Central Queensland Coal Project

Appendix 20 - *Draft* Significant Species Management Plan

Supplementary Environmental Impact Statement

Central Queensland Coal Project

Draft Significant Species Management Plan

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CDM Smith Australia Pty Ltd
ABN 88 152 082 936
Level 4, 51 Alfred Street
Fortitude Valley
QLD 4006
Tel: +61 7 3828 6900
Fax: +61 7 3828 6999

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Abbreviations

Term	Definition
CEMP	Construction Environmental Management Plan
CHPP	Coal handling preparation plant
DES	Queensland Department of Environment and Science
DotEE	Department of the Environment and Energy
EA	Environmental Authority
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESCP	Erosion and Sediment Control Plan
GDE	Groundwater Dependent Ecosystem
HGTC	High grade thermal coal
LUMP	Land Use Management Plan
MIA	Mining Infrastructure Area
ML	Mining Lease
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
Mtpa	million tonnes per annum
NC Act	*Nature Conservation Act 1992*
ODP	Offsets Delivery Plan
OEMP	Operation Environmental Management Plan
RE	Regional Ecosystem
REMP	Receiving Environment Monitoring Program
RMP	Rehabilitation Management Plan
ROM	Run-of-mine
SSCC	Semi-soft coking coal
SSMP	Significant Species Management Plan
TEC	Threatened Ecological Community
TLF	Train load out facility
WMP	Waste Management Plan

1 Introduction

Central Queensland Coal Proprietary Limited (Central Queensland Coal) and Fairway Coal Proprietary Limited (Fairway Coal) (the joint Proponents), propose to develop the Central Queensland Coal Mine Project (the Project). 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. The Project comprises the Central Queensland Coal Mine, where coal mining and processing activities will occur, along with a train loadout facility (TLF) developed to connect to the existing Queensland Rail North Coast Line.

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 is generally located on the "Mamelon" property, described as real property Lot 11 on MC23, Lot 10 on MC493 and Lot 9 on MC496. The TLF is located on the "Strathmuir" property, described as real property Lot 9 on MC230. A small section of the haul road to the TLF is located on the "Brussels" property described as real property Lot 85 on SP164785.

Figure 1-1 depicts the proposed layout of the mine. The Project consists of two open cut operations that will be mined using a truck and shovel methodology. The run-of-mine (ROM) coal will ramp up to approximately 2 Mtpa during Stage 1 (2019 to 2022). Stage 2 of the Project (2023 to 2038) will include further processing of up to an additional 4 Mtpa ROM coal within another coal handling and preparation plant (CHPP) to SSCC and up to 4 Mtpa of HGTC.

Initial mining operations will begin to the north-east of the Bruce Highway (Open Cut 2). Mining operations to the south-west of the highway is predicted to occur in Year 10 of operations. Mining of Open Cut 1 will commence at the western edge of the pit with mining operations then progressing towards the east. Mining of Open Cut 2 will commence in the north and progress generally in a southern direction. Open Cut 1 and Open Cut 2 cover an area of 248 ha and 500 ha respectively. Waste rock spoil from the pits will be stored in Waste Rock Stockpile areas – one stockpile for Open Cut 2, and two smaller stockpiles for Open Cut 1.

Other significant infrastructure associated with the Project includes Mine Infrastructure Areas associated with the CHPPs and several dams required for mine dewatering, raw water supply / storage, and environmental dams associated with run-off from Project infrastructure. At full production, two CHPPs (one servicing each open cut) will be in operation. A haul road approximately 4.5 km long will connect the CHPP 2 area to the TLF located to the east. The TLF will be developed to connect into the existing Queensland Rail North Coast Rail Line. This connection will allow the product coal to be transported to the established coal loading infrastructure at the Dalrymple Bay Coal Terminal near Mackay.

Development of the Project is expected to commence in 2019 with initial early construction works and extend operationally for approximately 19 years until depletion of the current reserve, and rehabilitation and mine closure activities are successfully completed. Rehabilitation works will occur progressively through mine operation (including the open pit areas), with final rehabilitation and mine closure activities occurring between Years 18 to 20.

A number of conservation significant fauna species listed under the Queensland *Nature Conservation Act 1992* (NC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) 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 that are identified as having the potential to occur and be impacted by the construction and operation of the Project.

This is to be regarded as 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).

1.1 Purpose and Scope of SSMP

To be updated on approval of the Project

The Project received approval from the Commonwealth Department of the Environment and Energy (DotEE) under the EPBC Act (201insert/insert) on <date>. Under Condition <insert condition number> of the approval Central Queensland Coal is required to:

The approval holder must submit a SSMP for the Ministers written approval. The SSMP must include:

- *Measures that will be taken to avoid, mitigate and manage impacts to EPBC threatened species and EPBC migratory species and their habitat, and EPBC communities during clearance of vegetation, including supervision by a suitably qualified person at all times during clearance of vegetation;*
- *Further requirements to be added*

In addition, the Environmental Authority (EA) for the Project was issued to Central Queensland Coal and took effect on <insert date>. Condition <insert condition number> of the EA requires a SSMP to be prepared as part of the overall Land Use Management Plan (LUMP) for the Project.

This SSMP is also intended to serve as an Impact Management Plan required as part of the Project's 'Species management program for tampering with animal breeding places (high risk of impacts)'. An approved species management program is required under Section 332 of Queensland's Nature Conservation (Wildlife Management) Regulation 2006 (Wildlife Regulation) where a Project unavoidably impacts the following 'breeding places':

- Protected animals prescribed as extinct in the wild, endangered, vulnerable, near threatened, or a special least concern animal under the Wildlife Regulation;
- Least Concern animals that are colonial breeders; or
- Least concern animals where proposed tampering with a breeding place may have impacts on the broader population of the species.

As such, this SSMP also includes Special Least Concern fauna species with potential to be impacted by the Project. The species management program, with this SSMP attached as an appendix, will be submitted to the Department of Environment and Science (DES) for final approval.

1.2 Objectives

The objectives of this SSMP are summarised as follows according to the predicted impacts potentially resulting from Project activities:

- There will be no clearing of vegetation beyond that required for the construction and operation of the Project as detailed in the LUMP;
- It is noted that vegetation/habitat clearing will be ongoing across the site during operational works due to the progressive expansion of the open cut pits and waste rock stockpile areas;
- There will be no deliberate fauna deaths as a direct result of Project activities;
- To protect the quality of the existing surface water quality and hydrology as a result of Project activities;
- To protect the quality of the existing groundwater resources and any connected surface ecosystems including habitat supporting significant fauna species;
- The main objectives of pest and weed management will be early detection and early control / eradication of any invasive species new to the local area, and to manage and control existing weed and pest populations;
- Induction and education procedures will minimise the chances of accidental bushfires resulting from Project activities; and
- To protect the native fauna and minimise any adverse impacts by artificial lighting, noise, or dust deposition as a result of Project activities.

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

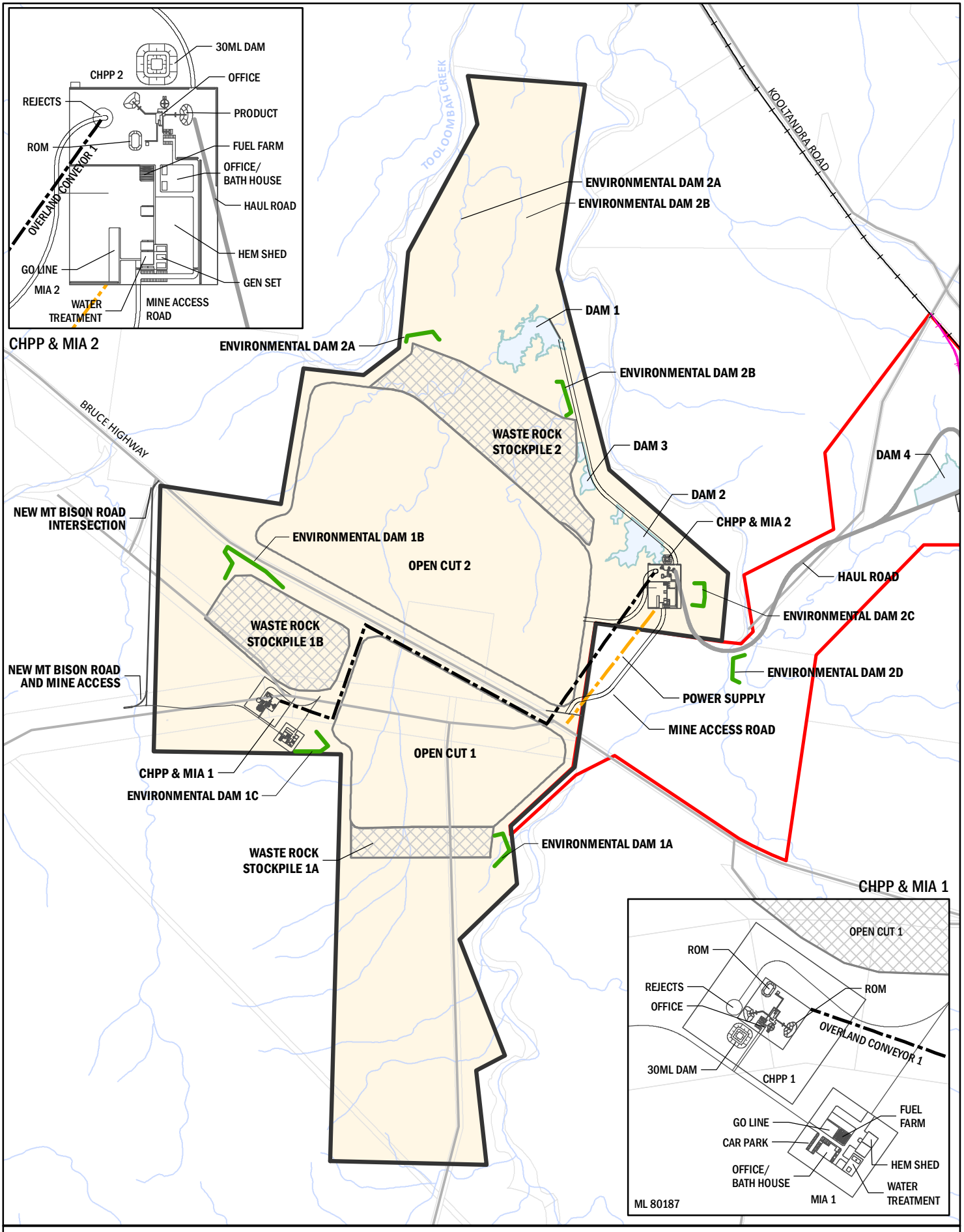

Figure 1-1
Mine arrangement and haul road corridor

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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 Commonwealth

1.3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides for the protection of the environment, in particular matters of national environmental significance (MNES). The EPBC Act lists those threatened species, including migratory species, and threatened ecological communities that are to be considered MNES. Under the EPBC Act, 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 EPBC Act.

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

1.3.2 State

1.3.2.1 Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) provides the key legislative framework for environmental management and protection in Queensland. The objective of the EP Act 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 EP Act, 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 EP Act is applicable to the Project as under Chapter 5 of the EP Act, the Project requires an 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 (EA) 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.

1.3.2.2 Nature Conservation Act 1992

In broad terms, the objective of the NC Act is the conservation of nature (plants and animals) within Queensland. Specifically, the NC Act seeks to gather relevant information, identify critical habitat areas, manage protected areas, protect wildlife and promote ecologically sustainable development. The NC Act 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 NC Act a Species Management Program must also be approved when interfering with native fauna habitat and breeding places.

1.4 Relevant Management Plans

This SSMP describes the actions to be implemented to mitigate the potential impacts of construction and operation activities of the Project on listed fauna species. The SSMP is to be used in concert with all other Project associated management plans which may overlap and/or assist with the reduction and recovery from any impacts identified in this document, such as:

- Environmental Management Plan (EMP) – incorporates both a Construction EMP and Operation EMP and aims to detail general approach to overall management of Project with regard to general environmental management;
- Land Use Management Plan (LUMP) – aims to facilitate and guide management measures throughout the life cycle of the mine such that the present land values of the surrounding area are retained;
- Water Management Plan (WMP) – to monitor and manage surface water and groundwater usage and preservation of water quality;
- 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;
- Rehabilitation Management Plan (RMP) – detailing all aspects of the progressive rehabilitation of the Project's mining areas including landforms, rehabilitation schedule, plant species selections, goals and objectives, and rehabilitation monitoring;
- Erosion and Sediment Control Plan (ESCP) – detailing approach to managing erosive soils and potential water quality contamination resulting from exposed soils during construction and operation;
- Waste Management Plan (Waste MP) – detailing approach to managing general and hazardous waste associated with the Project; and
- Offsets Delivery Plan (ODP) – details approach to land use management of proposed offset sites (for species detailed in this SSMP) which includes the surrounding Mamelon property which encompasses the Project footprint.

2 Roles and Responsibilities

The roles and responsibilities of the various stakeholders related to the implementation of this SSMP are outlined Table 2-1.

Table 2-1 Management and Monitoring Roles and Responsibilities

Role	Responsibility
General Manager – Central Queensland Coal	Provide adequate resources to ensure compliance with the SSMP.
Manager Environment and Communities	Coordinate/undertake environmental system and environmental compliance audits.
Site Environmental Officer	Manage consultants and contractors, maintain records, carry out environmental inspections of the site, monitor and review the effectiveness of the SSMP. Oversee presentation of site induction to all site staff / contractors.
Contractors (general)	Implement SSMP control activities and ensure required specifications are met.
Fauna Spotter-Catcher	Undertake pre-clearance surveys, handles fauna during pre-clearing/clearing activities, determines if handled fauna can be relocated or requires veterinary attention, monitor and review the effectiveness of measures within the SSMP.
Superintendents, Supervisors and all Personnel	Undertake all work on the Project in compliance with EA and environmental management plans, including this SSMP. Complete incident reports for: ▪ Unusual or unauthorised clearing ▪ Outbreaks and sightings of declared plants and animals ▪ Fauna deaths from vehicle collisions, clearing activities or other Project activities.

2.1 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 Site Environmental Officer 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.

Central Queensland Coal will carry out general environmental training and awareness programs for all personnel/contractors working on the site as part of its Project specific site induction and ongoing refresher and toolbox training.

All fauna spotter-catchers will be required to have experience with the species identified in this SSMP and be in possession of the relevant permit (Rehabilitation permit – spotter catcher) as required by DES.

3 Significant Species

The potential presence of significant fauna species in the Project area were assessed based on the following:

- A review of existing database records (Wildlife Online and Atlas of Living Australia), peer-reviewed literature, previous and other relevant database information, such as DotEE's Species Profile and Threats Database; and
- Project-associated fauna surveys and habitat assessments.

Following site surveys, all flora and fauna species predicted as being potentially present from the desktop research were categorised as to their likelihood of occurrence in the Project area and surrounds. Four categories were used to classify the likelihood of a threatened fauna or flora species being present. Categories were defined as:

- Known (confirmed during field assessments);
- Likely (known distribution, database records within or around the Project area, and suitable habitat observed during field assessments);
- Potential (known distribution, limited records of the species occurring in the wider area and possibility of suitable habitat occurring); and
- Unlikely (no suitable habitat or not known to occur within the local region).

Only those species considered as 'known' or 'likely' to occur in the area are considered as potentially impacted by Project activities and as such, are considered under this SSMP.

3.1 Threatened Ecological Communities

Two Threatened Ecological Communities (TECs) are known to occur on the site, having been recorded during site surveys:

- Brigalow (*Acacia harpophylla* dominant and codominant); and
- Semi-evergreen Vine Thickets of the Brigalow Belt (north and south) and Nandewar Bioregions.

Descriptions of the TECs and their equivalent Regional Ecosystems (REs) are provided in Appendix A.

3.2 Threatened Species

Fifteen flora and 29 fauna species listed as threatened under the EPBC Act and / or NC Act have the potential to occur within the Project area and surrounds based on the results of the desktop EPBC Protected Matters Search Tool and database searches. Of these, the presence of four species was confirmed during onsite surveys and habitat suitability assessments: Squatter Pigeon (southern) (*Geophaps scripta scripta*); Greater Glider (*Petauroides volans*); and Koala (*Phascolarctos cinereus*). One further threatened species is considered likely to occur: Ornamental Snake (*Denisonia maculata*).

A single species listed as Special Least Concern under the NC Act is also known to occur: Short-beaked Echidna (*Tachyglossus aculeatus*).

Descriptions of threatened species that are known or likely to occur in the Project area are provided in Appendix B.

Description of Short-beaked Echidna is provided in Appendix C.

3.3 Migratory Species

A total of twenty four species listed as Migratory under the EPBC Act were predicted to occur in the Project area through the EPBC Protected Matters search and database searches. Five of these species were recorded within the Project area during field assessments: Latham's Snipe (*Gallinago hardwickii*); Oriental Cuckoo (*Cuculus optatus*); White-throated Needletail (*Hirundapus caudacutus*); Fork-tailed Swift (*Apus pacificus*) and Rufous Fantail (*Rhipidura rufifrons*).

Glossy Ibis (*Plegadis falcinellus*) was recorded in estuarine/wetland habitat north of the Project area during the 2011/2012 surveys and is considered likely to occur within the ML given the habitat occurring in the Project area and local surrounds.

Estuarine Crocodile (*Crocodylus porosus*) is considered likely to occur in the waterways downstream of the Project and potentially in larger waterholes adjacent to the Project (based on anecdotal evidence and observations of 'slides' on Deep Creek in 2011). The most suitable habitat for this species is the Styx River downstream of the Project.

Descriptions of Migratory species that are known or likely to occur in the Project area are provided in Appendix C.

3.4 Significant Species Occurrence

No significant flora species are considered likely to occur in the Project area. The significant fauna species considered known or likely to occur within the Project area are presented in Table 3-1. These species are listed under the EPBC Act (therefore considered MNES) and are also listed under the NC Act [therefore considered Matters of State Environmental Significance (MSES)]. Three species are also listed as Vulnerable by the International Union for Conservation of Nature.

Details of the habitat preference, occurrence on site and key threats for each of the listed species is summarised in Table 3-1. Appendix 1 provides detailed species profiles including habitat preference descriptions and Project habitat mapping, and predicted impacts from the Project.

Table 3-1 Significant species occurrence and onsite habitat preference

Species	EPBC Status	NC Status	IUCN Status	Likelihood of occurrence
Squatter Pigeon (southern) *Geophaps scripta scripta*	V	V		**Known**. Species observed on all surveys including within the ML. Species is relatively common in the wider area. Species observed in Project area in Poplar Box (RE11.4.2) and Narrow-leaf Ironbark (RE11.11.15a) woodlands and cleared habitat, generally close to farm dams/watering points. Project will directly impact 82.75 ha of remnant vegetation that is suitable, and 508 ha of cleared habitat that may be used for foraging.
Ornamental Snake *Denisonia maculata*	V	V	V	**Likely**. Recorded on three occasions during 2011/2012 fauna surveys in areas associated with remnant RE 11.4.9 outside of the current Project area: two records 3.5 km west and one record 5.8 km northwest of the ML. Cracking clay soils with gilgais and regrowth Brigalow habitat is widespread in the ML north of the Bruce Highway and is suitable for this species. Project will directly impact 20.87 ha of remnant vegetation and 353 ha of cleared habitat that is suitable for the species.
Short-beaked Echidna *Tachyglossus aculeatus*	-	SLC	SLC	**Known.** Scats of this species observed at several sites within ML during 2011 surveys. Recorded in wider area in September 2017. Recorded within southern ML on several occasions on remote cameras (September to December 2017). Common and widespread species that may occur throughout the Project area although more likely in wooded areas.
Greater Glider *Petauroides volans*	V	V	V	**Known**. Two individuals recorded in woodland habitat (RE 11.11.15a) and three individuals recorded in riparian habitat (RE 11.3.25) along Deep Creek across two separate surveys, both areas south of the highway. Suitable habitat in southern and eastern extent of ML where continuous forest with large hollows remain. The Project will not directly impact habitat where the species is expected to occur (south of the Bruce Highway). Minor potential to occur in riparian habitat along Deep Creek and Barrack Creek where haul road is located.
Koala (Qld, NSW and ACT populations) *Phascolarctos cinereus*	V	V	V	**Known**. Species recorded onsite in several REs throughout 2017/2018: Poplar Box woodland (RE 11.4.2), Poplar Gum woodland (RE 11.5.8a), and Narrow-leaf Ironbark woodlands (RE 11.10.3 and 11.10.7). Forest Red Gum habitats (RE 11.3.4 and 11.3.25) likely the most favoured habitat for this species. Project will directly impact 108.22 ha of remnant vegetation that is suitable.
Glossy Ibis *Plegadis falcinellus*	M	SLC	LC	**Likely**. Recorded in 2011 northwest of the ML on estuarine sedge swamp. Seasonal wetlands and shallow dams in the Project area provide habitat for this species. Several farm dams/wetlands will be removed under the Project footprint.

