Central Queensland Coal Project

Appendix 9e – Significant Species Management Plan

Central Queensland Coal

CQC SEIS, Version 3

October 2020

Draft Significant Species Management Plan

Central Queensland Coal Project

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1. Introduction

1.1. Background

Central Queensland Coal Proprietary Limited (Central Queensland Coal) and Fairway Coal Proprietary Limited (Fairway Coal) propose to develop the Central Queensland Coal Mine Project (the Project). As Central Queensland Coal is the senior proponent for the Project and are referred to as the proponent in this document. The Project is a proposed coal mine in the Styx Coal Basin located 130 km northwest of Rockhampton, within the Livingstone Shire Council Local Government Area.

On 27 January 2017 the Queensland Government approved an application for the proponents to voluntarily prepare an Environmental Impact Statement (EIS) for the proposed Project under the *Environmental Protection Act 1994* (EPA). On 3 February 2017 the proposed Project was determined to be a controlled action (EPBC 2016/7851) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (hitherto referred to as the EPBCA). The Project is being assessed under the bilateral agreement between the Commonwealth and the State of Queensland (section 45 of the EPBCA).

In accordance with the EPA, the proponent has prepared an Environmental Impact Statement (November 2017), a Supplementary Environmental Impact Statement in May 2018 (SEIS Version 1), an SEIS in December 2018 (SEIS Version 2) and an SEIS in 2020 (SEIS Version 3).

Through the EIS and SEIS Process Central Queensland Coal has identified a number of conservation significant fauna species listed under the Queensland *Nature Conservation Act 1992* (NCA) and Commonwealth EPBCA that are known, or have potential to, occur within or near the Project area. The purpose of this Significant Species Management Plan (SSMP) is to provide a guidance document that incorporates practical solutions to the management of conservation significant fauna species and their habitat with the potential to be impacted by the construction and operation of the Project.

This is a Draft version of the SSMP as the Project has not received final approval and therefore may be subject to further conditions under the Project's Environmental Authority approval (State) and/or EPBC Act approval (Commonwealth).

1.2. Purpose

The purpose of the SSMP is to reduce the environmental impacts of the Project on listed species and their habitat, through the development of mitigation and monitoring measures for implementation prior to construction, during construction, during operations and as part of the decommissioning process. The management plans for each species and community are consistent with relevant guidelines and policies on the protection of Matters of National Environmental Significance (MNES) under the EPBCA, and the management of threatened species listed under the NCA.

Objectives of this SSMP are as follows:

- Describe practical strategies, measures, and treatments to mitigate impacts of the Project on listed species and ecological communities.
- Describe monitoring measures that will be implemented to assess the effectiveness of mitigation measures, and inform adaptive management actions.
- Provide a consistent framework across the Project for the mitigation of risks to species and ecological communities listed under Commonwealth and Queensland legislation.
- Collate relevant Project commitments relating to mitigation and monitoring of ecological values, to assist in streamlining their implementation, the monitoring of compliance and reporting.
- Achieve compliance with relevant Commonwealth and Queensland approval conditions.

This SSMP applies to the Project layout as depicted in **Figure 1-1.**

1.3. Legislative Framework

This SSMP has been developed taking into consideration the requirements of relevant Commonwealth and State legislation. A summary of the key legislation is outlined below.

1.3.1. Environment Protection and Biodiversity Conservation Act 1999

The EPBCA provides for the protection of the environment, in particular MNES. The EPBCA lists those threatened species, including migratory species, and threatened ecological communities that are to be considered MNES. Under the EPBCA, a person must not take an action that has, will have, or is likely to have a significant impact on any MNES without approval from the Australian Government Environment Minister or the Minister's delegate. A proposed action likely to significantly impact MNES should be referred, to obtain a decision on whether a proposed action will need formal assessment and approval under the EPBCA.

The Project will be undertaken in accordance with the conditions of EPBC Approval <insert approval number>.

1.3.2. Environmental Protection Act 1994

The EPA provides the key legislative framework for environmental management and protection in Queensland. The objective of the EPA is to: 'Protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains ecological processes on which life depends' (s 3). Under the EPA, Central Queensland Coal must comply with the general environmental duty not to undertake an: 'Activity that causes, or is likely to cause, environmental harm unless…all reasonable and practicable measures to prevent or minimise the harm are taken' (s 319).

The EPA is applicable to the Project as under Chapter 5 of the EPA, the Project requires an Environmental Authority (EA) for mining activities. The EA imposes environmental management conditions based on EHP's Model Mining Conditions on mining activities undertaken on the ML that Central Queensland Coal must comply with.

The Environmental Authority for the Project was issued to Central Queensland Coal and took effect on <date>. Condition <insert EA condition number> of the EA requires a SSMP to be prepared for the Project.

1.3.3. Nature Conservation Act 1992

In broad terms, the objective of the NCA is the conservation of nature (plants and animals) within Queensland. Specifically, the NCA seeks to gather relevant information, identify critical habitat areas, manage protected areas, protect wildlife and promote ecologically sustainable development. The NCA has 10 subordinate regulatory instruments in the form of regulations, conservation plans and notices. Of relevance to the Project is the *Nature Conservation (Wildlife) Regulation 2006* which categorises flora and fauna species as extinct in the wild, endangered, vulnerable, near threatened or of least concern. Also listed is international wildlife and prohibited wildlife.

Under the NCA, a Species Management Program must also be approved when interfering with native fauna habitat and breeding places.

1.4. Relationship with other Project Management Plans

Central Queensland Coal has prepared a draft Environmental Management Plan (EMP) for construction and operation of the Project. The draft EMP has been developed to manage and mitigate potential environmental impacts, and to assist Central Queensland Coal to comply with relevant environmental approvals and permit conditions. The draft EMP has been prepared generally in accordance with the Commonwealth Environmental Management Plan Guidelines (Commonwealth of Australia 2014) and is modelled on the AS/NZS ISO 14001 (Standards Australia 2016) Plan-Do-Check-Act continual improvement model. This SSMP has been developed to be consistent with, and to complement, the draft EMP.

As part of the EMP process, a number of separate, more detailed management plans, have been prepared including this SSMP. Within this SSMP, recommended measures and strategies to mitigate potential impacts of the Project on MNES and MSES may be in part, or wholly reliant upon, a number of these other Project management plans including the:

- **Erosion and Sediment Control Plan (ESCP)** – detailing approach to managing erosive soils and potential water quality contamination resulting from exposed soils during construction and operation.
- **Groundwater Dependent Ecosystem Management and Monitoring Plan (GDEMMP)** - which describes the program for monitoring Groundwater Dependent Ecosystems (GDEs), including stygofauna, groundwater fed pools and associated aquatic habitats, riparian vegetation, and their associated groundwater resources. Triggers are outlined which will be evaluated, with corrective actions identified for implementation in response to the monitoring results.
- **Receiving Environment Monitoring Program (REMP)** – to monitor the health of wetlands, streams and riparian vegetation adjacent to the Project for indirect impacts such as water level reductions (in permanent waterholes), dust and surface water contamination.
- **Progressive Rehabilitation and Closure Plan (PRCP)** – detailing all aspects of the progressive rehabilitation of the Project's mining areas including landforms, rehabilitation schedule, plant species selections, goals and objectives, and rehabilitation monitoring.

An **Offset Area Management Plan (OAMP)** has also been prepared to outline the approach to land use management of proposed offset sites on the Mamelon property adjacent to the Project area. The implementation of the SSMP and the OAMP will involve a co-ordinated approach.

1.5. Compliance with Approval Conditions

The SSMP has been prepared to meet the requirements of relevant conditions under both the Commonwealth and Queensland government approvals. The following Table presents compliance matrices demonstrating how the approval conditions and commitments relevant to the SSMP have been addressed.

Table 1-1 Project Approval Conditions and SSMP Compliance

Condition Number	Condition	SSMP Compliance
<insert>	<insert condition details>	<insert>

1.6. Terminology, Nomenclature and Acronyms

The **Project area** is located within Mining Lease Applications 80187 and 700022 and the Mount Bison Road realignment (
Figure 1-1). The Project area contains the **disturbance area** which is the footprint within which mining operations will be undertaken (
Figure 1-1).

The **surrounding area** refers generally to the lands within approximately 100 km of the Project area, including the townships of Ogmore to the north and Marlborough in the south. **Near surrounds** refers to land (particularly relevant habitat) adjacent to, or within, approximately 3 km of the Project area, which has relevance from a biological perspective in regard to considering local population context for mobile taxa relevant to this report.

Nomenclature used for this study follows Bostock & Holland (2010) for flora, Van Dyck and Strahan (2008) for non-flying mammals, Christidis and Boles (2008) for birds and Wilson (2009) for reptiles. The **conservation status** of a species is described in accordance with the Commonwealth EPBCA (e.g. *Endangered, Vulnerable,* or *Migratory*) and, for completeness where relevant, the Queensland NCA and its regulations and amendments (e.g. *Endangered, Vulnerable, Regionally Vulnerable, Near Threatened*[1] or *Least Concern*).

A **threatened ecological community** (TEC) is a naturally occurring ecological community listed under section 181 of the EPBCA. Categories for listing TECs under the EPBCA are: critically endangered; endangered; or vulnerable.

The definition of a **regional ecosystem** (RE) follows that provided by Sattler and Williams (1999), *i.e.*, a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. The conservation status (under the *Vegetation Management Act 1999* (VMA)) of REs follows that of the Regional Ecosystem Description Database (REDD) published and maintained by Queensland Herbarium (2019). Each RE is assigned vegetation management class under the VMA Vegetation Management Regulation (2012) as either Endangered, Of Concern or Least Concern.

Acronyms and Terms used in this report are provided in **Tables 1-2 and 1-3.**

[1] Previous reports referred to in this report have included reference to *Rare* species. This conservation status was superseded by the status *Near Threatened* with the introduction of the *Nature Conservation (Wildlife) Amendment Regulation (No. 1) 2010*.

Table 1-2 Report Acronyms

Acronym	Name, Term or Expression
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DE	Former Commonwealth Department of the Environment
DEE	Former Commonwealth Department of the Environment and Energy
DEHP	Former Queensland Department of Environment and Heritage Protection
DERM	Former Queensland Department of Environment and Resource Management
DES	Queensland Department of Environment and Science
DEWHA	Former Commonwealth Department of Environment, Water, Heritage and the Arts
EHP	Queensland Department of Environment and Heritage Protection
LPA	Queensland Land Protection (Pest and Stock Route Management) Act 2002
LPR	Queensland Land Protection (Pest and Stock Route Management) Regulation 2002
RMP	Rehabilitation Management Plan
SEWPaC	Former Commonwealth Department of Sustainability, Environment, Water, Population & Communities
CHPP	Coal handling preparation plant
EA	Environmental Authority
EIS	Environment Impact Statement
EMP	Environmental Management Plan
EPA	Queensland Environmental Protection Act 1994
EPBCA	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPC	Exploration Permit for Coal
ESCP	Erosion and Sediment Control Plan
GDE	Groundwater Dependent Ecosystem
GDEMMP	Groundwater Dependent Ecosystem Management and Monitoring Plan
Ha	Hectares
HGTC	High grade thermal coal
km	Kilometre
MIA	Mining Infrastructure Area
ML	Mining Lease
MNES	Matter of National Environmental Significance
MP	Management Plan
MSES	Matter of State Environmental Significance
Mtpa	million tonnes per annum
NCA	Queensland Nature Conservation Act 1992
NP	National Park
OAMP	Offset Area s Management Plan
PRCP	Progressive Rehabilitation and Closure Plan
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
REMP	Receiving Environment Monitoring Program

Acronym	Name, Term or Expression
ROM	Run-of-mine
SEIS	Supplementary Environment Impact Statement
sp.	Species (singular)
spp.	Species (plural)
SSCC	Semi-soft coking coal
SSMP	Significant Species Management Plan
TEC	Threatened Ecological Community
The Project	Central Queensland Coal Mine Project
TLF	Train Load Out facility
VMA	Queensland Vegetation Management Act 1999
WHDF	Weed Hygiene Declaration Forms
WMP	Water Management Plan
WoN	Weed of National Significance as listed by the Australian Weeds Committee 2012
WSDF	Weed-Sludge Disposal Facility
WWF	Weed Wash-down Facility

Table 1-3 Selected Report Terms

Term	Description
Carrying capacity	The maximum population size of the species that an environment can sustain indefinitely, given the availability of food, habitat, water, and other important resources (e.g., nest and shelter sites). In population biology, carrying capacity is defined as the maximum number of animals (of one or more species) an area of habitat can support in the long-term (after Hui 2006).
Declared plant	Refers to a species declared under the Queensland LPR.
Ecology	The totality or pattern of relations between organisms and their environment. Note that ecology is the study and the science of the interrelations between living organisms and their environment. The term ecology is now frequently misused, usually as "the ecology", when what is meant is a particular ecosystem, a set of ecosystems or the environment.
Ecosystem	A community of living things and the non-living environment functioning together as a system - an ecological system.
Endemic	Native to a particular area and found nowhere else in the wild.
Environmental weed	Refers to any plant that survives in a natural area where its presence is undesirable, harmful or troublesome to native biodiversity.
Invasive species	A species spreading beyond its accepted normal distribution and which threatens valued environmental, agricultural or personal resources by the disruption it causes.
Land zone	A geomorphic category that describes the major geology and associated landform and soils and takes account of their origin and function.
Threatened	A common use term to collectively describe species listed as Critically Endangered, Endangered or Vulnerable species under Commonwealth EPBCA and/or the Queensland VCA.

Styx Coal Project

Figure 1-1

Project Area

austecology

ML 80187

ML 700022

BRUCE HIGHWAY

KOOLTANDRA ROAD

North Coast Line

Deep Creek

Barrack Creek

Woodleigh Creek

Mining Lease

Disturbance Area

Remnant Vegetation – Regional Ecosystems

SOURCE:
DCDB: DNRME 2019
Mining Leases: DNRME 2019
Vegetation: 3D Environmental 2019 (site) and © State of Queensland (Department of Natural Resources, Mines and Energy), 2019 (for the surrounds)

N
W
E
S

0 500 1,000 1,500
Meters

A3 Scale: 1:30,000

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2. Project Description

The Project will involve mining a maximum combined tonnage of up to 10 million tonnes per annum (Mtpa) of semi-soft coking coal (SSCC) and high-grade thermal coal (HGTC). The Project will be located within Mining Lease (ML) 80187 and ML 700022, which are adjacent to Mineral Development License 468 and Exploration Permit for Coal 1029, which are both held by the Proponent (the Project area).

The Project is generally located on the "Mamelon" property, situated on Lot 10 on MC493, Lot 1 on RL3001, Lot 11 on MC23 and Lot 9 on MC496, all of which are freehold tenures. The Mamelon property is currently owned by QNI Metals Pty Ltd. The east-west oriented, Mount Bison Road reserve also traverses the mine area. The transport corridor is situated on Lot 10 on MC493 (Mamelon), Lot 85 and part of Lot 87 on SP164785 (Brussels), and Lot 107 on SP316283 (Strathmuir), all of which are freehold tenures. The Train Load Out Facility (TLF) is to be located entirely Lot 107 on SP316283 (Strathmuir).

Figure 1-1 identifies the Project area and the disturbance footprint. The Project is a greenfield site and will comprise the following as major components:

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

The open cut mines will be developed progressively. The construction of the Open Cut 2, the initial Coal Handling and Preparation Plant (CHPP), the Haul Road and TLF and associated mine infrastructure located on the east of the Bruce Highway is planned to commence simultaneously in 2021 and will continue into 2022. Open Cut 1 construction will commence at approximately 2029 and will continue into 2031.

The run-of-mine (ROM) coal will ramp up to approximately 2 Mtpa during Stage 1 (2021 - 2024), where coal will be crushed, screened and washed to SSCC grade with an estimated 80% yield. Stage 2 of the Project (2025 - 2039) will include further processing of up to an additional 8 Mtpa ROM coal within another CHPP to SSCC, and a HGTC plant with an expected 100% yield.

At full production, two CHPPs, one servicing each open cut mine, will be in operation. Rehabilitation will be ongoing from Year 3, however rehabilitation to final landform and mine closure activities will occur between 2038 and 2044.

The final commencement date for construction is dependent upon the timing of the Project approvals process.

3. Existing Environment

3.1. Landscape and Ecological Context

The Project area is located approximately 25 km north-west of Marlborough, about 23 km inland from the central Queensland coast. The Project area is bisected by the Bruce Highway and the North Coast Rail Line transects the eastern most part of the Project area (**Figure 1-1**).

The Project area is representative of the wider region and landscape, predominantly comprising cleared land for cattle grazing. Of the total disturbance area (1,372.50 ha) approximately 90% is located within non-remnant vegetation which has been previously cleared for cattle grazing (1,231.13 ha). Remnant vegetation is largely confined to the western portions of the Project area.

The majority of the Project area lies within the Styx River catchment, east of the Connors and Broadsound Ranges. The Styx River and its tributaries (including Deep, Tooloombah and Barrack Creeks) flow into the Broad Sound, to the north-east of the Project area.

The Project area predominantly lies within the Marlborough Plains subregion of the Brigalow Belt North bioregion, with a small area in the west located within the Nebo-Connors Ranges subregion. Vegetation within the Marlborough Plains subregion is dominated by alluvial plains and colluvial slopes, usually supporting eucalypt woodlands to open forests characterised by Poplar Gum *Eucalyptus platyphylla*, Ghost Gum *Corymbia dallachiana*, Forest Red Gum *Eucalyptus tereticornis*, and paperbarks (*Melaleuca spp.*) with low rises supporting Narrow-leaved Ironbark *Eucalyptus crebra* (DES 2018).

DES (2018) describes two areas of special fauna biodiversity value, one to the north-east and the other to the west of the Project area. The *Torilla Plain and Broadsound* is located approximately 20 km downstream of the Project area. This area is regarded as a nationally important wetland system which supports substantial populations of waterbirds, including migratory shorebirds (DES 2018).

The *Southern Connors / Broadsound Range* is located approximately 20 km west of the Project area. DES (2018) notes that the *Southern Connors / Broadsound Range* supports a high density and size range of hollow-bearing trees which are an important feature of this area for both the Greater Glider *Petauroides volans* and Yellow-bellied Glider *Petaurus australis*. Other threatened or priority taxa[2] include the Squatter Pigeon *Geophaps s. scripta* and Koala *Phascolarctos cinereus*.

3.2. Project Surveys and Habitat Assessments

The Project area and surrounding area has been subject to a variety of fauna, flora and vegetation community assessments between 2011 through to early 2020.

In regard to fauna, the following work underpins an understanding of fauna habitat values of the Project area and surrounds:

- A fauna assessment of (Exploration Permit for Coal [EPC] 1029) was carried out under summer-season conditions over five days in March 2011 (Meyer 2011a). A wide variety of methodologies were used to sample the diversity of fauna potentially present.
- A fauna assessment of EPC 1029 was also carried out under early spring (dry season) conditions over five days in September 2011 (Meyer 2011b). Again, a wide variety of standardised and non-standardised methodologies were employed to sample a diversity of fauna potentially present.

[2] Priority taxa are non-EVNT species that are considered to be of particular conservation significance in the bioregion. The rationale for inclusion is based upon the eligibility criteria described in DES (2018).

- The fauna surveys in February 2012 used a variety of survey methods designed to target conservation significant fauna species (listed under NCA and/or EPBCA) throughout EPC 1029 (Meyer 2012).
- A baseline fauna assessment program focusing on the Project area and staged throughout 2017 (CDM Smith 2018).
- A series of surveys throughout the Project area in 2018 using a variety of survey methods designed to target threatened fauna species (listed under NCA and/or EPBCA) (CDM Smith 2018).
- A series of surveys targeting Koala and Greater Glider, threatened microbats, and other relevant threatened fauna species within the eastern part of the Project area, and particularly Deep Creek during November 2019 (Austecology 2020a).
- Habitat suitability assessments and target species surveys within the western parts of the Project area during December 2019 (Austecology 2020a).

