

Lamb Creek Iron Ore Project

SUPPORTING DOCUMENT

Referral under Section 38 *Environmental Protection Act*
1986


Proponent: Process Mineral International, a wholly owned subsidiary of Mineral Resources Limited


EPA Assessment No.: TBA

Prepared by: Mineral Resources Limited

Date: 12/20/2024

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Acknowledgement of Country

MinRes is committed to reconciliation and recognises and respects the significance of Aboriginal and Torres Strait Islander peoples’ communities, cultures, and histories. MinRes acknowledge and respect Aboriginal and Torres Strait Islander peoples as the traditional custodians of the land.

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ABBREVIATIONS

Abbreviation	Term
ACHM	Australian Cultural Heritage Management
ACN	Australian Company Number
AEP	Annual exceedance probability
AH Act	<i>Aboriginal Heritage Act 1972</i>
AHIS	Aboriginal Heritage Inquiry System
ARR	Australian rainfall and runoff
ASS	Acid sulphate soil
AUL	Auxiliary left-turn treatment
AUR	Auxiliary right-turn treatment
BAL	Basic left-turn treatment
BIF	Banded iron formation
CHMP	Cultural Heritage Management Plan
CHR	Channelised right-turn treatment
CID	Channel iron deposit
CPI	Consumer Price Index
Cr	Critically Endangered
Critical Habitat	Habitat that is critical to the survival of MNES listed species
CSI	Crushing Services International
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DMAs	Decision-making Authorities
DEMIRS	Department of Energy, Mining, Industry Regulation and Safety
DPIRD	Department of Primary Industries and Regional Development
DGS Act	<i>Dangerous Goods Safety Act 2004</i>
DoT	Department of Transport
DSO	Direct Shipping Ore
DWER	Department of Water and Environmental Regulation
EPAS	Environmental Protection Authority Services

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Abbreviation	Term
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
EP Act	<i>Environmental Protection Act 1986</i>
EPA	Environmental Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FVMP	Flora and Vegetation Management Plan
GNH	Great Northern Highway
GWOS	Groundwater operating strategy
HV	Heavy Vehicle
IBRA	Interim Biogeographic Regionalisation of Australia
IFD	Intensity-Frequency-Duration
IRR	Impact Reconciliation Report
kVA	kilo-volt-ampere
kWh	kilowatt-hour
LV	Light Vehicle
Mbcm	Million bank cubic metres
mbgl	Meters below ground level
MCP	Mine Closure Plan
MHERC	MinRes Heritage Environment Reference Committee (Banjima People)
MinRes	Mineral Resources Limited
MNES	Matters of National Environmental Significance
Mtpa	million tonnes per annum
NPI	Non-process Infrastructure
NT Act	<i>Native Title Act 1993</i>
P	Priority
PAF	Potentially acid forming
PEC	Priority ecological community
PEOF	Pilbara Environmental Offsets Fund
PMP	Probable maximum precipitation

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Abbreviation	Term
PMP	Project Management Plan
POW	Programme of works
RAV	Restricted access vehicle
RIWI Act	<i>Rights in Water and Irrigation Act 1914</i>
RO	Reverse osmosis
RoM	Run of mine
RSD	Referral Supporting Document
DSEWPC	Department of Sustainability, Water, Populations and Community
SFMP	Significant Fauna Management Plan
SWL	Standing Water Level
SWMP	Surface Water Management Plan
T	Threatened
TEC	Threatened ecological community
vph	Vehicles per hour
WA	Western Australia
WAH	Western Australian Herbarium
WAPC	Western Australian Planning Commission
WRL	Waste rock landform
WWTP	Wastewater treatment plant

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EXECUTIVE SUMMARY

Introduction, Background and Context

Process Minerals International (PMI; the Proponent), a wholly owned subsidiary of Mineral Resources Limited (MinRes) (ACN 118 549 910), proposes to develop the Lamb Creek Iron Ore Project (the Proposal). The Proposal is located approximately 130 kilometres (km) northwest of Newman via the Great Northern Highway (**Figure ES 1**), in the East Pilbara Local Government Authority (LGA) in Western Australia (WA).

The Proposal is being referred under s. 38 of the *Environmental Protection Act 1986* (EP Act) as it has the potential to significantly affect key environmental factors, defined by the WA Environmental Protection Authority (EPA) in its *Statement of environmental principles, factors, objectives and aims of EIA (EPA 2023c)*. The purpose of this Referral Supporting Document (RSD) is to present sufficient information on the Proposal and its effects on the environment for assessment under Part IV of the EP Act.

The potential impacts to key environmental factors are described in detail and assessed based on the findings from environmental studies specific to the Proposal. Impacts from all phases of the Proposal are considered, including construction, commissioning, operations, and closure. Cumulative impacts with other projects are also addressed.

This RSD was prepared in accordance with *Referral of a proposal under section 38 of the Environmental Protection Act 1986: Instructions* (EPA 2021c) and *How to prepare an Environmental Review Document: Instructions* (EPA 2021a)

Overview of the Proposal

The Proposal is a greenfield site, located approximately 130 km northwest of Newman. No mining infrastructure currently exists within the Proposal Area. The Proposal is largely situated on Juna Downs pastoral lease (LPL N050471), and the current land use is pastoral. An overview of the Proposal content is provided in **Table ES-1**. The Proposal will be implemented within a Development Envelope of 860.9 ha (**Figure ES 2**). **Table ES-2** outlines the extent of Proposal elements that have the potential to significantly affect the environment.

TABLE ES-1: GENERAL DESCRIPTION OF THE PROPOSAL

Proposal Title	Lamb Creek Iron Ore Project
Proponent Name	Process Minerals International (PMI) a wholly owned subsidiary of Mineral Resources Limited (MinRes) (ACN 118 549 910)
Short Description	<p>Open pit iron ore mine located approximately 130 km northwest of Newman (Figure ES 1) to produce up to 10 million tonnes per annum (Mtpa) of crushed and screened iron ore over an anticipated period of three to five years. The Proposal comprises a multi-stage crushing and screening (two or three stages) process plant and associated mine infrastructure including, but not limited to, site offices, maintenance and equipment service area, water pipelines, fuel storage, power generation, telecommunications and an accommodation village for site personnel. The total disturbance footprint of the proposal is 638.4 ha (Indicative Footprint), within a Development Envelope of 860.9 ha (Figure ES 2).</p> <p>Iron ore product will be loaded onto road trains and transported 16 km on a dedicated private haul road to its intersection with Great Northern Highway (GNH), where it will be transported 320 km to ship load-out facilities at the Utah Point berth in Port Hedland.</p>

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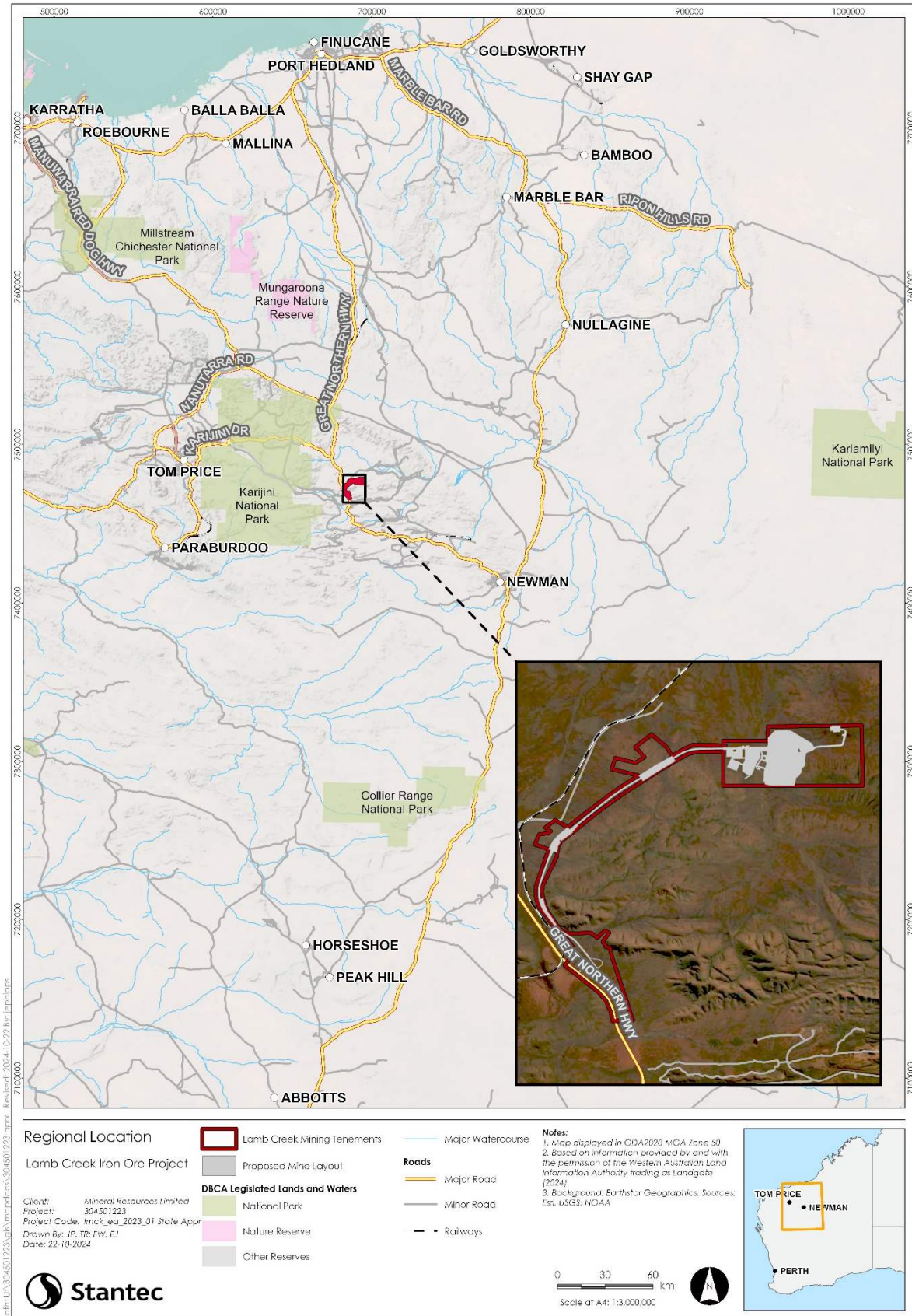


FIGURE ES 1: REGIONAL LOCATION OF THE PROPOSAL

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TABLE ES-2: PROPOSAL ELEMENTS THAT HAVE THE POTENTIAL TO SIGNIFICANTLY AFFECT THE ENVIRONMENT

Proposal Element	Location	Maximum Extent, Capacity or Range
Physical Elements		
Development Envelope	Figure ES 2	860.9 ha
Indicative Footprint	Figure ES 2	638.4 ha
<p>Mining and processing elements including, but not limited to:</p> <ul style="list-style-type: none"> • Open pit • Internal haul roads • Run of mine (RoM) pad • Waste rock landforms (WRLs) • Processing facilities • Water storage dam • Laydown/hardstands • Ore stockpiles • Topsoil stockpiles. <p>Infrastructure elements including, but not limited to:</p> <ul style="list-style-type: none"> • Accommodation camp • Light vehicle roads • Workshops • Power supply infrastructure • Fuel/hydrocarbon storage • Potable water storage • Waste disposal • Sewage treatment and disposal. 	Figure ES 2	Clearing of no more than 638.4 ha of the Indicative Footprint within the 860.9 ha Development Envelope
Transport corridor, including borrow areas along the road alignment	Figure ES 2	Mine site to Great Northern Highway along a 16 km haul road; clearing of no more than 168 ha within the Indicative Footprint
Operational Elements		
Pit dewatering	Figure ES 2	Pit dewatering via production bores and in-pit sumps; estimated flow rates to vary during pit development from 17 L/s to 58 L/s with water to be used on site
Groundwater abstraction	Figure ES 2	Preliminary estimated water requirement of up to 950 ML/yr to be obtained from production bores and in-pit sumps for use on site
Waste disposal	Figure ES 2	Non-hazardous waste (estimated maximum of 2,500 tpa) and hazardous wastes to be transported for off-site disposal / treatment at licensed premises.
Power supply	Figure ES 2	Average demand of 1,880 kW, peaking at 3,460 kW; on-site generation with built-in redundancy (multiple units on operating or standby duty)
Greenhouse Gas Emissions		
Peak annual		
Scope 1	Total greenhouse gas emissions for Year 2: 230,935 tCO ₂ -e/yr	
Scope 2	None, all electricity generated on-site and is accounted for in Scope 1	

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Scope 3	Total greenhouse gas emissions for Year 4: 11,114,740 tCO ₂ -e/yr
Annual average life of mine	
Scope 1	Annual greenhouse gas emissions for Year 1: 103,615 tCO ₂ -e/yr
	Average annual greenhouse gas emissions for Year 2-5: 186,987 tCO ₂ -e/yr
Scope 2	None, all electricity generated on-site and is accounted for in Scope 1
Scope 3	Annual greenhouse gas emissions for Year 1: 2,215,024 tCO ₂ -e/yr
	Average annual greenhouse gas emissions for Year 2-5: 9,741,013 tCO ₂ -e/yr
Total Proposal emissions Scope 1 (based on annual emissions) – 1 year construction, 4-year life of mine	
851,654 tCO ₂ -e	
Commissioning	
<p>The forecast key milestones for construction and commissioning are:</p> <ul style="list-style-type: none"> • Construction Q3 2025 to Q1 2026. • Commence commissioning Q4 2025 to Q1 2026. • Commence operation from Q1 2026 to Q2 2026. <p>Construction and commissioning will be sequenced as per the following stages:</p> <ul style="list-style-type: none"> • Stage 1 – construction verification. • Stage 2 – pre commissioning or functional testing. • Stage 3 – no load commissioning. • Stage 4 – load commissioning. • Stage 5 – performance verification. 	
Rehabilitation	
<p>The Proponent will implement a Mine Closure Plan (MCP) in accordance with <i>Mine Closure Plan Guidance – How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans (DMIRS 2020)</i>. Progressive rehabilitation will be undertaken over the life of the mine, with progressive backfilling of the pit occurring during all four stages of pit development, to at least 5 m above the pre-mining water table. Areas disturbed through implementation of the Proposal will be designed to be safe and non-polluting and constructed so that final shape, size, stability and ability to support local native vegetation are comparable to natural landforms in the area.</p>	
Decommissioning	
<p>The Proposal is largely situated on the Juna Downs pastoral lease (LPL N050471). When operation ceases it is expected that the Proposal land will return to pastoral activities and Traditional Owner use. Some domains will require additional closure management in the short term or permanently to ensure the end land use can be safely and effectively achieved. Immediately following decommissioning, land use will be “mine site rehabilitation” until ecosystems have demonstrated sufficient resilience and satisfy closure objectives and completion criteria. Rehabilitated WRLs and the partially backfilled open pit will be permanent landscape features; however, the size and location of the final landforms may be altered, subject to the nature and extent of future mining campaigns.</p>	
Other elements which affect extent of environmental effects	
Proposal time	Approximately 3 to 5 years
Construction phase	Approximately 6 to 12 months (including early works and construction from overlapping approvals)
Commissioning phase (including commissioning and commencement of mining)	Commissioning – approximately 3 months
	Commencement of mining – approximately 3 months
Operation phase	Up to 365 operation days per year over 3 to 5 years; up to 24 hours per day

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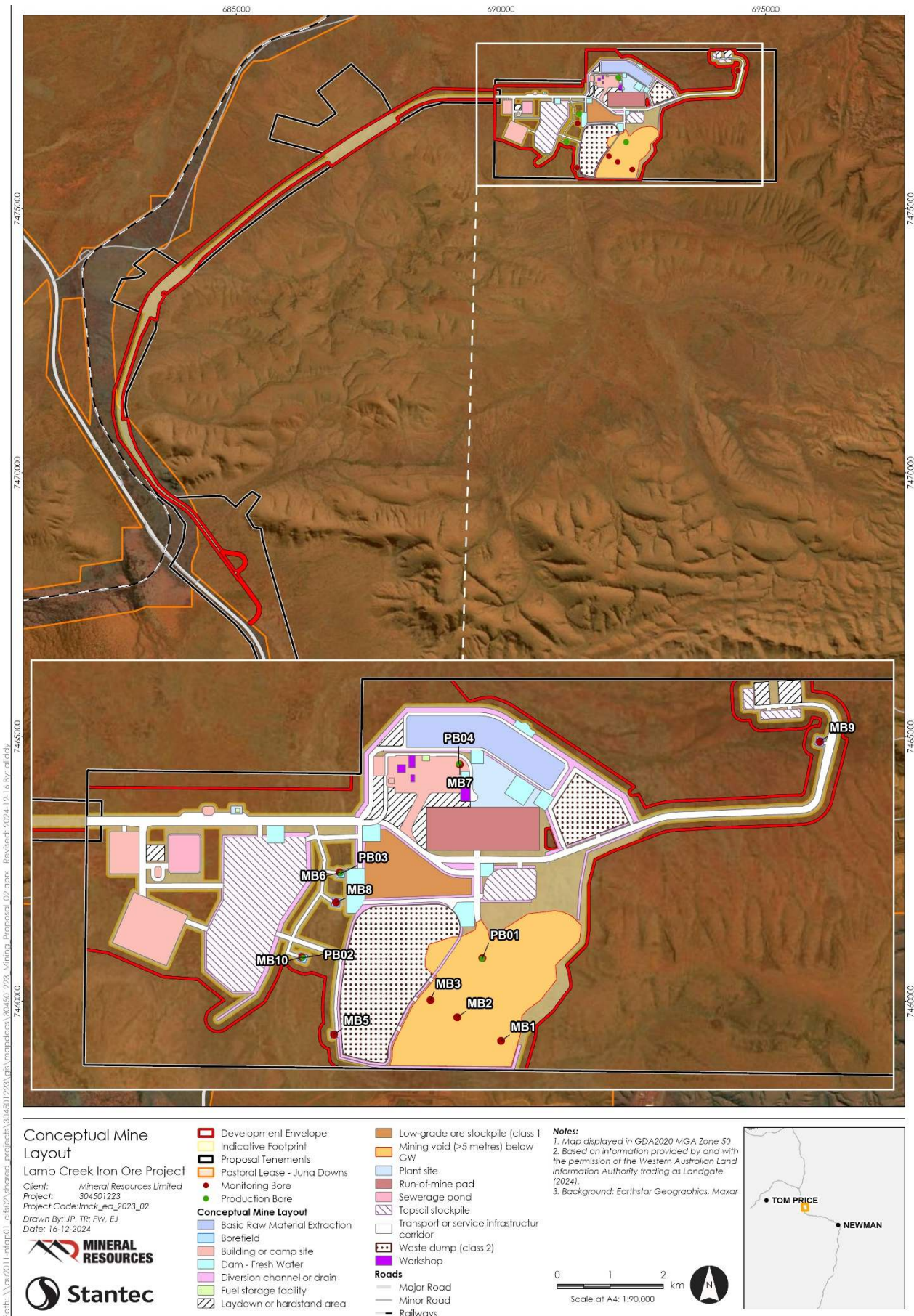


FIGURE ES 2: CONCEPTUAL MINE LAYOUT AND DEVELOPMENT ENVELOPE

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Flora and Vegetation

Recent flora and vegetation surveys undertaken by Umwelt (2022a) have identified 328 vascular flora taxa from 45 different families from within the Flora and Vegetation Survey Area. Of these, seven taxa are listed under the *Biodiversity Conservation Act, 2016* (BC Act). These include:

- *Aristida lazaridis* (P2)
- *Aristida jerichoensis* var. *subspinulifera* (P3)
- *Eremophila naaykensis* (P3)
- *Eremophila naaykensis* (P3)
- *Hibiscus* sp. Gurinbidy Range (M.E. Trudgen MET 15708) (P2)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- *Rostellularia adscendens* var. *latiflora* (P3).

Two additional taxa *Euphorbia ferdinandi* s. lat. and *Corchorus* sp. were recorded and are considered to be a taxon of 'other significance' and are potentially undescribed. All significant flora taxa recorded within the Flora and Vegetation Survey Area also occur within the broader Hamersley subregion.

No priority ecological communities (PECs), threatened ecological communities (TECs) or groundwater-dependent vegetation were identified within the Flora and Vegetation Survey Area. The nearest PEC to the Flora and Vegetation Survey Area is a subtype of the "Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara". The edge of the PEC's buffer zone is located approximately 5 km south of the Flora and Vegetation Survey Area. Vegetation types SP01, CLP01, CLP02 and CLP03 are considered locally significant as they support *Aristida lazaridis* (P2).

The Proposal will result in the clearing of 638.4 ha of native vegetation from within the Hamersley (PIL3) subregion of the Pilbara region, within 9 of the 10 identified vegetation types. This includes the loss of 55 individuals (0.8%) of the recorded local population of *Aristida Lazaridis* (P2), and five individuals (8.8%) of the recorded *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) population. Residual impacts from the Proposal, after the implementation of the mitigation hierarchy, comprise clearing up to 638.4 ha of native vegetation in 'Good to Excellent' condition in the Hamersley subregion.

The proposed removal of 638.4 ha of native vegetation by itself is not considered to be a significant residual impact. However, the EPA has highlighted that native vegetation clearing is likely to require an environmental offset in accordance with *Cumulative environmental impacts of development in the Pilbara region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the Environmental Protection Act 1986* (EPA 2014). Therefore, the Proponent proposes offsets, whereby financial contributions will be made to the Pilbara Environmental Offset Fund (PEOF) to offset the clearing of native vegetation. The final offset amount will be based on extents of actual clearing undertaken, which will be determined through an Impact Reconciliation Procedure (IRP) and Impact Reconciliation Report (IRR) that will be developed in consultation with relevant agencies. The intended construction timeframe is less than one year, so it is intended that the first and final offset amount will be calculated within three months of completion of construction.

The Proponent considers the Proposal will meet the EPA's objectives for the Flora and Vegetation factor.

Terrestrial Fauna

The most recent survey undertaken by Rapallo (2022b) recorded 128 vertebrate fauna, including 20 mammal species, 44 reptiles and one frog. Combined with the 2012 fauna survey undertaken by Rapallo (2012b), the total number of vertebrate fauna recorded in and around the Lamb Creek Proposal Area is 185 species. A total of 31 terrestrial vertebrate fauna species of significance with the potential to occur within the Terrestrial Fauna Survey Area were recorded in the desktop assessment, comprising eight mammal, five reptile and 18 bird species. Five species of vertebrate fauna listed as conservation significant under either the Western Australian *Biodiversity Conservation Act 2016* (BC Act) and/or the federal *Environment Protection and Biodiversity Conservation Act 1950* (EPBC Act) or ranked as a priority species by the Department of Biodiversity Conservation and Attractions (DBCA) have been recorded from or proximal to the Lamb Creek Development Envelope to date. These are listed below:

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- Northern Quoll (*Dasyurus hallucatus*) listed Endangered under both the EPBC Act and BC Act – Confirmed, recorded in the broader survey area in 2012.
- Ghost Bat (*Macroderma gigas*) listed Vulnerable under both the EPBC Act and the BC Act – Confirmed, recorded in the broader survey area in 2012, 2020 and 2021.
- Western Pebble-mound Mouse (*Pseudomys chapmani*) DBCA Priority 4 – Confirmed, mounds recorded within the Lamb Creek Development Envelope and throughout the broader survey area in 2012 and 2020.
- Fork-tailed Swift (*Apus pacificus*) listed migratory and marine under the EPBC Act – Confirmed, recorded within the Development Envelope in 2012.
- Pilbara Olive Python (*Liasis olivaceus barroni*) listed Vulnerable under both the EPBC Act and the BC Act – Confirmed, recorded within the broader fauna survey area in 2012.

A further four species of conservation significance were considered likely to occur within the 2022 Fauna Survey Area, these were:

- Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*) listed Vulnerable under both the EPBC Act and the BC Act.
- Peregrine Falcon (*Falco peregrinus*) listed Other Specially Protected Fauna under the BC Act.
- Gane's Blind Snake (*Anilius ganei*) DBCA Priority 1.
- Pilbara Barking Gecko (*Underwoodisaurus seorsus*) DBCA Priority 2.

Impacts to terrestrial fauna associated with the Proposed Action will be mitigated and managed through the implementation of the Significant Fauna Management Plan (SFMP) to ensure that potential impacts to terrestrial fauna are managed to an acceptable level. Significant residual impacts from loss of habitat considered critical and/or supporting habitat for listed threatened fauna species resulting from construction of the Proposal are proposed to be offset for the entire Indicative Footprint (638.4 ha). Significant residual impacts are predicted to be:

- Northern Quoll: 44.2 ha critical habitat, 125.6 ha supporting habitat
- Ghost Bat: 638.4 ha supporting habitat
- Pilbara Olive Python: 118.7 ha supporting habitat.

The actual offset amounts will be calculated based on extents of actual clearing undertaken, which will be determined through an IRP and IRR, to be developed in consultation with relevant agencies.

The Proponent considers the Proposal will meet the EPA's objectives for the Terrestrial Fauna factor.

Subterranean Fauna

Surveys have collected a total of 250 specimens of stygofauna from the Subterranean Fauna Survey Area, comprising at least 13 taxa from eight families, with amphipods the most abundant and widespread group, followed by oligochaete worms from the family Phreodrilidae and the copepod *Diacyclops humphreysi* s.l., which is widespread throughout the Pilbara. Most taxa occurred at low abundances and two taxa were represented by a singleton specimen. Two taxa are currently known only from surveys within the Subterranean Fauna Survey Area, adjacent to the proposed pit (<1.2 km); the syncarid *Brevismobathynella* 'BSY222' and the harpacticoid copepod *Parastenocaris* sp. B25.

A total of 137 specimens of troglifauna have been collected from the Subterranean Fauna Survey Area, comprising at least 27 taxa from 13 orders. A total of 16 taxa have been recorded from the proposed pit, although a number of these are understood to have a wider distribution within the Pilbara bioregion. Insects were numerically dominant, and arachnids were also relatively common. However, most taxa occurred at low abundances and 12 taxa were represented by a singleton specimen. Four taxa are currently known only from the proposed pit within the Indicative Footprint; *Draculoides* 'BSC026', *Noticola* sp. B31, *Trinemura* sp. B25 and *Zuphiini* sp.

The troglifauna taxa known only from the proposed pit, and the stygofauna species within the modelled drawdown area of the Proposal, are most likely restricted due to a lack of sampling intensity and limited availability of drill holes, rather than an accurate representation of the ranges of the taxa. Sampling was affected by a higher number of suitable drill holes located within the deposit boundaries in comparison to

regional reference areas (i.e. bias towards mineralised deposits), underestimating the true range of most species, and limited access to older bores for repeated sampling.

Furthermore, given the extent of other primary (nearby surficial detritals comprising alluvium, colluvium and calcrete deposits) and secondary habits (fractured and weathered lower members of the BIF), it would be reasonable to expect that stygofauna, if present, would be well represented outside of the Subterranean Fauna Survey Area across the region (where connectivity allows for dispersal of stygofauna).

Studies concluded that the most likely suitable geological unit for troglofauna habitat (Dales Gorge D4 sub-member), present within the proposed pit, also extends outside the pit. These sub-members have been modelled based on drill hole data and do not represent isolated troglofauna habitat. Therefore, it is likely that the troglofauna found only within the proposed pit to date would also be present outside the proposed pit given that there is no clear evidence of a geological barrier between the various suitable habitat layers inside and outside the proposed pit.

The Proponent considers the Proposal will meet the EPA's objectives for the Subterranean Fauna factor.

Inland Waters

The Proposal will not have any significant residual impact on any permanent or semi-permanent pools or other water bodies. Drainage in the area is ephemeral and occurs as a result of substantial rainfall events. The Proposal Area will require some diversion features to be constructed; however, these will have negligible impact on surface water flows or quality within the Indicative Footprint. Any changes to potential flood water levels will be confined to within 500 m downstream of the diversion features and contamination will be prevented through on-site management of water flows and bunding where required. Water from dewatering of the ore body (production bores, in-pit sumps) will be transported via pipelines to a large raw water storage dam, where it will supply site water demand. It is expected that site water demand is equal to, or greater than, the dewatering rate and as such, discharge of excess dewatered water to the environment will not be required. Surface runoff from disturbed areas will be managed through diversion drains/bunds and contained within sediment ponds. In rare instances, during large rainfall events, surface runoff may need to be discharged to the environment from dedicated control points after passing through one or more sediment ponds.

The Proponent considers the Proposal will meet the EPA's objectives for the Inland Waters factor.

Social Surroundings

The Proposal lies within the Banjima Native Title Determination Area (WCD2014/001; WAD6096/1998), and the Proponent has a strong relationship with the Traditional Owners. Comprehensive heritage investigations have been undertaken, in cooperation with the Banjima People. A total of 27 heritage places have been identified within the project tenure. A number of sites recorded are lodged under the *Aboriginal Heritage Act 1972* (AH Act). The project development envelope and infrastructure footprint avoids all DPLH Lodged Places and Registered Sites.

A significant ethnographic place, Gaguna (DPLH Lodged Place 30213), is situated in proximity to the Proposal. The Development Envelope avoids this and other known Places, and the Proponent is committed to ensuring the cultural values of Aboriginal Places and Sites are protected. Impacts on amenity for the general public from increased traffic, and the generation of visual, noise, dust, or odour impacts from the Proposal, are considered insignificant due to the remote location and the lack of sensitive receptors such as residential areas. During consultation with the Traditional Owners (as below), concerns over visual amenity related to the upper pit wall and waste rock and topsoil landforms were raised. These issues were discussed through the (ongoing) consultation process and are addressed in the Mine Closure Plan.

The Proponent has undertaken detailed engagement and consultation with the Banjima Native Title Aboriginal Corporation (BNTAC), the Prescribed Body Corporate holding native title rights and interests on trust for the Banjima People and nominated Traditional Owners. This consultation resulted in the establishment of a Mineral Resources Heritage Environment Reference Committee (MHERC), led by nominated members of the Banjima People, and has considered the impact of the proposed Lamb Creek

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Project on important heritage values including Social Surrounds. Specific Social Surrounds consultation with the MHERC and BNTAC has been conducted including on-Country discussions and inspections of the site. Through these engagements the Proponent has been able to identify values that may be present within the development envelope, understand if and how these values may be impacted, and implement measures to avoid, minimise or offset impacts, as guided by the Banjima Traditional Owners.

The Proponent considers the Proposal will meet the EPA's objectives for the Social Surroundings factor.

Impacts, Mitigation and Outcomes

The Proponent has undertaken a comprehensive assessment of potential impacts to key environmental factors, applying an iterative process in the design and layout of the Project components as follows:

- Definition of the Proposal's elements (physical, construction, operational and contribution to greenhouse gas emissions).
- Assessment in accordance with applicable EPA guidance.
- Peer review and advice from leading practitioners.
- Application of the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) and consideration of outcomes (specifically around alterations of the Indicative Footprint and design options).

Table ES 3 summarises the key and other environmental factors that have been identified for the Proposal. The remaining environmental factors are not relevant to the Proposal. A summary of potential impacts, mitigation and outcomes for each of the key environmental factors is included in **Table ES 4** to **Table ES 8**.

The RSD demonstrates that potential impacts associated with construction and operation of the Proposal can be mitigated to acceptable levels; therefore, will meet the EPA's environmental objectives for each key environmental factor.

TABLE ES 3: PRELIMINARY AND OTHER ENVIRONMENTAL FACTORS IDENTIFIED FOR THE PROPOSAL

Theme	Preliminary Key Factor	Other Factor
Land	Flora and Vegetation Terrestrial Fauna Subterranean Fauna	Landforms Terrestrial Environmental Quality
Water	Inland Waters	-
Air	-	Air Quality Greenhouse Gas Emissions
People	Social Surroundings	Human Health

TABLE ES 4: FLORA AND VEGETATION

Key Environmental Factor – Flora and Vegetation	
EPA Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Potential Impacts	<p>Direct:</p> <ul style="list-style-type: none"> • Loss of native vegetation as a result of clearing. • Loss of significant flora as a result of clearing. <p>Indirect:</p> <ul style="list-style-type: none"> • Fragmentation of vegetation. • Introduction and / or spread of introduced flora species. • Degradation or alteration of vegetation as a result of altered fire regimes. • Degradation or alteration of vegetation as a result of altered hydrological regimes. • Degradation of vegetation through dust deposition.
EPA Mitigation Hierarchy	<p>Avoid:</p> <ul style="list-style-type: none"> • Proposed clearing has been minimised as far as practicable to reduce the extent of disturbance required; the Proponent has revised the Development Envelope from 1,399 ha to 860.9 ha. • A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. • The area to be cleared shall be clearly demarcated and machinery operators made aware of the operational boundary, following confirmation with the relevant manager. Some heavy equipment used may have in-cab GPS mapping and alarm functions, however in the absence of this functionality, other control measures such as the use of spotters, pegging of boundaries, and/or restricting clearing to the daylight hours will be undertaken. • Where significant flora taxa populations cannot be avoided, as may be the case with <i>Aristida lazaridis</i> (P2) and <i>Rhagodia</i> sp. Hamersley (P3), infrastructure should be placed to avoid the highest densities, ensuring surface water flow is maintained. • Significant flora populations and the area to be cleared shall be clearly demarcated and machinery operators made aware of the operational boundary, following confirmation with the relevant manager. • Off-road driving shall be prohibited unless authorised by management. • Avoid hot work in fire sensitive areas and during fire risk day. • Haul road and Development Envelope design shall consider surface water flow to minimise obstruction to seasonal overland water flow to the loamy drainage flats proximal to the GNH that contain the Priority species <i>Aristida lazaridis</i> and <i>Rhagodia</i> sp. Hamersley and other significant taxa with the potential to occur.

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Key Environmental Factor – Flora and Vegetation

- Intersection of the haul road with GNH, and remainder of the access road up to the operational area within M47/1592, will be sealed to reduce the generation of dust.
- Road haulage iron ore loads will be covered.
- Ground clearing (including topsoil stripping) shall not be undertaken during periods of high wind (unless soil moisture levels are also high, inhibiting dust formation).

Minimise:

- Spatially restricted Indicative Footprint and short life of mine.
- Implement the Flora and Vegetation Management Plan (FVMP – **Appendix B**).
- Clearing awareness training undertaken by all personnel involved in clearing activities.
- Vegetation clearing shall be kept to the minimum amount required, as far as practicable.
- A Weed Management Plan shall be prepared and implemented as part of the FVMP, prior to construction and operation, to control access and movement of vehicles and construction personnel to prevent the introduction and spread of weeds into the Development Envelop, weed free areas, and between work areas.
- In accordance with the MinRes Weed Hygiene and Control Procedure (MRL-EN-PRO-007), vehicles with ground engaging equipment to be cleaned, inspected and issued with a Weed Hygiene Certificate prior to entry to site or moving between areas on-site.
- Vehicles and equipment shall be restricted to designated roads and tracks.
- Weed awareness and weed hygiene training shall be delivered to all personnel as part of the site induction process.
- Regular inspection and maintenance of vehicles and equipment shall be undertaken (fire and spill prevention).
- Fire management and firefighting training shall be delivered to all personnel as part of the induction process.
- Firebreaks will be incorporated into mine layout planning in accordance with the local government firebreak notice under s. 33 of the *Bush Fires Act 1954*.
- Smoking will only be permitted in designated areas, which shall be appropriately signed and contain self-arresting cigarette butt disposal containers.
- An Emergency Response Plan shall be prepared and implemented.
- An Emergency Response Team shall be formed in accordance with requirements as discussed with DEMIRS.
- The Emergency Response Team will ensure that sufficient operational fire suppression equipment is located as per the Emergency Response Plan.
- Hot Work Permits and a Traffic Management Plan shall be prepared and implemented.
- All vehicles and machinery will be fitted with fire extinguishers and/or in-plant fixed water suppression.
- Fire extinguishers will be located at infrastructure/building facilities across the project.

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Key Environmental Factor – Flora and Vegetation	
	<ul style="list-style-type: none"> Implement surface and groundwater management strategies in accordance with the Surface Water Management Plan (SWMP) and the Groundwater Operating Strategy (GWOS). Dust suppression shall be implemented to manage dust emission on cleared areas and iron ore handling areas. Speed limits shall apply on unsealed roads. <p>Rehabilitate:</p> <ul style="list-style-type: none"> Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP, particularly following the occurrence of fire. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. Seasonal weed control programs shall be implemented, including herbicide spraying or physical removal, as required. Weeds which are physically removed will be disposed of at the waste rock landform and buried, or buried within pit backfill. Drainage management structures shall remain post closure and shall meet recognised Australian drainage design specifications. The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level.
Assessment and Significance of Residual Impacts	<ul style="list-style-type: none"> Following the application of the EPA’s mitigation hierarchy, the Proponent considers that there will be no significant residual impacts on flora and vegetation. Although the clearing of native vegetation in Good to Excellent condition is not considered to be a significant residual impact, the EPA has highlighted that native vegetation clearing is likely to require an environmental offset in accordance with <i>Cumulative environmental impacts of development in the Pilbara region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the Environmental Protection Act 1986</i> (EPA 2014).
Environmental Outcomes	<p>The environmental outcomes for flora and vegetation are:</p> <ul style="list-style-type: none"> Total clearing of 638.4 ha of native vegetation within the Pilbara bioregion within 9 of the 10 identified vegetation types. This equates to clearing of 16.9% of the vegetation within the Flora and Vegetation Survey Area, ranging from less than 1% up to 24% of clearing of individual vegetation types within the Flora and Vegetation Survey Area. No PECs, TECs or groundwater dependent vegetation were recorded within the Flora and Vegetation Survey Area. Loss of 58 individuals (0.8%) of the recorded local population of <i>Aristida lazardis</i>, and three individuals (5.6%) of the recorded local <i>Rhagodia</i> sp. Hamersley population will occur. This represents the loss of 0.8% and 5.6% of the known regional populations of these species, respectively. Negligible indirect impacts are anticipated, with weeds, dust, fire and surface water managed by a FVMP and a SWMP. <p>The Proponent considers the Proposal can be managed to meet the EPA’s objective for flora and vegetation, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain values.</p>
Environmental Offset Requirement	<p>Residual impacts from the Proposal, after the implementation of the mitigation hierarchy, comprise clearing up to 638.4 ha of native vegetation in “Good to Excellent” condition in the Hamersley subregion.</p>

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Key Environmental Factor – Flora and Vegetation

In accordance with the EPA's advice on cumulative impacts in the Pilbara (EPA 2014), the proponent proposes offsets whereby financial contributions will be made to the Pilbara Environmental Offset Fund (PEOF) to offset the residual impact to native vegetation. The final offset amounts will be based on extents of actual clearing undertaken, which will be determined through an Impact Reconciliation Procedure (IRP) and Impact Reconciliation Report (IRR) that will be developed in consultation with relevant agencies. The intended construction timeframe is less than one year, so it is intended that the first and final offset amount will be calculated within three months of completion of construction. The approach to offsetting the residual impacts associated with the Proposal is considered to be consistent with the six principles outlined in the WA Environmental Offset Policy (Government of Western Australia 2011).

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TABLE ES 5: TERRESTRIAL FAUNA

Key Environmental Factor – Terrestrial Fauna	
EPA Objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Potential Impacts	<p>Direct Impacts:</p> <ul style="list-style-type: none"> • Clearing of native vegetation resulting in habitat loss. • Fragmentation of fauna habitat limiting access and movement of fauna species. • Fauna injury or mortality. <p>Indirect Impacts:</p> <ul style="list-style-type: none"> • Introduced fauna species and feral predators. • Species disturbance due to noise and vibration and artificial light. • Habitat degradation due to dust, introduction or spread of weeds, and altered fire and hydrological regimes.
EPA Mitigation Hierarchy	<p>Avoid:</p> <ul style="list-style-type: none"> • Proposed clearing has been minimised as far as practicable to reduce the extent of disturbance required; the Proponent has revised the Development Envelope from 1,399 ha to 860.9 ha. • Placement of infrastructure in any habitat of high significance (gorges and gullies and hills, ranges and plateau) has been avoided where practicable through re-design of the access road and camp locations. • Ensure all clearing works are compliant with regulatory requirements and are within approved boundary. This includes requirements for weed hygiene to prevent introduction or spread of weeds. • The area to be cleared shall be clearly demarcated and machinery operators made aware of the operational boundary, following confirmation with the relevant manager. Some heavy equipment used may have in-cab GPS mapping and alarm functions however in the absence of this functionality, other control measures such as the use of spotters and/or restricting clearing to the daylight hours will be undertaken. • Habitat and fauna surveys have been undertaken to identify key areas and species to avoid. • Cave 1 to be temporarily closed during construction and operation which will eliminate risk of habitation and nursing by Ghost Bats which may be impacted from mining activity (e.g., blasting excavation, haulage and overburden stacking). The cave structural integrity should be protected and when reopened after operations Ghost Bats are expected to return to the cave. • Barbed wire fencing shall not be used by the Proponent in any new fencing, in consultation with the pastoralist. However, if the pastoralist requires use of barbed wire for effective stock management, bat deflectors/reflectors between the top two strands will be used within the Proposed Action Area. • Prohibit feeding of all fauna. • Prohibit entry to caves, unless authorised.

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Key Environmental Factor – Terrestrial Fauna

- Demarcate areas that may not be entered by personnel and/or machinery.
- Intersection of the haul road with GNH, and remainder of the access road up to the operational area within M47/1592, will be sealed to reduce the generation of dust.
- Road haulage iron ore loads will be covered.
- Ground clearing (including topsoil stripping) shall not be undertaken during periods of high wind.
- Off-road driving shall be prohibited unless authorised by management.
- Avoid hot work in fire sensitive areas and during high fire risk days.
- Haul road and Development Envelope design shall consider surface water flow to minimise obstruction to seasonal overland water flow to the loamy drainage flats proximal to the GNH.

Minimise:

- Spatially restricted Indicative Footprint and short life of mine.
- Implement SFMP (**Appendix E**).
- Where placement of infrastructure such as the pit shell cannot avoid important habitat (drainage lines), minimise clearing as far as practicable. Minimise noise from vehicles / machinery and blasting etc. to avoid disturbance to roosting bats through appropriate selection of machinery reducing the number and duration of operating machines required to achieve the work. Implement vibration monitoring as outlined in SFMP to minimise potential impacts at critical bat habitat cave.
- In consultation with the pastoralist, replace the top strands of barbed wire in fences within the Project area with single-strand wire. If however the pastoralist requires use of barbed wire for effective stock management, bat deflectors/reflectors between the top two strands will be used within the Project area.
- Implement a 100 m radius exclusion zone around recorded Category 2 and Category 3 Ghost Bat roosts (**Figure 17**).
- Vehicles and equipment shall be restricted to designated roads and tracks.
- Laydown areas should be situated in previously disturbed locations, where practicable.
- Temporary Closure of Cave 1. Closure of Cave 1 is likely to be closed by using a lightweight steel frame fitted to the entrance and bird aviary steel netting or any heavier style with apertures not exceeding 100 mm. This would exclude Ghost bats but smaller species up to 10g such as Pilbara leaf-nosed bats (*Rhinonictis aurantia*) or Finlayson's cave bat (*Vespadelus finlaysoni*) would be able to pass through unharmed. Other small fauna of a similar size including reptiles, frogs and snakes would also be able to access the cave. With regard to larger fauna such as Quolls, Dingoes and/or Macropod species that will be excluded by the closures, Lamb Creek Cave 1 is situated in an area with numerous alternative deep overhangs and shallow caves that are suitable for their foraging and/or resting activities. Each of these species is known to travel significant distances on a daily basis (Bat Call WA 2023b).
- Clearing during peaks in breeding activity (i.e., immediately after the wet season) shall be avoided, where practicable.
- Avoid providing accessible artificial water sources.

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Key Environmental Factor – Terrestrial Fauna

- Minimise use of artificial lighting needed for safe operations, as outlined in SFMP and adhering to DCCEEW (2023) Light Pollution guidelines where possible.
- Driving between dusk and dawn shall be avoided where practicable and light vehicle use will be limited to transporting crews to and from camp to minimise traffic during start and end of shift.
- Machinery and vehicle movements should be restricted during construction to minimise the potential for vehicle strikes, where practicable.
- Machinery and vehicle movements that must be undertaken between dusk and dawn should be limited to low speeds on access tracks.
- Excavations and trenches will be kept open only as long as needed to undertake the work and egress points will be provided dependant on depth / morphology of the excavation.
- For trenches or excavations that can be covered by a wooden fence panel, this will be undertaken to prevent animal entrapment.
- Any steep-sided holes (e.g., sumps) will be fitted with egress matting or another method of escape to avoid fauna entrapment.
- Regular inspection of all excavations shall be undertaken to minimise fauna mortality in accordance with the SFMP.
- Native fauna shall not be fed or intentionally harmed.
- Environmental responsibility awareness training shall be delivered to all personnel as part of the induction process.
- Vehicles and equipment shall be restricted to designated roads, tracks and cleared areas.
- Ensure food waste is disposed of appropriately so it cannot be accessed by fauna.
- Targeted control program to be implemented (e.g., shooting or trapping) where increased presence of feral animals are observed on site.
- Noise, vibration and artificial light awareness training shall be delivered to all personnel as part of the site induction process.
- Regular inspection and maintenance of vehicles and equipment shall be undertaken to ensure no excessive operating noise is experienced from faulty machinery and noise suppression equipment is operating adequately.
- Asset management and machine maintenance to comply with equipment manufacturers warranty standards ensuring emissions and noise management controls are in working order.
- Ensure blasting is undertaken during daylight hours and is strictly controlled to minimise air blast and ground vibration (as far as practicable in relation to minimising impacts to fauna).
- Minimise the use of artificial lighting needed for safe operation (as detailed in SFMP), use directional and / or screened lighting where practicable, and when required for safety, avoid light spill onto important habitats (e.g., rocky outcrops).
- Implement the FVMP (**Appendix B**).
- Dust suppression shall be implemented to manage dust emission on cleared areas and iron ore handling areas.
- Stockyard ore product will be conditioned through addition of water to ensure dust extinguishing moisture limits are maintained (as per export license stipulations)

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Key Environmental Factor – Terrestrial Fauna

- Speed limits shall apply on sealed and unsealed roads.
- Blasting plans will consider meteorological conditions to minimise dust lift off.
- Dust awareness and dust management training shall be delivered to all personnel as part of the induction process.
- A Weed Management Plan shall be prepared and implemented as part of the FVMP, prior to construction and operation, to control access and movement of vehicles and construction personnel to prevent the introduction and spread of weeds into the Development Envelope, weed free areas, and between work areas.
- Vehicles and equipment to be cleaned, inspected and issued with a Weed Hygiene Certificate prior to entry to site or moving between areas on-site.
- Weed awareness and weed hygiene training shall be delivered to all personnel as part of the site induction process.
- Fire management and firefighting training shall be delivered to all personnel as part of the induction process.
- Firebreaks will be incorporated into mine layout planning in accordance with the local government firebreak notice under s. 33 of the *Bush Fires Act 1954*.
- Smoking will only be permitted in designated areas, which shall be appropriately signed and contain self-arresting cigarette butt disposal containers.
- An Emergency Response Plan shall be prepared and implemented.
- An Emergency Response Team shall be formed in accordance with requirements as discussed with DEMIRS.
- The Emergency Response Team will ensure that sufficient operational fire suppression equipment is located as per the Emergency Response Plan.
- Hot Work Permits and a Traffic Management Plan shall be prepared and implemented.
- All vehicles and machinery will be fitted with fire extinguishers and/or in-plant fixed water suppression.
- Fire extinguishers will be located at infrastructure/building facilities across the project.
- Implement surface and groundwater management strategies in accordance with the Surface Water Management Plan (SWMP) and Groundwater Operating Strategy (GWOS).

Rehabilitate:

- Progressive rehabilitation of foraging habitat within close proximity of roost habitat (<2 km from Category 2 and Category 3 Ghost Bat caves).
- Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable.
- Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP, particularly following the occurrence of fire.
- Seasonal weed control programs shall be implemented, including herbicide spraying or physical removal, as required.
- Weeds which are physically removed will be disposed of at the waste rock landform and buried, or buried within pit backfill.

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Key Environmental Factor – Terrestrial Fauna	
	<ul style="list-style-type: none"> • Salvage and stockpile particular vegetation types, soil, or habitat features (e.g. vegetation, stumps, logs, and boulders) for use in rehabilitation programs. • Rehabilitation shall include spatially heterogenous habitat with appropriate refuge areas to increase ability for animals to disperse between patches. • Ensure all drill holes are capped as soon as reasonably practicable. • Drainage management structures shall remain post closure and shall meet recognised Australian drainage design specifications. • The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level.
Assessment and Significance of Residual Impacts	<ul style="list-style-type: none"> • In terms of direct impacts, the Proposal will result in the clearing of up to 638.4 ha of terrestrial fauna habitat. • Following the application of the EPA’s mitigation hierarchy, the Proponent considers that there will be significant residual impacts on Northern Quoll, Ghost Bat and Pilbara Olive Python habitat.
Environmental Outcomes	<p>The environmental outcomes for terrestrial vertebrate fauna are:</p> <ul style="list-style-type: none"> • No permanent / semi-permanent surface water pools were identified within the Indicative Footprint or Development Envelope. • There will be no effect on the conservation status of significant fauna species as a result of the Proposal. • Noise and vibration from blasting and artificial light sources are not expected to have a significant impact on terrestrial fauna, following implementation of mitigation during clearing and operation. • Clearing of up to 638.4 ha of native vegetation comprising terrestrial fauna habitat from the Proposal is considered likely to have a significant residual impact to Northern Quoll, Ghost Bat and Pilbara Olive Python. <p>The environmental outcomes for terrestrial SRE invertebrate fauna are:</p> <ul style="list-style-type: none"> • The Proposal will result in negligible risk to SRE invertebrate fauna through the removal of up to 638.4 ha of native vegetation comprising potential SRE fauna habitat. • Risks to potential SRE invertebrate fauna are considered low and as a result significant residual impacts are not expected given that no potentially restricted SRE habitats were identified in the Development Envelope and all habitats are considered connected within the landscape and not isolated. <p>The Proponent considers the Proposal can be managed to meet the EPA’s objective for terrestrial fauna, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain terrestrial fauna values.</p>
Environmental Offset Requirement	<p>Impacts to terrestrial fauna associated with the Proposed Action will be mitigated and managed through the implementation of the SFMP to ensure that potential impacts to terrestrial fauna are managed to an acceptable level.</p> <ul style="list-style-type: none"> • Residual impacts from the loss of critical and/or supporting habitat for listed threatened fauna species resulting from construction of the Proposal are proposed to be offset for the entire Indicative Footprint (638.4 ha). Residual impacts are predicted to be: <ul style="list-style-type: none"> • Northern Quoll: 44.2 ha critical habitat, 125.6 ha supporting habitat

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Key Environmental Factor – Terrestrial Fauna

- Ghost Bat: 638.4 ha supporting habitat
- Pilbara Olive Python: 118.66 ha supporting habitat.

The actual offset amounts will be calculated based on extents of actual clearing undertaken, which will be determined through an Impact Reconciliation Procedure (IRP) and Impact Reconciliation Report (IRR) that will be developed in consultation with relevant agencies. The intended construction timeframe is less than one year, so it is intended that the first and final offset amount will be calculated within three months of completion of construction. The approach to offsetting the significant residual impacts associated with the Proposal is considered to be consistent with the six principles outlined in the WA Environmental Offset Policy (Government of Western Australia 2011).

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TABLE ES 6: SUBTERRANEAN FAUNA

Key Environmental Factor – Subterranean Fauna	
EPA Objective	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.
Potential Impacts	<p>Direct Impact:</p> <ul style="list-style-type: none"> Loss of individuals and/or habitat as a result of pit excavation and aquifer dewatering. <p>Indirect Impact:</p> <ul style="list-style-type: none"> Degradation of subterranean fauna habitats (as a result of groundwater drawdown, vibration, blasting and contamination).
EPA Mitigation Hierarchy	<p>Avoid:</p> <ul style="list-style-type: none"> The area to be excavated shall be clearly demarcated and machinery operators made aware of the operational boundary. Excavation of PAF and ASS will be avoided, where practicable. <p>Minimise:</p> <ul style="list-style-type: none"> Short life of mine. Implement surface and groundwater management strategies in accordance with the SWMP and GWOS. Groundwater abstraction for pit dewatering will be managed in accordance with a RIWI Act groundwater licence and associated GWOS. Hydrogeological assessments will continue to be undertaken to inform progressive dewatering requirements, allowing early management strategies to be implemented. Implement the Proposal EMS to minimise spillage and environmental contamination from handling, storage and processing of materials. Implement the PAF Management Plan and/or ASS Management Plan, where PAF/ASS is present (in accordance with the DWER). <p>Rehabilitate:</p> <ul style="list-style-type: none"> Implement an appropriate rehabilitation plan in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level. Groundwater is expected to recover to a substantial extent within 3 years of cessation of dewatering. Implement the approved MCP.
Assessment and Significance of Residual Impacts	Based on the assessment of potential impacts and the application of the EPA’s mitigation hierarchy to protect environmental values associated with this factor, the Proponent considers that the EPA objective for this factor can be met, and that there will be no significant residual impacts on subterranean fauna.
Environmental Outcomes	<p>The environmental outcomes for subterranean fauna are:</p> <ul style="list-style-type: none"> No subterranean fauna TECs or PECs occur within, or immediately adjacent to, the Proposal Area.

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	<ul style="list-style-type: none"> • Stygofauna and troglifauna habitat is largely determined by geology/hydrogeology. The particular habitats (geologic units) affected by the Proposal have been shown (drilling, block model) to extend well beyond the proposed pit and area impacted by drawdown. Most subterranean fauna species observed have distributions extending well beyond the proposed pit. It is considered likely that the few historic (2013) specimens (2 stygofauna, 4 troglifauna) only observed in the Proposal area would be present outside the Proposal area, based on habitat connectivity of the geologic units. • Other factors contributing to the overall low risk to subterranean fauna are the short mine life, backfilling of the pit to a minimum of 5 m above the baseline groundwater level and the expected recovery of groundwater following cessation of dewatering. • The area affected by drawdown is considered negligible, with geological formations extending beyond modelled drawdown, and occurring more broadly throughout the region. Monitoring and management of groundwater will be undertaken in alignment with the GWOS. • Vibration from blasting and potential contamination of habitat are not expected to impact on subterranean fauna, with limited ASS / PAF material identified from the area and appropriate management of potentially hazardous materials to be undertaken during operations. <p>The Proponent considers that the Proposal can be managed to meet the EPA’s objective for subterranean fauna, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain values.</p>
<p>Environmental Offset Requirement</p>	<p>No environmental offsets will be required for subterranean fauna.</p>

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TABLE ES 7: INLAND WATERS

Key Environmental Factor – Inland Waters	
EPA Objective	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.
Potential Impacts	<p>Direct Impacts:</p> <ul style="list-style-type: none"> • Altered hydrological regime. • Groundwater drawdown. <p>Indirect Impacts:</p> <ul style="list-style-type: none"> • Disturbance and exposure of PAF / ASS. • Contamination of surface water and/or groundwater. <p>Note: Impacts from drawdown of groundwater on subterranean fauna are addressed in Chapter 9.</p>
EPA Mitigation Hierarchy	<p>Avoid:</p> <ul style="list-style-type: none"> • Access road crossing of Mine Creek designed so as not to impede normal surface water flow. • No groundwater dependent vegetation was identified from the Proposal Area. • Excavation of PAF and ASS will be avoided, where practicable. • Avoid fuel / chemical storage and transfer from occurring outside of designated areas. • Avoid off-road driving and stay on approved access tracks and roads. <p>Minimise:</p> <ul style="list-style-type: none"> • Spatially restricted Indicative Footprint and short life of mine. • Culverts and floodways along access roads will maintain existing flood characteristics and maintain natural flow volumes. • With mine water demand expected to exceed dewatering rates, discharge of dewatered water to the environment is not required. • Any runoff or rainfall required to be discharged to the environment (e.g. during a 10% AEP flood event) will be captured by bunding and diverted to settling ponds and sediment traps, located downstream of the mine disturbance area (outside of the 1% AEP floodplain of major drainage lines), prior to being released to the environment to reduce impacts to any temporary aquatic biota (e.g. sediment loading), where present. • Any runoff or rainfall that accumulates in the pit will be used for dust suppression and/or as process water in the first instance. However, during rare rainfall events, there may be a requirement for short-term discharge to a local drainage line after passing through settling ponds and sediment traps, so as to limit impacts to natural hydrological regimes, as well as impacts to any temporary aquatic biota (e.g. sediment loading), where present. • Sediment traps will be designed to remove particles greater than, or equal to, 75 µm from surface water prior to release to the environment. • Groundwater abstraction for pit dewatering will be managed in accordance with a RIWI Act groundwater licence and associated GWOS.

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Key Environmental Factor – Inland Waters	
	<ul style="list-style-type: none"> • Hydrogeological analyses will continue to be undertaken to inform progressive dewatering requirements, allowing early management strategies to be implemented. • While subterranean fauna has been identified from the Proposal Area, impacts to this GDE type are likely to be able to be managed appropriately (Table 40). • Implement the PAF Management Plan and/or ASS Management Plan, where PAF/ASS is present. • PAF shale to be managed in accordance with PAF Management Plan, and any shale waste rock will be encapsulated within pit backfill. • Implement the Proposal EMS to minimise spillage and environmental contamination from handling, storage and processing of materials. • Spill response training shall be delivered to all personnel as part of the induction process. • Hydrocarbons will be managed according to the MinRes Hydrocarbon and Chemical Procedure (MRL-EN-PRO-0002). • Hydrocarbons will be managed to avoid leaks and spills through the use of bunds, location of bunded areas being either outside floodplains or appropriately elevated to avoid the risk of inundation. • Signage and bunding on all unstable landforms. • Maintain high standard of housekeeping around Proposal Area. • Treat and dispose of all domestic wastewater / WWTP effluent appropriately. <p>Rehabilitate:</p> <ul style="list-style-type: none"> • Rehabilitate surfaces to align with original topography, as far as practicable. • Implement an appropriate rehabilitation plan in accordance with the approved MCP. • Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. • Groundwater is expected to recover to a substantial extent within 3 years of cessation of dewatering, and to recover back to original SWL within five to 30 years. • The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level which will reduce the residual drawdown following groundwater recovery. • PAF shale to be managed in accordance with PAF Management Plan, and any shale waste rock will be encapsulated within the pit backfill and the pit will be backfilled above any known shale locations. • Where spills occur outside bunded areas, remediation will occur immediately to avoid contamination of surface and groundwater.
Assessment and Significance of Residual Impacts	Based on the assessment of potential impacts and the application of the EPA’s mitigation hierarchy to protect environmental values associated with this factor, the Proponent considers that the EPA objective for this factor can be met, and that there will be no significant residual impacts to Inland Waters.
Environmental Outcomes	The environmental outcomes for inland waters are:

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Key Environmental Factor – Inland Waters	
	<ul style="list-style-type: none"> • The Marillana Creek sub-catchment will decrease by approximately 0.3% during operations and 0.1% post-closure, as a result of the location of the proposed pit and associated infrastructure, which is unlikely to substantially affect the surface hydrology of the Proposal Area or waterbodies located downstream of the confluence of Mine Creek and Marillana Creek. • There is a lack of permanent or semi-permanent surface water within the Proposal Area. • Surface water flow diversion structures will be relatively small in size and are not expected to significantly impact surface water flow downstream, with only minor increases (up to 0.5 m) to flood levels experienced during a 1% AEP event and dissipating within a few hundred metres of the Proposal Area. • The discharge of excess rainfall water into the environment will only occur during significant rainfall events, with this water being managed to remove sediment and contaminants, prior to discharge. • Negligible indirect impacts area anticipated, with mitigation proposed to manage surface water flow on-site and to maintain hydrological regimes in the broader region through implementation of a SWMP. • Operational impacts will be managed through a licence issued under Part V of the EP Act. • A MCP will be implemented to ensure that closure design aligns with regulatory and stakeholder expectations, including partial backfilling of the pit to avoid the development of a pit lake. <p>The Proponent considers that the Proposal can be managed to meet the EPA’s objective for Inland Waters, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain values.</p>
Environmental Offset Requirement	No environmental offsets will be required for inland waters.

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TABLE ES 8: SOCIAL SURROUNDINGS

Key Environmental Factor – Social Surroundings	
EPA Objective	To protect social surroundings from significant harm.
Potential Impacts	<p>Direct Impacts:</p> <ul style="list-style-type: none"> • Disturbance of sites of Aboriginal heritage significance. • Increased traffic on GNH which may result in impacts on amenity. <p>Indirect Impacts:</p> <ul style="list-style-type: none"> • Disturbance of places of cultural significance, plants, and animals with cultural associations. • Visual, noise, dust or odour impacts on amenity.
EPA Mitigation Hierarchy	<p>Avoid:</p> <ul style="list-style-type: none"> • Heritage surveys have been undertaken and all Proposal elements and activities have been designed to avoid heritage places recorded to date. • No registered Aboriginal heritage sites or sites of cultural significance have been identified within the Development Envelope to date. If any additional sites are identified within the Development Envelope, the Proponent will assess options for implementing exclusion zones in consultation with Traditional Owners. • Cumulative impact avoided due to heavy vehicle haulage from the Proposal replacing haulage planned from other MinRes operations which are winding down and comparative size and duration of Proposal operations to other operations in the area. • Proposal Area located away from sensitive receptors. • Avoidance through informed design, including that concerns regarding visual amenity have been addressed through changes to design. • The intersection of the haul road with GNH, and remainder of the access road up to the operational area within M47/1592, will be sealed to reduce the generation of dust. <p>Minimise:</p> <ul style="list-style-type: none"> • Spatially restricted Indicative Footprint and short life of mine. • Comply with recommendations in heritage survey reports and from engagement with Traditional Owners, including implementation of a CHMP. • Implement best-practice management for Aboriginal heritage, including the close involvement of Traditional Owners in management and monitoring. • Implement SFMP, FVMP and CHMP to minimise impacts on plants, animals with cultural associations. • Consultation with Traditional Owners to be ongoing to ensure the Proponent is aware of any new sites that may be identified. • Implement the MinRes Dust Management Procedure (MRL-EN-PRO-0012) to ensure dust emissions and associated impacts are minimised.

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	<ul style="list-style-type: none"> • Implement SWMP and GWOS to minimise impacts on hydrological regimes. • Noise levels from construction and operation are predicted to comply with the Noise Regulations. The Proponent will implement noise standard controls including ensuring all relevant plant and machinery is fitted with noise dampening equipment. • Access for Traditional Owners to Proposal Area and proximate cultural areas to be preserved where safe and stable to do so. <p>Rehabilitate:</p> <ul style="list-style-type: none"> • Rehabilitate surfaces to align with original topography, as far as practicable. • Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. • Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable.
Assessment and Significance of Residual Impacts	<p>Based on the assessment of potential impacts and the application of the EPA’s mitigation hierarchy to protect environmental values associated with this factor, the Proponent considers that the EPA objective for this factor can be met, and that there will be no significant residual impacts on social surroundings.</p>
Environmental Outcomes	<p>The environmental outcomes for social surroundings are:</p> <ul style="list-style-type: none"> • No impact to any Aboriginal heritage site, place, plant, or animal of cultural heritage significance. • No impact on amenity from traffic on GNH as the ore haulage will replace haulage from other projects. • No visual, noise, dust or odour impacts on sensitive receptors as there are none close by to the proposed mine. • No cumulative impacts on Social Surroundings are expected to occur. <p>The Proponent considers that the Proposal can be managed to meet the EPA’s objective for Social Surroundings, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain values.</p>
Environmental Offset Requirement	<p>No environmental offsets will be required for social surroundings.</p>

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Other Environmental Factors

In addition to the key environmental factors relevant to the Proposal, and described in this RSD, the EPA identifies a number of other environmental factors that require consideration for detailed environmental assessment. The environmental factors of Landforms, Terrestrial Environmental Quality, Air Quality, Greenhouse Gas Emissions and Human Health were also not considered to be key environmental factors, and the Proposal is considered unlikely to result in a significant impact to these other environmental factors, which were not subject to detailed environmental assessment. These other environmental factors will be managed to ensure no significant impact will result from the Proposal.

Cumulative Impacts

Fourteen active mine sites are located within 100 km of the Development Envelope. In comparison to existing operations within the region, the Proposal is a relatively small operation with a limited mine life. Mining Area C has approval to clear 21,824 ha of native vegetation, Yandicoogina 7,400 ha, Yandi ~3,500 ha, and Hope Downs 1 and Baby Hope >2,000 ha. The clearing of an additional 638.4 ha as a result of the Proposal is minor in comparison and will not significantly contribute to cumulative impacts to key environmental factors from development in the region as a result of implementation of the Proposal.

Significant residual impacts are not expected for flora and vegetation on a local scale; however, the Proposal will contribute to cumulative impacts at a bioregional scale, as the development of other projects occurs. Existing and foreseeable projects have a combined clearing extent of 140,664 ha. The loss of 638.4 ha of native vegetation due to clearing as a result of implementing the Proposal represents only 0.45% of loss when considered in culmination together with other projects. In addition to the existing proposals, there are four proposals included in the BHP Strategic Proposal that are considered reasonably foreseeable. As there is no detailed information available on these proposals, potential impacts to flora and vegetation, in particular significant flora, cannot be assessed for other proposals. Overall, it is considered that cumulative impacts to flora and vegetation from the Proposal are expected to be low, given:

- Clearing required for the Proposal represents less than 0.1% of the pre-European vegetation within the state and within the Pilbara bioregion.
- Significant flora recorded (*Aristida lazaridis* (P2), *Rhagodia* sp. Hamersley (P3)) have also been found to occur within nearby existing and foreseeable projects, representing only 0.5% out of the total 2.53% cumulative impact to known *Aristida lazaridis* individuals, and only 0.09% of the total 5.39% cumulative impact to known *Rhagodia* sp. Hamersley individuals.

Cumulative disturbance and loss of foraging habitat is likely to be of greater consequence for terrestrial fauna of significance such as the Ghost Bat, Pilbara Leaf-nosed Bat, and Pilbara Olive Python that utilise multiple habitat types within the Development Envelope (e.g. drainage lines, hill crests and slopes). Drainage line habitat (major and minor) supports foraging and dispersal for fauna and is important for the persistence of these species within an area.

There are eight active mine sites that are located within 100 km of the Proposal and occur within comparable land systems. Collectively, these mines have potential to cause habitat fragmentation and reduce foraging habitat within the region for significant fauna species. Clearing may result in localised impacts to individuals within the disturbance footprint, however similar habitat occurs extensively throughout the Pilbara.

Analysis of available habitat data suggests that the Proposal will not result in an increase in cumulative impacts to any specific broad fauna habitat type by more than 4%. Significant terrestrial fauna are unlikely to be significantly impacted by cumulative clearing of fauna habitat attributed to the Proposal, and no change to the conservation status or bioregional distribution of significant fauna species is expected to occur.

No significant cumulative impacts are expected to subterranean fauna confirmed to occur in the Development Envelope. The nearest mining operation to the Proposal is Mining Area C, located approximately 15 km to the southeast, which is a significantly larger operation. There are no other operating or reasonably foreseeable mines situated within the Marillana Creek sub-catchment. Cumulative impacts to subterranean fauna are expected to be low as a result of occurrence of the majority of subterranean fauna taxa outside of the Development Envelope, the likelihood for occurrence and connectivity of habitat outside of the Development Envelope, the spatially restricted Indicative Footprint and short life of mine.

In terms of catchment reduction, the location of the proposed pit, WRLs and topsoil stockpile will reduce the overall Marillana Creek sub-catchment by approximately 0.3%. This is not considered to be environmentally significant, particularly when considering the high variability and natural seasonal fluctuations in rainfall and catchment runoff, known from the Pilbara bioregion. Given the minor impacts on surface water flow, cumulative impacts to Inland Waters (surface water flow and groundwater availability and quality) are expected to be negligible.

No significant residual cumulative impacts are predicted for the purposes of the Social Surroundings objective, and the minimal cumulative impact of the Proposal for other factors has been acknowledged by relevant stakeholders as part of Social Surrounds consultation, due to the small size, short duration and operational and closure controls.

Environmental Offsets

The Proposal will result in clearing of up to 638.4 ha of native vegetation within a Development Envelope of approximately 860.9 ha. The proponent proposes to offset residual impacts associated with clearing of native vegetation (638.4 ha), which also provides habitat for threatened fauna species. Offsets are proposed to be in the form of a monetary contribution through the Pilbara Environmental Offsets Fund (PEOF) at the appropriate per hectare rate at the time, with the final offset amount to be determined based on the actual extent of clearing undertaken as determined through an Impact Reconciliation Procedure (IRP) and Impact Reconciliation Report (IRR) (to be developed in consultation with relevant agencies).

The Proposal is situated in the Hamersley subregion and the applicable current base rate per hectare as at 2022/2023 is \$945/ha, with a higher rate of \$1,891 (subject to Consumer Price Index (CPI)). As the 638.4 ha of native vegetation within the Development Envelope is in 'Good to Excellent' condition, supports known populations of Priority flora taxa, *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Aristida lazaridis* (P2) and also provides critical and/ or supporting habitat for listed threatened fauna species (Northern Quoll, Ghost Bat and Pilbara Olive Python), the higher per hectare rate is proposed to offset clearing of vegetation for the proposal. The estimated PEOF contribution from the Proposal is summarised in **Table ES 9**.

TABLE ES 9: ESTIMATED PEOF CONTRIBUTION

Environmental Value	Rate/ha (Hamersley IBRA Subregion)	Area Cleared (ha)	Estimated Offset
Clearing of native vegetation (638.4 ha) in Good to Excellent condition that: <ul style="list-style-type: none"> • Supports Priority flora taxa populations • May support other Priority flora taxa • Provides habitat for the Northern Quoll, Ghost Bat and Pilbara Olive Python. 	\$1,891	Up to 638.4	\$1,207,214

Holistic Impact Assessment

The Proponent has commissioned numerous studies to understand the environmental values of the Development Envelope, and the potential effects of implementing the Proposal, which meet the EPA

objectives for each factor and are manageable. The outcomes of these studies have assisted with the refinement of the Proposal and have considered the application of the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset).

The Proponent has sought to understand the environmental processes and environmental values of the ecosystem within the Development Envelope holistically. Holistic impact assessment recognises the inextricable links between flora and vegetation, terrestrial fauna, inland waters, subterranean fauna and social surroundings, and the connections and interactions between these environmental factors. For the Proposal, there is interaction between flora and vegetation and terrestrial fauna, through the clearing of native vegetation that provides habitat for numerous species of fauna. There is also interaction between inland waters and subterranean fauna through the abstraction of groundwater to dewater the proposed pit.

Impacts from the Proposal will not result in any significant or long-term impacts on the key environmental factors of flora and vegetation, subterranean fauna, inland waters and social surrounds. However, the removal of 638.4 ha of native vegetation that provides habitat for listed threatened fauna species is considered a significant residual impact and is proposed to be offset. From a holistic view point, vegetation types and terrestrial fauna habitats are typically widespread, and significant flora and fauna species all occur outside of the Development Envelope. While there are a small number of subterranean fauna species that may be restricted, their habitat and the geological formations extend beyond the proposed pit, and rapid groundwater recovery is expected following cessation of dewatering. Therefore, the environmental effect of these interconnections can be effectively managed by applying the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) for the Proposal.

There are no additional significant residual impacts or additional mitigation required for the Proposal, based on this holistic impact assessment. The combined effects on the local environment for the Proposal are not considered greater than any individual environmental factor.

1. INTRODUCTION

1.1. PURPOSE AND SCOPE

Process Minerals International (PMI; the Proponent), a wholly owned subsidiary of Mineral Resources Limited (MinRes) (ACN 118 549 910), proposes to develop the Lamb Creek Iron Ore Project (the Proposal). The Proposal is located approximately 130 kilometres (km) northwest of Newman, in the East Pilbara Local Government Authority (LGA) in Western Australia (WA).

The Proposal is being referred under s. 38 of the *Environmental Protection Act 1986* (EP Act) as it has the potential to significantly affect key environmental factors, defined by the WA Environmental Protection Authority (EPA) in its *Statement of environmental principles, factors, objectives and aims of EIA* (EPA 2020a). The purpose of this Referral Supporting Document (RSD) is to present sufficient information on the Proposal and its effects on the environment for assessment under Part IV of the EP Act.

The potential impacts to key environmental factors are described in detail and assessed based on the findings from environmental studies specific to the Proposal. All technical reports have been provided as appendices. Impacts from all phases of the Proposal are considered, including construction, commissioning, operations and closure. Cumulative impacts with other projects are also addressed.

This RSD was prepared in accordance with *Referral of a proposal under section 38 of the Environmental Protection Act 1986: Instructions* (EPA 2021c) and *How to prepare an Environmental Review Document: Instructions* (EPA 2018a).

1.2. PROPONENT DETAILS

Proponent: Process Minerals International (PMI) a wholly owned subsidiary of Mineral Resources Limited (MinRes) (ACN 118 549 910)

Address: 20 Walters Drive, Osbourne Park, WA, 6017

Postal Address: Locked Bag 13, Osbourne Park DC, WA, 6916

Corporate contact: Celine Mangan – General Manager Environment and Heritage

Phone: +61 8 9315 8774

Email: celine.mangan@mrl.com.au

1.3. PRE-REFERRAL DISCUSSIONS

MinRes has held pre-referral discussions with EPA Services (EPAS) on several occasions throughout the development of the project. Detailed information on this consultation is provided in **Table 12**.

1.4. NOMENCLATURE

Key nomenclature used throughout this document is summarised below:

- **The Proposal:** This refers to the boundary within which the elements of the proposed activities are situated.
- **Proposal Area:** Refers to the combined area within R47/19 (to be converted to M47/1592) and L47/1008, within which the majority of the Development Envelope is on the Juna Downs pastoral lease (LPL N050471). A small portion of the access road is within railway corridor L021124 (Hamersley Iron Pty Ltd- Yandicoogina Rail) that is excised from Juna Downs.
- **Development Envelope:** delineates the area within which the Proposal components are located.
- **Indicative Footprint:** the proposed Indicative Footprint occurs entirely within the Development Envelope and refers to the area that is proposed to be directly disturbed by the Proposal (e.g. clearing of native vegetation). The layout of the Indicative Footprint may be subject to change; however, total disturbance will not exceed the maximum area of disturbance identified and will not go beyond the extent of the Development Envelope.
- **Flora and Vegetation Survey Area:** refers to the boundary within which all Flora and Vegetation investigations and field surveys were undertaken.
- **Terrestrial Fauna Survey Area:** refers to the boundary within which all Terrestrial Fauna (including short-range endemic (SRE) invertebrate fauna) investigations and field surveys were undertaken.
- **Subterranean Fauna Survey Area:** refers to the boundary within which all subterranean fauna field surveys were undertaken.

2. PROPOSAL

2.1. PROPOSAL CONTENT

2.1.1. General Description

The Proposal is a greenfield site, located approximately 130 km northwest of Newman. No mining infrastructure currently exists within the Proposal Area (**Figure 1**). The Proposal is largely situated on Juna Downs pastoral lease (LPL N050471), and the current land use is pastoral. An overview of the Proposal content is provided in **Table 1**. A detailed description of Proposal elements is provided in **Section 2.1.3**.

TABLE 1: GENERAL PROPOSAL CONTENT DESCRIPTION

Proposal Title	Lamb Creek Iron Ore Project
Proponent Name	Process Minerals International (PMI) a wholly owned subsidiary of Mineral Resources Limited (MinRes) (ACN 118 549 910)
Short Description	<p>Open pit iron ore mine located approximately 130 km northwest of Newman (Figure 1) to produce up to 10 million tonnes per annum (Mtpa) of crushed and screened iron ore over a period of three to five years. The Proposal comprises a multi-stage crushing and screening (two or three stages) process plant and associated mine infrastructure including, but not limited to, site offices, maintenance and equipment service area, water pipelines, fuel storage, power generation, telecommunications and an accommodation village for site personnel. The total disturbance footprint of the proposal is 638.4 ha (Indicative Footprint), within a Development Envelope of 860.9 ha (Figure 2).</p> <p>Iron ore product will be loaded onto road trains and transported 16 km on a dedicated private haul road to its intersection with GNH, where it will be transported 320 km to ship load-out facilities at the Utah Point berth in Port Hedland.</p>

2.1.2. Proposal Elements

The Proposal will be implemented within a Development Envelope of 860.9 ha, and a detailed description of these elements is included in **Section 2.1.3**. **Table 2** outlines the extent of Proposal elements that have the potential to significantly affect the environment.

TABLE 2: PROPOSAL ELEMENTS THAT HAVE THE POTENTIAL TO SIGNIFICANTLY AFFECT THE ENVIRONMENT

Proposal Element	Location	Maximum Extent, Capacity or Range
Physical Elements		
Development Envelope	Figure 2	860.9 ha
Indicative Footprint	Figure 2	638.4 ha
Mining and processing elements including, but not limited to: <ul style="list-style-type: none"> • Open pit • Internal haul roads • Rom pad • Waste rock landforms (WRLs) • Processing facilities • Water storage dam • Laydown/hardstands • Ore stockpiles • Top soil stockpiles. 	Figure 3	Clearing of no more than 638.4 ha of the Indicative Footprint within the 860.9 ha Development Envelope.

