Significant Species Management Plan

Miralga Creek DSO Project

180-LAH-EN-PLN-0001

Revision 0

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Authorisation

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1. Introduction

1.1 Project Overview

The Miralga Creek DSO Project (the Project) is located approximately 100 km south east of Port Hedland, as shown in Figure 1.1. Mining will be via conventional open cut, crushing and screening mining methods above the groundwater table. The Project will include open pits, waste rock dumps and other supporting infrastructure.

1.2 Purpose

The Project has the potential to impact conservation significant fauna species which are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act). A desktop assessment identified 38 vertebrate species considered to be of conservation significance and/ or Priority fauna that may occur within the Study Area, comprising ten mammals, 24 birds and four reptiles (Biologic 2020a). Seven species of conservation significance were recorded during baseline surveys completed in 2019. This comprised five mammals including the Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat, Northern Brushtail Possum and the Western Pebble-mound Mouse, and two birds, the Grey Falcon and Peregrine Falcon. Of these species, only the Ghost Bat and Northern Quoll were assessed during the environmental impact assessment process to be at risk of significant impact.

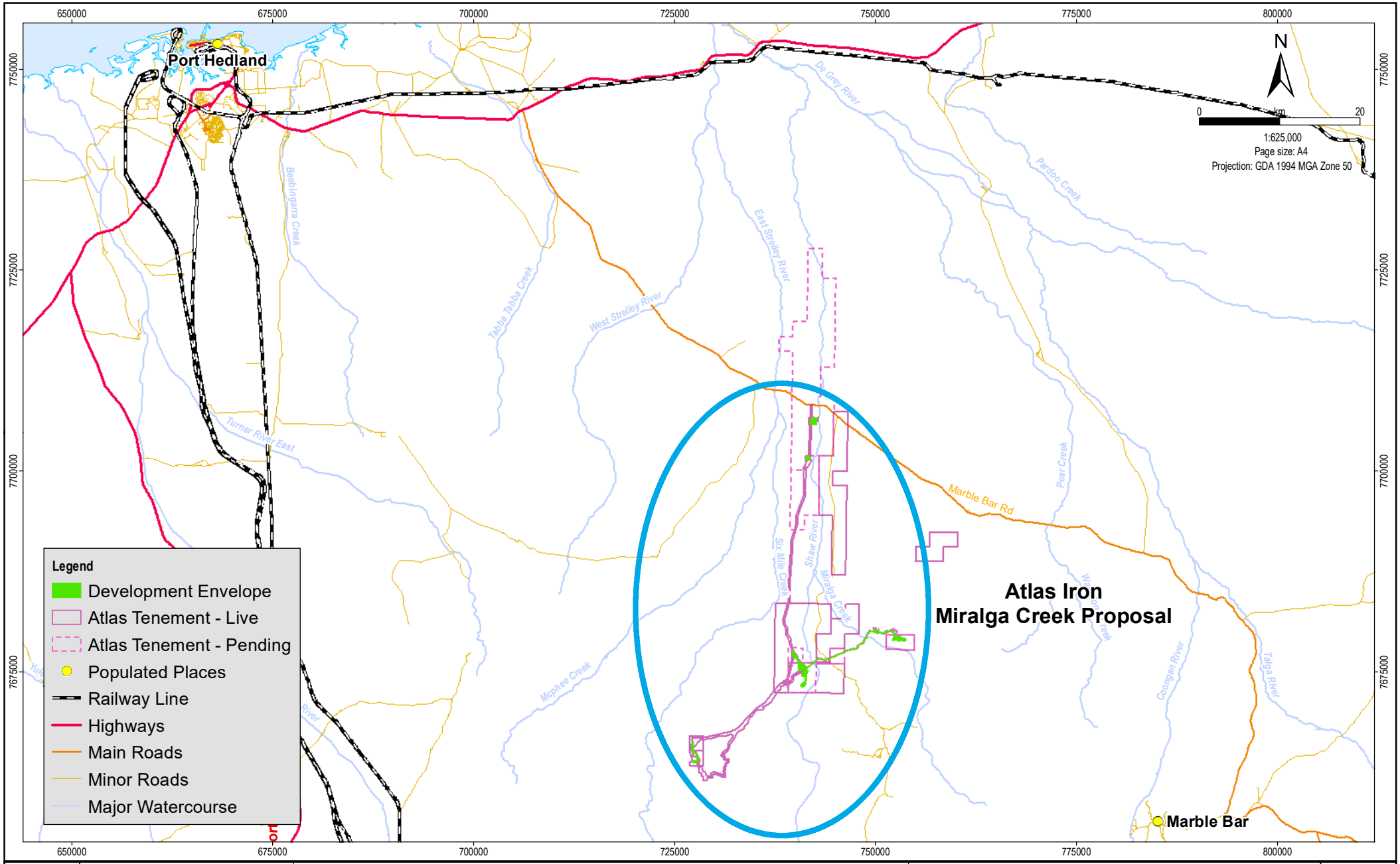
The purpose of this Significant Species Management Plan (SSMP) is to mitigate potential impacts to conservation significant fauna species and ensure the Project is developed in an environmentally acceptable manner.

The specific objectives of this SSMP are to:

- Maintain an inventory of conservation significant species that have the potential to be impacted by the Project.
- Maintain records of conservation significant species observed within the Project area.
- Avoid or minimise impacts to conservation significant species and habitats.
- Monitor for potential impacts to conservation significant species.
- Detail the reporting requirements relating to conservation significant species.

1.3 Legislative Context

Environmental legislation relevant to this management plan includes the federal *Environment Protection and Biodiversity Act 1999* (EPBC Act) and the state *Environmental Protection Act 1986* (EP Act), *Biodiversity Conservation Act 2016* (BC Act) and the *Mining Act 1978* (Mining Act).



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	Date: 30/03/2020	Source & Notes:	
	Author: Heath.Maconachie	*Disclaimer: This figure has been produced for internal review only and may contain inconsistencies or omissions. It is not intended for publication.*	

PROJECT NAME *Atlas*

1.3.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act provides for the protection of Matters of National Environmental Significance (MNES). Actions likely to cause a significant impact to MNES are assessed under the EPBC Act. The main authority under this Act is the Department of Agriculture, Water and the Environment (DAWE).

Nationally threatened species listed under the EPBC Act are MNES. Migratory species listed under international conventions and agreements that Australia is a party to are also protected under the EPBC Act. Definitions of the various conservation categories for nationally threatened species and migratory species are provided in Appendix A.

Threatened species and migratory species have been confirmed as present in the vicinity of the Project.

1.3.2 *Environmental Protection Act 1986*

The *Environmental Protect Action 1986* (EP Act) is the primary legislation that governs environmental impact assessment and protection in Western Australia. The aim of this Act is to prevent, control and abate environmental pollution for the conservation, preservation, protection, enhancement and management of the environment. Authorities under this Act include the Department of Water and Environment Regulation (DWER) and the independent Environmental Protection Authority (EPA).

Approvals and permits can be required under two parts of the Act: Part IV, Environmental Impact Assessment; and Part V, Environmental Regulation. The EP Act also specifically deals with the clearing of native vegetation and is supported by the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Under this framework clearing of native vegetation is considered an offence unless a clearing permit is obtained, or there is a valid exemption under EP Act. Native vegetation clearing permits can be assessed by the Department of Mines, Industry Regulation and Safety (DMIRS) under delegation from DWER in accordance with the provisions of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*

1.3.3 *Biodiversity Conservation Act 2016*

The BC Act provides for the protection of native flora and fauna if they are under identifiable threat of extinction, rare, or generally in need of protection. The main authority under this Act is the Department of Biodiversity and Conservation and Attractions (DBCA).

Threatened fauna are listed in government gazettes as Specially Protected Fauna. Definitions of the various conservation categories are provided in Appendix A.

1.3.4 *Mining Act 1978*

The Mining Act regulates mineral exploration and mining in Western Australia. The main authority under this Act is DMIRS. Under this Act, DMIRS prescribes environmental protection conditions on Mining Tenure through the assessment of Mining Proposals and Mine Closure Plans which outline the potential environmental impacts and management practices for individual projects.

1.4 Terminology and Definitions

1.4.1 Conservation Significant

For the purpose of this SSMP, conservation significant species are defined as species:

- Listed under federal or state legislation.
- Listed as priority species by DBCA.
- Considered by qualified specialists to be locally important.

Commonwealth and State-listed species are discussed in Section 3 and the definition of their specific conservation category or categories are provided in Appendix A. Species of concern (i.e. those species that are poorly known, uncommon, rare or otherwise threatened) that are not listed under legislation may be prioritised by the DBCA and have been included in this SSMP. Their conservation significance is reviewed by the DBCA on a regular basis.

1.4.2 Likelihood of Occurrence

The likelihood of occurrence for conservation significant fauna species in the Study Area was determined using a matrix based on known information relating to species' distribution, habitat preferences, locality records and previous studies (Biologic, 2020a). The fauna assessments assigned each species to one of six ratings as follows:

- Confirmed
- Highly Likely
- Likely
- Possible
- Unlikely
- Highly Unlikely.

1.4.3 Project Terminology

Project terminology is as follows:

- 'Project' refers to the Miralga Creek DSO Project.
- 'Study Area' is defined as the area over which field surveys for terrestrial fauna have been conducted (7,834.6 ha), as described in Section 3 and depicted in Figure 2.1.

- ‘Development Envelope’ refers to the 621.1 ha area within which Atlas Iron intends to clear no more than 284.9 ha (Figure 2.1).