All of these survey programs and events have taken into account the potential presence of a variety of threatened fauna. The design and implementation of the surveys was informed by previous experience in practices which provide consistency with recognised survey guidelines and best practice guidelines including: i.e. DEWHA 2010a, DEWHA 2010b, SEWPaC 2011a, SEWPaC 2011b, SEWPaC 2011c, Eyre *et al.* 2012, and. DE 2014.

In regard to flora and vegetation, the following work underpins an understanding of values present within the Project area and surrounds:

- Summer (late wet season) flora survey of EPC 1029 (five days) 21 to 25 March 2011 by Oberonia Botanical Services (OBS 2011);
- Spring (dry season) flora survey of EPC 1029 (five days) 25 to 29 September 2011 by Oberonia Botanical Services (OBS 2011);
- Summer (wet season) flora survey of ML 80187 and immediate surrounds (three days) 8 to 10 February 2017 by Dr Andrew Daniel (Terrestria);
- Vegetation mapping, habitat quality assessments and GDE-associated sampling measurements on Project associated impact sites (ML 80187), and habitat quality assessments on proposed offset sites (wider Mamelon property) in July and August 2018, by David Stanton (3D Environmental);
- Ground truth regional ecosystem mapping at Mamelon outside of the ML (lots 11 MC23, 10 MC493 and 9 MC496) and lot 9 MC230, except for areas previously ground-truthed by 3D Environmental from 23 to 27 September 2019 by Simon Danielsen (Astrebla Ecological Services); and
- Ground-truthing of regional ecosystem mapping and BioCondition assessments within ML 80187, including along Deep Creek from September 2019 to July 2020 by Dr Jarrad Cousin (CO2 Australia).

3.3. Ecological Values within the Project Area

Extensive areas within the northern and eastern parts of the Project area have been substantially impacted by vegetation clearing and the landscape subject to long-term cattle grazing. Connectivity between remaining tracts of remnant vegetation is tenuously maintained by thin strips of riparian vegetation along creek lines such as Tooloombah Creek (which borders the Project area) and Deep Creek which flows within and adjacent to the Project area.

The riparian habitat of both waterways supports habitat for a variety of fauna and is of local importance in contributing to ecological connectivity with areas of woodland and open forest habitat. Within the Project area, larger patches of woodland and open forest occur within the north-west. These habitats are contiguous with an extensive tract of remnant vegetation which extends along the western flank of the Project area.

A total of 11 Regional Ecosystems have been mapped across the Project area (**Table 3-1**). **Figure 3-1** describes the location and extent of remnant vegetation and non-remnant vegetation across the Project area.

Weed species are abundant within the Project area, including several Weeds of National Significance (WONS) and species listed under the Queensland *Biosecurity Act 2014*. Of these, Rubber Vine (*Cryptostegia grandiflora*) and Lantana (*Lantana camara*) were common, often forming dense infestations along both Deep Creek and Tooloombah Creek. Away from watercourses, the ground layer of cleared areas within the northern section of the Project area is dominated by the introduced Buffel Grass (*Cenchrus ciliaris*) where cracking clays occur.

Field surveys of the Study Area from 2011 to 2019 identified a total of 264 native terrestrial species including 170 birds, 40 mammals, 36 reptiles and 18 frogs. The total number of species recorded is likely to be an overestimation of that existing within the Project area due to the broader extent of most of the survey events.

Also recorded within the Project area, were 9 introduced fauna species - cattle, horses, cats, dogs, pigs, house mouse, rabbits, cane toad, and common mynah. Evidence of their occurrence was widespread.

Table 3-1 Ground-truthed Regional Ecosystems within the Project Area

RE	Short Description (Queensland Herbarium 2019)	VMA Class	Biodiversity Status
11.3.4	*Eucalyptus tereticornis* and / or *Eucalyptus spp*. woodland on alluvial plains.	Of concern	Of concern
11.3.11	Semi-evergreen vine thicket on alluvial plains.	Endangered	Endangered
11.3.12	*Melaleuca viridiflora M. argentea* +/- *M. dealbata* woodland on alluvial plains.	Least concern	No concern at present
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Least concern	Of concern
11.3.27	Freshwater wetlands - Palustrine or Lacustrine wetland (e.g. vegetated swamp or lake).	Least concern	Of concern
11.3.35	*Eucalyptus platyphylla*, *Corymbia clarksoniana* woodland on alluvial plains.	Least concern	No concern at present
11.4.2	*Eucalyptus spp*. and / or *Corymbia spp.* grassy or shrubby woodland on Cainozoic clay plains.	Of concern	Of concern
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains.	Endangered	Endangered
11.5.8	*Melaleuca spp*., *Eucalyptus crebra*, *Corymbia intermedia* woodland on Cainozoic sand plains and/or remnant surfaces.	Least concern	No concern at present
11.11.1	*Eucalyptus crebra* +/- *Acacia rhodoxylon* woodland on old sedimentary rocks with varying degrees of metamorphism and folding.	Least concern	No concern at present
11.11.15	*Eucalyptus crebra* woodland on deformed and metamorphosed sediments and interbedded volcanics.	Least concern	No concern at present

4. MNES and MSES Species

The Project's EIS and SEIS present detailed results of the terrestrial ecology assessment.

One threatened ecological community (TEC) is known to occur within the Project area, i.e.: Brigalow (*Acacia harpophylla* dominant and codominant). This TEC is listed as Endangered under the EPBCA. The results of ground-truthed mapping shows that there is 3.91 ha of the Brigalow TEC within the Project area. Small patches of Semi-evergreen vine thickets (SEVT) of the Brigalow Belt (north and south) and Nandewar Bioregions (SEVT TEC) have been recorded adjacent to the Project area, along Tooloombah Creek. Field surveys identified a small patch of SEVT TEC intersected by the western boundary of ML 80187, north of the Bruce Highway. Most of this patch of SEVT is located outside the Project area and is associated with the alluvial terraces and riparian vegetation of Tooloombah Creek. The total patch size is 1.14 ha, however only 0.0013 ha is within the Project area. This TEC is listed as Endangered under the EPBCA.

No flora species listed as threatened under either the EPBCA or NCA was recorded within (or expected to occur within) the Project area.

A total of 11 conservation significant fauna species listed under the EPBCA and / or the NCA are considered known or likely to occur within the Project area or near surrounds as listed in **Table 4-1**.

Although it is considered highly unlikely that the species Collared Delma (*Delma torquata*) would occur within the Project area itself given there is no suitable habitat present, there is considered potential for the Collared Delma to occur within habitat to the south of the Project area and the species has been included in this SSMP as a precautionary approach.

The following sections provide key information on each of these MNES and Matters of State Environmental Significance (MSES) species covered by this SSMP.

Table 4-1 MNES and MSES Fauna Known or Likely to Occur

Species	Status		Migratory Shorebird
	NC Act	EPBC Act	
Greater glider (*Petauroides Volans*)	V	V	
Koala (*Phascolarctos cinereus*)	V	V	
Ornamental snake (*Denisonia maculata*)	V	V	
Squatter pigeon (southern subspecies) (*Geophaps scripta scripta*)	V	V	
Short-beaked echidna (*Tachyglossus aculeatus*)	SL		
Fork-tailed swift (*Apus pacificus*)	SL	M	
Glossy ibis (*Plegadis falcinellus*)	SL	M	
Latham's snipe (*Gallinago hardwickii*)	SL	M	x
Oriental cuckoo (*Cuculus optatus*)	SL	M	
Rufous fantail (*Rhipidura rufifrons*)	SL	M	
White-throated needletail (*Hirundapus caudacutus*)	V	V, M	

4.1. Koala

The Koala *Phascolarctos cinereus* was listed as *Vulnerable* under the EPBCA in May 2012. The listing status of the Koala in Queensland is Vulnerable under the NCA. There is no Commonwealth or State recovery plan for the Koala (DE 2020a; DES 2020). No Threat Abatement Plan has been identified as being relevant for this species (DE 2020a).

The following summarises key aspects of the Koala's biology and ecology as described within Melzer & Tucker 2011, SEWPaC 2012, Flint & Melzer 2013, Melzer *et al.* 2014 & 2018, Ellis *et al.* 2018, DE 2020a, and research referred to therein:

- The Koala is a folivore, with a diet restricted mainly to leaves of *Eucalyptus* spp. and related genera (including *Corymbia* spp., *Angophora* spp. and *Lophostemon* spp.).
- The diet of individual Koalas is usually limited to one or a few of the species present at a site. Dietary preferences (i.e. preferred tree species) can vary between regions or seasons.
- In areas of suitable habitat, Koalas also show strong preferences for individual trees.
- In humid tropical woodlands/forests of the Central Queensland Coast Bioregion, higher Koala densities have been associated with communities where *Eucalyptus tereticornis*, *E. platyphylla*, *E. drepanophylla*, and / or *Corymbia clarksoniana* have been abundant. Within the Brigalow Belt North bioregion, tree species thought to be favoured in subhumid tropical woodland / forests include *E. coolabah*, *E. tereticornis*, *E. populnea*, and *E. crebra*. A study within the Clarke Connors Range (134 observational records and analysis of faecal samples) suggest a preference for *E. tereticornis*, with *E. drepanophylla / E. crebra* also forming part of the diet of Koalas in this area.
- Research in part of the Central Queensland Coast Bioregion (around St. Lawrence) indicates that eucalypt forests and woodlands in lower-lying, better-watered parts of the landscape are the main koala habitat in this region. Vegetation communities ranked with the highest likelihood for Koala occurrence were REs 11.3.4[3], 11.3.25[4], and 11.3.29[5].
- The Koala is not territorial and individual home ranges extensively overlap. Individuals tend to use the same set of trees, but generally not at the same time.
- Individual home ranges are variable, with animals in 'poorer' habitats having larger home ranges than animals in areas of higher quality habitat[6]. On average, males usually have larger home ranges than female Koalas. Koalas are known to increase movement and home range size during the breeding season between September and March.
- Female Koalas can potentially produce up to one offspring each year (with an average of 0.3 - 0.8 offspring per year), with births occurring between October and May. Young Koalas are independent from 12 months of age.
- Longevity in the wild is >15 years for females and >12 years for males. Generation length has been estimated to be 6-8 years.
- Average Koala densities within the Brigalow Belt North Bioregion have been variously estimated at 0.155 and 0.01 to 0.005 Koalas / Ha. A study conducted approximately 45 km to the north of the study site provided an estimated density of 0.12 koalas / Ha (based on 64 km of linear transect surveyed in woodland near St. Lawrence).
- The key identified threats to Koalas are habitat loss and fragmentation, vehicle strike, disease, and predation by dogs. Drought and extreme heat are also known to cause significant mortality amongst Koalas, and post-drought recovery may be substantially impaired by other threatening factors.

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[3] *Eucalyptus tereticornis* and/or *Eucalyptus* spp. tall woodland on alluvial plains.
[4] *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.
[5] *Eucalyptus crebra*, *E. exserta*, *Melaleuca* spp. woodland on alluvial plains.
[6] Ellis *et al.* (2018) assessed radio-tracking data for Koalas throughout parts of the Clarke Connors Range and considered home ranges in the order of 3-10 Ha as standard in woodlands of central Queensland (though also noting considerable variation between individuals), compared to larger ranges of up to 100 Ha observed further inland (e.g. Blair Athol).

- Loss of habitat, attrition of populations due to mortality of animals on roads and rail lines and increasing development along resource corridors have been identified as key threats to Koala populations in central Queensland.

4.1.1. Occurrence – Project Area and Surrounding Area

Koalas have previously been recorded within the north-west corner of the of the Project area during surveys in 2017 and 2018 (CDM Smith 2018). On these surveys, evidence was recorded from Poplar Box (*Eucalyptus populnea*) woodland (RE11.4.2) and Poplar Gum (*Eucalyptus platyphylla*) woodland. CDM Smith (2018) considered Forest Red Gum communities along creeks were likely the most favoured habitat for Koala although it evidently occurs in low population density throughout the Project area.

The 2019 surveys provided widespread evidence of Koala presence, including observations of eight individual Koalas, as well as an adult female with joey (Austecology 2020a). Whilst these surveys provided a primary focus on Deep Creek and associated habitats, records of Koalas and evidence of their occurrence were drawn from a variety of vegetation communities, including woodlands dominated by Gum-topped box (*Eucalyptus moluccana*), Clarkson's Bloodwood (*Corymbia clarksoniana*), Carbeen (*C. tessellaris*) and Narrow-leaved Ironbark (Austecology 2020a).

Melzer *et al.* (2018) describe a series of Koala records extending north approximately 25 to 45 km north of the study site[7], as well as scattered Koala records to the near west of Mount Buffalo State Forest, approximately 35 km north-west of the Project area.

4.2. Greater Glider

The Greater Glider *Petauroides volans* was listed as Vulnerable under the EPBCA in May 2016. The listing status of the Greater Glider in Queensland is Vulnerable under the NCA. There is no Commonwealth or State recovery plan for the Greater Glider (DE 2020b; DES 2020). No Threat Abatement Plan has been identified as being relevant for this species (DE 2020b).

The following summarises key aspects of the Greater Glider's biology and ecology as cited in Kehl & Boorsboom 1984, Eyre 2006, Smith *et al.* 2007, Woinarski *et al.* 2014, TSSC 2016, Burbidge & Woinarski 2016, and research referred to therein:

- Although broad in its distributional range, the Greater Glider is an ecological specialist.
- The Greater Glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. An isolated inland subpopulation occurs in the west of Townsville (Gregory Range), and another in the Einasleigh Uplands. Greater Gliders are typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.
- Forest stand and landscape scale habitat selection was investigated at 506 survey sites sampling a variety of forest types in southern Queensland. That work found that while Greater Gliders were detected in a wide range of forest types, they were most abundant in the more productive, tall eucalypt forests. The generated model predicted that *Corymbia citriodora* and *Eucalyptus tereticornis* were important in greater glider habitat selection, as were live hollow-bearing trees.
- The Greater Glider is arboreal and nocturnal, largely restricted to eucalypt forests and woodlands.
- The Greater Glider is primarily folivorous, with a diet mostly comprising eucalypt leaves, selecting young leaves with higher concentrations of nitrogen and lower ligno-cellulose content than mature

[7] Melzer & Tucker (2011) systematically surveyed forest and woodlands near the Bruce Highway from the St Lawrence Connection Road south to Granite Creek. In this area, koalas were associated with alluvial and gently undulating plains where associated low hills and rises support woodlands with *Eucalyptus crebra*, *E. platyphylla*, and *E. exserta*, as well as *E. tereticornis*.

leaves. They favour forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Distribution may be patchy even in suitable habitat.

- Greater Gliders shelter in tree hollows by day; favours large hollows in large, old trees. Abundance of Greater Gliders has been strongly linked to relative abundance of tree hollows.
- The species requires a variety of den trees which are used at different times within habitat occupied. Research within the drier inland of southern Queensland found that large (dbh >50 cm) and old living trees (in deteriorating and senescent condition: 'late mature' and 'over-mature' categories) were primarily used as den trees, with individual gliders utilising 4–20 den trees. Females utilised more den trees per unit area of home range (3.8 den trees / Ha, maximum) than males (0.9 den trees / Ha, maximum). Greater Gliders used older living "over mature' trees more than expected by their availability (scarce in study forest), presumably because of the hollows they contained.
- The Greater Glider has one of the highest known demands for hollows of any of the arboreal marsupial species that inhabit the sclerophyll forests of eastern Australia, utilising up to 20 hollows per 2 Ha of home range.
- Home ranges are typically relatively small (1 to 4 Ha) but are larger in lower productivity forests and more open woodlands (up to 16 Ha). In a study forest of the drier inland of southern Queensland, mean home range areas varied from 3.3 to 11.5 Ha for males and females respectively (population density of 1.6 to 2.3 individuals Ha^{-1}). This contrasts with the findings within coastal lowland forest in south-east Queensland with mean home range areas of 2.6 Ha (males) and 2.5 Ha (females), with a population density of 1.6 to 2.3 individuals Ha^{-1}.
- Sexual maturity is reached in the second year, and females give birth to single young, from about March to June.
- Greater Gliders are considered to be poor dispersers across open / cleared areas and vegetation that is not native forest.
- They are sensitive to forest clearance, habitat fragmentation and wildfire, and have relatively low persistence in small forest fragments.
- Low reproductive rate (with generation length likely to be 7-8 years) may render small isolated populations in small remnants prone to extinction.
- Modelling suggests that they need native forest patches of at least 160 km^2 to maintain viable populations.
- Key threats to the Greater Glider include habitat loss and fragmentation, intense or frequent fires (and destruction of senescent trees due to prescribed burning), entanglement in barbed wire fencing, competition for hollows with species which are increasing in abundance (e.g. sulphur-crested cockatoos). The cumulative effects of clearing and logging activities, current burning regimes and the impacts of climate change are a major threat to large hollow-bearing trees on which the species relies.

4.2.1. Occurrence – Project Area and Surrounding Area

Greater Gliders were recorded in 2011 and 2017 surveys within riparian habitat (RE11.3.25) along Deep Creek and nearby woodland within the southern and south-western parts of the Project area (CDM Smith 2018). CDM Smith (2018) considered that REs 11.3.4 and 11.3.25, and 11.11.15a constituted potentially suitable habitat, provided large mature trees with large tree hollows were present in suitable abundance.

The 2019 survey program provided records for 21 individual Greater Gliders (Austecology 2020a). The majority of these records were from riparian vegetation fringing Deep Creek on the eastern side of the Project area – downstream of the Bruce Highway. A high proportion of the records were of gliders observed within *Corymbia tessellaris* (Carbeen), a feed tree species which is common along Deep Creek. Other glider records were mostly of animals observed in large, hollow-bearing *Eucalyptus tereticornis* (Forest Red Gum) which were relatively common along Deep Creek. In addition to the animals recorded from riparian habitat, several Greater Gliders were also recorded in woodland extending west from the central section of Deep Creek.

Investigations undertaken by Austecology (2020a) provided evidence that areas of riparian habitat outside of the Project area (whilst not assessed in detail) support suitable habitat for Greater Glider, i.e. further downstream (Deep Creek), adjacent and to the near north (Tooloombah Creek), and upstream (Barrack Creek) of the Project area. The 2019 surveys also indicated that remnant woodland within the northern part of the Project area (adjacent to Tooloombah Creek) and within the southern part of the Project area (adjacent to Deep Creek) appear to support potentially suitable habitat for Greater Gliders (Austecology 2020a).

Searches of the Queensland Government's Wildlife Online database show that there are seven records between 30 to 50 km of the centre of the Project area (Austecology 2020a). There were no records for Bukkulla Conservation Park, Tooloombah Creek Conservation Park, Marlborough State Forest, Eugene State Forest, or Mount Buffalo State Forest (DSITIA 2020). Whether the paucity of previous records from these areas is due to limited survey effort/coverage or reflects a patchy/sparse distribution in the region is not known.

4.3. Squatter Pigeon (southern)

The Squatter Pigeon (southern) *Geophaps scripta scripta* is listed as *Vulnerable* under the Commonwealth's EPBCA and Queensland's NCA.

