Rhodes Ridge

Management Services Pty Ltd

# Rhodes Ridge Iron Ore Project

## Section 38 Referral – Supporting Document

Rhodes Ridge Management Services Pty Ltd

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RTIO-1036208

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| Document Status | | | | | |
|---|---|---|---|---|---|
| **Rev** | **Author/s** | **Reviewer/s** | **Date** | **Approved for Issue** | |
| | | | | **To Whom** | **Date** |
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| 0 | RTIO | E. Sutherland/ M. Brand/ A. Hutchinson/ SME. | 23/01/2024 | EPAS | 25/01/2024 |

## EXECUTIVE SUMMARY

Rhodes Ridge Management Services Pty Ltd (the Proponent) as manager of the Rhodes Ridge Joint Venture between Hamersley Resources Limited (a member of the Rio Tinto Group) and Wright Prospecting Pty Ltd, proposes to develop the Rhodes Ridge Iron Ore Project (the Proposal).

The Proposal is located within the Pilbara Region of Western Australia, approximately 40 km north-west of the township of Newman, in the East Pilbara Region of Western Australia (WA). It is located within the Native Title Determination areas of the Nyiyaparli and Ngarlawangga People.

A general description of the Proposal is provided in **ES Table 1**, and the key characteristics of the Proposal are summarised in **ES Table 2**.

**ES Table 1: General Description of the Proposal**

| | |
|---|---|
| **Proposal Title** | Rhodes Ridge Iron Ore Project |
| **Proponent Name** | Rhodes Ridge Management Services Pty Ltd (ACN: 662 895 927) |
| **Short Description** | The Rhodes Ridge Iron Ore Project (the Proposal) is located approximately 40 km north-west of the township of Newman, and within the Native Title Determination Areas of the Nyiyaparli and Ngarlawangga People.<br>The Proposal includes the development of above and below water table (AWT/BWT) deposits and associated mining and support infrastructure.<br>The Proposal includes, but is not limited to the following:<br>• Development of AWT and BWT deposits<br>• Ore processing, transport and handling infrastructure<br>• Ore, topsoil and subsoil stockpiles<br>• Mineral waste infrastructure, including:<br>o Waste rock landforms<br>o Low-grade ore stockpiles<br>o Waste fines management (in-pit and/or ex-pit)<br>• Surface water management infrastructure<br>• Groundwater abstraction and management infrastructure<br>• Other associated mining infrastructure and support facilities, including:<br>o Workshops<br>o Hydrocarbon and Ammonium Nitrate Fuel Oil (ANFO) storage facilities<br>o Laydown areas, offices, and accommodation facilities<br>o Linear infrastructure, including but not limited to, heavy and light vehicle access roads, conveyors, pipe and power lines, utilities and communication lines, rail and associated infrastructure.<br>• Renewable energy infrastructure, including solar farm and associated connections.<br>The Proposal will be comprised of a Conceptual Disturbance Footprint of up to 14,850 ha, within a Development Envelope of 61,301 ha. |

**ES Table 2: Key Proposal Characteristics**

| Proposal element | Location/ description | Maximum extent, capacity or range |
|---|---|---|
| **Physical elements** | | |
| Mine and associated infrastructure elements including but not limited to:<br>- Open pits (above and below water table) at Rhodes Main and Arrowhead deposits, and Giles Mini (above water table only)<br>- Water management infrastructure including culverts, drains and diversions<br>- Haul roads and light vehicle tracks,<br>- Waste rock landforms<br>- Ore stockpiles<br>- Topsoil stockpiles<br>- Power generation infrastructure including renewable energy (e.g. solar) | **Figure 1-2** | Disturbance footprint of up to 14,850 ha within a 61,301 ha Development Envelope |
| **Construction elements** | | |
| Construction elements will include, but not limited to:<br>- Construction camp<br>- temporary offices / ablutions<br>- access roads<br>- borrow pits<br>- laydowns<br>- water supply infrastructure including but not limited to pumps, pipelines, bores and turkey nests<br>- movement of topsoil and bulk earthworks | | Within the 14,850ha disturbance footprint |
| **Operational elements** | | |
| Production capacity | | Up to 50 million tonnes per annum (mtpa) |
| Tailings Storage | | Up to 6 mtpa. Cumulative tailings of 150 mt (25-year life of mine) |
| Abstraction of groundwater for pit dewatering and operational supply | | Peak of 80 gigalitres per annum (GL/a) |
| Surplus water management | | Up to 50 GL/a surplus.<br>Surplus water will be managed through a range of options which may include aquifer recharge, surface discharge, and transfer to other users including to third-party operations.<br><br>Surface discharge options:<br>Option 1 – Discharge to Western Creek<br>Option 2 – Discharge to Spearhole Creek |

| Proposal element | Location/ description | Maximum extent, capacity or range |
|---|---|---|
| **Proposal elements with greenhouse gas emissions** | | |
| Operation elements: | | |
| Mining and associated activities (diesel emissions) | Scope 1 - peak emissions approximately 370,000 t $CO_2$-e | |
| Electricity emissions | Scope 2 – peak emissions approximately 160,000 t $CO_2$-e | |
| | Scope 3 – peak emissions approximately 70,000,000 t $CO_2$-e | |
| **Rehabilitation** | | |
| Progressive rehabilitation will be undertaken throughout the life of mine where practicable.<br>The key closure outcome of this Proposal will be a safe, stable and non-polluting landscape consistent with the post-mining land use and will consider environmental and cultural heritage values. | | |
| **Commissioning** | | |
| Commissioning will be undertaken in accordance with the requirements of approvals under the *Environmental Protection Act 1986*. | | |
| **Decommissioning** | | |
| The Mine Closure Plan (MCP) will outline the plan for decommissioning of the mine and post-mining land use. | | |
| **Other elements which affect extent of effects on the environment** | | |
| Proposal time | Maximum project life | 35 years |
| | Construction phase | Approximately 5 years |
| | Operations phase | Approximately 25 years |
| | Decommissioning phase | Approximately 5 years |

# CONTENTS

# ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| AH Act | *Aboriginal Heritage Act 1972* (WA) |
| AHIS | Aboriginal Heritage Inquiry System |
| AMD | Acid Mine Drainage |
| ANFO | Ammonium Nitrate Fuel Oil |
| ARCS | Approvals Request Coordination System |
| AWT | Above Water Table |
| BAM Act | *Biosecurity and Agriculture Management Act 2007* (WA) |
| BC Act | *Biodiversity Conservation Act 2016* (WA) |
| BIF | Banded Iron Formation |
| BoM | Bureau of Meteorology |
| BWT | Below Water Table |
| CEA | Cumulative Effects Assessment |
| CSP | Communities and Social Performance |
| CVLM | Cultural Values Land Mapping |
| DBCA | Department of Biodiversity, Conservation and Attractions |
| DEMIRS | Department of Energy, Mines, Industry Regulation and Safety |
| DMA | Decision-making Authorities |
| DCCEEW | Department of Climate Change, Energy, the Environment and Water |
| DPLH | Department of Planning, Lands and Heritage |
| DWER | Department of Water and Environmental Regulation |
| EIA | Environmental Impact Assessment |
| EMP | Environment Management Plan |
| EN | Endangered |
| EP Act | *Environmental Protection Act 1986* (WA) |
| EPA | Environmental Protection Authority |
| EPA Services | Environmental Protection Authority Services |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) |
| ERD | Environmental Review Document |
| ESD | Environmental Scoping Document |
| GDE | Groundwater Dependent Ecosystem |

| Abbreviation | Description |
|---|---|
| GL | Gigalitres |
| GL/a | Gigalitres per annum |
| HSC | Heritage Sub-Committee |
| IBRA | Interim Biogeographic Regionalisation for Australia |
| JTSI | Department of Jobs, Tourism, Science and Innovation |
| KNAC | Karlka Nyiyaparli Aboriginal Corporation |
| LIC | Local Implementation Committee |
| LoM | Life of Mine |
| LoMP | Life of Mine Planning |
| MCP | Mine Closure Plan |
| MEZ | Mining Exclusion Zone |
| MI | Migratory |
| Mining Act | *Mining Act 1978 (WA)* |
| MMIF | Marra Mamba Iron Formation |
| MNES | Matters of National Environmental Significance |
| MRZ | Mining Restriction Zone |
| Mt | Million tonnes |
| Mt/a | Million tonnes per annum |
| NAC | Ngarlawangga Aboriginal Corporation |
| NGER Act | *National Greenhouse and Energy Reporting Act 2007* |
| NVCP | Native Vegetation Clearing Permit |
| OTU | Operational taxonomic unit |
| PAF | Potential Acid Forming |
| PBC | Prescribed Body Corporate |
| PEC | Priority Ecological Communities |
| PFAS | Per- and polyfluoroalkyl substances |
| Proponent | Rhodes Ridge Management Services Pty Ltd |
| Proposal | Rhodes Ridge Iron Ore Project |
| RTIO | Rio Tinto Iron Ore |
| RiWI Act | *Rights in Water and Irrigation Act 1914* (WA) |
| SCHMP | Social and Cultural Heritage Management Plan |
| SRE | Short-Range Endemic |

| Abbreviation | Description |
|---|---|
| TEC | Threatened Ecological Communities |
| TSF | Tailings Storage Facility |
| VIA | Visual Impact Assessment |
| VU | Vulnerable |
| YMAC | Yamatji Marlpa Aboriginal Corporation |

# 1. INTRODUCTION

Rhodes Ridge Management Services Pty Ltd (the Proponent) as manager of the Rhodes Ridge Joint Venture between Hamersley Resources Limited (a member of the Rio Tinto Group) and Wright Prospecting Pty Ltd, proposes to develop the Rhodes Ridge Iron Ore Project (the Proposal).

The Proposal is located within the East Pilbara Region of Western Australia (WA), approximately 40 km north-west of the township of Newman. The Proposal is located within the Native Title Determination Areas of the Nyiyaparli and Ngarlawangga People (**Figure 1-1**). The Proposal will facilitate an 50 million tonne per annum (Mtpa) operation over a 25-year Life of Mine (LoM).

## 1.1. Purpose and Scope

The Proposal is being referred to the Environmental Protection Authority (EPA) under section 38 of the *Environmental Protection Act 1986* (EP Act) (WA) as the potential impacts may have a significant impact on the environment. The purpose of this document is to provide supporting information to enable the EPA to determine whether or not to assess the Proposal under s. 38G of the EP Act, and if so, the appropriate Level of Assessment (LoA).

This document has been prepared in consideration of the EPA guideline documents, *Environmental Impact Assessment (Part IV Divisions 1 And 2) Administrative Procedures* (EPA 2021a), *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual 2021* (EPA, 2021b), and the *Instruction: How to Prepare an Environmental Review Document* (EPA, 2021c). The intent of the document is to provide a preliminary assessment of the potential impacts of the Proposal on identified environment factors related to the Proposal's implementation.

The scope of the document includes:

- Describe the operational components of the Proposal, and their extent, that have the potential to have a significant effect on the environment
- Describe the local and regional context within which the Proposal would be implemented, drawing upon proposal specific biological and other technical studies that have been completed
- Identify and describe the potential impacts resulting from the implementation of the Proposal
- Outline overarching mitigation strategies the Proponent would use to avoid, minimise, and manage potential adverse impacts

In addition, the document will summarise and describe the proposal specific environmental studies that have been completed for the Proposal, as well as studies that are currently in progress and planned to be completed to inform subsequent environmental impact assessment (EIA).

## 1.2. Proponent Details

The Proponent Details are provided in **Table 1-1**.

