Kaban Green Power Hub – Fauna Management Plan

Neoen Australia Pty Ltd c/o AECOM Australia Pty Ltd

Level 1
30 Little Cribb Street
MILTON QLD 4064

Issue Date: 10 May 2021
mail@e2mconsulting.com.au
www.e2mconsulting.com.au

Document management

Rev.	Issue Date	Description	Author (s)	Approved	Signature
4	22/11/2019	Issued for Use	Chays Ogston	Scott Baker	
5	14/02/2020	Issued for Use	Chays Ogston	Scott Baker	
6	22/01/2021	Issued for Use	Ofalia Ho	Chays Ogston	
7	12/02/2021	Issued for Use	Georgia Day	Scott Baker	
8	10/05/2021	Issued for Use	Chays Ogston	Scott Baker	

Document Reference: KABAN GREEN POWER HUB_FMP_REV8.DOCX

Contents

List of tables

List of figures

Appendices

Definitions

Term	Definition
Disturbance footprint	The approved clearing extent based on the proposed layout.
The site	The areas of Lot 1 on RP735194, Lot 33 on CWL374, Lot 35 on CWL391, Lot 2 on RP735194 and Lot 34 on CWL374 that will be disturbed as part of the proposed development.
Suitable habitat	A species preferred environment required to sustain a viable population. Suitable habitat includes breeding, foraging and/or shelter resources for fauna.
Threatened species	Extinct (EX), extinct in the wild (XW), critically endangered (CE), endangered (E), vulnerable (V) or conservation dependent (CD) under the *Environmental Protection and Biodiversity Conservation Act 1999* or extinct in the wild (PE), Endangered, Vulnerable or Near Threatened (EVNT) under the *Nature Conservation Act 1992*.

Abbreviations

Abbreviation	Description
AECOM	AECOM Pty Ltd
BBMP	Bird and Bat Management Plan
DA	Development application
DAWE	Commonwealth Government Department of Agriculture, Water and the Environment
DEE	Commonwealth Government Department of the Environment and Energy
DES	Queensland Department of Environment and Science
DNRME	Queensland Department of Natural Resources, Mines and Energy
E	Endangered
E2M	E2M Pty Ltd
EO Act	*Environmental Offsets Act 2014* (QLD)
EOP	EPBC Act Environmental Offsets Policy (Cth)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
FMP	Fauna Management Plan
LGA	Local Government Area
NC Act	*Nature Conservation Act 1992* (QLD)
NC Regulation	*Nature Conservation Wildlife Regulation 2006* (QLD)
Neoen	Neoen Australia Pty Ltd
NT	Near Threatened
Planning Act	*Planning Act 2016* (QLD)
Planning Regulation	*Planning Regulation 2017* (QLD)
RE	Regional Ecosystem
SARA	Queensland State Assessment and Referral Agency
SDAP	State Development Assessment Provisions
SLC	Special Least Concern
SPP	State Planning Policy (July 2017) (QLD)
sp.	Singular species. For example, *Eucalyptus* sp. refers to a single species of *Eucalyptus*
spp.	Multiple species. For example, *Eucalyptus* spp. refers to multiple species of *Eucalyptus*
V	Vulnerable
VM Act	*Vegetation Management Act 1999* (QLD)
VMP	Vegetation Management Plan

1 Introduction

1.1 Background

Neoen Australia Pty Ltd (Neoen) propose to develop the Kaban Green Power Hub (the project) in north Queensland to use the available wind resource to supply renewable energy to the national electricity market. The project is located near the township of Tumoulin, Queensland, within the Tablelands Regional Council (TRC) Local Government Area (LGA). The project consists of a wind farm development containing up to 28 wind turbines, battery storage and ancillary infrastructure, located across the following land parcels (Figure 1), herein collectively referred to as 'the site':

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

E2M Pty Ltd (E2M) has been commissioned by AECOM Australia Pty Ltd (AECOM) to provide supporting documentation, including a Fauna Management Plan (FMP) in accordance with *State Code 23: Wind farm development planning guideline* (Department of Infrastructure, Local Government and Planning, 2017) and *Environmental Management Plan Guidelines* (Department of the Environment, 2014). This document will act to provide detailed mitigation and management measures to limit impacts on Matters of State Environmental Significance (MSES) and Matters of National of National Environmental Significance (MNES), while informing the assessment of the:

1. Development Application (DA) (Ref: 60528526) submitted to the State Assessment and Referral Agency (SARA); and.
2. EPBC Act referral (Ref: 2018/8289) submitted to the Department of Agriculture, Water and the Environment (DAWE), formerly the Department of the Environment and Energy (DEE).

1.1.1 Project design amendment

The initial project design received approval under the EPBC Act on 21 April 2020 (EPBC 2018/8289) under conditions outlined in Appendix B. Included as part of the approval conditions (Appendix B), the project is limited to a maximum clearing limit of 129 ha of habitat for EPBC Act listed threatened species and communities within the project area. Since receiving approval, the 2020 project design has been amended to reflect the detailed design requirements undertaken by Vestas (the construction contractor) in January 2021. These design amendments have resulted in a reduced clearing impact area of 128 ha. As such, changes to the project do not exceed the maximum clearing limits as approved in EPBC 2018/8289: Approved 21 April 2020. This FMP has been amended to reflect changes in the project disturbance footprint to ensure currency and transparency of project documentation and reflect the subsequent changes in the proposed offset areas.

1.2 Scope and objectives

The objective of this FMP is to detail how potential impacts of the development on fauna, specifically MSES and MNES, will be minimised and managed throughout the lifespan of the project. This FMP will achieve this through providing the following information:

- a description of the nature and location of activities (Section 1.1 and Section 1.4).
- a description of the extent and condition of fauna habitat across the site including mapping the location of threatened fauna habitat and existing records (Section 3).
- a description of the location and extent of works required including detailing how these have been designed to minimise impacts on fauna (Section 4 and Section 5).
- a description of roles, responsibilities and training associated with the management plan (Section 5.1).
- mitigation and management measures to be implemented across construction and operation to reduce significant residual impacts on fauna (Section 5), including but not limited to:
  - signage requirements
  - clearing procedures and protocols
  - protection measures for threatened fauna
  - procedures for managing fauna observed immediately prior to vegetation clearing
  - procedures for managing fauna during vegetation clearing
  - procedures for the treatment / removal of injured fauna from the site; and
  - procedures for habitat feature salvation and relocation.
- rehabilitation and revegetation measures (Section 5.8).
- monitoring and reporting requirements for pre-construction, construction and post-construction / operation phases including but not limited to:
  - magnificent brood frog microhabitat and abundance monitoring
  - biosecurity monitoring
  - fauna injury and mortality monitoring; and
  - rehabilitation monitoring.

1.3 Site description

The site consists largely of remnant eucalypt woodlands with small areas of non-remnant vegetation. The primary land use across the site is cattle grazing that has impacted the shrub and ground layer vegetation throughout the site (AECOM 2017). The site is bound by Bluff State Forest to the south and west, and rural properties to the north and east.

Refer to Figure 1 for an overview of the Kaban Green Power Hub development in relation to the site.

1.4 Project description

The proposed project will include the construction and operation of:

- 28 wind turbines
- Laydowns and facilities (including temporary concrete batching plant)
- access tracks (average width of 45m)
- substation and potential battery storage areas; and
- meteorology masts (met masts).

The proposed development layout is presented in Figure 1.

1.4.1 Final location of infrastructure - micro-siting

Micro-siting, as referred to in this document, is the minor change in infrastructure location according to avoidance of ecologically important areas and/or unfavourable engineering considerations (i.e. adverse topography). The micro-siting of all infrastructure will occur following pre-clearance surveys. The proposed project design detailed in Section 1.4 will be subject to micro-siting prior to final infrastructure placement.

1.5 Project schedule

The current proposed project schedule is:

- February 2021 – Pre-clearance surveys completed.
- May 2021 - Start of construction (physical work started on the site)
- December 2022 - End of construction (end of physical construction work at site)
- December 2022 to December 2047 - Operation (no construction works at site to be carried out)
- January 2048 - Decommissioning (dismantle the operating asset)

Figure 1 Site location and development layout

2 Legislative context

2.1 Commonwealth legislative considerations

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects the environment in relation to Matters of National Environmental Significance (MNES). Under the EPBC Act, if a development proposal involves an action that is likely to result in a significant impact on an MNES, referral to the Commonwealth Government Department of Agriculture, Water and the Environment (DAWE) is required. Subsequently, the project (termed a 'proposed action' by the DAWE) has been referred to the DAWE who concluded the proposed action is a 'controlled action'.

2.1.2 EPBC Act Environmental Offsets Policy

The EPBC Act Environmental Offsets Policy (EOP) outlines the federal government's approach to the use of environmental offsets under the EPBC Act, which is a streamlined national environment assessment and approvals process. The policy was finalised on 20 September 2012 and applies to any referrals and variations to approval conditions from 2nd October 2012.

Specifically, the EPBC Act EOP applies to project assessments and approvals under Parts 8 and 9 of the EPBC Act, in addition to strategic assessments under Part 10. Where appropriate, 'environmental offsets' are considered during the assessment phase of an environmental impact assessment under the EPBC Act. Offsets are relative and should compensate for 'residual significant impacts' an action has on Matters of National Environmental Significance (MNES) after all reasonable actions to avoid or mitigate environmental damage have been investigated.

2.2 State legislative considerations

2.2.1 Planning Act 2016

The *Planning Act 2016* (Planning Act) is Queensland's key piece of legislation pertaining to the strategic planning and development of the State. The Planning Act mandates the framework of planning instruments and process for development assessment whilst incorporating the regulatory requirements of other Queensland environmental statutory legislation, such as the *Vegetation Management Act 1999* (VM Act), *Coastal Protection and Management Act 1995* and *Fisheries Act 1994* (Fisheries Act).

Subordinate to the Planning Act, the *Planning Regulation 2017* (Planning Regulation) details the mechanics for the operation of the Planning Act. This includes prescription of accepted, prohibited and assessable development, assessment benchmarks for assessable development and identification of the assessment manager (i.e. the chief executive or local government).

2.2.1.1 State Planning Policy (July 2017)

The purpose of State planning instruments such as the State Planning Policy (SPP) (July 2017), is to guide local and State government in land-use planning and development by defining the Queensland Government policies relating to matters of State interest. Local governments must consider the State interest and reflect appropriately when amending local planning schemes and in some cases assessing development applications.

2.2.2 Vegetation Management Act 1999

The clearing of native vegetation and essential habitat in Queensland is regulated by the VM Act. The purpose of the VM Act is to conserve remnant vegetation, conserve vegetation in declared areas, prevent the loss of biodiversity, maintain ecological processes, allow for sustainable land use etc.

Mapping is provided by DNRME, which outlines vegetation categories used to determine clearing and assessment requirements under the Planning Act.

2.2.3 Nature Conservation Act 1992

The primary purpose of the *Nature Conservation Act 1992* (NC Act) is to conserve biodiversity by creating and managing protected areas, managing and protecting native flora and fauna and managing the spread of introduced/non-native (i.e. pest) wildlife. Proposed developments must take into consideration wildlife and natural areas protected under the NC Act and associated regulations and determine if permits or approvals are required to undertake the proposed works.