In 2000, the Action Plan for Australian Birds described the disappearance of the Squatter Pigeon (southern) in New South Wales, though present throughout its range in eastern Queensland (Garnett *et al.* 2000). The updated Action Plan did not list this subspecies, citing the reason being "no recent declines and persists at numerous sites across a broad distribution." (Garnett *et al.* 2011). The subspecies is listed as Least Concern under the Action Plan for Australian Birds 2010.

There is no Commonwealth or State recovery plan for the Squatter Pigeon (southern) (DE 2020c; DES 2020). DE (2020c) identifies the following Threat Abatement Plans as relevant to the Squatter Pigeon (southern):

- Threat abatement plan for predation by feral cats (DE 2015a);
- Threat abatement plan for competition and land degradation by rabbits (DEE 2016); and
- Threat abatement plan for predation by the European red fox (DEWHA 2008a).

Whist the subspecies seems fairly abundant in the central and northern parts of its range in Queensland, populations south of the Carnarvon Ranges are highly fragmented as a result of extensive land clearing (Squatter Pigeon Workshop 2011). All relatively small, isolated and sparsely distributed sub-populations occurring south of the Carnarvon Ranges in Central Queensland are considered to be important sub-populations of the subspecies (DE 2020c). The subspecies remains common north of the Carnarvon Ranges in Central Queensland and is considered to be distributed as a single, continuous (i.e. inter-breeding) sub-population (DE 2020c).

The southern subspecies typically occurs in dry grassy open forests to sparse eucalypt woodlands, on free draining soils, often sandy, or gravelly (Squatter Pigeon Workshop 2011). Soil type is thought to be a useful predicator of where the subspecies occurs naturally (Agnew 2007). A patchy cover of native perennial tussock grasses contributing to about 30% foliage projective cover, is considered to be important as suitable foraging habitat (Agnew 2007; DE 2020c). As a granivore, daily access to water to drink is essential, thus proximity to water is also a useful predictor of occurrence within the landscape (Agnew 2007; Squatter Pigeon Workshop 2011).

The Squatter Pigeon (southern) remains common in much of central Queensland, in both cleared and relatively intact landscapes, though less common where Buffel Grass *Cenchrus ciliaris* dominates the grass cover (Reis 2012; L. Agnew, unpub. data.). Disturbed areas where the sub-species has been recorded foraging include cattle yards, road and railway easements, and sown pastures with scattered trees (Squatter Pigeon Workshop 2011).

Squatter Pigeons (southern) tend to be found in small flocks, pairs, or family groups (Reis 2012). In central Queensland, the average flock size for one data set analysed (n = 348) was about 3 birds per record (Agnew 2007).

Larger scale movements and/or dispersal are not well understood, with the subspecies thought to be locally dispersive in response to changes in reliable water sources during the dry season, and droughts, though otherwise relatively sedentary (Squatter Pigeon Workshop 2011; L. Agnew, pers obs.). No long-distance seasonal movements have been recorded (Higgins & Davies 1996).

There are significant knowledge gaps with regards to the characteristics of breeding habitats and the feeding ecology of the subspecies within modified habitats (Squatter Pigeon Workshop 2011). There are few published nesting records within the scientific literature, though it is widely accepted that breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011 in DE 2020c). The nest is a shallow depression scraped into the ground beneath a tussock of grass (L. Agnew, pers obs.), bush, fallen tree or log and sparsely lined with grass (Higgins & Davies 1996).

Current threats to Squatter Pigeon (southern) include ongoing vegetation clearance and fragmentation, overgrazing of habitat by livestock and feral herbivores such as rabbits (*Oryctolagus cuniculus*), introduction of weeds, inappropriate fire regimes, thickening of understorey vegetation, predation by feral cats (*Felis catus*) and foxes (*Vulpes vulpes*), trampling of nests by domestic stock (TSSC 2015).

4.3.1. Occurrence – Project Area and Surrounding Area

The Squatter Pigeon (southern) has been recorded during most surveys within the Project area (2011-2019). The majority of those records derive from the central southern part of the Project area (either side of the Bruce Highway). This part of the project area has been cleared and is grazed by cattle, though dams are present.

Austecology (2020b) posited that given the presence of water would attract Squatter Pigeons, that birds are easier to detect in these open grazed pastures and often close to tracks, and that these areas are the main entry / exit points to the Project area for survey personnel, it is not surprising that there is a concentration of records within this part of the Project area. Similar circumstances may also help to explain a 'concentration' of records along Kooltandra Road which is adjacent to the eastern side of the project area (Austecology 2020b).

Austecology (2020b) concluded that abovementioned habitat within the central southern part of the Project area, does not support the combination of habitat conditions or resources which are consistent with where Squatter Pigeons have been observed to nest, i.e. woodland on stony rises occurring on sandy or gravelly soils, within about 1 km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011 in DE 2020c; L. Agnew unpub. data).

Squatter Pigeons have also been recorded within remnant vegetation throughout the Project area, including RE 11.3.35, RE 11.4.2, RE 11.5.8a, and RE 11.11.15. In areas of remnant vegetation adjacent to the project area, Squatter Pigeons have been recorded in RE 11.5.8 / 11.7.2 and RE 11.11.15a (CDM Smith 2018; Austecology 2020a).

Habitat suitability assessments indicate that the largest patch of comparatively higher quality habitat for Squatter Pigeon (southern) is located off-site, and to the near south of the Project area (Austecology 2020b). This habitat forms part of a much larger, contiguous area of remnant woodland which extends to the south-west and south through to the upper section of Deep Creek.

Habitat within this area includes important areas of open woodland on low rises with gravelly to stony soils (e.g. RE 11.11.15a; Queensland Herbarium 2019) and generally consistent with the information on habitat where Squatter Pigeons nesting has been recorded (Squatter Pigeon Workshop 2011 in DE 2020c; L. Agnew unpub. data). There are also a variety of locations (<1 km of potential nesting habitat), where water would be locally available throughout the year, i.e. a combination of dams and standing water within the upper sections of Deep Creek.

Meyer (2011 & 2012) recorded the Squatter Pigeon (southern) at a variety of locations within the surrounding area. Searches of the Queensland Government's Wildlife Online database confirm 25 records within 30 km of the Project area (Austecology 2020b).

4.4. Collared Delma

The Collared Delma *Delma torquata* is listed as *Vulnerable* under the Commonwealth EPBCA. The listing status of the Collared Delma in Queensland is Vulnerable under the NCA. There is no Commonwealth or State recovery plan for the Collared Delma (DE 2020d; DES 2020). No Threat Abatement Plan has been identified as being relevant for this species (DE 2020d).

The following summarises key aspects of the Collared Delma's biology and ecology as cited in Porter 1998, Hines *et al.* 2000, Porter 2006, QEPA 2006a, BBRW 2010, Peck 2012, Sanderson *et al.* 2018, DE 2020d, and research referred to therein:

- The Collared Delma is endemic to Queensland, with highly restricted, disjunct populations extending from the outer Brisbane western suburbs north to near Blackwater (Blackdown Tablelands NP) and west to Roma, central Queensland. The total number of known localities for this species has increased with surveys (since ~ 2000) but population sizes are unknown.
- The Collared Delma is regarded as a cryptic reptile, typically associated with rocky sloped or ridge-top areas, often westerly-facing, in eucalypt and acacia dominated woodland with ground cover comprising native grasses, thick leaf litter, and an abundance of loose surface rocks.
- Within this habitat the Collared Delma can be located under weathered loose rocks, flattish bedrock outcroppings, logs or mats of leaf litter, or in cracks and crevices among tussock grasses.
- Collared Delmas have been recorded from a variety of soil types, though the presence of rocks, logs, bark and other coarse woody debris, and mats of leaf litter (typically 30–100 mm thick) are thought to be essential microhabitat characteristics and always present where the species occurs.
- The Collared Delma has also been recorded from eucalypt-dominated woodlands and open forests on alluvium of river and creek flats, and brigalow communities on cracking clay soils in low lying areas.
- Key factors that may contribute to the decline of the Collared Delma include: land clearing for agriculture, pastoralism, urban development, and resource extraction; overgrazing (compacting soil, making it difficult to find suitable shelter); removal of rocks, logs and timber (reduction in available shelter); inappropriate fire regimes (impact to invertebrate prey populations; and removal of the understorey layer (particularly leaf litter and woody debris); and weed invasion (e.g. *Lantana montevidensis*).

4.4.1. Occurrence – Project Area and Surrounding Area

The Collared Delma has not been recorded within the Project area. Specific target species searches (active ground searches) were included in the 2012 fauna surveys for Collared Delma (Meyer 2012). Target surveys were implemented in what was considered to be potentially suitable habitat within the elevated areas of Mamelon Station.

The habitat was described as a rocky hill slope with remnant mixed eucalypt woodland with abundant loose rock, leaf litter and fallen timber in the west of Mamelon station. Meyer (2012) concluded that the area appeared highly suitable for the Collared Delma. The surveyed habitat is located adjacent and to the south-west of the Project area.

The Draft referral guidelines (SEWPaC 2011a) describes 'suitable habitat' for Collared Delma as: 'Open-forests, woodlands and adjacent exposed rocky areas in QLD RE Land Zones 3, 9 and 10.' Habitat suitability assessments across the Project area demonstrate that Land Zone 3 habitats do not support suitable conditions or resources for Collared Delma (L. Agnew & E. Meyer, December 2019, unpub. data)[8]. Conversely, those assessments indicate that potentially suitable habitat occurs offsite, and south-west of the Project area, i.e. RE 11.10.7. Habitat within RE 11.10.7 includes the habitat searched by Meyer (2012) and described then as highly suitable for the Collared Delma. These habitats do not appear to have been subjected to low stock grazing pressure and weeds are uncommon (S. Danielsen, 2019 *pers comm.*). It should be noted that there is no habitat which occurs on Land Zone 9 within the project area.

Searches of the Queensland Government Wildlife Online show that there are no records within 100 km of the centre of the Project area (Austecology 2020b). Searches of the Atlas of Living Australia database list a single record from Blackdown Tableland National Park (SEQ Comprehensive Regional Assessment Fauna Survey, 24/11/1997). Blackdown Tableland National Park is approximately 130 km to the south-west of the project area, and represents the closest record of Collared Delma.

4.5. Ornamental Snake

The Ornamental Snake *Denisonia maculata* is listed as *Vulnerable* under the Commonwealth's EPBCA and Queensland's NCA.

The diet of the Ornamental Snake consists predominantly of frogs (Shine 1983). The species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland Regional Ecosystem Land Zone 4, but also lake margins and wetlands (Agnew 2010 cited in DE 2020e; Brigalow Belt Reptiles Workshop 2010; and Wilson & Knowles 1988).

The most common REs in which the species has been recorded is RE 11.4.3. Other common RE types where the species has been recorded are (Agnew 2010 cited in DE 2020e; Brigalow Belt Reptiles Workshop 2010): RE 11.4.3; RE 11.4.6; RE 11.4.8; and RE 11.4.9[9]. Other REs where the species has been recorded (Agnew 2010 cited in DE 2020e) are: RE 11.3.3 and RE 11.5.16.

Sites where Ornamental Snakes have been recorded in abundance share the following habitat characteristics (Agnew 2010 cited in DE 2020e):

- They are located within the lowest part of the catchment. The Ornamental Snake has been found in greatest numbers in shallow water where some aquatic vegetation is present, or where fringing groundcover vegetation has been inundated, especially in flooded gilgais where the dominant aquatic macrophyte is Bog Hyacinth (*Monochoria cyanea*).
- They have diversity of gilgai size and depth (if deep, then broad with gently sloping gradients at the sides.
- There are soils of high clay content and deep-cracking characteristics. Water retention capacity increases with an increase in the fine clay particle fraction of soils. This, in turn, influences certain habitat conditions that are important for the Ornamental Snake and the frog species it preys upon. Cracking clays with higher sand and more sodic cracking clays, often associated with Brigalow / Belah-dominated communities, have a lower fine clay particle fraction and are likely to have lesser water retention capacity.
- Ground timber is usually relatively common (especially piles adjacent to or close by to gilgais).

[8] Essential microhabitat characteristics which are either absent or in such depauperate states due to unsuitable geology and / or a long history of land degradation, include: rock slabs; logs; and mats of leaf litter (3 to 10 cm thick). Further, cattle grazing has resulted in soil compaction, degraded understorey characteristics (i.e. native tussock grass ground cover, leaf litter and woody debris), and invasion of weeds (invasive grasses and woody weeds).

[9] Whilst several of the above RE descriptions make reference to Belah, it has tended to be absent or rare where the Ornamental Snake has been recorded in surveys conducted by Agnew (Agnew 2010 cited in DE 2020e).

- Where burrowing frogs (*Cyclorana* species) are abundant.
- Habitat patches are typically greater than 10 hectares in area and are within, or connected, to larger areas of remnant vegetation.

4.5.1. Occurrence – Project Area and Surrounding Area

The Ornamental Snake has not been recorded within the Project area. CDM Smith (2018) undertook surveys and habitat suitability assessments for the Ornamental Snake across the Project area. CDM Smith (2018) concluded that 'Whilst cracking clay soils with gilgais and regrowth Brigalow habitat is widespread in the ML north of the Bruce Highway, structural habitat conditions (soils and gilgais) are poorly developed and the depauperate nature of key resources (fallen timber) indicate that it is unlikely that this habitat supports a productive set of conditions and resources required for this species.'

There are two records 3.5 km west, and one record 5.8 km northwest, of the Project area (CDM Smith 2018). Those records from 2011 are from locations associated with remnant RE 11.4.9 (CDM Smith 2018).

4.6. White-throated Needletail

The White-throated Needletail *Hirundapus caudacutus* is listed as *Vulnerable*, and as *Migratory* under the Commonwealth's EPBCA. The species is listed as Least Concern under the Action Plan for Australian Birds 2010 (Garnett *et al.* 2011).

A large proportion of the White-throated Needletails (nominate subspecies *caudacutus*) occur in Australia as non-breeding visitors (mid-May to late-February; DE 2020f). The White-throated Needletail is widespread in eastern and south-eastern Australia. The species is almost exclusively aerial, where they forage for a variety of flying insects along the edges of low-pressure weather systems.

Whilst the species has been recorded over most types of habitat (natural remnant, non-remnant, urban, pastures, etc.), they are thought to be more regularly recorded above wooded areas, including open forest and rainforest, though may also fly between trees or in clearings (Higgins 1999).

Due to the limited nature of any threats to the species (within Australia) and its mobility, there are no threat abatement or recovery actions either underway or proposed (DE 2020f). Furthermore, there have been no mitigation measures developed specifically for this species (DE 2020f).

The White-throated Needletail was recorded over the Project area in November 2017 (CDM Smith 2018).

DE (2015c) regard 'important habitat' as 'Large tracts of native vegetation, particularly forest, may be a key habitat requirement for species. Found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces. Appears to have traditional roost sites." There is habitat which is consistent with the description, though that habitat area is to the west of the Project area – and will be retained. DE (2015c) does not list any invasive species harmful to White-throated Needletails.

4.7. Short-beaked Echidna

A special least concern animal is listed under Queensland's *Nature Conservation (Wildlife) Regulation* 2006 (Part 2 Division 5 Section 34 (3)). As described under (Section 34 (2) 'The proposed management intent for each special least concern animal includes ensuring each person exercising a power or carrying out a function for a State government agency has regard to, when exercising the power or carrying out the function – (a) the special cultural significance of the animal; and (b) the need to conserve existing populations of the animal.'

In Queensland, there is no 'conservation plan' prepared for the Short-beaked Echidna (*Tachyglossus aculeatus*).

Evidence of Short-beaked Echidna (scats and individuals) has been recorded across the Project area throughout surveys from 2017 to 2019 (CDM Smith 2018; Austecology 2020a). Echidnas were also recorded on remote cameras from September to December 2017 at sites adjacent and to the south of the Project area (CDM Smith 2018).

The Short-beaked Echidna is Australia's most widespread native mammal, occurring in almost all terrestrial habitats except for intensively managed farms (Augee & Gooden 1993; Augee 2008). Echidnas are solitary (except in breeding season), with an average home range of 50 Ha, where they forage for ants and termites (Augee & Gooden 1993). Areas which are known to have high densities of Echidnas are all areas with abundant fallen and dead trees (decaying tree stumps and hollow logs provide sources of termites) (Augee & Gooden 1993). When avoiding extreme temperatures requires insulation from the environment, Echidnas seek shelters such as deep rock crevices, burrows or large hollow logs, otherwise Echidnas find take refuge wherever appropriated during periods of inactivity (Augee & Gooden 1993; Augee2008).

4.8. Migratory Bird Species

Migratory species listed under international agreements to which Australia is a party are protected under the Australian Government's EPBCA. Listed migratory species under the provisions of the EPBCA, are those listed in the:

- *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention);
- *China-Australia Migratory Bird Agreement* (CAMBA);
- *Japan-Australia Migratory Bird Agreement* (JAMBA); and / or
- *Republic of Korea-Australia Migratory Bird Agreement* (ROKAMBA).

4.8.1. Fork-tailed Swift

The Fork-tailed Swift (*Apus pacificus*) has not been recorded within the Project area.

For database searches within 100 km of the Project area, there are five records within 80 to 90 km of the Project area (DSITIA 2020).

The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia (Higgins 1999). In regard to Queensland, DE (2020g) note the following '… that there are scattered records of the Fork-tailed Swift in the Gulf Country, and a few records on Cape York Peninsula. In the north-east region there are many records east of the Great Divide from near Cooktown and south to Townsville. They are also widespread but scattered in coastal areas from 20° S, south to Brisbane and in much of the south south-eastern region. They are more widespread west of the Great Divide, and are commonly found west of the line joining Chinchilla and Hughenden. They are found to the west between Richmond and Winton, Longreach, Gowan Range, Maraila National Park and Dirranbandi. They are rarely found further west to Windorah and Thargomindah (Higgins 1999).'

The species is almost exclusively aerial, where birds forage for a variety of flying insects along the edges of low-pressure weather systems. As a wide-ranging aerial species, the Fork-tailed Swift could occur over any part of the Project area during the non-breeding season.

There are no significant threats to the Fork-tailed Swift in Australia (DE 2020g). Due to the wide range of the species the potential impacts are thought to be negligible (Birdlife International 2009). DE (2015c) does not list any invasive species harmful to Fork-tailed Swifts.

DE (2015c) regard 'important habitat' as 'Non-breeding habitat only: Found across a range of habitats, from inland open plains to wooded areas, where it is exclusively aerial.' There is habitat which is consistent with the description, as with the Fork-tailed Swift, large wooded areas of habitat occur to the west of the Project area – and will be retained.

4.8.2. Rufous Fantail

There is an incomplete description of a record for Rufous Fantail within the Project area ('recorded on March 2011 survey although location unknown'; CDM Smith 2018).

For database searches within 100 km of the Project area, there are three records of this species within 20 to 30 km, and a further four records within 40 to 50 km of the Project area (DSITIA 2020).

The Rufous Fantail occurs in coastal and near coastal districts of northern and eastern Australia (Higgins *et al.* 2006). In the northern part of its distribution, Rufous Fantails often occur in tropical rainforest and monsoon rainforests, including semi-evergreen mesophyll vine forests, semi-deciduous vine thickets or thickets of Paperbarks (*Melaleuca* spp.) (Higgins *et al.* 2006). Storr (1984) regards the species as migratory, moving north through Queensland in February-April and south in September-November, with breeding in the highlands of southern Queensland.

DE (2015c) regard 'important habitat' as 'Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands and Brigalow shrublands.' DE (2015c) regards the Black Rat *Rattus rattus* and invasive vines of riparian habitat (e.g. rubber vine *Cryptostegia grandiflora*) as invasive species' harmful to the Rufous Fantail.

There is no adopted or made Recovery Plan for this species, and no Threat Abatement Plan has been identified as being relevant for this species (DE 2020h).