Species	EPBC Status	NC Status	IUCN Status	Likelihood of occurrence
Latham's Snipe *Gallinago hardwickii*	M	SLC	LC	**Known**. Up to 15 individuals observed at farm dam within the ML in February 2017. Seasonal wetlands and shallow dams in the Project area provide habitat for this species. Several farm dams/wetlands will be removed under the Project footprint.
Oriental Cuckoo *Cuculus optatus*	M	SLC	LC	**Known**. Recorded on March 2011 survey although sighting location unknown. May be occasional visitor to denser woodlands (such as riverine and adjacent woodland) in the Project area. Most potential to occur in riparian and adjacent habitat (RE 11.3.25 and 11.3.4) in summer along Deep Creek and Barrack Creek where haul road is located.
White-throated Needletail *Hirundapus caudacutus* Fork-tailed Swift *Apus pacificus*	M	SLC	LC	**Known**. Fork-tailed Swift recorded during the September 2011 survey although well to the northwest of the ML. White-throated Needletail recorded in ML in November 2017. Both are wide ranging aerial species which migrates from the northern hemisphere to eastern Australia. May occur over the Project area in the summer months. The Project will not impact either species.
Rufous Fantail *Rhipidura rufifrons*	M	SLC	LC	**Known**. Recorded on March 2011 survey although sighting location unknown. May occur throughout the Project area including regrowth Brigalow. More likely in denser woodlands such as riverine and adjacent woodland. Most potential to occur in riparian and adjacent habitat in winter along Deep Creek and Barrack Creek where haul road is located.
Estuarine Crocodile *Crocodylus porosus*	M	SLC	LC	**Likely**. Anecdotal accounts of species in Styx River and reports of slides in Deep Creek from June 2011 aquatic ecology survey. Most potential to occur in Styx River downstream of Project. No direct impacts from Project.

Status abbreviations: V = Vulnerable, M = Migratory, SLC = Special Least Concern, LC = Least Concern.

4 Project Impacts to Significant Species

Throughout the construction, operation and decommissioning phases, the Project has the potential to impact significant species through the following activities:

- Removal of remnant vegetation for mine infrastructure (CHPP / MIA areas), waste rock stockpile areas, dams, open cut pits, TLF and site access and haul roads;
- Topsoil stripping and earthworks;
- Day and night time operation of coal mining activities;
- Stockpiling and transportation of the coal resource and waste rock; and
- General transportation movements.

Considering key threats faced by the relevant significant species and the location of potential habitat within the Project area in relation to Project activities, potential impacts relating to the species found within and around the Project area include: habitat clearance and degradation, vehicular movements, changes in surface water quality and hydrology, groundwater changes, dust, weeds, and fire. These are described in further detail below.

4.1 Vegetation Clearance

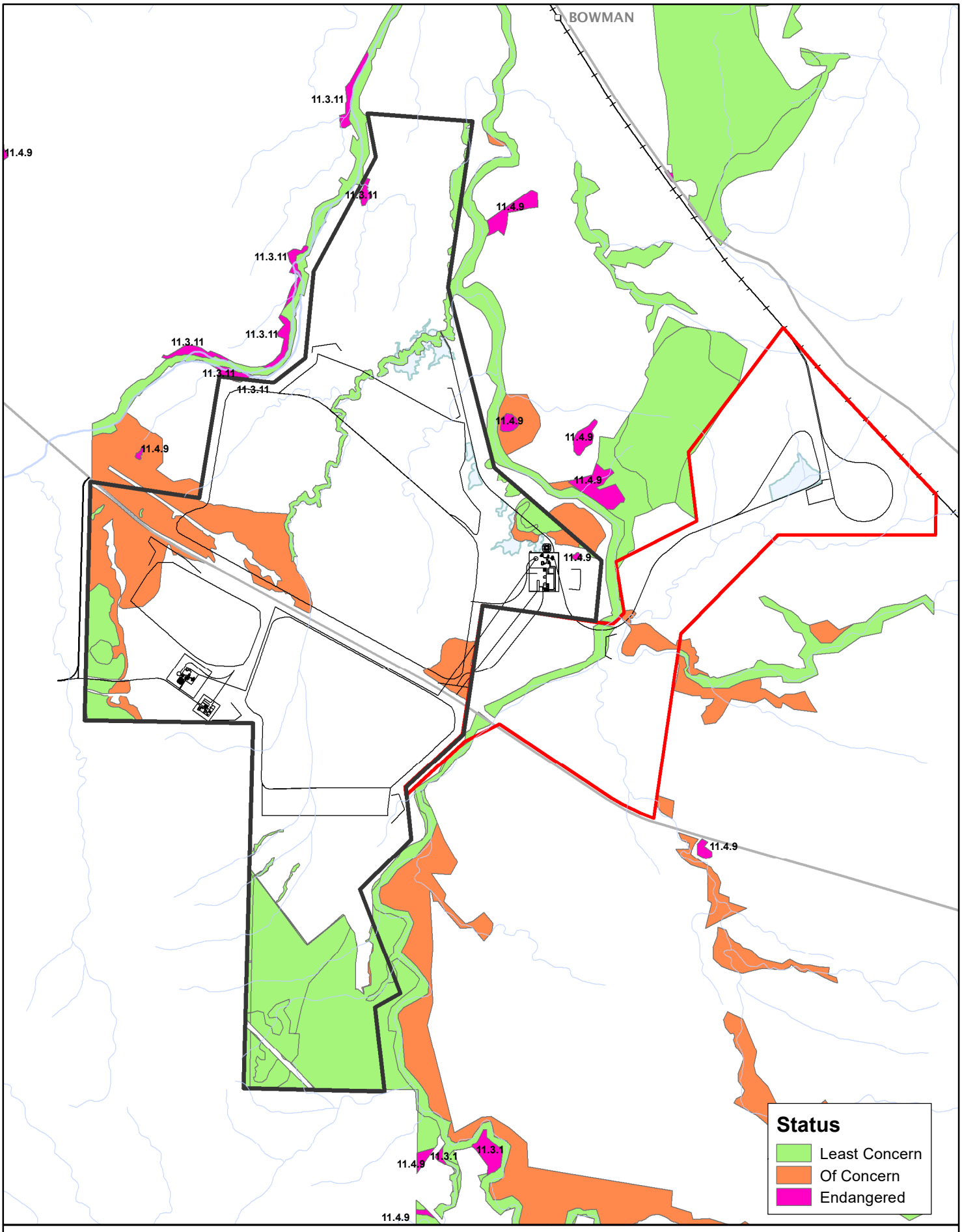
Clearance of remnant habitat will necessarily occur during the construction phase of the Project. Much of the mine area footprint has been cleared for cattle grazing. The remainder is dominated by grassy woodlands. Most of the haul road and TLF is also cleared of remnant vegetation.

Under the current Project footprint an approximate total of 108.22 ha of remnant habitat is predicted to be cleared within the mine and associated infrastructure areas, haul road and TLF over the lifespan of the Project. The majority of remnant habitat to be impacted will be open woodland dominated by Poplar Box and Narrow-leaf Ironbark (RE 11.4.2) or Forest Red Gum (RE 11.3.25). The ground-truthed vegetation communities and associated threatened fauna habitat values predicted to be impacted by clearing are described in Table 4-1 and depicted in Figure 4-1.

The Project is located on the Mamelon property. Mamelon encompasses a total area of 6,478 ha of which the Project footprint covers 1,323 ha. Central Queensland Coal have proposed destocking the majority of the property and restricting general cattle access to already cleared habitat in the south-west and south of the property. This area encompasses approximately 1,000 ha. The remaining area, including the creek lines which lie adjacent to the mine area, will be managed (including weed and pest and bushfire management activities) and allowed to regenerate native vegetation cover, thereby increasing habitat for threatened species in the wider area surrounding the Project.

Table 4-1 Predicted impact on extant vegetation communities within Project ML and potential habitat for significant species and threatened vegetation communities

RE	Brief description	MNES habitat	Direct impact (clearing) area (ha)
11.3.4	Forest Red Gum woodland on alluvial soils	Koala – Forest Red Gum is a known preferred forage tree species – core foraging habitat Greater Glider – may provide hollow-bearing habitat where it occurs next to continuous woodlands in the south of the mine ML	0.6
11.3.11	SEVT on alluvial soils	SEVT TEC	0
11.3.25	Forest Red Gum riparian woodland	Koala – Forest Red Gum is a known preferred forage tree species – core foraging habitat Greater Glider – provides hollow-bearing habitat where it occurs connected to continuous woodlands in the south of the mine ML Ornamental Snake – may provide habitat where it occurs within the ML adjacent to cleared / regrowth Brigalow habitat	21.27
11.3.27b	Wetlands with fringing Forest Red Gums	Koala – core foraging habitat available in surrounding trees (Forest Red Gum)	2.2
11.3.35	Poplar Gum /	Koala – secondary foraging habitat Squatter Pigeon – species may forage in this habitat.	1.4
11.4.2	Poplar Box / Narrow-leaf Ironbark woodland on Cainozoic clay plains	Koala – Foraging habitat as Poplar Box considered feed species Squatter Pigeon observed in this habitat	82.75
11.4.9	Brigalow shrubby woodland on Cainozoic clay plains	Brigalow TEC Ornamental Snake – species recorded in this community outside of the Project area	0
Non remnant	Lands cleared for cattle grazing	Squatter Pigeon - observed in this habitat (excluding areas of regrowth Brigalow on gilgais north of Bruce Highway) Ornamental Snake – provides habitat where gilgais / regrowth Brigalow habitat observed	508 353
Total remnant vegetation area			**108.22**



Legend

- ML 80187
- ML 700022
- Mine infrastructure
- North Coast Rail Line
- Main Road
- Major watercourse
- Minor watercourse
- Dam

0 0.5 1 km

Scale @ A4 1:50,000
Date: 08/11/18
Drawn: J Parnwell

Figure 4-1
Project vegetation community mapping as ground-truthed from field verifications

DATA SOURCE
Waratah Coal, 2018
QLD Open Source Data, 2018
QLD Department of Environment and Heritage Protection, 2016

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4.2 Fauna Mortality and Injury

Direct mortality to MNES fauna may occur during tree clearing and during the construction phase of the Project and collision with increased vehicular activity during all Project phases. Mortality from tree clearing has potential to impact Koala and Greater Glider. Clearing and earthworks in cracking clay / gilgai habitat north of the highway has potential to impact Ornamental Snake should it occur in the area. Squatter Pigeon is not expected to be directly impacted during clearing activity.

Increased traffic within the Central Queensland Coal mine area may impact Squatter Pigeon, Ornamental Snake (should it occur in this area) and Koala. A focus point for potential collisions may be the haul road crossing of the Deep Creek / Barrack Creek riparian corridor and adjacent alluvial habitat which provides the most suitable habitat for Koala. Increased traffic in the wider region resulting from workers 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 mine ML.

Fauna may potentially also become exposed to additional mortality risk from the following:

- Using operational site infrastructure (e.g. buildings associated with CHPP / MIA areas) as shelter sites. The CHPP / MIA 1 area is located well away from vegetated habitat. The TLF is also located entirely within cleared habitat and well away from potential habitat for threatened species;
- Fauna may become entrapped in open trenches left exposed overnight (where trenching is required during construction); and
- Fauna accessing Project dams containing polluted waters (mine dewater, stormwater runoff from infrastructure areas) may be subject to risk of mortality.

No impacts are expected once the decommissioning phase has been completed and no further Project related traffic occurs within the Project area.

4.3 Change in Surface Water Quality

The Project will involve the construction of structures and diversion systems which will modify surface water flows, and potentially surface water quality. The potential impacts of these may manifest during both the construction and operation phase of the Project.

The stormwater diversion system has been designed as part of the Project Water Management Plan. Hydrological modelling indicates only very minor changes are expected to local water flows because of catchment modification caused by the Project layout. No impacts to habitat for significant species are expected as a result.

The design of the creek crossings along the haul road will be undertaken such that impacts on surface water, both upstream and downstream, are minimised. Flow in the creeks crossed by the corridor are expected to be intermittent, at best, given their position high in the catchment. As such, it is not anticipated that the haul road will have an impact on vegetation communities or downstream MNES because of surface water impacts.

The potential impacts of these may manifest during both the construction and operation phase of the Project.

The main construction activities that could impact on surface water quality values include:

- Excavations and earthmoving including topsoil and mine spoil removal and stockpiling, for the construction of open cut mine pits and mine infrastructure including site access roads, cut and cover and drifts, environmental dams, the haul road and TLF. This may potentially lead to erosion and sedimentation, deterioration of water quality, and changes to water flows; and
- The use of fuels and chemicals for vehicles and construction equipment, potentially resulting in water contamination because of spills, leaks, or other uncontrolled releases.

Operational impacts are in relation to:

- Stormwater runoff, erosion and contaminants from the TLF, waste rock stockpiles and MIA / CHPP areas.

Changes in water quality due to sedimentation or chemical contamination in water bodies following heavy rainfall events have the potential to temporarily impact downstream terrestrial flora and fauna.

Most of the Project lies within the catchment of Deep Creek. This could potentially affect aquatic species such as Estuarine Crocodile, adjacent to and downstream of the Project area. Squatter Pigeon occurs in the area and is reliant on permanent water sources, and therefore may also be impacted by changes to surface water quality.

Any potential impacts are expected to be mitigated once the decommissioning phase has been completed.

4.3.1 Sedimentation of Waterways

During construction and operation 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 and aquatic habitats. Specifically, increased suspended sediments can reduce light penetration, decreasing photosynthesis of aquatic flora and decrease dissolved oxygen.

This may impact refugial pools in Deep Creek and Tooloombah Creek, although for the most part the Project area drains towards Deep Creek. These creeks in turn drain into the Styx River which may support Estuarine Crocodile. Suspended sediments from runoff will likely contain elevated nitrogen and phosphorus levels due to the agricultural activities within the surrounding landscape. The Project has committed to the removal of cattle from much of the property and allow vegetation regeneration in cleared areas, so this could be expected to decrease over time. Increased nutrients can promote algal growth and in extreme cases result in blooms and surface water deoxygenation within low flow situations.

Several Project components, including the site access road and haul road, will traverse a number of drainage features. At these crossings impacts may include riparian vegetation clearing, direct deformation of the bed and banks, and alteration of hydrological flows. Consequential impacts may include decreased instream and riparian habitat, and vegetation removal and earthworks leading to increased erosion and sediment entering downstream waterways. The haul road crosses Deep Creek and Barrack Creek. There are no large waterholes at these crossing points which will require direct disturbance during construction. As a result, no direct impact to habitat suitable for significant species is considered likely.

4.3.2 Accidental Release of Pollutants

Changes to surface water quality may also occur due to contaminated runoff from the haul road, waste rock stockpile areas, coal stockpiles, coal conveyor and other infrastructure elements such as environmental dams. Coal mine water collected in dewatering and sediment dams may contain a range of pollutants (depending on the source material) such as hydrocarbons and heavy metals. The release of pollutants into the surrounding environment and waterways has the potential to cause habitat degradation for significant species (as well as other aquatic fauna species) covered under this plan (Estuarine Crocodile), degrade stream habitat quality near the Project and with a much lesser likelihood, adversely impact downstream estuarine and marine waters. Without mitigation, potential exists for several potential 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.

During operations, Deep Creek and Tooloombah Creek are not anticipated to be directly impacted by surface water runoff from Project facilities (such as the CHPP / MIA areas) as runoff will be captured in a number of environmental dams for re-use or treatment. Cattle will be excluded from the majority of the property and riparian vegetation will be allowed to regenerate. In the longer term this will create a vegetated buffer to the creeks reducing sediment and nutrient inputs from the property. Together with Project erosion and sediment controls as described in the Project ESCP it is predicted there will be minimal (if any) impact on surface water runoff, and in the long-term water quality of runoff may improve due to improved land management practises.

Deep Creek which is located approximately 250 m from the eastern edge of the Open Cut 1 pit area and 500 m from the south-eastern corner of Open Cut 2. Other potential sources of pollutants include the MIA / CHPP 2 areas which are located approximately 250 m and 500 m from Deep Creek respectively. The Waste Rock Stockpile 1a and Waste Rock Stockpile 2 are located relatively close to Deep Creek and thereby have potential to release contaminated run-off in the creek. Surface water run-off from the TLF facility will be diverted into environmental dams for remediation before discharge into Barrack Creek.

Contaminated runoff is only likely to impact local or downstream aquatic values as a result of heavy rainfall events. Given the transient nature of such an event (should it occur) it is considered unlikely to cause any significant or lasting impact to these values.