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Proposal Element	Location	Maximum Extent, Capacity or Range
Infrastructure elements including, but not limited to: <ul style="list-style-type: none"> Accommodation camp Light vehicle roads Workshops Power supply infrastructure Fuel/hydrocarbon storage Potable water storage Waste disposal Sewage treatment and disposal. 		
Transport corridor, including borrow areas along the road alignment	Figure 3	Mine site to Great Northern Highway along a 16 km haul road; clearing of no more than 168 ha within the Indicative Footprint
Operational Elements		
Pit dewatering	Figure 3	Pit dewatering will be via a number of in-pit or ex-pit bores and in-pit sumps when/where required; estimated dewatering rates to range from 17 L/s to 58 L/s during pit development, with the water used on site.
Groundwater abstraction	Figure 3	Preliminary estimated water requirement of up to 950 ML/yr to be obtained from dewatering and/or supply bores and in-pit sumps.
Waste disposal	Figure 3	Non-hazardous waste (estimated maximum of 2,500 tpa) and hazardous wastes to be transported for off-site disposal / treatment at licensed premises.
Power supply	Figure 3	Average demand of 1,880 kWh, peaking at 3,460 kWh; on-site generation with built-in redundancy (multiple units on operating or standby duty)
Greenhouse Gas Emissions		
Peak annual		
Scope 1	Total greenhouse gas emissions for Year 2: 230,935 tCO ₂ -e/yr	
Scope 2	None, all electricity generated on-site and is accounted for in Scope 1	
Scope 3	Total greenhouse gas emissions for Year 4: 11,114,740 tCO ₂ -e/yr	
Annual average life of mine		
Scope 1	Annual greenhouse gas emissions for Year 1: 103,615 tCO ₂ -e/yr	
	Average annual greenhouse gas emissions for Year 2-5: 186,987 tCO ₂ -e/yr	
Scope 2	None, all electricity generated on-site and is accounted for in Scope 1	
Scope 3	Annual greenhouse gas emissions for Year 1: 2,215,024 tCO ₂ -e/yr	

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Proposal Element	Location	Maximum Extent, Capacity or Range
		Average annual greenhouse gas emissions for Year 2-5: 9,741,013 tCO ₂ -e/yr
Total Proposal emissions Scope 1 (based on annual emissions) – 1 year construction, 4-year life of mine		
851,564 tCO ₂ -e		
Commissioning		
<p>The forecast key milestones for construction and commissioning are:</p> <ul style="list-style-type: none"> • Construction Q3 2025 to Q1 2026. • Commence commissioning Q4 2025 to Q1 2026. • Commence operation from Q1 to Q2 2026. <p>Construction and commissioning will be sequenced as per the following stages:</p> <ul style="list-style-type: none"> • Stage 1 – construction verification. • Stage 2 – pre commissioning or functional testing. • Stage 3 – no load commissioning. • Stage 4 – load commissioning. • Stage 5 – performance verification. 		
Rehabilitation		
<p>The Proponent will implement a Mine Closure Plan (MCP) in accordance with <i>Mine Closure Plan Guidance – How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans</i> (DMIRS 2020). Progressive rehabilitation will be undertaken over the life of the mine, with progressive backfilling of the pit occurring during all three stages of pit development, to at least 5 m above the pre-mining water table. Areas disturbed through implementation of the Proposal will be designed to be safe and non-polluting and constructed so that final shape, size, stability and ability to support local native vegetation are comparable to natural landforms in the area.</p>		
Decommissioning		
<p>The Proposal is largely situated on the Juna Downs pastoral lease (LPL N050471). When operation ceases it is expected that the Proposal land will return to pastoral activities. Some domains will require additional closure management in the short term or permanently to ensure the end land use can be safely and effectively achieved. Immediately following decommissioning, land use will be “mine site rehabilitation” until ecosystems have demonstrated sufficient resilience and satisfy closure objectives and completion criteria. The rehabilitated WRLs and the partially backfilled open pit will be permanent landscape features; however, the size and location of the final landforms may be altered, subject to the nature and extent of future mining campaigns.</p>		
Other elements which affect extent of environmental effects		
Proposal time	Approximately 3 to 5 years	
Construction phase	Approximately 6 to 12 months (including early works and construction from overlapping approvals)	
Commissioning phase (including commissioning and commencement of mining)	Commissioning – approximately 3 months	
	Commencement of mining – approximately 3 months	
Operation phase	Up to 365 operation days per year over anticipated 3 to 5 years; up to 24 hours per day	

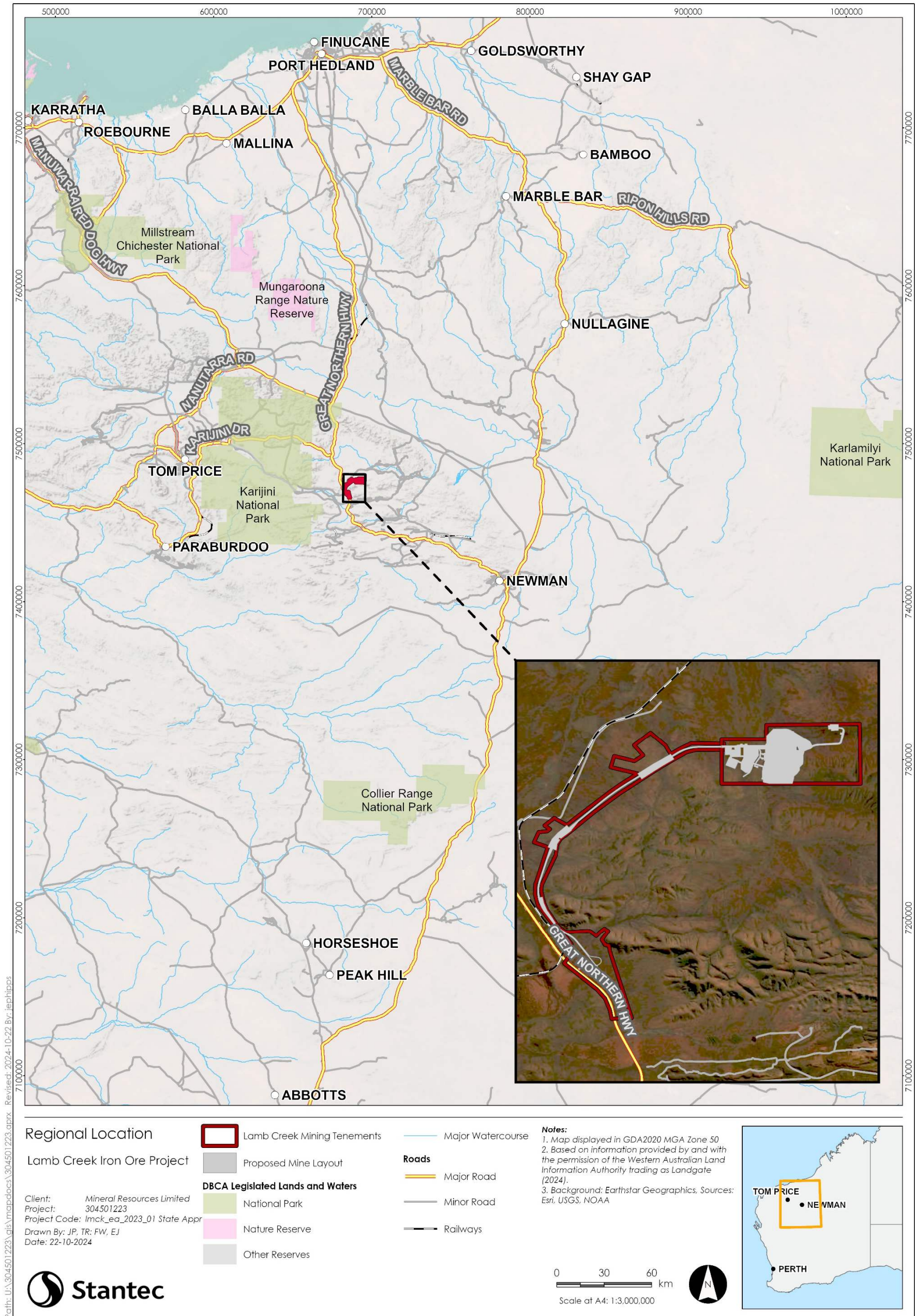


FIGURE 1: REGIONAL LOCATION OF THE PROPOSAL

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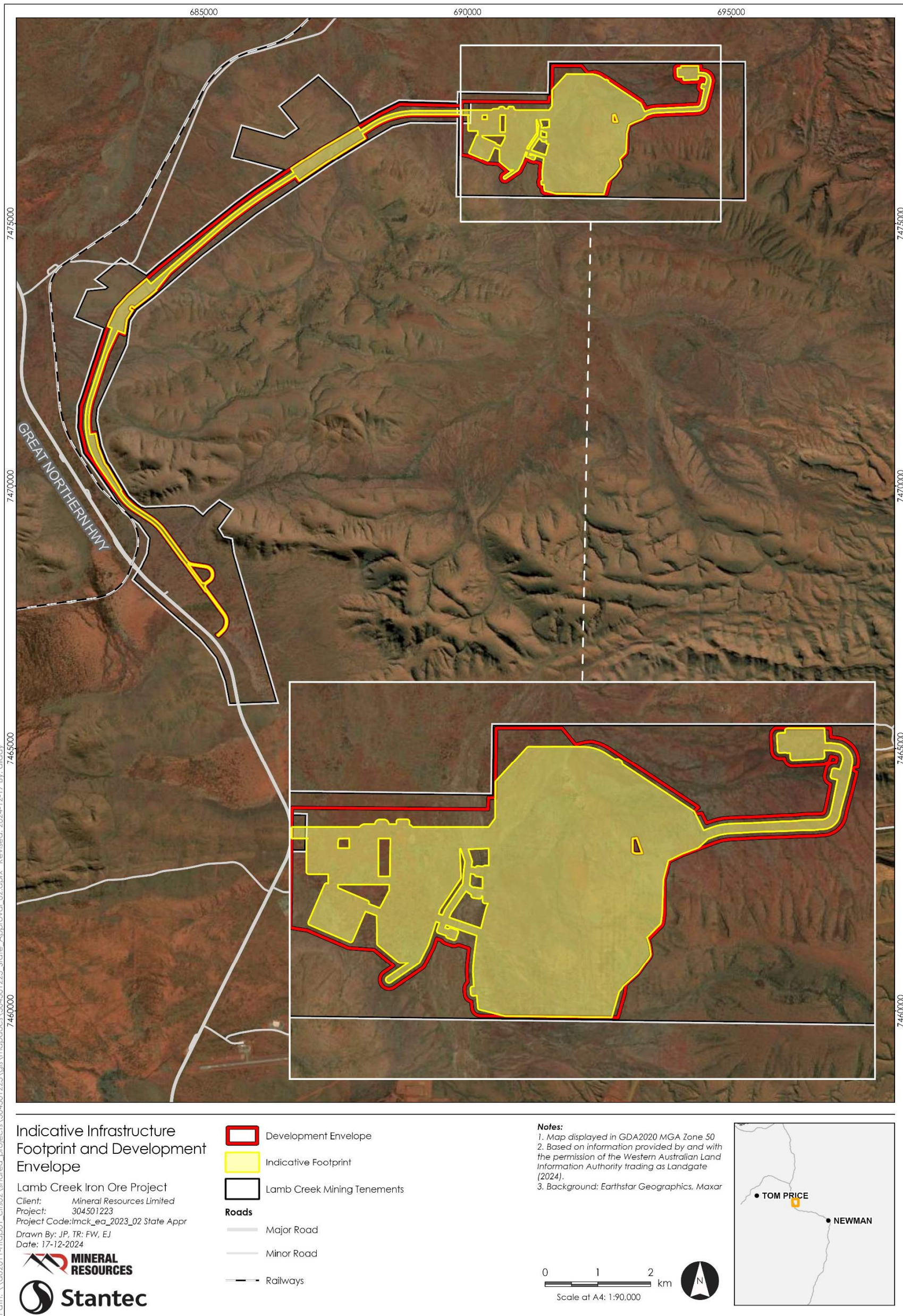


FIGURE 2: INDICATIVE FOOTPRINT AND DEVELOPMENT ENVELOPE OF THE PROPOSAL

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2.1.3. Detailed Description of Proposal Elements

2.1.3.1. Construction Elements

Construction will be undertaken over a 6 to 12-month period (approximately), 24 hours per day, seven days per week and will include:

- Construction fronts: progressively expanding and moving work fronts for the construction of the primary (eg. mine, processing plant) and supporting infrastructure (eg camp, roads, workshops) elements of the Proposal.
- Laydown areas: constructed for mobile concrete batching plant, temporary construction facilities, storage of construction materials and storage of plant and equipment.
- Mobile crushing and screening plant: plant will be capable of processing up to 3 Mtpa for the purpose of the following key activities:
 - Production of construction materials.
 - Initial production depending on Proposal schedule requirements.
 - Complementing the main fixed crushing and screening facility during Proposal commissioning and operation.
- Temporary accommodation camp comprising up to 150 rooms for construction personnel. During the overlap period between construction and operation, this accommodation camp will remain in use and will be removed when no longer required. The only remaining accommodation camp will be the accommodation camp for operational personnel.

2.1.3.2. Haul Road

The haul road will be the main route from the Proposal and will commence at the mine and extend for approximately 16 km to GHN. It will be designed and constructed by the Proponent who has extensive experience in mining and civil construction in the area and building similar roads.

The road will be utilised for ore haulage, trucks supplying goods and services and light vehicle traffic in and out of site. The haul road configuration will have either non-segregated or separated heavy vehicle (HV) and light vehicle (LV) sides (dual lane each side). If segregated HV and LV design selected, travelling from the Great Northern Highway intersection towards the mine site, separated HV/LV traffic lanes will begin shortly after leaving the GNH at the intersection and return to shared traffic lanes after reaching the accommodation camp.

The HV/LV access road will be designed in accordance with Ausroads and Main Roads WA standards, and in the following manner:

- Clearing vegetation and stockpiling of topsoil.
- Earthworks cut to fill as well as imported soil fill (waste from pit).
- Construction of road including sub-base and base-course pavement layers.
- Cutting of side drains.
- Construction of drainage infrastructure along the length of the road will include culverts, stabilised backfill, headwalls, and stone pitching and sheet flow areas as required.

The access road will be sheeted with *in situ* material or material sourced from mine pre-strip, all located within the miscellaneous licences and mining lease (M47/1592, L47/1008). The intersection of GNH and remainder of the access road up to the operational area within M47/1592 will be sealed to reduce the generation of dust. A fibre optic cable for telecommunications, and/or a freshwater pipeline for standpipes and dust control, may also run alongside the length of the haul road within the Indicative Footprint.

2.1.3.3. Mine Operation

Operation of the mine will be conducted by the Proponent as proposed in the conceptual mine layout (**Figure 3**). Mining will be undertaken as a conventional open cut drill, blast, load, and haul operation using diesel hydraulic excavators and haul trucks on a 24 hour/day, 7 day a week basis.

The mine pit has been designed in four stages, which will be mined sequentially with some overlap between the completion of one stage and the commencement of the next. Some sections of each stage will be below water table and dewatering of the pit will be required (utilising in-pit sumps and production bores). Sequencing of mine operation has been designed to allow for backfilling of the pit to at least 5 m above the level of the pre-mining water table. Topsoil removed from the proposed mine pit footprint will be stockpiled in designated topsoil stockpile locations.

Drill and blast will be undertaken on 6 m to 9 m high benches, which will be mined selectively over multiple passes of 2.5 m to 6.0 m. Blasting will occur up to seven times per week (day shift only) with appropriate exclusion zones established around the pit.

2.1.3.4. Run of Mine (ROM) Pad

Ore will be placed onto grade-based fingers on a RoM pad constructed at ground level with windrows. Topsoil removed from the proposed ROM pad will be stockpiled in designated topsoil stockpile locations. The RoM pad will be constructed using low grade ore. Geochemical characterisation has identified that the material from the pit is non-acid-forming, and is generally classified as non-saline, and has a low risk of causing metalliferous drainage. Dust generation will be controlled via the use of water sprays at major source locations including RoM bins and key transfer points.

2.1.3.5. Processing

A modular (fixed) multi-stage crushing and screening plant will be installed, capable of crushing at a rate of up to 10 Mtpa and will operate 24 hours per day. The modular crusher provides multi-stage crushing and screening and a combination of diesel/electric powered modular mounted crushers, screens, and relocatable conveyors. The plant will be capable of producing lump and fines product (e.g. two stage), or with an optional third crushing stage to produce an all fines product. This flexible circuit is based upon MinRes' subsidiary Crushing Services International's (CSI) standard multi-stage jaw/cone/screen mobile crushing arrangement. No chemical additives or reagents are utilised, and no tailings are produced during this process. Dust generation will be controlled at key transfer points using sprays in conveyor head chutes and/or on downstream dust hoods as required.

Product generated from the modular crushing plant will be stacked using mobile stackers to form fine and coarse ore stockpiles, which will be rehandled according to grade. Any unsaleable material generated from the onsite mobile crushing plant will be utilised as blast hole stemming on site or in-pit ramp and haul road sheeting on site.

2.1.3.6. Product Transport

The iron ore will be transported by road trains along GNH to Utah Point in Port Hedland, approximately 320 km north-west of the Proposal. The Proponent proposes to utilise 60 m quad road trains with 120 to 140 tonne payloads. Anticipated vehicle movements average 228 road trains per day, likely ranging from 200 to 250 per day, assuming 350 operating days per year (24 hours per day, 7 days per week). As iron ore from the Proposal is replacing tonnes from MinRes' Iron Valley project, there will be no net increase in haulage transport to Port Hedland.

2.1.3.7. Waste Rock

Approximately 11.8 million bank cubic metres (Mbcm) of waste rock is expected to be generated from the mining operation for the Proposal. Waste rock will initially be used to construct mine site infrastructure and then transported to WRLs. Two WRLs will be located west and north of the open pit. Mine plan sequencing

to allow for backfilling of some waste rock (to at least 5 m above the level of the pre-mining water table) is planned.

The mine planning sequence will complete the mining of the pit in four stages, enabling the commencement of backfilling as soon as possible to minimise the requirements for external Waste Rock Landforms (WRLs). Contingency capacity is planned within the WRLs at the expected start of backfilling in the first mined stage. Backfilling will also be undertaken for the western extents of the pit located beneath the footprint of WRL1, with this section of the pit and backfill to be completed ahead of the WRL dump progression. The backfilling of this section of the pit will be carried out to an extent maintaining a minimum distance of 20 meters outside the Zone of Instability (ZOI) for the WRL. WRLs will be designed to manage runoff flows and reduce potential erosion. Sediment containment bunds will be constructed around waste rock and stockpile areas. All WRL surfaces will be deep ripped on contour to assist with water infiltration and provide a seed bed. Stockpiled vegetation will be spread on the surfaces of the WRLs to provide erosion protection and fauna habitat.

Assessment of the physical and geochemical characteristics of waste rock (MBS Environmental 2021) confirmed the majority of the materials to be handled have extremely low acid generation potential and are considered unlikely to produce saline seepage. One waste rock type (shale) had a single sample (of 10) characterised as potentially acid-forming (PAF); however, the shales are present below the baseline water table, the pit will be backfilled to at least 5 m above the level of the pre-mining water table, and a PAF Management Plan will be developed and implemented to ensure PAF waste is encapsulated within the WRLs. Therefore, waste rock is not anticipated to be an environmental risk to the surrounding surface water, land, soil or groundwater.

2.1.3.8. Water Supply

The Proposal is expected to require approximately 950 ML of groundwater per year for the purposes of dust suppression, processing, fire management, and potable water for treatment with reverse osmosis (RO). Groundwater for water supply will be sourced from in-pit and ex-pit production bores, supplemented by other supply bores located within an unnamed ephemeral creek referred to as Mine Creek; in-pit sump water will be used for dust suppression as necessary.

The 950 ML annual water demand (approximately 30 L/s) is comprised of; 12 L/s process water demand, 15 L/s dust suppression, and 3 L/s camp water demand. This water demand will initially be met through groundwater extraction from the orebody aquifer via in-pit and ex-pit production bores, including production bore PB01, currently installed on the northwestern side of the proposed pit (**Figure 3**). Another three production bores (**Figure 3**) have also been installed west of the proposed pit along Mine Creek (PB02 and PB03) and north of the pit (PB04), for additional water supply if demand cannot be fully met from the orebody aquifer. Understanding of the groundwater conditions across the site has been informed by data from the installation of these production and monitoring bores, initial slug testing at time of drilling (2021), and a hydraulic test-pumping program on the production bores (2022). Technical assessment of this available information has been conducted by MinRes in-house hydrogeologists and the results used to inform the water supply and dewatering strategy for the site. A memo on the results of MinRes assessment (MinRes 2024) and water supply and dewatering strategy is provided in **Appendix L**, along with the pump-testing report from the independent consultants (Pennington Scott) who conducted the testing.

Water from production bores (dewatering and supply bores) will be transferred and stored in a raw water storage dam lined with HDPE near the ore stockpile area. This will be the main raw water dam, with a design capacity of up to 93,000m³. The raw water dam will receive a minor volume of brine discharged from the RO plant; this will have a negligible effect on the water quality in the dam due to the relative volumes of the brine inputs, dam capacity and water use volumes. There will potentially be a raw water pipeline from the mine area for standpipes and dust control, running along the length of the haul road.

In summary, the assessment of groundwater data indicates that the volume of water stored within the pit shell will only provide water supply for a short period of time, and abstraction to meet water supply will practically dewater the pit ahead of mining. Therefore, supply from the production bores in the mine Creek area will also be required for ongoing operations. Other plans noted in the memo for ensuring water supply and dewatering security include plans for additional in-pit production bores, and a contingency production

bore northeast of the pit (near MB9) if needed to meet supply demands. Additional production bores may be required to meet the water demand. Contingencies for a surplus of dewatering water have also been made, with large surface water storage facilities included in the mine infrastructure layout to store excess water. For full details on the assessment of production bore pump-testing results and the proposed water supply and dewatering strategy (**Appendix L**).

Water from in-pit sumps will be transferred and stored in a mine water storage dam near the top of the pit ramp, with a standpipe arrangement for filling water trucks. A pipeline from this storage dam to other storage ponds may be installed as a water management control. All water will be transferred via aboveground high-density polyethylene (HDPE) pipelines.

The groundwater within the Proposed Action Area is neutral to slightly alkaline (pH range 7.2 to 8.7) and generally fresh (range 97 $\mu\text{S}/\text{cm}$ to 748 $\mu\text{S}/\text{cm}$) with low levels of heavy metals and nutrients.

2.1.3.9. Supporting Infrastructure

Site Access

Site access roads will be required to service the accommodation camp, explosives magazine and production bores. Construction methodology will be similar to the main haul road.

Ancillary Support Buildings

Buildings including offices, a medical centre with ambulance, warehouses, and housing for communications equipment. Workshops will be constructed for the maintenance of plant, heavy, light vehicles, and equipment.

Washdown Facility

Vehicle washdown will occur on a dedicated slab, with solids reporting to a drive-in sump and water recycled via a coalescing tube or plate style oily water separator.

Wastewater and Potable Water Treatment

Wastewater from the accommodation camp and administration offices will be conveyed to a wastewater treatment plant (WWTP) with treated effluent discharged to a dedicated spray field. WWTP design will be based upon peak capacity of 300 persons to accommodate the overlap when both construction and operational accommodation will be operating.

Waste Disposal

The Proponent anticipates a maximum of 2,500 tpa of non-hazardous waste will be generated on-site, comprising of inert and putrescible waste from the accommodation camp and mining facilities. In response to preferences expressed by stakeholders for no on-site waste disposal, MinRes will transport these wastes off-site for disposal at a licensed facility. All hazardous wastes (e.g. waste hydrocarbons) will also be removed from site for treatment or disposal at appropriately licensed facilities.

Communications

Ancillary support building(s) within the Development Envelope will house communications equipment. Connection to the existing commercial telecommunications network will be via installation of a telecoms tower on site (within the identified Development Envelope), or by laying a fibre optic cable along the length of the access road.

Power Generation and Distribution

Power generation will occur via gensets with built-in redundancy (multiple units on operating or standby duty) and an average load of 1,880 kilowatt-hour (kWh) (peak 3,460 kWh). The typical size range will be 200 kilo-volt-ampere (kVA) to 1000+ kVA and will provide electricity for the Proposal (mine, processing, non-process infrastructure, accommodation camp). High voltage power generation will be used for the

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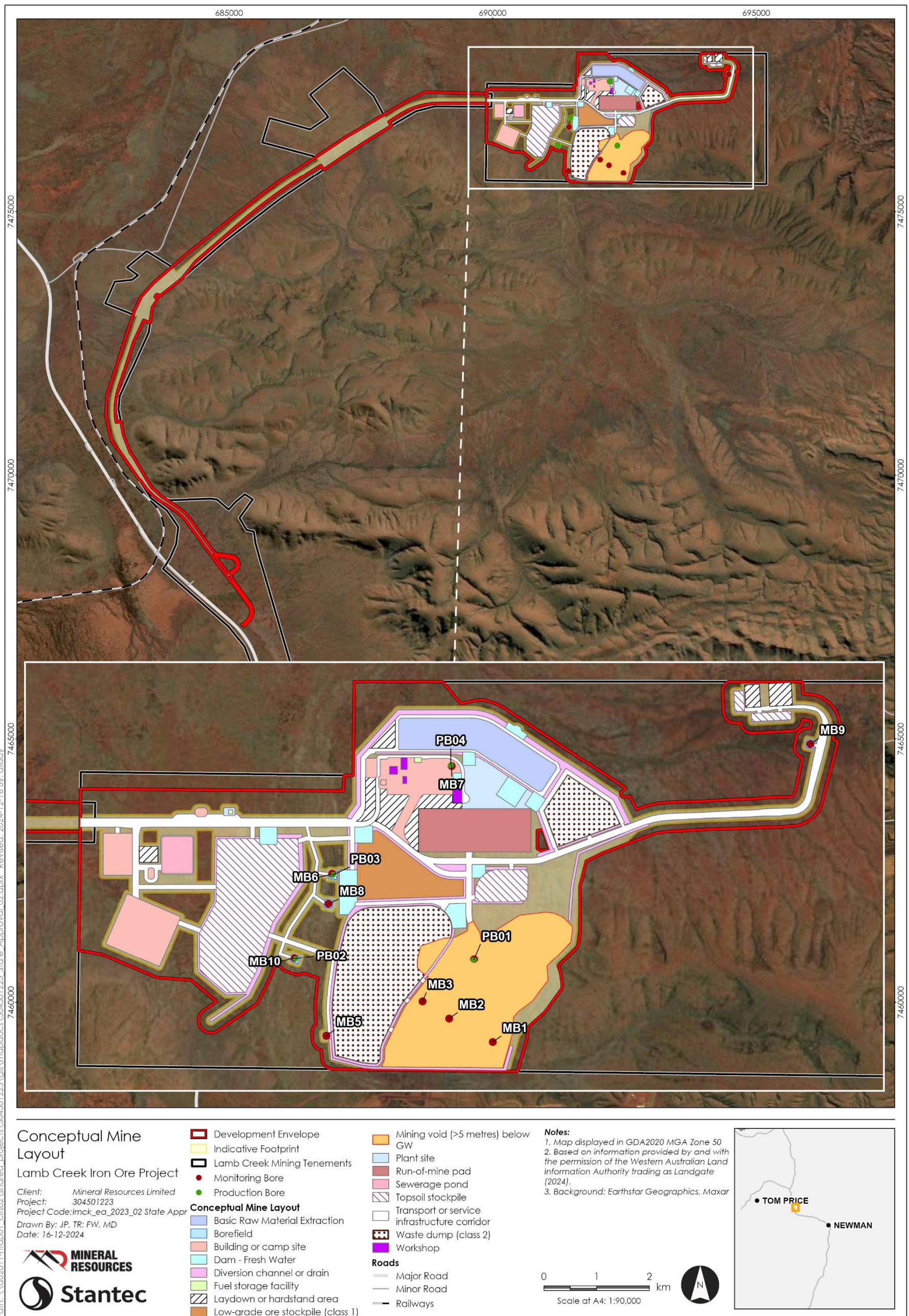
main substation feeders and potential future renewable energy tie-ins. Power distribution to the crushing and screening circuit will be limited to low voltage power generation sources. Substations will distribute power for earthworks, earthing, footings, bollards and access structures. Provision for a solar farm located on the site of the construction accommodation camp will be provided for, following its demobilisation.

Accommodation Camp

The proposed accommodation camp will be constructed by the Proponent or via a Design and Construct contract. The accommodation camp will include the following features:

- A temporary construction accommodation camp of up to 150 people, removed after permanent accommodation camp constructed.
- A permanent accommodation camp up to 150 ensuite rooms for operational personnel and surge allowance (e.g. shutdowns).
- Kitchen / dry mess and dining room.
- Wet mess.
- Recreation rooms / outdoor areas.
- Laundry/ablution blocks.
- Vehicle parking area.

The area will be sheeted with *in situ* material. If this is unsuitable, borrow material from the road alignment and/or pre-striping of other areas of the mine/processing plant areas will be used.



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FIGURE 3: CONCEPTUAL MINE LAYOUT OF THE PROPOSAL

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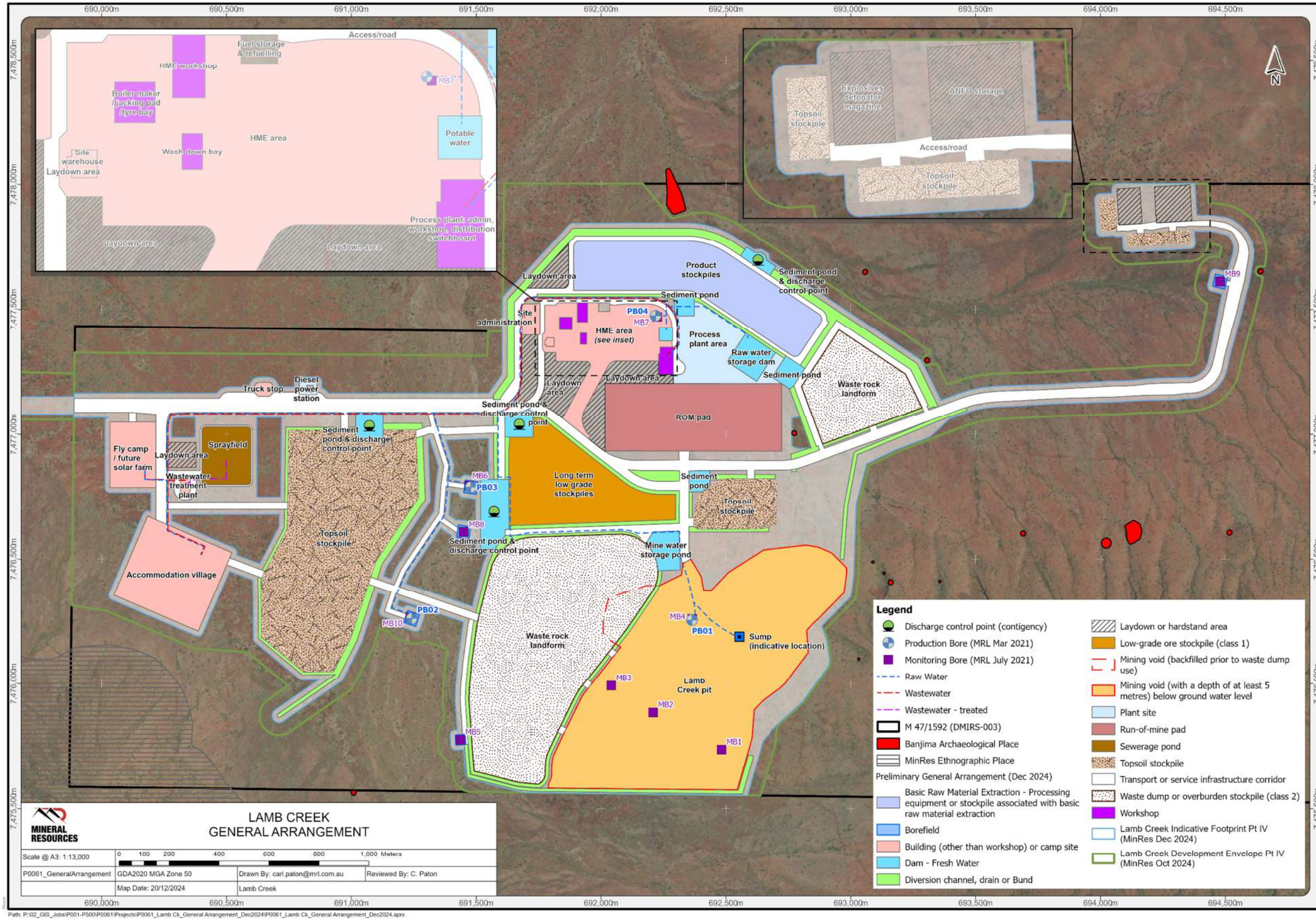


FIGURE 4: PROJECT SITE - GENERAL ARRANGEMENT

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2.1.4. Proposal Exclusions

Elements that are specifically excluded from the Proposal include:

- Development within the Main Roads WA road reserve located at the intersection of GNH and the haul road. Approval for works undertaken in the road reserve will be sought via a Native Vegetation Clearing Permit to be submitted by the Proponent to the Department of Water and Environmental Regulation (DWER).
- Utah Point port facility, where the iron ore will be exported, and which already has environmental approval to operate (Ministerial Statement 788). The quantities of iron ore shipped out of Utah Point will be within MinRes' existing approved usage limits; therefore, no changes to road or port approvals are required.

2.1.5. Indicative Timeline

Subject to approval, construction of the Proposal is anticipated to commence in quarter 3 or 4 of 2025. The Proposal is not a staged development, and an indicative implementation schedule is shown in **Table 3**.

TABLE 3: INDICATIVE TIMELINE FOR THE PROPOSAL

Stage	Indicative Timing
Commence construction	Q3 2025 to Q1 2026
Commence commissioning	Q4 2025 to Q1 2026
Commence operation	Q1 to Q2 2026
Commence mining, haulage and export	Q1 2026
End operation	FY 2030
Commence decommissioning and closure	FY 2030

2.2. PROPOSAL ALTERNATIVES AND PROPOSAL JUSTIFICATION

2.2.1. Need for the Proposal

Australia is currently the world's leading iron ore producer and exporter, and development of the Proposal will ensure the country continues to be a reliable and stable supplier to meet strong global demand. An increase in urbanisation of highly populated Asian countries and their continued industrial expansion will drive growing steel demand to 2030 and beyond (Minerals Council of Australia & Commodity Insights 2020). The Proposal will mine up to 30 Mt of iron ore to meet MinRes' tonnage throughput rates, *in lieu* of other projects (such as Iron Valley) approaching closure.

The Proposal will provide direct and indirect employment opportunities, both during the construction and operational phases, supplemented by workforces from sites in care and maintenance. During construction, a workforce of approximately 150 personnel will be required over a 6-month period. When operation commences, an estimated 98 full-time equivalent personnel will be employed directly. Opportunities for local employment and supporting local industries (through purchase of goods and services) can be expected to assist the local economy in the Pilbara.

The Proposal will additionally provide a revenue stream to the Government through the payment of royalties (State Government) and taxation (Australian Government and State Government) during each year the Proposal is in operation. Iron ore production and export has played, and will continue to play, a key role in supporting Australia's economy as it recovers from the economic downturn that resulted from the Covid-19 pandemic.

At a local scale, the Proposal will deliver economic and social benefits to the local Traditional Owners, the Banjima People (**Section 11.3.2**). MinRes is committed to increasing Indigenous participation year-on-year in the business through their apprentice, trainee, graduate, and employment programs, and through Indigenous business opportunities.

For these reasons, the Proponent believes the Proposal is a highly desirable option that benefits not only the Pilbara, but also the wider WA and Australian community.

2.2.2. Alternatives to the Proposal

In developing the Proposal, the Proponent has assessed numerous alternatives for components of the operation and made design decisions, and changes, to minimise disturbance areas and avoid to the extent practicable identified sensitive environmental or heritage features. This consideration of alternatives is a dynamic process as new information becomes available, whether from the results of site investigations and environmental studies, stakeholder inputs, or through company/industry experience.

2.2.2.1. Technologies and Processes

The design of the processing plant (crushing and screening) and supporting infrastructure has been selected based on the Proponent's extensive experience and accomplishments in the WA iron ore industry.

2.2.2.2. Location of Proposal Elements

All components of the Proposal, except for the access road connecting to GNH, are located within tenement M47/1592 (pending conversion from R47/19). Tenement L47/1008 will cover the proposed access road and intersection with the GNH.

The proposed components and locations for the Proposal have been developed to balance avoidance/minimisation of impacts to sensitive environmental factors and heritage values, and workforce/public safety, against operational efficiencies and economics.

Specific examples of this are as follows:

- In 2012, the Proponent sought to develop a larger variation of the current Proposal, consisting of two ore deposits ('Boundary' and 'Wedge'), a haul road between the deposits, two haulage route options, and three options for accommodation camp sites. In late 2017, several contributing factors resulted in this concept being delayed and conversion of the tenement to Retention Licence R47/19. In early 2020, the Proponent re-evaluated the concept and resolved to progress the Proposal with a smaller footprint, and a shorter duration. The design was revised for the current Proposal to include the 'Boundary' deposit only, conversion of the retention licence to mining lease, and selection of a preferred haul route which took into account the location of sensitive environmental and heritage values.
- Arrangement and location of WRLs to reduce impact on visual amenity and avoid watercourses, minimising disturbance of natural landforms while also providing viable haul distances. Re-working of mine plan and sequencing to allow for increasing the backfilling of the pit to a minimum of 5 m above the baseline pre-mining water table and reducing waste landform footprints.
- Use of the existing GNH transport route and Utah Point shipping facilities provides economic benefits as well as eliminating need for new disturbances that would be required to develop dedicated facilities. The quantities of iron ore hauled on GNH and shipped out of Utah Point will be within the Proponent's existing approved usage limits and therefore no changes to road or port approvals are required.

2.2.2.3. No Proposal

If the Proposal does not proceed, the demand for iron ore could be met through the development of equivalent projects located overseas. However, this would result in a substantial reduction in economic

benefits to the Pilbara, the State and Australia, and the loss of social and employment opportunities for the Banjima People and wider Pilbara community.

2.2.3. Rationalisation of Development Envelopes

The Development Envelope has been designed to avoid (where practicable) or minimise impacts to sensitive environmental and heritage features based on the information available. This rationalisation has been an iterative process and will be ongoing during the development and refinement of the Proposal as additional information (e.g. new survey results, stakeholder consultation) becomes available. Examples of this in the Proposal include:

- For the routing of the proposed access haul road connecting the proposed mine to GNH, northern and southern route options were initially considered. Following completion of initial flora, fauna surveys, and consultation with Traditional Owners, the southern route was eliminated to avoid impacts to a culturally significant heritage feature. Eliminating this southern route also avoids nearby Ghost Bat roosting caves and a location where the Pilbara Olive Python was observed in 2012 (the only sighting over 2012 and 2020 surveys) (Rapallo 2022b).
- Three potential accommodation camp locations (two on the southern haul road route and one on the northern haul road route) were also removed due to proximity to a culturally significant heritage feature. Subsequently, the proposed accommodation camp was moved to its present location on M47/1592 (pending conversion from R47/19) near the proposed mine/processing areas.
- The preferred northern haul road route was further revised to include a number of proposed new borrow pit locations on the north and south side of this northern route. However, after further consultation with the Traditional Owners, the Proponent established a Heritage Exclusion Zone and eliminated all potential borrow pit areas within this exclusion zone and shifted the northern haul road route slightly north. With this realignment of the haul road route and elimination of borrow areas, confirmation has been received that the Proposal completely avoids the recorded location of all registered heritage Sites and lodged Places. The Development Envelope and Indicative Footprint avoid all heritage places. (**Figure 5**).

This rationalisation of the Development Envelope has reduced its area by approximately 58% and has substantially reduced, or avoided, impacts on both environmental factors and heritage sites.

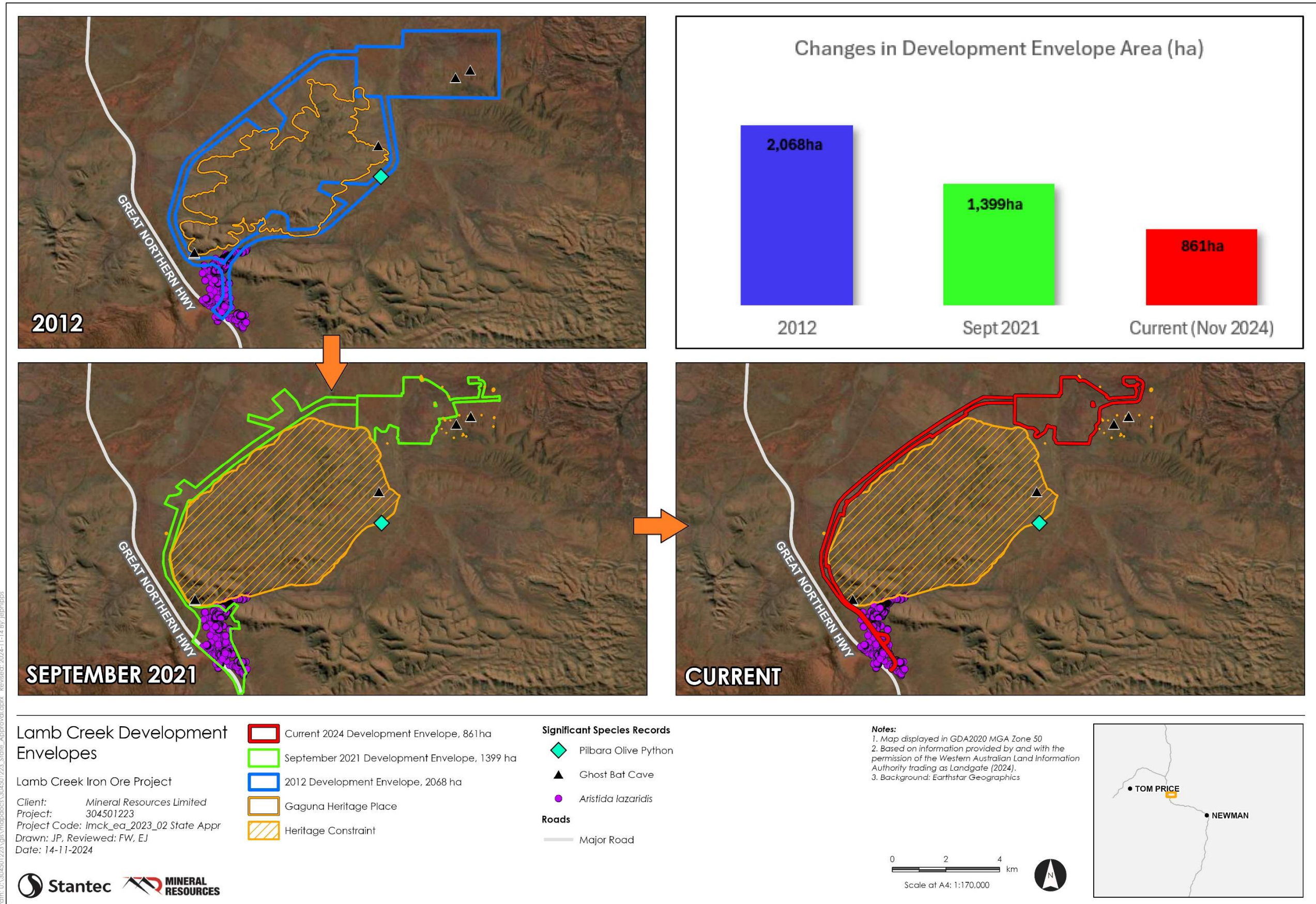


FIGURE 5: EVOLUTION OF THE DEVELOPMENT ENVELOPE FOR THE PROPOSAL

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3. REGIONAL AND LOCAL CONTEXT

3.1. BIOREGION

The Interim Biogeographic Regionalisation for Australia (IBRA) is a bioregional framework that divides Australia into 89 biogeographic regions and 419 subregions on the basis of climate, geology, landforms, vegetation, and fauna (Thackway and Cresswell 1995). The Proposal Area lies within the Pilbara bioregion and the Hamersley (PIL3) subregion (**Figure 6**). The Hamersley subregion is described as a mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges of basalt, shale and dolerite (Kendrick 2001). Vegetation of the subregion is typically Mulga (*Acacia aneura*) low woodland over bunched grasses on fine textured soil in valley floors, and *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soil of the ranges (Kendrick 2001).

3.2. LAND SYSTEMS

Five land systems have been mapped across the Flora and Vegetation Survey Area within the Hamersley subregion as described by (van Vreeswyk *et al.* 2004). These are detailed in **Table 4**.

TABLE 4: LAND SYSTEMS WITHIN THE DEVELOPMENT ENVELOPE

Land System	Description
Boolgeeda	Stony lower slopes and stony plains and narrow drainage floors and channels, supporting hard and soft spinifex grasslands and mulga shrublands, level stony plains and narrow sub-parallel drainage floors, relief up to 20 m. Often occurs below hill systems such as Newman and Rocklea.
McKay	Hills, ridges, plateaux remnants and minor breakaways of sedimentary and meta sedimentary rocks supporting hard spinifex grasslands; relief up to 100 m.
Newman	Rugged high mountains, ridges and plateaux with near vertical escarpments of jaspilite, chert and shale, supporting hard spinifex grasslands; relief up to 400 m.
Platform	Stony upper plains, dissected slopes and drainage floors, supporting hard spinifex grasslands. Erosional surfaces formed by partial dissection of the old tertiary surface. The gently inclined upper plains have extensive marginal dissection zones with gently inclined to steep slopes. Floors incised up to 30 m with steep stable marginal slopes becoming wider downslope.
Wannamunna	Hardpan plains and internal drainage tracts supporting mulga shrubland and woodlands, and occasionally eucalypt woodlands). Depositional surfaces, level hardpan wash plains subject to overland sheet flow. Broad internal drainage flats receiving run-on from adjacent hardpan surfaces; rare channelled tracts but mostly no organised through drainage; relief up to 5 m.



FIGURE 6: IBRA REGION AND SUBREGION RELATIVE TO THE PROPOSAL

3.3. CLIMATE

The climate of the Pilbara bioregion is typically arid, with hot summers and cool winters. Temperatures range from below 0°C in winter, to more than 45°C in summer. At Marillana Station, 60 km northeast of the Proposal, a weather station has measured rainfall data since 1936, providing 84 years of data. There are two additional weather stations within approximately 60 km of the Proposal, as well as the Newman Airport weather station. The latter is situated within 120 km of the site and is the closest weather station with temperature data.

Marillana has an average annual rainfall of 328.9 mm; however, rainfall is highly variable. Larger rainfall events are typically a result of cyclones and tropical lows during late summer. For example, 255 mm fell on the 26th of January 2003. Average rainfall statistics for the Marillana meteorological station (5009) are shown in **Figure 7**. Evaporation rates at Newman are estimated at 3,200 mm annually (BoM 2023), which is substantially greater than the mean annual rainfall.

Intensity-Frequency-Duration (IFD) data is required to characterise rainfall intensities and the Australian Rainfall and Runoff national guideline document (ARR), data and software suite are used to estimate design flood characteristics in Australia (Ball *et al.* 2019). Information on storms exceeding the 100-year average reoccurrence interval (ARI) event is not available in ARR but, by extrapolation, estimates can be made. The 1,000-year ARI and probable maximum precipitation (PMP) rainfall intensities are approximately 1.5x and 3.5-4x the 100-year IFDs respectively, shown in **Table 5**.

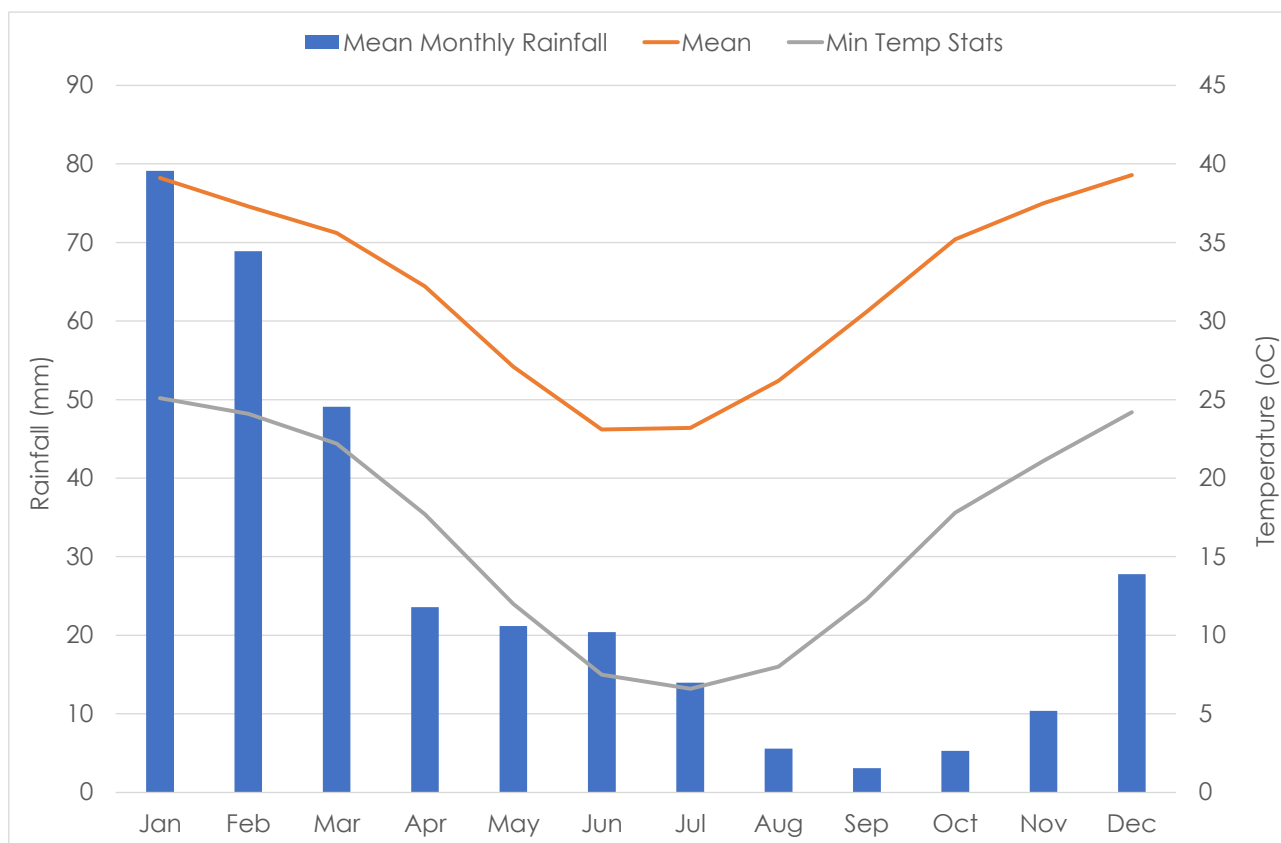


FIGURE 7: MEAN RAINFALL 1936-2020 AT MARILLANA (BOM STATION 005009)

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TABLE 5: AVERAGE RECURRENCE INTERVAL V RAINFALL DURATION (HOURS)

Average Recurrence Interval	Rainfall (mm, 1hr)	Rainfall (mm, 12 hr)	Rainfall (mm, 72 hr)
2	29	64	93
50	59	170	296
100	67	199	341
1000	100	300	500
PMP	250	750	1300

3.4. GEOLOGY, TOPOGRAPHY AND LANDFORMS

The Proposal Area occurs within the Hamersley Ranges which dominate the subregion (Thorne and Tyler 1997). Basement rocks in the region comprise early Proterozoic Brockman Iron Formation and Weeli Wolli Formation within the Hamersley Basin, a late Archaean to early Proterozoic (2,765-2,470 million years) depositional basin which is exposed over most of the southern part of the Pilbara Craton (MBS Environmental 2021). The Brockman Iron Formation, consisting of banded iron formation (BIF) and shale, is the main iron formation within the Hamersley Group (Trendall and Blockley 1970). The geological units found within the Proposal Area are outlined in **Table 6**.

TABLE 6: PROPOSAL GEOLOGY DESCRIPTIONS (THORNE AND TYLER 1997)

Geological Unit	Abbrev.	Description
Brockman Iron Formation	PLHB	BIF, chert and pelite.
Quaternary Alluvium	Qa	Unconsolidated silt, sand and gravel; in drainage channels and adjacent floodplains
Quaternary Alluvium and Colluvium	Qw	Red-brown sandy clayey soil; on low slopes and sheetwash areas.
Cainozoic Colluvium	Czc	Partly consolidated quartz and rock fragments in silt and sand matrix; old valley-fill deposits.

The topography of the subregion is rugged, comprising three small mountain ranges; Packsaddle Range in the centre, Jirrapalpur Range in the south and the Hancock Range to the north (Rapallo 2021b). The Proposal Area is situated within the Hancock Range, which is characterised by low rugged hills. The Proposal Area ranges in elevation from approximately 700 m RL to 800 m RL on a ridgeline on the east side, although majority of the site is between 700 m RL and 720 m RL, with typical surface slopes of about 1%. The eastern ridge has a maximum height is approximately 1,064 m RL.

The landform types within the Proposal Area are considered to be extensively represented within the subregion. Gazetted landforms in the region include Iron Ore Ridge, which runs east-west around 12 km south of the Proposal Area (location of BHP's 'Mining Area C' iron ore mine) (MBS Environmental 2021).

3.5. SURFACE HYDROLOGY AND HYDROGEOLOGY

Within the Hamersley subregion, drainage runs into either the Fortescue River to the north, the Ashburton River to the south, or the Robe River to the west (Kendrick 2001) (**Figure 8**). There are no permanent or semi-permanent surface water features in the Proposal Area. The Lamb Creek orebody is located approximately 600 m east of Mine Creek, which drains northward to a confluence with Marillana Creek about 9 km north of the Proposal Area. Marillana Creek flows into Weeli Wolli Creek which supports the Weeli Wolli Spring, listed as a Priority 2(P2) priority ecological community (PEC), associated with riparian woodland and forest associations of unusual composition, relatively high diversity of stygofauna, and a diverse microbat assemblage (DBCA 2022; Kendrick 2001). Weeli Wolli Creek eventually transitions to a channel with an alluvial fan floodplain before discharging to the Fortescue Marsh (approximately 100 km downstream). The Weeli Wolli Spring is the nearest site considered to be of high ecological and cultural

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value, as it represents a rare source of permanent water within the region and is located upstream of the confluence of Weeli Wolli Creek and Marillana Creek.

The Fortescue Marshes are an extensive, episodically inundated samphire marsh, approximately 100 km long and 10 km wide. It is the largest ephemeral wetland in the Pilbara bioregion and is listed under the *WA Biodiversity Conservation Act 2016* (BC Act) as a P1 priority ecological community (PEC) (Fortescue Marsh, Martuyitha, Marsh Land System) and is also listed (Fortescue Marshes – WA066) under the Directory of Important Wetlands of Australia as “nationally important” (DAWE 2021). The Fortescue Marshes support a diverse flora and fauna community of high conservation value and is part of an array of alluvial aquifers and groundwater systems.

Within the subregion, diffuse recharge to the groundwater system occurs at very low rates, occurring preferentially during rainfall-runoff events along the major creeks and other areas of surface water concentration / inundation (AQ2 2021b). The main iron-bearing formation within the Hamersley Group, the Brockman Iron Formation, comprises generally low permeability BIF and shales. However, where mineralised, the BIF has enhanced permeability and storage and can be considered an aquifer.

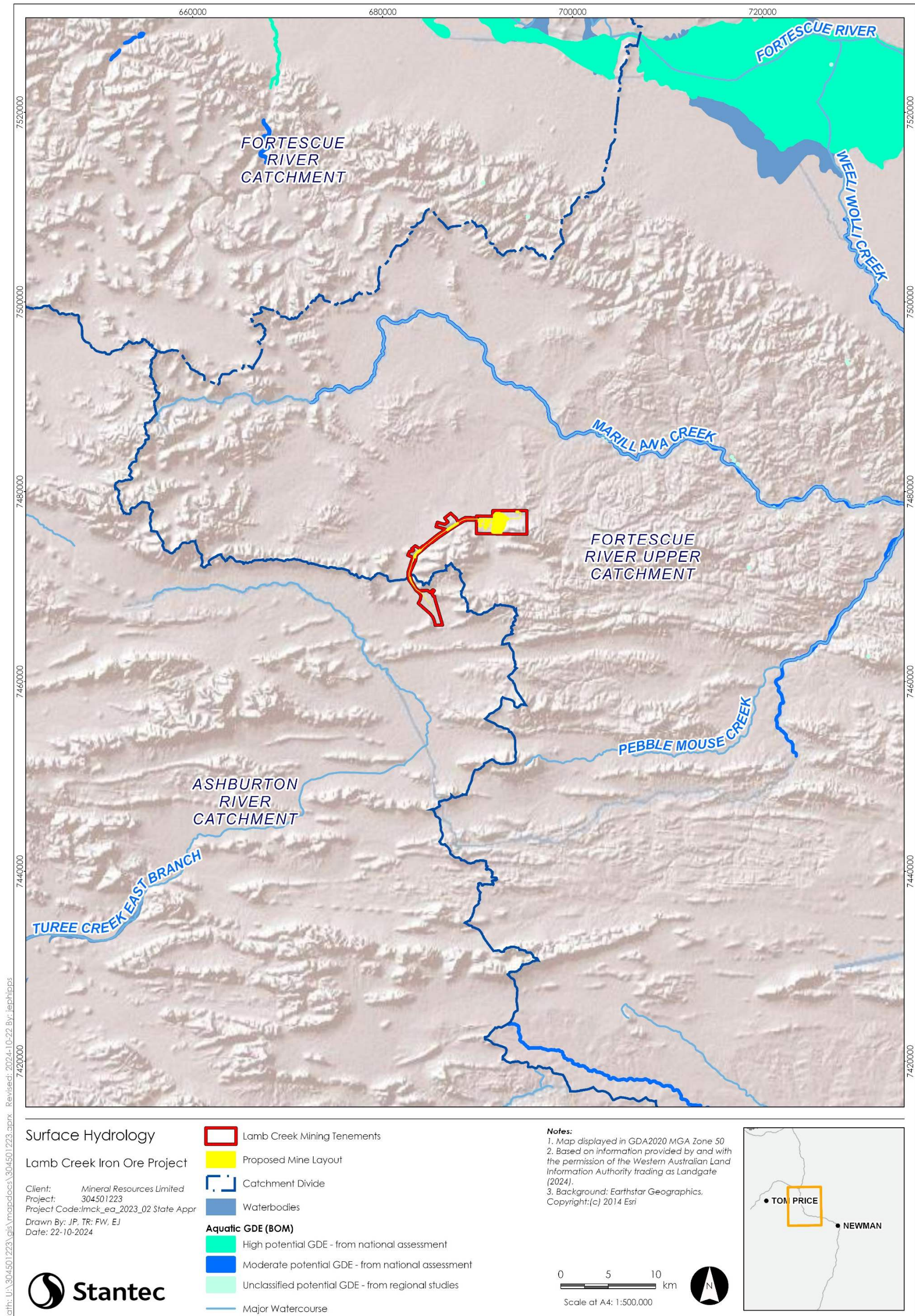


FIGURE 8: SURFACE HYDROLOGY IN THE VICINITY OF THE PROPOSAL

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3.6. FEATURES OF SIGNIFICANCE

The Development Envelope does not contain any environmental features of significance. It is located within the Hamersley subregion which hosts the Karijini Gorges and a Wetland of National Significance, located within the Karijini National Park. Wetlands of subregional significance within the Hamersley subregion include Weeli Wolli Spring, Palm Spring, Duck Creek, Mount Bruce Coolibah claypan, and springs and surface water pools of the Robe River. The nearest of these features is Weeli Wolli Spring at approximately 31 km to the northeast, with most others being over 100 km away.

3.7. NATIVE TITLE

The Proposal Area is located on land the subject of Banjima People Native Title Determination (WCD2014/001, WAD6096/1998), in respect of which BNTAC holds on trust the native title rights and interests of the Banjima People (**Section 4.2.1**).

3.8. LAND USE

The Proposal Area is within the Juna Downs pastoral lease (LPL N050471). The dominant land uses in the Pilbara bioregion are pastoralism, conservation, mining, agriculture, tourism, urban and traditional owner land uses.

3.9. EXISTING PROJECTS AND FORESEEABLE PROPOSALS

There are a number of existing projects and reasonably foreseeable proposals within 120 km to the Lamb Creek Proposal. These are listed in **Table 7** and shown in **Figure 9**

TABLE 7: EXISTING PROJECTS AND FORESEEABLE PROPOSALS WITHIN THE VICINITY OF THE PROPOSAL

Project Name	Approximate Distances (km)
Mining Area C (Southern Flank) (BHP)	15.3
Yandi (BHP)	19.4
Hope Downs 1 (Rio Tinto)	28.8
West Angelas (Rio Tinto)	32.4
Yandicoogina (Rio Tinto)	35.1
Hope Downs 4 (Rio Tinto)	75.6
Gudai-Darri (Rio Tinto)	29.7
Marandoo (Rio Tinto)	63.7
Marillana (MinRes/Brockman Mining)	42.5
Iron Valley (MinRes)	43.4
Cloudbreak (FMG)	67.3
Christmas Creek (FMG)	108.4
Roy Hill (Roy Hill)	116.4
Brockman Syncline 4 (Hamersley Iron)	158.8
Reasonably Foreseeable Proposals	
Minister's North (BHP)	31.9
Gurinbidy (BHP)	54.6
Jinidi (BHP)	56.9

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Project Name	Approximate Distances (km)
Ophthalmia (BHP)	103.7
Hope Downs 2 (Rio Tinto)	31.6
Nyidinghu (FMG)	46.9

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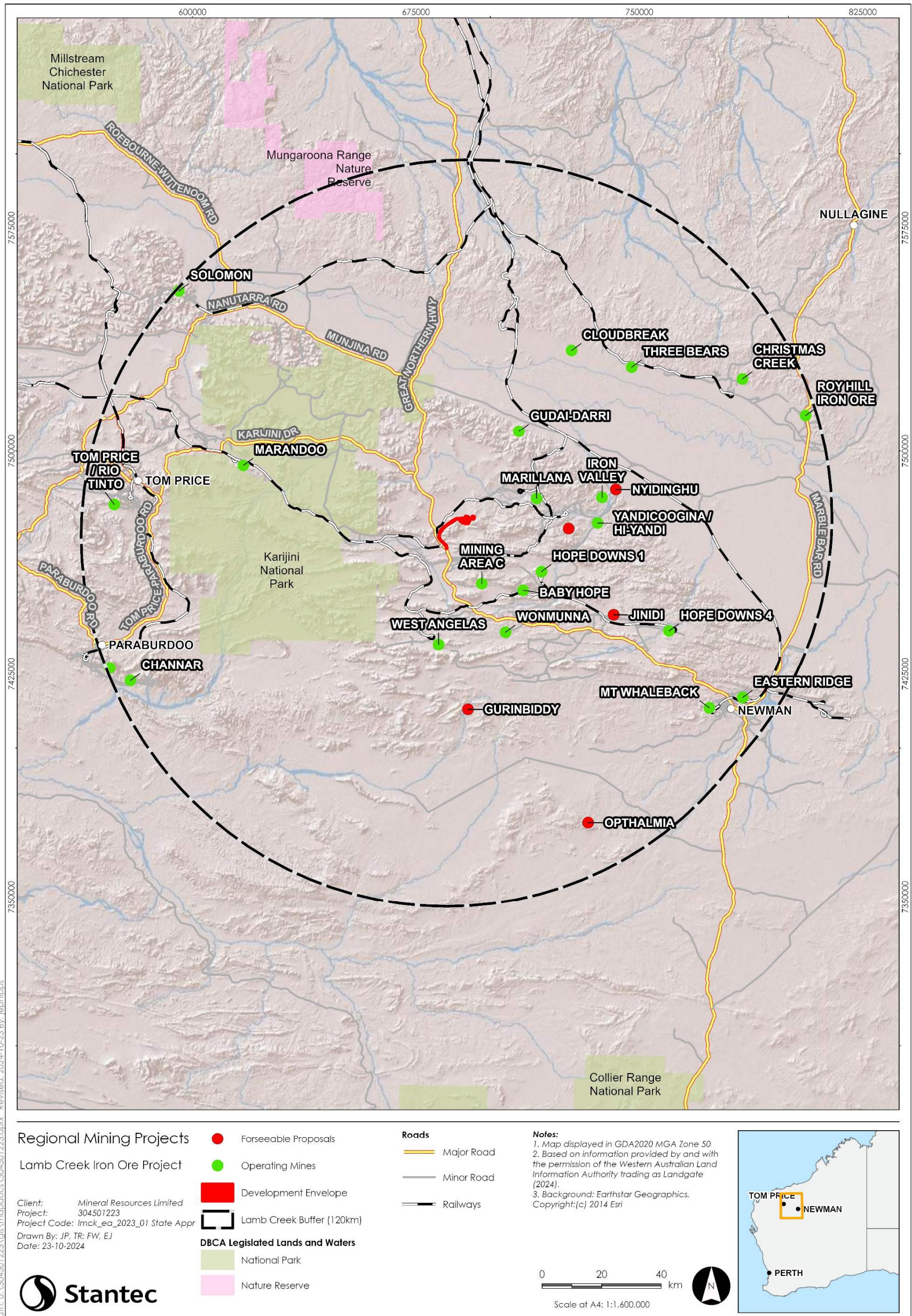


FIGURE 9: EXISTING AND FORESEEABLE PROPOSALS IN PROXIMITY TO THE PROPOSAL

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4. LEGISLATIVE CONTEXT

4.1. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The Proposal is submitted for assessment under Part IV of the EP Act. The Proposal has also been referred (Application reference # 2023/09754) for assessment under the EPBC Act, however this is for a slightly larger footprint that includes the Great Northern Highway intersection (**Section 4.1.2**). The Proponent does not intend to seek approval under a Bilateral Agreement between the State and Commonwealth.

The content, format and EIA presented in this RSD have considered the following EPA guidance:

- *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures* (EPA 2021e)
- *Statement of environmental principles, factors and objectives and aims of EIA* (EPA 2023c)
- *How to identify the Content of a Proposal: Instruction and template* (EPA 2021f)
- *How to prepare an Environmental Review Document: Instructions* (EPA 2021a)
- *Environmental outcomes and outcomes-based conditions: Interim Guidance* (EPA 2021g)
- *Instructions for preparing data packages for the Index of Biodiversity Surveys for Assessments (IBSA)* (EPA 2021h)
- *How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: Instructions* (EPA 2020b).

4.1.1. Environmental Protection Act 1986

In WA, the principal legislation governing environmental assessment of development proposals is the EP Act. The EIA of development proposals is undertaken by the EPA in accordance with Part IV Division 1 of the EP Act and the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016* (EPA 2021i).

Any proposal likely to have a significant environmental effect on the environment should be referred to the EPA under s. 38 of the EP Act. The EPA will decide whether to assess the proposal and if it is to be assessed will determine the level of assessment of the proposal and other proposal-specific information required. The EPA will assess the proposal based on referral information, additional assessment information where required (including an RSD that meets EPA's Environment Review Document (ERD) preparation guidance) prepared by the Proponent or the EPA's own investigations and inquiries), and submissions if information is made available for public review.

At the completion of the assessment, the EPA will prepare a report and recommendations for the WA Minister for Environment. The assessment report sets out what the EPA considers are the key environmental factors identified during the assessment, the EPA's recommendations as to whether or not the proposal may be implemented and the conditions and procedures to which implementation should be subject. The Minister for Environment considers the EPA's report and any public appeals before determining, in consultation with other Ministers, whether the proposal should be allowed to proceed, and if so, under what conditions.

The Proponent has undertaken pre-referral consultation with EPAS, regarding the EIA of the Proposal. The Proponent anticipates that the Proposal will be assessed under Part IV of the EP Act based on referral information.

4.1.2. *Environment Protection and Biodiversity Conservation Act 1999*

An earlier iteration of the Proposal (larger pit, longer mine life) and was referred to the Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW, previously Department of Sustainability, Environment, Water, Population and Communities [DSEWPAC]) in 2012 for consideration of Matters of National Environmental Significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The previous EPBC referral was deemed 'NOT a Controlled Action' (ref 2012/6666) on 4th December 2012.

Due to changes in the Project Description and new knowledge around threatened and migratory species in the region, the Proponent made the decision to re-refer the Proposal. Significant species with the potential to occur within the Proposal Area were assessed against *Matters of National Environmental Significance: Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013) by technical specialists. The Proponent considers that potential impacts to habitat for MNES fauna species are likely to be significant; therefore, the Proposal has been referred to the DCCEEW, reference 2023/09754, and found to be a Controlled Action assessed by preliminary documentation with additional information. The Development Envelope for the DCCEEW referral also covers the GNH intersection which is excluded from this Part IV referral.

4.2. OTHER APPROVALS AND REGULATION

4.2.1. Native Title

Native Title is the set of rights and interests over land and water in Australia and its Territories that have been established through traditional Aboriginal law and custom and is recognised under the Commonwealth *Native Title Act 1993* (NT Act), balanced with other rights and interests in the area in question.

Native title rights and interests may include rights to:

- Decide who can access land.
- Access an area for traditional purposes, like camping or ceremonies.
- Visit and protect important places and sites.
- Hunt, fish and gather food or traditional resources like water, wood and ochre.
- Teach law and custom on country.

Australian law recognises that native title exists where Aboriginal people have maintained a traditional connection to their land and water, where acts of government have not extinguished it.

The Development Envelope is located on land the subject of Banjima People Native Title Determination Area (WCD2014/001, WAD6096/1998) (**Figure 10**).

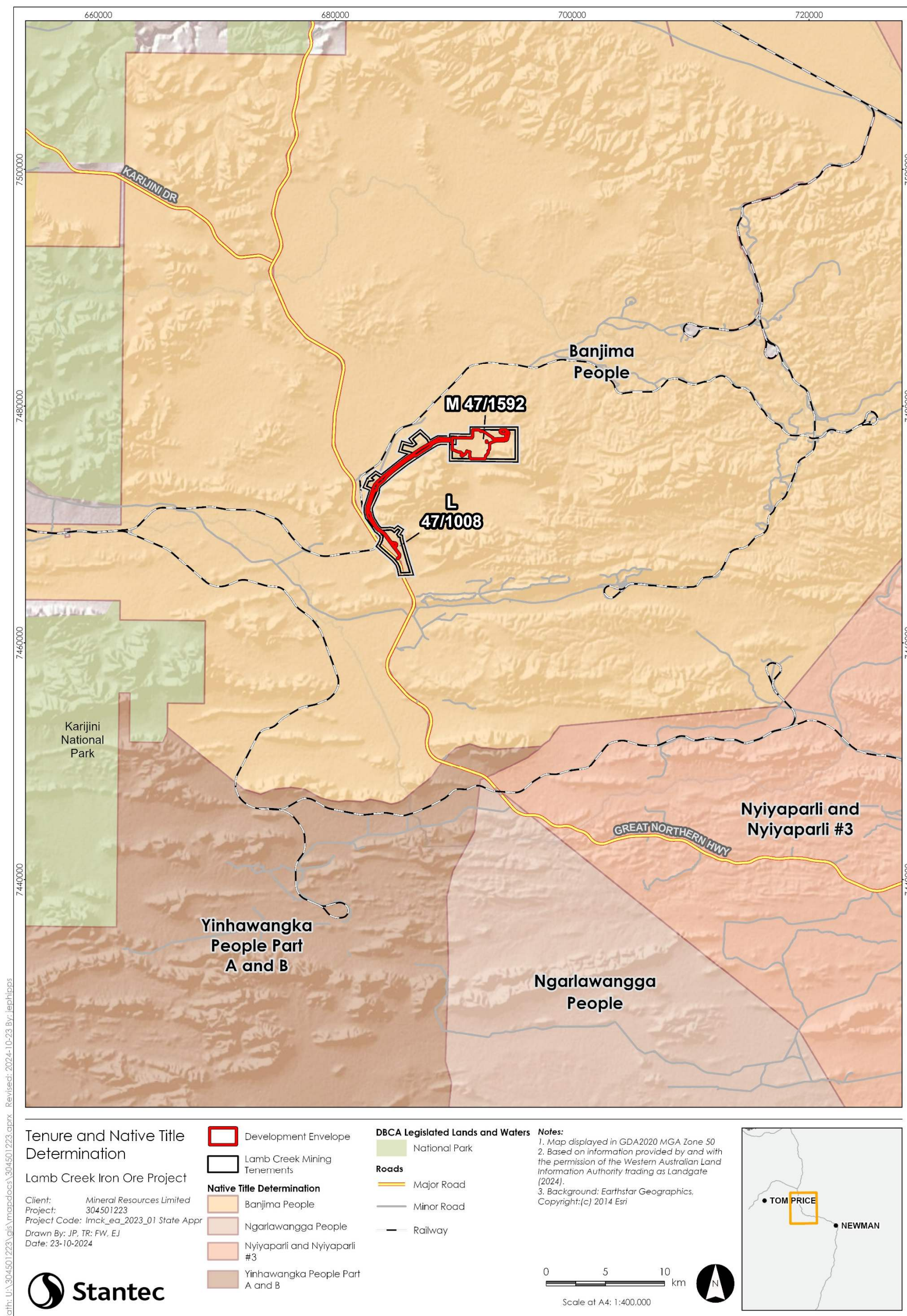


FIGURE 10: LAND TENURE AND NATIVE TITLE DETERMINATIONS RELEVANT TO THE PROPOSAL

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4.2.2. Tenure

The activities associated with the Proposal will be undertaken on the tenements listed in **Table 8** and shown in **Figure 10**. This mining tenure overlies the Juna Downs pastoral lease (LPL N050471) owned and operated by Rio Tinto Pty Ltd. In addition, portions of L47/1008 overlap:

- L021124 (Hamersley Iron Pty Ltd – Yandicoogina Rail).
- E47/1790 (Hamersley Iron Pty Ltd).
- E47/1329 (Hamersley Iron Pty Ltd).
- ML281SA (Mitsui Iron Ore Corporation Pty Ltd, BHP Billiton Minerals Pty Ltd, Itochu Minerals and Energy of Australia Pty Ltd).

TABLE 8: PROPOSAL TENEMENTS

Tenement	Area (Ha)	Holder	Granted	Expiry
M47/1592	1,200.4	Process Minerals International Pty Ltd	Pending	Pending
L47/1008	998.9	Process Minerals International Pty Ltd	16/07/2021	27/03/2044

4.2.3. Other Decision-Making Authorities and Approvals

Other decision-making authorities (DMAs), their statutory decision-making processes, and approvals that are required for the Proposal are summarised in **Table 9**.

Regarding approvals required from the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS), a Mining Proposal will be submitted in support of the application of a mining lease under the *Mining Act 1978*. A MCP will also be required to be submitted with the Mining Proposal and updated throughout the life of the Proposal. Separate to the above, a Project Management Plan (PMP) will be submitted to DEMIRS addressing construction works. The PMP will be progressively augmented to address operational risks.

TABLE 9: OTHER APPROVALS

Decision-making Authority	Legislation Or Agreement Regulating The Activity	Approval Required	Can The Statutory Decision-Making Process Regulate Impacts On The Environment? (Yes/No And Summary Of Reasons)
DCCEEW	<i>EPBC Act</i>	<ul style="list-style-type: none"> • EPBC Act Referral 	<ul style="list-style-type: none"> • Yes – assessment of potential impacts to MNES associated with the Proposal.
DWER	<i>Rights in Water and Irrigation Act 1914 (RIWI Act)</i>	<ul style="list-style-type: none"> • s 5C licence to take water 	<ul style="list-style-type: none"> • Yes – assessment of the abstraction of groundwater associated with the water supply for purposes of dust suppression, processing, fire management, and potable water
		<ul style="list-style-type: none"> • s 26D licence to construct or alter a well 	<ul style="list-style-type: none"> • Yes – assessment of the construction of a bore to access water
		<ul style="list-style-type: none"> • Permit to Obstruct or Interfere with Bed/Banks 	<ul style="list-style-type: none"> • Yes – assessment of the interference with bed and banks of a watercourse
DWER	EP Act Part V	<ul style="list-style-type: none"> • Works Approval and Licence • Operating Licence 	<ul style="list-style-type: none"> • Yes – assessment of construction and operation of premises for processing or beneficiation of metallic or non-metallic ore, mine dewatering, screening etc. of material, processing sewage
DEMIRS	<i>Dangerous Goods Safety Act 2004 (DGS Act)</i>	<ul style="list-style-type: none"> • Dangerous goods licence 	<ul style="list-style-type: none"> • Yes – assessment of the storage and handling of dangerous goods.
DWER	EP Act Part V	<ul style="list-style-type: none"> • Native Vegetation Clearing for clearing in Main Roads WA road reserve for intersection of haul road and GNH. 	<ul style="list-style-type: none"> • Yes – assessment of impacts of clearing of native vegetation
Department of Planning, Lands and Heritage	<i>Aboriginal Heritage Act 1972</i>	<ul style="list-style-type: none"> • No – no anticipated impacts to Aboriginal sites (authorisation otherwise required to enter, excavate, destroy, damage, conceal, alter or remove an Aboriginal site). 	<ul style="list-style-type: none"> • Yes – Act provides process to obtain, undertake activities which would otherwise be an offence under the Act (where required).
DEMIRS	<i>Mining Act 1978</i>	<ul style="list-style-type: none"> • Mining lease • Mining Proposal • MCP • Programme of Works 	<ul style="list-style-type: none"> • Yes – assessment of Mining Proposal and Mine Closure Plan to ensure compliance with relevant legislation, resulting in granting of a mining lease(s)

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5. STAKEHOLDER ENGAGEMENT

The Proponent recognises the value of building positive relationships with key stakeholders and the community, and seeks to build sustainable partnerships with business partners, governments, non-government organisations, host communities and other stakeholders to support mutually beneficial outcomes. The Proponent strives to engage early, openly, honestly and regularly with the communities impacted by the Proposal and consider their views in our decision-making with respect to key planning, operation and closure aspects. A Stakeholder Engagement Plan is developed and implemented for each Proposal.

5.1. KEY STAKEHOLDERS

The Proponent has identified key Proposal stakeholders, and these are listed in **Table 10**.

TABLE 10: KEY STAKEHOLDERS FOR THE PROPOSAL

Stakeholder Sector	Organisation
Australian Government Agencies	Department of Climate Change, Energy, the Environment and Water
State Government Agencies & Members of Parliament	Department of Biodiversity, Conservation and Attractions
	Department of Jobs, Tourism, Science and Innovation
	Department of Energy, Mines, Industry Regulation and Safety (formally the Department of Mines, Industry Regulation and Safety)
	Department of Planning, Lands and Heritage
	Department of the Premier and Cabinet (Ministers for Water and Environment)
	Department of Primary Industries and Regional Development
	Department of Transport
	Environmental Protection Authority Services
	Department of Water and Environmental Regulation
	Development WA
	Environmental Protection Authority
	Main Roads WA
	Pilbara Port Authority
	Alinta Energy
Local Government	Shire of East Pilbara
Traditional Owners	Banjima Native Title Aboriginal Corporation (Prescribed Body Corporate for the Banjima People)
Corporate and Community	Rio Tinto/Juna Downs Pastoral Lease
	Bird Life Western Australia
	Wildflower Society of Western Australia
	Conservation Council of Western Australia
	Wilderness Society

5.2. STAKEHOLDER ENGAGEMENT PROCESS

Stakeholder engagement commenced in 2012 and specific stakeholder engagement activities undertaken have included:

- Briefings and presentations with key regulatory authorities and potentially affected parties to provide information on the proposal, planned studies and request feedback
- Face to face meetings, telephone calls and written correspondence with potentially affected stakeholders to provide updates on the proposal and obtain additional feedback.