2.2.4 Environmental Offsets Act 2014

The *Environmental Offsets Act 2014* (EO Act) outlines the framework for environmental offsets within Queensland and how they should be provided. As defined within Section 7 of the EO Act, an environmental offset is an *activity undertaken to counterbalance a significant residual impact of a prescribed activity on a prescribed environmental matter*, such as matters of national, State or Local significance.

Environmental offsets are not an assessment trigger but are imposed as a condition for a proposed activity. Categorising instruments such as the Planning Regulation and local planning schemes identify assessment benchmarks that require prescribed activities to firstly demonstrate how all reasonable avoidance and mitigation measures have been, or will be, undertaken. Following this, if a significant residual impact on the prescribed environmental matter remains, an environmental offset may be required and conditioned.

2.2.5 State Development Assessment Provisions – State Code 23 Wind Farm Development

The purpose of *State Code 23: Wind farm development planning guideline*, of the State Development Assessment Provisions (SDAP) is to provide assistance in the preparation of development applications for new or expanding wind farms and assist in responding to the performance outcomes and acceptable outcomes of the code. This code prescribes the requirement for the development of an FMP for any proposed wind farm project.

2.3 Local legislative considerations

The site is located within the TRC LGA and as such, is subject to the provisions of the *Tablelands Regional Council Planning Scheme Version 3* (Tablelands Regional Council, 2017). The property holding details and associated overlays applicable to the site are presented in Table 1.

Table 1 Property holding details for the site

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

Overlays relevant to ecological matters	• Environmental Significance
	  • Wetland Values (MSES – Regulated Vegetation Intersecting a Watercourse)
	  • Vegetation and Habitat (MSES – Wildlife Habitat and MSES – Regulated Vegetation)

3 Existing fauna habitat

3.1 Habitat types

The site is dominated by six major habitat types varying from mature Eucalypt open woodlands to non-remnant areas (AECOM, 2017). Each habitat provides different habitat values and suitable habitat for different species. Detailed description of each habitat type, their condition and ecological value for different species are presented in the *Kaban Green Power Hub – Fauna Technical Report* (AECOM, 2017). The habitat types and corresponding areas within the site are presented in Table 2. The distribution of these habitats across the site are depicted in Figure 2.

Table 2 Fauna habitat types within site

Habitat Type	Habitat Description	Analogous Regional Ecosystems (RE)	Area (ha)
1	*Corymbia citriodora* and mixed Eucalypt open woodland	7.8.8b, 7.12.27a, 7.12.27c, 7.12.30a and 7.12.34	470.3
2	*Eucalyptus tereticornis, Eucalyptus moluccana, Corymbia intermedia* and *C. clarksoniana* woodland	7.8.7a, 7.8.8a, 7.8.10b and 7.8.19	22.6
3	Open woodland on alluvium fringing streams including elevated rock pavement communities	7.12.65a, 7.3.26 and 9.3.15	1.3
4	*Melaleuca viridiflora* low woodland on depositional plains	7.12.60a	7.2
5	*Corymbia* and Eucalypt mixed woodland to low woodland on igneous hills and rocks	9.12.30a and 9.12.4	700.8
6	Non remnant vegetation, including artificial wetlands (dams)	Non-remnant	143.2
		Total	**1,345.4**

Figure 2 Fauna habitat types

3.2 Threatened and migratory species

Based on findings of the Fauna Technical Report (AECOM, 2017), Ecological Gap Analysis (E2M, 2019a) and RFI – Ecological Assessment Report (E2M, 2019b), 19 threatened fauna species were identified as having a likelihood of occurrence of moderate or greater, including five species known to occur within the site (Table 3). Suitable habitat for each of the species are presented in the Figure 3 series.

Table 3 Threatened fauna species with a moderate or greater likelihood of occurrence

Species	Conservation Status[1]		Likelihood of Occurrence	Suitable Habitat Types	Area within the Site (ha)
	NC Act	EPBC Act			
Macroderma gigas (ghost bat)	E	V	Known	1,2,3,4,5	1,202.2
Petauroides volans (greater glider)	V	V	Known	1,2,3	494.2
Pteropus conspicillatus (spectacled flying-fox)	V	V	Known	1,2,3,4	501.4
Pseudophryne covacevichae (magnificent brood frog)	V	V	Known	Seeps and drainage channels dominated by *Themeda triandra*.	60.8 (55.4 high suitability habitat and 5.4 low suitability habitat)
Tachyglossus aculeatus (short-beaked echidna)	SLC	-	High	1,2,3,4,5,6	1,345.4
Apus pacificus (fork-tailed-swift)	SLC	Migratory	High	1,2,3,4,5,6	1,345.4
Hirundapus caudacutus (white-throated needletail)	SLC	Migratory	High	1,2,3,4,5,6	1,345.4
Erythrotriorchis radiatus (red goshawk)	E	V	High	1,2,3	494.2
Dasyurus hallucatus (northern quoll)	LC	E	High	1,2,3,5	1,194.9 (1,070 foraging habitat and 124.9 den habitat)
Mesembriomys gouldii rattoides (black-footed tree-rat) - North Queensland	LC	V	Moderate	1,2,3	494.2
Petaurus australis (yellow-bellied glider) - Wet Tropics subspecies	V	V	Moderate	3	1.3
Tyto novaehollandiae kimberli (masked owl) - Northern	V	V	High	1,2,3,4	501.4

Species	Conservation Status[1]		Likelihood of Occurrence	Suitable Habitat Types	Area within the Site (ha)
	NC Act	EPBC Act			
Phascolarctos cinereus (koala)	V	V	Moderate	1,2,3	494.2
Delma mitella (Atherton delma)	NT	V	Moderate	1,2,3,5,6	1,338.2
Ornithorhynchus anatinus (platypus)	SLC	-	Moderate	3	1.3
Cuculus optatus (oriental cuckoo)	SLC	Migratory	High	1,2,3,4,5	1,202.2
Myiagra cyanoleuca (satin flycatcher)	SLC	Migratory	High	1,2,3,4,5	1,202.2
Gallinago hardwickii (Latham's snipe)	SLC	Migratory	High	Dams	2.3
Rhipidura rufifrons (rufous fantail)	SLC	Migratory	Known	Dams and parts of 6	37

[1]Conservation Status – SLC = Special Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, CE = Critically Endangered

Figure 3 Series: Individual threatened fauna habitat

4 Extent of works – habitat removal and retention

Proposed disturbance areas discussed in the following sections are based on the proposed layout and conservative disturbance footprint. As discussed in Section 1.4.1, micro-siting of project infrastructure following pre-clearance surveys will not result in additional habitat removal above that approved.

4.1 Habitat removal

Based on the current project design, the project will result in the disturbance of approximately 127.9 ha of habitat, including 100.2 ha of remnant habitat. The project design has been altered to reduce impacts on threatened fauna habitat. The greatest impact on remnant fauna habitat will occur within communities 1 and 5, with approximately 97% of the proposed remnant habitat disturbance occurring in these habitats (Table 4). As previously stated, this area will be larger than the final project design and has been established to manage the worst-case scenario fauna impacts.

Table 4 Potential impact on fauna habitat

Habitat Type	Habitat Description	Potential Impact Extent (ha)
1	*Corymbia citriodora* and mixed *Eucalypt* open woodland	57.1
2	*Eucalyptus tereticornis, Eucalyptus moluccana, Corymbia intermedia* and *C. clarksoniana* woodland	0.1
3	Open woodland on alluvium fringing streams including elevated rock pavement communities	0
4	*Melaleuca viridiflora* low woodland on depositional plains	3
5	*Corymbia* and *Eucalypt* mixed woodland to low woodland on igneous hills and rocks	40
6	Non remnant vegetation, including artificial wetlands (dams)	27.7

4.2 Threatened and migratory species

Based on the current project design, the project will result in the removal of suitable habitat for 15 of the 19 threatened fauna species identified as having a moderate to high likelihood of occurrence on site, which have been summarised in Table 5 (AECOM, 2017). Appendix A provides threatened fauna species profiles for each species likely to be impacted by the project.

Table 5 Potential threatened species habitat clearing

Species	Suitable Habitat Types	Area Within the Disturbance Footprint (ha)
Macroderma gigas (ghost bat)	1,2,3,4,5	100.2
Petauroides volans (greater glider)	1,2,3	57.2
Pteropus conspicillatus (spectacled flying-fox)	1,2,3,4	60.2

Species	Suitable Habitat Types	Area Within the Disturbance Footprint (ha)
Pseudophryne covacevichae (magnificent brood frog)	Seeps and drainage channels dominated by *Themeda triandra*.	1.4 (high suitability)
Tachyglossus aculeatus (short-beaked echidna)	1,2,3,4,5,6	127.9
Apus pacificus (fork-tailed-swift)	1,2,3,4,5,6	127.9
Hirundapus caudacutus (white-throated needletail)	1,2,3,4,5,6	127.9
Erythrotriorchis radiatus (red goshawk)	1,2,3	57.2
Dasyurus hallucatus (northern quoll)	1,2,3,5	97.3 (92.2 foraging habitat and 5.1 den habitat)
Mesembriomys gouldii rattoides (black-footed tree-rat) - North Queensland	1,2,3	57.2
Tyto novaehollandiae kimberli (masked owl) - Northern	1,2,3,4	60.2
Phascolarctos cinereus (koala)	1,2,3	57.2
Delma mitella (Atherton delma)	1,2,3,5,6	127.9
Cuculus optatus (oriental cuckoo)	1,2,3,4,5	100.2
Myiagra cyanoleuca (satin flycatcher)	1,2,3,4,5	100.2
*Gallinago hardwickii (*Latham's snipe)	Dams	0
Rhipidura rufifrons (rufous fantail)	Dams and parts of 6	5.5

[1]Conservation Status – SLC = Special Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, CE = Critically Endangered

5 Mitigation and management measures

Mitigation and management measures prescribed in this section are derived from current best practice and information detailed in the following guidelines:

- *State Code 23: Wind Farm Development Planning Guideline* (Department of Infrastructure, Local Government and Planning, 2017)
- *Environmental Management Plan Guidelines* (Department of the Environment, 2014)
- *Tablelands Regional Council Planning Scheme Version 3* (Tablelands Regional Council, 2017); and
- Relevant species EPBC Act 'Conservation Advice' and 'Recovery Plans', specifically:
  - *Recovery plan for magnificent broodfrog Pseudophryne covacevichae 2000-2004* (McDonald et al., 2000)
  - *Approved Conservation Advice – Magnificent broodfrog (Pseudophryne covacevichae)* (Threatened Species Scientific Committee, 2017); and
  - *Approved Conservation Advice – Greater glider (Petauroides volans)* (Threatened Species Scientific Committee, 2016).