4.4 Change in Groundwater

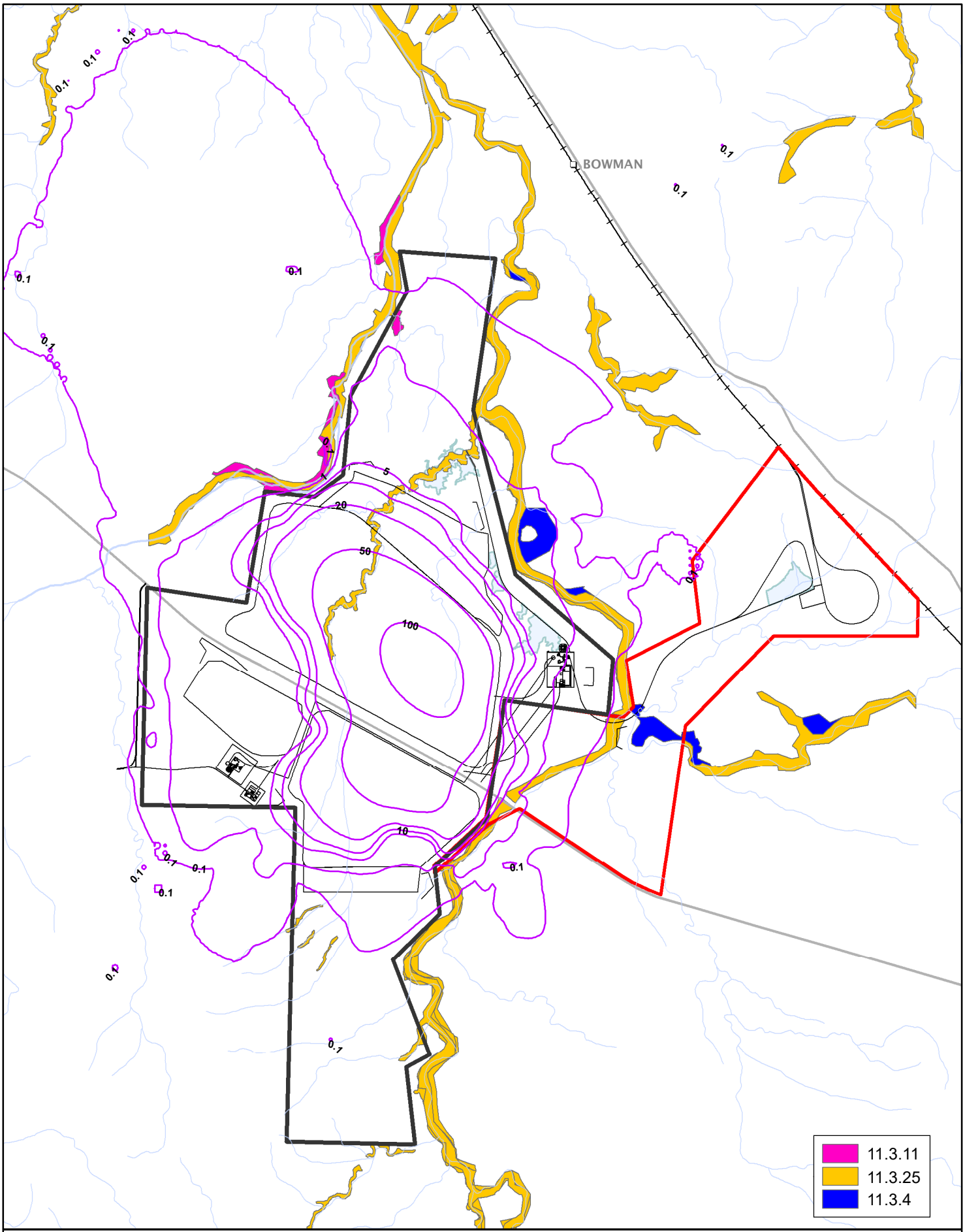
Based on the knowledge of local groundwater conditions and characterisation of groundwater dependant ecosystems (GDEs) in the area it is considered likely that permanent waterholes in Tooloombah Creek and the lower section of Deep Creek are connected to the water table. As a result, groundwater drawdown may have a localised impact on water levels in permanent waterholes on Tooloombah Creek and Deep Creek, potentially impacting habitat for Estuarine Crocodile and reducing fauna access to watering points.

Groundwater modelling of the potential for groundwater drawdown resulting from Project activities (largely open cut mining) has been carried out. Figure 4-2 depicts the predicted maximum extent of groundwater drawdown occurring 10 years after the cessation of mining activity.

Groundwater drawdown may result in long-term (up to 50 years post-mining) impacts to the following threatened species / communities:

- Riparian Forest Red Gum communities (RE 11.3.25) in these areas may suffer adverse impacts in the long-term if groundwater levels decline below the necessary rooting depth required for tree species within this community. These habitats provide foraging habitat for Koala and Greater Glider.
- Semi-evergreen vine thicket communities occur as tracts of riparian vegetation along Tooloombah Creek (RE 11.3.11). This community may also suffer adverse impacts due to lowering of ground water levels.
- Areas predicted to be subject to more than 1 m of drawdown is considered a moderate to high threat to riparian communities (refer Figure 4-2); and
- Drawdown may impact water levels within waterholes on both Deep Creek and Tooloombah Creek. The Styx River will not be impacted. This habitat has a minor potential to provide habitat for Estuarine Crocodile.

A low to moderate threat of adverse effects are expected along stream reaches supporting permanent pools within the predicted 0.1 m to 1 m drawdown contour, while more than 1 m drawdown is expected to cause a high threat. Based on this classification, mining effects are expected to pose a low to moderate threat of adverse impact to 5 km of Tooloombah Creek and almost 4.8 km of Deep Creek, while a high threat is expected at 0.38 km of Tooloombah Creek and 2.5 km of Deep Creek (refer Figure 4-2).



N

0 0.5 1 km

Scale @ A4 1:55,000
Date: 08/11/18
Drawn: J Parnwell

Legend

- Groundwater drawdown contours
- ML 80187
- ML 700022
- Mine infrastructure
- North Coast Rail Line
- Main Road
- Major watercourse
- Minor watercourse
- Dam

Figure 4-2
Maximum predicted groundwater drawdown impacts on GDEs

DATA SOURCE
Waratah Coal, 2018
QLD Open Source Data, 2018
QLD Department of Environment and Heritage Protection, 2016

CDM Smith

4.5 Dust

Increased dust resulting from excavations, topsoil stripping, vehicle movement, open cut mining activities, construction of infrastructure, coal transport (by road and conveyor) and from coal stockpiles has the potential to impact local flora and fauna values within and surrounding the Project area throughout construction and operation.

Coal dust can result in adverse impacts on plant photosynthesis and productivity (Chaston and Doley 2006), changes in soil properties ultimately impacting plant species assemblages' (Farmer 1993; Spencer and Tinnin 1997), and mortality and / or decrease in aquatic health on aquatic communities from the toxicity of poor water quality. Naidoo and Naidoo (2006) found coal dust on mangroves located within 3 km of a coal terminal in South Africa impaired the productivity of two out of four species tested by reducing photosynthetic activity. Only leaves that were 'extensively covered and appeared black' were tested.

The deposition of (unpaved) road dust on nearby freshwater wetlands caused by heavy traffic increases due to energy development projects found minimal impact on water quality or soils (Creuzer et al. 2016). However, the actual impacts on wetlands or wetland vegetation from coal dust deposition, as (opposed to increased atmospheric dust) appear little studied.

The predominant wind directions from the region are as follows: from the north and northeast during spring; north, northeast and southeast during summer; in autumn, the winds are primarily from the southeast; and southerly and southeast winds are more frequent during the winter season. Modelling of potential dust particle deposition resulting from both Project construction and operation activities showed the area most likely to be impacted were receptor points located to the direct west of the Project (Tooloombah Creek service station) and in the Ogmore area to the north of the Project. However, these impacts were minimal in comparison to the modelled natural background dust concentration and all concentrations were below air quality criteria set by the State under the Environmental Protection (Air) Policy 2008.

Vegetation along Deep Creek in the vicinity of the Project area has potential to be impacted during construction works for infrastructure (such as access roads), the CHPP / MIA 2 area, and the raw water dam which is located within 500 m of Deep Creek. Operational Project components located close to extant vegetation includes Open Cut 1 and Waste Rock Stockpile 1A (200 m to 300 m from Deep Creek), Open Cut 2 (north-west corner adjacent to Tooloombah Creek and south-west corner adjacent to eucalypt woodland), and Waste Rock Stockpile 2 (adjacent to both Tooloombah and Deep Creeks). It is important to note that mining activities in the Open Cut Pits and Stockpile areas will be sequential and will include rehabilitation of mined areas as the Project progresses.

The haul road crosses Deep Creek and Barrack Creek, although there are no large, permanent pools on either creek at, or near, the proposed haul road crossing points. Dust emitted during coal transport may have a minor potential to impact riparian vegetation associated with the creeks where they occur adjacent to the haul road.

Upon decommissioning, all potential dust generating areas will be rehabilitated and revegetated, and dust is unlikely to cause further impacts.

4.6 Pests and Weeds

Pests and weeds may pose a significant threat to habitat values for significant species within and surrounding the Project area, including habitat for threatened fauna and direct predation. Introduced grasses dominate the ground layer in many areas because of the long grazing history within the Project area. Much of the remaining remnant vegetation habitat already contains a high

proportion of introduced grass species and woody weeds including Lantana (*Lantana camara*) and Rubber Vine (*Cryptostegia grandiflora*), particularly in the vicinity of creek lines. Olive Hymenachne (*Hymenachne amplexicaulis*), has the potential to infest wetland areas and was observed at several wetland / farm dam sites and may impact gilgai habitat suitable for Ornamental Snake. Other problem weed species such as Parthenium (*Parthernium hysterophus*), which is toxic to cattle, occurs within riparian habitat Tooloombah Creek and Deep Creek. Any potential introductions of weeds and pests as a result of Project activities (including construction and operational phases), particularly transportation and operation of construction vehicles and equipment, will need to be managed.

One of the key threats to Ornamental Snake is contact with Cane Toads. Cane Toads are already prevalent in the Project area and will have been present in the area for a long time. The Project may provide additional habitat for Cane Toads in the water storage (environmental) dams to be constructed for the Project. However, it is considered that given their presence within the Project area, which already contains several farm dams suitable for Cane Toad breeding, it is unlikely that the Project would significantly promote the presence of Cane Toads relative to numbers already present.

Key identified pest threats to Squatter Pigeon (as well as many native fauna species) include predation by Red Fox (*Vulpes vulpes*) and feral Cats (*Felis catus*), land degradation caused by European Rabbits (*Oryctolagus cuniculus*), and tramp ant invasion. Rabbits were readily encountered within the mine site area during surveys and cats were identified in the wider area during spotlighting surveys. Dingo (*Canis lupus dingo*) was recorded in the area during remote camera surveys – a known predation risk for Koala. Other feral species known to be present that may have degrading impacts on vegetation communities and species habitats include Pig (*Sus scrofa*) and Chital (*Axis axis*).

4.7 Fire

Fire is a natural part of the Australian landscape, and most vegetation communities are adapted to periodic fires. However, changes in the natural fire regime may result in changes in the species composition and / or structure of the vegetation.

Project activities are not inherently likely to cause fires, although there is potential for coal stockpiles to combust. In regard to the rehabilitation and decommissioning phase of the Project, spontaneous combustion is considered a low risk of occurring. It has been considered as it is a potential issue associated with final voids, particularly where coal seams (and other carbonaceous materials) are left exposed (that is not capped or covered). However, the mining method to be employed for the Project comprises sequential backfilling of the open cut pits as the mine progresses. Therefore, there is little possibility that a bushfire occurring post-closure could ignite remaining or redundant coal seams.

Within the vicinity of mining activities, the majority of remaining remnant vegetation is woodland with a grassy understorey and is subject to cattle grazing, which under normal grazed circumstances would also be relatively resistant to carrying fires. All vegetation along the haul road and the TLF area consists of cleared lands and is grazed apart from habitat on and adjacent to the haul road crossing of Deep Creek and Barrack Creek. A potential hazard exists if grassy woodlands remain ungrazed for some time and develop high fuel loads that could carry fires under dry conditions. Woody weeds such as Lantana, which is common along and close to drainage lines in the area, provide additional risks by increasing potential fire fuel loads in these areas impacting potential Koala and Greater Glider habitat.

4.8 Noise

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

Understanding of the impacts of noise on fauna is limited. There are no current government policies or guidelines that recommend thresholds or limits in relation to fauna. Noise may adversely affect wildlife by interfering with communication, masking the sound of predators and prey, causing stress or avoidance reactions, and in some cases, may lead to changes in reproductive or nesting behaviour. Excessive noise may lead some species to avoid noisy areas, potentially resulting in the fragmentation of species habitat. 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). Currently, 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 rural traffic would cause occasional elevated levels in localised areas.

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. If noise or vibration is intermittent, fauna may pause their activities or flee the area. Conventional blast methods and piling employed during construction will create a higher level of intermittent noise and vibration pulses which could potentially disturb fauna. However, blasting and piling would only occur during daylight hours during the construction and operation phase of the Project.

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 EIS, indicates that operational noise levels below 60 dB 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.

The generation of construction and operational noise, within the mine area, will largely be in cleared areas in which Squatter Pigeon and Ornamental Snake may occur. It is likely that individuals that occur on the site will leave the immediate area of impact. During operation, the species may become habituated to adjacent habitat following completion of construction disturbance. Other significant fauna habitat nearest to construction and operation noise sources is likely to be adjacent to the southern waste rock dump and along the haul road where intact vegetation communities provide habitat for Greater Glider and Koala. Given Koalas occur in urban habitats it is considered unlikely noise will be a significant impact on this species.

With general measures to mitigate noise impacts implemented as part of the Project design and management (such as proper maintenance of machinery/vehicles and enforcing speed limits onsite), noise is not expected to cause a significant impact to fauna in the area.

4.9 Lighting

Artificial lighting from infrastructure and machinery may impact fauna within the Study area during construction and operation. Artificial lighting may have a range of impacts across different groups of taxa and between species within these groups. Rodents may avoid brightly lit areas at night. Frogs and nocturnal reptiles may congregate at artificial lights to feed on insects attracted to light (Perry et al. 2008). Similarly, many microbat species may congregate at artificial lighting (Rich and Longcore 2006), although other species may avoid well-lit areas (Threlfall et al. 2013). Species such as Sugar Glider (*Petaurus breviceps*) have been experimentally shown to reduce foraging time under artificial lighting (Barber-Meyer 2007), although whether this effect occurs in natural situations is unknown. Known impacts on birds include disruption of migratory patterns and choice of nest sites (Longcore and Rich 2004).

There are few if any studies to suggest the fauna inhabiting the woodland around the Project area will be impacted to more than a minor extent. As suggested by the evidence above there will be differing responses between species or taxa group with some responses considered quite benign (e.g. microbats and other taxa attracted to night lighting). Habitat around the Project area is largely cleared or woodland with a limited suite of species present. Significant fauna habitat nearest to the CHPP / MIA 2 area is likely to be Forest Red Gum habitat which may support Koala. This species was also observed onsite in Poplar Box woodland which will remain adjacent to the open cut 2 area. Non-remnant areas containing regrowth Brigalow and gilgaied habitat surrounding the CHPP / MIA 2, Open Cut 2 and the adjacent waste spoil area may provide habitat for Ornamental Snake. Squatter Pigeon occurs in woodland as well as cleared grassy habitat in the area, but it is uncertain what impact lighting will have on this species. Koala may occur, although given the species occurs in suburban habitats Project lighting is not expected to impact this species. With informed lighting design, this habitat will be at a distance where light levels would have attenuated to levels where they are unlikely to be causing a significant impact to fauna.

4.10 Project Impacts – Summary

Table 4-2 provides a summary of the potential impacts on significant fauna species per each stage of the Project as identified from the Project-associated activities detailed in the previous sections.

Table 4-2 Summary of Project impacts on significant species / communities

Project activity	Potential impacts	Applicable Project phase			Potentially impacted threatened fauna species / communities
		Construction	Operation	Mine Closure	
Vegetation clearance	▪ Reduction in available fauna habitat area for threatened species ▪ Fauna injury or mortality during vegetation clearing ▪ Physical disturbance / removal of shelter or nest sites (tree hollows, bird nests)	X	X		All species
Fauna mortality	▪ Fauna injury or mortality during earthworks ▪ Road collisions due to increased local traffic ▪ Fauna entrapped in open trenches ▪ Fauna accessing polluted waters at Project dams	X	X		Squatter Pigeon (road collisions) Ornamental Snake (earthworks and trenches) Koala Short-beaked Echidna
Changes in surface water	▪ Degradation of available water sources for fauna due to sedimentation of waterways caused by stormwater run-off ▪ Degradation of available water sources for fauna due to Project-associated pollutants entering waterways	X	X		Squatter Pigeon Koala
Changes in groundwater	▪ Reduction / degradation of available fauna habitat as a result of localised groundwater drawdown impact on riparian vegetation ▪ Reduction of available water sources for fauna as a result of localised groundwater drawdown impact on riverine waterholes		X	X	Koala (vegetation reduction) Greater Glider (vegetation reduction) Squatter Pigeon (waterhole reduction)
Dust	▪ Degradation of available fauna habitat due to dust deposition	X	X		All species
Pests and weeds	▪ Degradation of available fauna habitat / vegetation communities due to weed invasion / spread ▪ Increased localised fauna predation due to pest fauna (such as cats, dingoes, foxes) attracted to Project infrastructure for shelter / food	X	X	X	All species
Fire	▪ Fauna injury or mortality during accidental (Project initiated) wildfires ▪ Reduction / degradation of available fauna habitat as a result of accidental wildfires	X	X	X	All species
Noise	▪ May impact fauna behaviour causing avoidance of suitable habitat for nesting / foraging	X	X		Squatter Pigeon Greater Glider Koala Short-beaked Echidna
Lighting	▪ May impact fauna behaviour causing avoidance of suitable habitat for nesting / foraging		X		All species

5 Management of Significant Species

Mitigation measures have been developed to minimise impacts associated with construction and operation of the Project. Mitigation strategies have been developed based on the following criteria:

- Avoid potential direct and indirect impacts where possible;
- Minimise the severity and / or duration of the impact;
- Mitigate potential impacts with specific design / management methods;
- Rehabilitation of impacted areas to promote environmental recovery; and
- Environmental offsets used where unavoidable residual impacts occur.

5.1 Project Design Mitigation Measures – Avoidance and Minimise

During the Project detailed design phase Central Queensland Coal have incorporated a number of elements into the Project design to avoid or minimise impacts to significant species and threatened vegetation communities that had been identified earlier in the submission of the Project EIS and SEIS. These design measures are outlined in the following sections and are not considered as part of this SSMP (excepting where applied under related management plans outlined in Section 1.4).

5.1.1 Mamelon Station – Environmental Management

The Project is located on the Mamelon property. Mamelon encompasses a total area of 6,478 ha of which the Project footprint covers approximately 1,070 ha. Central Queensland Coal have proposed destocking the majority of the property and restricting general cattle access to already cleared habitat in the south-west and south of the property. This area encompasses approximately 1,000 ha. The remaining area, including the creek lines which lie adjacent to the mine area, will be managed and allowed to regenerate. This measure will contribute in the long-term to localised water quality improvements, and contribute to improving the water quality entering Broad Sound and the GBRWHA through the following:

- The long-term restoration of this habitat, and in particular allowing vegetation to regrow along the riparian zones along Deep Creek and Tooloombah Creek (which are presently mostly cleared), will capture / entrain sediment and nutrient run-off from the property;
- The restoration of cleared areas will also reduce soil erosion on cleared areas of the property, thereby reducing the entrainment of sediments entering creek lines during bouts of heavy rainfall; and
- The removal of cattle from much of the property will also remove a source of long-term nutrient input into creek lines following rainfall.

5.1.2 Vegetation Clearance

Following the submission of the EIS the Project layout was adjusted so as to eliminate impacts to threatened vegetation communities (Brigalow and SEVT) and habitat for Greater Glider.

5.1.3 Fauna Mortality and Injury

Central Queensland Coal will incorporate fauna sensitive infrastructure within the haul road crossing area within the Deep Creek / Barrack Creek vegetation corridor to minimise the potential for road mortality of fauna. In particular this area provides suitable habitat for Koala. Fauna infrastructure design will be informed by the latest design considerations such as the Queensland Department of Transport and Main Road's *Fauna sensitive road design manual Vol 2* (SoQ 2010) and may include fauna-proof fencing and 'fauna-friendly' underpasses / culverts.

5.1.4 Change in Surface Water Quality

Under the Project WMP the environmental dams associated will store ground and surface waters pumped from the mine pits, as well as capturing run-off from various infrastructure components. The dams are designed with a 1:100 Annual Exceedance Probability standard flood spillway capacity. Given the proposed dam design capacities and the transient nature of heavy rainfall events it is considered very unlikely the Project will cause any sustained impact to water quality in the area.

Water quality in creek line waterholes adjacent to the Project will be subject to regular monitoring under the Project REMP.

5.1.5 Change in Groundwater

The impacts of Project-associated groundwater drawdown on Groundwater Dependent Ecosystems (GDEs) and related vegetation communities / habitat for threatened fauna are uncertain at this stage. Groundwater and creek line waterholes will be subject to regular monitoring of water levels and quality under the Project REMP. Vegetation health monitoring, targeting those areas likely to be subject to groundwater drawdown impacts, will be carried out under the Project LUMP.

Where impacts to vegetation are observed as a result of groundwater drawdown the Project will investigate the use of supplementary water flows using treated mine water. Where impacts are found to be irreversible the impacted habitat will be subject to the Project ODP.

