Environmental Management Plan

Lynas Find Project – EPBC 2023/09471

Prepared for Pilbara Minerals Limited ABN 95 112 425 788

17 June 2024

Project Number: TE23060

DOCUMENT CONTROL

Version	Description	Date	Author	Reviewer	Approver
1.0	First Approved Release	31/10/2023	AJ	JK	AJ
1.0	Changed to EMP - Updated following DCCEEW feedback	13/02/2024	AJ	GB	AJ
2.0	Amended to include details of water monitoring	17/06/2024	AJ	GB	AJ

Approval for Release

Name	Position	File Reference
Ami Jamieson	Senior Environmental Consultant	TE23060_Environmental Management Plan_2.0_tracked
Signature		

Declaration of Accuracy

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed: _____

Full name: Eulogio Almanza

Organisation: Pilbara Minerals Limited

Date: _____

Condition Reference Table

EPBC Approval Condition	Relevant Section of Document

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1 Introduction

This Environmental Management Plan (EMP) has been developed to support the referral of the Lynas Find Project (the Proposed Action) under the *Environmental Protection and Biodiversity Conservation Act (Cth) 1999* (EPBC). The EMP outlines the risks of the Proposed Action implementation, and management actions that will be undertaken to ensure the risk to conservation significant terrestrial fauna is minimised.

1.1 Project Description

The Proposed Action is a component of a larger project – the Pilgangoora Project, operated by Pilbara Minerals Limited (PML) since 2018. The Proposed Action includes construction of an open pit mine (Lynas Find Pit) and Waste Rock Landform (WRL) (Lynas Find WRL) to the north of the current Pilgangoora operations, as well as necessary supporting infrastructure including access and haul roads, laydown areas, and topsoil stockpiles, as required. A layout plan has been provided as Figure 1-1, and includes the infrastructure to be constructed for the Proposed Action, as well as information on the surrounding areas that may be impacted through implementation of the Proposed Action.

Mining of the Proposed Action area will be undertaken using routine open pit mining methods, including:

- Land clearing and site preparation (including stockpiling of topsoils);
- Drill and blast activities;
- Excavation and haulage of material; and
- Closure and rehabilitation activities.

Waste rock will be transported by haul truck to the Lynas Find WRL, which may also be used to store waste rock from other locations in the broader project area.

Ore will be transported to an existing process plant where it will be crushed and processed to produce lithium and tantalite concentrates for export.

Due to the short life of the Proposed Action, no maintenance works are expected to be required.

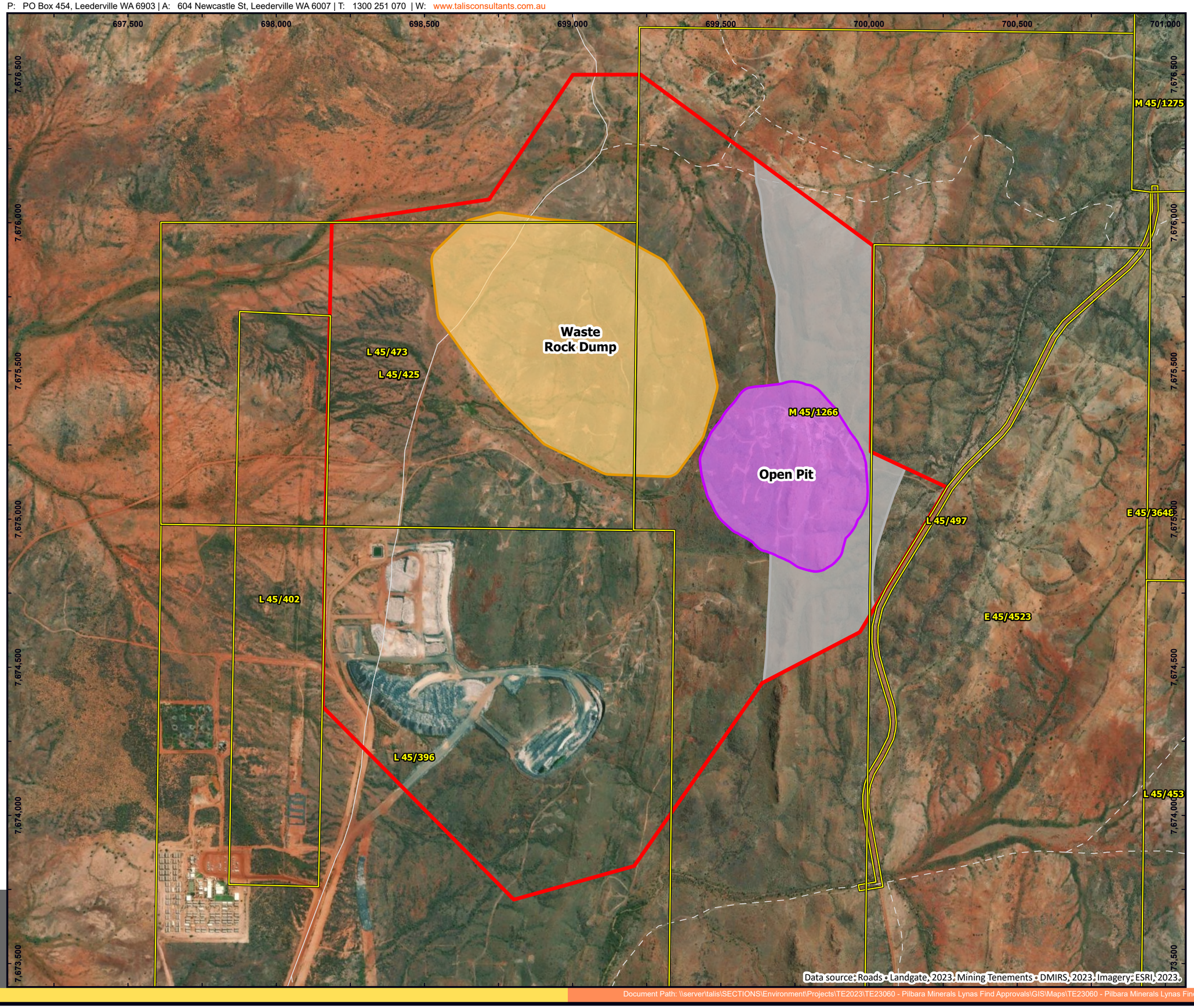
1.1.1 Location

The current Pilgangoora operations are located approximately 80 km SSE of Port Hedland in the Pilbara region of Western Australia, and the Lynas Find deposit is located approximately 5 km to the north of the existing operations. A locality map has been provided as Figure 1-2.

The Proposed Action includes a Development Envelope of 394.86 ha, of which 26.32 ha will comprise of open pit disturbance, and 61.02 ha of disturbance for the WRL, totalling 87.34 ha of total disturbance. Included in the proposed disturbance footprint is a buffer of approximately 23 ha, which allows peripheral disturbance for low impact associated infrastructure such as access roads and topsoil stockpiles.

Within the Development Envelope, 37.54 ha will be classified as an avoidance area, which will not be disturbed by PML mining activities. This area includes rocky ridges that have the potential to be utilised as denning habitat for the nationally threatened species, the Northern Quoll, and as such, all efforts will be taken to preserve this habitat.

P: PO Box 454, Leederville WA 6903 | A: 604 Newcastle St, Leederville WA 6007 | T: 1300 251 070 | W: www.talisconsultants.com.au



Data source: Roads - Landgate, 2023. Mining Tenements - DMIRS, 2023. Imagery: ESRI, 2023.

LEGEND

- Lynas Find Mine Development Envelope
- Mining Tenements

Site Layout

- Open Pit Footprint
- Waste Rock Landform Footprint
- Proposed Avoidance Area

Western Australian Roads

- Minor Road
- Other

LOCALITY

0 200 400 600 800 1,000 km

SITE LAYOUT

Lynas Find Mine Site
EPBC and EPA Referral

Pilbara Minerals Limited

N

0 100 200 300 400 500 m

Coordinate System: GDA2020 MGA Zone 50
Scale @ A3: 1:12,000

Prepared:	E Jackson	Date:	1/09/2023
Reviewed:	A Jamieson	Revision:	A
Project:	TE23060		

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Figure 1-1

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660,000 680,000 700,000 720,000 740,000 760,000 780,000 800,000

7,760,000 7,740,000 7,720,000 7,700,000 7,680,000 7,660,000

IBRA REGION: DAMPIERLAND

IBRA Sub-Region: Pindanland

IBRA REGION: GREAT SANDY DESERT

IBRA Sub-Region: McLarty

IBRA Sub-Region: Roebourne

Port Hedland

South Hedland

Marble Bar Rd

Great Northern Hwy

IBRA REGION: PILBARA

IBRA Sub-Region: Chichester

Marble Bar

Data source: Roads, Rail - Landgate, 2023. IBRA Regions - Department of Environment, 2023. Imagery: ESRI, 2023.

LEGEND

- Lynas Find Mine Development Envelope

IBRA Sub-Regions

- Chichester
- McLarty
- Pindanland
- Roebourne

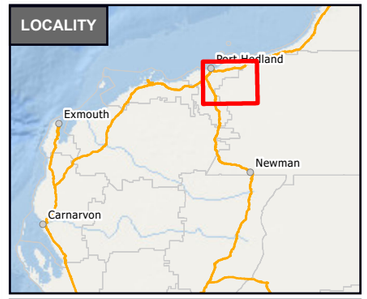
Rail Network

- Railway Stations
- Railway Lines

Western Australian Roads

- Freeway / Highway
- Main Road

LOCALITY



0 200 400 600 800 1,000 km

SITE LOCALITY

Lynas Find Mine Site
EPBC and EPA Referral

Pilbara Minerals Limited

N 0 5 10 15 20 Km

Coordinate System: GDA2020 MGA Zone 50
Scale @ A3: 1:500,000

Prepared:	E Jackson	Date:	20/09/2023
Reviewed:	A Jamieson	Revision:	A
Project:	TE23060		

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Figure 1-2

Document Path: \\server\talis\SECTIONS\Environment\Projects\TE2023\TE23060 - Pilbara Minerals Lynas Find Approvals\GIS\Maps\TE23060 - Pilbara Minerals Lynas Find Approvals\TE23060 - Pilbara Minerals Lynas Find Approvals.aprx

1.2 Objectives

The Objective of the EMP is to avoid direct and indirect impacts to conservation significant terrestrial fauna species present in the Proposed Action area, including the Northern Quoll (*Dasyurus hallucatus*), Ghost Bat (*Macroderma gigas*) and Pilbara Leaf-nosed bat (PLNB) (*Rhinonicteris aurantia*). Where impacts are not possible to avoid, the objectives are to minimise impacts and implement mitigation strategies which are then to be monitored and measured to gauge their effectiveness.