2. Roles and Responsibilities

Atlas Iron is committed to managing its activities in an environmentally and socially responsible manner, as reflected in Atlas Iron's Health, Safety and Environment Policy. This policy is based on the recognition that mining projects affect the environment. Through prudent planning and excellence in management, most significant impacts can be avoided or mitigated.

Atlas Iron's indicative roles and responsibilities for the implementation of this SSMP are outlined in Table 1.

Table 1 – Atlas Iron's Roles and Responsibilities for SSMP Implementation

Role	Responsibility
Senior Environmental Advisor	Implement and maintain the SSMP. Review the SSMP. Annual Audit of Compliance. Review and update, where applicable, the conservation status of fauna occurring within the Study Area annually.
Miralga Creek Environmental Advisor	Implement monitoring programs. Maintain monitoring records. Deliver monitoring/ reporting data to the DAWE, DBCA, DMIRS and DWER. Implement and deliver awareness training programs to personnel, contactors and visitors. Record all sightings of or incidents involving conservation significant fauna. Assess ground disturbance and access applications. Ensure all personnel involved in fauna surveys are appropriately licensed and qualified. Investigate any incidents involving conservation significant species and implement findings where relevant.
Construction and Operation Managers	Endorse implementation of the SSMP by Project personnel and contractors.
All personnel, contractors and visitors	Participate in awareness training prior to commencing duties. Implement SSMP in daily activities, where relevant. Report all sightings and/ or incidents involving conservation significant fauna.

ATLAS	GIS_2797_SSMP_Fig2_1_MIR_CK_StudyArea.mxd	**Miralga Creek Study Area**	Figure No: **2-1**
	Date: 30/03/2020	Source & Notes:	
	Author: Heath.Maconachie	*Disclaimer: This figure has been produced for internal review only and may contain inconsistencies or omissions. It is not intended for publication.*	

3. Fauna Values

Biologic Environmental Survey Pty Ltd (Biologic) conducted a two-season Level 2 vertebrate and short-range endemic (SRE) invertebrate fauna survey for the Project in May and July 2019. The survey methodology was aligned with the relevant sections of the following guidelines (Biologic, 2020a):

- Survey Guidelines for Australia's Threatened Bats (DEWHA, 2010)
- Survey Guidelines for Australia's Threatened Birds (DEWHA, 2010)
- Survey Guidelines for Australia's Threatened Mammals (DSEWPaC, 2011)
- Survey Guidelines for Australia's Threatened Reptiles (DSEWPaC, 2011)
- Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna (EPA, 2016)
- Technical Guidance: Sampling of Short-Range Endemic Invertebrate Fauna (EPA, 2016)
- Technical Guidance: Terrestrial Fauna Surveys (EPA, 2016)
- Interim guidelines for the preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia (DPaW, 2017)
- EPBC Act referral guideline for the endangered Northern Quoll (*Dasyurus hallucatus*) (DEE, 2016)

The overall objective of the surveys was to identify the occurrence of vertebrate and SRE invertebrate fauna species within the Study Area and their supporting habitats. Specifically, the key objectives of the assessment were to:

- Conduct a comprehensive desktop study of vertebrate and SRE invertebrate fauna likely to occur within and within the vicinity of the Study Area.
- Define and delineate broad fauna habitats occurring within the Study Area, and report on their significance.
- Conduct a Level 2 survey for vertebrate fauna to determine vertebrate fauna assemblages occurring within the Study Area.
- Conduct a Level 2 SRE invertebrate fauna survey to determine the occurrence and likelihood of occurrence for SRE invertebrates.
- Assess the likelihood for vertebrate and SRE fauna of conservation significance occurring within the Study Area.

As no conservation significant invertebrate fauna were considered likely to be significantly impacted during the environmental impact assessment process, this SSMP focuses on vertebrate fauna only.

3.1 Habitats

A total of six vertebrate fauna habitat types were recorded and mapped within the Study Area. These comprised, in decreasing order of extent:

- Low Stony Hills

- Stony Plain
- Sandy Plain
- Major Drainage Line
- Hillcrest/ Hillslope
- Gorge Gully.

Low Stony Hills and Stony Plains were the dominant broad fauna habitats within the Study Area, covering approximately 33.0% and 29.1% respectively, followed by Sandy Plain (19.6%) and Major Drainage (12.7%) habitats. The remaining two broad fauna habitats, Hilcrest/ Hillslope and Gorge/ Gully, each covered only 5.5% and 0.1% respectively.

Additionally, a small portion of the Study Area comprised cleared areas from previous clearing and tracks.

Of the six broad fauna habitats recorded within the Study Area, three were deemed to be of high significance for vertebrate fauna due to the potential to provide habitat for species of conservation significance:

- Gorge/ Gully
- Hillcrest/ Hillslope
- Major Drainage.

Of the remaining habitats, Sandy Plain was deemed to be of moderate significance, and Low Stony Hills and Stony Plain were considered to be low significance, as species of conservation significance are typically not dependent on these habitats at the broad scale. Furthermore, these habitats are widely distributed within the Study Area (Biologic, 2020a) and more broadly within the Pilbara region (McKenzie et al., 2002).

Some habitats showed evidence of disturbance in the form of selective clearing for tracks and drill pads from contemporary exploration activities, particularly within Hilcrest/ Hillslope habitat where iron ore deposits are primarily located. At the time of the baseline surveys, a large portion of the Study Area was had been subject to a recent largescale fire, resulting in reduced vegetation cover and fauna habitat availability throughout most of these areas.

Caves and water sources are among a number of important microhabitats present in the Study Area, providing sources of shelter, food and water for conservation significant species. Many of these features were within the Gorge/ Gully and Hillcrest/ Hillslope habitats, which have not been commonly recorded in surrounding broad habitat types.

A total of 16 caves were recorded across the Study Area, with Ghost Bats or evidence of their occurrence recorded at ten caves (Biologic 2020a).

During the fauna survey, 15 natural water features (water holes) (other than creeks and rivers) were recorded by Biologic, plus a turkeys nest (dam). All water sources in the Study Area provide foraging habitat fauna (when water is present).

No water holes will be directly impacted by proposed clearing, and no potentially permanent features will be impacted by drawdown.

3.2 Conservation Significant Species

Seven vertebrate species of conservation significance were recorded in the surveyed Study Area and are detailed in Table 2.

Table 2 – Conservation Significant Species Confirmed Present

Common name (Species name)	Conservation Status[1]	
	EPBC Act	In WA
Northern Quoll (*Dasyurus hallucatus*)	EN	EN
Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)	Pending VU	VU
Pilbara Leaf-nosed Bat (*Rhinonicteris aurantius*)	VU	VU
Ghost Bat (*Macroderma gigas*)	VU	VU
Grey Falcon (*Falco hypoleucos*)	Pending VU	VU
Peregrine Falcon (*Falco peregrinus*)	-	OS
Western Pebble-mound Mouse (*Pseudomys chapmani*)	-	P4

(1) Conservation Categories are:
EN – Endangered (EPBC and BC Act)
VU – Vulnerable (EPBC and BC Act)
OS – Other Specially Protected Fauna (BC Act only)
P4 – Priority 4
Pending – the DAWE is currently determining whether these species qualify to be considered in the Vulnerable category

Further information regarding each conservation significant species either known to occur or potentially occurring in the Study Area is provided in Appendix B, excluding migratory birds which are not deemed at risk of significant impact from implementation of the Project (Biologic 2020b).

Only the Ghost Bat and Northern Quoll are considered to be at risk of significant impact from the implementation of the Project.

4. Potential Impacts

Each stage of the Project (construction, operation and closure/ rehabilitation) has the potential to affect the abundance, distribution and condition of conservation significant fauna within the Project area and surrounds. Potential impacts of the Project on terrestrial fauna of conservation significance include:

- Removal, fragmentation or modification of habitat
- Vehicle strike
- Introduced species
- Increased light
- Noise and vibration
- Dust
- Changed fire regimes
- Modification of water regimes.

5. Management Measures

Management measures have been developed to control and mitigate impacts to conservation significant fauna from the Project. The management measures in this section have been classified as either Standard Management Measures, or Species-Specific Management Measures:

- Standard: are measures developed and implemented to manage and mitigate impacts to all conservation significant terrestrial vertebrate fauna.
- Species-Specific: are measures developed and implemented for a conservation significant fauna species that has been confirmed as present in the Project area and potentially subject to significant impacts from the Project's implementation.

5.1 Standard Management Measures

This section details the management measures relevant to all conservation significant terrestrial vertebrate fauna. These management measures have been developed in consideration of baseline studies (Section 3), identified potential Project impacts (Section 4), specialist advice and industry best practices.

The following management measures will be implemented:

- No more than 284.9 ha of vegetation/habitat within the 621.1 ha Development Envelope will be cleared/ disturbed.
- Clearing will occur in accordance with Atlas Iron's Ground Disturbance Permit Procedure (GDP). No clearing will occur without prior authorisation from Atlas Iron's Ground Disturbance Permitting System. This will ensure that clearing does not occur outside the Development Envelope or exceed 284.9 ha.
- Clearing in/ of sensitive habitats including caves, gorges and drainage lines will be kept to the minimum necessary for safe construction and operation of the Proposal.
- Atlas Iron will abstract water in accordance with 5C Licences to take groundwater, a Water Management Plan and Site Water Operating Plan in accordance with the Department of Water and Environmental Regulations requirements.
- Turkey's nests will be constructed to ensure a point of fauna ingress/egress.
- Borrow pits will be designed and constructed to permit egress of fauna.
- Speed limits will be enforced across the site.
- Off-road driving will be prohibited unless otherwise authorised by senior management to minimise potential vehicle strikes.
- Night-time vehicle movements will be restricted where possible to minimise potential vehicle strikes.
- All bins storing putrescible waste will have tightly secured lids to avoid fauna attraction and entry.