5.1.6 Dust

Vegetation health monitoring, targeting those areas likely to be subject to dust deposition impacts (such as threatened species habitat along Tooloombah Creek), will be carried out under the Project LUMP. Results of the vegetation monitoring will be used to inform improved management of dust mitigation measures where impacts are found to be occurring.

5.1.7 Pests and Weeds

Weed and pest monitoring and management within the ML areas will be carried out under the Project LUMP. Weed monitoring and management across the surrounding area within the Mamelon property will be carried out under the Project Offset Management Plan.

5.1.8 Fire

Fire management within the ML areas and immediate surrounds area will be carried out under the Project LUMP. Fire management across the surrounding area within the Mamelon property will be carried out under the Project Offset Management Plan.

5.1.9 Noise

Noise management measures will be detailed in the Project EMP which will outline general measures (such as appropriate maintenance of machinery and roads, and staff training) to ensure

noise impacts are minimised. Other general 'physical' measures include (but are not restricted to) the following:

- Using rubber linings in or constrained layer damping on, for example, chutes and dumpers to reduce impact noise;
- Positioning of overburden and top soil piles in between haul roads and receptors, where practicable, to provide noise shielding;
- As far as reasonably practicable, enclosing sources of significant noise; and
- Maintaining a complaints procedure register to address issues raised by community members or stakeholders in regard to noise and vibration.

5.1.10 Lighting

Lighting management measures will be detailed in the Project EMP which will outline 'physical' measures to limit lighting impacts on surrounding vegetation / habitat. Night lighting will mainly be limited to lights required for safety and security. During operations Project lighting will be minimised (i.e. low luminance) as far as possible and directed towards the CHPP / MIA areas and open cut pit areas and thereby away from fauna habitat to reduce any minor localised impacts even further. Further investigations will be carried out during the detailed design phase of the Project into low-light spill lighting options.

5.2 Significant Species Management Plan – Mitigation Measures

Table 5-1 outlines the standard (or generic) Project mitigation measures to be applied to ameliorate potential impacts to significant fauna species / vegetation communities associated with the Project. Threatened vegetation communities are described and specific management actions (where applicable) are outlined in Appendix A. Threatened fauna species communities are described and specific management actions are outlined in Appendix B. Migratory fauna and other species listed under the NC Act are described and specific management actions (where applicable) are outlined in Appendix C.

Table 5-1 Standard mitigation measures for significant species management – all Project phases

Activity	Mitigation measures
Pre-construction phase	
General	The Project will be subject to ongoing refinement of the design of mine infrastructure in order, where practical, to minimise impacts on significant species and fauna in general.
	Site induction - all personnel, including contractors, will be subject to a general site induction. The induction will include specific content to raise awareness of site values for significant fauna and general measure to avoid impacts. Where necessary, personnel will be advised of temporary site limitations (e.g. temporary exclusion zones), standard measures to access/activity during work toolbox meetings.
	All Project management plans relevant to this SSMP as described in Section 1.4 (including the LUMP and ESCP) will be submitted to government (where necessary) and approved prior to any construction activity.
	Environmental Officer will establish register for pest fauna sightings, and significant fauna sightings.
Vegetation Clearing	The extent of disturbance in significant species habitat will be clearly marked/delineated by the site Environmental Officer.

Activity	Mitigation measures
	Prior to vegetation clearing, a fauna spotter-catcher will survey the area, prior to the commencement of vegetation, for the presence of potential significant fauna breeding/resting places including tree hollows and nest sites. In the event of: ▪ Active breeding places for significant arboreal fauna species (such as tree hollows) will be clearly marked. ▪ Active nests of significant bird species being located (i.e. Squatter Pigeon or Red Goshawk) an exclusion zone will be placed around the nest site. The nest site will be monitored to ensure the breeding site has been vacated prior to the exclusion zone being removed. ▪ Where possible fauna spotter may encourage resident fauna to leave the habitat tree of its own accord or handle and relocate extant resident fauna to a predetermined location.
Surface Water Quality / Groundwater	A detailed Project REMP will be developed, approved and implemented (i.e. water quality monitoring will be in pace) prior to any Project construction activity being carried out. The REMP will include a water quality monitoring program (surface and groundwater) and a GDE groundwater water use/receptor monitoring program. Monitoring activities and GDE water use studies associated with the REMP will be in place prior to construction activity.
	A detailed vegetation condition survey will be carried out in those areas identified as being subject to future dust deposition and / or groundwater drawdown impacts as part of activities under the LUMP and ODP.
Pests and Weeds	A detailed weed survey and mapping will be carried out across the property prior to any Project construction activity being carried out as part of activities under the LUMP.
Construction and Operation phases	
Site Access	Access to and from Project construction sites will only be along designated access routes
	Exclusion zones will be established around Squatter Pigeon/Red Goshawk nests that have been identified prior to or while construction has commenced.
Vegetation Clearing	Where vegetation clearance is required, then clearance will only take place once a Permit to Clear has been issued by the site environmental officer.
	The extent of disturbance in significant species habitat will be clearly marked/delineated by the site Environmental Officer.
	Clearing will only occur within the approved and marked areas. Also refer to specific measures per species in Appendix 1.
	Prior to vegetation clearing, a fauna spotter-catcher will survey the area, prior to the commencement of vegetation, for the presence of potential significant fauna breeding/resting places including tree hollows and nest sites. In the event of: ▪ Active breeding places for significant arboreal fauna species (such as tree hollows) will be clearly marked. ▪ Active nests of significant bird species being located (i.e. Squatter Pigeon or Red Goshawk) an exclusion zone will be placed around the nest site. The nest site will be monitored to ensure the breeding site has been vacated prior to the exclusion zone being removed. ▪ Where possible fauna spotter may encourage resident fauna to leave the habitat tree of its own accord or handle and relocate extant resident fauna to a predetermined location.
	All vegetation clearance will be carried out under ecological supervision i.e. a fauna spotter-catcher will be present at the time of clearing.
	To avoid unnecessary risk of damaging threatened vegetation, any occurrence of Brigalow and semi-evergreen vine-thicket community within the vicinity of construction works will be fenced off and appropriately marked as a No-Go Zone to site workers.
	Revegetation of any exposed surfaces not required for future operations will be undertaken as soon as practicable, using native species where appropriate.

Activity	Mitigation measures
	Where trees which have been marked prior to clearing (i.e. containing tree hollows) occur – the trees will be felled in such a manner as to minimise impacts to potentially resident fauna e.g. felled gently or lowered to ground. Fauna will be allowed to leave of own accord before further clearing activity. Otherwise the fauna spotter-catcher will be allowed to inspect hollows as soon as is practicable (and before further clearing) to relocate resident fauna (where they occur) to a predetermined suitable location. Any injured animals (native) will be taken to a predetermined veterinarian for immediate attention.
Fauna Mortality and Injury	All clearance will be carried out under ecological supervision i.e. a fauna spotter-catcher will be present.
	All clearing within identified significant fauna habitat must comply with relevant Project approval conditions.
	Where trees have been marked prior to clearing (i.e. containing tree hollows) occur – the trees will be felled in such a manner as to minimise impacts to potentially resident fauna e.g. felled gently or lowered to ground. The fauna spotter-catcher will be allowed to inspect hollows as soon as is practicable and (where they occur) relocate resident fauna to a predetermined suitable location. Any injured animals will be taken to a predetermined veterinarian for immediate attention. Fauna encountered during fauna spotter-catcher activities will be recorded in a Project-specific register.
	Prior to earthworks being carried out in areas suitable for Ornamental Snake (cracking clays / gilgais), the fauna spotter-catcher/s will search the area for fauna. Where fauna are located they will be relocated to a predetermined location.
	Site speed limits (40 km/hr) will be set on all access roads / tracks throughout the site to minimise potential fauna collisions.
	Fauna infrastructure (such as barriers and underpasses) will be installed along the haul road where it intersects with the potential fauna corridor in the Deep Creek / Barrow Creek area to reduce the likelihood of collision with vehicles.
	All sightings of significant fauna will be reported to the site Environmental Officer and recorded in a specific register within 24 hours of the sighting. A review of the SSMP will be carried out where a significant species is recorded and is not currently included in the SSMP. The review will be carried out within one month of the species being recorded.
Surface Water Quality	Water quality monitoring under the REMP will continue throughout Project construction and operation.
	The Project WMP will comprise the following measures to minimise the potential for release of contaminants into the environment: ▪ Bunding of chemical storage facilities and appropriate storage of chemicals according to AS 1940 - 'The storage and handling of flammable and combustible liquids.' ▪ Spill containment kits (including booms and absorbent materials) located onsite at all times and near likely impacted waterways. ▪ Disturbed or exposed soil will be managed so that the loss of sediment is minimised - minimising the area of exposed soil wherever possible and no undertaking clearing or earthworks during rainfall events. ▪ The Project will employ retention basins around designated construction areas to allow a pre-treatment of water and wastewater prior to discharge into the aquatic environment. ▪ Discharge (if any) of treated wastewaters to receiving water will occur during wet periods where possible.
	All construction/operation machinery is maintained to minimise the risk of spill or leakage of chemicals/fuels.
	All refuelling facilities and the storage and handling of oil and chemicals will be in appropriately designed sites and will comply with relevant Australian Standards.
	Wash-down areas for plant and equipment will be clearly marked to prevent contaminated water from leaching into soils or flowing into nearby watercourses.

Activity	Mitigation measures
	The Project ESCP will be enforced and comprise the following measures to minimise the potential for release of sediments into the environment: ▪ Sediment fences will be installed along the down slope sides of any disturbed areas likely to experience rainfall runoff. ▪ Site drainage will divert all clean water runoff around disturbed areas. ▪ Erosion control devices will be installed in diversion drains. ▪ Construction works will only disturb the minimum amount of land required for operation.
Change in Groundwater	Groundwater quality/level monitoring and GDE water use studies under the REMP will continue throughout Project construction and operation.
	Annual vegetation health monitoring (as part of the Project LUMP) carried out in significant species habitat considered at moderate/high risk of groundwater drawdown impact.
	Use of supplementary environmental flows (using treated mine water) where impacts to significant species habitat attributed to groundwater are detected. Further vegetation monitoring required to measure effectiveness of supplementary environmental flows.
	Implementation of Project Offsets Delivery Plan where impacts to significant species habitat unable to be mitigated.
Dust	Dust suppression measures will be in place as per the Project EMP during construction and operation to protect significant species and their habitat including: ▪ Regular wetting down of Project features likely to produce airborne dust (unsealed roads, soil stockpiles, etc). ▪ Speed limits of 40 km/hr will be implemented throughout the site to minimise dust generated. ▪ Regular cleaning of machinery and vehicles tyres to prevent wheel entrained dust emissions. ▪ Areas stripped of topsoil for Project construction will be rehabilitated as soon as practicable where not required during operations.
Pest and Weeds	Site pest and weed management measures as designated under the Project LUMP will be in place during construction and operation.
	Vehicle washdown procedures will be in place and strictly enforced as per LUMP.
	Food waste storages will be covered to minimise pest vertebrate fauna access to food scraps.
	Weed management to be carried out as per Project LUMP and Mamelon Environmental Offset Management Plan to prevent significant species habitat degradation.
Fire	Site fire management measure as designated under the Project LUMP will be in place during construction.
	Weed management as per Project LUMP and Mamelon offset site management to prevent increased fire risk.
Noise	Site noise management measures as designated under the Project EMP will be in place during construction and operation.
	Appropriate maintenance of machinery and plant carried out at regular intervals to ensure noise levels remain as low as possible.
Lighting	Site light management measures as designated under the Project EMP will be in place during construction and operation.
Site Rehabilitation	Areas subject to vegetation clearing for Project construction will be rehabilitated as soon as practicable where not required during operations (refer RMP).
	Project components (open cut pits and waste rock stockpiles) will be rehabilitated progressively during operations (refer RMP).
	Cleared habitat outside of mine footprint will be managed and rehabilitated as per Mamelon Environmental Offset Management Plan.
Post-operation Phase	
Site Access	Access to and from Project construction sites will only be along designated access routes
Fauna Mortality and Injury	Site speed limits will be set on all access roads / tracks throughout the site to minimise potential fauna collisions.
Surface Water Quality	Water quality monitoring under the REMP will continue until Project infrastructure has been removed and site rehabilitation activities cease.
	All measures applicable to construction and operation of the Project site, including measures within the ESCP and chemical/fuel storage and containment, will also apply to the post-operation phase during the removal of Project infrastructure.

Activity	Mitigation measures
Change in Groundwater	Groundwater quality/level monitoring and GDE water use studies under the REMP will continue following the cessation of Project operations. <<insert on approval>>
	Annual vegetation health monitoring (as part of the Project LUMP) carried out in significant species habitat considered at moderate/high risk of groundwater drawdown impact.
	Use of supplementary environmental flows (using treated mine water) where impacts to significant species habitat attributed to groundwater are detected. Further vegetation monitoring will be required to measure effectiveness of supplementary environmental flows.
	Implementation of Project Offsets Delivery Plan where impacts to significant species habitat unable to be mitigated.
Dust	All measures applicable to construction and operation of the Project site will also apply to the post-operation phase during the removal of Project infrastructure.
Pest and Weeds	All pest and weed measures, within the LUMP, applicable to construction and operation of the Project site will also apply to the post-operation phase during the removal of Project infrastructure.
	Weed management measures across and surrounding the Project, as per the Mamelon Environmental Offset Management Plan will continue post operations.
Fire	All measures applicable to construction and operation of the Project site will also apply to the post-operation phase during the removal of Project infrastructure.
Site Rehabilitation	Rehabilitation of Project components (open cut pits and waste rock stockpiles) and site of removed infrastructure will continue to be rehabilitated progressively during operations.
	Cleared habitat outside of mine footprint will continue to be managed and rehabilitated as per Mamelon Environmental Offset Management Plan.

6 Environmental Performance

The management measures as detailed in the SSMP will be overseen by the Site Environmental Team.

6.1 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 Site Environmental Officer 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.

Central Queensland Coal will carry out general environmental training and awareness programs for all personnel/contractors working on the site as part of its Project specific site induction and ongoing refresher and toolbox training.

6.2 Incident and Non-compliance Management

An incident or non-compliance is defined as any non-compliance with the objectives identified within each section of the SSMP, an action that causes unapproved environmental harm, and a notice of environmental harm issued by a government agency with environmental justification.

To work effectively, the SSMP requires the implementation of a number of monitoring programs or events, and compliance register/recording for each impact management section. These actions are collated in Table 6-1.

Where an incident is recorded (in the context of the LUMP) the incident will be reported immediately to the Project General Manager. Depending on the potential severity of the incident, an investigation will be carried out by the Site Environmental Officer and/or the Manager of Environment and Communities and appropriate remedial actions will be recommended (if necessary) and approved by the Site Environmental Officer and Manager of Environment and Communities. Where required under the EA or associated legislation, incidents will also be reported to relevant government bodies.

6.2.1 Associated Monitoring

Central Queensland Coal is implementing related environmental monitoring programs through the REMP and LUMP. These aim to monitor the health of wetlands, streams and riparian vegetation adjacent to the Project for indirect impacts such as groundwater drawdown (on water levels in permanent pools and riparian vegetation health), dust and surface water contamination.

In addition, the plans outlined in Section 1.4, all contribute to the ongoing management and monitoring of the mines interaction with the Project areas environmental values.

Table 6-1 Collated environmental monitoring, records and potential corrective actions

LUMP management section	Monitoring event required / timing	Compliance register required	Trigger event	Potential corrective action
Vegetation clearing and degradation	Pre-clearing surveys carried out prior to any vegetation clearing event. Post-clearing assessment by Site Environmental Officer to ensure works have not exceeded Project footprint.	Incident report to record Project clearing infringements.	Destruction of active breeding place of significant fauna species. Disturbance to significant fauna species habitat outside of designated (approved) area.	Review circumstances of SSMP breach and update site procedures. Update site induction where necessary. Reinforce need to carry out clearing within designated areas during toolbox meetings / site inductions. Recalculate impacts where Project footprint has exceeded approved limits and revise Offsets Delivery Plan.
Fauna management	Pre-clearing surveys carried out prior to any clearing event. Fauna spotter present during all vegetation clearing events.	Fauna register to record all translocated or otherwise encountered fauna. Incident report for fauna road mortality.	Mortality/injury of fauna species during vegetation clearing. Destruction of active breeding place of fauna species. Fauna Road Mortality.	Inform DES / DotEE within 48 hours of significant species mortality. Review circumstances of SSMP breach and update site procedures. Update site induction where necessary. Reinforce need to carry out clearing within designated areas during toolbox meetings / site inductions.
Fauna habitat management	Dust and particulate monitoring events where requested by administering authority.	As required by administering authority.	Complaint by neighbouring landowner/sensitive receptor. As required by administering authority.	Review dust management activity and revise intensity of management actions (e.g. increased road watering, decreased site speed limits), or implement new management actions.
	Bi-annual monitoring of wetlands and riparian vegetation in designated areas 'at risk' to dust deposition/and / or groundwater drawdown. Additional monitoring where needed to identify effectiveness of corrective actions	Reporting as per LUMP	Habitat degradation noted as per LUMP	Review dust management activities as per above. Implement supplementary environmental flows as per REMP. Where supplementary environmental flows are considered ineffective recalculate impacts where Project footprint has exceeded approved limits and revise Offsets Delivery Plan.

LUMP management section	Monitoring event required / timing	Compliance register required	Trigger event	Potential corrective action
Surface water quality and hydrology	Surface water monitoring events as detailed in REMP.	Incident report as per REMP / EA.	Non-conformance to water quality criteria outlined in REMP / EA.	Review surface water management activity and revise intensity of management actions or implement new management actions.
	Inspection of site ESCP controls on a weekly basis and after heavy rainfall periods	Incident report to record Project clearing infringements.	Non-conformance with ESCP control specifications	Review circumstances of ESCP breach and update site procedures. Update site induction where necessary. Reinforce need to carry out ESCP actions. Review ESCP measures and implement new management actions if required.
Change in Groundwater	Monitoring events as detailed in REMP.	Incident report as per REMP / EA.	Non-compliance with water quality criteria outlined in REMP / EA.	Review groundwater management activity and revise intensity of management actions or implement new management actions.
Dust	Air quality monitoring associated with CEMP and OEMPs.	Incident report as per CEMP and OEMP.	Non-compliance with air quality criteria outlined in CEMP and OEMP.	Review dust management activities as per above.
Pest and weed management	Monthly weed inspections at 'high risk' areas (i.e. known infestation areas and haul roads). Bi-annual weed inspection of entire Project area including edges of mine pits. Quarterly monitoring for feral predators at 'high risk' sites (i.e. waste storage areas and staff areas).	Pest and weed register to record suspected pest/weed occurrence and identified weed/pest infestations. Pests and weeds register will record results of all pest and weed monitoring and controls.	New weed infestations occur within or close to Project area as a result of Project activities. Increased occurrence or density of currently occurring weed species within Project mine lease. Increased pest populations detected within Project area associated with Project infrastructure.	Review surface water management activity and revise intensity of management actions or implement new management actions. Implement weed control program on designated infestation event. Update site induction where necessary. Reinforce need for weed hygiene protocols during toolbox meetings / site inductions. If increased pest populations are identified a feral fauna control program will be developed and implemented.
Fire management	No specific monitoring event required.	Incident report for accidental fires related to Project activity.	Accidental fire due to Project activities.	Review fire management activity and where necessary implement new management actions.
Noise Management	Noise monitoring associated with CEMP and OEMPs.	Incident report as per CEMP and OEMP.	Non-compliance with noise criteria outlined in CEMP and OEMP.	Review noise management activity and revise current management actions or implement new management actions.