5.1 Performance criteria / management objectives

Performance criteria for fauna issues associated with the project include:

- Micro-siting does not result in additional disturbance to magnificent brood frog and greater glider habitat above what is approved
- Micro-siting limits the removal of hollow-bearing trees
- No injury to native fauna
- All habitat features (i.e. hollow logs and limbs) are relocated to adjacent habitat
- No exceedance of approved clearing limits
- An Erosion and Sediment Control Plan (ESCP) is prepared and implemented to limit potential impacts on threatened fauna, specifically magnificent brood frog
- Disturbance is limited to the disturbance footprint
- No loss or decline in threatened fauna population sizes resulting from indirect impacts associated with construction and operation
- No introduction or spread of priority weed species within the site and successful removal of priority weed species within the disturbance footprint
- No increase in hydrocarbon abundance within magnificent brood frog habitat
- No increase in sedimentation of magnificent brood frog habitat; and
- Successful progressive stabilisation of disturbed areas and rehabilitation of the disturbance footprint following construction.

5.2 Roles and responsibilities

The roles and responsibilities assigned to individuals are outlined in Table 6.

Table 6 Roles and responsibilities

Roles	Responsibility	Activities
Site Project Manager	Overseeing construction and operation works	• Ensure processes are in place to include the necessary provisions of the FMP into works/projects • Ensure that contractual arrangements with the contractors specify the need for adequate training to be provided to all members of the construction crew involved in the project • Ensure construction workers are trained in the procedures of the FMP • Implement monitoring programs • Undertake and record corrective actions; and • Report to regulatory authorities.
Site Construction Manager	Construction	• Implement the requirements of the FMP throughout the construction phase.
Site Environment Officer	Ensure the supervising engineer and contractors are implementing the requirements of FMP throughout the construction and operational phases.	• Undertake monitoring in accordance with the FMP; and • Meet with the site supervisor and audit site works to ensure compliance with the FMP as required.
Independent Ecologist	Provide ecological expertise	• Undertake pre-clearance surveys, baseline surveys and monitoring in accordance with the FMP; and • Provide ecological advice as required.
Fauna Spotter-Catcher	Overseeing clearing activities	• Supervise all clearing activities, including undertaking targeted searches for magnificent brood frog and northern quoll prior to clearing of suitable habitat (i.e. flipping rocks and logs limited to that able to be undertaken and complying with manual handling techniques and clearance zones around heavy equipment, and searching potential northern quoll den sites). • Undertake spotlighting surveys in areas to be cleared which contain mapped magnificent brood frog habitat if clearing occurs within the species calling period (December to May) with the intent to recover individuals; and • Provide pre and post clearing report.
All site personnel	Construction and operation	• Receive training • Abide by FMP requirements; and • Report environmental incidents.

5.3 Training requirements

The effectiveness of the FMP will depend on those responsible for its implementation. Those responsible must be familiar with the content of the FMP to ensure successful implementation of the management actions. The site manager will ensure relevant individuals are trained in the procedures of the FMP and are capable of implementation. This will involve a site induction and/or "toolbox" training outlining the contents of the FMP including the vegetation retention/clearing plan prior to the construction phase. A copy of this FMP is to be retained and displayed at the site office at all times during the construction phase.

5.4 Habitat removal and retention mitigation measures

Table 7 provides mitigation and management measures to be implemented to minimise impacts on fauna habitat.

Table 7 Habitat removal / protection mitigation and management measures

Project Phase	Activity	Management Practices	Responsibility
Pre-construction	Pre-clearance Surveys	Pre-clearance surveys will be undertaken prior to construction to guide infrastructure planning and mark fauna habitat features, including hollow-bearing trees, to be avoided or managed during clearing.	Independent Ecologist
	Infrastructure planning / Siting	Locate infrastructure to avoid and/or minimise impacts. Micro-site to avoid removal of vegetation particularly in areas of threatened fauna habitat. Specifically, limit clearing of known locations of magnificent brood frog and hollow-bearing trees.	Project design team Consistency review by Site Environment Officer
	Linear Infrastructure Planning/ Siting	Limit disturbance to threatened fauna habitat through locating access tracks and electrical connections adjacent to existing access or farm tracks. Narrow access tracks when crossing magnificent brood frog habitat.	Site Environment Officer
	Erosion and sediment control plan	Prepare an Erosion and Sediment Control Plan (ESCP) to minimise potential impacts on threatened fauna. Specifically, limit potential of sedimentation of mapped magnificent brood frog habitat. Specific requirements are detailed in Section 5.7.	Site Environment Officer
	Site preparation	Clearly demarcate extent of clearing works required. The extent of disturbance / clearing is to be clearly demarcated with fencing, spray paint, flagging tape, barricade webbing, signage or similar, depending on the duration of the disturbance. Areas outside of demarcated extents are considered to be 'no go' zones.	Site Construction Manager
		Where habitat trees are immediately adjacent to areas of earthworks, install tree protection measures in accordance with *Australian Standard: Protection of trees on development sites* (AS 4970–2009).	Site Construction Manager
		Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the requirements of the FMP.	Site Construction Manager

Project Phase	Activity	Management Practices	Responsibility
	Site Induction / Work Instruction	All relevant site personnel are to be advised of 'no-go' zones. The following activities are not to occur in these zones: • Storage and mixing of materials • Vehicle parking • Liquid disposal • Machinery repairs and/or refuelling • Construction of site office or shed • Combustion of any material • Stockpiling of soil, rubble or debris; and • Any filling or excavation including trenching, topsoil skimming and/or surface excavation.	Site Construction Manager
Construction	Magnificent brood frog habitat clearing	Targeted searches of magnificent brood frog habitat prior to clearing of suitable habitat (i.e. flipping logs and rocks)	Fauna Spotter Catcher
		Where clearing of magnificent brood frog habitat occurs during the species calling period (December to May), spotlighting surveys will be undertaken the night prior to clearing to identify and relocate individuals.	Fauna Spotter Catcher
		Individuals located during pre-clearing spotlight surveys and spotter catcher activities will be relocated to the nearest undisturbed suitable habitat.	Fauna Spotter Catcher
		Records of re-located wildlife are to be kept and lodged to the Queensland Government in accordance with Fauna Spotter Catcher permit requirements.	Fauna Spotter Catcher
	Northern quoll disturbance	Targeted searches of potential den sites (e.g. hollow logs and rocky outcrops) prior to clearing. This includes inspection of timbered windrows and relocated rock piles, if disturbance is to occur in these areas.	Fauna Spotter Catcher
		If active den sites are located during construction, bulk earthworks are to halt immediately within 100 m of the den site, an exclusion zone is to be established and DAWE/DES are to be notified immediately to determine future management measures.	Site Environment Officer

Project Phase	Activity	Management Practices	Responsibility
		Food scraps will be removed from site or kept in sealed containers, to prevent attracting individuals.	Site Environment Officer
	Vegetation Clearing	Vegetation clearing and clearing of fauna habitat features are to be kept to the minimum required to facilitate construction activities.	Site Construction Manager
		Vegetation clearing is restricted to identified work areas only.	Site Construction Manager
		Trees immediately adjacent to work areas are to be pruned rather than cleared.	Site Construction Manager / Site Environment Officer
		Prior to vegetation clearing, salvageable habitat features such as hollow logs and strewn rock are to be relocated to adjacent areas of vegetation to be retained.	Site Construction Manager / Site Environment Officer
		Vegetation clearing is to be conducted directionally towards areas of retained vegetation and in the presence of a fauna spotter catcher.	Site Construction Manager / Site Environment Officer
		Direct contact with wildlife is to be avoided and limited to the fauna spotter catcher (or ecologist).	Site Construction Manager / Site Environment Officer
		All fauna located during spotter catcher activities will be relocated to the nearest undisturbed suitable habitat.	Fauna Spotter Catcher
		Injured wildlife is to be collected and taken to the nearest vet by the fauna spotter catcher, Site Environment Officer or a licensed wildlife carer. Clearing is to cease if no fauna spotter catcher is present on site. The nearest vet details are: • Tableland Veterinary Service, 4097 7923, 26 Moffat St, Ravenshoe, Qld, 4888 • Eagles Nest Wildlife Hospital, 4097 6098, 161 River Rd, Millstream, Qld, 4888	Fauna Spotter Catcher / Site Environment Officer
	Vegetation clearing - hollow bearing trees	Where hollow-bearing trees require removal, a fauna spotter catcher is to be present. The fauna spotter catcher must be able to clearly communicate with plant operators.	Site Construction Manager / Fauna Spotter Catcher
		Hollow-bearing trees immediately adjacent to work areas are to be pruned rather than cleared.	Site Construction Manager

Project Phase	Activity	Management Practices	Responsibility
		Hollow-bearing limbs must be dismantled slowly. When on the ground, hollows are to be checked for signs of wildlife. Wildlife is to be relocated at a suitable time of day within areas of adjacent habitat to be retained.	Site Construction Manager / Fauna Spotter Catcher
		Relocate hollow limbs to areas of adjacent habitat to be retained.	Site Environment Officer
		Records of re-located wildlife are to be kept and lodged to the Queensland Government in accordance with Fauna Spotter Catcher permit requirements.	Fauna Spotter Catcher
	Access	Access is to occur along designated access tracks only.	All site personnel
		A maximum speed limit of 40km/hr is designated for all access tracks.	Site Construction Manager
		All speed limits are to be enforced to prevent the likelihood of fauna strike. If fauna strike occurs, injured wildlife is to be collected and taken to the nearest vet by the fauna spotter catcher, Site Environment Officer or a licensed wildlife carer. Clearing is to cease if the no fauna spotter catcher is present on site. The nearest vet details are: • Tableland Veterinary Service, 4097 7923, 26 Moffat St, Ravenshoe, Qld, 4888 • Eagles Nest Wildlife Hospital, 4097 6098, 161 River Rd, Millstream, Qld, 4888	Site Construction Manager / All site personnel
	Construction Activities	All no-go zones are to remain in place throughout the construction phase.	All site personnel
		Domestic pets are not permitted on construction sites.	Site Construction Manager
Post-construction / operation	Access	Access is to occur along designated access tracks only.	All site personnel
		A maximum speed limit of 40km/hr is designated for all access tracks.	Site Project Manager
		All speed limits are to be enforced to prevent the likelihood of fauna strike. If fauna strike occurs, injured wildlife is to be collected and taken to the nearest vet by the Site Environment Officer or a licensed wildlife carer. The nearest vet details are: • Tableland Veterinary Service, 4097 7923, 26 Moffat St, Ravenshoe, Qld, 4888 • Eagles Nest Wildlife Hospital, 4097 6098, 161 River Rd, Millstream, Qld, 4888	Site Project Manager / all site personnel

5.5 Noise, vibration and lighting mitigation measures

Table 8 provides mitigation and management measures for potential noise, vibration and lighting impacts on fauna.