**Table 1-1: Proponent Details**

| Item | Detail |
|---|---|
| Company | Rhodes Ridge Management Services Pty Ltd |
| ACN/ABN | ACN: 662 895 927<br>ABN: 33 662 895 927 |
| Address | 152–158 St Georges Terrace, Perth WA 6000 |

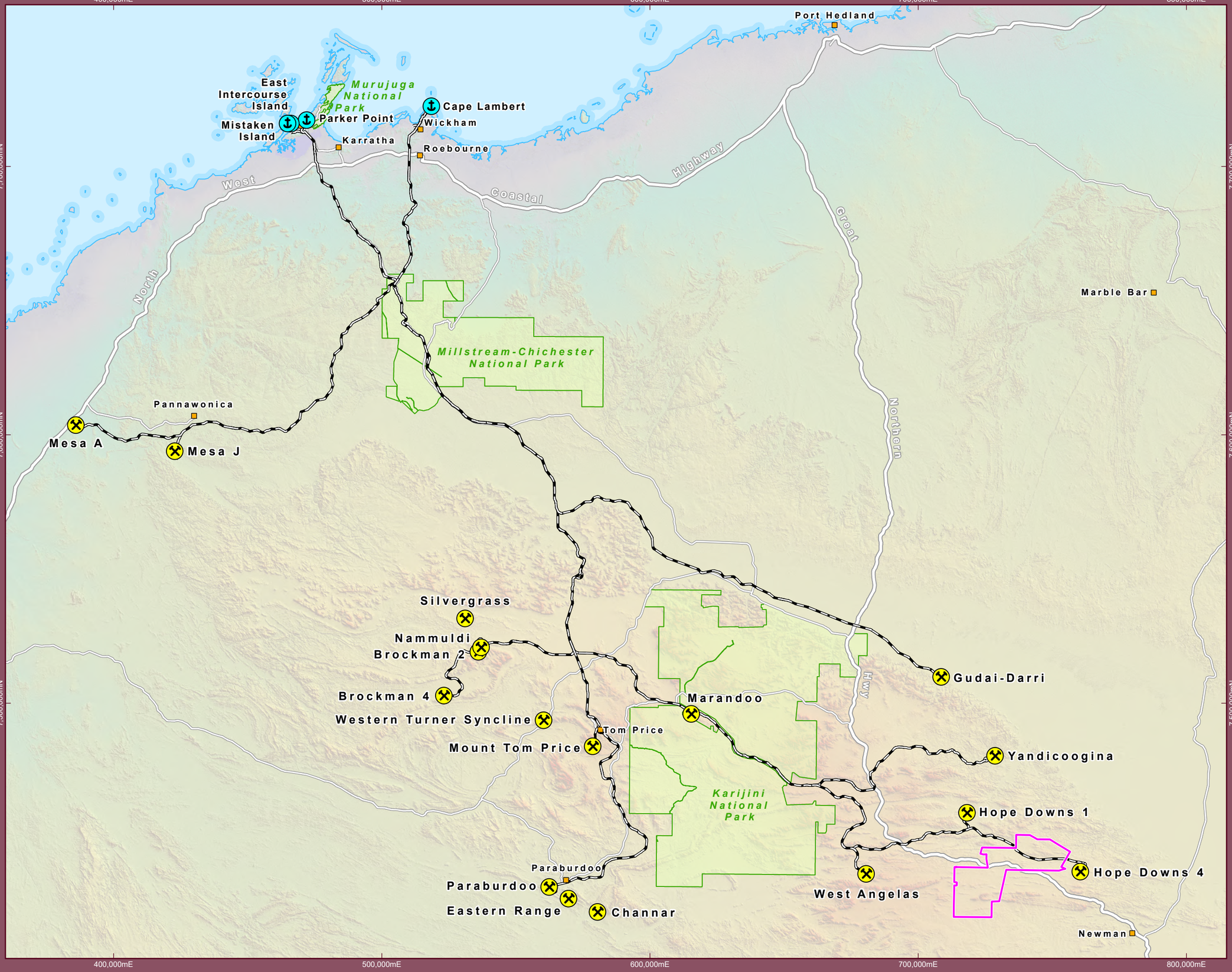


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Figure 1-1: Regional Location of the Proposal

## 1.3. Proposal Content

The key characteristics of the Proposal are provided in **Table 1-2** and presented in **Figure 1-2**.

**Table 1-2: Key characteristics table**

| Proposal element | Location | Maximum extent, capacity or range |
|---|---|---|
| **Physical elements** | | |
| Mine and associated infrastructure elements including but not limited to:<br>- Open pits (above and below water table) at Rhodes Main and Arrowhead deposits, and Giles Mini (above water table only)<br>- Water management infrastructure including culverts, drains and diversions<br>- Haul roads and light vehicle tracks,<br>- Waste rock landforms<br>- Ore stockpiles<br>- Topsoil stockpiles<br>- Power generation infrastructure including renewable energy (e.g. solar) | **Figure 1-2** | Disturbance footprint of up to 14,850 ha within a 61,301 ha Development Envelope |
| **Construction elements** | | |
| Construction elements will include, but not limited to:<br>- Construction camp<br>- temporary offices / ablutions<br>- access roads<br>- borrow pits<br>- laydowns<br>- water supply infrastructure including but not limited to pumps, pipelines, bores and turkey nests<br>- movement of topsoil and bulk earthworks | **Figure 1-2** | Within the 14,850ha disturbance footprint |
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| Production capacity | | Up to 50 million tonnes per annum (mtpa) |
| Tailings Storage | **Figure 1-2** | Up to 6 mtpa. Cumulative tailings of 150 mt (25-year life of mine) |
| Abstraction of groundwater for pit dewatering and operational supply | **N/A** | Peak of 80 gigalitres per annum (GL/a) |
| Surplus water management | **Figure 1-2** | Up to 50 GL/a surplus.<br>Surplus water will be managed through a range of options which may include aquifer recharge, surface discharge, and transfer to other users including to third-party operations.<br><br>Surface discharge options:<br>Option 1 – Discharge to Western Creek<br>Option 2 – Discharge to Spearhole Creek |

| Proposal element | Location | Maximum extent, capacity or range |
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| **Rehabilitation** | | |
| Progressive rehabilitation will be undertaken throughout the life of mine where practicable.<br>The key closure outcome of this Proposal will be a safe, stable and non-polluting landscape consistent with the post-mining land use and will consider environmental and cultural heritage values. | | |
| **Commissioning** | | |
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| The Mine Closure Plan (MCP) will outline the plan for decommissioning of the mine and post-mining land use. | | |
| **Other elements which affect extent of effects on the environment** | | |
| Proposal time | Maximum project life | 35 years |
| | Construction phase | Approximately 5 years |
| | Operations phase | Approximately 25 years |
| | Decommissioning phase | Approximately 5 years |

### 1.3.1. Options to be assessed

In developing the Proposal, a number of potential options are being assessed, which may require changes to the current Conceptual Disturbance Footprint, which is indicative only. These include, but are not limited to:

- **Surplus water management and associated infrastructure** - Options to be investigated include:
    - aquifer recharge
    - transfer to third-party operations and other users (including but not limited to utilising existing approved infrastructure), and
    - temporary discharge of surplus water to the environment (into existing creeklines), subject to investigations and consultation being undertaken to determine the suitability and appropriateness (culturally and environmentally) of temporary discharge to Western Creek and/or Spearhole Creek, located on Nyiyaparli and Ngarlawangga Country, respectively.
- **Aquifer recharge locations**: A number of aquifer recharge locations have been included within the Development Envelope and conceptual footprint. These are indicative locations and subject to

hydrogeological investigations undertaken to inform the assessment (including aquifer recharge trials) will determine the suitability of final aquifer recharge locations.

- **Infrastructure hub**: Ten initial locations were investigated for the infrastructure hub; however, the majority were removed due to potential environmental or cultural impacts (see Section 1.3.3). Two options require additional investigation before confirming the final location of the infrastructure hub. Two options will be assessed as part of the Proposal, hub locations at Rhodes and Arrowhead (**Figure 1-2**). An indicative footprint for the proposed placement of the infrastructure hub will be presented in the ERD.

### 1.3.2. Exclusions

The scope of the Proposal subject to this assessment excludes:

- Low impact activities, including but not limited to drilling and associated activities for the purposes of resource evaluation, geotechnical assessment and hydrogeological investigations (including aquifer recharge trials) prior to Part IV approval of the Proposal. These activities will be subject to relevant provisions under Part V of the EP Act (WA), and the *Rights in Water and Irrigation Act 1914* (RiWI Act) (WA),
- Biological and cultural heritage investigations and surveys prior to Part IV approval of the Proposal, and
- Activities as approved under the Hope Downs 4 Ministerial Statement 854[1] including within the Hope Downs 4 Infrastructure Corridor.

### 1.3.3. Alternatives

The design of the Conceptual Disturbance Footprint (**Figure 1-2**) has been influenced by the initial findings from the baseline surveys. As additional surveys and investigations (both biological and cultural) are undertaken the Conceptual Disturbance Footprint will be subject to change to avoid, where possible, and minimise potential impacts to identified significant environmental and cultural values.

Throughout the iterative project design process, a number of Proposal alternatives were considered, however were ultimately excluded. These Proposal alternatives, including rationale for removal, are summarised in **Table 1-3**.

**Table 1-3: Proposal Alternatives**

| Alternative Project Design | Potential Impact | Reason for Removal |
|---|---|---|
| Placement of waste dump against Pamelia Ridge | Clearing and disturbance to Gorge/Gully and Breakaway/Cliffs habitat | To avoid impacts to potential high value MNES habitat and potentially significant vegetation types. |
| Various rail loops and corridors | Clearing to a PEC.<br>Disturbance to significant heritage sites. | A number of rail loops were investigated; however, a number were deemed not suitable and subsequently removed to avoid impacts to PEC and cultural heritage sites. |
| Infrastructure Hub Locations | Clearing to a PEC. | Ten potential infrastructure hubs were initially investigated. This number has been reduced down to two options (at |

[1] Activities approved under this statement were also referred to the Commonwealth for consideration under the EPBC Act (EPBC 2008/4636) and were subsequently determined to be “Not a controlled action” (date of decision 24 July 2009).

| Alternative Project Design | Potential Impact | Reason for Removal |
|---|---|---|
| | Disturbance to significant heritage sites. | Arrowhead and Rhodes), which will undergo additional assessment as part of the assessment process. The other hub locations were removed for a number of reasons, including but not limited to, potential impacts to PECs, heritage areas, and tenure considerations. |

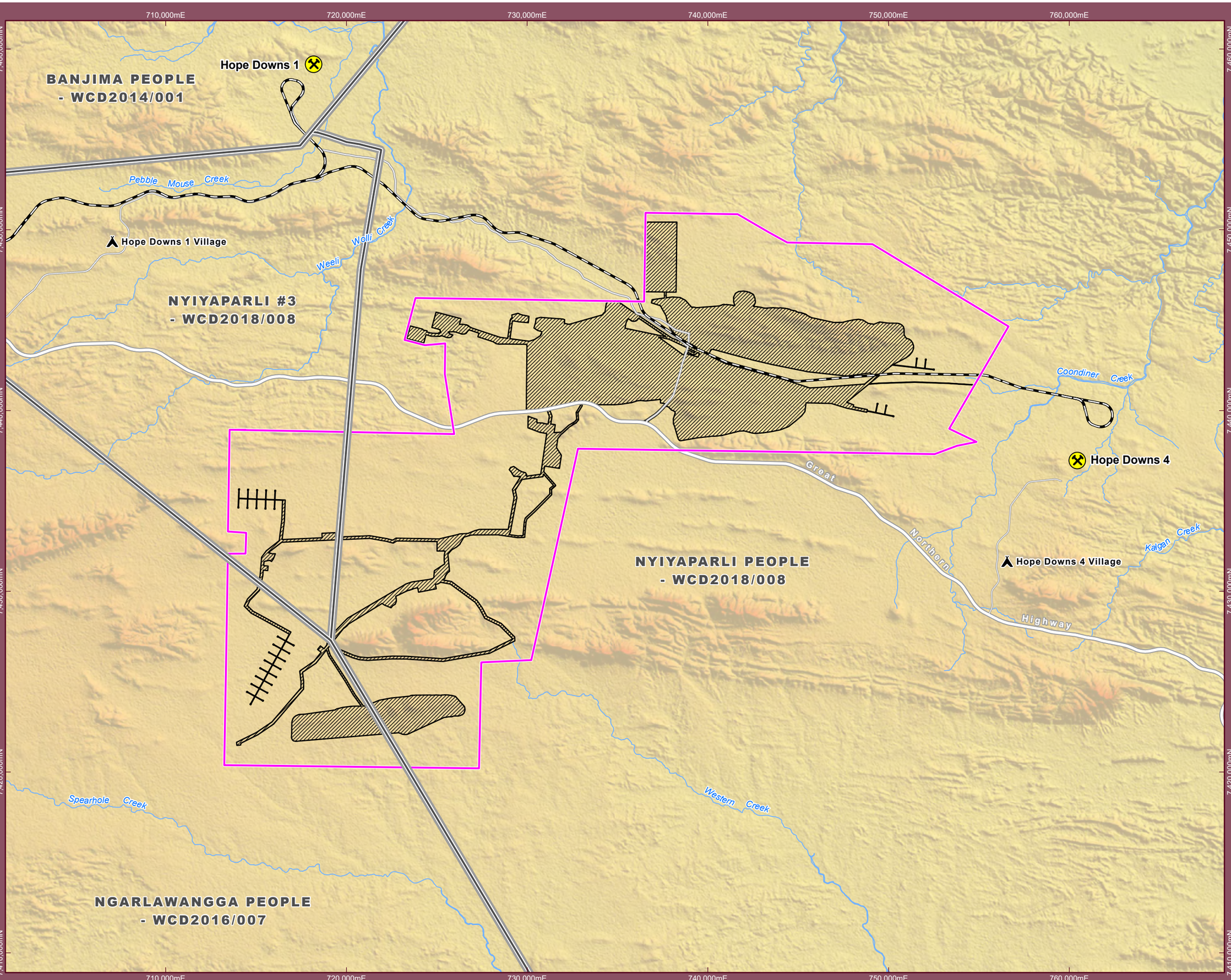
## 1.4. Proposal Justification

The Proposal is required to ensure long-term sustained iron ore production from Rio Tinto's Pilbara operations. Containing significant quantities of high-grade ore, and a mix of Marra Mamba, and Low and High Phosphorus Brockman ore bodies, Rhodes Ridge is strategically important for optimising Rio Tinto's future saleable products, including those suitable for "green steel" initiatives to decarbonise steel production.