LUMP management section	Monitoring event required / timing	Compliance register required	Trigger event	Potential corrective action
Rehabilitation Management	Rehabilitation Monitoring as per RMP.	As per RMP.	Failure of revegetation in rehabilitated sites.	Review RMP and revise current management actions or implement new management actions.

7 Reporting

The CEMP, OEMP, LUMP, REMP, RMP and WMP are the benchmarks for measuring the effectiveness of environmental protection and management of the environment during the different phases of the Project construction and operation.

The site environmental officer will keep a record of fauna encountered as part of fauna spotter catcher activities, and sightings of significant species (or evidence of presence) encountered in the Project area.

Details collected will include the following:

- Species name;
- Regulatory status (NC Act and EPBC Act);
- Date of sighting;
- Number of individuals present;
- Details of recorder of sighting;
- Co-ordinates of sighting; and
- Other relevant details (e.g. observed nesting).

If a significant fauna species is killed or injured because of mine activities the following reporting procedure must be followed:

- The contractor must immediately report the incident to the environmental officer;
- The environmental officer must report the injury or death to the 1300 ANIMAL hotline (1300 264 625);
- The death or injury must be verbally reported within 24 hours to DotEE and DES within two business days; and
- A written incident report detailing the species injured, location where the incident occurred, or the animal was found, nature of the injuries, and circumstances surrounding the incident will be developed and made available during audits as required.

Central Queensland Coal will report on Project activities as required by EA Condition <insert on approval> and DotEE Condition <insert number on approval>. Details of any impact or presumed impact to a significant species along with a record of any assessments required will be kept and submitted to the administering authority as detailed under requirements under the Project EA and EPBC Act approvals.

8 Audit and Review

8.1 Environmental Auditing

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.

The Site Environmental Officer will be responsible for coordinating internal audits.

8.2 Management Plan Review

This SSMP will be reviewed on an annual basis and more often as required (for example, in response to new information or as directed by DotEE / DES) to ensure that the conditions and objectives outlined in this SSMP are being met and are fit for purpose. Reviews will address matters such as:

- The overall design and effectiveness of this SSMP including progress in environmental performance and review of changes in environmental performance measures and actions;
- Project changes such as expansion in the Project layout or new activities not covered in this SSMP;
- Changes in business conditions or legislative changes; and
- New threatened species recorded on or near site and other relevant emerging environmental issues.

If this SSMP is amended, Central Queensland Coal will notify DotEE and DES in writing and provide an electronic copy of the revised SSMP at least four weeks prior to the revised SSMP being implemented.

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Appendix A

TEC Descriptions and Management Measures

Brigalow (*Acacia harpophylla* dominant and codominant)

Status

TEC listed as Endangered (EPBC Act); and vegetation community occurring on-site (RE 11.4.9) also listed as Endangered under the State's VM Act

Ecology

Distribution

This community occurs across a broad swathe of north-east Australia from Charters Towers in Queensland south to inland northern New South Wales around Narrabri and Bourke. In Queensland the community reaches the coast north of Rockhampton and in the Bowen area and occurs west towards Blackall, Charleville and Cunnamulla.

In Queensland the TEC encompasses 16 Regional Ecosystems mostly located within the northern and southern Brigalow Belt Bioregions.

Remnant Brigalow patch in east of ML80187

Characteristics

This TEC is characterised by the presence of Brigalow as one of the three most abundant tree species present. Brigalow is either dominant or codominant in the canopy layer. Co-occurring species include (commonly) Belah (*Casuarina cristata*), as well as other *Acacia* or *Eucalyptus* species. In some cases, these species may be more common than Brigalow within the community matrix.

The vegetation structure ranges from open woodland (sparse canopy cover) to open forest (relatively dense canopy cover). Canopy height ranges from 9 m up to 25 m dependent on local rainfall conditions. A distinct shrub layer is often present and dominated by species associated with

semi-evergreen vine thicket communities such as Yellowwood (*Terminalia oblongata*) and False Sandalwood (*Eremophila* mitchellii), Holly Bush (*Alectryon diversifolius*), Currant Bush (*Carissa ovata*), Wilga (*Geijera parviflora*) and Leopardwood (*Flindersia dissosperma*) (Queensland Herbarium 2017). The ground layer is usually dominated by a thick leaf litter layer and abundant woody debris. As such, ground layer species are usually sparse but may include grasses such as *Enteropogon acicularis*, *Panicum decompositum* and *Paspalidium* species, and other low-growing species including Ruby Saltbush (*Enchylaena tomentosa*) and *Cyperus gracilis* (DotEE 2018).

The majority of instances of these communities, including those on the Project site and surrounds, occur on flat to gently undulating Cainozoic clay plains that are not alluvial in origin. Where Brigalow is the dominant species the soils are usually cracking clays. These soils often form 'gilgai' depressions likely due to cyclic shrinking and swelling resulting from seasonal rainfall patterns. Gilgais vary in nature from shallow (< 30 cm), and sparse to relatively deep and continuous across the landscape (DotEE 2018).

Associated Fauna

Brigalow communities provide important habitat value for a range of fauna such as abundant woody debris, deep leaf litter layer, peeling bark, large soil cracks, seasonal standing water in gilgais, and fruit and nectar. A number of threatened fauna species are known to be associated with the community:

- Snails such as *Adclarkia cameroni* and *A. Dulacca* (Endangered under the EPBC Act);
- Glossy Black-cockatoo (*Calyptorhynchus lathami*) (Vulnerable under the NC Act) feeds on the cones of Belah;
- Painted Honeyeater (*Grantiella picta*) (Vulnerable under the NC Act and EPBC Act) feeds on mistletoes associated with Brigalow;
- Snake species such as Ornamental Snake (refer Appendix B), Dunmall's Snake and Grey Snake (*Hemiaspis damelii*) (Endangered under the NC Act); and
- The Pale Imperial Hairstreak (northern) (*Jalmenus eubulus*) (Vulnerable under the NC Act) is dependent on the presence of old growth Brigalow trees.

Occurrence in Project Area

Within the Project area this community occurs as two isolated patches of RE 11.4.9: Brigalow shrubby woodland with Yellowwood on Cainozoic clay plains (Queensland Herbarium 2017). There is an isolated small remnant patch (0.54 ha) within the eastern portion of ML80187. Much of the ML north of the Bruce Highway comprises dark cracking clays with extensive low regrowth of this community. A larger patch (3.37 ha) is located to the east of Deep Creek in the southern portion of the ML700022 (Figure A1).

Known Threats

This community has been subject to extensive clearing in the past for cropping and livestock grazing. The soil fertility and climatic regime made these areas suitable for summer and winter crops. In the northern Brigalow Belt large-scale clearing occurred from the 1960s onwards. Extensive landscape destruction has resulted in follow on (and still current) impacts to the remaining Brigalow remnants such as changed fire regimes, and weed and pest invasion.

Brigalow is unlikely to have been subject to fire commonly prior to extensive clearing occurring. Fire is a threat particularly where exotic grasses have been established including pasture species such as Buffel Grass (*Pennisetum ciliare*) and Green Panic (*Megathyrsus maximus*). These species can invade patchy Brigalow remnants creating a heavy ground fuel load with a potential to feed intense fires. Brigalow and many associated plant species can resprout from suckers, but forest structure will be compromised and habitat features such as leaf litter and woody debris are likely to be severely impacted. This may be a particular problem in fragmented landscapes (Butler 2007). Buffel Grass is present within the Project area where the community has been cleared for grazing.

Intact Brigalow communities, particularly open forest types, are relatively resistant to weed invasion due to canopy shading. The most likely pest plant species that may have deleterious impacts on Brigalow communities are grass species prone to fire (as mentioned above). Other pest shrubs known to commonly occur include Prickly Pear (*Opuntia tomentosa* and *O. stricta*), Harrisia Cactus (*Harrisia martini*), Rubber Vine (*Cryptostegia grandiflora*), Parthenium (*Parthenium hysterophus*), Noogoora Burr (*Xanthium occidentale*), and Parkinsonia (*Parkinsonia aculeata*). Climbing species such as Brazilian Nightshade (*Solanum seaforthianum*) and Asparagus weeds (*Asparagus* spp.) may also become established. Several of these species are known to be well established within the Project area including Rubber Vine and Prickly Pears (Butler 2007),

Domestic livestock and feral herbivores may have impacts by browsing on Brigalow vegetation, and damaging habitat features through trampling including soil structure, leaf litter cover and woody debris. Grazing may have substantial impact on seedling recruitment in Brigalow communities where vine thicket species occur in the understorey. The Project area is currently subject to cattle grazing and this will cease in close proximity to the mine area. Chital (*Axis axis*) is present on the property and is an adaptable species that can feed on both grasses and shrubs / trees. Feral Pigs (*Sus scrofa*) are also present in the Project area and have potential to degrade Brigalow vegetation (Butler 2007).

Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

Status

TEC listed as Endangered (EPBC Act); and vegetation community occurring on-site (RE 11.3.11) also listed as Endangered under the State's VM Act

Ecology

Distribution

This community occurs patchily in Queensland from the Townsville area south to the Warwick area and inland northern New South Wales around Narrabri. The community occurs from the coast west towards Charters Towers, Blackall and Roma.

In Queensland the TEC encompasses 10 Regional Ecosystems located entirely within the northern and southern Brigalow Belt Bioregions.

SEVT lined gully in north of ML80187

Characteristics

This TEC is most often associated with rocky sedimentary soils on plains, and basaltic hills. It also occurs on coastal dunes, clay, loam and sandy plains, and hills on metamorphic rocks. It tends to be associated with elevated, well drained areas (DotEE 2018).

Semi-evergreen vine thickets (SEVT) are floristically diverse being considered a dry form of seasonal subtropical rainforest. Across the community's range diversity decreases with annual rainfall. They are generally characterised by trees and shrubs with 'microphyll' leaves (i.e. 2.5 cm to 7.6 cm in length) and emergent *Brachychiton* species (Bottle Trees). The vegetation structure tends to become lower growing and more open where this community occurs on rocks (McDonald 1996).

The SEVT community in the Project area is located within the 'northern SEVT' group (considered approximately north of the Tropic of Capricorn) (Fensham 1995). SEVT in this area is diverse and occurs on a variety of landforms/substrates. A small number of plant species are generally present including: Broad-leaved Bottle Tree (*Brachychiton australis*), Grey Boxwood (*Drypetes deplanchei*), *Diospyros humilis*, Brush Wilga (*Geijera salicifolia*), and Strychnine Bush (*Strychnos psilosperma*). Vines present include *Cissus reniformis* and *Jasminum didymium* (DotEE 2018).

Patches within the Project area are characterised by a relatively low canopy (7 – 10 m) comprising species such as Python Tree (*Gossia bidwillii*), Red Kamala (*Mallotus philippensis*), Peanut Tree (*Sterculia quadrifida*), White Cedar (*Melia azedarach*), Tuckeroo (*Cupaniopsis anacardioides*), Silver Croton (*Croton insularis*), McDonald's Laurel (*Cryptocarya mcdonaldii*), Native Orange (*Capparis mitchellii*), Small-leaved Coondoo (*Pouteria cotinifolia*), among other taxa. Small-leaved Bottle Tree (*Brachychiton rupestris*), Forest Red Gum (*Eucalyptus tereticornis*) and Carbeen (*E. tesselaris*) occur as occasional emergents. A varied understorey with abundant vines is present and comprised of species such as Brush Myrtle (*Psydrax oleifolia*), Chain Fruit (*Alyxia ruscifolia*), Queensland Ebony (*Diospyros geminata*), Sandpaper Fig (*Ficus opposita*), Broad-leaved Cherry (*Exocarpos latifolius*), and Velvet Mock-orange (*Notelaea microcarpa*), Whalebone Tree (*Streblus brunonianus*) and

Currant Bush (*Carissa ovata*). Vines present include Harlequin Fruit (*Melodinus australis*), and Burny Vine (*Trophis scandens*).

Associated Flora and Fauna

SEVT communities provide important habitat value for a range of fauna such as abundant fruits, woody debris, deep leaf litter layer, and abundant shelter sites in rocky debris (where they occur on this substrate). Threatened fauna known to occur in this habitat include Brush-tailed Rock Wallaby (*Petrogale pennicilata*) and Black-breasted Button-quail (*Turnix melanogaster*) (both Vulnerable under the NC Act and EPBC Act). A number of threatened flora species are known to be associated with SEVT although only one species is associated with the community (RE 11.3.11) associated with the Project area: *Eucalyptus raveretiana* (Vulnerable under the EPBC Act).

Occurrence in Project Area

Within the Project area this community occurs as several patches of RE 11.3.11: semi-evergreen vine thicket on alluvial plains (Queensland Herbarium 2017). These patches are associated with riparian vegetation along Tooloombah Creek and are largely located outside the western boundary of ML80187. Site surveys indicate the edge of a 2.9 ha patch of SEVT adjacent to Tooloombah Creek is intersected by the ML boundary, with 0.4 ha lying within the mine ML. Four more patches of this TEC covering approximately 19 ha in total, occur along the creek, although outside of the ML. Another patch of SEVT covering approximately 2.5 ha in the north of the ML is associated with an incised gully line (Figure A1). SEVT has not been associated with Deep Creek or within ML700022.

Known Threats

This community has been subject to extensive clearing in the past for cropping and livestock grazing. In the northern Brigalow Belt approximately 70% of SEVT communities have been cleared (Fensham 1996). Clearing activity often selected SEVT because regrowth was much less extensive compared to Brigalow communities, and the community was known to provide shelter for 'problem' native grazers such as Black-striped Wallaby (*Macropus dorsalis*). Fragmentation of the community as a result of clearing may promote a number of threats as outlined in the following sections.

Fire is not generally a threat to SEVT. Many plant species and the localised microclimate (created by dense vegetation) that occur are fire resistant, and the community often occurs in areas protected from fire by topography and/or substrate (i.e. rocky habitat). Fire may become a threat where exotic grasses have been established in adjacent areas including pasture species such as Buffel Grass (*Pennisetum ciliare*) and Green Panic (*Megathyrsus maximus*) and where Lantana (*Lantana camara*) may become established within the community itself. Lantana is present on the site including within and adjacent to the SEVT community.

The most likely pest plant species that may have deleterious impacts on Brigalow communities are grass species prone to fire (as mentioned above). Other pest plants known to commonly occur include Prickly Pear (*Opuntia tomentosa* and *O. stricta*), Rubber Vine (*Cryptostegia grandiflora*), Parthenium (*Parthenium hysterophus*) and Lantana. Climbing species such as Brazilian Nightshade (*Solanum seaforthianum*) may also become established. Rubber Vine and Lantana are a particular problem as they are both able to displace native species and Lantana may promote the ingress of fires within the community (DotEE 2018). Both species are present in the Project area and often in dense infestations associated with SEVT communities.

Domestic livestock and feral herbivores may have impacts by browsing on SEVT vegetation, although available evidence suggests this may be restricted to the understorey layer. The Project area is currently subject to cattle grazing and this will cease in close proximity to the mine area.

Feral Pigs (*Sus scrofa*) are also present in the Project area and are known to kill trees via their diggings although this appears to be a minor impact (DotEE 2018). Chital (*Axis axis*) is present on the property and is an adaptable species that can feed on both grasses and shrubs / trees.

Impacts to TECs from Project

No patches of either TEC will be subject to clearing as a result of the Project. Nevertheless, Project infrastructure components will be located in close proximity to some TEC patches:

- CHPP/MIA 2 and environmental dam 2C are located within 150 m of the small patch of Brigalow TEC located within ML 80178; and
- Open cut 2, waste rock stockpile 2 and environmental dam 2A are located within 150 m of patches of SEVT located along Tooloombah Creek (Figure A1).

The results of groundwater assessments indicate no groundwater use by the riparian SEVT vegetation, with sampled vegetation accessing the soil water reservoir at depths well above the water table. Consequently, the riparian SEVT vegetation will not be impacted by drawdown of groundwater. Notwithstanding, these areas will be subject to vegetation monitoring under the Project LUMP.

Other potential impacts on TECs from the Project include the following:

- Increased risk of bushfire impacting TECs;
- Dust emissions from Project activities may settle on TEC vegetation potentially impacting photosynthetic production. Studies associated with the Project EIS process indicate prevailing wind conditions are as follows: from the north and northeast during spring; north, northeast and southeast during summer; in autumn, the winds are primarily from the southeast; and southerly and southeast winds are more frequent during the winter season;
- Introduction of novel weeds and spread of existing weeds through Project area due to Project activities;
- Clearing and habitat fragmentation may increase the occurrence of deleterious pest species in TEC vegetation; and
- Contamination / degradation of TEC patches due to Project-associated pollutants (chemical / fuel; spills).

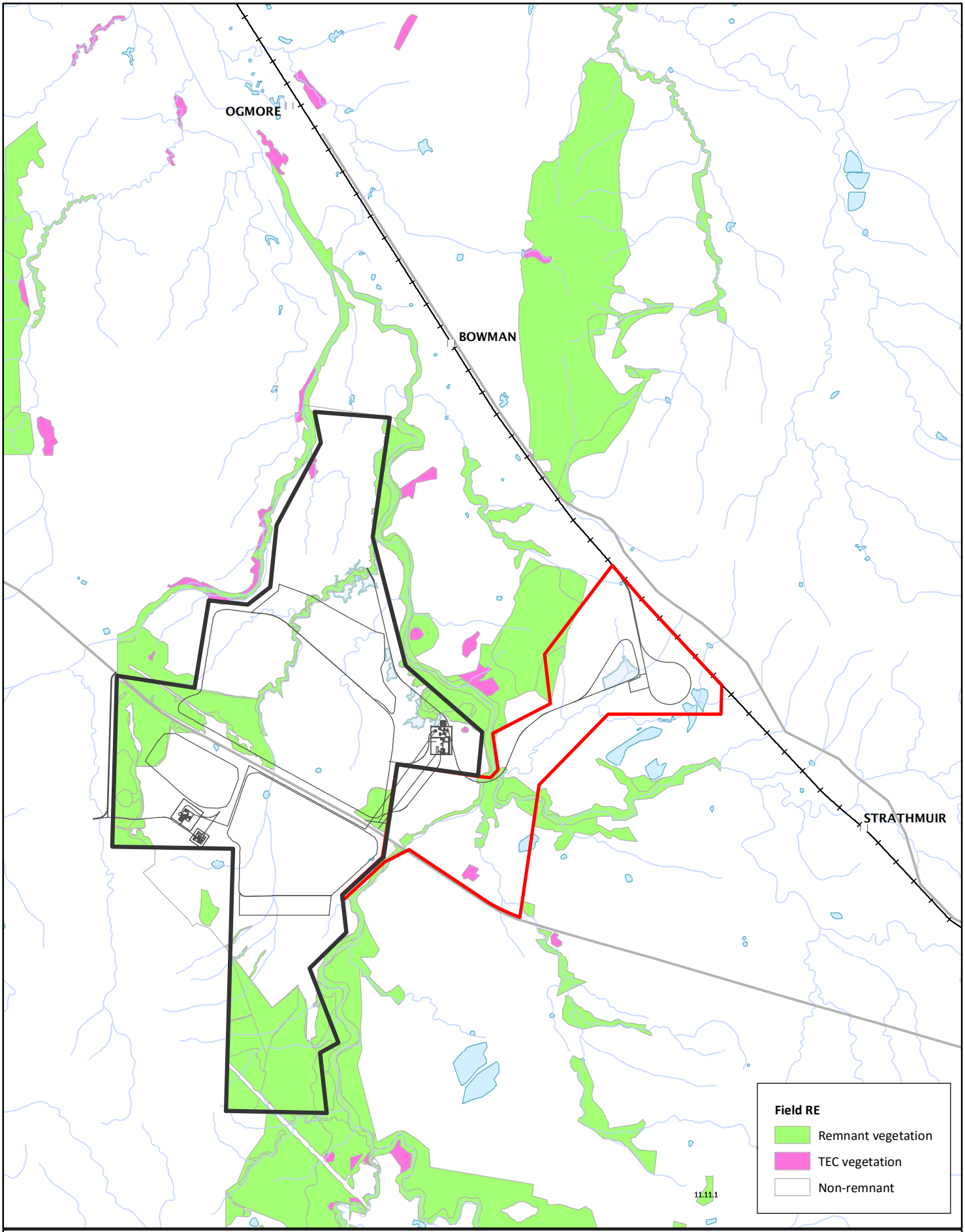
TEC Management Measures

The mitigation of the impacts listed above are managed under the Project LUMP. The following management measures outlined in Table 8-1 are generic but applicable to TECs and are also detailed in the Project LUMP.