Table 8 Noise, vibration and lighting mitigation and management measures

Project Phase	Activity	Management Practices	Responsibility
Pre-construction	Pre-clearance Surveys	Pre-clearance surveys will be undertaken prior to construction to guide infrastructure planning and mark nesting and roosting habitat to be avoided.	Independent Ecologist
	Infrastructure planning / siting	Identify reduced impact location for infrastructure. Micro-siting to avoid placing infrastructure in close proximity to nesting and roosting areas for threatened species.	Project design team Consistency review by Site Environment Officer
	Site induction	Prior to site entry, all relevant site personnel including contractors shall be appropriately trained and made aware of the requirements of the FMP.	Site Construction Manager
Construction	All works	All works are only to occur during daylight hours (except for prescribed monitoring requirements and emergency events) to limit potential disturbance to nocturnal species.	Site Construction Manager
	Lighting	As no construction is to occur outside daylight hours, construction lighting will only be utilised during low-light daytime conditions and during emergency events. Where construction lighting is utilised, it must be directed away from retained vegetation.	Site Construction Manager
Operation	Infrastructure lighting	Infrastructure lighting will be minimised to areas required for security, maintenance and operations. Infrastructure lighting will be directed away from retained vegetation. Turbine lighting will also be minimised to the lowest illumination levels that meet Civil Aviation Safety Authority requirements, including where possible the use of red lights to prevent attraction of insects.	Site Project Manager
	Access	The site will only be accessed during daylight hours (except for prescribed monitoring requirements and emergency events) to limit potential disturbance to nocturnal species.	Site Project Manager

5.6 Weed management

Weed management is to occur in accordance with the measures prescribed in the *Kaban Green Power Hub - Vegetation Management Plan* (E2M, 2021b).

5.7 Erosion and sediment control, altered hydrology and dispersal impedance

Potential impacts of erosion and sedimentation, altered hydrology and dispersal impedance on MNES species, specifically magnificent brood frog, will be mitigated through the development and implementation of an ESCP. Specifically including:

- where stream crossings are not maintained as level crossings, it is a requirement that for access tracks crossing drainage lines in magnificent brood frog habitat, culverts must be installed which facilitate adequate flow of water and movement of magnificent brood frog up and down stream
- establishment of adequate erosion control devices to be prevent the sedimentation of drainage lines within the study area, specifically those mapped as magnificent brood frog habitat.

The ESCP will be implemented throughout the construction and operation phases of the project.

5.8 Spread/introduction of Chytrid fungus

Potential impacts of the introduction/spread of chytrid fungus on potentially occurring MNES, specifically magnificent brood frog, within the study area will be mitigated through the requirement for state and federal disease control protocols to be implemented throughout all phases of the project. These include:

- *Hygiene protocols for the control of diseases in Australian frogs* (Murray et al., 2011); and
- *Technical Manual: Interim hygiene protocol for handling amphibians* (Department of Environment and Heritage Protection, 2016).

5.9 Cane toad management

Cane toads currently occur at low abundance across the site and have the potential to adversely impact native fauna species, including threatened species such as the magnificent brood frog and northern quoll (E2M, 2019b). Past efforts to manage broad scale control and/or eradication of cane toads has proven ineffective (Department of Sustainability, Environment, Water, Population and Communities, 2011). Cane toad management within the site will be confined to minimising the factors that contribute to increasing cane toad abundance. These factors include:

- Progressive rehabilitation of disturbed areas to reduce cane toad habitat and movement opportunities across site; and
- Prevent the introduction of new breeding habitat by restricting the accumulation of water where accessible to cane toads (e.g. washdown bay pits or upturned equipment that may retain rainwater).

5.10 Rehabilitation measures

Rehabilitation measures are prescribed in the *Kaban Green Power Hub - Vegetation Management Plan* (E2M, 2021b).

5.11 Turbine collision mitigation and management measures

Specific mitigation and management measures related to the potential impacts from wind turbine collisions on bat and birds are prescribed in the *Bird and Bat Management Plan* (E2M, 2021a).

6 Monitoring and reporting

Mitigation and management measures detailed in Section 5 will be monitored throughout the life of the project to ensure their ongoing effectiveness. Regularly monitoring the effectiveness of the mitigation measures over time allows the FMP to be adapted if environmental performance criteria are not met.

The following sections detail the:

- monitoring activities and reporting requirements for the project's pre-construction, construction and post-construction / operation phases; and
- performance criteria, impact triggers and corrective actions of each monitoring activity.

Monitoring requirements associated with weeds and rehabilitation are prescribed in the Kaban Green Power Hub – Vegetation Management Plan (E2M, 2021b), while monitoring associated with potential turbine collisions impacts on birds and bats are prescribed in the Kaban Green Power Hub – Bird and Bat Management Plan (E2M, 2021a).

6.1 Pre-construction

The objective of the pre-construction monitoring requirements is to establish a set of baseline data demonstrating the condition or status of environmental values prior to disturbance.

Key monitoring and reporting requirements during pre-construction relate to baseline magnificent brood frog abundance and habitat surveys and pre-clearance surveys. These requirements are outlined in Table 9. Specific monitoring methods for magnificent brood frog microhabitat and abundance monitoring are presented in Section 6.1.1.

Table 9 Pre-construction monitoring requirements

Activity	Frequency	Timing	Purpose	Reporting	Responsibility
Baseline magnificent brood frog surveys	One off	Prior to construction	Determine baseline population estimate and abiotic characteristics within known breeding habitat	Baseline Threatened Fauna Monitoring Report	Independent Ecologist
Pre-clearance survey	One off	Within 3 months prior to commencement of construction	Identify fauna habitat features (i.e. hollow bearing trees, nests, roosts) to be avoided or managed during construction	Pre-clearance Report	Independent Ecologist

6.1.1 Magnificent brood frog surveys

Baseline magnificent brood frog surveys will be conducted prior to construction to determine relative abundance of magnificent brood frog and assess microhabitat condition, including the presence and abundance of:

- sedimentation; and
- hydrocarbons.

Both magnificent brood frog abundance and microhabitat assessments will be undertaken across three different monitoring site types, including:

- Impacts sites (3 replicates) – sites are located directly adjacent to the disturbance footprint in areas of magnificent brood frog habitat where the species is known to occur. These sites will determine whether indirect impacts associated with the project are impacting the abundance of magnificent brood frog within the site.
- On-site control sites / offset sites (3 replicates) – sites are located within the proposed offset areas (minimum of 100 m from disturbance) in magnificent brood frog habitat where the species is known or likely to occur. These sites will act as on-site control as they won't be subject to anthropogenic impacts such as cattle grazing. Comparison of control sites to impact sites will assist in determining if changes in magnificent brood abundance at the impact sites are caused by project related impacts or due to non-project related factors (e.g. climatic variation).
- Off-site control sites (3 replicates) – sites are located in nearby National Parks and State Forests in suitable habitat where the species is known to occur. These sites will act as an additional level of control and aim to assist in determining if changes in magnificent brood abundance at the impact sites are caused by project related impacts or due to non-project related factors (e.g. climatic variation). The location of these sites within protected areas minimises the potential that control sites are impacted by anthropogenic impacts.

[1]Indicative monitoring sites are presented in 4.

6.1.1.1 Relative abundance surveys

Species relative abundance estimates will be undertaken in accordance with the survey guidelines prescribed in the Species Profile and Threats Database (Department of Environment and Energy, 2019). Relative abundance surveys will consist of acoustic transects in known species locations undertaken during suitable survey conditions (i.e. wet season). Transects will be a minimum of 200 m long and repeated over two consecutive nights. Surveys will be undertaken across all monitoring sites (impact sites, on-site control sites and off-site control sites).

Additional, presence/absence surveys will be undertaken at other known populations to be directly impacted by the development, to ensure the species continued persistence in these areas.

[1] These sites are only indicative and may vary depending on the suitability of sites assessed during the baseline monitoring survey. Sites with higher number of individuals will be preferentially selected to provide increased statistical power in determining potential declines.

6.1.1.2 Microhabitat assessment

Magnificent brood frog microhabitat assessments will be undertaken to assist in determining potential project related indirect impacts, including sedimentation and hydrocarbons. These microhabitat features will be assessed through the establishment of photo monitoring plots at ponded/seep areas along each relative abundance survey transect. Each transect will have a minimum of two photo monitoring plots, with one to be established at the nearest ponded/seep area downstream of the disturbance footprint. Microhabitat assessment photo monitoring points will be taken from approximately 1 m high facing directly down at the ponded/seep area and cover an area of approximately 1x1 m. At each microhabitat assessment site, data will be collected on evidence of sedimentation and hydrocarbon presence.

6.1.1.3 Survey timing

Magnificent brood frog surveys will be undertaken during the suitable survey conditions occurring within the species calling period (December to May). Suitable survey conditions are considered to be the four week period, after a substantial rainfall event (100 mm over a five-day period), from December to May. If a substantial rainfall event has not occurred before March, surveys will be undertaken at anytime from March to May.

Figure 4 Magnificent brood frog indicative monitoring sites

6.2 Construction

Key monitoring requirements during construction, relate largely to ensuring compliance with measures designed to mitigate the risk of injury to native fauna as well as reduce disturbance from habitat removal, noise, vibration and lighting. To ensure these mitigation measures are effective, the performance criteria, impact triggers and monitoring specifications required to evaluate the prescribed construction mitigation measures are detailed in Table 10.

Monitoring of magnificent brood frog abundance and microhabitat assessments will be conducted annually during construction. Magnificent brood frog monitoring is to occur in accordance with the baseline survey methods prescribed in Section 6.1.1. Additional, photo monitoring of the disturbance footprint will be undertaken as part of the magnificent brood frog monitoring, during the construction and operation phases, to assist in determining causes of potential increases in sedimentation and hydrocarbons. These additional photo monitoring surveys are outlined in Section 6.2.1.

The impact triggers in which magnificent brood frog monitoring results will be compared are detailed in Section 6.2.2. Where these impact triggers are exceeded corrective actions detailed in Table 10 are to be implemented.

6.2.1 Disturbance footprint photo monitoring

Disturbance footprint photo monitoring points will be established at each impact monitoring site. These photo monitoring points will be established at the point where the civil earthworks (i.e. disturbance) intercepts the drainage line. At each point four photos will be taken, including upstream, downstream and cross slope (both directions), to identify any erosion features present. Additional, photos of specific erosion features will be taken where not visible in the four primary photos.

6.2.2 Magnificent brood frog monitoring impact triggers

6.2.2.1 Relative abundance triggers

To determine whether indirect impacts associated with the project are impacting magnificent brood frog populations, specific impact triggers have been established. These impact triggers compare baseline magnificent brood frog relative abundances against on-going monitoring results. These triggers include a:

- 30% reduction in the average relative abundance of magnificent brood frog across all impact sites between two monitoring events (i.e. over a one year); and/or
- 50% reduction in the relative abundance of magnificent brood frog at an individual impact site between two monitoring events (i.e. over a one year); and/or
- continued 10% reduction (10% per year over five years) in the relative abundance of magnificent brood frog across all impact sites.

Note: Monitoring results will be assessed against control sites to determine whether comparable declines also occur. Comparable changes in magnificent brood frog abundance at both control sites and impact sites suggest a non-project related cause, such as climatic variation.