The Proposal will result in economic benefits for Australia and Western Australia through:

- Contribution to the value of mineral exports
- Royalties and taxation payments
- Development and ongoing sustaining capital investment
- Sustaining direct and indirect employment opportunities in the Pilbara and other regions of WA
- Sustaining demand for goods and services supporting the national, state and local economy.

The Proposal will utilise as much of Rio Tinto's existing infrastructure, including ports and railway, power, communications, and road networks as possible, reducing the extent of new infrastructure required.




## Legend

- Proposed Development Envelope
- Conceptual Disturbance Footprint
- Native Title Determination Area
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

**Drawn:** A.Coulson
**Plan:** RTIO-1023036v2
**Date:** December 2023

**Checked by:** M.Buck
**Proj:** GDA 1994 MGA Zone 50
***GIS.Team@riotinto.com***

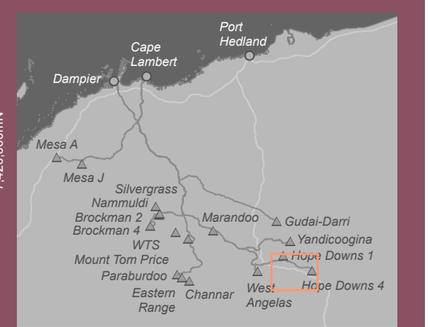



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Figure 1-2: Conceptual Footprint and Development Envelope of the Proposal

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N

# 2. RECEIVING ENVIRONMENT

## 2.1. Climate

The climate of the Pilbara region of Western Australia is classified as arid tropical with two distinct seasons: a hot, wet summer (October – April) and a mild, dry winter (May – September) (BoM 2023).

Based on long-term climatic data from the nearest Bureau of Meteorology (BoM) weather station at Newman Aero (Station 007176) (approximately 34 km south-east of the survey area), the mean annual rainfall since 1971 is 317 mm (BoM 2023). The mean maximum daily temperatures since 1996 range between 23.0°C and 39.3°C and exceed 30°C for much of the year (BoM 2023) (**Figure 2-1**).

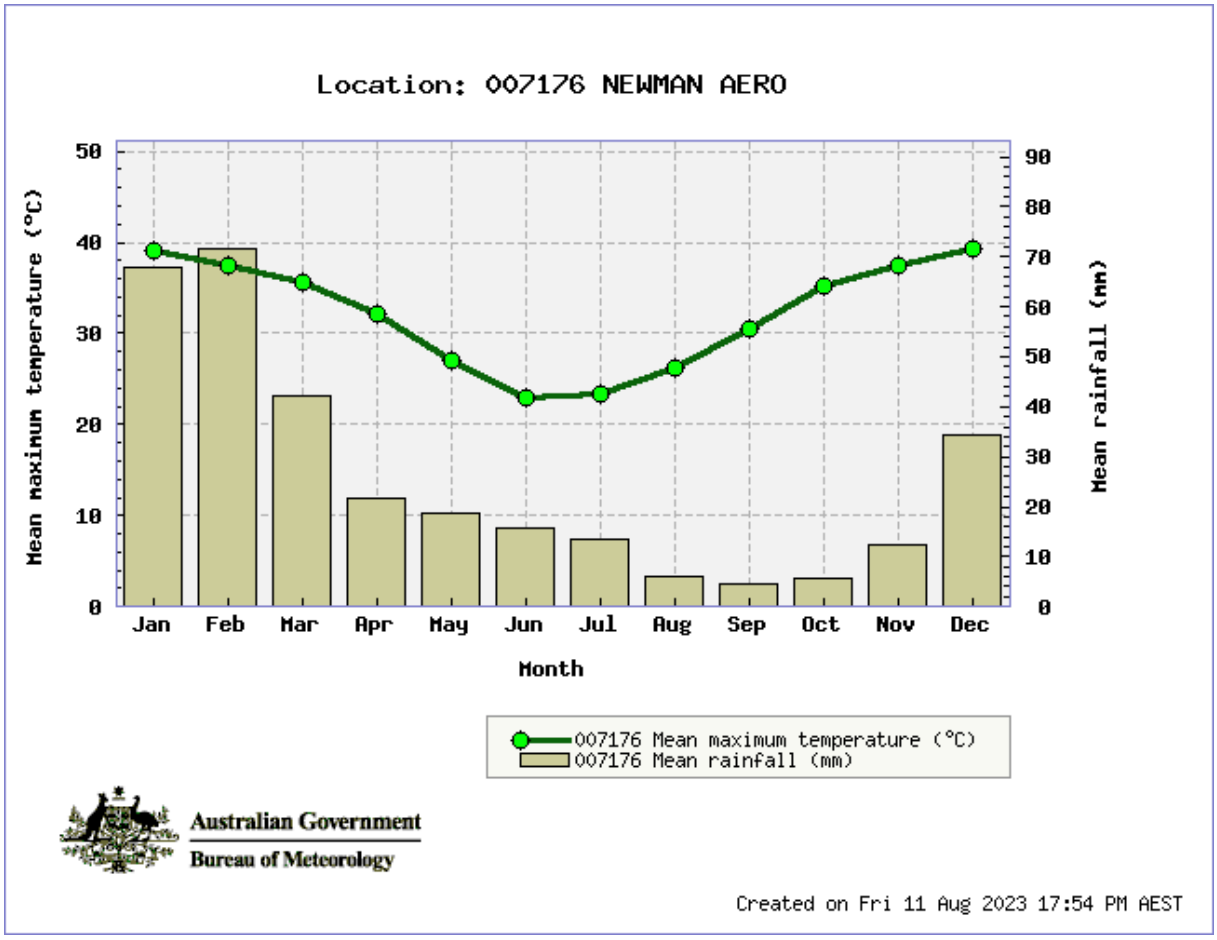


**Figure 2-1: Climate data for Newman Aero Station**

## 2.2. Geology

The Proposal occurs on the Hamersley Basin, which overlies the older Archaean Pilbara Craton. The Hamersley Basin comprises mafic and felsic volcanics, shale, siltstone, sandstone and conglomerate, as well as dolomite and banded iron formation. The sequence is extensively deformed with the rocks being folded and faulted (van Vreeswyk *et al.* 2004).

The Development Envelope is mapped as soil landscape zone 285 – Hamersley Plateaux in the Fortescue Province (Tille 2006). The Hamersley Plateaux soil unit is described as hills and dissected plateaux with some stony plains and hardpan wash plains on volcanic and sedimentary rocks. It is

composed predominantly of stony soils with red shallow loams and some red-brown non-cracking clays and red loamy earths (Tille 2006).

## 2.3. Bioregion

The Proposal is located within the Pilbara Bioregion (PIL) under the Interim Biogeographic Regionalisation for Australia (IBRA). The Pilbara bioregion is divided into four sub-regions: Chichester (PIL1), Fortescue Plains (PIL2), Hamersley (PIL3) and Roebourne (PIL4). The Proposal occurs entirely within the Hamersley subregion of the Pilbara region, which is described as:

*Hamersley PIL3 – dissected bold plateaux and ranges of flat lying, moderately folded sandstone and quartzite with vegetation described as Mulga low woodland over tussock grasses occurring on fine textured soils in valley floors, with scattered Snappy gum (Eucalyptus leucophloia) over Triodia brizoides on skeletal soils of the ranges* (Kendrick 2001).

## 2.4. Surface Water

The Proposal occurs within the 'Fortescue River Upper' catchment. No Wetlands of International Importance (i.e. Ramsar wetlands) or Nationally Important Wetlands occur within, or in the vicinity of, the Proposal (DoEE 2017a, 2017b). Fortescue Marsh is the nearest Nationally Important Wetland, being located approximately 44 km north-east of the Proposal at its nearest point.

No major rivers occur within the Proposal. However, several ephemeral creeks occur to the north of the Development Envelope, including tributaries of the Fortescue River (and Fortescue Marsh). Weeli Wolli Creek and Coondiner Creek occur outside of the Development Envelope to the north-west and south-east of the Proposal respectively. The upper reaches of Western Creek and Spearhole Creek are located in the southern portion of the Development Envelope, located on Nyiyaparli and Ngarlawangga Country, respectively. These creeks drain generally south-east, before joining with the Fortescue River. Both creeks have been identified as potential options for temporary and emergency surplus water discharge.

Three ephemeral water features were identified within the vicinity of the Proposal; RRPL4, Bakers Lake and Rhodes Ridge Lakes. These water bodies accumulate water during heavy rainfalls and dry out during the dry season. Only RRPL4 is located within the Development Envelope.

## 2.5. Land Systems

Land systems of the Western Australian rangelands have been mapped and described by the Department of Agriculture and Food (now the Agriculture and Food Sector of the Department of Primary Industries and Regional Development (DPIRD) Western Australia) outlining the distributions and providing comprehensive descriptions of biophysical resources, including soil and vegetation condition (van Vreeswyk et al. 2004).

A hundred and ten land systems occur in the Pilbara bioregion (covering 181,723 km$^2$), of which ten occur in the Proposal (**Table 2-1**). The Newman land system is the most widespread within the Proposal and surrounding region.

**Table 2-1: Land System Units within the Development Envelope**

| Land System | Description |
|---|---|
| Boolgeeda Land System | Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands |
| Egerton Land System | Highly dissected plains and slopes with sparse mulga shrublands or shrubby hard spinifex grasslands. |

| Land System | Description |
|---|---|
| Kumina Land System | Duricrust plains and plateau remnants supporting hard spinifex grasslands. |
| McKay Land System | Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts. |
| Newman Land System | Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands. |
| Platform Land System | Dissected slopes and raised plains supporting shrubby hard spinifex grasslands. |
| Rocklea Land System | Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs. |
| Spearhole Land System | Gently undulating gravelly hardpan plains and dissected slopes supporting groved mulga shrublands and hard spinifex. |
| Table Land System | Low calcrete plateaux, mesas and lower plains supporting mulga and cassia shrublands and minor spinifex grasslands. |
| Wannamunna Land System | Hardpan plains and internal drainage tracts supporting mulga shrublands and woodlands and occasionally eucalypt woodlands. |

## 2.6. Land Use and Existing Development

The Proposal is located within the Shire of East Pilbara. The nearest pastoral stations to the Proposal are Marillana Station, located approximately 11 km to the north, and Prairie Downs Station, located approximately 25 km to the north-west.

The east Pilbara is dominated by iron ore mining, with Hope Downs 1 and 4 located adjacent to the Proposal, and multiple mines in the surrounding region, including West Angelas, South Flank, Mining Area C and Yandicoogina.

## 2.7. Conservation Reserves and Environmentally Sensitive Areas

No Environmentally Sensitive Areas (ESAs) occur within the Proposal. The nearest ESAs to the Proposal are the Ethel Gorge aquifer stygobiont community and the Fortescue Marshes (Nationally Important Wetland site), respectively located approximately 31 km south-east and 62 km north of the Proposal.

Karijini National Park is the nearest conservation reserve and is located approximately 52 km west of the Proposal.

# 3. LEGISLATIVE CONTEXT

## 3.1. Environmental Impact Assessment Process

The Proposal will be subject to assessment under both the Western Australian (WA) *Environmental Protection Act 1986* (EP Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

### *3.1.1. Environmental Protection Act 1986*

The EP Act is the principal environmental legislation in the State. The EP Act established the Environmental Protection Authority (EPA), which is charged with development of environmental protection policies under Part III of the Act, and environmental impact assessment of proposals and schemes under Part IV. The EP Act is WA's primary environmental legislation governing environmental protection and impact assessment. Part IV, Division 1 of the EP Act, provides for the referral and assessment of proposals that may significantly impact the environment. The EPA Services division within the Department of Water and Environmental Regulation (DWER) administers the impact assessment process.