The intended outcomes of the EMP are to:

- Avoid the direct and indirect impacts to Conservation Significant (CS) terrestrial fauna species from the Proposed Action where possible;
- Minimise residual impacts on terrestrial fauna and implement mitigation strategies;
- Outline monitoring programs for the effectiveness of mitigation strategies;
- Adopt an adaptive management approach, based on monitoring outcomes, that identifies management responses to be enacted where trigger and threshold values are exceeded.

1.3 Environmental Management Roles and Responsibilities

Overall responsibility for the implementation of this EMP resides with the Registered Mine Manager of the Lynas Find Project. This may be transferred during the construction phases of the Proposed Action to the Project Manager.

Responsibility for specific tasks required under this EMP may be delegated to other site personnel. Any delegation of responsibility must be clearly recorded and communicated to key personnel.

Site Role	Responsibilities
Registered Mine Manager/Project Manager	• Provide adequate resources for the implementation and compliance with the EMP; • Oversee compliance with the provisions of the EMP; and • Communicate delegated tasks required under the EMP.
Site Manager/Supervisor	• Ensure compliance with the EMP; • Provide information for land use certificate (LUC) applications; • Ensure an approved LUC is in place prior to any ground disturbance; • Implement requirements outlined in the approved LUC; • Audit LUC disturbance boundaries against approved areas; and • Communicate requirements of the EMP across site as required.

Site Role	Responsibilities
Site Environmental Manager and Environmental Advisors	• Review LUC applications, ensuring minimisation of impacts to conservation significant fauna habitat; • Enforcement of LUC conditions; • Ensure proposed disturbances are in line with regulatory approvals; • Pre-clearance inspections of proposed disturbance areas; • Communicate LUC and other regulatory requirements to project teams and work crews; • Ensure GIS disturbance data is regularly updated; • Undertake inspections of project areas to ensure compliance with LUC and other regulatory conditions; • Prepare and deliver environmental awareness on site, including at inductions and toolbox meetings; • Promote awareness of presence of CS fauna in the Proposed Action area; • Maintain responsibility for ongoing monitoring and reporting relating to CS fauna; and • Ensure contractors undertaking fauna monitoring on site have the appropriate permits and animal ethics approvals.

1.4 Reporting

Reporting of CS fauna species issues, events, and monitoring results will be undertaken to ensure communication and understanding of the actual measured impacts of the Proposed action on the CS fauna species in the area.

Reporting required includes:

- Regular reporting to regulators as required by project approvals;
- Reporting under the Land Use Certificate system for completion of clearing;
- Internal incident reporting, including all fauna injuries or mortalities as a result of the Proposed Action; and
- External incident reporting, including reporting of all mortalities of CS fauna on site.

1.5 Environmental Training

Environmental training is incorporated across site, raising awareness of the presence of CS fauna on site and the management actions required in order to minimise the impact of the Proposed Action on these species.

Training and awareness programs on site include an induction process for all permanent staff and contractors working across the Pilgangoora Project. This induction includes a fauna component, with a focus on how to identify the CS fauna found in the area and the expected behavioural actions required to minimise impacts to any identified species.

Further training will be undertaken in targeted toolbox meetings and will be mandatory for crews involved in clearing and land disturbance.

In addition, educational materials will be displayed on rotation in crib rooms and other high traffic areas, to include information on reporting sightings and identification of conservation significant fauna species.

1.6 Emergency Contacts and Procedures

The emergency contact on site will be the site General Manager. The General Manager of the Lynas Find site will have the power to stop or otherwise direct works to ensure effective and timely management of any environmental emergencies that may arise.

Where operations are considered likely to have an impact on CS terrestrial fauna species, works are to be stopped until formal assessment of the situation can be undertaken, and any required actions implemented to reduce the risk of continuing operations.

Environmental emergencies often coincide with safety emergencies, relating to severe weather events including cyclones and bushfires. In these situations, safety will be a primary consideration. Where safety concerns have been adequately managed, environmental concerns will be addressed.

2 Potential Environmental Impacts and Risks

2.1 Threats to Matters Protected Under the EPBC Act

Matters of National Environmental Significance (MNES) include threatened species listed under the EPBC Act.

Implementation of the Proposed Action will require vegetation clearing of the proposed areas, as well as removal of a portion of rocky ridge that represents fauna habitat for the Northern Quoll. This habitat may also be used sporadically by other listed threatened species, including the PLNB and the Ghost bat.

The Proposed Action will result in impacts to approximately 4.62 ha of rocky ridge habitat, and a further 82.48 ha of additional vegetation that may be used for foraging by CS species. This EMP has been developed to ensure that measures are taken to avoid or mitigate further impacts to the CS species present in the Proposed Action area.

2.1.1 Northern Quoll

The Northern Quoll is listed as Endangered under the EPBC Threatened species list. A number of surveys have been conducted over the Lynas Find area and broader Pilgangoora area, showing that there are populations of Northern Quoll within the area. The population within this area is considered important for the long-term survival of the Northern Quoll as it occurs in a habitat that is unaffected by cane toads and is unlikely to support cane toads upon arrival (DSEWPC, 2011).

Habitat critical to the survival of the Northern Quoll is present in the Proposed Action area, and includes rocky ridge habitat, as well as the surrounding native vegetation used for foraging and connection with other nearby populations.

2.1.1.1 *Local Population*

Northern Quoll records within the Proposed Action area occur predominately within the rocky ridge habitat, consisting of rocky outcrops, hills and ridgelines. Another Northern Quoll population is known to exist in the Turner River area, approximately 16 km to the west of the Proposed Action area. It has not been established whether the Turner River Northern Quoll population is connected to the Pilgangoora population, however, it is expected that connectivity would occur through the creeks and channels, which provide greater foraging opportunity and shelter. No current evidence of connectivity through scats within the potential connection corridors exists, and the lack of denning habitat within these corridors may be a limiting factor on species dispersal.

2.1.2 Pilbara Leaf Nosed Bat

The PLNB is listed as Vulnerable under the EPBC Threatened species list. The PLNB is an insectivorous species that roosts during the day in caves and underground mines with stable, warm and humid microclimates. This habitat is critical to the PLNB due to the poor ability to maintain body temperature and water balance (Churchill et al 1988).

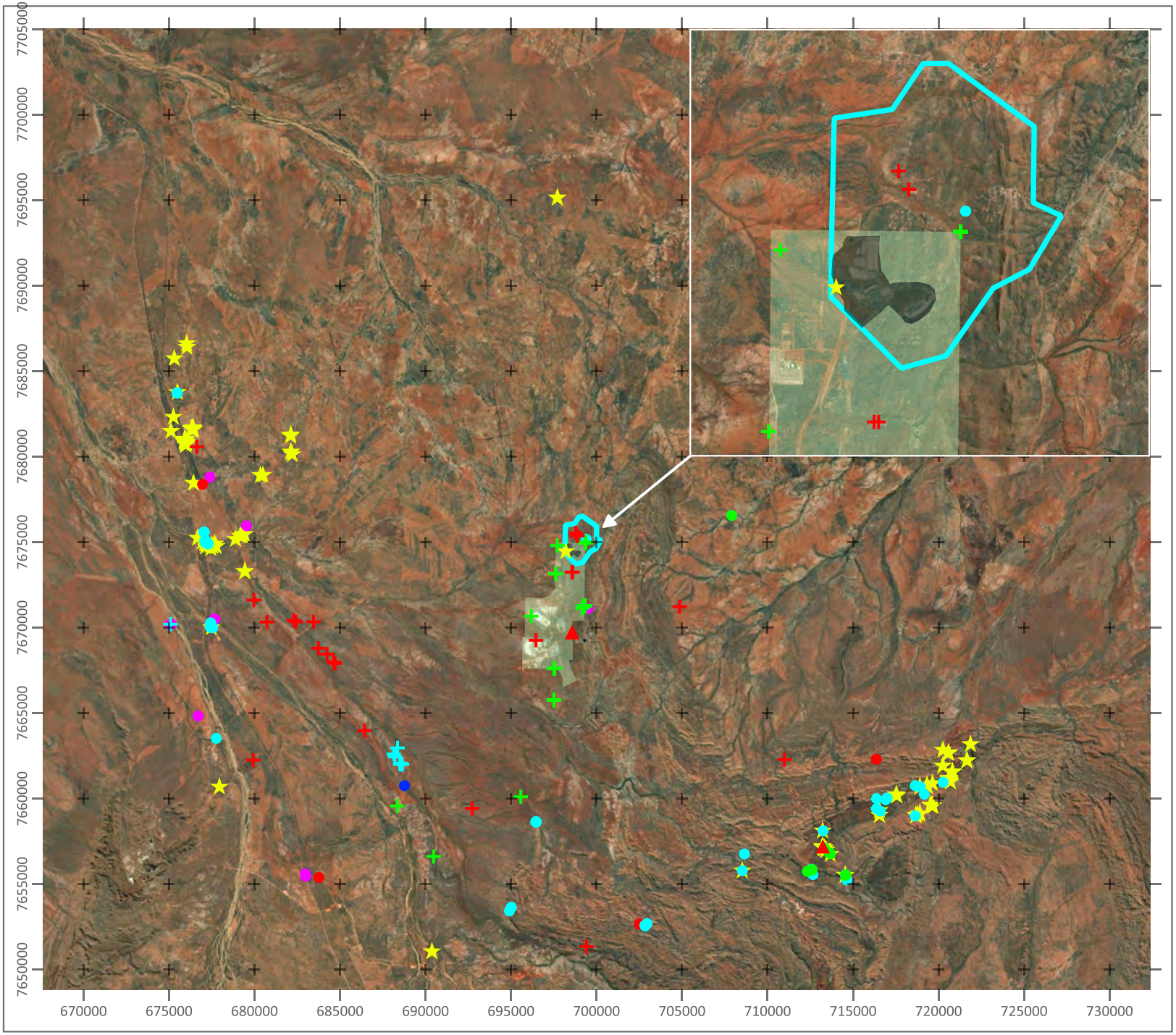
No PLNB roosts have been found within the Proposed Action area, however foraging bats have been recorded at several locations. Due to the timing of the recordings well after sunset, it is likely these bats were out foraging, away from diurnal roosting locations. Foraging habitat for the PLNB includes

open grasslands, open woodland, tall open forest, and monsoon rainforest (Churchill, 2008). They are often encountered in areas containing water sources, given their insectivorous diet.