Through this variety of engagement forums, the Proponent has been able to identify the required studies and investigations and, importantly, key environmental and social impacts and associated mitigation strategies required to support the Proposal, to ensure the Proposal aligns with expectations, where practicable.

5.3. STAKEHOLDER CONSULTATION

The Proponent is committed to continued engagement with stakeholders through all development phases of the Proposal, as documented in the Stakeholder Engagement Plan. The key stakeholder consultation and engagement activities undertaken to date by the Proponent are summarised in **Table 12**. Outcomes of these activities are recorded in a Stakeholder Management System, which is a live document that interconnects with the Stakeholder Engagement Plan for this Proposal.

5.3.1. Ongoing Engagement

Consultation will continue to be undertaken with the respective stakeholders identified in **Table 11** to ensure the Proposal aligns with expectations, where practicable.

TABLE 11: PROPOSED ONGOING STAKEHOLDER ENGAGEMENT

Stakeholder	Proposed Engagement
DEMIRS EPA / DWER	<ul style="list-style-type: none"> • Annual compliance reporting and site inspections. • For any Proposal changes that may require approval, consultation will be undertaken through an initial pre-submission scoping meeting with the applicable regulatory agency.
DBCA	<ul style="list-style-type: none"> • Consultation regarding significant flora and fauna species management as required.
Shire	<ul style="list-style-type: none"> • Quarterly meetings with Shire of East Pilbara to provide update on the project and provide opportunity to raise and discuss any issues, concerns or opportunities and provide feedback.
Pastoral Station • Juna Downs (RTIO)	<ul style="list-style-type: none"> • Project update pre-construction of site access • As/if required to discuss incidents, complaints over activities of either party • Closure planning considerations – preliminary closure plan and plan updates (DEMIRS mandated every three years)
Other tenement holders • RTIO (includes Juna Downs) • BHP	<ul style="list-style-type: none"> • Project update pre-construction of site access • Periodic tenure and Land Access meetings – as per access agreements (every 2 – 3 months) to discuss completed and planned activities, any issues or concerns.
Traditional Owners • Banjima Native Title Aboriginal	<ul style="list-style-type: none"> • Engagement in relation to any heritage management and places. • Biannual implementation meetings / MHERC meetings under the native title agreement.

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Stakeholder	Proposed Engagement
Corporation (Prescribed Body Corporate for the Banjima People)	<ul style="list-style-type: none"> • Ad hoc engagement, as required.
Non-governmental Organisations <ul style="list-style-type: none"> • Wildflower Society WA • Bird Life WA • Conservation Council WA • Wilderness Society 	<ul style="list-style-type: none"> • Project briefing after initial approvals licensing submissions

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TABLE 12: STAKEHOLDER CONSULTATION REGISTER

Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
DCCEEW	12 December 2024	Email	DCCEEW provided comments on MinRes response to RFI queries on Preliminary Document. Additional information required for some MinRes responses.	MinRes to provide additional information requested regarding; progressive rehabilitation plans, habitat type and quantity cleared for fringed firebush, potential impacts of dust/vibration/noise on some MNES, offset details, understanding of groundwater conditions.
BNTAC	6 December 2024	Email	Final versions of Mining Proposal, Mine Closure Plan and Section 38 Referral Supporting Document provided to BNTAC prior to submission to DEMIRS/DWER.	MinRes to continue its collaboration with BNTAC on mine closure plan and Part IV and V approval submissions.
DEMIRS	2 December 2024	Meeting	Mining Proposal pre-submission briefing, MinRes intention to submit MP before Christmas break.	MinRes to finalise and submit MP and MCP before end of 2024. MinRes staff available for any queries from DEMIRS staff.
BNTAC, Banjima People (MHERC)	22 November 2024	Email	BNTAC letter of support for the Lamb Creek Iron Ore Project. BNTAC provided MinRes with a letter of support for the Lamb Creek Project. The letter is provided conditionally with BNTAC and the MHERC being satisfied with the level of engagement by MinRes to date. Conditions for this support listed in the letter and included (among others); no on-site landfills, pit backfilled to minimum of 5m above the pre-mining water table, no ex-pit storage of mineralised waste, various measures to support visual amenity (e.g. upper pit benches treatment), access road to be paved with asphalt.	MinRes to include the letter of support when submitting its Section 38 Referral Supporting Document to the WA-EPA, and other licencing submissions as needed. MinRes to continue its collaboration with BNTAC closure planning.
BNTAC, Banjima People (MHERC)	7 November 2024	Email	BNTAC advised MinRes of resolution passed by Banjima board 6/11/24 to provide letter of support for Lamb Creek Project Section 38 referral.	MinRes to provide draft letter to BNTAC for their review and edit as necessary and issuing under Banjima letterhead.
BNTAC	October-December 2024	Emails	Native title agreement negotiations between BNTAC and MinRes.	Progress in drafting agreement.
BNTAC	25 October 2024	Meeting	Follow-up to 21-22 October 2024 On-Country visit to discuss BNTAC/MHERC view of the proposed Project and management controls presented to date. Discuss MinRes request for BNTAC/MHREC formal endorsement/support of the project. MinRes draft statement of position to Banjima Closure Outcomes for the project discussed and the progress of mine closure plan update for Lamb Creek.	MinRes to provide update to key opportunities for BNTAC to provide input, feedback, comments on the various approval applications for the Lamb Creek Project (information emailed to BNTAC). BNTAC will provide comments on MinRes response to Banjima Closure Outcomes.
DCCEEW	23 October 2024	Email	MinRes provided minor update to EPBC Preliminary Documentation report. Figure 3 (Conceptual Mine Layout) was updated to reflect a revised (expanded) pit boundary. No changes to the Proposed Action Area (PAA) or Indicative Footprint (IF) are required by this update. No effect on assessment of potential impacts given no change to PAA or IF.	DCCEEW assessment of Preliminary Documentation to continue.
BNTAC, Banjima People (MHERC)	21-22 October 2024	Meeting	On-Country meetings and site inspection with Banjima members of their MinRes Heritage and Environment Reference Committee (MHERC) and BNTAC staff and consultants. MinRes provided project overview and inspection of the site to ensure MHERC members are fully informed before making decisions on level of support for the project. Further examination of opportunities for reducing extent of ex-pit waste rock landforms remaining post-operations to continue.	MHERC and BNTAC to report to their Board at November 2024 meeting and consider MinRes' request for letter of support for the Lamb Creek Project (letter of support provided 22/11/2024). BNTAC staff and consultants advised MHERC on results of consultations with MinRes and acceptability of proposed project design and management controls. No ex-pit mineralised WRL(#2) to remain after closure (achieved by MinRes mine plan redesign). Support for the project will be dependent on continuing collaboration on development of the Mine Closure Plan.
BNTAC	14 October 2024	Meeting	MinRes met with Technical Representatives and Consultants for BNTAC to present the 'Statement of Position' for the Project for each Closure Outcome. Alternative Closure Outcome phrasing for the Project were presented based on ability to meet original Closure Outcome.	MinRes to revise Statement of Position based on 14 October 2024 meeting and provide to BNTAC for presentation to the MHERC.
BNTAC	4 October 2024	Meeting	Technical Representatives and Consultants for BNTAC presented the under-development Banjima Closure Principles and Outcomes to MinRes for consultation. This presentation included an overview of the Banjima Closure Framework, Closure Objectives, Closure Principles and Behaviours and Closure Outcomes, also known as the End State Values – for any Projects that occur on Banjima Country. BNTAC noted that these Closure Outcomes are in development and	MinRes to develop a 'Statement of Position' for the Project against BNTAC Closure Outcomes (completed at 25/10/2024 meeting).

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Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
			will be Project specific, however represent the aspirational Closure Outcomes on Banjima Country.	
BNTAC	3 September 2024	Email	BNTAC and MinRes confirm dates for the next MHERC meeting to occur 21-23 October 2024.	Engagement between MinRes and BNTAC is ongoing, including coordination of attendees and logistics.
DCCEEW	29-August-2024	Email	Finalised meeting (23/08/2024) notes provided by DCCEEW. Advice also provided regarding how change in EPBC approval area (reduction) could be presented in upcoming Preliminary Documentation submission. Agreed meeting notes finalised. DCCEEW recommendation to MinRes for proposed reduction in EPBC Proposed Action Area (PAA), keep PAA area unchanged but reduce Indicative Footprint to account for change in waste rock landform design.	MinRes to consider advice when finalising Preliminary Documentation for submission to DCCEEW in response to RFI.
DCCEEW	28-August-2024	Email	MinRes provided draft Project Action Plan (PAP) to DCCEEW staff for the EPBC assessment, including steps and indicative timelines. Draft PAP to be reviewed by DCCEEW and comments provided to MinRes before finalising.	DCCEEW to review draft and provide comments to MinRes.
DCCEEW	23-August-2024	Meeting	MinRes provide DCCEEW staff with outline of approach taken to address EPBC-RFI questions and high level summary of responses. Subject to review of details, MinRes' approach for addressing RFI sounds reasonable to DCCEEW. This approach is based on using fauna habitat suitability, and local and regional fauna survey info, supported by technical expert review and advice, to provide justification that no additional fauna surveys are required. MinRes advised DCCEEW of proposed change (reduction) to disturbance area from reduction/relocation of waste rock landform resulting for Social Surrounds engagement with Banjima (to be reflected in Preliminary Documentation). Next steps includes preparation of a Project Assessment Plan (PAP) to outline steps and indicative timing for the assessment and approval. MinRes offered to provide draft PAP for DCCEEW's consideration.	MinRes to complete and submit Preliminary Documentation for DCCEEW assessment, addressing RFI queries and any updates in PAA or disturbance areas. MinRes to provide draft PAP for DCCEEW review and consideration.
BNTAC, Banjima People (MHERC)	19-August-2024	Meeting	Initial meeting of Banjima's MinRes Heritage, Environment Reference Committee (MHERC) with MinRes presenting Lamb Creek Project overview and technical area summaries, including progress of Mine Closure Plan (MCP) updating. As step toward MHERC understanding of Project and expression of support for environmental approvals.	MHERC/BNTAC satisfied with amount and detail of information presented, however the MHERC members need to visit the site to be fully informed before making decisions regarding level of support for the proposed Project. Mine closure is of particular interest given the short mine life. MinRes to work with BNTAC to facilitate the next MHERC meeting being held at Lamb Creek (meeting held 21 - 22 Oct, 2024). MinRes to continue consultations with BNTAC, MHERC and independent consultants on approval submission reviews and MCP updates (completed, resulting in BNTAC letter of support 22/11/2024).
Banjima Traditional Owners	5-7 August 2024	On ground Consultation	A request received following Social Surroundings consultation undertaken June 2024, recommended further ethnographic consultation occur to confirm the avoidance of Ethnographic Place Gaguna. The additional ethnographic consultation occurred in August 2024, 2024_BAN_Trip06.	In August 2024, MinRes conducted further ethnographic consultation with nominated Traditional Owners. Heritage report received confirms MinRes proposed Project footprint and activities within development envelope avoid heritage place Gaguna, administered by the DPLH. No further ethnographic sites within the proposed development site identified.
BNTAC	6-August-2024	Meeting	MinRes and BNTAC/consultants workshop on Mine Closure Plan updating. Post Mining Land Use (PMLU) development, target ecosystem restoration. MinRes noted that backfilling of all ex-pit waste rock is uneconomic and WRL1 will need to be a permanent feature,	BNTAC accept position regarding backfilling of all ex-pit waste rock and WRL1 with efforts to minimise ex-pit waste. MinRes to consider BNTAC comments when updating MCP, continue with closure studies, further consultation with BNTAC on MCP development to continue.
BNTAC, Banjima People	17-June-2024	On ground consultation	On Country Social Surrounds consultation and engagement with Banjima People, 17 to 21 June, 2024 (2024_BAN_Trip04) The purpose of the MinRes's engagement was to provide the Banjima Traditional Owners Project brief, detail regarding completed supporting studies; and the	MinRes to be provided a report; including the consultation outcomes; and management recommendations regarding any identified concerns, and social surroundings values. MinRes to consider Banjima's requests and

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Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
			proposed project infrastructure layout. The consultation opportunity was for MinRes to understand Banjima People' social surrounding values and any concerns with proposed Project and management measures.	recommendations; and investigate options to address concerns including visual impacts mitigation, pit design and closure considerations; to achieve best outcomes for the Project and Banjima People. A request for MinRes to conduct further ethnographic consultation to confirm the avoidance of Gaguna (completed 5-7/08/2024), BNTAC to confirm establishment of the MHERC and for all future MinRes consultation to occur with the MHERC
DPLH	21 May 2024	ACHknowledge Inquiry	Inquiry sent to DPLH 21 May 2024, seeking DPLH advice regarding the partial intersect between the Lamb Creek Project Development Envelope and DPLH Lodged Place 30213.	DPLH advice received 26 June 2024 confirming Lamb Creek Development Envelope situated within the public boundary for DPLH Aboriginal Heritage Place 30213; however, avoids the Place .boundary administered by the DPLH, confirming there are no approvals required under the <i>AHA 1972</i>
DWER	8-May-2024	Meeting	Discuss MinRes' CAW application (57093) for additional monitoring and production bores at Lamb Creek, clarify intended use of bores.	Proposed bore(s) are within lodged heritage place, DWER-water requires confirmation on heritage status, consent of TO group in absence of s18. MinRes clarified proposed bores will be for production water to support mining operations as well as initial test pumping and ongoing water monitoring purposes. CAW application (57093) will be placed on hold pending further information being provided on status of heritage/TO of area proposed for new bores.
BNTAC	2-May-2024	Email	MinRes provide additional info to BNTAC consultant (Pentium Water) in followup to 5/04/2024 meeting.	MinRes memo on pump testing revised to include added info on water management strategies under deficit or surplus scenarios, were they to occur. All comments, information requests from BNTAC (consultant) regarding proposed water management have been addressed by MinRes (subject to BNTAC review of updated memo).
DCCEEW	20-April-2024	Email	DCCEEW notification letter and decision notice on EPBC referral - Controlled Action, assessment on preliminary information with additional information.	Proceed with referral assessment proces - MinRes pay assessment fee, DCCEEW issue request for further information, MinRes responses, assessment.
RTIO / Juna Downs	11-April-2024	Email	Following up from 8/02/2024 meeting with MinRes, RTIO provide update re: potential impact on pastoral infrastructure, future pastoral activities.	RTIO confirmed no current or future pastoral infrastructure within Lamb project area. Also noted Project would sterilize grazing area and request confirmation that rehabilitation post mine closure would restore potential for grazing. Request MinRes provide the total area (ha) that will be fenced during operations. Also request a copy of the ALCAM for the rail crossing. RTIO/Juna Downs do not have any concerns with the proposed Lamb Creek operation regarding the pastoral station operations. MinRes to provide requested information and contine engagement regarding post closure land uses.
DCCEEW	11-April-2024	Meeting	Teams meeting. DCCEEW staff reviewing EPBC referral submission had questions regarding the Gaguna heritage exclusion zone. Also discussed buffer distances (access road & ghost bat caves) and fauna survey adequacy (northern quoll).	DCCEEW decision on referral (Controlled Action or not) due 19/4/2024. Additional info exchanged (emails) in followup to meeting re: Bat Call WA endorsement of 100m buffer distance for access road and ghost bat caves, also info on northern quoll survey efforts and limitations against EPBC guidance. DCCEEW position whether to assess and any further info requirements due to be issued 19/4/2024.
BNTAC	28-March-2024	Email	Notify BNTAC of planned sampling of groundwater monitoring bores at Lamb Creek, Apr 16 to 18, 2024.	No issues, notification of on ground activities completed as per arrangements with BNTAC, and Banjima monitor observed sampling.
BHP	26-March-2024	Email	Notification of planned groundwater sampling at Lamb Creek Apr 16 to 18, 2024. Access to Lamb Creek passing through BHP tenure ML 281SA and ML 251SA.	BHP had no issues with requested access, BHP provided list of conditions to be followed while accessing their tenure. Sampling conducted adhering to BHP conditions.

Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
RTIO / Juna Downs	26-March-2024	Email	Notification of planned groundwater sampling at Lamb Creek Dec 12 to 14, 2023. Access to Lamb Creek passing through RTIO tenure E47/1790 and Juna Downs Station.	RTIO had no issues with requested access, notification of on ground activities completed as per agreement with RTIO/Juna Downs. Sampling conducted by MinRes adhering to RTIO conditions.
DCCEEW	26-March-2024	Phone and email	DCCEEW staff reviewing EPBC referral submission had questions regarding the areas covered by fauna survey	The differences in survey coverage and minor (2.3% of indicative footprint) gap in fauna survey coverage were explained and additional images displaying this was provided to DCCEEW by email. Review of the referral for decision whether proposal is a Controlled Action is continuing and is due by 19/4/2024.
BNTAC	21-March-2024	Meeting	Discuss MinRes responses to BNTAC/consultant review comments on draft Section 38 referral. BNTAC update on access agreement negotiations, planning for Social Surroundings consultation.	Lacking detail on groundwater, surface water conditions and predicted impacts. Further info provided by MinRes hydrgeos, technical discussions with BNTAC consultant to continue after meeting. Detail and understanding of mine closure plans also needed given short LoM. MinRes hydrogeo and hydrology specialists to continue discussions with BNTAC consultant, report on pump testing also provided by MinRes 22/3/2024.
BNTAC	18-March-2024	Email	MinRes provided responses to BNTAC review comments on Draft Section 38 referral.	MinRes agreed to utilise off-site disposal for solid waste during construction and operations. During decommissioning and closure however concrete foundations may be broken up and buried in the pit or waste rock dumps. MinRes and BNTAC/consultants to meet 21/03/2024 to discuss review comments and responses.
BNTAC	19-February-2024	Email	BNTAC provided review comments (water focused) on draft Section 38 referral.	BNTAC seeking further details on site water balance and information used in developing dewatering plans. MinRes to review comments and facilitate discussions with BNTAC/consultant to provide responses.
BNTAC	16-February-2024	Email	BNTAC provided review comments (general environmental, approvals focus) on draft Section 38 referral and site-wide NVCP. Request meeting to discuss comments.	General comments on updates required due to changes in project footprints (e.g. changes to mine plan, pit backfilling) and pending results of Social Surroundings consultation. BNTAC not supportive of on-site landfill. MinRes to review comments and provide responses.
RTIO / Juna Downs	8-February-2024	Meeting	MinRes provided Project update, approvals status, pastoral station (Juna Downs) operational status/plans. EPBC referral submitted Dec 2023 includes restrictions on use of barbed wire fencing (re: impact on ghost bats). Juna Downs being restocked but should be north of RTIO rail line and so minimal consequence for MinRes' Lamb Creek project. Confirmation of what (if any) existing pastoral infrastructure is in/near MinRes' project area is required.	RTIO will brief Juna Downs pastoral manager and revert to MinRes with any concerns and info on current/planned pastoral infrastructure in area of proposed operations. MinRes to check and provide, as available, traffic, rail crossing(ALCAM) assessment, related to GNH intersection and RTIO rail line.
BNTAC	19-January-2024	Email	MinRes provided draft Section 38 Referral Supporting Document (RSD) and draft site-wide NVCP application (only needed if s38 decision is Not Assessed) for BNTAC review and comment.	BNTAC/consultants to review and comment on draft submissions.
BNTAC	12-January-2024	email	MinRes issued scope and request for scope to BNTAC for the review of draft submissions - Section 38 referral, NVCP (site-wide, only needed if s38 decision is Not Assessed), and Works Approval.	BNTAC to review with consultants and provide quote to MinRes.
BNTAC	18-December-2023	Meeting	Consultation with BNTAC and their consultants regarding comments on draft submissions; EPBC, Mine Closure Plan, Mining Proposal. Pit backfilling, on-site landfill not acceptable, visual amenity lacking. MinRes provided info on work (underway and planned) to further refine mine closure plan. BNTAC request to minimise ex-pit waste rock disposal, maximise pit backfilling. BNTAC uncomfortable with on-site landfill (within WRL) prefer off-site disposal. Level of maturity of MCP considered inadequate for short mine life, visual amenity needs addressing	A number of BNTAC comments are common between the various submission documents, e.g. level of pit backfilling, maturity of design/plans. Gaps in information provided to BNTAC were identified and plans to address discussed. Agreed on collaborative approach

Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
BNTAC	5-December-2023	email	MinRes provided responses to BNTAC comments/questions on the EPBC Referral Supporting document and SFMP.	Responses issued for review and discussion with BNTAC. Arrange for meeting to discuss responses and consideration of culturally appropriate mitigation methods (where required).
BHP	14-November-2023	email	Notification of planned groundwater sampling at Lamb Creek Dec 12 to 14, 2023. Access to Lamb Creek passing through BHP tenure ML 281SA and ML 251SA	No issues with requested access, BHP provided list of conditions to be followed while accessing their tenure. Sampling conducted adhering to BHP conditions.
RTIO, Juna Downs	14-November-2023	email	Notification of planned groundwater sampling at Lamb Creek Dec 12 to 14, 2023. Access to Lamb Creek passing through RTIO E47/1790 and Juna Downs tenure.	No issues with requested access, notification of on ground activities completed as per agreement with RTIO/Juna Downs. Sampling conducted adhering to RTIO conditions
BNTAC	14-November-2023	email	MinRes notify BNTAC of planned sampling of groundwater monitoring bores at Lamb Creek, Dec 12 to 14, 2023.	No issues, notification of on ground activities completed as per arrangements with BNTAC. MinRes collect groundwater samples as planned, add to baseline database
BNTAC	30-October-2023	email	BNTAC provided written comments on EPBC submission Referral Supporting Document and Significant Fauna Management Plan(SFMP).	MinRes assess and provide responses to BNTAC review comments and questions including any revisions to documents as a result of BNTAC comments.
BNTAC	20-October-2023	email	BNTAC provide list of meeting dates with BNTAC Heritage & Env Committee for engagement on Lamb Creek. Three meetings with MRHEC scheduled for 2024 (Apr, Jun & Oct), high demand for Banjima representatives from multiple proponents. No meeting before end of 2023 due to cultural events, Lore in Dec/Jan.	BNTAC anticipate MRHEC will be established in Jan 2024. MinRes to incorporate meeting dates into engagement schedule and advise BNTAC on alignment with approval submission endorsements being sought by MinRes.
BNTAC	13-October-2023	Meeting	Discuss progress on Land Access Agreement (LAA) for MinRes activities on Banjima Country.	Agreement to be progressed
BNTAC	11-October-2023	Meeting	Discuss draft schedule, process, and objectives for BNTAC review/commenting on approval submissions, with objective to allow for BNTAC to provide support MinRes' proposed projects. Focused on the mining proposal (MP) and closure plan but also relevant for other approvals.	MinRes and BNTAC staff continue collaboration to refine consultation schedule with further inputs from BNTAC on creation of BNTAC's Heritage & Environment Committee for review of MinRes projects. MinRes provided draft copy of MP via portal for review alongside MCP.
BNTAC	6-October-2023	Meeting	Facilitate engagement with BNTAC regarding review of approval submissions and discussions around mine closure/rehabilitation and end land uses. BNTAC developing "statement of principles" guidelines for closure, including end land uses. Review of EPBC submission also discussed and is MinRes' priority for Referral submission by end of October.	BNTAC to set up Heritage & Env Reference Group to conduct reviews & TO inputs for approval documents & mine closure plans. EPBC submission review to be prioritised. Scope of works for EPBC and MP/MCP submission reviews provided to BNTAC, and draft EPBC submissions uploaded to portal.
BNTAC	29-August-2023	Email	MinRes provide information requested by BNTAC; 1) GIS files of proposed Development Envelope & Indicative Footprint for Lamb Creek, and 2) groundwater quality monitoring data	Requested information provided to BNTAC
BNTAC	22-August-2023	Meeting / Presentation	MinRes provide BNTAC summary & update on environmental studies/reports on Banjima country in Lamb Creek/Wedge area	MinRes & BNTAC to continue discussions on consultation, engagement process. MinRes provide link to monitoring data. MinRes requests written comments on MCP
MRWA	17-August-2023	Email	MRWA approval of GNH intersection design	100% design IFC drawings approved, MRWA approval to proceed pending satisfying of MRWA conditions as given
BNTAC	16-August-2023	Email	MinRes to provide BNTAC and their consultants with electronic copies of final Lamb Creek baseline environmental study reports and mine closure plan (MCP), prior to in person meeting	Electronic link to baseline reports & MCP provided to BNTAC and consultants
MRWA	25-July-2023	Email	MinRes to provide updated 100% design IFC drawing to MRWA for review and signoff	IFC drawings provided for MRWA review and signoff
DCCEEW	13-July-2023	Meeting / Presentation	Pre-referral meeting with DCCEEW on the EPBC referral and MNES likely to be impacted	MinRes will ensure DCCEEW comments on buffers are addressed in EPBC referral submission.
BNTAC	10-July-2023	Meeting / Presentation	MinRes provide briefing to BNTAC staff on current and proposed works on Banjima country and discuss approach for future engagements. Status and way forward for agreement	Workload on BNTAC resources, establishment of BNTAC heritage and negotiation committees. BNTAC request for copies of baseline studies for review by BNTAC subject matter experts (consultants)

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Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
EPA	1-February-2023	Letter	MinRes decision to withdraw referral to allow engagement and project support from BNTAC (Banjima)	MinRes letter withdrawing Lamb Creek Section 38 referral
BNTAC	27-January-2023	Letter	Letter from BNTAC requesting further engagement regarding Project	MinRes to engage further
MRWA	24-January-2023	Letter	MRWA letter issued consenting to MinRes applying for NVCP to work within GNH road reserve to construct intersection	MRWA letter available to support MinRes' NVCP application (when made)
MRWA	12-January-2023	Teams Meeting	MinRes provide briefing to MRWA environmental staff on proposed NVCP for intersection at GNH	MRWA to consider MinRes request for letter of support
EPA	19-December-2022	Letter	EPA letter request for further info (Section 38F(1) and (2)) regarding Social Surroundings- Cultural Heritage- for assessment of s38 referral. EPA require evidence that Banjima People (BNTAC) have been appropriately consulted on how potential impacts on the Social Surroundings have been avoided and minimised.	MinRes to contact BNTAC representatives with request for letter
BNTAC	6-December-2022	Letter	MinRes letter outlining past engagements/attempted engagements and a request for the opportunity to meet with the BNTAC board	Request meeting with BNTAC board
BNTAC	25-November-2022	Meeting / Presentation	Meeting with Acting CEO to discuss potential BNTAC Board presentation	Future engagements to be arranged
MRWA	23-November-2022	Email	MinRes provided list of current and upcoming projects interacting in MRWA road reserve areas	Proposed intersection of Lamb Creek access road with GNH (within road reserve) and approvals approach. MinRes propose to obtain their own NVCP for work within the road reserve and seek MRWA consent.
Shire of East Pilbara	10-November-2022	Teams Meeting	MinRes gave an overview of MinRes, it's central Pilbara operations (including Lamb Creek) and the Pilbara hub development	The Shire indicated they were supportive of the proposal subject to the details
Main Roads (MRWA)	02-November-2022	Email	MinRes responses to MRWA review comments on 85% design report MinRes responded to all MRWA queries. Before proceeding to 100% design, a few MinRes comments require confirmation of MRWA Region preference/direction	MRWA 85% design review comments addressed, a few MinRes comments require MRWA Region responses
RTIO, Juna Downs	14-October-2022	Meeting	Meeting of Rio Tinto / MinRes tenure land access liaison meeting group. Discuss status and identify actions concerning current and upcoming activities/plans in areas involving RTIO/MinRes tenure. MinRes has concluded access agreements with RTIO and BHP regarding Lamb Creek (L47/1008 and others). RTIO advised of plans for re-stocking pastoral station around the Lamb Creek area	Granting of L47/1008 (for MinRes Lamb Creek Project access route) is pending action from Mining Register. Management arrangement for re-stocking to be considered by pastoral manager. Access agreements in place with RTIO and BHP.
MRWA	10-October-2022	Email	MRWA review comments on 85% design report for proposed GNH intersection MRWA comments/questions on a number of design elements	MRWA 85% design review comments to be addressed
BNTAC	13-September-2022	Email	MinRes following up invitation for Banjima representatives to participate in ongoing Lamb Creek environmental activities and seeking comment on environmental assessments	
BNTAC	09-September-2022	Email	MinRes following up invitation for Banjima representatives to participate in ongoing Lamb Creek environmental activities	
BNTAC	05-September-2022	Email	Copies of Referral documents, supporting appendices and other relevant documents issued to BNTAC with invitation to comment and offer to give a presentation on key aspects	
BNTAC	02-September-2022	Email	Invitation for Banjima representatives to participate in ongoing Lamb Creek environmental activities issued	
DEMIRS	10-August-2022	Meeting / Presentation	Mining Proposal (MP) Pre-submission meeting Project description, approvals approach, proposed MP Key Activities POW for access road construction only valid if for exploration purposes. Post closure surface water control & pit flooding assessment required. Abandonment bunds also serving as surface water controls must be designed to function in perpetuity	MinRes will ensure DEMIRS comments on access road and abandonment bund are addressed in MP submission.

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EPA	08-August-2022	Email	Request for information from EPA for assessing s38 submission and setting level of assessment\ Subterranean fauna- extent of stygofauna habitat impacted Inland waters- spatial extent of impact, any GDE Social surroundings- evidence of engagement with Banjima, Gaguna extent, impacts to Juna Downs Station	EPA referred to info in s38 submission (RSD) and additional info also provided in MinRes email 12 Aug
Rio Tinto (RTIO)	08-July-2022	Meeting/ Presentation	Meeting convened to assist and support tenure interactions between the companies' interests in the Central Pilbara arising due to new project developments. Withdrawal of Objections by RIO. Signed agreement reached May 2022	RIO and MinRes to consider a date such as around Friday 14 October 2022 to re-convene and review action items.
BHP	21-June-2022	Meeting	Lamb Creek haul road tenure	The primary agenda item was to review the access agreement for the Lamb Creek haul road tenure which is currently being negotiated but we also introduced the Mulga (Central Pilbara) Haul Road to their new tenure manager. Next steps on this is to review with their rail superintendent which is anticipated around end of July.
BNTAC	May 30 to Aug 1-2022	Phone and email	Email and telephone correspondence with BNTAC and BNTAC legal counsel regarding matters relating to other MinRes projects BNTAC wished resolved before progressing other discussions on Lamb Creek	
BNTAC	23-May-2022	Email	MinRes issue revised memorandum to BNTAC setting out further information on matters to be discussed with the BNTAC Board	
EPA	13 May 2022	Email	Section 38 Referral for the Lamb Creek Iron Ore Project submitted.	
MRWA	09-May-2022	Email	GNH / Lamb Creek Intersection - Handley Surveys received the MRWA approval for work at Lamb Creek. Site mob 17/05/22, demob 20/05/22.	MRWA provided approval and issued conditions for undertaking the work.
RTIO	29-April-2022	Meeting	Draft access agreement had been settled for execution and is currently in the signing process. Matter scheduled for Warden on 6 May 2022. Withdrawal of Objections by RIO is subject to completing document execution and making programming orders for grant.	RIO and MinRes to consider a date to re-convene and review action items.
BNTAC	29-April-2022	Email	Further formal request to meet with BNTAC Board including a memorandum outlining all issues to be discussed	
BNTAC	11-April-2022	Meeting	Meeting with BNTAC Officers to discuss revised process for securing date to present to BNTAC Board	
BNTAC	04-April-2022	Phone and email	MinRes renewed discussions on presentation to BNTAC Board and follow up on draft agreement	
BHP	28-March-2022	Meeting	Meeting convened to assist and support tenure interactions between the companies' interests in the Central Pilbara arising due to new project developments.	Review of bridge crossing plan.
DWER	21-March-2022	Email	MinRes provide updated GWOS incorporating DWER comments on earlier version. All DWER comments incorporated into GWOS. MinRes proposed that due to access restrictions, baseline groundwater quality monitoring will be conducted quarterly until drive-in access is established, then monthly thereafter. In addition, data loggers are to be installed to record groundwater levels.	
DWER	15-March-2022	Email	MinRes provide additional info to DWER for assessment of 5C water licence application, follow-up to 6/12/2021 meeting MinRes provided memo report to DWER with additional info on potential for perched aquifers at Lamb Creek and the occurrence of subterranean fauna and potential impacts from dewatering. MinRes advised that it is still working on providing responses to enquiries on heritage. Evidence of consultation with other water user (RTIO) also provided.	RTIO has no objections to issuing of water licence Additional info/update on heritage questions to be provided by MinRes

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Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
BNTAC	02-March-2022	Email	Invitation to participate in further Lamb Creek baseline environmental surveys around the Lamb Creek project.	
DBCA	25-February-2022	Meeting	MinRes presented a brief outline of the Project and summary of the baseline ecological investigations completed and potential impacts on flora, vegetation, terrestrial fauna and subterranean fauna. Briefing of DBCA as background for upcoming Section 38 referral submission for Lamb Creek. DBCA will be looking for contextual information on the presence, numbers of ghost bats and the level of understanding of roosting sites in the area. DBCA are also interested in the potential cumulative impacts on conservation significant flora and fauna.	DBCA appreciates the Project briefing and summary of ecological investigations and potential impacts. This will assist them when they are asked for advice on the flora/fauna aspects of the referral.
DBCA	17-February-2022	Phone and email	Provide brief introduction to Lamb Creek Project and high level summary of flora and fauna values and potential impacts. Approvals pathway via Part IV referral and DBCA involvement in reviews. Request more detailed presentation on Lamb Creek Project and environmental setting and potential impacts	DBCA appreciates the introduction to the project and summary of key points with respect to DBCA remit. DBCA request a formal presentation (Teams) on Lamb Creek to further inform them of site environment and potential impacts in advance of them being asked to comment on referral.
BNTAC	15-February-2022	Email	Draft mine closure plan presentation to introduce MinRes mine closure planning. MinRes seeking an opportunity to start consulting with Banjima regarding this plan as it develops.	MinRes awaiting feedback on Mine Closure Plan and ongoing engagement
BNTAC	15-February-2022	Email	Draft land access agreement between MinRes and BNTAC issued to BNTAC and legal counsel for Banjima	
Shire of East Pilbara	10-February-2022	Meeting	Provided update on MinRes's Central Pilbara Iron Ore hub Provided update re Lamb Creek project including updated timings for approvals and expected construction Requested support regarding accessing alternative Shire Roads to access tenements for exploration drilling	Shire continues to remain highly supportive of MinRes projects and of use of roads. MinRes request to maintain roads to our required standard, as needed Requested MinRes inspect roads in question to determine required upgrades, and to capture these upgrades and future maintenance commitments in an agreement
RTIO	05-January-2022	Email	RTIO advised that their hydrologists have no concern with abstraction in the area given the low volumes and length of use. However, they have pointed out the lack of data in this area – asked if data sharing could be an opportunity?	MinRes responded. Thanked for the update on RTIO's position in relation to our water licence application, we are pleased to hear our proposed water extraction does not raise any concerns with RTIO interests. Regarding data sharing, MinRes is also open to this and just need to finish checking with a few internal groups to determine how this can work and get the official go ahead. At present anticipate that, assuming confirmation of approval to proceed, our hydrogeo people can liaise directly with your hydrogeos after introductions.
RTIO	21-December-2021	Email	RTIO query on MinRes's purpose for the water licence application. Purpose of water abstraction applied for by MinRes. Potential for data sharing.	Informed RTIO the water abstraction is for supply and dewatering, from both in-pit sump and production bores. RTIO indicated no significant concerns with MinRes's proposed water licence application.
BNTAC	17-December-2021	Email	Email seeking an opportunity to give project update to Banjima Board. No issues raised.	BNTAC CEO will advise on suitable dates
DWER	16-December-2021	Email	DWER email received following up on 6/12/21 meeting. DWER areas of interest for written response from MinRes - info on potential impact to stygofauna, drawdown. Evidence of consultation and 'consent' from TOs for proposed activities.	Information presented re: drawdown, stygofauna appears to address DWER queries, written response to be provided by MinRes. Evidence of consultation with other users (RTIO) to be provided by MinRes. MinRes presented info that DPLH 'lodged' Gaguna heritage site is larger than the site agreed with the Banjima people, and proposed bores are not within the actual Gaguna site. All registered sites have been avoided in the project design. DWER cannot accept the revised site boundaries unless reflected in DPLH database, or MinRes can provide documentary evidence of Banjima consent to the bores & other proposed activity within the DPLH designated site.

Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
RTIO	10-December-2021	Phone	Consultation on MinRes's water licence application with adjacent licence holder (RTIO). Status of RTIO licence and any concerns with proposed MinRes allocation. RTIO's existing GWL#173219 only approx 1.5 km south of MinRes Project, but of small annual quantity (45,000 kL) and likely for exploratory purposes. Any impacts of MinRes's proposed water allocation on RTIO?	No initial RTIO concerns with proposed allocation but will require confirmation with RTIO water specialists.
DWER	06-December-2021	Meeting/ Presentation	DWER-water comments/questions on water licence application & supporting documents (GWOS, H2 study). Included a heritage update. H2 study - potential of perched aquifers/shallow groundwater in detritals supporting groundwater-dependent vegetation/other ecosystems? GWOS - consultation required with neighbouring water user (Groundwater License (GWL) # 173219), DWER acceptance of proposed monitoring program, bores within lodged aboriginal heritage site and agreements with TOs.	H2 study - study data & model indicates absence of perched/shallow groundwater that would support groundwater-dependent vegetation or subterranean fauna. No groundwater-dependent vegetation found during flora studies; subterranean fauna found in underlying bedrock not detritals. GWOS - DWER accepts proposed monitoring program, MinRes in contact with other water user (RTIO) to determine any concerns with MinRes water allocation request, MinRes in ongoing consultations with TO group (Banjima) to renew an access agreement & have conducted numerous heritage surveys identifying some (registered) sites, Project design IF avoids all heritage sites. Noted that lodged sites not recognized until registered.
RTIO	01-December-2021	Email	MinRes provided updated map and associated shapefiles. No issues raised.	Updated map and shapefiles provided.
BHP	01-December-2021	Email	PMI BHP Lamb Creek Access Deed - MinRes provided updated map and the associated shapefiles for the access deed. No issues raised	Updated map and shapefiles provided.
RTIO /Juna Downs	30-November-2021	Meeting	The Lamb Creek proposed alignment and access agreement. RTIO exploration team are not comfortable with the position of borrow pits or infrastructure located close to the haul road intersection. MinRes confirmed that it will not be progressing any of the borrow pits in that iteration of the haul road alignment.	RTIO to review shapefiles and respond to MinRes comments on draft deed. I believe (Tom can confirm) that both parties were happy with the outcome.
EPA	26-November-2021	Meeting	Pre-referral meeting for Lamb Creek s38 submission. Provide high level summary of potential impacts on significant factors and proposed management measures, seek EPA feedback. No significant issues. The plant shown as critically endangered at GNH intersection is a result of misidentification and expected to be de-listed. EPA advice on aspects to ensure are included in referral, and recent experiences with other referrals identify changes made to avoid heritage sites, committing to ongoing TO group engagement is important, clearly demonstrate any risk, or lack thereof, of PAF wastes, ghost bat habitat and distances from disturbances important. EPA advised that any recent assessments that included GHG have been appealed on this factor (Conservation Council-philosophically opposed to GHG emissions).	No significant issues raised with Lamb Creek as proposed, should be an uncomplicated assessment. However, EPA also advised that appeals can, and have recently, come from unexpected, interested parties.
DWER	18-November-2021	Email	Email correspondence from/to DWER water regarding MinRes's water licence application. DWER requesting further information on the potential for perched/shallow groundwater systems at Lamb Creek. Also provided review comments on MinRes's proposed GWOS. MinRes has requested a meeting to respond to DWER enquiries and is awaiting a response. Plan for a meeting in December 2021. No issues raised.	MinRes has requested a meeting to respond to DWER enquiries and is awaiting a response. Plan for a meeting in December 2021.
EPA	18-November-2021	Phone	Provided an email update on project referral status (including Lamb Creek) - confirming this will be referred and seeking a pre-referral meeting. No issues raised.	
BNTAC	16-November-2021	Email	Discuss approach to drafting in regard to new Aboriginal Heritage Legislation. Agreed New Act should be provided for.	Drafting to proceed on that basis.
BNTAC	12-November 2021	Phone and email	Email correspondence and phone calls regarding future heritage surveys and COVID-19 management protocols	
DEMIRS	10-November-2021	DEMIRS	Whole of projects and mining activity presentation which included discussion on Lamb Creek and confirmation of referral under s38 and adjusted timeframes for submission of Mining Proposal. No issues raised.	Further update in next bi-monthly meeting.

Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
BNTAC	5-9-November-2021	Email	Discussion regarding Board meeting to consider agreement drafting. Banjima preferred draft agreement before Board meeting. Drafting to commence whilst Board meeting date agreed	Drafting to commence.
BHP	19-October-2021	Email	Notification that MinRes will be undertaking airborne imagery surveys in late October in association with its Lamb Creek and Ophthalmia projects. The survey will include various tenements and pastoral leases held by BHP. No issues raised.	BHP responded and advised they have no concerns.
Juna Downs Station	19-October-2021	Email	Notification that MinRes will be undertaking airborne imagery surveys in late October in association with its Lamb Creek and Ophthalmia projects. The survey will include various tenements and pastoral leases held by RTIO. No issues raised.	RTIO to circulate to internal stakeholders and revert back if any feedback.
BNTAC	11-13/10/2021	Email	Seeking date to present update to Banjima Board as agreed on 8 September. Purpose of Board update queried - what level of information.	Banjima to consider if Board update appropriate course.
BNTAC	4-October-2021	Email	Formal request to meet with the BNTAC Board issued via email	
BNTAC	30-September-2021	Phone	Seeking date to present update to Banjima Board as agreed on 8 September. No issues raised.	Date to be provided by Banjima.
DEMIRS EPA	21-September-2021	Meeting	Discussion of Lamb Creek Project. Intent is to put through DEMIRS approvals process - get a feel in terms of preliminary impact assessment that may change the approvals strategy/approach. Undertaken baseline studies and regarding developing envelopes. No issues raised. EPA advised MinRes evidence of avoidance is good. Reaffirmed GHG, Culture and Heritage important. MinRes advised project is effectively replacing tonnes from Iron Valley. Cumulative impacts considered in this regard. No net increase in trucks from Lamb Creek to PH (direct replacement for Iron Valley haulage) MinRes total GHG would not change.	EPA advised unrelated activity but definitely worth noting in submission. Mentioned previous studies assessing whole vs single operations GHG assessment. Advised to avoid going down this path. Additionally, emissions from diesel are costly, alternatives not likely to occur within short mine life.
BNTAC	16-September-2021	Phone and email	Email correspondence and phone calls exploring possibility of meeting with Banjima Working Group in lieu of BNTAC Board	
BNTAC	08-September-2021	Meeting	Delivered a project update to Officers and discussed meeting with the Board to deliver a similar overview	Desire for ongoing dialogue.
DEMIRS	08-September-2021	Meeting	Bi-monthly whole of projects and mining activity presentation which included discussion on Lamb Creek. No issues raised.	Further update in next bi-monthly meeting.
Shire of East Pilbara	24-August-2021	Meeting	MinRes met with the Shire to give them an overview of the proposed Lamb Creek project. No issues raised.	Good opportunity to meet with the new CEO and present an overview of our projects and operations. The Shire did not raise any concerns and indicated they would support new developments through the usual approvals processes etc. The relationship will become more significant as we progress the development of our broader Central Pilbara project.
Birdlife WA Conservation Council WA Wilderness Society Wildflower Society WA	18-August-2021	Email	MinRes sent email invitation to NGOs to attend a briefing update on the proposed Lamb Creek Project. No issues raised.	No NGOs were available to attend therefore MinRes offered individual briefings at times that are suitable to the NGOs via phone or Teams.
MRWA	16-August-2021	Phone	Native veg clearing in MRWA road reserve required for GNH intersection. Determine NVCP approval pathway for clearing in road reserve- use MRWA state-wide CPS-818, or MinRes lodge NVCP via DWER. Understand MRWA requirements for working in road reserve in either case.	MinRes apply for NVCP via DWER but also prepare supporting documents meeting MRWA requirements. MRWA will review MinRes application and supporting documents and provide letter giving consent for MinRes to submit NVCP and work in road reserve.
DWER	22-July-2021	Email	MinRes's application for 5C water licence and required supporting H2 hydrogeo study and GWOS submissions. MinRes request further 2-week deferral of submission for H2 hydrogeo study and GWOS (in support of 5C licence application) until 13 August 2021. Amendment to H2 study underway to predict water table recovery levels (post mining). Results of this additional work will inform GWOS.	DWER-Water approve revised submission date for H2 study and GWOS to 13 August 2021.

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Stakeholder	Date of Consultation	Type of Consultation	Purpose and Items Discussed	Outcomes
DEMIRS	21-July-2021	Meeting	Bi-monthly whole of projects and mining activity presentation which included discussion on Lamb Creek. No issues raised.	Further update in next bi-monthly meeting.
BNTAC and Australian Cultural Heritage Management (ACHM)	1- 14-July-2021	Email	Additional spatial data provided clarifying boundaries of Gaguna and acceptable buffer around the place	The Proposal has been modified in response to the recommendations of the ethnographic survey – the northern haul road alignment has been shifted north to place it further away from Gaguna.
BNTAC	13-November-2020	Email	Drafting of native title agreement	
DWER	09-November-2020	Email	MinRes application for 5C water licence and required supporting H2 hydrogeo study and GWOS submissions. MinRes request deferral of submission for H2 hydrogeo study and GWOS (in support of 5C licence application) until 31 July 2021. Due to difficulty in securing drilling contractors given industry-wide demand.	DWER-Water approved revised submission date for H2 study and GWOS to 31 July 2021.
DPLH	24-September-2020	Letter	Programme of Works (POW) 89255: A review of the Register of Places and Objects as well as the Aboriginal Heritage Database	The proposed drilling program does not intersect the actual boundary of Aboriginal heritage place ID 30213 (Gaguna) as currently administered by DPLH.
BNTAC	30-September-2020	Email / Phone	Drafting of native title agreement	
BNTAC	July 2020	Emails	Native title agreement and protection of Gaguna	
DWER	16-April-2020	Meeting/ Presentation	Lamb Creek Iron Ore Project Presentation for DWER to provide an overview of MinRes proposed Lamb Creek Iron Ore Project and complete pre referral meeting, discuss environmental acceptability and next steps in assessment process. No issues raised.	
BNTAC	13-March-2020	Email	Advised of upcoming mining lease application to replace M47/1468 and development of Proposal	
DEMIRS	01-March-2020	Meeting	Introduced the Project to DEMIRS. Complete pre-referral meeting, agree environmental acceptability and next steps in assessment process. DEMIRS stated that targeted fauna surveys will be required as original surveys are over five years old and there were potential MNES. Flora surveys not required as no TEC/PEC or priorities.	MinRes to undertake targeted flora and fauna studies. Reports to be submitted with POW application. MinRes to develop and submit an Exploration EMP, to be submitted with POW application. MinRes to ensure excess tonnage applied for prior to submitting POW application.
DWER	15-September-2017	Meeting	Pre-referral meeting with EPA Services to discuss environmental factors relevant to the proposal. Potential for significant impact on troglofauna (five new species recorded found only in pit extent).	The Proposal has been modified in response to the potential impact to restricted troglofauna – the northern extent of the pit has been reduced via the application of a troglofauna exclusion zone. This zone effectively avoids the recorded occurrence of three restricted troglofauna within the mine pit.
DAWE	21-December-2012	Letter	EPBC Referral: EPBC referral assessment decision.	SEWPaC Decision: The proposed action is not a controlled action.
DAWE	01-November-2012	Letter	EPBC Referral: Letter dated 1 November 2012, referred to a meeting on 15 November 2012 to discuss the Lamb Creek project.	
BNTAC	August/September 2012	Survey	Martidja Banyjima Site Avoidance Survey of Lambs Creek Project, East Pilbara, WA. The archaeological survey was undertaken between 14 August and 23 August, and 11 September and 20 September 2012.	The Proposal has been modified in response to the recommendations of the ethnographic avoidance survey – the northern haul road alignment has been shifted north to place it further away from the hill known as Gaguna.

6. PRINCIPLES OF THE EP ACT

6.1. ENVIRONMENTAL PROTECTION PRINCIPLES

The principles of the EP Act have been considered in relation to the Proposal, outlined in **Table 13**.

TABLE 13: PRINCIPLES OF THE EP ACT IN RELATION TO THE PROPOSAL

Principle	Consideration
<p>1. The precautionary principle</p> <p>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</p> <p>In application of this precautionary principle, decisions should be guided by:</p> <p>a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and</p> <p>b) an assessment of the risk-weighted consequences of various options.</p>	<p>Comprehensive surveys have been undertaken as part of the Proposal to aid understanding of the environmental and social values of the Proposal Area and surrounds, and the potential impacts resulting from the Proposal.</p> <p>The results of surveys have been used to guide the design phase of the Proposal.</p> <p>Where significant potential environmental impacts are identified, measures have been, and will continue to be, incorporated into the Proposal design and management to avoid or minimise these impacts where practical.</p>
<p>2. The principle of intergenerational equity</p> <p>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</p>	<p>MinRes' Environmental Policy (Appendix A:) frames the way all work is undertaken. The Proponent is committed to operating in an environmentally responsible and sustainable manner, acknowledging that mine operation may have the potential to impact on the environment now and in the future.</p> <p>For this reason, the Proponent adopts a systematic approach to understand, minimise, manage and remediate the environmental impacts of its operation. Decision-making processes incorporate sustainability principles and the principle of intergenerational equity.</p> <p>Throughout development of the Proposal, the Proponent has undertaken high level review followed by more detailed assessment of environmental factors and has designed the Proposal with careful consideration of sustainable outcomes.</p> <p>The Proposal will not compromise current or foreseeable future land use options in the area. The Proposal has been designed to avoid, manage, and mitigate impacts to maintain and/or enhance the health, diversity, and productivity of the environment for the benefit of future generations.</p> <p>The Proponent has applied the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) by amending the alignment of the proposed access haul road connecting the mine site to GNH to avoid impacting a culturally significant heritage feature, and also to avoid nearby ghost bat roosting caves, thereby protecting these values for future generations.</p>
<p>3. Principles relating to improved valuation, pricing and incentive mechanisms</p> <p>(1) Environmental factors should be included in the valuation of assets and services.</p> <p>(2) The polluter pays principles – those who generate pollution and waste</p>	<p>The Proponent acknowledges the need to pursue these principles. To this end:</p> <ul style="list-style-type: none"> • Environmental surveys have been undertaken to identify and confirm the relative environmental values within the Development Envelope. • The Proponent acknowledges that it is responsible to bear the costs associated with generation of wastes and pollution in terms of containment, avoidance, and abatement.

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Principle	Consideration
<p>should bear the cost of containment, avoidance and abatement.</p> <p>(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</p> <p>Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.</p>	<p>The Proposal will be subject to a MCP prepared in accordance with <i>Mine Closure Plan Guidance – How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans</i> (DMIRS 2023b) .</p> <p>The MCP will incorporate environmental management / mitigation, rehabilitation, and closure planning costs as appropriate. All costs of monitoring, mitigation provisions, offsets and closure will be borne by the Proponent, and this has been included in the financial provisioning for the Proposal, therefore meeting the intent of Principle 3</p>
<p>4. The principle of the conservation of biological diversity and ecological integrity</p> <p>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</p>	<p>Comprehensive biological surveys have been undertaken as part of the Proposal. The results of the biological surveys have been used to guide the design phase of the Proposal. Where significant potential environmental impacts are identified, measures have been, and will continue to be, incorporated into the Proposal design and management to avoid, or minimise these impacts where practical. The Proposal will ensure that conservation of biological diversity and ecological integrity will be maintained.</p>
<p>5. The principle of waste minimisation</p> <p>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</p>	<p>As stated in MinRes' Environmental Policy, the Proponent is committed to undertaking activities with efficient use of natural resources such as energy and water, reduced wastes, and minimised emissions to air, including dust pollution and operational greenhouse gas.</p> <p>The hierarchy of waste controls: avoid, minimise, reuse, recycle and safe disposal would be adhered to during all Proposal phase, minimising the generation of waste.</p>

6.2. EPA'S MITIGATION HIERARCHY

In their assessment and proposed management of potential impacts to environmental factors from the Proposal, MinRes has considered the EPA's mitigation hierarchy (Government of Western Australia 2014). This hierarchy is founded on a series of control measures focussed on reducing adverse impacts to the surrounding environment. The sequence of these actions is as follows:

- **Avoid:** The EPA's most preferred approach of the hierarchy is to avoid causing an environmental impact entirely.
- **Minimise:** Where an impact cannot be avoided, the EPA suggests that a proponent should seek to limit the degree or magnitude of the impact.
- **Rehabilitate:** In the case of an adverse impact being unavoidable and has been minimised as far as practicable, the results of the impact should be repaired, rehabilitated or restored at the earliest opportunity. The preparation for rehabilitation relies heavily on early identification of knowledge gaps and risks to meeting objectives.
- **Offset:** The last option to manage an adverse impact, where the other mitigation measures are not possible, is to provide compensatory environmental benefit or reduction in environmental impact to counterbalance significant adverse environmental impacts. The suitability of offset measures is determined on a proposal-by-proposal basis and may not always be appropriate.

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7. ENVIRONMENTAL FACTOR AND OBJECTIVES – FLORA AND VEGETATION

7.1. EPA OBJECTIVE

The EPA's environmental objective for flora and vegetation is “*To protect flora and vegetation so that biological diversity and ecological integrity are maintained.*” (EPA 2016d) .

7.2. POLICY AND GUIDANCE

The Proponent has considered published policy and guidance relevant to this factor as summarised in **Table 14**. The Proponent has specifically considered guidance documents in the following ways:

- Surveys and analyses undertaken and planned to describe the receiving environment and its significance.
- Identification of activities which may lead to impacts to flora and vegetation.
- Application of the EPA's mitigation hierarchy in elements of Proposal design.

TABLE 14: POLICY AND GUIDANCE FOR FLORA AND VEGETATION

Policy / Guidance	Consideration
Referral of a proposal under section 38 of the <i>Environmental Protection Act 1986</i> : Instructions (EPA 2021c).	The RSD has been prepared in accordance with the instructions.
How to prepare an Environmental Review Document: Instructions (EPA 2021a).	This RSD has been prepared in accordance with the instructions.
Statement of environmental principles, factors and objectives and aims of EIA (EPA 2023c).	Impacts of the Proposal have been assessed against the EPA objective for this factor.
How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: Instructions (EPA 2020b).	The attached Flora and Vegetation Management Plan (FVMP) (Appendix B) has been prepared in accordance with this guidance.
Environmental Factor Guideline: Flora and Vegetation (EPA 2016d).	The information provided in this chapter addresses the 'considerations for environmental impact assessment' listed in this guideline.
Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016g).	This document guides the appropriate obtainment and collation of flora and vegetation data to be used in EIA. All studies (Appendix C) conducted for the Proposal are in accordance with the guidance document.
WA Environmental Offsets Policy (Government of Western Australia 2011). WA Environmental Offsets Guidelines (Government of Western Australia 2014).	The policy and guidelines have been considered in relation to the definition of significant residual impacts and the proposed offsets strategy.
Cumulative environmental impacts of development in the Pilbara region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the <i>Environmental Protection Act 1986</i> (EPA 2014)	The cumulative impact assessment process considers both direct and indirect impacts that may combine over time and/or space, for example the potential for multiple mining projects to affect environmental values within the region of the Proposal Area. Due consideration is given to other projects, activities and threats in the region when determining whether cumulative impacts may be significant.

7.3. NOMENCLATURE

For this factor, references to the Flora and Vegetation Survey Area refer specifically to where in-field terrestrial flora surveys were undertaken during 2012, 2020, 2021 and 2022. A summary of these surveys

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is provided in **Table 15**. The Flora and Vegetation Survey Area is shown in **Figure 11**. The Flora and Vegetation Survey Area covers a total of 3785.7 ha.

7.4. RECEIVING ENVIRONMENT

7.4.1. Environmental Studies and Survey Methods

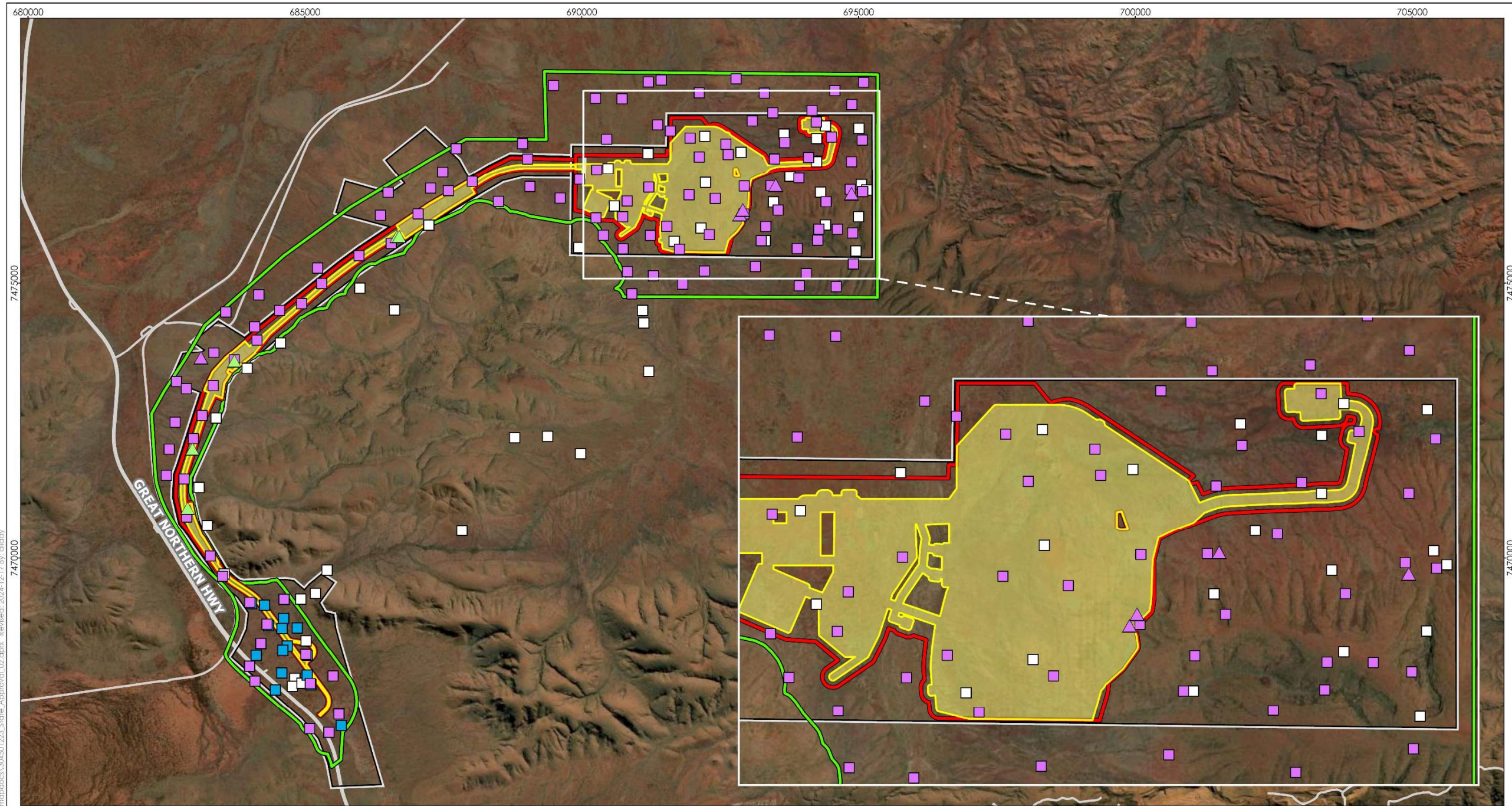
The Flora and Vegetation Survey Area, including the proposed mine, haul road route (nominally 120 m buffer either side) and three alternative accommodation camp sites, has been subject to several in-field surveys since 2012. In addition to surveys completed within the Flora and Vegetation Survey Area, regional surveys undertaken in the vicinity of the Development Envelope were used to provide contextual information and to inform the baseline desktop assessment. There have been three detailed field surveys, one two-phase targeted survey and one desktop vegetation mapping exercise undertaken within, and for, the Flora and Vegetation Survey Area (**Figure 11**).

TABLE 15: STUDIES FOR FLORA AND VEGETATION

Studies And Surveys	Area	Scope And Timing	Survey / Study Effort	Consistency With Guidance and Limitations
Lamb Creek Detailed and Targeted Flora and Vegetation Survey (Umwelt 2022a)	3785.7 ha	<p>The 2022 field survey was conducted within the most appropriate time to survey in the Pilbara Region (approximately six to eight weeks post wet season – March to June). Above-average precipitation was received during the wet-post wet season 2021/2022, with significant above-average precipitation received in February and May 2022. This significant rainfall in May 2022 combined with reasonably warm temperatures allowed for further follow-up targeted survey in late June-July 2022.</p> <p>The 2022 survey was conducted mid-to end of season and the flowering season was good, with a relatively high proportion of annual and ephemeral vascular taxa recorded and many perennial taxa in flower. All perennial taxa were in at least good condition.</p>	<p>A detailed survey was undertaken encompassing the entire Study Area. At least three quadrats were established in each vegetation pattern identified through initial aerial photography interpretation and on-ground field survey in the Study Area. Re-scoring of an appropriate sample of existing quadrats (Rapallo 2021a) was undertaken during the survey. Mapping of vegetation type boundaries was undertaken using a combination of aerial photography (scale 1:10,000) and information collected during traverses between quadrats and relevés. Field verification of vegetation type boundaries post-analysis was not undertaken.</p> <p>Targeted survey was undertaken using transects spaced approximately 50m apart, with finer scale transects employed where significant flora taxa were identified. Opportunistic targeted survey for significant flora taxa was also undertaken while traversing the Study Area to establish quadrats and relevés during the 2022 survey.</p> <p>Detailed and Targeted Survey was conducted over a total of 90 person days in 2022. No constraints prevented appropriate sampling techniques (quadrat/relevé establishment, foot transects) being employed. Access within the Study Area enabled detailed vegetation type and condition mapping to be undertaken throughout the Study Area via foot, vehicle and helicopter. Mapping and data reliability is therefore considered to be relatively high.</p>	<p>The survey and reporting works comply with the following documents:</p> <ul style="list-style-type: none"> • Environmental Factor Guideline – Flora and Vegetation (EPA 2016d) • Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016g)
Detailed flora and vegetation survey of the Great Northern Highway intersection – Lamb Creek Project (Rapallo 2021a)	254 ha	Detailed flora and vegetation survey of the GNH intersection. The survey period of 12-17 May 2021 aligned with the recommended timing for vegetation surveys in the Eremaean Botanical Province and occurred within the primary survey period (EPA 2016g)	<p>A total of 19 flora quadrats (50 m by 50 m) and 1 relevé were sampled during the field survey. Additional flora taxa were recorded opportunistically while traversing between quadrats. Survey also included:</p> <ul style="list-style-type: none"> • Opportunistic records and field notes • Specimen collection and identification • Vegetation health classification. 	The flora survey was conducted in accordance with (EPA 2016g) and conformed to requirements for a single-season detailed flora survey.
Targeted conservation significant flora survey of the Lamb Creek project area (Rapallo 2022c)	3,000 ha	<p>A targeted significant flora survey was conducted over two phases:</p> <ul style="list-style-type: none"> • Phase one: 15-29 April 2020, including the proposed mine site within R47/19 (271 ha), the haul road corridor (L47/736; 388 ha) and the GNH intersection (57 ha). • Phase two: 12-17 May 2021, includes the targeted survey area at the GNH intersection (156 ha). 	<p>Survey comprised:</p> <ul style="list-style-type: none"> • A flora desktop assessment • Systematic parallel traverses spaced approximately 50 m apart • Additional searches on foot and via helicopter, outside the survey area. 	<p>Survey undertaken in April 2020 and May 2021, which is within the appropriate time to survey for flora and vegetation in the Pilbara bioregion, in accordance with (EPA 2016g) and was undertaken by suitably experienced botanists.</p> <p>Key limitations included:</p> <ul style="list-style-type: none"> • The interrogation area / methodology used for the desktop searches could have been more appropriate for the shape of the survey area. • A number of essential sources stipulated by guidance requirements were not reviewed prior to the survey as part of the desktop assessment. There is no clear summary of the review of previous local flora and vegetation surveys to indicate whether any significant flora taxa have been previously recorded in the vicinity of the survey area. • The full extent of significant flora populations outside the survey area were not surveyed; however, information from studies for other projects in the region are available.

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Studies And Surveys	Area	Scope And Timing	Survey / Study Effort	Consistency With Guidance and Limitations
Lamb Creek flora mapping update and data review (Rapallo 2017)	233 ha (215 ha of L47/736 outside of the previous area mapped in 2012)	An extension to the 2012 vegetation mapping to account for a change in alignment of one of the proposed haul road options.	This desktop report comprised: <ul style="list-style-type: none"> • Extrapolation of vegetation mapping into the new haul road corridor • A review of the 2012 flora survey data • No field work was conducted within the portion of the new haul road located outside the area surveyed in 2012 • 2012 observations and drawings were utilised. 	This report was an update to the 2012 mapping data. The update was in line with <i>Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment</i> (EPA 2016g).
Level 2 Flora and Vegetation Survey of Lamb Creek project area for Process Minerals International (Rapallo 2012a)	2,068 ha	The flora and vegetation survey took place from 27 March to 1 April 2012 (6 days) and was conducted at a suitable time for the Eremaean Botanical Province (EPA 2016g). The survey encompassed the proposed mine site, two alternate haul road routes (nominal 120 m buffer either side) and three alternate accommodation camp locations.	Desktop search and a single-phase level 2 comprehensive field survey. A total of 46 flora quadrats of 50 x 50 m were established within the area within each of the five land systems within the Flora and Vegetation Survey Area as well as opportunistic collections of species. The team comprised three botanists. A total of 230 species, from 110 genera and 42 families, were recorded. Of those, 209 species were recorded within survey quadrats, and 21 species were recorded opportunistically.	The flora and vegetation survey was designed according to <i>Guidance Statement No. 51: Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia</i> (EPA 2004b) which has since been superseded by <i>Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment</i> (EPA 2016g); therefore, the field survey may not have met the existing requirements. There were very few access tracks, and all sites were accessed by helicopter.



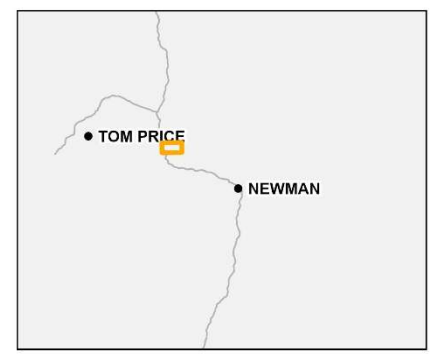
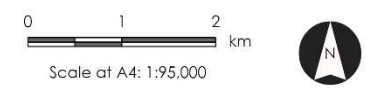
Flora and Vegetation Survey Area and Survey Effort

Lamb Creek Iron Ore Project
 Client: Mineral Resources Limited
 Project: 304501223
 Project Code: Imck_ea_2023_02 State Appr
 Drawn: JP, Reviewed: FW, EJ
 Date: 17-12-2024



- Development Envelope
 - Indicative Footprint
 - Lamb Creek Mining Tenements
 - Flora and Vegetation Survey Area
 - 2022 Flora Quadrat
 - 2021 Flora Quadrat
 - 2012 Flora Quadrat
 - 2020 Releve
 - 2022 Releve
- Roads**
- Major Road
 - Minor Road

Notes:
 1. Map displayed in GDA2020 MGA Zone 50
 2. Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2024).
 3. Background: Earthstar Geographics, Maxar



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FIGURE 11: FLORA AND VEGETATION SURVEY AREA AND SURVEY EFFORT

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7.4.2. Vegetation

7.4.2.1. Pre-European Vegetation

Pre-European vegetation mapping was originally undertaken by (Beard 1975) at various scales across WA and has since been updated to be consistent with the National Vegetation Information System (NVIS) descriptions at a scale of 1:250,000 (DPIRD 2019). Two vegetation associations have been mapped within the Flora and Vegetation Survey Area; Hammersley 18 and Hammersley 82 (**Table 16**) described as follows:

- Hammersley 18: Low woodland; continuous Mulga woodland communities over spinifex *Triodia basedowii* and *Triodia epactia* hummock grasslands on stony undulating plains
- Hammersley 82: Low scattered tree steppe; Snappy Gum *Eucalyptus leucophloia* over spinifex *Triodia wiseana* hummock grassland on stony undulating plains.

Vegetation associations retaining less than 30% of their pre-European extent generally experience accelerated species loss at an ecosystem level and are regarded as being 'vulnerable', while vegetation types retaining less than 10% of their original extent are regarded as being 'endangered' (EPA 2000). The two vegetation associations found to intersect the Flora and Vegetation Survey Area have close to 100% of their original extent remaining and are considered 'least concern'. In addition, at a scale of 1:1,000,000, the vegetation units described by (Beard 1975) within the Flora and Vegetation Survey Area are well represented throughout the Pilbara bioregion.

TABLE 16: PRE-EUROPEAN VEGETATION ASSOCIATIONS WITHIN THE FLORA AND VEGETATION SURVEY AREA (DBCA 2019)

Vegetation Association	Scale	Pre-European Extent (Ha)	Current Extent Remaining (Ha)	Pre-European Extent Remaining	Conservation Status	Extent In Survey Area (Ha)
Hammersley 18.11	State Wide	19,892,306	19,843,148	99.75%	Least Concern	1,094.65
	Pilbara Bioregion	676,556	671,843	99.30%	Least Concern	
Hammersley 82.3	State Wide	2,565,901	2,157,841	99.51%	Least Concern	707.24
	Pilbara Bioregion	2,563,583	2,550,888	99.50%	Least Concern	

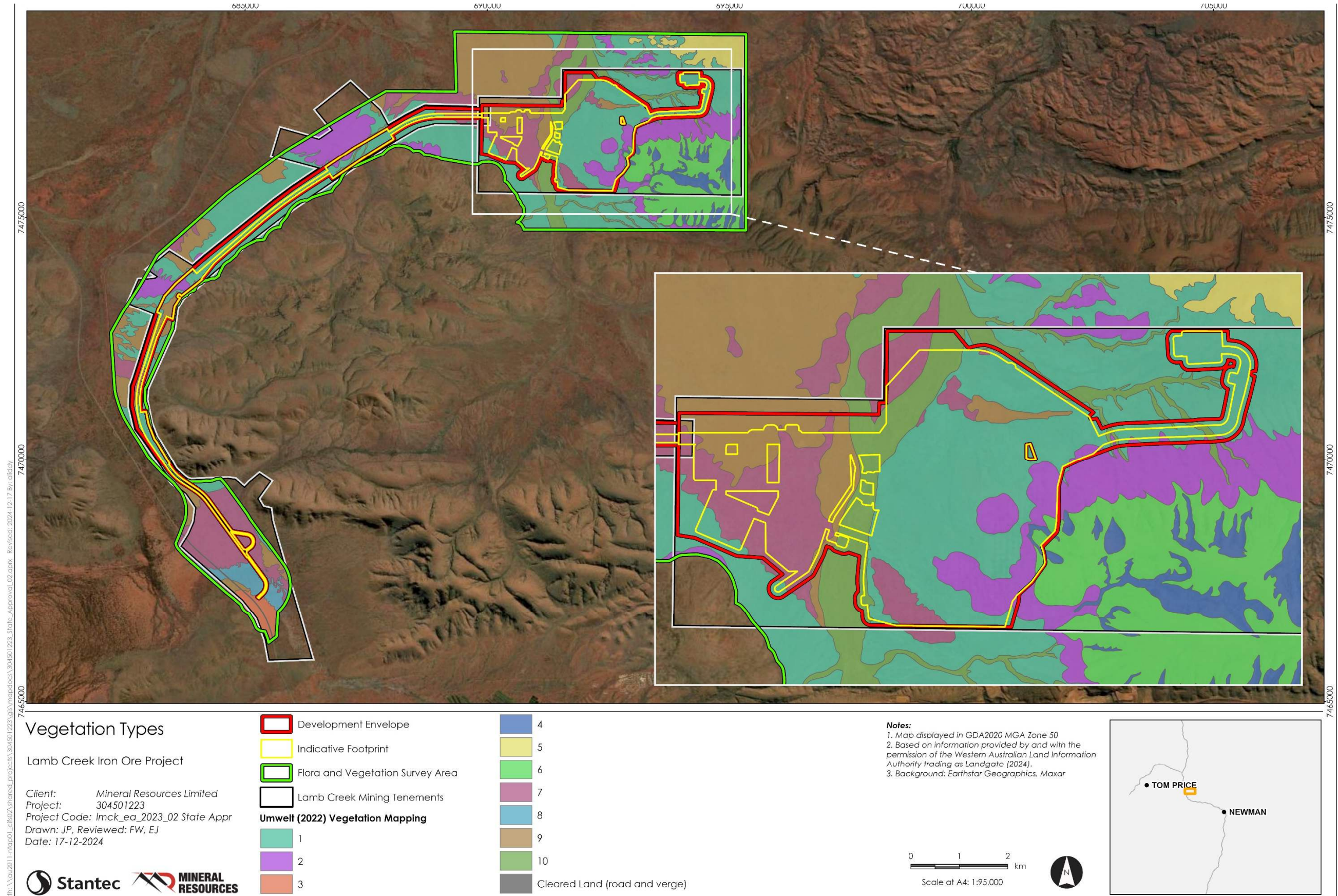
7.4.2.2. Vegetation Types

The most recent detailed flora and vegetation survey undertaken by (Umwelt 2022a) found a total of 10 vegetation types within the study area with nine of these being within the Proposal area (**Table 17, Figure 12, Appendix C**), based on the findings of work completed to date (Rapallo 2012a; 2017; 2021a). The vegetation types mapped belonged to three broad groups based on soil and topography, including:

- Group 1 is characterised by Woodlands over sparse shrublands and hummock grasslands on gentle lower to upperslopes on redbrown clay loams.
- Group 2 is characterised by Open Woodlands over sparse shrublands and tussock and hummock grasslands on steep slopes, crests, gullies and gorges with exposed ironstone and skeletal soils.
- Group 3 is characterised by Mulga Woodlands over tussock grasslands and open woodlands over sparse shrublands over hummock grasslands on red-brown clay-loam on plains; and open woodlands over shrublands over hummock grasslands on major and minor drainage lines.

TABLE 17: VEGETATION TYPES MAPPED WITHIN THE FLORA AND VEGETATION SURVEY AREA

Vegetation Type	Description	Extent in Survey Area (ha)	Extent in DE Area (ha)
Group 1: Woodlands over sparse shrublands and hummock grasslands on gentle lower to upperslopes on redbrown clay loams			
1	Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and/or <i>E. gamophylla</i> with isolated <i>Corymbia deserticola</i> subsp. <i>deserticola</i> over low to mid sparse to open shrubland dominated by species including <i>Acacia atkinsiana</i> and <i>A. ancistrocarpa</i> over low open hummock grassland of <i>Triodia pungens</i> , <i>T. vanleeuwenii</i> and <i>T. wiseana</i> and low open tussock grassland of <i>Themeda</i> sp. Mt Barricade and <i>Paraneurachne muelleri</i> on red-brown sandy clay loam to clay loam on gently inclined mid to lower slopes and associated drainage lines	1429.2 (37.8%)	445.8 (51.6%)
2	Low open woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> with occasional <i>Corymbia deserticola</i> subsp. <i>deserticola</i> and <i>C. hamersleyana</i> over low sparse shrubland of <i>Acacia hilliana</i> and <i>Hakea chordophylla</i> over open hummock grassland of <i>Triodia vanleeuwenii</i> and <i>T. wiseana</i> on red-brown clay loam with ironstone pebbles on gently inclined lower to upper slopes	382.3 (10.1 %)	66.4 (7.7 %)
3	Isolated trees of <i>Corymbia hamersleyana</i> , <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>E. gamophylla</i> over low sparse shrubland of mixed Acacia species over low hummock grassland of <i>Triodia pungens</i> and <i>T. wiseana</i> on red-brown sandy clay loam on mid to lowerslopes with ironstone pebbles	48.2 (1.3 %)	0.21 (0.02%)
Group 2: Open Woodlands over sparse shrublands and tussock and hummock grasslands on steep slopes, crests, gullies and gorges with exposed ironstone and skeletal soils.			
4	Low open woodland of <i>Corymbia ferritcola</i> or <i>Corymbia hamersleyana</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> with <i>Ficus brachypoda</i> occurring on gorge and gully areas, over low sparse shrubland of mixed species dominated by <i>Corchorus laniflorus</i> , <i>Dodonaea viscosa</i> subsp. <i>mucronata</i> and <i>Gossypium robinsonii</i> over sparse hummock grassland dominated by <i>Triodia pungens</i> with <i>T. wiseana</i> and tussock grasses including <i>Cymbopogon ambiguus</i> and <i>Aristida burbridgeae</i> on red brown clay loam on steep upperslopes, gullies, breakaways and gorges with significant ironstone outcropping.	95.3 (2.5 %)	1.6 (0.2%)
5	Occasional <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Corymbia hamersleyana</i> over mixed isolated shrubs including <i>Acacia inaequilatera</i> and <i>Senna artemisioides</i> subsp. <i>glutinosa</i> over low hummock grassland of <i>Triodia wiseana</i> on steep upperslopes and associated drainage lines on red-brown clay loam with exposed ironstone and dolerite	100.9 (2.7 %)	0
6	Low woodland to open woodland of <i>Corymbia hamersleyana</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and occasional <i>E. kingsmillii</i> over mid isolated shrubs of <i>Acacia hamersleyensis</i> and <i>Grevillea wickhamii</i> ?subsp. <i>hispidula</i> over low hummock grassland of <i>Triodia wiseana</i> on red brown sandy clay loam on steep mid to upperslopes with exposed ironstone	316.6 (8.4 %)	3.9 (0.5%)
Group 3: Mulga Woodlands over tussock grasslands and open woodlands over sparse shrublands over hummock grasslands on red-brown clay-loam on plains; and open woodlands over shrublands over hummock grasslands on major and minor drainage lines			
7	Isolated trees of <i>Corymbia hamersleyana</i> , <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Eucalyptus xerothermica</i> over low open to sparse shrubland dominated by <i>Acacia aptaneura</i> , <i>A. aneura</i> and <i>A. pruinocarpa</i> over low tussock grassland to sparse tussock grassland dominated by <i>Themeda</i> sp. Mt Barricade (M.E. Trudgen 2471), <i>Enneapogon polyphyllus</i> , <i>Chrysopogon fallax</i> and <i>Aristida</i> spp. with occasional <i>Triodia pungens</i> on red brown clay loam with some ironstone pebbles on plains	523.4 (13.8 %)	170.22 (19.7 %)
8	Isolated trees of <i>Eucalyptus xerothermica</i> over tall open to sparse shrubland of <i>Hakea lorea</i> subsp. <i>Lorea</i> and <i>Acacia aptaneura</i> over low open tussock grassland of <i>Aristida contorta</i> , <i>A. inaequiglumis</i> and <i>Themeda triandra</i> on red-brown sandy clay to clay on plains	68.9 (1.8 %)	2.96 (0.3%)
9	Low open woodland of <i>Corymbia hamersleyana</i> , <i>C. deserticola</i> subsp. <i>deserticola</i> , <i>Eucalyptus gamophylla</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> over tall sparse shrubland of <i>Acacia atkinsoniana</i> and occasional <i>A. ancistrocarpa</i> and <i>A. aptaneura</i> over low hummock grassland dominated by <i>Triodia pungens</i> and occasional <i>T. wiseana</i> with <i>Paraneurachne muelleri</i> also dominant on red-brown clay loam with ironstone pebbles on plains	600.8 (15.9 %)	102.6 (11.9 %)
10	Low open woodland of <i>Corymbia hamersleyana</i> with occasional <i>Eucalyptus gamophylla</i> , <i>E. leucophloia</i> subsp. <i>leucophloia</i> and <i>E. xerothermica</i> over tall open shrubland dominated by taxa including <i>Acacia cowleana</i> , <i>A. tumida</i> var. <i>pilbarensis</i> , <i>Gossypium robinsonii</i> and <i>A. pyrifolia</i> over low open hummock grassland of <i>Triodia pungens</i> and tussock grassland dominated by <i>Themeda</i> sp. Mt Barricade (M.E. Trudgen 2471) and <i>Aristida</i> spp. on red-brown clay loams on major and minor drainage lines	215.5 (5.7 %)	67.1 (7.8 %)
Cleared, rehabilitated, existing roads and tracks (not a vegetation type.)			
	Cleared	4.6 (0.1%)	2.9
Total		3785.7	860.9



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FIGURE 12: VEGETATION TYPES MAPPED WITHIN THE FLORA AND VEGETATION SURVEY AREA

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7.4.2.3. Vegetation Condition

The condition of the vegetation in the Flora and Vegetation Study Area was rated Good to Excellent (Umwelt 2022a). The majority of the vegetation (90.5 %) rated as Excellent, with no obvious signs of damage caused by human activities. The remainder of the vegetation was rated as Very Good and Good (8.2 % and 1.2 % respectively), with some historical mechanical disturbance but mostly low levels of introduced flora. Less than 1 % of the Flora and Vegetation Study Area (5 ha) was mapped as cleared with no native vegetation remaining.