- The landfill will be operated and managed in accordance with the Environmental Protection (Rural Landfill) Regulations 2002. This will include fencing to reduce the potential for attracting fauna.
- Blasting operations will be limited to daytime only to limit disturbance to fauna including bats.
- Noise, dust and light emissions will be controlled where possible to avoid excessive disturbance to native fauna, including directing lights to working areas, shielding lights to reduce glow, and using conventional dust suppression techniques (i.e. water trucks).
- Awareness training will identify conservation significant fauna and habitat and discuss relevant management measures, personnel/ contractor responsibilities, and incident reporting requirements (i.e. reporting of fauna observations and/ or incidents).
- All fauna mortalities and injuries will be reported to the Miralga Creek Environmental Advisor within 24 hours and recorded within Atlas Iron's incident reporting system.
- All sightings of conservation significant fauna will be reported to the Miralga Creek Environmental Advisor.
- Where required, fauna will be handled and transported in accordance with the procedures outlined in the DBCA Standard Operating Procedure Transport and Temporary Holding of Wildlife (Department of Biodiversity, Conservation and Attractions, 2017).
- Interactions with fauna (e.g. feeding, harassment, capture, killing) are not permitted unless specifically authorised by the Senior Environmental Advisor.
- The Miralga Creek Environmental Advisor will report all conservation significant fauna injuries and mortalities to DBCA within one week.
- Domestic pets are prohibited to avoid interactions with or disturbance to conservation significant fauna.
- Implementation of Atlas Iron' Introduced Fauna / Pest Control Procedure (950-HSE-EN-PRO-0022), including recording all introduced fauna sightings and the implementation of a feral animal control program, as required (i.e., where sightings are regular and/or if nuisance or dangerous individuals are recorded).
- In addition to the GDP, implementation of the following procedures to ensure weeds are controlled, as far as practicable:
  - Flora Management Procedure (950-HSE-EN-PRO0010).
  - Weed Hygiene Procedure (950-HSE-EN-PRO-0002).

5.2 Species-specific Management Measures

Seven species of conservation significance were recorded during the survey, comprised of five mammals and two birds, recorded from 149 individual records at 21 sites and 28 opportunistic locations. All conservation significant species were recorded within the main Study Area encompassing the Miralga East, Miralga West and Sandtrax orebodies. No conservation significant species were recorded within the stockyard areas.

This section details management measures specific to species which have been confirmed to be present within the Study Area and are most likely to be impacted by the Project; namely, the Northern Quoll and Ghost Bat.

5.2.1 Northern Quoll *(Dasyurus hallucatus)* (Endangered – EPBC Act; Vulnerable – BC Act)

The presence of Northern Quoll within the Study Area was confirmed from 89 records during the survey, including 44 trapped individuals (comprising 28 unique individuals), 35 captures on motion camera (comprising 10 or 11 unique individuals) and ten observations from secondary evidence (six scats and four tracks).

Two young males were captured at Phase 1 systematic trapping sites in Low Stony Hills and Sandy Plain habitats. Due to the timing of their capture coinciding with the early stages of the breeding season (when males are most active and mobile) it is most likely they were dispersing/ traversing the habitat while migrating from other areas of more suitable habitat rather than using those habitat types as a key refuge (Hernandez-Santin et al., 2019).

During the Phase 2 survey, 18 individuals were captured at one site in Hillcrest/ Hillslope habitat at Miralga West. The high number of females captured (11 individuals), highlighted the significant value of denning/ shelter habitat for the species in the area.

The species was recorded within a range of fauna habitats within the Study Area, including Gorge/ Gully, Hillcrest/ Hillslope, Low Stony Hills and Sandy Plain habitats. Northern Quoll are likely to occur throughout the Study Area, particularly within Gorge/ Gully and Hillcrest/ Hillslope habitats where suitable denning /shelter and/ or foraging habitat is present, in addition to Major Drainage habitat for foraging and/ or dispersal. These habitats form part of the core habitats critical to the survival of Northern Quoll (DoE, 2016). To a lesser extent, all habitats occurring within the Study Area may be utilised by the species to forage and or during dispersal activities; however, their significance to the species will vary depending on resource availability and connectivity. Foraging habitat within the Study Area is likely to vary depending on resource availability and recent fires within large sections of the Study Area.

In addition to the implementation of the Standard Management Measures, Atlas Iron is committed to implementing the following Species-Specific Management Measures for the Northern Quoll:

- Implementation of a Northern Quoll monitoring program (Appendix C).
- Inductions will provide detailed information about the Northern Quoll, including identification of employee and contractor responsibilities.
- Northern Quoll sightings, injuries and mortalities will be reported to the Miralga Creek Environmental Advisor in accordance with Atlas Iron's HSE Incident Management Procedure.

5.2.2 Ghost Bat (*Macroderma gigas*) (Vulnerable – EPBC Act / BC Act)

Ghost Bats roost in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines (Armstrong and Anstee, 2000). These features often occur within habitats including gorges, gullies, ridgelines and low hills

(Armstrong and Anstee, 2000). Ghost Bats have previously been recorded within the Study Area, near Sulphur Springs within the Sandtrax deposit (DBCA, 2019d). The species has also been recorded on numerous occasions within 10 km of the Study Area, including at the Lalla Rookh roost site and in the vicinity of the Abydos DSO Project during annual monitoring of the species at the site (DBCA, 2019d).

The Ghost Bat was recorded a total of 25 times within the Study Area during the current survey. The species was recorded five times from direct observation (individuals observed at night and within or flushed from caves), ten times from ultrasonic call recordings and ten times from secondary evidence (scats). The species was recorded within Major Drainage, Hillcrest/ Hillslope, Gorge/ Gully and Stony Plain habitat within the Study Area.

Timing of calls from most sites were consistent with bats from both species originating from Lalla Rookh (Biologic, 2020a). Lalla Rookh is a permanent bat roost which lies outside of the Development Envelope, approximately 700 m south of the existing Abydos Link Road, which runs between Sandtrax and Miralga West. From Lalla Rookh, Sandtrax is approximately 9 km southwest, Miralga West 3 km northeast and Miralga East 19 km northeast. Any bats exhibiting short-term abandonment from the caves in the Project area are expected to use Lalla Rookh as their preferred location (Bat Call WA, 2020).

Within the Study Area, Ghost Bat are likely to occur within all mapped broad fauna mapped to forage, with roosting more likely to be concentrated to areas where suitable caves are present in Hillcrest/ Hillslope and Gorge/ Gully Habitats. The species occurrence is likely to be regular, particularly when roosting occurs within the Study Area. Gorge/ Gully represent significant habitat for the Ghost Bats as caves are often formed within this habitat type which can be utilised for roosting and foraging. Drainage areas provides suitable foraging habitat for Ghost Bats in the Study Area. Water features are also important for the species as foraging and drinking sources.

Thirteen caves were confirmed or identified as potential roost caves for Ghost Bat as summarised in Table 3.

Table 3 – Ghost Bat Caves Recorded in the Study Area

Cave	Habitat Value to and Use By Ghost Bat	Category[1]				Distance to Nearest Proposed Pit[2]
		1	2	3	4	
Sandtrax						
CMRC-03	Nocturnal roost			✓		185 m
CMRC-07	Diurnal roost			✓		225 m
CMRC-19	Night roost				✓	385 m
Miralga West						
CMRC-02	Potential nocturnal roost				✓	Within pit
CMRC-04	Nocturnal roost				✓	340 m
CMRC-06	Diurnal roost		✓			400 m
CMRC-08	Nocturnal roost			✓		470 m
CMRC-10	Nocturnal roost			✓		450 m
CMRC-12	No usage				✓	340 m
Miralga East (near pits 2 and 3)						
CMRC-01	Nocturnal roost				✓	50 m [3]
CMRC-13	Nocturnal roost				✓	95 m
CMRC-14	Diurnal roost			✓		117 m
CMRC-15	Diurnal roost / possible maternity roost		✓			55 m
Miralga East (west of pits)						
CMRC-16	No usage				✓	~1,000 m
CMRC-17	No usage				✓	~1,000 m
CMRC-18	Potential diurnal roost			✓		~1,000 m

Sources: Biologic (2020a), Bat Call WA (2020).
(1) Cave category definitions (full definitions in Appendix A of Bat Call WA (2020)):
Category 1 – diurnal roosts with permanent occupancy
Category 2 – diurnal roosts with regular occupancy
Category 3 – roosts with occasional occupancy
Category 4 – nocturnal roosts with opportunistic usage
(2) Distance is measured from nearest edge of proposed pit disturbance to the cave entrance.
(3) Cave CMRC-01 was previously incorrectly reported as being on the edge of pit 3 at Miralga East. It is actually located midway between pits 2 and 3, approximately 50 m from pit 2 and 100 m from pit 3.

Only CMRC-02 is anticipated to be removed by mining. The most important cave complex in the area is the grouping of CMRC-13, -14 and -15, which are also the closest to impact areas. Atlas Iron has commissioned a number of specialist investigations to help better understand this cave complex (in particular CMRC-15) to tailor management and mitigation. This has involved close consultation with leading experts including Bob Bullen of Bat Call WA. Bat Call WA was engaged to

guide the scoping of additional studies by geotechnical and blasting consultants to ensure the protectability of CMRC-15. Following the completion of additional investigations and studies, the habitat values of the cave complex for Ghost Bat are not expected to be significantly impacted by the Project. Ghost Bats are anticipated to return to the complex after mining is completed (Bat Call WA, 2020).