2.1.3 Ghost Bat

The Ghost bat is listed as Vulnerable under the EPBC Threatened species list. The Ghost bat is an easily disturbed carnivorous species that may abandon sites where human disturbance occurs (TSSC 2016), including minor disturbances by approaching vehicles and people. Fences have also been known to kill substantial numbers of Ghost bats (Armstrong & Anstee, 2000). They generally require a number of cave roosts, as they will move between caves seasonally, and as such, may disperse widely when not breeding. In the Pilbara, Ghost bats are often recorded either singly, or in small groups of less than 15 individuals, however, large colonies can exist in abandoned mines.

Roost sites include caves, rock crevices and disused mine adits. No Ghost bats have been recorded in the Proposed Action area, and the nearest recording of an individual was approximately 2.5 km to the north of the project area. Regardless, given Ghost bats have been recorded foraging in all productive habitats in the Pilbara (Bullen, 2020), the Proposal will likely have an impact on available foraging habitat.



Legend

- Study Area
- Cleared
- Pilgangoora Mine Operations

Endangered

- Northern quoll

Vulnerable

- Bilby
- Ghost bat
- Grey falcon
- Pilbara leaf-nosed bat
- Pilbara olive python

Priority 1

- Gane's blind snake (Pilbara)

Priority 4

- Brush-tailed mulgara
- Spectacled hare-wallaby (mainland)
- Western pebble-mound mouse

Scale: @ A4
1: 32,000

0 5 10 km

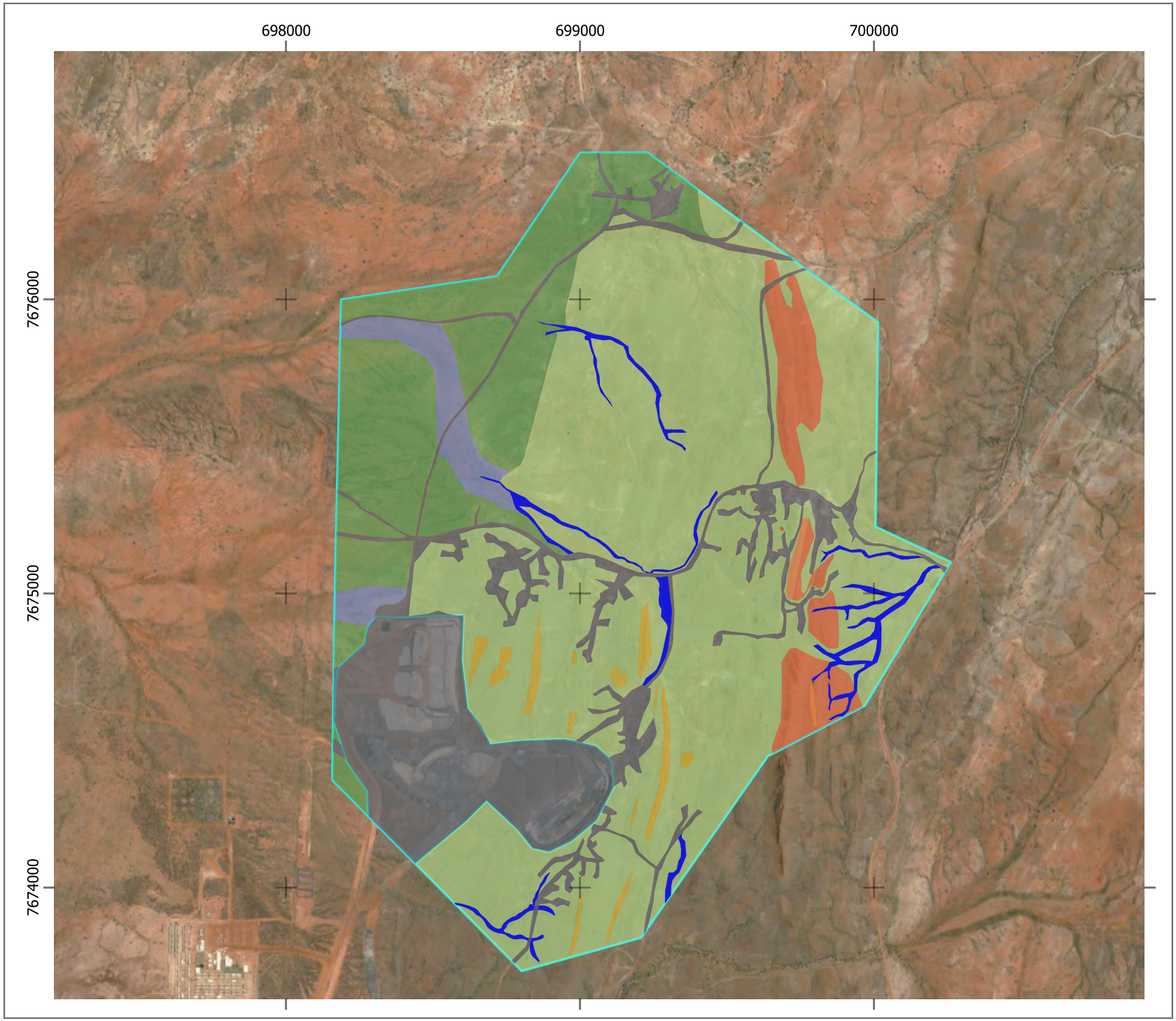
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator

Author: TB Approved: EH Date: 18/08/2022

Threatened and Priority Fauna Records

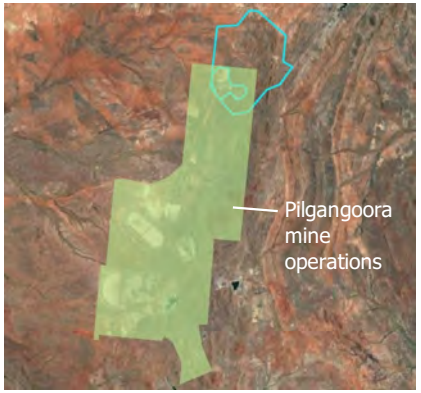
Prepared for:
Pilbara Minerals

Figure: 2-1



Legend

- FH1
- FH2
- FH3
- FH4
- FH5
- FH6
- D
- Study Area



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1: 18,000

0 200 400 m

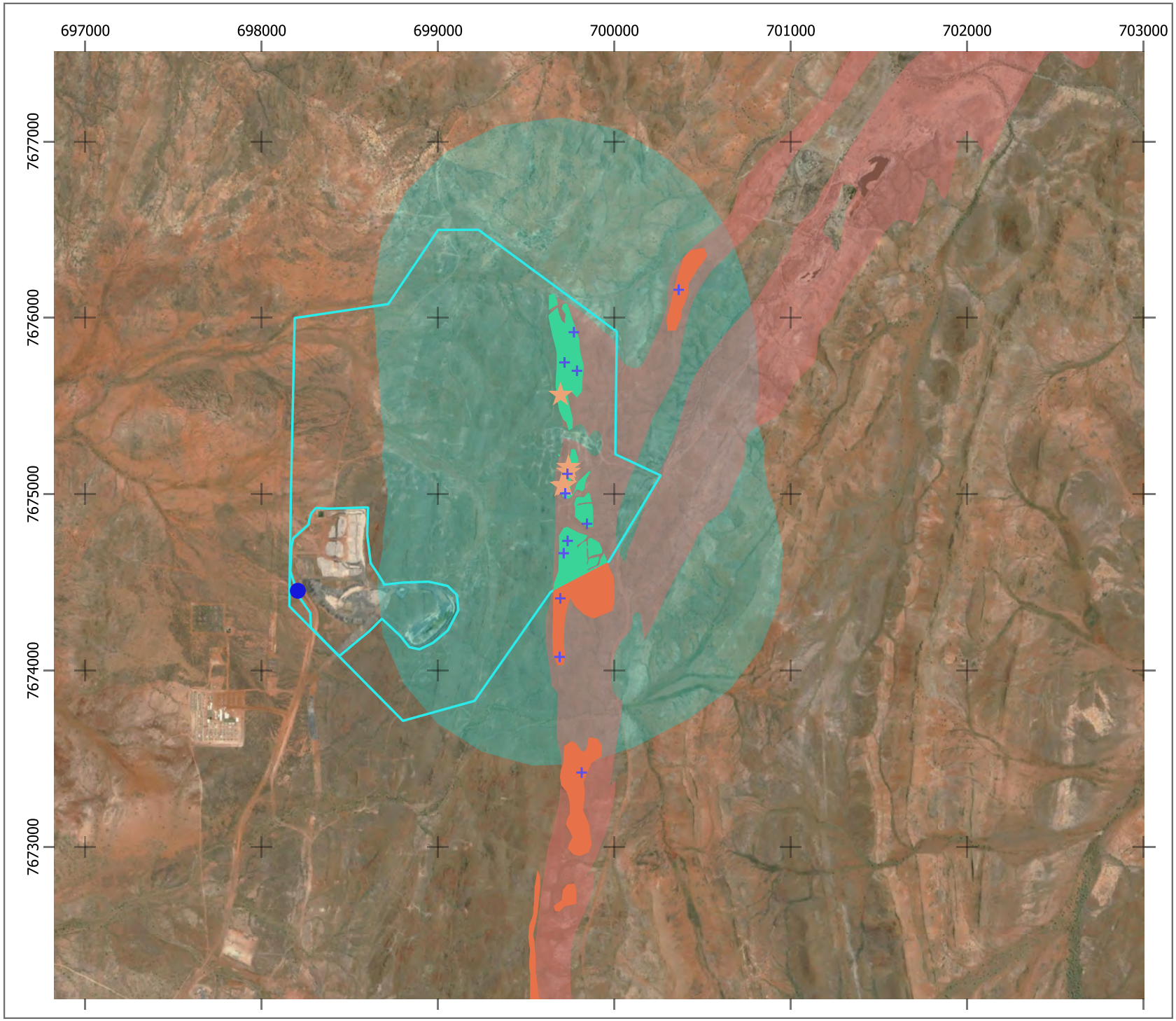
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator

Author: EH Approved: ML Date: 25/10/2022

Fauna Habitats

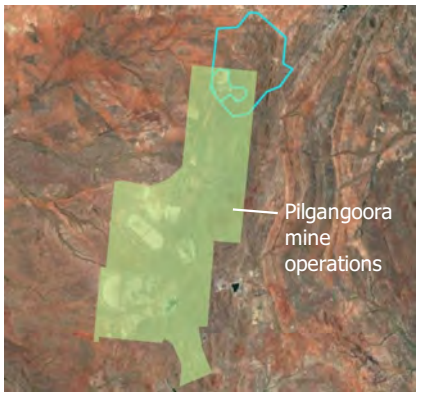
Prepared for:
Pilbara Minerals

Figure: 2-2



Legend

- Camera captures and scat locations - present study
- Camera captures Terrestrial Ecosystems (2020)
- Database record (2018)
- FH1 - Critical Habitat
- Rocky Hills Habitat identified by Terrestrial Ecosystems (2020) outside of Lynas Find Study Area
- A-KEe-xmws-mus Geological unit -likely dispersal habitat
- 1 km critical habitat buffer
- Study Area



Scale: @ A4
1: 30,000

0 250 500 m

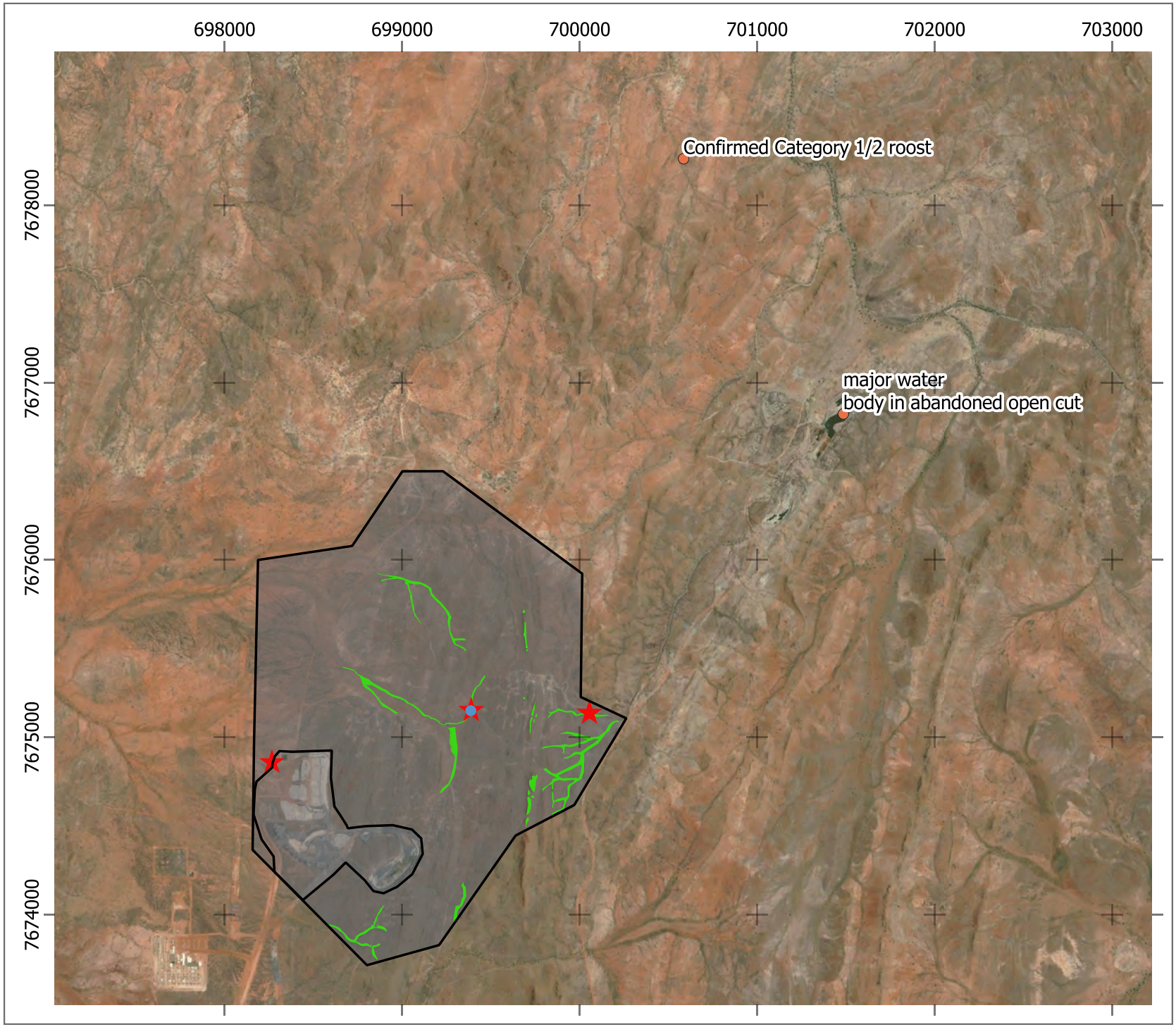
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator

Author: EH Approved: ML Date: 25/10/2022

Northern Quoll

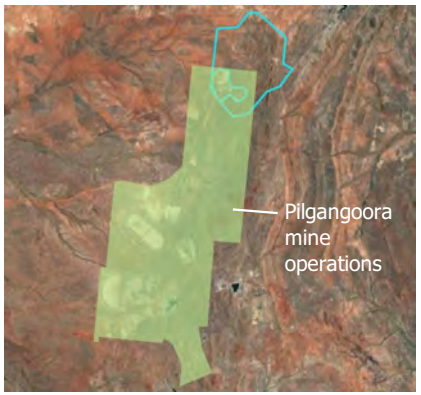
Prepared for:
Pilbara Minerals

Figure: 2-3



Legend

- Acoustic recordings of Pilbara Leaf-nosed Bat
- Moderate habitat rating
- Low habitat rating
- Database record from previous Targeted Survey



Scale: @ A4
1: 30,000

0 250 500 m

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator

Author: EH Approved: ML Date: 25/10/2022

Pilbara Leaf-nosed Bat

Prepared for:
Pilbara Minerals

Figure: 2-4

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690,000 692,000 694,000 696,000 698,000 700,000 702,000 704,000 706,000

7,678,000 7,676,000 7,674,000 7,672,000 7,670,000 7,668,000 7,666,000

ETRR
C6
C5
C18iv
C7iv
C12i
C11i
C6i
C16iv
C16iii
C11iii

Data source: Roads • Landgate, 2023. Imagery: ESRI, 2023.

LEGEND

- Lynas Find Mine Development Envelope
- Proposed Avoidance Area

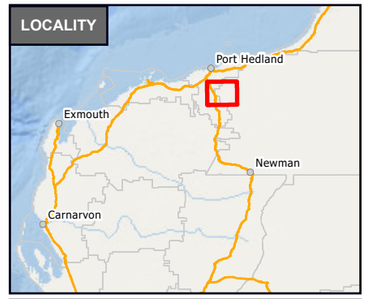
Ghost Bat Roost Sites

- Category 4 Roost
- Potential Category 2 or 3 Roost
- Potential Category 3 Roost
- Ghost bat camera capture

Western Australian Roads

- Minor Road

LOCALITY



0 200 400 600 800 1,000 km

GHOST BAT ROOST SITES

Lynas Find Mine Site
EPBC and EPA Referral

Pilbara Minerals Limited

N

0 500 1,000 1,500 2,000 2,500 m

Coordinate System: GDA2020 MGA Zone 50
Scale @ A3: 1:55,000

Prepared:	E Jackson	Date:	7/05/2024
Reviewed:	A Jamieson	Revision:	A
Project:	TE23060		

talis consultants

Figure 2-5

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2.2 Potential Impacts

2.2.1 Direct impacts

2.2.1.1 *Vegetation Clearance and Loss of Habitat*

The nature of the Proposed Action requires the clearing of native vegetation be undertaken for the placement of infrastructure. Both the native vegetation as well as the natural rock formations in the area provide habitat for native fauna, and the proposed disturbance will result in impacts to the area.

A maximum of 87.1 ha of vegetation will be disturbed as a result of Proposed Action implementation. Of this 87.1 ha, up to 4.62 ha is considered to be high quality denning habitat for Northern Quolls and may also be used sporadically by CS bats in the area. The remaining vegetation consists of good condition vegetation, that is well represented in the surrounding areas.