The vegetation of the Flora and Vegetation Study Area has for the most part been subject to fire in the past 10 years however none of it had been burnt more recently than four and a half years prior to survey (Umwelt 2022b). This has resulted in a mosaic of vegetation of different fire ages. Floristic data and site photos collected in 2020 and 2021 indicate that these fires have changed both vegetation structure and floristic composition since 2012 (Rapallo 2021a).

7.4.2.4. Vegetation of Significance

None of the vegetation types recorded from the Flora and Vegetation Survey Area are consistent with threatened ecological communities (TECs) or PECs listed under the BC Act or EPBC Act for the Pilbara bioregion (DBCA 2021b). The nearest PEC to the Flora and Vegetation Survey Area is a subtype of the "Coolibah-lignum flats: *Eucalyptus victrix* over lignum community in the Pilbara". The edge of the PEC's buffer zone is located approximately 3 km south of the Flora and Vegetation Survey Area (Umwelt 2022a). As neither *Eucalyptus victrix* nor *Muehlenbeckia* spp. (lignum) have been recorded within the Flora and Vegetation Survey Area, the Coolibah-lignum flats PEC is considered unlikely to occur.

7.4.2.5. Other Vegetation of Significance

Vegetation may be of significance for reasons other than being listing as a TEC or PEC. This may include, although is not limited to, scarcity, combination of species, role as a refuge, restricted distribution and vegetation extent being below a threshold level (EPA 2004b). Local significance can be determined where a vegetation type is confined to a specialised habitat and/or landform that is not common in the local area or the vegetation types are supporting significant species or groundwater-dependent species.

Mulga (species in the *Acacia aneura* complex) is widespread across arid and semi-arid regions, covering approximately 37% of WA (Fox 1980; Kendrick 2001). There are a number of 'other ecosystems at risk', including 'Valley floor Mulga' within the Hamersley subregion, where the Proposal Area is located (Kendrick 2001). This ecosystem is considered to be 'at risk' as these Mulga communities occur at the most northern extent of their range and are likely to have higher sensitivity to disturbance in the dominant summer rainfall patterns of the Pilbara (Fox 1980; Kendrick 2001; Maslin and Reid 2012). Mulga vegetation of *Acacia catenulata* subsp. *occidentalis* and *Acacia aptaneura* that aligns with 'Valley floor Mulga' is common between Newman and Roy Hill and may occur within the Flora and Vegetation Survey Area (Onshore 2017).

None of the vegetation types in the Flora and Vegetation Study Area are considered to be significant (Umwelt 2022a). No vegetation is considered to have a significant degree of historical impact due to threatening processes; historical clearing for exploration has been limited in the Flora and Vegetation Study Area, and weeds are not widespread. Likewise, no vegetation types are providing important functions required to maintain ecological integrity of a significant ecosystem. Vegetation type 4 could be considered to provide a role as a refuge, due to the presence of gorges, gullies and steep cliffs which could provide both micro habitats for refuge species to occur, and protect from significant, repeated burning. All vegetation types mapped in the Study Area are either known to, or considered likely to, extend outside the Flora and Vegetation Study Area to some extent, and are not considered to be restricted in distribution. All are associated with both soil landscape systems and vegetation system association which are not restricted in the region.

7.4.2.6. Groundwater dependent Vegetation

No groundwater dependent vegetation was recorded within the Flora and Vegetation Survey Area (Rapallo 2022c), consistent with the characterisation of part of the area as a floodplain, as well as an apparent lack of permanent or semi-permanent surface water and a lack of broad incised channels.

7.4.3. Flora

7.4.3.1. Floristic Composition

The (Umwelt 2022a) flora surveys recorded 328 vascular flora taxa from 45 families and 137 genera, including 7 introduced taxa (**Appendix C**). The most well-represented families were Fabaceae (64 discrete taxa, three known hybrids), Poaceae (56 taxa), Malvaceae (45 taxa) and Amaranthaceae (16 taxa).

7.4.3.2. Conservation Significant Flora

Nine conservation significant flora species were recorded within, and adjacent to, the DE. This includes six DBCA-listed Priority flora taxa, one Commonwealth listed taxa and two taxa considered significant under the 'new species or species with anomalous features that indicate a potential new species' which are referred to as "potentially undescribed (Umwelt 2022a):

- *Aristida jerichoensis* var. *subspinulifera* (P3)
- *Aristida lazaridis* (P2)
- *Corchorus* sp. (Potentially undescribed)
- *Eremophila naaykensis* (P3)
- *Euphorbia ferdinandi* s. lat. (Potentially undescribed)
- *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) (P2)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)
- *Rostellularia adscendens* var. *latiflora* (P3)
- *Seringia exastia* (CE – Commonwealth).

Two conservation significant taxa were recorded in the Indicative Footprint. These were:

- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) was not recorded (Umwelt 2022a) but three plants were previously recorded by (Rapallo 2022c).
- *Aristida lazaridis* (P2) - (Umwelt 2022a) recorded three records with a total of four individuals while Rapallo 2022c recorded 58 plants from 44 records.

A single plant of *Aristida jerichoensis* var. *subspinulifera* (P3) has been recorded in the DE in the indirect impact assessment zone but outside of the Indicative Footprint (Umwelt 2022a).

The (Umwelt 2022a) survey recorded *Seringia exastia* within the Indicative Footprint. This species is currently listed as Critically Endangered under the EPBC Act, but this is due to a taxonomic revision where a threatened and a common species were merged, and the name of the former was adopted as the new name, with the conservation status still attached. The current distribution map published on FloraBase (Western Australian Herbarium 1998) incorporates this revision, showing *Seringia exastia* as widespread across northern Western Australia, ranging from the Coolgardie and Murchison IBRA regions in the south to the Dampierland IBRA region in the north. *Seringia exastia* is no longer listed as Threatened under State legislation and is expected to be de-listed under the EPBC Act in the future (Umwelt 2022a).

Locations of conservation significant flora taxa recorded in the Flora and Vegetation Study Area by the Umwelt 2022 survey are presented in Table 19. All significant flora taxa recorded also occur within the broader Hamersley subregion. **Figure 13** shows the locations of the significant flora in relation to the DE.

As *Seringia exastia* is no longer listed under state legislation, it has been excluded from **Table 19** or **Figure 13**.

7.4.3.3. Introduced Flora

In total, seven introduced flora species (weeds) have been recorded within the Survey Area (**Table 18, Figure 14**). None of these taxa were listed as Declared Pests (DPIRD 2021) or Weeds of National Significance (DoE 2014). *Bidens bipinnata*, *Cenchrus ciliaris* and *C. setigera* were the most common introduced taxa in terms of numbers of locations and individuals recorded. Introduced flora were most recorded in drainage areas (**Table 18, Figure 14**). Whilst some of the introduced flora have a High/Rapid ecological impact and invasiveness ratings, no introduced taxa were widespread in the Study Area, and the vegetation was considered to be in mostly Excellent condition (Umwelt 2022a).

TABLE 18: INTRODUCED FLORA SPECIES RECORDED IN THE FLORA AND VEGETATION SURVEY AREA

Species	Common Name	Number of Locations	Number of individuals	Vegetation Type	Ecological Impact*	Invasiveness*
<i>Bidens bipinnata</i>	Bipinnate Begger's Tick	31	824	1, 2, 4, 6, 7, 9, 10	Unknown	Rapid
<i>Cenchrus ciliaris</i>	Buffel Grass	13	149	1, 4, 7, 10	High	Rapid
<i>Cenchrus setiger</i>	Birdwood Grass	17	2,654	1, 7, 10	High	Rapid
<i>Malvastrum americanum</i>	Spiked Malvastrum	11	70	1, 7, 10	High	Rapid
<i>Portulaca pilosa</i>	Pink Purslane	1	1	2	Not rated	Not rated
<i>Setaria verticillata</i>	Whorled Pigeon Grass	6	20	1, 7, 10	High	Rapid
<i>Tribulus terrestris</i>	Caltrop	3	5	7, 10	Unknown	Moderate

* Data from DBCA, Department of Biodiversity, Conservation and Attractions. (2014). Ecological Impact and Invasiveness Ratings from the Department of Parks and Wildlife Pilbara Region Species Prioritisation Process 2014.

TABLE 19: CONSERVATION SIGNIFICANT FLORA RECORDED IN THE RAPALLO 2021 AND UMWELT 2022 FLORA AND VEGETATION SURVEY AREA

Species	Conservation Status	Habitat	Vegetation Types	No. of Individuals		Other previous records of species
				Survey Area (both surveys)	Impact Footprint (Umwelt 2022a)	
<i>Aristida lazaridis</i>	P2	Plain, clay/loam, drainage, slope; often Mulga low open woodland with or without <i>Eucalyptus</i> spp., over variety of shrubs and herbs, often over tussock grassland but sometimes with <i>Triodia</i> spp. hummock grassland.	7~, 8~, 3, 9	7217 in 3094 locations	4 from 3 records (58 recorded by (Rapallo 2022c))	(Rapallo 2022c) recorded an estimated population of 12773 plants from 6757 point locations over the 2020 and 2021 surveys undertaken. Searches outside the survey area on foot and from helicopter recorded the species extending outside the project area. A significant population of <i>Aristida lazaridis</i> (2405 individuals) has been recorded in deep loam soil along an un-incised drainage line north and west of the BHP Packsaddle Village, approximately 7 km south-east of the Clearing Permit Area. The species has also been recorded from Lake Robinson on the eastern fringe of the Coondewanna Flats. The Western Australian Herbarium (WAH) has 20 specimen records within their database, with collections from locations across approximately 130 km extending from the Rangers Station at Karijini National Park to near Newman (DBCA 2021b). There are 43 records from the Rio Tinto Priority Flora database (RTIO 2018a) extending over 60 km. Additionally, this species occurs over a 2,500 km range across the Northern Territory and Queensland (ALA 2021a).
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	P3	Plain or flat, clay/loam. Often Mulga woodlands or <i>Acacia</i> spp. shrublands over spinifex and/or tussock grassland.	8~	97 in 8 locations	0	Locally, there is a WAH record of <i>Aristida jerichoensis</i> var. <i>subspinulifera</i> from 800 m northwest of the Clearing Permit Area, from a level plain of orange light clay (DBCA 2021a). There are 39 specimen records within the WAH database, with collections from locations spread across 290 km extending between Nammuldi to Newman, with outliers in the Little Sandy Desert and Murchison, as well as collections from the Northern Territory and Queensland (ALA 2021a; DBCA 2021a).
<i>Eremophila naaykensis</i> previously <i>Eremophila</i> sp. Hamersley Range	P3	Rocky gullies and gorges. Steep rocky hill slopes and summits, high in the landscape.	4~	73 from 37 locations	0	This species has been recorded approximately 8 km south of the Clearing Permit Area (DBCA 2021a) and from Baby Hope Downs approximately 35 km southeast of Proposal from five locations in rocky gullies and gorges (Biota 2014). There are 15 specimen records within Western Australia, with WAH records from locations spread across 220 km from Paraburdoo to Newman (WAH 1998) and 345 records, within the Rio Tinto database; recorded from Eastern Range, Channar, Turee Syncline, Karijini National Park, West Angelas, Angelo Central and Hope Downs 1 (RTIO 2016).
<i>Corchorus</i> sp.	Potentially undescribed	The habitat of the recorded population was restricted to drainage lines of sandy loam soils, with no or very few stones, and an open lower stratum of tussock grasses and low shrubs	9~	35 from 23 locations	0	This species does not match reference specimens of any published species and has potential taxonomic significance. This entity is distinct in having elongated fruit. Fruiting specimens were collected in April and June 2022, indicating approximately a March-May flowering period. Flowering specimens were also collected in late June, though this could be considered a response to the unseasonably late rains of May 2022 rather than an indicator of usual flowering time. There are no other known populations of this entity, which may indicate that it is geographically restricted. A precautionary approach would see it regarded as a taxon of potential conservation significance, though this is not yet able to be formally assessed (Umwelt 2022a).
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	P3	Mulga over mixed grassland. Emergent eucalypts and <i>Triodia</i> spp. grassland. Very open Mulga woodland over patchy mixed grasses. Floodplains, hardpan plains.	7~, 8, 9	53 from 49 locations	0 (3 recorded by (Rapallo 2022c))	This species is widespread on Mulga plains. Locally, 13 populations of <i>Rhagodia</i> sp. Hamersley have been recorded within 3 km of the Proposal Area. There are 63 specimen records in the WAH database, with collection locations spread approximately 290 km extending between Tom Price and Newman (DBCA 2021a). Fifty plants were recorded near the Great Northern Highway by (Rapallo 2022c). The (Rapallo 2022c) survey found 49 additional records in their targeted flora survey area of the Lamb Creek site with 3 plants been previously recorded in the Clearing Permit Area. (Umwelt 2022a) however did not record any plants in their survey.
<i>Hibiscus</i> sp. Gurrinbiddy Range (M.E. Trudgen MET 15708)	P2	Rocky gullies, drainage lines and gorges with loamy skeletal soil	4~	17 from 2 locations	0	This taxon is known from 24 WA Herbarium records across 10 broad regional locations, two of which occur within DBCA-managed tenure within Karijini National Park, no records are within 10km of the Study Area. This record of <i>Hibiscus</i> sp. Gurrinbiddy Range (M.E. Trudgen MET 15708) is a slight range extension of the known range of this taxon to the north.
<i>Euphorbia</i> aff. <i>ferdinandi</i>	Potentially undescribed	Often found in open woodland, <i>Acacia aneura</i> woodland, low shrublands, flats, in clay loam soil	8~, 7	60 individuals from 19 locations	0	This taxon was recorded from four locations near the Great Northern Highway. It was only recognised as a potentially undescribed species, and different from any known species, when the specimen was compared in detail with other <i>Euphorbia</i> specimens at the WAH. Further advice was sought from Steve Dillon at the WAH, who advised that the specimen differed from <i>Euphorbia ferdinandii</i> by having broader seeds and a stigma different from what has been described for this species (S. Dillon pers. comm., September 2021). All locations of this taxon were within the Flora and Vegetation Survey Area, but outside of the Development Envelope. The (Rapallo 2022c) survey found 4 additional records in their targeted flora survey area of the Lamb Creek site.
<i>Rostellularia adscendens</i> var. <i>latiflora</i>	P3	Acacia shrubland, sometimes with Eucalypts and Corymbias, over shrublands and herblands, over tussock grassland, or <i>Triodia pungens</i> hummock grassland.	1	1	0	Local population has been assessed to be of low regional significance. The taxon has a distribution of approximately 450 km from west of Tom Price to north east of Meenthen Station. The species is known from 42 WA Herbarium records across more than 280km from near Mt Farquhar (89km north-west of Tom Price) to the Oakover River with at least six locations occur in the Karijini National Park. This taxon has been recorded approximately 20km south-east of the Lamb Creek retention license on the MAC development Envelope (Umwelt 2022b). A single plant was recorded by Rapallo (2022c) within a minor flowline within the area of the proposed haul road. While the study area is within the known range of the taxon, (Umwelt 2022a) however did not record any plants in their survey.

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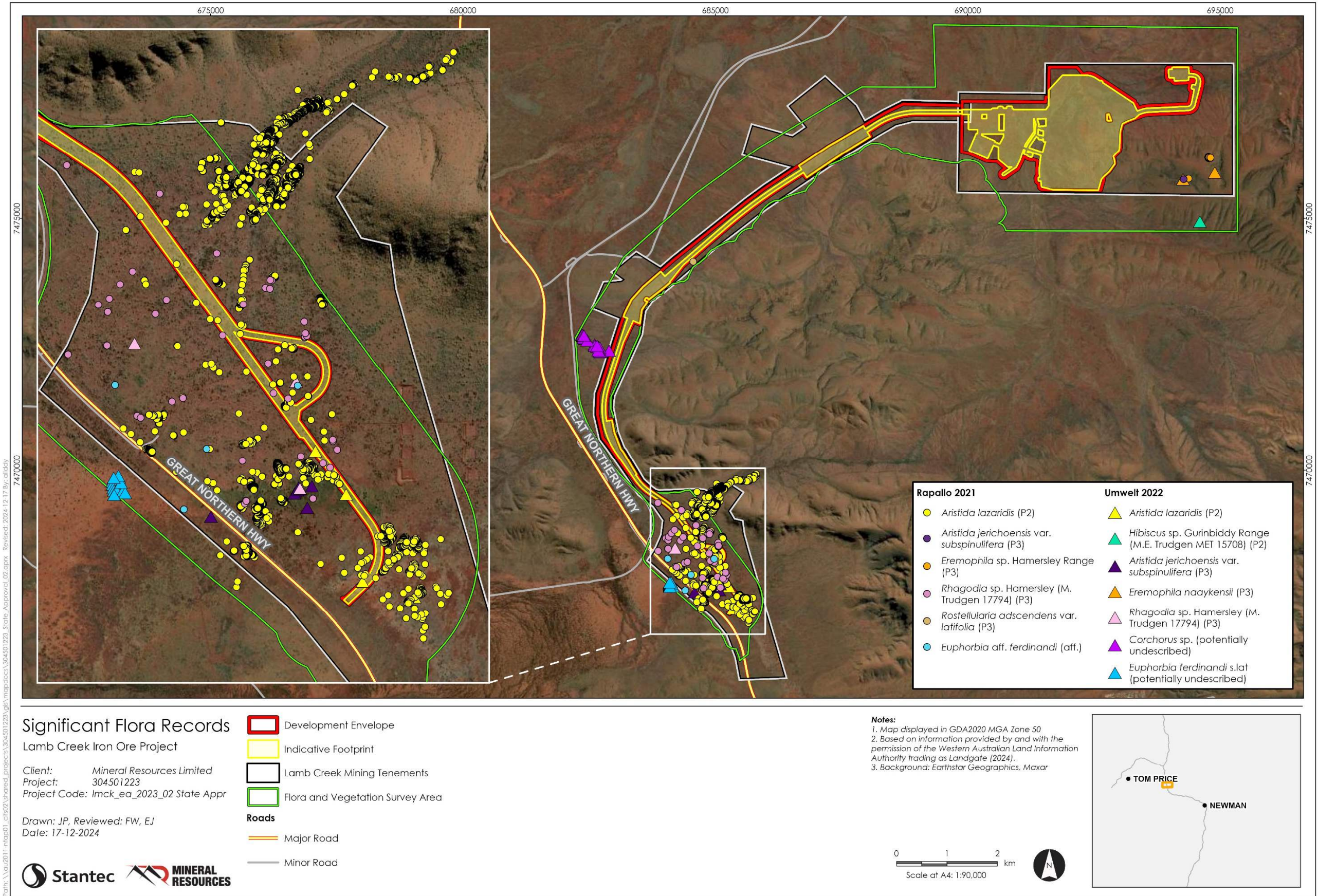


FIGURE 13: PRIORITY FLORA RECORDED WITHIN THE FLORA AND VEGETATION SURVEY AREA

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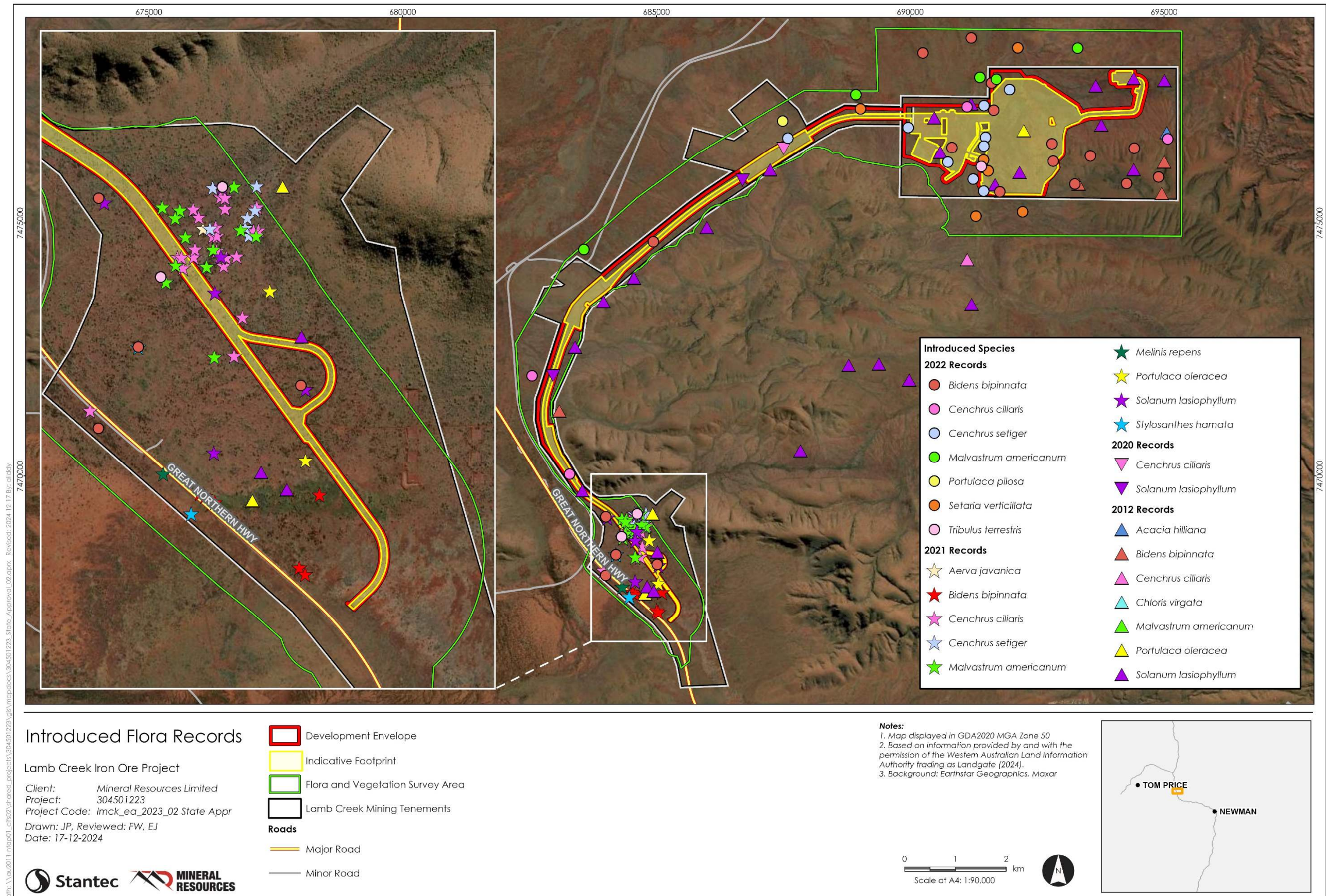


FIGURE 14: INTRODUCED FLORA SPECIES RECORDED IN THE FLORA AND VEGETATION SURVEY AREA

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7.5. POTENTIAL IMPACTS AND MITIGATION

7.5.1. Direct and Indirect Impacts

The Proposal may directly and indirectly impact on flora and vegetation, with the potential direct impacts identified as:

- Loss of native vegetation due to clearing.
- Loss of significant flora taxa due to clearing.

The potential indirect impacts have been identified as:

- Potential for fragmentation of vegetation as a result of construction of linear corridors.
- Introduction and / or spread of introduced flora species.
- Degradation or alteration of vegetation as a result of altered fire regimes.
- Degradation or alteration of vegetation as a result of altered hydrological regimes.
- Degradation of vegetation through dust deposition.

7.5.2. Loss of Native Vegetation as a result of Clearing

Proposed clearing of native vegetation also impacts on four of the (Beard 1975) vegetation associations. At a regional and subregional scale, the impact to the pre-European extent of these vegetation associations as a result of the Proposal is equivalent to, or less than, 0.06% (**Table 20**). Therefore, implementation of the Proposal will not result in a significant impact on the vegetation associations of the Pilbara bioregion. There are also no TECs or PECs located within the Development Envelope.

The Proposal will result in clearing of up to 638.4 ha of native vegetation in 'Good to Excellent' condition within the Pilbara bioregion within 9 of the 10 mapped vegetation types (**Table 21**), including 0.32 ha of area that has already been cleared or disturbed. Clearing of native vegetation is required for the construction of the Proposal, for mining and processing infrastructure, the haul road, and ancillary services such as access roads and the accommodation camp. This disturbance will occur within the Indicative Footprint of the Development Envelope. Any potential loss of native flora and vegetation due to clearing is expected to be managed through suitable design and mitigation measures, with negligible impacts. Loss of native vegetation is considered a **Medium** risk and is proposed to be offset.

TABLE 20: LOSS OF PRE-EUROPEAN VEGETATION ASSOCIATIONS IN THE FLORA AND VEGETATION SURVEY AREA (DBCAs 2019)

Vegetation Association	Current Extent (Ha) (% Of Pre-European Extent)	Extent Within Development Envelope (Ha)	Extent Within Indicative Footprint (Ha)	Pre-European Vegetation to Be Removed (~%)
Beard Vegetation Associations - State				
Hammersley 18	19,843,148	588.4	410.43	0.002
Hammersley 82	2,157,841	272.44	227.99	0.01
Beard Vegetation Associations – Bioregion				
Hammersley 18	671 843	588.4	410.43	0.06
Hammersley 82	2,550,888	272.44	227.99	0.009

TABLE 21: APPROXIMATE CLEARING OF VEGETATION TYPES

Vegetation Type	Extent in Flora and Vegetation Survey Area (ha)	Extent in Development Envelope (ha)	Extent in Indicative Footprint (ha)	Area Remaining In Flora and Vegetation Survey Area (~%)	Area Remaining in Development Envelope (~%)
1: Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and/or <i>E. gamophylla</i> with isolated <i>Corymbia deserticola</i> subsp. <i>deserticola</i> over low to mid sparse to open shrubland dominated by species including <i>Acacia atkinsiana</i> and <i>A. ancistrocarpa</i> over low open hummock grassland of <i>Triodia pungens</i> , <i>T. vanleeuwenii</i> and <i>T. wiseana</i> and low open tussock grassland of <i>Themeda</i> sp. Mt Barricade and <i>Paraneurachne muelleri</i> on red-brown sandy clay loam to clay loam on gently inclined mid to lower slopes and associated drainage lines	1429.16	445.79	342.68	76.02%	23.13%
2: Low open woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> with occasional <i>Corymbia deserticola</i> subsp. <i>deserticola</i> and <i>C. hamersleyana</i> over low sparse shrubland of <i>Acacia hilliana</i> and <i>Hakea chordophylla</i> over open hummock grassland of <i>Triodia vanleeuwenii</i> and <i>T. wiseana</i> on red-brown clay loam with ironstone pebbles on gently inclined lower to upper slopes	382.30	66.36	62.36	83.69%	6.03%
3: Isolated trees of <i>Corymbia hamersleyana</i> , <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>E. gamophylla</i> over low sparse shrubland of mixed <i>Acacia</i> species over low hummock grassland of <i>Triodia pungens</i> and <i>T. wiseana</i> on red-brown sandy clay loam on mid to lower slopes with ironstone pebbles	48.16	0.21	0.16	99.67%	23.81%
4: Low open woodland of <i>Corymbia ferritcola</i> or <i>Corymbia hamersleyana</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> with <i>Ficus</i>	95.32	1.57	1.46	98.47%	7.01%

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Vegetation Type	Extent in Flora and Vegetation Survey Area (ha)	Extent in Development Envelope (ha)	Extent in Indicative Footprint (ha)	Area Remaining In Flora and Vegetation Survey Area (~%)	Area Remaining in Development Envelope (~%)
<i>brachypoda</i> occurring on gorge and gully areas, over low sparse shrubland of mixed species dominated by <i>Corchorus laniflorus</i> , <i>Dodonaea viscosa</i> subsp. <i>mucronata</i> and <i>Gossypium robinsonii</i> over sparse hummock grassland dominated by <i>Triodia pungens</i> with <i>T. wiseana</i> and tussock grasses including <i>Cymbopogon ambiguus</i> and <i>Aristida burbridgeae</i> on red brown clay loam on steep upperslopes, gullies, breakaways and gorges with significant ironstone outcropping.					
5: Occasional <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Corymbia hamersleyana</i> over mixed isolated shrubs including <i>Acacia inaequilatera</i> and <i>Senna artemisioides</i> subsp. <i>glutinosa</i> over low hummock grassland of <i>Triodia wiseana</i> on steep upperslopes and associated drainage lines on red-brown clay loam with exposed ironstone and dolerite	100.95	0.00	0.00	100.00%	100.00%
6: Low woodland to open woodland of <i>Corymbia hamersleyana</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and occasional <i>E. kingsmillii</i> over mid isolated shrubs of <i>Acacia hamersleyensis</i> and <i>Grevillea wickhamii</i> ?subsp. <i>hispidula</i> over low hummock grassland of <i>Triodia wiseana</i> on red brown sandy clay loam on steep mid to upperslopes with exposed ironstone	316.61	3.98	3.41	98.92%	14.32%
7: Isolated trees of <i>Corymbia hamersleyana</i> , <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Eucalyptus xerothermica</i> over low open to sparse shrubland dominated by <i>Acacia aptaneura</i> , <i>A. aneura</i> and <i>A. pruinocarpa</i> over low tussock grassland to sparse tussock grassland dominated	523.39	170.22	117.63	77.53%	30.90%

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Vegetation Type	Extent in Flora and Vegetation Survey Area (ha)	Extent in Development Envelope (ha)	Extent in Indicative Footprint (ha)	Area Remaining In Flora and Vegetation Survey Area (~%)	Area Remaining in Development Envelope (~%)
by <i>Themeda</i> sp. Mt Barricade (M.E. Trudgen 2471), <i>Enneapogon polyphyllus</i> , <i>Chrysopogon fallax</i> and <i>Aristida</i> spp. with occasional <i>Triodia pungens</i> on red brown clay loam with some ironstone pebbles on plains					
8: Isolated trees of <i>Eucalyptus xerothermica</i> over tall open to sparse shrubland of <i>Hakea lorea</i> subsp. <i>Lorea</i> and <i>Acacia aptaneura</i> over low open tussock grassland of <i>Aristida contorta</i> , <i>A. inaequiglumis</i> and <i>Themeda triandra</i> on red-brown sandy clay to clay on plains	68.93	2.96	2.22	96.78%	25.00%
9: Low open woodland of <i>Corymbia hamersleyana</i> , <i>C. deserticola</i> subsp. <i>deserticola</i> , <i>Eucalyptus gamophylla</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> over tall sparse shrubland of <i>Acacia atkinsoniana</i> and occasional <i>A. ancistrocarpa</i> and <i>A. aptaneura</i> over low hummock grassland dominated by <i>Triodia pungens</i> and occasional <i>T. wiseana</i> with <i>Paraneurachne muelleri</i> also dominant on red-brown clay loam with ironstone pebbles on plains	600.81	102.64	67.81	88.71%	33.93%
10: Low open woodland of <i>Corymbia hamersleyana</i> with occasional <i>Eucalyptus gamophylla</i> , <i>E. leucophloia</i> subsp. <i>leucophloia</i> and <i>E. xerothermica</i> over tall open shrubland dominated by taxa including <i>Acacia cowleana</i> , <i>A. tumida</i> var. <i>pilbarensis</i> , <i>Gossypium robinsonii</i> and <i>A. pyrifolia</i> over low open hummock grassland of <i>Triodia pungens</i> and tussock grassland dominated by <i>Themeda</i> sp. Mt Barricade (M.E. Trudgen 2471) and <i>Aristida</i> spp. on red-brown clay loams on major and minor drainage lines	215.50	67.13	40.67	81.13%	39.42%

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Vegetation Type	Extent in Flora and Vegetation Survey Area (ha)	Extent in Development Envelope (ha)	Extent in Indicative Footprint (ha)
Cleared	4.62	0.00	0.00
Total	3785.75	860.63	638.4

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7.5.3. Loss of Significant Flora due to Clearing

Of the nine conservation significant flora taxa recorded in the Flora and Vegetation Survey Area, only two were located within the Indicative Footprint; *Aristida lazaridis* (P2) and *Rhagodia* sp. Hamersley (P3) (Table 22).

Aristida lazaridis (P2) occurs predominantly at the western end of the Development Envelope near the haul road intersection with the GNH. Of the 7217 individuals recorded, 63 were within the Indicative Footprint. This equates to an impact of 0.8% of the individuals recorded within the Flora and Vegetation Survey Area. Previously (Rapallo 2021a) found 12,773 individuals in their detailed flora and vegetation survey of the Great Northern Highway intersection. Regionally, there are 20 records from the WAH database, from locations across approximately 130 km, extending from the Rangers Station at Karijini National Park to near Newman (WAH 2022b). Rio Tinto has also recorded the species 43 times over 60 km (RTIO 2018b). In the NT and Queensland this species is widespread and occurs over a 2,500 km range (ALA 2021a).

Rhagodia sp. Hamersley (P3) was found predominantly at the western end of the Development Envelope near the haul road intersection with the GNH. Of the 57 individuals recorded, six were found within the Indicative Footprint. While this represents an impact of 8.8% to the individuals recorded within the Flora and Vegetation Survey Area, there are 13 local populations recorded within 3 km of the Proposal Area and it is also widespread on Mulga plains. Regionally, there are 63 specimen records within the WAH database, from locations extending approximately 290 km between Tom Price and Newman (WAH 2022a).

The risk to the populations of *Aristida lazaridis* (P2) and *Rhagodia* sp. Hamersley (P3) is considered to be **low**; therefore, there is not expected to be significant impacts to significant flora as a result of Proposal implementation.

TABLE 22: INDICATIVE LOSS OF PRIORITY FLORA SPECIES

Flora Taxa	No. of individuals recorded	No. of individuals in the DE	No. of individuals in the IF	Loss Of Individuals (~%)
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i> (P3)	97	-	-	-
<i>Aristida lazaridis</i> (P2)	7,217	63	55	0.8
<i>Euphorbia</i> aff. <i>ferdinandi</i> (potentially undescribed)	4	-	-	-
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) (P3)	57	6	5	8.8
<i>Rostellularia adscendens</i> var. <i>latifolia</i> (P3)	1	-	-	-
<i>Eremophila naaykensis</i> (P3)	73	-	-	-
<i>Corchorus</i> sp. (potentially undescribed)	35	-	-	-
<i>Hibiscus</i> sp. Gurrinbidy Range (M.E. Trudgen MET 15708) (P2)	17	-	-	-
<i>Rostellularia adscendens</i> var. <i>latiflora</i> (P3)	1	-	-	-

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7.5.4. Fragmentation of Vegetation

Clearing of native vegetation for the Proposal has the potential to result in the fragmentation of vegetation, predominantly associated with the construction of linear infrastructure. However, it is considered that the narrow (approximately 70 m in width over majority of the alignment) and linear nature of the proposed haul road and infrastructure corridor is not sufficient to cause significant fragmentation of native vegetation, alter recruitment ability or affect community structure. In addition, native vegetation within the Indicative Footprint is well represented within the Development Envelope and wider Flora and Vegetation Survey Area, indicating that fragmentation is of low risk to native vegetation.

The risk to native vegetation through fragmentation is considered to be **low**; therefore, there is not expected to be significant impacts to native vegetation as a result of Proposal implementation.

7.5.5. Introduction and / or Spread of Introduced Flora Species

A total of seven introduced flora species have been recorded from the Flora and Vegetation Survey Area; however, none of these species are listed as a Declared Pest under the BAM Act. While clearing and vehicle / machinery movement have the potential to increase the spread of weeds, the Proponent will implement a FVMP and has established introduced flora species and hygiene management measures to reduce this risk (**Table 23, Appendix B**). Any impacts are predicted to be localised to disturbed areas and will have limited impact on adjacent native vegetation.

The risk to flora and native vegetation through the spread or introduction of weed species is considered to be **low**; therefore, there is not expected to be significant impacts to native vegetation as a result of Proposal implementation.

7.5.6. Degradation Or Alteration of Vegetation as a Result of Altered Fire Regimes

While mining activities, such as hot work and vehicle movements, have the potential to increase the risk of the occurrence and intensity of fire, the majority of the Flora and Vegetation Survey Area has been burnt in the last decade. However, the Proponent will implement a series of mitigation measures to reduce the occurrence and spread of fire during implementation of the Proposal. These include avoiding undertaking hot work in fire sensitive vegetation, implementing hot work procedures, ensuring personnel are correctly inducted, demarcating designated smoking areas, maintaining fire response equipment, and establishing an Emergency Response Plan and Emergency Response Team, as part of the FVMP (**Table 23**).

The risk to flora and native vegetation as a result of increased fire risk is considered to be **medium**; and will be managed through suitable design and mitigation measures.

7.5.7. Degradation or Alteration of Vegetation as a Result of Altered Hydrological Regimes

Drainage through the Development Envelope is ephemeral and part of the area is characterised as a floodplain. There is an apparent lack of permanent or semi-permanent surface water, and a lack of broad incised channels. No groundwater-dependent vegetation was recorded within the Flora and Vegetation Survey Area (Rapallo 2022c). Clearing of native vegetation for the construction of the Proposal may alter the natural hydrological regime and influence native vegetation health, as well as downstream receptors. Construction largely associated with linear infrastructure, such as the haul road, is of particular note for this indirect impact. However, the Proponent has designed the proposal to maintain surface water flow so that impacts due to alteration of surface flow is unlikely to occur.

The risk to native vegetation as a result of the altered hydrological regime is considered to be **low**; therefore, there is not expected to be significant impacts to native vegetation as a result of Proposal implementation.

7.5.8. Degradation of Vegetation Through Increased Dust Deposition

While there is some evidence that dust can cause degradation of vegetation, the Proposal is expected to effectively manage the anticipated localised and temporary dust emissions from clearing for construction of the haul road and operation of the mine. Dust suppression will be implemented including the use of water trucks, outlined in the FVMP. The intersection of the haul road with GNH, and remainder of the access road up to the operational area within M47/1592 will be sealed to reduce the generation of dust. These mitigation measures, as well as the spatially restricted Indicative Footprint, short life of mine and narrow width of linear infrastructure is likely to result in negligible dust emission.

The risk to native vegetation as a result of dust emission is considered to be **low**; therefore, there is not expected to be significant impacts to native vegetation as a result of Proposal implementation.

7.5.9. Mitigation

The Proponent has applied the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) during the design, planned construction and operation of the Proposal to reduce the potential impact to flora and vegetation, outlined in **Table 23**. Impacts to flora and vegetation associated with the Proposal are expected to be limited as a result of the spatially restricted Indicative Footprint, short life of mine, the proposed narrow linear infrastructure corridors, implementation of a FVMP (**Appendix B**), a general lack of water-dependent vegetation, a negligible proportion of significant flora within the Indicative Footprint, and the implementation of progressive rehabilitation.

TABLE 23: PROPOSED MITIGATION MEASURES FOR FLORA AND VEGETATION

Potential Impact	Avoid	Minimise	Rehabilitate	Offsets Required?
Direct Impacts				
Loss of native vegetation as a result of clearing	<ul style="list-style-type: none"> Proposed clearing has been minimised as far as practicable to reduce the extent of disturbance required; the Proponent has revised the Development Envelope from 1,399 ha to 860.9 ha. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. The area to be cleared shall be clearly demarcated and machinery operators made aware of the operational boundary, following confirmation with the relevant manager. Some heavy equipment used may have in-cab GPS mapping and alarm functions however in the absence of this functionality, other control measures such as the use of spotters and/or restricting clearing to the daylight hours will be undertaken. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement FVMP. Clearing awareness training is to be undertaken by all personnel involved in clearing activities, including specific information on significant flora within the Development Envelope, the requirements for clearing, and the Land Access Permit and Land Clearing Procedure processes. Vehicles and equipment shall be restricted to designated roads and tracks. Laydown areas should be situated in previously disturbed locations, where practicable. 	<ul style="list-style-type: none"> Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Seasonal weed control programs shall be implemented, including herbicide spraying or physical removal, as required. Salvage and stockpile particular vegetation types, soil, or habitat features (e.g. vegetation, stumps, logs, and boulders) for use in rehabilitation programs. 	<p>Yes – Residual impacts from the Proposal, after the implementation of the mitigation hierarchy, comprise clearing up to 638.4 ha of native vegetation in “Good to Excellent” condition in the Hamersley subregion.</p> <p>The proponent proposes offsets whereby financial contributions will be made to the Pilbara Environmental Offset Fund (PEOF) to offset the residual impact to native vegetation. The approach to offsetting the residual impacts associated with the Proposal is considered to be consistent with the six principles outlined in the WA Environmental Offset Policy (Government of Western Australia 2011).</p>
Loss of significant flora as a result of clearing	<ul style="list-style-type: none"> Proposed clearing has been minimised as far as practicable to reduce the extent of disturbance required; the Proponent has revised the Development Envelope from 1,399 ha to 860.9 ha. Where significant flora taxa populations cannot be avoided, as may be the case with <i>Aristida lazardis</i> (P2) and <i>Rhagodia</i> sp. Hamersley (P3), infrastructure should be placed to avoid the highest densities, ensuring surface water flow is maintained. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. Significant flora populations and the area to be cleared shall be clearly demarcated and machinery operators made aware of the operational boundary, following confirmation with the relevant manager. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement the FVMP. Clearing awareness training is to be undertaken by all personnel involved in clearing activities, including specific information on significant flora within the Development Envelope, the requirements for clearing, and the Land Access Permit and Land Clearing Procedure processes. Vegetation clearing shall be kept to the minimum amount required, as far as practicable. 	<ul style="list-style-type: none"> Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No
Indirect Impacts				
Fragmentation of vegetation	<ul style="list-style-type: none"> Proposed clearing has been minimised as far as practicable to reduce the extent of disturbance required; the Proponent has revised the Development Envelope from 1,399 ha to 860.9 ha. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. The area to be cleared shall be clearly demarcated and machinery operators made aware of the 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement the FVMP. Clearing awareness training is to be undertaken by all personnel involved in clearing activities, including specific information on significant flora within the Development Envelope, the requirements for clearing, and the Land Access Permit and Land Clearing Procedure processes. 	<ul style="list-style-type: none"> Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No

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Potential Impact	Avoid	Minimise	Rehabilitate	Offsets Required?
	operational boundary, following confirmation with the relevant manager.	<ul style="list-style-type: none"> Vegetation clearing shall be kept to the minimum amount required, as far as practicable. 		
Introduction and / or spread of introduced flora species	<ul style="list-style-type: none"> A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. 	<ul style="list-style-type: none"> Implement the FVMP. A Weed Management Plan shall be prepared and implemented as part of the FVMP, prior to construction and operation, to control access and movement of vehicles and construction personnel to prevent the introduction and spread of weeds into the Development Envelope, weed free areas, and between work areas. Vehicles with ground engaging equipment to be cleaned, inspected and issued with a Weed Hygiene Certificate prior to entry to site or moving between areas on-site. Vehicles and equipment shall be restricted to designated roads and tracks. Weed awareness and weed hygiene training shall be delivered to all personnel as part of the induction process. Regular inspection and maintenance of vehicles and equipment shall be undertaken. 	<ul style="list-style-type: none"> Weeds which are physically removed will be disposed of at a waste rock landform and buried, or buried in pit backfill. Seasonal weed control programs shall be implemented, including herbicide spraying or physical removal, as required. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No
Degradation or alteration of vegetation as a result of altered fire regimes	<ul style="list-style-type: none"> Off-road driving shall be prohibited unless authorised by management. Avoid hot work in fire sensitive areas and during fire risk day. 	<ul style="list-style-type: none"> Implement the FVMP. Fire management and firefighting training shall be delivered to all personnel as part of the induction process. Firebreaks will be incorporated into mine layout planning in accordance with the local government firebreak notice under s. 33 of the <i>Bush Fires Act 1954</i>. Smoking will only be permitted in designated areas, which shall be appropriately signed and contain self-arresting cigarette butt disposal containers. An Emergency Response Plan shall be prepared and implemented. An Emergency Response Team shall be formed in accordance with requirements as discussed with DEMIRS. The Emergency Response Team will ensure that sufficient operational fire suppression equipment is located as per the Emergency Response Plan. Hot Work Permits and a Traffic Management Plan shall be prepared and implemented. Regular inspection and maintenance of vehicles and equipment shall be undertaken. All vehicles and machinery will be fitted with fire extinguishers and/or in-plant fixed water suppression. Fire extinguishers will be located at infrastructure/building facilities across the project. 	<ul style="list-style-type: none"> Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP, following fire. 	No
Degradation or alteration of vegetation as a result of altered hydrological regimes		<ul style="list-style-type: none"> Haul road and Development Envelope design shall consider surface water flow to minimise obstruction to seasonal overland water flow to the loamy drainage flats proximal to the GNH that contain the Priority species <i>Aristida lazaridis</i> and <i>Rhagodia</i> sp. Hamersley and other significant taxa with the potential to occur. 	<ul style="list-style-type: none"> Drainage management structures shall remain post closure and shall meet recognised Australian drainage design specifications. The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level. 	No

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Potential Impact	Avoid	Minimise	Rehabilitate	Offsets Required?
Degradation of vegetation through dust deposition	<ul style="list-style-type: none"> Intersection of the haul road with GNH and remainder of the access road up to the operational area within M47/1592, will be sealed to reduce the generation of dust. Haul truck iron ore loads will be covered. Ground clearing (including topsoil stripping) shall not be undertaken during periods of high wind when low ground moisture conditions result in excessive dust lift off. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement the FVMP. Vehicles and equipment shall be restricted to designated roads and tracks. Dust suppression shall be implemented to manage dust emission on cleared areas and iron ore handling areas. Speed limits shall apply on sealed and unsealed roads. Ground disturbance activities will be accompanied by dust suppression via water cart as applicable. Stockyard ore product will be conditioned through addition of water to ensure dust extinguishing moisture limits are maintained (as per export license stipulations). Blasting plans will consider meteorological conditions to minimise dust lift off. Dust awareness and dust management training shall be delivered to all personnel as part of the induction process. 	<ul style="list-style-type: none"> Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No

7.6. ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

Based on the assessment of potential impacts and the application of the EPA's mitigation hierarchy to protect environmental values associated with this factor, the Proponent considers that the EPA objective for this factor can be met, and that there will be **no significant residual impacts** on flora and vegetation. The proposed loss of flora and vegetation is not expected to cause a loss of biological diversity at the local or regional scale or impact upon the persistence of populations of significant flora, and the ecological integrity of the area surrounding the Proposal Area is expected to be maintained.

The clearing of native vegetation in Good to Excellent condition is not considered to be a significant residual impact; however, the EPA has highlighted that native vegetation clearing is likely to require an environmental offset in accordance with *Cumulative environmental impacts of development in the Pilbara region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the Environmental Protection Act 1986* (EPA 2014).

7.7. ENVIRONMENTAL OUTCOMES

Based on the surveys and investigations undertaken to date, the potential direct, indirect and cumulative impacts of the Proposal are expected to align with the EPA objective (**Section 7.1**) and guidance (**Table 14**) for flora and vegetation, to maintain biological diversity and ecological integrity. The outcomes and proposed mitigation measures aim to:

- Protect environmental values associated with flora and vegetation.
- Facilitate meeting the EPA's objective for this factor.

The predicted environmental outcomes for flora and vegetation are summarised as follows:

- Total clearing of 638.4 ha of native vegetation within the Pilbara bioregion within 9 of the 10 identified vegetation types. This equates to clearing of 16.8% of the vegetation within the Flora and Vegetation Survey Area, ranging from less than 2% up to 24% of clearing of individual vegetation types within the Flora and Vegetation Survey Area (**Table 21**).
- No PECs, TECs or groundwater-dependent vegetation were recorded within the Flora and Vegetation Survey Area.
- Loss of 55 individuals (0.5%) of the recorded local population of *Aristida lazaridis*, and five individuals (8.8%) of the recorded local *Rhagodia* sp. Hamersley population will occur. There is unlikely to be a significant impact to either of these species due to the minor direct impact (*A. lazaridis*) and their preferred habitat being well represented outside of the disturbance footprint and in the local area (*A. lazaridis*, *Rhagodia* sp.).
- Negligible indirect impacts are anticipated, with weeds, dust, fire and surface water managed by a FVMP and a Surface Water Management Plan (SWMP).

The Proponent considers the Proposal can be managed to meet the EPA's objective for flora and vegetation, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain values.

8. ENVIRONMENTAL FACTOR AND OBJECTIVES – TERRESTRIAL FAUNA

8.1. EPA OBJECTIVE

The EPA’s environmental objective for terrestrial fauna is “*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.*” (EPA 2016f).

8.2. POLICY AND GUIDANCE

The Proponent has considered published policy and guidance relevant to this factor as summarised in **Table 24**. It should be noted that several guidance documents have been released following completion of some in-field survey.

The Proponent has specifically considered guidance documents in the following ways:

- Surveys and analyses undertaken and planned to describe the receiving environment and its significance.
- Identification of activities which may lead to impacts to terrestrial fauna.
- Application of the EPA’s mitigation hierarchy in elements of Proposal design.

TABLE 24: POLICY AND GUIDANCE FOR TERRESTRIAL FAUNA

Policy / Guidance	Consideration
Referral of a proposal under section 38 of the <i>Environmental Protection Act 1986: Instructions</i> (EPA 2021c)	The RSD has been prepared in accordance with the instructions.
How to prepare an Environmental Review Document: <i>Instructions</i> (EPA 2021a)	This RSD has been prepared in accordance with the instructions.
Statement of environmental principles, factors and objectives and aims of EIA (EPA 2023c)	Impacts of the Proposal have been assessed against the EPA objective for this factor.
How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: <i>Instructions</i> (EPA 2021b)	The attached Significant Fauna Management Plan (SFMP) (Appendix E) has been prepared in accordance with this guidance.
Environmental Factor Guideline – Terrestrial Fauna (EPA 2016f)	The information provided in this chapter addresses the ‘considerations for environmental impact assessment’ listed in this document.
Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020c)	This guidance document was considered during the implementation of terrestrial vertebrate fauna studies for the Proposal (Appendix F).
Technical Guidance: Sampling of short range endemic invertebrate fauna (EPA 2016b)	This guidance document was considered during the implementation of terrestrial vertebrate fauna studies for the Proposal (Appendix F).

Policy / Guidance	Consideration
<ul style="list-style-type: none"> • EPBC Act referral guideline for the endangered northern quoll <i>Dasyurus hallucatus</i> – EPBC Act Policy Statement (DoE 2016a). • Survey guidelines for Australia’s threatened mammals – Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DSEWPaC 2011a). • Survey guidelines for Australia’s threatened bats – Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DEWHA 2010a). • A review of ghost bat ecology, threats and survey requirements (Bat Call WA 2021a) • Survey guidelines for Australia’s threatened reptiles – Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DSEWPaC 2011b) • Survey guidelines for Australia’s threatened birds – Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DEWHA 2010b) • Interim guideline for preliminary surveys of night parrot (<i>Pezoporus occidentalis</i>) in Western Australia (DPaW 2017) 	<p>These guidance documents were considered during the implementation of studies focusing on significant terrestrial vertebrate fauna for the Proposal (Appendix F).</p>
<ul style="list-style-type: none"> • WA Environmental Offsets Policy (Government of Western Australia 2011) • WA Environmental Offsets Guidelines (Government of Western Australia 2014) 	<p>The policy and guidelines have been considered in relation to the definition of significant residual impacts and the proposed offset strategy.</p>
<p>Cumulative environmental impacts of development in the Pilbara region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16I of the <i>Environmental Protection Act 1986</i> (EPA 2014).</p>	<p>The cumulative impact assessment process considers both direct and indirect impacts that may combine over time and/or space, for example the potential for multiple mining projects to affect environmental values within the region of the Proposal Area. Due consideration is given to other projects, activities and threats in the region when determining whether cumulative impacts may be significant.</p>

8.3. NOMENCLATURE

For this factor, references to the Terrestrial Fauna Survey Area refer specifically to where in-field terrestrial fauna surveys were undertaken during 2012, 2021 and 2022. A summary of these surveys is provided in **Table 25**. The Terrestrial Fauna Survey Area is shown in **Figure 15**. The Terrestrial Fauna Survey Area encompasses the majority of the Development Envelope except for a small portion comprising 24 ha at the southern extent (**Figure 15**).

8.4. RECEIVING ENVIRONMENT

8.4.1. Environmental Studies and Survey Methods

The Terrestrial Fauna Survey Area has been subject to two detailed in-field surveys between 2012 and 2020 for terrestrial vertebrate fauna, and one detailed in-field survey in 2021 for SRE invertebrate fauna. In addition to this work, regional surveys undertaken in the vicinity of the Development Envelope were

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collated to provide further contextual information. In total, two desktop assessments, two detailed terrestrial fauna surveys and one detailed SRE survey have been completed within the Terrestrial Fauna Survey Area (**Table 25, Figure 15**). The Terrestrial Fauna Survey Area encompasses 1,645 ha, comprising the majority of the Development Envelope (**Figure 15**).

TABLE 25: STUDIES FOR TERRESTRIAL FAUNA

Studies and Surveys	Area	Scope and Timing	Survey/Study Effort	Consistency with Guidance and Limitations																				
<p>Level 2 Fauna Survey and Targeted Northern Quoll Survey of the Lamb Creek for Process Minerals International Pty Ltd (Rapallo 2012b)</p>	<p>Not included in report</p>	<p>Scope:</p> <ul style="list-style-type: none"> Level 2 fauna survey of the Terrestrial Fauna Survey Area and adjacent areas of similar habitat Targeted Northern Quoll survey of the Terrestrial Fauna Survey Area <p>Timing:</p> <ul style="list-style-type: none"> 19 – 20 March 2012 (reconnaissance survey) 26 March – 12 April 2012 (field surveys) 	<p>Desktop assessment:</p> <ul style="list-style-type: none"> Desktop assessment including database searches (max 50 km buffer) and review of relevant reports <p>Field survey:</p> <ul style="list-style-type: none"> Reconnaissance survey Vertebrate fauna trapping Bird and bat surveys Spotlighting Active searching and habitat assessments Remote sensing cameras Opportunistic records SRE surveys (leaf litter collection) Targeted Northern Quoll survey 	<p>Level 2 Fauna Survey</p> <p>Guidance considered:</p> <ul style="list-style-type: none"> Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020c). Survey guidelines for Australia's threatened bats - Guidelines for detecting bats listed as threatened under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (DEWHA 2010a). <p>Assessment against guidelines:</p> <ul style="list-style-type: none"> Scope and intensity: <ul style="list-style-type: none"> Suitable to achieve the survey aims of a detailed fauna survey. Limitations: <ul style="list-style-type: none"> Survey Effort: Approximately half of the Terrestrial Fauna Survey Area was not comprehensively surveyed and was not subject to baseline fauna surveys or targeted surveys for significant fauna such as the Pilbara Leaf-nosed Bat, Northern Quoll or Pilbara Olive Python. The Terrestrial Fauna Survey Area does not encompass the entire Development Envelope, the Indicative Footprint extends outside the Terrestrial Fauna Survey Area by 24 ha at the southern extent of the Development Envelope. The survey did not meet Commonwealth (DEWHA 2010a) survey requirements for survey effort for Ghost Bat caves as shown in the table below. However, independent expert review commissioned by MinRes (Bat Call WA, Appendix F), of this and subsequent Ghost Bat surveys in 2020, 2021, and 2022 and impact assessment results concluded there is a good understanding of Ghost Bat presence in the Proposed Action Area and surrounds, and the partial limitation of this survey is of no consequence. <table border="1"> <thead> <tr> <th rowspan="2">Site</th> <th colspan="2">Rapallo (2012)</th> </tr> <tr> <th>No. of nights ultrasonic recorder deployed</th> <th>Compliant with current guidance</th> </tr> </thead> <tbody> <tr> <td>Cave 1</td> <td>0</td> <td>No</td> </tr> <tr> <td>Cave 2</td> <td>1</td> <td>No</td> </tr> <tr> <td>Cave 3</td> <td>0</td> <td>No</td> </tr> <tr> <td>Cave 4</td> <td>0</td> <td>No</td> </tr> <tr> <td>Cave 5</td> <td>0</td> <td>No</td> </tr> </tbody> </table> <p>Conclusion: This survey partially met guidance; however, the survey is considered adequate for purposes of providing site-specific observations and building on the regional knowledge base used to assess potential for impacts and the survey is considered adequate to meet EPA guidance.</p> <p>Targeted Northern Quoll Survey</p> <p>Guidance considered:</p> <ul style="list-style-type: none"> EPBC Act referral guideline for the endangered northern quoll <i>Dasyurus hallucatus</i> – EPBC Act Policy Statement (DoE 2016a). <p>Assessment against guidelines:</p> <ul style="list-style-type: none"> Limitations: 	Site	Rapallo (2012)		No. of nights ultrasonic recorder deployed	Compliant with current guidance	Cave 1	0	No	Cave 2	1	No	Cave 3	0	No	Cave 4	0	No	Cave 5	0	No
Site	Rapallo (2012)																							
	No. of nights ultrasonic recorder deployed	Compliant with current guidance																						
Cave 1	0	No																						
Cave 2	1	No																						
Cave 3	0	No																						
Cave 4	0	No																						
Cave 5	0	No																						

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Studies and Surveys	Area	Scope and Timing	Survey/Study Effort	Consistency with Guidance and Limitations
				<ul style="list-style-type: none"> ○ Area was surveyed prior to guidelines being published ○ Survey did not cover the entire Development Envelope. <p>Conclusion: The survey partially met guidance; however, the survey is considered adequate for purposes of providing site-specific observations and building on the regional knowledge base used to assess potential for impacts and the survey is considered adequate to meet EPA guidance (Bamford Consulting Ecologists 2024, in Appendix F)</p>
Lamb Creek and Wedge Project: Vertebrate Fauna Desktop Assessment March (Western Wildlife 2020)	3,110 ha	<p>Scope:</p> <ul style="list-style-type: none"> • Desktop assessment including database searches and a review of previous fauna surveys in the region (within 35 km of Proposal Area) 	<p>Desktop assessment:</p> <ul style="list-style-type: none"> • Desktop assessment including database searches and review of relevant reports 	<p>Guidance considered</p> <ul style="list-style-type: none"> • Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020c). <p>Assessment against guidelines</p> <ul style="list-style-type: none"> • Scope and Intensity: <ul style="list-style-type: none"> ○ Suitable to achieve desktop assessment aims. • Limitations: <ul style="list-style-type: none"> ○ No limitations noted. <p>Conclusion:</p> <ul style="list-style-type: none"> • The desktop assessment was adequate to meet the EPA’s requirements of a desktop assessment.
Baseline Short-range Endemic Invertebrate Survey of the Lamb Creek Iron Ore Project (Rapallo 2022a)	1,645 ha	<p>Scope:</p> <ul style="list-style-type: none"> • Desktop assessment of SRE invertebrate fauna likely to occur within area and in vicinity of the Development Envelope. • SRE invertebrate fauna survey to determine the occurrence of SRE invertebrates within the Development Envelope and document associated habitat. <p>Timing:</p> <ul style="list-style-type: none"> • 17th to 25th February 2021 	<p>Desktop assessment:</p> <ul style="list-style-type: none"> • Desktop assessment including database searches (WAM; arachnids and myriapods) <p>Field survey:</p> <ul style="list-style-type: none"> • Aerial, vehicle, and foot surveys • Habitat assessments • Active searching • Opportunistic sampling • 51 survey sites 	<p>Guidance considered</p> <ul style="list-style-type: none"> • Technical Guidance: Sampling of short range endemic invertebrate fauna (EPA 2016b). <p>Assessment against guidelines</p> <ul style="list-style-type: none"> • Scope and intensity: <ul style="list-style-type: none"> ○ All invertebrate groups likely to be SRE were targeted and sampled for. ○ Field personnel experienced and competent, advised by invertebrate taxonomist. ○ Sites selected based upon habitat complexity rather than accessibility. ○ All broad habitats identified were sampled. ○ Survey period intercepted a significant rainfall period. • Survey Limitations: <ul style="list-style-type: none"> ○ Identifications relied on DNA sequences, some SRE target groups at the time of taxonomic identification had few reference sequences available. ○ Where reference sequences unavailable to help with identification, there are difficulties in identifying SRE based upon morphology. ○ Lag in updating taxonomic knowledge on desktop assessment databases. ○ Detectability of SRE inhibited by species being cryptic and present in low numbers. ○ The Indicative Footprint extends outside the Terrestrial Fauna Survey Area by 24 ha; however, given the knowledge that all broad fauna habitat types within the 2021 survey area were surveyed for SRE taxa, this is considered a minor limitation with respect to SRE. <p>Conclusion</p> <ul style="list-style-type: none"> • This study is considered adequate for the purposes of assessing potential impacts and the survey is considered adequate to meet EPA guidance.
Detailed vertebrate fauna survey of the Lamb Creek Project (Rapallo 2022b)	1,645 ha	<p>Scope:</p> <ul style="list-style-type: none"> • Desktop assessment including database searches and review of relevant reports undertaken to understand the regional fauna 	<p>Desktop assessment:</p> <ul style="list-style-type: none"> • Five databases (max 50 km buffer) • Review of relevant reports • Species richness estimates 	<p>Guidance considered</p> <ul style="list-style-type: none"> • Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020c). • EPBC Act referral guideline for the endangered northern quoll <i>Dasyurus hallucatus</i> – EPBC Act Policy Statement (DoE 2016a).

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Studies and Surveys	Area	Scope and Timing	Survey/Study Effort	Consistency with Guidance and Limitations
		<p>assemblage and habitats, identify vertebrate fauna species of significance within the Terrestrial Fauna Survey Area, and verify current taxonomy and conservation status of fauna and ecological communities.</p> <ul style="list-style-type: none"> Refine 2012 fauna habitat mapping and extend fauna habitat mapping into areas not previously mapped within the Terrestrial Fauna Survey Area. Level 2 fauna survey of Terrestrial Fauna Survey Area. <p>Timing:</p> <ul style="list-style-type: none"> 16 – 28 April 2020 (vertebrate fauna survey) 17 – 23 February 2021 (supplementary field work) 	<p>Field survey:</p> <ul style="list-style-type: none"> Systematic trapping Bird surveys Acoustic recording for bats and night parrot Active searching (foraging and leaf litter) Opportunistic observations Camera trapping 	<ul style="list-style-type: none"> Survey guidelines for Australia's threatened mammals – Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DSEWPaC 2011a). Survey guidelines for Australia's threatened bats – Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DEWHA 2010a). A review of ghost bat ecology, threats and survey requirements (Bat Call WA 2021a). Survey guidelines for Australia's threatened reptiles – Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DSEWPaC 2011b). Survey guidelines for Australia's threatened birds – Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DEWHA 2010b). Interim guideline for preliminary surveys of night parrot (<i>Pezoporus occidentalis</i>) in Western Australia (DPaW 2017). <p>Assessment against guidelines</p> <ul style="list-style-type: none"> Scope and intensity: <ul style="list-style-type: none"> Suitable to achieve the survey aims Limitations: <ul style="list-style-type: none"> Survey timing, rainfall, season of survey identified as a partial limitation: The survey was completed in late April, which falls within the (EPA 2020c) recommended timing to survey reptiles in the Eremaean Botanical Province. Rainfall in the two-month preceding the survey was low compared to the annual average and conditions over most of the project area were dry. The field survey occurred post-mating season for Northern Quoll. Survey effort for two of the five Ghost Bat caves met Commonwealth (DEWHA 2010a) and State (EPA 2020c) survey requirements for bats (Cave 1 and Cave 3). All other sites were not surveyed an adequate number of nights to meet Commonwealth bat survey requirements, as shown in the table below. <p>Conclusion</p> <ul style="list-style-type: none"> Approximately 14.8 ha (2.3%) of the Indicative Footprint Envelope has not been covered by fauna surveys and is considered a partial limitation. However, this is not considered a significant limitation given the knowledge that all broad fauna habitat types were surveyed and assessment of risk for conservation significant fauna based on habitat suitability is more effective than reliance of presence/absence surveys (Bamford Consulting Ecologists 2024, in Appendix F) There was also a partial limitation for the timing/rainfall/seasonality of the fauna work due to lower-than-average rainfall preceding the survey (Rapallo 2022b); however, this is not considered a significant risk given the number of species observed and the substantial body of knowledge of significant fauna habitat preferences and presence within the region from decades of studies conducted for the resource sector (Bamford Consulting Ecologists 2024, in Appendix F). The survey did not meet Commonwealth (DEWHA 2010a) survey requirements for survey effort for Ghost Bat caves; however, this was not considered a significant limitation given these caves are located outside of the Development Envelope (Bat Call WA 2024, in Appendix F).

Studies and Surveys	Area	Scope and Timing	Survey/Study Effort	Consistency with Guidance and Limitations						
				Site	Rapallo (2012)		Rapallo (2022)			
					2020 Data Collected		2021 Data Collected			
				# Nights Ultrasonic Recorder Deployed	Compliant	# Nights Ultrasonic Recorder Deployed	Compliant	# Nights Ultrasonic Recorder Deployed	Compliant	
				Cave 1	0	No	4	Yes	3	Yes
				Cave 2	1	No	2	No	0	No
				Cave 3	0	No	4	Yes	3	Yes
				Cave 4	0	No	0	No	2	No
				Cave 5	0	No	0	No	2	No
Ghost Bat Significance Assessment for the Lamb Creek Iron Ore Project (Phoenix 2022)	1,645 ha	Scope: <ul style="list-style-type: none"> Desktop assessment including an analysis of the Project against the EPBC Act significant impact criterion (Vu) and key threats identified by the (TSSC 2016a), with consideration of historic and recent fauna assessments. 	Desktop assessment: <ul style="list-style-type: none"> DBCA database search (40 km buffer) Review of relevant reports Gap analysis Significance assessment 	Guidance considered <ul style="list-style-type: none"> Matters of National Environmental Significance Significant Impact Guidelines 1.1 – <i>Environment Protection and Biodiversity Conservation Act 1999</i> (DoE 2013) Assessment against guidelines <ul style="list-style-type: none"> Scope and intensity: <ul style="list-style-type: none"> Suitable to achieve desktop assessment aims Limitations: <ul style="list-style-type: none"> No limitations noted Conclusion <ul style="list-style-type: none"> This report adequately met guidance for a desktop significance assessment 						
Targeted Ghost Bat survey for the Lamb Creek Iron Ore Project (Phoenix 2023)	8,010 ha	Scope: <p>Targeted Ghost Bat survey to collect detailed information on Ghost Bats, comprising searches for roost sites, ultrasonic recordings and scat collection and analysis.</p> Field Survey Timing: <ul style="list-style-type: none"> 12-14 September 2022 18 October 2022 	Desktop assessment: <ul style="list-style-type: none"> Protected Matters Search Tool DCCEEW (2023) (40 km buffer) DBCA Threatened and Priority Fauna Database (2021) (40 km buffer) Atlas of Living Australia (ALA 2023) (40 km buffer) Review of relevant reports Field Survey: <ul style="list-style-type: none"> Targeted Ghost Bat survey in Spring including: <ul style="list-style-type: none"> Habitat assessment Habitat/cave searches Bat echolocation recordings Scat collection and analysis Cave status assessment 	Guidance considered: <ul style="list-style-type: none"> EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020c) Survey guidelines for Australia's Threatened bats: guidelines for detecting bats listed as Threatened under the Environmental Protection and Biodiversity Conservation Act 1999 (DEWHA 2010a) A review of Ghost Bat ecology, threats and survey requirements (Bat Call WA 2021a). Assessment against guidelines: <p>The limitations of the survey were considered in accordance with (EPA 2020c) and the following limitations were noted:</p> <ul style="list-style-type: none"> <i>Scope and completeness:</i> Heritage access restrictions impeded surveys within the exclusion zone (where 3 known caves are located). This is not however considered a significant limitation given these caves are located outside of the Development Envelope, they have been previously surveyed, and there is an adequate number of known caves around the Project area to assess potential impact (Bat Call WA 2024, in Appendix F Appendix F. The most prospective 'new' areas to the east and south were surveyed. Importantly, known caves east of the Project (Cave 1, Cave 3), and a formerly surveyed cave in 2012 (LC003) were investigated. <i>Access within the study area:</i> A substantial section of the study area was not accessible due to heritage constraints; this area includes 3 previously known roosting caves intended for sampling and was to be searched for additional roost sites. This is not however considered a significant limitation for the reasons noted above. <p>No other limitations were noted.</p> Conclusion: <p>(Phoenix 2023) completed a comprehensive desk top review of earlier surveys completed by Rapallo between 2012 and 2021, a field survey campaign and post survey analysis using industry standard methods and techniques for bat identification that are in accordance with</p>						

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Studies and Surveys	Area	Scope and Timing	Survey/Study Effort	Consistency with Guidance and Limitations
				<p>current national and state guidelines. The equipment used (Songmeter SM series detectors by Wildlife Acoustics, USA) was current and provides accurate bat call recordings. All echolocation-based surveys carried out were analysed and bat species identified by experienced bat specialists familiar with cryptic PGb calls. DNA from scats collected was analysed by the DBCA laboratory at Kensington WA. Internal cave dimensional characteristics were reported by Phoenix that together with echolocation and scat DNA results confirm the cave categorisations below:</p> <ul style="list-style-type: none"> ● Cave 1: Category 2 – critical habitat cave ● Cave 2: Category 3 ● Cave 3: Category 3 ● Cave 4: Category 3 (apartment block) – critical habitat cave ● Cave 5: Category 2 – critical habitat cave.

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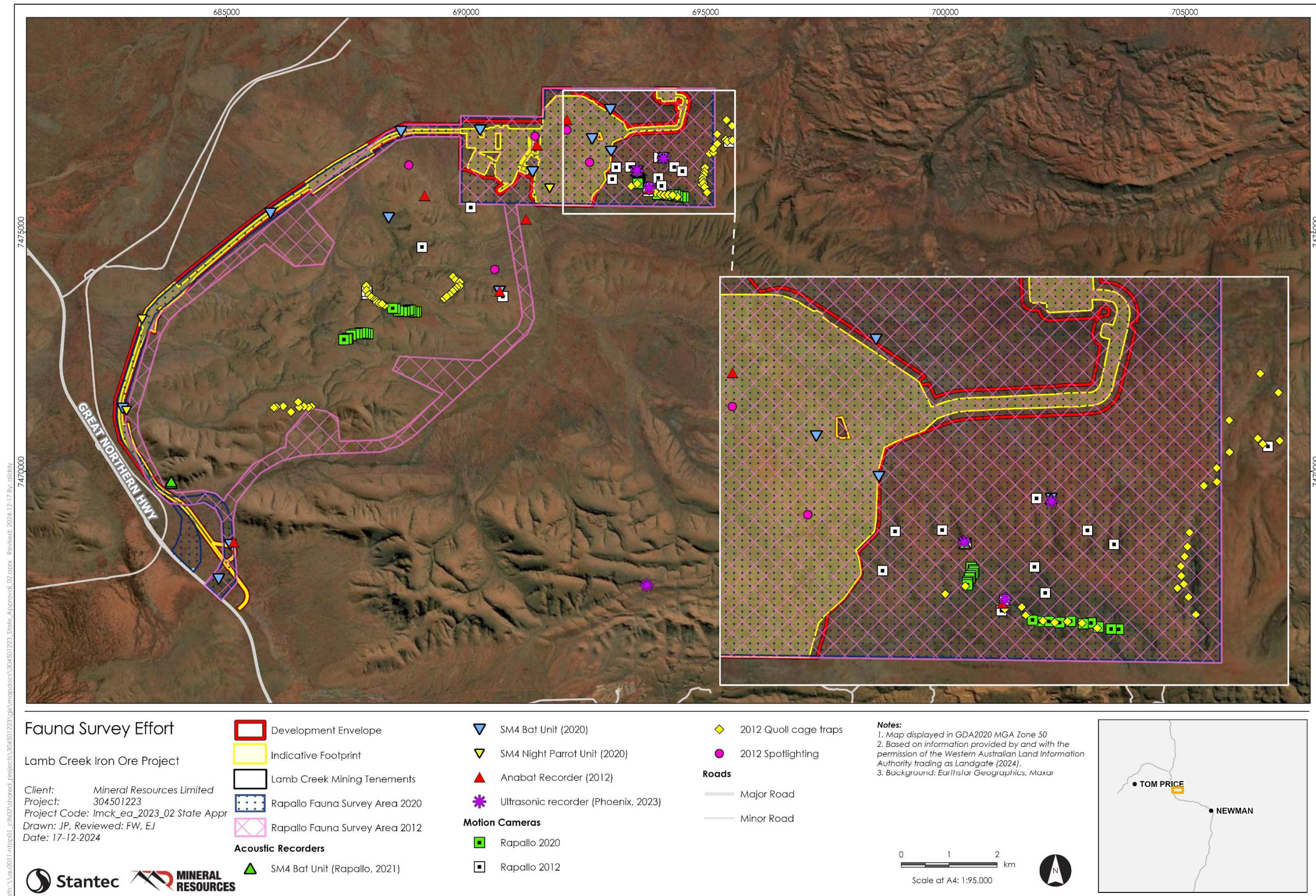


FIGURE 15: SURVEY EFFORT FOR TERRESTRIAL FAUNA WITHIN THE TERRESTRIAL FAUNA SURVEY AREA

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8.4.2. Terrestrial Fauna Habitat

8.4.2.1. Vertebrate Fauna Habitat

A total of 10 broad habitat types (excluding cleared areas) have been identified in the Terrestrial Fauna Survey Area (**Figure 16**) (**Appendix F**) including:

- Gorge, gully, and rocky breakaway
- Hill crests and hill slopes
- Stony plains
- Drainage line (minor and medium)
- Mulga / *Corymbia* spp. plain
- Tussock grassland plain
- Hummock grassland
- Rocky ridge and gorge
- Rocky hills and plateaus
- Mulga plain.

The following habitat features within the Terrestrial Fauna Survey Area are likely to be of importance to significant fauna and other fauna species in the region:

- Gorges with surface water pools
- Caves (both deep and shallow for diurnal, nocturnal, and maternity roosts)
- Rocky/pebble substrate
- Gullies
- Rocky outcrops
- Major watercourses
- Open grassland and woodland.

While the majority of habitats have some importance in supporting native fauna, these habitats may be of particular importance if they:

- Support very diverse or unique faunal assemblages
- Are restricted or rare in the region (and therefore may support faunal assemblages that are rare or restricted)
- Are refugia (e.g. from drought or fire)
- Provide ecological linkage
- Support significant fauna.

Of the habitats recorded within the Terrestrial Fauna Survey Area (**Table 26**) (**Appendix F**), the rocky ridge and gorge habitat is considered to be important, however none of this occurs within the Development Envelope. The rocky ridge and gorge habitat may comprise caves and crevices for shelter, as well as breeding and roosting sites for several significant fauna species. This habitat is limited in its extent in the region, compared with other more widely occurring fauna habitats, such as stony plain. The drainage line habitat is also important habitat, although it is widespread in the region. The drainage line habitat is likely to support a greater abundance and diversity of fauna than surrounding habitats and may provide a corridor for fauna movement. Any water present within drainage line habitats within the Development Envelope would be ephemeral; therefore, is present only following major rainfall events.

