DEHP 2017), with the results of that scoring detailed in Appendix C. The method quantifies the three components that contribute to the calculation of habitat quality under the offsets assessment guide: site condition, site context, and species stocking rate. Appendix D presents a detailed summary of the impact habitat quality score inputs and justifications used in the offsets assessment guides.

Table 3 summarises the habitat quality score for each relevant MNES (greater glider, koala, squatter pigeon, ornamental snake) (refer to detailed scoring in Appendix C). Note habitat quality scores for direct and indirect impacts on MNES were combined, as test of variance analysis showed no significant difference (*p-value* > 0.12) in habitat quality scores sites associated with direct and indirect impacts.

Table 3: Impact habitat quality scores for the Project's MNES offsets

MNES	Habitat quality score out of 10
Greater glider	7
Koala	7
Squatter pigeon	7
Ornamental snake	5

5.1.2 MSES land-based offset multiplier calculator

When a land-based offset is proposed to compensate for significant residual impacts on MSES the habitat quality score must be determined for the impact and offset site. This score is used to inform assessment under the land-based offset multiplier calculator and determine the offset ratio for each MSES. The impact and offset area baseline habitat quality scores for MSES were used to inform the MSES land-based offset multiplier calculations for the Project, which are detailed in the Project's ODP attached in Appendix G.

Details of the Project's impact habitat quality scores for MSES (and MNES) are provided in Appendix C and the details of the Project's offset habitat quality scores for MSES (and MNES) on Mamelon and [redacted] are provided in Appendix E and Appendix F, respectively.

Impact habitat quality score MSES

The habitat quality scores for MSES were calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality, Version 1.2 (DEHP 2017).

Table 4 summarises the impact habitat quality score for each MSES (refer to detailed scoring in Appendix C). Note habitat quality scores for direct and indirect impacts to each MSES were combined, as test of variance analysis showed no significant difference (*p-value* > 0.12) in habitat quality scores between sites associated with direct and indirect impacts.

Table 4: Impact habitat quality scores for the Project's significant residual impacts on MSES.

MSES	Habitat quality score out of 10
RE 11.3.4 (BVG 16c)	7
RE 11.4.2 (BVG 17a)	7
Watercourse vegetation RE 11.3.4 (BVG 16c)	7
Watercourse vegetation RE 11.3.25 (BVG 16a)	8
Essential habitat for greater glider	N/A*
Essential habitat for koala	N/A*
Essential habitat for squatter pigeon	N/A*
Protected wildlife habitat for greater glider	N/A*
Protected wildlife habitat for koala	N/A*
Protected wildlife habitat for squatter pigeon	N/A*
Protected wildlife habitat for ornamental snake	N/A*
Waterway providing for fish passage	N/A^

* An offset is already being provided for these species as MNES. The State cannot impose an offset condition for a prescribed activity that has the 'same, or substantially the same' impact on the 'same, or substantially the same' matter as the MNES, if it has already been assessed as a 'controlled action' under the EPBC Act.
^ A financial settlement offset is being provided in in accordance with the Queensland Environmental Offsets Policy.

6 PROJECT OFFSETS

6.1 OFFSET PACKAGE SUMMARY

An offset package has been developed to acquit the Project's significant residual impacts to MNES and MSES, in accordance with the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offset Policy. The proposed delivery approach involves a combination of direct land-based offsets and a financial settlement offset (MSES only), as summarised in Table 5.

Table 5: Proposed approach to offset delivery for the Project

Offset delivery method	Offset property	Offset requirements	
		MNES	MSES
Direct land-based offsets	Mamelon (Lot 9 MC496, Lot 10 MC493 and Lot 11 MC23)	✓	✓
	[redacted]	✓	✓
Financial settlement offsets	-	-	✓

Detailed field surveys were undertaken across the two offsets properties, Mamelon and [redacted], to confirm their suitability to acquit the Project's offset requirements. Figure 3 shows the location of these two properties in relation to the Project.

In accordance with the EPBC Act Environmental Offsets Policy (and associated offsets assessment guide) and the Queensland Environmental Offsets Policy (and associated land-based offset multiplier calculator), Mamelon and [redacted] have been assessed and determined to be suitable to acquit the majority of the Project's MNES and MSES offset requirements. A financial settlement offset will acquit the remaining MSES impacts not acquit by the combination of the Mamelon and [redacted] offset areas.

Table 6 provides a summary of the Project's total significant residual impacts to MNES and MSES and the land-based offset areas that will be secured on Mamelon and [redacted], as well as the financial settlement offset that will be provided, to fully acquit the Project's offset requirements as a complete package.

Descriptions of the Mamelon and [redacted] offset areas, including the results of detailed field assessments, offsets assessment guide and land based offset multiplier calculator assessments are provided in Sections 6.2 and 6.3. Section 6.4 summarises the financial settlement offset for two MSES. In turn, Section 6.5 details how the Project's proposed offset package meets the principles and requirements of the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offset Policy.

Table 6: Summary of offset acquittal for the Project

Protected Matter	Total significant residual impact (ha)	Mamelon		[redacted]		Remaining MSES impact to be offset as financial settlement offset (ha)
		Offset area to be secured (ha)	Acquittal (%)^ /minimum offset area required (ha)[#]	Offset area to be secured (ha)	Acquittal (%)^ /minimum offset area required (ha)[#]	
MNES						
Greater glider	281.0	2,428.4	100.03%	-	-	-
Koala	324.6	2,803.4	100.10%	-	-	-
Squatter pigeon	306.6	2,667.1	100.80%	-	-	-
Ornamental snake	18.8	-	-	121.1	102.37%	-
MSES						
RE 11.3.4 (BVG 16c)	40.7	14.8	162.8	148.2	162.8	-
RE 11.4.2 (BVG 17a)	110.8	443.2	443.2	-	-	-
Watercourse RE 11.3.4 (BVG 16c)	4.3	14.8	17.2	2.4	17.2	-
Watercourse RE 11.3.25 (BVG 16a)	78.8	100.8	315.2	78.6	315.2	33.95
Essential habitat - greater glider	15.0	As per MNES*	-	-	-	-
Essential habitat - koala	110.4	As per MNES*	-	-	-	
Essential habitat - squatter pigeon	28.9	As per MNES*	-	-	-	-
Protected wildlife habitat - greater glider	281.0	As per MNES*	-	-	-	-
Protected wildlife habitat - koala	324.6	As per MNES*	-	-	-	-
Protected wildlife habitat - squatter pigeon	306.6	As per MNES*	-	-	-	-
Protected wildlife habitat - ornamental snake	18.8	-	-	As per MNES*	-	-
Waterway for fish passage	8.35[+]	-	-	-	-	8.35[+]

^ Acquittal (%) calculated in accordance with the EPBC Act Environmental Offsets Policy and associated offsets assessment guide.
[#] Minimum offset area (ha) calculated in accordance with the Queensland Environmental Offsets Policy and associated land-based offset multiplier calculator.
* To be offset as an MNES protected matter, noting that the State cannot impose an offset condition for a prescribed activity that has the 'same, or substantially the same' impact on the 'same, or substantially the same' matter as the MNES, if it has already been assessed as a 'controlled action' under the EPBC Act.
+ Based on an impact to 8.35 km of waterway providing for fish passage with an average width of 10 m.

6.2 MAMELON OFFSET

6.2.1 Property summary

Mamelon is a 6,259 ha property located in Ogmore, 25 km north-west of Marlborough, and is the proposed site for both the Project and one of the land-based offsets to acquit the Project's offset requirements. The property is freehold and zoned rural within the Livingstone Shire Council local government area.

The Mamelon property (comprised of Lot 9 MC496, Lot 10 MC493 and Lot 11 MC23), is overlayed by two ML areas (ML 80187 and ML 700022), and it is mainly within ML 80187 that the majority of the Project's development is proposed. The property is currently managed for cattle grazing.

A total offset area of 2,803 ha on the Mamelon property is proposed to acquit relevant MNES and MSES requirements (Figure 5). This offset area is not encumbered with MLs and is outside the Project's proposed development (including direct and indirect Project impact areas). The 2,803 ha offset area includes 349 ha (12% of the offset area) that CQC has actively excised from ML 80187, in the eastern portion of the Mamelon property (Figure 5).

The offset areas have been situated outside of the MLs and any areas that may potentially be impacted by groundwater drawdown (Eco Logical Australia, 2020) to ensure the Project's activities do not adversely affect the offset areas. Potential indirect impacts associated with the Project, including impacts from dust generation, increased noise and increased traffic, are not considered to have a significant impact on the offset area and will be managed and monitored through the Project's EMP as outlined in Section 4.

The landholder and property details for Mamelon are provided in Table 7. The landholder, QNI Metals Pty Ltd, and the joint Project proponents (CQC and Fairway Coal) are all related companies having common shareholder ownership and control.

Table 7: Landholder and property details for Mamelon.

Landholder details	
Registered owner/s on title:	QNI Metals Pty Ltd
ABN/ACN:	ABN 56 066 656 175 / ACN 066 656 175
Phone:	07 4720 6422
Primary contact person:	George Lukacs
Email:	George.Lukacs@qni.com.au
Postal address:	PMB 5, Townsville MC QLD 4810
Offset property description	
Property address: 11 St Lawrence Road, Ogmore, Qld 4706	
Lot on plan: 9 MC496, 10 MC493, 11 MC23	
Tenure: Freehold	
Local government area: Livingstone Shire Council	**Zoning**: Rural

6.2.2 Ecological surveys

Extensive ecological surveys of the Mamelon property have been undertaken to confirm vegetation communities and fauna habitat values present, as well as determine its suitability as an offset for the Project. Ecological surveys have been completed by experienced ecologists with first-hand knowledge of habitats of the Project area, species occurrence within the Project area and surrounding area, and of the biology and ecology of those species elsewhere throughout their distribution.

The Mamelon offset area identified in this BOS has been determined based on the outcomes of a variety of ecological surveys between 2011 and 2020. Between March 2011 to July 2018, the majority of survey was restricted to the mining leases and immediate surrounds (i.e. adjacent Deep Creek) associated with the Project, with surveys after this time extending to the balance of Mamelon set aside by CQC for use as offsets.

- March and September 2011
  - Systematic fauna surveys in late wet season (March 2011) and dry season (September 2011), including fauna habitat assessments, trapping (Elliot Type A & B box traps, pitfall traps, & funnel traps), bird surveys, diurnal ground searches for herpetofauna, spotlight searches, microbat call detection surveys, camera trapping, and call playback by ecological consultant Ed Meyer and Oberonia Botanical Services.
  - Flora surveys in late wet season (March) and dry season (September) by ecological consultant Ed Meyer and Oberonia Botanical Services.
- February 2012
  - Fauna surveying targeting conservation significant fauna species (i.e. those listed under NC Act and the EPBC Act) by Ed Meyer.
- February 2017
  - Systematic and targeted threatened fauna surveys by CDM Smith (led by Brett Taylor).
  - Wet season flora surveys, including tertiary and quaternary assessments as well as regional ecosystem remnant vegetation ground-truthing by CDM Smith and Terrestria (led by Dr Andrew Daniel). This included 34 BioCondition assessments across the Mamelon property including the Project area and proposed offset area.
- May, August, September, November 2017 and January 2018
  - Supplementary fauna surveys, including remote camera surveys, bird surveys, herpetofauna searches and spotlighting by CDM Smith.
- July/August 2018
  - Ground-truthing of regional ecosystems remnant vegetation areas within the mining lease and adjacent Deep Creek, as well as upstream reaches of Mamelon Creek in the south-west of Mamelon. Vegetation mapped in accordance with Neldner et al. (2017), including tertiary and quaternary assessments by 3D Environmental (led by David Stanton).
  - BioCondition assessments of ground-truthed regional ecosystem remnant vegetation and assessment of vegetation and habitat condition at seven sites (across the Mamelon property including the Project area and proposed offset area) generally in accordance with the Guide to Determining Terrestrial Habitat Quality, Version 1.2 by 3D Environmental (led by David Stanton).
  -

- October 2019
  - Ground-truthing of regional ecosystems across balance of Mamelon, including communities within non-remnant areas. Vegetation mapped in accordance with Neldner et al. (2017), including tertiary and quaternary assessments by CO2 Australia (led by Dr Jarrad Cousin).
  - BioCondition assessments and assessment of vegetation and habitat condition at 15 sites generally in accordance with the Guide to Determining Terrestrial Habitat Quality, Version 1.2, representing those areas proposed to be considered for offsets by CO2 Australia (led by Dr Jarrad Cousin).
  - Targeted spotlighting surveys for koala and greater glider, as well as targeted diurnal surveying for squatter pigeon by CO2 Australia (led by Dr Jarrad Cousin).
  - Assessment of appropriateness and integrity of potential offset areas and location of current land management infrastructure (i.e. fencing, tracks, watering points) to inform offset availability and preparation of the offset area management plan by CO2 Australia.
- November 2019
  - Targeted fauna surveying (diurnal and nocturnal spotlighting) for koala and greater glider along Deep Creek and Surveyor's Creek, along with remnant vegetation communities adjacent Deep Creek by Austecology (led by Lindsay Agnew (Austecology 2020b).
- May/June 2020
  - BioCondition assessments and assessment of vegetation and habitat condition at 22 sites generally in accordance with the Guide to Determining Terrestrial Habitat Quality, Version 1.2 across additional regional ecosystems on Mamelon, including those indirectly impacted by ground-water drawdown, as well as additional greater glider, koala and squatter pigeon habitat areas by CO2 Australia (led by Dr Jarrad Cousin).
  - Targeted survey for squatter pigeon in southern half of Mamelon by CO2 Australia (led by Dr Jarrad Cousin).
  - Assessment of appropriateness and integrity of potential offset areas and location of current land management infrastructure (i.e. fencing, tracks, watering points) to inform offset availability and preparation of the offset area management plan by CO2 Australia.

6.2.3 Environmental values

The following section describes the vegetation communities and suitable habitat for fauna species present in the areas of the Mamelon property set aside by CQC for conservation purposes (Figure 5) based on the results of detailed ecological assessments outlined in section 6.2.2. Areas on Mamelon set aside for use as offsets are outside any areas proposed for mining activities (or associated infrastructure) and areas that may be impacted by groundwater drawdown (Figure 5). These areas on the property are characterised by a variety of vegetation communities comprised predominantly of eucalypt woodlands occurring on metamorphosed sediments (landzone 11) and to a lesser extent, coarse-grained sedimentary rocks (landzone 10) and Cainozoic clay plains (landzone 4). Alluvial vegetation communities (landzone 3) also occur in close proximity to existing watercourses and range from freshwater wetlands to semi evergreen vine thicket (SEVT) communities and eucalypt woodlands.

Regional Ecosystems

A summary of the ground-truthed RE present within the areas on Mamelon set aside for use as offsets is presented in Table 8. The results of the vegetation assessment on Mamelon confirmed the presence of 17 REs in the surveyed areas. Figure 6 illustrates the extent of this observed RE and the survey sites on Mamelon.

A total of 44 sites from nine different REs were assessed for site condition, including 17 sites assessed by ecologist David Stanton from 3D Environmental between 2018 and 2019, and 27 site assessed between November 2019 and May 2020 as part of detailed field surveys by CO2 Australia ecologist.

Table 8: Ground-truthed regional ecosystems observed on the surveyed area of Mamelon.

RE	Status*	Description	Area (ha)		
			Remnant	Non-remnant[#]	Total
11.3.11	EN	Semi-evergreen vine thicket on alluvial plains	0.81	-	0.81
11.3.25	LC	*Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines	120.50	-	120.50
11.3.27	LC	Freshwater wetlands	0.59	-	0.59
11.3.29	LC	*Eucalyptus crebra*, *E. exserta*, *Melaleuca* spp. woodland on alluvial plains	6.45	-	6.45
11.3.35	LC	*Eucalyptus platyphylla*, *Corymbia clarksoniana* woodland on alluvial plains	73.47	-	73.47
11.3.4	OC	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains	27.85	-	27.85
11.3.9	LC	*Eucalyptus platyphylla*, *Corymbia* spp. woodland on alluvial plains	50.25	-	50.25
11.4.2	OC	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains	348.18	234.17	582.35
11.4.9	EN	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	34.15	-	34.15
11.5.8	LC	*Melaleuca* spp., *Eucalyptus crebra*, *Corymbia intermedia* woodland on Cainozoic sand plains and/or remnant surfaces	300.80	13.47	314.28
11.9.7	OC	*Eucalyptus populnea*, *Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks	8.01	13.48	21.49
11.10.3	LC	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks. Crests and scarps	278.44	-	278.44
11.10.7	LC	*Eucalyptus crebra* woodland on coarse-grained sedimentary rocks	356.45	-	356.45
11.11.1	LC	*Eucalyptus crebra +/- Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding	572.86	4.54	577.41

RE	Status*	Description	Area (ha)		
			Remnant	Non-remnant#	Total
11.11.2	LC	*Acacia shirleyi* or *A. catenulata* low open forest on old sedimentary rocks with varying degrees of metamorphism and folding	75.53	-	75.53
11.11.5a	LC	Microphyll vine forest +/- *Araucaria cunninghamii* on old sedimentary rocks with varying degrees of metamorphism and folding	81.63	-	81.63
11.11.15	LC	*Eucalyptus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics	797.55	183.95	981.50

* VM Act: EN = Endangered, OC = Of Concern, LC = Least Concern
# Areas ground-truthed and observed to comprise regrowth (non-mature) vegetation, as distinct from remnant (largely intact, mature-like) vegetation. This terminology delineates assessment units for the purposes of assessing habitat condition, site context and species associations, and is not necessarily reflective of defined terms under the VM Act (i.e. remnant woody vegetation, high-value regrowth etc)

Vegetation communities

Alluvial watercourse and wetland

Surrounding Mamelon are a series of alluvial channels corresponding to Tooloombah Creek and Deep Creek – a tributary of the Styx River which originates north of the property. Vegetation along these channels is characterised by a diversity of alluvial vegetation communities, a number of which were assessed. *Eucalyptus tereticornis* woodland on alluvial plains was present in the south/south-west portion of Mamelon (consistent with RE 11.3.4). *Corymbia tessellaris* was found to be locally dominant and historical clearing has resulted in a relatively sparse canopy, allowing for a diverse shrub understorey and extensive grass cover. Small patches of freshwater wetland (consistent with RE 11.3.27) were interspersed amongst eucalypt woodlands along an alluvial channel in the north/north-east corner of the property, and supported a woodland dominated by *E. camaldulensis*, *E. tereticornis* and *Lophostemon suaveolens.*

Eucalyptus tereticornis +/- *E. camaldulensis* and *Corymbia tessellaris* woodland fringes Mamelon's surrounding drainage lines (RE 11.3.25; Figure 4), which grades to adjacent patches of *E. platyphylla* and *C. clarksoniana* woodland on alluvial plains (RE 11.3.35). Within the centre of the property, *E. platyphylla* +/- *Corymbia spp.* woodland (RE 11.3.9) occurs, where it is associated with a depositional drainage depression. As the waterway defining the south-west border of Mamelon becomes less defined and forms a broader depositional landscape feature, RE 11.3.25 gives rise to a small patch of *E. crebra, E. exserta* and *Melaleuca spp.* woodland (RE 11.3.29). Additionally, an isolated patch of semi-evergreen vine thicket fringes an alluvial channel on the northern boundary of the property, adjacent to RE 11.3.25. Weed cover within alluvial channel communities was high in some areas; irruptive thickets of *Cryptostegia grandiflora* (rubber vine) were identified within the bed and banks of many of the watercourses, where it smothered large, mature trees. *Jatropha gossypiifolia* (bellyache bush) and *Lantana camara* were also found to be prevalent in RE 11.3.25, especially along the eastern boundary of Mamelon.

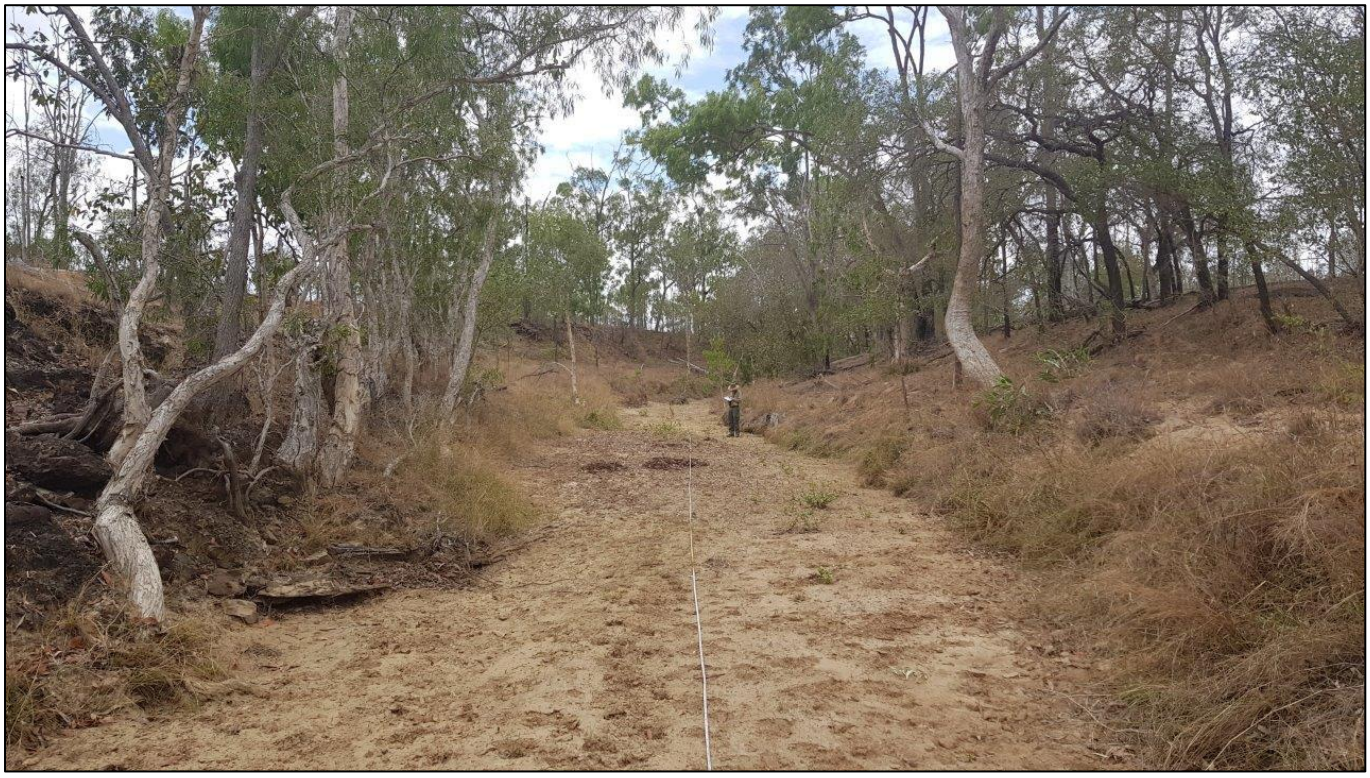

Figure 4: Representative photo of alluvial watercourse vegetation – RE 11.3.25.

Ironbark woodlands

Ironbark woodlands represented the dominant vegetative communities within the area set aside for offsets, represented by areas of RE 11.10.7 and RE 11.11.1. This area was dominated by *E. crebra* but supported a variety of canopy species including *Atalaya hemiglauca*, *C. dallachiana* and *Psydrax oleifolia*. The understory was relatively open, but where vegetated, comprised a mix of shrubs (e.g. *Petalostigma pubescens*, *Alyxia ruscifolia*, *Santalum lanceolatum*), forbs (e.g. *Cyperus sp., Enchylaena tomentosa*) and grasses (e.g. *Themeda triandra*, *Heteropogon contortus*). Situated adjacent to this community, and continuing up to the north-east boundary of Mamelon, were expansive patches of RE 11.11.1, typified by an abundance of exposed sandstone boulders. In most areas, *E. crebra* was found to be co-dominant with *Acacia rhodoxylon* and to a lesser extent, *C. clarksoniana* and *E. exserta*. The understory layer was diverse and supported considerable accumulations of timber and organic matter. Occurring across non-depositional landscape features and often fringing alluvial vegetation communities (RE 11.3.25, 11.3.35) along Mamelon's surrounding drainage lines, *E. crebra* woodland was also identified on clay plains (consistent with 11.4.2). A highly mixed canopy was present at all sites, with other co-occurring species including *E. populnea*, *Atalaya hemiglauca* and *Grevillea striolata*. Weed cover within these remnant and regrowth communities was low, apart from in smaller patches located adjacent to cleared pasture, where invasive species such as *Lantana camara*, *Cryptostegia grandiflora* and *Bidens pilosa* dominated.

The largest area of continuous vegetation (both remnant and HVR) is formed by RE 11.11.15, traversing the south/south-east portion of Mamelon. Often occurring over undulating rises and low hills, *E. crebra* dominates, alongside *C. erythrophloia* and *E. populnea*. On gently undulating sand plains, consistently bordering alluvial communities (RE 11.3.25 & 11.3.9), *Melaleuca viridiflora* and *E. crebra* +/- *C. intermedia* woodland also occurs (RE 11.5.8).

Other vegetation communities

Narrow strips of Brigalow woodland (consistent with RE 11.4.9) were associated with RE 11.4.2 and the weathered clay plains along the eastern property boundary, and often followed highly eroded gullies. These communities displayed a variety of canopy species, but were dominated largely by *A. harpophylla*, *Ehretia membranifolia* and *Alectryon diversifolius*. The presence of vine thicket associated shrub species such as *Acalypha eremorum* and *Carissa ovata* contributed to a very dense understory in some areas. Weed cover was generally low within these communities, however, small infestations of *Byrophyllum delagoense* (mother of millions) were consistently observed in Brigalow vegetation on Mamelon.

Acacia catenulata +/- *A. shirleyi* open forest (RE 11.10.3) forms a large, semi-continuous patch in the centre of the property, where it grades into ironbark woodland (RE 11.10.7, 11.11.1) at lower elevations. *Acacia shirleyi* +/- *A. catenulata* low open forest (RE 11.11.2), supporting a very similar species composition, occurs on older sedimentary rocks and is interspersed amongst larger areas of RE 11.11.1. Furthermore, small areas of remnant and regrowth *Eucalyptus populnea*, *Eremophila mitchellii* shrubby woodland (RE 11.9.7) occurs within the south-west corner of Mamelon, where it borders cleared pasture. Microphyll vine forest +/- *Araucaria cunninghamii* (RE 11.11.5a) was identified as a series of patches, with the largest occurring on a steep west-facing slope, surrounded by remnant vegetation.

149°36'0"E
149°38'0"E
149°40'0"E
149°42'0"E
22°40'0"S
22°42'0"S
22°44'0"S
22°46'0"S

Tooloombah Creek
Toolbombah Creek Conservation
Deep Creek
Surveyor's Creek
ML80187
ML700022
Barrack Creek
Mamelon Creek
Brussels Creek

Glencoe State Forest
Newport Conservation Park
Charon Point Conservation Park
Burwood Nature Refuge
Mount Buffalo State Forest
Burwood Nature Refuge
Tooloombah Creek Conservation Park
Bukkulla Conservation Park
Broadsound Range
Marlborough State Forest
Eugene State Forest
Develin Nature Refuge

Mamelon
Remnant vegetation areas
Protected area
Statewide Corridors
State
Regional

Central Queensland Coal

Location diagram

Queensland

Figure 5: Mamelon offset area and connectivity values

- Mamelon
- Mamelon offset area
- Watercourses
- Remnant vegetation areas
- Road
- Project MLs
- Excised ML80187 area
- Project footprint (direct impact area)
- Indirect impact area

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Watercourses
- Roads
- Statewide corridors

The following datasets were provided by CQC
- Project MLs (amended)
- Project footprint and indirect impact area

Date: 8/11/2020 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:47,500@A3

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Kilometres

N

CO2 Australia

149°36'0"E 149°38'0"E 149°40'0"E 149°42'0"E

22°40'0"S 22°42'0"S 22°44'0"S 22°46'0"S

Ground-truthed vegetation

- 11.10.3
- 11.10.7
- 11.11.1
- 11.11.1 regrowth
- 11.11.10
- 11.11.15
- 11.11.15 regrowth
- 11.11.2
- 11.11.5a
- 11.3.11
- 11.3.12
- 11.3.25
- 11.3.27
- 11.3.29
- 11.3.35
- 11.3.4
- 11.3.4 regrowth
- 11.3.9
- 11.4.2
- 11.4.2 regrowth
- 11.4.9
- 11.4.9 regrowth
- 11.5.8
- 11.5.8 regrowth
- 11.9.7
- 11.9.7 regrowth
- non-remnant

M82 M21 M18 M48 M54 M19 M20 M13 M49 M53 M58 M57 ML700022 M38 M45 M74 ML80187 M39 M46 M55 M56 M79 M59 M40 M69 M41 M16 M44 M43 M64 M12 M66 M63 M47 M42 M14 M67 M17 M03 M68 M15 M04 M83 M05 M65 M22 M23 M61 M11 M06 M25 M70 M24 M62 M08 M26 M27 M35 M36 M28 M29 M02 M32 M71 M72 M73 M81 M37 M01 M10 M80 M30 M34 M33 M31 M60

Central Queensland Coal

Figure 6:
Observed regional ecosystems and survey sites on the Mamelon property

- Mamelon
- Project MLs
- Project footprint (direct impact area)
- Indirect impact area
- Watercourses

Survey sites

- Impact habitat assessment site
- Offset monitoring site (discontinued)
- Offset monitoring site (existing)
- Offset monitoring site (to be established)

0 0.5 1 1.5 2
Kilometres

N

CO2 Australia

Location diagram

Queensland

DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Watercourses

The following datasets were provided by Orange Environmental
- Ground-truthed vegetation
- Project footprint and indirect impact area

Date: 8/13/2020 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:47,500@A3

Greater Glider

Greater glider habitat within the offset area comprises ~2,428 ha of ground-truthed remnant RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25. This habitat is located throughout Mamelon, including lowland areas in the vicinity of Tooloombah Creek, Mamelon Creek and Deep Creek as well as upland areas supporting eucalypt woodland. Each of these REs are considered suitable habitat; being consistent with the habitat assessment results undertaken by Austecology (2020a and 2020b) in the vicinity of the offset area.