2.2.1.2 *Habitat Fragmentation*

Habitat fragmentation occurs as a result of direct clearing of habitat, leading to smaller areas being suitable for habitation and limited connectivity between these areas. Currently populations of Northern Quolls are known to inhabit the rocky ridges to the east of the Pilgangoora (where the Proposed Action will impact), with another population located approximately 16km to the west near the Turner River (APM, 2023). Connectivity between these two populations may occur via creeks and channels providing greater vegetative cover, however there is no current evidence of this connectivity.

Northern Quolls are known to have home ranges of at least 35 ha, with individuals known to have travelled over 2 km in a single day (Schmitt et al., 1989), meaning Northern Quolls are able to move between denning habitat in the area easily. The proposed clearing works is unlikely to create significantly isolated fragments of NQ habitat in the area. The proposed clearing works may disrupt the potential connectivity between the population at Pilgangoora and the population at Turner River, however there is no current evidence of this connectivity, meaning the impact is unlikely to be significant.

The nearest PLNB roost is located approximately 3 km to the north of the Proposed Action area, and consists of an old mining shaft that houses a number of PLNB. Ghost bats have been located at an overhang approximately 2.4 km to the north of the Proposed Action area.

Both PLNB and Ghost bats have extensive foraging ranges of at least 20 km. There is no evidence that any area impacted by the Proposed Action is used as nesting habitat, other than for short rests during foraging activities.

2.2.1.3 *Increased Risk of Feral Animals, Weeds, and Fire Risk*

Implementation of the Proposed Action has the potential to increase the risk of feral animals, weeds and fire within the area, due to:

- An increase in vehicle movement within the area potentially spreading weeds;
- Increased vehicle movement and other human activity increasing risk of fire ignition;
- An increase in the susceptibility of vegetation to fire; and
- Domestic waste and mine site water sources attracting feral animals to the area.

2.2.1.4 *Direct Mortality*

The implementation of the Project may impact upon native fauna species via direct mortality through:

- Vehicle strike;
- Collision with fences (particularly for Ghost bats); and
- Entrapment in site infrastructure.

2.2.2 Indirect Impacts

2.2.2.1 *Increased Light Dust, Noise and Vibration*

The Project is expected to operate on a 24-hr basis, with an anticipated mining life of 3 years. The WRL will operate for a longer period, accepting waste rock from the greater Pilgangoora operations.

Given the proposed operation period, there will be a significant increase in the amount of noise, light, vibration and dust generated in the area, predominantly from machinery operations, as well as blasting activity. This may impact on native fauna through modification of behaviour to avoid the operations, which may also result in a reduction in habitat utilisation of nearby areas.

Changes in lighting patterns of the area may also result in behavioural changes to nocturnal species, which include the Northern Quoll, Ghost bat and PLNB. Lights may also attract invertebrates, which in turn may increase predation by bats, increasing the risk of further impacts such as vehicle strike.

Additionally, the increase in fugitive dust generation may impact upon local vegetation, decreasing the quality of both foraging area and habitat.

Increased vibration levels resulting from operation of heavy machinery as well as blasting activity may also impact fauna through avoidance of the area, as well as potential for habitat damage resulting from increased intensity of vibration in the area.

2.2.2.2 *Water Resources*

The Proposed Action is unlikely to have a significant impact on local water resources given it is located on a topographical ridge, which is the top of the local catchment and will only experience minimal surface water flows.

There are no permanent surface water features within the Proposed Action footprint. The construction of a water diversion bund around the proposed pit ensures that downstream surface water flows are maintained. Increased sedimentation of surface waters may result from water flows across cleared areas, as well as from the WRL. The WRL will be bunded to capture surface run-off and prevent mixing of run-off with natural creek waters.

Groundwater impacts are expected to be limited to changes in standing water level in the area immediately surrounding the pit due to groundwater drawdown. Given the inert properties of the waste rock, impacts to groundwater quality are not expected.

2.3 Risk Assessment

The risk assessment for the Proposed Action has been developed to identify the potential impacts of the Proposed Action on the conservation significant fauna species in the area, as well as potential management actions that can be implemented to reduce the potential impact.

The Risk matrix used is provided as Table 2-1, and the categories used to determine the likelihood and consequence of the risk has been provided in Table 2-2 and Table 2-3 respectively. The Risk Assessment has been adapted from the Northern Quoll Management Plan (NQMP) and Conservation Significant Bats Management Plan (CSBMP), and is provided in Table 2-4.

Table 2-1: Risk Matrix

		Consequence				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood	Rare	Low	Low	Low	Moderate	Moderate
	Unlikely	Low	Low	Moderate	Moderate	High
	Possible	Low	Moderate	Moderate	High	High
	Likely	Moderate	Moderate	High	Extreme	Extreme
	Almost Certain	Moderate	High	High	Extreme	Extreme

Table 2-2: Risk Likelihood Categories

Likelihood	Frequency	Description
Rare	Once in 20+ years	Event will occur in exceptional circumstances during the Proposed Action.
		Very few or no known occurrences.
Unlikely	Once in 10 years	Event is not likely to occur during the Proposed Action.
		Some occurrences known.
Possible	Once in 5 years	Event may occur in some instances during the Proposed Action.
		Occasional incidents known.
Likely	Once per year	Event likely to occur during the Proposed Action.
		Regular incidents known.
Almost Certain	Twice or more per year	Event will occur during the Proposed Action.
		High number of known incidents.

Table 2-3: Risk Consequence Categories

Consequence	Definition
Insignificant	Alteration or disturbance to an isolated areas with no effect on conservation significant fauna or ecosystem. No loss of Northern Quoll, PLNB or Ghost bat individuals.
Minor	Alteration or disturbance to <10% of rocky ridge habitat or ecosystem, resulting in impact recovery within 2 years. Loss of Northern Quoll, PLNB or Ghost bat individuals.
Moderate	Alteration or disturbance of 10-40% of a habitat ecosystem resulting in a recoverable impact within 2-5 years. Decrease of up to 50% of conservation significant fauna species level of activity and presence within Proposed Action area.
Major	Alteration or disturbance of 40-70% of a habitat ecosystem resulting in a recoverable impact within 5-15 years. Decrease of up to 80% of conservation significant fauna species level of activity and presence within Proposed Action area.
Severe	Alteration or disturbance of >70% of a habitat ecosystem resulting in a recoverable impact within >15 years. Decrease of >80% of conservation significant fauna species level of activity and presence within Proposed Action area.

Table 2-4: Risk Assessment

Risk Pathway	Description of Impact	Likelihood	Consequence	Inherent Risk	Controls/Risk Treatment	Likelihood	Consequence	Residual Risk
Vegetation clearing of rocky ridge habitat.	Decline in Northern Quoll population numbers. Fragmentation of habitat restricting movement through critical habitat areas. Isolation of Northern Quoll population.	Likely	Major	Extreme	Establishment of avoidance area surrounding rocky ridge habitat. Prior to ground-disturbing activities within denning habitat, pre-clearance trapping for Northern Quoll will be conducted. Further assessments of denning habitat will occur to map areas likely to host dens or potential future dens – this will include passive monitoring techniques (e.g. motion-sensor cameras) to establish quoll use. Disturbance to native vegetation will be minimised. A Clearing Permit will be obtained prior to clearing. Staged clearing. An internal Land Use Certificate (LUC) will be obtained prior to ground disturbance. No unauthorised off-track driving to occur. Conduct progressive rehabilitation where possible, using local provenance seed.	Possible	Major	High
Vegetation clearing and land disturbance of foraging and dispersal habitat.	Decline in conservation significant species population numbers due to reduced food sources. Fragmentation of habitat resulting in restricted movement to foraging and denning areas for the Northern Quoll.	Possible	Major	High	Prior to ground-disturbing activities, pre-clearance trapping for Northern Quoll will be conducted in foraging and denning habitat. Disturbance to native vegetation will be minimised where practicable. A Native Vegetation Clearing Permit (NVCP) will be obtained from DMIRS prior to clearing (if required). Staged clearing. An internal LUC will be obtained prior to ground disturbance. No unauthorised off-track driving to occur. Conduct progressive rehabilitation using local provenance seed to minimise the time between disturbance and rehabilitation.	Unlikely	Major	Moderate

Risk Pathway	Description of Impact	Likelihood	Consequence	Inherent Risk	Controls/Risk Treatment	Likelihood	Consequence	Residual Risk
Vegetation clearing and land disturbance. Vehicle movements. Human and mine site activities.	Introduction or spread of weed species resulting in: • an increase of the susceptibility of vegetation to fire and an increase in the intensity of fire. • degradation of foraging habitat.	Possible	Moderate	Moderate	A total LUC will be in place at the Project unless required for emergency response training (and in these cases only in low-risk weather conditions). Firebreaks of 5 m will surround all project infrastructure Roads and haul roads will act as fire breaks. No unauthorised vehicle or human access to exclusion areas or off main mine access roads. All vehicles will be clean of vegetation or soil material prior to mobilisation to site. Existing weed species and infestations within operational mining areas will be managed. Wash down bays will be installed for vehicles required to go off main mine roads (e.g., for environmental monitoring, exploration etc.). Where relevant, weed hygiene zones will be established around important habitat areas to maintain the integrity of Northern Quoll habitats. Monitoring of introduced flora will be conducted annually.	Unlikely	Moderate	Moderate
Vehicle movement and human activities increasing the risk of fire ignition.	Ignition of fires resulting in habitat loss and conservation significant species individual deaths. Reduction of population size.	Possible	Major	High	A total fire ban will be in place unless for emergency response training (and in these cases only in low-risk weather conditions). Fire breaks of 5 m will surround project infrastructure. Inductions will include fire safety and awareness, including not stopping hot vehicles over dry grass. Roads and haul roads will act as fire breaks. Firefighting equipment (e.g., extinguishers, fire blankets) will be located across site in fire risk areas including workshops, hydrocarbon and chemical storage areas, offices, camp site, mobile and fixed plant areas etc. All light vehicles will be fitted with firefighting equipment. Fire suppression equipment will be made available for all hot works. Hot work permits must be obtained prior to conducting work. Specific personnel will be trained in the use of fire extinguishing equipment and fire prevention in work areas. An emergency response team will be available to respond to fire where it is safe to do so.	Unlikely	Major	Moderate
Domestic waste, mine site water sources and human activities attracting feral fauna.	Degradation of habitat or habitat loss. Decline in population due to increased predation or competition for resources, disease transmission, poisoning from ingestion of cane toad. Health impacts from ingesting waste or contaminated water.	Possible	Moderate	Moderate	Inductions and training will address not feeding fauna, and reporting of Northern Quoll sightings by mine site personnel. Rubbish bins with lids located around site. Educational fauna signage in crib rooms and high traffic areas. Lined dams fenced with fauna egress points. Feral Animal Management Program-managed by PLS Environmental Team.	Unlikely	Moderate	Moderate