### *3.1.2. Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act is the primary Commonwealth environmental legislation protecting Matters of National Environmental Significance (MNES) and is administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). The Proposal has yet to be referred to DCCEEW, however, referral to DCCEEW will occur concurrently with referral under the (WA) EP Act. A pre-referral meeting with DCCEEW was held on the 20th September 2023. The Proposal will potentially impact the MNES 'Nationally threatened species and ecological communities', with the following protected matters identified within the Development Envelope:

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

It is anticipated that DCCEEW will determine that the Proposal may have a significant impact on the above listed protected matters, and that a detailed assessment is required. In making this determination, DCCEEW will likely declare the Rhodes Ridge Project a 'Controlled Action' with the subsequent assessment undertaken in accordance with instructions issued by the DCCEEW under the EPBC Act.

### 3.1.3. State Agreement

The Rhodes Ridge deposits are subject to the *Iron Ore (Rhodes Ridge) Agreement Authorisation Act 1972 (WA)* (RRSA). A State Agreement is a legal contract between the Western Australian Government and a Proponent of a major project within State boundaries. A State Agreement details the rights, obligations, terms and conditions for developing a specific project.

## 3.2. Other Approvals and Regulation

### 3.2.1. Native Title

The Proposal is predominantly located within the boundaries of the recognised Native Title Determination Areas of the Nyiyaparli People (WCD2018/008). Karlka Nyiyaparli Aboriginal Corporation (KNAC) is the Registered Native Title Body Corporate representing Nyiyaparli Common Law Holders.

The south-west portion of the Development Envelope extends into the lands of the Ngarlawangga People Native Title Determination area (WCD2016/007). Ngarlawangga Aboriginal Corporation (NAC) is the Registered Native Title Body Corporate and holds Native Title in trust for the Ngarlawangga People.

### 3.2.2. Land Tenure

The Proposal is located predominantly on nine Temporary Reserves that currently operate pursuant to the *Mining Act 1904 (WA)* and the RRSA, and five Exploration Licences and one Miscellaneous Licence that currently operate pursuant to the *Mining Act 1978 (WA)*.

**Table 3-1: Tenure of the Rhodes Ridge area**

| Tenement | Description | Tenement Holders | Legal Area |
|---|---|---|---|
| E47/00539 | HI/RRJV Exploration Licence | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 10,731.1 ha |
| E47/00622 | HI/RRJV Exploration Licence | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 2,746.8 ha |
| E47/00623 | HI/RRJV Exploration Licence | Hamersley Exploration Pty Limited | 2,371.9 ha |
| E47/00624 | HI/RRJV Exploration Licence | Hamersley Exploration Pty Limited | 606.7 ha |
| TR70/04192 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 11,620 ha |
| TR70/04193 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 11,235 ha |
| TR70/04266 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 2,597.5 ha |
| TR70/04267 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 8,376.5 ha |
| TR70/04737 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 6,141 ha |
| TR70/04881 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 11,215 ha |
| TR70/04882 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 10,890 ha |
| TR70/04883 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 6,648.5 ha |
| TR70/04884 | HI/RRJV Temporary Reserve | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 13,395 ha |
| L47/1092 | HI/RRJV Miscellaneous Licence | Hamersley Resources Limited<br>Wright Prospecting Pty Ltd | 2,179.34 ha |

### 3.2.3. Decision-making Authorities and Other Approvals

In addition to the EPA assessment of the Proposal under Part IV of the EP Act, numerous other environment-related assessments and authorisations will be required before the Proposal can be implemented. The authorities are listed in **Table 3-2** and have been identified as decision-making authorities (DMAs) for this Proposal.

**Table 3-2: Decision-making authorities identified for the Proposal and other approvals required**

| Decision-making Authority | Associated Legislation | Approval Required | Statutory Decision-Making Process to Mitigate Potential Impacts |
|---|---|---|---|
| Minister for Water, Department of Water and Environmental Regulation (DWER) | *Rights in Water and Irrigation Act 1914* (RiWI Act) | **Section 26D licence** required to construct dewatering and water supply bores<br><br>**Section 5C licence** required for the abstraction of groundwater | RiWI Act processes regulate the extraction of water associated with mine dewatering, but not disposal.<br>Assessments of licence applications to take groundwater include consideration of environmental and social impacts, including effects on:<br>• Groundwater resource - availability, allocation and quality<br>• Groundwater dependent ecosystems (GDE), and<br>• Other groundwater users.<br>Hydrogeological studies are required to inform the assessment, including the potential impacts of taking water. |
| | | **Groundwater Licence** required to manage significant volumes of water proposed to be taken from several sources and multiple bores | The Groundwater Operating Strategy supplements a section 5C licence detailing how the licensee will manage its operations to address broader management issues associated with taking and using water (DWER 2020). |
| | | **Section 11/17/21A Permit** required to interfere or obstruct bed or banks (i.e. creek diversion) | Permit applications consider the effect of the alteration to existing surface water catchments, surface water flow paths and sheetflows. |
| Chief Executive Officer, DWER | EP Act Part V | **Works Approval* and Licence**<br>Activities and prescribed premise categories applicable to the Proposal include, but are not limited to:<br>• 5 – Processing of ore<br>• 6 – Mine dewatering<br>• 12 – Screening, etc. of materials<br>• 64 – Class II Putrescible landfill<br>• 73 – Bulk storage of chemicals etc. | Works approvals and licences regulate industrial emissions and discharges to air, land or water and apply to 'prescribed premises' categories defined in Schedule 1 of the Environmental Protection Regulations.<br>Assessments consider the risk to the environment, public health and amenity and the controls proposed to mitigate these risks.<br>Compliance monitoring and reporting are included in standard conditions of approval. |

| Decision-making Authority | Associated Legislation | Approval Required | Statutory Decision-Making Process to Mitigate Potential Impacts |
|---|---|---|---|
| Chief Dangerous Goods Officer, Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) | *Dangerous Goods Safety Act 2004* (DG Safety Act) | **Dangerous Goods (DG) Licence** is required for the storage and handling of hazardous materials during construction | Dangerous goods licence applications require risk assessments demonstrating the dangerous goods site can be operated with minimal risk to people, property and the environment. |
| Minister for Aboriginal Affairs, Department of Planning, Lands and Heritage (DPLH) | *Aboriginal Heritage Act 1972* (AH Act) | **Section 16 Authorisation** is required to enter, excavate, examine or remove anything from an Aboriginal site<br>**Section 18 Notices** from the Minister is required in advance where the impact on an Aboriginal site is unavoidable<br>Both are undertaken in full consultation with the relevant Traditional Owner Group. | s.16 and 18 authorisations are predominately related to authorisations to impact heritage sites and therefore not expected to regulate impacts to the environment. |
| Minister for Environment and Chief Executive Officer, Department of Biodiversity, Conservation and Attractions (DBCA) | *Biodiversity Conservation Act 2016* (BC Act) | **Section 40 Authorisation** is required from the Minister to take and/or disturb threatened flora and/or fauna species. | Authorisation to take threatened species is always required irrespective of any approval granted or exemption under the EP Act.<br>The BC Act provides the ability to impose conditions on authorisations to take threatened species that mitigate or offset the impact of such actions. |
| Minister for Mines and Petroleum, Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) | *Mining Act 1978* (WA) (Mining Act)<br>*Mining Act 1904 (WA)* | **Mining Proposal** is required for any mining-related disturbance within tenements (i.e., all works apart from road intersection works) outside of the State Agreement area | Mining Proposals address all Proposal elements and activities and consider the likely environmental impacts within an 'Environmental Group Site' (a grouping of mining tenements that make up a mining operation). DEMIRS aims to focus its assessment on factors not regulated elsewhere (e.g., such as key environmental factors assessed under Part IV of the EP Act). |
| | | **Programme of Work (PoW)** Application is required to undertake ground disturbing activities with mechanised equipment on mining tenement (i.e., Exploration activities) | PoW include requirements to rehabilitate disturbed areas. |

| Decision-making Authority | Associated Legislation | Approval Required | Statutory Decision-Making Process to Mitigate Potential Impacts |
|---|---|---|---|
| Minister for State and Industry Development, Department of Jobs, Tourism, Science and Innovation (JTSI) | *State Agreement Act*<br>*Iron Ore (Hamersley Range) Agreement Act 1963*<br>*Iron Ore (Rhodes Ridge) Agreement Authorisation Act 1972 (WA)* | **State Agreement** is administered by JTSI on behalf of the Minister for State and Industry Development and the Western Australian Government. | The State Agreement details the rights, obligations, terms, and conditions for the project's development.<br>Modernisation of certain terms of the RRSA is underway with JTSI and will continue in parallel with assessment under the EP Act.<br>Development proposals can only be submitted following receipt of approvals required under the EP Act. |

# 4. STAKEHOLDER ENGAGEMENT

## 4.1. Stakeholder Identification

Relevant stakeholders identified as being relevant to, or interested in the Proposal are listed in **Table 4-1.**

**Table 4-1: Key stakeholders for the Rhodes Ridge Proposal**

| Stakeholder Sector | Organisation | Key Interest/s |
|---|---|---|
| Government of Western Australia | Environmental Protection Authority | Administers EP Act<br>Part IV (EP Act) EIAs |
| | Department of Planning, Lands and Heritage | Native Title requirements<br>Heritage, cultural, ethnographic and archaeological sites |
| | Department of the Premier and Cabinet | Aboriginal policy |
| | Department of Mines, Industry Regulation and Safety | Administers Mining Act and Regulations<br>Tenement conditions<br>Mining proposals and programs of work<br>Mine closure<br>Mining rehabilitation fund<br>Rehabilitation standards<br>Safety in resource sector |
| | Department of Water and Environmental Regulation | Administers RIWI Act<br>Provision of licences to abstract water<br>Groundwater quality and quantity<br>Administers Part V (EP Act), Industry regulation and licensing, and *Contaminated Sites Act 2003*<br>Supports administration of the Environmental Protection Authority and Part IV of the EP Act and *Environmental Protection Amendments Act 2020*. |
| | Department of Jobs, Tourism, Science and Innovation | Administers State Agreement Acts<br>Major Projects<br>Future Battery Mineral Strategy<br>Jobs<br>Renewable energy initiatives |
| | Department of Primary Industries and Regional Development (DPIRD)<br>Department of Communities | Regional and community development |
| | Department of Biodiversity, Conservation and Attractions (DBCA) | Administers BC Act<br>Flora, fauna and habitat conservation<br>Interest in projects that are located on DBCA managed land<br>Baseline surveys and licenses to take flora and fauna |
| | Department of Fire and Emergency Services | Fire breaks<br>Provision of emergency services |

| Stakeholder Sector | Organisation | Key Interest/s |
|---|---|---|
| | Department of Health | Environmental health, building and planning compliance |
| Australian Government | DCCEEW<br>Department of the Prime Minister and Cabinet<br>National Indigenous Australians Agency | Matters of National Environmental Significance<br>Native Title and Aboriginal heritage<br>Community Development Program |
| Local Government Authorities and community | Shire of East Pilbara<br>Newman Township | Rates<br>Local economy<br>Benefits to local economy and community<br>Safety of locals and passers-by<br>Use of public roads and infrastructure<br>Compliance with building, health, sewage and other<br>Local government regulation |
| Traditional Owner Groups | Nyiyaparli people<br>Ngarlawangga people<br>Karlka Nyiyaparli Aboriginal Corporation (KNAC)<br>Ngarlawangga Aboriginal Corporation (NAC)<br>Yamatji Marlpa Aboriginal Corporation (YMAC) | Access to and use of Traditional Owner land<br>Social and cultural heritage values<br>Native Title rights<br>Potential socio-economic opportunities resulting from the Proposal for individuals and/or businesses.<br>Direct and indirect impacts to cultural, heritage and social values of significance.<br>Cultural heritage protection<br>Water management – surface and subsurface, quantity and quality<br>Flora and Fauna (traditional resources) cultural assets<br>Operational interactions (including but not limited to traffic, road condition, noise, dust, vibrations and other amenity and aesthetic issues)<br>Closure and post mining land use |
| Pastoralists | Juna Downs Pastoral Station<br>Marillana and Ethel Creek Pastoral Station<br>Prairie Downs Pastoral Station<br>Turee Creek Pastoral Station | Access to and use of pastoral land<br>Business and other economic impacts and /or opportunities associated with the Proposal<br>Change of rights to land access<br>Land access agreement<br>Operational interactions (e.g. traffic, potential for cattle strikes, road condition, noise and other amenity issues)<br>Potential impacts from dust<br>Water management – surface and subsurface<br>Firebreaks<br>Provision of emergency service |
| Tenure holders | Rhodes Ridge Joint Venture<br>Third Party Tenure holders in the vicinity of the Proposal (including but not limited to BHP & Fortescue) | Access to and use of tenure<br>Change of rights to land access<br>Land access agreement<br>Operational interactions (e.g. traffic, road condition, noise and other amenity issues)<br>Firebreaks |

| Stakeholder Sector | Organisation | Key Interest/s |
|---|---|---|
| Interested Stakeholders | | |
| Non-government organisations and interested groups | Environmental Groups (e.g. Wildflower Society of WA, Conservation Council of WA)<br>Chamber of Commerce and Industry (Newman and WA)<br>Pilbara Development Commission<br>The Outback Way<br>Various Media Outlets (including Ngaarda Media) | Potential interest in baseline surveys and significance of data<br>Local content and service provision |
| Shareholders | Shareholders | Project value |
| Suppliers | Consultants and contracting | Business opportunities associated with the Proposal |
| Utilities and other service providers | Main Roads<br>Telstra<br>Water Corporation | Traffic interactions, changing road conditions<br>Interruptions to other facilities and services – power, gas, water, sewers, mobile signal etc. |

## 4.2. Stakeholder Engagement Process

A stakeholder consultation program was developed specifically for the Proposal to undertake effective consultation. The overarching objectives of the consultation program included the following:

- Ensure stakeholders understand the nature of the proposed project, including likely impacts, possible and practicable mitigation options, as well as future opportunities and benefits that may be derived from the Proposal
- Communicate the project vision to promote confidence in Rio Tinto as an organisation, and the proposed project, by ensuring open and transparent communication of the Proposals development process, likely direct and indirect impacts and risk management
- Enable individuals, groups, and agencies with interest in the Proposal to have access to up-to-date relevant information
- Establish opportunities for two-way feedback to engage stakeholders and maximise the Proposal outcomes through obtaining local knowledge and expertise
- Provide a means through which stakeholders can raise concerns and issues and Rio Tinto with the means to respond to these, and
- Assess stakeholder issues and concerns so that proposed impacts can be minimised to as low as reasonably practicable and in-line with stakeholder expectations.