Within the Project area, potentially suitable habitat occurs denser and wider sections of riparian vegetation along Deep Creek, mainly downstream of the proposed haul road crossing, and upstream of the Bruce Highway. Potentially this species could occur within such habitat, though unlikely to be resident. There is potentially suitable habitat along Tooloombah Creek (adjacent to the Project Area). There is a higher likelihood for occurrence within potentially suitable habitats during passage migration periods.

4.8.3. Oriental Cuckoo

There is an incomplete description of a record for Oriental Cuckoo (*Cuculus optatus*) within the Project area ('recorded on March 2011 survey although location unknown'; CDM Smith 2018).

For database searches within 100 km of the Project area, there is one record of this species within 50 to 60 km, and a further two records within 60 to 70 km of the Project area (DSITIA 2020). In Queensland, Storr (1984) regards the Oriental Cuckoo as a 'passage migrant and non-breeding visitor from eastern Palaeartic (all months, mostly November-Aril). Uncommon in humid and subhumid zones. Open forests and edge of scrubs and closed forests.'

There is no adopted or made Recovery Plan for this species, and no Threat Abatement Plan has been identified as being relevant for this species (DE 2020i).

DE (2015c) regard 'important habitat' as 'Non-breeding habitat only: monsoonal rainforest, vine thickets, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodlands. Frequently at edges or ecotones between habitat types. Riparian forest is favoured habitat in the Kimberley region.' DE (2015c) does not list any invasive species harmful to Oriental Cuckoos.

Within the Project area, potentially suitable habitat occurs denser and wider sections of riparian vegetation along Deep Creek, mainly downstream of the proposed haul road crossing, and upstream of the Bruce Highway. Potentially this species could occur within such habitat, though unlikely to be resident. There is potentially suitable habitat along Tooloombah Creek (adjacent to the Project Area) and the within the Tooloombah Creek Conservation Park (to the near north-west of the Project area). Given the extent of

potentially suitable habitat within Tooloombah Creek Conservation Park, the species may be resident there. There is a higher likelihood for occurrence within potentially suitable habitats during passage migration periods.

4.8.1. Glossy Ibis

Foraging and breeding habitat for the Glossy Ibis (*Plegadis falcinellus*) includes freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation (DE 2020j). It is also occasionally observed in coastal locations including estuaries, deltas, saltmarshes and coastal lagoons. It breeds in dense colonies, from mid-spring to the end of summer, often with other species of ibis and waterbirds (Marchant and Higgins 1990). Outside of the breeding season, the species is nomadic, seeking suitable foraging areas.

The Glossy Ibis feeds on aquatic invertebrates and occurs in terrestrial wetlands, preferring inland freshwater wetlands with abundant aquatic flora (Pringle 1985; and Marchant and Higgins 1990). The glossy ibis roosts in trees and shrubs typically close to water bodies (DE 2020j).

The Glossy Ibis is a migratory and nomadic species occurring throughout the northern hemisphere and over much of Australia. Core breeding habitat for the species is within the Murray-Darling Basin (New South Wales and Victoria), the Macquarie Marshes in NSW and in southern Queensland (DE 2020j). The species is known to move north in autumn and return to the main breeding areas in spring and summer.
The Glossy Ibis was recorded to the north-east of the Project area on a brackish swamp during the September 2011 survey (to the north-east of EPC 1029). The Project area and near surrounds are likely to provide suitable foraging habitat for the species, particularly following heavy rainfall.

4.8.2. Latham's Snipe

The Latham's Snipe (*Gallinago hardwickii*) has previously been recorded within the Project area. CDM Smith (2018) provide the following observations: 'Recorded at a single farm dam on Mamelon Station in February 2017. Several visits to the site were made to ascertain the number of individuals present. Up to 15 individuals were recorded. Single individual observed at large dam to the south of the Project in September 2017. Individuals were also recorded on farm dams in the wider area in November 2017 and January 2018.'

Latham's Snipe breed in Japan and far eastern Russia during the northern hemisphere summer, departing breeding grounds from July to November, and arriving in northern Australia from July to November (Frith *et al.* 1977; Higgins & Davies 1996). Latham's Snipe is a non-breeding visitor to Australia, passing through northern Australia as a passage migrant to south-eastern Australia (Higgins & Davies 1996).

The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia (Geering *et al.* 2007). Most birds spend the non-breeding period at sites located south of the Richmond River in New South Wales, with few (if any) remaining in northern Australia over the austral summer (Frith *et al.* 1977; Higgins & Davies 1996).

Latham's Snipe is regarded as highly dispersive in Australia, with movements in response to rainfall and the availability of food (Frith *et al.* 1977). Latham's Snipe typically inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies, though can also occur on wetland habitat with saline or brackish water, in modified or artificial habitats (e.g. farm dams), and in habitats located close to humans or human activity (Frith *et al.* 1977; Higgins & Davies 1996).

DE (2020k) note that it is difficult to determine which sites are most important for Latham's Snipe in Australia because of difficulties associated with surveying the species, however, six important sites (i.e. those with major populations) have been identified in Victoria, Tasmania and South Australia. DE (2015c) regards

'important habitat" for Latham's Snipe as 'areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals of the species'.

Hansen *et al.* (2016) note that for Latham's Snipe, a total of 300 individuals would be consistent with the threshold for 'international importance', whilst a total of 30 individuals would meet the threshold for 'Nationally important habitat'[10].

The Broad Sound is regarded as a nationally important wetland (QLD003; DEWHA 2008b) and is located to the near north of the Project area. It encompasses the Broad Sound IBA, and area of approximately 119,420 Ha of marine, estuarine and freshwater wetlands, and including extensive areas of suitable habitat for Latham's Snipe, e.g. the Torilla Plain (BirdLife International 2020).

BirdLife International (2020) estimates a population of between 206-500 Latham's Snipe, and as a result, regarded as one of six species populations of IBA trigger species. Further to the east, are the Shoalwater Bay IBA, and Shoalwater and Corio Bays Area Ramsar Site (wetland of international importance). Both the IBAs and the Ramsar wetland site are known to support Latham's Snipe, though have not been comprehensively surveyed to develop population estimates (BMT WBM 2010).

On the Project area, the location where Latham's Snipe were recorded supports approximately 0.4 Ha of potentially suitable (ephemeral) habitat associated with a farm dam. Impacted by cattle, this site is not regarded as important habitat. Seasonal wetland (RE 11.3.27) within the eastern flank of the MLA (though outside the disturbance footprint) supports a small area (approximately 2.5 Ha) of potentially suitable habitat. This area is not regarded as important habitat. There are a variety of other dams across the MLAs and throughout the adjacent surrounds, though none of these could be regarded as important habitat.

[10] The widely accepted and applied approach to identifying internationally important shorebird habitat throughout the world has been through the use of criteria adopted under the Ramsar Convention on Wetlands, i.e. if it supports 1% of the of the individuals in a population of one species (or a total abundance of at least 20,000 waterbirds). Nationally important habitat for migratory shorebirds has be defined using a similar approach to the international criteria, i.e. if it regularly supports 0.1 per cent of the flyway population of a single species of migratory shorebird (or 2000 migratory shorebirds or 15 migratory shorebird species) (after DE 2015b).

5. Potential Impacts and Threats

For each of the species considered known or likely to occur within the Project area or Near surrounds impact assessments have been undertaken and are presented in Project's EIS and SEIS. Those impact assessments have informed the development of this SSMP and the management and monitoring measures outlined in **Section 6**. The Project has the potential to result in direct and indirect impacts on terrestrial vegetation, flora and fauna values as a result of:

- direct clearing of vegetation;
- loss of connectivity due to Project infrastructure;
- groundwater drawdown;
- surface water changes;
- erosion and sedimentation, including erosion of stream banks
- increased dust, noise and lighting;
- increased traffic and transport;
- introduction of non-native species; and
- increased fire risk.

A brief summary of these impacts in relation to the Project is presented below.

5.1. Vegetation Clearing

The Project has been designed to avoid the clearing of remnant vegetation to the greatest extent possible. The total Disturbance Area over the period 2021 to 2031 is 1,372.50 ha with 90% of this area mapped as non-remnant vegetation (1,231.13 ha), previously cleared for cattle grazing. Despite all efforts to avoid the clearing of remnant vegetation the loss of some vegetation within the Project area is unavoidable during the construction phase of the Project. The area of remnant vegetation to be cleared comprises 141.37 ha.

5.2. Loss of Connectivity

Terrestrial habitat connectivity may be disturbed as a result of the Project by obstructing movement of fauna across the open cut pits, spoil areas and dams. The mine area largely occupies already cleared lands. Lands to the immediate east of the Project area are largely cleared. A relatively continuous tract of vegetation extending in a north-south orientation, and which includes Tooloombah Creek Conservation Park, is located to the immediate west of the Project area and is not impacted by the Project. The mine area presently consists of a mosaic of cleared grazing land, regrowth vegetation and some woodland and is unlikely to be used as a corridor by fauna, except for some large, highly mobile species that utilise open grassland such as kangaroos.

The haul road has the potential to reduce north-south remnant habitat connectivity along Deep Creek connecting patchy eucalypt woodlands in the north to larger habitat areas to the south and east. However, it is noted that riparian habitat along both Deep Creek (and a tributary that enters the main creek upstream of the proposed crossing point) is already intersected by the Bruce Highway to the south of the haul road maintaining an existing vegetation gap of approximately 25 m. The remainder of the haul road, TLF and rail loop is located in cleared or sparsely treed non-remnant lands which is unlikely to be used as a corridor for the majority of fauna. Impacts to landscape connectivity because of the Project activities are considered minor at worst.

The layout of the Project and its potential impact on connectivity were assessed using DES' 'Landscape Fragmentation and Connectivity' tool. The results of the assessment indicate no significant impact to connectivity is expected.

5.3. Groundwater Drawdown

Mine dewatering and depressurisation will result in groundwater drawdown near to the proposed mine and extending below parts of Deep, Tooloombah, Barrack and Mamelon Creeks.

Pit progression and associated drawdown will move in a south-easterly direction, and drawdown will extend to beneath Tooloombah Creek within the first three years of operation. Drawdown will not extend below Deep Creek until three to five years after Project commencement. Within the alluvial aquifer, which is the aquifer of importance for GDEs, the model predicts water levels will fall by a maximum of approximately 36 m beneath Deep Creek, and 4 m below Tooloombah Creek and Barrack Creek.

Groundwater drawdown is not predicted to occur beneath the Styx River and therefore loss of potential baseflow in downstream areas is not considered to be a potential impact of the Project. Further upstream, there is the potential for loss of baseflow / enhanced leakage from reduced groundwater inflows into pools in Tooloombah Creek, and to a lesser extent Deep Creek. While drawdown in the vicinity of Tooloombah Creek and Deep Creek is likely to result in a shorter period of pool persistence at some locations, periods of surface water flow will still occur after rainfall and remain largely unchanged from baseline conditions.

Loss of baseflow or enhanced leakage to pools is only relevant to downstream impacts while there is connectivity between the pools and downstream areas (i.e. when the rivers have streamflow). The amount of time some pools remain connected may reduce, however given the highly ephemeral nature of these creeks, this is also unlikely to change much overall from baseline conditions. As such, any impacts are likely to be limited in extent to the particular pools that are affected, rather than to larger regional areas. Pools that have been identified as potentially affected are limited in extent in Tooloombah Creek, with minimal impacts in Deep Creek, which does not have any large persistent pools.

Despite the salinity evident in some of the groundwater samples collected at the Project area and surrounding areas, it has been determined that the salinity in the groundwaters intersected by the Project is derived from regional geochemistry, and not an oceanic saltwater interface (the fresh-seawater interface). If any interface between oceanic saltwater and freshwater does exist within the groundwater in the vicinity of the Project, it will be hundreds of meters below sea level at the location of the pits, or beyond the extent of any drawdown influence from the Project, and would therefore not result in any movement of any interface between seawater and groundwater.

5.4. Surface Water Changes

Water will be managed on site via a number of dams, catchment diversion drains, levees and pipes, with water captured on the site used to supply site water demands.

Dam 1 is the main storage for runoff from active mining areas and groundwater inflows to the open cut pits, and for bulk operational water supply for the site. Dam 1 will also collect undisturbed catchment runoff in the early stages of the Project to provide water supply for mining operations. It will operate with a capacity of 1,800 ML, but will be capable of holding 2,783 ML, and will provide water for the CHPPs, haul road dust suppression, vehicle washdown and fire water. The Project also includes a number of Environmental Dams to collect and contain runoff from various areas and sediment dams to collect and treat runoff from overburden emplacements.

The two major mine pits (Open Cut 1 and Open Cut 2) will require the construction of two catchment diversion drains to divert water runoff around the site to Deep Creek. These will be constructed in a progressive manner as the pits expand, with the drain to the north of the Bruce Highway constructed first. The second drain, to the south of the Bruce Highway, will be constructed around nine years later in the latter half of the Project.

The general potential impacts to surface water systems as a result of the Project are discussed below and can be summarised as follows:

- Point source discharges to waterways – from intentional dam releases, unintentional dam overflow / releases, localised erosion and sedimentation, and spills and leaks, including from waste rock storages or groundwater affected by mining operations (such as from waste rock or in-pit storage).
- Area sources – altered loads from larger catchment areas as a result of land use change, including increases in erosion and sedimentation of waterways, broad based leakage from groundwater and waste rock storages.
- Changes to flow patterns from concentration of flows due to constrictions in flow passages, alterations of floodplain areas, and the like, resulting in changes to erosion, sedimentation and bed load.

These impacts have the potential to affect habitat and / or resources for a range of environmental values reliant on the availability of surface water resources.

5.4.1. Controlled Releases

During wet climatic conditions, controlled releases from Dam 1 to Deep Creek may be required to prevent excessive accumulation of water within the site storages and minimise the risk of uncontrolled discharges to the receiving environment. The controlled release point will be located on the northern boundary of Dam 1 and water directed along an existing drainage line into Deep Creek. The release point will be armoured and fitted with energy dissipation structures to prevent erosion and scour.

Flow based controlled release rules have been developed using the water balance model for the Project, requiring release only during flow in Deep Creek, with the flow rate and maximum EC and sulfate levels determining when and how releases can occur.

To assess the water quality impacts of controlled releases (and uncontrolled overflows – see below) six parameters, including Electrical Conductivity (EC), Arsenic (As), Molybdenum (Mo), Selenium (Se), Vanadium (V) and Sulphate (SO4), were modelled within the water management system and consequent discharges from the site. These parameters were chosen on the basis of geochemistry analysis for the site, which indicates that they are among the key parameters most likely to be present in high concentrations.

The results of the analysis demonstrate that the predicted concentrations of the six parameters at the key points of Deep Creek, Tooloombah Creek and at the confluence of the two creeks are well within the range of the typical historical receiving water concentrations for each element examined.

5.4.2. Uncontrolled Releases

The mine-affected water dams that could potentially overflow directly to the receiving environment if rainfall exceeded the storage design criteria include:

- Dam 1 – spilling to Tooloombah Creek;
- Environmental Dams 2D1 and 2D2 – spilling to Deep Creek; and
- Dam 4 – spilling to Deep Creek.

The water balance model was used to assess the risk of uncontrolled offsite spills from the proposed water management system. Across all storages the annual risk of overflows is considered to be low (between 1 – 10%) and would only occur under wet conditions. There are no modelled predicted overflows from Dam 1 (the largest storage) during median and dry conditions. If uncontrolled discharges do occur, modelling predictions confirm that the concentrations of modelled parameters at key points of Deep Creek, Tooloombah Creek and at the confluence of the two creeks is will be well within the range of the typical historical receiving water concentrations for each element examined.

5.4.3. Accidental Release of Pollutants

The release of pollutants into the surrounding environment and waterways has the potential to degrade stream habitat quality near the site, degrade stream water quality and thereby impact vegetation communities and terrestrial fauna utilising these areas. Without mitigation, potential exists for contaminants to enter waterways including: contaminated mine dewatering runoff; contaminated runoff from waste rock stockpiles; aqueous waste streams including oily waste water (from heavy equipment cleaning); contaminated runoff from chemical storage areas; potentially contaminated drainage from fuel oil storage areas; and general washdown water.

However, standard containment facilities for the storage of fuel, oils and other chemicals will ensure that leaks and spills of these contaminants does not occur. Runoff from Project facilities such as the CHPP / MIA areas and waste rock stockpiles will also be captured in a number of environmental dams (and Dam 1 for Waste Rock Stockpile 2) for re-use or treatment, and therefore will not flow directly to nearby waterways.

The risk of accidental releases is considered low, and therefore potential impacts are as addressed under controlled and uncontrolled releases in the sections above, which were determined to be low.

5.4.4. Flooding and Hydrology

A flood impact assessment found that the impacts of the Project are generally minor with flooding patterns predicted to remain largely unchanged, and the majority of the flood extent continuing to be confined within the banks of Deep and Tooloombah Creeks. Small increases in flood level, up to about 0.20 m, are caused by the proposed haul road crossing, the diversion of local catchment runoff by the Northern Drain and overflows from Dam 1. The study also found that impacts of the Project on flow velocities in the creeks are very small.

The Project is not expected to result in any major changes to the natural hydrological conditions of Tooloombah and Deep Creeks, and therefore to the Styx River. While some runoff within the creek catchments will be captured and retained on site within the mine footprint, the amount of water involved is minimal compared with that entering the creeks as runoff from the broader catchment. In this regard, the ephemeral nature of the creeks and the current flow regime will remain unchanged, and connectivity along the creek systems and into the downstream environments will not be affected.

Surface water modelling shows that there will be no substantial change to the number of no flow days in the system under a mining scenario. Downstream areas will continue to be primarily influenced by the tidal regime of the Styx River estuary and Broad Sound marine environment.

5.4.5. Changes to the Freshwater – Saltwater Interface

The location of highest astronomical tide is generally accepted to occur at the confluence of Deep and Tooloombah Creeks and modelling does not suggest this will change as result of the project. This, combined with the minimal reduction in hydrological regime suggests there will be no change in the location of the freshwater – saltwater interface within surface waters of the Styx River.

5.4.6. Erosion and Sedimentation

Vegetation clearing, mining operations and earthworks required during both construction and operation of the mine activities will expose the land to varying levels of erosion due to a number of factors including soil type, surface slopes and extent of ground coverage, runoff potential and rainfall intensity. Sediment can be mobilised and transported by surface water during rainfall events ultimately discharging into drainage lines which can result in negative impacts on water quality.

The risk of erosion and consequent loss of sediment has been calculated for the Project for both the existing pre-mine condition (baseline) and operationally which accounts for waste rock material, mine water management and the layout of the proposed mine.

The conceptual ESCP describes the proposed strategies and controls for management of erosion and sedimentation based on the site conditions, proposed mine features, seasonal influences, management controls and mitigation measures. This is informed by sediment generation modelling which has been calculated separately for the entire Mamelon Property, the two MLs and the proposed Project Disturbance Area.

The assessment shows that the Project will result in a reduction in the estimated baseline sediment generation rate of 5,037 t/year to approximately 2,297 t/year, due to the proposed water management system, destocking of the undisturbed Project area and Mamelon offset areas and the subsequent managed regeneration of native vegetation on the majority of the Mamelon property. An assessment against the Reef 2050 Water Quality Targets also indicates that the Project will result in a positive contribution through the expected reduction in sediment load reporting to the Styx River.