Risk Pathway	Description of Impact	Likelihood	Consequence	Inherent Risk	Controls/Risk Treatment	Likelihood	Consequence	Residual Risk
Mine site noise.	Reduction of habitat utilisation and corresponding reduction of population size and level of activity in the area. Behavioural changes.	Possible	Minor	Moderate	Engineering controls to minimise noise from plant and equipment. All plant and equipment designs will meet occupational noise standards.	Unlikely	Minor	Low
Generation of dust from mine activities.	Habitat degradation resulting in reduced use of denning / foraging habitat and subsequent level of activity in the area. Respiration issues resulting in reduction of population size and health.	Possible	Minor	Moderate	Use of water carts along roads and cleared areas to minimise dust generation. Staged clearing. Use of engineering controls to minimise dust. Use of sprinklers and deluge sprays where required. Vehicle speeds restricted on cleared tracks to minimise the generation of dust.	Unlikely	Minor	Low
Blasting and drilling at mine site.	Vibrations causing habitat destruction (e.g. cave/den collapse) and loss of significant habitat inside exclusion areas.	Possible	Major	High	Vibration impact zones will be mapped in relation to den habitat. Disturbance from blasting and drilling will be minimised where practicable. In close proximity, drilling should take place outside of the 'young in den' period.	Unlikely	Major	Moderate
Insufficient recording and reporting leading to lack of data on conservation significant species.	Impacts to conservation significant populations going unnoticed. Failure to identify all critical habitat or populations resulting in unintentional clearing of habitat and conservation significant species deaths. Reduction in populations of conservation significant species in the area.	Possible	Major	High	Camera trap monitoring to identify active denning and foraging areas. Ongoing bat monitoring to identify the presence of any conservation significant bats.	Unlikley	Major	Moderate
Vehicle movement and collision with conservation significant species.	Mortality to individuals through road kills.	Likely	Moderate	High	Vehicle speed will be restricted to 60 km/hr across site Vehicle speed will be restricted to 40 km/hr at night within 500m buffer zone of quoll habitat Roadkill will be moved off road to discourage scavenging and further strikes. Records of vehicle incidents involving fauna will be recorded.	Possible	Moderate	Moderate
Poor waste management.	Ingestion of waste material causing illness and mortality in individuals. Entrapment within waste material causing mortality in individuals	Possible	Moderate	Moderate	Inert and putrescible waste will be disposed of in a licensed landfill facility at the mine site. Waste will be regularly buried. Exposed waste to be compacted and covered at least weekly. Landfill will be fenced so as to preclude fauna. Rubbish bins will have lids to prevent dispersal of waste by wind and birds. Inductions will include fauna component and appropriate disposal of waste.	Rare	Moderate	Low

Risk Pathway	Description of Impact	Likelihood	Consequence	Inherent Risk	Controls/Risk Treatment	Likelihood	Consequence	Residual Risk
Attraction to mine site water sources.	Death via drowning of individuals in dams. Illness or death of individuals through consumption of contaminated water.	Possible	Moderate	Moderate	Fauna egress mats will be in place in dams. Dams to be fenced to preclude fauna.	Rare	Moderate	Low
Interaction with mine site personnel.	Feeding of Northern Quolls causing illness, mortality and reliance on human food sources resulting in a decline in population and health. Northern Quoll behavioural change.	Possible	Minor	Moderate	Training on the identification and reporting of Northern Quoll will be included in environmental inductions and toolbox training presentation. Feeding of Northern Quoll (and other native species) will be banned. This will be communicated to personnel in environmental inductions and environmental awareness sessions.	Unlikely	Minor	Low
Barbed wire fences and collision with bat species.	Mortality to individuals through collision with barbed wire fencing.	Possible	Moderate	Moderate	Minimise use of barbed wire fencing, where practicable. Investigate potential for different fencing designs to minimise risks to CS bats. Liaise with pastoralist regarding alternatives, where fencing is required	Rare	Insignificant	Low

3 Environmental Management Measures

3.1 Environmental Management Activities, Controls and Performance Targets

The key management measures to be implemented during the construction, operation and rehabilitation of the Proposed Action have been listed in Table 3-1 below.

Completion criteria for each management measure have been developed, and the monitoring and reporting requirements to ensure the performance or completion criteria are met have also been outlined in Table 3-3. Risks of implementation of each management measure and further measures to avoid these risks eventuating have also been identified.

The management measures outlined below have been developed to avoid impacts where practicable, and where avoidance is not possible measures will be implemented to minimise the potential impact on the surrounding environment and CS species. Rehabilitation measures have also been included, to minimise the Proposed Action impacts by reducing the time between disturbance and rehabilitation, and to ensure rehabilitation includes measures that are focused on maintaining the local populations of CS species.

Monitoring of the effectiveness of the proposed management measures is also key to ensure the expected outcomes are being met, and any issues with the current management approach can be fed back into this adaptive management plan.

Table 3-1: Management Measures

Management Measure	Performance or Completion Criteria	Monitoring and Reporting Requirements	Risks	Measures for Risk Mitigation
Establishment of avoidance area surrounding rocky ridge habitat.	No disturbance within avoidance area.	Disturbance data is reported on an annual basis through DMIRS MRF and AER systems.	Avoidance area incorrectly established leading to disturbance of rocky ridge habitat.	Avoidance area demarcation to be undertaken by qualified surveyors, and shape files checked against approved areas prior to disturbance.
Prior to ground disturbance or clearing, trapping for Northern Quoll will be undertaken within the denning habitat areas.	Trapping scheduled and undertaken for all clearing within denning habitat.	Records of fauna trapped as part of programs prior to clearing will be kept, and submitted to DBCA and DCCEEW as required.	Trapping unable to be undertaken prior to clearing due to lack of suitably qualified personnel, inclement weather or unsuitable access.	Clearing will be postponed until conditions allow for trapping to be undertaken.
Further monitoring and assessment of conservation significant fauna will be undertaken.	Targeted conservation significant species surveys to be carried out triennially.	Reports relating to conservation significant species surveys will be kept and submitted to DBCA and DCCEEW as required.	Conservation significant species monitoring unable to be undertaken due to lack of suitably qualified personnel, inclement weather or unsuitable access.	Monitoring events for conservation significant species are planned within 2 years of the previous monitoring event, to allow contingency for scheduling monitoring events.
Disturbance to native vegetation will be constrained within clearing boundaries, and minimised.	No clearing outside of approved areas.	Disturbance data is reported on an annual basis through DMIRS MRF and AER systems. A reconciliation of cleared vs approved areas is undertaken annually.	Clearing boundaries incorrectly established.	Clearing demarcation to be undertaken by qualified surveyors, and shape files checked against approved areas prior to disturbance.

Management Measure	Performance or Completion Criteria	Monitoring and Reporting Requirements	Risks	Measures for Risk Mitigation
Clearing will be undertaken progressively to retain habitat for as long as possible.	Clearing completed in a staged manner over the years of operation.	Disturbance data is reported on an annual basis through DMIRS MRF and AER systems. Records of timing of clearing will be kept.	Clearing not undertaken progressively, leading to a significant change in habitat in a short time frame.	Mine planning to ensure that clearing areas are completed in stages, separated by a minimum of 6 months between major clearing events of over 10 ha.
Internal Land Use Certificates (LUCs) will be required prior to clearing activities commencing.	No clearing undertaken without an approved LUC in place.	Records of all approved LUCs are to be maintained and used in the annual disturbance reconciliation.	LUC procedure not followed, leading to unauthorised clearing.	All staff are trained in the requirements for an approved LUC to be in place prior to disturbance activities.
Existing weed infestations on site will be effectively managed to reduce spread and overall density, and hygiene areas will be established around the avoidance zone.	No increase in weed infestations on site or within the avoidance zone.	Weed monitoring is to be undertaken annually to determine if there are any increases in weed infestations, and to ensure a targeted management approach.	Weeds not effectively managed and/or weed hygiene zone not enforced, leading to an increase in weed density and dispersion on site.	Weed management is undertaken on an ongoing basis dependant on season and plant physiology. Management timing and actions will be informed by results of annual weed monitoring events.

Management Measure	Performance or Completion Criteria	Monitoring and Reporting Requirements	Risks	Measures for Risk Mitigation
Feral animal management program to be implemented by site staff.	No increase in feral animal populations within the Development Envelope.	Records of all feral animal sightings on site to be maintained, and any increase over an annual period is to be investigated. Baseline data is to be established in the first year of construction. Fauna monitoring to be completed triennially and include an assessment of feral animal populations.	Feral animal management not undertaken, or measures are ineffective.	Best practice options for management of feral cats and foxes will be undertaken as required based on sightings in the area. Assessment as to requirements for feral animal management activities will be undertaken annually or more frequently depending on incidence of sightings.
Fires on site to be banned, except for emergency response training in low fire risk conditions.	No unauthorised fires on site.	Records of all fires or near misses to be maintained, and investigations into the cause of the fire to be undertaken.	Fires deliberately set outside of low risk conditions. Fire management procedures not followed leading to out of control fires on site.	Fire training to be undertaken by qualified personnel, with reference to fire risks at the time of training. Fire breaks and other fire management equipment to be inspected annually.