Table A-1 Management Measures – Brigalow and Semi-evergreen Vine Thicket TECs

Activity	Mitigation measures
Pre-construction phase	
Site Preparation	The boundaries of occurrences of TEC vegetation clearing will be recorded within the Project's Geographic Information System (GIS). The boundaries of prescribed vegetation clearing works will be clearly marked by the Site Environmental Officer (or nominated personnel) prior to any clearing works being carried out.

Activity	Mitigation measures
Also refer generic measures under: ▪ Site preparation ▪ Site Induction ▪ General	
Construction and Operation phases	
Vegetation Clearing	No vegetation clearing works will occur outside the boundary of the prescribed clearing activity. Following vegetation clearing activity the Site Environmental Officer will inspect and GPS all clearing works to ensure clearing has not occurred outside of the prescribed clearing zone.
Groundwater Drawdown	A vegetation monitoring program will be implemented as part of the LUMP to monitor the health of riparian vegetation communities on Tooloombah Creek including TECs. Monitoring of dust settlement in these areas will be carried out biannually. Refer to Section 5.1 of the LUMP.
Bushfire Risk	General fire management measures to be applied across the site are considered sufficient to manage risk on TECs. Refer to Section 4.5 of LUMP.
Dust Emissions	A vegetation monitoring program will be implemented as part of the LUMP to monitor the health of riparian vegetation communities on Tooloombah Creek including TECs. Monitoring of dust settlement in these areas will be carried out biannually. Refer to Section 5.1 of the LUMP. General dust management measures to be applied across the site will reduce Project dust emissions and manage risk on TECs. Refer to Section 4.4 of LUMP.
Pests and Weeds	General pest and weed management measures to be applied across the site are considered sufficient to manage risk on TECs. Refer to Section 4.6 of LUMP.
Accidental Release of Pollutants	General pest and weed management measures to be applied across the site are considered sufficient to manage risk on TECs. Refer to Section 4.7 of LUMP.
Also refer other generic measures under: ▪ Site access ▪ Site rehabilitation	
Post-Operation Phase	
No specific measures recommended.	



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0 1 2 km

Scale @ A4 1:70,000
Date: 22/11/18
Drawn: Jess P

Legend

- ML 80187
- ML 700022
- Mine infrastructure
- Main Road
- North Coast Rail Line
- Watercourse
- Reservoir
- Dam

Figure A1
Ground-truthed TECs

DATA SOURCE
Waratah Coal, 2018
QLD Open Source Data, 2018
QLD Department of Environment and Heritage Protection, 2016

CDM Smith

PARNWELLJA \\brbsvr1\PRO\Project\1000111 - Styx SEIS Post submission work\7Work\3GIS\DATA\MXD\Chapter 16_Supp_Report_MNES\1000111 revised RE mapping__SSMP.mxd 22/11/2018

Appendix B

Threatened Species Descriptions and Management Measures

Squatter Pigeon (southern)

Status

Vulnerable (NC Act and EPBC Act)

Biology

Description

Squatter Pigeon is a medium sized (up to 32 cm in length) and stockily built bird. It is grey-brown above and on the neck contrasting strongly with white underneath. There are patches of green or violet iridescence on the wings. The face has bold black and white markings with a light blue eye ring and a black beak. Females are similar to males. Juveniles are generally duller with less strong facial markings.

Squatter Pigeon recorded during Project surveys (March 2011)

Known Distribution

This subspecies was historically found from the Dubbo region in New South Wales north to the Burdekin River area in in Queensland. There have been no official records in New South Wales since the 1970s. Although the species has declined greatly in southern Queensland in the past, it appears this decline has slowed and the species now persists over a wide area and can be locally abundant north of the Canarvon Ranges (Garnett et al. 2011) where groups of up to 30 individuals can still be seen (Reis 2012). South of this area there are scattered populations in the Condamine River catchment, Darling Downs and the Warwick-Inglewood-Texas area (Squatter Pigeon Workshop 2011).

Ecology

The Squatter Pigeon is largely terrestrial, foraging and breeding on the ground. The southern subspecies occurs mainly in dry grassy eucalypt woodlands and open forests (Frith, 1982; Crome and Shields, 1992). It also inhabits *Callitris* and *Acacia* woodlands and was reported from open plains in its historical southern range (Frith, 1982). Most birds live in sandy sites near permanent

water (Blakers et al., 1984). Squatter Pigeons dust-bathe and are often encountered on dirt tracks and in areas of bare soil denuded of ground cover by livestock (Frith, 1982; Higgins and Davies, 1996). This species is largely granivorous although insects are seasonally important in the diet and some insects (Reis 2012).

Breeding is poorly known but does appear to be greatly influenced by rainfall. The nest is a shallow depression on the ground usually sheltered by a bush or log (Reis 2012). The total population size is estimated at 40,000 breeding birds and is thought to occur as a single continuous interbreeding population. This estimate is considered to be of low reliability. Numerous recent records from the Injune / Canarvon Range region suggest that individuals from this area are part of this population. South of this area and Tin Can Bay on the coast the subspecies population has become fragmented (DotEE 2018).

Habitat

Occurs in grassy woodlands or open forests tending to prefer sandy substrates that are close to permanent water. They will forage in highly modified habitats including cattle yards, roads, rail lines, bitumen carparks and landscaped lawns (such as golf courses). Although they remain common in heavily grazed country in tropical Queensland (Reis 2012) they are typically more common in ungrazed land compared to grazed land (Woinarski and Ash, 2002; Reis 2012).

The species is known to occur within 3 km of waterbodies and may utilise heavily modified habitats (including cleared areas) in order to access water, dispersal purposes, dust bathing and foraging for grass seed. Although, it is unlikely to move far from woodland trees (remnant or regrowth) to avoid predation by other bird species. Where non-alluvial clay soils (land zone 4) occur, the species is less likely to be present unless the ground cover has been thinned to suitable levels (Squatter Pigeon Workshop 2011; DotEE 2018).

Occurrence in Project Area

Recorded during most site surveys including within ML 80187, although mostly south of Bruce Highway (Figure B1). Although there appears abundant suitable habitat within the ML it is noted the species was encountered in the same locations (close to water) during successive survey periods in 2017 and 2018. The species was mainly observed in pairs or as individuals but groups of up to six individuals recorded. Within the mine ML the species was recorded in Poplar Box woodland (RE 11.4.2), Poplar Gum woodland (RE11.5.8a), as well as Narrow-leaf Ironbark woodland in the south of the ML (RE 11.11.15a) but was more commonly observed in non-remnant habitat close to remnant or regrowth vegetation and permanent water sources (farm dams).

Known Threats

Much of the original habitat in Queensland has been replaced with pasture for livestock (Higgins and Davies 1996). Threats to existing populations include clearing and fragmentation of habitat, overgrazing by livestock and feral herbivores, trampling of nests by livestock and feral animals, predation by cats and foxes, and illegal shooting (NSW NPWS 2003).

Impacts from Project

This is a widely distributed species that occurs in grassy woodlands with a preference for sandy areas near permanent water. Due to this open habitat preference, there are no recommended REs in which this species may be found. Clearing of remnant vegetation for the mine component predicted to impact this species will be focussed on RE 11.4.2 (80.12 ha). This habitat will be subject to the Project Offset Delivery Plan.

The species is known to occur within 3 km of waterbodies and may utilise heavily modified habitats (including cleared areas) in order to access water, dispersal purposes, dust bathing and foraging for grass seed. Where non-alluvial clay soils (land zone 4) occur (such as north of the Bruce Highway), the species is less likely to be present unless the ground cover has been thinned to suitable levels (Squatter Pigeon Workshop 2011; DotEE 2018). Given there are a number of farm dams and levees present on the property, the species may potentially occur throughout the mine area. Although it is noted, despite repeated site visits, the species was only observed in selected areas, often repeatedly (refer Figure B1), reflecting the species sedentary habits and a relatively limited home range for local individuals. Although there are substantial non-remnant grasslands in the Project area footprint it appears likely the species uses a limited subsection of the overall habitat present.

Squatter Pigeon was not detected within the transport corridor but was recorded to the north of the TLF area during 2011 surveys. Clearing of remnant vegetation for the mine component predicted to impact this species will be focussed on RE 11.4.2 (82.75 ha). This habitat will be subject to the Project Offset Delivery Plan. The Project will also impact 508 ha of non-remnant grasslands with some potential as sub-optimal foraging habitat located largely south of the Bruce Highway (refer Figure B1). The removal of farm dams and wetlands due to the Project layout may also impact the localised presence of Squatter Pigeon in these areas.

Other impacts from the Project may include road mortality through localised increases in Project-associated traffic.

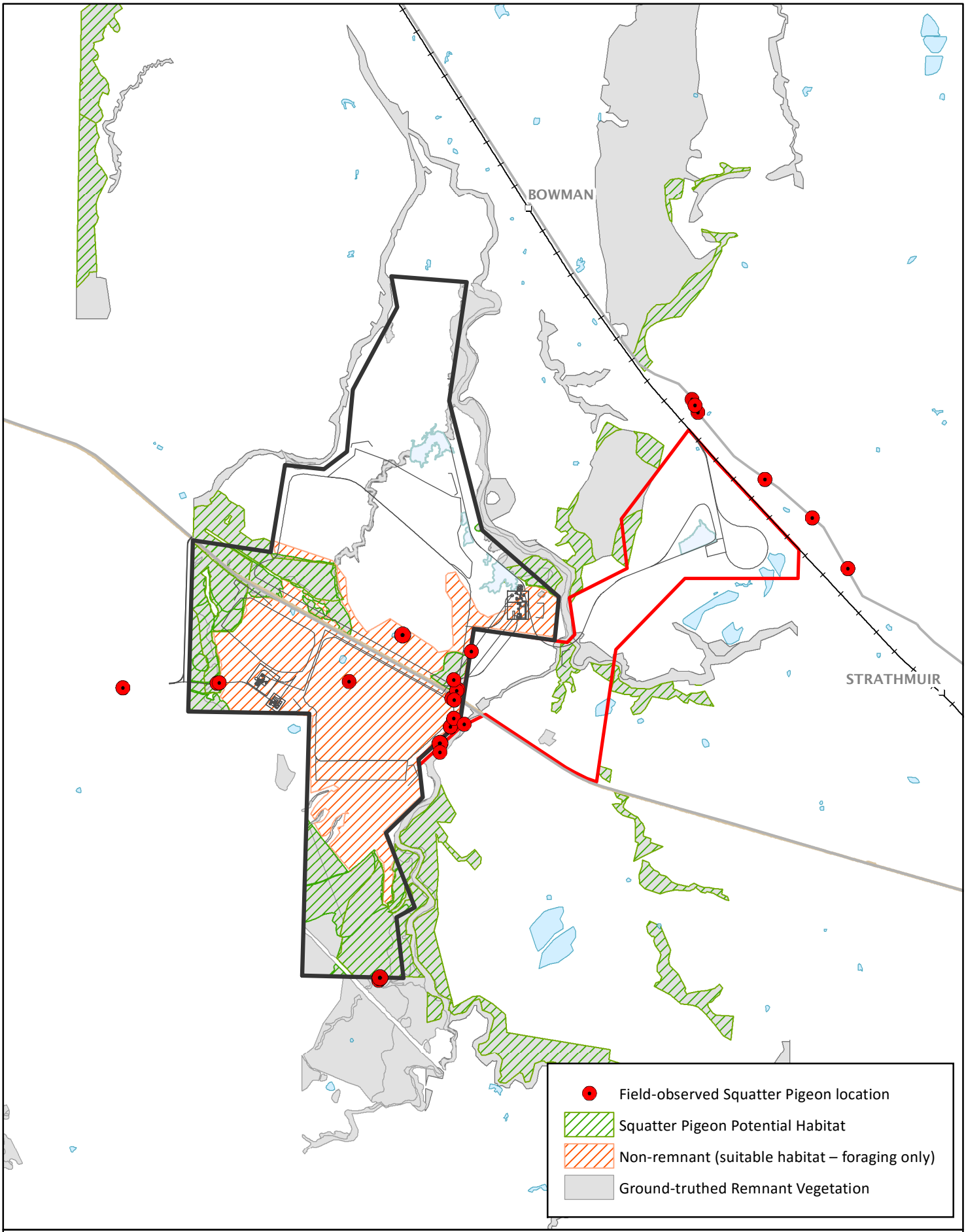
Species Management Measures

The following management measures are specific to Squatter Pigeon and should be applied in conjunction with the relevant generic management measures detailed in Table B-1.

Table B-1 Management Measures – Squatter Pigeon

Activity	Mitigation measures
Pre-construction phase	
Site Preparation	Specific searches for Squatter Pigeon nests to be conducted prior to vegetation clearing (remnant or non-remnant) where it occurs within 200 m of previous species records on the site (refer Figure B1). Where a Squatter Pigeon nest is identified the area will be cordoned off using a minimum 50 m buffer. The area will be considered a 'no go' zone until nesting and has been completed and chicks have fledged.
Also refer generic measures under: ▪ Site preparation ▪ Site Induction ▪ General	
Construction and Operation phases	
Vegetation Clearing	Specific searches for Squatter Pigeon nests to be conducted prior to vegetation clearing (remnant or non-remnant) where it occurs within 200 m of previous species records on the site (refer Figure B1).
Also refer other generic measures under: ▪ Site access ▪ Vegetation clearing ▪ Fauna mortality and injury (particularly regarding site speed limits) ▪ Surface water quality (regarding water quality of likely watering points) ▪ Pests and weeds ▪ Fire ▪ Site rehabilitation	
Post-Operation Phase	

Activity	Mitigation measures
No species specific measures recommended. Refer other generic measures under: ▪ Site access ▪ Fauna mortality and injury (particularly regarding site speed limits) ▪ Surface water quality (regarding water quality of likely watering points) ▪ Pests and weeds ▪ Fire ▪ Site rehabilitation	



Legend

- ML 80187
- ML 700022
- Mine infrastructure
- Main road
- North Coast Rail Line
- Reservoir
- Dam

N

0 0.5 1 km

Scale @ A4 1:70,000
Date: 06/11/18
Drawn: J Parnwell

Figure B1
Potential habitat for Squatter Pigeon

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

PARNWELLJA \\brbsvr1\PRO\Project\BES170354.01 - Teir 2 Approvals for Styx Coal Mine Project\7Work\3GIS\MXD\BES170354.01-013 R2 Potential habitat for Squatter Pigeon - MNES B1.mxd 6/11/2018

Ornamental Snake

Status

Vulnerable (NC Act and EPBC Act)

Biology

Description

Ornamental Snake is a robust but small snake with an average total length of 420 mm. They are grey-brown, brown to almost black on the back and white to cream underneath. The sides are lighter and sometimes patterned with darker 'flecks'. The top of the head is noticeably darker with a narrow pale collar. The face and sides are variably marked but the lips are barred (see Plate). The species is venomous and should be treated with caution. A single recorded bite produced severe swelling around the area of the bite (Wilson 2015).

Ornamental Snake recorded during Project surveys (March 2011)

Ornamental Snake -close up (Source: B. Taylor 2014)

Known Distribution

The species occurs in the eastern half of the central Brigalow Belt, and northern Brigalow Belt, mainly in the Fitzroy and Burdekin Basins from Charters Towers in the north to the Dawson River valley in the south. High population densities are known from the Isaac River (Dysart, Moranbah and Nebo) and Dawson River catchments (Melzer 2012).

Ecology

Ornamental snake requires microhabitat shelter sites such as soil cracks, rocks, human debris (e.g. corrugated iron sheeting) and under fallen timber. It is a nocturnal species and feeds almost entirely on frogs, though lizards may very occasionally be eaten (Ehmann 1992; Wilson 2015). They are known to congregate around waterholes and temporary pools where frogs are abundant. They are most likely to be encountered following heavy summer rains although may be encountered at any time (Melzer 2012).

It is a live-bearing species known to produce from 3 to 11 offspring prior to the summer wet season (September to November).

Habitat

Ornamental snake occurs in low-lying areas with deep-cracking clay soils that are subject to seasonal flooding, and adjacent areas of clay and sandy loams. The species is found in woodlands and shrublands in Brigalow (*Acacia harpophylla*), Gidgee (*Acacia cambagei*), Blackwood (*A. argyrodendron*) or Coolabah (*Eucalyptus coolabah*) dominated vegetation communities associated with moist areas, particularly gilgaied landscapes. It also occurs in modified grassland associated with gilgais, and lake margins and wetlands (Melzer 2012). The species has been recorded in the following REs: 11.4.6, 11.4.8, 11.4.9, 11.3.3 and 11.5.16 (DotEE 2018). Of these only RE 11.4.9 occurs in the Project area. Gilgais are a known important habitat for the species and the presence of woody vegetation is not required for the species to occur (DSEWPaC 2011).

Occurrence in Project Area

Two individuals were recorded in remnant Brigalow habitat (RE 11.4.9) 3.5 km west of the northern boundary of ML 80187 in September 2011. One individual was recorded in Brigalow habitat (RE 11.4.9) along a minor drainage line approximately 5.8 km north-west of the northern boundary of ML 80187 in March 2011. No individuals were observed during Project surveys despite targeted surveys (trapping, habitat searches and spotlighting) within the Project area in February 2012 and February, July and November 2017.

There are suitable cracking clay soils within the Project area north of the Bruce Highway where regrowth Brigalow occurs including extensive gilgai formations. Based on an analysis of aerial imagery as well as on-site observations of habitat conditions there is considered approximately 647 ha of this non-remnant habitat which may be suitable for Ornamental Snake to the north of the Bruce Highway (refer Figure B2). A degraded strip of riparian vegetation along a creek line that passes through this area may also provide shelter and foraging habitat. No habitat for Ornamental Snake was identified within the area of the haul road and TLF.

Known Threats

Threats to Ornamental Snake include: habitat clearing and fragmentation; altered water quality and hydrology affecting gilgai and wetland habitat; habitat degradation by cattle and exotic weed species, predation by feral species; and consuming Cane Toads (*Rhinella marina*). The species is generally not found in areas with high numbers of Cane Toads (Melzer 2012).

Impacts from Project

Clearing of remnant vegetation for the mine component predicted to impact this species will be focussed on RE 11.3.25 located along an ephemeral creek line within non-remnant Brigalow on dark clay soils (20.87 ha). This habitat will be subject to the Project Offset Delivery Plan. The Project will also impact approximately 353 ha of non-remnant grasslands / regrowth on clay soils with potential as habitat located north of the Bruce Highway (Figure B2).

This species may suffer direct mortality due to:

- Earthworks / vegetation clearing activity where suitable habitat occurs; and
- road mortality through localised increases in Project-associated traffic.