Targeted spotlighting surveys conducted in October and November 2019 by Austecology and CO2 Australia confirmed the presence of greater glider in the offset area, including foraging and denning in a variety of trees including *Eucalyptus crebra, E. platyphylla* and *E. populnea*. At least 22 greater glider were observed in November 2019 along and adjacent to Deep Creek in the east of Mamelon, with additional individuals observed along Barrack Creek in Strathmuir to the east of Mamelon (Austecology 2020b; Figure 7). A survey of fauna habitat features identified numerous large, hollow-bearing trees throughout all of the offset area REs, including a diversity of eucalypt foraging and denning trees species known or observed as being used by greater glider in the area (e.g. *E. camaldulensis*, *E. tereticornis, E. crebra, E. populnea, E. platyphylla* and dead standing stags).

Koala

Koala habitat within the offset area comprises ~2,803 ha of ground-truthed remnant RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35, RE 11.3.4, along with regrowth RE 11.4.2 and regrowth RE 11.11.15. The offset area comprises suitable foraging and breeding habitat for koala and is located throughout Mamelon, part of which is along and adjacent to Tooloombah Creek, Mamelon Creek and Deep Creek. Each of these REs are considered suitable habitat; being consistent with the habitat assessment results undertaken by Austecology (2020a) and Melzer and Tucker (2011) in the vicinity of the offset area.

Targeted surveys conducted in October and November 2019 by Austecology and CO2 Australia confirmed the presence of no fewer than 18 koalas within the offset area; including one observed feeding within a *E. exserta* on the boundary between RE 11.11.1 and RE 11.5.8 in the north-west of the Mamelon offset area, others sheltering in *E. crebra* within an area of regrowth RE 11.4.2, with numerous records along alluvial watercourses on Mamelon (RE 11.3.25) (Austecology 2020b; Figure 7). Additional evidence of their presence was confirmed throughout Mamelon in the form of characteristic scats and scratches.

Squatter Pigeon

Squatter pigeon habitat within the offset area comprises ~2,667 ha of ground-truthed remnant RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 and areas of regrowth RE 11.4.2. The offset area comprises suitable foraging and breeding habitat for squatter pigeon and is located throughout Mamelon, in the vicinity of Tooloombah Creek, Mamelon Creek and Deep Creek as well as upslope areas with appropriate grassy woodland habitat. These RE are considered appropriate habitat for squatter pigeon, represented by eucalypt grassy woodland (remnant and regrowth) on clay plains (RE 11.4.2), along alluvial channels (RE 11.3.25), remnant sand plain (RE 11.5.8) and old metamorphic and/or sedimentary surfaces (RE 11.10.7, RE 11.11.1 and RE 11.11.15). All areas of squatter pigeon offset habitat support eucalypt-dominated regrowth to remnant open-forest to open-woodland with a patchy, open grassy understorey. All offset areas are also within 3 km of permanent (artificial) or seasonal waterbodies, with much of the offset within 1 km.

Targeted surveys conducted in October and November 2019 by Austecology and CO2 Australia confirmed the presence of six (6) squatter pigeon on Mamelon, within the offset area, with a total of 25 confirmed

records from Mamelon and adjacent Strathmuir during 2019 (Figure 7). A further 58 squatter pigeon records are known from targeted surveys on those properties since March 2011 (Austecology 2020a and 2020b).

6.2.4 Condition

Mamelon is subject to impacts from historical grazing, with non-remnant, lowland areas impacted more than upslope areas. Impacts associated with grazing include trampling and compaction of soil, as well as facilitation of weed transportation throughout parts of the property. This is demonstrated in the increased cover of weeds in lowland areas, particularly watercourse REs (e.g. RE 11.3.25, RE 11.3.35). Pest animals were observed on the site (including foxes, feral cats and wild dogs), with management for pest animals proposed as part of the draft offset area management plan. Small areas of erosion were observed in lowland areas of Mamelon, particularly non-remnant areas with texture contrast soils and along access tracks. Additional detail on the condition and quality of the offset area is provided in the offsets assessment guides justifications in Appendix D and the draft Mamelon offset area management plan in Appendix G.

6.2.5 Landscape connectivity

The Mamelon offset area is within the Brigalow Belt bioregion, and straddles the Marlborough Plains and Nebo-Connors Ranges subregions, with a very small area in the very south-east intersecting the Boomer Range subregion. The property is flanked by Regional Significant Corridors along the east and west boundaries of the property, corresponding to Deep Creek and Mamelon Creek, respectively (Figure 5). These conservation corridors have been mapped as part of the Queensland Government's Biodiversity Planning Assessments (BPA) which assess the biodiversity significance of land in a bioregion. The mapping of corridors within the Brigalow Belt Bioregion, in which the Mamelon property is located, has focussed on those corridors that link adjacent bioregions or connect wildlife refugia.

Within the wider landscape Mamelon is well connected to large remnant habitat patches to the west; remaining contiguous with an extensive tract of remnant vegetation, which includes Tooloombah Creek Conservation Park, immediately to the north-west of Mamelon. Habitat to the south and south-west of the property remain relatively patchy but maintain connected to extensive habitat associated with Broadsound Range (located to the south and west). Broadsound Range is itself part of a State-wide ecological corridor mapped under the BPA, as are coastal lands to the north and east (Figure 5).

6.2.6 Mamelon offset acquittal

The total proposed Mamelon offset area of approximately 2,803 ha (Figure 7) is able to acquit the majority of the Project's MNES and MSES offset requirements, namely:

- Greater glider (*Petauroides volans*) – MNES
- Koala (Phascolarctos cinereus) – MNES
- Squatter pigeon (southern) (*Geophaps scripta scripta*) – MNES
- Of concern RE 11.3.4 (BVG 16c)– MSES (partly acquit on Mamelon)
- Of concern RE 11.4.2 (BVG 17a) – MSES
- Watercourse RE 11.3.4 (BVG 16c) – MSES (partly acquit on Mamelon)
- Watercourse RE 11.3.25 (BVG 16a) – MSES (partly acquit on Mamelon).

Offset areas on Mamelon were calculated using the habitat quality scores in Table 9, developed generally in accordance with the Guide to Determining Terrestrial Habitat Quality, Version 1.2 (DEHP 2017). For further details see Appendix B for the method used to calculate the habitat quality scores and Appendix E for a

summary of the data collected as part of ecological surveys and used to determine the Mamelon start habitat quality scores.

Table 9: MNES and MSES habitat quality scores relevant to Mamelon offset

Protected Matter	Impact habitat quality score	Start habitat quality score on Mamelon	Future habitat quality score on Mamelon
Greater glider	7	7	8
Koala	7	7	8
Squatter pigeon	7	7	8
Of concern RE 11.3.4 (BVG 16c)	7	7	9
Of concern RE 11.4.2 (BVG 17a)	7	6	8
Watercourse RE 11.3.4 (BVG 16c)	7	7	9
Watercourse RE 11.3.25 (BVG 16a)	8	8	10

Table 10 presents the area for each MNES and MSES to be secured on Mamelon (Figure 7), and whether the offset requirement will be fully acquit on Mamelon. Appendix D presents the of the inputs and justifications used in the offsets assessment guide, including the start and future habitat quality scores presented in Table 9.

Table 10: Availability of MNES and MSES offset values on Mamelon

Protected Matter	Total significant residual impact (ha)	Total offset area to be secured (ha) on Mamelon	MNES acquittal (%) using offsets assessment guide^	MSES minimum area (ha) using land-based offset multiplier calculator#	Is MNES/MSES offset requirement fully acquit on Mamelon?
MNES					
Greater glider	281.0	2,428.4	100.03%	-	Yes
Koala	324.6	2,803.4	100.10%	-	Yes
Squatter pigeon	306.6	2,667.1	100.80%	-	Yes
MSES					
Of concern RE 11.3.4 (BVG 16c)	40.7	14.8	-	162.8	No*
Of concern RE 11.4.2 (BVG 17a)	110.8	443.2	-	443.2	Yes
Watercourse RE 11.3.4 (BVG 16c)	4.3	14.8	-	17.2	No*
Watercourse RE 11.3.25 (BVG 16a)	78.8	100.8	-	315.2	No*

^ In accordance with EPBC Act Environmental Offsets Policy.
# In accordance with Queensland Environmental Offsets Policy.
* Balance of offset proposed to be secured on [redacted] (or other land-based offset and/or financial settlement offset) in accordance with Queensland Environmental Offsets Policy.

149°36'0"E
149°38'0"E
149°40'0"E
149°42'0"E
22°40'0"S
22°42'0"S
22°44'0"S
22°46'0"S

Tooloombah Creek
Tooloombah Creek Conservation Park
Deep Creek
Surveyor's Creek
ML80187
ML700022
Barrack Creek
Mamelon Creek
Brussels Creek

Central Queensland Coal

Figure 7:
Offset values on Mamelon

- Mamelon
- Project footprint (direct impact area)
- Indirect impact area
- Watercourses
- Project MLs
- Protected area

Threatened species records
- Greater glider records
- Squatter pigeon records
- Koala records

MNES offset areas
- Koala, greater glider and squatter pigeon
- Koala and squatter pigeon only
- Koala only

MSES offset areas
- Of concern and Watercourse RE 11.3.4 (BVG 16c)
- Of concern RE 11.4.2 (BVG 17a)
- Watercourse RE 11.4.2 (BVG 17a)
- Watercourse RE 11.3.25 (BVG 16a)

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Kilometres

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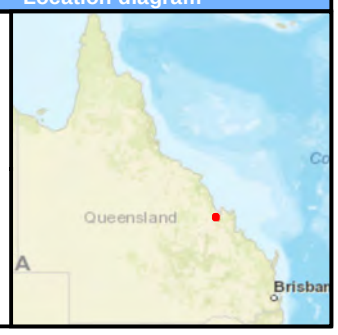
CO2 Australia

Location diagram



DATA SOURCE:
The following datasets are © State of Qld:
- Cadastral data
- Statewide corridors
- Protected areas
- Remnant vegetation areas

The following datasets were provided by Orange Environmental
- Project footprint and indirect impact area

Date: 8/11/2020 Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator Datum: GDA 1994 Scale: 1:47,500@A3

6.3 [redacted] OFFSET

6.3.1 Property summary

[redacted] The property is zoned rural with the primary use currently cattle grazing. Landholder and property details for [redacted] are outlined in Table 14.

Table 11: Landholder and property details for [redacted]

Landholder details	
Registered owner/s on title:	[redacted]
ABN/ACN:	[redacted]
Phone:	[redacted]
Primary contact person:	[redacted]
Email:	[redacted]
Postal address:	[redacted]
Offset property description	
Property address: [redacted]	
Lot on plan: [redacted]	
Tenure: [redacted]	
Local government area: [redacted]	**Zoning:** [redacted]

6.3.2 Landholder engagement

CQC has been in discussions with the landholders of [redacted] since February 2020 to secure a legal interest in the proposed offset area identified as part of this BOS. In addition to the completion of detailed field assessments in May 2020 (Section 6.3.3), CQC has maintained regular communication with the landholder including two in person discussions in March and June 2020. Subject to the approval of this BOS, CQC propose to execute an agreement with the landholder with provisions to secure the [redacted] offset area through a suitable legally binding mechanism (see Section 7.5) and allow CQC access to manage and monitor the offset area in accordance with an offset area management plan.

6.3.3 Ecological surveys

The [redacted] offset area has been determined based on the outcomes of ecological surveys undertaken by CO2 Australia in May 2020 including:

- Ground-truthing of RE mapping, including stratification of ground-truthed observed REs in the same general condition state (remnant or regrowth) in accordance with Neldner et al. (2017).
- BioCondition assessments and assessment of vegetation and habitat condition at 10 monitoring sites, generally in accordance with the Guide to Determining Terrestrial Habitat Quality (version 1.2; DEHP 2017).
- Spotlighting surveys over three (3) nights (for up to 3 hours per night), focusing on areas likely to support ornamental snake, targeting the presence of ornamental snake and their known prey frog species.
- Assessment of habitat attributes for ornamental snake.

- Targeted survey for frog prey species.
- Observation of other threatened species listed under the EPBC Act and/or NC Act.

6.3.4 Environmental values

Regional Ecosystems

A summary of the ground-truthed RE present within the area available for offsets on [redacted] is presented in Table 12. The results of the vegetation assessment on [redacted] confirmed the presence of five (5) REs in the surveyed areas. Figure 9 illustrates the extent of the observed RE and the survey sites on [redacted].

Table 12: Ground-truthed regional ecosystem observed on the surveyed area of [redacted].

RE	Status*	Description	Area (ha)
11.3.3	OC	Eucalyptus coolabah woodland to open woodland with a grassy understorey. Occurs on Cainozoic alluvial plains or levees with clay or sometimes texture contrast soils. (BVG 16c)	1,357.0
11.3.5	LC	*Acacia cambagei* +/- *A. harpophylla* low woodland or open forest sometimes clumped. Occurs on levees on alluvial plains which are rarely flooded. Associated soils are often texture contrast with sandy surfaces. (BVG 26a)	951.2
11.3.25	LC	*Eucalyptus tereticornis* or *E. camaldulensis* woodland to open forest. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays with or without some texture contrast. (BVG 16a)	264.1
11.3.10	LC	*Eucalyptus brownii* grassy woodland. This unit usually occurs as a woodland of *E. brownii*. There is usually a grassy ground layer of *Aristida spp.*, *Chloris spp.*, *Fimbristylis dichotoma*, *Eriachne spp.*, *Eragrostis spp.* and *Chrysopogon fallax.* Occurs on Cainozoic alluvial plains. (BVG 17a)	237.9
11.3.7	LC	*Corymbia clarksoniana, C. tessellaris* and *C. dallachiana* tall woodland to open woodland, usually with a low open woodland tree layer dominated by a variety of species such as *Acacia salicina, Lysiphyllum hookeri* or *Grevillea striata.* Occurs on levees and plains formed from Quaternary alluviaal deposits supporting soils that are usually deep uniform sands with minor areas of sandy red earths. (BVG 9e)	100.0
Non-remnant	-	Areas of cleared and improved pasture	235.2
		Total ground-truthed area (ha)	3,145.4

* VM Act: EN = Endangered, OC = Of Concern, LC = Least Concern

Vegetation communities

Vegetation within the surveyed areas on the site is characterised by alluvial vegetation communities (landzone 3) corresponding to red gum communities [redacted] grading to alluvial floodplain communities dominated by coolabah woodland on cracking clays with gilgai, grading to slightly elevated areas dominated by gidgee. In the east of the surveyed areas, Quaternary alluvial deposits with deeper uniform sands supports bloodwood and box eucalypt woodland.

Coolabah woodland

The dominant vegetative feature in the surveyed area of the site was represented by 1,357 ha of Eucalyptus coolabah woodland, predominantly on often deep, cracking clays, consistent with RE 11.3.3 (Figure 8). While coolabah woodland areas were dominated by *Eucalyptus coolabah* to approximately 14 m, there was also occasionally other species such as *Alectryon diversifolius*, *Terminalia oblongata*, *Acacia stenophylla*, *A harpophylla* and *Atalaya hemiglauca*. The shrub layer was often very open or absent, although where present, was characterised by species from the tree layer, *Eremophila spp*. as well as areas with locally dominant patches of *Duma florulenta* or *Sesbania cannabina*. The ground layer was dominated by grasses (e.g. *Panicum decompositum*, *Eriochloa pseudoacrotricha*, *Eulalia aurea*, *Enteropogon acicularis*, *Aristida leptopoda*) with a small cover of forbs in places (e.g. *Alternanthera nodiflora*, *Abuliton spp*., *Atriplex muelleri*), particularly in lower-lying areas. Gilgai were located throughout the areas of RE 11.3.3, with some areas supporting relatively deep (~1 m vertical depth) and wide (>6 m) relief, many with deep cracks (up to 40 cm) and supporting accumulations of timber. Many of the gilgai were interlaced with other gilgai, often stretching many tens of metres through the coolabah woodland community.

Much of the coolabah woodland area away from watercourse areas was low in weed cover, with evidence throughout of varying impacts from cattle grazing.

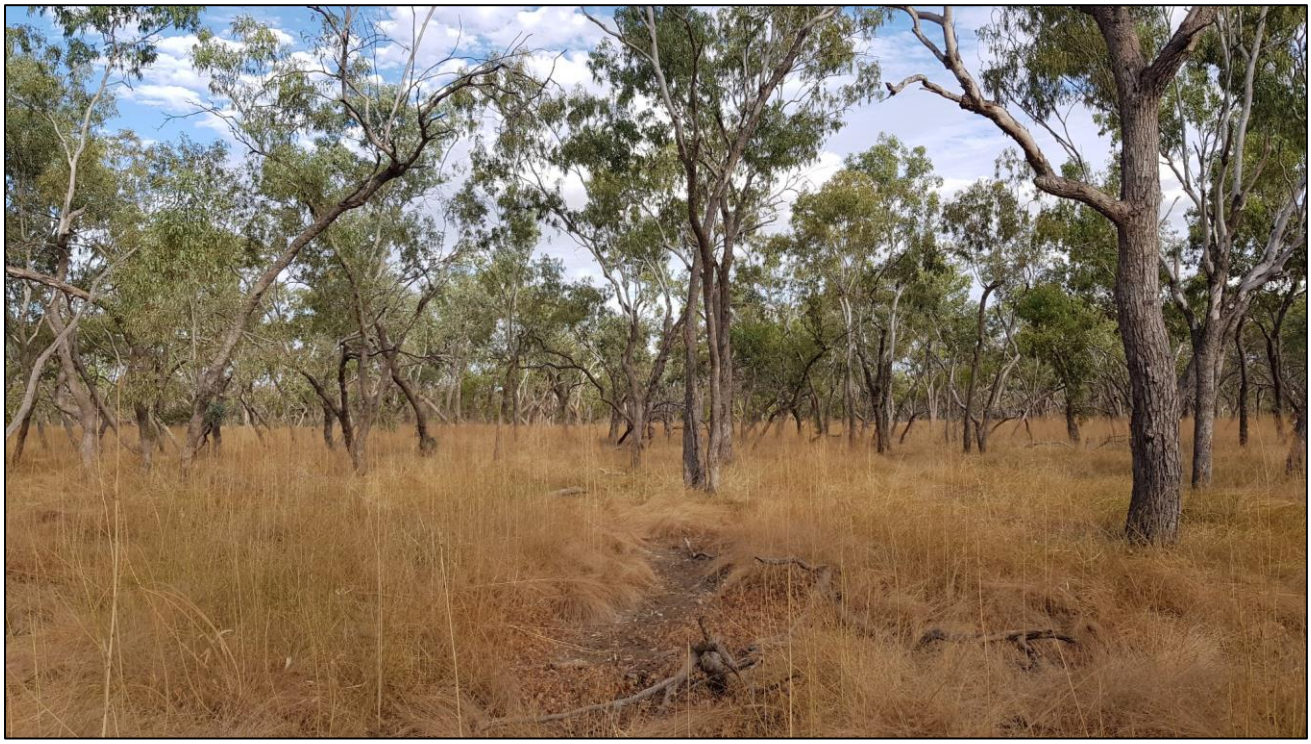


Figure 8: Representative photo of coolabah woodland vegetation – RE 11.3.3

Alluvial watercourse communities

Traversing the site are a series of alluvial channels draining from the south to the north, [redacted] consistent with RE 11.3.25. Vegetation along these channels are characterised by alluvial vegetation communities dominated by a diverse canopy of *Eucalyptus camaldulensis* +/- *Corymbia tessellaris*, *Melaleuca leucadendra*, *M. bracteata*, *Alstonia constricta*, *Acacia salicifolia*, *Lysiphyllum hookeri*, *Terminalia oblongata* and *Atalaya hemiglauca* to 15 m. Many of the alluvial watercourses, including their terraces were subject to dense weed cover dominated in parts by *Megathyrsus maximus*, *Parthenium*

hysterophorus, *Sida cordifolia*, *Cenchrus ciliaris*, *Xanthium occidentale*, *Vachellia farnesiana*, *Passiflora suberosa* or *Achyranthes aspera*.

Many of the watercourse areas were supporting pools of water; often expansive stretches of open water. Soils within these watercourses were of high clay content, aside from sandy areas within exposed beds of the watercourses.

Gidgee woodlands

Interspersed amongst the coolabah woodlands on slightly elevated terraces were large tracts of gidgee woodland (consistent with RE 11.3.5) supporting *Acacia cambagei* low woodland. These areas, with a canopy to 9 m, were characterised by a dense web of interspersed gilgai, some to 15 m wide. Understorey vegetation in these areas was relatively sparse, with occasional dense patches of Carissa ovata. Given the alluvial-derived nature of the underlying soils, gilgai in these areas did not support cracking clays, and were instead characterised by a sandy surface horizon, with any observed cracks invariably filled with loamy sand and silt.

Sandy woodlands on elevated alluvial plain

To the east of the surveyed area, [redacted] vegetation communities graded to those characterised by either a grassy woodlands of *Eucalyptus brownii* (RE 11.3.10) or woodlands comprising a mix of *Corymbia clarksoniana*, *C. tessellaris* and *C. dallachiana* (RE 11.3.7). These vegetation communities were located on levees and plains formed from Quaternary alluvial deposits, with soils deep uniform sands.

Ornamental Snake

The results of the survey in May 2020 confirmed the presence of a single ornamental snake (Figure 10) on the northern boundary of [redacted] in an area of RE 11.3.3 (refer to Figure 9 for location). While only a single ornamental snake was observed, this nocturnal species is more readily detectable during the warmer months following rainfall; coinciding with the elevated availability of their preferred frog species prey. The confirmed presence of an ornamental snake this far outside of the regular survey season is indicative of the favourable habitat and conditions (e.g. presence of standing water) available to the species and that persist on [redacted].

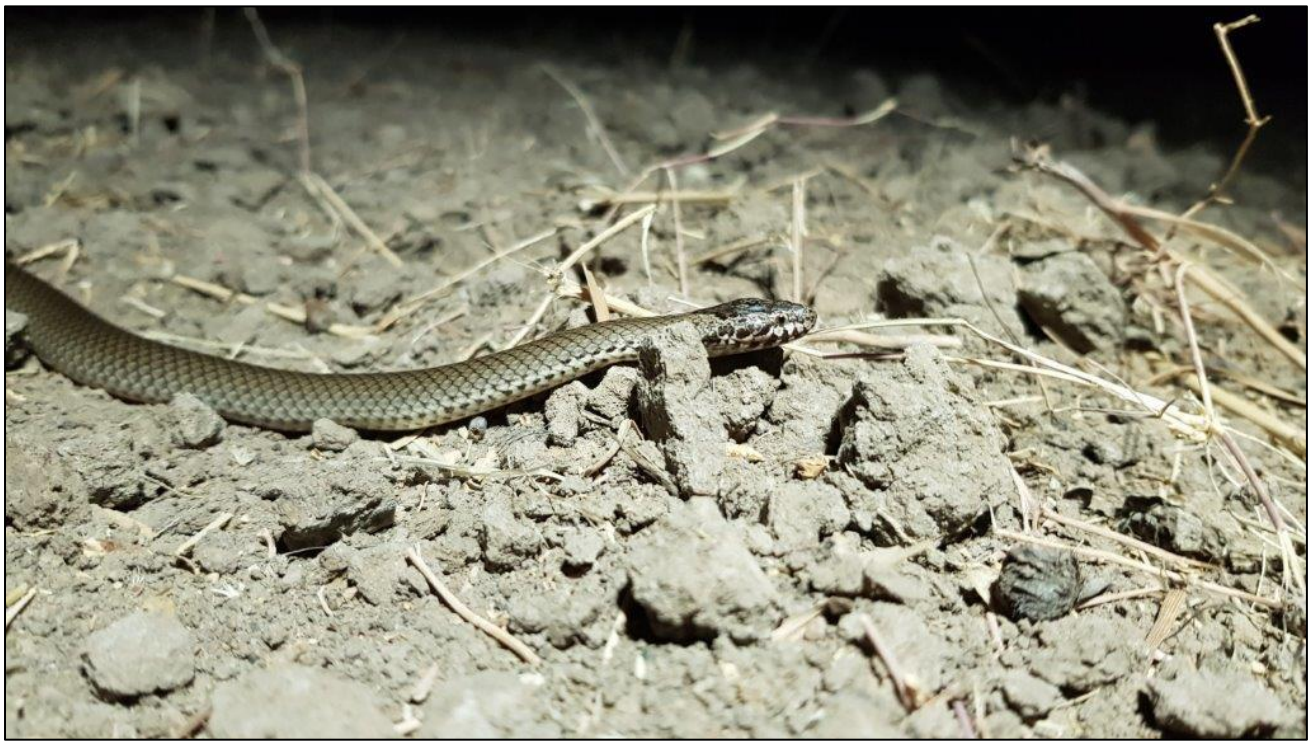


Figure 10: Photo of ornamental snake (*Denisonia maculata*) confirmed in vicinity of offset area in north of [redacted].

Other fauna/habitat values

The results of the spotlighting surveys on [redacted] confirmed the presence of a number of preferred frog prey species of the ornamental snake, including flooplain frog (*Litoria inermis*), spotted marsh frog (*Limnodynastes tasmaniensis*), desert tree frog (*Litoria rubella*), striped burrowing frog (*Cyclorana alboguttata*), New Holland frog (*Cyclorana novaehollandiae*) and green tree frog (*Litoria caerulea*).

During the May 2020 fieldwork on [redacted], the squatter pigeon was also confirmed on [redacted]. A total of 35 individuals were observed throughout the property, found in groups of between two (2) and 14. This included two squatter pigeon groups confirmed within the vicinity of the surveyed area, totalling 25 individuals.

6.3.5 Condition

[redacted] is located on land that has historically been developed for pastoral grazing. There is evidence of grazing throughout the property, with varying degrees of impact including browsing on shrubby vegetation, track formation, grazing on native grasses as well as trampling within gilgai and erosion within waterways. Weeds and exotic pasture grasses observed on [redacted] include Parthenium, mimosa bush (*Vachellia*

farnesiana) and *Megathyrsus maximus*, with the greatest density of weeds (particularly *M. maximus*) [redacted] corresponding to RE 11.3.25 (Figure 9). Pest animals present or that have the potential to be present within or in the immediate vicinity of the property include foxes, feral cats, wild dogs rabbits, and cane toads, with management for pest animals proposed as part of the draft offset area management plan. Additional detail on the condition and quality of the offset area is provided in the offsets assessment guides justifications in Appendix D and the draft Mamelon offset area management plan in Appendix G.

6.3.6 Landscape connectivity

The [redacted] property is situated in the Brigalow Belt bioregion, [redacted] and is adjacent to the Epping Forest National Park to the east. The offset area on the [redacted] property is mapped within an area identified as a Priority 3 – Strategic Footprint of the Galilee Basin Strategic Offset Investment Corridor (SOIC; DEHP 2013) (Figure 11). The Queensland Government has identified SOICs in each bioregion of Queensland with local input from regional natural resource management groups, ecology experts, landholders and local government. SOICs are identified as some of the best places in the landscape for environmental offsets as they mainly consist of core areas of largely intact remnant vegetation, generally associated with protected areas such as national parks, or areas that provide important links between those core areas.

6.3.7 [redacted] offset acquittal

The total proposed [redacted] offset area of approximately 227 ha (Figure 12) has been identified specifically to acquit the Project's MNES and MSES offset requirements for those matters not fully acquit by the Mamelon offset area, namely:

- Ornamental snake (*Denisonia maculata*) – MNES
- Of concern RE 11.3.4 (BVG 16c) – MSES (partly acquit on Mamelon)
- Watercourse RE 11.3.4 (BVG 16c) – MSES (partly acquit on Mamelon)
- Watercourse RE 11.3.25 (BVG 16a) – MSES (partly acquit on Mamelon).

Offset areas on [redacted] for the above MNES and MSES were calculated using the habitat quality scores in Table 13, developed generally in accordance with the Guide to Determining Terrestrial Habitat Quality (version 1.2; DEHP 2017). For further details see Appendix B for the method used to calculate the habitat quality scores and Appendix F for a summary of the data collected as part of ecological surveys and used to determine the [redacted] start habitat quality scores.

Table 13: MNES and MSES habitat quality scores relevant to [redacted] offset

Protected Matter	Impact habitat quality score	Start habitat quality score on [redacted]	Future habitat quality score on [redacted]
Ornamental snake	5	7	8
Of concern RE 11.3.4 (BVG 16c)	7	8	10
Watercourse RE 11.3.4 (BVG 16c)	7	8	10
Watercourse RE 11.3.25 (BVG 16a)	8	8	10

Table 14 presents the area for each MNES and MSES to be secured on [redacted] (Figure 12), and whether the offset requirement will be fully acquit . Appendix D presents the of the inputs and justifications used in the offsets assessment guide, including the start and future habitat quality scores presented in Table 13.