Management Measure	Performance or Completion Criteria	Monitoring and Reporting Requirements	Risks	Measures for Risk Mitigation
In order to avoid fauna mortalities, only authorised vehicles will be permitted on site, and no vehicles will be permitted to enter the avoidance zone outside of emergency conditions.	Avoidance zone to be barricaded and signed to prevent unauthorised access.	Records of permitted access, as well as any cases of unauthorised access are to be maintained.	Unauthorised access to the avoidance zone leading to impacts on Northern Quoll habitat.	Procedure for access to avoidance zone to include sign-off by the HSEQ team. Barricades to be inspected every 6 months to ensure integrity is maintained. Speed limits of 40 km/hr within exclusion zones where access is necessary.
Equipment is designed to meet occupational noise standards (85 dB over 8 hours, or 140 dB peak), and minimise noise emissions where possible.	Noise emissions of plant and equipment to meet noise standards. No excessive noise emissions from site.	Records of equipment compliance with noise standards to be maintained.	Changes in equipment leading to increases in noise emissions.	Regular equipment maintenance undertaken to ensure operation of equipment is in line with manufacturer recommendations.
Progressive rehabilitation to be undertaken on landforms.	Rehabilitation planning to commence on WRL within 3 years of commencement of waste rock dumping.	Areas rehabilitated to be reported through the annual MRF submission. Monitoring of rehabilitation condition to be undertaken annually following establishment.	Progressive rehabilitation not commenced within 3 years due to changes in mine schedule or landform design.	Changes to mine schedule or landform design are to consider implications of rehabilitation, and ensure that progressive rehabilitation can be undertaken as a priority.

Management Measure	Performance or Completion Criteria	Monitoring and Reporting Requirements	Risks	Measures for Risk Mitigation
Rehabilitation of landforms and other cleared areas are to include fauna habitat creation, with investigation into areas suitable to support Northern Quoll.	Northern Quoll present in provided habitat and rehabilitated areas.	Monitoring of rehabilitation condition to be undertaken annually following establishment. Assessment of utilisation of rehabilitated areas to be undertaken following establishment of rehabilitation vegetation.	Northern Quoll may not use rehabilitated areas. Investigation into artificial habitat use may indicate designs are unsuitable.	Rehabilitation program design to be informed through trials undertaken at other mine sites with impacts to Northern Quolls. Assessment of establishment of trials to determine best practice measures for artificial habitat design.
Bunding of the Lynas Find WRL to prevent loss of sediment to local creek systems.	Bund/surface water diversion constructed around the perimeter of the WRL made of competent rock. Water to be captured and does not mix with water from the natural creek system.	Annual inspections to ensure integrity of the bund is maintained. Water quality to be monitored opportunistically following large rainfall events.	Bund integrity compromised through incorrect materials management.	Annual inspection of bund integrity. Materials management procedures to ensure correct material handling and placement.
Additional groundwater monitoring to further understand dewatering requirements.	Installation of 4 monitoring bores within the vicinity of the proposed pit.	Monthly monitoring of water levels and quarterly water quality sampling. Records to be maintained.	Results indicate dewatering volumes higher than anticipated.	Bores to be installed prior to project commencement, allowing time to develop water management strategies if required.

3.2 Environmental Management Programs

3.2.1 Site Disturbance Permitting Process

All disturbance on site is managed through the Land Use Certificate (LUC) Procedure, which outlines the process for ensuring all works are undertaken in accordance with applicable approvals, and disturbance and other impacts are minimised as far as practicable.

Under the procedure, site personnel complete a LUC application outlining the proposed activities. This application is assessed by the Environment Team to ensure compliance with all environmental approvals, permits and internal environmental management system, including this EMP. The environmental review will initially involve a desktop assessment against existing environmental data (i.e. approved disturbance boundaries, flora and fauna studies, avoidance areas, heritage surveys and pastoral boundaries).

If the LUC application proceeds beyond this step, conditions and controls will be attached to the LUC to manage environmental impacts and risks as required. The LUC Register is maintained to include the disturbance and any key operational changes. Compliance with LUC conditions may be audited during and following works being carried out, and any non-compliances are recorded as incidents and investigated. Further controls may be included in the LUC in response to incidents and non-conformances.

3.2.2 Water Management

Although the Proposed Action is unlikely to impact significantly on water resources, a number of water management measures are proposed to ensure the potential impact is minimised.

Surface water will be diverted around the proposed pit to maintain natural water flow volumes. Additionally, the proposed WRL will be bunded with water capture infrastructure to ensure that all surface run-off is captured and downstream sedimentation does not occur.

Groundwater levels are likely to reduce in the area immediately surrounding the pit following mining below the water table and groundwater abstraction. There are no groundwater dependant ecosystems or other groundwater users in the area that will be impacted by the Proposed Action. Groundwater monitoring will be undertaken as per Section 3.3.4.

3.2.3 Weed Management

Eight introduced flora species have been recorded locally with three species identified during field surveys of the Proposed Action area (Table 3-2).

Table 3-2: Introduced Flora within Proposed Action Area

Species	Common Name	Description (Florabase, 2022)
Aerva javanica	Kapok	Erect, much-branched perennial herb, 0.4-1.6 m high. Flowers white from January to October. Often found growing on sandy soils and along drainage lines.
Cenchrus ciliaris	Buffel grass	Tufted or sometimes stoloniferous perennial, grass-like or herb. 0.2 - 1.5 m high. Flowers purple from February to

Species	Common Name	Description (Florabase, 2022)
		October. Grows on white, red, or brown sand, stony red loam, or black cracking clay.
Cenchrus setiger	Birdwood grass	Erect, tussocky, stoloniferous perennial, herb or grass-like. Grows to 0.5 m high. Flowers cream to purple from April to May. Grows on brown sands, red loam, or pindan soils on sand dunes, plains, rangelands, stony hillsides, or floodplains.

Weed management will be undertaken in accordance with the site Weed Management Procedure, and actions will include:

- Management of site access to ensure all vehicles on site are free of weeds and soils;
- Restriction of access to avoidance areas;
- Management including physical removal of weed species and application of appropriate weed killer to weeds present on site;
- Wash down bays to be provided for vehicles required to travel outside existing site roads; and
- Establishment of weed hygiene zones around areas of Northern Quoll habitat where required.

3.2.4 Feral Animal Management

A number of introduced fauna species have been recorded within 30 km of the Proposed Action area (APM, 2022), including:

- Camel (*Camelus dromedarius*);
- Cat (*Felis catus*);
- Cattle (*Bos taurus*);
- Dog (*Canis lupus*);
- Donkey (*Equus asinus*)
- Fox (*Vulpes vulpes*)
- Horse (*Equus caballus*); and
- House Mouse (*Mus musculus*).

Of these, only cattle have been sighted during fauna surveys of the Proposed Action area.

Feral animals on site will be managed in accordance with the site Fauna Management Procedure. Generally, prevention of access to site is preferred over direct management including culling. Management measures for reducing feral animal numbers on site include:

- Inductions, training and site signage to educate site personnel on identification of likely feral species and reporting requirements and procedures;
- Records of all feral animal sightings to be maintained;
- All bins containing putrescible waste on site to have secure lids;
- Any open water storage will be fenced to prevent access; and

- Where numbers indicate an increasing feral animal population, baiting or trapping programs will be considered in consultation with the WA Department of Biodiversity and Conservation.

3.2.5 Fire Management

A number of actions will be taken to minimise the risk of an increase in fires in the area as a result of the Proposed Action, including:

- Firebreaks will be installed around all project infrastructure, with haul roads and access roads acting as a firebreak where possible;
- No vehicle access to areas off main mine roads (unless expressly authorised);
- Implementation of a hot works permitting process; and
- Weed management as per Section 3.2.2 to minimise fuel loads.

3.3 Environmental Monitoring

Ongoing monitoring of CS bats and Northern Quoll will be undertaken over the life of the Proposed Action. The monitoring plans are summarised below, and further information can be found in the NQMP and CSBMP.

3.3.1 Northern Quoll Monitoring

An annual Northern Quoll monitoring program will be undertaken during operation of the Proposed Action. Monitoring will be undertaken through a trapping program implemented over four nights between April and August on an annual basis. This timing will avoid periods when females may be caring for young in dens.

Monitoring will record numbers of Northern Quoll individuals, as well as measurement of the health condition index (HCI) of captured females. HCI is calculated as the cube root of body weight (g) divided by the short pes length (mm). This data will be used to assess the impact of the Proposed Action on the Northern Quoll population, as well as whether the environmental outcomes are being met. Table 3-3 below outlines the proposed environmental outcomes for the Northern Quoll, as well as trigger and threshold levels requiring further monitoring and mitigation actions to be imposed.

Table 3-3: Performance criteria and outcomes

Outcome	Performance criteria	Trigger	Threshold
No change to the local geographic distribution of the Northern Quoll.	Northern Quoll presence is confirmed during annual monitoring with a distribution that is not different to baseline.	Northern Quoll distribution is lower than baseline, with Northern Quoll not recorded at an equal number of sites to baseline, and the change is not attributable to climatic conditions or fire ignited from natural sources.	Less than 50% of transects return Northern Quoll compared to baseline, during annual monitoring, for two consecutive years

Outcome	Performance criteria	Trigger	Threshold
No change to the abundance of Northern Quoll in the local area.	Trap success is not statistically significantly lower than base line.	Trap success is statistically significantly lower ($p<0.05$) than baseline for two consecutive years, and the change is not attributable to climatic conditions or fire ignited from natural sources.	Trap success is statistically significantly lower ($p<0.05$) than baseline for three consecutive years
No decline in population condition.	Female HCI doesn't decline over time. Mean mass of males and females does not decline over three or more consecutive monitoring years.	HCI declines over two consecutive monitoring years, and the change is not attributable to climatic conditions or fire ignited from natural sources.	HCI declines at a statistically significant ($p<0.05$) rate over a period of three consecutive years

Monitoring results will be analysed annually, and should the trigger or threshold levels be met, the contingency actions outlined in Table 3-4 will be undertaken. Any trigger level exceedances will be reported to DCCEEW as part of reporting requirements under the EPBC Act, and any threshold level exceedance will be reported within 7 days of the exceedance, with an investigation report to be provided within 21 days of the exceedance.