## 4.3. Stakeholder Engagement

The Proponent maintains the Stakeholder Consultation Register, which tracks and maintains all consultation with identified key stakeholders. The outcomes of the consultation undertaken to date is summarised in **Table 4-2**.

**Table 4-2: Community Engagement Register**

| Stakeholder | Community Engagement Forum | Date | Details |
|---|---|---|---|
| **2022** | | | |
| KNAC/ Nyiyaparli Traditional Owners | Nyiyaparli and Rio Tinto Life of Mine Planning (LoMP) | May 2022 | Formal introduction of Rhodes Ridge Study was provided. |
| Ngarlawangga Traditional Owners/ NAC / YMAC | Ngarlawangga and Rio Tinto LoMP | June 2022 | Formal introduction of Rhodes Ridge Study was provided. |
| KNAC/ Nyiyaparli Traditional Owners | Nyiyaparli and Rio Tinto LoMP | October 2022 | Overview of Rhodes Ridge project scope, joint venture, deposits, work undertaken to-date and proposed future works. Key topic of focus was the biological survey work undertaken and future work planned. |
| Shire of East Pilbara | Shire Engagement | October 2022 | Introduction of Rhodes Ridge was provided. |
| Turee Creek Pastoral Station Manager | Turee Creek and Rio Tinto Pastoral Engagement | December 2022 | Introduction of Rhodes Ridge was provided. |
| **2023** | | | |
| Ngarlawangga People NAC / YMAC | Ngarlawangga and Rio Tinto LoMP | February 2023 | Introduction of East Pilbara regional approach and update on Giles Mini deposit. The opportunity to conduct Cultural Values Landscape Mapping remains on offer when their schedule allows their availability. |
| Marilina and Ethel Creek Pastoral Station Manager | Pastoral Engagement | February 2023 | Introduction of Rhodes Ridge was provided. |
| Prairie Downs Pastoral Station Manager | Pastoral Engagement | February 2023 | Introduction of Rhodes Ridge was provided. |
| KNAC/ Nyiyaparli Traditional Owners | CVLM Scoping workshop | July 2023 | Workshop with KNAC staff, consultants and RTIO staff to discuss and agree Scope of Work for CVLM fieldwork. |
| EPA | EPA meeting | July 2023 | Discussion centred on the proposed approval approach for the Proposal, the consideration of cumulative impacts, and application of the revised Social Surrounds factor guideline. |

| Stakeholder | Community Engagement Forum | Date | Details |
|---|---|---|---|
| Ngarlawangga People and NAC / YMAC | Ngarlawangga and Rio Tinto LoMP | July 2023 | Discussion of Rhodes Ridge approval strategy, overview of deposits, work undertaken to-date and proposed future works. |
| KNAC/ Nyiyaparli Traditional Owners | Nyiyaparli and Rio Tinto Heritage Sub-committee (HSC) | September 2023 | Discussion of Cultural Values Landscape Mapping including agreed fieldwork beginning in October 2023 to cover Arrowhead and Rhodes Ridge Main. |
| KNAC/ Nyiyaparli Traditional Owners | Nyiyaparli and Rio Tinto Local Implementation Committee (LIC) | September 2023 | Discussion of current and future mining activities on KNAC Country, proposed Rhodes Ridge approval strategy and anticipated dates for Referral. |
| DCCEEW | Pre-referral meeting | September 2023 | Discussion of Rhodes Ridge approval approach, overview of deposits, work undertaken to-date and proposed future works. |
| KNAC/ Nyiyaparli Traditional Owners | CVLM fieldwork | October 2023 | Initial CVLM of Rhodes Ridge. |
| Ngarlawangga People and NAC / YMAC | Ngarlawangga and Rio Tinto HSC | October 2023 | Discussion of Referral conceptual footprint including Giles Mini deposits and anticipated Referral review and submission dates. |
| DWER (EPA Services) | Pre-referral meeting | October 2023 | Discussion of Rhodes Ridge Proposal work undertaken to-date and proposed future works. |
| JTSI | JTSI and Rio Tinto Monthly Meeting | October 2023 | Discussion of Rhodes Ridge project and proposed timelines. |

# 5. ENVIRONMENTAL PRINCIPLES AND FACTORS

## 5.1. Environmental Principles

Section 4A of the EP Act identifies the object and principles of the Act, which is to protect the Environment of the State, having regard to a list of specific principles. These principles are the highest order which the EPA must have regarded as a condition of the valid exercise of its powers when assessing and reporting on proposals under the EP Act.

The Proponent has considered these principles concerning the development and implementation of the Proposal. **Table 5-1** outlines how the principles relate to the Proposal.

**Table 5-1: EP Act Principles**

| Principle | Consideration |
|---|---|
| **The Precautionary Principle**<br>Where there are threats of serious or irreversible damage, a lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.<br>In application of this precautionary principle, decisions should be guided by:<br>• Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment<br>• An assessment of the risk-weighted consequences of various options. | The Proponent has conducted multiple studies to understand the social and environmental values within the Development Envelope and to identify the potential risks to these from the Proposal. Additional surveys will also be undertaken throughout the approval process to further understand these values.<br>These studies have informed the detailed design of the Proposal, and modifications to the Proposal have been made to avoid and minimise impacts, where practicable.<br>All applicable studies have and will be conducted to conform with EPA's Environmental Factors Guidelines, technical guidance documents, and other best practice guidelines to ensure the robust collection of data to make predictions on the impact of the Proposal on environmental and social values.<br>The Proponent has applied the mitigation hierarchy of avoid, minimise and mitigate environmental, social and cultural heritage impacts to as low as reasonably practicable. |
| **The Principle of Intergenerational Equity**<br>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations. | The Proposal has been designed to address the EPA's objectives for the identified environmental factors, with mitigation measures to reduce residual environmental impacts and offsets proposed to compensate for any significant residual impacts. The maintenance of biological diversity and natural resources and reducing greenhouse gas emissions are of particular importance in relation to this principle.<br>A Greenhouse Gas Management Plan will be prepared as part of the impact assessment to outline emissions targets and the process to reduce emissions over time, consistent with the net-zero by 2050 commitment by the Australian Government.<br>The Proponent has and will continue to work collaboratively with the Traditional Owners to ensure the maintenance of Indigenous social and cultural heritage values and the future enjoyment of the land.<br>The Proponent will implement mining exclusion zones and mining restriction zones (MEZ and MRZ) to protect significant environmental and cultural values. |
| **The Principle of Conservation of Biological Diversity and Ecological Integrity** | The Proponent has considered the relevant environmental factors and has modified the mine and infrastructure design to avoid/minimise impacts to significant environmental values associated with flora and vegetation, terrestrial fauna and subterranean fauna, where practicable. |

| Principle | Consideration |
|---|---|
| **Principles Relating to Improved Valuation, Pricing and Incentive Mechanisms**<br>• Environmental Factors should be included in the valuation of assets and services<br>• The polluter pays principles — those who generate pollution and waste should bear the cost of containment, avoidance or abatement<br>• 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 wastes<br>• 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 solutions and responses to environmental problems. | The Proponent acknowledges the need for improved valuation, pricing and incentive mechanisms and endeavours to pursue these principles when practicable. The Proponent will bear all costs of monitoring, mitigation provisions, offsets and closure. |
| **The Principle of Waste Minimisation**<br>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment. | The Proponent has considered the principle of waste minimisation, including the destination and use of removed materials. Waste will be minimised during construction, operation and closure by adopting the hierarchy of waste controls: avoid, minimise, reuse, recycle and safe disposal. |

## 5.2. Environmental Factors

As defined by EPA (2023a) environmental factors are factors that the EPA uses as an organising principle for EIA, comprising a number of environmental values. The EPA has identified an environmental objective for each environmental factor. It will have regard to these objectives when determining whether the environmental impact of a proposal or scheme may be significant, and at most other stages of EIA.

Consideration of the Proposal against the EPA's environmental factors and identification of the relevant key environmental factors is summarised in **Table 5-2**. Identified key environmental factors are discussed in **Section 6**.

**Table 5-2: Environmental Factors**

| Factor | Objective | Relevance to Proposal | Key Factor |
|---|---|---|---|
| **Sea** | | | |
| Benthic communities and habitats | To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained. | The Proposal does not directly interact with any benthic communities or habitat. No relevance to the proposal. | Not considered a key environmental factor. |

| Factor | Objective | Relevance to Proposal | Key Factor |
|---|---|---|---|
| Coastal processes | To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected. | The Proposal does not directly interact with coastal processes. No relevance to the proposal. | Not considered a key environmental factor. |
| Marine environmental quality | To maintain the quality of water, sediment and biota so that environmental values are protected. | The Proposal does not directly interact with the marine environment (including water, sediment or biota). No relevance to the proposal. | Not considered a key environmental factor. |
| Marine fauna | To protect marine fauna so that biological diversity and ecological integrity are maintained. | The Proposal does not directly interact with the marine environment (including marine fauna). No relevance to the proposal | Not considered a key environmental factor. |
| **Land** | | | |
| Flora and vegetation | To protect flora and vegetation so that biological diversity and ecological integrity are maintained. | The Proposal will result in the clearing of flora and vegetation. Significant flora species are known to occur within the Development Envelope. | **Considered a key environmental factor.** |
| Landforms | To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected | The Proposal will not substantially alter significant landforms as described in this factor. Visual amenity impacts are a result of this Proposal will be considered under Social Surroundings. | Considered as Other Environmental Factor (see **Section 12**). |
| Subterranean fauna | To protect subterranean fauna so that biological diversity and ecological integrity are maintained. | The Proposal will result in the permanent alteration of subterranean fauna habitat from mining and altered hydrology from groundwater abstraction and reinjection. | **Considered a key environmental factor** |
| Terrestrial environmental quality | To maintain the quality of land and soils so that environmental values are protected. | The Proposal will interact with this factor due to the construction and operation of waste rock landforms, and tailings facilities, as well as handling of potential acid forming materials. The Proponent however has a long history of managing those aspects relevant to this factor in a way that the EPA objective can be met. | Considered as Other Environmental Factor (see **Section 12**). |
| Terrestrial fauna | To protect terrestrial fauna so that biological diversity and ecological integrity are maintained | The Proposal will result in the clearing of fauna habitat. Significant fauna species are known to occur within the Development Envelope. | **Considered a key environmental factor**. |
| **Water** | | | |
| Inland Waters | To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected | The Proposal will require drainage diversions, drains and surface water levees, as well as abstraction of groundwater and surplus water management. Surplus water management includes but is not limited to, aquifer recharge, temporary surplus water discharge, and transfer to third parties. | **Considered a key environmental factor.** |

| Factor | Objective | Relevance to Proposal | Key Factor |
|---|---|---|---|
| **Air** | | | |
| Air quality | To maintain air quality and minimise emissions so that environmental values are protected | The Proposal will not result in a significant reduction in the quality of the local air shed. | Considered as Other Environmental Factor (see **Section 12**). |
| Greenhouse gas emissions | To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable | Forecast emissions as a result of the Proposal will exceed 100,000 tonnes $CO_2$-e of Scope 1 emissions per annum during the life of the project. As a result, Greenhouse Gas Emissions will be considered a Key Environmental Factor. | **Considered a key environmental factor.** |
| **People** | | | |
| Social Surroundings | To protect social surroundings from significant harm | The Proposal is predominantly located within the boundaries of the recognised Native Title Determination Areas of the Nyiyaparli People The south-west portion of the Development Envelope extends into the lands of the Ngarlawangga People Native Title Determination area.<br>The Proposal has the potential to impact on cultural, aesthetic and other Social Surroundings values. | **Considered a key environmental factor.** |
| Human Health | To protect human health from significant harm | The Proposal is unlikely to generate emissions that may impact on human health. Dust emissions will be considered under the factor of Air Quality. Therefore, Human Health is not a relevant factor for the Proposal. | Not considered a key environmental factor. |

# 6. KEY ENVIRONMENTAL FACTOR – FLORA AND VEGETATION

## 6.1. EPA Objective

The EPA objective for flora and vegetation is to protect flora and vegetation so that biological diversity and ecological integrity are maintained (EPA 2023a).