In addition to the implementation of Standard Management Measures, Atlas Iron is committed to implementing a number of species-specific management measures for the Ghost Bat. These include:

- Implementation of a Ghost Bat monitoring program including recommendations for cave protection provided by Blast It Global (2020) and Bat Call WA (2020) (Appendix D).
- Bat roosts will be recorded in a site database and mapped on all mine plans. The database will be accessible to all Atlas Iron departments.
- Access to caves known to be occupied by the Ghost Bat will be restricted.
- Atlas Iron will not install barbed-wire fences or other fences that could cause bat entanglements.
- Retention of 15 out of 16 cave features identified by Biologic (2020a).
- Mine site inductions will provide detailed information about Ghost Bats and employee and contractor responsibilities.

6. Performance Criteria and Corrective Actions

Performance criteria for this SSMP are provided in Table 4. Should the performance criteria not be met, corrective actions will be implemented.

Table 4 – Performance Criteria and Corrective Actions for Conservation Significant Fauna

Performance Objective	Key Performance Indicators	Corrective Actions
No roadkill incidents of conservation significant fauna.	Zero roadkill of conservation significant fauna.	• Identify likely cause of incident. • Review speed limits and driving procedures. • Review number of and locations of fauna signposts. • Undertake further education and awareness training.
No more than 284.9 ha will be cleared within the Development Envelope.	Clearing of no more than 284.9 ha. No clearing outside the Development Envelope.	• Check demarcation of areas to be cleared/not cleared has been undertaken and is obvious to those on the ground. • Identify likely cause. • Implement relevant corrective actions. • Report to relevant government authorities. • Undertake corrective rehabilitation. • Undertake further education and awareness training.
Persistence of the Northern Quoll within the Study Area during operations.	Absence of Northern Quoll at 50% of monitoring sites over two consecutive annual monitoring periods. Actions will be triggered once a 50% decrease in activity is noted across two years.	• Identify likely cause[1]. • Consider changes noted at control sites (if any). • Review monitoring procedure; frequency and methodology. • Review Northern Quoll management within this plan. • Report to relevant federal and state agencies. • Undertake any corrective rehabilitation.

Performance Objective	Key Performance Indicators	Corrective Actions
No unauthorised access to bat cave exclusion zones.	No ground disturbance within cave buffers. No incident reports of unauthorised access to cave buffers.	• Review training and induction programs. • Review number and locations of fauna signposts. • Review the size of and need for barriers to exclusion zone (e.g. fencing).
No significant damage to CMRC-15 that would prevent future use by Ghost Bats	All blasts monitored are <100 mm/s vibration as monitored at the nearest cave to all blasting at Miralga East pits 2 and 3. No significant damage to cave CMRC-15.	• Cease blasting near the relevant cave and review blasting requirements. • Increase cave inspection and monitoring frequency.
Effective waste management procedures.	No records of feral animals in close proximity camp, administrative or landfill facilities (due to poor waste management).	• Identify likely cause of incident. • Review the Waste Management (950-HSE-EN-PRO-0023) and Landfill Management (950-HSE-EN-PRO-0020) Procedures. • Review/implement the Introduced Fauna/ Pest Control Procedure (950-HSE-EN-PRO-0022. • Undertaking further education and awareness training.
Effective operation of the Project to minimise the risk of Project related fire	No records of Project-related fires.	• Identify likely cause of incident. • Review any relevant procedures or guidelines (e.g., Hydrocarbon Management Procedure (950-HSE-EN-PRO-0005), Hydrocarbon (and Chemical) Spill Management Procedure (950-HSE-ENPRO-0007), Hot Work Guideline (SA_GDL_009). • Undertake further education and awareness training.
Effective weed control.	No new species of weeds recorded within the Project area.	• Identify likely cause of incident. • Review the Weed Hygiene Procedure (950-HSE-EN-PRO-0002) and the Flora Management Procedure (950-HSE-EN-PRO-0010). • Undertaking further education and awareness training.

(1) If performance indicator is triggered, but the change is recorded regionally (across both impact and non-impact/control sites) and found to be indicative of a regional rather than project related change/impact (e.g., influencing environmental factor) no further corrective action is required.

7. Auditing and Review

7.1 Audits

The Senior Environmental Advisor will be responsible for ensuring a compliance audit against the requirements of this SSMP is conducted every 12 months over the life of the Project.

7.2 Reviews

Atlas Iron will undertake an initial review of the SSMP once the Project has received final environmental approvals to ensure all approval conditions, recommendations and commitments are covered. The SSMP will then be reviewed every 12 months or as required. All reviews will consider:

- Outcomes of monitoring programs.
- Changes to the conservation status of fauna species.
- Specialist advice and stakeholder consultation.
- Implementation and effectiveness of management measures and monitoring programs.
- Performance indicators and any corrective actions.
- Changes to relevant legislation, policy, guidelines, management plans and industry practices.
- The identification of a conservation significant fauna species not previously confirmed within the Project area.
- Recurring incidents of death/ injury to any conservation significant fauna.

8. Reporting

This section provides details of Atlas Iron's reporting requirements by this SSMP. A summary of reporting requirements is provided in Table 5.

Table 5 – Reporting Requirements

Department	Detail	Timing
Atlas Iron Internal	Incident Reporting	As required
Atlas Iron Internal	Opportunistic Reporting	As required
Atlas Iron Internal	Northern Quoll Monitoring Report	Annually
Atlas Iron Internal	Bat Monitoring Report	Annually
DAWE	Annual Environment Report	Annually
DMIRS	Annual Environment Report	Annually
DBCA	Fauna injury or mortality Report	As required

8.1 Internal Reporting

8.1.1 Incident Reporting

All fauna injuries and mortalities within the Project area will be reported to the Miralga Creek Environmental Advisor, in accordance Atlas Iron's HSE Incident Management Procedure.

All incidents are reported through Atlas Iron's Incident Reporting System (InControl) and will be investigated appropriately with additional management measures implemented where required to prevent reoccurrences.

All fauna incidents are also recorded in the InControl database and summaries are included in Atlas Iron's Annual Environmental Report (AER).

8.1.2 Opportunistic Reporting

All fauna sightings are reported through Atlas Iron's Incident Reporting System (InControl) and will be investigated appropriately with additional management measures implemented where required.

A summary will be included in Atlas Iron's Annual Environmental Report (AER).

8.1.3 Fauna Specialist Reports

The fauna specialist conducting monitoring for conservation significant species for which species-specific management has been implemented will report to Atlas Iron on each monitoring event. The specialist reports will be reviewed internally to ensure compliance with the SSMP objectives and performance criteria.

These specialist reports will be attached to the AER.

8.2 External Reporting

8.2.1 Department of the Agriculture, Water and the Environment

The AER will provide a summary of conservation significant fauna sightings, injuries and mortalities within the Project area, as well as performance in accordance with the objectives, key performance indicators and corrective actions listed in Table 4.

The AER will report on the results of the following monitoring programs:

- Northern Quoll Monitoring Program (detailed in Appendix C).
- Ghost Bat Monitoring Program (detailed in Appendix D).

Any significant changes to this SSMP will be also noted in the AER.

8.2.2 Department of Mining, Industry Regulation and Safety

The AER to be provided to DMIRS will include a summary of the significant fauna monitoring results and compliance with DAWE approval conditions.

8.2.3 Department of Biodiversity, Conservation and Attractions

Any mortality to conservation significant fauna will be reported to the DBCA, with their standard Fauna Report Form. This will determine if further actions are appropriate.

9. References

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Appendix A Definitions of Conservation Significance Status for Flora and Fauna

Table A.1 – Definition of State and Commonwealth Conservation Codes for Fauna

Status	Code	Description
Categories used in *Environment Protection and Biodiversity Conservation Act 1999*		
Extinct	EX	A taxon is Extinct when there is no reasonable doubt that the last individual has died.
Extinct in the Wild	EW	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual.
Critically Endangered	CR	A taxon is Critically Endangered when it is considered to be facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	EN	A taxon is Endangered when the best available evidence indicates that it is not critically endangered and is considered to be facing a very high risk of extinction in the wild.
Vulnerable	VU	A taxon is Vulnerable when the best available evidence indicates that it is not critically endangered or endangered, and it is considered to be facing a high risk of extinction in the wild in the medium-term future.
Conservation Dependent	CD	The species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered.
Migratory	M	Species migrate to, over and within Australia and its external territories.
Conservation Codes for Western Australian Flora and Fauna – DBCA		
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).
Priority 1: Poorly-known species	P1	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel

Status	Code	Description
		reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey
Priority 2: Poorly-known species	P2	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3: Poorly-known species	P3	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4: Rare, Near Threatened and other species in need of monitoring	P4	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix B Likelihood of Conservation Listed Vertebrate Species Occurring over the Study Area

Common name *Scientific name*	EPBC Act	In WA	Broad habitat type	Likelihood of occurrence
Brush-tailed Mulgara *Dasycercus blythi*	–	P4	Prefers spinifex *Triodia* spp. grasslands on sand plains and the swales between low dunes (Pavey et al., 2012; Woolley, 2006). Mature spinifex hummocks appear to be important for protection from introduced predators (Körtner et al., 2007).	Likely
Northern Quoll *Dasyurus hallucatus*	EN	EN	The species tends to inhabit rocky habitats which offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994; Oakwood, 2000). Other microhabitat features important to the species include: rock cover; proximity to permanent water and time-since last fire (Woinarski et al., 2008).	Confirmed
Long-tailed Dunnart *Sminthopsis longicaudata*	–	P4	Typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Burbidge et al., 2008). Once considered rare but now shown to be relatively common and widespread in rocky habitats (Burbidge et al., 2008).	Possible
Pilbara Leaf-nosed Bat *Rhinonicteris aurantia*	VU	VU	Species roosts within caves and abandoned mines with high humidity (95%) and temperature (32 °C) (Armstrong, 2001). Species forages in caves and along waterbodies with fringing vegetation (TSSC, 2016).	Confirmed
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	–	P4	Within the Pilbara the Spectacled Hare wallaby is known to occur in tussock and hummock grasslands and Acacia shrublands (Ingleby & Westoby, 1992).	Likely
Northern Brushtail Possum *Trichosurus vulpecula arnhemensis*	Pending	VU	Within the Pilbara region generally exhibit flexibility in their habitat preferences and occupy an array of habitat types provided enough tree hollows and ground refuges (such as hollow logs, rockpiles and the burrows of other animals) are available (Kerle et al., 1992).	Confirmed
Ghost Bat *Macroderma gigas*	VU	VU	Ghost Bats roost in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines (Armstrong & Anstee, 2000). These features often occur within habitats including gorge/gully, hill crest/hill slope and low hills (Armstrong & Anstee, 2000)	Confirmed