TABLE 26: VERTEBRATE FAUNA HABITAT TYPES IN THE TERRESTRIAL FAUNA SURVEY AREA

Habitat Type	Description	Value To Significant Fauna	Extent In Terrestrial Fauna Survey Area (ha)(%)
High value			
Gorge, gully, and rocky breakaway	Wide rocky gullies and gorges that bisect the hillcrest / hillslopes of the higher elevation areas containing caves, deep cracks, and crevices. Breakaways occur at the rugged edges of hillslopes. Spinifex hummock grassland with mixed shrubland patches or occasional <i>Ficus</i> spp. occurring in shaded locations or occasional <i>Eucalyptus leucophloia</i> .	<ul style="list-style-type: none"> • Potential foraging and dispersal habitat for Pilbara Olive Python, Pilbara Leaf-nosed Bat Northern Quoll, Ghost Bat and Peregrine Falcon. • Potential breeding habitat for Pilbara Olive Python, Northern Quoll and Peregrine Falcon. • Potential shelter habitat for Pilbara Olive Python and Northern Quoll. • Potential habitat for Pilbara Barking Gecko (<i>Underwoodisaurus seorsus</i>) and Gane's Blind Snake (<i>Anilius ganei</i>). 	54.68 (3.32%)
Moderate value			
Hillcrests / hillslope	Slopes and hill crests of higher elevation areas. Spinifex hummock grassland dominated with scattered <i>Eucalyptus leucophloia</i> trees and mallee, and <i>Acacia</i> spp. and <i>Grevillea</i> spp. shrubs on rocky, red skeletal soils (loams to clay/loam).	<ul style="list-style-type: none"> • Possible foraging and dispersal habitat for Ghost Bat, Pilbara Leaf-nosed Bat, Grey Falcon, Western Pebble-mound Mouse and Northern Quoll. • Possible breeding habitat for Western Pebblemound Mouse. 	319.01 (19.39%)
Mulga / <i>Corymbia</i> spp. plain	Open Mulga shrubland patches over spinifex hummock or tussock grassland on loam to sandy clay loam occurring in areas of sheet flow drainage. The Mulga patches are surrounded by run-off zones of stonier plain with open spinifex / tussock grassland under very open Mulga / <i>Corymbia deserticola</i> shrubland.	<ul style="list-style-type: none"> • Possible foraging and dispersal habitat for Ghost Bat, Pilbara Leaf-nosed Bat and Grey Falcon. • Possible habitat for Gane's Blind Snake. 	291.15 (17.70%)
Minor drainage	Smaller narrow drainage channels and shallow gullies that bisect the stony plain habitat and hill slopes, forming flow zones on the valley floor. Mixed open shrubland, to shrubland often over tussock grass and herbs with	<ul style="list-style-type: none"> • Possible foraging and dispersal habitat for Ghost Bat, Grey Falcon, Pilbara Leaf-nosed Bat, Peregrine Falcon, Pilbara Olive Python and Northern Quoll. 	210.61 (12.80%)

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Habitat Type	Description	Value To Significant Fauna	Extent In Terrestrial Fauna Survey Area (ha)(%)
	occasional fringing trees (scattered <i>Eucalyptus leucophloia</i> , <i>Corymbia</i> spp. or <i>Eucalyptus gamophylla</i>).		
Tussock grassland plain	Tussock grass (<i>Aristida inaequiglumis</i> , <i>Aristida contorta</i> , <i>Themeda triandra</i>) dominated, largely undefined drainage plain. Contains occasional open Mulga woodland stands or scattered Mulga individuals on brown sandy clay loam to loams. Contains patches of spinifex.	<ul style="list-style-type: none"> • Potential foraging and dispersal habitat for Ghost Bat, Grey Falcon and Peregrine Falcon. • Potential habitat for Gane's Blind Snake. 	137.93 (8.38%)
Medium drainage	Wide loamy drainage channels to undefined drainage (gravelly) containing occasional emergent <i>Corymbia hamersleyana</i> over patches of low mixed shrubs over Buffel Grass and tussock grass dominated understory on low relief. Contains very occasional Mulga stands in loamier soils.	<ul style="list-style-type: none"> • Potential foraging and dispersal habitat for Ghost Bat, Pilbara Leaf-nosed Bat, Grey Falcon, Pilbara Olive Python, Northern Quoll and Peregrine Falcon. • Potential breeding and nesting habitat for Grey Falcon. • Potential habitat for Gane's Blind Snake. 	113.06 (6.87%)
Low value			
Stony plain	Plains and lower slopes of spinifex hummock grasslands (or in small patches, tussock grass) on red sandy clay loam to loam soil. Typically, with a mantle of gravel (less so on the valley floor adjacent to drainage, where soils are loamier). Little to no overstory aside from scattered trees or patches of mixed shrubs often regenerating from fire. Generally, <i>Eucalyptus leucophloia</i> occurs on the slopes and <i>Eucalyptus gamophylla</i> on lower slopes, with <i>Corymbia hamersleyana</i> typically associated with drainage.	<ul style="list-style-type: none"> • Foraging and dispersal habitat for Ghost Bat, Grey Falcon, Western Pebblemound Mouse and Pilbara Olive Python. • Possible breeding and shelter habitat for Western Pebblemound Mouse. 	517.94 (31.48%)

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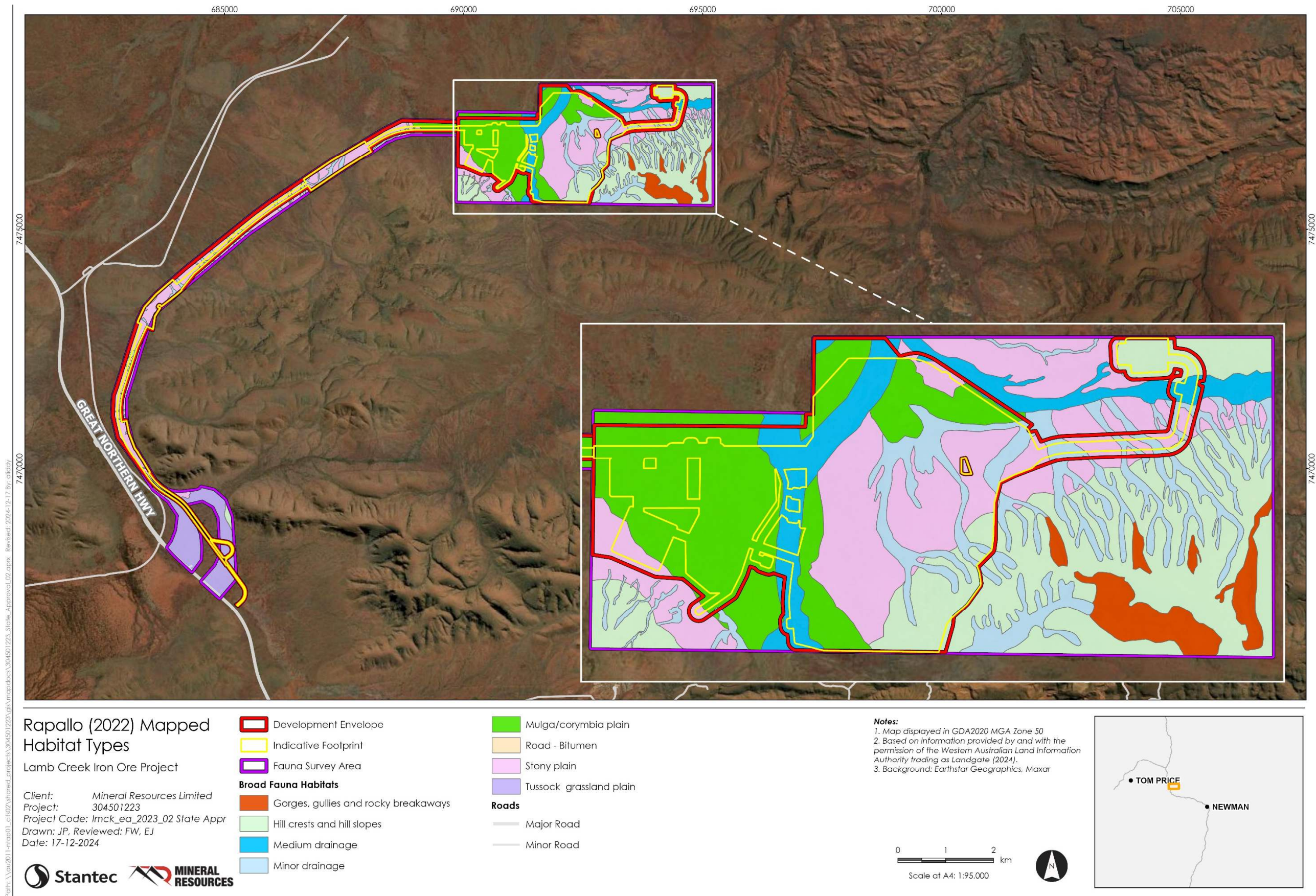


FIGURE 16: FAUNA HABITAT WITHIN THE TERRESTRIAL FAUNA SURVEY AREA

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8.4.2.2. SRE Invertebrate Fauna Habitat

The following seven broad habitat types were identified as having the potential to support SRE invertebrate fauna and were assessed during the SRE invertebrate fauna survey (**Appendix F**):

- Gorges, gullies, and rocky breakaways.
- Minor drainage lines.
- Medium drainage lines.
- Hillcrests and hillslopes.
- Stony plain.
- Tussock grassland plain.
- Mulga/*Corymbia* spp. plain.

Of the SRE habitats assessed, the stony plain habitat type is the most extensive habitat within the Terrestrial Fauna Survey Area, covering 518 ha (32%). Factors that contribute to the presence of suitable microhabitats for SREs include southeast facing slopes, moisture, rocky areas, habitat isolates, deep leaf litter, mountainous areas, deep gullies or gorges and riparian vegetation (**Table 27**). Within the Development Envelope, suitable microhabitats with a high probability of supporting SRE species include gorges, gullies, and rocky breakaways (**Table 27**). Some habitats assessed within the Development Envelope have also experienced disturbance through selective clearing for tracks, drill pads, and laydown areas associated with exploration activities (Rapallo 2022a). No SRE habitats identified are confined or restricted to the Development Envelope.

TABLE 27: SRE HABITAT SUITABILITY WITHIN THE TERRESTRIAL FAUNA SURVEY AREA

SRE Habitat Type	Extent in Terrestrial Fauna Survey Area (ha)(%)	SRE Habitat Suitability
Gorges, gullies, and rocky breakaways	54.68 (3.32%)	<ul style="list-style-type: none"> • The deepest gullies in the Terrestrial Fauna Survey Area occur on the south-eastern corner within a north-west and northern-facing slope. • Suitability for SRE is rated as moderate to high. This broad habitat type is not restricted to the Terrestrial Fauna Survey Area, and the habitat type contains at least two microhabitat factors.
Minor drainage lines	210.61 (12.80%)	<ul style="list-style-type: none"> • Despite some patchy shading from vegetation, the minor drainage lines assessed had low soil moisture levels, low accumulated litter, and generally gravelly soils. Connectivity of minor drainage is high as the drainage lines flow fast after significant rainfall into a network of drainage. • Suitability for SRE is low based on low protection and low isolation. This broad habitat type is not restricted to the survey area.
Medium drainage lines	113.06 (6.87%)	<ul style="list-style-type: none"> • In the Terrestrial Fauna Survey Area, detritus and litter within this habitat was sparse or in piles without accumulated soil-indicating recent fast flow and little opportunity for soil and fine detritus to accumulate. • Suitability for SRE is moderate to low based on medium to low protection and low isolation. This broad habitat type is not restricted to the Terrestrial Fauna Survey Area.
Hillcrests and hillslopes	319.01 (19.39%)	<ul style="list-style-type: none"> • Steep, south-facing hill slopes can provide a degree of protection; however, within the Terrestrial Fauna Survey Area there are no areas of high elevation that are steep, south facing and constantly shaded. Within

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SRE Habitat Type	Extent in Terrestrial Fauna Survey Area (ha)(%)	SRE Habitat Suitability
		<p>the Terrestrial Fauna Survey Area, this habitat type is continuous (not isolated).</p> <ul style="list-style-type: none"> Suitability for SRE is low based on low protection and low isolation and this broad habitat type is not restricted to the survey area.
Stony plain	517.94 (31.48%)	<ul style="list-style-type: none"> In the Terrestrial Fauna Survey Area within this habitat, there are no areas of continuous shade occurring due to topography. Within the Terrestrial Fauna Survey Area, this habitat type is continuous (not isolated). Suitability for SRE is moderate to low suitability based on low-medium protection and low isolation. This broad habitat type is not restricted to the Terrestrial Fauna Survey Area.
Tussock grassland plain	137.93 (8.38%)	<ul style="list-style-type: none"> Mulga stands within the Terrestrial Fauna Survey Area provide shade; however, the stands are not extensive or thick, therefore the shade is patchy as is the accumulated litter. The soils are loamier than the surrounding habitats, so there are areas of higher soil moisture under the bigger mulga stands. Suitability for SRE is medium based on low isolation and medium protection. This broad habitat type is unlikely to be restricted to the Terrestrial Fauna Survey Area.
Mulga/ <i>Corymbia</i> spp. plain	291.15 (17.70%)	<ul style="list-style-type: none"> Mulga stands within the Terrestrial Fauna Survey Area provide shade; however, the stands are not extensive or thick, therefore the shade is patchy as is the accumulated litter. Suitability for SRE is medium based on low isolation and medium protection. This broad habitat type is unlikely to be restricted to the Terrestrial Fauna Survey Area.

8.4.3. Terrestrial Fauna

8.4.3.1. Vertebrate Fauna

Desktop assessments indicate a predicted fauna assemblage of up to 307 species, with a total of 156 terrestrial vertebrate fauna species within the Terrestrial Fauna Survey Area, comprising 22 mammal, 58 reptile and 76 bird species (**Appendix F**). A total of 31 terrestrial vertebrate fauna species of significance with the potential to occur within the Terrestrial Fauna Survey Area (**Appendix H**) were recorded in the desktop assessment, comprising eight mammal, five reptile and 18 bird species.

The likelihood of the 31 significant fauna species occurring within the Terrestrial Fauna Survey Area was assessed against the criteria provided in **Appendix G**. Of these 31 species, one mammal and one bird species have been confirmed to occur within the Development Envelope during field surveys (Rapallo 2022b). A further two mammals, three reptiles and two birds were assessed as likely to occur (**Table 28**). Two mammals, two reptiles and two birds were considered possible to occur (**Appendix H**), and 15 species were considered unlikely to occur in the Terrestrial Fauna Survey Area (**Appendix H**) and have not been considered further.

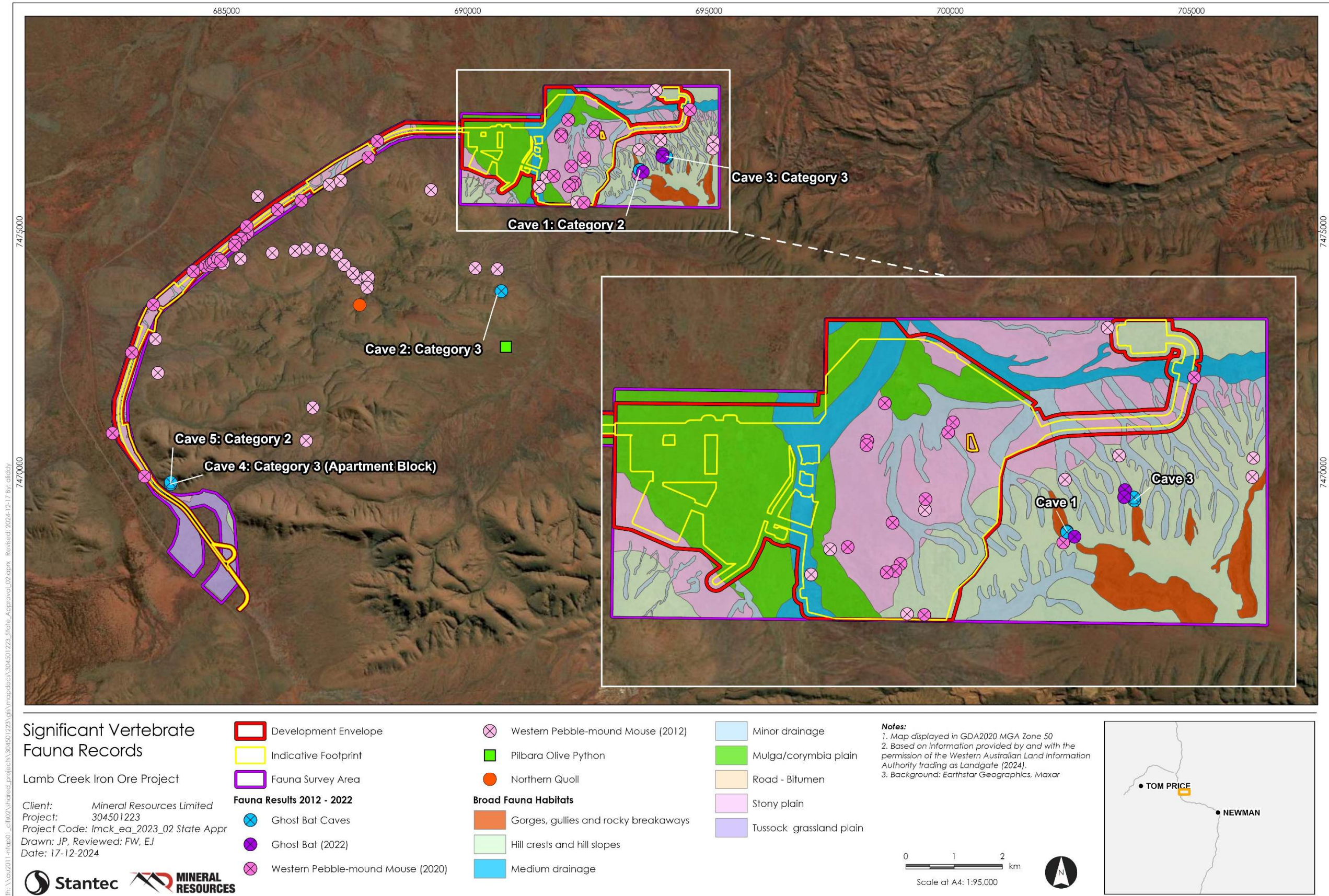
TABLE 28: SIGNIFICANT FAUNA SPECIES LIKELIHOOD OF OCCURRENCE WITHIN THE DEVELOPMENT ENVELOPE ASSESSMENT

Common Name	Scientific Name	Conservation Status		Literature Sources				Habitat Preference	Likelihood of Occurrence (Confirmed or Likely to Occur) within Development Envelope (50 km buffer)
		BC Act	EPBC Act	Rapallo (2012)	Western Wildlife (2020)	Rapallo (2022)	Phoenix (2022)		
Mammals									
Northern Quoll	<i>Dasyurus hallucatus</i>	En	En	✓	✓	✓	-	This species favours rocky habitats (e.g. escarpments, mesas, gorges, breakaways, boulder fields and some waterways) for shelter and breeding, with foraging occurring in adjacent vegetation. The Northern Quoll is nocturnal and leaves the den to forage at night.	Likely The Development Envelope occurs within the species' known distribution, contains suitable habitat, and the species has been recorded within the vicinity of the Development Envelope
Ghost Bat	<i>Macroderma gigas</i>	Vu	Vu	✓	✓	✓	✓	Geographically disjunct populations occur in the Pilbara and Kimberley regions within arid spinifex hillsides, black soil grasslands, monsoon forest, open savannah woodland, tall open forest, deciduous vine forest, tropical rainforest, sandstone caves, boulder piles, limestone caves and abandoned mines.	Likely The Development Envelope occurs within the species' known distribution, contains suitable habitat, and the species has been recorded within the vicinity of the Development Envelope
Pilbara Leaf-nosed Bat	<i>Rhinonicteris aurantia</i>	Vu	Vu	✓	✓	-	-	Found throughout the Pilbara bioregion within rocky outcrops, granite tor rockpiles, caves and abandoned mines with high temperature and humidity. Selective in choosing hot, humid roosting sites.	Likely The Development Envelope occurs within the species' known distribution, contains suitable habitat for foraging and breeding, and the species has been recorded adjacent to the Terrestrial Fauna Survey Area.
Western Pebble-mound Mouse	<i>Pseudomys chapmani</i>	P4	-	✓	✓	✓	-	Lives in pebbly soils in arid tussock grassland and <i>Acacia</i> woodland. Associated with eroding sands at natural features that expose pebbles.	Confirmed The Development Envelope occurs within the species' known distribution, contains suitable habitat, and the species has been recorded within the DE
Reptiles									
Pilbara Olive Python	<i>Liasis olivaceus barroni</i>	Vu	Vu	✓	✓	✓	-	Preferred habitat is often associated with open water, such as swamps and surface water pools. Typical habitat is found along larger waterways in environments with rocky hills, escarpments, and plains dominated by dense vegetation such grassy mounds of <i>Triodia</i> .	Likely The Development Envelope occurs within the species' known distribution, contains suitable habitat, and the species has been recorded in the vicinity of the Development Envelope
Gane's Blind Snake (Pilbara)	<i>Anilius ganei</i>	P1	-	✓	✓	✓	-	Data deficient and known from only a few locations and/or specimens.	Likely The Terrestrial Fauna Survey Area occurs within the species' known distribution, contains suitable habitat, and the species has been recorded in the vicinity of the Development Envelope
Pilbara Barking Gecko	<i>Underwoodisaurus seorsus</i>	P2	-	-	✓	✓	-	Data deficient and known from only a few locations and/or specimens. Occurs in rocky areas and gullies within the Hamersley Range area of the Pilbara bioregion.	Likely The Terrestrial Fauna Survey Area occurs within the species' known distribution, contains suitable habitat, and the species has been recorded in the vicinity of the Development Envelope
Birds									

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Common Name	Scientific Name	Conservation Status		Literature Sources				Habitat Preference	Likelihood of Occurrence (Confirmed or Likely to Occur) within Development Envelope (50 km buffer)
		BC Act	EPBC Act	Rapallo (2012)	Western Wildlife (2020)	Rapallo (2022)	Phoenix (2022)		
Grey Falcon	<i>Falco hypoleucos</i>	Vu	Vu	✓	✓	✓	-	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Likely The Development Envelope occurs within the area utilised by vagrant individuals of the species and contains only limited suitable habitat; however, the species has been recorded in the vicinity of the Development Envelope
Peregrine Falcon	<i>Falco peregrinus</i>	OS	-	✓	✓	✓	-	Found in most habitats, from rainforest to arid habitats, including coastal and alpine regions. Known to occur across Australia, but not common in any areas of its Australian range. Prefers coastal and inland cliffs, or open woodlands near water.	Likely The Development Envelope occurs within the area utilised by vagrant individuals of the species and contains only limited suitable habitat; however, the species has been recorded in the vicinity of the Development Envelope
Fork-tailed Swift	<i>Apus pacificus</i>	Mi	Mi	✓	✓	✓	-	A migratory species which spends the northern hemisphere's winter in Southeast Asia and Australia. It is a mainly aerial species and does not appear to be limited to particular fauna habitats or climatic zones.	Confirmed The Development Envelope occurs within the species' known distribution, contains suitable habitat, and the species has been recorded within the Terrestrial Fauna Survey Area.

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FIGURE 17: SIGNIFICANT VERTEBRATE FAUNA RECORDS WITHIN THE DEVELOPMENT ENVELOPE AND SURROUNDS

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Significant Fauna Recorded in the Development Envelope

Two fauna species of significance were confirmed as occurring within the Development Envelope based on the fauna detailed in-field surveys (Rapallo 2012b; 2022b) within the Terrestrial Fauna Survey Area (**Figure 17**). These species comprise:

- Western Pebble-mound Mouse (*Pseudomys chapmani*) (P4 under BC Act)
- Fork-tailed Swift (*Apus pacificus*) (Migratory under BC Act and EPBC Act).

These species are discussed in further detail in subsequent sections.

Western Pebble-mound Mouse

The Western Pebble-mound Mouse is listed as P4 under the BC Act. The species is currently restricted to the non-coastal central, eastern and southern parts of the Pilbara bioregion. They occur in ranges containing gentle stony slopes, that are often associated with *Acacia* spp. lined minor drainage areas (van Dyck and Strahan 2008). Within the Development Envelope, the tussock grasslands and stony plains habitats are most likely to support this species, considered common within the Development Envelope and the broader Terrestrial Fauna Survey Area. Furthermore, there is widespread occurrence of suitable habitat for the species within the region (Woinarski *et al.* 2014).

There are no key threatening processes identified for the species. However, potential impacts to the Western Pebble-mound Mouse include loss of suitable habitat, and elimination of the species in parts of its range, likely due to predation by feral cats and foxes.

The Western Pebble-mound Mouse was recorded during both of the (Rapallo 2012b; 2022b) in-field surveys, with 40 mounds recorded across the broader Terrestrial Fauna Survey Area from within stony plains habitat (**Figure 17**). This species is widespread in the broader region and has also been recorded numerous times at Mining Area C (Biologic 2017), situated approximately 15 km from the Development Envelope.

Fork-tailed Swift

The Fork-tailed Swift is listed as Migratory under the BC Act and the EPBC Act. The species has been recorded within the Terrestrial Fauna Survey Area and it is likely to forage above the Development Envelope during summer (Johnstone and Storr 1998). As the species is entirely aerial, the Proposal is not expected to impact the species; therefore, the Fork-tailed Swift has not been considered further.

Significant Fauna Likely to Occur in the Development Envelope

In addition to the two species of significance recorded from the detailed in-field surveys, another eight fauna species of significance are considered likely to occur within the Development Envelope, based on desktop assessments and habitat assessments undertaken during field surveys (Rapallo 2012b; 2022b; Western Wildlife 2020). They include:

- Ghost Bat (*Macroderma gigas*)
- Northern Quoll (*Dasyurus hallucatus*)
- Pilbara Leaf-nosed Bat (*Rhinioncteris aurantia*)
- Pilbara Olive Python (*Liasis olivaceus barroni*)
- Gane's Blind Snake (*Anilius ganei*)
- Pilbara Barking Gecko (*Underwoodisaurus seorsus*)
- Grey Falcon (*Falco hypoleucos*)
- Peregrine Falcon (*Falco peregrinus*).

These species are discussed in further detail in subsequent sections.

Ghost Bat

The Ghost Bat is listed as Vulnerable under the BC Act and the EPBC Act. The species was once widely distributed across Australia, but is now largely restricted to northern Australia, including parts of the Pilbara and Kimberley regions of WA. The Ghost Bat is distinctive in being very much larger than any other cave-dwelling bat in the region and it is easily identified. Scats and middens are also distinctive for this species and the use of caves can be noted through the presence of middens.

The Pilbara population is estimated to comprise 1,200 individuals (Armstrong and Anstee 2000). A subsequent population estimate by (McKenzie and Bullen 2009) found the Ghost Bat to be more common in the Pilbara than previously thought, with individuals recorded from 21 of 24 survey areas, and in all four Pilbara IBRA subregions. In the past decade, surveys for EIA have indicated a slightly larger Pilbara population of approximately 1,850 (350 across the Hamersley Range and 1,500 across the eastern Pilbara) (Bat Call WA 2021a).

The key threat to this species is habitat loss and degradation resulting from mining activities (McKenzie and Hall 2008; TSSC 2016a). Direct impacts decrease the abundance of the species in an area through mortality or displacement of individuals or populations.

For a given colony, potential direct impacts (Bat Call WA 2021a) include:

- Loss of roost sites including caves and old mine adits
- Loss of foraging habitat as a result of clearing
- Operational impacts from nearby mines, and low flying helicopters or military or civil aircraft during the maternity season
- Altered hydrological regimes as a result of flooding or dewatering, impacting important water sources
- Exposure to pollutants such as arsenic and / or cyanide associated with gold mines
- Barbed wire fences
- Human visitation / disturbance to caves during the maternity season.

Potential indirect impacts to colonies are:

- Introduced predatory species or zoonoses
- Sound, vibration and airborne dust
- Artificial light
- Altered fire regimes.

The Ghost Bat requires a number of cave sites to sustain populations and to move between a number of caves seasonally or as dictated by weather conditions and / or foraging opportunities (Richards *et al.* 2008). The species' persistence in the Pilbara depends on the physiologically benign day roosts found deep underground in temperature-stable caves (Armstrong and Anstee 2000; McKenzie and Bullen 2009) with chambers and / or cavities that trap humidity.

Roost habitat for the Ghost Bat can be classified into four categories, applicable to the Pilbara bioregion (Bat Call WA 2021a), described in **Table 29**. These categories are based on occupancy, breeding activities and importance, with Category 1 (maternity / diurnal roost sites with permanent occupancy) and Category 2 (maternity / diurnal roost sites with regular occupancy) roosts considered to be critical habitat.

Critical habitat:

Critical habitat for the species, defined by (Bat Call WA 2021b) and (Bullen et al. 2023), includes:

- Category 1 maternity/diurnal roost sites with permanent occupancy, which are essential for the daily presence and long-term survival of Ghost Bats.
- Category 2 maternity/diurnal roost caves with regular diurnal occupancy which make up an 'apartment block' grouping to support the daily and long-term presence of Ghost Bats.
- Category 3 roost caves, with occasional occupancy when adjacent to Category 2 caves, as these are considered to be a part of an 'apartment block' and therefore critical habitat to support

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reproducing females and ensure the ongoing presence of Ghost Bats in the area (Bat Call WA 2021b).

Supporting Habitat:

Within the Pilbara, the species is known to forage along drainage lines and riparian corridors, on alluvial plains supporting mulga woodland and tussock grassland, sparse woodland along ridge lines, as well as cave entrances where other bats hunt (Cramer *et al.* 2022). Other favoured areas for foraging include areas with moderate bare ground exposure (30-70%), sparsely wooded areas of Mulga, other Acacia or Eucalypt spp., or linear woodland features (e.g., riparian area) (Bullen *et al.* 2023)

Foraging areas tend to be located less than 5 km from diurnal roost sites; although larger distances have been reported through VHF and GPS/satellite tracking technologies (Augusteyn *et al.* 2017; Bat Call WA 2021a; Bullen *et al.* 2023). More recent studies in the Pilbara (Bullen *et al.* 2023) documented nightly flight path distances in excess of 40km. Ghost Bats are known to move periodically from roost to roost in response to season as well as local prey availability (Bat Call WA 2021a; Bullen *et al.* 2023).

TABLE 29: GHOST BAT ROOST AND CRITICAL HABITAT CLASSIFICATION

Roost Category	Roost Classification	Description (Bullen 2021)	Habitat Importance (Bat Call WA 2021a)
Category 1	Maternity/diurnal roost sites with permanent ghost bat occupancy	<ul style="list-style-type: none"> Breeding activities, such as mating and/or the repeated presence of males either pregnant or with pups, should be used to confirm the roost cave's categorisation. Often, ongoing studies or monitoring may be required before Category 1 and 2 roosts can be confirmed; it can rarely be unequivocally confirmed by a single visit. Proposing a cave to have category 2 'maternity' status may entail observing one or more of the following cave characteristics: <ul style="list-style-type: none"> One or more roosting chambers behind a narrow entrance or in-cave constriction that is elevated to reduce the risk of predation, always dark (though not necessarily completely dark), holds a steady microclimate, and contains substantial evidence of historic occupation (for example, extensive scat pile/s typically comprising >2,000 scats, sometimes but not always mixed with a food midden). Occupation by multiple individuals (preferably females) during the species' late pregnancy or lactating period. Caves used by multiple individuals on a semi-permanent or recurring basis. The presence of one or more large scat piles/middens where scat analysis shows usage by multiple females with high levels of progesterone. 	Critical habitat
Category 2	Maternity/diurnal roost caves with regular occupancy		Critical habitat
Category 3	Diurnal roost caves with occasional occupancy	<ul style="list-style-type: none"> Category 3 diurnal caves are usually less well developed as underground structures. They may be shallower allowing some light into their deeper areas, have a wide and not constricted entrance or not have a stable microclimate in an elevated roosting chamber. 	When adjacent to Category 2 caves, these are considered to be critical habitat important for the ongoing presence of the species in the area. In

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Roost Category	Roost Classification	Description (Bullen 2021)	Habitat Importance (Bat Call WA 2021a)
		<ul style="list-style-type: none"> Usually associated with a roosting chamber with a ceiling over 1.5 m high and usually, but not always, have significant scats and food middens. 	contrast, isolated Category 3 caves are not considered critical habitat.
Category 4	Nocturnal roost caves with opportunistic usage	<ul style="list-style-type: none"> Evidence of such visits is the widespread presence of small numbers of scats and/or food scraps found, or occasional echolocation calls recorded during surveys. These visits may or may not be repeated, depending on whether the bat is passing through a district or is a more permanent resident nearby. 	Not considered critical habitat.

No Ghost Bat roosts were identified within the Development Envelope during the in-field fauna surveys (Rapallo 2012b; 2022b), although five caves were being utilised by the Ghost bat outside of the Development Envelope, but within the Terrestrial Fauna Survey Area (**Figure 17**). Bat Call WA in (Rapallo 2022b) assigned the five Ghost Bat caves as the following cave type and habitat classification (Phoenix 2022):

- Ghost Bat roost cave recorded within the Terrestrial Fauna Survey Area:
 - Cave 1 – Provisional Category 2 (situated approximately 730 m from the proposed pit)
 - Cave 3 – Provisional Category 3 (situated >1 km from proposed pit).
- Ghost Bat roost cave recorded outside of the Terrestrial Fauna Survey Area:
 - Cave 2 – Provisional Category 3
 - Cave 4 – Category 3 (apartment block)
 - Cave 5 – Category 2.

The closest distance from the Development Envelope of the proposed pit to a Ghost Bat cave is approximately 550 m (Cave 1; Category 2). The same cave is located more than 810 m from the edge of a proposed access road disturbance. The remaining caves in proximity to the proposed pit are greater than 1 km away. Cave 4 and Cave 5 at the southern extent of the Development Envelope, near the GNH intersection, are located over 200 m from the edge of the access road disturbance (**Figure 19**). Regional Records of the Ghost Bat in proximity to the Development Envelope are shown in **Figure 18**.

Although the Ghost Bat has not been recorded within the Development Envelope, the Ghost Bat will likely forage over all habitats present within the Development Envelope, comprising 638.4 ha (no potential roost habitat of gorge/gully and rocky breakaways is within the Indicative Footprint). Foraging habitat is not restricted to the Development Envelope and the species is expected to utilise the expansive foraging habitats available in the surrounding area, with the species being recorded foraging up to 15 km from roost locations (Bat Call WA 2021a).

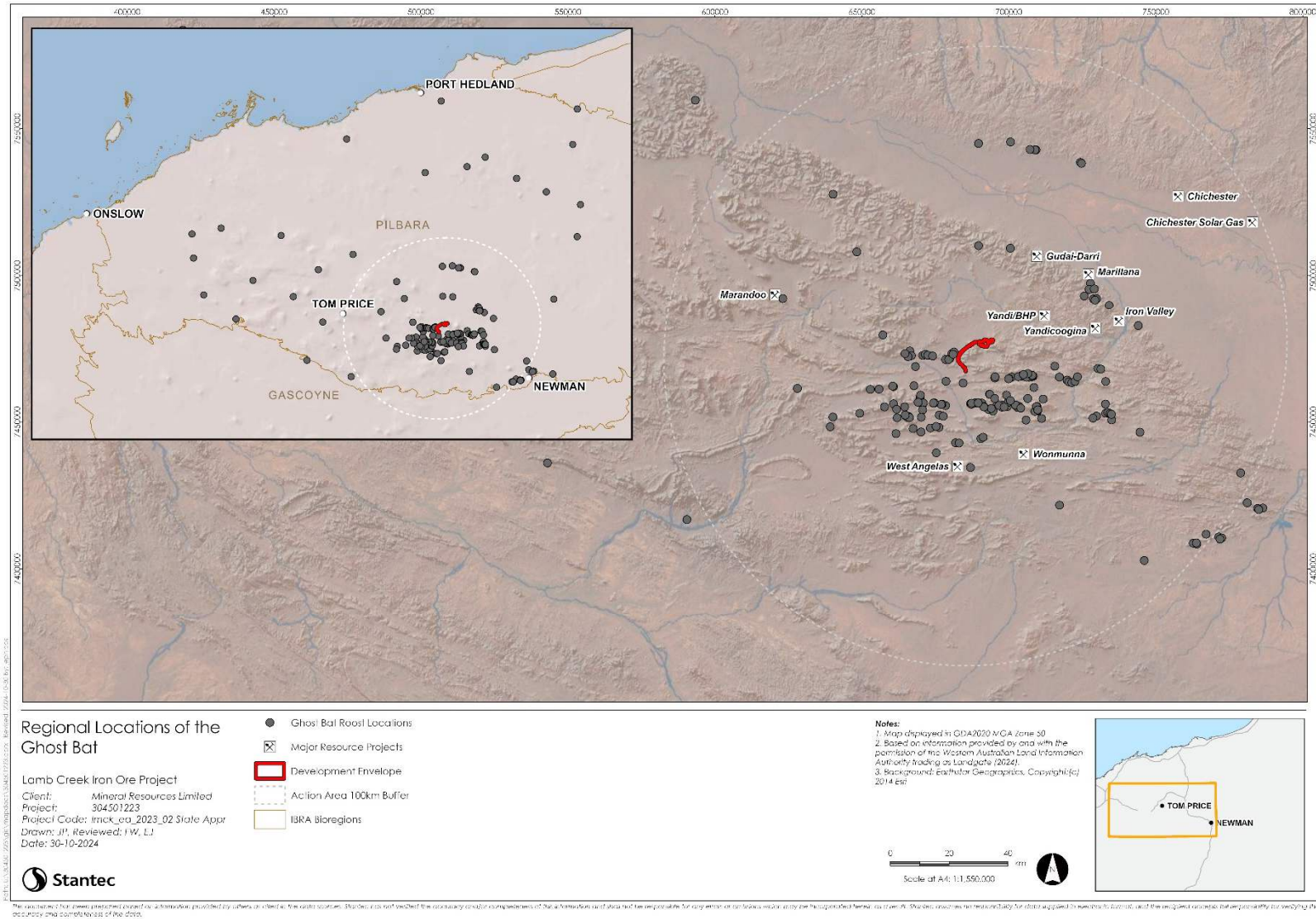
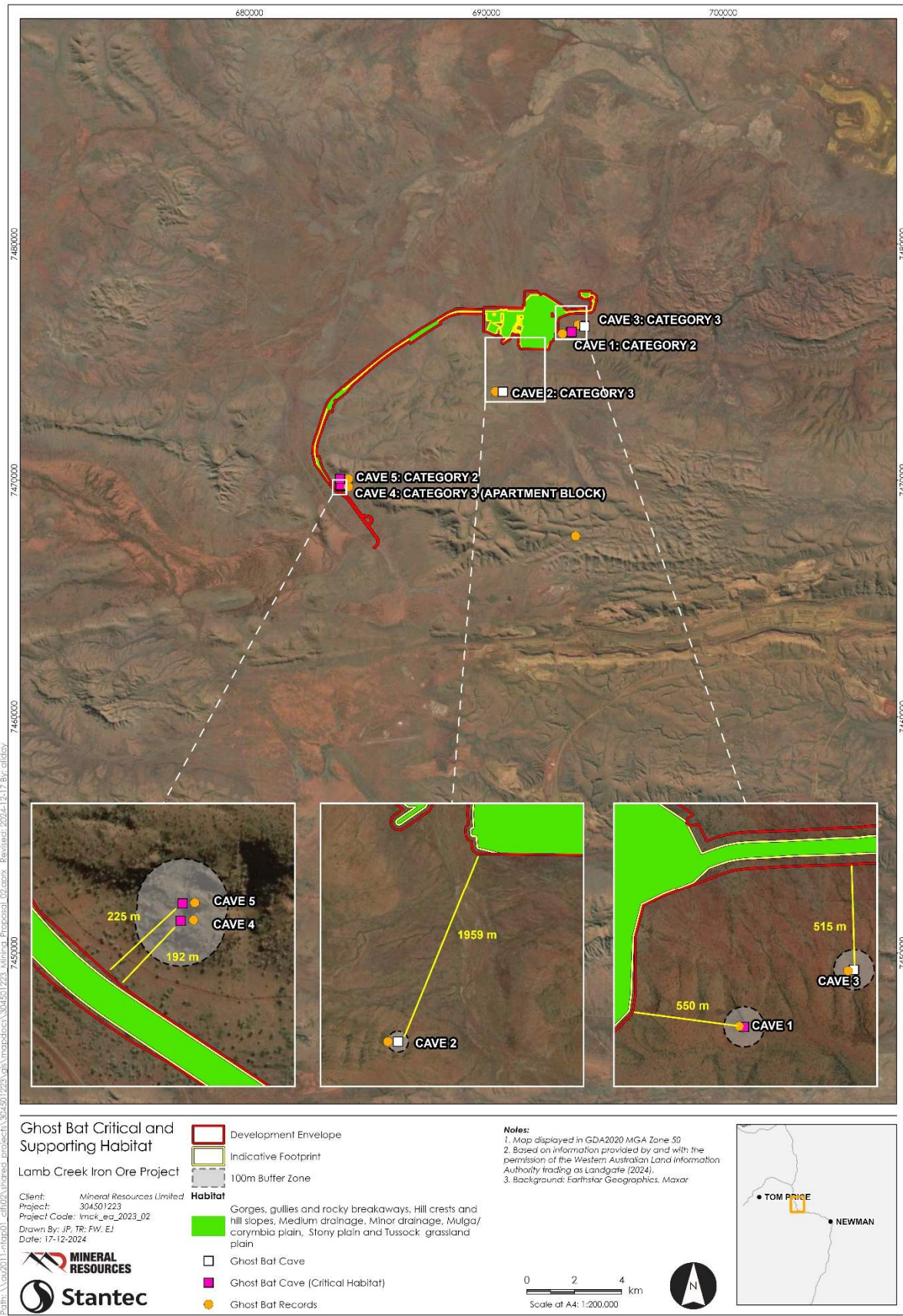


FIGURE 18: REGIONAL RECORDS OF GHOST BAT IN PROXIMITY TO THE DEVELOPMENT ENVELOPE

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FIGURE 19: GHOST BAT CRITICAL AND SUPPORTING HABITAT

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Northern Quoll

The Northern Quoll is listed as Endangered under the BC Act and the EPBC Act. The species was once common across northern Australia, occurring almost continuously from the Pilbara, WA, to near Brisbane in Queensland. It is currently moderately common within the Pilbara and is found within 150 km of the coast where suitable rocky habitat occurs. The Pilbara population of Northern Quoll is genetically distinct from the nearest Kimberley population.

Threatening Processes for the species include:

- Inappropriate fire regimes
- Predation by, and competition with, feral cats and foxes (and potentially dingoes)
- Habitat loss, fragmentation and degradation, particularly from mining and infrastructure development, as well as pastoralism.

The Northern Quoll referral guidelines (DoE 2016a) define populations important for the long-term survival of the species as:

- High density quoll populations, which occur in refuge-rich habitat critical to the survival of the species, including where Cane Toads are present.
- Occurring in habitat that is free of Cane Toads and unlikely to support Cane Toads upon arrival i.e. granite habitats in WA, populations surrounded by desert and without permanent water.
- Subject to ongoing conservation or research actions (i.e. populations being monitored by government agencies or universities or subject to reintroductions or translocation).

Critical Habitat:

Habitat critical to the survival of the Northern Quoll is defined by (DoE 2016a) as: habitat within the modelled distribution of the Northern Quoll, which provides shelter for breeding, refuge from fire or predation and potential poisoning from Cane Toads. Dispersal and foraging habitat associated with or connecting populations important for the long-term survival of the Northern Quoll are also considered habitat critical to the survival of the Northern Quoll (DoE 2016a).

Northern Quolls are found in a variety of habitats, particularly males during the breeding season, but show a preference for complex rocky areas in the Pilbara (Cowan *et al.* 2022; Gibson *et al.* 2023; Molloy *et al.* 2017; Moore 2021; Shaw *et al.* 2023). Complex, rocky landforms in close proximity to permanent water are considered critical habitat as they provide refuge from predators (Hernandez-Santin *et al.* 2016) and other threats such as fire (Cook 2010), as well as provide access to food (Dunlop *et al.* 2017) and shelter for denning (Braithwaite and Griffiths 1994; Hernandez-Santin *et al.* 2022).

Supporting Habitat:

There is limited understanding about the characteristics of foraging or dispersal habitat for the Northern Quoll. However, foraging or dispersal habitat is currently recognised to be any land comprising predominantly native vegetation in the immediate area (i.e. within 1 km) of shelter habitat, other quolls or land comprising predominately native vegetation that is connected to shelter habitat within the range of the species.

Watercourses may facilitate dispersal and foraging through connectivity (Cowan *et al.* 2022; Shaw *et al.* 2023), while areas with high silt or clay content (i.e., alluvial, coastal, and hardpan plains) may impede dispersal (Shaw *et al.* 2023). The spatial configuration of rocky habitat has been found to be more important than the amount of habitat (Moore *et al.* 2022), with quoll occupancy and abundance decreasing as fragmentation increased. Within rocky habitat, quolls favoured patches with higher vegetation cover and den availability, less edge habitat relative to patch size, and greater rocky habitat extent (Moore 2021). While the Northern Quoll largely avoids spinifex sandplain, which is likely due to the increased risk of predation (Hernandez-Santin *et al.* 2016), GPS tracking has shown that quoll activity increases with higher percentage cover in these areas (Cowan *et al.* 2022). In the Robe River valley, Northern Quolls increased their use of spinifex plains in response to broadscale feral cat baiting (Palmer *et al.* 2021).

Within the Development Envelope, shelter habitat primarily consists of medium drainage line habitat (69.06 ha) considered important for foraging and dispersal (Western Wildlife 2020). Importantly, none of the critical rocky ridge and gorge denning habitat occurs within the Development Envelope. Neither of these habitats are restricted to the Development Envelope or immediate area, with 55 ha of rocky ridge and gorge habitat and 113 ha of medium drainage occurring within the Terrestrial Fauna Survey Area. Regionally, rocky ridge, gorge habitat and drainage lines are common throughout the Pilbara due to the topography of the region. These habitats are also well represented within the region's conservation estates and are typically well connected within the landscape.

The Northern Quoll has not been recorded within the Development Envelope. This species has been recorded on a motion camera in 2012 approximately 5 km southwest of the proposed pit, and has been recorded infrequently at Mining Area C, with all records being from scats (Biologic 2017).

The paucity of records within the Development Envelope, and adjacent areas, combined with the lack of confirmed records (i.e. observations of individuals), suggests that the species is likely to occur in low numbers, if a permanent population occurs, or that the records to date have been made by individuals dispersing from nearby populations.

Pilbara Leaf-nosed Bat

The Pilbara Leaf-nosed Bat (PLNB) is listed as Vulnerable under the BC Act and the EPBC Act. The Pilbara Leaf-nosed Bat occurs throughout the Pilbara and upper Gascoyne regions of WA, with the Pilbara population considered to be a single interbreeding population comprising multiple colonies (TSSC 2016b). The breeding cycle for the Pilbara Leaf-nosed Bat occurs over a nine-month period with mating occurring in July, parturition occurring in late December or early January (following a prolonged gestation period), resulting in the young becoming independent between February and March (Armstrong 2001).

The PLNB requires warm, humid daytime roost sites and forages in gorges along watercourses and over low spinifex-covered hills (TSSC 2016b). Long-term roosting opportunities for the Pilbara Leaf-nosed Bat are restricted to a very limited habitat type, comprising geological formations like BIF that provides rocky outcrops and also has the propensity to erode into sufficiently deep underground structures (Bat Call WA 2021b). The following definitions apply to roost categories based on *Approved Conservation Advice for Rhinonictus aurantius (Pilbara form) (Pilbara Leaf-nosed Bat)* (TSSC 2016b):

- Permanent diurnal (Category 1 and Category 2) roosts:
 - Category 1 and Category 2 roosts are permanent roosts that are maternity roosts where seasonal presence of young is proven. These often have large colonies present. Category 2 permanent roosts are occupied year-round but without the proven presence of young. Based on wet season presence, these must also be classed as maternal sites, and these often have smaller colonies present. Both categories are considered as critical habitat that is essential for the daily and long-term survival of the Pilbara Leaf-nosed Bat.
- Semi-permanent diurnal (Category 3) roosts:
 - Category 3 roosts are used diurnally during some part of the year, but not occupied year-round. They may be used during the breeding cycle and may also facilitate long distance dispersal in the region, particularly during autumn. They are often associated with a nearby Category 1 or Category 2 permanent roost as a 'satellite' roost, that together make up a colony. They are considered as critical habitat that is essential for the long-term survival of the Pilbara Leaf-nosed Bat.
- Nocturnal refuge (Category 4) roosts:
 - These are occupied or entered at night for resting, feeding or other purposes, with perching not a requirement. These roosts are not considered critical habitat but are important for persistence in a local area. Most moderately deep caves and shallow abandoned mines fall into this category.

Critical Habitat:

Given the species' limited capacity to conserve water or energy, diurnal roost site suitability is governed by strict temperature (28-32°C) and humidity (85-100%) requirements (D'Rozario 2022), which are typically provided by the presence of ephemeral pools or waterfalls at roost entrances, or seeps and groundwater pools deeper inside caves (Armstrong 2001; BHP 2016).

Critical habitat, as defined by (Bat Call WA 2021b), includes permanent diurnal (categories 1 and 2) roosts that are essential for the daily and long-term survival of the PLNB; semi-permanent diurnal (category 3) roosts that are essential for the long-term survival of the PLNB; and any permanent pools close to permanent diurnal roosts.

Supporting Habitat:

Foraging in a variety of habitats including the characteristic *Triodia* hummock grasslands of the Pilbara, the PLNB favours the highly productive and structurally complex riparian zones where water is permanently available and insect biomass is sufficiently high (Armstrong 2001; McKenzie and Bullen 2009). Females are highly dependent on foraging habitat within close proximity to maternal roosts, especially during lactation (Woinarski *et al.* 2014). As such, diurnal roost sites (deep caves within banded ironstone strata and disused underground copper/gold mines; (McKenzie and Bullen 2009) are typically located within flying range (i.e., 5-7 km) of permanent water. Seasonal variation in intra-regional presence, corresponding with lower temperatures and higher humidity (i.e., April/May), has also been documented with bats travelling > 20 km from permanent diurnal roosts to occupy non-permanent roost caves (Bat Call WA 2021b).

PLNB activity ratings:

PLNB activity ratings show a measure of the number of bats passes within a specific location. They do not directly provide a guide to the usage of the site as a roost, forage location, commute site, etc. or accurate abundance data. However, data may be used to assist in inferring such results. Bat activity ratings and criteria Bat Activity Rating (AR) Criteria (Bat Call WA 2021b):

- Very Low (AR=0) Species not detected.
- Low (AR=1) Species is recorded with call spacing greater than ten minutes.
- Medium (AR=2) Species is recorded with call spacing of less than 10 minutes but greater than 2 minutes. This pattern is observed for at least an hour followed by sporadic records for the remainder of the session.
- High (AR=3) Species is recorded with call spacing less than 2 minutes apart for at least 2 hours followed by regular records for the remainder of the session.
- Very High (AR=4) Species is recorded in very large numbers with call spacing less than 2 minutes apart for over 4 hours followed by regular records for the remainder of the session.
- Extreme (AR=5) Species are recorded in high numbers continuously from dusk to dawn at roost entrances.

There are no records of the PLNB within the Development Envelope (PLNB activity rating of Very Low) and minimal non-roosting records occur within 15 km in the project's various fauna surveys and in Bat Call WAs data base (Bat Call WA 2023a). The closest PLNB roost site is at the Rio Tinto Gudai-Darri mine with an estimated colony size of approximately 430 individuals situated 29 km north of the Development Envelope. This cave system has been retained (Eco Logical 2013). Regional Records of the PLNB in proximity to the Development Envelope are shown in **Figure 20**.

No roosts for this species were recorded in the rocky ridge and gorge habitat in the Terrestrial Fauna Survey Area. Given the extensive surveys and the lack of records and/or roosting caves for PLNB within the survey areas, the Development Envelope does not support critical roosting habitat for the species.

Extensive surveying using echolocation detectors in recent years has provided a very large data set of PLNB activity at a large variety of sites that show that the PLNB forages very widely and utilises almost all productive and semi-productive habitats (Bat Call WA 2021b). All mapped fauna habitat within the Indicative Footprint is considered to provide potentially suitable foraging habitat (total 626.6 ha), including:

- Hill crests and hill slopes (50.49 ha)

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- Medium drainage (43.41 ha)
- Minor drainage (75.25 ha)
- Mulga/Corymbia spp. Plain (180.78 ha)
- Stony plain (266.35 ha)
- Tussock grassland plain (5.34 ha).

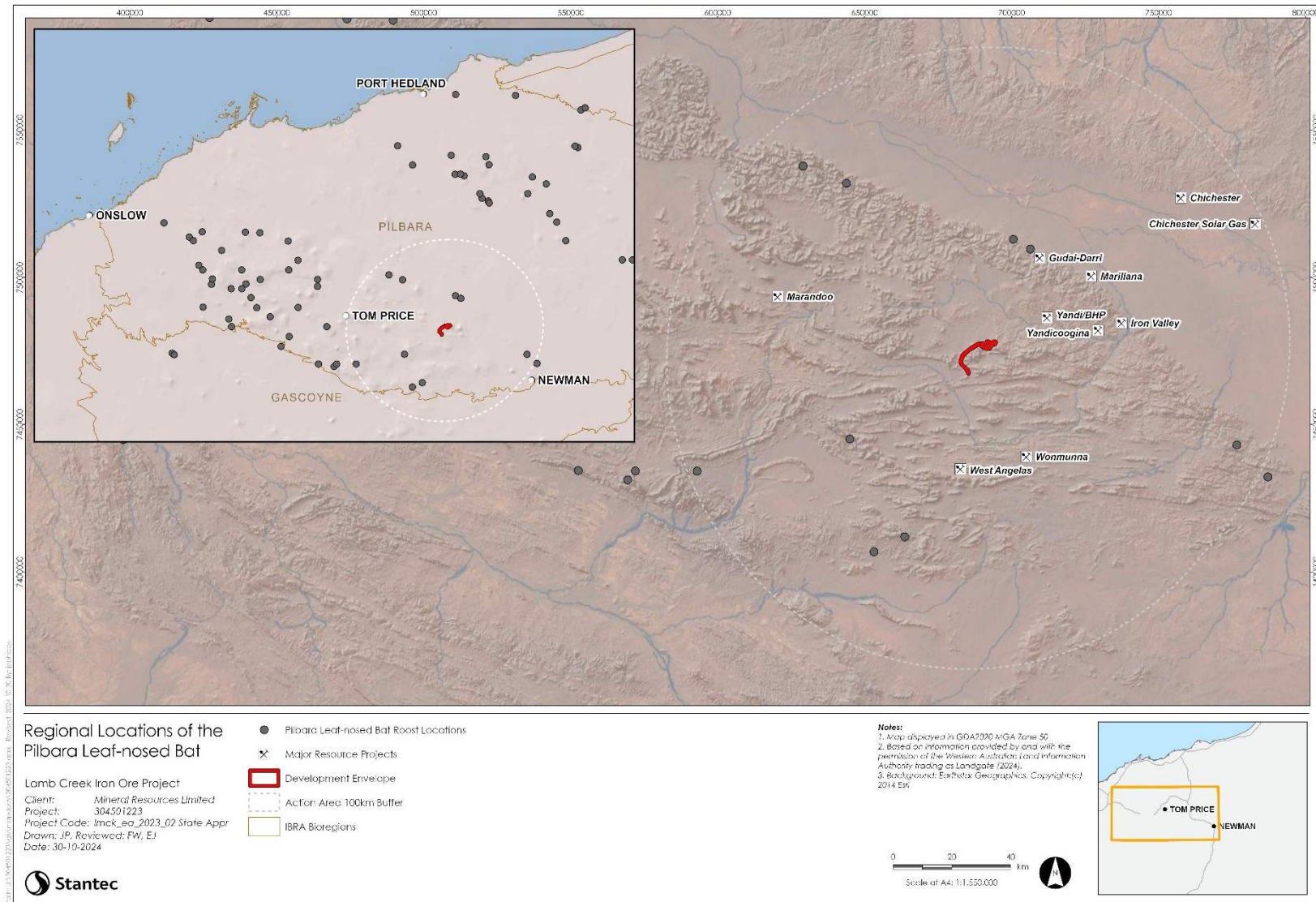


FIGURE 20: REGIONAL RECORDS OF PILBARA LEAF-NOSED BAT IN PROXIMITY TO THE DEVELOPMENT ENVELOPE

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Pilbara Olive Python

The Pilbara Olive Python (POP) is listed as Vulnerable under the BC Act and the EPBC Act. The species is restricted to ranges in the Pilbara and is known from relatively few localities. The POP inhabits rocky outcrops, usually in close proximity to waterholes (TSSC 2008). Suitable denning habitat for this species within the Terrestrial Fauna Survey Area comprises gorges, gullies and rocky breakaways, with drainage line habitat use for foraging and dispersal. While the home ranges of the POP have not been extensively studied, a radiotracking study by (Tutt *et al.* 2004) indicates that they have large home ranges (~88 ha to ~449 ha), with males having larger home ranges than females.

Threats to POP are poorly understood. The following threatening processes may impact the POP:

- The destruction of habitat (blasting, removal, flattening of rock shelters) during mining processes and infrastructure.
- Habitat fragmentation and degradation due to resource development and pastoralism shelter sites and/or prey resources.
- Vehicle collision (Pearson 1993).
- Predation by, and competition with, introduced predators (Chapple *et al.* 2019; Pearson 2007) may also impact on populations.
- Loss or suppression of prey species is a potential threat where introduced predators occur, or where other factors are impacting prey populations such as habitat change linked to pastoralism or mining activities (TSSC 2008).

The POP is considered likely to occur in the Development Envelope as suitable habitat exists, and the species was recorded in the (Rapallo 2012b) survey, 3 km south of the proposed pit (**Figure 17**). It has also been recorded from Mining Area C from five records which is 15 km from the Development Envelope (Rapallo 2022b). Potential foraging and dispersal habitat that is considered to be supporting habitat for the POP will be removed (118.7 ha), including the medium and minor drainage habitat.

Gane's Blind Snake

Gane's Blind Snake is listed as P1 under the BC Act. The species is considered to be data deficient and is known from only a few locations and/or specimens. Habitats suitable to this species are present in the Terrestrial Fauna Survey Area and are widespread outside of the Proposal Area. Potential habitat for this species may include the gorge, gully, breakaway, medium drainage, tussock grassland and Mulga / *Corymbia* spp. plain habitats. This is supported by observations of the species at five locations at Mining Area C within a drainage line, a rocky slope below the vertical wall of a gully, and within Mulga woodland habitat (Biologic 2017).

Gane's Blind Snake was not recorded within the Terrestrial Fauna Survey Area; however, the species is considered likely to occur based on the availability of suitable habitat.

Pilbara Barking Gecko

The Pilbara Barking Gecko is listed as P2 under the BC Act. The species is known to be distributed over a wide area, having been recorded 120 km to the northwest and approximately 40 km to the southwest of the Proposal Area. It is unknown whether its distribution is continuous between these areas, or if it occurs as a series of isolated populations. The species has been recorded from several locations at Mining Area C from the gorge / gully habitat (Biologic 2017).

The Pilbara Barking Gecko was not recorded within the Terrestrial Fauna Survey Area; however, potential habitat occurs within the gorge / gully and breakaway habitats that occur within areas of higher elevation and along the ranges of the Terrestrial Fauna Survey Area.

Grey Falcon

The Grey Falcon is listed as Vulnerable under the BC Act and the EPBC Act. The species is usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast (Menkhorst *et al.* 2019). The Grey Falcon forages over timbered plains, including *Acacia* shrublands, also ranging out onto treeless plains. It nests in tall trees on watercourses (TSSC 2020) and occasionally on man-made structures such as transmission line towers. Potential habitat occurs within the Terrestrial Fauna Survey Area with medium drainage habitats likely to provide suitable nesting habitat for the species. The Grey Falcon may also forage broadly across all habitats within the Terrestrial Fauna Survey Area particularly stony plain habitat.

The Proposal Area does not occur within the species' commonly frequented range; however, it has been recorded approximately 14 km from the Terrestrial Fauna Survey Area. The species is highly nomadic with multiple records within 20 km of the Terrestrial Fauna Survey Area, including from Mining Area C where none of the records were breeding records (Biologic 2017).

Peregrine Falcon

The Peregrine Falcon is listed as "other specially protected species" under the BC Act. The species is found in most habitats, from rainforest to arid habitats, including coastal and alpine regions (Menkhorst *et al.* 2019). The Peregrine Falcon is known to occur across Australia but is not considered common in any areas of its Australian range. The species prefers coastal and inland cliffs, or open woodlands near water. In arid areas, it is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone and Storr 1998). This species typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 m and 50 m high (Olsen and Olsen 1988). The species was recorded nearby in Mining Area C approximately 15 km from the Development Envelope (Biologic 2017).

Potential nesting habitat for this species occurs within the rocky ridge and gorge/gully habitat adjacent to the Proposal Area and within drainage line habitat in the Development Envelope. There is no rocky ridge and gorge/gully habitat present within the Development Envelope while there is 54.68 ha available in the wider Terrestrial Fauna Survey Area. No nests have been observed in the Development Envelope or the broader Terrestrial Fauna Survey Area (Rapallo 2022b). Medium drainage line habitat (69.06 ha within the Development Envelope) is likely to provide suitable foraging habitat for the species, with 113.06 ha in the Terrestrial Fauna Survey Area.

8.4.3.2. SRE Invertebrate Fauna

SRE taxa are endemic species with restricted ranges, currently defined in WA as less than 10,000 km² (100 km x 100 km). SRE taxa are usually invertebrates, as they are more likely to display poor dispersal abilities and a more defined or restrictive biology that promotes their isolation and eventual speciation. The groups of organisms which display short-range endemism include (but are not limited to) molluscs (e.g. camaenid land snails), onychophorans (e.g. velvet worms), millipedes, arachnids (e.g. scorpions, pseudoscorpions, mygalomorph spiders) and some crustaceans (isopods). The criteria for SRE status classification are provided in **Appendix I**.

In 2021, database searches for SRE taxa with the potential to occur in a 400 km² search area around the Terrestrial Fauna Survey Area yielded a total of 8,894 records of taxa from invertebrate groups known to contain SREs (Rapallo 2012b; 2022a). Of these desktop results, six taxa were considered to be SRE invertebrate fauna taxa and 376 were considered to have the potential to be SRE invertebrate fauna taxa, while the remainder were considered widespread.

A total of 25 possible SRE taxa were collected from within the Terrestrial Fauna Survey Area during field surveys and 16 possible SRE taxa were recorded in the Development Envelope (Rapallo 2012b; 2022a). These taxa are presented in **Table 30** and shown in **Figure 21**. The Mulga shrubland patches within the Mulga / *Corymbia* spp. plain habitat yielded the highest abundance and taxa richness of SREs, followed by stony plain, although survey effort was not uniform across habitats (Rapallo 2022a).

Six taxa have only been recorded from the Terrestrial Fauna Survey Area (**Table 30**). These taxa were found within the stony plain, Mulga, hillcrest/hillslope, medium drainage and minor drainage habitats.

No confirmed SRE invertebrate taxa were collected from the Terrestrial Fauna Survey Area or the Development Envelope (Rapallo 2022a). Despite 16 possible SRE taxa being recorded in the Development Envelope (**Table 30**), habitat connectivity across the landscape suggests that the potential SRE taxa found in these habitats are likely to have their distributions extending outside the Development Envelope (Rapallo 2022a).

TABLE 30: TAXA WITH THE POTENTIAL TO BE AN SRE INVERTEBRATE RECORDED IN THE DEVELOPMENT ENVELOPE AND SURROUNDS

Scientific Name	Literature Sources		SRE Status	Recorded in the TFSA	Recorded in the Development Envelope	Records in TFSA	Records in Development Envelope	Records in Indicative Footprint	Regional Records (Rapallo 2022a)	Habitat
	(Rapallo 2012b)	(Rapallo 2022a)								
Centipede										
<i>Cryptops</i> 'LCr01'	-	✓	Possible	✓	-					Gully/gorge
<i>Cryptops</i> 'LCr02'	-	✓	Possible	✓	✓	1	1	1	No	Stony plain
<i>Mecistocephalus</i> 'LCr01'	-	✓	Possible	✓	✓	6	6	6	No	Mulga, stony plain
<i>Mecistocephalus</i> 'LCr02'	-	✓	Possible	✓	-					Tussock grassland
<i>Orphnaeus</i> 'LCr01'	-	✓	Possible	✓	✓	1	1	1	No	Medium drainage
<i>Sepedonophilus</i> 'LCr01'	-	✓	Possible	✓	-					Gully/gorge
Gastropod										
<i>Bothriembryon</i> 'BOT065'	-	✓	Possible	✓	✓	4	4	4	Yes – unpublished WAM MSU data	Mulga
Isopod										
<i>Buddelundia</i> '10ma'	-	✓	Possible	✓	✓	3	3	3	Yes – 53 km northeast the Development Envelope	Stony plain
<i>Buddelundia</i> '13'	✓	✓	Possible	✓	✓	10	2	2	No – WAM database records of <i>Buddelundia</i> '13' available; however no sequenced data publicly available or via WAM MSU	Hillcrest/hillslope, medium drainage, Mulga
<i>Buddelundia</i> '16'	-	✓	Possible	✓	-					Deep gully
Buddelundiinae (Armadillidae) 'ISOP009'	-	✓	Possible	✓	✓	1	1	1	Yes – 124 km northwest and northeast of the Development Envelope	Medium drainage
Millipede										
<i>Austrostrophus</i> 'Clade A'	-	✓	Possible	✓	✓	2	1	1	Yes – undisclosed sampling location accessed via GenBank	Mulga, gully/gorge
<i>Austrostrophus</i> 'Clade M'	-	✓	Possible	✓	✓	3	3	3	No	Mulga, stony plain
Mygalomorph spider										
Kwonkan 'MYG324'	-	✓	Possible	✓	✓	1	1	1	Yes – records from Karijini National Park and Juna Downs Station	Mulga
Pseudoscorpion										
<i>Austrochthonius</i> 'LCr01'	-	✓	Possible	✓	-					Mulga
<i>Euryolpium</i> 'LCr01'	-	✓	Possible	✓						Gully/gorge
<i>Indolpium</i> 'LCr03'	-	✓	Possible	✓	✓	2	2	2	No	Hillcrest/hillslope
<i>Indolpium</i> 'LCr04'	-	✓	Possible	✓	✓					Gully/gorge
<i>Indolpium</i> 'LCr05'	-	✓	Possible	✓	✓	1	1	1	No	Minor drainage
Olpidae 'LCr02'	-	✓	Possible	✓	✓	3	3	3	Yes – two WAM lodged specimens collected approximately 7 km north of this specimen	Hillcrest/hillslope

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Scientific Name	Literature Sources		SRE Status	Recorded in the TFSA	Recorded in the Development Envelope	Records in TFSA	Records in Development Envelope	Records in Indicative Footprint	Regional Records (Rapallo 2022a)	Habitat
	(Rapallo 2012b)	(Rapallo 2022a)								
Scorpion										
<i>Lychas</i> 'bituberculatus complex'	-	✓	Possible	✓	✓	6	6	5	Yes – record from approx. 30 km south-southeast of the Proposal (Alacran reference sequence)	Mulga, stony plain
<i>Lychas</i> 'hairy tail complex'	-	✓	Possible	✓	-					Gully/gorge
<i>Lychas</i> 'harveyi complex'	-	✓	Possible	✓	✓	15	12	11	No – matches with sequenced specimen as <i>Lychas</i> 'harveyi complex' was not sequenced (previously believed to be widespread) as <i>Lychas</i> 'harveyi complex' was collected during the 2012 fauna survey. Nearest regional specimen of <i>Lychas</i> 'harveyi complex' is from Mining Area C.	Mulga shrubland patches, medium drainage, stony plain, tussock grassland plain
<i>Lychas</i> 'multipunctatus complex'	-	✓	Possible	✓	-					Tussock grassland plain
<i>Urodacus</i> sp. indet.	✓	-	Possible	✓	-					Flat

Note: TFSA = Terrestrial Fauna Survey Area; orange shading indicates taxa restricted to the Development Envelope.

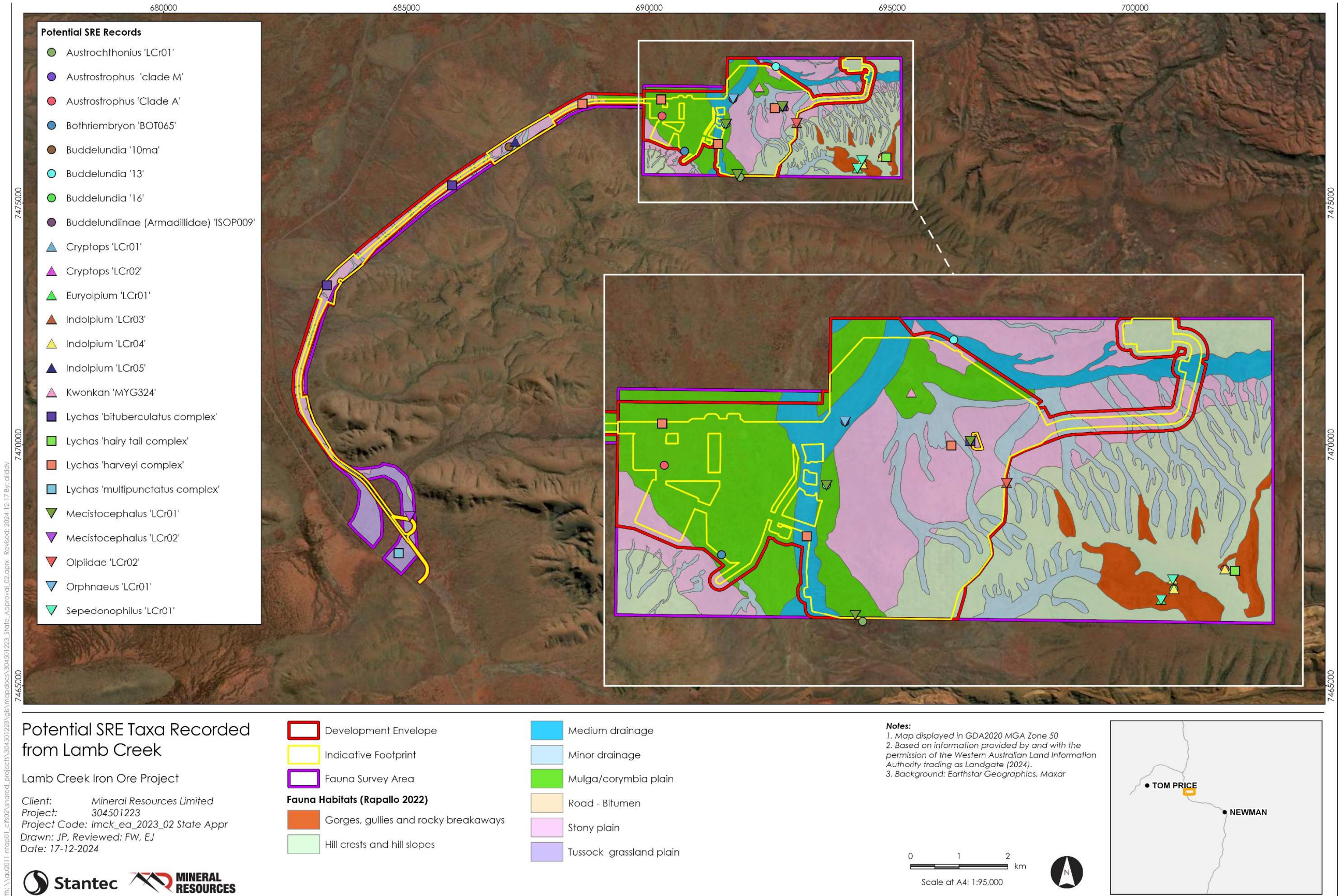


FIGURE 21: POTENTIAL SRE INVERTEBRATE FAUNA RECORDS AND SUITABLE HABITAT WITHIN THE DEVELOPMENT ENVELOPE AND SURROUNDS

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8.4.3.3. Introduced Fauna

(Rapallo 2022b) identified 10 introduced (feral) fauna as potentially occurring within the Terrestrial Fauna Survey Area. Of these, four were recorded within the Terrestrial Fauna Survey Area during fauna surveys (Rapallo 2012b; 2022b) (**Table 31**). Foxes and cats are identified as key threats to native mammals identified as likely to occur within the Development Envelope such as the Northern Quoll (DoE 2016a).

TABLE 31: DESKTOP RESULTS FOR INTRODUCED (FERAL) FAUNA RECORDED WITHIN 50 KM OF THE SURVEY AREA.

Common Name	Scientific Name	Likelihood
Rock Dove	* <i>Columba livia</i>	Unlikely
European Cattle	* <i>Bos taurus</i>	Confirmed
Dromedary, Camel	* <i>Camelus dromedarius</i>	Confirmed
Dog	* <i>Canis familiaris familiaris</i>	Confirmed
Red Fox	* <i>Vulpes vulpes</i>	Likely
Donkey	* <i>Equus asinus</i>	Unlikely
Horse	* <i>Equus caballus</i>	Unlikely
Cat	* <i>Felis catus</i>	Confirmed
Rabbit	* <i>Oryctolagus cuniculus</i>	Likely
House Mouse	* <i>Mus musculus</i>	Confirmed

8.5. POTENTIAL DIRECT AND INDIRECT IMPACTS AND MITIGATION

8.5.1. Direct and Indirect Impacts

The Proposal may directly and indirectly impact on terrestrial fauna and SRE invertebrate fauna, with the potential direct impact identified as:

- Clearing of native vegetation resulting in habitat loss
- Fragmentation of fauna habitat
- Fauna injury or mortality as a result of ground disturbance, machinery and blasting.

The potential indirect impacts have been identified as:

- Fauna mortality as a result of a potential increase in the prevalence of introduced species and feral predators
- Noise, vibration and/or artificial light disrupting of natural foraging and breeding behaviours
- Potential decline or change in the health/composition of fauna habitat arising from dust, weeds, fire regime or hydrological regime changes.

8.5.2. Clearing of Native Vegetation Resulting in Habitat Loss

The Proposal will result in clearing of up to 638.4 ha of native vegetation within the 860.9 ha Development Envelope, comprising 39% of the mapped extent (1,645 ha) of fauna habitat types within the Terrestrial Fauna Survey Area (**Table 32**). This will reduce available habitat for fauna species known to occur, or likely to occur, within the Development Envelope. However, the proposed Indicative Footprint has been minimised as far as practicable to reduce the extent of clearing and disturbance required, and a Land Access Permit and Land Clearing Procedure will be in place to ensure all clearing works are compliant with regulatory requirements (**Table 33**). Vehicle and equipment access will be restricted to designated access roads and laydown areas will be located at already disturbed sites where practicable. The SFMP will be implemented to minimise potential impacts from clearing to significant fauna species recorded, or likely to occur, within the Development Envelope.

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There may also be some direct mortality of fauna species during clearing of native vegetation and other earthworks for the Proposal. Mining for the Proposal is temporary with a short life of mine and should allow for species recolonisation following progressive rehabilitation of fauna habitat (**Table 33**).

While implementation of the Proposal may result in a loss of some fauna habitats, degradation to fauna habitats, and mortality of some individuals it is not expected that impacts will significantly increase on a regional scale, due to the spatially restricted Indicative Footprint, short life of mine and implementation of mitigation measures include the SFMP.

TABLE 32: POTENTIAL DIRECT IMPACT TO FAUNA HABITATS AS A RESULT OF CLEARING

Habitat Type	Total In TFSA (ha)	Area Within Development Envelope (ha)	Area Within Indicative Footprint (ha)	Max. Habitat Loss In TFSA (%)	Min. Extent Left In TFSA	
					ha	%
Gorges, gullies and rocky breakaways	54.68	0.0	0.0	0.0	54.68	100.0
Hill crests and hill slopes	319.01	61.63	52.49	15.80	268.60	83.55
Medium drainage	113.06	69.06	43.41	38.39	69.65	61.60
Minor drainage	210.61	92.21	75.25	35.72	135.38	64.27
Mulga/ <i>Corymbia</i> spp. plain	291.15	252.65	180.77	62.09	110.36	37.91
Road - Bitumen	0.83	-	-	-	0.83	100
Stony plain	517.94	360.45	266.35	51.42	251.59	48.58
Tussock grassland plain	137.93	6.80	5.34	3.87	132.58	96.13
Unmapped*	*	18.7	14.80	*	*	*
Total	1645.21	861	638.41	38.67	1022.86	61.20

Note: TFSA = Terrestrial Fauna Survey Area; * indicates that the entirety of the Development Envelope / Indicative Footprint was not mapped / surveyed.

8.5.2.1. Significant Fauna Recorded in the Development Envelope

Western Pebble-mound Mouse

The Western Pebble-mound Mouse is confirmed to occur throughout the stony plain habitat and gently sloping parts of the rocky hills and plateaus habitat in the Terrestrial Fauna Survey Area. Clearing for the implementation of the Proposal will include the footslopes and plain habitat, which represents preferred habitat for the Western Pebble-mound Mouse and will result in the loss of recorded pebble mounds. However, this habitat type is known to occur extensively throughout the Hamersley subregion.

Burrowing species are more susceptible to direct mortality. This species shelters in burrow systems below ground during the day. A total of 29 Western Pebble-mound Mouse mounds have been identified within the Development Envelope and 19 of these are within the Indicative Footprint. This represents 47.5% of the total number of mounds of this species that have been found during surveys of the area (40 mounds) most of which were deemed to be active (Rapallo 2022b). Risks to the species resulting from the direct mortality of individuals from clearing of active mounds is considered to be negligible as a result of implementation of the management actions detailed in **Table 33**, combined with the species being common within its habitat type and throughout the Hamersley and Chichester subregions.

Any loss of individuals as a result of the Proposal is **not expected** to significantly impact the Western Pebble-mound Mouse or adversely affect the conservation status of this species.

8.5.2.2. Significant Fauna Likely to Occur within the Development Envelope

Ghost Bat (*Macroderma gigas*) (En, En)

The following residual impacts to potentially suitable Ghost Bat foraging habitat are expected to occur as a result of the Proposal:

- Clearing of up to 638.4 ha of potential foraging habitat, comprising all fauna habitats in the area.