## 6.2. Policy and Guidelines

**Table 6-1** outlines the relevant policy and guidance for flora and vegetation and summarises how this material has been considered for the Proposal.

**Table 6-1: Relevant Policy and Guidelines for Flora and Vegetation**

| Policy or Guidance | Explain how the Policy and Guidance has been Considered |
|---|---|
| **Environmental Protection Authority** | |
| Statement of Environmental Principles, Factors and Objectives (EPA 2023a) | The EPA objective for flora and vegetation forms the basis of this assessment. This assessment has regard to the aims of EIA, consideration of significance and the application of the mitigation hierarchy. |
| Environmental Factor Guideline: Flora and Vegetation (EPA 2016a) | Considered in the design (methods and approach) of the flora and vegetation surveys. |
| EPA Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b) | |
| Environmental Impact Assessment (Part IV Divisions 1 And 2) Administrative Procedures (EPA 2021a) | Considered in preparation of the referral and impact assessment. |
| Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2021b) | |
| Instructions on how to prepare an Environmental Review Document (EPA 2021c) | This document forms the basis of the headings and content to be provided in the ERD. |
| Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans (EPA 2021d) | The EMP will be prepared in accordance with the guidance and addresses, amongst other things, matters related to flora and vegetation |
| Instructions on how to prepare *Environmental Protection Act 1986* Part IV Impact Reconciliation Procedures and Impact Reconciliation Reports (EPA 2021e) | Considered in the impact assessment and offset approach for flora and vegetation. |
| Template for *Environmental Protection Act 1986* Part IV Reconciliation Procedures (EPA 2021f) | |
| 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) | Considered in understanding cumulative impacts and supports conclusions on significance, and therefore offsets required for clearing of vegetation based on its condition |
| **Other State or Commonwealth** | |
| Mine Closure Plan Guidance – How to Prepare in Accordance with Part 1 of the Statutory Guidelines (DMIRS 2020a) | The MCP will be prepared in accordance with the guidance and addresses matters related to flora and vegetation |

| Policy or Guidance | Explain how the Policy and Guidance has been Considered |
|---|---|
| Statutory Guidelines for Mine Closure Plans (DMIRS 2020b) | |
| WA Environmental Offsets Policy (Government of Western Australia 2011) | Considered in the impact assessment and offset approach for Flora and Vegetation. |
| WA Environmental Offsets Guidelines (Government of Western Australia 2014). | |

## 6.3. Receiving Environment

### 6.3.1. Studies and Survey Effort

Extensive flora and vegetation surveys have been undertaken within the Development Envelope (and broader region) to support the impact assessment of this Proposal, as summarised in **Table 6-2** . Survey coverage is shown in **Figure 6-1**.

**Table 6-2: Flora and vegetation surveys undertaken for the Proposal**

| Survey consultant and date | Survey title | Description |
|---|---|---|
| Astron Environmental Services (2023a) | Rhodes Ridge Vegetation and Flora Assessment Interim Report | • Two phase detailed flora and vegetation survey<br>• Greater Rhodes Ridge survey area (113,496 ha)<br>• 28 surveys from June 2019 – August 2022 (4 dry seasons and 2 post-wet seasons)<br>• 562 quadrats and 49 relevés<br>• Survey work is still ongoing |
| GHD (2022) | Rhodes Ridge Targeted Flora Survey | • Targeted flora survey<br>• 3,470 ha survey area<br>• 19 – 24 April 2022 (post-wet) |
| Astron Environmental Services (2022a) | Species Distribution Models - Rhodes Ridge - Priority Flora and Ecological Communities | • Desktop assessment to model the spatial distribution of 11 priority taxa and two Priority Ecological Communities (PEC) (Coolibah Lignum Flats and West Angelas Cracking Clays) |
| Astron Environmental Services (2022b) | Rhodes Ridge Remote Sensing Vegetation Classification | • Remote Sensing Classification (RSC) model for vegetation types developed from botanical survey data and remote sensing data<br>• Provide useful insights into vegetation types (broad floristic formations and associations) and their boundaries |

In addition to these, multiple surveys have been undertaken across the Proposal to support Native Vegetation Clearing Permit (NVCP) applications, which have informed the detailed surveys.

### 6.3.2. Future Studies and Survey Effort

Investigations have been ongoing throughout 2023 and will continue in 2024 to inform the preparation of the Environmental Review Document (**Table 6-3**). A summary of the key flora and vegetation values identified within the Development Envelope is provided in following sections.

**Table 6-3: Future Studies - Flora and Vegetation**

| Proposed Survey | Survey Scope | Commencement Date |
|---|---|---|
| Targeted flora survey | Targeted survey for Priority flora species identified in previous surveys within the broader survey area. | H2 2024 |
| Regional targeted flora survey | Targeted survey for Priority flora species identified in previous surveys outside of the proposed Development Envelope. | H1 2025 |
| Flora and vegetation survey | Reassess and rescore quadrats from previous surveys that were undertaken during poor conditions. | H1 2025 |
| Detailed flora and vegetation survey | Two phase detailed survey within new tenure footprint (L47/1092). | H2 2024 |
| Baseline GDE exposure assessment | GDE assessment to identify potential GDE features within the Development Envelope and surrounding area. Reconnaissance survey undertaken in October 2023.<br>Continuation of survey in 2024 to further understand features that could be groundwater dependent. | H1 2024 |
| Riparian values assessment (RVA) | Assessment of riparian ecosystems and associated values in the broader survey area to identify riparian features of local, sub-regional and regional significance. Surveys undertaken in July and August 2023.<br>Additional survey phase in 2024 to map and delineate riparian vegetation within the Development Envelope. | H1 2024 |

720,000mE
740,000mE
760,000mE
7,460,000mN
7,440,000mN
7,420,000mN

BANJIMA PEOPLE
- WCD2014/001

NYIYAPARLI #3
- WCD2018/008

NYIYAPARLI PEOPLE
- WCD2018/008

NGARLAWANGGA PEOPLE
- WCD2016/007

Hope Downs 1
Hope Downs 1 Village
Hope Downs 4
Hope Downs 4 Village

Pebble Mouse Creek
Weeli Wolli Creek
Coondiner Creek
Great Northern Highway
Kalgan Creek
Spearhole Creek
Western Creek

## Legend

*Flora and Vegetation Survey Coverage*

- Mapping Note
- Quadrat
- Relevé
- Proposed Development Envelope
- Conceptual Disturbance Footprint
- Native Title Determination Area
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

**Drawn:** A.Coulson
**Plan:** RTIO-1023037v2
**Date:** December 2023

**Checked by:** M.Buck
**Proj:** GDA 1994 MGA Zone 50
***GIS.Team@riotinto.com***


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Figure 6-1: Flora and vegetation survey coverage in the Development Envelope

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N

### 6.3.3. Regional Vegetation

Regional scale vegetation associations have been defined from broad vegetation mapping of Western Australia (WA), completed on a broadscale (1:1,000,000 and 1:250,000) by Beard (1975). Several revisions and updates have been made since then, resulting in the most recent and comprehensive iteration, detailed in Beard *et al.* (2013).

The Proposal intersects four vegetation associations mapped by Beard (1975) (**Figure 6-2**).

**Table 6-4** summarises these four vegetation associations' current and pre-European extent with respect to the extent within the Development Envelope.

**Table 6-4: Pre-European Vegetation Associations in the Development Envelope**

| Vegetation Association | Association Description | Hamersley Subregion Extent (ha) | | Development Envelope Extent (ha) |
|---|---|---|---|---|
| | | Pre-European | Current | |
| Hammersley_18 | Low woodland; mulga *(Acacia aneura)* | 581,246.1 | 576,541.7 | 10,806.3 |
| Hammersley_29 | Sparse low woodland; mulga, discontinuous in scattered groups | 172,082.6 | 170,747.6 | 24,816.9 |
| Hammersley_82 | Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana* | 2,177,573.9 | 2,165,224.2 | 20,562 |
| Hammersley_175 | Short bunch grassland - savanna/ grass plain (Pilbara) | 93,039.8 | 92,751.1 | 5,116.1 |

### 6.3.4. Local Vegetation

Thirty-nine vegetation types have been delineated within the Development Envelope, including two mosaic vegetation types (Astron, 2023a). The majority of the intact vegetation assessed is classified as Very Good or Excellent condition. Vegetation types and their respective extents are summarised in **Table 6-5** and presented in **Figure 6-3**.

Vegetation within the proposed disturbance footprint is considered mostly to be in Very Good to Excellent condition. Previous disturbance within the Development Envelope is associated with current and historic exploration activities, authorised under both the EP Act and Mining Act. Examples of this disturbance include the old Rhodes Ridge camp and airstrip; and drilling pads and associated tracks.