Table 3-4 : Trigger and threshold exceedance actions

Outcome	Trigger level exceedance actions	Threshold level exceedance actions
No change to the local geographic distribution of the Northern Quoll	Undertake 10 person-hours of track and scat searches per site where Northern Quoll was not recorded. Audit NQMP and associated procedure/management plan management actions and remediate any non-conformances.	Repeat trapping monitoring program within 2 months if between 1 April and 30 September to avoid times when females may have young in their dens. If the 2-month period would result in trapping outside this timeframe, repeat monitoring should be conducted in April. Deploy Camera Traps. Location and number of cameras to be deployed will be determined following consultation with DBCA, DCCEEW and Fauna specialists. Consult the Regional Pilbara Northern Quoll Monitoring Program outcomes to investigate whether a Region wide decline is occurring. Consult with DCCEEW and DBCA. Review the NQMP, EMP and associated procedure/management plans. If any
No change to the abundance of Northern Quoll in the local Pilgangoora area	Audit NQMP and EMP and associated procedure/ management plan management actions and remediate any non-conformance	
No decline in population condition	Audit NQMP and EMP and associated procedure/ management plan management actions and	

Outcome	Trigger level exceedance actions	Threshold level exceedance actions
	remediate any non-conformance	revisions are required, the revised plan will be submitted to DCCEEW for approval.

3.3.2 Conservation Significant Bat Monitoring

Monitoring of CS bats at the Proposed Action area will involve a combination of three non-invasive methods to detect presence and level of activity. Acoustic-based monitoring will be conducted continuously to detect calls of the PLNB, and Ghost Bat calls at a known roost that lies out of the current Proposed Action area. Twice-yearly, an acoustic lure will be used to determine Ghost bat presence, and a camera trap will be set up to take periodic still images at caves within the vicinity of the area. Data from these non-invasive monitoring tolls will be uploaded every three to six months, and will be analysed on an annual basis by a suitably qualified zoologist.

Table 3-5 below outlines the outcomes and performance indicators for CS bat species in the Proposed Action area, as well as trigger and threshold levels that will require further monitoring or mitigation techniques to be investigated and deployed.

Table 3-5: Contingency Actions

Outcome	Performance Indicator	Trigger	Threshold
No detectable significant change to the level of activity or presence of conservation significant bats in the Proposed Action area	Measures of bat presence are equivalent to the established baseline	Measures of bat presence and activity are statistically significantly lower ($p<0.05$) than the established baseline for two consecutive years, and the change is not attributable to climatic conditions, fire ignited from natural sources, or disturbance to diurnal roosts outside the Pilgangoora Project area that are within the influence of other mining projects.	Measures of bat presence and activity are statistically significantly lower ($p<0.05$) than the established baseline for three consecutive years.

3.3.3 Habitat Monitoring

Confirmation of the extent of habitat types suitable for Northern Quoll denning will be undertaken in conjunction with annual Northern Quoll monitoring events. This will include passive monitoring techniques to establish quoll use of identified habitat areas and more detailed mapping of areas likely to host dens.

Any further expansions of the Project will include targeted searches for habitat types that may be critical to conservation significant species.

3.3.4 Water Monitoring

Groundwater monitoring bores will be established within the vicinity of the proposed Lynas Find pit and WRL to monitor water levels and water quality throughout construction and operation of the Project. Water levels will be monitored on a monthly basis and water quality will be tested quarterly. A baseline of at least 2 years of data relating to water quality and level will be established prior to commencement of mine dewatering. This baseline will be used to establish standards a that may trigger further investigation and implementation of environmental controls.

Additionally, the site water balance and groundwater model will be updated to include the potential impacts from dewatering of the Lynas Find pit. Contingency actions will be developed if any further impacts are identified during refinement of this groundwater modelling.

Table 3-6 outlines the proposed parameters for groundwater monitoring.

Table 3-6: Groundwater Monitoring Parameters

Parameter	Units	Monitoring Frequency	Parameter	Units	Monitoring Frequency
Standing water level	mbgl	Monthly	**Lithium**	mg/L	Quarterly
pH	pH units	Monthly (field sample)	**Magnesium**	mg/L	Quarterly
Electrical Conductivity	µs/cm	Monthly (field sample)	**Potassium**	mg/L	Quarterly
Ammonia	mg/L	Quarterly	**Silica (soluble)**	mg/L	Quarterly
Bicarbonate alkalinity as HCO3	mg/L	Quarterly	**Sodium**	mg/L	Quarterly
Calcium carbonate as CaCO3	mg/L	Quarterly	**Total nitrogen**	mg/L	Quarterly
Carbonate alkalinity as CaCO3	mg/L	Quarterly	**Total phosphorus**	mg/L	Quarterly
Nitrate NO3	mg/L	Quarterly	**Aluminium**	mg/L	Quarterly
Nitrite NO2	mg/L	Quarterly	**Antimony**	mg/L	Quarterly
Total alkalinity as CaCO3	mg/L	Quarterly	**Arsenic**	mg/L	Quarterly
Total dissolved solids (TDS)	mg/L	Quarterly	**Barium**	mg/L	Quarterly
Total hardness	mg/L	Quarterly	**Bismuth**	mg/L	Quarterly
Sulfate (SO4)	mg/L	Quarterly	**Boron**	mg/L	Quarterly
Calcium	mg/L	Quarterly	**Bromide**	mg/L	Quarterly
Chloride	mg/L	Quarterly	**Cadmium**	mg/L	Quarterly

Parameter	Units	Monitoring Frequency	Parameter	Units	Monitoring Frequency
Caesium	mg/L	Quarterly	**Phosphorus**	mg/L	Quarterly
Chromium	mg/L	Quarterly	**Rubidium**	mg/L	Quarterly
Cobalt	mg/L	Quarterly	**Selenium**	mg/L	Quarterly
Copper	mg/L	Quarterly	**Silicon**	mg/L	Quarterly
Fluoride	mg/L	Quarterly	**Silver**	mg/L	Quarterly
Hexavalent Chromium	mg/L	Quarterly	**Sodium**	mg/L	Quarterly
Iron	mg/L	Quarterly	**Strontium**	mg/L	Quarterly
Lead	mg/L	Quarterly	**Tantalum**	mg/L	Quarterly
Magnesium	mg/L	Quarterly	**Thallium**	mg/L	Quarterly
Mercury	mg/L	Quarterly	**Thorium**	mg/L	Quarterly
Molybdenum	mg/L	Quarterly	**Tin**	mg/L	Quarterly
Manganese	mg/L	Quarterly	**Uranium**	mg/L	Quarterly
Nickel	mg/L	Quarterly	**Vanadium**	mg/L	Quarterly
Niobium	mg/L	Quarterly	**Zinc**	mg/L	Quarterly

Surface water monitoring will be undertaken on an opportunistic basis, following large rainfall events where water may create local pools, and fill the proposed WRL bund. The parameters in Table 3-6 will be assessed for any surface water samples collected.

3.3.5 Weed Monitoring

Weed monitoring will be conducted annually, consisting of weed assessments and mapping. All environmental inspection templates will include an assessment of whether new weed infestations are apparent. Baseline data for weed infestations will be collected prior to commencement of clearing. Should any new weed infestation, increase in overall existing extent of weed location, or species not previously found on site be apparent following assessment, investigation will be undertaken, and appropriate management actions developed and implemented.

Records of weed management undertaken on site including location and method used will be maintained. Spatial records of weed locations within the Proposed Action area will be maintained and updated annually following weed assessments.

3.3.6 Feral Animal Monitoring

No specific feral animal monitoring events will be undertaken, however should threshold actions be required as per Table 3-4, deployment of camera traps will enable an assessment of feral animal populations within the Proposed Action area.

All sightings of feral animal species on site, including mortalities, are required to be reported internally. Preliminary assessment of feral animal numbers will be undertaken based on reports of sightings, with baseline data to be established in the first year of construction. Any sighting of an introduced species that has not previously been located on site (as per Section 3.2.3) will require investigation and potentially further monitoring.

4 Audit and Review

4.1 Environmental Auditing

Compliance with this EMP will be assessed in compliance reports required under EPBC approval conditions.

Internal audits against the PML Environmental policy and standards will be conducted on a regular basis, with frequency determined by the risk level. Audits will include an assessment of compliance with this EMP and other environmental management plans.

Any non-compliances identified will be addressed through implementation of corrective actions.

4.2 Environmental Management Plan Review

This EMP is intended to be adaptive, and as such will be reviewed in line with the site NQMP and CSBMP. These plans will be reviewed in the following circumstances:

- Every four years;
- In response to additional data indicating a change in the risk to terrestrial fauna species; or
- If ongoing monitoring suggests thresholds have been breached and objectives cannot be met.

5 References

Animal Plant Mineral (2023), Northern Quoll Management Plan, Pilgangoora Project. Report prepared for Pilbara Minerals Limited by Animal Plant Mineral Pty Ltd, August 2023.

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Armstrong KN and Anstee SD (2000) The ghost bat in the Pilbara: 100 years on. Australian Mammalogy 22, 93-101.

Bullen RD (2021) A review of Pilbara leaf-nosed bat ecology, threats and survey requirements. Prepared for the Department of Agriculture, Water and Environment, Bat Call WA Pty Ltd, May 2021.

DCCEEW (2005). Northern Quoll (Dasyurus hallucatus) http://www.environment.gov.au/biodiversity/threatened/species/dasyurus-hallucatus.html

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

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