Common name *Scientific name*	EPBC Act	In WA	Broad habitat type	Likelihood of occurrence
Short-tailed Mouse *Leggadina lakedownensis*	–	P4	The species occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, Acacia shrublands, tropical eucalypt and Melaleuca woodlands and stony ranges; however, the species is usually found in seasonally inundated habitats on red or white sandy-clay soils (Moro & Kutt, 2008).	Possible
Western Pebble-mound Mouse *Pseudomys chapmani*	–	P4	This species occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee, 1996; Start et al., 2000).	Confirmed
Greater Bilby *Macrotis lagotis*	VU	VU	Variety of habitats including spinifex hummock grassland and *Acacia* shrubland, on soft soils (Burrows *et al.* 2012). In the Pilbara often associated with major drainage line sandy terraces (How *et al.* 1991).	Possible
Grey Falcon *Falco hypoleucos*	Pending	VU	Timbered lowlands, particularly Acacia shrubland and along inland drainage systems. Also frequent spinifex and tussock grassland (Burbidge *et al.* 2010, Olsen and Olsen 1986).	Confirmed
Peregrine Falcon *Falco peregrinus*	–	OS	In arid areas, it is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr, 1998). It typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 m and 50 m high (Olsen et al., 2004; Olsen & Olsen, 1989).	Confirmed
Night Parrot *Pezoporus occidentalis*	EN	EN	The Night Parrot prefers sandy/stony plain habitat with old-growth spinifex (*Triodia*) for roosting and nesting in conjunction with native grasses and herbs for foraging (DPaW, 2017).	Possible
Australian Painted Snipe *Rostratula australis*	EN	EN	Generally, occupies shallow terrestrial freshwater wetlands (i.e. temporary and permanent lakes, swamps and claypans) with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire (Johnstone & Storr, 1998)	Unlikely

Common name *Scientific name*	EPBC Act	In WA	Broad habitat type	Likelihood of occurrence
Curlew Sandpiper *Calidris ferruginea*	CR, MI	VU/ MI	Inhabits intertidal mudflats in sheltered coastal areas (i.e. estuaries, bays, inlets and lagoons) (Geering et al., 2007). This rare species generally roosts on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (Geering et al., 2007).	Rarely
Eastern Curlew *Numenius madagascariensis*	CR/MI	MI/T	Mainly tidal mudflats, also reef flats, sandy beaches and rarely near-coastal lakes including saltwork ponds (Johnstone & Storr, 1998).	Rarely
Pilbara Olive Python *Liasis olivaceus barroni*	VU	VU	Species commonly recorded along watercourses and areas of permanent water, particularly in rocky gorges, escarpments and gullies (Pearson 1993).	Likely
Gane's Blind Snake *Anilios ganei*	–	P1	Little is known of the species' ecology but this species is often associated with moist soils and leaf litter within gorges and gullies (Wilson & Swan, 2014), and potentially within a wide range of other stony habitats. The species has been recorded from numerous habitats but is most likely to be present in rocky terrain and along drainage lines (DBCA, 2019d) such as that found in the Study Area.	Likely
Black-lined Ctenotus *Ctenotus nigrilineatus*	–	P1	Little is known about the habitat preferences of the species. Previous records have however been collected from spinifex plains at the base of granite outcrops (How & Dell, 2004); (How et al., 1991a).	Likely
Spotted Ctenotus *Ctenotus uber johnstonei*	–	P2	Within the Pilbara, the taxon is known from *Triodia* on hillslopes, *Acacia xiphophylla* over chenopods, and *Acacia xiphophylla* scattered tall shrubs to high open shrubland (Cogger, 2014).	Possible

Appendix C Northern Quoll Monitoring Program

Northern Quoll Monitoring Program

Miralga Creek DSO Project

180-LAH-EN-PLN-0002

Revision 0

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Rev	Reason for Issue	Prepared	Checked	Authorised	Date
A	Internal review	F. Jones	D. Morley M. Goggin		30/03/2020
B	Internal review	F. Jones	D. Morley	M. Goggin	02/04/2020
0	Inclusion in SSMP	F. Jones	D. Morley	M. Goggin	06/04/2020

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Northern Quoll Monitoring Program

The State and Federally listed Northern Quoll (*Dasyurus hallucatus*) was recorded in baseline studies for the Miralga Creek Project from 89 records including 44 trapped individuals (comprising 28 unique individuals), 35 times from motion camera captures (comprising 10-11 unique individuals) and ten times from secondary evidence (six scats and four tracks) (Biologic, 2020).

The species was recorded within a range of fauna habitats within the Study Area, including Gorge/ Gully, Hillcrest/ Hillslope, Low Stony Hills and Sandy Plain habitats. There was a strong association with areas where suitable denning and/ or foraging habitat was more available, such as Hillcrest/ Hillslope and Gorge/ Gully habitats. Single young males were trapped in Low Stony Hills and Sandy Plain habitats, suggesting they were dispersing/ traversing through the habitat while migrating from other areas of more suitable habitat within the vicinity (Biologic, 2020).

The large number of records within the vicinity of the Study Area suggests that the species is relatively common in the local region. Atlas Iron is therefore committed to implementing the following monitoring program.

1. Overview

This monitoring program aims to monitor the presence of Northern Quoll during the life of the Miralga Creek Project (the Project; including its rehabilitation phase) and to ensure the effectiveness of Atlas Iron's management measures.

This monitoring program includes:

- **Baseline population survey**: A level 2 terrestrial fauna survey to determine to presence of a Northern Quoll population within the Study area.
- **Annual monitoring**: The aim of this program is to monitor Northern Quoll population trends during the operational life of the Project.
- **Opportunistic monitoring**: The aim of this program is to provide additional data collected by site personnel to supplement the annual monitoring program and further the protection of the Northern Quoll.
- **Post-mining monitoring**: The aim of this program is to measure Northern Quoll recolonisation in rehabilitated Project areas as an indicator of rehabilitation success.

2. Monitoring Method

The monitoring methods that have been and will be deployed to monitor the presence of the Northern Quoll within the Development Envelope are discussed below.

2.1 Baseline Population Survey

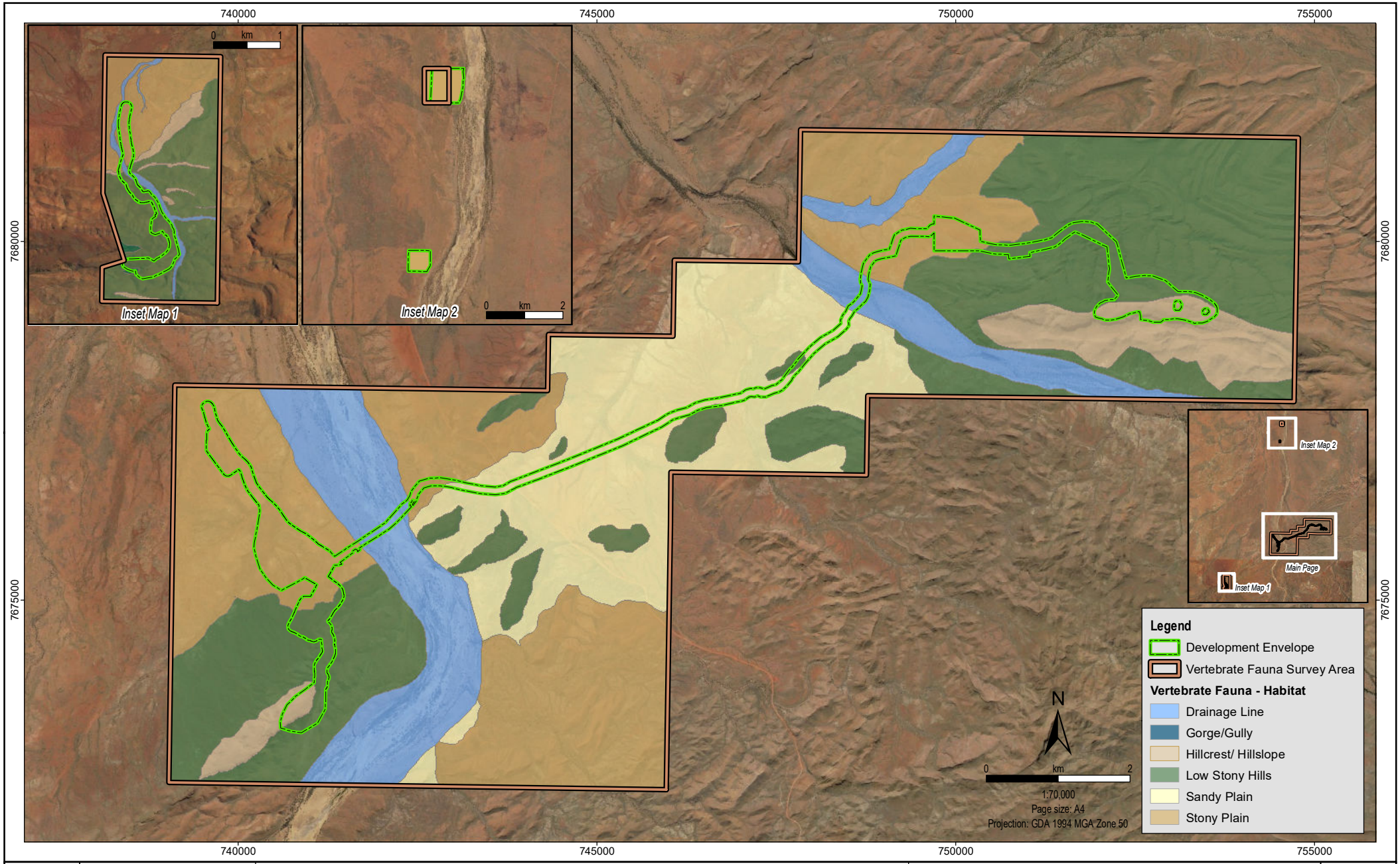
A desktop and two-phase Level 2 trapping survey was undertaken for terrestrial fauna in 2019 by Biologic (2020). The objective of the desktop study was to gather background information on the local region, to provide an indication of fauna species and habitats likely to be present, suitable survey methodology, and to provide a regional context to inform the analysis of field survey findings.