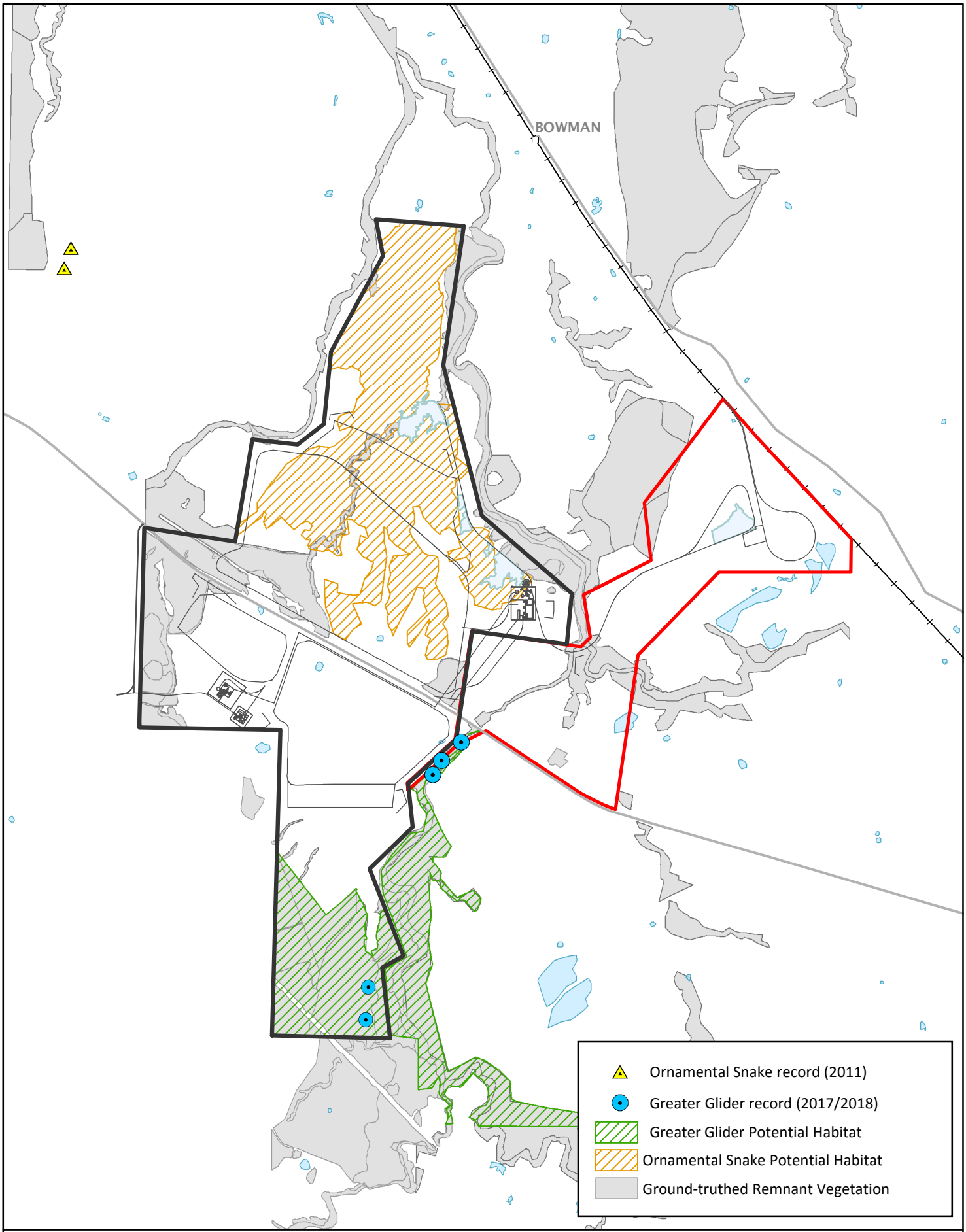
Ornamental Snake may be impacted by uncontrolled release of contaminated water into suitable gilgai habitat during rainfall events.

Species Management Measures

The following management measures are specific to Ornamental Snake and should be applied in conjunction with the relevant generic management measures detailed in Table B-2.

Table B-2 Management Measures – Ornamental Snake

Activity	Mitigation measures
Pre-construction phase	
Site Preparation	Specific nocturnal (spotlighting) searches for Ornamental Snake to be conducted within designated vegetation clearing areas prior to vegetation clearing (remnant or non-remnant) where it occurs within mapped 'potential habitat' within the site (refer Figure B2). Also daytime searches to look for individuals under debris on the ground (e.g. fallen timber, man-made debris). Where possible searches to be carried out during favourable conditions as per DotEE survey guidelines (September to March - warm and not too dry with days warmer than 25 degrees). Individuals to be relocated to a predetermined site comprising similar habitat located outside of the overall Project footprint within the Mamelon property, or adjacent lands where permission is obtained. Locations of any individuals to be recorded by the Environmental Officer on a dedicated fauna register.
Also refer generic measures under: ▪ Site preparation ▪ Site Induction ▪ General	
Construction and Operation phases	
Vegetation Clearing	Specific searches for Ornamental Snake to be conducted within designated vegetation clearing areas (remnant or non-remnant and prior to clearing occurring) where it occurs within mapped 'potential habitat' within the site (refer Figure B2). Searches to look for individuals under debris on the ground (e.g. fallen timber, manmade debris). Individuals to be relocated to a predetermined site comprising similar habitat located outside of the overall Project footprint within the Mamelon property, or adjacent lands where permission is obtained. Locations of any individuals to be recorded by the Environmental Officer on a dedicated fauna register.
Earthworks	Where trenching is carried out on site as part of Project construction activities – a fauna spotter will inspect open trenches for fauna prior to any activity being carried out each morning.
Road Mortality	General measures to be applied across the site are considered sufficient to manage risk on Ornamental Snake individuals. Refer to Section 4.3 of LUMP.
Also refer other generic measures under: ▪ Site access ▪ Vegetation clearing ▪ Fauna mortality and injury (particularly regarding site speed limits) ▪ Pests and weeds ▪ Site rehabilitation	
Post-Operation Phase	
No species specific measures recommended. Refer other generic measures under: ▪ Site access ▪ Fauna mortality and injury (particularly regarding site speed limits) ▪ Pests and weeds ▪ Site rehabilitation	



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Scale @ A4 1:60,000
Date: 06/11/18
Drawn: J Parnwell

Legend

- ML 80187
- ML 700022
- Mine infrastructure
- Main Road
- North Coast Rail Line
- Reservoir
- Dam

Figure B2
Potential habitat for Greater Glider and Ornamental Snake

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

PARNWELLJA \\brbsvr1\PRO\Project\BES170354.01 - Teir 2 Approvals for Styx Coal Mine Project\7Work\3GIS\MXD\BES170354.01-001 R1 - Potential habitat for greater glider & ornamental snake B2.mxd 6/11/2018

Greater Glider

Status

Vulnerable (NC Act and EPBC Act)

Biology

Description

Greater Glider is the largest gliding possum in Australia measuring up to 46 cm (head and body length) with a long, well-furred tail (up to 60 cm). It has dense fur over much of the body including (and noticeably) the large ears. It is white or cream below and variable above including grey, brown to almost black. All white / cream individuals also occur. Unlike other possums the tail is not prehensile.

Greater Glider (Source: Brett Taylor 2017)

Known Distribution

The species occurs across eastern Australia in a broad swathe of territory associated with the Great Dividing Range. It is known to occur from north Queensland (Atherton Tablelands) to central Victoria. Records in central Queensland extend as far west as the Canarvon Range and Clermont areas. Two subspecies are usually recognised from north-east Queensland (*Petauroides volans minor*) and the rest of eastern Australia (*Petauroides volans volans*). Some taxonomists propose the central Queensland population as a third subspecies (*Petauroides volans armillatus*).

Ecology

Greater Gliders are totally silent. The diet is largely composed of eucalypt leaves and sometimes flowers. Large hollows in old trees are favoured as shelter sites during the daytime (Goldingay 2012). Sites with a high abundance of suitable hollows appear to support higher populations. At sites in southern Queensland Greater Glider was found to require 2 to 4 den trees per 2 ha of suitable habitat (Eyre 2002). The species uses relatively small home ranges of 1 ha – 4 ha in more productive forests (Gibbons and Lindenmayer 2002), but up to 16 ha in more open and dry habitats (Smith et al. 2007). Males have a larger home range than females which generally does not overlap with other males (Kavanagh & Wheeler 2004; Pope et al. 2005).

Females breed in their second year giving birth to a single young each year (March to June). The species appears to have a poor ability to disperse. Their low birth rate may cause isolated populations in small forest fragments to be vulnerable to extinction (van der Ree et al. 2004).

Habitat

The highest abundances of the species are found in tall, montane, wet forests featuring mature trees and abundant hollows. They favour forests with a diversity of eucalypt species due to seasonal variations in preferred foraging species (Kavanagh 1984).

Occurrence in Project Area

Two individuals were recorded during spotlighting surveys of the site in February 2017. The individuals were recorded in the continuous tracts of woodland dominated by Narrow-leaf Ironbark (*E. crebra*) that characterise the southern portion of ML 80187. Another individual was observed in a narrow band of riparian Forest Red Gum on Deep Creek in December 2017. Two individuals were observed in the same area of Deep Creek in June 2018. This remains connected to the woodlands further south (see Figure B2). Suitable habitat within or near the Project is likely to be restricted to this area due to the extensive clearing carried out north of the Bruce Highway.

Known Threats

Greater Glider is thought to be particularly sensitive to forest clearing / logging and forest fragmentation. They appear to have a poor dispersal ability being relatively restricted to intact forests / woodlands. They are thought to be susceptible to major disturbances such as frequent or intense fires (TSSC 2016). Climate modelling suggests the species may be threatened by potentially increased temperatures associated with climate change, particularly populations in north Queensland (Kearney et al. 2010).

Impacts from Project

There is not expected to be any direct clearing of known suitable habitat for the species for Project construction. Some habitat that may be suitable for the species will be cleared for the haul road where mature Forest Red Gum open forest (including large tree hollows) occurs along Deep Creek and Barrack Creek. Approximately 1.25 ha of habitat may be cleared in this area. This tract is separated from riparian forest to the south by the Bruce Highway. The surrounding forest has been heavily cleared and it is uncertain whether the species occurs here.

The long-term impacts of groundwater drawdown on Forest Red Gum habitat is uncertain although riparian habitat may have a moderate to high chance of being impacted where the predicted drawdown is greater than 1 m below current levels. Based on the current predicted maximum extent of groundwater drawdown this has potential to impact 7.5 ha of habitat which may be

suitable for Greater Glider. These areas will be subject to vegetation monitoring under the Project LUMP.

The species may suffer direct mortality where clearing works occur in potentially suitable habitat with large tree hollows i.e. riparian habitat along Deep Creek and Barrack Creek.

Species Management Measures

The following management measures are specific to Greater Glider and should be applied in conjunction with the relevant generic management measures detailed in Table B-3.

Table B-3 Management Measures – Greater Glider

Activity	Mitigation measures
Pre-construction phase	
Site Preparation	Specific searches for trees with medium to large hollows suitable for Greater Glider resting sites to be conducted prior to vegetation clearing (remnant or non-remnant) where it occurs within the Deep Creek/Barrack Creek corridor (refer Figure B2). If possible, hollows should be checked for resident fauna either during the pre-clearance survey, or during hollow watches carried out at dusk to survey for emerging fauna. Locations of any individuals to be recorded by the Environmental Officer on a dedicated fauna register. Suitable hollow-bearing trees will be marked clearly so as to be identified during vegetation clearing.
Also refer generic measures under: ▪ Site preparation ▪ Site Induction ▪ General	
Construction and Operation phases	
Vegetation Clearing	Specific searches for trees with medium to large hollows suitable for Greater Glider resting sites to be conducted prior to vegetation clearing (remnant or non-remnant) where it occurs within the Deep Creek/Barrack Creek corridor (refer Figure B2). If possible, hollows should be checked for resident fauna either during the pre-clearance survey, or during hollow watches carried out at dusk to survey for emerging fauna.
	Where possible tree clearing in the Deep Creek/Barrack Creek corridor will occur outside of the known birthing season for Greater Glider (March to June).
	Where medium/large trees have been marked prior to clearing occur – the trees will be felled in such a manner as to minimise impacts to potentially resident Greater Glider individuals e.g. felled gently or lowered to ground. The fauna spotter-catcher will be allowed to inspect hollows as soon as is practicable and no further vegetation disturbance will be carried out in the vicinity until hollows have been inspected. Any resident individuals will be relocated to a predetermined location within Mamelon property comprising suitable habitat for the species i.e. multi-species eucalypt habitat with large hollow-bearing trees. Any injured animals will be taken to a predetermined veterinarian for immediate attention. Locations of any individuals to be recorded by the Environmental Officer on a dedicated fauna register.
Groundwater drawdown	A vegetation monitoring program will be implemented as part of the LUMP to monitor the health of riparian vegetation communities on Tooloombah Creek and Deep Creek including Greater Glider habitat. Refer to Section 5.1 of the LUMP.
Also refer other generic measures under: ▪ Vegetation clearing ▪ Groundwater (particularly in reference to monitoring vegetation health within potential groundwater drawdown zone) ▪ Pests and weeds ▪ Fire ▪ Site rehabilitation	
Post-Operation Phase	

Activity	Mitigation measures
No species specific measures recommended. Refer other generic measures under: ▪ Groundwater (particularly in reference to monitoring vegetation health associated with the Project LUMP within the predicted groundwater drawdown zone) ▪ Pests and weeds ▪ Fire ▪ Site rehabilitation	

Koala (combined populations of Qld, NSW and ACT)

Status

Vulnerable (NC Act and EPBC Act)

Biology

Description

Well known medium sized and stocky marsupial with large ears. It is for the most part arboreal although readily takes to ground to disperse. Koalas in the north average 6.5 kg while those in Victoria average 12kg. Males are generally larger than females. Similarly, Koalas in the north have shorter and greyer fur while those in the south have denser and browner fur (Martin & Handasyde 1999).

Koala recorded on remote camera in south of ML (November 2017)

Known Distribution

Koalas occur throughout eastern Australia from the southern Atherton Tablelands south through to Victoria and into South Australia and Kangaroo Island. In central Queensland they occur as far west as Barcaldine and Hughenden.

Ecology

Koalas have a distinct association with eucalypt woodland and forest habitat types containing suitable food trees (Hume and Esson, 1993; Moore and Foley, 2000; and Martin et al. 2008). They use a variety of trees, including many non-eucalypts, for feeding, shelter and breeding purposes (Dique et al. 2004; and Martin et al. 2008).

They are known to have localised preferences throughout their range, selecting some tree species over others (Pahl and Hume 1990). They are also known to favour individual trees and this has been suggested to be a response to a variety of factors including; high leaf moisture content, high leaf

nitrogen content (which is often related to low fibre content making leaves more palatable) and low levels of chemicals compounds which are expressed by eucalypts to resist herbivory (Pahl and Hume 1990; Hume and Esson 1993; and Moore and Foley 2000).

Breeding occurs in spring / summer when males become territorial, attacking and fighting rivals and using loud bellows to advertise their presence (Martin et al. 2008). Young permanently leave the females pouch after seven months, but continue to ride on the mothers back until 12 months and the beginning of a new breeding season. After this time, adolescent females may remain in the natal habitat, but males generally disperse to new territories between one to three years of age (Dique et al. 2003; and Martin et al. 2008).

Habitat

The species may occur anywhere there are suitable eucalypt forage tree species. They are not necessarily restricted to bushland or remnant areas and are known to exist and breed within farmland and the urban environment (Dique et al. 2004). Similarly, movement is not confined to vegetated corridors, as they also move across cleared rural land and through suburbs (Martin et al. 2008).

Occurrence in Project Area

The species was observed in Poplar Box remnant woodland within ML 80187 during spotlighting for the February and September 2017 site surveys and in Poplar Gum woodland in November 2017 and June 2018. Two individuals were recorded on remote camera in the south of the ML (Plate 5) in woodland dominated by Narrow-leaf Ironbark in November / December 2017 (Figure B3). The species has only been recorded as single individuals during sporadic survey events and evidently occurs in low densities in the area.

The central eastern and western portion of the ML is dominated by tracts of Poplar Box (RE 11.4.2) which is considered a secondary forage tree. Forest Red Gums are considered primary feed trees (Australian Koala Foundation 2015) and occur in narrow bands along creek lines including the drainage line that crosses the ML north of the Bruce Highway. The Forest Red Gum habitat in the local area (RE 11.3.4 and 11.3.25) is likely to be the most favoured habitat for this species.

Known Threats

Current threats to Koalas include habitat destruction and fragmentation, inappropriate bushfire regimes, habitat degradation due to weed invasion and disease. Populations around urban / populated areas are also at increased risk of mortality due to dog attack and road strike (Woinarski et al. 2014).

Impacts from Project

All remnant vegetation subject to clearing for the Project is considered suitable for Koala including RE 11.3.4, 11.3.25, 11.3.27, 11.3.35 and 11.4.2 (total of 108.22 ha). This habitat will be subject to the Project Offset Delivery Plan.

The long-term impacts of groundwater drawdown on Forest Red Gum habitat is uncertain although riparian habitat may be impacted where the predicted drawdown is greater than 1 m below current levels. Impacts to non-riparian eucalypt woodlands as these communities are not expected to rely on groundwater for survival. Based on the current predicted maximum extent of groundwater drawdown this has potential to impact 26.97 ha of habitat which may be suitable for Koala. These areas will be subject to vegetation monitoring under the Project LUMP.

This species may suffer direct mortality due to:

- Vegetation clearing activity where suitable habitat occurs;
- High intensity bushfires impacting individuals;
- Road mortality through localised increases in Project-associated traffic; and
- Mortality through dog/dingo attack.

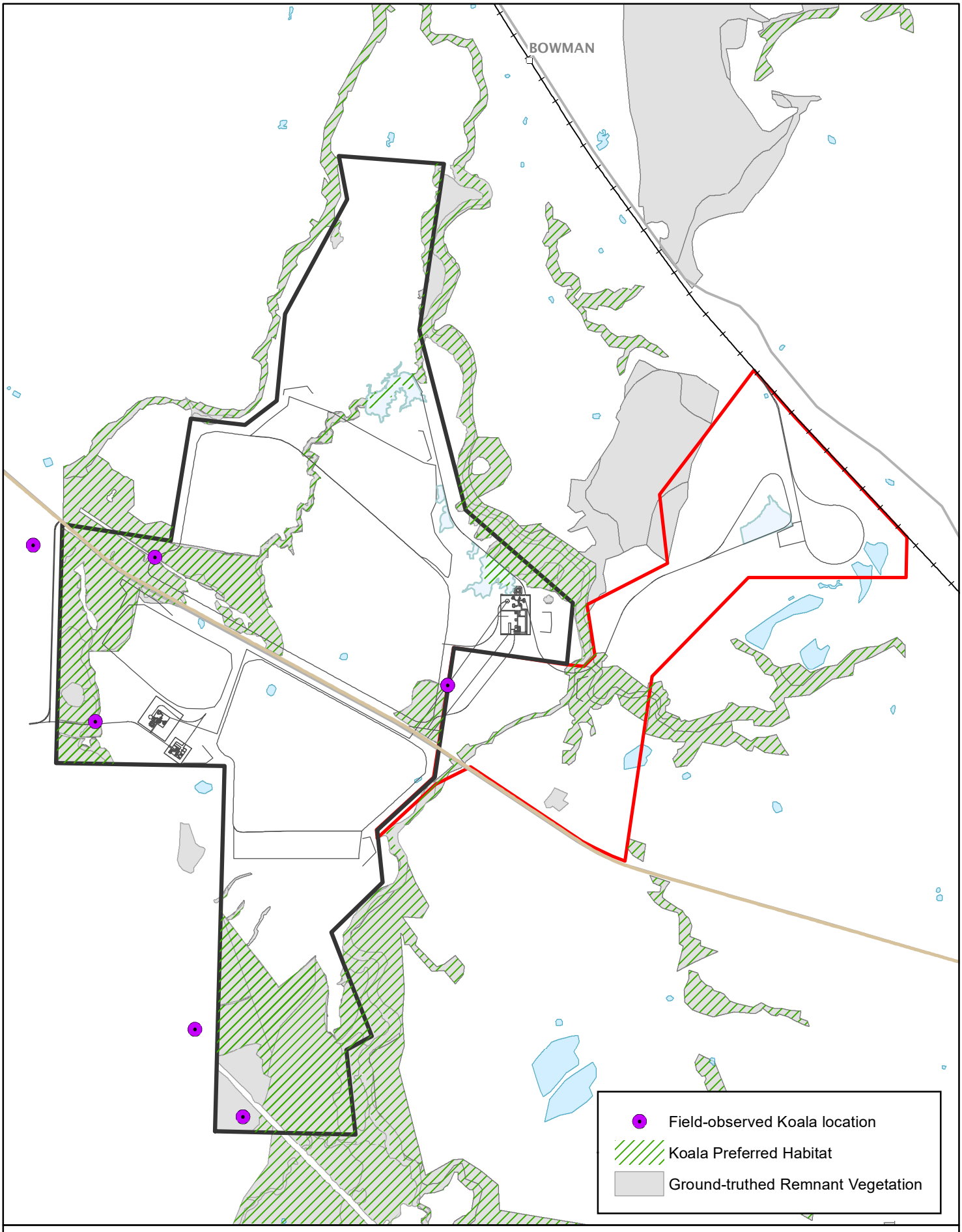
Species Management Measures

The following management measures are specific to Koala and should be applied in conjunction with the relevant generic management measures detailed in Table B-4.