Table 14: Availability of MNES and MSES offset values on [redacted]

Protected Matter	Total significant residual impact (ha)	Total offset area to be secured (ha) on [redacted]	MNES acquittal (%) using offsets assessment guide^	MSES minimum area (ha) using land-based offset multiplier calculator#	Is MNES/MSES fully acquit on [redacted] or in combination with Mamelon?
MNES					
Ornamental snake	18.8	121.1	102.37	-	Yes (full [redacted])
MSES					
Of concern RE 11.3.4 (BVG 16c)	40.7	148.2	-	162.8	Yes (part [redacted]/part Mamelon)
Watercourse RE 11.3.4 (BVG 16c)	4.3	2.4	-	17.2	Yes (part [redacted]/part Mamelon)
Watercourse RE 11.3.25 (BVG 16a)	78.8	78.6	-	315.2	No*(part [redacted]/part Mamelon)

^ In accordance with EPBC Act Environmental Offsets Policy.
# In accordance with Queensland Environmental Offsets Policy.
* Remaining MSES watercourse RE 11.3.25 (BVG 16a) impact area to be offset (33.05 ha of the total significant residual impact of 78.8 ha) proposed to be acquit through a financial settlement offset in accordance with Queensland Environmental Offsets Policy (see Section 6.4). The land-based offsets for this MSES on Mamelon and [redacted], plus the financial settlement offset for this MSES, will fully acquit this protected matter.

6.4 FINANCIAL SETTLEMENT OFFSET

Financial settlement offsets are proposed for the remaining MSES offsets which are unable to be secured on Mamelon and [redacted]. These two MSES are:

- Watercourse RE 11.3.25 (BVG 16a) (only part of impact remaining to be offset, 33.95 ha)
- Waterway providing for fish passage (all of impact remaining to be offset, 8.35 ha).

In accordance with the Queensland Environmental Offsets Policy, the financial settlement offset calculator has been used to calculate the cost of this financial settlement offset. Using a separate section for each of the two distinct matter area impacts listed above, a combined total cost of $874,585.65 has been calculated. The details of the financial settlement offset are provided in the Project's ODP (ODP Attachment B), and following DES approval of such, payment will be made to the Queensland Government's Offset Fund prior to Project commencement.

6.5 ADDRESSING OFFSET POLICY REQUIREMENTS

Table 15 and Table 16 demonstrate how the offset package proposed for the Project meets the key overarching requirements of the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offsets Policy, respectively.

Table 15: EPBC Act Environmental Offsets Policy requirements and the Project's compliance

EPBC Act Environmental Offsets Policy requirement	Offset Package for the Project
Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action	In accordance with the EPBC Act Environmental Offsets Policy and offsets assessment guide, the Mamelon and [redacted] offset areas will fully acquit the anticipated MNES offset requirements for greater glider, koala, squatter pigeon and ornamental snake. The Mamelon and [redacted] offset areas will be managed to improve the condition and viability of the threatened species habitat. The Mamelon and [redacted] OAMPs set out specific management objectives with interim performance targets and completion criteria. Management actions are outlined with accompanying adaptive management triggers and corrective actions in the event that monitoring identifies interim performance targets are not attained or completion criteria are not attained and/or maintained. The Mamelon and [redacted] offset areas will be managed and monitored from approval of the OAMPs for a minimum of 20 years. It is anticipated that the completion criteria will be achieved within a 20-year period.
Suitable offsets must be built around direct offsets but may include other compensatory measures	100% of the Project's anticipated MNES offset requirements will be acquit through the delivery of direct land-based offsets on Mamelon and [redacted]. These offset areas have been determined to be suitable in accordance with the EPBC Act Environmental Offsets Policy and offsets assessment guide.
Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter	The threatened status of the impacted protected matters are taken into account by the offsets assessment guide in calculating the area of the offsets to be provided.

EPBC Act Environmental Offsets Policy requirement	Offset Package for the Project
Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter	The size of the Mamelon and [redacted] offset areas to be secured have been calculated in accordance with the offsets assessment guide. The inputs and justifications are based on the results of detailed field assessments.
Suitable offsets must effectively account for and manage the risks of the offset not succeeding	The Mamelon and [redacted] offset areas to be secured have been calculated in accordance with the offsets assessment guide. The inputs, justifications and results are set out in Appendix D.
Suitable offsets must be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs	The proposed Mamelon and [redacted] offset areas are zoned rural under the Livingstone Shire Council and Isaac Regional Council, respectively. The current primary land use on both the offset properties is cattle grazing. The proposed offsets are subject to potential threats, including spread of weeds such as Parthenium (*Parthenium hysterophorus*) and exotic pasture grasses, pest animals, inappropriate fire regimes and potential future development.
Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable	The process used to identify, secure and establish offsets for the Project is consistent with the key requirements of the EPBC Act Environmental Offsets Policy. The offset areas have been identified and deemed suitable using an evidence-based and scientifically robust approach. The Mamelon and [redacted] OAMPs supports the efficient, effective, timely, transparent and scientifically robust approach to providing offsets.
Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The Mamelon and [redacted] OAMPs outline a governance framework and delivery pathway to legally secure the offset areas on the title of each of the properties, which will be monitored, and audited/enforced.

Table 16: Queensland Environmental Offsets Policy requirements and the Project's compliance

Queensland Environmental Offsets Policy requirement	Offset Package for the Project
Offsets will not replace or undermine existing environmental standards or regulatory requirements, or be used to allow development in areas otherwise prohibited through legislation or policy	A detailed assessment of the significant residual impacts on MSES associated with the Project was undertaken as part of SEIS (Version 3; August 2020). Since the publication of the previous SEIS (Version 2; December 2018) documentation, substantial additional ecological field surveys and technical studies have been undertaken in order to evaluate the habitat characteristics within the impact area that are specific to the respective threatened environmental values. The likely significant residual impacts on MNES and MSES have been refined and amended accordingly in the SEIS v3 and summarised in this BOS (Section 5).
Environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact.	The Project has been designed to avoid and minimise environmental impacts to the greatest extent possible; however, the mine layout is dependent on the underlying geology as well as the location of the existing North Coast Rail Line which will be used to transport the Project's coal to the existing Dalrymple Bay Coal Terminal. Avoidance and mitigation measures were considered as part of the impact assessment and identification of significant residual impacts on MNES and MSES for the Project. To avoid and minimise any further impacts on environmental values as part of construction and operation, CQC will implement a range of

Queensland Environmental Offsets Policy requirement	Offset Package for the Project
	mitigation, management and monitoring measures, a summary of which has been provided in this BOS (Section 4).
Offsets must achieve a conservation outcome that achieves an equivalent environmental outcome	Draft OAMPs for the Mamelon and [redacted] offset areas (appendices to the Project's ODP in Appendix G of this BOS) include specific management objectives and completion criteria for each of the MNES and MSES offset values as well as ongoing management and monitoring activities to ensure that a conservation outcome for the offset values can be achieved. In accordance with the Queensland Environmental Offset Framework and the Guide to Determining Terrestrial Habitat Quality the MSES offsets will be required to achieve: ▶ habitat quality score at least 1 point greater than the impact site's score, and ▶ minimum overall habitat quality gain of at least 2 points, relative to the offset sites starting habitat quality.
Offsets must provide environmental values as similar as possible to those being lost.	The Mamelon and [redacted] offset properties meet the specific criteria for the relevant MSES outlined in the Queensland Environmental Offsets Policy section 2.3.1.6 Characteristics of a land-based offset site. Detailed field surveys on Mamelon and [redacted] have been completed in accordance with the Guide to Determining Terrestrial Habitat Quality in order to confirm the extent and condition of MSES offset values.
Offset provision must minimise the time-lag between the impact and delivery of the offset.	This BOS, in conjunction with the ODP (Appendix G), has been prepared to outline CQC's proposed plan for the delivery of the Project's MNES and MSES offset package. As the MSES offset areas are to be provided in conjunction with the MNES offset areas on the same properties (Mamelon and [redacted]), CQC propose to align the timeframes for MNES and MSES offset delivery.
Offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values.	The offset areas will be secured through a legally binding mechanism negotiated between CQC, the Queensland and Commonwealth governments, the landholders and any other relevant parties with a registered interest in the land. Examples of legally binding mechanisms under the Queensland Environmental Offsets Policy available for use are detailed in section 7.5. Legal security of the Mamelon and [redacted] offset areas will provide greater protection for the environmental values than what is currently afforded to remnant vegetation under the VM Act, and the *Planning Act 2016* and associated policies and codes.
Where legal security is required, offsets must be legally secured for the duration of the impact on the prescribed environmental matter.	The offset areas for Mamelon and [redacted] will be protected by legally binding mechanisms which will remain in effect as required by the applicable State and Commonwealth legislative requirements (see section 7.5).

7 OFFSETS DELIVERY

7.1 LANDHOLDER AGREEMENTS

Given QNI Metals is the registered owner of the Mamelon property, and the joint proponents (CQC and Fairway Coal) are all related companies having common shareholder ownership and control, CQC already has a legal interest in the Mamelon offset area. As such a landholder offset agreement is not required for Mamelon. For the [redacted] offset area, CQC will secure a legal interest in this area through an executed landholder agreement currently being negotiated with the [redacted] landholder. In the event that CQC are unable to finalise the agreement with the [redacted] landholder (e.g. as a result of commercial considerations, landholder willingness to participate, etc) it is possible that a suitable alternative offset for the Project will be subsequently identified and this strategy does not preclude such a property being used to fulfil the Project offset requirements.

7.2 OFFSETS ASSESSMENT GUIDES

Endorsement of this BOS including the offsets assessment guides' inputs, justifications and results (Appendix D) is sought from the regulators prior to the finalisation of the Project's ODP (Appendix G) and draft OAMPs for Mamelon and [redacted].

7.3 OFFSETS DELIVERY PLAN

The ODP (Appendix G) has been developed for the Project in conjunction with this BOS and the draft OAMPs (attached to the ODP) to provide specific information regarding delivery of the offsets. It details CQC's approach to providing environmental offsets for the Project that comply with the Commonwealth Government's Environmental Offsets Policy (DSEWPC 2012) as required under the EPBC Act, and the Queensland Government's Environmental Offsets Policy (version 1.8; DES 2020) as required under the Queensland Environmental Offsets Framework.

7.4 OFFSET AREA MANAGEMENT PLANS

The OAMPs for Mamelon and [redacted] will guide the ongoing management and monitoring of the MNES and MSES offset areas. The draft OAMPs for Mamelon and [redacted] are attached to the Project's ODP (Appendix G) for regulator review (see ODP Appendix F and Appendix G, respectively). Following regulator endorsement of the offsets assessment guides as stated in section 7.2 above, and further liaison with CQC and the landholders, the OAMPs will be finalised and submitted to the Commonwealth and State for approval. The approved OAMPs will be implemented by CQC.

7.4.1 Management

Management actions in the OAMPs are based on detailed site assessments and the key threats and recommended priority actions for each offset matter, as listed in recovery plans, threat abatement plans and conservation advices. Property and species-specific details for management are defined in detail in the respective OAMPs for Mamelon and [redacted], with corresponding actions also informed by general guidance such as the regional and local priority actions under each conservation advice.

7.4.2 Monitoring

Monitoring measures identified in the Mamelon and [redacted] OAMPs are in accordance with recognised survey guidelines, other relevant documents and best practice. Monitoring in both offset areas will include habitat quality assessments, photo monitoring, weed surveys, pest animal surveys, targeted fauna surveys,

biomass monitoring, ground cover and erosion monitoring and general inspections of fencing, access tracks and firebreaks. Site and species-specific monitoring measures have been developed as part of the individual OAMPs.

7.4.3 Reporting

Following finalisation and approval of the Mamelon and [redacted] OAMPs, reporting against these OAMPs (including the management and monitoring undertaken and progress/results) will be prepared after the management years 1, 3, 5, and then every five years of the remaining 20-year management period (i.e. years 10, 15 and 20) to align with the interim performance targets and completion criteria milestone dates.

7.4.4 Adaptive management

In accordance with the principles of adaptive management, the OAMPs will be amended (if required) to incorporate changes identified through management actions and monitoring activities. This may include the revision of/addition to current management actions and monitoring activities, responses to adaptive management triggers and review of environmental threats.

7.5 LEGAL SECURITY

Offsets for the Project will be secured via a legally binding mechanism that is considered appropriate for protecting the MNES and MSES values in the offset areas on the offset properties. Such mechanisms include:

- Voluntary Declaration under the VM Act
- Statutory covenant under the *Land Title Act 1994* or the *Land Act 1994*
- Nature Refuge under the NC Act.

An overview and comparison of each of these legally binding mechanisms is provided in Table 17.

The mechanisms to legally secure offset areas are linked to an approved management approach (e.g. an application for a Voluntary Declaration must be accompanied by an approved OAMP). Therefore, the appropriate legally binding mechanism process for each offset area will commence post approval of the relevant OAMP by the Commonwealth and State.

Offset areas on the Mamelon property are proposed to be legally secured through a Voluntary Declaration under the VM Act, as are offset areas on the [redacted] property, subject to necessary further discussions between CQC, the regulators and the landholders.

Table 17: Legally binding mechanisms to secure offset areas

Mechanism	Summary
Voluntary Declaration *Vegetation Management Act 1999* (Qld) Division 4, Subdivision 2 - Declarations by the Chief Executive, sections 19E to 19L	▶ Voluntary mechanism for protecting areas of native vegetation on land of high conservation value. ▶ Registered on property title so its associated restrictions and obligations are binding on any subsequent landowner. ▶ Requires implementation of an approved management plan [i.e. offset area management plan; s.19E(2)-(4)]. ▶ Remains in place until the objectives of that plan are achieved, the declaration ends (s.19J and 19L), or in some cases, permanently. ▶ Offset area is mapped on a PMAV and given at least the same level of protection as a remnant endangered regional ecosystem under the VM Act.

Mechanism	Summary
	▶ Simple application process and less costly than other forms of protection such as a statutory covenant. ▶ Enforcement is more certain than a statutory covenant. ▶ Some activities can be exempt from the protection. ▶ Can be removed by the Chief Executive if it is found to be not in the interests of the State, having regard to the public interest. ▶ Timeframe: 3 to 12 months.
Statutory Covenant Freehold land - *Land Title Act 1994* (Qld), Part 6 Div. 4A Non-freehold land - *Land Act 1994* (Qld), Chapter 6 Part 4 Div. 8A	▶ Voluntary written agreement between two or more parties that restricts or requires certain activities be carried out upon the land. ▶ Registered on the land title, so the obligations they impose also bind any subsequent purchaser of the land. ▶ For statutory covenants related to environmental offsets, the parties are typically: ▶ The State of Queensland or another entity representing the State or a local government (covenantee) who ensures that the conditions of the statutory covenant are observed, and ▶ The landowner (covenantor) who is subject to the obligations outlined by the covenant which, for an offset, includes complying with restrictions outlined in the offset area management plan. ▶ To be capable of registration under Queensland legislation a statutory covenant must: ▶ relate to the use of a lot or part of a lot; or a proposed or existing building on the lot; or ▶ be aimed directly at preserving a native animal or plant; or a natural or physical feature of cultural or scientific significance; or ▶ ensure that the subject lots are transferred to single ownership only. ▶ A plan of survey is required if covenant affects part of the lot. ▶ Can be expensive due to survey costs as per the Registrar of Titles Directions for the Preparation of Plans. May not be suitable for land with multiple owners. ▶ Can be terminated or amended by agreement of the Government covenantee. ▶ Timeframe: 6 to 12 months.
Nature Refuge *Nature Conservation Act 1992* (Qld) Part 4, Division 4	▶ Voluntary nature refuge agreement between a landholder and the Government that acknowledges a commitment to manage and preserve land with significant conservation values while allowing compatible and sustainable land uses to continue. ▶ High level, long-term protection. ▶ Nature Refuges are managed to: ▶ conserve the area's significant cultural and natural resources; ▶ provide for controlled use of the area's cultural and natural resources; and ▶ provide for the interests of landholders to be considered. ▶ can allow for the continuation of other land uses including grazing, forestry and mining. ▶ Some landholders may not wish to enter such a long-term agreement. ▶ The Queensland Government no longer directly handles the establishment of privately-owned nature refuges. The Queensland Trust for Nature has been appointed by the Queensland

Mechanism	Summary
	Government to facilitate the application process for privately owned nature refuges. ▶ The referral process with the Queensland Government can encounter bottlenecks, which can cause time delays. ▶ Timeframe: 12-24 months.

7.6 REVIEW AND REPORTING

In addition to any compliance reporting described in the OAMPs or in subsequent Project approval conditions, CQC will also prepare an offset reconciliation report for the BOS five years after approval of the BOS. This report will be submitted to the Commonwealth and State administering authorities and will reconcile actual significant residual impacts of the Project on MNES and MSES with actual offset areas legally secured. The reconciliation review and report will ensure that commensurate offsets have been delivered and relevant conditions of approval have been fulfilled.

If this review and report finds any additional offsets are required for the Project, this BOS will be updated accordingly and resubmitted to regulators for approval/endorsement.

7.7 TIMEFRAMES

Offsets are proposed to be delivered in accordance with the tasks and timeframes in Table 18. These tasks and timeframes are subject to change due to a number of variables, including regulatory (Commonwealth and Queensland Government) approval, regulatory requirements, climatic conditions, stakeholder inactivity and other unexpected delays.

Table 18: Proposed CQC Project offset delivery timeframe

Description	Target date for completion
Negotiate on and gain endorsement of final BOS, including offsets assessment guides, and ODP with regulators	Q4 2020
Commonwealth and Queensland government approval granted for the project	Q4 2020
Commence construction	Q1 2021
Execute [redacted] Landholder Agreement	Q1 2021
Finalise OAMPs and submit to regulators	Q2 2021
Regulator review and anticipated approval of OAMPs	Q2 2021
Implement approved OAMPs	Q3 2021
Legally secure offset areas	Q3 2021
Five years post approval of the BOS, review and reconcile actual impacts with offsets and submit report to regulators	Q4 2025

8 REFERENCES

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APPENDIX A SIGNIFICANT RESIDUAL IMPACT ASSESSMENT FOR CONNECTIVITY

Department of Environment and Heritage Protection (DEHP)
Landscape Fragmentation and Connectivity (LFC) Tool version 1.4 LOGFILE
Process started at 15-07-2020 09:31:51 PM
Python version: 2.7.5 (default, May 15 2013, 22:43:36) [MSC v.1500 32 bit (Intel)]
Arcpy version: 10.3
Username: Arosha

INPUT PARAMETERS
Output Workspace: G:\Co2\Connectivity\CQC_connectivity\Temp\T5
Threshold lookup table:
G:\Co2\Connectivity\DP_EHP_LFC_TOOL2\LFC_data.gdb\tbl_Regional_frag_local_threshold
Remnant cover layer:
G:\Co2\Connectivity\DP_EHP_LFC_TOOL2\LFC_data.gdb\QLD_VEG_RVM_100K_v2p0_Updated
Remnant cover layer edited: True
Regional buffer extent: 20 kilometres
Local buffer extent: 5 kilometres
Impact layer: G:\Co2\Connectivity\CQC_connectivity\Temp\DATA.gdb\DisturbanceAreaD
layer projection: GDA_1994_MGA_Zone_55
Raster cell resolution for analysis: 10 metres
Edge Width: 50 metres
(The distance from non-remnant landscapes through to the core ecosystem - the edge of remnant ecosystems)
Default projection: G:\Co2\Connectivity\DP_EHP_LFC_TOOL2\scripts\QLD Albers Equal Area Conic.prj

21:31:51 Checking out the spatial analyst tool - required for LFC

21:31:51 _____BEGINNING LANDSCAPE FRAGMENTATION AND CONNECTIVITY ANALYSIS_____

21:31:51 This tool will categorise the landscape into:
{0: 'non-rem', 1: 'patch', 2: 'edge', 3: 'perforated', 4: 'core (< 100 hectares)', 5: 'core (100-500 hectares)', 6: 'core (> 500 hectares)'}

21:31:57 G:\Co2\Connectivity\CQC_connectivity\Temp\T5\lyr_file does not exist, creating it now.
21:31:57 Copying across impact site feature(s) and calculating area in hectares (AreaHA)
21:32:00 Making a local copy of the impact site
21:32:03 Preparing remnant cover layer for analysis
21:32:06 Created regional scale buffer of 20 kilometres
21:32:08 Created local scale buffer of 5 kilometres
21:32:24 Clipped the remnant cover to the regional buffer extent
21:32:30 Unioned the pre impact remnant layer with the impact site
21:32:35 Attributed the impact area as non-remnant
21:32:38 Categorised the cover attributes in clip_remcover_pre.shp ready for raster conversion
21:33:08 Converted clip_remcover_pre.shp to raster

21:33:11 Categorised the cover attributes in clip_remcover_post.shp ready for raster conversion
21:33:40 Converted clip_remcover_post.shp to raster

21:33:40 Run Landscape fragmentation analysis on the pre impact regional landscape

NATURALLY VEGETATED AND CLEARED LAND BEING EXTRACTED FROM LAND COVER
IDENTIFICATION OF CORE, PATCH, EDGE AND PERFORATIONS
COMBINING FRAGMENTATION CLASSES

CLASSIFYING CORE FOREST PATCHES BY AREA
COMPOSING FINAL FRAGMENTATION MAP
COMPOSING FINAL FRAGMENTATION MAP
(FRAGMENTATION CALCULATION TIME WAS 10.2 MINUTES)

21:43:52 Run Landscape fragmentation analysis on the post impact regional landscape

NATURALLY VEGETATED AND CLEARED LAND BEING EXTRACTED FROM LAND COVER
IDENTIFICATION OF CORE, PATCH, EDGE AND PERFORATIONS
COMBINING FRAGMENTATION CLASSES
CLASSIFYING CORE FOREST PATCHES BY AREA
COMPOSING FINAL FRAGMENTATION MAP
COMPOSING FINAL FRAGMENTATION MAP
(FRAGMENTATION CALCULATION TIME WAS 10.2 MINUTES)

Extracting a local subset of lfc_regional_pre_impact
Extracting a local subset of lfc_regional_post_impact

Collating pre and post impact statistics and trigger assessment
21:54:55 Summarising area statistics for: lfc_localmsk_pre_impact
21:54:55 Summarising area statistics for: lfc_localmsk_post_impact
21:54:55 Summarising area statistics for: lfc_regional_pre_impact
21:54:56 Summarising patch count for lfc_localmsk_pre_impact
21:55:08 Summarising patch count for lfc_localmsk_post_impact

Analysing impact on Connectivity Areas

SIGNIFICANCE TEST ONE

The regional total area is 172653.16
The regional extent of core remnant is 50361.91
The regional extent of core remnant is 29.17 percent
This level of regional fragmentation sets a local impact threshold of: 5.0 percent

The table below lists the local impact thresholds for categories of regional core remnant extent:

REGIONAL CORE CATEGORY	LOCAL IMPACT THRESHOLD
< 10	2.0
10 - 30	5.0
30 - 50	10.0
50 - 70	20.0
70 - 90	30.0
>90	50.0

Area of core at the local scale (pre impact): 5066.22
Area of core at the local scale (post impact): 4888.69
Percent change of core at the local scale (post impact): 3.50 percent

SIGNIFICANCE TEST TWO

The number of core remnant areas occurring on the site: 1
The number of core remnant areas remaining on the site post impact: 1
(Only core polygons greater than or equal to 1 hectare are included)

RESULT

21:55:29 This analysis has determined any impact on connectivity areas is NOT significant
(A significant reduction in core remnant at the local scale is False OR a change from core to non-core remnant at the site scale is False)

The significance table has been written to: ..\main_output\lfc_significance_assessment.csv
The local scale summary table has been written to: ..\main_output\lfc_local_scale_summary.csv
The site scale summary table has been written to: ..\main_output\lfc_site_scale_summary.csv
GIS layer files copied into folder \lyr_file within the project folder.
View layers in ArcMAP using..\G:\Co2\Connectivity\CQC_connectivity\Temp\T5\lyr_file\lyr_file\Connectivity Area Impact Assessment.lyr

Please scrutinise the output tables and spatial layers to confirm the desktop modelling of connectivity area impact

This analysis used an edited version of the Regulated Vegetation layer.

21:58:25 _____COMPLETED LANDSCAPE FRAGMENTATION AND CONNECTIVITY ANALYSIS_____

APPENDIX B OFFSET HABITAT QUALITY SCORE METHOD

SUMMARY

The habitat quality score for each matter of national environmental significance (MNES) will be calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality (version 1.2; DEHP, 2017) and the methods outlined below in order to be consistent with the requirements under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) guideline for the offsets assessment guide (OAG).

MNES HABITAT QUALITY SCORING METHOD

The habitat quality for each MNES for use in the offsets assessment guide, is required to consider three attributes:

- site condition
- site context
- species stocking rate.

The following sections provide an overview of the methodology used to calculate habitat quality for each of the threatened fauna.

SITE CONDITION

Method

The site condition score for each MNES will be calculated generally in accordance with the site condition assessment method outlined in Section 5 of the Guide to Determining Terrestrial Habitat Quality (DEHP 2017). Site condition is determined through a field-based assessment of 13 ecological attributes to describe the structure and function of the vegetation community, compared to the expected range for a relatively undisturbed community (i.e. regional ecosystem benchmark).

The results of the field-based assessment will be scored based on the scoring guide provided in the Guide to Determining Terrestrial Habitat Quality (DEHP 2017) to determine the site condition score, for each MNES at each relevant monitoring site, out of 80.

Offsets assessment guide requirements

In accordance with the OAG, the condition of a site is considered in relation to the ecological requirements of a threatened species or ecological community including:

- What is the structure and condition of the vegetation on the site?
- What is the diversity of relevant habitat species present (including both endemic and non-endemic)?
- What relevant habitat features are on the site?

Table B-1 summarises how each of the requirements of the OAG are considered as part of determining the site condition score for an offset value.

Table B-1: Assessment of site condition.

Habitat quality component	Assessment process
What is the structure and condition of the vegetation on the site?	The structure and condition of the vegetation is assessed generally in accordance with the site condition assessment component from the Guide to Determining Terrestrial Habitat Quality. This assessment measures a suite of ecological attributes to describe the structure, function and integrity of the vegetation community, compared to the same vegetation community in a relatively undisturbed state (i.e. a benchmark). The condition of the vegetation community has a direct influence on its ability to support and provide habitat for biodiversity values.
What is the diversity of relevant habitat species present (including endemic and non-endemic)?	The site condition component from the Guide to Determining Terrestrial Habitat Quality assesses different attributes of a vegetation community comparing the relevant species richness for particular attributes against the benchmark, including native tree, shrub, grass and forb species richness as well as extent of non-endemic plant species. The results of these assessments can be used to confirm the presence and diversity of habitat species relevant to the offset value.
What relevant habitat features are on the site?	The offset area for each value was initially determined based on ground-truthed RE and the presence of known habitat features identified as part of field surveys of the area undertaken between August 2018 and November 2019, in accordance with species conservation advice and other species-specific sources endorsed by Queensland and/or Commonwealth Governments. Ongoing site condition assessments for each offset value will continue to confirm the presence of relevant habitat features within previously shortlisted, suitable vegetation communities as well as assessing their condition against their corresponding benchmark.

SITE CONTEXT

Method

The method to calculate site context for a site has been calculated generally in accordance with the site condition assessment method outlined in Section 5 of the GTDTHQ. The following components were assessed through a GIS desktop analysis at each relevant monitoring site for each MNES.

Subregion assessment

The first step is to determine whether the site is located within a fragmented or intact subregion in Queensland. Fragmented subregions are defined as containing 30–95% non-remnant vegetation, while intact subregions are defined as containing less than 30% non-remnant vegetation. A list of fragmented and intact subregions is provided in the Appendix 11.6 of the GTDTHQ. All monitoring sites for all MNES are located within either the Marlborough Plains or Nebo-Connors Ranges subregions of the Brigalow Belt bioregion, identified as fragmented landscape subregions for the purposes of the site context assessment.

Patch size (fragmented subregion)

Patch size is only recorded for those monitoring sites within fragmented subregions. Patch size is the size of the patch/assessment unit being assessed and any directly connecting remnant vegetation. To calculate the patch size score:

- Measure the area of remnant vegetation in which the monitoring site is contained and add on all other directly connecting areas of remnant vegetation. Where the monitoring site is within an area not considered remnant vegetation (i.e. regrowth vegetation), the patch size is 0 ha.
- Determine the score for this attribute by matching with the class ranges in Table B-2.

Connectedness (fragmented subregion)

Connectedness is only recorded for those monitoring sites within fragmented subregions. Measure the proportion of the assessment unit's boundary which is connected to remnant vegetation. To calculate the connectedness score:

- Measure the percentage of remnant vegetation along the boundary of the patch containing the monitoring site. Where the monitoring site is within an area not considered remnant vegetation (i.e. regrowth vegetation), connectedness is assigned a 0.
- Determine the score for this attribute by matching with the class ranges in Table B-2.

Context (fragmented subregion)

Context is only recorded for those monitoring sites within fragmented subregions. Assessment involves measuring the percentage of remnant vegetation within a one-kilometre buffer around the monitoring site. To calculate the context score:

- Create a 1 km buffer around the monitoring site.
- Measure the percentage of remnant vegetation within the 1 km buffer.
- Determine the score for this attribute by matching with the thresholds Table B-2.