Six broad fauna habitat types were identified by Biologic (2020) (Figure 2.2), in order of most common to least common:

- Low Stony Hills
- Stony Plain
- Sand Plain
- Major Drainage
- Hillcrest/ Hillslope
- Gorge/ Gully.

Systematic sampling sites were established in the Study Area. The sampling program implemented at each of these sites consisted of standardised trapping, fixed-time avifauna census, systematic searching (active searching), nocturnal spotlighting, motion-sensor camera deployments and bat echolocation recordings.

The complete baseline population monitoring results can be found in the Miralga Creek: Level 2 Terrestrial Fauna Assessment report (Biologic, 2020).



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Date: 30/03/2020

Author: Heath.Maconachie

Source & Notes:

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Vertebrate Fauna Habitats

Figure No: 1

2.2 Annual Monitoring

Remote camera monitoring will be undertaken annually for the first two years of operations, in line with the recommendations of the EPBC Act Referral Guidelines for the Endangered Northern Quoll (2016), which recommends monitoring to be undertaken annually for the first two years of operations and then once every three years after that for the life of the Project (DEE, 2016). Atlas Iron will undertake annual Northern Quoll Monitoring between April and September in line with relevant guidelines (Dunlop 2014, DEE 2016). The dates for survey will aim to be standardised each year to ensure consistency between sampling events.

Four monitoring locations close to the Project's disturbance footprint were selected based on habitat type and presence of Northern Quolls during baseline sampling (Figure 2.2). One site is located at each of the main mining areas: Sandtrax, Miralga East and Miralga West. Ten cameras will be established at each monitoring site over four nights. Each camera will be established on permanent mounting posts or similar, to ensure the same locations can be monitored each year and will be baited with a perforated piece of PVC pipe containing universal bait. This method has been successful in detecting Northern Quolls at other Atlas Iron sites where population densities are thought to be high.

The setup of the remote sensor cameras will be undertaken in accordance with the Department of Environment and Conservation (now Department of Biodiversity, Conservation and Attractions) Standard Operating Procedure – Remote operation of cameras (SOP No. 5.2) (April 2011).

Four control sites will be established in key habitats including denning and foraging/ dispersal habitat outside of potential impact areas to provide regional context to any observed declines at the potential impact sites.

The benefits for this type of monitoring are:

- Maximise the chance of detecting the species.
- Can be used to estimate population size.
- Positioned in habitat critical for the survival of the species.
- Monitor all representative habitat types.
- Less labour intensive, more practical for working in remote areas.
- Becoming the preferred form of monitoring.
- Detect other species present as well, which may pose a threat to the Northern Quoll (e.g. cats) and allow for further management measures to be implemented to protect the Northern Quoll.
- More effective at capturing shy wildlife.
- Monitor how many different species are in the area.
- Non-invasive.

Absence/ presence of Northern Quolls will be recorded using motion cameras across the four monitoring and four control sites. Cameras can also document patterns of movement and activity, and in certain circumstances individual Northern Quolls can be distinguished based on the timing of photos and the size and other physical characteristics of individuals captured (Hohnen et al. 2012). Population estimates will be completed based on the spot identification analysis, where possible, to determine population trends, as is currently being undertaken for

the Corunna Downs Project. A trigger for action/ investigation of no greater than 50% decline in activity levels across the four monitoring sites during two consecutive monitoring periods will allow for greater understanding of how the population is tracking and corrective actions can be considered prior to reaching the SSMP's KPI of "Absence of Northern Quoll at 50% of monitoring sites over two consecutive annual monitoring periods".

Photo points will also be established at each monitoring and control location to document any changes to the site over time, should information be required to investigate population fluctuations. Photos will be collected at the time of monitoring. The following parameters will be assessed and measured, where present:

- Vegetation cover, condition and species composition.
- The presence or absence of habitat structures.
- The presence or absence of water.
- Types of disturbance and levels of disturbance.

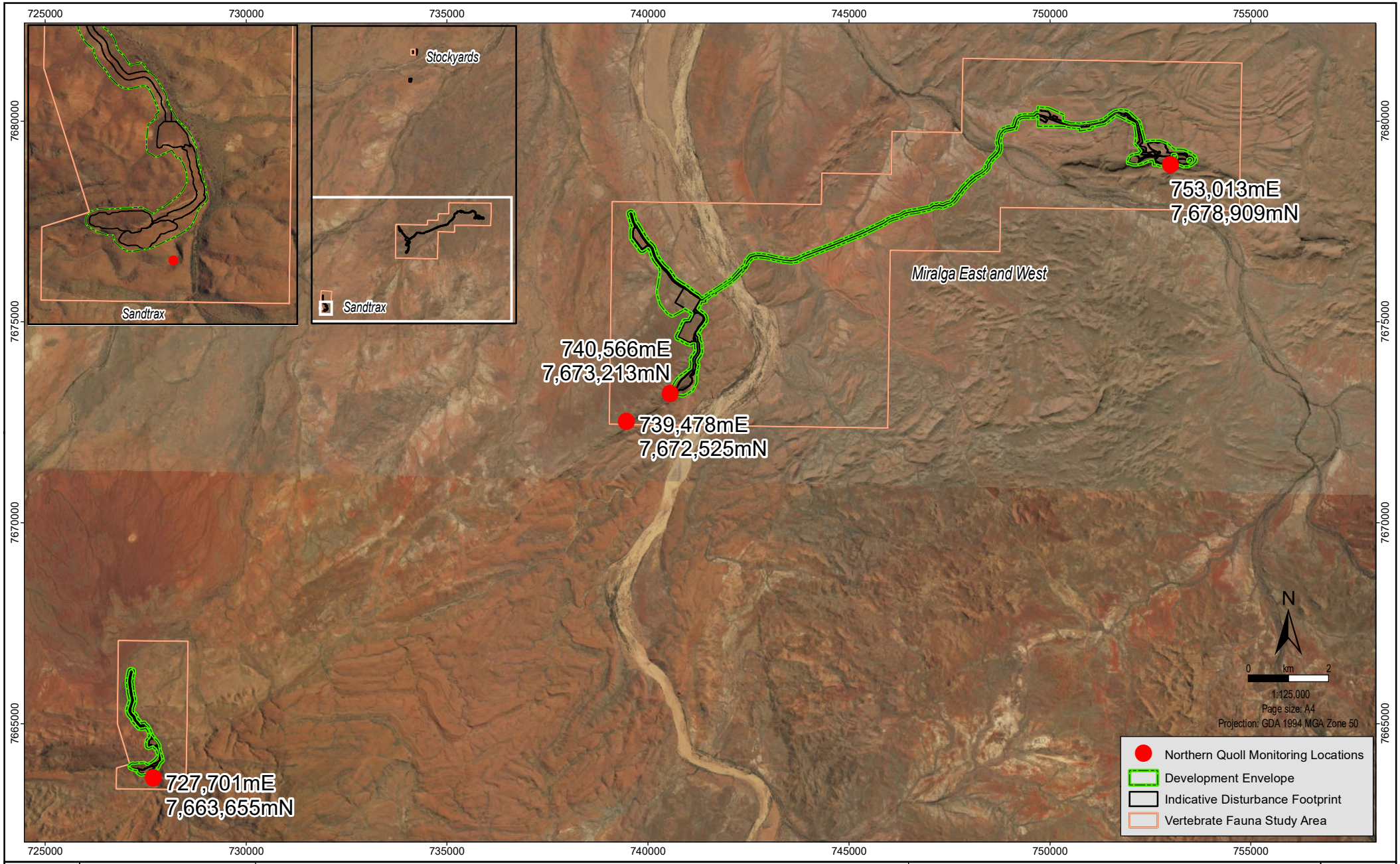
2.3 Opportunistic Monitoring

Opportunistic surveys will also be undertaken at each of the monitoring sites for two hours to obtain direct visual records of Northern Quolls, or indirect records such as bones, carcasses, tracks and scats. This will be undertaken annually, concurrent with camera monitoring. Any opportunistic observations of Northern Quolls will be documented. Other species of conservation significance will also be recorded, if observed.

Northern Quoll sightings (including scats and tracks), injuries and mortalities will be reported to the Site Environmental Advisor. All records will be entered into a site database (InControl) and summaries will be included in the Annual Environmental Report (AER).