5.4.7. Summary of Potential Surface Water Impacts

Collectively, the information described above indicates that surface water changes as a result of the Project pose a low risk to environmental values reliant on these resources, both within Tooloombah Creek and Deep Creek, and further downstream. The controlled release strategy will operate to minimise the risk of uncontrolled discharges. When water is released either during controlled releases or in the unlikely event of an uncontrolled spillway overflow, predicted downstream water quality is within historical ranges with insignificant changes found, and as such there will be no impacts on water quality in the downstream environment. Controlled and uncontrolled discharge infrastructure will be designed such that the risk of erosion and scour of drainage lines and creeks is low.

The impacts of the Project on flooding in Tooloombah and Deep creeks are expected to be minor, with flooding patterns predicted to remain largely unchanged and confined within the banks of Deep and Tooloomba Creeks. Impacts of the Project on flow velocities in the creeks are also very small and the Project is not expected to result in any major changes to the natural hydrological conditions of Tooloombah and Deep Creeks, and therefore nor to the Styx River. The ephemeral nature of the creeks and the current flow regime will remain unchanged, and connectivity along the creek systems and into the downstream environments will not be significantly affected. There will be no substantial change to the number of no flow days in the system under a mining scenario. Downstream areas will continue to be primarily influenced by the tidal regime of the Styx River estuary and Broad Sound marine environment. There will be no change in the location of the freshwater – saltwater interface within surface waters of the Styx River.

The Project will reduce the estimated baseline sediment generation rate of 5,037 t/year to approximately 2,297 t/year. An assessment against the Reef 2050 Water Quality Targets indicate that the Project will result in a positive contribution through the expected reduction in sediment load reporting to the Styx River.

5.5. Erosion of Stream Banks

Tooloombah Creek and Deep Creek are highly incised waterways that are likely to be partially reliant on the retention of riparian vegetation for streambank stability. The main channel of Deep Creek has steep sided slopes that are fully vegetated and subject to minimal evident erosion. The loss of riparian vegetation in some areas, either through direct clearing or indirect impacts associated with changes in hydrology or groundwater drawdown, has the potential to compromise the stability of the banks and lead to collapse. Mine water discharge also has the potential to cause local erosion of stream beds and banks, if not managed appropriately.

A description of the geomorphological values of the Project Area concluded that while there could be isolated areas subject to somewhat higher risk of scour compared with baseline conditions, the overall risk of rapid and significant geomorphic change in Tooloombah and Deep creeks and the Styx River due to the proposed mining activity is low. Impacts from the Project on hydraulic variables will be small enough that a rapid geomorphic response would not be expected. Rather, the channel will slowly adjust over the life of the mine to the altered hydraulic conditions through minor changes in bed and floodplain levels, or channel widths.

5.6. Dust

Increased dust resulting from excavations, topsoil stripping, vehicle movement, open cut mining activities, construction of infrastructure and roads, and from coal stockpiles has the potential to impact flora and fauna values within the Project area and Near surrounds.

Trees in urban and industrial areas significantly help to limit the amount of particulate matter (PM) suspended in the air, but PM can have a negative impact on their life (Lukowski *et al.* 2019). Dust can result in negative impacts on plant photosynthesis and productivity (Chaston & Doley 2006; Naidoo & Chirkoot 2006; Saadullah *et al.* 2014), and changes in soil properties which can ultimately impact plant species assemblages' (Farmer 1993; Spencer and Tinnin 1997; Creuzer *et al.* 2016).

The actual impacts on vegetation from coal dust deposition, as opposed to increased atmospheric dust and road dust, has not be widely researched, nor has the impact of dust to fauna, be it from any source, been well studied. There are no current government or other widely accepted guidelines in regard to dust levels or thresholds of relevance to terrestrial fauna.

Modelling of potential dust particle deposition resulting from both Project construction and operation showed that there is no exceedance of any air quality criteria at any sensitive receptor. Sensitive receptors included Tooloombah and Deep Creek, as well as Wetland 1 and 2. All predicted modelled concentrations were below the relevant air quality criteria set by the State under the Environmental Protection (Air) Policy 2019.

5.7. Noise

The potential effects of noise on terrestrial fauna has been previously described as including physiological stress responses, physical damage to hearing organs, increased energy expenditure or physical injury while responding to noise, interference with normal animal activities, and impaired communication (Workman & Bunch 1991, Patricelli & Bickley 2006, Dooling & Popper 2007, Parris & Schneider 2009, and Ortega 2012). The ongoing impacts of these effects can include habitat avoidance, reduced reproductive success and increased mortality. Reactions to noise depend on the type of noise produced, including frequency, loudness, consistency, and duration, with a species' susceptibility to disturbance likely to vary considerably with factors such as age, season, weather, and degree of previous exposure, though also complexed by inter and intra-species variation in responses to adapt acoustically to human-generated noise (Blumstein *et al.* 2003, Leonard & Horn 2005, Francis et al. 2009, Hoskin & Goosem 2010, & Potvin *et al.* 2011).

For species heavily reliant on acoustic communication such as birds and frogs, there can be differential impacts of industrial noise between species (Goosem *et al.* 2007, Parris *et al.* 2009, and Ortega 2012). For example, species with low-pitched songs have been found to be more susceptible to the effects of industrial and transportation noise pollution than species with higher-pitched songs or calls, and ultimately affecting occupancy patterns.

Stimuli duration can vary from abrupt and brief point sources such as gunshots or sonic booms to continuous, extended sources such as the drone of transportation or industrial noise (Pater *et al.* 2009).

Response durations may also range from brief, immediate behavioural responses, such as alerting or flushing, to long-term responses that affect reproductive success of individual and populations (Black *et al.* 1984, Delaney *et al*. 1999, Pater *et al*. 2009, and Francis *et al.* 2009). For some species, sound-level changes of only a few decibels can result in substantial changes in animal responses, though there is evidence to demonstrate notable differences for each combination of species and type of noise (e.g. Grubb *et al.* 1998; Delaney *et al.* 2011).

Persistence of a species in a high-noise environment (e.g. industrial region) may depend on their specific ability to adapt acoustically to human-generated noise (Potvin *et al.* 2011). I n response, some species may rapidly habituate to noises that they learn do not pose a threat whilst disruption of acoustic communication potentially forces others to significantly alter habitat use or abandon otherwise suitable areas. Radle (2007) states the consensus that terrestrial fauna will avoid any industrial plant or construction area where noise or vibration presents an annoyance to them. Additionally, many animals react to new noise initially as a potential threat, but quickly 'learn' that the noise is not associated with a threat (Radle 2007).

The US Department of Transportation (2004) summarises sensitivities of various groups of wildlife as follows:

- mammals (< 10 Hz to 150 kHz; sensitivity at 0-20 dB);
- birds (more uniform than mammals; 100 Hz to 8-10 kHz; sensitivity at 0-10 dB);
- reptiles (poorer than birds; 50 Hz to 2 kHz; sensitivity at 40-50 dB); and
- amphibians (100 Hz to 2 kHz; sensitivity from 10-60 dB).

For Australia, there is no current government or other widely accepted guidelines in regard to noise levels or thresholds of relevance to terrestrial fauna.

Collectively, research findings reviewed for this assessment indicate that intentional noise disturbance below 65.5 dB(A) was less likely to elicit strong behavioural responses (Gourdie & Jones 2004, Dooling & Popper 2007, Parris & Schneider 2009 (terrestrial birds); Wright *et al.* 2010, Cutts *et al.* 2009 (waterbirds); Brown 1990 (seabirds); Black et al. 1984 (waterbirds & shorebirds); Schaub *et al.* 2008, Siemers & Schaub 2011 (microchiropteran bats); and Manci *et al.* 1988 (insectivorous mammals). In the absence of national guidelines, and based on the findings of the applied research literature, a threshold level of LAeq of 65 db(A) be considered as a screening tool for ecological noise impacts.

Under pre-mining conditions, the Project area would experience noise and vibration levels typical of rural areas, with natural sounds, such as bird calls generating most noise. Farm machinery and traffic would cause occasional elevated levels in localised areas, particularly associated with the Bruce Highway which intersects the Project area.

Construction, operation, and closure of the Project will result in increased noise from traffic, machinery, blasting, piling, and the presence of personnel, primarily in the MIA, open cut mine pits haul road and TLF. Conventional blast methods and piling employed during construction will create a higher level of intermittent noise and vibration pulses. However, blasting and piling will only occur during daylight hours during the construction and operation phase of the Project.

Noise and vibration levels will remain elevated after construction when mining commences, although these will be more constant and less intermittent. Sources include primarily movements of haulage trucks, operation of coal handling equipment (including conveyors), open cut mine blasting and train loading. Blasting will remain as part of the open cut operations but will be on a very intermittent basis.

The generation of construction and operational noise, within the mine area, will largely be in cleared areas. It is likely that individuals that occur on the site will leave the immediate area of impact. Other significant fauna habitat nearest to construction and operation noise sources is likely to be adjacent to the southern waste rock stockpile and along the new Mount Bison access road where intact vegetation communities provide habitat for fauna.

Many fauna species, particularly birds, are likely to become habituated to constant background noise due to routine mining and processing operations. In addition, most noise will attenuate relatively quickly with increasing distance, while the local hilly topography will act as a barrier to noise generated by the mine and associated facilities.

Noise modelling undertaken for the Project, indicates that operational noise levels are approximately 60 dB(A) at the boundary of the Project area, and thus, are not expected to cause adverse responses in fauna. The relatively low level of impulsive or low frequency noise at a distance from operations is also not likely to impact fauna. The noise and vibration from haul truck movements could potentially produce the most likely occurrence of impact on fauna located near the transport corridor.

5.8. Lighting

Artificial lighting from infrastructure and machinery may impact fauna within the Project area and near surrounds during construction and operation. Artificial lighting may have a range of impacts across different groups of taxa and between species within these groups.

There is increasing evidence that artificial light affects a number of biological processes (IDSA 1996; Longcore *et al.* 2017; DEE 2019). Whilst there is evidence that artificial light at night can result in changes in behaviours and habitat usage in a variety of wildlife (Rich & Longcore 2006), there are few studies for Australian fauna[11], and little information overall on potential thresholds that may initiate behavioural responses or the extent that habituation might change those thresholds.

Francis *et al.* (2015) found that light pollution from urban sources had a negative influence on the frequency of use of trees by squirrel gliders (*Petaurus norfolcensis*). Generally, trees with higher activity were located in dark areas (within both urban and rural areas). Barber-Meyer (2007) found that captive sugar gliders (*Petaurus breviceps*) decreased activity and foraging time under two artificial light treatments, designed to be similar to street lighting[12]. That work found decreases in the time spent foraging and overall activity levels under the low luminosity treatment (7 Lux), and a substantial decrease in the amount of time spent foraging and cessation of other activities under the high luminosity treatment (>7 Lux to <12 Lux). Known impacts on birds include disruption of migratory patterns and choice of nest sites (Longcore and Rich 2004).

Longcore *et al.* (2017) conclude that the impacts of artificial lighting to wildlife can be reduced in five ways, i.e.: avoiding use of lighting that is not needed; controlling colour spectrum; limiting light intensity; managing the direction of light emissions; and limiting the duration of light output. In regard to the use of spectrum, Longcore *et al.* (2017) notes the following: the choice of colour significantly affects the degree of biological disruption, and should influence all Project night lighting adjacent to habitat; narrow spectrum lights are preferable to broad-spectrum sources (i.e. white light); ultraviolet light should be avoided; and emissions in blue and shorter wavelengths generally should be avoided. Shielding lights is a common mitigation measure to reduce light spill impacts on adjacent wildlife values (DEE 2019).

5.9. Direct Fauna Mortality

Direct fauna mortality may occur during vegetation clearing activities and through collision with vehicles during all Project phases. A focus point for potential collisions may be the haul road crossing of Deep Creek and the new Mount Bison access road. Increased traffic in the wider region resulting from workers

[11] Australian examples include: squirrel glider (Francis *et al.* 2015), sugar glider (Barber-Meyer 2007); insectivorous bats (Adams *et al.* 2005; Linley 2017); and marine turtles (Berry *et al.* 2013; Kamrowski *et al.* 2014; Roberston *et al.* 2016).

[12] That study investigated responses of captive sugar gliders to 12 Hr cycles with treatments simulating ambient low or high luminosity (7 and 12 Lux respectively). Lux values were chosen to simulate minimum and average streetlighting levels (after IDSA 1996).

accessing the Project may pose an increased risk to the regional population of koalas, although the additional traffic generated by the Project would be negligible relative to existing traffic movements already occurring on the Bruce Highway which bisects the Project area.

There is also widespread evidence of glider entanglement in barbed wire fencing, including greater gliders (e.g. van der Ree 1999; Booth 2007). Fauna may potentially also become exposed to mortality risk if using the operational site as shelter, although the CHPP / MIA areas are located well away from vegetated habitat. The TLF is also located entirely within cleared habitat. No impacts are expected once the decommissioning phase has been completed and no further Project related traffic occurs within the Project area.

5.10. Weeds

Weed species are abundant within the Project area and near surrounds. Lantana is regarded as major threat to a variety of conservation significant species within the Fitzroy NRM region (DERM 2010). Buffel grass is regarded as the most threatening invasive plant within the Brigalow Belt Bioregion (Ponce Reyes *et al.* 2016). Buffel grass invasion is associated with a loss of diversity and abundance of native ground vegetation, especially where the grass forms dense swards - and a decrease in the abundance of invertebrate prey has been linked with buffel grass density. Granivorous species that prefer native plant seeds or forage in areas with an open under-storey are likely to be negatively affected by increased buffel grass cover (Young & Schlesinger 2014). Research also suggests that buffel grass invasion may also lead to major changes in vegetation structure and composition as a result of altered fire regimes, i.e. a significant increase in the intensity and frequency of fires because of the increased fuel load created by buffel grass and through outcompeting and displacing native grasses (of lower fuel load).

The movement of earthmoving machinery and other plant and construction materials increases the risk of weed introduction. In addition, the use of that machinery on site can contribute to the spread of existing weeds within the site. Where the soil seed bank on site already has a weedy component, further movement of those seeds within the site by earthmoving equipment can be impossible to avoid.

Whilst there is potential for introduction and spread of weed species as a result of the Project, it is considered unlikely that the Project would contribute to a significant further change to existing threats given the current prevalence of weeds in the area and the land use history for the Project area and surrounds.

5.11. Pest Animals

Introduced fauna have been regularly recorded within the Project area and near surrounds, and the current predominant land use is cattle grazing. These species, to varying extents, can present additional pressures to the maintenance of local biodiversity.

The Project has the potential to increase pest animal numbers and / or introduce new invasive animal species through construction and operational activities. The greatest risk of increases in pest animals is through poor mine site waste management practices which may attract pests through the supply of artificial food sources. However, it is considered highly unlikely that the Project would contribute to a significant further change to existing threats given the current prevalence of introduced fauna in the area and the land use history for the Project area and surrounds.

5.12. Fire

In the absence of appropriate mitigation and management measures, the spontaneous combustion of product coal or waste rock material has the potential to impact air quality and ignite bushfires in adjacent vegetation.

5.12.1. Spontaneous Combustion of Product Coal

Coal is a combustible material that will naturally oxidise when exposed to air by exothermic reaction processes (Busfield 2012). When sufficient heat from the oxidation is generated to ignite the coal, then coal will burn (Busfield 2012). This spontaneous combustion can occur in thermal coal waste areas, coal pillars or coal stockpiles. During the operations phase, coal stockpiles may combust spontaneously resulting in fire and smoke. Coal dust explosions can also occur in the open pits from a build-up of coal dust which is ignited from exhausts or lighting strikes.

The off-site risk from spontaneous combustion of a coal stockpile includes impacts to air quality and ignition of a bushfire, which in turn has the potential to impact terrestrial ecological values within the Project area and surrounds. Central Queensland Coal will develop a management system to minimise the risk of spontaneous combustion occurring and to manage the risks should spontaneous combustion occur. These procedures would include routine monitoring of the coal stockpiles, stockpile compaction and minimising the stockpile stagnancy.

5.12.2. Spontaneous Combustion of Waste Rock Material

In pit emplacement areas are more susceptible to spontaneous combustion due to the inherent mixing that occurs through the mining process of the various waste materials removed. Consequently, managing spontaneous combustion in active spoil areas can prove to be difficult at times, dependent upon the location of outbreaks. If outbreaks occur in inaccessible areas, management of these areas involves visual monitoring prior to developing accesses into the areas for remediation works to be undertaken. If outbreaks occur in readily accessible areas, these access problems are not encountered, and remediation can be planned and undertaken with minimal changes to operations at the time.

6. Management and Monitoring Plans

6.1. Overview

The mitigation, management, and monitoring strategies provided in this report are prepared by experienced ecologists with direct knowledge of the Project area's habitats, of the species occurrence within the Project area and surrounding area, and the biology and ecology of those species elsewhere throughout their distribution.

All strategies are based on the broad practical experience of ecologists who have previously developed and implemented such strategies for the species considered in this report. The development of those strategies has been guided by legislative requirements, relevant species recovery plans, and best-practice approaches to species management and monitoring.

While individual species may require implementation of specific mitigation measures to reduce Project-related impacts, there are a variety of mitigation measures that are generic and relevant to all species - including other species and species groups not specifically referred to herein. For example, pre-clearance surveys will provide information on the composition and area of vegetation and habitat to be disturbed prior to construction works, mitigating the risk of disturbing environmental values that were not identified during the EIS process.

A description of the suite of generic mitigation measures which are applicable to all species and their habitats is provided in **Attachment A**. Where mitigation measures are applicable to an individual species, these are provided elsewhere in this report as relevant.

6.2. Adaptive Management Approach

The following management plans have been based on, as far as practical, the current state of knowledge of the species ecology and best practice habitat management approaches. When new facts emerge from future research, they will be integrated into the plan to ensure it remains consistent with the current state of knowledge (and best practice). That approach is consistent with adaptive management.

Adaptive management refers to a way of managing natural resources where management actions are regularly reviewed and, if necessary, modified based on monitored changes in environmental condition and/or changes in base knowledge which underpins the original management approach.

The adaptive management approach has been adopted for the reasons outlined below:

- Not all the effects of the future development are accurately predictable;
- The future development presents opportunities for continuing to provide fauna habitat concurrent with progressive, staged development of the Project; and
- The methods for ensuring that the permanent habitat area remains optimal for some species and fauna groups are not fully understood.

In the light of these uncertainties, an approach to management that includes flexible management responses guided by monitoring is considered necessary. This will ensure that native fauna, continue to use existing habitat, notwithstanding the ongoing changes occurring to their habitats and surrounds.

6.3. Management Plans

The following section provides a management plan (MP) for each of the following issues:
for each key management issue:

- MP1 – Pre-clearing Planning and Surveys for Threatened Fauna Habitat;
- MP2 – Vegetation Clearing Operations within Threatened Fauna Habitat;
- MP3 – Animal Welfare;
- MP4 – Management and Control of Pest Animals;
- MP5 – Management and Control of Invasive Weeds;
- MP6 – Vehicle Interactions with Fauna;
- MP7 – Road Design and Fauna Crossing Treatments; and
- MP8 – Artificial Lighting Impacts on Retained Habitat

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

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

Terms specific to the management plan are summarised **in Table 6-1.**

Table 6-1 Selected Management Plan Terms

Term	Description
Contractor	Contractor means a party or company that performs construction works on site, and includes all employees of the Contractor and its sub-contractors, e.g. machinery operator. The Contractor is responsible to the Site Manager.
Environment Manager	The Environment Manager means the party contracted by the Proponent to oversee implementation of EMP requirements, including requirements of this Fauna Management Plan. The Environment Manager is responsible to the Proponent.
Fauna Spotter/Catcher	A Fauna Spotter/Catcher means personnel employed to implement fauna welfare responsibilities associated with vegetation clearing operations or other construction activities. All personnel implementing this role must be licensed and working under current relevant permits.
Koala habitat tree	Koala habitat tree means a) a food tree of the *Corymbia*, *Melaleuca*, or *Lophostemon* or *Eucalyptus* genera; or b) a preferred shelter species such as *Angophora* (after QEPA 2006b).
Person taking the action	As per Commonwealth EPBCA Project approval, being “the person to whom approval is granted, or to whom the approval is transferred under section 1458 of the EPBC Act”.
Project Ecologist	Project Ecologist means a specialist biological or ecological consultant employed by the Proponent. The Project Ecologist is responsible to the Environment Manager.
Proponent	Central Queensland Coal Pty Ltd
Site Manager	The Site Manager means the party contracted by the Proponent to oversee daily site operations and site management. The Site Manager is responsible to the Proponent.
Suitably qualified person	A person who has professional qualifications, training, skill or experience relevant to the nominated subject matter and can give authoritative assessment, advice, and analysis to performance relative to the subject matter using the relevant protocols, standards, methods or literature.