Ecological corridors (fragmented and intact subregion)

This attribute is scored for monitoring sites within fragmented and intact landscapes. To calculate the ecological corridor score:

- Determine the proximity of the site to state, bioregional, regional or sub-regional corridors (terrestrial or riparian).
- Determine the score from Table B-2 based on whether the site is located within (wholly or partly), shares a common boundary with, or is not within a corridor.

Table B-2: Site context scoring guide.

Attribute		Score				
Size of patch	Score	0	2	5	7	10
	Description	<5 ha	5-25 ha	26-100 ha	101-200 ha	>200 ha
Connectedness	Score	0	2		4	5
	Description	0-10%	>10%-<50%		50-75%	>75% or >500 ha
Context	Score	0	2		4	5
	Description	<10%	>10-30%		>30-75%	>75%
Ecological corridors	Score	0	4		6	
	Description	Not within	Sharing a common boundary		Within (whole or part)	

The total site context score for each MNES at each relevant monitoring site is calculated out of 26.

Offsets assessment guide requirements

In accordance with the offsets assessment guide, site context is assessed based on the relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs of a threatened species or ecological community, including:

- What is the connectivity with other suitable/known habitat or remnants?
- What is the importance of the site in relation to the overall species population or the occurrence of the community?
- What threats occur on or near site?

Table B-3 summarises how each of the requirements above are considered as part of determining the site context score for an offset value.

Table B-3: Assessment of site context.

Habitat quality component	Assessment process
What is the connectivity with other suitable/known habitat or remnants?	This component is assessed through: ▶ Connectedness - measuring the proportion of the site's boundary which is connected to suitable/known habitat and remnant vegetation. ▶ Patch size – measuring the size of the patch being assessed and any directly connecting remnant vegetation.
What is the importance of the site in relation to the overall species population or the occurrence of the community?	This component is assessed through Context by measuring the percentage of remnant vegetation within a 1 km buffer around the site/assessment unit. The greater the proportion of suitable/known habitat and remnant vegetation within the buffer area the more likely the site and surrounding areas will support a viable, self-sustaining, source-meta-population of the species or community.
What threats occur on or near site?	This component is assessed as part of the species habitat index score for MNES.

SPECIES HABITAT INDEX

Method

A quantitative method will be used to determine the species habitat index score for each fauna and flora MNES based on the species habitat index assessment method used as part of the Guide to Determining Terrestrial Habitat Quality (DEHP 2017), as well as the requirements for species stocking rate under the offsets assessment guide.

Table B-5 to Table B-8 summarise the method to be used to calculate the species habitat index score out of 50 for greater glider, koala, squatter pigeon and ornamental snake. Each sub-component of species habitat index scoring method is tailored for each MNES to take into account species-specific habitat requirements and threats in accordance with conservation advices and other species-specific sources endorsed by Queensland and/or Commonwealth governments.

Information on species stocking rate will be derived from ongoing habitat quality assessment events in accordance with the OAMP.

Offsets assessment guide requirements

In accordance with the offsets assessment guide species stocking rate is assessed based on the usage and/or density of a species at a particular site and the role of the site population in regards to the overall species population viability or community extent, including:

- What is the presence of the species on the site? (i.e. confirmed / modelled).
- What is the density of species known to utilise the site?
- What is the role of the site population in regards to the overall species population?

Table B-4 summarises how each of the requirements above are considered as part of determining the species habitat index score for an offset value.

Table B-4: Assessment of species stocking rate.

Habitat quality component	Assessment process
What is the presence of the species on the site? (i.e. confirmed / modelled).	The components assessed as part of the method not only quantify the presence, density and role of the site's ability to actually or likely support a species population; however, also provide a measure in regards to additional components of the site in supporting or potentially supporting the MNES (e.g. presence of known koala food trees for koala, perennial grass cover for squatter pigeon). The relative presence and density of the MNES on the site will be assessed as part of ongoing targeted surveys undertaken in accordance with the DSITIA Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2018), Survey guidelines for Australia's threatened birds (DEWHA 2010), Survey guidelines for Australia's threatened mammals (DSEWPC 2011) or other species-specific survey guidelines endorsed by Queensland and/or Commonwealth Government.
What is the density of species known to utilise the site?	
What is the role of the site population in regards to the overall species population?	

Table B-5: Species habitat index scoring for greater glider.

Component	Score	Description
Threats to species	1	Habitat is not protected through legislation and/or is likely to be cleared for development or agricultural landuse and/or subject to ongoing degradation. No active fire management on site, with habitat either frequently burnt and/or subject to a high risk of uncontrolled wildfire on site, including from adjacent properties. Site is not actively managed for conservation purposes and lack of landholder awareness of threatened species habitat and conservation.
	7	Habitat is not protected through legislation and is unlikely to be cleared for development or agricultural landuse. Active fire management and/or low risk of uncontrolled fire on site, including from adjacent properties.
	15	Habitat protected as part of a legally binding mechanism for an offset and/or National Park and/or Nature Refuge, with management aimed at maintaining or improving habitat. Active fire management, with controlled burns on site and low risk of uncontrolled fire on site, including from adjacent properties. Site is actively managed for conservation purposes to enhance habitat for threatened species.
Quality and availability of food and foraging habitat	1	Overall habitat quality score <5 AND <50% of the RE benchmark value for large trees AND/OR <10% tree canopy cover (i.e. eucalypt species favoured as food source)
	5	Overall habitat quality score >5 - <8 AND >50% of the RE benchmark for attributes large trees AND/OR >10%-<50% (or >200%) tree canopy cover (i.e. eucalypt species favoured as food source)
	10	Overall habitat quality score >8 AND >70% of the RE benchmark for attributes large trees AND/OR >50-<200% tree canopy cover (i.e. eucalypt species favoured as food source)
Quality and availability of shelter	1	Overall habitat quality score <5 AND/OR <50% of the RE benchmark value for large trees AND Limited evidence of hollows
	5	Overall habitat quality score >5 - <8 AND >50% of the RE benchmark for large trees AND/OR Evidence of >5 hollows/ha for shelter
	10	Overall habitat quality score >8 AND >70% of the RE benchmark for large trees AND/OR Evidence of >10 hollows/ha for shelter
Species mobility capacity	1	The site is functionally isolated from other appropriate habitat for the species, with much of the landscape considered a barrier to species mobility, including natural barriers (e.g. mountain ranges, unsuitable habitats, major rivers/water bodies) and/or artificial barriers (e.g. such as roads, rail, mines), or developments that create treeless areas more than 2 km wide. The site is small compared with the known habitat known or likely to support the species. The site is generally representative of one likely to only support a relictual population, with little opportunity for dispersal from source metapopulations.
	4	The site is likely isolated to regular movement of the species into or out of habitat contiguous to the site, resulting in the site only likely to support a relictual population or, at best, a sink population, with very irregular dispersal from nearby populations.
	7	The site is representative of a stepping stone in the landscape between other patches of appropriate habitat for the species, with potential regular movement of the species into or out of habitat contiguous to the site, OR Given the presence of appropriate habitat, the site is large enough to likely support a self-sustaining population either representative of a source metapopulation, or a nearby satellite population.
	10	The site is limited in its barrier to movement by the species, or the site is sufficiently large to support a known source population of a likely or known metapopulation in the landscape.
Role of site location to species overall population in the state	1	Site likely to support a species population and site is within geographical range of the species although the site contains low quality food, foraging and shelter habitat OR The site is likely to support only a small or relictual population of the species.
	3	Site likely to support a population of the species and site is within geographical range of the species and site contains moderate quality food, foraging and shelter habitat OR The site is likely to support only a small or relictual population of the species.
	4	Evidence of one or more species records within the last 10 years within 15 km of the site AND the site contains habitat likely to support a population at or lower than average population density for the species, likely to be representative of a sink population from a nearby source metapopulation
	5	Evidence of one or more species records within the last 10 years within 15 km of the site AND the site contains habitat likely or known to support a relatively higher than average population density of the species, likely to represent a source metapopulation

Table B-6: Species habitat index scoring for koala.

Component	Score	Description
Threats to species	1	Known presence of wild dogs on site and within adjacent properties and/or evidence of predation known or observed and. No active pest animal management on site. Public vehicle access to site, with evidence of death through vehicle strike observed or likely. Habitat is not protected through legislation and/or is likely to be cleared for development or agricultural landuse and/or subject to ongoing degradation. No active fire management on site, with habitat either frequently burnt and/or subject to a high risk of uncontrolled wildfire on site, including from adjacent properties. Site is not actively managed for conservation purposes and lack of landholder awareness of threatened species habitat and conservation.
	7	Wild dogs observed on site or within adjacent properties and/or limited evidence of known or observed predation. Active pest animal management implemented on site. Restricted access to the site by authorised personnel only, with no public vehicle access. Habitat is not protected through legislation and is unlikely to be cleared for development or agricultural landuse. Active fire management and/or low risk of uncontrolled fire on site, including from adjacent properties.
	15	No wild dogs observed or known within the vicinity of the site and no known or observed evidence of predation. Successful active pest animal management implemented on site. Restricted access to the site for authorised personnel only, with no public vehicle access. Reduced speed limits in place and/or driver awareness and/or signs to identify species habitat and/or exclusion fencing to prevent koalas accessing road. Habitat protected as part of a legally binding mechanism for an offset and/or National Park and/or Nature Refuge, with management aimed at maintaining or improving habitat. Active fire management, with controlled burns on site and low risk of uncontrolled fire on site, including from adjacent properties. Site is actively managed for conservation purposes to enhance habitat for threatened species.
Quality and availability of food and foraging habitat	1	Minimum of one eucalypt species present (including species from the genera *Eucalyptus, Corymbia, Angophora* and *Lophostemon*) that is known from the RE, with limited foraging potential for the species.
	5	Minimum of one eucalypt species present (including species from the genera *Eucalyptus, Corymbia, Angophora* and *Lophostemon*) that is known from the RE, and provides known foraging habitat for the species including koala food trees known to support koalas within the region AND >50% of the RE benchmark for number of large trees attribute.
	10	Minimum of two eucalypt species present (including species from the genera *Eucalyptus, Corymbia, Angophora* and *Lophostemon*) that is known from the RE, and provides known foraging habitat for the species including koala food trees known to support koalas within the region AND >70% of the RE benchmark for attributes number of large trees OR 1 koala food tree species known to support koalas within the region that alone accounts for >50% of the canopy.
Quality and availability of shelter	1	Minimum of one eucalypt species present (including species from the genera *Eucalyptus, Corymbia, Angophora* and *Lophostemon*) that is known from the RE, with limited sheltering or dispersal habitat potential for the species.
	5	Minimum of one eucalypt species present (including species from the genera *Eucalyptus, Corymbia, Angophora* and *Lophostemon*) that is known from the RE, and provides known habitat for the species including emergent trees likely to support shelter and/or dispersal habitat for koalas AND >50% of the RE benchmark for attributes number of large trees and/or canopy cover and/or canopy height.
	10	Minimum of two eucalypt species present (including species from the genera *Eucalyptus, Corymbia, Angophora* and *Lophostemon*) that is known from the RE, and provides known habitat for the species including emergent trees known to support shelter and/or dispersal habitat for koalas AND >70% of the RE benchmark for at least two of the three following attributes: - number of larger trees - canopy cover - canopy height.
Species mobility capacity	1	The site is functionally isolated from other appropriate habitat for the species, with much of the landscape considered a barrier to species mobility, including natural barriers (e.g. mountain ranges, unsuitable habitats, major rivers/water bodies) and/or artificial barriers (e.g. such as roads, rail, mines), or developments that create treeless areas more than 2 km wide. The site is small compared with the known habitat known or likely to support the species. The site is generally representative of one likely to only support a relictual population, with little opportunity for dispersal from source metapopulations.
	4	The site is likely isolated to regular movement of the species into or out of habitat contiguous to the site, resulting in the site only likely to support a relictual population or, at best, a sink population, with very irregular dispersal from nearby populations.
	7	The site is representative of a stepping stone in the landscape between other patches of appropriate habitat for the species, with potential regular movement of the species into or out of habitat contiguous to the site, OR Given the presence of appropriate habitat, the site is large enough to likely support a self-sustaining population either representative of a source metapopulation, or a nearby satellite population.
	10	The site is limited in its barrier to movement by the species, or the site is sufficiently large to support a known source population of a likely or known metapopulation in the landscape.
	1	Site likely to support a species population and site is within geographical range of the species although the site contains low quality food, foraging and shelter habitat OR The site is likely to support only a small or relictual population of the species.

Component	Score	Description
Role of site location to species overall population in the state	3	Site likely to support a population of the species and site is within geographical range of the species and site contains moderate quality food, foraging and shelter habitat OR The site is likely to support only a small or relictual population of the species.
	4	Evidence of one or more species records within the last 10 years within 15 km of the site AND The site contains habitat likely to support a population at or lower than average population density for the species, likely to be representative of a sink population from a nearby source metapopulation
	5	Evidence of one or more species records within the last 10 years within 15 km of the site AND The site contains habitat likely or known to support a relatively higher than average population density of the species, likely to represent a source metapopulation

Table B-7: Species habitat index scoring for squatter pigeon.

Component	Score	Description
Threats to species	1	Habitat is not protected through legislation and/or is likely to be cleared for development or agricultural landuse and/or subject to ongoing degradation Overgrazing by livestock resulting in irreversible damage to ground layer vegetation that provide foraging and breeding habitat No management of invasive weeds, such as buffel grass (*Cenchrus ciliaris*) Known presence of foxes and/or feral cats on site and within adjacent properties and/or known or observed evidence of predation. No active pest animal management on site No active fire management on site, with habitat either frequently burnt and/or subject to a high risk of uncontrolled fire on site, including from adjacent properties Site is not actively managed for conservation purposes and lack of landholder awareness of threatened species habitat and conservation Removal of fallen timber
	7	Habitat is not protected through legislation and is unlikely to be cleared for development or agricultural landuse Strategic pulse livestock grazing resulting in irreversible damage to ground layer vegetation that provide foraging and breeding habitat Some management of invasive weeds, such as buffel grass (*Cenchrus ciliaris*) Foxes and/or feral cats observed on site or within adjacent properties and/or limited evidence of known or observed predation. Active pest animal management implemented on site Active fire management and/or low risk of uncontrolled wildfire on site, including from adjacent properties
	15	No foxes and/or feral cats observed or known within the vicinity of the site and no known or observed evidence of predation Successful active weed management implemented on site Successful active pest animal management implemented on site Habitat protected as part of a legally binding mechanism for an offset and/or National Park and/or Nature Refuge, with management aimed at maintaining or improving habitat Livestock grazing excluded from habitat at all times (except for need for fuel load control through strategic grazing, if required) Active fire management, with controlled burns on site and low risk of uncontrolled wildfire on site, including from adjacent properties Site is actively managed for conservation purposes to enhance habitat for threatened species
Quality and availability of food and foraging habitat	1	Overall habitat quality score <5 AND <50% of the RE benchmark value for grass species richness OR perennial grass cover <10% or >80% OR <50% of the RE benchmark value for grass species richness AND perennial grass cover <10% or >80%
	5	Overall habitat quality score >5 - <8 AND >50% of the RE benchmark for grass species richness OR perennial grass cover 10-20% or 40-80% OR >50% of the RE benchmark for grass species richness AND perennial grass cover 10-20% or 40-80%
	10	Overall habitat quality score >8 AND >70% of the RE benchmark for grass species richness OR perennial grass cover approx. 20-40% OR >70% of the RE benchmark for grass species richness AND perennial grass cover approx. 20-40% Where known, habitat within 1km of permanent water source
Quality and availability of shelter	1	Overall habitat quality score <5 OR Shrub canopy cover >20%
	5	Overall habitat quality score >5 - <8 AND Shrub canopy cover >5% to <20%
	10	Overall habitat quality score >8 AND <5% shrub cover OR <5% shrub cover AND perennial grass cover 20-40% AND Where known breeding habitat within 1km of permanent water source

Component	Score	Description
Species mobility capacity	1	The site is functionally isolated from other appropriate habitat for the species, with much of the landscape considered a barrier to species mobility, including natural barriers (e.g. mountain ranges, unsuitable habitats, major rivers/water bodies) and/or artificial barriers (e.g. such as roads, rail, mines), or developments that create treeless areas more than 2 km wide The site is small compared with the known habitat known or likely to support the species. The site is generally representative of one likely to only support a relictual population, with little opportunity for dispersal from source metapopulations
	4	The site is likely isolated to regular movement of the species into or out of habitat contiguous to the site, resulting in the site only likely to support a relictual population or, at best, a sink population, with very irregular dispersal from nearby populations
	7	The site is representative of a stepping stone in the landscape between other patches of appropriate habitat for the species, with potential regular movement of the species into or out of habitat contiguous to the site OR Given the presence of appropriate habitat, the site is large enough to likely support a self-sustaining population either representative of a source metapopulation, or a nearby satellite population
	10	The site is limited in its barrier to movement by the species, or the site is sufficiently large to support a known source population of a likely or known metapopulation in the landscape
Role of site location to species overall population in the state	1	Site likely to support a species population and site is within geographical range of the species although the site contains low quality food, foraging and shelter habitat OR The site is likely to support only a small or relictual population of the species.
	3	Site likely to support a population of the species and site is within geographical range of the species and site contains moderate quality food, foraging and shelter habitat OR The site is likely to support only a small or relictual population of the species.
	4	Evidence of one or more species records within the last 10 years within 15 km of the site AND The site contains habitat likely to support a population at or lower than average population density for the species, likely to be representative of a sink population from a nearby source metapopulation
	5	Evidence of one or more species records within the last 10 years within 15 km of the site AND The site contains habitat likely or known to support a relatively higher than average population density of the species, likely to represent a source metapopulation

Table B-8: Species habitat index scoring for ornamental snake.

Component	Score	Description
Threats to species	1	Habitat is not protected through legislation and/or is likely to be cleared for development or agricultural landuse and/or subject to ongoing degradation. Overgrazing by livestock resulting in irreversible damage to microhabitat including loss of deep cracks in clay soils, fallen timber and logs. Known presence of foxes and/or feral cats on site and within adjacent properties and/or known or observed evidence of predation. No active pest animal management on site. No active fire management on site, with habitat either frequently burnt and/or subject to a high risk of uncontrolled wildfire on site, including from adjacent properties. Site is not actively managed for conservation purposes and lack of landholder awareness of threatened species habitat and conservation. Removal of fallen timber.
	7	Habitat is not protected through legisltation and is unlikely to be cleared for development or agricultural landuse. Strategic pulse livestock grazing resulting in irreversible damage to critical microhabitat including deep cracks in clay soils, fallen timber and logs. Foxes and/or feral cats observed on site or within adjacent properties and/or limited evidence of known or observed predation. Active pest animal management implemented on site. Active fire management and/or low risk of uncontrolled wildfire on site, including from adjacent properties.
	15	No foxes and/or feral cats observed or known within the vicinity of the site and no known or observed evidence of predation. Successful active pest animal management implemented on site. Habitat protected as part of a legally binding mechnism for an offset and/or National Park and/or Nature Refuge, with management aimed at maintaining or improving habitat. Livestock grazing excluded from habitat at all times (except for need for fuel load control through strategic grazing, if required) Active fire management, with controlled burns on site and low risk of uncontrolled wildfire on site, including from adjacent properties. Site is actively managed for conservation purposes to enhance habitat for threatened species.
Quality and availability of food and foraging habitat	1	Overall biocondition score <5 AND/OR <50% of the RE benchmark value for coarse woody debris AND leaf litter Highly disturbed ground layer
	5	Overall biocondition score >5 - <8 AND/OR >50% of the RE benchmark for attributes coarse woody debris AND leaf litter. Evidence of some disturbance to ground layer reducing habitat condition for known food sources, e.g. frogs.
	10	Overall biocondition score >8 AND/OR >70% of the RE benchmark for attributes coarse woody debris AND leaf litter. Limited evidence of disturbance to ground layer likely to support known food sources, e.g. frogs.

Component	Score	Description
Quality and availability of shelter	1	Overall biocondition score <5 AND/OR <50% of the RE benchmark value for coarse woody debris Limited evidence of potential shelter habitat
	5	Overall biocondition score >5 - <8 AND/OR >50% of the RE benchmark for coarse woody debris. Evidence of disturbance to ground layer with presence of potential shelter sites (i.e. fallen timber and ground litter, cracks in alluvial clay soils)
	10	Overall biocondition score >8 AND/OR >70% of the RE benchmark for coarse woody debris. No evidence of disturbance to ground layer with presence of potential shelter sites (i.e. fallen timber and ground litter, cracks in alluvial clay soils)
Species mobility capacity	1	The site is functionally isolated from other appropriate habitat for the species, with much of the landscape considered a barrier to species mobility, including natural barriers (e.g. mountain ranges, unsuitable habitats, major rivers/water bodies) and/or artificial barriers (e.g. such as roads, rail, mines), or developments that create treeless areas more than 2 km wide. The site is small compared with the known habitat known or likely to support the species. The site is generally representative of one likely to only support a relictual population, with little opportunity for dispersal from source metapopulations.
	4	The site is likely isolated to regular movement of the species into or out of habitat contiguous to the site, resulting in the site only likely to support a relictual population or, at best, a sink population, with very irregular dispersal from nearby populations.
	7	The site is representative of a stepping stone in the landscape between other patches of appropriate habitat for the species, with potential regular movement of the species into or out of habitat contiguous to the site, OR Given the presence of appropriate habitat, the site is large enough to likely support a self-sustaining population either representative of a source metapopulation, or a nearby satellite population.
	10	The site is limited in its barrier to movement by the species, or the site is sufficiently large to support a known source population of a likely or known metapopulation in the landscape.
Role of site location to species overall population in the state	1	Site likely to support a species population and site is within geographical range of the species although the site contains low quality food, foraging and shelter habitat OR The site is likely to support only a small or relictual population of the species.
	3	Site likely to support a population of the species and site is within geographical range of the species and site contains moderate quality food, foraging and shelter habitat OR The site is likely to support only a small or relictual population of the species.
	4	Evidence of one or more species records within the last 10 years within 15 km of the site AND The site contains habitat likely to support a population at or lower than average population density for the species, likely to be representative of a sink population from a nearby source metapopulation
	5	Evidence of one or more species records within the last 10 years within 15 km of the site AND The site contains habitat likely or known to support a relatively higher than average population density of the species, likely to represent a source metapopulation

FINAL HABITAT QUALITY SCORE

The final habitat quality score for each MNES will be calculated in accordance with Section 8 of the Guide to Determining Terrestrial Habitat Quality (DEHP 2017), adjusted for weighting of component attributes.

Table B-9 provides a summary of the components used to score habitat quality for each MNES and the maximum score and relevant weighting for each component. The habitat quality score for each MNES is calculated as the average area-weighted score across each of the relevant monitoring sites within their component regional ecosystems.

Table B-9: Maximum score for each component and attribute.

Site condition		Site context		Species habitat index	
Recruitment of woody perennial species	5	Size of patch	10	Threats to species	15
Native plant species richness – trees	5	Connectivity	5	Quality and availability of food and foraging habitat	10
Native plant species richness – shrubs	5	Context	5	Quality and availability of shelter	10
Native plant species richness – grasses	5	Ecological corridors	6	Species mobility capacity	10
Native plant species richness – forbs	5			Role of site location to species overall population in the state	5
Tree canopy height	5				
Tree canopy cover	5				
Shrub canopy cover	5				
Native perennial grass cover	5				
Organic litter	5				
Large trees	15				
Coarse woody debris	5				
Non-native plant cover	10				
Total	/80	Total	/26	Total	/50
Weighting	30%	Weighting	30%	Weighting	40%

APPENDIX C HABITAT QUALITY SCORES – PROJECT IMPACT AREA

The following tables provide a summary of the data used to calculate the habitat quality score for MNES and MSES impacts, generally in accordance with the Guide to Determining Terrestrial Habitat Quality version 1.2 (DEHP, 2017). The data required to inform the site condition and the fauna species habitat index scores were collected as part of detailed field surveys between 2018 and 2020. The site context score was calculated based on a desktop assessment following the method prescribed in Appendix B.

Table C-1: Site condition score for each impact RE assessment unit across the Project, sites M13 – M21.

Ecological condition indicators	Site M13 RE 11.3.27			Site M16 Site RE 11.3.25			Site M17 Site RE 11.3.25			Site M18 Site RE 11.3.25			Site M19 Site RE 11.3.25			Site M20 Site RE 11.3.27			Site M21 Site RE 11.3.25		
	Raw data	Benchmark (11.3.27)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.27)	Score	Raw data	Benchmark (11.3.25)	Score
Recruitment of woody perennial species	100	100	5	60	100	3	80	100	5	100	100	5	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	13	1	5	6	4	5	6	4	5	6	4	5	6	4	5	2	1	5	5	4	5
Native plant species richness - shrubs	11	1	5	5	2	5	7	2	5	3	2	5	4	2	5	2	1	5	11	2	5
Native plant species richness - grasses	1	3	3	5	8	3	4	8	3	0	8	2.5	4	8	3	2	1	5	1	8	2.5
Native plant species richness - forbs	2	6	3	5	12	3	3	12	3	0	12	2.5	3	12	3	0	6	2.5	0	12	2.5
Tree canopy height	22.6	16	4	25	23	5	22	23	5	22	23	5	35	23	5	28	17	5	28	23	5
Tree sub canopy height	5.3	10																			
Tree canopy cover	28.2	40	2.5	69	22	3	53	22	3	19	22	4	38	22	4	38	46	4	49	22	3
Tree sub canopy cover	0	2																			
Shrub canopy cover				4	1	3	7	1	3	33	1	3	22	1	3		NA		13	1	3
Native perennial grass cover	7.4	3	5	20	12	5	3.25	12	1	0	12	0	7	12	3	0.7	16	0	0.5	12	0
Organic litter	36.4	15	3	8.75	15	5	25	15	5	6.7	15	3	10	15	5	19.65	20	5	45.5	15	3
Large eucalypt trees	10	28	5	22	14	15	14	14	15	14	14	15	14	14	15	12	12	10	32	14	15
Large non-eucalypt trees				48	7		28	7		42	7		16	7					16	7	
Coarse woody debris	467	530	5	128	375	2	178	375	2	178	375	2	204	375	5	32	406	0	236	375	5
Non-native plant cover	9.95	0	5	3	0	10	2.2	0	10	23.6	0	5	2.5	0	10	0.5	0	10	6	0	5
Total			50.5			67			65			57			71			56.5			59
/10			**6.73**			**8.38**			**8.13**			**7.13**			**8.88**			**7.53**			**7.38**

Table C-2: Site condition score for each impact RE assessment unit across the Project, sites M38 – M45.

Ecological condition indicators	Site M38 RE 11.4.2			Site M40 RE 11.5.8			Site M41 RE 11.5.8			Site M42 RE 11.4.2			Site M43 RE 11.3.25			Site M44 RE 11.3.4			Site M45 RE 11.4.2		
	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.5.8)	Score	Raw data	Benchmark (11.5.8)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.4)	Score	Raw data	Benchmark (11.4.2)	Score
Recruitment of woody perennial species	66	100	3	50	100	3	33	100	3	100	100	5	100	100	5	60	100	3	60	100	3
Native plant species richness - trees	3	4	3	4	6	3	2	6	3	2	4	3	4	4	5	5	4	5	5	4	5
Native plant species richness - shrubs	6	5	5	6	2	5	5	2	5	2	5	3	4	2	5	8	2	5	7	5	5
Native plant species richness - grasses	4	8	3	3	7	3	2	7	3	3	8	3	2	8	3	3	7	3	7	8	3
Native plant species richness - forbs	0	7	2.5	1	18	2.5	0	18	2.5	0	7	2.5	0	12	2.5	0	10	2.5	6	7	3
Tree canopy height	17	20	5	16	11	5	13	11	5	16	20	2.5	33	23	5	21	22	5	19	20	5
Tree sub canopy height	13	8		10	8		8	8		0	8					12	12		11	8	
Tree canopy cover	22	25	4	30	48	5	20	48	2	40	25	2.5	37	22	4	32	17	4	35	25	5
Tree sub canopy cover	19	5		15	11		5	11		0	5					11	5		10	5	
Shrub canopy cover	2.5	13	3	22	6	3	55	6	3	47	13	3	24	1	3	5	1	3	2.5	13	3
Native perennial grass cover	21	16	5	9	44	1	3	44	0	14.5	16	5	16.25	12	5	16.9	43	1	13	16	3
Organic litter	27.5	30	5	17	23	5	65.8	23	3	77.5	30	3	38	15	3	21	20	5	14.65	30	3
Large eucalypt trees	8	9	5	6	9	5	4	9	5	12	9	10	6	14	15	12	26	5	18	9	10
Large non-eucalypt trees	0	9		0	24		0	24		0	9		20	7		0	9		0	9	
Coarse woody debris	120	109	5	70	261	2	130	261	2	750	109	2	180	375	2	150	384	2	390	109	2
Non-native plant cover	0	0	10	1	0	10	0	0	10	2.5	0	10	20	0	5	20	0	5	0.5	0	10
Total			58.5			52.5			46.5			54.5			62.5			48.5			60
/10			**7.31**			**6.56**			**5.81**			**6.81**			**7.81**			**6.06**			**7.50**

Table C-3: Site condition score for each impact RE assessment unit across the Project, sites M46 – M55.