No Ghost Bat roosts have been recorded within the Development Envelope. Figure 17 shows the locations of recorded Ghost Bat roosts in proximity to the Development Envelope. There are two Ghost Bat roost caves (one Category 2 and one Category 3) present outside of the Development Envelope, in proximity to the proposed pit. A cluster of caves occurs close to the proposed haul road near its intersection with the GNH intersection (Category 2, Category 3). The closest distance from the proposed pit Development Envelope to a Ghost Bat cave is approximately 550 m (Cave 1; Category 2). The same cave is located more than 810 m from the edge of a proposed access road disturbance (**Figure 19**). The remaining Ghost Bat roost cave is greater than 1 km away from the proposed pit. Cave 4 and Cave 5 at the southern extent of the Development Envelope, near the GNH intersection, are located over 200 m from the edge of the access road disturbance.

A SFMP will be implemented and will outline management measures including a 100 m radius exclusion zone for Category 2 and Category 3 Ghost Bat roosts as shown in **Figure 19** in accordance with current recommendations (Bat Call WA 2021a). Potential disturbance to roosting bats from machinery and blasting will be negligible given the proximity of caves from the Development Envelope. Sound pressure levels at roost entrances should be limited to below 70 dB, based on current best practice advice (Bullen and Creese 2014). However, the Proponent is committed to temporarily (through construction and operations) closing off the entrance to critical habitat Cave 1 to ensure Ghost Bats will not nest in this cave. The Proponent has also conducted a geotechnical assessment (peak particle velocity-PPV) of Cave 1 indicating that the conservative limit of 25 mm/sec PPV (Bat Call WA 2023a; b) to maintain structural integrity of the cave will be met. This is considered to be an acceptable method to avoid impacts to nesting Ghost Bats (Bat Call WA 2023a; b). This indicates that once the cave is reopened, Ghost Bats are likely to return.

Given the distance from known caves to proposed operation and blasting areas, it is unlikely that blasting will cause any physical damage to Ghost Bat roost caves. It is considered unlikely that any of the five known roost sites (two of which were recorded approximately 1 km away from the Development Envelope) will be physically damaged or lost. It is also considered unlikely that the structural integrity of caves, or roosting site viability, will be adversely impacted by blasting or other operational elements such as vibration from the Proposal. The Proposal will not result in the direct disturbance or loss of critical Ghost Bat caves.

As the species regularly forages up to 10 to 12 km from its roost caves and does not limit its foraging habitat to particular habitat types, all foraging and dispersal habitat that is located within a 12km buffer from critical habitat caves in the Lamb Creek situation (caves 1, 4 and 5) is considered to be supporting habitat for the species (Bat Call WA 2023b). All areas of broad fauna habitats within the Development Envelope are considered supporting foraging habitat for Ghost Bat of which 638.4 ha occurs in the Indicative Footprint. All critical habitat caves (i.e. caves 1, 4 and 5) are to be retained no critical habitat will be lost due to the Proposal.

The Pilbara population of the Ghost Bat is considered an important population as it is genetically distinct and divergent (TSSC 2016a). The Proposal will clear 638.4 ha of supporting habitat for the species and **is proposed to be offset**. While clearing of this habitat may result in localised impacts to individuals within the disturbance footprint, considering the short life of the mine, implementation of proposed mitigation measures and that similar habitats are well represented in the vicinity of the Proposal, the Proposal is **not expected** to adversely affect the conservation status of this species.

Northern Quoll (*Dasyurus hallucatus*) (En, En)

Clearing of up to 43.4 ha of suitable foraging and dispersal habitat (medium drainage lines) representing 39% of the mapped extent of this habitat for the species within the broader Terrestrial Fauna Survey Area, has the potential to impact this species.

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The Northern Quoll was recorded within the Terrestrial Fauna Survey Area during 2012 (Rapallo 2012b); however, no evidence of the species was found during the 2020 survey (Rapallo 2022b) and the Northern Quoll has not been recorded in the Development Envelope.

The project area lies in a region where the species is present in favoured landscapes, (typically rocky hills, breakaways and gorges) however the Pilbara is a region of seasonal and annual weather extremes, and also one where fire plays an important ecological role. These factors mean that the abundance of species can vary enormously within and between years. Given the extent of recent fires in the area, it is likely the population of Northern Quoll has decreased in response

Considering the survey effort undertaken and lack of records of individuals of this species, the Development Envelope is unlikely to support a significant Northern Quoll population. Records to date are likely to be individuals dispersing from nearby populations. If present, they are likely to disperse along the 'medium drainage system' habitat.

The Proposal will remove 44.2 ha of critical habitat (foraging and dispersal habitat within 1 km of denning habitat) and 125.6 ha of supporting habitat (foraging and dispersal habitat outside the critical habitat) for the Northern Quoll. This habitat is **proposed to be offset**. While clearing of this habitat may result in localised impacts to individuals (if present) within the disturbance footprint, considering the short life of the mine, implementation of proposed mitigation measures and that similar habitats are well represented in the vicinity of the Proposal, the Proposal is **not expected** to adversely affect the conservation status of this species.

Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*) (Vu, Vu)

This species has not been recorded in the Development Envelope and is considered likely to occur in the Development Envelope at least as a foraging visitor. Potential impacts to the Pilbara Leaf-nosed Bat from the Proposal are the loss of potential foraging habitat (638.4 ha) due to clearing, and the potential for disruption of natural behavioural patterns due to the presence of artificial light, and noise and vibration from machinery operation and blasting. Impacts from artificial light, noise and vibration will be managed to within an acceptable level within the SFMP.

Given the lack of PLNB records, the lack of permanent/semi-permanent water pools, and the lack of known PLNB roosts within proximity to the Development Envelope (**Figure 20**), the habitat within the Development Envelope is unlikely to comprise important supporting habitat that is considered critical for survival (breeding, foraging and dispersal) for the species (as defined by (Bat Call WA 2023a)). The PLNB is likely to utilise habitats within the Development Envelope as an occasional foraging visitor only.

Given the above considerations, **the Proposal is unlikely to result in a significant impact on the PLNB.**

Pilbara Olive Python (*Liasis olivaceus barroni*) (Vu, Vu)

This species has not been recorded in the Development Envelope but is considered likely to occur in the Development Envelope at least as a foraging visitor. No clearing of potential denning habitat for the POP (gorges, gullies, rocky breakaways) is proposed. Clearing of up to 118.7 ha of suitable foraging and dispersal habitat (medium and minor drainage lines) representing 37% of the mapped extent of this habitat for the species within the broader Terrestrial Fauna Survey Area has the potential to impact this species. There are no permanent or semi-permanent surface water pools within the Proposal.

The Proposed removal of 118.7 ha of supporting habitat for POP is **proposed to be offset**. While clearing of this habitat may result in localised impacts to individuals within the disturbance footprint, considering the short life of the mine, implementation of proposed mitigation measures and that similar habitats are well represented in the vicinity of the Proposal, the Proposal is **not expected** to adversely affect the conservation status of this species.

Gane's Blind Snake (*Anilius ganei*) (P1 under the BC Act)

Gane's Blind Snake was not recorded in the Development Envelope during fauna surveys (Rapallo 2012b; 2022b), although potentially suitable habitat for this species occurs within the Development Envelope, comprising gorge, gully, breakaway, medium drainage, tussock grassland and Mulga / *Corymbia* spp. plain

habitats. Suitable habitat for this species is widespread outside of the Development Envelope within the broader Terrestrial Fauna Survey Area.

Based on the lack of records found during fauna surveys (Rapallo 2012b; 2022b), the availability of suitable habitat in the surrounding region, and the spatially restricted Indicative Footprint, **no significant residual impacts** are expected to occur for this species and the Proposal is not expected to adversely affect the conservation status of Gane's Blind Snake.

Pilbara Barking Gecko (*Underwoodisaurus seorsus*) (P2 under the BC Act)

The Pilbara Barking Gecko has not been recorded within the Development Envelope. No potentially suitable habitat, such as gorge / gully and breakaway habitats occur within the Development Envelope, however it is present in the wider Terrestrial Fauna Survey Area (54.7 ha). Preferred habitat for this species occurs at higher elevation which would coincide with the location of the proposed pit; however, relatively limited clearing is required in this area of the Indicative Footprint, comprising 16% of the total hill crests and hill slopes habitats within the mapped extent in the Terrestrial Fauna Survey Area. Therefore, it is unlikely that the Proposal will cause a significant impact to the species' preferred habitat.

Given the preferred habitat for this species occurs at higher elevation where relatively limited clearing is required in this area of the Indicative Footprint, **no significant residual impacts** are expected to occur for this species and Proposal is not expected to adversely affect the conservation status of the Pilbara Barking Gecko.

Grey Falcon (*Falco hypoleucos*) (Vu, Vu)

The Grey Falcon has not been recorded from the Development Envelope but considered is likely to occur there occasionally while foraging. Large areas of foraging habitat for this species occurs in the Development Envelope and surrounds including hills/ranges stony plain lower slopes/hillslopes habitat. Preferred nesting habitat for this species occurs at higher elevation which would coincide with the location of the proposed pit; however, relatively limited clearing is required in this area of the Indicative Footprint however 52.5 ha of hill crests and slopes habitat is within the Indicative Footprint, comprising 16% of the total hill crests and slopes habitats within the mapped extent in the Terrestrial Fauna Survey Area. Therefore, it is unlikely that the Proposal will cause a significant impact to the species' preferred habitat.

Given the preferred habitat for nesting in this species occurs at higher elevation where no clearing is required, **no significant residual impacts** are expected to occur for this species and Proposal is not expected to adversely affect the conservation status of the Grey Falcon.

Peregrine Falcon (*Falco peregrinus*) (Other specially protected species under the BC Act)

The Peregrine Falcon is considered uncommon in the Hamersley Range, nesting in cliff type habitat. Peregrine Falcon forage over a wide area and would use most habitats within the Development Envelope while foraging. While the preferred nesting habitat for this species occurs at higher elevation which would coincide with the location of the proposed pit, relatively limited clearing is required in this area of the Indicative Footprint, comprising 16% of the total hill crests and hill slopes habitats within the mapped extent in the Terrestrial Fauna Survey Area. Therefore, it is unlikely that the Proposal will cause a significant impact to the species' preferred habitat.

Given the preferred habitat for nesting in this species occurs at higher elevation where relatively limited clearing is required in this area of the Indicative Footprint, **no significant residual impacts** are expected to occur for this species and Proposal is not expected to adversely affect the conservation status of the Peregrine Falcon.

8.5.2.3. SRE Invertebrate Fauna

Potential SRE taxa were collected from all habitats within the Development Envelope, with the Mulga shrubland patches within the Mulga / *Corymbia* spp. plain habitat yielding the highest abundance and taxa richness of SREs, followed by stony plain, although survey effort was not uniform across habitats. At Lamb Creek the Mulga/*Corymbia* spp plain habitat occurs on the valley floor adjacent to medium drainage primarily in the retention licence and also in the northern section of the haul road corridor. 235 ha of this

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habitat type occurs within the Development Envelope and 38% of the mapped extent of this habitat type will remain in the Terrestrial Fauna Survey Area (**Table 26, Table 27**).

This habitat aligns broadly with the stony lower plains and narrow drainage floors, channels land landform unit of the Boolgeeda Land System (van Vreeswyk et al. 2004) and 'valley floor mulga' as described by Kendrick (2001). Boolgeeda is a common system in shallow valleys below hill systems such as the Newman and Rocklea Land system ((Van Vreeswyk et al. 2004). Aerial photography and helicopter visuals suggest that this habitat occurs widely outside of the survey area however ground truthing has not verified the extent of individual mulga patches beyond 50 metres south of the survey area. Risks to potential SRE invertebrate fauna from clearing 181 ha of Mulga/*Corymbia* spp. Plain are expected to be low

The gorges, gullies, and rocky breakaways habitat is the most prospective SRE habitat however this does not occur within the Development Envelope and only 54.7 ha occurs in the broader Terrestrial Fauna Survey Area. None of this will be impacted by the proposal.

Habitats with low to moderate prospectively for SRE, based on a low/medium protection for SRE invertebrate fauna and low isolation of habitat, includes minor drainage lines, medium drainage lines, stony plain, hillcrests and hillslopes, stony plain, tussock grassland plain and Mulga/*Corymbia* spp. plain. These broad habitat types are not restricted to the Development Envelope, are continuous, and are not isolated (Rapallo 2022a). Of the six taxa that have only been recorded from the Terrestrial Fauna Survey Area (**Table 26**), the habitats in which they were found are considered to be widespread; therefore, it is likely that these taxa occur outside of the Development Envelope.

While the Proposal will result in the clearing of up to 638.4 ha of potential SRE habitats within the Development Envelope, on a macroscale there is connectivity of all habitats to the surrounding landscape. Accordingly, it is unlikely that the potential SRE taxa collected would be restricted to the Development Envelope, especially where the Development Envelope is narrow (for example the proposed haul road). Therefore, **no significant residual impacts** are expected to occur as a result of clearing SRE habitats.

8.5.3. Fragmentation of Fauna Habitat Limiting Access and Movement of Fauna Species

Clearing of native vegetation may result in habitat fragmentation, which can impact fauna species by restricting dispersal, specifically SRE invertebrates and species with limited dispersal capability. Fossorial herpetofauna and small terrestrial mammals (e.g. Western Pebble-mound Mouse, Pilbara Barking Gecko, Gane's Blind Snake) have the potential to be at greater risk from habitat fragmentation.

The Indicative Footprint has been minimised as far as practicable to reduce the extent of clearing and disturbance required for the Proposal. Only a minor proportion of fauna habitat will be impacted by linear infrastructure (the haul road). Fauna movements are not expected to be significantly impacted by proposed infrastructure given the small footprint, low fauna abundance numbers and opportunities for crossing infrastructure corridors. Other non-threatened terrestrial fauna (eg invertebrates, reptiles) would also be expected to cross over/under pipelines. Pipelines are typically laid flat on the ground and run parallel to roadways and windrows, with locations where the earthen windrows abutting up against the pipeline allowing fauna to cross over. Impacts to surface water flows will be minimised through the implementation of design and control methods such as floodway's, culverts or diversion bunds/ditches). Impacts to fauna from isolation in habitat fragments and edge effects can be mitigated through progressive rehabilitation to re-establish habitat for fauna (**Table 33**).

Large areas of undisturbed habitat will remain, post-disturbance, and progressive rehabilitation of fauna habitats will be undertaken (**Table 33**). Therefore, fauna populations in these areas are unlikely to be adversely impacted from the Proposal. These fauna habitats are not restricted to the Development Envelope; therefore, following the implementation of mitigation measures outlined in **Table 33**, it is considered unlikely that fragmentation of habitat as a result of the Proposal will cause any significant impact to fauna.

8.5.4. Fauna Injury or Mortality

Fauna mortality may result from vehicle strike along linear infrastructure. Many species are susceptible to vehicle strikes, including nocturnal species crossing roads, low-flying bats, reptiles crossing / basking on

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tracks and kangaroos crossing tracks. However, night-time vehicle movements during construction for the Proposal will be restricted where practicable to minimise the potential for vehicle strikes. Such restrictions can include restricting off-duty light vehicle use and prioritising the use of communal transport, such as buses and shuttles for worker transfers between camp and operational areas. Restricting night-time vehicle movements for night-shift operations is not practicable.

The risk of fauna mortality or injury arising from entrapment within excavations or trenches during construction will be minimised through regular inspections of all excavations and the provision of egress points/matting from trenches or other steep-sided excavations (including raw water and minewater dams), depending on the dimensions of the excavation. On-site staff will be directed not to feed or in other ways encourage wildlife into the operational site, and barbed fencing will not be used by the proponent to reduce severity of interactions (potential exceptions for pastoral station operations, see **Table 33**). To minimise the potential for fauna injuries or deaths on haul and access roads, appropriate mitigation measures such as speed limit restrictions, avoidance of driving between dusk and dawn, and vehicles and equipment access limited to designated roads/access tracks and cleared areas (**Table 33**).

Potential impacts arising from mortality of individuals are expected to be localised and restricted to individuals only and are not expected to threaten terrestrial vertebrate fauna species at the population level. Prior to clearing activities, pre-clearance surveys for significant species shall be conducted in line with Section 4.3 of the SFMP, and, where practicable, clearing will be avoided during peaks in breeding activity (i.e. immediately after the wet season). It may not always be practicable to avoid peak breeding times depending on when approvals are received and resulting construction schedule requirements. Clearance areas shall be clearly flagged and machinery operators will be made aware of the operational routes and boundaries. All site personnel will be inducted with regards to environmental responsibilities, and the SFMP shall be implemented. While some mortality of fauna is expected, it is anticipated that the Proponent's proposed controls (**Table 33**) will be effective and ensure mortality is kept to a minimum. The potential impacts to terrestrial fauna can be managed such that there are no significant residual impacts, and the biological diversity and ecological integrity of terrestrial fauna will be maintained. Therefore, it is considered **unlikely** that the Proposal will result in significant impacts from fauna mortality from vehicle strikes.

8.5.5. Introduced Fauna Species and Feral Predators

Human activities and disturbances from mining activities may facilitate increased presence and abundance of introduced predator species such as cats, foxes and dogs due to increased availability of water (e.g. collected in sumps), food scraps, and increased accessibility along tracks. The availability of food scraps and inefficient management of waste facilities can attract feral animals to the site and increase the impact on native fauna.

Feral cats are a highly successful invasive predatory species and are a key threat to the survival of numerous native species including the Northern Quoll and Pilbara Olive Python, particularly juveniles. Potential impacts will be adequately managed by ensuring appropriate induction and training for staff working on the site with respect to introduced fauna and the responsibility of personnel to dispose of all food waste so it cannot be accessed by fauna and to not feed fauna. In addition to these measures, a targeted control (e.g. shooting or trapping) where increased presence of feral fauna is recorded will be undertaken as required.

While there are feral animals and predators in the region, it is anticipated that the Proponent's proposed controls (**Table 33**) will be effective and will prevent an increase in diversity and abundance of feral animals. The potential impacts to terrestrial fauna can be managed such that there are no significant residual impacts, and the biological diversity and ecological integrity of terrestrial fauna will be maintained. Therefore, it is considered **unlikely** that the Proposal will result in significant impacts from an increase to feral fauna predator activity.

8.5.6. Species Disturbance Due to Noise and Vibration and Artificial Light

The Proposal has the potential to disturb terrestrial fauna as a result of activities including drilling, blasting and noise (noise and vibration) from vehicles using linear infrastructure (e.g. roads), as well as mining of

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the pit. Anthropogenic noise and vibration are documented to significantly impact the behaviour, diversity and abundance of fauna (Cross *et al.* 2021), including disruption to sleep patterns, foraging behaviours, physiology and can increase stress (Raap 2018). The potential for impacts to species behaviour and breeding is low given the low abundance and population density of some fauna presence (such as the Northern Quoll), no maternal roosts being found present (such as the Ghost Bat), and common availability of other similar habitat in the wider area and region. The SFMP (**Appendix E**) includes mitigation measures to ensure no long-term impacts on breeding to significant species.

Artificial light could disrupt navigation, cause barriers to movement, impact foraging activity, cause abandoning of roosts and nests, and expose nocturnal animals to nocturnal predators (Rich and Longcore 2006). Many bat species are sensitive to artificial light and the presence of lighting in preferred bat flight paths has been shown to cause bats to seek alternative, potentially less favourable paths (Lewanzik and Voigt 2017). The SFMP includes implementation of best practice measures in accordance with the National Light Pollution Guidelines for Wildlife (DCCEEW 2023) except in the rare instances as required for safety considerations such as the use of reflective surfaces in some instances. Cave 1 is closest cave, being approximately 550 m away from the pit Development Envelope boundary however this cave will be closed during the life of the mine. Cave 2 is nearly 2 km and Cave 3 over 500 m away from the operational mine area. Cave 4 and 5 are between approximately 190 and 225 m away from the proposed access road disturbance however traffic is only sporadic **Figure 19**. Ghost Bat will avoid areas around the operations subject to artificial light and noise.

The following mitigation measures will be implemented to minimise potential impacts from artificial light sources; artificial lighting of key fauna habitat areas will be avoided as far as practicable, artificial lighting will only be used where it is required to enable safe operations and when not required it shall be turned off, ensure artificial light training shall be delivered to on site personnel, and minimisation of the use of directional light where possible to avoid light spill (**Table 33**). Furthermore, clearing will be avoided in areas of key habitat (foraging, nesting, breeding) to reduce the presence of lighting required for operations within cleared areas, and entry to caves will be prohibited with clearly defined exclusion zones in order to limit the potential exposure of artificial light to these locations from operational activities, The implementation of a Land Access Permit and Land Clearing Procedure will ensure that only approved areas are cleared and limit the areas exposed to operational lighting.

Disturbance to terrestrial fauna from activities drilling, blasting, linear infrastructure (e.g. roads), and pit operation is not expected to have a significant impact on terrestrial fauna. Noise and vibration (e.g. from vehicle movements and generators) may cause fauna to avoid areas of otherwise suitable habitat. However, studies indicate that, over time, mobile fauna species habituate to noise associated with mining operation or move a suitable distance away from the noise source so that it no longer causes disturbance (Bowen 2005; Larkin *et al.* 1996).

Specific management measures to reduce risks to fauna from noise and vibration (**Table 33**) include; ensuring appropriate induction and training for staff working on the site, implementation of noise and vibration minimisation strategies during Proposal construction, and regular maintenance of plant and machinery. Additionally, blasting will be carried out during daylight hours and strictly controlled to minimise air blast and ground vibration.

Negligible disruption of natural foraging and breeding behaviour of terrestrial fauna due to noise and vibration and/or artificial light are expected, which will be effectively managed via suitable mitigation measures (**Table 33**). Due to the limited nature of impacts and short life of mine, **no significant residual impacts** are expected to fauna from noise and vibration and artificial light as a result of the Proposal.

8.5.7. Habitat Degradation Due to Dust, Introduction or Spread of Weeds, and Altered Fire and Hydrological Regimes

The Proposal has the potential to degrade fauna habitat due to dust generation from clearing, construction and operational activities (e.g. ore handling and processing), and the operation of light and heavy vehicles. Where it impacts surrounding habitats (e.g. roadsides), dust may impact the health of flora and vegetation, which in turn may reduce the quality and suitability of that habitat to supply food and shelter to fauna. The use of mobile mining equipment, construction and ground disturbance activities and ongoing operational

activities associated with the Proposal may also facilitate the introduction of weeds. The introduction of weeds can alter the vegetation of a fauna habitat where infestations occur, and habitats significantly modified by weeds potentially support fewer fauna species, resulting in significant declines in species richness or diversity of local fauna (Adair and Groves 1998). Although fire is a natural part of the ecosystem, fires that are too frequent, too intense, or very widespread, can impact fauna by removing shelter (such as old growth spinifex) and reducing productivity. While fauna populations can recover after fire as habitats regenerate, frequent fires may prevent this, causing local extinction. Risks of fire occur from anthropogenic sources as a result of operational activities (i.e. vehicle exhausts, generators, power plant). Clearing of native vegetation for the construction of the Proposal has the potential to alter the natural hydrological regime of the area, influencing flora and fauna. Altered hydrological regimes can lead to a decline in biodiversity or changes in community structure and/or the quality of fauna habitat. Some fauna species may also be reliant on surface water as part of their lifecycle.

There is potential for dust accumulation to impact vegetation health and condition if not adequately controlled, these impacts and proposed mitigation measures are outlined in the Flora and Vegetation Management Plan (FVMP) (**Appendix B**). Recent investigation by MinRes into the effects of dust on flora occurring near mining operations over almost a decade of monitoring indicated very minimal impacts to plant condition or reproductivity (Mineral Resources 2023b). With the implementation of the proposed controls, limited spatial extent and short life of mine, no significant residual impacts are predicted on vegetation health and condition (or, subsequently, fauna habitat value).

Dust is identified as a potential secondary impact to fauna resulting from degradation of habitat (vegetation health and condition). With proposed control measures, dust deposition is expected to be localised thereby limiting the spatial extent for potentially impacted areas. Additionally, many fauna species will relocate to adjacent similar habitat with the commencement of construction and operational activities, further limiting the potential for impacts from dust generated by the operation. Cross *et al.* (2021) found that the direct impacts of dust to fauna were generally minimal, especially where sufficient mitigation measures were implemented, and there was no indication of a specific need for conservation or management strategies to alleviate the impacts. It was noted by Cross *et al.* (2021) that little is known about how dust impacts upon fauna communities however most negative impacts are expected to be a result of dust that is heavy metal and other contaminant-bearing (e.g. agricultural pesticides and other toxins). Dust generated from mining activities at Lamb Creek is not anticipated to contain elevated levels of heavy metals or other contaminants. Disturbances to fauna due to dust generation is expected to be negligible, with mitigation measures outlined in **Table 33**. Blasting plans will consider meteorological conditions such as wind speed and direction, to minimise dust lift off and speed limits will be reduced on unsealed roads depending on road conditions (typically 60km/h if the road is straight and flat but can be less dependent on road conditions). Vehicles and equipment will be restricted to designated roads and tracks and dust suppression will be implemented to control dust emissions on cleared areas. The intersection of the haul road with GNH, and remainder of the access road up to the operational area within M47/1592, will be sealed to reduce the generation of dust. Road haulage iron ore loads will be covered.

The Proponent will implement the FVMP and has established weed and hygiene management measures to reduce the risk of existing weeds being spread or new weeds being introduced into the Development Envelope (**Appendix B**). Weed control measures will be implemented within the Development Envelope, as well as in areas around the clearing front and in retained native vegetation adjacent to cleared areas, as outlined in **Table 23**Table 23.

The increased fire risk as a result of the Proposal is considered to be minor for vertebrate fauna and potential SRE invertebrates. Increased risk of fire will be mitigated by constructing firebreaks and providing emergency firefighting equipment and trained emergency response staff, in accordance with standard fire management practices outlined in **Table 33**. Firebreaks will be incorporated into mine layout planning in accordance with the local government firebreak notice under s. 33 of the *Bush Fires Act 1954*. Smoking will only be allowed in permitted areas. An Emergency Response Plan will be implemented and an Emergency Response Team members will be formed, in accordance with requirements as discussed with DEMIRS. Regular inspections and maintenance of equipment will be undertaken and all vehicles and machinery will be fitted with fire extinguishers. Fire control equipment (i.e. fire extinguishers) will also be located at infrastructure/building facilities across the project.

Clearing of native vegetation for the construction of the Proposal may alter the natural hydrological regime and influence native vegetation health, which may influence terrestrial fauna habitat. Construction largely associated with linear infrastructure, such as the haul road, is of particular note for this indirect impact. However, the Proponent has designed the proposal to maintain surface water flow so that impacts due to alteration of surface flow is unlikely to occur. MinRes has conducted a hydrological assessment of the site, estimating peak design flows from Project catchments, followed by flood modelling (pre- and post-development) to direct the design of management and control measures. Design principles included for the Proposal include:

- Installation of waterway crossings (culverts/floodways) at appropriate locations (from flood modelling) to allow continuity of existing flow regimes.
- Divert clean water flows around mine infrastructure areas where practical.
- Return diverted flows to the original catchment downstream of infrastructure,
- Where roads intercept sheet flow drainage, smaller culverts installed at frequent intervals to reduce water shadowing on the downstream side.

None of the significant fauna species recorded in, or likely to occur within, the Development Envelope rely solely on surface water for survival; therefore, the predicted impacts to significant fauna resulting from hydrological impacts relating to the Proposal are expected to be negligible.

Foraging habitat can become degraded from changed water regimes as a result of groundwater drawdown. Groundwater extraction will be managed through a Groundwater Operating Strategy (GWOS) and includes weekly recording of pumping rates and monthly standing water levels of the groundwater bores.

Groundwater dependent vegetation has not been identified in the flora and vegetation surveys (Rapallo 2012a; 2022c; Umwelt 2022a). Foraging habitat can become degraded from changed water regimes as a result of groundwater drawdown. Groundwater extraction will be managed through a Groundwater Operating Strategy (GWOS) and includes weekly recording of pumping rates and monthly standing water levels of the groundwater bores. Direct impacts to flora and vegetation from the post-closure hydrological regime are likely to be limited to a localised, short-term alteration to the maturity of the vegetation community as revegetation of disturbed areas is implemented and progresses. The combined loss of catchment area (due to pit, WRL footprints) for Marillana Creek at Flat Rocks is only 0.1%, and therefore unlikely to affect the hydrology of these downstream surface water resources.

Following the implementation of mitigation measures (**Table 33**), significant impacts are not anticipated, and impacts are not expected to affect the viability of fauna species populations within the Development Envelope. Any potential decline or change in the health/composition of fauna habitat arising from dust, weeds, fire or hydrological changes are expected to be managed through suitable design and mitigation measures, with negligible impacts. Due to the limited nature of impacts and short life of mine, **no significant residual impacts** are expected to fauna from dust, weeds, fire or hydrological changes as a result of the Proposal.

8.5.8. Mitigation

The Proponent has applied the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) during the design, planned construction and operation of the Proposal to reduce the potential impact to terrestrial fauna, outlined in **Table 33**. Impacts to terrestrial fauna associated with the Proposal are expected to be negligible. The Proposal has a spatially restricted Indicative Footprint and a short life of mine, and fauna habitats are not restricted to the Development Envelope. As such, key mitigation measures are mostly associated with management strategies. These comprise clearing and construction management to avoid or minimise loss of fauna habitat, the implementation of a SFMP to implement management measures for conservation significant species during clearing and operation, and implementation of the Proposal Environmental Management System (EMS) to prevent indirect impacts associated with altered fire regimes, feral animals and noise, vibration and artificial light sources associated with construction and operation of the Project. Rehabilitation of fauna habitat is also expected to occur, and habitat is expected to recover following cessation of mining (occurring mostly within a three-year period).

MinRes also commissioned independent peer review of the fauna knowledge base and impact assessment conclusions, including consideration of avoidance and mitigation measures. This review by Bamford Consulting Ecologists is included in **Appendix F** and includes suggestions of measures needed to manage threatening processes present in the area. Potential measures included fire management (to avoid single, extensive fires), avoiding denning habitat, minimising disturbance, restoration of disturbed areas where possible, signage and education to reduce risk of roadkill, and monitoring (particularly Ghost Bat roosts). All of these measures are being proposed in some form by MinRes.

TABLE 33: PROPOSED MITIGATION MEASURES FOR TERRESTRIAL FAUNA

Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
Direct Impacts				
Clearing of native vegetation resulting in habitat loss	<ul style="list-style-type: none"> Proposed clearing has been minimised as far as practicable to reduce the extent of disturbance required; the Proponent has revised the Development Envelope from 1,399 ha to 884 ha. Placement of infrastructure in any habitat of high significance (gorges and gullies and hills, ranges and plateau) has been avoided, where practicable through re-design of the access road and camp locations. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. The area to be cleared shall be clearly demarcated and machinery operators made aware of the operational boundary, following confirmation with the relevant manager. Some heavy equipment used may have in-cab GPS mapping and alarm functions however in the absence of this functionality, other control measures such as the use of spotters and/or restricting clearing to the daylight hours will be undertaken. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement the SFMP. Where placement of infrastructure such as the pit shell cannot avoid habitat of high significance (gorges and gullies), minimise clearing as far as practicable. Implement a 100 m radius exclusion zone around recorded Category 2 and Category 3 Ghost Bat roosts (Figure 17). Vehicles and equipment shall be restricted to designated roads and tracks. Laydown areas should be situated in previously disturbed locations, where practicable. 	<ul style="list-style-type: none"> Progressive rehabilitation of foraging habitat within close proximity of roost habitat (<2 km from Category 2 and Category 3 Ghost Bat caves). Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Seasonal weed control programs shall be implemented, including herbicide spraying or physical removal, as required. Salvage and stockpile particular vegetation types, soil, or habitat features (e.g. vegetation, stumps, logs, and boulders) for use in rehabilitation programs. 	Yes – Residual impacts from loss of critical and/ or supporting habitat for the Northern Quoll (44.2 ha critical habitat, 125.6 ha supporting habitat), Ghost Bat (638.4 ha supporting habitat) and the Pilbara Olive Python (118.7 ha supporting habitat) as a result of clearing and construction for the Proposal are proposed to be offset for the entire Indicative Footprint (638.4 ha).
Fragmentation of fauna habitat limiting access and movement of fauna species	<ul style="list-style-type: none"> Proposed clearing has been minimised as far as practicable to reduce the extent of disturbance required; the Proponent has revised the Development Envelope from 1,399 ha to 884 ha. Avoid placement of infrastructure in any habitat of high significance, where practicable. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. The area to be cleared shall be clearly demarcated and machinery operators made aware of the operational boundary, following confirmation with the relevant manager. Habitat and fauna surveys have been undertaken to identify key areas and species to avoid. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement the SFMP. 	<ul style="list-style-type: none"> Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Rehabilitation shall include spatially heterogenous habitat with appropriate refuge areas to increase ability for animals to disperse between patches. 	No
Fauna injury or mortality	<ul style="list-style-type: none"> Cave 1 to be temporarily closed during construction and operation which will eliminate risk of habitation and nursing by Ghost Bats which may be impacted from mining activity (e.g. blasting, excavation, haulage and overburden stacking). The cave structural integrity should be protected and when reopened after operations Ghost Bats are expected to return to the cave. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. The area to be cleared shall be clearly demarcated and machinery operators made aware of the 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement the SFMP. Implement a 100 m radius exclusion zone around recorded Category 2 and Category 3 Ghost Bat roosts (Figure 17). Clearing during peaks in breeding activity (i.e. immediately after the wet season) shall be avoided, where practicable. Closure of Cave 1 is likely to be closed by using a lightweight steel frame fitted to the entrance and bird avery steel netting or any heavier style with apertures not exceeding 100 mm. This would 	<ul style="list-style-type: none"> Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Ensure all drill holes are capped as soon as reasonably practicable. 	No

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Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
	<p>operational boundary, following confirmation with the relevant manager.</p> <ul style="list-style-type: none"> Barbed wire fencing shall not be used by the Proponent. 	<p>exclude Ghost bats but smaller species up to 10g such as Pilbara leaf-nosed bats (<i>Rhinonictoris aurantia</i>) or Finlayson's cave bat (<i>Vespadelus finlaysoni</i>) would be able to pass through unharmed. Other small fauna of a similar size including reptiles, frogs and snakes would also be able to access the cave. With regard to larger fauna such as Quolls, Dingoes and/or Macropod species that will be excluded by the closures, Lamb Creek Cave 1 is situated in an area with numerous alternative deep overhangs and shallow caves that are suitable for their foraging and/or resting activities. Each of these species is known to travel significant distances on a daily basis .(Bat Call WA 2023b)</p> <ul style="list-style-type: none"> Driving between dusk and dawn shall be avoided where practicable and light vehicle use will be limited with crews to be bused to and from camp to minimise traffic during start and end of shift. Machinery and vehicle movements should be restricted during construction to minimise the potential for vehicle strikes, where practicable. Machinery and vehicle movements that must be undertaken between dusk and dawn should be limited to low speeds on access tracks. Excavations and trenches will be kept open only as long as needed to undertake the work and egress points will be provided dependant on depth / morphology of the excavation. For trenches or excavations that can be covered by a wooden fence panel, this will be undertaken to prevent animal entrapment. Any steep-sided holes (e.g. sumps) will be fitted with egress matting or another method of escape to avoid fauna entrapment. Regular inspection of all excavations shall be undertaken to minimise fauna mortality, in accordance with SFMP. Native fauna shall not be feed or intentionally harmed. Environmental responsibility awareness training shall be delivered to all personnel as part of the induction process. Vehicles and equipment shall be restricted to designated roads and tracks. In consultation with the pastoralist, replace the top strands of barbed wire in fences within the Project area. If however the pastoralist requires use of barbed wire for effective stock management, bat deflectors/reflectors between the top two strands will be used within the Project area. 		
Indirect Impacts				
Introduced fauna species and feral predators	<ul style="list-style-type: none"> Prohibit feeding of all fauna. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement SFMP. 	<ul style="list-style-type: none"> Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No

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Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
		<ul style="list-style-type: none"> Avoid providing accessible artificial water sources. Environmental responsibility awareness training shall be delivered to all personnel as part of the induction process. Ensure food waste is disposed of appropriately so it cannot be accessed by fauna. Targeted control program to be implemented (e.g. shooting or trapping) where increased presence of feral fauna is recorded. 		
Species disturbance due to noise and vibration and artificial light	<ul style="list-style-type: none"> Cave 1 to be temporarily closed during construction and operation which will prevent potential impacts due to noise levels expected from the construction and operations. Avoid placement of infrastructure in any habitat of high significance, where practicable. Prohibit entry to caves. Artificial lighting will only be used where it is required to enable safe operations, and when not required it shall be turned off. Ensure artificial lighting is not directed toward habitat of high significance, where practicable. Demarcate areas that may not be entered by personnel and/or machinery. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement SFMP which includes adhering to the DCCEEW (2023) National Light Pollution Guidelines for Wildlife, except where safety considerations mean this is not possible such as the use of non-reflective, dark coloured surface in some instances. Noise, vibration and artificial light awareness training shall be delivered to all personnel as part of the induction process. Regular inspection and maintenance of vehicles and equipment shall be undertaken to ensure no excessive operating noise is experienced from faulty machinery and noise suppression equipment is operating adequately. Asset management and machine maintenance to comply with equipment manufacturers warranty standards ensuring emissions and noise management controls are in working order. Ensure blasting is undertaken during daylight hours and is strictly controlled to minimise air blast and ground vibration, where practicable (as outlined in SFMP Appendix E). Minimise the use of artificial lighting needed for safe operation, use directional and / or screened lighting where practicable, and when required for safety, avoid light spill onto important habitats (e.g. rocky outcrops). Minimise noise from vehicles / machinery and blasting etc. to avoid disturbance to roosting bats through appropriate selection of machinery reducing the number and duration of operating machines required to achieve the work. 	<ul style="list-style-type: none"> Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No
Habitat degradation due to dust, introduction or spread of weeds, and altered fire and hydrological regimes	<p>Dust</p> <ul style="list-style-type: none"> Cave 1 to be temporarily closed during construction and operation which will prevent potential impacts due to dust expected from the construction and operations as Ghost Bats will temporarily be restricted from accessing the cave. Intersection of the haul road with GNH, and remainder of the access road up to the operational area within M47/1592, will be sealed to reduce the generation of dust. Road haulage iron ore loads will be covered. 	<p>Dust</p> <ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement the FVMP. Vehicles and equipment shall be restricted to designated roads and tracks. Dust suppression shall be implemented to manage dust emission on cleared areas and iron ore handling areas. Speed limits shall apply on unsealed roads. 	<p>Dust</p> <ul style="list-style-type: none"> Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No

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Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
	<ul style="list-style-type: none"> Ground clearing (including topsoil stripping) shall not be undertaken during periods of high wind when low ground moisture conditions result in excessive dust lift off. A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. 	<ul style="list-style-type: none"> Ground disturbance activities will be accompanied by dust suppression via water cart as applicable. Stockyard ore product will be conditioned through addition of water to ensure dust extinguishing moisture limits are maintained (as per export license stipulations) Blasting plans will consider meteorological conditions such as wind speed and direction to minimise dust lift off. Dust awareness and dust management training shall be delivered to all personnel as part of the induction process. 		
	<p>Weeds</p> <ul style="list-style-type: none"> A Land Access Permit and Land Clearing Procedure will be implemented to ensure all clearing works are compliant with regulatory requirements and are within approved boundary. This includes requirements for weed hygiene to prevent introduction or spread of weeds 	<p>Weeds</p> <ul style="list-style-type: none"> Implement the FVMP. A Weed Management Plan shall be prepared and implemented as part of the FVMP, prior to construction and operation, to control access and movement of vehicles and construction personnel to prevent the introduction and spread of weeds into the Development Envelope, weed free areas, and between work areas. Vehicles and equipment to be cleaned, inspected and issued with a Weed Hygiene Certificate prior to entry to site or moving between areas on-site. Vehicles and equipment shall be restricted to designated roads and tracks. Weed awareness and weed hygiene training shall be delivered to all personnel as part of the induction process. Regular inspection and maintenance of vehicles and equipment shall be undertaken. 	<p>Weeds</p> <ul style="list-style-type: none"> Seasonal weed control programs shall be implemented, including herbicide spraying or physical removal, as required. Weeds which are physically removed will be disposed of at a waste rock landform and buried. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	
	<p>Fire</p> <ul style="list-style-type: none"> Off-road driving shall be prohibited unless authorised by management. Avoid hot work in fire sensitive areas and during fire risk day. 	<p>Fire</p> <ul style="list-style-type: none"> Implement the FVMP. Fire management and firefighting training shall be delivered to all personnel as part of the induction process. Firebreaks will be incorporated into mine layout planning in accordance with the local government firebreak notice under s. 33 of the <i>Bush Fires Act 1954</i>. Smoking will only be permitted in designated areas, which shall be appropriately signed and contain self-arresting cigarette butt disposal containers. An Emergency Response Plan shall be prepared and implemented. An Emergency Response Team shall be formed in accordance with requirements as discussed with DEMIRS. The Emergency Response Team will ensure that sufficient operational fire suppression equipment is located as per the Emergency Response Plan. Hot Work Permits and a Traffic Management Plan shall be prepared and implemented. Regular inspection and maintenance of vehicles and equipment shall be undertaken. 	<p>Fire</p> <ul style="list-style-type: none"> Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP, following fire. 	

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Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
		<ul style="list-style-type: none"> All vehicles and machinery will be fitted with fire extinguishers and/or in-plant fixed water suppression. Fire extinguishers will be located at infrastructure/building facilities across the project. 		
		<p>Hydrology</p> <ul style="list-style-type: none"> Proposed Action Area design, particularly the haul road, shall consider surface water flow to minimise obstruction to seasonal overland water flow to the loamy drainage flats proximal to the Great Northern Highway. Implement the FVMP. Implement surface and groundwater management strategies in accordance with the SWMP and GWOS. 	<p>Hydrology</p> <ul style="list-style-type: none"> Drainage management structures shall remain post closure and shall meet recognised Australian drainage design specifications. The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	

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8.6. ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

Based on the assessment of potential impacts and the application of the EPA's mitigation hierarchy to protect environmental values associated with this factor, the Proponent considers that the EPA objective for this factor can be met, and that there will be **no significant residual impacts on terrestrial fauna as a result of indirect impacts**.

In terms of direct impacts, the Proposal will result in the clearing of up to 638.4 ha of terrestrial fauna habitats within the Development Envelope which is **considered to be a significant residual impact** on:

- Northern Quoll (*Dasyurus hallucatus*): The Pilbara population of the Northern Quoll is considered an important population as these are outside of the predicted range of cane toads (Hill and Ward 2010). The Proposed Action will remove 44.2 ha of critical habitat and 125.6 ha of supporting habitat for Northern Quoll. The removal of critical and supporting habitat for Northern Quoll is proposed to be offset.
- Ghost Bat (*Macroderma gigas*): The Pilbara population of the Ghost Bat is considered an important population as it is genetically distinct and divergent (TSSC 2016a). The Proposed Action will remove 638.4 ha of supporting habitat for Ghost Bat, and is proposed to be offset.
- Pilbara Olive Python (*Liasis olivaceus barroni*): The Proposed Action will remove 118.7 ha of supporting habitat for Pilbara Olive Python and is proposed to be offset.

Impacts to terrestrial fauna associated with the Proposal will be managed and mitigated in accordance with the SFMP to ensure that potential impacts to terrestrial fauna are managed to an acceptable level. Residual impacts to habitat areas from clearing and construction are proposed to be offset and the Proposal has been referred to the DCCEEW for assessment under the EPBC Act.

8.7. ENVIRONMENTAL OUTCOMES

Based on the studies and investigations undertaken to date, the potential direct, indirect and cumulative impacts of the Proposal are expected to align with the EPA objective (**Section 8.1**) and guidance (**Section 8.2**) for terrestrial fauna, to maintain biological diversity and ecological integrity. The outcomes and proposed mitigation measures aim to:

- Protect environmental values associated with terrestrial fauna
- Facilitate meeting the EPA's objective for this factor.

The predicted environmental outcomes for terrestrial fauna are summarised as follows:

- The risk to terrestrial fauna resulting from clearing of up to 638.4 ha of native vegetation comprising terrestrial fauna habitat from the Proposal is considered to be low given all fauna habitats recorded within the Development Envelope are widely distributed throughout the Terrestrial Fauna Survey Area and regionally.
- No permanent/semi-permanent surface water pools were identified within the Indicative Footprint or Development Envelope.
- There will be no effect on the conservation status of significant fauna species as a result of the Proposal.
- Noise and vibration from blasting and artificial light sources are not expected to impact on terrestrial fauna, following implementation of mitigation during clearing and operation.
- There is negligible risk associated with 7 (of the 10) significant species confirmed from, or likely to occur within, the Development Envelope. No significant residual impacts are expected for these 7 species.
- Significant residual impacts from the removal of critical and supporting habitat for the Northern Quoll, Ghost Bat and Pilbara Olive Python is proposed to be offset via a financial contribution to the Pilbara Environmental Offset Fund (PEOF), or alternative if agreed between agencies and MinRes.

The predicted environmental outcomes for terrestrial SRE invertebrate fauna are summarised as follows:

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- The Proposal will result in negligible risk to SRE invertebrate fauna through the removal of up to 638.4 ha of native vegetation comprising potential SRE fauna habitat. Risks to potential SRE invertebrate fauna are considered low and as a result significant residual impacts are not expected given that no potentially restricted SRE habitats were identified in the Development Envelope and all habitats are considered connected within the landscape and not isolated.

The Proponent considers the Proposal can be managed to meet the EPA's objective for terrestrial fauna, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain terrestrial fauna values.

9. ENVIRONMENTAL FACTOR AND OBJECTIVES – SUBTERRANEAN FAUNA

9.1. EPA OBJECTIVE

The EPA's environmental objective for subterranean fauna is "*To protect subterranean fauna so that biological diversity and ecological integrity are maintained.*" (EPA 2016a).

9.2. POLICY AND GUIDANCE

The Proponent has considered published policy and guidance relevant to this factor as summarised in **Table 34**. It should be noted that in-field sampling undertaken prior to December 2021 was completed with reference to the following EPA guidance statements:

- Guidance Statement 54: Guidance for the assessment of environmental factors: consideration of subterranean fauna in groundwater and caves during environmental impact assessment in Western Australia (EPA 2003).
- Guidance Statement 54a: Sampling methods and survey considerations for subterranean fauna in Western Australia (Technical Appendix to Guidance Statement no. 54) (EPA 2007).
- Technical Guidance – subterranean fauna surveys (EPA 2016e).
- Technical Guidance – sampling methods for subterranean fauna (EPA 2016c).

These guidance documents have since been superseded by Technical guidance – Subterranean fauna surveys for environmental impact assessment (EPA 2021d).

The Proponent has specifically considered guidance documents in the following ways:

- Surveys and analyses undertaken and planned to describe the receiving environment and its significance.
- Identification of activities which may lead to impacts to subterranean fauna.
- Application of the EPA's mitigation hierarchy in elements of Proposal design.

TABLE 34: POLICY AND GUIDANCE FOR SUBTERRANEAN FAUNA

Policy / Guidance	Consideration
Referral of a proposal under section 38 of the <i>Environmental Protection Act 1986</i> : Instructions (EPA 2021c)	The RSD has been prepared in accordance with the instructions.
How to prepare an Environmental Review Document: Instructions (EPA 2021a)	This RSD has been prepared in accordance with the instructions.
Statement of environmental principles, factors and objectives and aims of EIA (EPA 2020a)	Impacts of the Proposal have been assessed against the EPA objective for this factor.
How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: Instructions (EPA 2021b)	An EMP is not anticipated to be required for this factor given the extent of other primary and secondary habitats persisting beyond the proposed pit, the short life of mining duration, and the expected rapid recovery of groundwater following cessation of dewatering.
Environmental Factor Guideline – Subterranean Fauna (EPA 2016a)	The information provided in this chapter addresses the 'considerations for environmental impact assessment' listed in this guideline.
Technical guidance – Subterranean fauna surveys for environmental impact assessment (EPA 2016e)	This guidance document, and appropriate superseded documents, were considered during the implementation of subterranean fauna studies for the Proposal.
<ul style="list-style-type: none"> • WA Environmental Offsets Policy (Government of Western Australia 2011) 	The policy and guidelines have been considered in relation to the definition of significant residual impacts and the proposed offset strategy.

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<ul style="list-style-type: none"> • WA Environmental Offsets Guidelines (Government of Western Australia 2014) 	
<p>Cumulative environmental impacts of development in the Pilbara region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the <i>Environmental Protection Act 1986</i> (EPA 2014)</p>	<p>The cumulative impact assessment process considers both direct and indirect impacts that may combine over time and/or space, for example the potential for multiple mining projects to affect environmental values within the region of the Proposal Area. Due consideration is given to other projects, activities and threats in the region when determining whether cumulative impacts may be significant.</p>

9.3. NOMENCLATURE

For this factor, references to the Subterranean Fauna Survey Area refer specifically to where in-field subterranean fauna surveys were undertaken during 2011 and 2021. A summary of these surveys is provided in **Table 35**. The Subterranean Fauna Survey Area is shown in **Figure 22** and **Figure 23**. The Subterranean Fauna Survey Area encompasses the northern area of Development Envelope in which the proposed pit will be located, as well as the Wedge Deposit to the east of the Development Envelope.

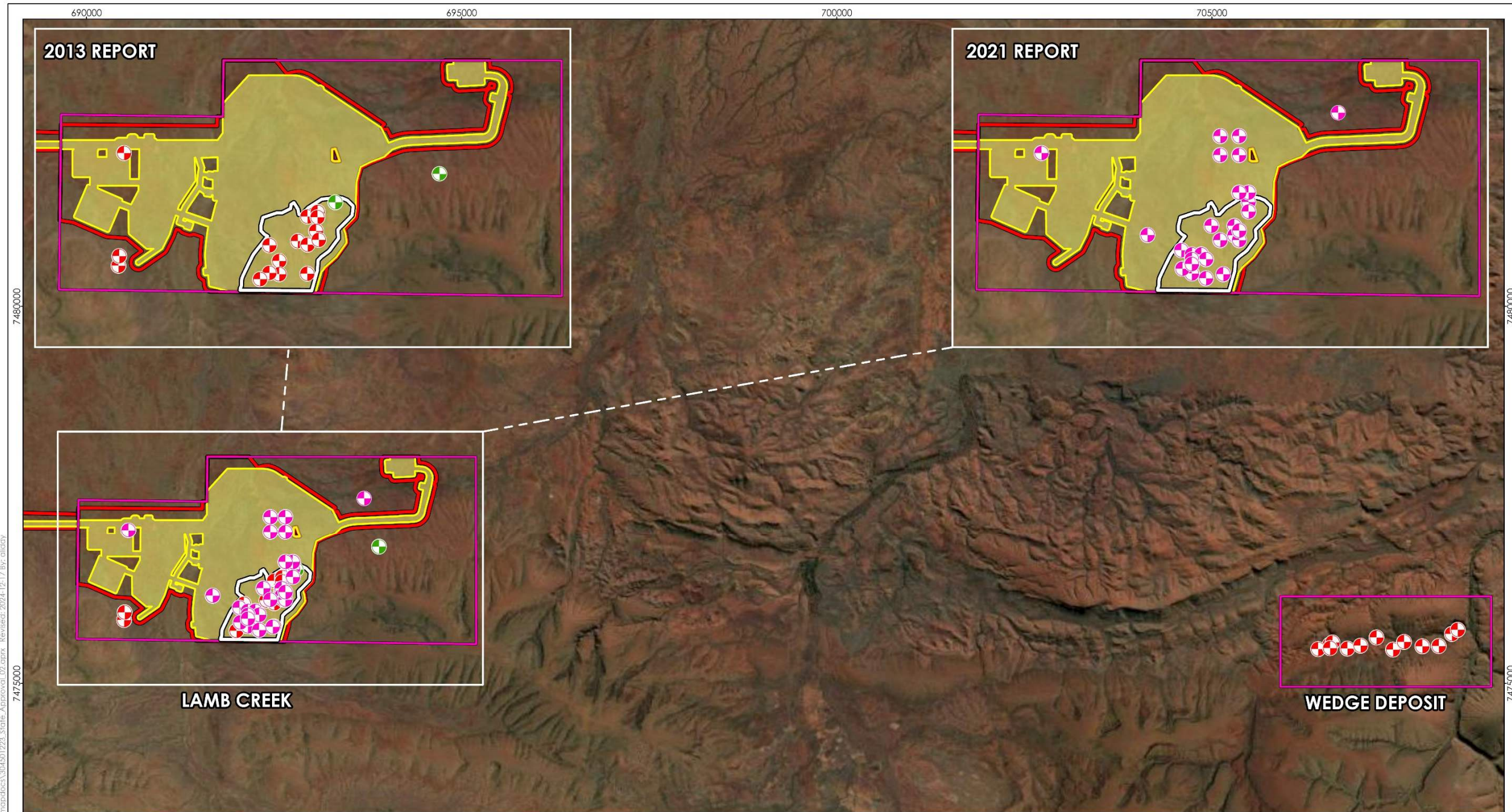
9.4. RECEIVING ENVIRONMENT

9.4.1. Environmental Studies and Survey Methods

The Subterranean Fauna Survey Area has been subject to five surveys on subterranean fauna and associated hydrogeology since 2011. These have comprised three desktop assessments and three in-field sampling events (**Figure 22, Figure 23**). Subterranean fauna surveys have targeted the proposed pit area (impact area) and comparable reference area (outside of the proposed pit). Surveys at the Wedge Deposit, located approximately 13 km to the east have also been collated to provide regional context for the Proposal (Bennelongia 2017). To date, a total of 69 samples for stygofauna (**Table 36**) and 75 samples for troglifauna (**Table 37**) have been collected in the Proposal Area and Wedge Deposit reference area to the east (**Figure 22, Figure 23**).

TABLE 35: SUBTERRANEAN FAUNA STUDIES

Studies And Surveys	Area	Scope and Timing	Survey/Study Effort	Consistency with Guidance and Limitations
Lamb Creek Subterranean Fauna Survey Report (Bennelongia 2021)	Proposal Area within R47/19 (to be converted to M47/1592), focused on DE	Single phase sampling of subterranean fauna within the Development Envelope inside R47/19 (March – June 2021)	Field survey: <ul style="list-style-type: none"> Single phase sampling 26 stygofauna samples 35 troglofauna samples 	Sampling was undertaken in alignment with (EPA 2016a), (EPA 2016e), and (EPA 2016c). However, the following limitations apply: <ul style="list-style-type: none"> Single phase sampling only Sampling was restricted to within, and immediately adjacent to, the Development Envelope within tenement R47/19 only Access to the Wedge Deposit was not available to collect reference samples for regional context The above technical guidance documents have been superseded by <i>Technical guidance – Subterranean fauna surveys for environmental impact assessment</i> (EPA 2021d).
Hydrogeological Assessment of Stygofauna Sites at the Proposed Lamb Creek Mine (MRL 2021)	Two sample drill holes approximately 1.2 km west of the Proposal pit	Hydrogeological analytical modelling to estimate dewatering drawdown and recovery and assess likely impacts on habitat of two stygofauna taxa known only from the surveys within the Subterranean Fauna Survey Area, adjacent to the proposed pit (<1.2 km)	Desktop modelling: <ul style="list-style-type: none"> Estimated maximum drawdown extent Estimated drawdown recovery extent and duration, post-mining Analytical model included pit inflow and outflow relevant to the Proposal operational parameters (pit catchment only) Analytical model included sensitivity analysis 	The following limitations for the desktop assessment apply: <ul style="list-style-type: none"> Limited site data on hydrogeological conditions Analytical model did not include horizontal upstream groundwater inflow or impacts of backfilling post-mining on recovery extent and rates (resulting estimates considered conservative).
Lamb Creek Deposit Subterranean Fauna Assessment (Bennelongia 2017)	Exploration tenement E47/1238	Dual phase sampling for subterranean fauna from the proposed pit (impact area) and out-of-pit reference areas (October 2011; March and May 2013; June and August 2013)	Field survey: <ul style="list-style-type: none"> Dual phase sampling Phase 1 – 20 troglofauna samples and 15 stygofauna samples from impact sites Phase 2 – 20 troglofauna 19 stygofauna samples from reference sites Included data from additional 2011 sampling 9 bores for stygofauna (troglofauna caught as by-catch was included in the results) 	Sampling was undertaken in alignment with (EPA 2016a), (EPA 2016e), and (EPA 2016c). However, the following limitations apply: <ul style="list-style-type: none"> The 2011 sampling phase targeted stygofauna only The above technical guidance documents have been superseded by <i>Technical guidance – Subterranean fauna surveys for environmental impact assessment</i> (EPA 2021d).
Literature Review of Troglofauna and Stygofauna surveys of the Lamb Creek Region (Rapallo 2013)	Pilbara region	Literature review of regional subterranean fauna surveys completed between 2006 and 2012	Desktop literature review: <ul style="list-style-type: none"> Desktop assessment reviewed the following survey reports: <ul style="list-style-type: none"> Yandi Junction Iron Ore Project (Biota 2005) Hope Downs Iron Ore Project: Subterranean Fauna (Biota 2006) Hope Downs 4 Iron Ore: Troglofauna Assessment (Biota 2009) Assessment of the stygofauna within the Hope Downs 4 study area (Outback Ecology 2009) Yandicoogina Subterranean Fauna Assessment Phases I-V (Biota 2010) Iron Valley Project: Subterranean Fauna Assessment (Bennelongia 2012b) Turee Syncline Iron Ore Project, Troglofauna Survey (Bennelongia 2012a). 	The following limitations apply: <ul style="list-style-type: none"> Literature sources were not relevant to the Proposal Area Localised variation in the abundance and diversity of subterranean fauna communities is known to occur Variation in the taxonomic resolution has occurred between reports/consultants and years.
Initial Assessment Of Drawdown Impact For Stygofauna Surveys At Lamb Creek Deposit (Rockwater 2013)	Proposed pit	Numerical assessment of potential dewatering drawdown scenarios to assist subterranean fauna study design	Desktop modelling: <ul style="list-style-type: none"> Estimated drawdown extent in relation to stygofauna communities. 	The following limitations apply: <ul style="list-style-type: none"> No previous hydrogeological field assessments were available for comparison Analytical model assumed that mineralisation was within the Joffre Member of the Brockman Iron Formation Further hydrogeological data was required (in 2013) to verify assessment results.

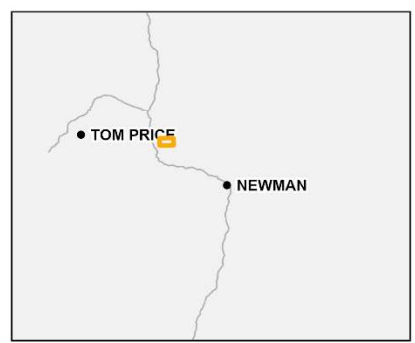
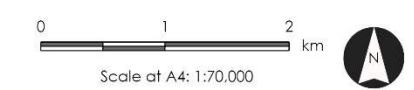


Stygofauna Sampling from Lamb Creek
 Lamb Creek Iron Ore Project
 Client: Mineral Resources Limited
 Project: 304501223
 Project Code: lmck_ea_2023_02 State Appr
 Drawn: JP, Reviewed: FW, EJ
 Date: 17-12-2024

- Development Envelope
- Indicative Footprint
- Subterranean Fauna Survey Area
- Proposed Pit Area

- Sampling Sites**
- 2011
 - 2013
 - 2021

Notes:
 1. Map displayed in GDA2020 MGA Zone 50
 2. Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2024).
 3. Background: Earthstar Geographics



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FIGURE 22: SUBTERRANEAN FAUNA SURVEY AREA AND SAMPLING LOCATIONS FOR STYGOFAUNA

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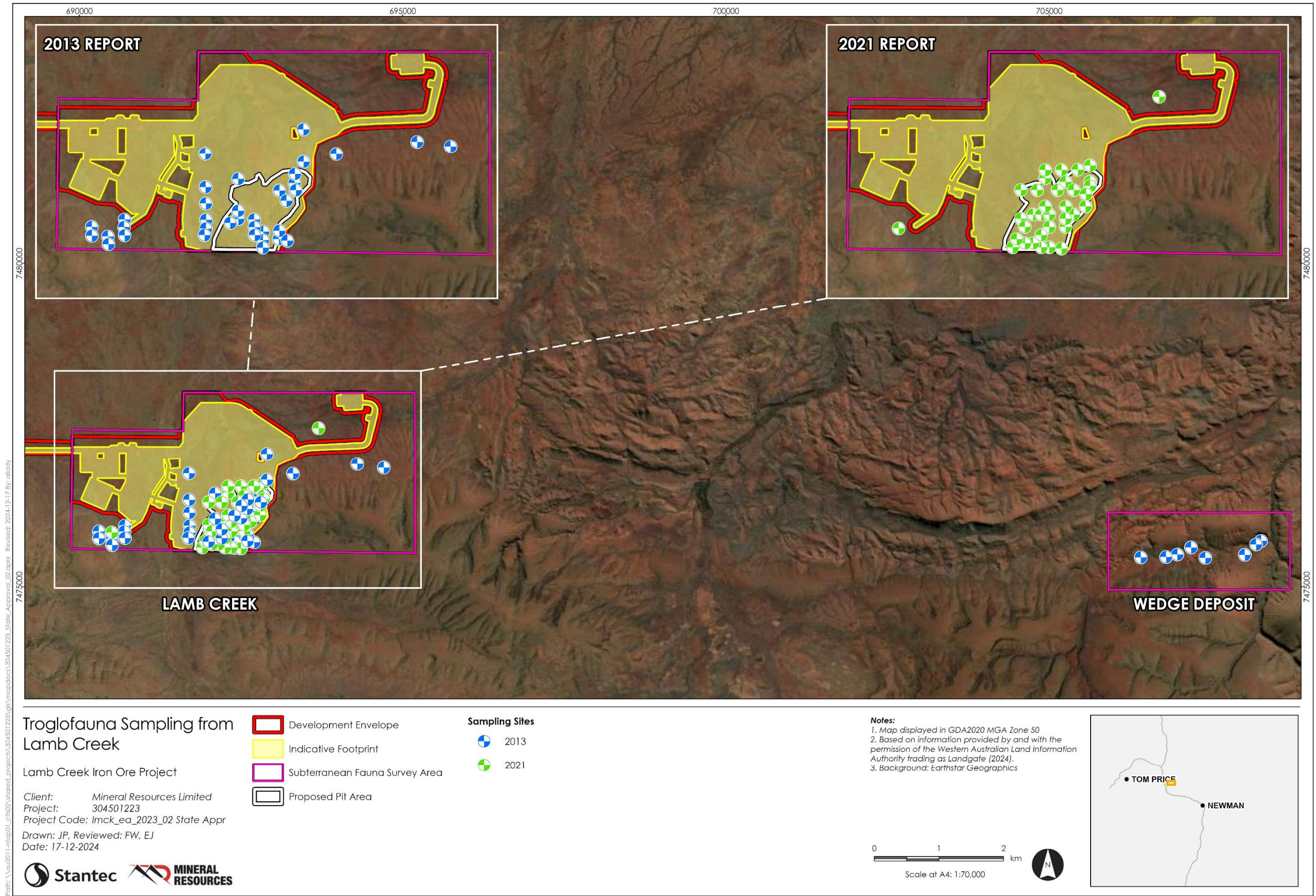


FIGURE 23: SUBTERRANEAN FAUNA SURVEY AREA AND SAMPLING LOCATIONS FOR TROGLOFAUNA

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9.4.2. Habitat Characterisation

The occurrence of subterranean fauna is influenced by local geological formations, with the presence of subterranean cavities (vugs and voids) affecting distribution and abundance. These cavities are common within certain lithologies such as porous detrital deposits such as calcrete due to a high degree of secondary weathering. In addition, where BIF geology is exposed near the surface and/or faulted and folded, it has the potential to become deeply weathered and fractured and may contain suitable habitat for subterranean fauna.

However, the suitability of habitat also depends on habitat connectivity between vugs and voids, as well as nutrient input, water, and oxygen from the surface (Halse *et al.* 2014). Lateral connectivity of vugs and voids enables animals to disperse. Geological features such as major faults can either act as barriers or conduits to below-ground dispersal of subterranean fauna. Barriers to dispersal can limit species to fragmented spaces and cause short-range endemism (Eberhard *et al.* 2009).

9.4.2.1. Stygofauna Habitats

Stygofauna are present in groundwater and, in WA, are associated with a variety of geologies. These include calcrete aquifers within palaeochannels, pisolitic aquifers, karstic aquifers, alluvial aquifers, fractured-rock aquifers, spring and hyporheic habitats (Halse 2018). These aquifers contain the three known critical habitat characteristics for stygofauna; porosity, hydraulic connectivity and depth to water table. Depth to water influences the availability of nutrients and oxygen to maintain suitable habitats (Hose *et al.* 2017).

The Proposal is located within the Upper Fortescue River catchment, with major waterways and tributaries in the region comprising the Fortescue River, Marillana Creek and Weeli Wolli Creek (**Figure 8**). The Marillana Creek sub-catchment comprises a broad alluvial plain, with Marillana Creek underlain by Yandicoogina palaeovalley channel iron deposit (CID). Sections of palaeovalley with high transmissivity are likely to provide good habitat for stygofauna as large interstitial spaces tend to be available (Bennelongia 2021). Aquifers associated with CID and Weeli Wolli Creek have been found to yield diverse stygofauna communities (Bennelongia 2017).

While there are no known palaeovalleys directly below the Proposal, branches of the Yandicoogina palaeovalley occur relatively close to the north side of the Proposal (Bennelongia 2021). Water quality recorded within, and immediately adjacent to, the Development Envelope is considered suitable for stygofauna, with groundwater pH ranging from 4.6 to 7.1, and electrical conductivity ranging between 97 $\mu\text{S}/\text{cm}$ and 817 $\mu\text{S}/\text{cm}$ (Bennelongia 2021). Standing water levels ranged from 28.5 m below ground level (mbgl) to 79 mbgl, with the occurrence of stygofauna in the Pilbara tending to decrease at standing water levels greater than 30 m (Halse *et al.* 2014), with the exception of karst habitats.

9.4.2.2. Troglifauna Habitats

The suitability of geological formations as troglifauna habitat is predominantly determined by availability of vadose zone environments. Key elements comprise the presence and interconnectivity of cavities, the potential for nutrient infiltration from the surface and the ability of the inhabited geology to maintain a stable humidity.

Geology within the Proposal Area comprises BIF and the weathering of BIF produces a widespread regolith profile known as hardcap. Hardcap is not limited to a particular rock type, and can be observed on unconsolidated sediment, BIF and ore. This zone can be extremely variable and is known to contain vugs and voids; habitat suitable for troglifauna. Hardcap is usually strongest near the surface and often grades into semi-hardcap and then unaltered rock with depth.

Within the Proposal Area, vugs and voids range in size from 10 mm to 30 mm (Bennelongia 2021); however, there is some infilling from secondary materials such as goethite, quartz, maghemite, clay and opaline silica (Bennelongia 2017; 2021). Between the hardcap and underlying bedded mineralisation lies a layer of semi-hardcap that has similar characteristics to hardcap, but contains relict bedding and can be mineralised (Bennelongia 2017; 2021). During the 2021 subterranean fauna survey (Bennelongia 2021),

the depth to water ranged from 28.5 mbgl to 79 mbgl, which provides sufficient space within the vadose zone to support troglofauna.

9.4.3. Stygofauna

Surveys have collected a total of 250 specimens of stygofauna from the Subterranean Fauna Survey Area, comprising at least 13 taxa from eight families (**Table 36, Figure 24**) (Bennelongia 2017; 2021). Amphipods were the most abundant and widespread group, followed by oligochaete worms from the family Phreodrilidae and the copepod *Diacyclops humphreysi* s.l., which is widespread throughout the Pilbara. However, most taxa occurred at low abundances and two taxa were represented by a singleton specimen.

Two taxa are currently known only from surveys within the Subterranean Fauna Survey Area, adjacent to the proposed pit (<1.2 km); the syncarid *Brevismobathynella* 'BSY222' and the harpacticoid copepod *Parastenocaris* sp. B25 (**Table 38, Figure 26**) and are discussed further in **Section 9.5.2**.

9.4.4. Troglofauna

A total of 137 specimens of troglofauna have been collected from the Subterranean Fauna Survey Area, comprising at least 27 taxa from 13 orders (**Table 36, Figure 25**). A total of 16 taxa have been recorded from the proposed open pit, although a number of these are understood to have a wider distribution within the Pilbara bioregion. Insects were numerically dominant, and arachnids were also relatively common. However, most taxa occurred at low abundances and 12 taxa were represented by a singleton specimen.

Four taxa are currently known only from the proposed pit within the Indicative Footprint; *Draculoides* 'BSC026', *Noticola* sp. B31, *Trinemura* sp. B25 and *Zuphiini* sp. (**Table 38, Figure 26**) and are discussed further in **Section 9.5.2**.

9.4.5. Subterranean Fauna Values

The nearest PEC listed under the BC Act that is associated with subterranean fauna communities is located approximately 25 km east southeast of the proposed pit. While stygofauna species are not specifically listed under State or Commonwealth legislation, it is likely that a number of significant species exist, as well as additional undocumented TECs and/or PECs. Recent research suggests that relatively localised impacts (such as mining) have the potential to alter the conservation status of locally endemic subterranean fauna species (Bennelongia 2021).

(Bennelongia 2021) considers that the troglofauna taxa known only from the proposed pit, and the stygofauna species within the modelled drawdown area, of the Proposal are most likely restricted due to a lack of sampling intensity and limited availability of drill holes, rather than an accurate representation of the ranges of the taxa. Sampling was affected by:

- A higher number of suitable drill holes located within the deposit boundaries in comparison to regional reference areas (i.e. bias towards mineralised deposits), underestimating the true range of most species
- Limited access to older bores for repeated sampling.
- Detecting subterranean fauna throughout the full extent of their potential range usually requires intensive, repetitive survey effort, especially for those species that occur in low abundances. In addition, taxonomic verification of subterranean fauna species usually required DNA analysis and can be inconsistent hindering reliable understanding of species ranges. (Bennelongia 2021) also concluded that the most likely suitable geological unit for troglofauna habitat (Dales Gorge D4 sub-member), present within the pit, also extends well outside the pit.

TABLE 36: STYGOFAUNA TAXA RECORDED FROM THE PROPOSAL

Higher Identification	Lower Identification	Survey Year		Known Distribution	Subterranean Fauna Survey Area		Notes
		2013	2021		Outside Pit	Inside Pit	
Annelida							
Clitellata							
Oligochaeta							
Enchytraeida							
Enchytraeidae							
Enchytraeus	Enchytraeidae '3 bundle' s.l. (short sclero)	7	2	Widespread	X	X	Taxonomy poorly understood
Haplotaxida							
Tubificina							
Phreodrilidae							
Insulodrilus	<i>Insulodrilus lacustris</i>	20	-	Known throughout the Pilbara	-	X	
	Phreodrilidae sp. AP DVC s.l.	4	-	Known throughout the Pilbara	X	X	
	Phreodrilidae sp. AP SVC s.l.	8	-	Known throughout the Pilbara	X	X	
Athropoda							
Crustacea							
Malacostraca							
Amphipoda							
Paramelitidae							
<i>Maarrka</i>	<i>Maarrka weeliwollii</i>	4	-	Known linear range ~90 km	-	X	
Paramelitidae Genus 2	Paramelitidae Genus 2 sp. B02	100	8	Known linear range ~90 km	X	X	

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Higher Identification	Lower Identification	Survey Year		Known Distribution	Subterranean Fauna Survey Area		Notes
		2013	2021		Outside Pit	Inside Pit	
	Paramelitidae sp. B16	6	8	Known linear range ~50 km	-	X	
Isopoda							
Tainisopidae							
Pygolabis	<i>Pygolabis</i> sp.	1	-	Uncertain	X	X	Higher order identification
Syncarida							
Bathynellaceae							
Parabathynellidae							
Brevismobathynella	<i>Brevismobathynella</i> 'BSY222'	4	-	Known only from the Proposal Area	X	-	Known only from the Subterranean Fauna Survey Area, outside of the Development Envelope ~1.3 km from the edge of the pit
nr Billibathynella	<i>nr Billibathynella</i> sp. B02 (=Parabathynellidae sp. S03)	1	-	Known linear range ~77 km	-	X	
Maxillopoda							
Copepoda							
Cyclopidae							
Diacyclops	<i>Diacyclops humpreysi</i> s.l.	46	8	Widespread in the central Pilbara	X	X	Genetically complex but considered widespread outside the Subterranean Fauna Survey Area, occurring throughout the Pilbara and beyond
Harpacticoida							
Parastenocarididae							
Parastenocaris	<i>Parastenocaris</i> sp. B25	4	-	Known only from the Proposal Area	X	-	Known only from the Subterranean Fauna Survey Area, outside of the Development Envelope ~1.3 km from the edge of the pit
Nematoda							

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Higher Identification	Lower Identification	Survey Year		Known Distribution	Subterranean Fauna Survey Area		Notes
		2013	2021		Outside Pit	Inside Pit	
Nematoda	Nematoda sp.	5	3	Not assessed as part of EIA process	-	X	

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TABLE 37: TROGLOFAUNA TAXA RECORDED FROM THE PROPOSAL

Higher Identification	Lower Identification	Survey Year			Known Distribution	Subterranean Fauna Survey Area		Comments
		2011	2013	2021		Outside Pit	Inside Pit	
Athropoda								
Chelicerata								
Arachnida								
Araneae								
Prethopalpus	<i>Prethopalpus</i> sp.	-	1	-	Known only from the Proposal Area	X	X	
Palpigradi								
Palpigradi	Palpigradi sp. B15	-	1	-	Known only from the Proposal Area	X	-	
Schizomida								
Hubbardiidae								
Draculoides	<i>Draculoides</i> 'BSC025'	-	1	-	Known only from the Proposal Area	X	-	
	<i>Draculoides</i> 'BSC026'	-	1	-	Known only from the Proposal Area	-	X	Only known from the proposed pit area
	<i>Draculoides</i> 'BSC027'	-	2	-	Linear distribution ~11 km	X	-	
Hexapoda								
Entognatha								
Diplura								
Japygidae	Japygidae 'BDP157'	-	1	-	Known only from the Proposal Area	X	-	
	Japygidae 'DPL002' s.l.	-	1	1	Linear distribution ~330 km	-	X	This is a taxa complex that may be made up of multiple taxa/species; the taxonomy of this group is poorly understood.