6.2.2.2 Microhabitat assessment triggers

To assess the potential impacts of sedimentation and hydrocarbons on magnificent brood frog abundances, impacts triggers have been established. These impact triggers compare baseline microhabitat assessment results to on-going monitoring results. Impact triggers include a:

- visual increase in the amount of sedimentation present within the photo monitoring plot when compared to the baseline photo; and/or
- visual increase in the amount of hydrocarbon sheen present within the photo monitoring plot when compared to the baseline photo.

6.2.2.3 Disturbance footprint photo monitoring triggers

To assist in determining potential causes of increased sedimentation within magnificent brood frog habitat, impact triggers have been established. These triggers include:

- visual evidence of erosion within disturbance footprint; and
- evidence of erosion and sediment control device failure.

6.3 Post-construction / operation

Key post-construction / operational monitoring requirements include evaluation of the status or condition of the retained threatened fauna habitat, as well as ensuring continual presence of magnificent brood frog adjacent to the project area. Performance criteria, impact triggers and monitoring specifications required to evaluate the performance criteria are detailed in Table 10.

Monitoring of magnificent brood frog abundance and microhabitat assessments will be conducted annually for the first three years post-construction, then every five years for the remainder of operation. Magnificent brood frog monitoring is to occur in accordance with the survey methods prescribed in Section 6.1.1 and Section 6.2.1. Additionally, following a significant stochastic event (i.e. bushfire) monitoring will return to an annual basis for a period of three years.

The impact triggers in which magnificent brood frog monitoring results will be compared are detailed in Section 6.2.2. Where these impact triggers are exceeded corrective actions detailed in Table 10 are to be implemented.

Table 10 Construction and post-construction / operation monitoring requirements

Performance criteria	Non-compliances / triggers	Frequency of monitoring	Responsibility	Reporting	Corrective Action
Construction					
• No exceedance of approved clearing limits • Disturbance is limited to the disturbance footprint	Extent of works not clearly demarcated	• Daily throughout vegetation clearing • Weekly inspection at other times	Site Construction Manager	Environmental Incidents Register	• Re-instate demarcations; and • Re-education.
	Protection fencing not installed around retained habitat features	• Daily throughout vegetation clearing • Weekly inspection at other times	Site Construction Manager	Environmental Incidents Register	• Re-instate demarcations; and • Re-education.
	Excess habitat cleared	Daily throughout vegetation clearing	Site Construction Manager	Environmental Incidents Register	• Notify Site Environment Officer immediately to record incident in register. • Site Environmental Officer to notify DAWE and/or DES within 48hrs of incident to identify remedial action required. • Remedial action will require: – Additional offsets; and/or – Immediate restoration and rehabilitation.

	Vehicle and personnel traversing areas outside of approved access tracks and zones	As required	Site Construction Manager	Environmental Incidents Register	• Re-education.
	Erosion and sediment controls are not installed or have failed	Daily	Site Environment Officer	Environmental Incidents Register	• Notify Site Environment Officer immediately to record incident in register; and • Rectify control measures as per Erosion and Sediment Control Plan.
All habitat features are relocated to adjacent habitat	Habitat features are mulched, burnt or discarded	Daily throughout vegetation clearing	Site Construction Manager	Environmental Incidents Register	• Recover and reclaim for relocation in adjacent habitat; and • Re-education.
No injury to native fauna	Fauna injured during construction	As required	Fauna Spotter Catcher / Site Environment Officer	Environmental Incidents Register	• Injured fauna is to be taken immediately to nearest vet. • Notify Site Environment Officer immediately to record incident in register. • Where a threatened species is injured notify DAWE and/or DES within 48hrs of the incident. • Assessment of prescribed mitigation measures and update FMP where required.
	Identification of northern quoll within the site	As required	Fauna Spotter Catcher / Site Environment Officer	Environmental Incidents Register	• Halt all bulk earthworks within 100 m of den site. Immediately set up exclusion zone. • Notify DAWE and/or DES within 48hrs of identification to determine future management measures.

No loss or decline in threatened fauna population sizes resulting from indirect impacts associated with construction and operation	Refer to Section 6.2.2.1	Annually (magnificent brood frog monitoring)	Independent Ecologist	Threatened Fauna Monitoring Report	• Undertake additional surveys to confirm species decline • Notify DAWE within 48hrs of confirmation of species decline; and • Assessment of prescribed mitigation measures and update FMP where required.
No increase in hydrocarbon abundance within magnificent brood frog habitat	Visible increase in the hydrocarbon sheen compared to baseline survey	Annually (magnificent brood frog monitoring)	Independent Ecologist	Threatened Fauna Monitoring Report	• Undertake investigation to determine potential cause of hydrocarbon increase • Clean up hydrocarbon if spill evident • Rectify causation of hydrocarbon increase immediately; and • Assessment of prescribed mitigation measures and update FMP where required.
No sedimentation of magnificent brood frog habitat	Visible increase in the sedimentation compared to baseline survey	Annually (magnificent brood frog monitoring)	Independent Ecologist	Threatened Fauna Monitoring Report	• Notify Site Environment Officer immediately to record incident in register • Rectify control measures as per Erosion and Sediment Control Plan; and • Assessment of Erosion and Sediment Control Plan and update where required.

	Visible evidence of erosion within the disturbance footprint where it intercepts magnificent brood frog habitat (e.g. access track intercepting)	Annually (magnificent brood frog monitoring)	Independent Ecologist	Threatened Fauna Monitoring Report	• Notify Site Environment Officer immediately to record incident in register • Rectify control measures as per Erosion and Sediment Control Plan; and • Assessment of Erosion and Sediment Control Plan and update where required.
Post-construction / Operation					
Disturbance is limited to the disturbance footprint	Vehicle and personnel traversing areas outside of approved access tracks and zones	As required	Site Environment Officer	Environmental Incidents Register	• Re-education.
No injury to native fauna	Fauna injured during operation	As required	Site Environment Officer	Environmental Incidents Register	• Injured fauna is to be taken immediately to nearest vet • Notify Site Environment Officer immediately to record incident in register • Where threatened species is injured notify DAWE and/or DES within 48hrs of the incident; and • Assessment of prescribed mitigation measures and update FMP where required.

No loss or decline in threatened fauna population sizes resulting from indirect impacts associated with construction and operation	Refer to Section 6.2.2.1	Annually for first 3 years, then every 5 years (magnificent brood frog monitoring) Additionally, monitoring will return to an annual basis for a period of 3 years following a major stochastic event (i.e. bushfire)	Independent Ecologist	Threatened Fauna Monitoring Report	• Undertake additional surveys • Identity and mitigate causal factors responsible for decline; and • Update FMP where required.
No increase in hydrocarbon abundance within magnificent brood frog habitat	Visible increase in the hydrocarbon sheen compared to baseline survey	Annually for first 3 years, then every 5 years (magnificent brood frog monitoring) Additionally, monitoring will return to an annual basis for a period of 3 years following a major stochastic event (i.e. bushfire)	Independent Ecologist	Threatened Fauna Monitoring Report	• Undertake investigation to determine potential cause of hydrocarbon increase • Clean up hydrocarbon if spill evident • Rectify causation of hydrocarbon increase immediately; and • Assessment of prescribed mitigation measures and update FMP where required.

No sedimentation of magnificent brood frog habitat	Visible increase in the sedimentation compared to baseline survey	Annually for first 3 years, then every 5 years (magnificent brood frog monitoring) Additionally, monitoring will return to an annual basis for a period of 3 years following a major stochastic event (i.e. bushfire)	Independent Ecologist	Threatened Fauna Monitoring Report	• Notify Site Environment Officer immediately to record incident in register • Rectify control measures as per Erosion and Sediment Control Plan; and • Assessment of Erosion and Sediment Control Plan and update where required.
	Visible evidence of erosion within the disturbance footprint where it intercepts magnificent brood frog habitat (e.g. access track intercepting)	Annually for first 3 years, then every 5 years (magnificent brood frog monitoring) Additionally, monitoring will return to an annual basis for a period of 3 years following a major stochastic event (i.e. bushfire)	Independent Ecologist	Threatened Fauna Monitoring Report	• Notify Site Environment Officer immediately to record incident in register • Rectify control measures as per Erosion and Sediment Control Plan; and • Assessment of Erosion and Sediment Control Plan and update where required.

7 Adaptive management

This FMP is a living document that requires review and amendment throughout the life of the project to ensure that measures within this document remain effective. It is recommended that this document be updated:

- Where there is a significant change to the project schedule, site layout, or a change in the construction methods that require amendment to fauna protection measures
- Where a corrective action is recorded or performance criteria are not being met and additional measures are identified for inclusion to prevent reoccurrence. Table 11 prescribes example additional mitigation measures which may be investigated where performance criteria are not being met; or
- Where a change in legislation or best practice methodology has been identified.

To ensure compliance with this FMP a compliance register will be developed to outline all EPBC Act obligations and track how these obligations are being met. This compliance register will include document tracking for all reporting required, along with how data and reporting is stored and disseminated.

Table 11 Example mitigation measures to be investigated where performance criteria are not met

Non-compliance	Mitigation measure[1]	Likelihood of impact continuing	Implementation schedule
Visible increase in sedimentation compared to baseline survey	• Implement additional erosion and sediment controls • Seal high risk erosion areas • Provide compensatory shelter (e.g. roofing tiles) • Restrict activities during rainfall events • Implement additional rehabilitation of disturbed areas	Low	As soon as possible
Altered hydrology of magnificent brood frog habitat	• Check for impediments for water flow (e.g. remove debris from culverts) • Rock line culvert exits to prevent scouring	Low	As soon as possible
Visible increase in hydrocarbons compared to baseline survey	• Review vehicle movement and maintenance behaviours • Install additional bunding around high risk areas • Update spill control and clean up procedures	Low	As soon as possible

1 = Implementation of these mitigation measures will be dependent on the causation of the non-compliances

8 References

AECOM. (2017). *Kaban Green Power Hub—Fauna Technical Report*.

Anstis, M. (2013). *Tadpoles and Frogs of Australia*. New Holland Publishers.

Aumann, T., & Baker-Gabb, D. (1991). *A Management Plan for the Red Goshawk* [RAOU Report 75]. Royal Australasian Ornithologists Union.

Australian Museum. (2018). *Platypus, Ornithorhynchus anatinus*. https://australianmuseum.net.au/platypus

BA NRS. (2002). *Birds Australia Nest Record Scheme*.

Blakers, M., Davies, S. J. J. F., & Reilly, P. N. (1984). *The Atlas of Australian Birds*. Melbourne University Press.

Chapman, G. (1969). Notes on birds of the Kosciusko high country. *Canberra Bird Notes*, *1*(4), 2–6.

Corben, C., Roberts, G., & Smyth, A. (1982). Roosting of a White-throated Needletail. Sunbird. *Sunbird*, *12*, 47–48.

Crowther, M. S., Lunney, D., Lemon, J., Stalenberg, E., Wheeler, R., Madani, G., Ross, K., & Ellis, M. (2013). Climate-mediated habitat selection in an arboreal folivore. *Ecography*, *36*, 1–8.