Ecological condition indicators	Site M46 RE 11.4.2			Site M47 RE 11.4.2			Site M48 RE 11.3.25			Site M49 RE 11.3.35			Site M53 RE 11.3.35			Site M54 RE 11.3.4			Site M55 RE 11.4.2 (regrowth)		
	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.35)	Score	Raw data	Benchmark (11.3.35)	Score	Raw data	Benchmark (11.3.4)	Score	Raw data	Benchmark (11.4.2)	Score
Recruitment of woody perennial species	60	100	3	100	100	5	100	100	5	80	100	5	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	3	4	3	3	4	3	3	4	3	5	6	3	16	6	5	9	4	5	2	4	3
Native plant species richness - shrubs	6	5	5	3	5	3	7	2	5	7	4	5	10	4	5	8	2	5	4	5	3
Native plant species richness - grasses	7	8	3	4	8	3	1	8	2.5	7	7	5	5	7	3	5	7	3	7	8	3
Native plant species richness - forbs	6	7	3	7	7	5	2	12	2.5	2	12	2.5	19	12	5	13	10	5	13	7	5
Tree canopy height	20	20	5	19	20	5	23	23	5	16	15	5	16	15	5	16	22	4	14	20	3
Tree sub canopy height	11	8		13	8		11			11	6		6	6		7	12		5	8	
Tree canopy cover	45	25	4	22	25	4	41	22	4	54	30	5	47.8	30	5	46.1	17	4	27.7	25	5
Tree sub canopy cover	15	5		19	5		25			13	15		16.1	15		7.6	5		3.9	5	
Shrub canopy cover	4	13	3	2.5	13	3	6	1	3	2.5	5	5	6.5	5	5	9	1	3	0	13	0
Native perennial grass cover	17.5	16	5	13.75	16	3	3.75	12	1	16.9	52	1	47	52	5	39.8	43	5	4	16	1
Organic litter	13.85	30	3	18.5	30	5	20	15	5	21	15	5	13	15	5	11	20	5	7.4	30	3
Large eucalypt trees	32	9	15	12	9	10	16	14	15	18	20	10	4	20	5	6	26	5	0	9	5
Large non-eucalypt trees	0	9		0	9		6	7		0	12		0	12		0	24		8	9	
Coarse woody debris	470	109	2	190	109	5	1370	375	2	750	319	2	635	319	5	648	384	5	268	109	2
Non-native plant cover	0.5	0	10	0.5	0	10	5	0	5	2.5	0	10	20.4	0	5	50.4	0	0	58	0	0
Total			64			64			58			63.5			63			54			38
/10			**8.00**			**8.00**			**7.25**			**7.94**			**7.88**			**6.75**			**4.75**

Table C-4: Site condition score for each impact RE assessment unit across the Project, sites M56 – M74.

Ecological condition indicators	Site M56 RE 11.4.2 (regrowth)			Site M57 RE 11.11.1 (regrowth)			Site M58 RE 11.11.1 (regrowth)			Site M74 RE 11.3.25		
	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.11.1)	Score	Raw data	Benchmark (11.11.1)	Score	Raw data	Benchmark (11.3.25)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	7	4	5	5	4	5	3	4	3	10	4	5
Native plant species richness - shrubs	12	5	5	6	7	3	3	7	3	14	2	5
Native plant species richness - grasses	4	8	3	9	8	5	8	8	5	5	8	3
Native plant species richness - forbs	8	7	5	9	10	3	7	10	3	17	12	5
Tree canopy height	12	20	3	16	16	5	12	16	5	18	23	5
Tree sub canopy height	4	8		6	7		6	7				
Tree canopy cover	32.5	25	5	15.2	30	4	27.7	30	5	53.4	22	3
Tree sub canopy cover	3.1	5		15.2	6		3.8	6				
Shrub canopy cover	0.8	13	0	2.5	4	5	0.7	4	3	10.7	1	3
Native perennial grass cover	11	16	3	27	30	3	8.4	30	1	8	12	3
Organic litter	36	30	5	21	32	5	18.4	32	5	13	15	5
Large eucalypt trees	0	9	0	8	10	10	4	10	5	10	14	5
Large non-eucalypt trees	0	9		2	0		0	0		0	7	
Coarse woody debris	12	109	2	129	176	5	376	176	2	206	375	5
Non-native plant cover	8	0	5	5.8	0	5	71	0	0	42	0	3
Total			46			63			45			55
/10			**5.75**			**7.88**			**5.63**			**6.88**

Table C-5: Summary of the site condition, site context and fauna species habitat index scores used to calculate the impact habitat quality score for each habitat quality monitoring point – sites M01 – M31.

Habitat quality attributes	M13 RE 11.3.27	M16 RE 11.3.25	M17 RE 11.3.25	M18 RE 11.3.25	M19 RE 11.3.25	M20 RE 11.3.27	M21 RE 11.3.25	M38 RE 11.4.2	M40 RE 11.5.8	M41 RE 11.5.8	M42 RE 11.4.2	M43 RE 11.3.25	M44 RE 11.3.4	M45 RE 11.4.2	M46 RE 11.4.2	M47 RE 11.4.2	M48 RE 11.3.25	M49 RE 11.3.35	M53 RE 11.3.35	M54 RE 11.3.4	M55 RE 11.4.2 (regrowth)	M56 RE 11.4.2 (regrowth)	M57 RE 11.11.1 (regrowth)	M58 RE 11.11.1 (regrowth)	M74 RE 11.3.25
Site condition																									
Recruitment of woody perennial species	5	3	5	5	5	5	5	3	3	3	5	5	3	3	3	5	5	5	5	5	5	5	5	5	5
Native plant species richness – trees	5	5	5	5	5	5	5	3	3	3	3	5	5	5	3	3	3	3	5	5	3	5	5	3	5
Native plant species richness – shrubs	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	3	5	5	5	5	3	5	3	3	5
Native plant species richness – grasses	3	3	3	2.5	3	5	2.5	3	3	3	3	3	3	3	3	3	2.5	5	3	3	3	3	5	5	3
Native plant species richness – forbs	3	3	3	2.5	3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	5	2.5	2.5	5	5	5	5	3	3	5
Tree canopy height	4	5	5	5	5	5	5	5	5	5	2.5	5	5	5	5	5	5	5	5	4	3	3	5	5	5
Tree canopy cover	2.5	3	3	4	4	4	3	4	5	2	2.5	4	4	5	4	4	4	5	5	4	5	5	4	5	3
Shrub canopy cover		3	3	3	3		3	3	3	3	3	3	3	3	3	3	3	5	5	3	0	0	5	3	3
Native perennial grass cover	5	5	1	0	3	0	0	5	1	0	5	5	1	3	5	3	1	1	5	5	1	3	3	1	3
Organic litter	3	5	5	3	5	5	3	5	5	3	3	3	5	3	3	5	5	5	5	5	3	5	5	5	5
Large trees	5	15	15	15	15	10	15	5	5	5	10	15	5	10	15	10	15	10	5	5	5	0	10	5	5
Coarse woody debris	5	2	2	2	5	0	5	5	2	2	2	2	2	2	2	5	2	2	5	5	2	2	5	2	5
Non-native plant cover	5	10	10	5	10	10	5	10	10	10	10	5	5	10	10	10	5	10	5	0	0	5	5	0	3
TOTAL BioCondition attributes	**50.5**	**67**	**65**	**57**	**71**	**56.5**	**59**	**58.5**	**52.5**	**46.5**	**54.5**	**62.5**	**48.5**	**60**	**64**	**64**	**58**	**63.5**	**63**	**54**	**38**	**46**	**63**	**45**	**55**
MAX Ecological Condition score	75	80	80	80	80	75	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
/10	6.73	8.38	8.13	7.13	8.88	7.53	7.38	7.31	6.56	5.81	6.81	7.81	6.06	7.50	8.00	8.00	7.25	7.94	7.88	6.75	4.75	5.75	7.88	5.63	6.88
Site context																									
Size of patch (fragmented bioregions)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	5	2	10	10	10	10	0	0	0	0	5
Connectivity (fragmented bioregions)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	2	0	5	5	5	5	0	0	0	0	0
Context (fragmented bioregions)	4	2	2	0	4	2	2	5	4	5	4	2	2	5	2	2	0	4	4	4	2	0	0	4	2
Distance to permanent watering point (intact bioregions)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological corridors	4	6	6	6	6	4	6	0	0	0	0	4	6	0	0	0	0	4	4	4	0	0	0	0	0
TOTAL site context attributes	**23**	**23**	**23**	**21**	**25**	**21**	**23**	**20**	**19**	**20**	**19**	**21**	**23**	**20**	**9**	**4**	**15**	**23**	**23**	**23**	**2**	**0**	**0**	**4**	**7**
MAX Site Context score	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
/10	8.85	8.85	8.85	8.08	9.62	8.08	8.85	7.69	7.31	7.69	7.31	8.08	8.85	7.69	3.46	1.54	5.77	8.85	8.85	8.85	0.77	0.00	0.00	1.54	2.69
Species habitat index – greater glider																									
Threats to species	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	-	-	-	-	7
Quality and availability of food and foraging habitat	5	10	10	5	10	5	5	5	5	5	5	5	5	5	10	10	5	5	5	5	-	-	-	-	5
Quality and availability of shelter	5	10	10	5	10	5	5	1	1	1	5	5	1	5	10	10	10	5	5	5	-	-	-	-	5

Habitat quality attributes	M13 RE 11.3.27	M16 RE 11.3.25	M17 RE 11.3.25	M18 RE 11.3.25	M19 RE 11.3.25	M20 RE 11.3.27	M21 RE 11.3.25	M38 RE 11.4.2	M40 RE 11.5.8	M41 RE 11.5.8	M42 RE 11.4.2	M43 RE 11.3.25	M44 RE 11.3.4	M45 RE 11.4.2	M46 RE 11.4.2	M47 RE 11.4.2	M48 RE 11.3.25	M49 RE 11.3.35	M53 RE 11.3.35	M54 RE 11.3.4	M55 RE 11.4.2 (regrowth)	M56 RE 11.4.2 (regrowth)	M57 RE 11.11.1 (regrowth)	M58 RE 11.11.1 (regrowth)	M74 RE 11.3.25
Species mobility capacity	4	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	10	10	10	-	-	-	-	4
Role of site location to species overall population in the state	3	5	5	5	5	4	5	4	4	4	4	5	5	4	4	4	5	5	5	5	-	-	-	-	4
TOTAL fauna habitat quality score	**24**	**39**	**39**	**29**	**39**	**28**	**29**	**24**	**24**	**24**	**28**	**29**	**25**	**28**	**38**	**38**	**34**	**32**	**32**	**32**	-	-	-	-	**25**
MAX fauna habitat quality score	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	-	-	-	-	50
/10	4.80	7.80	7.80	5.80	7.80	5.60	5.80	4.80	4.80	4.80	5.60	5.80	5.00	5.60	7.60	7.60	6.80	6.40	6.40	6.40	-	-	-	-	5.00
Species habitat index – koala																									
Threats to species	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	10	10	10	10	10	10	10	5	1	1	10	10	1	10	10	10	10	5	1	1	1	1	10	1	1
Quality and availability of shelter	10	10	10	10	10	10	10	10	1	1	5	10	10	10	10	10	10	10	10	5	5	5	10	5	10
Species mobility capacity	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	4	4	1	4	4
Role of site location to species overall population in the state	5	5	5	5	5	5	5	5	4	4	5	5	4	5	5	5	5	5	5	5	4	4	3	4	4
TOTAL fauna habitat quality score	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**34**	**20**	**20**	**34**	**39**	**29**	**39**	**39**	**39**	**39**	**34**	**30**	**25**	**21**	**21**	**31**	**21**	**26**
MAX fauna habitat quality score	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
/10	7.80	7.80	7.80	7.80	7.80	7.80	7.80	6.80	4.00	4.00	6.80	7.80	5.80	7.80	7.80	7.80	7.80	6.80	6.00	5.00	4.20	4.20	6.20	4.20	5.20
Species habitat index – squatter pigeon																									
Threats to species	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	1	10	5	1	5	5	1	5	1	1	5	5	5	5	5	5	1	5	5	5	1	5	5	5	5
Quality and availability of shelter	5	10	5	1	1	5	5	10	1	1	1	1	5	5	5	5	5	5	5	5	1	5	5	5	5
Species mobility capacity	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	4
Role of site location to species overall population in the state	4	5	5	4	4	4	4	5	4	4	4	4	5	5	5	5	4	5	5	5	5	5	5	5	4
Total fauna habitat quality score	**24**	**39**	**29**	**20**	**24**	**28**	**24**	**34**	**20**	**20**	**24**	**24**	**29**	**29**	**29**	**29**	**24**	**29**	**29**	**29**	**21**	**29**	**29**	**29**	**25**
MAX fauna habitat quality score	7	50	50	50	50	7	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
/10	1	7.80	5.80	4.00	4.80	5	4.80	6.80	4.00	4.00	4.80	4.80	5.80	5.80	5.80	5.80	4.80	5.80	5.80	5.80	4.20	5.80	5.80	5.80	5.00
Species habitat index – ornamental snake																									
Threats to species	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	7
Quality and availability of food and foraging habitat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	5
Quality and availability of shelter	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	5
Species mobility capacity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4
Role of site location to species overall population in the state	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	3
Total fauna habitat quality score	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**24**	-	-	-	-	-	-	-	**24**

Habitat quality attributes	M13 RE 11.3.27	M16 RE 11.3.25	M17 RE 11.3.25	M18 RE 11.3.25	M19 RE 11.3.25	M20 RE 11.3.27	M21 RE 11.3.25	M38 RE 11.4.2	M40 RE 11.5.8	M41 RE 11.5.8	M42 RE 11.4.2	M43 RE 11.3.25	M44 RE 11.3.4	M45 RE 11.4.2	M46 RE 11.4.2	M47 RE 11.4.2	M48 RE 11.3.25	M49 RE 11.3.35	M53 RE 11.3.35	M54 RE 11.3.4	M55 RE 11.4.2 (regrowth)	M56 RE 11.4.2 (regrowth)	M57 RE 11.11.1 (regrowth)	M58 RE 11.11.1 (regrowth)	M74 RE 11.3.25
MAX fauna habitat quality score	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	-	-	-	-	-	-	-	50
/10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.80	-	-	-	-	-	-	-	4.80

Table C-6: Summary of the MSES habitat quality score for each RE assessment unit contributing to the Project impact area.

Assessment unit habitat quality score /10	M16 RE 11.3.25	M17 RE 11.3.25	M18 RE 11.3.25	M19 RE 11.3.25	M21 RE 11.3.25	M38 RE 11.4.2	M42 RE 11.4.2	M43 RE 11.3.25	M44 RE 11.3.4	M45 RE 11.4.2	M46 RE 11.4.2	M47 RE 11.4.2	M48 RE 11.3.25	M54 RE 11.3.4	M74 RE 11.3.25
Site condition score (/80)	67	65	57	71	59	58.5	54.5	62.5	48.5	60	64	64	58	54	55
Site context score (/26)	23	23	21	25	23	20	19	21	23	20	9	4	15	23	7
Site condition + site context (/106)	90	88	78	96	82	78.5	73.5	83.5	71.5	80	73	68	73	77	62
Habitat quality score (/10)	**8.49**	**8.30**	**7.36**	**9.06**	**7.74**	**7.41**	**6.93**	**7.88**	**6.75**	**7.55**	**6.89**	**6.42**	**6.89**	**7.26**	**5.85**

Table C-7: Final habitat quality score for each MSES within the Project impact area.

MSES	Average habitat quality score	FINAL HABITAT QUALITY SCORE
Of concern RE 11.3.4 (BVG 16c)	7.00	**7**
Of concern RE 11.4.2 (BVG 17a)	7.04	**7**
Watercourse RE 11.3.4 (BVG 16c)	7.00	**7**
Watercourse RE 11.4.2 (BVG17a)	7.04	**7**
Watercourse RE 11.3.25 (BVG 16a)	7.69	**8**

Table C-8: Summary of the MNES habitat quality score for each RE assessment unit contributing to the Project impact area.

Assessment unit habitat quality score /10	M13 RE 11.3.27	M16 RE 11.3.25	M17 RE 11.3.25	M18 RE 11.3.25	M19 RE 11.3.25	M20 RE 11.3.27	M21 RE 11.3.25	M38 RE 11.4.2	M40 RE 11.5.8	M41 RE 11.5.8	M42 RE 11.4.2	M43 RE 11.3.25	M44 RE 11.3.4	M45 RE 11.4.2	M46 RE 11.4.2	M47 RE 11.4.2	M48 RE 11.3.25	M49 RE 11.3.35	M53 RE 11.3.35	M54 RE 11.3.4	M55 RE 11.4.2 (regrowth)	M56 RE 11.4.2 (regrowth)	M57 RE 11.11.1 (regrowth)	M58 RE 11.11.1 (regrowth)	M74 RE 11.3.25
Greater glider																									
Site condition score (/80) – 30% of final score	50.5	67	65	57	71	56.5	59	58.5	52.5	46.5	54.5	62.5	48.5	60	64	64	58	63.5	63	54	-	-	-	-	55
Site context score (/26) = 30% of final score	23	23	23	21	25	21	23	20	19	20	19	21	23	20	9	4	15	23	23	23	-	-	-	-	7
Species habitat index score (/50) – 40% of final score	24	39	39	29	39	28	29	24	24	24	28	29	25	28	38	38	34	32	32	32	-	-	-	-	25
Habitat quality score (/10)	**6.59**	**8.29**	**8.21**	**6.88**	**8.67**	**6.92**	**7.19**	**6.42**	**6.08**	**5.97**	**6.48**	**7.09**	**6.47**	**6.80**	**6.48**	**5.90**	**6.63**	**7.60**	**7.58**	**7.24**	**-**	**-**	**-**	**-**	**4.87**
Koala																									
Site condition score (/80) – 30% of final score	50.5	67	65	57	71	56.5	59	58.5	52.5	46.5	54.5	62.5	48.5	60	64	64	58	63.5	63	54	38	46	63	45	55
Site context score (/26) = 30% of final score	23	23	23	21	25	21	23	20	19	20	19	21	23	20	9	4	15	23	23	23	2	0	0	4	7
Species habitat index score (/50) – 40% of final score	39	39	39	39	39	39	39	34	20	20	34	39	29	39	39	39	39	34	30	25	21	21	31	21	26
Habitat quality score (/10)	**7.79**	**8.29**	**8.21**	**7.68**	**8.67**	**7.80**	**7.99**	**7.22**	**5.76**	**5.65**	**6.96**	**7.89**	**6.79**	**7.68**	**6.56**	**5.98**	**7.03**	**7.76**	**7.42**	**6.68**	**3.34**	**3.41**	**4.84**	**3.83**	**4.95**
Squatter pigeon																									
Site condition score (/80) – 30% of final score	50.5	67	65	57	71	56.5	59	58.5	52.5	46.5	54.5	62.5	48.5	60	64	64	58	63.5	63	54	38	46	63	45	55
Site context score (/26) = 30% of final score	23	23	23	21	25	21	23	20	19	20	19	21	23	20	9	4	15	23	23	23	2	0	0	4	7
Species habitat index score (/50) – 40% of final score	24	39	29	20	24	28	24	34	20	20	24	24	29	29	29	29	24	29	29	29	21	29	29	29	25
Habitat quality score (/10)	**6.59**	**8.29**	**7.41**	**6.16**	**7.47**	**6.92**	**6.79**	**7.22**	**5.76**	**5.65**	**6.16**	**6.69**	**6.79**	**6.88**	**5.76**	**5.18**	**5.83**	**7.36**	**7.34**	**7.00**	**3.34**	**4.05**	**4.68**	**4.47**	**4.87**
Ornamental snake																									
Site condition score (/80) – 30% of final score	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58	-	-	-	-	-	-	-	55
Site context score (/26) = 30% of final score	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	-	-	-	-	7
Species habitat index score (/50) – 40% of final score	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-	-	-	-	-	-	-	24
Habitat quality score (/10)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**5.83**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**4.79**

Table C-9: Final area-weighted habitat quality score for each MNES within the Project impact area.

MNES	11.3.27	11.3.25	11.4.2	11.5.8	11.3.4	11.3.35	11.4.2 (regrowth)	11.11.1 (regrowth)
Greater glider								
Impact area (ha)	0.6	111.1	85.2	5.6	40.7	37.8	0	0
Average habitat quality score	6.76	7.23	6.42	6.03	6.86	7.59	-	-
Area-weighted contribution to habitat quality score	0.01	2.86	1.94	0.12	0.99	1.02	-	-
Summed habitat quality score	**6.95**							
FINAL HABITAT QUALITY SCORE – Greater glider	**7**							
Koala								
Impact area (ha)	0.6	111.1	110.8	5.6	40.7	37.8	13.7	4.4
Average habitat quality score	7.80	7.59	6.88	5.71	6.74	7.59	3.37	4.34
Area-weighted contribution to habitat quality score	0.01	2.60	2.35	0.10	0.84	0.88	0.14	0.06
Summed habitat quality score	**6.98**							
FINAL HABITAT QUALITY SCORE – Koala	**7**							
Squatter pigeon								
Impact area (ha)	0.6	111.1	110.8	5.6	40.7	37.8	0	0
Average habitat quality score	6.76	6.69	6.24	5.71	6.90	7.35	-	-
Area-weighted contribution to habitat quality score	0.01	2.42	2.25	0.10	0.92	0.91	-	-
Summed habitat quality score	**6.62**							
FINAL HABITAT QUALITY SCORE – Squatter pigeon	**7**							
Ornamental snake								
Impact area (ha)	0	18.8	0	0	0	0	0	0
Average habitat quality score	-	5.31	-	-	-	-	-	-
Area-weighted contribution to habitat quality score		5.31						
Summed habitat quality score	5.31							
FINAL HABITAT QUALITY SCORE – Ornamental snake	**5**							

APPENDIX D OFFSETS ASSESSMENT GUIDE - INPUTS, JUSTIFICATIONS & RESULTS

The following tables present the offsets assessment guides, inputs and supporting justification for MNES proposed to be offset on Mamelon and [redacted]

For the following inputs, the justifications provided for each MNES are based on impact habitat quality scoring method outlined in Appendix B, identified risks and threats to each MNES and its habitat considering the current management regime on Mamelon and [redacted]:

- Quality of impact area
- Quality of offset area
- Future quality without offset management
- Future quality with offset management
- Risk of loss without offset
- Time until ecological benefit (years).

For the inputs listed below, the relevant scores were assessed at an offset area level or are relevant for each MNES:

- Confidence in result – future quality
- Risk of loss with offset
- Confidence in result – risk of loss
- Time over which loss is averted (years).

Table D-1: summarises the offsets assessment guide inputs for each MNES.

Table D-2, Table D-3 and Table D-4 present the inputs and justifications for each MNES.

Table D-1: Summary of offsets assessment guide inputs for each MNES

Inputs		Greater glider (Mamelon)	Koala (Mamelon)	Squatter pigeon (Mamelon)	Ornamental snake ([redacted])
Impact	Area (ha)	281.0	324.6	306.6	18.8
	Quality	7	7	7	5
Offset start hectares (ha)		2,428.4	2,803.4	2,667.1	121.1
Offset quality	Start quality	7	7	7	7
	Future quality without offset	7	7	7	7
	Future quality with offset	8	8	8	8
	Confidence in result (%)	80%	80%	80%	80%
Risk of loss	Without offset	0.69%	0.69%	0.69%	0.42%
	With offset	0%	0%	0%	0%
	Confidence in result (%)	90%	90%	90%	90%
Risk related time horizon/time over which loss is averted (max. 20 years)		20	20	20	20
Time until ecological benefit		20	20	20	20
% impact offset		100.15%	100.06%	100.81%	102.37%

Table D-2: Greater glider offsets assessment guide input justifications (Mamelon).

Input	Score	Justification
Quality of impact area	7	Greater glider habitat within the immediate vicinity of the project area was assessed and defined by Austecology (2020a and 2020b), whom considered 8 REs as supporting suitable habitat for greater gliders. These REs included either tree species in which gliders were assumed to be browsing during site surveys, and/or tree species regarded by other studies as known feed tree species in Queensland, e.g. *Eucalyptus tereticornis, E. tessellaris, E. crebra, E. moluccana, Angophora floribunda, Corymbia citriodora,* and *C. intermedia* (Kehl and Boorsboom 1984, Smith et al. 2007, L. Agnew pers obs.). Clearing associated with direct and indirect impacts (water drawdown) of the project on greater glider habitat comprises ~281 ha of areas supporting RE 11.3.25, RE 11.4.2, RE 11.3.4, RE 11.3.35, RE 11.5.8 and RE 11.3.27. This comprises ~157 ha of known remnant habitat and 124 ha of potential remnant habitat (Austecology 2020a). The quality of greater glider habitat within the project impact area was calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality, identifying an impact habitat quality score of 7. Details of habitat quality scoring in the Project impact area are outlined in Appendix C.
Quality of offset area	7	Greater glider habitat within the offset area comprises 2,428 ha of ground-truthed remnant RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25. This habitat is located throughout Mamelon, including lowland areas in the vicinity of Tooloombah Creek, Mamelon Creek and Deep Creek as well as upland areas supporting eucalypt woodland. Each of these REs are considered suitable habitat; being consistent with the habitat assessment results undertaken by Austecology (2020a and 2020b) in the vicinity of the offset area. Targeted spotlighting surveys conducted in October and November 2019 confirmed the presence of greater glider in the offset area, including foraging and denning in a variety of trees including *Eucalyptus crebra, E. platyphylla* and *E. populnea*. At least 22 greater glider were observed in November 2019 along and adjacent Deep Creek in the east of Mamelon, with additional individuals observed along Barrack Creek in Strathmuir to the east of Mamelon (Figure 7). A survey of fauna habitat features identified numerous large, hollow-bearing trees throughout all of the offset area REs, including a diversity of eucalypt foraging and denning trees species known or observed as being used by greater glider in the area (e.g. *E. camaldulensis*, *E. tereticornis, E. crebra, E. populnea, E. platyphylla* and dead standing stags). The quality of greater glider habitat within the offset area was calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality (see method in Appendix B). Appendix E provides a detailed summary of the data used to calculate the baseline habitat quality scores for greater glider in the Mamelon offset area, used in the Offsets Assessment Guide. The current land use across much of Mamelon is cattle grazing, with grazing evident in all areas of greater glider habitat. Grazing in these areas has resulted in reduced recruitment of habitat trees, as well as evidence of weeds and exotic pasture grasses, particularly *Parthenium*, prickly pear (*Opuntia spp.*), lantana (*Lantana camara*) and rubber vine (*Cryptostegia grandiflora*), with the greatest density of weeds (particularly *Megathyrsus maximus*) within Tooloombah Creek, Mamelon Creek and Deep Creek corridors corresponding to RE 11.3.25. The incursion of weeds and exotic pasture has the potential to increase the frequency of high intensity fires as they increase fuel loads causing habitat tree recruitment loss, habitat loss, and fragmentation of habitat.
Future quality without offset management	7	Should an offset not be secured, the quality of habitat for the greater glider within the next 20 years is expected to be maintained at a score of 7 based on the following: ▶ Ongoing commercial livestock grazing across the property, with livestock favouring riparian and adjacent areas associated with Tooloombah Creek, Mamelon Creek and Deep Creek and surrounding remnant and regrowth areas resulting in: – Limited recruitment of preferred roosting and shelter tree species for the greater glider – Continued presence of weeds and exotic pasture grasses, particularly *Parthenium*, prickly pear (*Opuntia spp.*), lantana (*Lantana camara*), rubber vine (*Cryptostegia grandiflora*) and *Megathyrsus maximus* within the creek corridors corresponding to RE 11.3.25. – Limited pest animal control, other than the landholder's general biosecurity obligation under the Biosecurity Act 2014 (Qld), increasing the risk of pest animal predation and decreasing the viability of the offset area to support greater glider populations – Potential for clearing of unregulated vegetation (associated particularly with regrowth RE 11.4.2) within the offset area by the current or future landholder. While regrowth RE 11.4.2 is not considered offset habitat, clearing of this or other unregulated vegetation within the offset area will contribute to further fragmenting habitat connectivity through the landscape.
Future quality with offset management	8	An offset area for greater glider on Mamelon will be secured and managed, to improve the quality of vegetation communities and accompanying habitat features contributing to greater glider habitat. The quality of greater glider habitat will be improved through an increase in site condition, site context and/or species stocking rate to achieve a future quality of 8. The following outlines increases in relevant attributes that in part or whole will contribute to the completion criteria being achieved (a future quality score of 8) over 20 years of active management under the OAMP: ▶ Site condition – the following scores for each ecological attribute will be achieved through the implementation of specific management actions under the OAMP: – Native shrub species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 – Native grass species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 – Native forb species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 – Tree canopy height – increase the score across all monitoring sites to a 5 representing 70% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 – Shrub canopy cover – increase the score across all monitoring sites to a 5 representing between 50% and 200% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 – Native perennial grass cover – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 – Large trees – increase the score across all monitoring sites to a 10, representing between 50% to 100% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 – Non-native plant cover – increase the score across all monitoring sites to a 10 representing <5% non-native plant cover at each site. ▶ Site context – Average site context score for each RE is maintained or increased compared to the start quality score: – RE 11.10.7 – ≥ 7.03 – RE 11.11.15 – ≥ 7.38 – RE 11.4.2 – ≥ 8.50 – RE 11.5.8 – ≥ 7.60