Table 6-2 MP1 – Pre-clearing Planning and Surveys for Threatened Fauna Habitat

Issue	Preparation of plans and processes to inform clearing operations within areas identified as habitat for threatened fauna
Objective	Prevent mortality and minimise disturbance to fauna within areas mapped as 'habitat' for threatened fauna (MNES & MSES species).
Implementation Requirements	1) At least one month before commencement of vegetation clearing, the **environment manager** is to prepare plans which identify all known or potential habitat within and / adjacent to clearing precincts for inclusion within the vegetation clearing plans. 2) To minimise any confusion in the field, flagging guidelines are to be established by the **site manager** prior to pre-clearing surveys. These are to be recorded on vegetation clearing plans and on signage at clearing precinct ingress points. As a minimum, a colour coding system is required to contrast the following: clearing precinct boundaries; habitat trees; sensitive areas within the clearing precinct; and sensitive areas to be retained that are close to and /or adjoining the clearing precinct (e.g. contiguous threatened fauna habitat). 3) Where clearing is to occur within habitat for threatened species, pre-clearance surveys must: a) Be undertaken consistent with best practice survey guidelines in effect at the time, and implemented by a **suitably qualified person**. b) Be completed 1 week to not more than 3 weeks prior to commencement of vegetation clearing. c) Take account of findings of previous fauna surveys undertaken for the area and any relevant new information on the likely presence or absence of a threatened species. d) Map the location of all habitat trees within the clearing area. i) A 'habitat tree' is defined by one of the following criteria: ≥ 50 cm DBH; or supports at least one hollow ≥ 10 cm diameter which is ≥ 2 m above ground level; or a stag (dead tree) with a primary trunk of either 7m in height or >40cm DBH. e) Habitat trees are to be marked in the field with the symbol 'H' in high-visibility marking paint and accompanying flagging tape (following flagging guidelines) and their position recorded with a GPS. f) Describe and map habitat trees which support potentially suitable resources (e.g. large hollow limbs) which could be salvaged for deployment within retained threatened fauna habitat. g) Map the location of all habitat trees within 50 m beyond the outer edge of the clearing precinct, in order to flag priority specialised directional felling techniques which may be required for large trees (> 40 cm) and / or habitat trees which are close to the clearing precinct boundary (e.g. < 50 m inside the clearing precinct boundary). 4) Within the area mapped as 'breeding habitat' for Squatter Pigeon (southern), a **suitably qualified person** is to implement / complete systematic transect searches for nesting birds within a 14-day period immediately prior to scheduled clearing. a) Searches are to be undertaken within the designated clearing precinct and within 100m of the edge of the clearing precinct where mapped 'breeding habitat' is contiguous with the clearing precinct. b) If nesting is confirmed, a 100 m exclusion zone is to be maintained around the nest site until the breeding cycle is completed or the nest is abandoned. c) The exclusion zone is applicable to all machinery and human activity, and is applicable to both remnant or non-remnant habitat. d) Persons entering the zone must be authorised by the **site manager**. e) A **suitably qualified person** is to undertake monitoring observations and upon their advice, the **site manager** can nominate when the exclusion zone is no longer applicable. 5) A **suitably qualified person** is to investigate and identify appropriate fauna relocation sites. The selection of relocation sites will be undertaken to provide separate sites for each tranche of 50 ha of habitat to be cleared. These sites are to be described in a report to the **environment manager** to inform **fauna spotter/catcher** activities during clearing operations. 6) A **suitably qualified person** is complete an assessment of weed infestations and map and report on those infestations which need to be controlled prior to clearing operations. This information is to be provided to the **environment manager** to inform control requirements prior to vegetation clearing operations.

Issue	Preparation of plans and processes to inform clearing operations within areas identified as habitat for threatened fauna
	7) A **suitably qualified person** is to prepare a report, providing information on the pre-clearing surveys (including methodologies, target species, results, significant findings, etc.), appropriate fauna relocation sites, and any additional management measures identified from the findings of the pre-clearing surveys. This information is to be provided to the **environment manager** to inform subsequent clearing operations.
Performance Indicators	• Prevent fauna mortality and disturbance to significant fauna species. • No clearing operations to be initiated in areas of potential habitat for threatened species prior to completion of pre-clearance surveys described above.
Responsible Persons - Key Actions	• The **environment manager** is responsible for: ○ appointing a suitably qualified person and scheduling of work consistent with the required timelines above. ○ ensuring that no vegetation clearing occurs prior to the above requirements being completed. ○ ensuring that a copy of the pre-clearance survey results is available at the Project area office. • The **site manager** is responsible for ensuring that clearing works are executed as informed by the results of the pre-clearance surveys and advice from the **environment manager**. • The **project ecologist** is to be consulted as required to assist in specialist biological / ecological input to processes, auditing, and survey design issues.
Auditing and Reporting	• Pre-clearing survey documentation to be prepared by the **suitably qualified person** and provided to the **environment manager** according to the abovementioned timelines. • The **environment manager** is responsible for ensuring a copy of the documentation is provided to the **site manager** prior to the commencement of clearing. • The **site manager** is responsible for ensuring that a copy of all pre-clearing survey documentation is maintained within the site Project management office. • Monthly report by the **environment manager** to the **proponent** to include documenting compliance, non-compliance incidents and corrective actions taken.
Corrective Action	In the event that **environment manager** or **site manager** identifies practices inconsistent with the strategies described herein, the **responsible persons** identified herein, shall take the necessary corrective steps as soon as practicable, and the **environment manager** must record inconsistent practices / corrective steps / resolutions in the monthly report.
Timing	Prior to the commencement of each stage of vegetation clearing works (construction phase).

Table 6-3 MP2 – Vegetation Clearing Operations within Threatened Fauna Habitat

Issue	Terrestrial Vegetation Clearing
Objective	To minimise the adverse direct and indirect effects on threatened fauna and adjacent habitat during vegetation clearing operations.
Implementation Requirements	1) No vegetation removal shall occur until relevant permit approvals have been obtained by the **site manager**. All permit approval conditions will be followed. 2) Prior to any clearing within Koala or Greater Glider habitat, the **environment manager** is to confirm a list of veterinarians and a licensed wildlife careers who are able to assist if required. The **environment manager** is to provide the **site manager** with the full contacts for each of the suite of designated veterinary options and licensed wildlife careers should fauna need to be repatriated off site. 3) No vegetation clearing is to commence within any areas of threatened fauna habitat without the presence of a **fauna spotter/catcher.** 4) The **fauna spotter/catcher** will check vegetation prior to its felling and, if required, will relocate native wildlife into appropriate habitat areas within the site which are to be retained. 5) A **fauna spotter/catcher** is to ensure that positive communications are maintained with the machinery operator via UHF radio, and supporting visual directions, during clearing operations, especially during removal of "habitat trees". 6) The **site manager** is to ensure that all **fauna spotter/catchers** and machinery operators have competent UHF communications prior to the start of clearing operations each day and that these are functional throughout the day's operations. 7) Avoid clearing of vegetation between the hours of 1830 hrs and 0500 hrs. 8) Vegetation clearing should be undertaken sequentially, so as to encourage fauna to disperse towards adjacent habitats that will remain intact. Vegetation clearing is to be consistent with the following: a) The direction of clearing should be away from threatening processes or hostile environments, and towards any retained vegetation or habitat link. b) Fauna are not required to disperse though construction areas or areas that require movement of greater than 200m over cleared ground to reach suitable habitat. c) Fauna are not left occupying an "island" of habitat between hostile environments, such as a construction area and a cleared area, unless there are no other more suitable habitat areas in which to direct fauna. d) Fauna can safely leave the site of clearing and relocate to adjacent habitat. e) Cleared vegetation is to be stockpiled so as not to impede fauna movement. 9) To prevent damage and / or disturbance to native vegetation and associated habitat values outside clearing areas: a) Clearing boundaries are to be delineated on all drawings and in the field to define the extent of authorized / permitted clearing. b) Installation of vegetation clearance markers (e.g. high visibility tape, poly-web fencing, etc.; consistent with flagging colour guidelines) prior to the commencement of vegetation clearance to identify and protect vegetation for retention. c) Where trees occur along the interface between clearing precincts and retained habitat, trees are to be felled towards (into) the clearing precinct to avoid damage to adjacent retained habitat. d) In some instances, felling in a predetermined and desired direction will need to be implemented by skillful directional felling techniques by individuals as determined from pre-clearing surveys.

Issue	Terrestrial Vegetation Clearing

10) Temporary access tracks are to be contained within the Project operational footprint where possible. Tracks outside of this area are to be agreed with the **Environment Manager** prior and are to be a maximum of 3 m in width or the required vehicle width plus 1 m.
11) Cleared vegetation is to be stockpiled so as not to impede waterway drainage and avoid damage to adjacent retained vegetation.
12) In regard to hollow-bearing habitat trees within Greater Glider habitat, removal should be consistent with the following process:
    a) No hollow-bearing habitat tree is to be completely isolated and prior to felling, and there should be at least a treed linkage between the habitat tree and retained habitat wherever possible. A single row of trees could be sufficient, though will need to be determined by a **suitably qualified person** or **fauna spotter/catcher**.
    b) A hollow-bearing habitat tree should be inspected by a tree climber to inspect potential occupation by gliders. In the presence of at least two **fauna spotter/catchers** as ground support, an attempt may be made to capture the gliders. In the event that gliders cannot be captured because the tree hollow is too large, high or its recovery would breach OH&S requirements, then the tree will be cautiously felled and animals recovered post-felling and repatriated in accordance with the relevant **fauna spotter/catcher** license and permit conditions.
    c) All reasonable attempts will be made to clear a habitat tree as late in the day as possible to avoid disturbing / dislocating nocturnal fauna in the middle parts of the day and thus exposing them to a greater period of daylight without shelter.
    d) Habitat trees shall be carefully felled under the supervision of the **suitably qualified person** or **fauna spotter/catcher**.
    e) Hollow-bearing habitat trees are to be mechanically shaken or agitated prior to felling to encourage any remaining animals to either leave the tree or reveal themselves and subsequently be removed prior to felling.
    f) Felling is to involve gently pushing against the tree and lowering or felling using equipment (e.g. claw extension or forestry harvester) that would allow the habitat trees to be lowered to the ground with minimal impact and to avoid sudden falling which is likely to injure wildlife. This could also require, in part, selective removal of large hollow limbs by a climbing arborist.
    g) Animals that emerge should be captured, inspected for injury then relocated to pre-determined habitat identified for fauna release or repatriated to designated veterinary options or a licensed wildlife carer.
    h) Felled hollow-bearing habitat trees should be left for a period of 24 hours (and where possible, adjacent to retained a habitat area which contains hollow-bearing trees) to allow any undetected fauna further opportunity to escape.
    i) Following the felling of hollow-bearing trees, a **suitably qualified person** is to identify and mark natural hollows for potential salvage as hollow ground timber or arboreal hollows. Such resources are to be removed from the clearing precinct as soon as practicable.
13) The following requirements are additional and required in regard to Koala habitat:
    a) No vegetation clearing is to commence without the presence of a licensed **fauna spotter/catcher** who has experience in surveying for Koalas.
    b) A **fauna spotter/catcher** is not to be involved in the clearing of vegetation while they are responsible for surveying for Koalas on the clearing site.
    c) On each day of operations, no vegetation clearing is to commence without the **site manager**:
        i) Ensuring that vegetation clearing boundaries are marked;
        ii) That all koala habitat trees within the daily clearing footprint are assessed for the presence of Koala;
        iii) Where two **fauna spotter/catchers** are in attendance, then the following procedure may be implemented (and repeated where required):
            - That all trees within 100 m of the “starting point” of the day’s clearing operations have been assessed to ensure that no Koalas are present within that area prior to start of machinery operations (both **fauna spotter/catchers**).

Issue	Terrestrial Vegetation Clearing

- Then, progressive assessment of the remainder of the daily clearing footprint is to follow and implemented by one **fauna spotter/catcher**, whilst the second personnel remains working with the machinery operator.
- That the end of the 100 m zone is delineated by the **fauna spotter/catcher** with a high visibility flag line (following flagging guidelines) so that both the machinery operator and attending **fauna spotter/catcher** are clear as to the end of the 100 m zone.
- That the **contractor** (machinery operator) is briefed on the limitations of the extent of vegetation to be cleared.

d) The **site manager** is responsible for ensuring, throughout the duration of the clearing operations, that a tree in which a Koala is present, or a tree with a crown overlapping a tree in which a Koala is present, should not be felled, damaged or interfered with until the Koala has moved from the felling site of its own volition.

e) Where a Koala is present in a tree scheduled for removal, the strategy is to allow the Koala to move of its own accord, overnight. The following is to be implemented:
   i) Habitat trees are to be marked in the field with the symbol 'K' in high-visibility marking paint and accompanying flagging tape (following flagging guidelines) and other identification means as determined by the **fauna spotter/catcher**.
   ii) The **fauna spotter/catcher** is to clearly distinguish a 50 m exclusion zone around the tree and a vegetated corridor from this exclusion zone to the habitat extending in the opposite direction to the clearing front. A vegetated corridor could comprise a single row of trees.
   iii) The **contractor** (machinery operator) is to be briefed on the location of the tree and clearly confirmed with the operator(s) that the subject tree(s) is to remain undisturbed until the Koala has moved of its own volition.
   iv) On the following day, such trees are to be checked again prior to their eventual removal and, if necessary, the procedure is repeated until the Koala has moved.
   v) Neither the **site manager** nor **contractor** nor **fauna spotter/catcher** is to physically move a Koala from a tree in which it is residing to another location.

f) The **site manager** is responsible for ensuring that during clearing operations, capabilities and practices to respond to an injured Koala are consistent with the following:
   i) That vegetation clearing operations within 300 m of a Koala injury site are immediately ceased and not resumed until the **fauna spotter/catcher** has ensured a resolution of the incident (e.g. injured Koala has been relocated off-site for veterinary treatment).
   ii) That the **environment manager** is advised of a Koala injury at the earliest possible opportunity in order to confirm relocation options with the **fauna spotter/catcher**.
   iii) That the **fauna spotter/catcher** (or their nominated delegate) is to relocate the injured Koala to either the nearest designated veterinary clinic or licensed wildlife carer as advised by the **site manager.**
   iv) That the **fauna spotter/catcher** (or their nominated delegate) implements the rescue, handling, transportation, housing, and provision of food and water for a Koala subject to repatriation of veterinary care in a manner consistent with the requirements of the relevant Code of Practice and/or animal ethics approval.
   v) A register of Koala observations / incidents / interactions is to be maintained daily during clearing operations by the **fauna spotter/catcher**.

g) There is a possibility that Koalas may become disorientated during vegetation clearing and early-operational works stages as they attempt to assimilate changes in habitat and social structure. When clearing is occurring within Koala habitat, contractors involved are to be reminded at daily toolbox talks that potentially disorientated Koalas may be seen wandering through disturbed areas, and if observed, the contractor is to convey that observation immediately to **fauna spotter/catcher**.

Issue	Terrestrial Vegetation Clearing
	14) The following procedures should be implemented in regard to specific habitat features: a) Log piles – these should be dissected by hand by the **fauna spotter/catcher** as much as possible before using machinery. Excavators can easily dissect these piles using their bucket/ripper/grabs. Dozers may dissect log piles by lifting logs up using the blade or rippers, carefully sliding logs to the side, preferably without dragging logs across the ground. Care must be taken that the dozer does not track on top of the log pile. b) Logs – large logs should be lifted and rolled rather than dragged across the ground. c) Burrows – should be excavated by the Fauna Spotter/Catcher using a spade, shovel or crowbar. d) Excavated terrestrial termite mounds – these features should be carefully opened up using a shovel or a crowbar. e) Arboreal features – trees containing nests and arboreal termite mounds should be carefully felled in a direction that guarantees the least amount of damage to the habitat feature. Tree felling dozers can effectively arrest or slow down the fall of a tree by putting the dozer blade on the root bulb after/while pushing the tree forward gently. 15) All **contractors** involved in vegetation clearing operations to complete a site induction, including instruction on the relevant obligations in regard to vegetation clearing protocols and to protect native fauna.
Performance Indicators	• No disturbance to native vegetation outside permitted clearing footprints. • Prevent fauna mortality and disturbance to terrestrial fauna. • All construction personnel to complete a site induction, including awareness training in regard to this management issue.
Responsible Persons - Key Actions	• The **site manager** is responsible for ensuring requirements are included in relevant contract tenders and acknowledged in subsequent contracts awarded. • The **environment manager** is responsible for ensuring that relevant environmental awareness information is included within site induction processes. • The **contractor** is responsible for implementing clearing operations consistent with the relevant obligations of this management plan. • The **spotter/catcher** is responsible for implementing clearing operations consistent with the relevant obligations of this management plan. • The **project ecologist** is to be consulted as required to assist in specialist input to processes, auditing, and design issues.
Auditing and Reporting	• Weekly report by the **fauna spotter/catcher** to the **environment manager** on the clearing of any native vegetation and any animals encountered or relocated. • For each week of native vegetation clearing operations, a weekly log is to be completed by the **site manager** either prior to, or on completion of daily operations. Audit of key requirements, e.g. clearing contained within designated limits, integrity of clearing boundary devices, no damage to vegetation outside clearing boundaries, and that the fauna spotter/catcher was present throughout operations. • Monthly report by the **environment manager** to the **proponent** to include documenting compliance, non-compliance incidents and corrective actions taken.
Corrective Action	In the event that **environment manager** or **site manager** identifies practices inconsistent with the strategies described herein, the **responsible persons** identified herein, shall take the necessary corrective steps as soon as practicable, and the **environment manager** must record inconsistent practices / corrective steps / resolutions in the monthly report.
Timing	Duration of vegetation clearing works (construction phase).