Curtis, L. K., & Dennis, A. J. (2012). *Queensland's threatened animals* (K. R. McDonald, P. M. Kyne, & S. J. S. Debus, Eds.). CSIRO Publishing.

Day, N. (1993). Tree perching and presumed roosting of White-throated Needletails Hirundapus caudacutus. *Australian Bird Watcher*, *15*, 43–44.

Debus, S. J. S., & Czechura, G. V. (1988). Field identification of the Red Goshawk Erythrotriorchis radiatus. *Australian Bird Watcher*, *12*, 154–159.

Department of Agriculture, Water and the Environment. (2020). *Species Profile and Threats Database*. http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of Environment and Energy. (2019). *Species Profile and Threats Database—Pseudophryne covacevichae (Magnificent Brood Frog)*. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64385

Department of Environment and Heritage Protection. (2016). *Technical manual: Interim hygiene protocol for handling amphibians*. Queensland Government.

Department of Environment and Resource Management. (2010). *National recovery plan for the spectacled flying fox Pteropus conspicillatus*. Department Sustainability, Environment, Water, Population and Communities, Canberra.

Department of Environment, Land, Water and Planning. (2016). *National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus*. Australian Government.

Department of Infrastructure, Local Government and Planning. (2017). *State Code 23: Wind Farm Development Planning Guideline*.

Department of Sustainability, Environment, Water, Population and Communities. (2011). *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads*.

Department of the Environment. (2014). *Environmental Management Plan Guidelines*.

E2M. (2019a). *Kaban Green Power Hub – Ecological Gap Analysis*.

E2M. (2019b). *Kaban Green Power Hub RFI - Ecological Assessment Report*.

E2M. (2021a). *Kaban Green Power Hub – Bird and Bat Management Plan*.

E2M. (2021b). *Kaban Green Power Hub – Vegetation Management Plan*.

Emison, W. B., Beardsell, C. M., Norman, F. I., Loyn, R. H., & Bennett, S. C. (1987). *Atlas of Victorian Birds*. Department of Conservation (Forest & Lands) & Royal Australian Ornithological Union.

Eyre, T. J. (2004). Distribution and conservation status of the possums and gliders of southern Queensland. In *The Biology of Australian Possums and Gliders* (pp. 1–25). Surrey Beatty & Sons.

Ford, H. A., & Bell, H. (1981). Density of birds in eucalypt woodland affected to varying degrees by dieback. *Emu*, *81*, 202–208.

Frith, H. J., Crome, F. H. J., & Brown, B. K. (1977). Aspects of the Biology of the Japanese Snipe Gallinago hardwickii. *Australian Journal of Ecology*, *2*, 341–368.

Gilbert, P. A. (1935). The seasonal movements and migrations of birds in eastern New South Wales. *Emu*, *35*, 17–27.

Hill, B. M., & Ward, S. J. (2010). *National Recovery Plan For the Northern Quoll Dasyurus hallucatus*. Department of Natural Resources, Environment, The Arts and Sport.

Krockenberger, A., Gordon, G., & Dennis, A. J. (2012). Koala (south-east QLD Bioregion), Phascolarctos cinereus. In *Queensland's Threatened Animals*. CSIRO Publishing.

Longmore, N. W. (1978). Avifauna of the Rockhampton area, Queensland. *Sunbird*, *9*, 25–53.

Madden, J. L. (1982). Avian predation of the Woodwasp, Sirex noctilio F., and its parasitoid complex in Tasmania. *Australian Wildlife Research*, *9*, 135–144.

Marchant, S., & Higgins, P. J. (Eds.). (1993). *Handbook of Australian, New Zealand and Antarctic Birds: Raptors to Lapwings* (Vol. 2). Oxford University Press.

Martin, R., & Handasyde, K. (1999). *The Koala: Natural history, conservation and management*. UNSW Press.

McDonald, K. R., Bolitho, E., Dennis, A., Simpson, N., & Winter, J. W. (2000). *Recovery Plan for the magnificent broodfrog Pseudophryne covacevichae 2000-2004*. Environment Australia, Canberra.

Moore, B. D., & Foley, W. J. (2000). A review of feeding and diet selection in koalas (Phascolarctos cinereus). *Australian Journal of Zoology*, *48*, 317–333.

Murray, K., Skerratt, L., Marantelli, G., Berger, L., Hunter, D., Mahony, M., & Hines, H. (2011). *Hygiene protocols for the control of diseases in Australian frogs*. Australian Government Department of Sustainability, Environment, Water, Population and Communities.

Naarding, J. A. (1981). *Latham's Snipe (Gallinago hardwickii) in Tasmania* (Wildlife Division Technical Report. 81/2). National Parks and Wildlife Service.

Naarding, J. A. (1982). *Latham's Snipe (Gallinago hardwickii) in Tasmania* (Wildlife Division Technical Report. 82/1). National Parks and Wildlife Service.

Naarding, J. A. (1983). *Latham's Snipe (Gallinago hardwickii) in Southern Australia* (Wildlife Division Technical Report. 83/01). National Parks and Wildlife Service.

Oakwood, M. (2002). Spatial and social organization of a carnivorous marsupial, Dasyurus hallucatus. *Journal of Zoology, London, 257*, 237–248.

Phillips, S., & Callaghan, J. (2000a). The tree species preferences of koalas (Phascolarctos cinereus) inhabiting forest and woodland communities on Quaternary deposits in the Port Stephens area, New South Wales. *Wildlife Research, 27*, 1–10.

Phillips, S., & Callaghan, J. (2000b). Tree species preferences of koalas (Phascolarctos cinereus) in the Campbelltown area south-west of Sydney, New South Wales. *Wildlife Research, 27*, 509–516.

Pizzey, G., & Knight, F. (2007). *The field guide to the birds of Australia*. Harper Collins Publishers.

Quested, T. (1982). Spine-tailed Swift landing in tree. *Australian Birds, 16*, 64.

Richards, G. C. (1990). The Spectacled Flying-fox, Pteropus conspicillatus (Chiroptera: Pteropididae), in north Queensland, 1.Roost sites and distribution patterns. *Australian Mammalogy, 13*, 1–22.

Shilton, L. A., Latch, P. J., McKeown, A., Pert, P., & Westcott, D. A. (2008). Landscape-scale redistribution of a highly mobile threatened species, Pteropus conspicillatus (Chiroptera, Pteropodidae), in response to Tropical Cyclone Larry. *Austral Ecology, 33*, 549–561.

Smith, L. E., & Chafer, C. J. (1987). The avifauna of Bass Point, New South Wales. *Australian Birds, 21*, 1–18.

Smith, P. (1990). *The Biology and Management of Waders (Suborder Charadrii) in New South Wales* (Species Management Report 9). NSW National Parks and Wildlife Service.

Strahan, R. (Ed.). (1995). *The mammals of Australia*. Reed New Holland.

Tablelands Regional Council. (2017). *Tablelands Regional Council Planning Scheme Version 3*.

Threatened Species Scientific Committee. (2015). *Conservation Advice Mesembriomys gouldii rattoides Black-footed tree-rat (north Queensland)*. Department of the Environment.

Threatened Species Scientific Committee. (2016). *Approved Conservation Advice for Petauroides volans (greater glider)*. Department of the Environment.

Threatened Species Scientific Committee. (2017). *Conservation Advice Pseudophryne covacevichae (magnificent brood frog)*. Department of the Environment and Energy.

Tidemann, C., & Vardon, M. (1997). Pests, pestilence, pollen and pot-roasts: The need for community-based management of flying foxes in Australia. *Australian Biologist, 10*(1), 77–83.

Todd, M. K. (2000). Feeding ecology of Latham's Snipe Gallinago hardwickii in the Lower Hunter Valley. *Emu, 100*, 133–138.

Traill, B. J., Collins, E., Peake, P., & Jessup, S. (1996). Current and past status of the birds of Chiltern- a Box-Ironbark forest in north-eastern Victoria. *Australian Bird Watcher*, *16*, 309–326.

Watkins, D. (1993). *A national plan for shorebird conservation in Australia* (RAOU Report Series).

Wilson, S., & Swan, G. (2011). *A complete guide to reptiles of Australia* (3rd ed.). New Holland Publishers.

Woinarski, J. C. Z., Oakwood, M., Winter, J., Burnett, S., Milne, D., Foster, P., Myles, H., & Holmes, B. (2008). *Surviving the toads: Patterns of persistence of the northern quoll Dasyurus hallucatus in Queensland*. Report submitted to the Natural Heritage Trust Strategic Reserve Program.

Appendix A Threatened Fauna Species Profiles

Apus pacificus (fork-tailed-swift)	
EPBC Act Status	Migratory
NC Act Status	SLC
Likelihood of Occurrence	High
Species Description[2]	• *characterized by a long and deeply forked tail* • *mainly blackish with a white band across the rump* • *white patch on the chin and throat* • *length of 18-21 cm, a wingspan of 40-42 cm and weighs around 30-40 g* • *long scythe-shaped wings that taper to finely pointed tips*
Habitat Description	The fork-tailed swift is predominantly aerial and occurs over inland areas and occasionally above the foothills in coastal areas with dry and open habitat. They can also occur over low scrub, heathland, saltmarsh and riparian woodlands and are associated with low pressure systems that favour the occurrence of insect prey (Department of the Environment and Energy 2019).
Relevant Biology / Ecology	Non-breeding migrant that arrives into Australia between October and late April. The species is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground (Department of the Environment and Energy 2019).

Source: H.B.W. Alive via the Internet Bird Collection

[2] Species descriptions have been directly adapted from the species relevant Species Profile and Threats Database (Department of Agriculture, Water and the Environment, 2020)

Cuculus optatus (oriental cuckoo)	
EPBC Act Status	Migratory
NC Act Status	SLC
Likelihood of Occurrence	High
Species Description[3]	• *bill part yellow* • *eye, eye-ring and feet yellow* • *underparts whitish, wavily barred black*
Habitat Description	Monsoon forest, rainforest edges, leafy trees in paddocks, river flats, roadsides, mangroves, islands (Pizzey & Knight, 2007).
Relevant Biology / Ecology	Breeds in Asia but migrates to Australia Sept-May (Pizzey & Knight, 2007).