Input	Score	Justification
		– RE 11.3.25 – ≥ 8.53 ▶ Species habitat index – Increase the threats to species score to a 15 through the implementation of the OAMP specifically implementation of successful pest animal control targeting wild dogs, cats and foxes, active fire management, security through a legally binding mechanism and active management of the area for conservation purposes. The OAMP will be implemented, in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for greater glider, including specific management actions aimed at reducing the impact of threatening processes and improving the quality of greater glider habitat within the offset area, including: ▶ Pest animal control – control measures will be implemented focussing on control of wild dogs, feral cats and foxes within the offset area reducing the threat of predation on greater glider. ▶ Livestock management – livestock will be excluded from the offset area except during strategic grazing events to control fuel loads and exotic pasture grasses. Periods of grazing will be followed by an extended period of rest and stocking rates will depend on seasonal conditions and pasture growth. ▶ Weed control – weed hygiene restrictions and weed control activities will be undertaken within the offset area in order to reduce the threat of invasive weeds species (including exotic pasture grasses) to control fuel loads and to promote recruitment of foraging and shelter trees. ▶ Fire management – fire management including establishment of fire breaks, control of fuel loads and implementation of low-intensity, controlled burns at appropriate intervals and times of year will be undertaken within the offset area. This will aim to reduce the risk of high intensity fires within the offset and assist with natural regeneration of vegetation communities, including foraging and shelter trees.
Confidence in result – future quality	80%	An OAMP will be developed in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for the species, and negotiations with the landholder. The OAMP will detail specific management objectives and outcomes aimed at improving the quality of species habitat. Ongoing monitoring of the offset area will also be undertaken to regularly assess the progress of the offset and ensure the OAMP achieves its required outcomes. The OAMP will support an efficient, effective, timely, transparent, scientifically robust and reasonable approach to managing and monitoring the offset area.
Risk of loss without offset	0.69%	The clearing of remnant vegetation in Queensland is regulated by the VM Act and the *Planning Act 2016* and associated policies and codes. This framework identifies vegetation as one of four categories, varying in their degree of restriction on permissible clearing. Under the VM Act, an application must be made to the Queensland Government to clear remnant vegetation (Category B) unless an exemption applies. The VM Act prevents broad-scale clearing of remnant vegetation for agriculture or other development activities; however, clearing of some remnant vegetation for resource development purposes (e.g. mining) is allowed. The VM Act allows clearing of category X areas without requiring landholders to obtain approval. Areas mapped as category X are not subject to vegetation clearing codes and therefore have the potential to be cleared by the current or future landholders at any time. Pastoralists are motivated to clear vegetation for a variety of reasons; however, historically a combination of favourable conditions and higher commodity prices have coincided with increased rates of clearing (Evans, 2016). Market conditions over the coming years look to continue to put pressure on pastoralists to increase production which inevitably leads to higher rates of clearing (M. Taylor pers comm). This is supported by clearing rates for regrowth vegetation increasing every year since 2012 (Steffen and Dean, 2018). Historical clearing has disproportionately impacted vegetation on the most fertile soil, such as eucalypt woodlands on alluvial flats and Brigalow vegetation on clay plains. Expert estimates of the likelihood of clearing regrowth of alluvial ecosystems are as high as 90% (C. Hempel pers comm). The previous landholder previously cleared areas of unregulated Category X vegetation across the property. Much of the regrowth areas of RE 11.4.2 across the property were cleared in 2008, with retention of these regrowth areas representing important habitat facilitating dispersal between remnant vegetation areas in upslope areas and fringing riparian habitats; both known to support greater glider populations on Mamelon. Notwithstanding the property-specific decisions influencing any landholder's decision to clear, the risk that areas will be cleared resulting in the complete loss of habitat for greater glider within the next 20 years, is considered to be 0.69%. This percentage reflects the average annual background rate of loss (2005 – 2014) within the Rockhampton Local Government Area as outlined in the *Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act* document prepared by Maseyk et al. (2017).
Risk of loss with offset	0%	The offset area will be secured through declaration as an area of high nature conservation value under section 19F of the VM Act.
Confidence in result – risk of loss	90%	The legally binding mechanism will be registered on the land title and bind all current and future land owners to ensure that the offset is protected.
Time over which loss is averted (years)	20	The offset area will be protected by a legally binding mechanism which will remain in effect as required by the applicable State and Commonwealth legislative requirements, therefore, the time over which loss is averted is considered to be the maximum allowable time of 20 years.
Time until ecological benefit (years)	20	The implementation of site-specific land management actions through the development and application of an OAMP is expected to increase the quality of the offset area by improving vegetation condition and reducing potential threats to greater glider habitat. An ecological benefit is expected to be realised in 20 years.

Table D-3: Koala offsets assessment guide input justifications (Mamelon).

Input	Score	Justification
Quality of impact area	7	Koala habitat within the immediate vicinity of the project area was assessed and defined by Austecology (2020a and 2020b), whom considered 8 REs as supporting suitable habitat for koalas. These REs included regionally known koala food tree species, e.g. *Eucalyptus tereticornis*, *E. camaldulensis, E. platyphylla, E. crebra, E. exserta*, *Corymbia clarksoniana* and *C. intermedia* (Ellis et al. 2018, L. Agnew pers obs.). Furthermore, Melzer and Tucker (2011) ranked three RE, present in the immediate vicinity of the project, (RE 11.3.25, RE 11.5.8a, and RE 11.11.15a) within the moderate to high rankings for predicted likelihood of koala occurrence for their St Lawrence study area, to the north of the project area (Austecology 2020a). Koalas have been recorded within the project area during surveys in 2017 and 2018 by CDM Smith and by Austecology in 2019 (Austecology 2020a and 2020b). Clearing associated with direct and indirect impacts (groundwater drawdown) of the project on koala habitat comprises ~325 ha of areas supporting ground-truthed RE 11.3.25, RE 11.4.2 (remnant and regrowth(non-remnant)), RE 11.3.4,, RE 11.3.35, RE 11.5.8, RE 11.11.1 (regrowth) and RE 11.3.27. This comprises ~ 180 ha of known remnant habitat, ~127 ha of potential remnant dispersal habitat and 18 ha of known or potential non-remnant habitat* (Austecology 2020a). The quality of koala habitat within the project impact area was calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality, identifying an impact habitat quality score of 7. Details of habitat quality scoring in the Project impact area are outlined in Appendix C.
Quality of offset area	7	Koala habitat within the offset area comprises ~2,803.4 of ground-truthed remnant RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35, RE 11.3.4, along with regrowth (non-remnant) RE 11.4.2 and regrowth (non-remnant) RE 11.11.15. The offset area comprises suitable foraging and breeding habitat for koala and is located throughout Mamelon, part of which is along and adjacent to Tooloombah Creek, Mamelon Creek and Deep Creek. Each of these REs are considered suitable habitat; being consistent with the habitat assessment results undertaken by Austecology (2020a and 2020b) in the vicinity of the offset area. These RE are considered appropriate habitat for koala, represented by a mix of *Eucalyptus tereticornis* woodland fringing Tooloombah, Mamelon and Deep Creek (RE 11.3.25) and adjacent *Eucalyptus populnea* and/or *E. platyphylla* grassy woodland on alluvial soils (RE 11.3.35) or clay plains (remnant and regrowth RE 11.4.2) and *Eucalyptus crebra* dominated woodland on remnant sand plain (RE 11.5.8) and old metamorphic sedimentary surfaces (RE 11.11.1, as well as remnant and regrowth RE 11.11.15). Areas of koala habitat offsets support known koala food trees, including *Eucalyptus crebra, E. tereticornis*, *E. populnea, E. exserta* and *C. citriodora*. Targeted surveys conducted in October and November 2019 confirmed the presence of no fewer 18 koalas within the offset area; including one observed feeding within a *E. exserta* on the boundary between RE 11.11.1 and RE 11.5.8 in the north-west of Mamelon, others sheltering in *E. crebra* within an area of regrowth RE 11.4.2, with numerous records along alluvial watercourses on Mamelon (RE 11.3.25). Additional evidence of their presence was confirmed throughout Mamelon in the form of characteristic scats and scratches. The quality of koala habitat within the offset area was calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality (see method in Appendix B). Appendix E provides a detailed summary of the data used to calculate the baseline habitat quality scores for koala in the Mamelon offset area, used in the Offsets Assessment Guide. The current land use across much of Mamelon is cattle grazing, with grazing evident in all areas of koala habitat, particularly regrowth areas of RE 11.4.2 and RE 11.11.15. Grazing in these areas has resulted in reduced recruitment of habitat trees, as well as evidence of weeds and exotic pasture grasses, particularly *Parthenium*, prickly pear (*Opuntia spp.*) and rubber vine (*Cryptostegia grandiflora*), with the greatest density of weeds (particularly *Lantana camara* and *Megathyrsus maximus*) within Tooloombah Creek, Mamelon Creek and Deep Creek corridors corresponding to RE 11.3.25. The incursion of weeds and exotic pasture has the potential to increase the frequency of high intensity fires as they increase fuel loads causing habitat tree recruitment loss, habitat loss, and fragmentation of habitat. Pest animal species have been observed in the offset area, including wild dogs; a known predator of koalas.
Future quality without offset management	7	Should an offset not be secured, the quality of habitat for the koala within the next 20 years is expected to be maintained at a score of 7 based on the following: ▶ Ongoing commercial livestock grazing across the property, with livestock favouring riparian areas along Tooloomah and Mamelon Creek and surrounding remnant and regrowth areas resulting in: – Limited recruitment of preferred habitat tree species for the koala – Continued presence of weeds and exotic pasture grasses, particularly *Parthenium*, prickly pear (*Opuntia spp.*), lantana (*Lantana camara*), rubber vine (*Cryptostegia grandiflora*) and *Megathyrsus maximus* within the creek corridors corresponding to RE 11.3.25. – Limited pest animal control for wild dogs (confirmed in the offset area), other than the landholder's general biosecurity obligation under the Biosecurity Act 2014 (Qld), maintaining the viability of the offset area to support koala populations. – Potential for clearing of unregulated vegetation within the offset area by the current or future landholder, particularly regrowth areas of RE 11.4.2 corresponding to Category X areas under the Vegetation Management Act 1999
Future quality with offset management	8	An offset area for koala on Mamelon will be secured and managed, to improve the quality of vegetation communities and accompanying habitat features contributing to koala habitat. The quality of koala habitat will be improved through an increase in site condition, site context and/or species stocking rate to achieve a future quality of 8. The following outlines increases in relevant attributes that in part or whole will contribute to the completion criteria being achieved (a future quality score of 8) over 20 years of active management under the OAMP: ▶ Site condition – the following scores for each ecological attribute will be achieved through the implementation of specific management actions under the OAMP: – Native shrub species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35 and RE 11.3.4 – Native grass species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35 and RE 11.3.4 – Native forb species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35 and RE 11.3.4 – Tree canopy height – increase the score across all monitoring sites to a 5 representing 70% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35 and RE 11.3.4

Input	Score	Justification
		– Shrub canopy cover – increase the score across all monitoring sites to a 5 representing between 50% and 200% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35 and RE 11.3.4 – Native perennial grass cover – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35 and RE 11.3.4 – Large trees – increase the score across all monitoring sites to a 10, representing between 50% to 100% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8, RE 11.3.25, RE 11.11.1, RE 11.3.35 and RE 11.3.4 – Non-native plant cover – increase the score across all monitoring sites to a 10 representing <5% non-native plant cover at each site. ▶ Site context – Average site context score for each RE is maintained or increased compared to the start quality score: – RE 11.10.7 – ≥ 7.03 – RE 11.11.15 – ≥ 7.38 – RE 11.11.15 regrowth – ≥ 1.15 – RE 11.4.2 – ≥ 8.50 – RE 11.4.2 regrowth – ≥ 1.15 – RE 11.5.8 – ≥ 7.60 – RE 11.3.25 – ≥ 8.53 – RE 11.11.1 – ≥ 7.69 – RE 11.3.35 – ≥ 8.85 ▶ Species habitat index – Increase the threats to species score to a 15 through the implementation of the OAMP, specifically, implementation of successful pest animal control targeting wild dogs, active fire management, security through a legally binding mechanism and active management of the area for conservation purposes. The OAMP will be implemented, in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for koala, including specific management actions aimed at reducing the impact of threatening processes and improving the quality of koala habitat within the offset area, including: – Pest animal control – control measures will be implemented focussing on control of wild dogs within the offset area reducing the threat of predation on koala. – Livestock management – livestock will be excluded from the offset area except during strategic grazing events to control fuel loads and exotic pasture grasses. Periods of grazing will be followed by an extended period of rest and stocking rates will depend on seasonal conditions and pasture growth. – Weed control – weed hygiene restrictions and weed control activities will be undertaken within the offset area in order to reduce the threat of invasive weeds species (including exotic pasture grasses) to control fuel loads and to promote recruitment of koala habitat trees. – Fire management – fire management including establishment of fire breaks, control of fuel loads and implementation of low-intensity, controlled burns at appropriate intervals and times of year will be undertaken within the offset area. This will aim to reduce the risk of high intensity bushfires within the offset and assist with natural regeneration of vegetation communities, including koala food trees.
Confidence in result – future quality	80%	An OAMP will be developed in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for the species, and negotiations with the landholder. The OAMP will detail specific management objectives and outcomes aimed at improving the quality of species habitat. Ongoing monitoring of the offset area will also be undertaken to regularly assess the progress of the offset and ensure the OAMP achieves its required outcomes. The OAMP will support an efficient, effective, timely, transparent, scientifically robust and reasonable approach to managing and monitoring the offset area.
Risk of loss without offset	0.69%	The clearing of remnant vegetation in Queensland is regulated by the VM Act and the *Planning Act 2016* and associated policies and codes. This framework identifies vegetation as one of four categories, varying in their degree of restriction on permissible clearing. Under the VM Act, an application must be made to the Queensland Government to clear remnant vegetation (Category B) unless an exemption applies. The VM Act prevents broad-scale clearing of remnant vegetation for agriculture or other development activities; however, clearing of some remnant vegetation for resource development purposes (e.g. mining) is allowed. The VM Act allows clearing of category X areas without requiring landholders to obtain approval. Areas mapped as category X are not subject to vegetation clearing codes and therefore have the potential to be cleared by the current or future landholders at any time. Pastoralists are motivated to clear vegetation for a variety of reasons; however, historically a combination of favourable conditions and higher commodity prices have coincided with increased rates of clearing (Evans, 2016). Market conditions over the coming years look to continue to put pressure on pastoralists to increase production which inevitably leads to higher rates of clearing (M. Taylor pers comm). This is supported by clearing rates for regrowth vegetation increasing every year since 2012 (Steffen and Dean, 2018). Historical clearing has disproportionately impacted vegetation on the most fertile soil, such as eucalypt woodlands on alluvial flats and Brigalow vegetation on clay plains. Expert estimates of the likelihood of clearing regrowth of alluvial ecosystems are as high as 90% (C. Hempel pers comm). The previous landholder previously cleared areas of unregulated Category X vegetation across the property. Much of the regrowth areas of RE 11.4.2 across the property were cleared in 2008, with retention of these regrowth areas representing not only important habitat for koalas, but facilitating dispersal between remnant vegetation areas in upslope areas and fringing riparian habitats; both known to support koala populations on Mamelon. Notwithstanding the property-specific decisions influencing any landholder's decision to clear, the risk that areas will be cleared resulting in the complete loss of habitat for koala within the next 20 years, is considered to be 0.69%. This percentage reflects the average annual background rate of loss (2005 – 2014) within the Rockhampton Local Government Area as outlined in the *Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act* document prepared by Maseyk et al. (2017).

Input	Score	Justification
Risk of loss with offset	0%	The offset area will be secured through declaration as an area of high nature conservation value under section 19F of the VM Act.
Confidence in result – risk of loss	90%	The legally binding mechanism will be registered on the land title and bind all current and future land owners to ensure that the offset is protected.
Time over which loss is averted (years)	20	The offset area will be protected by a legally binding mechanism which will remain in effect as required by the applicable State and Commonwealth legislative requirements, therefore, the time over which loss is averted is considered to be the maximum allowable time of 20 years.
Time until ecological benefit (years)	20	The implementation of site-specific land management actions through the development and application of an OAMP is expected to increase the quality of the offset area by improving vegetation condition and reducing potential threats to koala habitat. An ecological benefit is expected to be realised in 20 years.

* Non-remnant habitat refers to areas ground-truthed and observed to comprise regrowth (non-mature) vegetation, as distinct from remnant (largely intact, mature-like) vegetation. This terminology delineates assessment units for the purposes of assessing habitat condition, site context and species associations, and is not necessarily reflective of defined terms under the VM Act (i.e. remnant woody vegetation, high-value regrowth etc).

Table D-4: Squatter pigeon offsets assessment guide input justifications (Mamelon).

Input	Score	Justification
Quality of impact area	7	Squatter pigeon habitat within the immediate vicinity of the project area was assessed and defined by Austecology (2020a and 2020b), whom concluded that the majority of records within the vicinity of the project area include grazed areas where dams are present. It was also noted that the concentration of records in these areas are likely a consequence of the ease of detection in these open grazed pastures close to tracks. Notwithstanding, Austecology (2020a) noted that squatter pigeons had also been recorded within remnant vegetation throughout the project area, including areas of RE 11.3.35, RE 11.4.2, RE 11.5.8a, and RE 11.11.15a, with the likely availability of a variety of locations with water throughout the year such as dams and standing water within the upper sections of Deep Creek. Clearing associated with direct and indirect (groundwater drawdown) impacts of the project on squatter pigeon habitat comprises ~307 ha of areas supporting RE 11.3.25, RE 11.4.2, RE 11.3.4, RE 11.3.35, RE 11.5.8 and RE 11.3.27. This comprises ~ 152 ha of known or potential remnant habitat, 150 ha of potential dispersal habitat and 5 ha of potential breeding habitat (Austecology 2020a). The quality of squatter pigeon habitat within the project impact area was calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality, identifying an impact habitat quality score of 7. Details of habitat quality scoring in the Project impact area are outlined in Appendix C.
Quality of offset area	7	Squatter pigeon habitat within the offset area comprises ~2,667 ha of ground-truthed remnant RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 and areas of regrowth RE 11.4.2. The offset area comprises suitable foraging and breeding habitat for squatter pigeon and is located throughout Mamelon, in the vicinity of Tooloombah Creek, Mamelon Creek and Deep Creek as well as upslope areas with appropriate grassy woodland habitat. These RE are considered appropriate habitat for squatter pigeon, represented by eucalypt grassy woodland (remnant and regrowth(non-remnant)) on clay plains (RE 11.4.2), along alluvial channels (RE 11.3.25), remnant sand plain (RE 11.5.8) and old metamorphic and/or sedimentary surfaces (RE 11.10.7, RE 11.11.1 and RE 11.11.15). All areas of squatter pigeon offset habitat support eucalypt-dominated regrowth to remnant open-forest to open-woodland with a patchy, open grassy understorey. All offset areas are also within 3 km of permanent (artificial) or seasonal waterbodies, with much of the offset within 1 km. Targeted surveys conducted in October and November confirmed the presence of six squatter pigeon on Mamelon, within offset area, with a total of 25 confirmed records from Mamelon and adjacent Strathmuir during 2019 (Figure 7). A further 58 squatter pigeon records are known from targeted surveys on those properties since March 2011. The quality of squatter pigeon habitat within the offset area was calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality (see method in Appendix B). Appendix E provides a detailed summary of the data used to calculate the baseline habitat quality scores for squatter pigeon in the Mamelon offset area, used in the Offsets Assessment Guide. The current land use across much of Mamelon is cattle grazing, with grazing evident in all areas of squatter pigeon habitat. Grazing in these areas has resulted in reduced recruitment of native perennial grass species, as well as evidence of weeds and exotic pasture grasses, particularly *Parthenium*, prickly pear (*Opuntia spp.*) and lantana (*Lantana camara*) with incursion of *Megathyrsus maximus* in creek corridors corresponding to RE 11.3.25. The incursion of weeds and exotic pasture has the potential to increase the frequency of high intensity fires as they increase fuel loads causing habitat loss, and fragmentation of habitat. Pest animal species have been observed in the offset area, including foxes, feral cats and wild dogs; potential predators to squatter pigeon.
Future quality without offset management	7	Should an offset not be secured, the quality of habitat for the squatter pigeon within the next 20 years is expected to be maintained at a score of 7 based on the following: ▶ Ongoing commercial livestock grazing across the property, with livestock favouring riparian areas along Tooloombah, Mamelon and Deep Creeks and surrounding remnant and regrowth areas resulting in: – Limited recruitment of native perennial grass species richness and cover – An increase in the presence of weeds and exotic pasture grasses, particularly buffel grass, *Parthenium*, prickly pear (*Opuntia spp.*) and lantana (*Lantana camara*) with incursions of weeds (particularly *Megathyrsus maximus*) away from Tooloombah and Mamelon Creek having the potential to further reduce recruitment of native perennial grasses. – Limited pest animal control, other than the landholder's general biosecurity obligation under the Biosecurity Act 2014 (Qld), increasing the risk of pest animal predation and decreasing the viability of the offset area to support squatter pigeon populations. – Potential for clearing of unregulated vegetation (associated particularly with regrowth RE 11.4.2) within the offset area by the current or future landholder. Clearing of regrowth RE 11.4.2 or other unregulated vegetation within the offset area will contribute to further fragmenting habitat connectivity through the landscape.
Future quality with offset management	8	An offset area for squatter pigeon on Mamelon will be secured and managed, to improve the quality of vegetation communities and accompanying habitat features contributing to squatter pigeon habitat. The quality of squatter pigeon habitat will be improved through an increase in site condition, site context and/or species stocking rate to achieve a future quality of 7. The following outlines increases in relevant attributes that in part or whole will contribute to the completion criteria being achieved (a future quality score of 8) over 20 years of active management under the OAMP: ▶ Site condition – the following scores for each ecological attribute will be achieved through the implementation of specific management actions under the OAMP: – Native shrub species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2 (remnant and regrowth), RE 11.5.8 and RE 11.3.25 – Native grass species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2 (remnant and regrowth), RE 11.5.8 and RE 11.3.25 – Native forb species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2 (remnant and regrowth), RE 11.5.8 and RE 11.3.25 – Tree canopy height – increase the score across all monitoring sites to a 5 representing 70% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2 (remnant and regrowth), RE 11.5.8 and RE 11.3.25 – Shrub canopy cover – increase the score across all monitoring sites to a 5 representing between 50% and 200% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2 (remnant and regrowth), RE 11.5.8 and RE 11.3.25 – Native perennial grass cover – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2 (remnant and regrowth), RE 11.5.8 and RE 11.3.25 – Large trees – increase the score across all monitoring sites to a 10, representing between 50% to 100% of the benchmark for RE 11.10.7, RE 11.11.15, RE 11.4.2, RE 11.5.8 and RE 11.3.25 – Non-native plant cover – increase the score across all monitoring sites to a 10 representing <5% non-native plant cover at each site.

Input	Score	Justification
		▶ Site context – Average site context score for each RE is maintained or increased compared to the start quality score: – RE 11.10.7 – ≥ 7.03 – RE 11.11.15 – ≥ 7.38 – RE 11.4.2 – ≥ 8.50 – RE 11.4.2 regrowth – ≥ 1.15 – RE 11.5.8 – ≥ 7.60 – RE 11.3.25 – ≥ 8.53 ▶ Species habitat index – Increase the threats to species score to a 15 through the implementation of the OAMP, specifically, implementation of successful pest animal control, active fire management, security through a legally binding mechanism and active management of the area for conservation purposes. The OAMP will be implemented, in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for squatter pigeon, including specific management actions aimed at reducing the impact of threatening processes and improving the quality of squatter pigeon habitat within the offset area, including: – Pest animal control – control measures will be implemented focussing on control of wild dogs, feral cats and foxes within the offset area reducing the threat of predation on squatter pigeon. – Livestock management – livestock will be excluded from the offset area except during strategic grazing events to control fuel loads and exotic pasture grasses. Periods of grazing will be followed by an extended period of rest and stocking rates will depend on seasonal conditions and pasture growth. – Weed control – weed hygiene restrictions and weed control activities will be undertaken within the offset area in order to reduce the threat of invasive weeds species (including exotic pasture grasses) to control fuel loads and to promote recruitment of foraging and shelter trees. – Fire management – fire management including establishment of fire breaks, control of fuel loads and implementation of low-intensity, controlled burns at appropriate intervals and times of year will be undertaken within the offset area. This will aim to reduce the risk of high intensity fires within the offset and assist with natural regeneration of vegetation communities, including a natural and diverse understorey perennial grass cover important for squatter pigeon.
Confidence in result – future quality	80%	An OAMP will be developed in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for the species, and negotiations with the landholder. The OAMP will detail specific management objectives and outcomes aimed at improving the quality of species habitat. Ongoing monitoring of the offset area will also be undertaken to regularly assess the progress of the offset and ensure the OAMP achieves its required outcomes. The OAMP will support an efficient, effective, timely, transparent, scientifically robust and reasonable approach to managing and monitoring the offset area.
Risk of loss without offset	0.69%	The clearing of remnant vegetation in Queensland is regulated by the VM Act and the *Planning Act 2016* and associated policies and codes. This framework identifies vegetation as one of four categories, varying in their degree of restriction on permissible clearing. Under the VM Act, an application must be made to the Queensland Government to clear remnant vegetation (Category B) unless an exemption applies. The VM Act prevents broad-scale clearing of remnant vegetation for agriculture or other development activities; however, clearing of some remnant vegetation for resource development purposes (e.g. mining) is allowed. The VM Act allows clearing of category X areas without requiring landholders to obtain approval. Areas mapped as category X are not subject to vegetation clearing codes and therefore have the potential to be cleared by the current or future landholders at any time. Pastoralists are motivated to clear vegetation for a variety of reasons; however, historically a combination of favourable conditions and higher commodity prices have coincided with increased rates of clearing (Evans, 2016). Market conditions over the coming years look to continue to put pressure on pastoralists to increase production which inevitably leads to higher rates of clearing (M. Taylor pers comm). This is supported by clearing rates for regrowth vegetation increasing every year since 2012 (Steffen and Dean, 2018). Historical clearing has disproportionately impacted vegetation on the most fertile soil, such as eucalypt woodlands on alluvial flats and Brigalow vegetation on clay plains. Expert estimates of the likelihood of clearing regrowth of alluvial ecosystems are as high as 90% (C. Hempel pers comm). The previous landholder previously cleared areas of unregulated Category X vegetation across the property. Much of the regrowth areas of RE 11.4.2 across the property were cleared in 2008, with retention of these regrowth areas representing not only important foraging and breeding habitat for squatter pigeon, but facilitating dispersal between remnant vegetation areas in upslope areas and fringing riparian habitats. Notwithstanding the property-specific decisions influencing any landholder's decision to clear, the risk that areas will be cleared resulting in the complete loss of habitat for squatter pigeon within the next 20 years, is considered to be 0.69%. This percentage reflects the average annual background rate of loss (2005 – 2014) within the Rockhampton Local Government Area as outlined in the *Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act* document prepared by Maseyk et al. (2017).
Risk of loss with offset	0%	The offset area will be secured through declaration as an area of high nature conservation value under section 19F of the VM Act.
Confidence in result – risk of loss	90%	The legally binding mechanism will be registered on the land title and bind all current and future land owners to ensure that the offset is protected.
Time over which loss is averted (years)	20	The offset area will be protected by a legally binding mechanism which will remain in effect as required by the applicable State and Commonwealth legislative requirements, therefore, the time over which loss is averted is considered to be the maximum allowable time of 20 years.
Time until ecological benefit (years)	20	The implementation of site-specific land management actions through the development and application of an OAMP is expected to increase the quality of the offset area by improving vegetation condition and reducing potential threats to squatter pigeon habitat. An ecological benefit is expected to be realised in 20 years.

Table D-5: Ornamental snake offsets assessment guide input justifications ([redacted]).