Table 6-4 MP3 – Animal Welfare

Issue	Animal Welfare
Objective	Prevent fauna mortality and minimise disturbance to fauna during construction operations.
Implementation Requirements	1) All personnel implementing the role of **fauna spotter/catcher** must be licensed and working under a current Rehabilitation Permit as issued by the Department of Environment and Science under Section 12(e) – *Nature Conservation (Administration) Regulation 2006*. 2) All personnel involved in the work relevant to Koalas are to have demonstrated experience in locating koalas in koala habitats or conducting fauna surveys, and experience in the safe handling of Koalas. 3) All fauna handling and relocation activities must only be undertaken by those identified under a current Rehabilitation Permit. 4) Fauna handling and relocation is to be undertaken in compliance with conditions set out in the permit approval decision, in addition to the general requirements of the *Animal Welfare Act 2000*. 5) All activities involved in the care and rehabilitation of injured wildlife are to be consistent with the *Code of Practice Care of Sick, Injured or Orphaned Protected Animals in Queensland Nature Conservation Act 1992*. 6) All personnel authorised to undertake fauna handling and relocation activities under the required permits, must implement such work consistent with a general biosecurity obligation to ensure that all reasonable steps are taken to avoid the spread of a pest, disease or contaminant. 7) A register of fauna incidents / interactions is to be maintained and kept in the Project area office. 8) Additional specific measures in regards to vegetation clearing[13] include the following: a) If practicable, the timing of vegetation clearance should be selected in order to minimise impacts (direct and indirect disturbances) to affected fauna habitats during optimum breeding periods. 9) Specific measures in regards to avoiding fauna mortality[14] in regard to trenches[15], include the following: a) Frequent inspections of trenches will be undertaken by a fauna spotter/catcher throughout the day. Inspection will commence at sunrise each day to allow the entire excavated trench to be inspected and captured wildlife removed prior to exposure to high daytime temperatures, and at least an afternoon collection will be undertaken. b) If any trenches are to remain open after daily site works have been completed, trench escape ramps (e.g. wooden planks or logs with slopes <50%) are to be installed at appropriate intervals to provide a potential means of escape for trapped fauna. 10) Specific measures in regards to vehicle interactions with fauna include the following[16]: a) A **contractor** is required to report the incident to the **site manager** as soon as practicable (at least prior to end of shift) and details to be entered on a fauna incident register. b) Where there is a fauna-vehicle interaction which results in a mortality, the **site manager** is to ensure that animal is relocated off the road (well away from the road) as soon as possible, to reduce potential for scavengers to be subsequently struck.

[13] See also MP2 – Terrestrial Vegetation Clearing Operations for further measures.

[14] Animals captured in excavations are exposed to various elements such as predators, effects from the sun and subsequent dehydration (e.g. Woinarski *et al.* 2000b).

[15] Construction is planned for the dry season when activity levels of reptiles, which are the wildlife most likely to be captured in a pit / trench, and frogs and mammals are generally lower due to the cooler weather.

[16] See also MP5 - Vehicle and Vessel Interactions with Fauna for further measures.

Issue	Animal Welfare
	11) All new fencing within or adjacent to retained habitats should exclude barbed wire. In places where existing fences are required for stock control, as a minimum, the top one or two strands should be replaced with high tensile plain wire. For short sections of existing barbed wire fencing, particularly in entanglement 'hot spots', interim alternatives are either to make the fence more obvious is by installing metal tags at 30 cm intervals along the top wire strand, or cover barbs of the top strand with lengths of split poly pipe. 12) There is a possibility that Koalas may become disorientated during vegetation clearing and early-operational works stages as they attempt to assimilate changes in habitat and social structure. When clearing is occurring within Koala habitat, contractors involved are to be reminded at daily toolbox talks that potentially disorientated Koalas may be seen wandering through disturbed areas, and if observed, the contractor is to convey that observation immediately to the **fauna spotter/catcher.** 13) All construction personnel to complete a site induction, including awareness training and obligations in regard to animal welfare and to protect native fauna.
Performance Indicators	• No instances of fauna mortality. • All fauna handling, treatment and / or relocation undertaken in accordance with relevant permit conditions and the overarching requirements of the *Animal Welfare Act 2000*. • All construction personnel to complete a site induction, including awareness training in regard to this management issue.
Responsible Persons – Key Actions	• The **environment manager** is responsible for ensuring that: ○ relevant environmental awareness information and animal welfare obligations are included within site induction processes. ○ all personnel involved in fauna handling and relocation activities have the relevant permits. ○ an annual audit of all fencing within or adjacent to retained habitats is undertaken. • The **site manager** is responsible for ensuring that a register of fauna incidents / interactions is maintained at the site Project office. • The **project ecologist** is to be consulted as required to assist in specialist input to processes, auditing, and design issues.
Auditing and Reporting	• Monthly report by the **environment manager** to the **proponent** to include documenting compliance, non-compliance incidents and corrective actions taken.
Corrective Action	In the event that **environment manager** or **site manager** identifies practices inconsistent with the strategies described herein, the **responsible persons** identified herein, shall take the necessary corrective steps as soon as practicable, and the **environment manager** must record inconsistent practices / corrective steps / resolutions in the monthly report.
Timing	Duration of construction and operational periods.

Table 6-5 MP4 – Management and Control of Pest Animals

Issue	Management and Control of Pest Animals
Objective	To minimise the impact of introduced pest animal species on threatened fauna within retained habitat.
Implementation Requirements	1) Minimise available food sources for introduced rodents such as house mouse around Project-built facilities (e.g. camps, workshops, storage sheds, site offices and crib huts). This is to be maximised through maintenance of routine practices and environmental education, e.g.: promoting good housekeeping practices in relation to food scraps; ample provision of waste receptacles which prevent access by rodents; ensuring daily food waste removal; and maintain staff awareness of the linkage between poor housekeeping practices and the environments which support rodent populations, which in turn, support feral cats and the consequent impact of feral cats on native fauna. 2) Food waste will be segregated from the other waste streams and disposed of at an approved landfill facility. 3) All **contractors** will be required to place a high emphasis on housekeeping and waste management. 4) Implementation of an on-going, monthly rodent baiting program around built facilities. Both rodent poison and disposable traps are cost-effective measures. 5) Implementation of an on-going, cat baiting program around built facilities using proprietary baits such as Curiosity® with the toxin PAPP (para-aminopropriophenone). 6) Domestic dogs are to be prohibited within the Project area during both construction and operational phases. 7) Implementation of an on-going, 1080 (sodium fluoroacetate) baiting program for wild dogs, foxes and feral pigs. 8) Baiting programs must be implemented under the condition requirements of the relevant permits, e.g. *1080 Pest Animal Management Authorisation* and *Permit to Take Protected Wildlife*, and consistent with the requirements of the *Animal Welfare Act 2000*. 9) Consultation with managers of adjoining property and Mamelon Station to engage in co-ordinated baiting programs to maximise effectiveness in the control of feral cats, foxes, dogs, and pigs[17]. 10) All construction personnel to complete a site induction, including information on practices to minimise encouraging rodent populations, which in turn, support feral cats, and the consequent impacts to native fauna.
Performance Indicators	• On-going implementation of control programs. • All construction personnel to complete a site induction, including awareness training in regard to this management issue.
Responsible Persons – Key Actions	• The **environment manager** is responsible for developing a suitable control program for introduced fauna. • The **environment manager** is responsible for preparing relevant awareness components within the site induction training. • The **site manager** is responsible for **contractor** compliance with the implementation of control and management strategies on the site.
Auditing and Reporting	• Monthly report by the **environment manager** to the **proponent** to include documenting compliance, non-compliance incidents and corrective actions taken.

[17] For wide-ranging species such as dogs and pigs, the ultimate success of any control strategy within the project footprint is linked to the management approaches implemented as part of the grazing operations on the remainder of Mamelon Station, and those implemented by adjoining land holders.

Issue	Management and Control of Pest Animals
Corrective Action	In the event that **environment manager** or **site manager** identifies practices inconsistent with the strategies described herein, the **responsible persons** identified herein, shall take the necessary corrective steps as soon as practicable, and the **environment manager** must record inconsistent practices / corrective steps / resolutions in the monthly report.
Timing	Duration of construction and operational periods.

Table 6-6 MP5 – Management and Control of Invasive Weeds

Issue	Management and Control of Invasive Weeds
Objective	To minimise the impact of invasive weeds on threatened fauna within retained habitat.
Implementation Requirements	1) Prior to construction, the Project area will be surveyed to map existing weeds within the Project area or immediate surrounds. The survey will focus on declared weeds, being Weeds of National Significance (WONS) and species listed under the Queensland Biosecurity Act 2014. The information from the baseline weed survey will be used to map and categorise weed management zones (WMZs) and inform specific weed management plans (WMPs). a) WMZs are to inform weed control and weed hygiene requirements across the Project Area. b) Action plans are to be developed in regard to control strategies for WONS. 2) All vehicles, equipment and machinery to be used in construction must be thoroughly cleaned, washed down and declared weed-free on a Project-approved Weed Hygiene Declaration Form to be supplied prior to arrival at the Project Area. a) Weed Hygiene Declaration Forms (WHDFs) available at the entrance to the Project Area and completed WHDFs to be retained in a register. 3) Prior to entering the Project area, vehicles, machinery and equipment must undergo weed hygiene inspections carried out by a trained Weed Hygiene Inspector in compliance with the Queensland Government Biosecurity Queensland Checklists. 4) Spot checks on vehicles / machinery / plant arriving at site to ensure compliance. 5) Establishment of at least one Weed Wash-down Facility (WWF) to be constructed at or near the entrance to the Project area. a) The WWF is to be capable for use by the largest and smallest vehicles to be brought onto the construction site. b) The WWF is to be supported by a sump that is capable of collecting and holding contaminated water and / or soil without draining / leakage to the surrounding environment. 6) A Weed-Sludge Disposal Facility (WSDF) is to be established in a suitable quarantined location for the wash down facility sump sludge. a) Sludge must be contained such that water can drain through an earth or rock wall or other suitable filter for weed seeds. b) The WSDF must be located at least 500 m from waterways and close to the wash-down facility. c) The WSDF receiving environment should be capable of draining relatively rapidly and should not be susceptible to over-topping during wet season rains. d) Sludge should be treated with a pre-emergent herbicide after drying1 and a record kept of date, operator, treatment details, and climatic conditions. e) The Weed-Sludge Disposal Facility must be inspected every three months to within a radius of 200 m for evidence of new or unknown weed species, a record of this inspection kept, and any possible new weeds isolated, flagged, and reported to the relevant Queensland Weed Management Branch. 7) The introduction of soil or fill material into the Project area, or removal from the disturbance area to other parts of the Project area, must be accompanied by a Weed Hygiene Declaration form. 8) Transport must be via approved transport routes within the Project area. Vehicle access outside the disturbance area must be authorised by the **site manager**. 9) Some Landholders may have specific weed hygiene requirements. These will be taken into consideration when identifying WMZs and action plans for WONS.

Issue	Management and Control of Invasive Weeds
	10) Consultation with managers of adjoining property and Mamelon Station to engage in co-ordinated control programs to maximise effectiveness in the control WONS. 11) As part of the site-specific induction, all staff, contractors and visitors to site will be made aware of their weed hygiene obligations under the Queensland Biosecurity Act 2014 and this plan, including vehicle wash-down and weed-free declaration procedures.
Performance Indicators	• No introduction of new weed species to the Project area. • On-going implementation of control programs. • A Pre-construction weed survey report which includes maps, and WMZs describing infestation details and for all declared weeds. • Action plans prepared for WONS. • Weed Wash-down Facility and Weed-Sludge Disposal Facility constructed prior to the initiation of the construction phase of the Project. • All construction personnel to complete a site induction, including awareness training in regard to this management issue.
Responsible Persons – Key Actions	• The **environment manager** is responsible for developing pre-construction weed survey report. • The **environment manager** is responsible for preparing relevant awareness components within the site induction training. • The **site manager** is responsible for **contractor** compliance with the implementation of control and management strategies on the Project area. • The **site manager** is responsible for the construction and maintenance regimes for the WWF and WSDF.
Auditing and Reporting	• Monthly report by the **environment manager** to the **proponent** to include documenting compliance, non-compliance incidents and corrective actions taken.
Corrective Action	In the event that **environment manager** or **site manager** identifies practices inconsistent with the strategies described herein, the **responsible persons** identified herein, shall take the necessary corrective steps as soon as practicable, and the **environment manager** must record inconsistent practices / corrective steps / resolutions in the monthly report.
Timing	Duration of pre-construction, construction and operational periods.

Table 6-7 MP6 - Vehicle Interactions with Fauna

Issue	Vehicle Interactions with Fauna
Objective	To minimise impacts to fauna resulting from vehicle usage across terrestrial environments.
Implementation Requirements	1) A map is to be developed to identify the network of authorised access tracks. 2) Site protocols are to be established which restrict authorised area access by activity to the approved track network identified with the plan. 3) Vehicle movements outside designated operational areas will be subject to specific approval only. 4) For areas outside the disturbance footprint, establish an enforceable maximum vehicle speed limit of 60 km per hour. 5) Set an enforceable maximum vehicle speed limit of 50 km per hour between 1900hrs and 0500hrs for the following areas: a) The crossing of Deep Creek and for a distance of 100 m either side. b) The section of Mount Bison Road which traverses through remnant habitat on the western side of the Project area and for a distance of 100 m east of that remnant vegetation. c) The full extent of the haul road which extends along the western side of the Project area and connects between Mount Bison Road (in the south) and the Bruce Highway (in the north). 6) Road signage to be used to increase awareness and alert drivers to the fact that Koalas may cross the roadway in particular areas. Strategic locations for signage include: a) On approaches to the crossing of Deep Creek. b) On approach along Mount Bison Road to remnant vegetation on the western side of the Project area. c) Along the haul road which continues north from Mount Bison Road to the Bruce Highway (western side of Project area). 7) The installation of speed limit signage is to accompany awareness signage at the abovementioned strategic locations. 8) Implement measures to improve driver awareness, and thereby minimise the incidence of fauna-vehicle collisions, including: a) The installation of general signage to signal the presence of native wildlife at road entry points to the site. b) The installation of more specific signage treatments to be installed to signal areas within the site where there is an increased likelihood of encountering native wildlife on a road, roadside exits from contractor camps or where a road passes through / by habitats of particular value (e.g. crossings of Alligator Creek). 9) All **contractors** shall attend environmental training as part of the site induction and instructed on their obligations in regard to movement restrictions and road speed limits.
Responsible Persons – Key Actions	• The **environment manager** is responsible for ensuring that awareness information relating to this management issue is included as part of the site induction process. • The **site manager** is responsible for ensuring that information on the authorised track network is provided to all **contractors** and that site-wide driver awareness signage is maintained.
Performance Indicators	• Project traffic is restricted to an established track network and road speeds between / within designated construction areas are adhered to. • No collisions between vehicles with fauna. • All construction personnel to complete a site induction, including awareness training in regard to this management issue.

Issue	Vehicle Interactions with Fauna
Auditing and Reporting	• Monthly report by the **environment manager** to the **proponent** to include documenting compliance, non-compliance incidents and corrective actions taken.
Corrective Action	In the event that **environment manager** or **site manager** identifies practices inconsistent with the strategies described herein, the **responsible persons** identified herein, shall take the necessary corrective steps as soon as practicable, and the **environment manager** must record inconsistent practices / corrective steps / resolutions in the monthly report.
Timing	Duration of construction and operational periods.

Table 6-8 MP7 - Road Design and Fauna Crossing Treatments

Issue	Facilitating safe and on-going fauna movement along Deep Creek
Objective	To minimise impact to Koala and Greater Glider movement associated with the development of a road crossing of Deep Creek.
Implementation Requirements	1) In regard to Koala, a preferred solution comprises a dedicated 'grade-separated' road crossing treatment. a) The key structural element is either: a large open bridge underpass (e.g. spanned bridge or bebo arch) centrally located within the corridor crossing (preferred); or two sub-road spaces (fauna underpasses), being typically culverts of minimum size of 2.4 m high by 3 m wide[18]. b) In regard to the bridging structure, wherever possible, the design will make provision for dry land passage through the retention of either the watercourse embankment beneath the bridge, or elevated portions of road bridging dry land underneath. Where this is not achievable, the structure is to incorporate a dedicated Koala 'boardwalk ledge' at each end of the bridge. c) At least one dedicated fauna underpass (culvert or similar) is to incorporate a Koala 'bridge' or 'boardwalk ledge' structure which mirrors the length of the underpass to reduce the threat of predation and / or provide a resource for Koala access in the event of inundation. i) The 'bridge' structure comprises a line of horizontal poles / planks (extending through the length of the culvert), which are supported at regular intervals (app. 5 m) by vertical poles for the Koalas to ascend / descend as required, with several vertical (retreat / refuge) poles near the culvert entrances. Horizontal logs / planks should be placed as high off the ground as possible for koalas to avoid predators, with a minimum space of 60 cm between the top of the horizontal log / plank and the culvert ceiling. Poles, either horizontal or vertical poles, are to be ≥15 cm in diameter. Horizontal planks should be ≥15 cm in width. Materials should be timber and a post /rail diameter should not exceed 50 cm diameter as a maximum. ii) The 'boardwalk ledge' structure comprises a timber surface having a minimum width of 50 cm, which is fixed to metal brackets along outer wall of the single-cell culvert. The boardwalk ledge is to extend from the culvert opening out and around the adjacent fill batter (or wing wall) and terminate adjacent to natural ground, and near / adjacent to a Koala 'refuge pole'. The boardwalk ledge should be at least 1 m above the floor of culvert, though higher if possible – though no less than 60 cm between the boardwalk ledge and the top / ceiling of the culvert. iii) Koala refuge poles are to be installed at strategic locations – near / adjacent to – entry / exit points of culvert structures. Two poles should be set within 10 to 20 m of each culvert opening, and a further refuge pole adjacent to the outer extent of the timber boardwalk. A pole should be: treated timber; at least 20 cm diameter (though <50 cm); with an escape / rest fork near the top of pole (30 cm timber "arm" set at app. 45° angle to pole); and with the top of pole at least 3 m (preferably 4 m) above ground level. d) Other design considerations for a grade-separated crossing include the following: i) That there is no external lighting at culvert entrances. ii) Provision of an unobstructed view through to the far side of the underpass / sub-road space.

[18] The author has incorporated in previous underpass design, 'stock' culverts of 4.2 m wide x 3 m high, and 3.6m wide x 2.4m high (supplied November 2017 by Humes Ipswich for the Yarrabilba PDA Koala underpasses).

Issue	Facilitating safe and on-going fauna movement along Deep Creek

iii) Dedicated fauna underpass design to ensure suitable drainage and avoidance of water logging – even shallow pools of surface water may deter Koalas from using the crossing structure. Underpass floors are to be designed to remain dry at all times except in significant rain events where the structure quickly dries out, or ledges or Koala furniture are incorporated in the underpass to provide a dry path for movement.

iv) The ground surface around the culvert entrances should be shaped to allow free drainage so surface water and swampy vegetation does not dominate these areas, making koala passage difficult.

v) Habitat rehabilitation to provide some protective cover on approach/exiting the underpass though should not obstruct access or view of underpass entrance. For Koalas, the most suitable environment should reflect open forest or woodland conditions, with eucalypts near the overpass structure that are connected to adjacent Koala habitat, scattered midstorey species, and a sparse or low groundcover. Dense or overgrown ground cover or low shrub cover (e.g. tall, rank grass cover, dense weed infestations) are not favourable conditions for Koala ground movement and may be deterred usage of the crossing structure under such circumstances.

vi) Installation of Koala refuge poles at strategic locations near entry / exit points where suitable tree cover is sparse or absent. The purpose of these structures is to provide an available retreat / refuge site if a koala is disturbed/threatened (e.g. by a dog). Access poles must be of a width suitable for climbing (approximately 50 cm diameter maximum) and should be timber.

e) Where an under-road treatment is not feasible, an alternative solution comprises 'at-grade' road crossing treatment.

i) Here, the primary management intent is to create a 'slow zone' which limits traffic speed and raises driver awareness.

ii) Treatments will include speed reduction or other traffic calming devices (e.g. speed bumps), and koala movement awareness signs and other awareness heightening treatments such as the use of Cat's eye road reflectors.

f) The use of directional (exclusion) fencing should be considered for dedicated 'grade-separated' road crossing treatments. Given the often-unpredictable nature of Koala movement and dispersal patterns, it is not possible to ensure that all animals are guided to these crossing points, thus the aim of such treatment is to minimise, rather than prevent casualties. The following provides the key design and siting considerations for the application of directional fencing:

i) Fencing in place to guide koalas to the underpass(es) should extend at least 100 m on either side of the underpass entrance.

ii) Chain wire fencing to a height of least 1.5 m, with a Koala exclusion metal strip or similar of at least 50 cm in width which is attached beneath the top rail on the exclusion side of the fence.

iii) Fence bracing / supports are located on the opposite side to the Koala exclusion Koala exclusion metal strip or similar (i.e. the non-exclusion side of the fence).

iv) Fencing has a gap of <10 cm between the ground and the fence.

v) A treated timber pole (15 cm diameter) which mirrors the height of the fence, is to be located at 20 m centres, on the opposite side to Koala exclusion metal strip or similar (i.e. the non-exclusion side of the fence).

vi) Vegetation adjacent to the fence is to be maintained to achieve the following: exclusion of trees and shrubs from within 3 m of the fence; keeping tree canopies trimmed to remove links to tree canopies on the other side of the fence; and removal of fallen branches and vines growing on the fence to maintain fence effectiveness.