Source: Atlas of Living Australia

[3] Species descriptions have been directly adapted from (Pizzey & Knight, 2007)

Dasyurus hallucatus (northern quoll)	
EPBC Act Status	E
NC Act Status	LC
Likelihood of Occurrence	High
Species Description[2]	• *pointy snout and reddish brown fur, with a cream underside* • *white spots on its back and rump and a long, sparsely-furred, unspotted tail* • *tail length ranges between 202 and 345 mm* • *hindfeet have striated pads and five toes*
Habitat Description	The species occupies a diversity of habitats across its range including Eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. Northern Quoll are also known to occupy non-rocky lowland habitats such as beach-scrub communities in central Queensland (Department of the Environment and Energy 2019). Rocky areas provide prime habitat for northern quolls (Hill & Ward, 2010).
Relevant Biology / Ecology	Recent surveys throughout Queensland have suggested Northern Quolls are more likely to be present in high relief areas that have shallower soils, greater cover of boulders, less fire impact and were closer to permanent water (Woinarski et al., 2008). Northern Quoll habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats are usually of high relief, often rugged and dissected but can also include tor fields or caves in low lying areas. Eucalypt forest or woodland habitats usually have a high structural diversity containing large diameter trees, termite mounds or hollow logs for denning purposes (Department of the Environment and Energy 2019). Dens are made in rock crevices, tree holes or occasionally termite mounds (Department of Environment, Land, Water and Planning, 2016). The Northern Quoll is predominately nocturnal and opportunistic omnivores that consume a wide range of prey which include insects, fruit, carrion and other vertebrates. Northern Quolls have short life spans, with males living for approximately one year and the oldest recorded female in the wild being three years of age (Department of Environment, Land, Water and Planning, 2016). Radio tracking and live trapping in lowland savannah of Kakadu National Park indicated that female Northern Quolls occupied home ranges averaging 35 ha with intra-sexually exclusive denning areas (Oakwood, 2002).

Source: Australian Wildlife Conservancy

Delma mitella (Atherton delma)	
EPBC Act Status	V
NC Act Status	NT
Likelihood of Occurrence	Moderate
Species Description[2]	• *reddish-brown with pale yellow/white underbody* • *darker top of head with four narrow pale cream cross-bands edged with black* • *lower lips, throat and belly without darker markings* • *scales in 16 rows at mid-body* • *grows to 8 cm*
Habitat Description	The Atherton Delma is known only from tall open forests and rainforest interfaces (Wilson & Swan, 2011). Grass cover in known locations includes *Themeda triandra, Imperata cylindrica* and *Mnesithea rottboellioides* (Curtis & Dennis, 2012).
Relevant Biology / Ecology	Mostly known from areas of thick ground cover and leaf litter. Feeds on insects and spiders (Curtis & Dennis, 2012).
Image not available.	

Erythrotriorchis radiatus (red goshawk)	
EPBC Act Status	V
NC Act Status	E
Likelihood of Occurrence	High
Species Description[2]	• *boldly mottled and streaked, with rufous scalloping on the back and upper wings, rufous underparts that are brightest and lack streaking on the thighs, and with massive yellowish legs and feet, and boldly barred underwings* • *growing to a length of 45-60 cm, with a wingspan of 100-135 cm* • *broad 'six-fingered' wings that are held at slightly angled planes when soaring* • *long tail which is square tipped to slightly rounded at the tip*
Habitat Description	The red goshawk prefers landscapes containing a mosaic of habitats including coastal and sub-coastal tall open forest, woodland and rainforest edges (Marchant & Higgins, 1993). Forests of intermediate density are particularly favoured, as are ecotones between variably dense habitats (i.e. ecotone between rainforest and sclerophyll forest). Large bird populations (the primary prey of this species) are also an important determinant of red goshawk habitat utilisation (Department of the Environment and Energy 2019). It generally avoids open habitats and is only rarely encountered over agricultural land. Nesting occurs in tall trees within one kilometre of permanent water, generally in open, biologically rich forest or woodland (Marchant & Higgins, 1993). The species is sparsely dispersed across approximately 15 per cent of coastal and sub-coastal Australia. The species occurs at low densities occupying home ranges estimated between 50 – 220 km^2 (Department of the Environment and Energy 2019).
Relevant Biology / Ecology	Habitat has to be open enough for fast attack and manoeuvring in flight but provide cover for ambushing of prey. The Red Goshawk breeds solitarily, in forested or wooded areas, within one km of permanent water, and in a large (> 20 m tall) tree. Breeding occurs generally in the spring with eggs laid between May and October in the north (Aumann & Baker-Gabb, 1991), and between August and October in the southeast of its range (Debus & Czechura, 1988). More Red Goshawk breeding records and activity have been recorded from August through November than in other months (Aumann & Baker-Gabb, 1991; Debus & Czechura, 1988).

Source: http://www.endangered-animals.com.au

Gallinago hardwickii (Latham's snipe)	
EPBC Act Status	Migratory
NC Act Status	SLC
Likelihood of Occurrence	High
Species Description[2]	• *length of 29-33 cm, a wingspan of 50-54 cm and a mass of 150-230 g* • *cryptic plumage is intricately marked with barring and chevrons of buff, black and various shades of brown, with blackish-brown stripes across the crown and cream streaks down the back* • *colour of the bill varies from pale-brown to olive, becoming blackish at the distal third and olive-yellow at the base*
Habitat Description	Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level (Chapman, 1969; Naarding, 1981). They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity (Frith et al., 1977; Naarding, 1983). Various other freshwater habitats can be used including bogs, waterholes, billabongs, lagoons, lakes, creek or river margins, river pools and floodplains (Frith et al., 1977; Naarding, 1981, 1983).
Relevant Biology / Ecology	Breeds in Japan and eastern Russia, residing in Australia from July to April. The entire global population of Latham's Snipe is thought to migrate to Australia (P. Smith, 1990; Watkins, 1993). Foraging habitats are mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation) (Frith et al., 1977; Todd, 2000). Roost on the ground near (or sometimes in) their foraging areas, usually in sites that provide some degree of shelter, e.g. beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable (Frith et al., 1977; Naarding, 1982, 1983). Feeds on seeds and other plant material and on invertebrates including insects (mainly flies and beetles), earthworms and spiders and occasionally molluscs, isopods and centipedes (Frith et al., 1977; Todd, 2000).

Source: Leo via Living Atlas of Living Australia

Hirundapus caudacutus (white-throated needletail)	
EPBC Act Status	Migratory
NC Act Status	SLC
Likelihood of Occurrence	High
Species Description[2]	• *20 cm in length and approximately 115-120 g* • *cigar-shaped body, stubby tail and long pointed wings* • *adults have a dark-olive head and neck, with an iridescent gloss on the crown* • *upper wings are blackish, sometimes with a greenish gloss, with a contrasting white patch at the base of the trailing edge* • *face is dark-olive with a narrow, white band across the forehead*
Habitat Description	In Australia, almost exclusively aerial (1-1000 m above ground) yet occurs over a variety of habitats with a preference for wooded areas (Department of the Environment and Energy 2019).
Relevant Biology / Ecology	Breeds in Asia. Disperses from its breeding grounds in Asia in September and departs Australia in March. Observed roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows (Corben et al., 1982; Day, 1993; Quested, 1982). Eats a wide variety of insects, including beetles, cicadas, flying ants, bees, wasps, flies, termites, moths, locusts and grasshoppers (Madden, 1982).

Source: Birdlife Australia

Macroderma gigas (ghost bat)	
EPBC Act Status	E
NC Act Status	V
Likelihood of Occurrence	Known
Species Description[2]	• *carnivorous bat* • *light to dark grey fur above and paler below* • *head and body length is 10-13 cm, while the forearm lengths is 10-11 cm* • *wingspan reaches up to 60 cm* • *large ears that are joined together, large eyes, a simple nose leaf and no tail*
Habitat Description	The species occurs across a range of habitats, from arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. Roost sites used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23°–28°C and a moderate to high relative humidity of 50–100 percent (Department of the Environment and Energy 2019). The average foraging distance is approximately 2 km from the daytime roost (Tidemann & Vardon, 1997).
Relevant Biology / Ecology	Permanent roosts are in deep natural cave systems or large disused mines. Only 14 maternity colonies are currently known. Carnivorous, feeding on large insects such as grasshoppers and beetles, and also frogs, lizards, birds and mammals (including small bats) (Department of the Environment and Energy 2019).

Source: Bruce Thomson via Department of Science, Information Technology and Innovation

Mesembriomys gouldii rattoides (black-footed tree-rat) - North Queensland	
EPBC Act Status	V
NC Act Status	LC
Likelihood of Occurrence	Moderate
Species Description[4]	• *long shaggy medium grey to black fur on top, pale underside, large black ears and a distinctive long hairy tail with terminal white brush*
Habitat Description	The species occurs across a range of habitats, from arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. Roost sites used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23°–28°C and a moderate to high relative humidity of 50–100 percent (Threatened Species Scientific Committee, 2015). The average foraging distance is approximately 2 km from the daytime roost.
Relevant Biology / Ecology	Permanent roosts are in deep natural cave systems or large disused mines. Only 14 maternity colonies are currently known. Carnivorous, feeding on large insects such as grasshoppers and beetles, and also frogs, lizards, birds and mammals (including small bats) (Threatened Species Scientific Committee, 2015).

Source: Project Noah (http://www.projectnoah.org/)

[4] Species descriptions have been directly adapted from the (Threatened Species Scientific Committee, 2015)

Myiagra cyanoleuca (satin flycatcher)	
EPBC Act Status	Migratory
NC Act Status	SLC
Likelihood of Occurrence	High
Species Description[2]	• *length around 17.5 cm, a wingspan of 23 cm and a weight of 17 g* • *characterised by an upright posture, short erectile crest, and a distinctive habit of quivering the tail when perched* • *Males are glossy blue-black above, with a blue-black chest and white below, while females are duskier blue-black above, with a orange-red chin, throat and breast, and white underparts and pale-edged wing and tail feathers*
Habitat Description	Satin Flycatchers mainly inhabit eucalypt forests, often near wetlands or watercourses. They generally occur in moister, taller forests than the Leaden Flycatcher, *Myiagra rebecula*, often occurring in gullies (Blakers et al., 1984; Emison et al., 1987). They also occur in eucalypt woodlands with open understorey and grass ground cover and are generally absent from rainforest (Emison et al., 1987). Mainly recorded in eucalypt forests, especially wet sclerophyll forest, often dominated by eucalypts such as Brown Barrel, Mountain Gum, Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash. They sometimes also occur in dry sclerophyll forests and woodlands, usually dominated by eucalypts such as Blakely's Red Gum, Mugga Ironbark, Yellow Box, White Box, Manna Gum or stringybarks, including Red Stringybark and Broad-leaved Stringybark, usually with open understorey (Ford & Bell, 1981; Traill et al., 1996).
Relevant Biology / Ecology	Occur singly or in pairs, and sometimes in groups of three or four (Longmore, 1978; L. E. Smith & Chafer, 1987). Each pair occupies a discrete territory. They nest in loose colonies, or nests are at least clustered (BA NRS, 2002). Nest in a fork of outer branches of trees, such as paperbarks, eucalypts, and banksias (BA NRS, 2002; Gilbert, 1935). They nest in the same locality each year, and sometimes in the same tree (BA NRS, 2002). The average height of the nest is 12.3 m. In Queensland, eggs have been recorded in December (BA NRS, 2002). Mainly insectivorous, preying on arthropods, mostly insects, although very occasionally they will also eat seeds. Arboreal foragers. Move north in autumn to spend winter in northern Australia and New Guinea.