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Higher Identification	Lower Identification	Survey Year			Known Distribution	Subterranean Fauna Survey Area		Comments
		2011	2013	2021		Outside Pit	Inside Pit	
	Japygidae sp. B34	-	1	-	Linear distribution ~10.5 km	-	X	
Insecta								
Blattodea								
Noticolidae								
Noticola	<i>Noticola</i> sp. B10	-	24	-	Linear distribution ~20 km	X	-	
	<i>Noticola</i> sp. B31	4	4	-	Known only from the Proposal Area	-	X	~200 m
Coleoptera								
Carabidae	Zuphiini sp.	-	6	-	Uncertain	-	X	High level ID only, widely distributed across Pilbara
Curculionidae								
Curculionidae	Curculionidae Genus 1. B02 (=Cucrculionidae sp. S02)	-	5	-	Linear distribution ~30 km	X	X	
Diptera								
Sciaridae								
Allopnxyia	<i>Allopnxyia</i> sp. B01	-	1	-	Widespread across the Pilbara	X	-	
Hemiptera								
Meenoplidae								
Phaconeura	<i>Phaconeura</i> sp. B08	-	27	-	Known only from the Proposal Area	X	-	Linear distribution ~850 m
Zygentoma								
Nicoletiidae								

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Higher Identification	Lower Identification	Survey Year			Known Distribution	Subterranean Fauna Survey Area		Comments
		2011	2013	2021		Outside Pit	Inside Pit	
Dodecastyla	<i>Dodecastyla</i> sp. B02 (= <i>Atelurodes</i> sp. S0 2)	-	8	-	Widespread across the Pilbara	-	X	
Trinemura	<i>Trinemura</i> sp. B25	-	1	-	Known only from the Proposal Area	-	X	Only known from the proposed pit area
Myriapoda								
Chilopoda								
Geophilida								
Chilenophilidae								
Ribautia	<i>Ribautia</i> sp. B02	-	1	-	Known only from the Proposal Area	X	-	
	Chilenophilidae 'BGE053'	-	-	1	Known only from the Proposal Area	X	-	
Scolopendrida								
Scolopendridae	Scolopendridae sp. B02	-	1	-	Known only from the Proposal Area	X	-	
Diplopoda								
Polyxenida								
Lophoproctidae								
Lophoturus	<i>Lophoturus madecassus</i>	-	-	18	Widespread in WA	X	-	
Symphyla								
Cephalostigmata								
Scutigerellidae								
Hanseniella	<i>Hanseniella</i> sp. B21	-	3	-	Known only from the Proposal Area	X	-	Linear distribution ~850 m

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TABLE 38: SUBTERRANEAN FAUNA TAXA LIKELY TO BE IMPACTED BY THE PROPOSAL

Lower Identification	Survey Year			Known Distribution	Subterranean Fauna Survey Area		Comments
	2011	2013	2021		Outside Pit	Inside Pit	
Stygofauna							
<i>Brevismobathynella</i> 'BSY222'	-	4	-	Known only from the Proposal Area	X	-	Within drawdown modelled contours, but estimated (worst case) maximum aquifer thickness drawdown 50% (i.e. minimum 50% aquifer remaining – habitat refuge) Habitat (Whaleback shale) extending away from pit
<i>Parastenocaris</i> sp. B25	-	4	-	Known only from the Proposal Area	X	-	Within drawdown modelled contours, but estimated (worst case) maximum aquifer thickness drawdown 50% (i.e. minimum 50% aquifer remaining – habitat refuge) Habitat (Whaleback shale) extending away from pit
Troglofauna							
<i>Draculoides</i> 'BSC026'	-	1	-	Known only from the Proposal Area	-	X	Habitat extension outside pit
<i>Noticola</i> sp. B31	4	4	-	Known only from the Proposal Area	-	X	~200 m Habitat extension outside pit
Zuphiini sp.	-	6	-	Uncertain	-	X	High level ID only, this group is widely distributed across Pilbara Habitat extension outside pit
<i>Trinemura</i> sp. B25	-	1	-	Uncertain	-	X	Habitat extension outside pit

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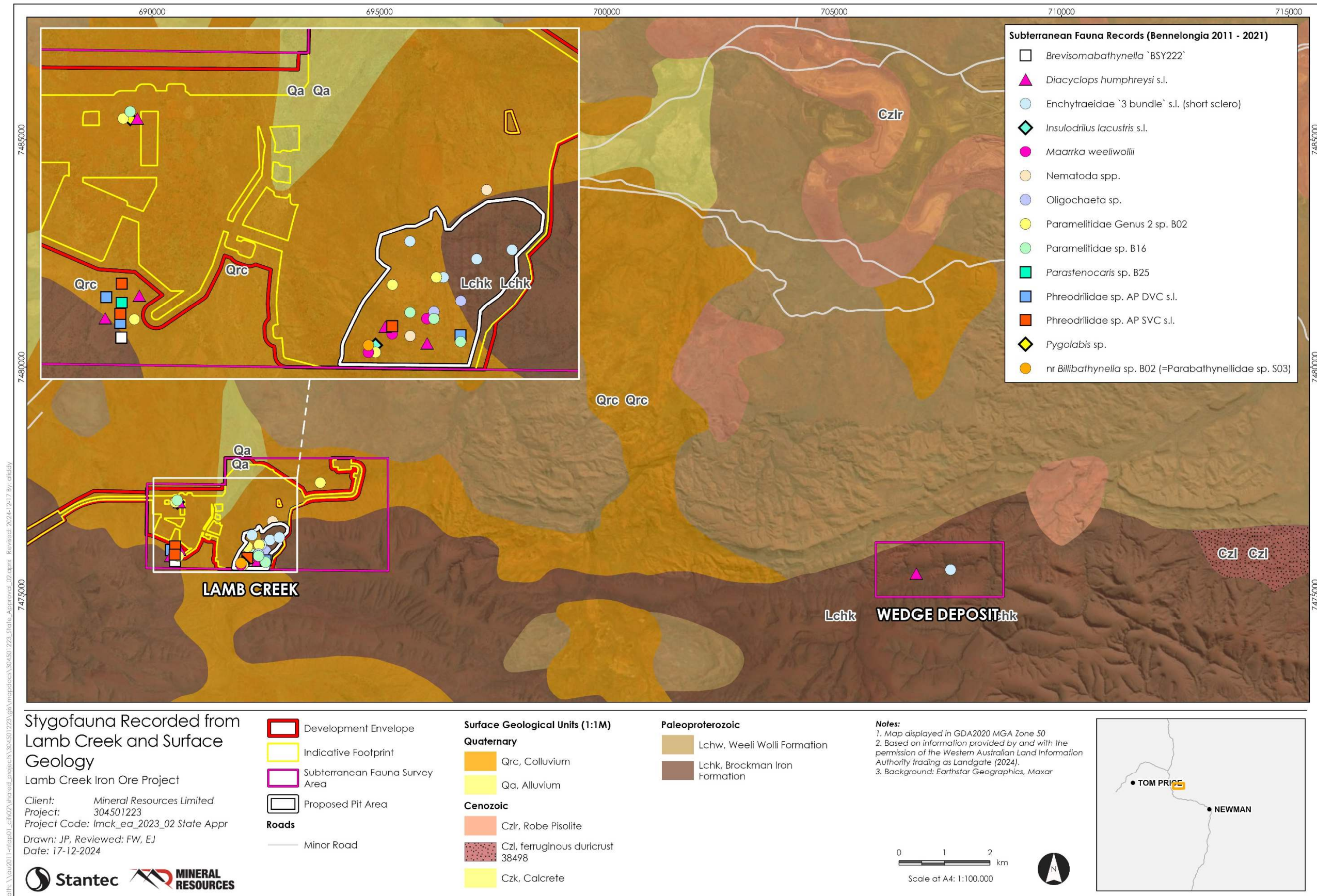


FIGURE 24: STYGOFAUNA TAXA RECORDED FROM THE SUBTERRANEAN FAUNA SURVEY AREA

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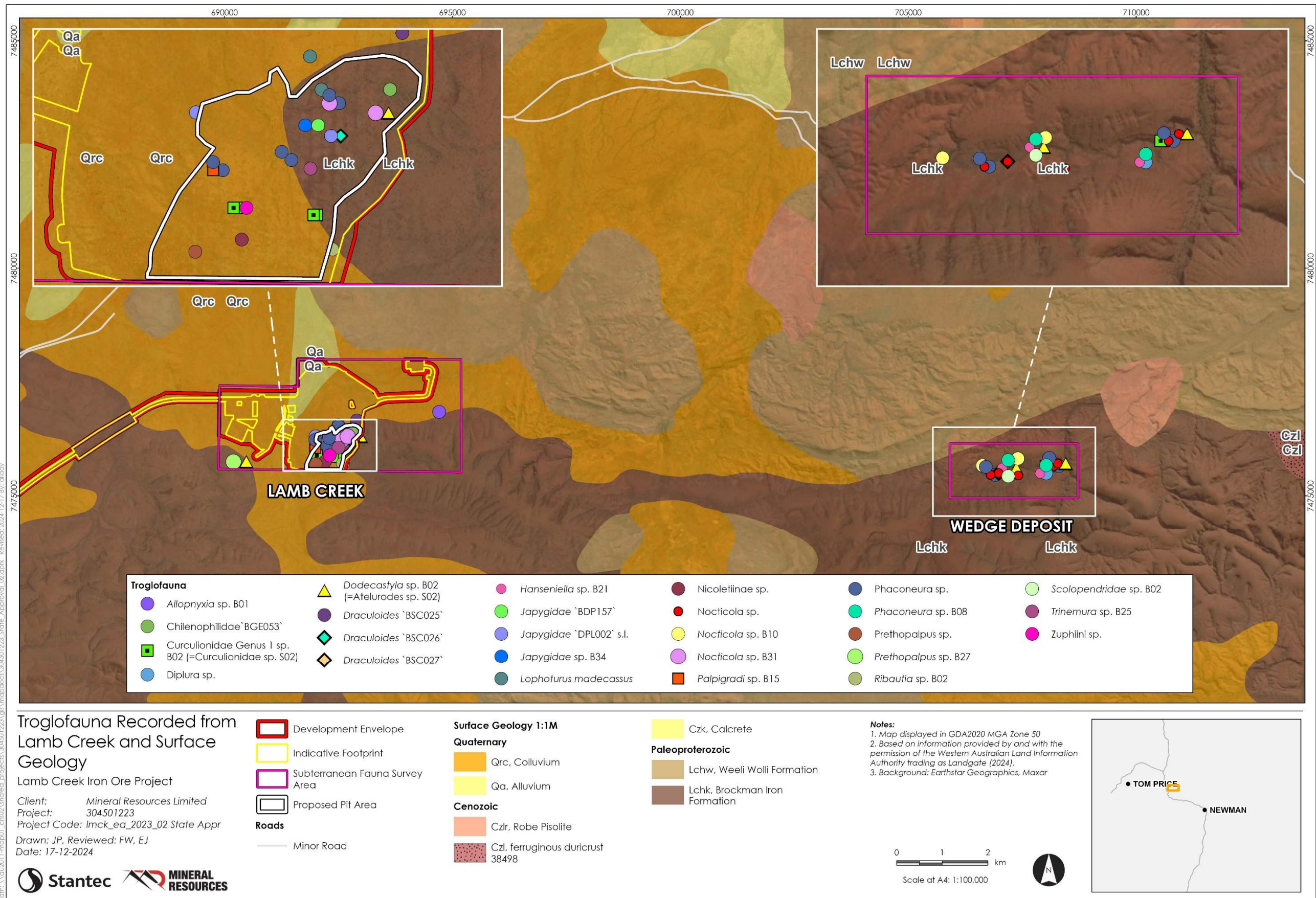


FIGURE 25: TROGLOFAUNA TAXA RECORDED FROM THE SUBTERRANEAN FAUNA SURVEY AREA

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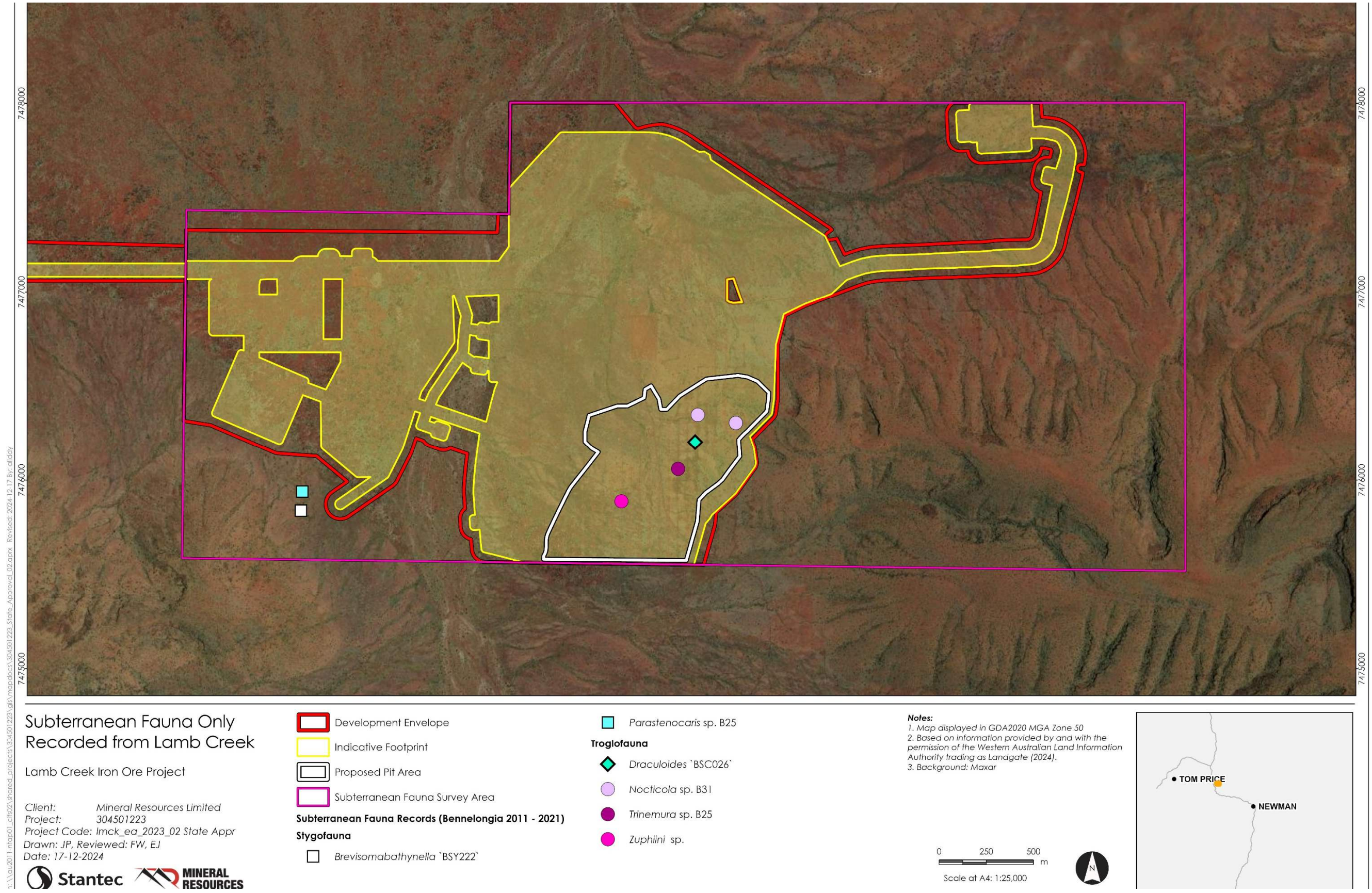


FIGURE 26: SUBTERRANEAN FAUNA TAXA KNOWN ONLY FROM THE SUBTERRANEAN FAUNA SURVEY AREA WITHIN, AND IN THE VICINITY OF, THE PROPOSED PIT

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9.5. POTENTIAL IMPACTS AND MITIGATION

9.5.1. Direct and Indirect Impacts

The Proposal may directly and indirectly impact on subterranean fauna, with the potential direct impact identified as:

- A loss of individuals and/or habitat as a result of pit excavation and aquifer dewatering.

The potential indirect impact has been identified as:

- The possible degradation of potential subterranean fauna habitat as a result of blasting and/or contamination.

9.5.2. Loss of Individuals and/or Habitat as a Result of Pit Excavation and Aquifer Dewatering

9.5.2.1. Stygofauna

Impact assessments for stygofauna were undertaken by (Bennelongia 2017; 2021) and are provided in **Appendix J**, indicating that impacts are likely to be limited based on current geological and hydrogeological knowledge. While mining for the Proposal will result in the direct removal of stygofauna habitat below the water table, the geological formation and primary habitat for stygofauna (mineralised ore bodies in the Brockman Iron Formation) are well-represented in the region. The area affected by mining is also considered negligible in comparison to the broader extent of the formation.

All but two of the stygofauna taxa recorded from the Subterranean Fauna Survey Area have been recorded in historic and recent sampling events, and are known to have distributions extending beyond the Proposal Area (Bennelongia 2021). The two taxa that are currently only known from the Subterranean Fauna Survey Area are adjacent to the proposed pit (<1.2 km away), these are the syncarid *Brevismobathynella* 'BSY222' and the harpacticoid copepod *Parastenocaris* sp. B25. While syncarids in the Pilbara are a highly diverse group and the range of many species may be restricted (Guzik *et al.* 2008), they are also well adapted to existing in interstitial spaces due to their morphology and life history traits such as multiple non-resting larval stages (Guzik *et al.* 2008). Harpacticoid copepods in the Pilbara have variable ranges (Eberhard *et al.* 2005), with most species occupying one or two subregions.

These two stygofauna taxa were recorded less than 1.2 km from the edge of the proposed pit at the base of a range extending to the southwest. With respect to potential hydrogeological impact at these sites, it is demonstrated in the results of the 2022 test pumping (Mineral Resources 2023a) that drawdown at these stygofauna locations is expected to be limited.

Given the extent of other primary (nearby surficial detritals comprising alluvium, colluvium and calcrete deposits) and secondary habits (fractured and weathered lower members of the BIF), it would be reasonable to expect that stygofauna, if present, would be well represented outside of the Subterranean Fauna Survey Area across the region (where connectivity allows for dispersal of stygofauna). The short life of mine and rapid recovery of groundwater (within three years following cessation of abstraction) are also expected to limit impacts to stygofauna and preserve habitat (Mineral Resources 2023a). These assumptions are consistent with (EPA 2021d) guidance regarding habitat characterisation, with stygofauna considered to be at **low** risk of impact from mining transmissivity (Bennelongia 2017; 2021).

9.5.2.2. Troglifauna

Impact assessments for troglifauna were undertaken by (Bennelongia 2017; 2021) and are provided in **Appendix J**, indicating that impacts are likely to be limited based on current geological and hydrogeological knowledge. Mining above the water table will result in the removal of a small proportion of primary troglifauna habitat, based on available geological information, which comprises mineralised ore bodies in the Dales Gorge member of the Brockman Iron Formation and colluvium, which extend beyond the proposed pit and into the adjacent area. Similar to stygofauna, it is considered that the area impacted

by mining is negligible, in comparison to the extent of this formation in the broader region (Bennelongia 2017; 2021).

Of the four troglofauna taxa only known from the proposed pit area, two are singletons and two have multiple records, one of which was collected from only one drill hole and another from two drill holes. These species comprise *Draculoides* 'BSC026' (schizomid), *Noticola* sp. B31 (cockroach), *Trinemura* sp. B25 (silverfish) and Zuphiini sp. (carabid beetle). These groups are commonly associated with troglofauna representatives, which may be restricted in distribution (Bennelongia 2021), depending on the extent of habitat.

The paucity of records is considered a feature of the inherent difficulties in sampling subterranean fauna, rather than an indication of restricted distribution. The taxonomic framework for reliable identification of species is still developing, which provides challenges for the interpretation of sampling results and species distributions. The taxa were assigned an uncertain probability in relation to distribution, due to insufficient information; however, additional drilling was subsequently undertaken to further characterise habitat.

Recent drilling resulted in the development of a block model of the area, specifically for the Dales Gorge member. This member has been divided into four sub-members; D1, D2, D3 and D4, each of which shows varying degrees of habitat prospectivity (**Table 39**) (Bennelongia 2017; 2021). Sub-members D2 and D4 were identified to host suitable vugs and voids to support troglofauna and have been modelled, based on drill hole data, to extend beyond the extent of the proposed pit; therefore, they do not represent isolated troglofauna habitat (Bennelongia 2021). While a degree of heterogeneity between these strata is to be expected, there is no clear evidence of a geological barrier between the various suitable habitat layers inside and outside the proposed pit (Bennelongia 2017; 2021).

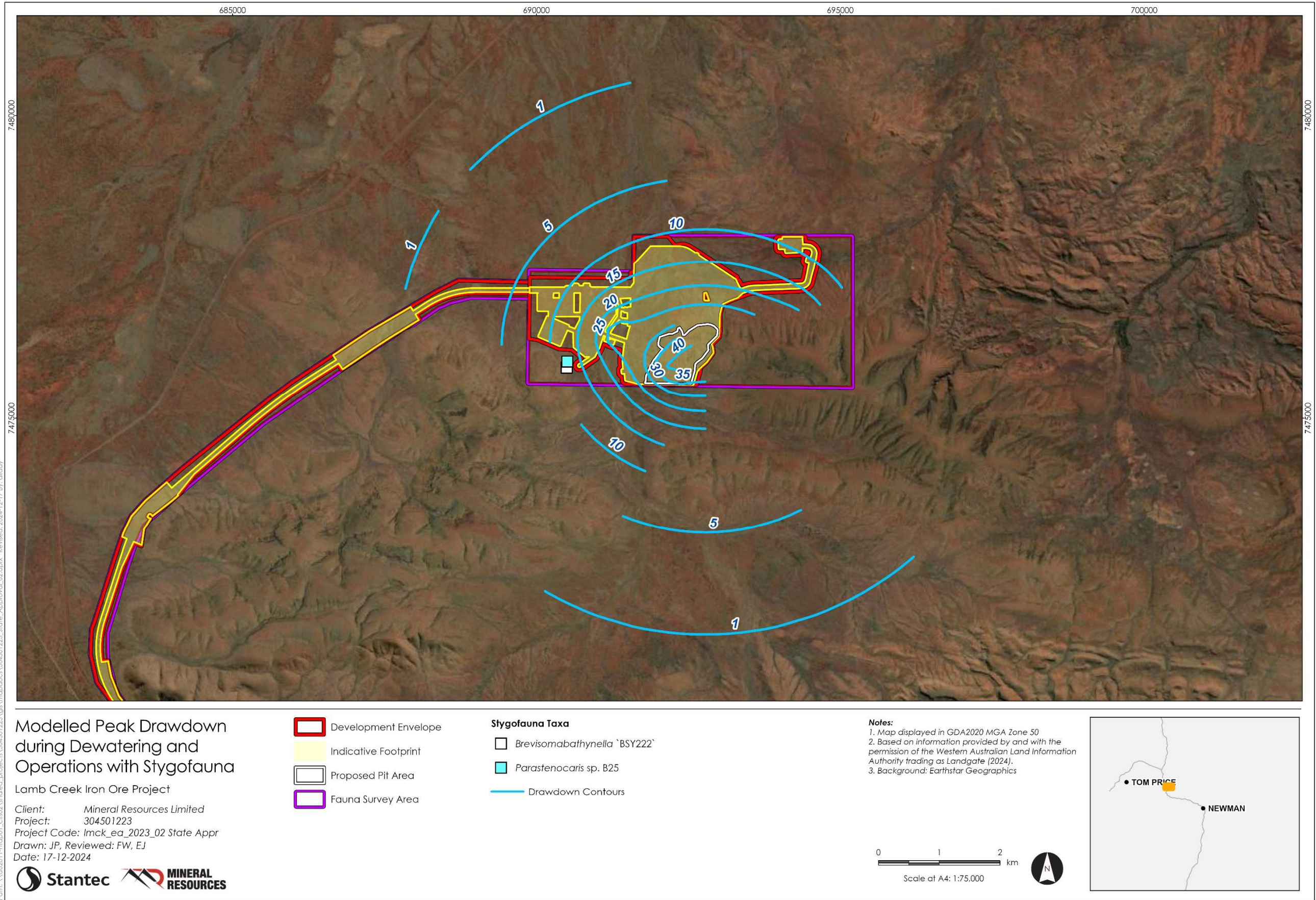
TABLE 39: DALES GORGE SUB-MEMBERS DESCRIPTIONS (BENNELONGIA 2021)

Sub-member	Description	Available Vugs / Voids	Troglofauna Prospective Geology
D1	Soft rock, with high fine silt and clay content primarily below the water table	No	No
D2	Hard rock, well weathered geology with large vugs and voids. Some areas sit above the water table	Yes	Yes
D3	Soft rock, with high fine silt and clay content primarily below the water table	No	No
D4	Hard rock, well weathered geology with large vugs and voids. Some areas sit above the water table	Yes	Yes

As troglofauna require a high moisture content within their habitats they may be susceptible to the effects of drawdown (ecologia 2013), although there is limited data available on the extent to which humidity is affected. Given that residual water will likely be trapped within the area of modelled drawdown for the Proposal, that rapid recovery of groundwater is expected following cessation of the short life of mine, and that overlying detritals / colluvium layers will be recharged with episodic rainfall events, it is unlikely that drawdown will have significant impact on troglofauna habitat. In addition, lowering of the water table has the potential to increase the amount of habitat available for troglofauna, where prospective geology occurs (Bennelongia 2017; 2021). Troglofauna may further avoid the effects of potential desiccation by moving deeper into the geological formation where there is suitable connection and habitat at depth.

Given the extent of other primary habitats (nearby surficial detritals comprising alluvium and colluvium, pisolite and calcrete) and secondary habitats (fractured and weathered BIF to the east), it may be assumed that troglofauna, if present, would be well represented across the region. Drawdown is also unlikely to affect troglofauna habitat suitability or availability. The current known occurrence of troglofauna taxa recorded from the proposed pit are also likely to extend beyond this area and may be well-represented regionally. In addition, for the four troglofauna taxa known only from the proposed pit, there is likely to be connectivity to habitats which extend outside of this area (Bennelongia 2017; 2021). These assumptions are consistent with (EPA 2021d) guidance based on habitat characterisation, with troglofauna considered to be at **low** risk of impact from mining (Bennelongia 2017; 2021).

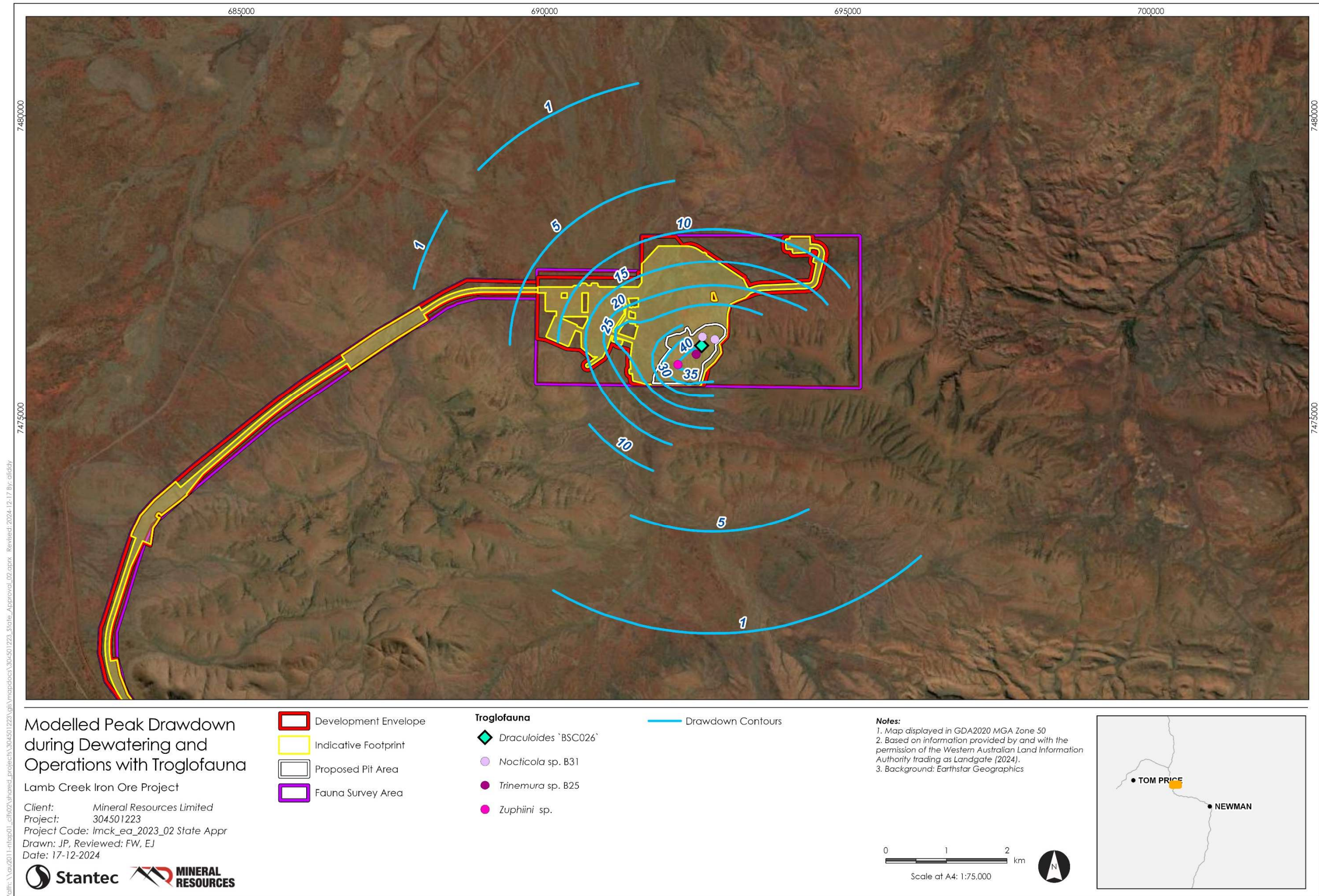
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FIGURE 27: MODELLED MAXIMUM DRAWDOWN DURING DEWATERING AND OPERATION SHOWING LOCATION OF STYGOFAUNA TAXA KNOWN ONLY FROM THE SUBTERRANEAN FAUNA SURVEY AREA

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FIGURE 28: MODELLED MAXIMUM DRAWDOWN DURING DEWATERING AND OPERATION SHOWING LOCATION OF TROGLOFAUNA TAXA KNOWN ONLY FROM THE SUBTERRANEAN FAUNA SURVEY AREA

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9.5.3. Degradation of Subterranean Fauna Habitats

Vibration as a result of blasting is not expected to have a significant impact on subterranean fauna habitat as a result of Proposal implementation, although there is limited understanding of these effects. Altered geological formation structure may also occur due to rock fragmentation, resulting in loss of some habitat through collapse of voids; however, it may also create habitat. In addition, as vibration through rock formations dissipates rapidly with distance, any vibration effects on subterranean fauna habitat are likely to be localised; therefore, blasting is unlikely to constitute a significant impact.

With regard to the risk of contamination of soil or groundwater occurring as a result of spills, the Proponent will implement their EMS and SWMP to ensure that handling, storage and processing of materials is undertaken safely and correctly. Wastes will be managed in accordance with relevant approvals and legislation. There is negligible risk of contamination from ASS and/or PAF, which have also not been identified as a risk for the Proposal. Therefore, contamination is not considered to be a significant impact.

9.5.4. Mitigation

The Proponent has applied the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) during the design, planned construction and operation of the Proposal to reduce the potential impact to subterranean fauna, outlined in **Table 40**. As impacts to subterranean fauna associated with the Proposal are expected to be negligible, with primary habitat extending beyond the proposed pit, a short life of mine, and a reduced pit size, the key mitigation measures are mostly associated with management strategies. These comprise the GWOS to manage dewatering, and EMS documentation to manage contamination of soils and groundwater. There is also the potential for some protection to remnant subterranean fauna habitat to be provided by the backfilling of pits, which may also create habitat where suitable voids occur. Groundwater is also expected to recover rapidly following cessation of abstraction and mining, mostly within a three-year period.

TABLE 40: PROPOSED MITIGATION MEASURES FOR SUBTERRANEAN FAUNA

Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
Direct Impacts				
Loss of individuals and/or habitat as a result of pit excavation and aquifer dewatering	<ul style="list-style-type: none"> The area to be excavated shall be clearly demarcated and machinery operators made aware of the operational boundary. 	<ul style="list-style-type: none"> Short life of mine. Implement surface and groundwater management strategies in accordance with the SWMP and GWOS. Groundwater abstraction for pit dewatering will be managed in accordance with a RIWI Act groundwater licence and associated GWOS. Hydrogeological modelling will continue to be undertaken to inform current and future dewatering requirements, allowing dewatering volumes to be minimised as far as practicable. 	<ul style="list-style-type: none"> Implement an appropriate rehabilitation plan in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level. Groundwater is expected to recover to a substantial extent within 3 years of cessation of dewatering. Implement the approved MCP. 	No
Indirect Impacts				
Degradation of subterranean fauna habitats (as a result of groundwater drawdown, vibration, blasting and contamination)	<ul style="list-style-type: none"> The area to be excavated shall be clearly demarcated and machinery operators made aware of the operational boundary. Excavation of PAF and ASS will be avoided, where practicable. 	<ul style="list-style-type: none"> Short life of mine. Implement surface and groundwater management strategies in accordance with the SWMP and GWOS. Groundwater abstraction for pit dewatering will be managed in accordance with a RIWI Act groundwater licence and associated GWOS. Hydrogeological modelling will continue to be undertaken to inform current and future dewatering requirements, allowing dewatering volumes to be minimised as far as practicable. Implement the Proposal EMS to minimise spillage and environmental contamination from handling, storage and processing of materials. Implement the PAF Management Plan and/or ASS Management Plan, where PAF/ASS is present (in accordance with the (DER 2015). Ensure blasting is strictly controlled to minimise ground vibration, where practicable. As outlined in SFMP for minimising potential impacts to cave habitats Appendix E. 	<ul style="list-style-type: none"> Implement an appropriate rehabilitation plan in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level. Groundwater is expected to recover to a substantial extent within 3 years of cessation of dewatering. Implement the approved MCP. 	No

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9.6. ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

Based on the assessment of potential impacts and the application of the EPA's mitigation hierarchy to protect environmental values associated with this factor, the Proponent considers that the EPA objective for this factor can be met, and that there will be **no significant residual impacts** on subterranean fauna.

9.7. ENVIRONMENTAL OUTCOMES

Based on the surveys and investigations undertaken to date, the potential direct, indirect and cumulative impacts of the Proposal are expected to align with the EPA objective (**Section 9.1**) and guidance (**Table 34**) for subterranean fauna, to maintain biological diversity and ecological integrity. The outcomes and proposed mitigation measures aim to:

- Protect environmental values associated with subterranean fauna
- Facilitate meeting the EPA's objective for this factor.

The predicted environmental outcomes for subterranean fauna are summarised as follows:

- No subterranean fauna TECs or PECs occur within, or immediately adjacent to, the Proposal Area.
- Given the extent of other primary and secondary habitats, stygofauna and troglifauna (if present), may be well represented throughout the region, with potential habitat persisting beyond the proposed pit, a short life of mine, and the expected rapid recovery of groundwater following cessation of dewatering meaning that the overall risk to subterranean fauna is considered low.
- The area affected by drawdown is considered negligible, with geological formations extending beyond modelled drawdown, and occurring more broadly throughout the region. Monitoring and management of groundwater will be undertaken in alignment with the GWOS.
- Vibration from blasting and potential contamination of habitat are not expected to impact on subterranean fauna, with limited ASS / PAF material identified from the area and appropriate management of potentially hazardous materials to be undertaken during operations.

The Proponent considers that the Proposal can be managed to meet the EPA's objective for subterranean fauna, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain values.

10. ENVIRONMENTAL FACTOR AND OBJECTIVES – INLAND WATERS

10.1. EPA OBJECTIVE

The EPA’s environmental objective for Inland Waters is “*To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*” (EPA 2018b).

10.2. POLICY AND GUIDANCE

The Proponent has considered published policy and guidance relevant to this factor as summarised in **Table 41**. The Proponent has specifically considered guidance documents in the following ways:

- Surveys and analyses undertaken and planned to describe the receiving environment and its significance
- Identification of activities which may lead to impacts to inland waters
- Application of the EPA’s mitigation hierarchy in elements of Proposal design.

TABLE 41: POLICY AND GUIDANCE FOR INLAND WATERS

Policy / Guidance	Consideration
Referral of a proposal under section 38 of the <i>Environmental Protection Act 1986</i> : Instructions (EPA 2021c)	The RSD has been prepared in accordance with the instructions.
How to prepare an Environmental Review Document: Instructions (EPA 2021a)	This RSD has been prepared in accordance with the instructions.
Statement of environmental principles, factors and objectives and aims of EIA (EPA 2020a)	Impacts of the Proposal have been assessed against the EPA objective for this factor.
How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: Instructions (EPA 2021b)	The attached SWMP (Appendix K (AQ2 2021b)) has been prepared in accordance with this guidance.
Environmental Factor Guideline – Inland Waters (EPA 2018b)	The information provided in this chapter addresses the ‘considerations for environmental impact assessment’ listed in this guideline.
WA Environmental Offsets Policy (Government of Western Australia 2014) WA Environmental Offsets Guidelines (Government of Western Australia 2014)	The policy and guidelines have been considered in relation to the definition of significant residual impacts and the proposed offset strategy.
Cumulative environmental impacts of development in the Pilbara region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the <i>Environmental Protection Act 1986</i> (EPA 2014)	The cumulative impact assessment process considers both direct and indirect impacts that may combine over time and/or space, for example the potential for multiple mining projects to affect environmental values within the region of the Proposal Area. Due consideration is given to other projects, activities and threats in the region when determining whether cumulative impacts may be significant.

10.3. NOMENCLATURE

For this factor, an Inland Waters Survey Area cannot be defined as the majority of studies undertaken to date are desktop assessments and/or modelling exercises, and in-field studies were conducted over a limited spatial extent (**Appendix L**).

10.4. RECEIVING ENVIRONMENT

10.4.1. Environmental Studies and Survey Methods

There have been five studies undertaken for Inland Waters since 2017 (**Appendix L**). These have comprised two desktop assessments (surface and groundwater) and three in-field studies comprising surface and groundwater sampling (**Table 42**). Waterways, waterbodies and PECs listed under the BC Act and/or EPBC Act, relevant to Inland Waters, are presented in **Figure 29**. MinRes technical specialists have also completed several desktop assessments and interpretations of data (as referenced in subsections below).

10.4.2. Regional and Local Surface Hydrology

The Proposal Area is located within the DWER surface water management area for Upper Fortescue River and sub-management area Fortescue Marsh. The Upper Fortescue River catchment drains a large portion of the eastern Pilbara and terminates at the Fortescue Marshes (P 1; “nationally important”) (**Figure 8**). The Goongarrie Hills separate the Upper and Lower Fortescue Rivers, with water level in the Fortescue Marshes unlikely to overtop and flow through the Goongarrie Hills area into the Lower Fortescue River catchment. The total Fortescue Marshes (Upper Fortescue) catchment area is approximately 29,750 km².

The Proposal is located in the catchment of Mine Creek, which drains through a valley from south to north to the Flat Rocks Sub-Catchment (1,370 km²) of Marillana Creek. Marillana Creek drains a total area of 2,230 km² into Weeli Wolli Creek about 50 km downstream from the Flat Rocks Sub-Catchment outlet. Weeli Wolli Creek passes through a gap in the Hamersley Ranges then transitions to a channel with an alluvial fan floodplain before discharging into the Fortescue Marshes. The total Weeli Wolli Creek sub-catchment is approximately 4,220 km². Creeks within the Pilbara are predominantly ephemeral, with runoff events triggered by significant rainfall events.

The main surface water features in the broader region include:

- Weeli Wolli Creek – Marillana Creek flows into Weeli Wolli Creek located more than 40 km to the east of the Proposal Area. Weeli Wolli Creek supports riparian vegetation and seasonal surface water pools and supports the Weeli Wolli Spring Community PEC (P 1), which contains permanent water and is considered to be of high ecological, social and cultural value (AQ2 2021b) (Appendix L). The spring is located 18 km upstream of the confluence of Weeli Wolli Creek with Marillana Creek. Weeli Wolli Creek is unlikely to be impacted by the Proposal.
- Fortescue Marshes – located approximately 100 km downstream of the Proposal Area. The Fortescue Marshes is a P1 PEC listed under the BC Act, and under the Directory of Important Wetlands of Australia as “nationally important” (DAWE 2021). The Fortescue Marshes support a diverse flora and fauna community of high conservation value and is part of an array of alluvial aquifers and groundwater systems. The Fortescue Marshes are unlikely to be impacted by the Proposal.

The main surface water features in proximity to the Proposal Area include:

- Mine Creek – bisects the central western side of the Proposal Area from south to north. Mine Creek is an ephemeral creek and/or floodplain that likely only flows for a short duration following intense rainfall, is unlikely to support permanent or semi-permanent surface water pools and does not appear to support a substantial riparian vegetation community.
- Marillana Creek – the confluence with Mine Creek is located approximately 7 km downstream of the Proposal Area and supports riparian vegetation and seasonal surface water pools in the Flat Rocks area (approximately 24 km downstream of the Proposal Area). Marillana Creek is currently impacted by BHP and Rio Tinto mining operations. Marillana Creek is unlikely to be impacted by the Proposal.

In 2020, the Proponent installed surface water monitors to collect baseline hydrological information (AQ2 2021a) (**Appendix L**). These monitors were positioned in the main drainage line at the northern and southern lease boundaries. The maximum depths of flow at these sites during the monitoring period (December 2020 and April 2021), was 0.12 m.

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TABLE 42: STUDIES FOR INLAND WATERS

Studies And Surveys	Scope And Timing	Survey/Study Effort	Consistency With Guidance and Limitations
Lamb Creek Surface Water Assessment (RPS Aquaterra 2017)	23 November 2017 <ul style="list-style-type: none"> Characterise the existing surface water environment, Identify key surface water management issues and hydrological risks associated with the development Estimation of catchments and associated flood flows at key locations throughout the site. Conceptual surface water management scheme to mitigate potential surface water impacts and the management measures to be put in place to minimise erosion / sedimentation Indicative diversion (channel / bund) dimensions in the mining areas, in particular those required to 100-year flood levels 	<ul style="list-style-type: none"> Desktop assessment 	<ul style="list-style-type: none"> n/a
Lamb Creek Surface Water Monitoring Installation and Monitoring Data Review (AQ2 2021a)	December 2020 to April 2021 <ul style="list-style-type: none"> Ground truth proposed surface water monitoring station installation locations Install two new surface water monitoring stations consisting of a pressure transducer and water quality mounting kit Collection and validation of monitoring data 	<ul style="list-style-type: none"> Install two monitoring stations Sampling from December 2020 – April 2021 	Key limitations: <ul style="list-style-type: none"> The Karijini North weather station is located 36 km away from the Project site and the recorded rainfall may not represent site rainfall conditions. It is likely that the water samples collected in the recent sampling visit were representative of rainfall rather than creek flow. It is likely that rainfall directly entered the bottle through the top of the mounting kit.
Lamb Creek Iron Ore Project – Hydrological Scoping Study (AQ2 2020)	28 July 2020 <ul style="list-style-type: none"> A review of available data to develop a conceptual hydrogeological model of the Proposal Area Preliminary analytical modelling to provide preliminary dewatering requirements A high-level project water balance to identify potential surplus water and / or make-up water requirements, over the duration of the mining operation. 	<ul style="list-style-type: none"> Desktop assessment 	Key limitation: <ul style="list-style-type: none"> Lack of adequate data to confidently assess the various water supply options.
Lamb Creek Iron Ore Project Hydrogeological Assessment (PSM 2021)	Study occurred between 10 December 2020 to 11 February 2021 <ul style="list-style-type: none"> The consultant supervised drilling of pilot holes, and supported decisions for construction of monitoring bores Use of findings and facts to reconcile forward works program in context to water supply Record relevant hydrogeological data (for example airlift yield, groundwater strikes, loss circulation, cuttings wetness and so on) Geological logging of cuttings Perform in-situ hydraulic testing and analyse results Sample groundwater for laboratory analysis Redact bore completion reports/diagrams 	<ul style="list-style-type: none"> Drilling of 13 holes Falling head hydraulic slug tests in the constructed monitoring bores Collection of representative groundwater samples from five of the monitoring bores Laboratory analysis of the groundwater samples. 	Key assumptions and limitations: <ul style="list-style-type: none"> The lateral and vertical hydraulic extents of the orebody aquifer and its connectivity to faults are not characterised and defined. This is reflected in coarse parameterisation reflecting broad-scale representation of the aquifer system The base of the aquifer was assumed to be bounded by low-transmissivity bedrocks of fresh BIF No interpreted faults are explicitly represented in the model The range of simulated dewatering rates and drawdown extents are considered indicative given influences from assumptions and model representation Rainfall recharge was not considered in the simulated water budgets The modelling for this investigation was conducted in accordance with the Australian Groundwater Modelling Guidelines (National Water Commission 2012)
Hydraulic Bore Testing Completion Report – Lamb Creek Project (Pennington Scott 2022)	Hydraulic testing program completed between 18 th September 2022 and 30 th September 2022. <ul style="list-style-type: none"> The consultant carried out airlift development on existing monitoring bores and carried out test pumping on four existing production bores. The test pumping results were analysed by the consultant to estimate hydraulic parameters and sustainable bore yields. 	<ul style="list-style-type: none"> Airlift development of monitoring bores Test pumping of production bores Desktop assessment of results Establishing water supply and dewatering strategies 	Key limitation: <p>One production bore was not fully developed so test pumping could not be completed in this bore.</p>

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Studies And Surveys	Scope And Timing	Survey/Study Effort	Consistency With Guidance and Limitations
	<ul style="list-style-type: none"> Data obtained from the test pumping investigation ((Mineral Resources Limited 2024), copy in Appendix L was used to inform water supply and dewatering management strategies. 		

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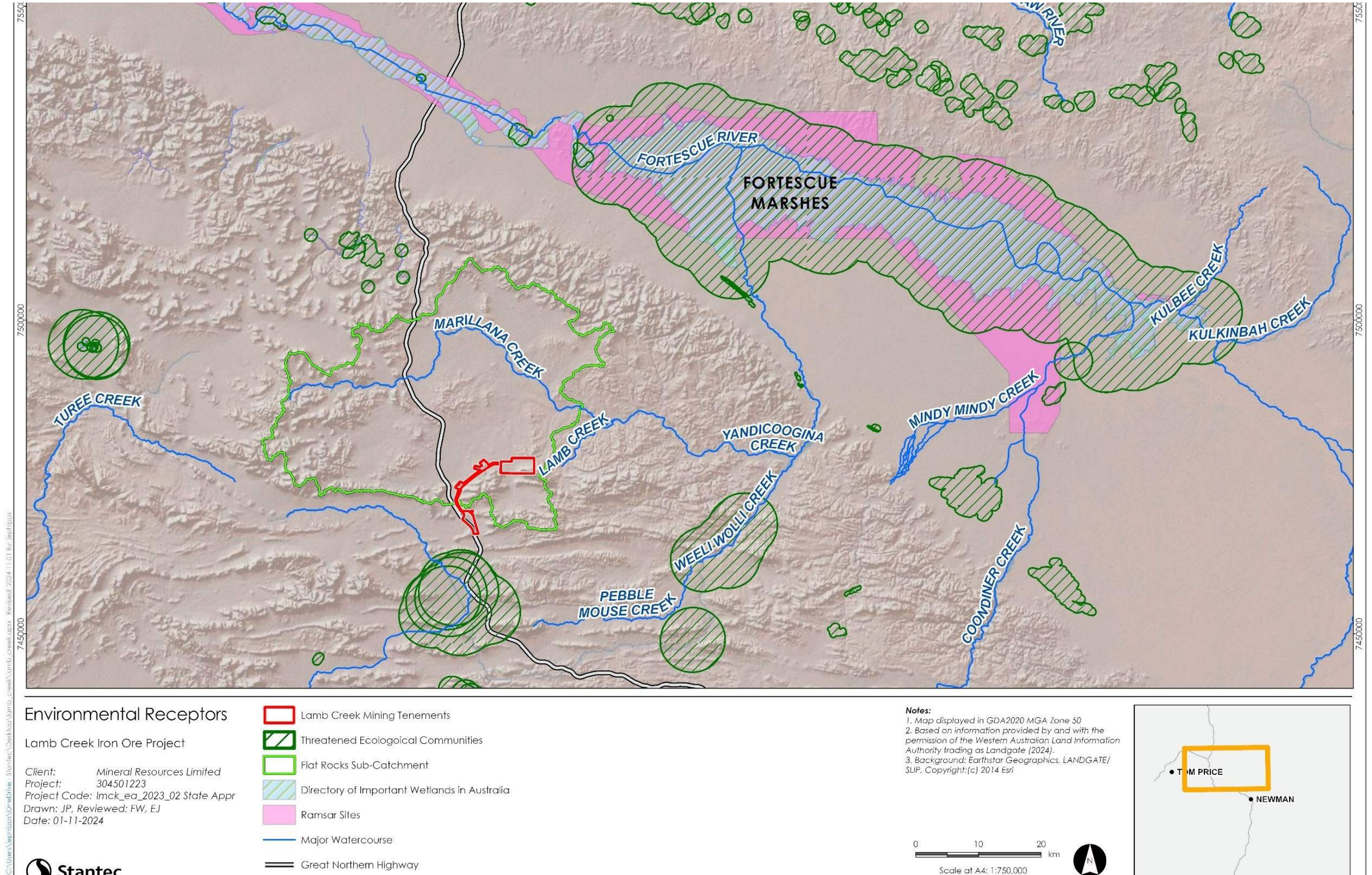


FIGURE 29: WATERWAYS, WATERBODIES AND PECs RELEVANT TO INLAND WATERS

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10.4.3. Regional and Local Hydrogeology

The Proposal Area is located on the Brockman Iron Formation on the southern section of the regional Yandicoogina Syncline. Locally, the Joffre Member and Dales Gorge Member have minor cross-folding on northeast to southwest orientated axes. Several north to south lineaments and potential faults are inferred beneath Mine Creek, which runs north to south adjacent to the western edge of the proposed mine pit and WRLs. Iron mineralisation is predominantly hosted in the Dales Gorge Member (PSM 2021).

Across the Pilbara, the Brockman Iron Formation, where fresh, comprises generally low permeability BIF and shale with limited groundwater storage. However, where mineralised, the Brockman Iron Formation has enhanced permeability and storage forming an important localised aquifer. Aquifer potential in Brockman Iron Formation orebodies is limited to zones of mineralisation, being restricted at depth and along strike by low permeability, unmineralised BIF and shale (AQ2 2020a) (**Appendix L**).

The main hydrostratigraphic units identified or inferred within the Development Envelope include (AQ2 2021a) (**Appendix L**):

- valley-fill deposits (alluvium material and Tertiary detritals);
- weathered bedrock
- mineralised BIF (primarily Dales Gorge Member)
- fresh, unmineralised bedrock
- fault zones in bedrocks.

Tertiary detritals of up to about 30 m thickness overly the bedrock beneath the Proposal Area. These typically comprise immature detritals (unsorted, sub-angular to sub-rounded, coarse to medium BIF and chert fragments, within a partial red clay matrix) overlying more mature detritals (sorted, sub-angular to sub-rounded, coarse to medium BIF fragments within a red clay matrix). Weathering often occurs at the contact between Tertiary detrital and underlying bedrocks and is represented as a vuggy hard-cap zone. Drilling data indicates the Tertiary detritals across the Proposal Area occur above the water table and do not form part of any aquifer system in the area.

Within the Proposal Area the mineralised zone of the Brockman Iron Formation hosts a localised orebody aquifer, considered to be a “bathtub” type aquifer with localised and enhanced porosity and permeability, surrounded by a more extensive lower porosity and permeability fractured rock aquifer (AQ2 2020a) (**Appendix L**). Aerial lineament analysis has identified several faults across the Project area which are inferred to provide some preferential groundwater flow between the orebody aquifer and its surrounds (MRL 2024).

Aquifer potential also exists in “halos” of sub-mineralised ore (more than 50% iron) around and between the main orebodies. The vuggy hardcap / semi hardcap associated with weathering of the Brockman Iron Formation can also be correlated with the mineralised unit (AQ2 2021a) (**Appendix L**).

10.4.3.1. Groundwater Characteristics

Regionally, groundwater in the Proposal Area flows to the north-northeast towards Marillana Creek. Within the Indicative Footprint, recorded water level from accessible drill holes, together with bore elevation data, resulted in an initial estimated water table elevation of approximately 672 m AHD for the pit (i.e. between 44 mbgl and 60 mbgl, averaging approximately 50 mbgl) (AQ2 2021a) (**Appendix L**). Subsequent monitoring by MinRes of SWL in the production and monitoring bores over 2022 to 2024, along with survey pickup of the bore elevations, has confirmed a baseline water table SWL in the area of the proposed pit of 673 m AHD.

The main aquifers are recharged by infiltration of rainfall and surface water flow. Given the location of the Proposal in the headwater of the Mine Creek tributary, runoff volumes will be relatively small, and recharge

is estimated to be minor. Experience in similar areas of the Pilbara indicates that recharge is approximately 0.5% to 1.5% of annual rainfall (AQ2 2021a) (**Appendix L**).

Groundwater quality was measured as part of site hydrogeological investigations during exploratory drilling and monitoring bore installation in 2020 and 2021 (PSM 2021) (**Appendix L**), the tested parameters included pH, electrical conductivity (EC) and per- and poly-fluoroalkyl (PFAS). Groundwater pH was neutral to slightly alkaline (range 7.2 to 8.7) and EC was generally fresh (range 97 $\mu\text{S}/\text{cm}$ to 748 $\mu\text{S}/\text{cm}$). Concentrations of PFAS were below the limit of reporting in all samples. Water quality data was collected in 2022 during the pump testing program and the results are shown in **Table 43**. These results were consistent with the previous analysis undertaken during the exploratory drilling and monitoring bore installation (PSM 2021) by (Mineral Resources 2023a).

TABLE 43: BASELINE GROUNDWATER QUALITY RESULTS (FROM 2022 PUMP -TESTING) (MINERAL RESOURCES 2023A)

Bore ID	Field pH	Field Electrical Conductivity ($\mu\text{S}/\text{cm}$)	Temperature ($^{\circ}\text{C}$)	Date
PB01	7.5	592	27.2	20 Sep 2022
PB02	7.6	611	26.6	25 Sep 2022
PB03	7.7	623	28.2	22 Sep 2022
PB04	7.3	156	26.6	29 Sep 2022

Groundwater quality from other mining operations in the nearby area is generally fresh to brackish and weakly acidic to slightly alkaline and dominated by calcium / magnesium and bicarbonate (AQ2 2021a) (**Appendix L**).

10.5. POTENTIAL IMPACTS AND MITIGATION

10.5.1. Direct and Indirect Impacts

The Proposal may directly and indirectly impact on Inland Waters, with the potential direct impact identified as:

- altered hydrological regime associated with the Proposal, influencing surface water flow, which may adversely affect surrounding ecosystems
- groundwater drawdown causing changes to hydraulic connectivity and/or groundwater quality and subterranean ecosystems (primarily stygofauna).

The potential indirect impacts have been identified as:

- potential disturbance and exposure of PAF material
- potential for contamination of surface water and/or groundwater as a result of hydrocarbon and/or chemical spills, and WWTP operations.

10.5.2. Altered Hydrological Regime

Proposal activities that may result in altered hydrological regime include:

- development of the mine pit and construction of infrastructure such as WRLs, haul / access roads, and other support infrastructure

- storage, handling and transport of hazardous substances, and generation of leachate from the mine pit, stockpiles, RoM pad and WRLs leading to generation of contaminated discharge to nearby surface water and and/or groundwater environments
- mine dewatering leading groundwater drawdown, generation of PAF through mine dewatering, and discharge of excess water into the environment, which could cause changes to hydrologic regimes, downstream.

The floodplain of Mine Creek is located between a proposed topsoil stockpile adjoining the left bank and a WRL and low-grade stockpiles adjoining the right bank. Modelled flood peak depth along this stretch of Mine Creek is likely to be up to 1.5 m during a 1% annual exceedance probability (AEP) flood event. Due to flood protection embankments in this stretch of Mine Creek, the flood depth is likely to increase by up to 0.5 m. However, this impact would be constrained to within a few hundred metres of this mine infrastructure (**Figure 30, Figure 31** post development conditions). There are no expected changes in flood level outside of this localised area (AQ2 2021b) or to the broader hydrological regime of the region, including downstream waterways such as Marillana Creek, which contains surface water pools at Flat Rocks.

In terms of catchment reduction, the location of the proposed pit, WRL and topsoil stockpile will reduce the overall Marillana Creek sub-catchment by approximately 0.3% which is unlikely to substantially affect the surface hydrology of the Proposal Area or waterbodies located downstream of the confluence of Mine Creek and Marillana Creek (AQ2 2021b).

With regard to aquatic ecology, no aquatic biota has been recorded within the Proposal Area due to the lack of permanent and semi-permanent waterbodies. While there may be some opportunistic aquatic biota that colonise temporary pools and watercourses during wet conditions, these taxa are likely to have efficient dispersal mechanisms and be widespread through the broader area. Due to limited surface water presence, the Proposal Area is also unlikely to hold significance for waterbirds.

10.5.3. Groundwater Drawdown

The proposed dewatering of groundwater to enable mining below the water table, and to provide water supply for site activities, may result in the exposure of PAF material, and minor discharge of excess rainwater into the environment during significant rainfall events, with this water being managed to remove sediment and contaminants, prior to discharge.

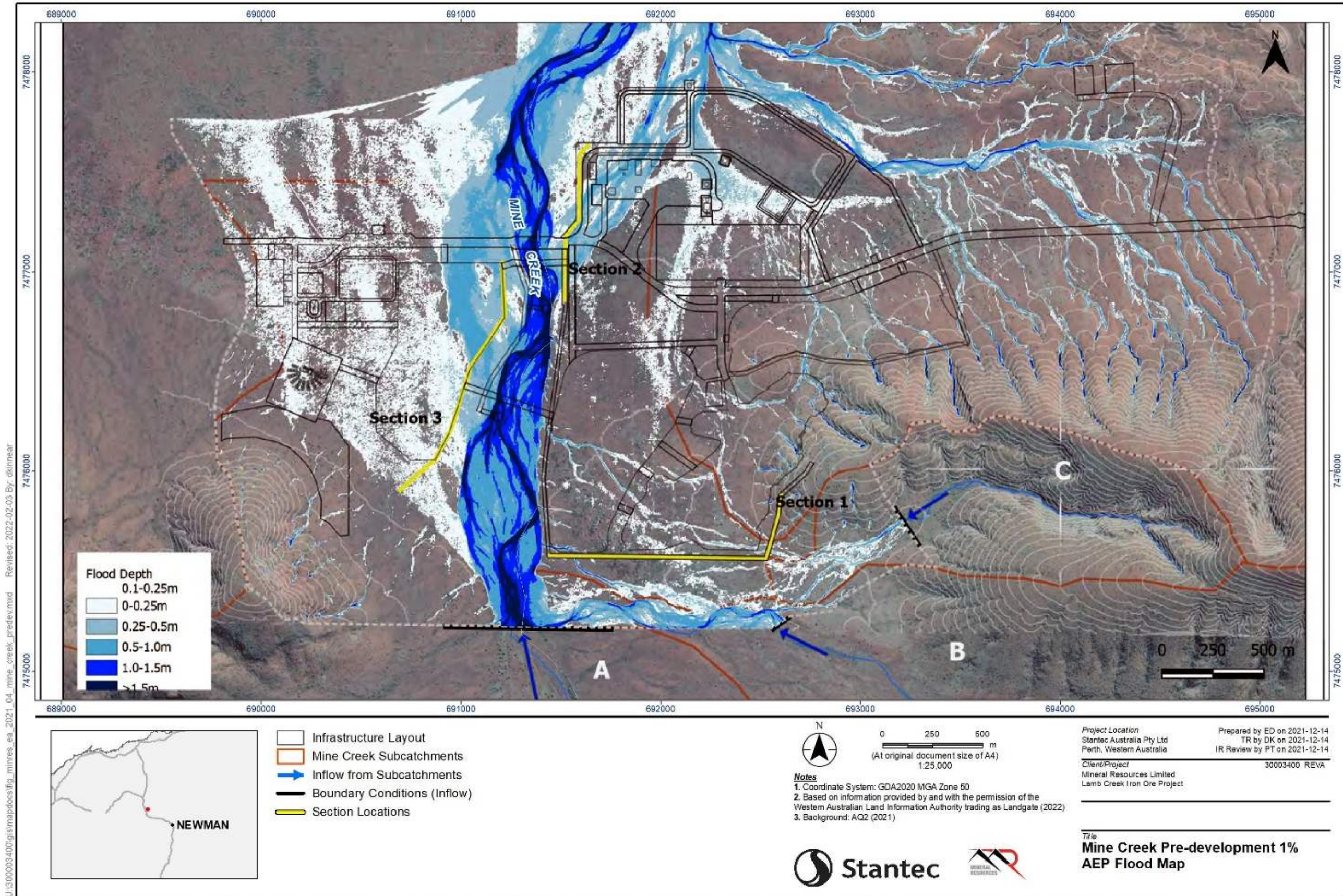
Impacts to groundwater have the potential to affect GDEs such as stygofauna, with the potential influence of groundwater drawdown on subterranean fauna from the Proposal detailed in **Section 9**. Pre-test pumping analytical modelling was conducted (PSM 2021) to model the estimated groundwater drawdown that may occur as a result of dewatering. The predicted maximum groundwater drawdown contours at the end of operation (assuming maximum water demand with no backfilling of the pit) are shown in **Figure 32**. While there will be drawdown, it is expected to have only minor impacts on these communities as a result of the likely extent of other primary and secondary habitats throughout the region, there is a short life of mine, and the expected rapid recovery of groundwater following cessation of dewatering. There was no groundwater dependent vegetation identified within the Proposal Area, associated with the limited residence time of surface water.

Two stygofauna taxa were recorded less than 1.2 km from the edge of the proposed. With respect to potential hydrogeological impact at these sites, the results of the 2022 test pumping demonstrate that drawdown at these stygofauna locations is expected to be limited; during a 48-hour test pump of PB02 at 29.8 L/s, drawdown at a monitoring bore 400 m from PB02 showed no drawdown response to pumping – the stygofauna locations are some 800 m from PB02.

Figure 32 Groundwater abstraction will be managed under a groundwater operating strategy (GWOS), in compliance with DWER requirements under the water licence. The GWOS includes regular monitoring of groundwater with an annual report due on the 31st of March each year; monthly monitoring will be continued

for two years post closure. Groundwater monitoring data will form the basis to further refine conceptual and analytical models in alignment with the GWOS.

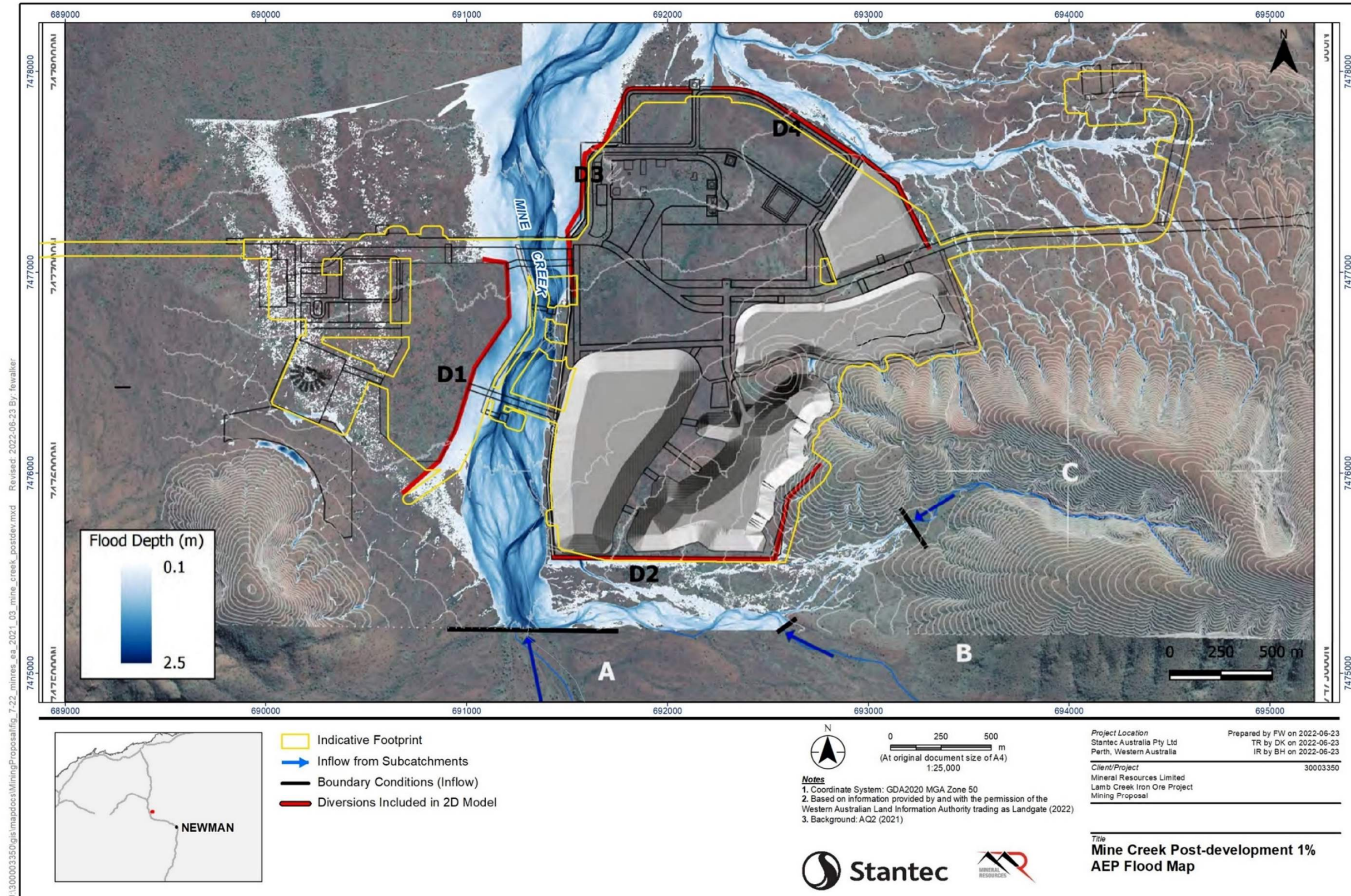
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FIGURE 30: MINE CREEK PRE-DEVELOPMENT 1% AEP FLOOD MAP

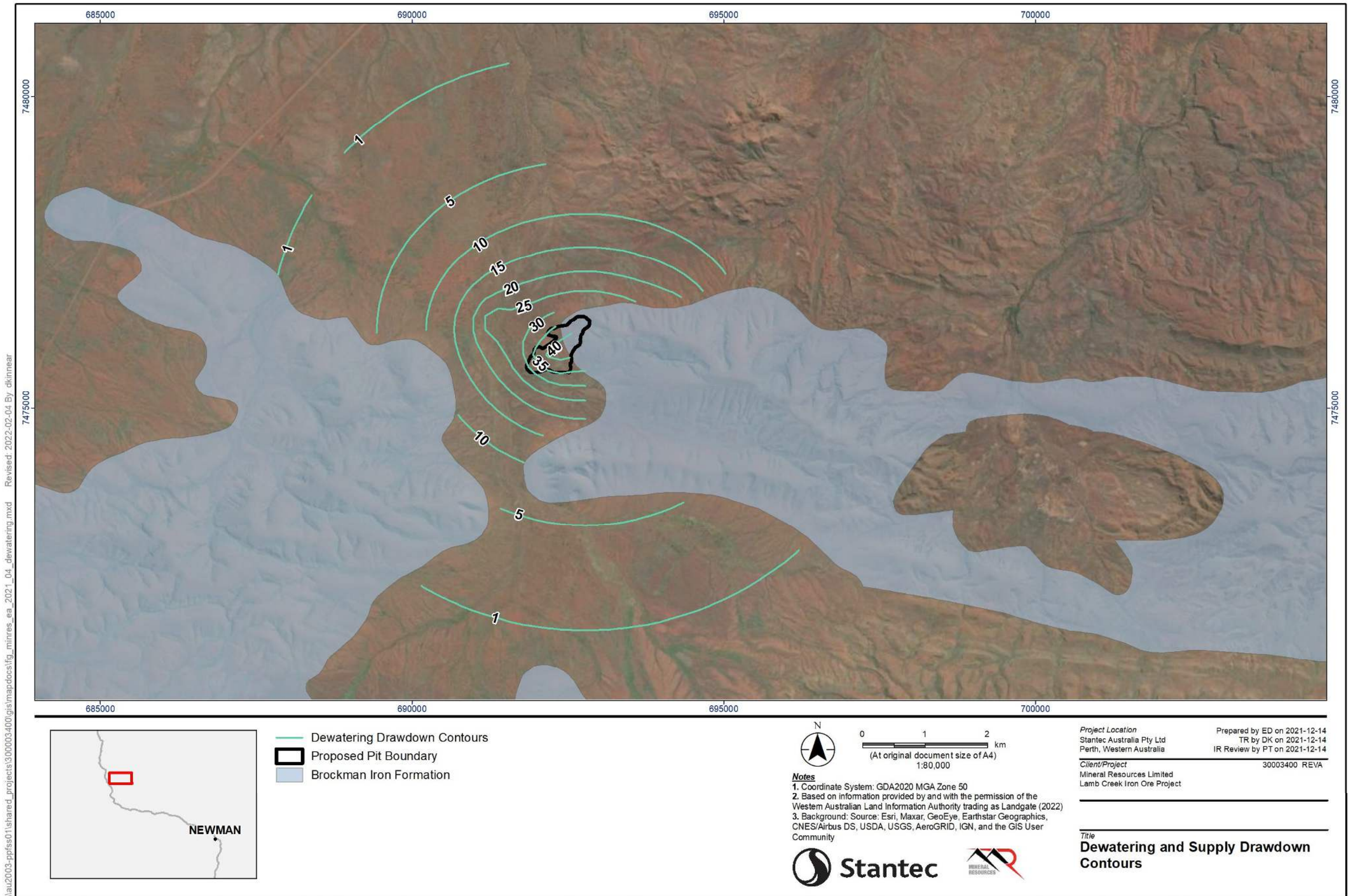
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FIGURE 31: MINE CREEK POST-DEVELOPMENT 1% AEP FLOOD MAP

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FIGURE 32: GROUNDWATER DRAWDOWN CONTOURS

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10.5.4. Disturbance and Exposure of PAF / ASS

One sample out of 10 of shale waste rock, found at the base of the proposed pit, was classed as PAF (MBS Environmental 2021). Any of this type of shale potentially exposed at or near the base of the pit will be covered by backfilling and will eventually be located beneath the recovered water table. A 'Waste Rock Management Work Instruction' specific to the Project will be developed to minimise the risk from PAF shale wastes, should it be encountered. This Procedure will be developed in accordance with the MinRes Waste Rock Management Procedure (MRL-EN-PRO-0021) and implemented to ensure PAF waste is encapsulated within the pit backfill. Therefore, waste rock is not anticipated to be a risk to the surrounding land, soil or groundwater.

There are no impacts expected as a result of ASS. Geochemical characterisation of waste rock has confirmed the majority of the materials to be handled have extremely low acid generation potential and are considered unlikely to produce acidic or saline seepage. Of the seven waste rock types present within the Proposal Area, geochemical assessment and physical characterisation has shown that six types pose low to no risk of generating saline, acidic or metalliferous discharges. The geochemical assessment included colluvium and detrital waste types and these were also shown to have very low concentrations of total sulphur (0.01% to 0.02%) (MBS Environmental 2021). However, if any ASS is discovered, the Proponent will implement an ASS Management Plan to manage such material.

10.5.5. Contamination Of Surface Water and / or Groundwater

There are no anticipated impacts from the Proposal on surface or groundwater quality as a result of contamination. Hydrocarbons will be managed to avoid leaks and spills through the use of bunds, location of bunded areas either outside floodplains or appropriately elevated to avoid the risk of inundation. Fuel / chemical storage and transfer will occur within designated bunded areas. Off-road driving will be avoided. In addition, waste rock is not anticipated to contain PAF / ASS material and seepage is not expected to occur due to the presence of drainage bunds to direct water away from the mining area as soon as practicable.

10.5.6. Mitigation

The Proponent has applied the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) during the design, planned construction and operation of the Proposal to reduce the potential impact to Inland Waters, outlined in **Table 44**. As impacts to Inland Waters associated with the Proposal are expected to be negligible, with a spatially restricted Indicative Footprint and a short life of mine, the key mitigation measures are mostly associated with management strategies. The design and implementation of the Proposal will incorporate management actions to minimise or mitigate any adverse changes in existing flow regime, flood characteristics, scour, siltation and erosion of the drainage channels, inundation of areas upstream and water starvation of areas downstream of the Proposal, as well as minimise impacts to groundwater.

TABLE 44: PROPOSED MITIGATION MEASURES FOR INLAND WATERS

Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
Direct Impacts				
Altered hydrological regime	<ul style="list-style-type: none"> Access road crossing of Mine Creek designed so as not to impede normal surface water flow. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Culverts and floodways along access roads will maintain existing flood characteristics and maintain natural flow volumes. There is not anticipated to be any excess groundwater requiring discharge to the environment, minimising impacts to natural hydrological regimes, as well as impacts to any temporary aquatic biota (e.g. sediment loading), where present. Any runoff or rainfall required to be discharged to the environment (e.g. during a 10% AEP flood event) will be captured by bunding and diverted to settling ponds and sediment traps, located downstream of the mine disturbance area (outside of the 1% AEP floodplain of major drainage lines), prior to being released to the environment to reduce impacts to any temporary aquatic biota (e.g. sediment loading), where present. Any runoff or rainfall that accumulates in the pit will be used for dust suppression and/or as process water in the first instance. However, during rare rainfall events, there may be a requirement for short-term discharge to a local drainage line after passing through settling ponds and sediment traps, so as to limit impacts to natural hydrological regimes, as well as impacts to any temporary aquatic biota (e.g. sediment loading), where present. Sediment traps will be designed to remove particles greater than, or equal to, 75 µm from surface water prior to release to the environment. 	<ul style="list-style-type: none"> Rehabilitate surfaces to align with original topography, as far as practicable. Implement an appropriate rehabilitation plan in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No
Groundwater drawdown	<ul style="list-style-type: none"> Unavoidable within the pit location. No groundwater dependent vegetation was identified from the Proposal Area, avoiding impacts to this GDE type. 	<ul style="list-style-type: none"> Short life of mine. Implement groundwater management strategies in accordance with the GWOS. Groundwater abstraction for pit dewatering will be managed in accordance with a RIWI Act groundwater licence and associated GWOS. Hydrogeological assessments will continue to be undertaken to inform progressive dewatering requirements. While subterranean fauna has been identified from the Proposal Area, drawdown at the stygofauna location is expected to be minimal to no drawdown (Section 10.5.3). 	<ul style="list-style-type: none"> Groundwater is expected to recover to a substantial extent within 3 years of cessation of dewatering, and to recover back to original SWL within five to 30 years. The open pit will be backfilled to a minimum of 5 m above the baseline groundwater level, to manage residual drawdown following groundwater recovery. Implement an appropriate rehabilitation plan in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No
Indirect Impacts				
Disturbance and exposure of PAF / ASS	<ul style="list-style-type: none"> Excavation of PAF and ASS will be avoided, where practicable. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement the PAF Management Plan and/or ASS Management Plan, where PAF/ASS is present (in accordance with the (DER 2015). 	<ul style="list-style-type: none"> PAF shale to be managed in accordance with PAF Management Plan, and any shale waste rock will be encapsulated within pit backfill, and the pit will be backfilled above any known shale locations. Implement an appropriate rehabilitation plan in accordance with the approved MCP. 	No

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Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
Contamination of surface water and/or groundwater	<ul style="list-style-type: none"> Avoid fuel/chemical storage and transfer from occurring outside of designated areas. Avoid off-road driving and stay on approved access tracks and roads. 	<ul style="list-style-type: none"> PAF shale to be managed in accordance with PAF Management Plan, and any shale waste rock will be encapsulated. Short life of mine. Implement surface and groundwater management strategies in accordance with the SWMP and GWOS. Implement the Proposal EMS to minimise spillage and environmental contamination from handling, storage and processing of materials. Implement the PAF Management Plan, where PAF is present. Spill response training shall be delivered to all personnel as part of the induction process. Hydrocarbons will be managed to avoid leaks and spills through the use of bunds, location of bunded areas being either outside floodplains or appropriately elevated to avoid the risk of inundation. Signage and bunding on all unstable landforms. Maintain high standard of housekeeping around Proposal Area. Treat and dispose of all domestic wastewater / WWTP effluent appropriately. 	<ul style="list-style-type: none"> Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. Where spills occur outside bunded areas, remediation will occur immediately to avoid contamination of surface and groundwater. Implement an appropriate rehabilitation plan in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No

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10.6. ASSESSMENT OF SIGNIFICANT RESIDUAL IMPACTS

Based on the assessment of potential impacts and the application of the EPA's mitigation hierarchy to protect environmental values associated with this factor, the Proponent considers that the EPA objective for this factor can be met, and that there will be **no significant residual impacts** to Inland Waters.

10.7. ENVIRONMENTAL OUTCOMES

Based on the surveys and investigations undertaken to date, the potential direct, indirect and cumulative impacts of the Proposal are expected to align with the EPA objective (**Section 10.1**) and guidance (**Table 41**) for Inland Waters, to maintain biological diversity and ecological integrity. The outcomes and proposed mitigation measures aim to:

- protect environmental values associated with Inland Waters
- facilitate meeting the EPA's objective for this factor.

The predicted environmental outcomes for Inland Waters are summarised as follows:

- The Marillana Creek sub-catchment will decrease by approximately 0.3% during operations (0.1% post-closure), as a result of the location of the proposed pit and associated infrastructure, which is unlikely to substantially affect the surface hydrology of the Proposal Area or waterbodies located downstream of the confluence of Mine Creek and Marillana Creek.
- There is a lack of permanent or semi-permanent surface water within the Proposal Area.
- Surface water flow diversion structures will be relatively small in size, located within a few hundred metres of the Proposal Area, and are not expected to impact surface water flow downstream.
- The discharge of excess water into the environment will only occur during significant rainfall events, with this water being managed to remove sediment and contaminants, prior to discharge.
- Negligible indirect impacts are anticipated, with mitigation proposed to manage surface water flow on-site and to maintain hydrological regimes in the broader region through implementation of a SWMP.
- Operational impacts will be managed through a licence issued under Part V of the EP Act.
- A MCP will be implemented to ensure that closure design aligns with regulatory expectations, including partial backfilling of the pit to avoid the development of a permanent pit lake.

The Proponent considers that the Proposal can be managed to meet the EPA's objective for Inland Waters, aided by the conceptual design, planned construction and operational procedures that will be implemented to avoid, mitigate and maintain values.

11. ENVIRONMENTAL FACTOR AND OBJECTIVES – SOCIAL SURROUNDINGS

11.1. EPA OBJECTIVE

The EPA's objective for social surroundings is 'to protect social surroundings from significant harm' (EPA 2023a).

11.2. POLICY AND GUIDANCE

The Proponent has considered published policy and guidance relevant to this factor as summarised in **Table 45**. The Proponent has specifically considered guidance documents in the following ways:

- Surveys and analyses undertaken and planned to describe the receiving environment and its significance
- Identification of activities which may lead to impacts to social surroundings
- Application of the EPA's mitigation hierarchy in elements of Proposal design.

TABLE 45: POLICY AND GUIDANCE FOR SOCIAL SURROUNDING

Policy / Guidance	Consideration
Referral of a proposal under section 38 of the <i>Environmental Protection Act 1986</i> : Instructions (EPA 2021c)	The RSD has been prepared in accordance with the instructions.
How to prepare an Environmental Review Document: Instructions (EPA 2021a)	This RSD has been prepared in accordance with the instructions.
Statement of environmental principles, factors and objectives and aims of EIA (EPA 2020a)	Impacts of the Proposal have been assessed against the EPA objective for this factor.
Environmental Factor Guideline – Social Surroundings (EPA 2023a)	The information provided in this chapter addresses the 'considerations for environmental impact assessment' listed in this document
Guidance Statement No. 41: Assessment of Aboriginal Heritage (EPA 2004a)	This guidance considers 'Aboriginal heritage' in circumstances where heritage values are linked directly to the physical and biological attributes of the environment and when the protection and management of those attributes are threatened as a result of a proposed development. All Aboriginal heritage surveys conducted for the Proposal will be conducted in accordance with the guidance in this document.
Aboriginal Heritage Due Diligence Guidelines (DAA and DPC 2013)	The purpose of these guidelines is to assist land users to be more aware of how their activities could adversely impact an Aboriginal site. The Proponent remains mindful of these guidelines in evaluating how Proposal activities may affect Aboriginal heritage.
Engage Early: Guidance for proponents on best practice Indigenous engagement for environmental assessments under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) (DoE 2016b)	Guidance for proponents on best practice Indigenous engagement for environmental assessments. The Proponent has actively taken steps to identify and engage with Traditional Owner and other Aboriginal stakeholders as early as possible in the development of the Proposal.

11.3. RECEIVING ENVIRONMENT

11.3.1. Environmental Studies and Survey Methods

A Traffic Impact Assessment has been conducted to address any potential impacts to Social Surroundings related to the proposed site access road intersection with the Great Northern Highway and vehicle movements (**Appendix M**Appendix N) (Shawmac 2021). The results of this assessment are summarised in **Table 46**.

Heritage surveys and social surrounds consultation have been undertaken with the relevant Traditional Owners.