2) In regard to Greater Glider, the road crossing treatment involves the installation of vertical poles placed on the road verge and in the centre median to provides intermediate landing and launch opportunities to enable arboreal movements.

a) The following ecological data has been taken into consideration in the treatment design:

i) The glide distance is directly proportional to launch height (Ball & Goldingay, 2008).

Issue	Facilitating safe and on-going fauna movement along Deep Creek
	ii) ABMS (2001) estimated an average glide distance of between 25 to 35 m, with an average launch height of 20 to 25 m, and a minimum cross beam (launch) height of 11.96 m (average). iii) It is generally agreed that the glide angle for Greater Glider is 40° (Wakefield 1970, Jackson 1999, and Taylor & Goldingay 2009). b) Based on an understanding of the ecological data for the Greater Glider, and a clearing gap of 51 m, the following forms the treatment design: i) Glider poles are to be spaced at intervals of 20 m along both edges of the road and within the centre median. Poles are to be located opposite each other. ii) The height of a glider pole should be a minimum of 26m – top of pole to ground level. iii) Each pole will have two cross-arms running perpendicular to each other to assist in glider launch. Launching cross-arms are to be located at 50 cm and 1 m from the top of each pole to allow maximum choice of glides between individual poles and surrounding habitat. iv) Each pole will have a predation refuge located at the bottom cross-arm at heights of approximately 6, 9, 14, 17, 20, and 23 m above ground. A predation refuge comprises a length of PVC pipe (11 cm x 38 cm). v) The height of the glider pole accounts for a launch height from either of the cross-arms to enable a glide over a horizontal distance of 26 m to arrive at the pole within the centre median at a landing point approximately 3 m above ground. A glider would then need to ascend the pole within the centre median, and undertake a second glide to reach to pole on the habitat edge on opposite side of the clearing. vi) The height of the glider pole and spacing design accounts for a conservative assessment of the gliding capabilities of the Greater Glider[19] and gliding attempts under a variety of conditions. c) Refinement of design should only be progressed with the involvement of **suitably qualified person** whom is able to contribute ecological expertise in crossing treatments for Greater Glider.
Responsible Persons – Key Actions	• The **environment manager** is responsible for ensuring that: ○ the **project ecologist** and / or a **suitably qualified person** is engaged to work within the design process and that outcomes are consistent the above requirements. ○ the **project ecologist** and / or a **suitably qualified person** is engaged to prepare a program to assess and monitor usage of the road crossing treatments by the target species. ○ the engineering drawings for the treatment designs are incorporated with construction works contracts. ○ Road crossing treatments and associated site rehabilitation is completed within 12 months of vegetation clearing and road construction.
Performance Indicators	• Road crossing treatments are to be consistent with the abovementioned details, and with best practice guidelines including QDTMR (2010), QEPA (2006b), QDEHP (2012), RTA (2011), and VicRoads (2012). • That there are no collisions between vehicles with Koalas or Greater Gliders. • That there is positive evidence of use of treatments by Koalas and Greater Gliders.

[19] *cf.* conclusions by Taylor & Goldingay (2009) that "The installation of wooden poles 20 m in height should enable a glide of approximately 33 m and potentially allow the movement of greater gliders across the motorways [Compton Road, Karawatha] in our study area." and alternative estimates of lesser glide angle of 31° (Kavanagh pers comm. cited in Taylor & Goldingay (2009))

Issue	Facilitating safe and on-going fauna movement along Deep Creek
Auditing and Reporting	• Monthly report by the **environment manager** to the **proponent** to include documenting compliance, non-compliance incidents and corrective actions taken.
Corrective Action	In the event that **environment manager** or **site manager** identifies practices inconsistent with the strategies described herein, the **responsible persons** identified herein, shall take the necessary corrective steps as soon as practicable, and the **environment manager** must record inconsistent practices / corrective steps / resolutions in the monthly report.
Timing	Duration of construction and operational periods.

Table 6-9 MP8 – Artificial Lighting Impacts on Retained Habitat

Issue	Artificial Lighting Impacts on Retained Habitat
Objective	To minimise artificial light impacts on retained habitats
Implementation Requirements	1) In working areas adjacent to habitat, lighting should be consistent with the following guidelines: a) Lights should be shielded beyond full cut-off to ensure that light falls only on the intended surfaces, and minimise direct light above the horizontal and minimise light spill along habitat edges. b) Use light emitting diodes (LEDs) for lighting wherever possible. c) Use long wavelength (550-700 nanometers; orange to red) lights wherever possible. d) Lighting is to be designed to avoid the use of ultraviolet light and adjacent short wavelengths. e) Avoid use of white lights that emit ultraviolet light and limit strong blue or green spectral elements (e.g. mercury vapour lights) as far as possible / practicable. 2) Lighting for the road crossing over Deep Creek and along roads within remnant habitat on the western side of the Project area should be restricted to the minimum necessary to meet safety standards. Within these areas, consideration should be given to the use of red light which has the least effect on nocturnal mammals. 3) Lighting design to minimise impact to Greater Gliders and Koalas should be consistent with best practice and best available technology (e.g. Longcore *et al.* 2017; ISDA 2018; DEE 2019). 4) A **suitably qualified person** should be consulted in regard to ecological considerations in the design process for night lighting within these areas of threatened fauna habitat.
Responsible Persons – Key Actions	• The **environment manager** is responsible for ensuring that awareness information relating to this management issue is included as part of the site induction process. • The **site manager** is responsible for ensuring that contractors are aware of night lighting requirements and these are reflected in contract tenders. • The **project ecologist** is to be consulted as required to assist in specialist input to processes, auditing, and survey design issues.
Performance Indicators	• Minimise disturbance to significant fauna species to the lowest extent possible. • Strategies to minimise disturbance are implemented during all construction operations. • All construction personnel to complete a site induction, including awareness training in regard to this management issue.
Auditing and Reporting	• Monthly report by the **environment manager** to the **proponent** to include documenting compliance, non-compliance incidents and corrective actions taken.
Corrective Action	In the event that **environment manager** or **site manager** identifies practices inconsistent with the strategies described herein, the **responsible persons** identified herein, shall take the necessary corrective steps as soon as practicable, and the **environment manager** must record inconsistent practices / corrective steps / resolutions in the monthly report.
Timing	Duration of construction and operational periods.

7. Environmental Performance

7.1. Evaluation and Environmental Auditing

The implementation and effectiveness of the SSMP and its associated procedures will be regularly assessed to ensure:

- The proponent is demonstrating compliance with legal and landholder obligations;
- The overall management strategy remains relevant and up to date; and
- The plan and procedures adequately manage the environmental issue.

Audits ensure the implementation of this SSMP and other construction and operational-related plans and compliance with any legal obligations is being achieved. Central Queensland Coal's environmental audit schedule will include environmental compliance audits of the various site contractors at any time during construction and operation. Inspections or audits may also be conducted by the regulating or administering authority as directed and the summaries of these audits may be publicised.

7.2. SSMP Review

The SSMP is a live document and shall be reviewed at least every three years or sooner if any of the following occur:

- The plan is not adequately managing the issue - an unauthorised direct or indirect impact to significant species and / or TEC is identified as a result of activity in the Project area;
- Legislative requirements change;
- The area of activity changes;
- A new listed species or community is identified within the Project area;
- The protection status of a listed species or ecological community changes;
- Details of specific recovery plans or action statements change;
- Conditions of approval relevant to significant species and communities management in the Project Area are amended;
- Planning for the commencement of a new stage of development in the Project area; and / or
- A written request from the Minister for the SSMP to be reviewed is received by Proponent.

Reviews shall be undertaken by a qualified ecologist. Updates will consider data collected through Project monitoring programs, information made available by the Commonwealth and Queensland Government Departments, other mining proponents and input from other the Proponent. Approved revisions of the SSMP will be communicated to relevant Project personnel for immediate implementation.

7.3. Training and Awareness

Central Queensland Coal recognises that training and awareness is an essential part of the Project environmental management approach. Central Queensland Coal will ensure the Project's environmental management team, and other environmental personnel, including outside contractors, are sufficiently experienced and / or trained in their field to carry out the management measures described within this SSMP.

All relevant Project personnel and visitors will be required to undertake appropriate environmental training and induction programs prior to working within the Project Area. These training and induction programs will incorporate the identification, management and reporting of significant species (as appropriate) on-site.

7.4. Incident and Non-compliance Management

Incident and Non-compliance Management processes will be the responsibility of the Health, Safety and Environment Manager (HSE Manager) and Community Manager.

Non-compliance with any aspect of this SSMP will require corrective action and reporting. The type and scale of corrective action and reporting will depend on the type and scale of the non-compliance. All incidents that require some form of incident response, rectification or with the potential to cause material or serious environmental harm must be recorded in the incidents – complaints register.

Depending on the potential severity of the incident, the incident will be reported to the Project Site Manager and HSE Manager and an investigation will be carried out. If necessary, appropriate remedial actions will be recommended and implemented. Where required, incidents will also be reported to relevant government bodies.

8. References

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Attachment A Overarching Impact Mitigation Strategies and Measures

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
No remnant vegetation removal shall occur until relevant approvals have been obtained.	✓	✓	✓					
Clearing boundaries will be delineated on all drawings and in the field to define the extent of authorized/permitted clearing.	✓	✓	✓					
Installation of vegetation clearance markers (e.g. high visibility poly-web fencing) prior to the commencement of remnant vegetation clearance to identify and protect remnant vegetation for retention.	✓		✓	✓				
Clearly define all areas not directly affected by construction/mining activities to delineate limits of disturbance. No unauthorised disturbances should occur outside defined disturbance areas (e.g. dumping of excavated material).	✓	✓	✓	✓				
Avoiding additional clearing of remnant vegetation for construction vehicle access tracks, truck turning areas and extra workspaces, etc. A track plan is to be developed for areas of retained habitat and rehabilitation. Site protocols are to be established which restrict authorised area access to the approved track network identified with the plan.	✓	✓		✓			✓	✓
Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions.	✓		✓					
No clearing is to commence without the presence of a suitably experienced and licensed spotter/catcher.	✓		✓		✓			

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
Pre-clearing surveys are to be undertaken by suitably experienced and licensed spotter/catchers in advance of remnant vegetation clearing and pre-empting such operations with suitable lead times to ensure that specific management and mitigation measures can be implemented (e.g. avoidance of disturbance to nesting birds).	✓		✓		✓			
Conduct clearing in a sequential manner. The direction of sequential clearing should be away from the disturbance area and towards any retained vegetation or habitat links.	✓		✓		✓			
Along the interface between clearing precincts and retained remnant habitat, trees are to be felled towards the clearing precinct to avoid damage to adjacent retained remnant habitat.	✓		✓	✓				
Cleared vegetation is to be stockpiled so as not to impede wildlife, surface drainage and avoid damage to adjacent retained vegetation.	✓		✓		✓	✓		
Cleared material should not be deposited in or adjacent to watercourses. Setbacks to waterways as defined by approval permits need to be enforced.	✓		✓	✓		✓		
Suitable buffer distances for sensitive locations (e.g. active nest sites, presence of a Koala, etc.) must be established and clearly marked as a 'no go zone' until spotter/catcher has authorised that clearing in the area can commence/continue.	✓		✓		✓			
The timing of vegetation clearance (particularly areas of remnant vegetation) should be selected in order to minimise impacts (direct and indirect disturbances) to affected fauna habitats during optimum breeding periods.	✓		✓		✓			
No remnant vegetation clearing is to be conducted between the 1700hrs and 0500 hours unless subject to area-specific exemptions identified in the management plan.	✓		✓		✓			

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
Habitat trees are to be identified in the field and by plan prior to commencement of clearing operations. These shall be marked and dismantled using a cherry picker and a suitably qualified arborist and spotter/catcher. Hollows containing fauna shall be blocked, removed from the tree and gently lowered to the ground, with species relocated to a pre-identified, suitable site. Areas inaccessible to a cherry picker, requiring hollow removal shall use a hydraulic grabber to remove and gently to the ground.	✓	✓	✓		✓			
Wherever practicable, all remnant vegetation removed should be reused, either within the offset areas and/or within the rehabilitation areas. Logs and large rocks should be placed in nearby vegetation or adjacent to such vegetation to create shelter habitat for terrestrial fauna species. These 'stock piles' may then be used during later operations to create artificial habitats within rehabilitation areas.	✓	✓	✓	✓				✓
To ensure that the seed bank in removed soil is preserved as much as practical, stockpiling of topsoil will be undertaken in accordance with best practice storage guidelines.	✓	✓	✓					✓
Wildlife assessment/rescue services are to be engaged prior to vegetation clearing, to assess appropriate site clearing approaches to minimise deleterious impacts to fauna. Spotter/catcher services (wildlife handlers) are to be employed during vegetation clearing activities.	✓		✓		✓			
Spotter/catcher services (wildlife handlers) must only be undertaken by those identified on a current site-specific Damage Mitigation Permit (Removal and Relocation of Wildlife) from Queensland Department of Environment and Science and appropriate Animal Ethics Permit from the Department of Employment, Economic Development and Innovation.	✓	✓	✓		✓			

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
Where badly injured fauna requires euthanasia, only personnel suitably licensed shall undertake such actions. The Australian National Health and Medical Research Council's Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (2004) are to be followed when dealing with injured fauna. Alternatively, any injured fauna should be taken to the nearest veterinary clinic.	✓	✓	✓		✓			
Development and implementation of protocols for the relocation of any displaced fauna must be prepared prior to clearing operations.	✓	✓	✓		✓			
A register of fauna incidents/interactions needs to be maintained daily during clearing operations.	✓	✓	✓		✓			
Post-disturbance reconstructed landforms to be contoured to resemble the original local topography as far as practical.		✓						✓
A weed management plan will be implemented during both construction and operational phases. Weed control strategies are to be developed and implemented and include, but not be limited to the design and implementation of an ongoing eradication program which targets environmental weeds and an ongoing systematic monitoring program to detect the occurrence of environmental weeds and to assess the success of the control/eradication program.	✓	✓	✓	✓			✓	✓
Prior to commencement of clearing operations, a survey of weed species is to be undertaken in order to identify areas requiring treatment.	✓	✓	✓				✓	
All weed infestations within the construction area are to be treated and/or removed where practical from the clearing precinct prior to clearing.	✓	✓	✓				✓	
All construction machinery entering the site shall be free of soil, weeds, soil pathogens and pest species.	✓	✓					✓	
Designated wash down points for vehicles and plant entering the site will be established and plant will be inspected prior to mobilsation and demobilisation. A register of vehicle approval certification is to be developed and maintained.	✓	✓					✓	

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
It will be mandatory that vehicles and equipment to be used within areas of retained habitat are subject to a separate, more detailed and comprehensive wash-down before entering such areas. The remainder of the workforce vehicles/equipment will be required to stay on Project/site approved roads and designated works areas to minimise contact with weeds.	✓	✓		✓			✓	✓
The proposed development will not deliberately introduce any invasive species. Companion animals (e.g. dogs) are to be banned from all construction and operational areas.	✓	✓	✓				✓	
Feral animal control strategies are to be developed and implemented and include, but not be limited to the design and implementation of an ongoing eradication program which targets pest animals (especially cats, dogs and foxes) and an ongoing systematic monitoring program to detect the occurrence of feral animals and to assess the success of the eradication program.	✓	✓		✓			✓	✓
All sightings of non-indigenous fauna and conservation significant fauna will be reported to the Site Manager.	✓	✓		✓			✓	
Implementation of a program to ensure strict litter/waste control throughout the construction and operational works on the site. This is to be supported by: site-wide signage; an adequate number of litter bins (which by design exclude birds and vermin); bin clearance on a regular basis; daily maintenance of crib rooms to ensure cleanliness; educational signage within crib rooms on the linkage between poor waste management practices, increases in pest animal populations and subsequent impacts to native fauna.	✓	✓					✓	
Implementation of design features for permanent structures and temporary site facilities (e.g. construction site offices. etc.) which minimise harbourage or roost opportunities for vermin and animal pests.		✓					✓	
Fauna shall not be fed and direct contact with fauna is to be avoided. This includes both native and introduced species.	✓	✓			✓			

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
Identify barriers to safe fauna movement and remove or modify these barriers where possible (external to the open cut mine and infrastructure operational areas).	✓	✓				✓		
Implement measures to reduce fauna mortality on roads.	✓	✓		✓	✓	✓		
Vehicle speed limits will be imposed and enforced on Project roads.	✓	✓			✓	✓		
All fauna mortalities and injuries will be reported to the Site Manager within 24 hours and recorded within the incident reporting system.	✓	✓			✓			
Establishment of fauna exclusion fences to prevent fauna inadvertently re-entering the open cut mine operational areas.	✓	✓			✓	✓		
Monitoring of the movements of, and any incidents involving, the fauna populations will identify if there is the need for erection of fauna exclusion fencing around active quarry. If required, fencing should be designed and located with the assistance of an ecologist.	✓	✓			✓	✓		
The use of barbed wire should be avoided and used only where essential to exclude stock from adjoining pastoral activities. Where the use of barbed wire cannot be avoided, the fence design should incorporate alternate strands of plain wire and barbed wire, e.g. top strand plain wire, middle strand barbed wire and bottom strand plain wire.	✓	✓		✓	✓	✓		
Existing boundary fences associated with any offset areas should be retrofitted to meet the above recommendations (assuming there is no conflict with existing/approved rights of use).	✓	✓		✓	✓	✓		
All personnel shall attend environmental training prior to entering the work site. As part of this training, all personnel will be briefed about their obligations to protect fauna.	✓	✓						
Awareness training will identify conservation significant fauna and habitat and discuss relevant management measures, personnel/contractor responsibilities, and incident reporting requirements (i.e. reporting of fauna observations and/or incidents).	✓	✓		✓				

Management Strategies and Measures	Relevant Project Phase		Issue Category					
	Construction	Operational	Habitat Clearing	Management of Retained habitat	Animal Welfare	Fauna Movement	Pest Management	Habitat Rehabilitation
Off-road driving will be prohibited unless otherwise authorised by the Site Manager.	✓	✓		✓				✓
Temporary access tracks are to be contained within the Project operational footprint where possible. Tracks outside of this area are to be agreed with the Environment Manager prior and are to be a maximum of three metres in width or the required vehicle width plus one metre.	✓	✓	✓	✓				
Implementation of a comprehensive suite of dust suppression techniques to minimise impacts to areas of retained habitat and rehabilitation which are in proximity to operational areas.	✓	✓	✓					✓
Any proposed site lighting should be designed to ensure that leakage of artificial light onto adjoining retained habitat is avoided.	✓	✓		✓				