**Table 6-5: Local Vegetation Types/units**

| Vegetation type | Description | Extent | | |
|---|---|---|---|---|
| | | Survey area (ha (%)) | Development Envelope (ha) | Disturbance Footprint (ha) |
| D1 | *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees to low open woodland over *Acacia tumida* var. *pilbarensis, Petalostylis labicheoides* and *Grevillea wickhamii* subsp. *hispidula* tall open shrubland to tall open scrub over *Androcalva luteiflora*, *Acacia maitlandii* and *Santalum lanceolatum* scattered shrubs to shrubland over (*Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186) and/or *Indigofera fractiflexa* subsp. *fractiflexa* scattered low shrubs to low open heath over) *Triodia pungens* very open hummock grassland to open hummock grassland over *Themeda triandra* (*Eriachne mucronata* and *Paraneurachne muelleri*) scattered tussock grasses to open tussock grassland. | 2,169 (1.9%) | 902.6 | 323.9 |
| D2 | *Eucalyptus xerothermica* scattered low trees to low open woodland over *Acacia aptaneura, A. catenulata* subsp. *occidentalis* and/or *A. citrinoviridis* tall shrubland to tall open scrub over *Petalostylis labicheoides* (and other species) scattered low shrubs to open shrubland over *Triodia pungens* very open hummock grassland over *Chrysopogon fallax* scattered tussock grasses to very open tussock grassland. | 432.4 (0.4%) | 191.6 | 96.7 |
| D4 | *Eucalyptus camaldulensis* and *E. victrix* low open woodland to woodland over *Petalostylis labicheoides*, *Acacia citrinoviridis* and *Gossypium robinsonii* scattered tall shrubs to tall shrubland over *G. sturtianum* var. *sturtianum* (and *Androcalva luteiflora*) scattered shrubs to open shrubland (over *Triodia longiceps* and/or *T. pungens* scattered hummock grasses to very open hummock grassland) over *Themeda triandra, Eulalia aurea* and *Eriachne tenuiculmis* open tussock grassland with *Eragrostis tenellula* scattered annual grasses to very open annual grassland. | 285.9 (0.3%) | 72.8 | 36.9 |
| D5 | *Eucalyptus xerothermica* (and *Corymbia hamersleyana*) low open woodland over *Petalostylis labicheoides, Eremophila longiflora* and *Androcalva luteiflora* tall open shrubland to tall shrubland over *Senna artemisioides* subsp. x *artemisioides*, *Gossypium sturtianum* var. *sturtianum* and *Santalum lanceolatum* scattered shrubs to open shrubland over *Triodia pungens, T. longiceps* and/or *T. wiseana* scattered hummock grasses to open hummock grassland over *Themeda triandra, Eulalia aurea* and *Chrysopogon fallax* tussock grassland (over *Eragrostis cumingii, Digitaria ctenantha* and/or *Perotis rara* scattered annual grasses to open annual grassland with *Arivela viscosa* and **Bidens bipinnata* scattered herbs to very open herbland). | 551.4 (0.5%) | 283.6 | 107.0 |
| D8 | *Eucalyptus xerothermica* low open woodland over *Acacia aptaneura, A. catenulata* subsp. *occidentalis* and other *Acacia* spp. scattered tall shrubs to tall shrubland over (*Dipteracanthus australasicus* subsp. *australasicus*, *Ptilotus obovatus* var. *obovatus* and/or other species low open shrubland over) *Themeda triandra* (*Eulalia aurea* and *Paraneurachne muelleri*) tussock grassland. | 229.5 (0.2%) | 68.7 | 3.9 |
| D15 | *Eucalyptus xerothermica* scattered low trees to open woodland over *E. socialis* subsp. *eucentrica* and/or *E. trivalva* low open mallee woodland over *Acacia steedmanii* subsp. *borealis*, *A. bivenosa* and other species tall open shrubland over *Triodia angusta* and/or *T. wiseana* very open hummock grassland to open hummock grassland with *Themeda triandra* open tussock grassland. | 198.2 (0.2%) | 164.1 | 30.6 |
| G1 | *Corymbia ferriticola, Ficus brachypoda* (and *Callitris columellaris*) low open woodland to open woodland over *Acacia aptaneura*, *Dodonaea petiolaris* and/or *A. catenulata* subsp. *occidentalis* scattered tall shrubs to tall shrubland over *Prostanthera albiflora* and *Dodonaea viscosa* subsp. *mucronata* scattered shrubs to open shrubland over *Triodia pungens* very open hummock grassland over *Aristida burbidgeae, Eriachne mucronata* and *Cymbopogon ambiguus* scattered tussock grasses to very open tussock grassland with *Pandorea pandorana* very open lianas. | 9.2 (<0.1%) | 9.1 | 0 |
| G3 | *Corymbia hamersleyana, C. ferriticola* and *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Grevillea wickhamii* subsp. *hispidula*, *Acacia tumida* var. *pilbarensis* and *Androcalva luteiflora* tall shrubland (over *A. maitlandii* and *A. hamersleyensis* scattered shrubs to open shrubland) over *Triodia pungens* very open hummock grassland over *Eriachne mucronata, Themeda triandra* and *Cymbopogon ambiguus* very open tussock grassland. | 365.6 (0.3%) | 132.1 | 9.6 |
| G24 | *Corymbia ferriticola* (*Eucalyptus leucophloia* subsp. *leucophloia* and *Ficus brachypoda*) low open woodland to low woodland over *Acacia catenulata* subsp. *occidentalis*, *A. aptaneura* and/or *A. mulganeura* tall open shrubland (over *Dodonaea pachyneura* and other species scattered shrubs to open shrubland) over *Triodia pungens* (and *T.* sp. Mt Ella (M.E. Trudgen 12739) P3) very open hummock grassland to open hummock grassland with *Eriachne mucronata* very open tussock grassland. | 115.5 (0.1%) | 42.8 | 0.7 |
| H3 | *Eucalyptus leucophloia* subsp. *leucophloia* and/or *Corymbia deserticola* subsp. *deserticola* scattered low trees to low open woodland over *Hakea chordophylla*, *Acacia trudgeniana* and/or *A. inaequilatera* scattered tall shrubs to tall open shrubland (over *A. hilliana, A. bivenosa* and/or *Ptilotus rotundifolius* scattered shrubs to low open shrubland) over *Triodia vanleeuwenii* (and *T. pungens, T. wiseana* and/or *T. brizoides*) open hummock grassland to hummock grassland (over *Fimbristylis simulans* scattered sedges to very open sedgeland). | 19,168.8 (16.9%) | 9,009.3 | 2,382.2 |
| H10 | *Eucalyptus socialis* subsp. *eucentrica* and/or *E. repullulans* scattered low mallees to low mallee woodland over *Triodia wiseana* and *T. angusta* very open hummock grassland to hummock grassland | 2,507.4 (2.2%) | 1,220.5 | 640.3 |
| H11 | (*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees to low open woodland over) *Eucalyptus gamophylla* scattered low mallees to low mallee woodland over *Acacia bivenosa*, *Hakea chordophylla* and/or *A. trudgeniana* (and/or other *Acacia* spp.) scattered shrubs to tall open shrubland over (*Androcalva loxophylla*, *Seringia exastia* and/or *Scaevola parvifolia* scattered low shrubs to low open shrubland over) *Triodia vanleeuwenii* and *T. pungens* very open hummock grassland to hummock grassland. | 6,111.8 (5.4%) | 2,975 | 687.9 |
| H12 | (*Corymbia hamersleyana* and/or *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees to low open woodland over) *Acacia inaequilatera* (and/or *A. bivenosa*) scattered shrubs to tall open shrubland over (*Senna artemisioides* subsp. *oligophylla* scattered low shrubs over) *Triodia wiseana* open hummock grassland. | 3,332.5 (2.9%) | 1,428.9 | 207.5 |
| H14 | *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees to low open woodland over *Acacia sibirica*, *A. bivenosa* and other *Acacia* spp. scattered shrubs to tall open shrubland over *Triodia vanleeuwenii* (and *T. pungens*) open hummock grassland to hummock grassland. | 367.8 (0.3%) | 367.8 | 133.1 |
| H15 | *Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees over *Hakea chordophylla* (and/or *Acacia marramamba* or *A. pruinocarpa*) scattered tall shrubs over *A. arida* open shrubland to shrubland over *Triodia vanleeuwenii* (and *T. pungens* or *T. wiseana*) open hummock grassland to closed hummock grassland. | 1,363.1 (1.2%) | 763.3 | 526.9 |

| Vegetation type | Description | Extent | | |
|---|---|---|---|---|
| | | Survey area (ha (%)) | Development Envelope (ha) | Disturbance Footprint (ha) |
| H19 | *Eucalyptus leucophloia* subsp. *leucophloia* and/or *Corymbia deserticola* subsp. *deserticola* scattered low trees to low open woodland over *Acacia pruinocarpa, A. aptaneura* and *A. catenulata* subsp. *occidentalis* (and other *Acacia* spp.) tall open shrubland (over *Eremophila exilifolia*, *Ptilotus rotundifolius* and/or *P. obovatus* scattered low shrubs to shrubland) over *Triodia pungens, T. vanleeuwenii* (and *T. wiseana*) hummock grassland. | 4,318.1 (3.8%) | 2,381.1 | 456.1 |
| H21 | *Eucalyptus socialis* subsp. *eucentrica* and *E. repullulans* scattered low mallees to low mallee woodland over (*Acacia bivenosa* and/or other *Acacia* spp. scattered tall shrubs to tall open shrubland over) *Melaleuca eleuterostachya* scattered shrubs to shrubland over *Triodia wiseana* and *T. angusta* very open hummock grassland to hummock grassland. | 3,041.4 (2.7%) | 2,170.2 | 450.7 |
| H22 | *Eucalyptus leucophloia* subsp. *leucophloia* (and *Corymbia ferriticola*) scattered low trees over *Acacia catenulata* subsp. *occidentalis*, *A. aptaneura* (and *Grevillea berryana*) tall shrubland to tall open scrub over *Triodia pungens* scattered hummock grasses to open hummock grassland over *Eriachne mucronata* scattered tussock grasses to very open tussock grassland. | 536 (0.5%) | 198.1 | 34.4 |
| H25 | *Eucalyptus leucophloia* subsp. *leucophloia* (and *Corymbia deserticola* subsp. *deserticola*) scattered low trees to low open woodland over *Acacia marramamba*, *A. rhodophloia* and *A. sibirica* (and/or other *Acacia* spp.) scattered shrubs to tall open shrubland over *Triodia pungens* and *T. vanleeuwenii* very open hummock grassland to hummock grassland. | 1,626.7 (1.4%) | 815.4 | 545.8 |
| H26 | *Corymbia hamersleyana* (and *Eucalyptus leucophloia* subsp. *leucophloia*) low open woodland over *Acacia hamersleyensis*, *A. adsurgens* and *A. sibirica* (and other *Acacia* spp.) tall open scrub over *Triodia vanleeuwenii* and *T. wiseana* hummock grassland. | 69.5 (0.1%) | 69.5 | 1.3 |
| H27 | *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* scattered low trees to low open woodland over (*Hakea chordophylla* scattered tall shrubs over) *Seringia exastia*, *Acacia adoxa* var. *adoxa* and *Mirbelia viminalis* scattered low shrubs to low open shrubland over *Triodia vanleeuwenii*, *T. pungens* and/or *T. wiseana* open hummock grassland to hummock grassland. | 13,764.2 (12.1%) | 3,469.4 | 691.3 |
| H32 | *Acacia sibilans (A. aptaneura* and *Eremophila oppositifolia* subsp. *angustifolia*) tall open shrubland to tall shrubland over *Triodia wiseana, T. angusta* or *T. longiceps* very open hummock grassland. | 64.7 (0.1%) | 64.4 | 0 |
| H33 | *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* scattered low trees to low open woodland over *E. gamophylla* and *E. kingsmillii* low open mallee woodland (over *Acacia adoxa* var. *adoxa*, *A. hilliana* and *Seringia exastia* scattered low shrubs to low shrubland) over *Triodia pungens, T. vanleeuwenii* and/or *T. brizoides* open hummock grassland. | 1,050.8 (0.9%) | 321.6 | 0 |
| H34 | *Eucalyptus trivalva, E. repullulans* (and *E. socialis* subsp. *eucentrica*) low open mallee woodland over *Triodia wiseana* open hummock grassland. | 1,056.2 (0.9%) | 369.4 | 76.2 |
| H36 | *Eucalyptus ewartiana* (and *Eucalyptus kingsmillii*) low open mallee woodland to low mallee woodland over *Dampiera metallorum* P3 scattered low shrubs over *Triodia pungens, T. brizoides* and *T.* sp. Mt Ella (M.E. Trudgen 12739) P3 open hummock grassland over *Eriachne mucronata* scattered tussock grasses. | 27.8 (<0.1%) | 27.8 | 0 |
| H40 | (*Eucalyptus leucophloia* subsp. *leucophloia* scattered low trees to low open woodland over) *Eucalyptus gamophylla, E. socialis* subsp. *eucentrica* and *E. trivalva* low open mallee woodland to low mallee woodland (over *Acacia atkinsiana*, *A. bivenosa* and/or other *Acacia* spp. low open shrubland to scattered tall shrubs) over *Triodia wiseana, T. vanleeuwenii* and/or *T. pungens* open hummock grassland. | 384.4 (0.3%) | 2.1 | 0 |
| H42 | *Eucalyptus gamophylla* and *E. kingsmillii* low open mallee woodland over *Acacia atkinsiana* (*A. kempeana*, *A. sibirica* and/or *A. rhodophloia*) tall open shrubland to tall shrubland over *A. spondylophylla* scattered low shrubs to low open shrubland over *Triodia vanleeuwenii* and *T. pungens* hummock grassland. | 601.3 (0.5%) | 245.6 | 6.8 |
| P1 | *Acacia catenulata* subsp. *occidentalis*, *A. aptaneura* and *A. pruinocarpa* tall open shrubland to tall open scrub over *Sida ectogama, Eremophila forrestii* subsp. *forrestii* and/or *Rhagodia* sp. Hamersley (M. Trudgen 17794) P3 scattered shrubs to open shrubland (over *Triodia pungens* and/or *T. melvillei* scattered hummock grasses to open hummock grassland) over *Aristida contorta, Perotis rara, Aristida obscura* (and other species) scattered annual grasses to open annual grassland (over **Bidens bipinnata* scattered herbs to open herbland), with strong to weak banding on sheet flow hard pan clay plains. | 13,028 (11.5%) | 9,355.1 | 2,137.5 |
| P3 | *Acacia pruinocarpa, A. catenulata* subsp. *occidentalis* and *A. aptaneura* tall open shrubland to tall open scrub over *Eremophila forrestii* subsp. *forrestii* scattered shrubs to shrubland over *Triodia pungens* very open hummock grassland to open hummock grassland on pediments and rocky plains. | 9,858.6 (8.7%) | 4,653.4 | 1,221.8 |
| P1/P3 Mosaic | Mosaic of vegetation unit P1 weakly banded mulga vegetation with vegetation unit P3 rocky clay plain and pediment mulga shrublands. | 420 (0.4%) | 420 | 180.6 |
| P5 | (*Eucalyptus victrix* scattered low trees to low open woodland over) *Acacia aptaneura* tall open shrubland to tall shrubland over (*Rhagodia eremaea* and/or *Ptilotus obovatus* var. *obovatus* scattered low shrubs to shrubland over) *Aristida latifolia* and *Chrysopogon fallax* scattered tussock grasses to open tussock grassland over *Iseilema vaginiflorum*, *Urochloa occidentalis* var. *occidentalis* and *Enneapogon polyphyllus* very open annual grassland to annual grassland over **Bidens bipinnata* scattered herbs on crabhole clay plains. | 3,317.7 (2.9%) | 983.6 | 106.3 |
| P8 | (*Corymbia candida*, or *C. deserticola* subsp. *deserticola* and/or *Eucalyptus xerothermica* scattered low trees to open woodland over) *Acacia aptaneura* (*A. catenulata* subsp. *occidentalis* and *A. pruinocarpa*) tall open shrubland to tall open scrub over *Ptilotus obovatus* var. *obovatus* scattered low shrubs to low open shrubland over (*Triodia melvillei* scattered hummock grasses over) *Themeda triandra, Eriachne benthamii* and *Chrysopogon fallax* very open tussock grassland over *Aristida contorta*, *Perotis rara*, *Enneapogon polyphyllus* (and other species) scattered annual grasses to open annual grassland over **Bidens bipinnata* scattered herbs to very open herbland on hardpan clay plains. | 5,147.9 (4.5%) | 3,826.6 | 864.4 |
| P9 | *Acacia aptaneura* scattered tall shrubs to tall open shrubland over *Eremophila lanceolata* or *E. caespitosa* and/or *Ptilotus schwartzii* var. *schwartzii* scattered low shrubs over *Aristida contorta* scattered annual grasses to open annual grassland on hardpan clay plains | 4,416.8 (3.9%) | 2,902.9 | 427.0 |