Table B-4 Management Measures – Koala

Activity	Mitigation measures
Pre-construction phase	
Site Preparation	Specific searches for individual Koalas within suitable woodland habitat immediately prior to vegetation clearing. Where an individual/s are observed within the clearing zone: ▪ Vegetation clearing activity will avoid the tree the individual is observed in (including an additional 25 m radius buffer) until the individual has moved on ▪ This area will be allowed to retain a connection to adjacent vegetation to allow the individual to disperse ▪ The individual will be allowed to disperse from the clearing area overnight ▪ Where the individual has not dispersed overnight, a qualified fauna spotter may physically remove the individual (where possible) prior to clearing activity continuing Locations of any individuals to be recorded by the Environmental Officer on a dedicated fauna register.
Also refer generic measures under: ▪ Site preparation ▪ Site Induction ▪ General	
Construction and Operation phases	
Vegetation Clearing	Specific searches for individual Koalas within suitable woodland habitat immediately prior to vegetation clearing. Where an individual/s are observed within the clearing zone: ▪ Vegetation clearing activity will avoid the tree the individual is observed in (including an additional 25 m radius buffer) until the individual has moved on ▪ The avoided area will be allowed to retain a connection to adjacent vegetation to allow the Koala individual to disperse ▪ The individual will be allowed to disperse from the clearing area overnight ▪ Where the individual has not dispersed overnight, a qualified fauna spotter may physically remove the individual (where possible) prior to clearing activity continuing Locations of any individuals to be recorded by the Environmental Officer on a dedicated fauna register.
Groundwater Drawdown	A vegetation monitoring program will be implemented as part of the LUMP to monitor the health of riparian vegetation communities on Tooloombah Creek and Deep Creek including Koala habitat. Refer to Section 5.1 of the LUMP.
Bushfire Risk	General fire management measures to be applied across the site are considered sufficient to manage risk on Koala and habitat. Refer to Section 4.5 of LUMP.
Pests and Weeds	General pest management measures to be applied across the site are considered sufficient to manage risk on Koala. Refer to Section 4.6 of LUMP.
Road Mortality	Fauna infrastructure (such as barriers and underpasses) will be installed along the haul road where it intersects with the potential fauna corridor (along Deep Creek / Barrow Creek to reduce the likelihood of Koala collision with vehicles. General measures to be applied across the site are considered sufficient to manage risk on Koala individuals. Refer to Section 4.3 of LUMP.

Activity	Mitigation measures
Also refer other generic measures under: ▪ Vegetation clearing ▪ Groundwater (particularly in reference to monitoring vegetation health within potential groundwater drawdown zone) ▪ Pests and weeds ▪ Fire ▪ Site rehabilitation	
Post-Operation Phase	
No species specific measures recommended. Refer other generic measures under: ▪ Groundwater (particularly in reference to monitoring vegetation health associated with the Project LUMP within the predicted groundwater drawdown zone) ▪ Pests and weeds ▪ Fire ▪ Site rehabilitation	



Legend

- ML 80187
- ML 700022
- Mine infrastructure
- Main road
- North Coast Rail Line
- Reservoir
- Dam

0 0.5 1 km

Scale @ A4 1:50,000
Date: 07/11/18
Drawn: J Parnwell

Figure B3
Potential habitat for Koala

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

Appendix C

Other Species Descriptions and Management Measures

Short-beaked Echidna

Status

Special Least Concern (NC Act)

Biology

Description

Well known small-medium monotreme with dense covering of spines. Several subspecies are recognised. Individuals in the south of its range (particularly in Tasmania) are more heavily furred than northern individuals. Adults weigh from 2 kg up to 7 kg in areas such as the Snowy Mountains. Individuals in Queensland generally weigh around 4 kg. Males are larger than females.

Short-beaked Echidna captured on remote camera (November 2017)

Known Distribution

Short-beaked Echidna occurs throughout the entirety of Australia. It is one of the few (if not the only) small-medium sized mammals that still occurs across much of its original range in Australia.

Ecology

The Short-beaked Echidna is, with the Platypus and the Long-beaked Echidna (*Zaglossus bruijni*) of New Guinea, the only three extant species of monotreme, a group of mammals believed to have diverged early in the evolution of mammals, possibly about 200 million years ago (Augee 2008). The species is unusual (for its size) in being long-lived, with a captive zoo specimen recorded as living as long as 50 years (Crandall 1964; in Nicol and Anderson 2007). The Short-beaked Echidna is specialised for feeding on ants, termites and beetle larvae.

In warmer areas winter the species may be active both day and night in winter, and often becoming nocturnal in summer. The species shelters in caves, logs, crevices, burrows and leaf litter

(Menkhorst and Knight 2004; and Augee 2008). The species will enter periods of torpor, particularly in winter in the south of its range. Short periods (no longer than one day) of torpor have also been observed during summer months in southern Queensland as well (Brice et al 2002).

The species breeds in winter (July to September) throughout its range. In Queensland individuals may breed a second time within a season in the event the first young is lost (Beard and Grigg 2000). Pregnant females retreat to a burrow (plugging the entrance) for the birth of a single hatchling. In south-east Queensland the young are carried in the pouch from 45 to 60 days and are then left in a nursery burrow. The female returning every 4 to 6 days to suckle the young. The young are independent at 5 to 6 months (Beard and Grigg 2000).

Habitat

Short-beaked Echidna may occur in any habitat where suitable prey occurs. It occurs in almost all terrestrial habitats except for intensively managed farms. They are known from coastal areas to deserts to mountainous areas above the snowline.

Occurrence in Project Area

Scats and diggings attributable to this species were encountered on all surveys of the area. Several individuals recorded on long-term remote cameras in the south of the ML from September to December 2017. The species may occur anywhere on the site including remnant or non-remnant habitats.

Known Threats

Short-beaked Echidnas are killed by dingoes / dogs and motor vehicles.

Impacts from Project

The species may occur across the entire site although is more likely to forage where woody vegetation occurs. All remnant vegetation subject to clearing for the Project may be considered suitable for Short-beaked Echidna including RE 11.3.25, 11.3.4 and 11.4.2 (total of 132.47 ha). This habitat will be subject to the Project ODP.

This species may suffer direct mortality due to:

- Vegetation clearing activity where individuals occur;
- Road mortality through localised increases in Project-associated traffic; and
- Predation through increased presence of feral dogs / Dingoes.

Species Management Measures

There are no management measures specific to Echidna. General management measures associated with vegetation clearing and setting site speed limits (refer Table 5-1) are considered sufficient to mitigate impacts on this species. Pre-clearance surveys carried out by an experienced fauna-spotter catcher immediately prior to vegetation clearing will identify and relocate local individuals.

Listed Migratory Species

Estuarine Crocodile

Status

Vulnerable (NC Act) and Migratory (EPBC Act)

Biology

Description

Largest extant reptile in the world. Males average 5 m in length and weigh 450 kg. Females are significantly smaller on average at 3 m in length and weighing 150 kg. They have a mottled appearance ranging from grey, brown to almost black above and white underneath.

Known Distribution

Widespread throughout northern Australia and its range includes all of the Gulf of Carpentaria and the Queensland east coast south to Elliott Heads near Bundaberg. The most southerly breeding population is located in the Fitzroy River, Rockhampton (Read et al. 2004).

Ecology and Habitat

Their habitat includes marine habitats such as mangroves, but they also commonly occur in freshwater habitats such as rivers, lakes and swamps. Crocodiles have wide and varied diets which differ between habitats. Prey size increases with the size of the crocodile, with the diet of juveniles consisting of smaller prey such as insects, crustaceans and occasionally small mammals such as rats. Larger crocodiles feed on fish, crabs, turtles, birds and mammals including large prey items such as wallabies, pigs, water buffalo, cattle and horses.

In the Northern Territory the species nests in the wet season with a peak in the January / February period (Webb et al. 1987). The species builds nest mounds preferring areas with tall vegetation and nearby close water. The female remains close by during incubation (between 2 to 4 months in length) to defend the nest (Magnusson 1979). Upon hatching the female digs the young out of the nest. Hatchlings form creches and the mother may guard the young for up to two months (Webb et al. 1977).

Occurrence in Project Area

There are no database records of the species from the wider area. Species known to occur in low numbers in the Shoalwater Bay area (DoD 2009).

During the June 2011 survey evidence of the presence of estuarine crocodiles was observed at two Styx River sites and at a site on Deep Creek. Anecdotal evidence collected at the time suggested crocodiles have occurred in Deep Creek, as well as the Styx River. No evidence of crocodile presence was observed at any of the aquatic ecology sampling sites in February 2017 and in general habitat conditions appeared less suitable for the species i.e. isolated pools largely with steep banks. Anecdotal evidence collected in May 2017 suggested an individual was resident in the Styx River in the area of surface water sampling down river from the confluence of Deep Creek and Tooloombah Creek. However, no evidence of the species presence has been observed during monthly water

sampling activity (May 2017 to April 2018) at this site, or sites located on the two creek lines. It is assumed the species is considered likely to occur in the Styx River, and 'potentially' occurs in Deep Creek and Tooloombah Creek.

Impacts from Project

This species may be impacted by the Project from unmanaged releases of pollutants (sediment or chemicals) into waterholes and downstream habitat. Groundwater drawdown may impact long-term level water levels in creek line waterhole habitat where groundwater drawdown is predicted to occur (refer Figure 4-2). No drawdown impact is predicted where the species is most likely to occur (Styx River).

Species Management Measures

There are no management measures within this SSMP specific to Estuarine Crocodile. General management and water monitoring measures associated with surface water and groundwater quality (refer Table 5-1) are considered sufficient to mitigate impacts on this species.

Latham's Snipe

Status

Special Least Concern (NC Act) and Migratory (EPBC Act)

Biology

Description

Medium sized wader with a length of 29 cm to 33 cm. It has a long straight bill that is darker at the tip becoming olive-yellow towards the base. Plumage is variously marked with black and varying shades of brown chevrons with cream streaks down the back. The head is marked with dark stripes across the crown. The belly, parts of the head and tail tip are white.

Known Distribution

Latham's Snipe breeds mainly in Japan, arriving in northeast Queensland during the northern winter and then moving south through the coastal / sub-coastal areas of south east Queensland into much of eastern Australia during spring / summer (Pringle 1987; and Pizzey and Knight 2012). It has been recorded in Australia from the Cape York Peninsula through South Australia and ranges inland over the central and southern tablelands of Queensland.

Ecology and Habitat

Latham's Snipe is a secretive species that occurs in swamp and marsh margins and in wet pasture, feeding mainly on invertebrates such as earthworms, flies, beetles and insect larvae (Pringle 1987) but also plant material and sometimes molluscs. In Australia the species occurs on wetlands (modified or natural) up to 2,000 m above sea level. The prefer open shallow freshwater wetlands with low dense vegetation and can occur close to significant human disturbance (e.g. airfields). Foraging habitat is characterised by open mudflat areas with low dense plant cover for roosting and shelter.

Occurrence in Project Area

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. The species may occur around shallow wetlands and farm dams in the Project area.

Impacts from Project

This species will lose habitat in the form of artificial wetlands (farm dams) located within the Project footprint.

Species Management Measures

There are no management measures within this SSMP specific to Latham's Snipe. General management measures associated with vegetation clearing (refer Table 5-1) are considered sufficient to mitigate impacts on this species. Pre-clearance surveys carried out by an experienced fauna-spotter catcher immediately prior to vegetation / wetland clearing will identify if the species is present at wetland sites at the time of clearing works. The species is expected to vacate the site after being 'flushed' by Project activity.

Glossy Ibis

Status

Special Least Concern (NC Act) and Migratory (EPBC Act)

Biology

Description

Small ibis (48 cm – 61 cm in length) with rich iridescent plumage. Breeding adults are uniformly brown on the neck, chest and upper back. The back, wings and tail are almost black. Feathers have an iridescent purple / green gloss. Non-breeding and juveniles have less brown on the neck and are generally duller in colour (Menkhorst et al. 2017).

Known Distribution

Glossy Ibis is a widespread species, occurring throughout the northern hemisphere and over much of Australia. Core breeding habitat for the species is within the Murray-Darling Basin (NSW and Victoria), the Macquarie Marshes in NSW and in southern Queensland.

Ecology and Habitat

This species breeds in dense colonies, 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. It feeds on aquatic invertebrates and occurs in terrestrial wetlands, preferring inland freshwater wetlands with abundant aquatic flora (Pringle 1985; and Marchant and Higgins 1990).

Occurrence in Project Area

Recorded in the wider area to the north of the Project on a brackish swamp associated with the Styx River marine plains during the September 2011 survey. Wetlands/flooded pasture within the Project area is likely to provide suitable habitat, particularly following heavy rainfall.

Impacts from Project

This species will lose habitat in the form of artificial wetlands (farm dams) located within the Project footprint.

Species Management Measures

There are no management measures within this SSMP specific to Glossy Ibis. General management measures associated with vegetation clearing (refer Table 5-1) are considered sufficient to mitigate impacts on this species. Pre-clearance surveys carried out by an experienced fauna-spotter catcher immediately prior to vegetation / wetland clearing will identify if the species is present at wetland sites at the time of clearing works. The species is expected to vacate the site after being 'flushed' by Project activity.

Oriental Cuckoo

Status

Special Least Concern (NC Act) and Migratory (EPBC Act)

Biology

Description

Mid-sized cuckoo species (28 cm to 33 cm) with boldly barred chest distinguishing it from other cuckoo species in Australia. Adults are light grey on the back and neck with a white and black-barred chest. Adult morphs with a mottled rufous back and neck also occur.

Known Distribution

Oriental Cuckoo breeds in China, Japan and Mongolia in the northern summer. It migrates south to the Australasian region. It is widespread but sparsely recorded across eastern Queensland in the summer months any time from September to May (more commonly November to March).

Ecology and Habitat

The species may occur in a wide range of habitats from densely wooded forests to more open woodlands to relatively cleared areas such as leafy trees in paddocks (Pizzey and Knight 2012) with an apparent preference for riparian forests. Insectivore that favours caterpillars. Unobtrusive behaviour and found as individuals or sometimes in small groups (Menkhorst et al. 2017).

Occurrence in Project Area

A single record of this species 1.3 km east of the ML during the March 2011 survey.

Impacts from Project

This species will lose potential habitat located within the Project footprint should it occur on the site. The most suitable habitat is expected to be the riparian habitat along creek lines adjacent to the Project and which occurs within the haul road.

Species Management Measures

There are no management measures within this SSMP specific to Oriental Cuckoo. General management measures associated with vegetation clearing (refer Table 5-1) are considered sufficient to mitigate impacts on this species. Pre-clearance surveys carried out by an experienced fauna-spotter catcher immediately prior to vegetation clearing will identify if the species is present at the time of clearing works. The species is expected to vacate the site of works after being 'flushed' by Project activity.

Fork-tailed Swift and White-throated Needletail

Status

Special Least Concern (NC Act) and Migratory (EPBC Act)

Biology

Description

Medium to large swifts with powerful and fast flight. Fork-tailed Swift is largely dark with a pale chin. It has long relatively thin wings. The deeply forked tail may not be obvious if the tail is held closed. White-throated Needletail is larger with a sharply demarcated white throat patch and tail on black. The tail is short and square with several short spines that are not obvious except on close view.

Known Distribution

White-throated Needletail occurs over eastern and south eastern Australia during the warmer months. Fork-tailed Swift is widespread across much of Australia also during the southern summer. Both species breed in eastern Asia and spend the non-breeding season mainly in Australia, and occasionally in New Guinea and New Zealand (Blakers et al. 1984; and Higgins 1999).

Ecology and Habitat

White-throated Needletail arrives in eastern Australia in late October moving south along both sides of the Great Dividing Range as far south as Tasmania. Fork-tailed Swift also arrives in October. Both species return to the northern hemisphere by around April (Higgins 1999). Both are aerial insectivore species that can occur in large flocks. They are commonly associated with storm fronts that stir up insect prey. Usually seen flying at height but may be observed low to ground where weather conditions bring insect prey closer. They can occur over most habitats including heavily disturbed areas. Rarely seen to perch in Australia although some individuals are observed to roost in tall trees at dusk (Menkhorst et al. 2017).

Occurrence in Project Area

Fork-tailed Swift was recorded during 2011 and 2012 surveys of the wider area. White-throated Needletail recorded near the southern boundary of the mine ML in November 2017.

Impacts from Project

There will be no impacts from the Project on these species.

Species Management Measures

None required.

Rufous Fantail

Status

Special Least Concern (NC Act) and Migratory (EPBC Act)

Biology

Description

Small insectivore with longish tail which is constantly fanned when moving about. Grey-brown on the back with a rufous lower back extending partway along the tail feathers grading into grey white tail tips. The throat, belly and chest is white with a black patch (or 'bib') and spotting on the upper chest.

Known Distribution

The species occurs across Northern Australia from the Kimberley to Cape York and down the entire eastern coast (Pizzey and Knight 2012). The eastern races migrate to the north in early autumn and return in early spring to breed (Pizzey and Knight 2012; Higgins et al. 2006).

Ecology and Habitat

Rufous Fantails occur in moist habitats, including wet forests (rainforest and eucalypt), coastal scrubs, mangroves and along watercourses and gullies. It may occur in unusual habitats including saltmarsh or urban / rural areas during mid-year migration (Higgins et al. 2006; Menkhorst et al 2017). They predominantly feed on small insects within the understorey (Higgins et al. 2006). Very active species often twisting / turning with fanned tail.

Occurrence in Project Area

A single record of this species during the March 2011 survey. Most suitable habitat for this occurs along Deep Creek and Tooloombah Creek but may also occur in other habitats on the site where a dense understorey occurs.

Impacts from Project

This species will lose potential habitat located within the Project footprint should it occur on the site. The most suitable habitat is expected to be the riparian habitat along creek lines adjacent to the Project and which occurs within the haul road.

Species Management Measures

There are no management measures within this SSMP specific to Rufous Fantail. General management measures associated with vegetation clearing (refer Table 5-1) are considered sufficient to mitigate impacts on this species. Pre-clearance surveys carried out by an experienced fauna-spotter catcher immediately prior to vegetation clearing will identify if the species is present at the time of clearing works. The species is expected to vacate the site of works after being 'flushed' by Project activity.