Input	Score	Justification
Quality of impact area	5	Ornamental snake habitat within the immediate vicinity of the project area was limited, and significant residual impacts were considered to be limited to areas of degraded remnant RE 11.3.25, corresponding to a tributary of Deep Creek located within ML 80187. While the species has been recorded in remnant Brigalow vegetation (RE 11.4.9) 3.5 km west of the northern boundary of ML 80187 in September 2011 , targeted surveys for ornamental snake since 2011 have failed to confirm the presence of the species within the impact area or tributaries of Deep Creek. Targeted surveys in regrowth areas adjacent to the tributaries of Deep Creek in May 2020 indicated much of the gilgai communities support a sandy, clay, loam surface rather than deep cracking clays the species is typically associated with. Consequently, any cracks in the clays were observed as being filled by surface sand, affording little foraging or shelter habitat potential for ornamental snake. The quality of ornamental snake habitat within the project impact area was calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality, identifying an impact habitat quality score of 5. Details of habitat quality scoring in the Project impact area are outlined in Appendix C.
Quality of offset area	7	Ornamental snake habitat within the offset area comprises 121 ha of ground-truthed remnant RE 11.3.3 and RE 11.3.25. This habitat is located in the north of [redacted], on floodplain gilgai soils dominated by *Eucalyptus coolabah* grassy woodland, dissected by the stream order 3 tributary [redacted]. These two REs are considered suitable habitat for ornamental snake; with areas of RE 11.3.3 supporting large, deep gilgai on deep cracking clays, and the small area of dissecting watercourse supporting cracking clays as well as intermittent pools of water. These pools of water were confirmed to support a number of preferred frog prey species of the ornamental snake, including flooplain frog (*Litoria inermis*), spotted marsh frog (*Limnodynastes tasmaniensis*), desert tree frog (*Litoria rubella*), striped burrowing frog (*Cyclorana alboguttata*), New Holland frog (*Cyclorana novaehollandiae*) and green tree frog (*Litoria caerulea*). Targeted spotlighting surveys conducted in May 2020 confirmed the presence of ornamental snake ~1 km from the offset area along the northern boundary of [redacted] in an area of RE 11.3.3 consistent with habitat in the offset area. As a consequence of the cooler weather at the time of surveying, it is likely that greater numbers of ornamental snake will be detectable during the warmer months in other areas of [redacted], including throughout the offset area. The quality of ornamental snake habitat within the offset area was calculated generally in accordance with the Guide to Determining Terrestrial Habitat Quality (see method in Appendix B). Appendix F provides a detailed summary of the data used to calculate the baseline habitat quality scores for ornamental snake in the [redacted] offset area, used in the Offsets Assessment Guide. The current land use across much of [redacted] is cattle grazing, with grazing evident in all areas of ornamental snake habitat. Grazing in these areas has resulted in trampling of gilgai, as well as evidence of weeds and exotic pasture grasses, particularly *Parthenium*, mimosa bush (*Vachellia farnesiana*) and *Megathyrsus maximus*, with the greatest density of weeds (particularly *M. maximus*) within the bed and banks [redacted] corresponding to RE 11.3.25. The incursion of weeds and exotic pasture into areas of RE 11.3.3 has the potential to increase the frequency of high intensity fires as they increase fuel loads causing loss of critical microhabitat for ornamentals snake and impacts on frog prey species.
Future quality without offset management	7	Should an offset not be secured, the quality of habitat for the ornamental snake within the next 20 years is expected to be maintained at a score of 7 based on the following: ▶ Ongoing commercial livestock grazing across the property, with livestock favouring riparian and adjacent grassy alluvial coolabah woodlands [redacted] and surrounding remnant areas resulting in: – Trampling of critical microhabitat features for the ornamental snake (e.g. coarse woody debris and cracking clays), but also altering of water quality supporting prey species (e.g. frogs) for ornamental snake when rains fill gilgai and pools of retained water [redacted] within the proposed offset area. – The landholders have indicated they intend to further develop the property to allow for heavier stocking rates if an offset arrangement does not occur. This has the potential to continue to degrade the proposed ornamental snake offset area, which is currently already impacted by weed encroachment, particularly around existing watering points within the proposed offset area – Continued presence of weeds and exotic pasture grasses, particularly *Parthenium*, mimosa bush (*Vachellia farnesiana*) and *Megathyrsus maximus*. – Limited pest animal control, other than the landholder's general biosecurity obligation under the Biosecurity Act 2014 (Qld), increasing the risk of pest animal predation and decreasing the viability of the offset area to support ornamental snake populations
Future quality with offset management	8	An offset area for ornamental snake on [redacted] will be secured and managed, to improve the quality of vegetation communities and accompanying habitat features contributing to ornamental snake habitat. The quality of ornamental snake habitat will be improved through an increase in site condition, site context and/or species stocking rate to achieve a future quality of 8. The following outlines increases in relevant attributes that in part or whole will contribute to the completion criteria being achieved (a future quality score of 8) over 20 years of active management under the OAMP: ▶ Site condition – the following scores for each ecological attribute will be achieved through the implementation of specific management actions under the OAMP: – Native shrub species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.3.3 and RE 11.3.25 – Native grass species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.3.3 and RE 11.3.25 – Native forb species richness – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.3.3 and RE 11.3.25 – Tree canopy height – increase the score across all monitoring sites to a 5 representing 70% of the benchmark for RE 11.3.3 and RE 11.3.25 – Shrub canopy cover – increase the score across all monitoring sites to a 5 representing between 50% and 200% of the benchmark for RE 11.3.3 and RE 11.3.25 – Native perennial grass cover – increase the score across all monitoring sites to a 5 representing > 90% of the benchmark for RE 11.3.3 and RE 11.3.25 – Large trees – increase the score across all monitoring sites to a 10, representing between 50% to 100% of the benchmark for RE 11.3.3 and RE 11.3.25 – Non-native plant cover – increase the score across all monitoring sites to a 10 representing <5% non-native plant cover at each site. ▶ Site context – Average site context score for each RE is maintained or increased compared to the start quality score: – RE 11.3.3 – ≥ 9.23 – RE 11.3.25 – ≥ 9.81 ▶ Species habitat index

Input	Score	Justification
		– Increase the threats to species score to a 15 through the implementation of the OAMP specifically implementation of successful pest animal control targeting feral cats and foxes as well as degradation of habitat by feral pigs, active fire management, security through a legally binding mechanism and active management of the area for conservation purposes. The OAMP will be implemented, in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for ornamental snake, including specific management actions aimed at reducing the impact of threatening processes and improving the quality of ornamental snake habitat within the offset area, including: – Pest animal control – control measures will be implemented focussing on control of feral cats and foxes within the offset area reducing the threat of predation on ornamental snake (and their prey), while also controlling degradation of habitat by feral pigs. – Livestock management – livestock will be excluded from the offset area except during strategic grazing events to control fuel loads and exotic pasture grasses. Any periods of grazing will be followed by an extended period of rest and stocking rates will depend on seasonal conditions and pasture growth. – Weed control – weed hygiene restrictions and weed control activities will be undertaken within the offset area in order to reduce the threat of invasive weeds species (including exotic pasture grasses) to control fuel loads and to reduce threat of smothering of gilgai habitat and watercourse habitat for frog prey. – Fire management – fire management including establishment of fire breaks, control of fuel loads outside of the offset area only, with no controlled burns within the offset area. This in combination with strategic grazing (if required) will aim to reduce the risk of high intensity fires within the offset and assist with natural regeneration of vegetation communities.
Confidence in result – future quality	80%	An OAMP will be developed in accordance with approved conservation advice, recovery plans and recommended threat abatement and management advice for the species, and negotiations with the landholder. The OAMP will detail specific management objectives and outcomes aimed at improving the quality of species habitat. Ongoing monitoring of the offset area will also be undertaken to regularly assess the progress of the offset and ensure the OAMP achieves its required outcomes. The OAMP will support an efficient, effective, timely, transparent, scientifically robust and reasonable approach to managing and monitoring the offset area.
Risk of loss without offset	0.42%	The clearing of remnant vegetation in Queensland is regulated by the VM Act and the *Planning Act 2016* and associated policies and codes. This framework identifies vegetation as one of four categories, varying in their degree of restriction on permissible clearing. Under the VM Act, an application must be made to the Queensland Government to clear remnant vegetation (Category B) unless an exemption applies. The VM Act prevents broad-scale clearing of remnant vegetation for agriculture or other development activities; however, clearing of some remnant vegetation for resource development purposes (e.g. mining) is allowed. The VM Act allows clearing of category X areas without requiring landholders to obtain approval. Areas mapped as category X are not subject to vegetation clearing codes and therefore have the potential to be cleared by the current or future landholders at any time. Pastoralists are motivated to clear vegetation for a variety of reasons; however, historically a combination of favourable conditions and higher commodity prices have coincided with increased rates of clearing (Evans, 2016). Market conditions over the coming years look to continue to put pressure on pastoralists to increase production which inevitably leads to higher rates of clearing (M. Taylor pers comm). This is supported by clearing rates for regrowth vegetation increasing every year since 2012 (Steffen and Dean, 2018). Historical clearing has disproportionately impacted vegetation on the most fertile soil, such as eucalypt woodlands on alluvial flats and Brigalow vegetation on clay plains. Expert estimates of the likelihood of clearing regrowth of alluvial ecosystems are as high as 90% (C. Hempel pers comm). The current landholder has expressed an interest in increasing pastoral activities in the offset area if not otherwise protected, being highly productive alluvial-derived soils with a rich native grass cover. Notwithstanding the property-specific decisions influencing any landholder's decision to clear, the risk that areas will be cleared resulting in the complete loss of habitat for ornamental snake within the next 20 years, is considered to be 0.42%. This percentage reflects the average annual background rate of loss (2005 – 2014) within the Isaac Local Government Area as outlined in the *Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act* document prepared by Maseyk et al. (2017).
Risk of loss with offset	0%	The offset area will be secured through declaration as an area of high nature conservation value under section 19F of the VM Act.
Confidence in result – risk of loss	90%	The legally binding mechanism will be registered on the land title and bind all current and future land owners to ensure that the offset is protected.
Time over which loss is averted (years)	20	The offset area will be protected by a legally binding mechanism which will remain in effect as required by the applicable State and Commonwealth legislative requirements, therefore, the time over which loss is averted is considered to be the maximum allowable time of 20 years.
Time until ecological benefit (years)	20	The implementation of site-specific land management actions through the development and application of an OAMP is expected to increase the quality of the offset area by improving vegetation condition and reducing potential threats to ornamental snake habitat. An ecological benefit is expected to be realised in 20 years.

APPENDIX E BASELINE HABITAT QUALITY SCORES – MAMELON OFFSET AREA

The following tables provide a summary of the data used to calculate the baseline habitat quality score for MNES (incorporated into the offsets assessment guide) and MSES for Mamelon, generally in accordance with the Guide to Determining Terrestrial Habitat Quality version 1.2 (DEHP, 2017). The data required to inform the site condition and the fauna species habitat index scores were collected as part of detailed field surveys between 2018 and 2020. The site context score was calculated based on a desktop assessment following the method prescribed in Appendix B.

Table E-1: Site condition score for each offset RE assessment unit across Mamelon, sites M01 – M10.

Ecological condition indicators	Site M01 RE 11.3.4			Site M02 RE 11.10.7			Site M03 RE 11.10.7			Site M04 RE 11.4.2 (regrowth)			Site M05 RE 11.4.2 (regrowth)			Site M06 RE 11.4.2 (regrowth)			Site M08 RE 11.4.2 (regrowth)			Site M10 RE 11.3.4		
	Raw data	Benchmark (11.3.4)	Score	Raw data	Benchmark (11.10.4)	Score	Raw data	Benchmark (11.10.4)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.3.4)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	7	4	5	4	4	5	10	4	5	6	4	5	8	4	5	7	4	5	7	4	5	9	4	5
Native plant species richness - shrubs	7	2	5	5	6	3	7	6	5	7	5	5	6	5	5	5	5	5	7	5	5	10	2	5
Native plant species richness - grasses	3	7	3	3	5	3	2	5	3	2	8	3	2	8	3	2	8	3	3	8	3	3	7	3
Native plant species richness - forbs	3	10	3	3	5	3	3	5	3	2	7	3	1	7	2.5	5	7	3	4	7	3	2	10	2.5
Tree canopy height	18.8	22	4	17.2	20	5	13	20	4	8.4	20	3	9.3	20	3	8.3	20	3	9.7	20	4	19.6	22	4
Tree sub canopy height	5.6	12		9.4	4		5.35	4		4.3	8		3.9	8		4.5	8		6	8		6.5	12	
Tree canopy cover	36.4	17	4	48.6	27	4	27.4	27	4	18	25	2.5	17	25	3.5	25	25	5	21.6	25	3.5	43.2	17	2.5
Tree sub canopy cover	6.1	5		14.6	3		7.6	3		0%	5		2	5		3.4	5		1.4	5		2.4	5	
Shrub canopy cover	1.7	1	5	4.5	4	5	2.8	4	5	2.2	13	3	0.3	13	0	0	13	0	0.4	13	0	3.1	1	3
Native perennial grass cover	60	43	5	35	23	5	25	23	5	37	16	5	33	16	5	19	16	5	55	16	5	43	43	5
Organic litter	35	20	5	49.4	30	5	33.8	30	5	30	30	5	30	30	5	44.6	30	5	41.2	30	5	47	20	3
Large eucalypt trees	10	26	5	0	16	0	0	16	0	0	9	0	0	9	0	0	9	0	0	9	0	16	26	5
Large non-eucalypt trees	0	24		0	5		0	5		0	9		0	9		0	9		0	9		6	24	
Coarse woody debris	498	384	5	182	410	2	163	410	2	881	109	2	629	109	2	907	109	2	668	109	2	79	384	2
Non-native plant cover	5.8	0	5	0.6	0	10	25.8	0	3	5	0	5	3.6	0	10	1.3	0	10	0.1	0	10	5.75	0	5
Total			59			55			49			46.5			49			51			50.5			50
/10			**7.38**			**6.88**			**6.13**			**5.81**			**6.13**			**6.38**			**6.31**			**6.25**

Table E-2: Site condition score for each offset RE assessment unit across Mamelon, sites M11 – M25.

Ecological condition indicators	Site M11 RE 11.10.7			Site M12 RE 11.10.7			Site M14 RE 11.10.7			Site M15 RE 11.10.7			Site M22 RE 11.11.15			Site M23 RE 11.4.2			Site M24 RE 11.4.2			Site M25 RE 11.4.2		
	Raw data	Benchmark (11.10.4)	Score	Raw data	Benchmark (11.10.4)	Score	Raw data	Benchmark (11.10.4)	Score	Raw data	Benchmark (11.10.4)	Score	Raw data	Benchmark (11.11.15)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5	60	100	3	50	100	3	100	100	5
Native plant species richness - trees	9	4	5	9	4	5	10	4	5	12	4	5	1	4	3	4	4	5	4	4	5	3	4	3
Native plant species richness - shrubs	6	6	5	11	6	5	9	6	5	15	6	5	6	3	5	8	5	5	8	5	5	4	5	3
Native plant species richness - grasses	3	5	3	4	5	3	3	5	3	3	5	3	6	7	3	5	8	3	5	8	3	7	8	3
Native plant species richness - forbs	2	5	3	2	5	3	3	5	3	2	5	3	1	12	2.5	4	7	3	4	7	3	2	7	3
Tree canopy height	18.9	20	5	12.8	20	4	11.3	20	4	15.6	20	5	19	18	5	20	20	5	19	20	5	19	20	5
Tree sub canopy height	6	4		5.4	4		5.9	4		5.5	4		14	10		11	8		13	8		10	8	
Tree canopy cover	62.3	27	3	42.9	27	4	64.3	27	3	46.9	27	4	51	35	5	37	25	4	35	25	4	53	25	3
Tree sub canopy cover	27.5	3		40	3		11.8	3		30.7	3		8	5		23	5		12	5		43	5	
Shrub canopy cover	14.7	4	3	5.7	4	5	1.2	4	3	4	4	5	4	3	5	0	13	0	0	13	0	10	13	5
Native perennial grass cover	10.6	23	1	8.8	23	1	13.2	23	3	14.6	23	3	12.4	45	1	39	16	5	29	16	5	23.2	16	5
Organic litter	69.4	30	3	79.2	30	3	70.2	30	3	54.4	30	5	65.8	23	3	28.3	30	5	39.5	30	5	26.8	30	5
Large eucalypt trees	4	16	5	6	16	5	6	16	5	12	16	10	2	17	5	8	9	10	6	9	5	8	9	5
Large non-eucalypt trees	0	5		0	5			5			5		0	0		8	9		0	9		0	9	
Coarse woody debris	708	410	5	261	410	5	648	410	5	730	410	5	64	441	2	40	109	2	58	109	5	30	109	2
Non-native plant cover	0	0	10	3.4	0	10	0.1	0	10	0.4	0	10	4	0	10	2.7	0	10	0.5	0	10	0	0	10
Total			56			58			57			68			54.5			60			58			57
/10			**7.00**			**7.25**			**7.13**			**8.50**			**6.81**			**7.50**			**7.25**			**7.13**

Table E-3: Site condition score for each offset RE assessment unit across Mamelon, sites M26 – M33.

Ecological condition indicators	Site M26 RE 11.4.2			Site M27 RE 11.3.25			Site M28 RE 11.4.2			Site M29 RE 11.4.2			Site M30 RE 11.3.25			Site M31 RE 11.3.25			Site M32 RE 11.4.2			Site M33 RE 11.4.2		
	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5	70	100	3	100	100	5	100	100	5
Native plant species richness - trees	2	4	3	5	4	5	2	4	3	3	4	3	4	4	5	7	4	5	3	4	3	2	4	3
Native plant species richness - shrubs	10	5	5	5	2	5	10	5	5	9	5	5	8	2	5	5	2	5	9	5	5	4	5	3
Native plant species richness - grasses	7	8	3	2	8	3	9	8	5	9	8	5	4	8	3	1	8	2.5	6	8	3	8	8	5
Native plant species richness - forbs	2	7	3	2	12	2.5	2	7	3	2	7	3	4	12	3	3	12	3	3	7	3	0	7	2.5
Tree canopy height	19	20	5	27	23	5	19	20	5	18	20	2.5	33	23	5	29	23	5	19	20	5	19	20	5
Tree sub canopy height	11	8					13	8			8								12	8		10	8	
Tree canopy cover	40	25	5	32	22	4	51	25	3	51	25	1.5	34	22	4	25	22	4	47	25	4	65	25	3
Tree sub canopy cover	8	5					15	5			5								18	5		14	5	
Shrub canopy cover	2	13	3	24	1	3	11	13	5	4	13	3	49	1	3	19	1	3	2	13	3	7	13	5
Native perennial grass cover	35	16	5	7	12	3	23.5	16	5	36	16	5	8	12	3	8	12	3	25	16	5	32	16	5
Organic litter	25.2	30	5	28	15	5	53.1	30	5	51	30	5	28	15	5	6	15	3	50	30	5	36.5	30	5
Large eucalypt trees	12	9	10	26	14	15	4	9	5	10	9	10	12	14	15	56	14	15	4	9	5	4	9	5
Large non-eucalypt trees	0	9		18	7		0	9		0	9		30	7		26	7		0	9		0	9	
Coarse woody debris	90	109	5	46	375	2	164	109	5	98	109	5	14	375	0	11	375	0	184	109	5	194	109	5
Non-native plant cover	0.2	0	10	6	0	5	0.2	0	10	0.2	0	10	21.5	0	5	1	0	10	1	0	10	0.5	0	10
Total			67			62.5			64			63			61			61.5			61			61.5
/10			**8.38**			**7.81**			**8.00**			**7.88**			**7.63**			**7.69**			**7.63**			**7.69**

Table E-4: Site condition score for each offset RE assessment unit across Mamelon, sites M34 – M61.

Ecological condition indicators	Site M34 RE 11.3.25			Site M35 RE 11.3.25			Site M36 RE 11.4.2			Site M37 RE 11.4.2			Site M39 RE 11.4.2			Site M59 RE 11.3.25			Site M60 RE 11.3.4			Site M61 RE 11.3.35		
	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.4.2)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.4)	Score	Raw data	Benchmark (11.3.35)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	100	100	5	100	100	5	66	100	3	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	7	4	5	6	4	5	3	4	3	3	4	3	3	4	3	16	4	5	11	4	5	14	6	5
Native plant species richness - shrubs	4	2	5	5	2	5	6	5	5	9	5	5	5	5	5	4	2	5	15	2	5	7	4	5
Native plant species richness - grasses	1	8	2.5	2	8	3	4	8	3	6	8	3	4	8	3	4	8	3	10	7	5	6	7	3
Native plant species richness - forbs	1	12	2.5	1	12	2.5	3	7	3	3	7	3	0	7	2.5	14	12	5	19	10	5	12	12	5
Tree canopy height	29	23	5	17	23	5	19	20	5	20	20	5	27	20	5	20	23	5	15	22	3	18	15	5
Tree sub canopy height							12	8		12	8		10	8					5	12		8	6	
Tree canopy cover	21	22	4	64	22	3	50	25	4	57	25	4	35	25	4	12.4	22	4	47.6	17	3	69.6	30	3
Tree sub canopy cover							11	5		9	5		17	5					14.2	5		43.8	15	
Shrub canopy cover	22	1	3	24	1	3	22	13	5	24	13	5	2.5	13	3	4.7	1	3	8	1	3	10.4	5	3
Native perennial grass cover	3	12	1	11	12	5	9	16	3	25	16	5	5	16	1	3.6	12	1	4	43	0	10.4	52	1
Organic litter	15	15	5	41	15	3	43	30	5	50	30	5	37	30	5	18	15	5	47.4	20	3	56	15	3
Large eucalypt trees	16	14	15	6	14	15	14	9	10	4	9	5	18	9	10	4	14	5	2	26	5	4	20	5
Large non-eucalypt trees	10	7		62	7		0	9		0	9		0	9		2	7		0	24		0	12	
Coarse woody debris	24	375	0	70	375	2	176	109	5	184	109	5	140	109	5	355	375	5	560	384	5	214	319	5
Non-native plant cover	22.7	0	5	12	0	5	8.5	0	5	0.2	0	10	0.5	0	10	51	0	0	34.2	0	3	82	0	0
Total			58			61.5			61			63			59.5			51			50			48
/10			**7.25**			**7.69**			**7.63**			**7.88**			**7.44**			**6.38**			**6.25**			**6.00**

Table E-5: Site condition score for each offset RE assessment unit across Mamelon, sites M62 – M69.

Ecological condition indicators	Site M62 RE 11.3.35			Site M63 RE 11.11.1			Site M64 RE 11.11.1			Site M65 RE 11.10.7			Site M66 RE 11.5.8			Site M67 RE 11.5.8			Site M68 RE 11.5.8			Site M69 RE 11.5.8		
	Raw data	Benchmark (11.3.35)	Score	Raw data	Benchmark (11.11.1)	Score	Raw data	Benchmark (11.11.1)	Score	Raw data	Benchmark (11.10.4)	Score	Raw data	Benchmark (11.5.8)	Score	Raw data	Benchmark (11.5.8)	Score	Raw data	Benchmark (11.5.8)	Score	Raw data	Benchmark (11.5.8)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	14	6	5	10	4	5	9	4	5	9	4	5	9	6	5	12	6	5	8	6	5	6	6	5
Native plant species richness - shrubs	8	4	5	8	7	5	7	7	5	4	6	3	5	2	5	11	2	5	4	2	5	4	2	5
Native plant species richness - grasses	8	7	5	12	8	5	10	8	5	8	5	5	8	7	5	10	7	5	10	7	5	10	7	5
Native plant species richness - forbs	11	12	5	15	10	5	21	10	5	10	5	5	10	18	3	5	18	3	10	18	3	20	18	5
Tree canopy height	18	15	5	14	16	5	14	16	5	14	20	4	15	11	4	11	11	4	17	11	5	12	11	4
Tree sub canopy height	8	6		6	7		6	7		6	4		3.5	8		5	8		7	8		3	8	
Tree canopy cover	47.4	30	5	47	30	4	33.1	30	4	57.7	27	3	55.6	48	4	47.9	48	5	52.8	48	4	63.8	48	5
Tree sub canopy cover	13.6	15		47.3	6		43.5	6		28.4	3		29.2	11		21.5	11		29.8	11		14.3	11	
Shrub canopy cover	2.9	5	5	13.5	4	3	9.2	4	3	5.7	4	5	4.5	6	5	2.5	6	3	5.1	6	5	16.3	6	3
Native perennial grass cover	14	52	1	43	30	5	34	30	5	6	23	1	35	44	3	43	44	5	36	44	3	27.6	44	3
Organic litter	3.2	15	3	26	32	5	21.8	32	5	36	30	5	32	23	5	17	23	5	22	23	5	27	23	5
Large eucalypt trees	8	20	5	6	10	10	0	10	0	0	16	0	6	9	10	4	9	5	4	9	5	2	9	5
Large non-eucalypt trees	0	12		0	0		0	0		0	5		26	24		12	24		6	24		2	24	
Coarse woody debris	232	319	5	450	176	2	460	176	2	501	410	5	583	261	2	291	261	5	519	261	5	129	261	2
Non-native plant cover	87	0	0	1.6	0	10	8	0	5	48	0	3	17	0	5	9.4	0	5	2.6	0	10	16.25	0	5
Total			54			69			54			49			61			60			65			57
/10			**6.75**			**8.63**			**6.75**			**6.13**			**7.63**			**7.50**			**8.13**			**7.13**

Table E-6: Site condition score for each offset RE assessment unit across Mamelon, sites M70 – M73.

Ecological condition indicators	Site M70 RE 11.11.15			Site M71 RE 11.11.15			Site M72 RE 11.11.15			Site M73 RE 11.11.15		
	Raw data	Benchmark (11.11.15)	Score	Raw data	Benchmark (11.11.15)	Score	Raw data	Benchmark (11.11.15)	Score	Raw data	Benchmark (11.11.15)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	5	4	5	5	4	5	8	4	5	6	4	5
Native plant species richness - shrubs	4	3	5	5	3	5	9	3	5	7	3	5
Native plant species richness - grasses	8	7	5	9	7	5	13	7	5	9	7	5
Native plant species richness - forbs	11	12	5	15	12	5	16	12	5	14	12	5
Tree canopy height	16	18	4	16	18	4	15	18	4	14	18	4
Tree sub canopy height	7	10		6	10		5	10		4	10	
Tree canopy cover	50	35	3.5	55.4	35	5	66.4	35	3.5	40.7	35	4
Tree sub canopy cover	2.1	5		3.4	5		2.4	5		13.4	5	
Shrub canopy cover	0.3	3	3	1	3	3	3.4	3	5	3.9	3	5
Native perennial grass cover	27	45	3	24	45	3	5	45	1	33	45	3
Organic litter	10.4	23	3	38	23	5	24	23	5	3	23	3
Large eucalypt trees	5	17	5	2	17	5	14	17	10	6	17	5
Large non-eucalypt trees	0	0		0	0		0	0		0	0	
Coarse woody debris	311	441	5	477	441	5	261	441	5	404	441	5
Non-native plant cover	19	0	5	1	0	10	2	0	10	15.2	0	5
Total			56.5			65			68.5			59
/10			**7.06**			**8.13**			**8.56**			**7.38**

Table E-7: Summary of the site condition, site context and fauna species habitat index scores used to calculate the offset habitat quality score for each habitat quality monitoring point – sites M01 – M31.

Habitat quality attributes	M01	M02	M03	M04	M05	M06	M08	M10	M11	M12	M14	M15	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31
	RE 11.3.4	RE 11.10.7	RE 11.10.7	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.3.4	RE 11.10.7	RE 11.10.7	RE 11.10.7	RE 11.10.7	RE 11.11.15	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.25
Site condition																						
Recruitment of woody perennial species	5	5	5	5	5	5	5	5	5	5	5	5	5	3	3	5	5	5	5	5	5	3
Native plant species richness – trees	5	5	5	5	5	5	5	5	5	5	5	5	3	5	5	3	3	5	3	3	5	5
Native plant species richness – shrubs	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	5	5
Native plant species richness – grasses	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	5	3	2.5
Native plant species richness – forbs	3	3	3	3	2.5	3	3	2.5	3	3	3	3	2.5	3	3	3	3	2.5	3	3	3	3
Tree canopy height	4	5	4	3	3	3	5	4	5	4	4	5	5	5	5	5	5	5	5	2.5	5	5
Tree canopy cover	4	4	4	2.5	3.5	5	3.5	2.5	3	4	3	4	5	4	4	3	5	4	3	1.5	4	4
Shrub canopy cover	5	5	5	3	0	0	0	3	3	5	3	5	5	0	0	5	3	3	5	3	3	3
Native perennial grass cover	5	5	5	5	5	5	5	5	1	1	3	3	1	5	5	5	5	3	5	5	3	3
Organic litter	5	5	5	5	5	5	5	3	3	3	3	5	3	5	5	5	5	5	5	5	5	3
Large trees	5	0	0	0	0	0	0	5	5	5	5	10	5	5	5	5	5	15	5	5	15	15
Coarse woody debris	5	2	2	2	2	2	2	2	5	5	5	5	2	2	5	2	5	2	5	5	0	0
Non-native plant cover	5	10	3	5	10	10	10	5	10	10	10	10	10	10	10	10	10	5	10	10	5	10
TOTAL BioCondition attributes	**59**	**55**	**49**	**46.5**	**49**	**51**	**51.5**	**50**	**56**	**58**	**57**	**68**	**54.5**	**55**	**58**	**57**	**62**	**62.5**	**64**	**58**	**61**	**61.5**
MAX Ecological Condition score	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
/10	7.38	6.88	6.13	5.81	6.13	6.38	6.44	6.25	7.00	7.25	7.13	8.50	6.81	6.88	7.25	7.13	7.75	7.81	8.00	7.25	7.63	7.69
Site context																						
Size of patch (fragmented bioregions)	10	10	5	0	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Connectivity (fragmented bioregions)	5	5	2	0	0	0	0	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Context (fragmented bioregions)	4	4	4	4	2	2	4	4	4	5	4	5	4	4	5	5	4	4	4	5	4	4
Distance to permanent watering point (intact bioregions)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological corridors	6	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	6	4	0	0	0
TOTAL site context attributes	**25**	**19**	**11**	**4**	**2**	**2**	**4**	**19**	**19**	**20**	**19**	**20**	**19**	**23**	**24**	**24**	**23**	**25**	**23**	**20**	**19**	**19**
MAX Site Context score	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
/10	9.62	7.31	4.23	1.54	0.77	0.77	1.54	7.31	7.31	7.69	7.31	7.69	7.31	8.85	9.23	9.23	8.85	9.62	8.85	7.69	7.31	7.31
Species habitat index – greater glider																						
Threats to species	7	7	7	-	-	-	-	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	5	5	5	-	-	-	-	5	5	5	5	10	5	5	5	5	10	5	10	5	5	5
Quality and availability of shelter	5	1	1	-	-	-	-	5	1	5	5	10	1	5	5	5	5	5	5	5	5	5

Habitat quality attributes	M01	M02	M03	M04	M05	M06	M08	M10	M11	M12	M14	M15	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31
	RE 11.3.4	RE 11.10.7	RE 11.10.7	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.3.4	RE 11.10.7	RE 11.10.7	RE 11.10.7	RE 11.10.7	RE 11.11.15	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.25
Species mobility capacity	7	7	4	-	-	-	-	7	10	7	7	10	7	10	10	10	10	7	10	10	7	7
Role of site location to species overall population in the state	5	4	4	-	-	-	-	5	4	5	4	4	4	4	4	4	4	5	4	4	5	5
TOTAL fauna habitat quality score	**29**	**24**	**21**	**-**	**-**	**-**	**-**	**29**	**27**	**29**	**28**	**41**	**24**	**31**	**31**	**31**	**36**	**29**	**36**	**31**	**29**	**29**
MAX fauna habitat quality score	50	50	50	-	-	-	-	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
/10	5.80	4.80	4.20	-	-	-	-	5.80	5.40	5.80	5.60	8.20	4.80	6.20	6.20	6.20	7.20	5.80	7.20	6.20	5.80	5.80
Species habitat index – koala																						
Threats to species	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	1	1	1	1	1	1	10	5	10	5	5	10	1	10	10	10	10	10	10	10	10	10
Quality and availability of shelter	10	5	5	1	1	1	1	10	10	10	10	10	5	10	10	10	10	10	10	10	10	10
Species mobility capacity	7	7	4	7	7	7	7	7	10	10	7	10	7	7	7	7	7	7	7	7	7	7
Role of site location to species overall population in the state	4	4	4	4	4	4	4	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5
TOTAL fauna habitat quality score	**29**	**24**	**21**	**20**	**20**	**20**	**29**	**34**	**42**	**37**	**34**	**42**	**24**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**	**39**
MAX fauna habitat quality score	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
/10	5.80	4.80	4.20	4.00	4.00	4.00	5.80	6.80	8.40	7.40	6.80	8.40	4.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80
Species habitat index – squatter pigeon																						
Threats to species	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	5	5	5	5	5	5	5	5	5	1	5	5	5	5	5	10	10	1	10	10	5	1
Quality and availability of shelter	5	10	10	10	10	5	5	5	5	5	5	10	5	10	10	5	10	1	5	10	1	5
Species mobility capacity	7	7	4	7	7	7	7	7	10	10	7	10	7	7	7	7	7	7	7	7	7	7
Role of site location to species overall population in the state	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	4	5	5	4	4
Total fauna habitat quality score	**29**	**34**	**31**	**34**	**34**	**29**	**29**	**29**	**32**	**27**	**29**	**37**	**29**	**34**	**34**	**34**	**39**	**20**	**34**	**39**	**24**	**24**
MAX fauna habitat quality score	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
/10	5.80	6.80	6.20	6.80	6.80	5.80	5.80	5.80	6.40	5.40	5.80	7.40	5.80	6.80	6.80	6.80	7.80	4.00	6.80	7.80	4.80	4.80

Table E-8: Summary of the site condition, site context and fauna species habitat index scores used to calculate the offset habitat quality score for each habitat quality monitoring point – sites M32 – M73.