2.4 Post-mining Monitoring

The four camera monitoring sites and four control sites established during operations will continue to be monitored at three yearly intervals once operations cease. This monitoring will record re-colonisation trends and rehabilitation effectiveness.



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	Date: 2/04/2020			
	Author: Heath.Maconachie			

3. Reporting

A standalone report at the conclusion of each annual monitoring period will be prepared. This report will include the following sections; methods, results, discussion and recommendations. This report will also be appended to Atlas Iron's AER.

4. Performance Criteria and Corrective Actions

Performance criteria for the Northern Quoll have been provided in the SSMP. Should this monitoring program indicate that these performance criteria are not being met; the relevant corrective actions will be implemented.

5. References

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Appendix D Ghost Bat Monitoring Program

Ghost Bat Monitoring Program

Miralga Creek DSO Project

180-LAH-EN-PLN-0003

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Ghost Bat Monitoring Program

The State and Federally listed Ghost Bat (*Macroderma gigas*) was recorded at various sites within the Study Area during the baseline studies for the Miralga Creek Project (Biologic 2020).

Biologic (2020) recorded the Ghost Bat across four habitats types in the Study Area:

- Major Drainage
- Hillcrest/ Hillslope
- Gorge/ Gully
- Stony Plain.

They are likely to occur in all six broad habitats in the Study Area as follows (Biologic, 2020):

- Low Stony Hills – foraging
- Stony Plain – foraging
- Sand Plain – primary foraging
- Major Drainage – foraging/ dispersal
- Hillcrest/ Hillslope – foraging/ roosting
- Gorge/ Gully – foraging/ roosting.

The species was recorded five times from direct observation (individuals observed at night and within or flushed from caves), ten times from ultrasonic call recordings and ten times from secondary evidence (scats), these observations were made at caves and standardised trapping sites (Biologic, 2020). Sixteen caves have been recorded in the Study Area, ten of which contained evidence of use by Ghost Bats.

Second only in importance to the Lalla Rookh roost site (which is outside of the Development Envelope), one cave complex at Miralga East was determined to be the key habitat feature for Ghost Bats in the local area (Bat Call WA, 2020). The focus of monitoring will be on that cave complex, specifically caves CMRC-13, -14 and -15.

1. Overview

This monitoring program aims to monitor the presence of Ghost Bats during and after the cessation of mining, monitor vibrational impacts and functional integrity of the cave complex which includes CMRC-13, -14 and -15 during the life of the Miralga Creek Project (the Project) and to ensure the effectiveness of Atlas Iron's management measures.

The program will also assist Atlas Iron to build on the knowledge of the species across its operations for future management planning and approvals.

This monitoring program will include:

- **Baseline population survey:** level 2 terrestrial fauna survey and a targeted survey of significant caves for the Ghost Bat populations within the Project area.
- **Annual monitoring:** The aim of this program is to assess bat activity levels within significant caves during the life of the Project. This will be supported by daily monitoring of vibration from mining activities.
- **Opportunistic monitoring:** The aim of this program is to provide additional data and information collected by site personnel to supplement the annual monitoring program, and to generate interest amongst site personnel in the protection of the Ghost Bat.
- **Post-mining monitoring**: The aim of this program is to demonstrate Ghost Bat use of the CMRC-13, -14, and -15 complex once mining has ceased.

2. Monitoring Method

Atlas Iron will undertake monitoring of Ghost Bat throughout the life of the Project. The various monitoring methods that have been and will be deployed to ensure the continued presence of these species within the Development Envelope and wider region are discussed below.

2.1 Baseline Population Survey

A desktop and two-phase Level 2 trapping survey was undertaken for terrestrial fauna in 2019 by Biologic (2020). The objective of the desktop study was to gather background information on the local region, to provide an indication of fauna species and habitats likely to be present, suitable survey methodology, and to provide a regional context to inform the analysis of field survey findings.

Six broad fauna habitat types were identified by Biologic (2020), in order of most common to least common:

- Low Stony Hills
- Stony Plain
- Sand Plain
- Major Drainage
- Hillcrest/ Hillslope
- Gorge/ Gully.

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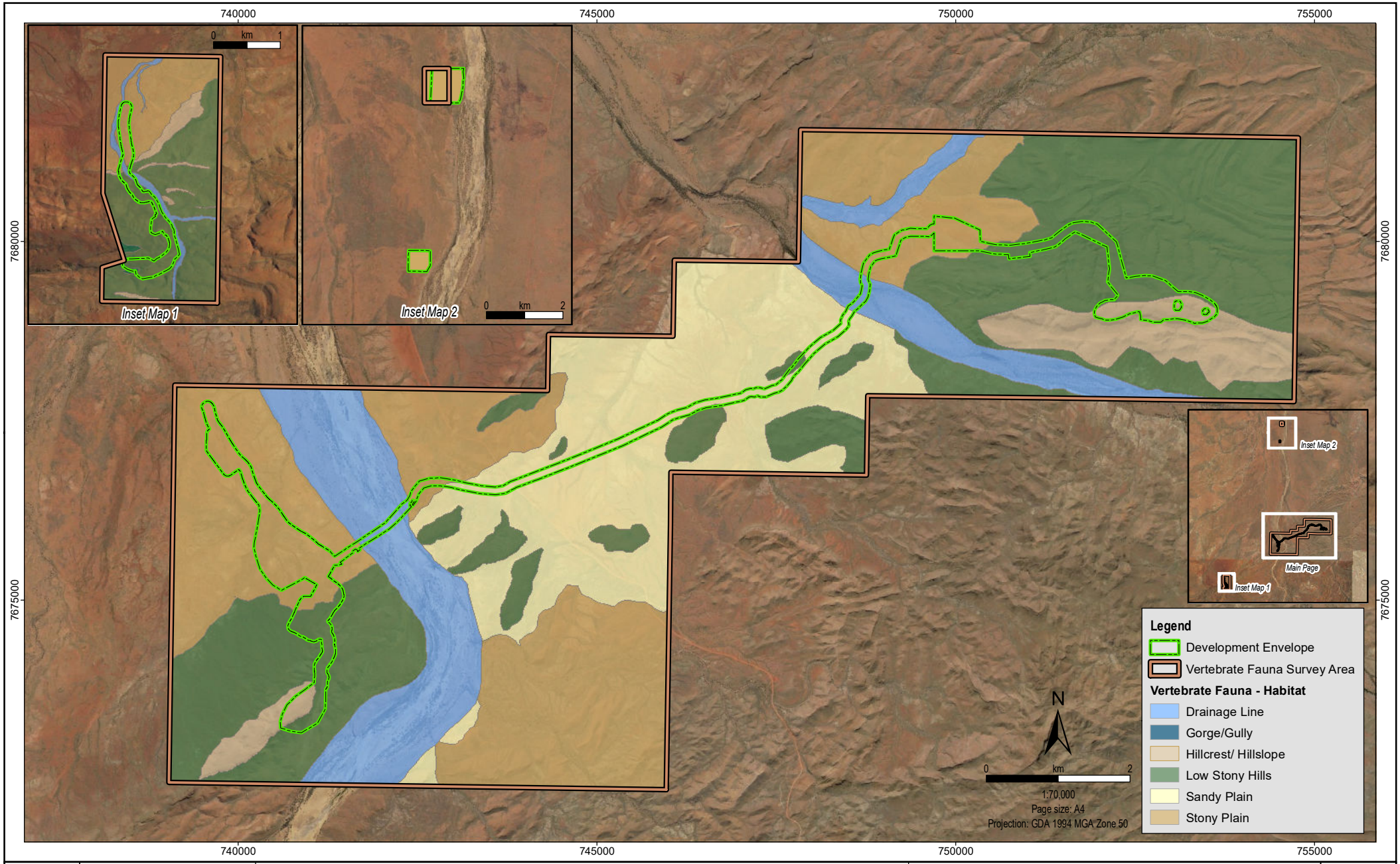
The complete baseline population monitoring results can be found in the Miralga Creek: Level 2 Terrestrial Fauna Assessment report (Biologic, 2020).



GIS_2800_GB_Fig2_1_VertFaunaHab.mxd	Source & Notes:	**Vertebrate Fauna Habitats**	Figure No: **1**
Date: 30/03/2020			
Author: Heath.Maconachie	*Disclaimer: This figure has been produced for internal review only and may contain inconsistencies or omissions. It is not intended for publication.*		