Source: Birdlife Australia (male and female right and left respectively)

Ornithorhynchus anatinus (platypus)	
EPBC Act Status	-
NC Act Status	SLC
Likelihood of Occurrence	Moderate
Species Description[5]	• *streamlined body with a bill and broad flat tail* • *short limbs with webbed feet* • *dense dark brown to reddish brown fur with light brown/silver underfur*
Habitat Description	Occur in freshwater systems and prefers river or stream systems with vegetated earth banks to allow for the establishment of burrows (Australian Museum, 2018).
Relevant Biology / Ecology	Is primarily a nocturnal feeder, with a diet mainly consisting of benthic invertebrates. Shelters during the day in burrows constructed into soil banks (Australian Museum, 2018).

Source: H.D. Millen via Australian Museum

[5] Species descriptions have been directly adapted from the (Australian Museum, 2018)

Petauroides volans (greater glider)	
EPBC Act Status	V
NC Act Status	V
Likelihood of Occurrence	Known
Species Description[6]	• *head and body length of 35–46 cm and a long furry tail measuring 45–60 cm* • *fur colour is white or cream below and varies from dark grey, dusky brown through to light mottled grey and cream above* • *large furry ears and a short snout*
Habitat Description	The species is generally restricted to eucalypt forests and woodlands, particularly favouring forest with a diversity of eucalypt species. During the day the species shelters in tree hollows, with a particular selection for large hollows in large, old trees (Department of the Environment and Energy 2019). Modelling suggests that they require native forest patches of at least 160 km^2 to maintain viable populations (Eyre, 2004).
Relevant Biology / Ecology	Folivorous arboreal marsupial which is mostly constricted to eucalypt forests and woodlands. Favours forests with a heterogeneous composition of eucalypts and is typically found in taller, montane forests with abundant hollows (Threatened Species Scientific Committee, 2016).

Source: Beth Boughton via Atlas of Living Australia

[6] Species descriptions have been directly adapted from the (Threatened Species Scientific Committee, 2016)

Petaurus australis (yellow-bellied glider) - Wet Tropics subspecies	
EPBC Act Status	V
NC Act Status	V
Likelihood of Occurrence	Moderate
Species Description[2]	• *grows to 30 cm long and can weigh up to 700 g* • *gliding marsupial with grey-brown fur and a distinctive off-white to yellow-orange belly* • *fluffy tail growing to 48 cm long and large, bare ears*
Habitat Description	Tall eucalypt forest above 600m altitude along the western margin of the Wet Tropics rainforests. Habitat always includes Flooded Gum and Red Mahogany and generally Turpentine and Coast Banksia (Department of the Environment and Energy 2019).
Relevant Biology / Ecology	Live in family groups with one male. Defend a home range of 25-120 ha. Den by day in *Eucalyptus grandis* hollows. Rarely use hollows in any other species. Feed primarily on sap harvested from incisions in the trunk and major branches of *E. resinifera*. Also eats nectar and pollen from a range of plants (particularly Banskia), invertebrates, occasionally small vertebrates, and the honeydew and manna from a range of insects (Department of the Environment and Energy 2019).

Source: http://www.endangered-animals.com.au

Phascolarctos cinereus (koala)	
EPBC Act Status	V
NC Act Status	V
Likelihood of Occurrence	Moderate
Species Description[2]	• *medium-sized marsupial with a stocky body, large rounded ears, sharp claws and predominantly grey-coloured fur*
Habitat Description	Koalas occur in a variety of eucalypt forests and woodland communities. They feed almost entirely on eucalypt foliage with preferences varying regionally (Krockenberger et al., 2012). Diet is thought to be a major determinant of habitat selection, with the species being able to use small remnants of original vegetation where suitable habitat is present. Koalas are also known to occur in modified or regenerating native vegetation communities, as well as urban and rural landscapes where food trees or shelter trees may be highly scattered (Department of the Environment and Energy 2019).
Relevant Biology / Ecology	The Koala is a leaf-eating specialist that feeds primarily during dawn, dusk or night (Crowther et al., 2013). Its diet is restricted mainly to foliage of Eucalyptus spp.; however, it may also consume foliage of Corymbia spp., Angophora spp. and Lophostemon spp. The Koala may supplement its diet with Leptospermum spp. and Melaleuca spp. (Martin & Handasyde, 1999). The diet of individual Koalas is usually limited to one or a few species present at a site (Moore & Foley, 2000). Consequently, assessment of habitat quality for Koalas is usually based on the identification of local preferences for species and quantification of the availability of those species (Phillips & Callaghan, 2000b, 2000a). Koala food trees by Local Government Area in Australia are available in Mitchell 2015. Crowther and colleagues (2013) suggest that shelter trees are equally important as food trees and should be weighted as such when assessing habitat suitability. Shelter trees play an essential role in thermoregulation and are likely to be selected based on height, canopy cover and elevation (i.e. trees occurring in gullies are preferable) (Crowther et al., 2013). The Koala is not territorial and the home ranges of individuals extensively overlap. Home ranges range from 10 ha to 135 ha, depending on habitat quality (Department of the Environment and Energy 2019).

Source: http://www.endangered-animals.com.au

Pseudophryne covacevichae (magnificent brood frog)	
EPBC Act Status	V
NC Act Status	V
Likelihood of Occurrence	Known
Species Description[2]	• *snout-vent length between 24 and 28 mm* • *distinguished from other members of the genus by a bright rufous, rusty brown or yellow triangular patch from the upper snout to the forehead* • *sides and forearms are uneven grey, peppered with white and dark spots* • *upper arms are bright yellow* • *ventral surface of the frog is strikingly marbled with black and white*
Habitat Description	Found in open eucalypt forests with an understorey comprised of *Themeda triandra, Xanthorrhoea sp., Gahnia sp., Lophostemon suaveolens, Allocasuarina littoralis* and *A. torulosa* (Department of the Environment and Energy 2019).
Relevant Biology / Ecology	Appears to be restricted to seepage areas within rhyolites of the Glen Gordon Volcanics (McDonald et al., 2000). Breeding occurs seepage areas above the water level of small creeks, which only flow during the summer wet season. Eggs are laid in late sprong or summer after heavy rain. Nests are found within soil cavities at the base of grassy tussocks or under leaf litter. Tadpoles are mostly bottom-dwellers in shallow pools of temporary creeks (Anstis, 2013).

Source: (AECOM 2018)

Pteropus conspicillatus (spectacled flying-fox)	
EPBC Act Status	V
NC Act Status	V
Likelihood of Occurrence	Known
Species Description[2]	• *distinctive straw-coloured fur which surrounds the eyes* • *head and body ranges between 220-240 mm* • *forearm length and weight range is 160-180 mm and 580-850 g for males, and 155-175 mm and 500-650 g for females*
Habitat Description	Associated with, but not restricted to, tropical rainforests. Also uses eucalypt forests, melaleuca swamps, littoral and coastal mixed forests and mangroves, farmlands, and urban and suburban gardens. Colonies tend to be within or near rainforest. One study showed that the Spectacled Flying-fox roosts within 6.5 km of rainforest (Richards, 1990), although a roost 16 km from rainforest has also been observed (Shilton et al., 2008). The Mabi Forest (Complex Notophyll Vine Forest 5b) is considered a key habitat for the Spectacled Flying-fox.
Relevant Biology / Ecology	Forage widely, easily covering 50-100 km each night. Individuals move between camps regularly. Eats fruits and blossoms (Department of Environment and Resource Management, 2010). Disperses seeds, mosses, micro-organisms, and pollen (Department of the Environment and Energy 2019). Roosts in large colonies, in the exposed branches of canopy trees. Throughout the year an unknown proportion of animals roost away from camps, either solitarily or in small groups (Department of Environment and Resource Management, 2010). Spectacled Flying-foxes are highly mobile and have complex and irregular movement patterns primarily determined by seasonal nectar flows (Department of the Environment and Energy 2019). The number of Spectacled Flying-foxes in particular sites varied five-fold through the year.

Source: Martin Schulz via Department of Environment and Resource Management (Qld)

Tachyglossus aculeatus (short-beaked echidna)	
EPBC Act Status	-
NC Act Status	SLC
Likelihood of Occurrence	High
Species Description[7]	• *head and body length 30-45 cm* • *dorsal surface and rudimentary tail covered with spines* • *long tubular snout*
Habitat Description	The species occurs throughout Australia in a wide variety of habitats; wherever there is a supply of ants and termites, upon which it feeds. The species usually seeks shelter under thick bushes, in hollow logs, under piles debris, or occasionally in a rabbit burrow (Strahan, 1995).
Relevant Biology / Ecology	Seeks shelter under thick bushes, in hollows and under debris (Strahan, 1995).

Source: E2M Pty Ltd

[7] Species descriptions have been directly adapted from (Strahan, 1995)

Tyto novaehollandiae kimberli (masked owl) - Northern	
EPBC Act Status	V
NC Act Status	V
Likelihood of Occurrence	High
Species Description[2]	• *large owl with prominent heart-shaped facial disc, owl with prominent heart-shaped facial disc* • *plumage highly patterned by speckling, and generally darker on the back and paler below*
Habitat Description	Mostly in coastal and upland areas. Sclerophyll forest and woodland, often near ecotones with open areas, such as grassland, heath or cane fields, and typically grassy or with a mosaic of sparse and dense ground-cover (Department of the Environment and Energy 2019).
Relevant Biology / Ecology	Roosting sites are tree-hollows, caves, or dense foliage (3-8 m above the ground), and rarely buildings. Preys mainly on terrestrial mammals, particularly rodents, up to bandicoot-size. Also takes arboreal mammals (e.g. small gliders), and some birds, frogs, lizards, and large insects. Resident in large home ranges of 400-1500 ha, sometimes > 3000 ha. Nests Feb-Oct. Nest in a large hollow in a big old eucalypt, usually live but sometimes dead. Nest entrance is 10 – 45 m above the ground, more than 20 cm wide, and the chamber at least 45 cm wide and up to 500 cm deep (Department of the Environment and Energy 2019).

Source: D.P. Lewis via Cape York NRM Plan and Investment Strategy

Rhipidura rufifrons (rufous fantail)	
EPBC Act Status	Migratory
NC Act Status	SLC
Likelihood of Occurrence	Known
Species Description[2]	• *14.5 - 18.5 cm in length and approximately 10 g in weight* • *forehead is a rich reddish-brown colour across the eyes* • *eyes have a white arc underneath* • *top of the head, back of the neck and the upper back, transition from an olive to reddish-brown colour, which then blends into a blackish-brown, long, fan-shaped tail* • *blackish-brown tail, contrasts with the base of the tail, which is tipped with a paler colour, often white*
Habitat Description	In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts; usually with a dense shrubby understorey often including ferns (Department of the Environment and Energy 2019).
Relevant Biology / Ecology	Populations possibly move altitudinally in the Atherton Region (Wet Tropics) where reporting rates >500 m above sea level were 37% in summer and 0% in winter. At elevations of >600 m above sea level in south-east Australia, they breed November to January. Nests are placed in a wide variety of plant species, from shrubs to trees (Department of the Environment and Energy 2019). The species is insectivorous, mainly foraging in the low to middle strata of forests, sometimes in or below the canopy or on the ground; in northern Australia they also forage in mangroves (Department of the Environment and Energy 2019).

Source: Birdlife Australia

Appendix B EPBC Approval Conditions