Habitat quality attributes	M32	M33	M34	M35	M36	M37	M39	M59	M60	M61	M62	M63	M64	M65	M66	M67	M68	M69	M70	M71	M72	M73
	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.4	RE 11.3.35	RE 11.3.35	RE 11.11.1	RE 11.11.1	RE 11.10.7	RE 11.5.8	RE 11.5.8	RE 11.5.8	RE 11.5.8	RE 11.11.15	RE 11.11.15	RE 11.11.15	RE 11.11.15
Site condition																						
Recruitment of woody perennial species	5	5	5	5	5	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Native plant species richness – trees	3	3	5	5	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Native plant species richness – shrubs	5	3	5	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	5	5	5	5
Native plant species richness – grasses	3	5	2.5	3	3	3	3	3	5	3	5	5	5	5	5	5	5	5	5	5	5	5
Native plant species richness – forbs	3	2.5	2.5	2.5	3	3	2.5	5	5	5	5	5	5	5	3	3	3	5	5	5	5	5
Tree canopy height	5	5	5	5	5	5	5	5	3	5	5	5	5	4	4	4	5	4	4	4	4	4
Tree canopy cover	4	3	4	3	4	4	4	4	3	3	5	4	4	3	4	5	4	5	3.5	5	3.5	4
Shrub canopy cover	3	5	3	3	5	5	3	3	3	3	5	3	3	5	5	3	5	3	3	3	5	5
Native perennial grass cover	5	5	1	5	3	5	1	1	0	1	1	5	5	1	3	5	3	3	3	3	1	3
Organic litter	5	5	5	3	5	5	5	5	3	3	3	5	5	5	5	5	5	5	3	5	5	3
Large trees	5	5	15	15	5	5	10	5	5	5	5	10	0	0	10	5	5	5	5	5	10	5
Coarse woody debris	5	5	0	2	5	5	5	5	5	5	5	2	2	5	2	5	5	2	5	5	5	5
Non-native plant cover	10	10	5	5	5	10	10	0	3	0	0	10	5	3	5	5	10	5	5	10	10	5
TOTAL BioCondition attributes	**61**	**61.5**	**58**	**61.5**	**56**	**63**	**59.5**	**51**	**50**	**48**	**54**	**69**	**54**	**49**	**61**	**60**	**65**	**57**	**56.5**	**65**	**68.5**	**59**
MAX Ecological Condition score	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
/10	7.63	7.69	7.25	7.69	7.00	7.88	7.44	6.38	6.25	6.00	6.75	8.63	6.75	6.13	7.63	7.50	8.13	7.13	7.06	8.13	8.56	7.38
Site context																						
Size of patch (fragmented bioregions)	10	10	10	10	10	10	10	10	2	10	10	10	10	10	10	10	10	10	10	10	10	10
Connectivity (fragmented bioregions)	5	5	5	5	5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5	5	5
Context (fragmented bioregions)	4	4	4	4	4	4	5	5	2	4	4	5	5	5	5	4	5	5	5	4	4	4
Distance to permanent watering point (intact bioregions)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological corridors	0	4	6	6	6	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0
TOTAL site context attributes	**19**	**23**	**25**	**25**	**25**	**19**	**20**	**20**	**6**	**23**	**23**	**20**	**20**	**20**	**20**	**19**	**20**	**20**	**20**	**19**	**19**	**19**
MAX Site Context score	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
/10	7.31	8.85	9.62	9.62	9.62	7.31	7.69	7.69	2.31	8.85	8.85	7.69	7.69	7.69	7.69	7.31	7.69	7.69	7.69	7.31	7.31	7.31
Species habitat index – greater glider																						
Threats to species	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	5	5	5	5	5	5	5	5	5	5	5	10	5	5	5	5	5	5	5	10	10	5
Quality and availability of shelter	5	5	5	5	5	1	5	5	5	5	5	5	1	5	5	1	1	1	1	1	10	1
Species mobility capacity	10	7	7	7	7	10	7	10	7	10	10	10	10	10	7	7	7	7	10	10	7	7
Role of site location to species overall population in the state	4	4	5	5	4	4	4	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4

Habitat quality attributes	M32	M33	M34	M35	M36	M37	M39	M59	M60	M61	M62	M63	M64	M65	M66	M67	M68	M69	M70	M71	M72	M73
	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.4	RE 11.3.35	RE 11.3.35	RE 11.11.1	RE 11.11.1	RE 11.10.7	RE 11.5.8	RE 11.5.8	RE 11.5.8	RE 11.5.8	RE 11.11.15	RE 11.11.15	RE 11.11.15	RE 11.11.15
Total fauna habitat quality score	**31**	**28**	**29**	**29**	**28**	**27**	**28**	**32**	**29**	**32**	**32**	**36**	**27**	**31**	**28**	**24**	**24**	**24**	**27**	**32**	**38**	**24**
MAX fauna habitat quality score	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
/10	6.20	5.60	5.80	5.80	5.60	5.40	5.60	6.40	5.80	6.40	6.40	7.20	5.40	6.20	5.60	4.80	4.80	4.80	5.40	6.40	7.60	4.80
Species habitat index – koala																						
Threats to species	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	10	10	10	10	10	10	10	1	1	1	1	5	1	1	1	1	1	1	1	1	10	1
Quality and availability of shelter	10	10	10	10	10	10	10	5	5	10	10	10	5	5	1	10	10	1	5	5	10	5
Species mobility capacity	7	7	7	7	7	10	7	7	7	7	7	7	7	10	7	7	7	7	10	10	10	10
Role of site location to species overall population in the state	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	4	4	4	4
Total fauna habitat quality score	**39**	**39**	**39**	**39**	**39**	**42**	**39**	**25**	**25**	**30**	**30**	**34**	**25**	**27**	**21**	**30**	**30**	**21**	**27**	**27**	**41**	**27**
MAX fauna habitat quality score	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
/10	7.80	7.80	7.80	7.80	7.80	8.40	7.80	5.00	5.00	6.00	6.00	6.80	5.00	5.40	4.20	6.00	6.00	4.20	5.40	5.40	8.20	5.40
Species habitat index – squatter pigeon																						
Threats to species	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	10	10	1	5	5	10	5	1	5	5	5	10	5	5	5	5	10	5	5	10	10	5
Quality and availability of shelter	10	5	1	1	1	1	5	5	5	5	5	5	5	5	10	5	10	5	10	10	10	10
Species mobility capacity	7	7	7	7	7	10	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Role of site location to species overall population in the state	5	5	4	4	4	4	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Total fauna habitat quality score	**39**	**34**	**20**	**24**	**24**	**32**	**29**	**24**	**29**	**29**	**29**	**34**	**29**	**29**	**34**	**29**	**39**	**29**	**34**	**39**	**39**	**34**
MAX fauna habitat quality score	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
/10	7.80	6.80	4.00	4.80	4.80	6.40	5.80	4.80	5.80	5.80	5.80	6.80	5.80	5.80	6.80	5.80	7.80	5.80	6.80	7.80	7.80	6.80

Table E-9: Summary of the MSES habitat quality score for each RE assessment unit contributing to the Mamelon offset area.

Assessment unit habitat quality score /10	M01	M04	M05	M06	M08	M10	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M39	M59	M60
	RE 11.3.4	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.3.4	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.4
Site condition score (/80)	59	47	49	51	52	50	55	58	57	62	63	64	58	61	62	61	62	58	62	56	63	60	51	50
Site context score (/26)	25	4	2	2	4	19	23	24	24	23	25	23	20	19	19	19	23	25	25	25	19	20	20	6
Site condition + site context (/106)	84	51	51	53	56	69	78	82	81	85	88	87	78	80	81	80	85	83	87	81	82	80	71	56
Habitat quality score (/10)	**7.92**	**4.81**	**4.81**	**5.00**	**5.28**	**6.51**	**7.36**	**7.74**	**7.64**	**8.02**	**8.30**	**8.21**	**7.36**	**7.55**	**7.64**	**7.55**	**8.02**	**7.83**	**8.21**	**7.64**	**7.74**	**7.55**	**6.70**	**5.28**

Table E-10: Final habitat quality score for each MSES within the Mamelon offset area.

MSES	Average habitat quality score	FINAL HABITAT QUALITY SCORE
Of concern RE 11.3.4 (BVG 16c)	6.57	**7**
Of concern RE 11.4.2 (BVG 17a)	6.26	**6**
Watercourse RE 11.3.4 (BVG 16c)	6.57	**7**
Watercourse RE 11.3.25 (BVG 16a)	7.68	**8**

Table E-11: Summary of the MNES habitat quality score for each RE assessment unit contributing to the Mamelon offset area.

Assessment unit habitat quality score /10	M01	M02	M03	M04	M05	M06	M08	M10	M11	M12	M14	M15	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31
	RE 11.3.4	RE 11.10.7	RE 11.10.7	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.4.2 (regrowth)	RE 11.3.4	RE 11.10.7	RE 11.10.7	RE 11.10.7	RE 11.10.7	RE 11.11.15	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.25
Greater glider																						
Site condition score (/80) – 30% of final score	59	55	49	-	-	-	-	50	56	58	57	68	55	55	58	57	62	63	64	58	61	62
Site context score (/26) = 30% of final score	25	19	11	-	-	-	-	19	19	20	19	20	19	23	24	24	23	25	23	20	19	19
Species habitat index score (/50) – 40% of final score	29	24	21	-	-	-	-	29	27	31	28	41	24	31	31	31	36	29	36	31	29	29
Habitat quality score (/10)	**7.42**	**6.17**	**4.79**	**-**	**-**	**-**	**-**	**6.39**	**6.45**	**6.96**	**6.57**	**8.14**	**6.16**	**7.20**	**7.42**	**7.39**	**7.86**	**7.55**	**7.93**	**6.96**	**6.80**	**6.82**
Koala																						
Site condition score (/80) – 30% of final score	59	55	49	47	49	51	52	50	56	58	57	68	55	55	58	57	62	63	64	58	61	62
Site context score (/26) = 30% of final score	25	19	11	4	2	2	4	19	19	20	19	20	19	23	24	24	23	25	23	20	19	19
Species habitat index score (/50) – 40% of final score	29	24	21	20	20	20	29	34	42	37	34	42	24	39	39	39	39	39	39	39	39	39
Habitat quality score (/10)	**7.42**	**6.17**	**4.79**	**3.81**	**3.67**	**3.74**	**4.71**	**6.79**	**7.65**	**7.44**	**7.05**	**8.22**	**6.16**	**7.84**	**8.06**	**8.03**	**8.10**	**8.35**	**8.17**	**7.60**	**7.60**	**7.62**
Squatter pigeon																						
Site condition score (/80) – 30% of final score	59	55	49	47	49	51	52	50	56	58	57	68	55	55	58	57	62	63	64	58	61	62
Site context score (/26) = 30% of final score	25	19	11	4	2	2	4	19	19	20	19	20	19	23	24	24	23	25	23	20	19	19
Species habitat index score (/50) – 40% of final score	29	34	31	34	34	29	29	29	32	27	29	37	29	34	34	34	39	20	34	39	24	24
Habitat quality score (/10)	**7.42**	**6.97**	**5.59**	**4.93**	**4.79**	**4.46**	**4.71**	**6.39**	**6.85**	**6.64**	**6.65**	**7.82**	**6.56**	**7.44**	**7.66**	**7.63**	**8.10**	**6.83**	**7.77**	**7.60**	**6.40**	**6.42**

Table E-12: Summary of the MNES habitat quality score for each RE assessment unit contributing to the Mamelon offset area.

Assessment unit habitat quality score /10	M32	M33	M34	M35	M36	M37	M39	M59	M60	M61	M62	M63	M64	M65	M66	M67	M68	M69	M70	M71	M72	M73
	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.25	RE 11.4.2	RE 11.4.2	RE 11.4.2	RE 11.3.25	RE 11.3.4	RE 11.3.35	RE 11.3.35	RE 11.11.1	RE 11.11.1	RE 11.10.7	RE 11.5.8	RE 11.5.8	RE 11.5.8	RE 11.5.8	RE 11.11.15	RE 11.11.15	RE 11.11.15	RE 11.11.15
Greater glider																						
Site condition score (/80) – 30% of final score	61	62	58	62	56	63	60	51	50	48	54	69	54	49	61	60	65	57	57	65	69	59
Site context score (/26) = 30% of final score	19	23	25	25	25	19	20	20	6	23	23	20	20	20	20	19	20	20	20	19	19	19
Species habitat index score (/50) – 40% of final score	31	28	29	29	28	27	28	32	29	32	32	36	27	31	28	24	24	24	27	32	38	24
Habitat quality score (/10)	**6.96**	**7.20**	**7.38**	**7.51**	**7.22**	**6.71**	**6.78**	**6.78**	**4.89**	**7.01**	**7.24**	**7.78**	**6.49**	**6.63**	**6.84**	**6.36**	**6.67**	**6.37**	**6.59**	**7.19**	**7.80**	**6.32**
Koala																						
Site condition score (/80) – 30% of final score	61	62	58	62	56	63	60	51	50	48	54	69	54	49	61	60	65	57	57	65	69	59
Site context score (/26) = 30% of final score	19	23	25	25	25	19	20	20	6	23	23	20	20	20	20	19	20	20	20	19	19	19
Species habitat index score (/50) – 40% of final score	39	39	39	39	39	42	39	25	25	30	30	34	25	27	21	30	30	21	27	27	41	27
Habitat quality score (/10)	**7.60**	**8.08**	**8.18**	**8.31**	**8.10**	**7.91**	**7.66**	**6.22**	**4.57**	**6.85**	**7.08**	**7.62**	**6.33**	**6.31**	**6.28**	**6.84**	**7.15**	**6.13**	**6.59**	**6.79**	**8.04**	**6.56**
Squatter pigeon																						
Site condition score (/80) – 30% of final score	61	62	58	62	56	63	60	51	50	48	54	69	54	49	61	60	65	57	57	65	69	59
Site context score (/26) = 30% of final score	19	23	25	25	25	19	20	20	6	23	23	20	20	20	20	19	20	20	20	19	19	19
Species habitat index score (/50) – 40% of final score	39	34	20	24	24	32	29	24	29	29	29	34	29	29	34	29	39	29	34	39	39	34
Habitat quality score (/10)	**7.60**	**7.68**	**6.66**	**7.11**	**6.90**	**7.11**	**6.86**	**6.14**	**4.89**	**6.77**	**7.00**	**7.62**	**6.65**	**6.47**	**7.32**	**6.76**	**7.87**	**6.77**	**7.15**	**7.75**	**7.88**	**7.12**

Table E-13: Final area-weighted habitat quality score for each MNES within the Mamelon offset area.

MNES	RE 11.3.4	RE 11.3.25	RE 11.3.35	RE 11.4.2	RE 11.4.2 RG	RE 11.5.8	RE 11.10.7	RE 11.11.1	RE 11.11.15	RE 11.11.15 RG
Greater glider										
Offset area (ha)	0	100.8	0	354.6	0	297.8	862.4	0	812.8	0
Average habitat quality score	-	7.14	-	7.24	-	6.56	6.53	-	6.81	-
Area-weighted contribution to habitat quality score	-	0.30	-	1.06	-	0.80	2.32	-	2.28	-
Summed habitat quality score	**6.76**									
FINAL HABITAT QUALITY SCORE – Greater glider	**7**									
Koala										
Offset area (ha)	14.8	100.8	48.7	354.6	238.7	297.8	862.4	51.7	812.8	21
Average habitat quality score	6.26	7.71	6.97	7.92	3.98	6.60	6.80	6.97	6.83	3.98*
Area-weighted contribution to habitat quality score	0.03	0.28	0.12	1.00	0.34	0.70	2.09	0.13	1.98	0.03
Summed habitat quality score	**6.70**									
FINAL HABITAT QUALITY SCORE – Koala	**7**									
Squatter pigeon										
Offset area (ha)	0	100.8	0	354.6	238.7	297.8	862.4	0	812.8	0
Average habitat quality score	6.23	6.59	6.89	7.49	4.72	7.18	6.71	7.13	7.29	
Area-weighted contribution to habitat quality score	-	0.25	-	1.00	0.42	0.80	2.17	-	2.22	-
Summed habitat quality score	**6.86**									
FINAL HABITAT QUALITY SCORE – Squatter pigeon	**7**									

* Habitat quality score for RE 11.11.15 RG not assessed, although assumed to be similar overall condition for koala as RE 11.4.2 RG, with age, structure and condition observed to be similar.

APPENDIX F BASELINE HABITAT QUALITY SCORES – [redacted] OFFSET

The following tables provide a summary of the data used to calculate the baseline habitat quality score for MNES (incorporated into the offsets assessment guide) and MSES for [redacted], generally in accordance with the Guide to Determining Terrestrial Habitat Quality version 1.2 (DEHP, 2017). The data required to inform the site condition and the fauna species habitat index scores were collected as part of detailed field surveys in 2020. The site context score was calculated based on a desktop assessment following the method prescribed in Appendix B.

Table F-1: Site condition score for each RE assessment unit across [redacted], sites B01 – B07.

Ecological condition indicators	Site B01 RE 11.3.25			Site B02 RE 11.3.25			Site B03 RE 11.3.3			Site B04 RE 11.3.3			Site B05 RE 11.3.3			Site B06 RE 11.3.25			Site B07 RE 11.3.3		
	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.3)	Score	Raw data	Benchmark (11.3.3)	Score	Raw data	Benchmark (11.3.3)	Score	Raw data	Benchmark (11.3.25)	Score	Raw data	Benchmark (11.3.3)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	50	100	3	100	100	5	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	8	4	5	11	4	5	2	3	3	4	3	5	2	3	3	6	4	5	5	3	5
Native plant species richness - shrubs	9	2	5	7	2	5	7	5	5	6	5	5	7	5	5	6	2	5	6	5	5
Native plant species richness - grasses	0	8	2.5	1	8	2.5	6	12	3	7	12	3	4	12	3	6	8	3	6	12	3
Native plant species richness - forbs	1	12	2.5	1	12	2.5	7	15	3	5	15	3	6	15	3	8	12	3	8	15	3
Tree canopy height	19.2	23	5	15.5	23	3	13.4	18	4	12.9	18	4	14.2	18	2.5	15.5	23	3	17.4	18	5
Tree sub canopy height							5.9	10		5.4	10		0	10					8.3	10	
Tree canopy cover	19.8	22	5	48.1	22	3	30.9	28	3.5	24.1	28	5	50.2	28	2.5	68.9	22	3	35.9	28	5
Tree sub canopy cover							0.5	5		3.3	5		0	5					2.8	5	
Shrub canopy cover	5.4	1	3	14.8	1	3	6.2	4	5	0.9	4	3	3.5	4	5	1	1	5	0	4	0
Native perennial grass cover	0	12	0	0	12	0	54	45	5	25	45	3	33	45	3	69	12	5	57.4	45	5
Organic litter	29	15	5	7	15	3	15.8	30	5	25	30	5	9	30	3	13	15	5	5	30	3
Large eucalypt trees	26	14	15	16	14	15	4	10	5	0	10	0	12	10	15	24	14	15	26	10	15
Large non-eucalypt trees	0	7		18	7											10	7				
Coarse woody debris	125	375	2	335	375	5	159	285	5	208	285	5	52	285	2	320	375	5	418	285	5
Non-native plant cover	78.25	0	0	73.25	0	0	0.25	0	10	0.2	0	10	7.5	0	5	7.25	0	5	0.5	0	10
Total			55			52			59.5			56			57			67			69
/10			**6.88**			**6.50**			**7.44**			**7.00**			**7.13**			**8.38**			**8.63**

Table F-2: Site condition score for each RE assessment unit across [redacted], sites B08 – B10.

Ecological condition indicators	Site B08 RE 11.3.3			Site B09 RE 11.3.3			Site B10 RE 11.3.25		
	Raw data	Benchmark (11.3.3)	Score	Raw data	Benchmark (11.3.3)	Score	Raw data	Benchmark (11.3.25)	Score
Recruitment of woody perennial species	100	100	5	100	100	5	100	100	5
Native plant species richness - trees	2	3	3	5	3	5	2	4	3
Native plant species richness - shrubs	5	5	5	5	5	5	5	2	5
Native plant species richness - grasses	4	12	3	4	12	3	4	8	3
Native plant species richness - forbs	4	15	3	5	15	3	4	12	3
Tree canopy height	11.1	18	1.5	14.6	18	4	11.1	23	3
Tree sub canopy height	0	10		6.6	10				
Tree canopy cover	14.2	28	2.5	39	28	2.5	14.2	22	5
Tree sub canopy cover	0	5		0	5				
Shrub canopy cover	3.6	4	5	0	4	0	3.6	1	3
Native perennial grass cover	24	45	3	47	45	5	24	12	5
Organic litter	14	30	3	7	30	3	14	15	5
Large eucalypt trees	0	10	0	6	10	10	0	14	0
Large non-eucalypt trees							0	7	
Coarse woody debris	8	285	0	238	285	5	8	375	0
Non-native plant cover	0.4	0	10	0	0	10	0.4	0	10
Total			44			60.5			50
/10			**5.50**			**7.56**			**6.25**

Table F-3: Summary of the site condition, site context and fauna species habitat index scores used to calculate the habitat quality score for each habitat quality monitoring point – sites B01 – B10.

Habitat quality attributes	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10
	RE 11.3.25	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25
Site condition										
Recruitment of woody perennial species	5	5	3	5	5	5	5	5	5	5
Native plant species richness – trees	5	5	3	5	3	5	5	3	5	3
Native plant species richness – shrubs	5	5	5	5	5	5	5	5	5	5
Native plant species richness – grasses	2.5	2.5	3	3	3	3	3	3	3	3
Native plant species richness – forbs	2.5	2.5	3	3	3	3	3	3	3	3
Tree canopy height	5	3	4	4	2.5	3	5	1.5	4	3
Tree canopy cover	5	3	3.5	5	2.5	3	5	2.5	2.5	5
Shrub canopy cover	3	3	5	3	5	5	0	5	0	3
Native perennial grass cover	0	0	5	3	3	5	5	3	5	5
Organic litter	5	3	5	5	3	5	3	3	3	5
Large trees	15	15	5	0	15	15	15	0	10	0
Coarse woody debris	2	5	5	5	2	5	5	0	5	0
Non-native plant cover	0	0	10	10	5	5	10	10	10	10
TOTAL BioCondition attributes	**55**	**52**	**59.5**	**56**	**57**	**67**	**69**	**44**	**60.5**	**50**
MAX Ecological Condition score	80	80	80	80	80	80	80	80	80	80
/10	6.88	6.50	7.44	7.00	7.13	8.38	8.63	5.50	7.56	6.25
Site context										
Size of patch (fragmented bioregions)	10	10	10	10	10	10	10	10	10	10
Connectivity (fragmented bioregions)	5	5	5	5	5	5	4	5	5	5
Context (fragmented bioregions)	5	4	5	5	5	5	5	5	4	4
Distance to permanent watering point (intact bioregions)	-	-	-	-	-	-	-	-	-	-
Ecological corridors	6	6	4	4	4	6	4	4	6	6
TOTAL site context attributes	**26**	**25**	**24**	**24**	**24**	**26**	**23**	**24**	**25**	**25**
MAX Site Context score	26	26	26	26	26	26	26	26	26	26
/10	10.00	9.62	9.23	9.23	9.23	10.00	8.85	9.23	9.62	9.62
Species habitat index – ornamental snake										
Threats to species	7	7	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	5	5	5	5	5	10	10	1	5	5
Quality and availability of shelter	1	10	5	10	1	10	10	1	10	1
Species mobility capacity	7	7	7	7	7	7	7	7	7	7
Role of site location to species overall population in the state	4	4	4	4	4	4	4	4	4	4

Habitat quality attributes	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10
	RE 11.3.25	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25
TOTAL fauna habitat quality score	**24**	**33**	**28**	**33**	**24**	**38**	**38**	**20**	**33**	**24**
MAX fauna habitat quality score	50	50	50	50	50	50	50	50	50	50
/10	4.80	6.60	5.60	6.60	4.80	7.60	7.60	4.00	6.60	4.80

Table F-4: Summary of the MSES habitat quality score for each RE assessment unit contributing to the [redacted] offset area.

Assessment unit habitat quality score /10	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10
	RE 11.3.25	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25
Site condition score (/80)	55	52	60	56	57	67	69	44	61	50
Site context score (/26)	26	25	24	24	24	26	23	24	25	25
Site condition + site context (/106)	81	77	84	80	81	93	92	68	86	75
Habitat quality score (/10)	**7.64**	**7.26**	**7.92**	**7.55**	**7.64**	**8.77**	**8.68**	**6.42**	**8.11**	**7.08**

Table F-5: Final habitat quality score for each MSES within the [redacted] offset area.

MSES	Average habitat quality score	FINAL HABITAT QUALITY SCORE
Of concern RE 11.3.4 (BVG 16c)	7.72*	**8**
Watercourse RE 11.3.4 (BVG 16c)	7.72*	**8**
Watercourse RE 11.3.25 (BVG 16a)	7.69	**8**

* represented by of concern RE 11.3.3 (BVG 16c)

Table F-6: Summary of the MNES habitat quality score for each RE assessment unit contributing to the [redacted] offset area.

Assessment unit habitat quality score /10	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10
	RE 11.3.25	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25
Ornamental snake										
Site condition score (/80) – 30% of final score	55	52	60	56	57	67	69	44	61	50
Site context score (/26) = 30% of final score	26	25	24	24	24	26	23	24	25	25

Assessment unit habitat quality score /10	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10
	RE 11.3.25	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25	RE 11.3.3	RE 11.3.3	RE 11.3.3	RE 11.3.25
Species habitat index score (/50) – 40% of final score	24	33	28	33	24	38	38	20	33	24
Habitat quality score (/10)	**6.98**	**7.47**	**7.24**	**7.51**	**6.83**	**8.55**	**8.28**	**6.02**	**7.79**	**6.68**

Table F-7: Final area-weighted habitat quality score for each MNES within the [redacted] offset area.

MNES	RE 11.3.3	RE 11.3.25
Ornamental snake		
Offset area (ha)	117.7	3.4
Average habitat quality score	7.28	7.42
Area-weighted contribution to habitat quality score	7.07	0.21
Summed habitat quality score	**7.28**	
FINAL HABITAT QUALITY SCORE – Ornamental snake	**7**	

APPENDIX G OFFSETS DELIVERY PLAN