2.2 Blast Management and Monitoring

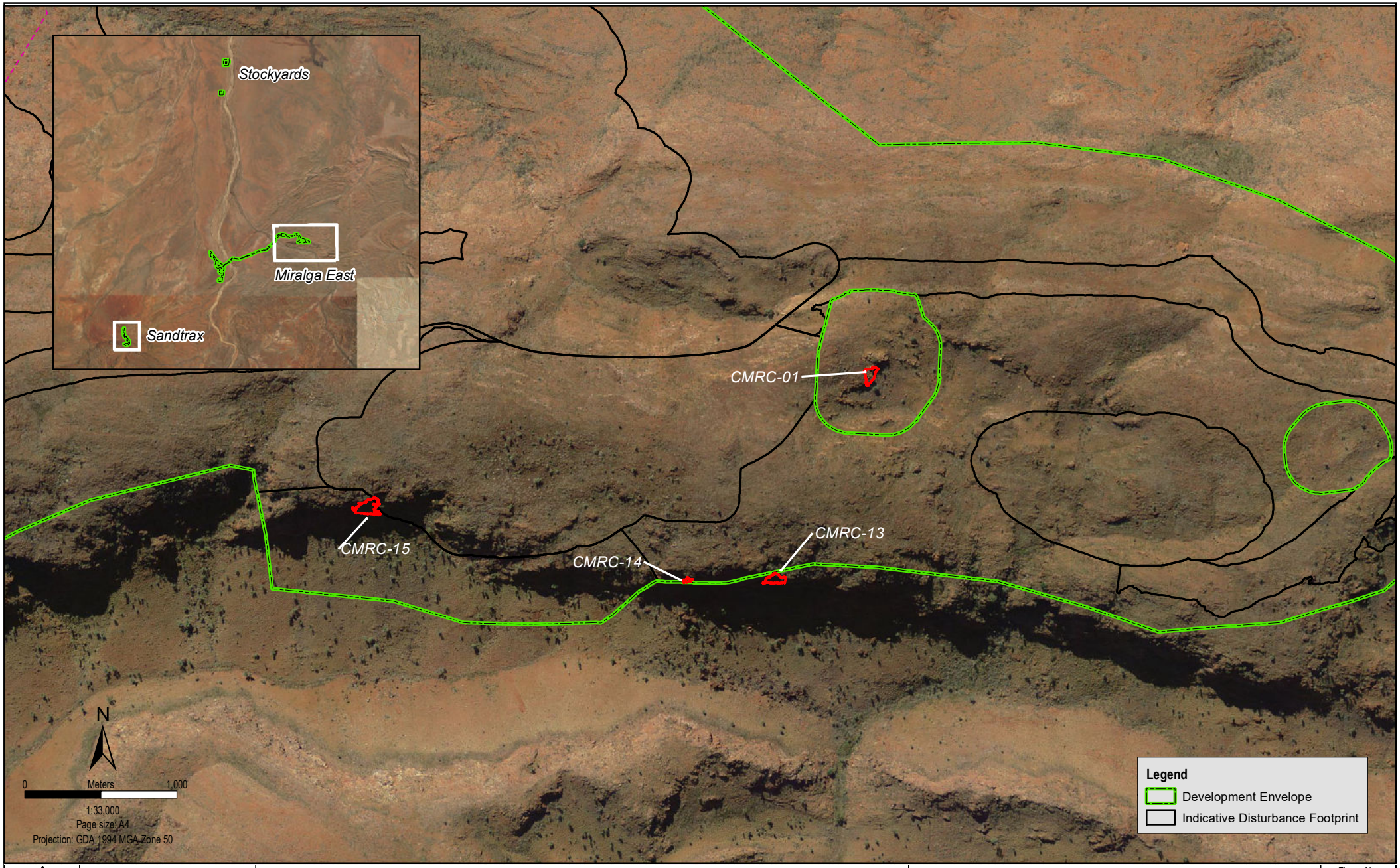
All personnel using and installing blast monitoring equipment, and the blast designers and shotfirers in charge, must have undertaken industry training for blast monitoring to ensure sufficient competency to undertake the requirements of this specific blasting scenario.

Management measures and monitoring were recommended by Blast It Global (2020) to validate predicted vibration and measure vibration received at caves. Atlas Iron will adopt the recommendations to ensure that blasting is carried out appropriately. Key measures include:

- Design blasts to perform to the blast criteria (i.e. limit to 100 mm/s but design to achieve <85 mm/s) using the reference values set out in Blast It Global (2020).
- Conduct a cave inspection[1] after each blast that exceeds 85 mm/s. If damage is noted conduct an investigation to determine the root cause for the exceedance. Re-establish controls and/ or lower blast vibration limits.
- Establish vibration monitors in (or close to) the nearest cave for all blasting at Miralga East pits 2 and 3.
- Avoid blasting within 100 m of a cave until the results of monitoring validate predictions with a reasonable degree of confidence.
- If vibration exceeds 100 mm/s, blasting should cease until the cause has been determined and steps to prevent a reoccurrence have been taken. A cave inspection is required to assess any impacts.
- Periodically inspect caves to confirm the vibration limits are fit for purpose (annually and in response to vibration exceeding 85 mm/s).
- Establish a Blast Exclusion Zone of 50 m around CMRC-13, -14 and -15 with radius 50 m.

Due to the difficulties of access to cave sites situated on the lower regions of the escarpment Blast It Global (2020) recommended that representative monitoring locations be installed on top of the escarpment. A permanent blast vibration monitoring block will be located as close to CMRC-13, -14 and -15 as possible (ideally within 10 m) and positioned between the cave and the proposed blasting locations. A surveyor must use the surveyed location of the cave void to determine the closest blast monitoring location to the cave in the event that the cave entrance is not an appropriate location for the monitoring block. The locations of caves at Miralga East are shown on Figure 2.

[1] The ability to inspect caves is limited at some times of year, see Appendix A for more details.



ATLAS	GIS_2801_GB_Fig2_2_BatCaveMonLocs.mxd		Figure No:
	Date: 2/04/2020	Source & Notes:	**Bat Caves at Miralga East** 2-2
	Author: Heath.Maconachie		

2.3 Management of Caves

Bat Call WA (2020) included a number of recommendations to support the persistence of Ghost Bat in the Miralga Creek/ Lalla Rookh area. Atlas Iron will:

- Avoid direct disturbance of all caves except the category 4 cave CMRC-02 at Miralga West.
- Establish suitable exclusion zones around all remaining caves to prevent direct disturbance from the Proposed Action.
- Restrict personnel from entering any category 2 or 3 cave, except for survey personnel in accordance with the protocol outlined in Appendix A.
- Monitor Ghost Bat usage of the category 2 caves CMRC-06 and -15 annually during operations and for one year following operations (Section 2.4 contains further details).
- Limit blasting vibrations at caves CMRC-13, -14 and -15 as per the recommendations of Blast It Global (2020), as detailed in Section 2.2.

2.4 Annual Monitoring

Monitoring of the Ghost Bat will be undertaken annually between April and September and consider the restrictions covered in Appendix A. The dates for the survey will aim to be standardised each year to enable consistency between sampling events and will often be aligned with the monitoring program for the Northern Quoll to maximise efficiencies.

Annual monitoring will occur at CMRC-06, -13, -14 and -15 as recommended by Blast It Global (2020) and Bat Call (2020).

A combination of monitoring techniques will be used, including scat counts and video census to provide a quick and effective method to identify any changes in fauna presence, noting that the primary management and monitoring tool for Ghost Bat at the Project is related to blast management.

Habitat assessments and photo monitoring points will also be established at all bat monitoring locations to document any changes to the habitat over time. The following parameters will be assessed and measured, where applicable:

- Presence of bats and/ or odours.
- Roost characteristics and condition (for example, rock falls, cracking etc.).
- Surrounding landscape, vegetation and presence of water.
- Noise and vibration levels (where mining activity comes within close proximity to any significant roosts). Monitoring of these parameters may occur separately to the scheduled annual monitoring program on an as needs basis.
- Presence and/ or the impact of any artificial light sources.
- Bat behaviour in response to noise, vibration and light emissions (on an as needs basis in line with the two points above).

2.5 Opportunistic Monitoring

During the activities on site it is possible to obtain direct visual records of Ghost Bats, or indirect records such as foraging debris, carcasses and scats. Any opportunistic observations of Ghost Bats will be documented.

Ghost Bat sightings (including scats), injuries and mortalities will be reported to the Miralga Creek Environmental Advisor. All records will be entered into a site database (InControl) and summaries will be included in the Annual Environmental Report (AER).

2.6 Post-mining Monitoring

Short-term abandonment is expected to occur at CMRC-15 roost cave (and caves CMRC-13 and -14) due to blasting-induced vibration and associated impacts. The caves will be monitored post-mining to measure and monitor the return of bats to the cave.

3. Reporting

A standalone report at the conclusion of each annual monitoring period will be prepared. This report will include the following sections: methods, results, discussion and recommendations. This report will also be appended to Atlas Iron's AER.

4. Performance Criteria and Corrective Actions

Performance criteria for the Ghost Bat have been provided in Section 6 in the SSMP. Should this monitoring program indicate that these performance criteria are not being met; the relevant corrective actions will be implemented.

5. References

Bat Call WA. (2020). Miralga Creek Review.

Biologic. (2020). Miralga Creek Level 2 Terrestrial Fauna and SRE Survey. Perth.

Blast It Global. (2020). Assessment of Blasting at Miralga Creek Project: Preservation of Ghost Bat Habitats Post Mining Activities.

Appendix A Cave Disturbance Guidelines

A conservative protocol is recommended to protect the reproducing females and their young during the most important part of their reproductive cycle. This covers the periods when:

- Gravid females are subject to premature birth due to either capture and handling or repeated flushing the bats from their diurnal roost caves.
- Females carrying newborns are subject to dropping them due to capture or disturbance.
- Non-volant young in nurseries are subject to abandonment due to repeated disturbance of the mothers.
- Newly volant young during the early adolescent period are subject to premature abandonment due to repeated disturbance of the mothers and/ or young.

For Ghost Bat category 1, category 2, and category 3 roost caves that are part of an important cave grouping, it is recommended that restrictions tighter than Governmental licencing limitations be enforced:

1. Successful survey sessions, i.e. when Ghost bats are captured or are present and disturbed, be limited to once per cave during August, September and January,
2. Multiple survey entries per cave are allowed in August, September and January. The surveys should be done by one ecologist working quietly to minimise stressing the bats present and hopefully not flushing them. If a Ghost bat(s) is disturbed and flushed, the caves and their entrance areas be vacated allow the bat(s) to return and settle. Restrictions per 1. above then apply.
3. No cave entries should be carried out from October to December inclusive. Damage assessments during blasting operations should be carried out from the entrance.
4. Survey entries in accordance with Governmental licencing limitations be allowed outside these periods.