TABLE 46: STUDIES FOR SOCIAL SURROUNDINGS

Studies And Surveys	Scope And Timing	Consistency With Guidance And Limitations	Key Findings
Social Surroundings On-Country Consultation (October 2024)	On-Country meeting of the MHERC conducted 21-22 October 2024 to ensure committee members are fully informed before making decisions on level of support for the project.	The Social Surroundings consultation was conducted in accordance with the WA Environmental Protection Authority's <i>Technical Guidance – Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage</i> (EPA 2023)	Further examination of opportunities for reducing extent of ex-pit waste rock landform remaining post-operations to continue. Support for the project on the basis of continuing collaboration on development of the Mine Closure Plan.
Ethnographic On-Country Consultation (August 2024)	As follow-up from June 2024 Social Surrounds consultation, further ethnographic consultation conducted in August 2024 to confirm avoidance of Gaguna heritage place by identifying if it was connected with another place.	Conducted in accordance with arrangements agreed with BNTAC.	Consultation confirmed MinRes' proposed Project footprint and activities within development envelope avoid heritage place Gaguna, administered by the DPLH. Banjima representatives to be engaged as monitors during initial land clearance. Further ethnographic studies required prior to entry into any heritage zones. Further discussion required regarding proposed mineralised waste dump as Banjima representatives concerned about proximity to hill.
Social Surroundings On-Country Consultation (June 2024)	On-Country consultation with Banjima Traditional Owners conducted 17-21 June 2024 to identify Social Surroundings values within the Lamb Creek Project area. The purpose of the Social Surrounds Consultation was to identify values that may be present within the development envelope, understand if and how these values may be impacted, and implement measures to avoid, minimise or offset impacts, as guided by the Banjima Traditional Owners.	The Social Surroundings consultation was conducted in accordance with the WA Environmental Protection Authority's <i>Technical Guidance – Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage</i> (EPA 2023)	The extent of the heritage place known as Gaguna should be reviewed and confirmed, validating whether proposed disturbance avoids all heritage sites. MinRes should consider further options for mine closure, including those requiring disturbance beyond current development envelope and provide access to base of the (partially) backfilled pit. MinRes should provide further information supporting its position that backfilling of all waste rock into pit void is economically unviable.
Traffic Impact Assessment – Lamb Creek Iron Ore Project Great Northern Highway Intersection Design (Shawmac 2021)	The study report was finalised in May 2021 and the scope included: <ul style="list-style-type: none"> Collection of background data including traffic counts and crash data Details of the proposed transportation of ore as provided by the client. This includes the proposed yields, operating hours and periods, vehicle numbers, types and loads. Assessment of the proposed access onto GNH in accordance with MRWA and Austroads guidelines with regards to safety, sight distance requirements, geometry and interaction with non-site traffic Assessment of the development impact on the immediately adjacent road network at the subject intersection Review of any site-specific safety issues associated with the proposal. Assessment of the proposed crossing in relation to the MRWA RAV Assessment Guidelines 	The Traffic Impact Assessment (TIA) was undertaken in accordance with the WA Planning Commission's (WAPC) <i>Transport Impact Assessment Guidelines for Developments: Volume 4 – Individual Developments</i> (WAPC 2016)	This TIA has concluded the following: <ul style="list-style-type: none"> A conservative estimate of the peak traffic generation of 15 loaded and 15 unloaded haulage vehicles in addition to 100 LV movements (50 in each direction to and from Newman) per hour can be accommodated within the capacity of the existing road network. The additional traffic generated by the site is not considered likely to increase the likelihood of crashes to unacceptable levels. The proposed intersection can operate at acceptable levels of service. GNH has the appropriate Restricted Access Vehicle (RAV) network for proposed operation at present. Based on the predicted traffic volume, the mine access road intersection is required to have Basic Left-turn treatment (BAL) and Auxiliary Right Turn (AUR) treatment. In this instance, Auxiliary left turn (AUL) treatment and Channelised Right-Turn (CHR) treatment is recommended to improve safety. Further, in accordance with MRWA requirements, the seal should be extended for 100 m or to the road reserve boundary, whichever the greater, into the mine access road. A 900 m (minimum) acceleration lane is considered warranted towards north of the mine access road intersection.

11.3.2. Aboriginal Social and Cultural Heritage

11.3.2.1. Native Title

The Proposal lies wholly within the Banjima Native Title Determination Area (WCD2014/001, WAD6096/1998). Initially recognised by the Federal Court in 2014 and varied by appeal in 2015, this determination area encompasses more than 8,000 km² of the Central Pilbara region. The Banjima People were recognised as having a range of exclusive and non-exclusive Native Title rights across the determination area.

11.3.2.2. Consultation and Engagement with Traditional Owners

Engagement with Traditional Owners in relation to the Proposal commenced in 2012 through the heritage survey processes and the negotiation of a native title agreement that was concluded in 2017 (since expired). Extensive further engagement and consultation has been undertaken with BNTAC in relation to the Proposal as set out in **Table 12**.

The Proponent has engaged in ongoing consultation with BNTAC and relevant Banjima People over the history of the Proposal and continues to work collaboratively to foster this relationship with regular meetings. Consultation has addressed:

- Proposal overview and progress updates, including amendment of Proposal elements following feedback.
- Key referral and approvals documents.
- The Proponent's commitment to its relationship with the Banjima People.
- Heritage surveys, including protection of Aboriginal sites.
- Business and employment opportunities that may arise during project development.

In particular, the detailed engagement and consultation undertaken with BNTAC has resulted in the establishment of a Mineral Resources Heritage Environment Reference Committee (**MHERC**), led by nominated members of the Banjima People to consider the impact of the Proposal on important heritage values. Specific engagement has included on-Country discussions and inspections of the site. Through these engagements the Proponent has been able to identify Social Surrounds values that may be present within the disturbance envelope (e.g. general amenity, water availability), understand if and how these values may be impacted, and implement measures to avoid, minimise or offset impacts, as guided by the Banjima Traditional Owners.

As a result of the detailed engagement and consultation, in November 2024 BNTAC provided MinRes with a letter of support for the Lamb Creek Project (**Appendix N**). The letter notes that MinRes has undertaken detailed engagement and consultation with the Banjima People on the proposal and has altered the Proposal's design and management controls in response to feedback from the MHERC. As a result, BNTAC and the MHERC are satisfied with the level of engagement to this point in the life of the Proposal and provide support subject to conditions as listed in the letter. These included (among others); no on-site landfills, pit backfilled to minimum of 5m above the pre-mining water table, no permanent ex-pit storage of mineralised waste, various amendments which have been made to Proposal elements to minimise impacts to visual amenity and access road to be paved with asphalt to reduce impacts from dust.

11.3.2.3. Aboriginal Heritage Sites

The *Aboriginal Heritage Act 1972* protects all Aboriginal heritage sites in WA, regardless of whether they are listed on the Register of Aboriginal Sites and requires that consent is obtained from the Minister for Aboriginal Affairs for any activity which will impact Aboriginal heritage sites. Authorisation can also be granted under the *Aboriginal Heritage Act 1972* to enter, excavate, examine or remove anything on an Aboriginal heritage site for research purposes (e.g. for archaeological excavation). In parallel with this, the terms of the native title agreement and any agreed Cultural Heritage Management Plan (CHMP) will govern the protection of Aboriginal sites which may be impacted by the Proposal.

Over the course of the Proposal, comprehensive heritage investigations have been conducted in cooperation with the Banjima People. Through this work, 28 heritage places were identified within, and adjacent to, the Proposal Area. A number of the sites recorded have been lodged (not registered) under the *Aboriginal Heritage Act 1972*. No registered sites recorded in the Aboriginal Cultural Heritage Inquiry System (AHIS) (DPLH 2018) under the *Aboriginal Heritage Act 1972* occur within the Indicative Footprint or Development Envelope.

The most significant site identified during heritage investigations is a large ethnographic site, known by the Banjima People as Gaguna. The 27 other places are archaeological in nature and consist of artefact scatters and scarred trees. The Proposal's Indicative Footprint and Development Envelope avoid Gaguna and the 27 other identified heritage places to ensure that their cultural values are protected. Due to the sensitive and confidential nature of the cultural significance of this place, no further details are provided in this RSD.

11.3.2.4. Cultural Uses

The Proponent recognises the high cultural value of the Gaguna site and has taken steps to ensure that it is not impacted by the Proposal. The Proponent will ensure that its activities associated with the Proposal do not detract from the value of this place and that Banjima People the Proponent's activities do not restrict access to this area for traditional cultural purposes to maintain its values. Through ongoing engagement and consultation, the Proponent will ensure the Banjima People are also able to access the Proposal Area and other heritage places to the extent it is safe to do so.

11.3.3. European Heritage and Cultural Values

In WA, the *Heritage Act 2018* makes provision for the preservation of places of historic significance. Under the *Heritage Act 2018*, places identified as meeting the criteria outlined in s. 37 are placed on the State Register of Heritage Places. Places of Commonwealth heritage significance are protected under the EPBC Act and can be placed on the Australian Heritage Database.

European settlement of the Pilbara began in the 1860s (van Vreeswyk *et al.* 2004), with pastoralism dominating the region for the next 100 years as European settlers arrived with livestock to establish sheep and cattle stations. Many of the European heritage sites in the Pilbara relate to these historic pastoral stations, natural features (such as surface water pools) and town sites. The inHerit database indicates that there are no European heritage sites present within the Development Envelope, and no World Heritage Properties or National Heritage Places listed under the EPBC Act occur within the Development Envelope.

11.3.4. Amenity, Tourism, Recreational and Community Uses

The Pilbara is a large, sparsely populated region. The closest population centre (sensitive receptor) is the town of Newman, located approximately 130 km from the Proposal Area. The region is home to the Banjima People, with the majority of the community living in the Pilbara's regional centres of Karratha, Roebourne, Onslow, Pannawonica and Port Hedland, and in a number of remote Pilbara communities such as Yandeyarra, Youngaleena, Wakathuni, Bellary Springs and Wirrilimarra. None of these sensitive receptors are in proximity to the Development Envelope.

GNH is located approximately 10 km from the Proposal Area. This highway is one of two main routes available for north-south traffic connecting the southwest, Midwest and Pilbara regions in WA. It is used by tourists as well as both national and regional freight and mining-related traffic. The Pilbara is increasingly recognised for its natural values, and tourism is therefore a key economic driver for the region with more than one million visitors every year, generating \$413 million in gross revenue annually (Minerals Council of Australia & Commodity Insights 2020).

Mining and associated infrastructure (e.g. accommodation camps, rail lines) are prominent land features in the Pilbara. The region is also subject to several pastoral leases, including the Juna Downs pastoral lease (currently being restocked, but not in the area of the Proposal – 8/02/2024, **Table 12**) that underlies the Proposal Area. Historic pastoral land use has significantly modified or impacted the natural form of the landscape in the region.

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11.4. POTENTIAL IMPACTS AND MITIGATION

11.4.1. Direct and Indirect Impacts

The Proposal may directly and indirectly impact on social surroundings, with the potential direct impacts identified as:

- Disturbance to sites of cultural heritage significance; however, the Proposal has been designed to avoid and maintain identified places of significance.
- Increased traffic on GNH hauling iron ore to Port Hedland which may result in impacts to amenity for the three-to-five-year operating life of the mine.

The potential indirect impacts have been identified as:

- Disturbance of places of cultural significance, plants, and animals with cultural associations due to dust, noise and altered hydrological regimes
- Visual, noise, dust or odour impacts on amenity (although these will be short-term and are likely to be negligible).

11.4.2. Disturbance of Sites of Aboriginal or European Cultural Heritage Significance

There are no registered sites of Aboriginal or European cultural heritage significance currently identified within the Development Envelope. All Aboriginal heritage places identified within, and adjacent to, both the Development Envelope and Indicative Footprint have been avoided. Consultation will be ongoing to ensure the Proponent is aware of any concerns that Traditional Owners may have in regard to Aboriginal heritage and culture issues. A comprehensive CHMP is proposed to be developed with the Banjima People to ensure any significant sites (including Gaguna) are appropriately managed. The Proponent is committed to **continuing to avoid** impacts to sites of Aboriginal heritage significance and as noted above, has designed all Proposal elements and activities to avoid all heritage places recorded to date (i.e. Gaguna and the 27 other sites). It is considered that there is no risk to sites of cultural heritage significance being impacted as a result of the Proposal.

11.4.3. Increased Traffic on GNH Hauling Iron Ore to Port Hedland Which May Result in Impacts to Amenity

A Traffic Impact Assessment (TIA) was conducted (refer **Table 46**) based upon haulage of 10 mtpa with a conservative estimate of peak traffic generation of 15 haulage vehicles per hour (vph) inbound and 15 haulage vph outbound, in addition to 100 light vehicle movements (50 inbound, 50 outbound) per hour. The TIA also determined the estimated peak traffic generated could be accommodated within the capacity of the existing road network. The TIA identified GNH has the appropriate RAV network to accommodate heavy vehicle haulage, and the additional traffic potentially associated with the Proposal is not expected to increase the likelihood of crashes to unacceptable levels (Shawmac 2021). In addition, iron ore produced by the Proposal will be replacing iron ore haulage capacity from other MinRes operations delivering to Port Hedland. Therefore, it is expected there will be no net increase in heavy vehicular traffic on GNH resulting from the Proposal.

11.4.4. Disturbance Of Places of Cultural Significance, Plants, and Animals with Cultural Associations

The Proposal is located approximately 10 km from GNH and the site will be accessed via a private haul road. Mine pits, WRLs and associated infrastructure are not expected to be visible to tourists and community members driving along GNH, and no noise or odour impacts are expected to impact highway users.

In the Pilbara, dust generated by mining activities is likely to be both short-lived and transported for relatively short distances of 100 m to 200 m. Therefore, given the distance of the Proposal Area from GNH there is a low risk of any significant impacts to users of GNH.

In consultation with BNTAC and relevant Banjima People, the Development Envelope has been designed to avoid all culturally sensitive places. Disturbance of plants and animals with cultural associations has

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also been minimised in the project design. With the implementation of the proposed management controls (e.g. SFMP, FVMP) and CHMP, no significant impacts are expected on culturally significant plants or animals identified within the Development Envelope to date. If any new culturally sensitive places are identified during the operation of the Proposal, exclusion zones will be implemented in consultation with the Traditional Owners and the proposed dust, noise and water management controls will be implemented for these areas.

11.4.5. Visual, Noise, Dust or Odour Impacts on Amenity

As the Proposal is not located within close proximity to sensitive receptors, it is considered unlikely that there will be any impact on amenity as a result of implementing the Proposal. Any impacts are anticipated to be short-term and are likely to be negligible. Amendments have been made to Proposal elements to mitigate concerns raised by stakeholders regarding visual amenity.

11.4.6. Mitigation

The Proponent has applied the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) during the design, planned construction and operation of the Proposal to reduce the potential impact to social surroundings, outlined in **Table 47**.

Impacts to social surroundings associated with the Proposal are expected to be negligible, with all Proposal elements and activities designed to avoid heritage places recorded to date, a lack of registered Aboriginal heritage sites or sites of cultural significance located within the Development Envelope, a CHMP, GWOS and SWMP to be implemented to minimise impacts, a spatially restricted Indicative Footprint and a short life of mine. In addition, amendments have been made to Proposal elements to mitigate concerns raised by stakeholders regarding visual amenity and concerns over cumulative impacts have been discussed and agreed to be minimal.

The proposed access road from the intersection with the GNH up to the operational area of the Project within M47/1592 will be sealed, minimising the potential for impacting dust conditions on the GNH. Iron ore loads transported on the GNH will also be covered.

TABLE 47: PROPOSED MITIGATION MEASURES FOR SOCIAL SURROUNDINGS

Potential Impact	Avoid	Minimise	Rehabilitate	Offset Required?
Direct Impacts				
Disturbance of sites of aboriginal or European cultural heritage significance	<ul style="list-style-type: none"> All Proposal elements and activities have been designed to avoid heritage places recorded to date. No registered Aboriginal or European heritage sites or sites of cultural significance have been identified within the Development Envelope to date. If any additional heritage places are identified within the Development Envelope, the Proponent will assess options for implementing exclusion zones. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement best-practice management for Aboriginal heritage, including the close involvement of Traditional Owners in management and monitoring. Consultation with Traditional Owners to be ongoing to ensure the Proponent is aware of any new heritage places that may be identified. 	<ul style="list-style-type: none"> n/a 	No
Increased traffic on GNH which may result in impacts on amenity	<ul style="list-style-type: none"> Additional cumulative impact avoided due to heavy vehicle haulage from the Proposal replacing haulage planned for other MinRes operations. 	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> n/a 	No
Indirect Impacts				
Disturbance of places of cultural significance, plants, and animals with cultural associations	<ul style="list-style-type: none"> No culturally sensitive places have been identified within the Development Envelope to date. If any new culturally sensitive places are identified within the Development Envelope, the Proponent will assess options for implementing exclusion zones. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement SFMP, FVMP and CHMP to minimise impacts on plants, animals with cultural associations. Implement best-practice management for Aboriginal heritage, including the close involvement of Traditional Owners in management and monitoring. Consultation with Traditional Owners to be ongoing to ensure the Proponent is aware of any new sites that may be identified. Implement Dust Management Procedure to ensure dust emissions and associated impacts are minimised. Implement SWMP and GWOS to minimise impacts on hydrological regimes. Minimise any access restrictions on Traditional Owners to culturally significant places 	<ul style="list-style-type: none"> Rehabilitate surfaces to align with original topography, as far as practicable. Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No
Visual, noise, dust or odour impacts on amenity	<ul style="list-style-type: none"> Proposal Area located away from sensitive receptors. Avoidance through informed design. The intersection of the haul road with GNH, and remainder of the access road up to the operational area within M47/1592, will be sealed to reduce the generation of dust. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Implement Dust Management Procedure to ensure dust emissions and associated impacts are minimised. Noise levels from construction and operation are predicted to comply with the Noise Regulations. The Proponent will implement noise standard controls including ensuring all relevant plant and machinery is fitted with noise dampening equipment. 	<ul style="list-style-type: none"> Rehabilitate surfaces to align with original topography, as far as practicable. Implement an appropriate rehabilitation plan (surface treatments; seed selection, collection, storage and management) in accordance with the approved MCP. Progressive rehabilitation of disturbed areas will be undertaken throughout the life of mine, as far as practicable. 	No

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11.5. ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

Based on the assessment of potential impacts and the application of the EPA's mitigation hierarchy to protect environmental values associated with this factor, the Proponent considers that the EPA objective for this factor can be met, and that there will be **no significant residual impacts** on social surroundings.

11.6. ENVIRONMENTAL OUTCOMES

The outcomes of the assessment of potential impacts and proposed mitigation measures to protect values associated with Social Surroundings meet the EPA's objective for this factor. The predicted environmental outcomes are summarised below:

- No impact to any registered Aboriginal site, other heritage place of cultural heritage significance, with continued, planned engagement to occur throughout the life of mine of the Proposal.
- No impact on amenity from traffic on GNH as the ore haulage will replace haulage from other projects.
- No visual, noise, dust or odour impacts on sensitive receptors as there are none close by to the proposed mine and concerns regarding visual amenity have been addressed through amendment of relevant Project elements.
- No cumulative impacts on Social Surroundings are expected to occur.

Given no significant residual impacts are predicted for this factor, no environmental offsets are proposed, and the Proponent considers the Proposal can be managed to meet the EPA's objective for Social Surroundings.

12. CUMULATIVE IMPACTS

In determining the significance of an impact, it is important to consider impacts at a regional scale. The cumulative impact assessment process considers both direct and indirect impacts that may interact spatially and / or temporally. For example, the potential for multiple mining projects to affect environmental values within a region. In isolation, a project may not be considered to have a significant impact; however, when considered along with other projects, activities and threats in the region, the cumulative impacts may be significant (EPA 2014). In relation to the Proposal, the cumulative impacts are considered to be incremental, considering existing impacts and proposed developments in the surrounding region.

Cumulative impacts from the Proposal were assessed at a local, landscape, and bioregional scale where possible, defined as follows:

- **Local scale:** expressed as the cumulative increase in impacts to significant terrestrial fauna from the Proposed Action; includes the area around the impact site that has similar geology, topography, soils to the Proposed Action.
- **Landscape scale:** expressed as the cumulative impacts from third-party projects within 100 km of the Proposed Action.
- **Bioregional scale:** expressed as the cumulative impacts from third-party projects within the same Interim Biogeographic Regionalisation for Australia (IBRA) bioregion (e.g. Pilbara bioregion).

12.1. FLORA AND VEGETATION

Projects within a 100km radius of the Proposal are shown in **Figure 33**. In comparison to existing operations within the region, the Proposal is a relatively small operation with a limited mine life of five years. Mining Area C has approval to clear 21,824 ha of native vegetation, Yandicoogina 5,600 ha, Yandi 4,558 ha, and Hope Downs 1,800 ha. The clearing of an additional 638.4 ha as a result of the Proposal is minor in comparison and will not significantly contribute to cumulative impacts to key environmental factors in the region.

Significant residual impacts are not expected for flora and vegetation on a local scale; however, the Proposal will contribute to cumulative impacts at a bioregional scale, as the development of other projects occurs. Existing and foreseeable projects have a combined clearing extent of 140,664 ha. The loss of 638.4 ha of native vegetation due to clearing from the Proposal represents only 0.45% of loss when considered in culmination together with other projects (**Table 48**). In addition to the existing proposals listed in **Table 48**, there are four proposals included in the BHP Strategic Proposal that are considered reasonably foreseeable; Jinidi, Gurinbidy, Ophthalmia and Minister's North. As there is no detailed information available on these proposals, potential impacts to flora and vegetation, in particular significant flora, may be underestimated.

Loss of vegetation from the Proposal in the context of pre-European vegetation discussed in **Section 7.4.2.1**. The cumulative impact of historic clearing in the Pilbara bioregion, with the addition of the Proposal, is detailed in **Table 49**.

Clearing from the Proposal represents less than 0.1% of the pre-European vegetation within the state and within the Pilbara bioregion, with a current remaining extent of 671,843 ha (99.94%) of Hammersley 18 and 2,550,888 ha (99.99%) of Hammersley 82 vegetation associations remaining in the Pilbara bioregion. This is well above the 30% threshold for remaining extent of vegetation association within a bioregion that is set out in *Guideline: Native vegetation clearing referrals – Native vegetation clearing activities regulated under the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (DWER 2021), indicating that clearing as a result of the Proposal is low risk.

With regard to significant flora, both *Aristida lazardis* and *Rhagodia* sp. Hammersley have also been found to occur within nearby existing and foreseeable projects. The cumulative impacts to these species from existing and foreseeable projects in the region are outlined in **Table 50**. The Proposal represents only 0.5% out of the total 2.53% cumulative impact to known *Aristida lazardis* individuals, and only 0.09% of the total 5.39% cumulative impact to known *Rhagodia* sp. Hammersley individuals known in the region, indicating that clearing as a result of the Proposal is low risk.

Overall, it is considered that cumulative impacts to flora and vegetation are expected to be **low**.

TABLE 48: CUMULATIVE VEGETATION CLEARING FROM FORESEEABLE FUTURE PROPOSALS IN PROXIMITY TO THE PROPOSAL

Existing Projects in the Pilbara bioregion	Proposed Extent of Native Vegetation Disturbance (Ha)	Contribution to Clearing in the Region (%)
Mining Area C (Southern Flank) (BHP)	21,824	15.51
Yandi (BHP)	4,558	3.24
Yandicoogina (Rio Tinto)	5,600	3.98
Hope Downs 1 (Rio Tinto)	1,800	1.28
Hope Downs 4 (Rio Tinto)	5,470	3.89
Iron Valley (MinRes)	988	0.70
Marillana (MinRes/Brockman Mining)	2,985	2.12
West Angelas (Rio Tinto)	19,405	13.80
Christmas Creek (FMG)	17,956	12.77
Cloudbreak (FMG)	5,500	3.91
Roy Hill (Roy Hill)	17,395	12.37
Brockman Syncline 4 (Hamersley Iron)	3,560	2.53
Koodaideri (Rio Tinto)	12,171	8.65
Marandoo (Rio Tinto)	3749	2.67
Nyidinghu (Chichester Metals Pty Ltd)	12,365	8.79
Hope Downs 2 (Rio Tinto)	4,700	3.34
The Proposal	638.4	0.45
Region Total	140,664	-

TABLE 49: CUMULATIVE IMPACTS TO PRE-EUROPEAN VEGETATION (DBCA 2018)

Vegetation Association	Scale	Known Current Extent Remaining		Proposed Proposal Clearing Extent		Extent Remaining Post-Proposal	
		(ha)	(%)	(ha)	(%)	(ha)	(%)
Hamersley 18	State Wide	19,843,148	99.75	410.43	0.002	19,842,510	99.99
	Pilbara Bioregion	671,843	99.30				
Hamersley 82	State Wide	2,157,841	99.51	227.98	0.011	2,157,613	99.99
	Pilbara Bioregion	2,550,888	99.50				

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TABLE 50: CUMULATIVE IMPACT TO PRIORITY FLORA SPECIES

Species	Project	Number Individuals Impacted	Number Known Individuals*	Proportion Known Individuals Impacted (%)
<i>Aristida lazaridis</i> (P2)	Mining Area C (Southern Flank) (BHP)	7	2,977	0.07
	West Angelas (Rio Tinto)	204	334	1.94
	Lamb Creek Iron Ore	55	7,217	0.52
	Total	266	10,528	2.53
<i>Rhagodia</i> sp. Hamersley (P3)	Hope Downs 4 (Rio Tinto)	4	8	0.08
	Roy Hill (Roy Hill)	275	3,240	5.19
	West Angelas (Rio Tinto)	4	2,047	0.08
	Lamb Creek Iron Ore	5	51	9.4
	Total	288	5,346	5.39

Note: * indicates the number of known individuals taken from the recorded individuals detailed in the ERDs of each project considered in this cumulative impact assessment.

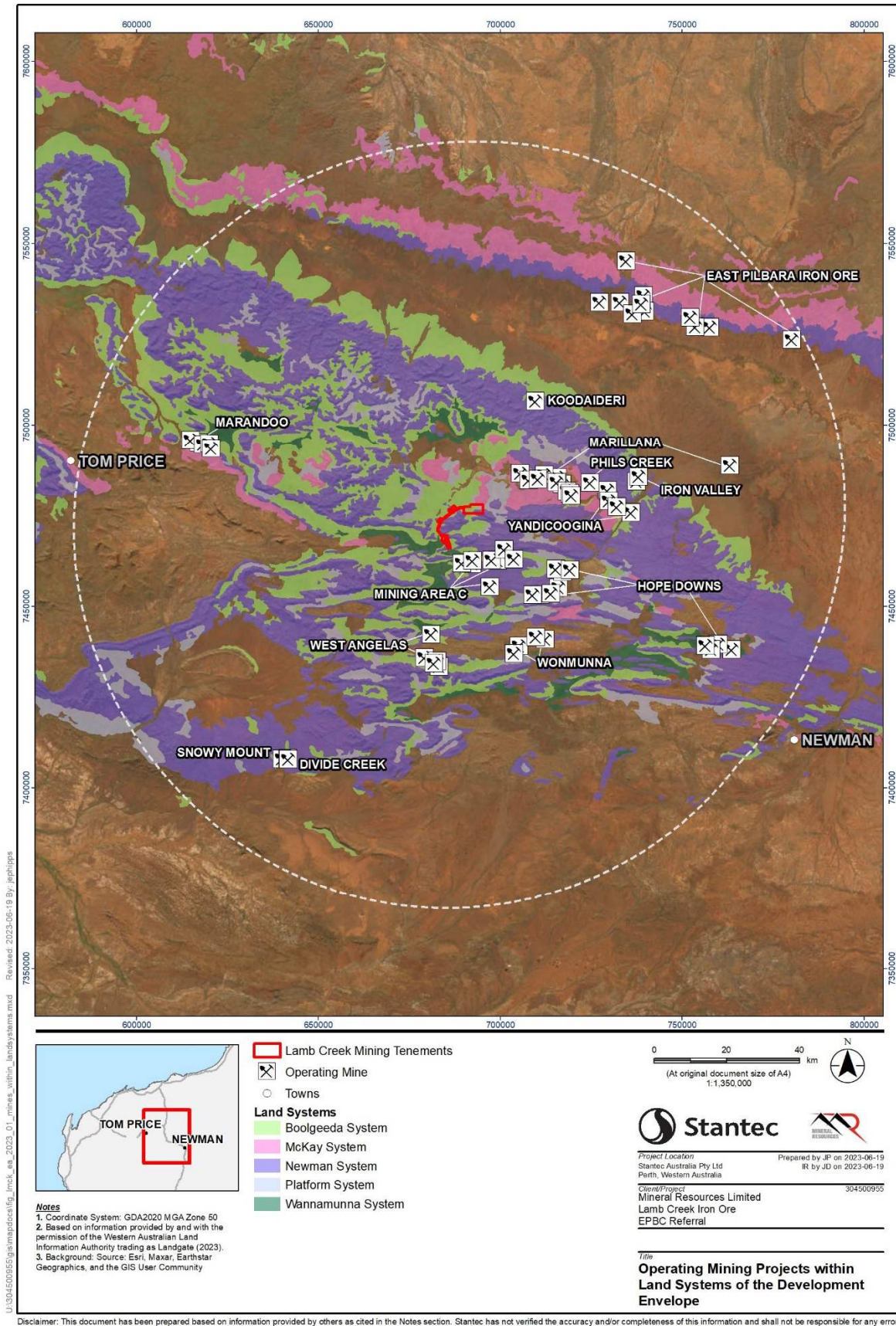


FIGURE 33: THIRD PARTY PROJECTS LOCATED IN PROXIMITY TO THE PROPOSAL

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12.2. TERRESTRIAL FAUNA

There is no central consolidated database that provides the extent of cumulative impacts of native vegetation clearing on fauna habitat in the Pilbara bioregion. The following publicly available information sources can assist with informing the cumulative impact assessment to terrestrial fauna at a landscape scale:

- DBCA Statewide Vegetation Statistics (updated in 2021) (DBCA 2019)
- Environmental Offsets Register (Government of Western Australia 2011)
- Proposal search (EPA 2023b)
- Mines and Mineral Deposits (MINEDEX) online search (DMIRS 2023a)
- Clearing referrals and other matters not for public comment or appeal search (DWER 2023).

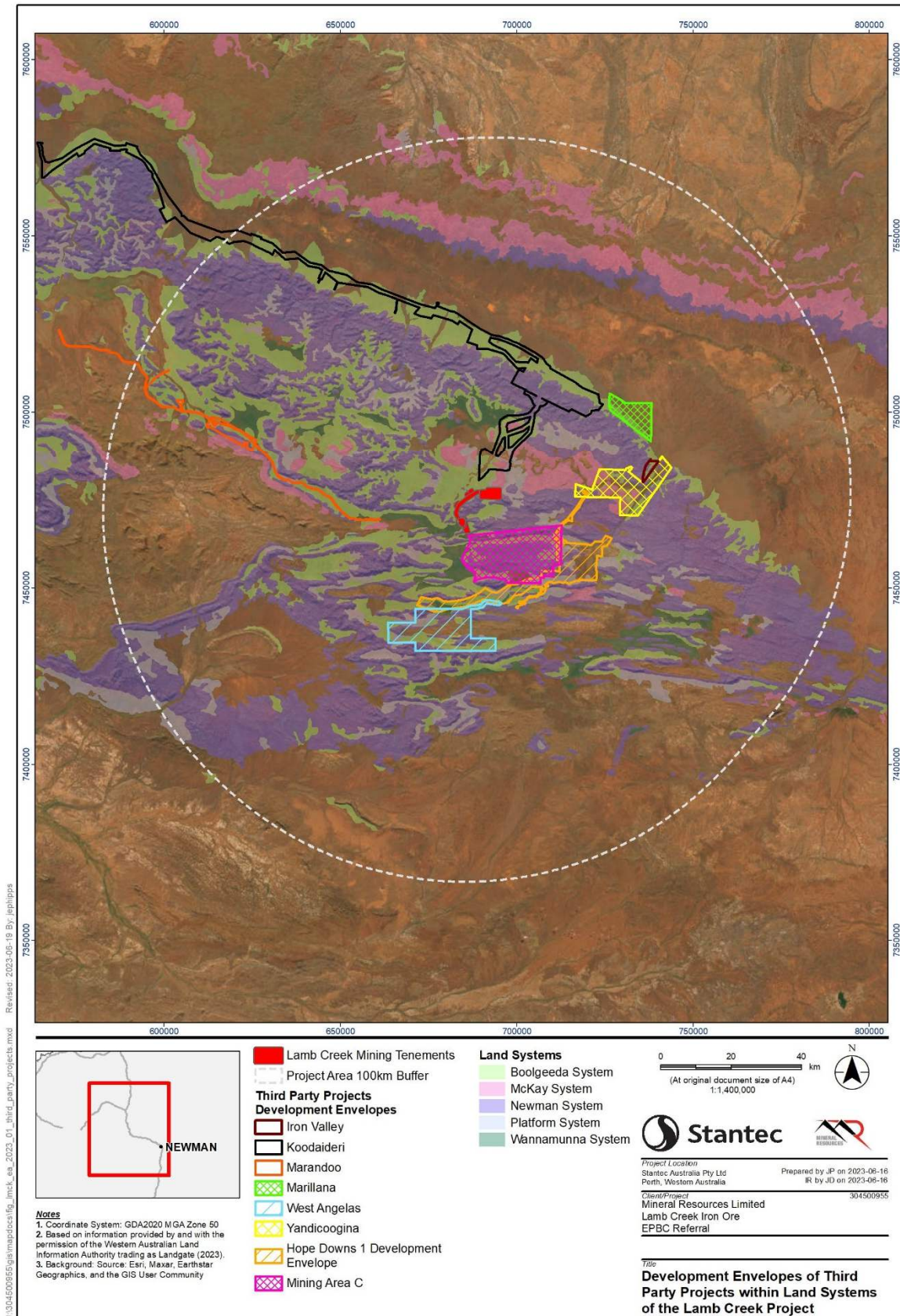
Projects within a 100 km radius of the Proposal which occur in comparable land systems to the Proposal (**Figure 34**) and have sufficient publicly accessible data, were investigated to determine their impact on environmental key factors. Existing and reasonably foreseeable third-party projects which meet the outlined criteria and which may contribute to cumulative impacts with the Proposal include:

- BHP: Mining Area C
- Brockman Resources: Marillana Ion Ore Project
- Iron Ore Holdings: Iron Valley Project
- Rio Tinto: Koodaideri Project now called Gudai-Darri
- Rio Tinto: Hope Downs (1&2)
- Rio Tinto: West Angelas
- Rio Tinto: Yandicoogina Project
- Rio Tinto: Marandoo Mine.

Other existing or reasonably foreseeable third-party projects which were identified but did not hold sufficient publicly accessible information, and as such were not considered further within the assessment, are as follows:

- BHP: Yandi
- BHP: Jinidi
- BHP: Ministers North
- Rio Tinto: Hope Downs 2.

Where possible, the cumulative impacts relevant to the Proposal have been calculated based on the third-party projects' indicative disturbance footprint. Alternatively, a more conservative estimate is provided using the Development Envelope, where values for the indicative disturbance footprint are not publicly available. Subsequently, the percentage increase in cumulative impacts attributed to the Proposal were ranked, defined as Low (0-10%); Moderate (>10%-30%) and High (>30%). This Assessment takes into consideration mitigation, monitoring and adaptive management measures applied by proponents to minimise potential impacts.



Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

FIGURE 34: ASSESSED THIRD PARTY PROJECT DEVELOPMENT ENVELOPES WITHIN 100KM AND COMPARABLE LAND SYSTEMS OF THE PROPOSAL

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Cumulative impacts to significant terrestrial fauna resulting from the Proposal may have the potential to impact the carrying capacity (i.e. maximum number of species or individuals that the environment can support) within the area for some significant terrestrial fauna species, which is largely dependent on the species' specific resource requirements and home range. Where cumulative habitat loss occurs to species which have exclusive home ranges and specific habitat requirements within the species home range, there is the potential for the cumulative disturbance to result in a reduced maximum population size for the species into the future. Conservation significant species with exclusive home ranges and specific habitat requirements relevant to the Proposal include the:

- Northern Quoll (*Dasyurus hallucatus*; En, BC Act; En, EPBC Act), which relies on rocky habitat for denning.
- Ghost Bat (*Macroderma gigas*; Vu, BC Act; Vu, EPBC Act), which relies on the presence of roost caves and, to a lesser extent, water pools.
- Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*; Vu, BC Act; Vu, EPBC Act), which relies on the presence of roost caves and water pools; and
- Pilbara Olive Python (*Liasis olivaceus barroni*; Vu, BC Act; Vu, EPBC Act) which relies on the presence of permanent water pools and rocky habitat for denning.

The confirmed records for significant terrestrial fauna species, and those considered likely to occur across relevant assessed third-party projects within 100 km of the Proposed Action within comparable land systems, are shown in **Table 51**. The following significant fauna species have been recorded or are considered likely to occur across all third-party projects and the Proposal:

- Northern Quoll (*Dasyurus hallucatus*) – Endangered.
- Ghost Bat (*Macroderma gigas*) – Vulnerable.
- Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*) – Vulnerable.
- Western Pebble-mound Mouse (*Pseudomys chapmani*) – P4, recorded.
- Pilbara Olive Python (*Liasis olivaceus barroni*) – Vulnerable.
- Gane's Blind Snake (*Anilius ganei*) – P1.
- Pilbara Barking Gecko (*Underwoodisaurus seorsus*) P2.
- Grey Falcon (*Falco hypoleucos*) – Vulnerable.
- Fork-tailed Swift (*Apus pacificus*) – Migratory, recorded.
- Peregrine Falcon (*Falco peregrinus*) – Overseas.

There is no single significant fauna that occurs across the Proposal and all third party assessed project areas. The following species have been either confirmed or likely to occur across seven or more of the nine assessed projects, indicating that these significant terrestrial fauna species are likely to be subject to cumulative impacts from development at a landscape scale within the bioregion:

- Ghost Bat (*Macroderma gigas*).
- Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*).
- Pilbara Olive Python (*Liasis olivaceus barroni*).

The Proposal is likely to result in residual impacts to the habitat of the Northern Quoll, Ghost Bat and the Pilbara Olive Python (**Section 8.6**) through the removal of critical and/ or supporting habitat. The cumulative effect of modifying critical and supporting habitat in the Pilbara is a potential indirect impact to the persistence of these species' populations. Eight active mine sites are located within 100 km of the Proposal and have potential to result in cumulative impacts through habitat fragmentation and a reduction in available critical and supporting habitat extent within the region for these species.

TABLE 51: SIGNIFICANT TERRESTRIAL FAUNA SPECIES CONFIRMED OR LIKELY TO OCCUR AT EXISTING AND REASONABLY FORESEEABLE PROJECTS ASSESSED WITHIN 100 KM OF THE PROPOSED ACTION WITHIN COMPARABLE LAND SYSTEMS.

Significant Terrestrial Fauna	Conservation Status		Proposal	Mining Area C (BHP) ¹	Marilina (Brockman Resources) ²	Iron Valley (Iron Ore Holdings) ³	Hope Downs 1 (Rio Tinto) ⁴	Gudai-Darri (Rio Tinto) ⁵	Yandicoogina (Rio Tinto) ⁶	Marandoo (Rio Tinto) ⁷	West Angelas (Rio Tinto) ⁸
	EPBC Act	BC Act									
Northern Quoll (<i>Dasyurus hallucatus</i>)	EN	EN	Likely	√	-	-	√	√	-	√	Likely
Ghost Bat (<i>Macroderma gigas</i>)	VU	VU	Likely	√	√	-	√	√	Likely	√	√
Pilbara Leaf-nosed Bat (<i>Rhinochiropterus aurantia</i>)	VU	VU	Likely	√	-	-	√	√	Likely	Likely	√
Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>)	-	P4	√	√	-	√	√	√	√	√	√
Pilbara Olive Python (<i>Liasis olivaceus barroni</i>)	VU	VU	Likely	√	Likely	-	-	√	√	√	Likely
Gane's Blind Snake (<i>Anilius ganei</i>) – P1;	-	P1	Likely	√	-	-	-	√	Likely	-	Likely

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Significant Terrestrial Fauna	Conservation Status		Proposal	Mining Area C (BHP) ¹	Marilina (Brockman Resources) ²	Iron Valley (Iron Ore Holdings) ³	Hope Downs 1 (Rio Tinto) ⁴	Gudai-Darri (Rio Tinto) ⁵	Yandicoogina (Rio Tinto) ⁶	Marandoo (Rio Tinto) ⁷	West Angelas (Rio Tinto) ⁸
	EPBC Act	BC Act									
Pilbara Barking Gecko (<i>Underwoodis aurus seorsus</i>)	-	P2	Likely	√	-	Likely	-	-	Likely	-	√
Grey Falcon (<i>Falco hypoleucos</i>)	VU	VU	Likely	√	-	-	-	√	-	-	-
Fork-tailed Swift (<i>Apus pacificus</i>)	MI	MI	√	√	Likely	Likely	-	√	√	-	√
Peregrine Falcon (<i>Falco peregrinus</i>)	-	OS	Likely	Likely	-	Likely	Likely	√	Likely	√	Likely

Note: √ = significant fauna species confirmed to occur within the Development Envelope; Likely = significant fauna species considered Likely to occur within the respective Proposal Development Envelope.

¹(BHP 2017), ²(ecologia 2011), ³(Iron Ore Holdings Ltd 2012), ⁴(Hope Downs Management Services 2000), ⁵(Eco Logical 2013), ⁶(Eco Logical 2015), ⁷(RTIO 2015), ⁸(Eco Logical 2018)

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Overall, habitat removal and degradation are together considered to be the primary impact to significant terrestrial fauna species within the Proposal area. Fauna habitats may be significant if they provide habitat important to the life history of a significant species (i.e. breeding, feeding, and roosting or aggregation areas), or where they are unique or isolated habitats (e.g. wetlands) in the landscape or region (EPA 2016f). Broad terrestrial fauna habitat within the Proposal and surrounding area was categorised into three types to allow for consolidation and comparison across third-party projects:

- **Gorges and Gullies:** considered to be of high habitat significance as it provides potential denning and foraging habitat for the Northern Quoll and Pilbara Olive Python. This habitat also provides primary foraging habitat for the Ghost Bat and the Pilbara Leaf-nosed Bat, as well as roosting habitat for the Ghost Bat and potential nocturnal refuges for the Pilbara Leaf-nosed Bat. Noting none of this habitat type is within the Proposal Development Envelope but is in close proximity in a few locations.
- **Hills, Ranges and Plateau:** considered to be of high habitat significance as it provides supporting habitat for the Northern Quoll and Pilbara Olive Python. The Peregrine Falcon may also use the cliff areas for breeding habitat. This habitat type also supports numerous caves that are considered significant habitat for the Ghost Bat and Pilbara Leaf-nosed Bat.
- **Minor Drainage Line:** considered to be of low to moderate habitat significance as it provides dispersal and foraging habitat for the Northern Quoll, Ghost Bat, Pilbara Leaf-nosed Bat, Pilbara Olive Python, potential foraging and breeding habitat for the Grey Falcon, and foraging habitat for the Peregrine Falcon.

Cumulative potential disturbance to consolidated broad terrestrial fauna habitats occurring within the Proposal, as a result of third-party projects occurring within comparable land systems within 100 km, are presented in **Table 52**. Through available habitat data, the cumulative impacts to terrestrial fauna habitat from the Proposal will not result in an increase in cumulative impacts to any specific broad fauna habitat type by more than 4%.

Cumulative disturbance is likely to be of greater consequence for terrestrial fauna of significance such as the Ghost Bat, Pilbara Leaf-nosed Bat, and Pilbara Olive Python which utilise 'Gorges and Gullies' habitat. However, note that no Gorges and Gullies habitat is within the Proposal Development Envelope. Gorges and Gullies habitat support caves, which are important for the persistence of these species within an area. While clearing may result in localised impacts to individuals within the disturbance footprint, considering that similar habitat occurs extensively throughout the Pilbara and are well represented in the vicinity of the Proposal, no significant impacts to terrestrial fauna are expected on a regional or local scale as a result of the proposed clearing.

Table 53 shows the confirmed Ghost Bat and Pilbara Leaf-nosed Bat roost caves that were identified from publicly available information, although the number of confirmed roosts is likely to be an underestimate given that survey coverage is largely associated with mining tenure in the Pilbara bioregion. The Proposal will result in a **Negligible** cumulative increase to confirmed roost caves for the Pilbara Leaf-nosed Bat and Ghost Bat that are subject to significant impacts, following implementation of mitigation measures.

Significant terrestrial fauna are unlikely to be significantly impacted by cumulative clearing of fauna habitat attributed to the Proposal, and no change to the conservation status or bioregional distribution of significant fauna species is expected to occur.

TABLE 52: CUMULATIVE IMPACTS TO BROAD TERRESTRIAL FAUNA HABITAT

Habitat Type	Proposal ²		Mining Area C (BHP) ¹		Marillana Iron Ore Project (Brockman Resources) ²	Iron Valley Project (Iron Ore Holdings) ³	Gudai-Darri Project (Rio Tinto) ⁴	Hope Downs (Rio Tinto) ⁵	West Angelas (Rio Tinto) ⁶		Yandicoogina Project (Rio Tinto) ⁷		Marandoo (Rio Tinto) ⁸	Cumulative Impact				
	Indicative Footprint (ha)	Total mapped habitat extent	DE Extent (ha)	Total mapped habitat extent					DE Extent (ha)	Total mapped habitat extent (ha)	DE Extent (ha)	Total mapped habitat extent (ha)		Total Impact of Third Party Projects (ha)	Total Cumulative Disturbance Inclusive of Proposal (ha)	Increase In Cumulative Impacts Attributed to Proposal	Total mapped habitat extent across assessed Projects (ha)	% of total mapped habitat extent (total cumulative disturbance)
Gorges & Gullies	0.0	55	1,564	4,282	Habitat information not stated	Habitat information not stated	Habitat information not stated	Habitat information not stated	2	170	0	0	Habitat information not stated	1,566	1,566	0%	4,507	35%
Hills, Ranges & Plateau	505.0	Total 1,266.1ha 319 ha Hillcrest 291.2 ha Mulga 137.9 ha Tussock grassland 517.9 ha Stony plain	Total 22,614 ha 18,696 ha Crest/slope 1,607 ha Stony plain 1,203 ha Mulga 1,108 ha Sand plain	332,646					2,140	13,232	1,222	12,349		25,976	26,481.0	2% (Low)	359,493	7%
Drainage Lines	118.7	323.7 ha	2,886	11,170					15	51	72	1,167		2,973	3,091.7	4% (Low)	12,712	24%

Note: Total cumulative disturbance includes the Proposed Action.

¹(BHP 2017), ²(ecologia 2011), ³(Iron Ore Holdings Ltd 2012), ⁴(Eco Logical 2013), ⁵(Hope Downs Management Services 2000), ⁶(Eco Logical 2018), ⁷(Eco Logical 2015), ⁸(RTIO 2015)

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TABLE 53: CUMULATIVE IMPACTS TO CAVES

Cave Category	Proposal	Third-party Projects within 100 km radius of the Proposal								Cumulative Impact		
		Mining Area C (BHP) ¹	Marillana Iron Ore Project (Brockman Resources) ²	Iron Valley Project (Iron Ore Holdings) ³	Gudai-Darri (Rio Tinto) ⁴	Hope Downs (Rio Tinto) ⁵	West Angelas (Rio Tinto) ⁶	Yandicoogina Project (Rio Tinto) ⁷	Marandoo (Rio Tinto) ⁸	Total confirmed roost caves (Total impact third party projects)	Total confirmed roost caves (Total cumulative impact including Proposed Amendment)	% Increase Cumulative Impacts Attributed to The Proposed Amendment (Cumulative Impacts Significance Rating)
Total number of caves assessed	5	150	Says several caves were assessed but no number given	Not stated	3 cave systems	9	5	1	Not stated	168	173	N/A
Number of caves recorded where Ghost Bat roost confirmed (Number subject to potential indirect or direct impacts)	5 <ul style="list-style-type: none"> • 0 direct • 5 indirect 	63 <ul style="list-style-type: none"> • 51 direct • 0 indirect 	Not stated	Not stated	1 Cave system within K75W pit adit. The size and the exact location of the roost were not determined during the survey. Estimate suggest between 1 and 5 individuals may occupy cave system	7 <ul style="list-style-type: none"> • 0 direct • 0 indirect 	5 <ul style="list-style-type: none"> • 0 direct • 0 indirect 	0	0	76 <ul style="list-style-type: none"> • 51 (67%) direct • 0 (0%) indirect 	81 <ul style="list-style-type: none"> • 51 (63%) direct • 5 (6%) indirect 	Negligible cumulative increase to confirmed Ghost Bat roost caves directly impacted. 6% cumulative increase to confirmed roost caves indirectly impacted (Low).
Number of caves recorded where Pilbara Leaf-nosed Bat roost caves confirmed (Number subject to potential indirect or direct impacts)	0	0	0	0	1 Cave system within K75W pit adit. The size and the exact location of the roost were not determined during the survey. Estimate suggest the colony could comprise 430 individuals.	0	0	0	0	1 <ul style="list-style-type: none"> • 0 (0%) direct • 0 (0%) indirect 	1 <ul style="list-style-type: none"> • 0 (0%) direct • 0 (0%) indirect 	Negligible cumulative increase to confirmed roost caves directly impacted. Negligible cumulative increase to confirmed roost caves indirectly impacted.
Mitigation measures proposed/ or implemented (Yes/No).	YES 5 caves retained. (100m radius exclusion zone from Cat. 2 and Cat. 3 Ghost bat roosts) 1 cave (Cave 1) will be temporarily closed off	YES 27 caves retained. (150m buffer implemented around all GB caves outside of the modified impact assessment area and Mining Area A EMP revision impact	NO (no caves recorded for PLNB; not stated for GB)	NO (no caves recorded for PLNB; not stated for GB)	YES K75W adit/cave system (30m x 50m) retained. (Non-mining, non-excavation, and directional lighting buffers of cave system)	NO (not mentioned)	YES 5 caves retained. 100m permanent exclusion zone around 1 cave (Cave AA1) 100m restriction zone maintained	NO (no caves recorded for PLNB and GB)	NO (no caves recorded for PLNB and GB)			

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Cave Category	Proposal	Third-party Projects within 100 km radius of the Proposal								Cumulative Impact		
		Mining Area C (BHP) ¹	Marillana Iron Ore Project (Brockman Resources) ²	Iron Valley Project (Iron Ore Holdings) ³	Gudai-Darri (Rio Tinto) ⁴	Hope Downs (Rio Tinto) ⁵	West Angelas (Rio Tinto) ⁶	Yandicoogina Project (Rio Tinto) ⁷	Marandoo (Rio Tinto) ⁸	Total confirmed roost caves (Total impact third party projects)	Total confirmed roost caves (Total cumulative impact including Proposed Amendment)	% Increase Cumulative Impacts Attributed to The Proposed Amendment (Cumulative Impacts Significance Rating)
		assessment area)					around other 4 caves.					
Number of caves (% of caves assessed) subject to significant impacts following implementation of mitigation measures.	0 (0%)	36 (24%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	36 (21%)	36 (21%)	Negligible cumulative increase to confirmed roost caves significantly impacted.

¹(BHP 2017), ²(ecologia 2011), ³(Iron Ore Holdings Ltd 2012), ⁴(Eco Logical 2013), ⁵(Hope Downs Management Services 2000), ⁶(Eco Logical 2018), ⁷(Eco Logical 2015), ⁸(RTIO 2015)

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12.3. SUBTERRANEAN FAUNA

Significant residual impacts are not expected to occur to subterranean fauna confirmed to occur in the Development Envelope (**Section 8.6**). The nearest mining operation to the Proposal is Mining Area C, located approximately 15 km to the southeast, which is a significantly larger operation. There are no other operating or reasonably foreseeable mines situated within the Marillana Creek sub-catchment.

Several subterranean fauna taxa recorded from the Proposal Area are also known from Mining Area C or the broader Pilbara bioregion. This includes the stygofauna *Diacyclops humphreysi*, *Paramelitidae* Genus 2 sp. B02, *Paramelitidae* sp. B16 and *Maarrka weeliwolli* (BHP 2017) and the troglofauna *Japygidae* 'DPL002', *Curculionidae* Genus 1 sp. B02 and *Lophoturus madecassus* (ALA 2021b; c; d). This demonstrates some degree of connectivity and habitat continuity for some of the geological formations, which are known to extend beyond the Proposal Area. The spatially restricted Indicative Footprint, short life of mine (with rapid recovery of groundwater), and the distance to Mining Area C mean there is limited opportunity for cumulative impacts from the Proposal. Therefore, cumulative impacts to subterranean fauna are expected to be **low**.

12.4. INLAND WATERS

In terms of catchment reduction, the location of the proposed pit, WRLs and topsoil stockpile will reduce the overall Marillana Creek sub-catchment by 0.3%, representing a decrease of <0.02% of the Upper Fortescue River catchment. This is not considered to be environmentally significant, particularly when considering the high variability and natural seasonal fluctuations in rainfall and catchment runoff, known from the Pilbara bioregion. Given the minor impacts on surface water flow, cumulative impacts to Inland Waters (surface water flow and groundwater availability and quality) are expected to be **negligible**.

12.5. SOCIAL SURROUNDINGS

As noted above, the Proponent has undertaken comprehensive consultation and on-Country Social Surroundings engagement with BNTAC and relevant Banjima People. In response to the outcomes of these studies, it has been accepted that the cumulative impact of the Proposal is minimal due to the small size, short duration and operational and closure controls.

As a result of the detailed engagement and consultation with the Banjima People, in November 2024 BNTAC provided MinRes with a letter of support for the Lamb Creek Project (**Section 11.3.1, Appendix N**).

13. OTHER ENVIRONMENTAL FACTORS OR MATTERS

In addition to the key environmental factors relevant to the Proposal and described in this RSD, the (EPA 2020a) identifies a number of other environmental factors that require consideration for detailed environmental assessment. The environmental factors of Benthic Communities and Habitat, Coastal Processes, Marine Environmental Quality and Marine Fauna were not considered relevant because the Proposal Area is not located within proximity to the marine environment. The remaining environmental factors of Landforms, Terrestrial Environmental Quality, Air Quality, Greenhouse Gas Emissions and Human Health were also not considered to be key environmental factors, with a summary and justification provided in **Table 54**.

The Proposal is considered unlikely to result in a significant impact to these other environmental factors, and accordingly they were not subject to detailed environmental assessment. These other environmental factors will be managed to ensure no significant impact will result from the Proposal (**Table 55**).

TABLE 54: OTHER ENVIRONMENTAL FACTORS

Environmental Factor	EPA Objective	Justification
Landforms	To maintain the variety and integrity of significant physical landforms so that environmental values are protected	The Proposal will not significantly impact any significant natural landforms.
Terrestrial Environmental Quality	To maintain the quality of land and soils so that environmental values are protected	The Proposal will not significantly impact the environmental values of land or soil.
Air Quality	To maintain air quality and minimise emissions so that environmental values are protected	The Proposal will not result in emissions that will significantly impact air quality.
Greenhouse Gas Emissions	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.	The Proposal will not result in release of a significant concentration of greenhouse gas emissions that will increase the risk of environmental harm associated with climate change.
Human Health	To protect human health from significant harm	The Proposal will not cause or emit radiation that could significantly impact on human health

TABLE 55: ASSESSMENT AND MANAGEMENT OF OTHER ENVIRONMENTAL FACTORS

Factor	Receiving Environment	Potential Environmental Effect	Management and Predicted Outcomes
Landforms	<p>Findings from Lamb Creek Iron Ore Proposal Baseline Soil and Landform Assessment (MBS Environmental 2021):</p> <ul style="list-style-type: none"> None of the landforms identified appear to have been significantly disturbed or fragmented and all landform types appear to be common within the region. Given all the landform types appear common within the proposed disturbance area, ecological impacts from landform disturbance are not expected to be significant. There are no known scientific or evolutionary values associated with the landforms within the Proposal Area. The closest geoheritage site to the Proposal Area, Hamersley Range Gorges, is around 40 km to the north northwest. It is unlikely that landforms within the Proposal Area would be considered to be geoheritage sites, given they are not unique or restricted to this area. 	<ul style="list-style-type: none"> The Proposal will involve the excavation of a small open pit mine and the construction of two WRLs. The open pit and WRLs will be permanent landscape features. The effect of these works will result in a change to the physical landforms within the Development Envelope. Further, the Proposal will require the clearing of native vegetation and soil within parts of the Development Envelope, resulting in a physical change to the environmental values currently supporting landforms. Progressive and post-mining rehabilitation works will seek to restore the environmental values within the physically altered landforms. Noting the absence of uncommon or ecologically, scientifically or socially significant landforms, the effect of the Proposal to landforms is not considered to be environmentally significant. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint. Noting there are no uncommon or ecologically, scientifically or socially significant landforms within the Development Envelope, the effect of the Proposal on landforms is not considered to be environmentally significant. In order to manage the environmental impact of the proposal on landforms, the Proponent has prepared a MCP consistent with <i>Mine Closure Plan Guidance – How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans</i> (DMIRS 2020) to be submitted with the Mining Proposal for the Proposal. The MCP incorporates general environmental management actions for progressive and post-mining rehabilitation works expected to restore the environmental values associated with landforms. The Proposal is not expected to result in a significant detrimental effect to the variety, integrity, ecological function or environmental values of landforms within the Development Envelope. Therefore, the EPA’s objective for the environmental factor for Landforms can be met.
Terrestrial Environmental Quality	<p>Findings from Lamb Creek Iron Ore Proposal Baseline Soil and Landform Assessment (MBS Environmental 2021):</p> <ul style="list-style-type: none"> Based on the characteristics of soil and subsoil within the Proposal Area it is unlikely that any of the proposed disturbances will increase the chances that the area would be subject to waterlogging, acidification, salinization, subsoil compaction and/or erosion. Based on the physical and chemical characteristics of soil types, it is recommended that surface soil can be stripped from all areas of potential disturbance as it has the potential to be used as a plant growth medium for rehabilitation purposes. Subsoil from the pit and WRD areas are physically, chemically, and structurally very similar to the topsoil and thus can also be harvested for rehabilitation purposes. Both of the major soil groups are non-sodic and non-dispersive and are structurally suitable for rehabilitation. Both soil should also be able to support plant growth given they have favourable pH ranges, low concentrations of phytoavailable contaminants and are not deficient in most nutrients and trace elements. The presence of plant roots in most of the trial pits excavated attests to the suitability of the soil to support plants native to the Proposal Area. <p>Findings from Waste Characterisation Lamb Creek Iron Ore Mine (MBS Environmental 2017):</p> <ul style="list-style-type: none"> Low to very low concentrations of sulphur and consequently extremely low acid generation potential based on the current depth of mining (i.e. remaining above the long-term water table). Low to very low concentrations of chloride (and sulphur), which indicates that waste rock is considered unlikely to produce any saline seepage. Other than a requirement for sediment management, runoff from WRLs or ore stockpiles is unlikely to adversely impact the 	<ul style="list-style-type: none"> Soil and subsoil characterisation has confirmed that it is unlikely that any of the proposed disturbances will increase the chances that the area would be subject to waterlogging, acidification, salinization, subsoil compaction and/or erosion. Studies also confirmed the soil are structurally suitable for rehabilitation to support plants native to the Proposal Area. Geochemical characterisation of waste rock has confirmed the majority of the materials to be handled have extremely low acid generation potential and are considered unlikely to procedure saline seepage. Therefore, waste rock is not anticipated to be an environmental risk to the surrounding land, soil, and groundwater. 	<ul style="list-style-type: none"> Spatially restricted Indicative Footprint and short life of mine. Soil and waste rock have been characterised and are not considered to present a significant risk to terrestrial environmental quality. In order to manage the environmental impact of the proposal on land and soil, the Proponent has prepared a MCP consistent with <i>Mine Closure Plan Guidance – How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans</i> (DMIRS 2020) to be submitted with the Mining Proposal for the Proposal. The MCP incorporates general environmental management actions aimed at protecting and minimising the impacts on terrestrial environmental quality. The MCP proposes progressive and post-mining rehabilitation works expected to restore land and soil values associated with terrestrial environmental quality. The Proposal is not expected to result in a significant detrimental effect to the quality of land and soil, or the ecological and social values they support. Therefore, the EPA’s objective for the environmental factor for Terrestrial Environmental Quality can be met.

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Factor	Receiving Environment	Potential Environmental Effect	Management and Predicted Outcomes																																																								
	<p>environment and no special management measures are required.</p> <ul style="list-style-type: none"> Waste rock from above the long-term water table and within the area of the proposed pit shell is considered geochemically benign and is suitable for construction purposes, rock armouring or other requirements as needed. 																																																										
Air Quality	<p>There are no existing land uses or residential dwellings in the vicinity of the Proposal that could be affected by changes in air quality.</p>	<ul style="list-style-type: none"> In the Pilbara, dust generated by mining activities is likely to be both short-lived and transported for relatively short distances of 100 m to 200 m (Grierson, 2015). Therefore, given the lack of sensitive receptors within the vicinity of the proposal dust generated will not result in a significant environmental impact. 	<ul style="list-style-type: none"> Short life of mine. The Proponent will implement a Dust Management Procedure to ensure localised dust emissions and associated impacts are minimised. In order to manage the post-closure environmental impact of the Proposal on air quality, the Proponent has prepared a MCP consistent with <i>Mine Closure Plan Guidance – How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans</i> (DMIRS 2020) to be submitted with the Mining Proposal for the Proposal. The MCP incorporates general environmental management actions aimed at minimising the effect of dust on air quality through progressive and post-mining rehabilitation works expected to restore cleared areas. The Proposal is not expected to result in a significant detrimental effect to air quality. Therefore, the EPA’s objective for the environmental factor for Terrestrial Environmental Quality can be met. 																																																								
Greenhouse Gas Emissions	<p>In October 2024 the Government of Western Australia updated its Greenhouse Gas Emissions Policy for Major Projects, replacing the previous 2019 policy (EPA 2019). The Government of Western Australia is committed to working with all sectors of the Western Australian economy to achieve net zero greenhouse gas emissions by 2050.</p> <p>Under this updated 2024 policy, where greenhouse gas emissions of a major proposal assessed under Part IV of the Environmental Protection Act 1986 (WA) (EP Act) will be subjected to alternative regulatory measures, the State will no longer apply conditions to reduce net greenhouse gas emissions. However, the State also intends to impose a standard condition that requires proponents to notify the State of a substantial change to its obligations under the Safeguard Mechanism.</p> <p>The Proposal is expected to be subject to requirements under the Commonwealth Safeguard reporting mechanisms, being expected to exceed 100,000 tonnes of Scope 1 emissions each year measured in CO₂-e. Scope 1 emissions are those direct emissions from company-owned and controlled resources.</p>	<ul style="list-style-type: none"> The Proposal will contribute to greenhouse gas emissions by the clearance of vegetation and consumption of fuel for power generation and operation of mining equipment. Fuel type options for power generation are being investigated (e.g. diesel, liquified natural gas); however, for the purposes of greenhouse gas emissions estimates it was assumed diesel powered generators would be used to meet power demands. The Proposal will add a total of 851,564 tCO₂-e throughout its life. Greenhouse gas emissions have been estimated by the Proponent, presented in (tCO₂-e), in the table below. The expected generation of Scope 1 greenhouse gas emissions annually associated with the Proposal is expected to be subject to requirements under the Commonwealth Safeguard reporting mechanism. Details of these calculations can be found in Appendix O. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Year 1</th> <th>Year 2</th> <th>Year 3</th> <th>Year 4</th> <th>Year 5</th> <th>Annual Average</th> </tr> </thead> <tbody> <tr> <td>Power Generation</td> <td>3,305</td> <td>10,335</td> <td>10,300</td> <td>10,498</td> <td>5,312</td> <td>7,950</td> </tr> <tr> <td>HME</td> <td>21,850</td> <td>30,361</td> <td>29,088</td> <td>26,576</td> <td>13,326</td> <td>24,240</td> </tr> <tr> <td>Offsite Haulage (Scope 1)</td> <td>34,729</td> <td>159,627</td> <td>159,884</td> <td>164,145</td> <td>84,767</td> <td>120,630</td> </tr> <tr> <td>Clearing</td> <td>43,731</td> <td>30,611</td> <td>13,119</td> <td>-</td> <td>-</td> <td>17,492</td> </tr> <tr> <td>Total Scope 1</td> <td>103,615</td> <td>230,935</td> <td>212,391</td> <td>201,219</td> <td>103,405</td> <td>170,313</td> </tr> <tr> <td>Total Scope 3</td> <td>2,215,024</td> <td>10,827,170</td> <td>10,965,726</td> <td>11,114,740</td> <td>6,056,417</td> <td>8,235,815</td> </tr> <tr> <td>Total –all sources</td> <td>2,318,639</td> <td>11,058,105</td> <td>11,178,117</td> <td>11,315,959</td> <td>6,159,822</td> <td>8,406,128</td> </tr> </tbody> </table>		Year 1	Year 2	Year 3	Year 4	Year 5	Annual Average	Power Generation	3,305	10,335	10,300	10,498	5,312	7,950	HME	21,850	30,361	29,088	26,576	13,326	24,240	Offsite Haulage (Scope 1)	34,729	159,627	159,884	164,145	84,767	120,630	Clearing	43,731	30,611	13,119	-	-	17,492	Total Scope 1	103,615	230,935	212,391	201,219	103,405	170,313	Total Scope 3	2,215,024	10,827,170	10,965,726	11,114,740	6,056,417	8,235,815	Total –all sources	2,318,639	11,058,105	11,178,117	11,315,959	6,159,822	8,406,128	<ul style="list-style-type: none"> Short life of mine. The Scope 1 greenhouse gas emissions are expected to exceed 100,000 tCO₂-e and the Proponent is committed to identifying and assessing climate-related risks and opportunities that can be implemented for the Proposal to reduce the contribution to the state’s annual emissions and climate change. The Proposal is expected to be subject to requirements under the Commonwealth Safeguard reporting mechanisms. Given the Proposal has a five-year mine life projected to run from 2025 to 2030, it will inherently achieve net-zero emissions by 2050 as operations will have ceased well before this. The Proposal is not expected to result in a significant level of greenhouse gas emissions that will increase the risk of environmental harm associated with climate change. It is also expected to be subject to Safeguard reporting mechanisms. Therefore, the EPA’s objective for the environmental factor for Terrestrial Environmental Quality can be met.
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Human Health	<p>Not applicable</p> <p>The Proposal will not cause or emit radiation that could impact on human health. Additionally, the Proposal is not located in proximity to</p>	<ul style="list-style-type: none"> Not applicable The Proposal will not cause or emit radiation that could impact on human health. Additionally, the Proposal is not located in proximity to occupied residences (receptors) for which human health could be affected. 	<ul style="list-style-type: none"> Not applicable The Proposal will not cause or emit radiation that could impact on human health. Additionally, the Proposal is not 																																																								

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Factor	Receiving Environment	Potential Environmental Effect	Management and Predicted Outcomes
	occupied residences (receptors) for which human health could be affected.		located in proximity to occupied residences (receptors) for which human health could be affected.

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14. ENVIRONMENTAL OFFSETS

The Proposal will result in a low-level impact to flora populations and limited clearing (638.4 ha) of native vegetation. Given the short mine life (approximately 3 to 5 years) and implementation of mitigation measures, impacts will be avoided and minimised where possible. However, the Proponent acknowledges the loss of Northern Quoll, Ghost Bat, and Pilbara Olive Python habitat within the region could have short term significant residual impacts (until revegetation is complete post operations). A commitment to offset significant residual impacts from loss of critical and/or supporting habitat for these threatened fauna species is provided in **Section 14.1** below.

14.1. OFFSET COMMITMENT

The Proposal will result in clearing of up to 638.4 ha of native vegetation within a Development Envelope of approximately 860.9 ha. The Proponent proposes to offset significant residual impacts associated with the clearing of 638.4 ha of native vegetation, that provides habitat for threatened fauna species. Offsets are proposed to be in the form of a monetary contribution through the Pilbara Environmental Offsets Fund (PEOF) at the appropriate per hectare rate at the time (with the final offset amount to be determined based on the actual extent of clearing undertaken). It is noted that the Proposal has also been referred for EPBC assessment and negotiation of offsets with DCCEEW is likely to be required and may become part of the process in establishing offsets required under WA state requirements.

The PEOF combines money from individual offset payments required under Part IV of the EP Act, and contributions required under Part 9 or 10 of the Commonwealth EPBC Act. The PEOF sets out the rate per hectare of clearing per Pilbara IBRA subregion that a Proponent must pay, comprising a base rate or a higher rate. The rate per hectare is determined based on the level of biodiversity protection in the region, and cumulative impacts to environmental values within the associated region, the quality of vegetation and the occurrence of conservation of significant-species habitat. A base rate applies for impacts to native vegetation in good to excellent condition. A higher rate may apply for impacts to some types of specialised environmental values, including but not limited to impacts on:

- Riparian vegetation
- Threatened or Priority Ecological Communities
- Important vegetation types
- Specialised fauna habitat.

The Proposal is situated in the Hamersley subregion and the applicable current base rate per hectare as at 2022/2023 is \$945/ha, with a higher rate of \$1,891 (subject to Consumer Price Index (CPI)). As the 638.4 ha of native vegetation within the Development Envelope is in 'Good to Excellent' condition, supports known populations of Priority flora taxa, *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3) and *Aristida lazaridis* (P2) and also provides critical and/ or supporting habitat for threatened fauna species (Northern Quoll, Ghost Bat and Pilbara Olive Python), the higher per hectare rate is proposed to offset clearing of vegetation for the proposal. The estimated PEOF contribution from the Proposal is summarised in **Table 56**.

TABLE 56: ESTIMATED PEOF CONTRIBUTION

Environmental Value	Rate/ha (Hamersley IBRA Subregion)	Area Cleared (ha)	Estimated Offset
Clearing of native vegetation (638.4 ha) in “Good to Excellent” condition that: <ul style="list-style-type: none"> • Supports Priority flora taxa populations. • May support other Priority flora taxa. • Provides critical and/or supporting habitat for the Northern Quoll, Ghost Bat, and Pilbara Olive Python. 	\$1,891	Up to 638.4	\$1,207,214

The final offset amount will be based on the extent of actual clearing undertaken for the Proposal, which will be determined through development of an Impact Reconciliation Procedure, and production of an Impact Reconciliation Report. These will be prepared by the Proponent in accordance with *Instructions on how to prepare Environmental Protection Act 1986 Part IV Impact Reconciliation Procedures and Impact Reconciliation Reports* (Woinarski *et al.* 2014). The Impact Reconciliation Report will provide the location and spatial extent of native vegetation clearing undertaken within ‘Good to Excellent’ condition vegetation to calculate the required monetary contribution to the PEOF.

14.2. CONSISTENCY WITH OFFSETS POLICY

The approach to offsetting the significant residual impacts associated with the Proposal is considered to be consistent with the six principles outlined in the WA Environmental Offsets Policy (Government of Western Australia 2011). The manner in which these principles have been considered during the development of the offsets approach for the Proposal are summarised in **Table 57**.

TABLE 57: PRINCIPLES OF THE WA ENVIRONMENTAL OFFSETS POLICY

Principle	Response
Environmental offsets will only be considered after avoidance and mitigation options have been pursued	Avoidance and minimisation of impacts have been included as part of the planning and design process. The Proponent considered various options to avoid impacts to areas of high-value where practicable. In particular, the Development Envelope has reduced in size from 1399 ha to 861 ha (by approx. 38%). The application of the EPA’s mitigation hierarchy for the Proposal has ensured that all practical avoidance and minimisation measures have been considered and pursued where appropriate. Offsets have only been considered for significant residual impacts that are not able to be avoided or minimised.
Environmental offsets are not appropriate for all Proposals	The identified significant residual impacts are considered appropriate to be offset as they are not considered to be either too minor to require an offset or considered environmentally unacceptable regardless of offsets.
Environmental offsets will be cost-effective, as well as relevant and proportionate to significance of the environmental value being impacted	The proposed offsets are proportionate to counterbalance the significant residual impacts to the identified environmental values. The rates applied have been determined by the WA Government as being appropriate to the Hamersley subregion of the Pilbara.
Environmental offsets will be based on sound environmental information and knowledge	Offsets will be directed to the PEOF for conservation and research projects.
Environmental offsets will be applied within a framework of adaptive management	Offsets will be directed to the PEOF for conservation and research projects.

Principle	Response
Environmental offsets will be focussed on longer term strategic outcomes	Offsets will be directed to the PEOF for conservation and research projects.

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15. HOLISTIC IMPACT ASSESSMENT

15.1. SUMMARY OF THE ENVIRONMENTAL EFFECTS OF THE PROPOSAL

The Proponent has commissioned numerous studies to understand the environmental values of the Development Envelope, and the potential effects of implementing the Proposal, which meet the EPA objectives for each factor and are manageable. The outcomes of these studies have assisted with the refinement of the Proposal and have considered the application of the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset). As a result of the size and timeframe of mining compared to other projects throughout the Pilbara, the Proposal can be implemented without significant residual impacts to the key environmental factors of flora and vegetation, subterranean fauna, inland waters and social surrounds. However, the removal of 638.4 ha of native vegetation that provides habitat for listed threatened fauna species is considered a significant residual impact and is proposed to be offset.

15.2. INTERCONNECTED FACTORS

The Proponent has sought to understand the environmental processes and environmental values of the ecosystem within the Development Envelope holistically. Holistic impact assessment recognises the inextricable links between flora and vegetation, terrestrial fauna, inland waters, subterranean fauna and social surroundings, and the connections and interactions between these environmental factors.

For the Proposal, there is interaction between flora and vegetation and terrestrial fauna, through the clearing of native vegetation that provides habitat for numerous species of fauna. There is also interaction between inland waters and subterranean fauna through the abstraction of groundwater to dewater the proposed pit. However, there is no permanent sources of water or groundwater-dependent vegetation in the Proposal Area.

Impacts from the Proposal are expected to be negligible and will not result in any significant or long-term impacts on key environmental factors within the Development Envelope or adjacent areas. Vegetation types and terrestrial fauna habitats are typically widespread, and significant flora and fauna species all occur outside of the Development Envelope. While there are a small number of subterranean fauna species that may be restricted, their habitat and the geological formations extend beyond the proposed pit, and rapid groundwater recovery is expected following cessation of dewatering.

Therefore, the environmental effect of these interconnections can be effectively managed by applying the EPA's mitigation hierarchy (avoid, minimise, rehabilitate, offset) for the Proposal. A holistic view of interconnections between environmental factors is shown in **Figure 35**, to highlight the predicted impacts and interactions, together with appropriate mitigation tools that have been developed as part of the Proposal.

15.3. ADDITIONAL CONSIDERATIONS ARISING FROM HOLISTIC IMPACT ASSESSMENT

There are no additional significant residual impacts or additional mitigation required for the Proposal, based on this holistic impact assessment. The combined effects on the local environment for the Proposal are not considered greater than any individual environmental factor (360 Environmental 2009).

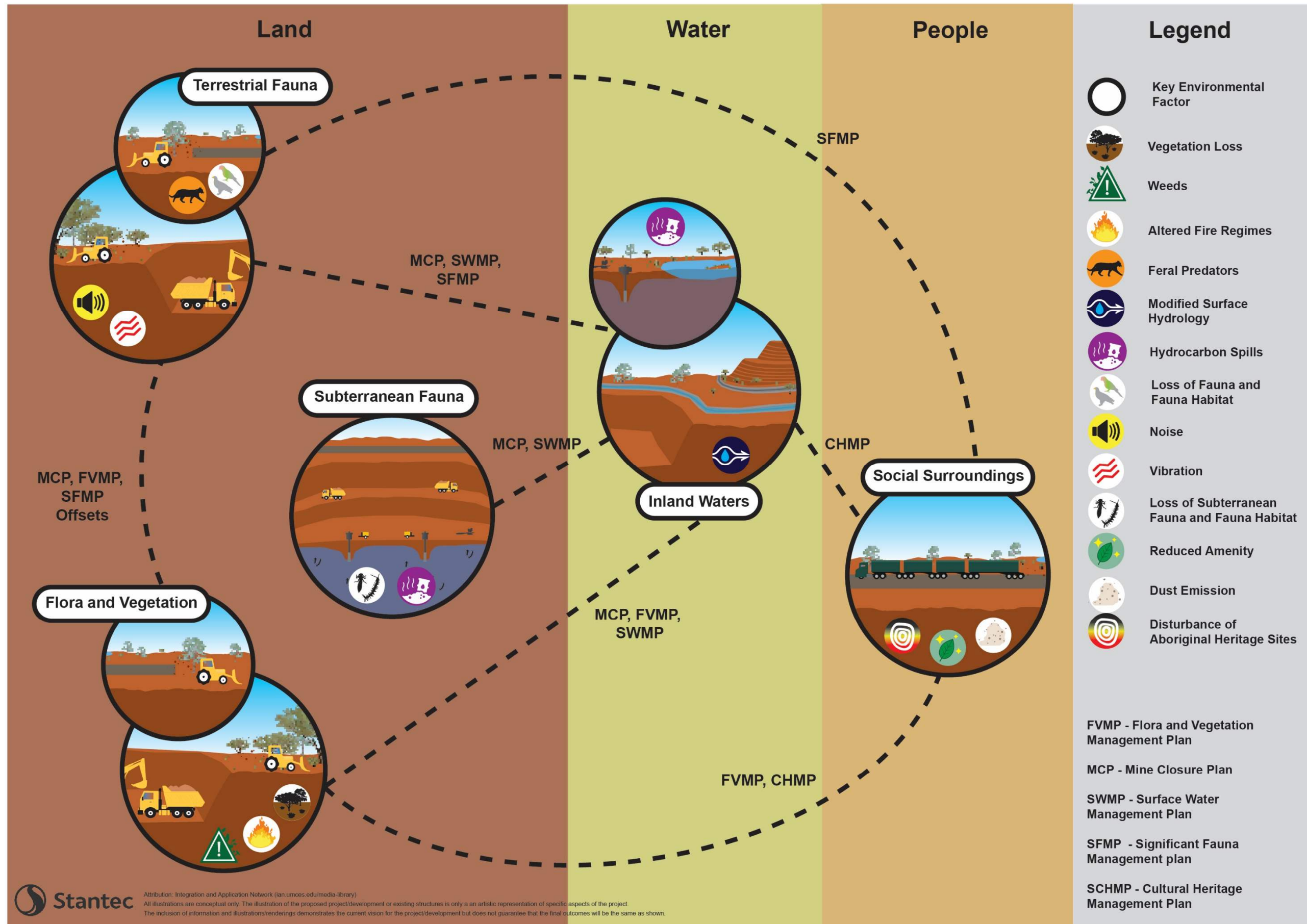


FIGURE 35 HOLISTIC VIEW OF LINKS BETWEEN ENVIRONMENTAL FACTORS

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