| Vegetation type | Description | Extent | | |
|---|---|---|---|---|
| | | Survey area (ha (%)) | Development Envelope (ha) | Disturbance Footprint (ha) |
| P8/P9 Mosaic | Mosaic of sparsely vegetated P9 hardpan clay plains, intermingled with P8, mulga shrublands on tussock grasses on the same hardpan clay plains. | 4,977.5 (4.4%) | 3,496 | 380.6 |
| P13 | (*Eucalyptus xerothermica* scattered low trees over) *Acacia aptaneura* and *Hakea lorea* subsp. *lorea* scattered tall shrubs to tall open shrubland over *Themeda triandra* and *Chrysopogon fallax* open tussock grassland to tussock grassland over *Iseilema vaginiflorum, Enneapogon polyphyllus, Eragrostis cumingii* (and other species) very open annual grassland to annual grassland over *Ptilotus polystachyus* and *Rhodanthe charsleyae* scattered herbs to very open herbland on crabhole clay plains. | 783.7 (0.7%) | 782.7 | 5.1 |
| P14 | *Acacia catenulata* subsp. *occidentalis*, *A. aptaneura* and *A. pruinocarpa* tall open shrubland to tall open scrub over (*Sida ectogama* and/or *Eremophila forrestii* subsp. *forrestii* scattered shrubs to shrubland over) *Triodia melvillei* very open hummock grassland to open hummock grassland (over *Aristida contorta* and *Enneapogon polyphyllus* scattered annual grasses to very open annual grassland) on pediments and the edges of rocky plains. | 5,277.5 (4.6%) | 4,253.9 | 1,886.9 |
| P15 | *Astrebla elymoides* (*Astrebla pectinata*, *Aristida latifolia* and *Chrysopogon fallax*) open tussock grassland to tussock grassland over *Dichanthium sericeum* subsp. *humilius*, *Iseilema vaginiflorum*, *Urochloa occidentalis* var. *occidentalis* and other species very open annual grassland with *Ipomoea lonchophylla*, *Euphorbia coghlanii* and *Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113) scattered herbs to open herbland on crabhole clay plains. | 109.7 (0.1%) | 71.9 | 0 |
| P16 | (*Acacia aptaneura* scattered tall shrubs over) *Aristida latifolia*, *Eragrostis xerophila*, *Eriachne flaccida* (and other species) open tussock grassland (over mixed species scattered annual grasses to closed annual grassland) with *Sida fibulifera* and *Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113) scattered herbs to very open herbland on crabhole clay plains. | 428.3 (0.4%) | 239.7 | 0 |
| P20 | *Eucalyptus xerothermica* and/or *E. victrix* (and *E. camaldulensis)* low open woodland over *Petalostylis labicheoides, Acacia aptaneura* and *A. dictyophleba* tall open shrubland over *Triodia longiceps* (and *Triodia pungens*) very open hummock grassland over *Themeda triandra, Eulalia aurea* and *Aristida lazaridis* P2 open tussock grassland. | 191.6 (0.2%) | 14.4 | 0 |
| *Cleared or Rehabilitated* | | 500.1 (0.5%) | 388.2 | 190.5 |
| *Not yet surveyed* | | N/A | 2,145.6 | N/A |
| **TOTAL** | | **113,495.9** | **61,301** | **14,850.5** |

### 6.3.5. Significant Vegetation

No Commonwealth or State listed threatened ecological communities have been recorded within the Development Envelope or the broader survey area. Three priority ecological communities (PECs) have identified within the broader survey area:

- Weeli Wolli Spring community P1 PEC (D6)
- West Angelas Cracking-Clays P1 PEC (P15)
- Coolibah – lignum flats: sub type 1 P3 PEC (D12).

Only the West Angelas Cracking-Clays P1 PEC has been recorded within the Development Envelope. A fourth PEC, Kumina Land System P3, could not be identified or defined through detailed flora and vegetation survey assessment, however coarser, broad scale land system mapping (Beard 1975) has it mapped within the Development Envelope (see **Table 2-1**).

In addition, within the Development Envelope, eight vegetation units considered to be of 'other significance' were recorded. These units comprise potential GDE (D4[2]), refugia (G1, H33 and H36), crabhole clay plains (P5, P13 and P16), and potentially restricted or uncommon vegetation (G1, H32 and H36). Further work is required to understand the significance of these vegetation units.

### 6.3.6. Flora

Within the broader survey area, 708 confirmed vascular flora taxa, from 68 families and 233 genera, have been recorded (Astron 2023). The dominant plant families were Fabaceae, Poaceae and Malvaceae. Acacia was the most frequently recorded genus with 56 taxa. These results are from approximately 34,309 species records from all quadrats, relevés, mapping notes and opportunistic observations taken across the survey area and include the identification of an estimated 5,756 specimens, which were returned to Perth for confirmation. An estimated 1,003 of these specimens have been submitted to the WA Herbarium for confirmation. In addition to the 708 confirmed taxa, the overall species list currently includes 210 informal or unresolved taxa names representing 672 species records or collections (Astron 2023a).

Targeted searches in potential habitat and opportunistic recordings identified 36 State listed priority (P) flora species within the broader survey area, including the P1 species *Paranotis* sp. Pilbara (H. Ajduk HAOP04a). Thirty of which, have been recorded in the proposed Development Envelope, comprising eight P2, 19 P3 and three P4 species (**Figure 6-3; Table 6-6**). The P1 species, *Paranotis* sp. Pilbara (H. Ajduk HAOP04a), was only identified within the broader survey area and not within the Development Envelope.

**Table 6-6: Priority Flora Species in the Development Envelope**

| Priority | Flora Species |
|---|---|
| P2 | *Aristida lazaridis* |
| | *Eragrostis* sp. Mt Robinson (S. van Leeuwen 4109) |
| | *Eremophila* sp. West Angelas (S. van Leeuwen 4068) |
| | *Euphorbia inappendiculata* var. *inappendiculata* |
| | *Euphorbia inappendiculata* var. *queenslandica* |
| | *Hibiscus* sp. Gurinbiddy Range (M.E. Trudgen MET 15708) |

[2] Vegetation unit D4 may represent 'all major ephemeral watercourses' which has been identified as an 'Ecosystem at Risk

| Priority | Flora Species |
|---|---|
| | *Oxalis* sp. Pilbara (M.E. Trudgen 12725) |
| | *Teucrium pilbaranum* |
| P3 | *Acacia subtiliformis* |
| | *Aristida jerichoensis* var. *subspinulifera* |
| | *Dampiera metallorum* |
| | *Dolichocarpa* sp. Hamersley Station (A.A. Mitchell PRP 1479) |
| | *Euphorbia australis* var. *glabra* |
| | *Euphorbia stevenii* |
| | *Glycine falcata* |
| | *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) |
| | *Grevillea saxicola* |
| | *Indigofera gilesii* |
| | *Isotropis parviflora* |
| | *Rhagodia* sp. Hamersley (M. Trudgen 17794) |
| | *Rostellularia adscendens* var. *latifolia* |
| | *Solanum kentrocaule* |
| | *Streptoglossa* sp. Cracking clays (S. van Leeuwen et al. PBS 7353) |
| | *Swainsona thompsoniana* |
| | *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) |
| | *Triodia* sp. Mt Ella (M.E. Trudgen 12739) |
| | *Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) |
| P4 | *Acacia bromilowiana* |
| | *Eremophila magnifica* subsp. *magnifica* |
| | *Lepidium catapycnon* |

No Threatened flora species have been recorded within the Development Envelope.

Eighteen introduced species were recorded within the broader survey area, with 12 of these occurring in the Development Envelope. None of the introduced species are listed as a Weeds of National Significance or a Declared Pest plant in Western Australia under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).

### 6.3.7. Culturally Significant Vegetation

The Proponent acknowledges that a variety of species, not listed under legislation, are significant to both the Nyiyaparli and Ngarlawangga People. Plants are understood to be utilised for a number of purposes including:

- Medicine
- Bush tucker
- Ceremonial and artefact
- Other purposes

The Proponent is committed to undertaking targeted engagement and surveys, in collaboration with the Traditional Owners, throughout the Development Envelope. The results from these surveys will be incorporated into the impact assessment of the Proposal that will be presented in the ERD.

720,000mE
740,000mE
760,000mE
7,460,000mN
7,440,000mN
7,420,000mN

BANJIMA PEOPLE
- WCD2014/001

NYIYAPARLI #3
- WCD2018/008

NYIYAPARLI PEOPLE
- WCD2018/008

NGARLAWANGGA PEOPLE
- WCD2016/007

Hope Downs 1
Hope Downs 1 Village
Hope Downs 4
Hope Downs 4 Village

Pebble Mouse Creek
Weeli Creek
Weeli
Coondiner Creek
Great Northern Highway
Kalgan Creek
Spearhole Creek
Western Creek

## Legend

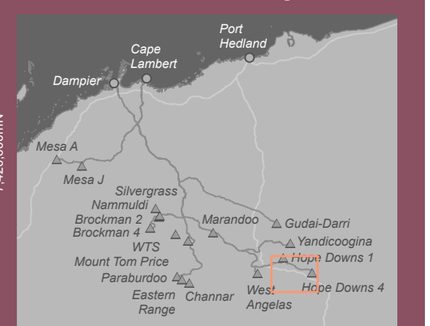
*Vegetation Associations (Beard 1970)*

- Hamersley 175
- Hamersley 18
- Hamersley 29
- Hamersley 82

- Proposed Development Envelope
- Native Title Determination Area
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

**Drawn:** A.Coulson
**Plan:** RTIO-1023038v2
**Date:** December 2023

**Checked by:** M.Buck
**Proj:** GDA 1994 MGA Zone 50
***GIS.Team@riotinto.com***

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# Figure 6-2: Pre-European Vegetation Associations in the Development Envelope

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N

720,000mE
740,000mE
760,000mE
7,460,000mN
7,440,000mN
7,420,000mN

BANJIMA PEOPLE
- WCD2014/001

NYIYAPARLI #3
- WCD2018/008

NYIYAPARLI PEOPLE
- WCD2018/008

NGARLAWANGGA PEOPLE
- WCD2016/007

Hope Downs 1
Hope Downs 1 Village
Hope Downs 4
Hope Downs 4 Village

Pebble Mouse Creek
Weeli Creek
Weeli
Coondiner Creek
Great Northern Highway
Kalgan Creek
Western Creek
Spearhole Creek

## Legend

- Proposed Development Envelope
- Native Title Determination Area
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

### Vegetation Type

*Hills*
- G1
- G3
- G24
- H3
- H10
- H11
- H12
- H14
- H15
- H19
- H21
- H22
- H25
- H26
- H27
- H32
- H33
- H34
- H36
- H40
- H42

*Plains*
- P1
- P1/P3 Mosaic
- P3
- P5
- P8
- P9
- P8/P9 Mosaic
- P13
- P14
- P16
- P20

*Drainage*
- D1
- D2
- D4
- D5
- D8
- D15

*Cracking Clay*
- P15

*Other*
- Cleared
- Rehab

**Drawn:** A.Coulson
**Plan:** RTIO-1023039v2
**Date:** December 2023

**Checked by:** M.Buck
**Proj:** GDA 1994 MGA Zone 50
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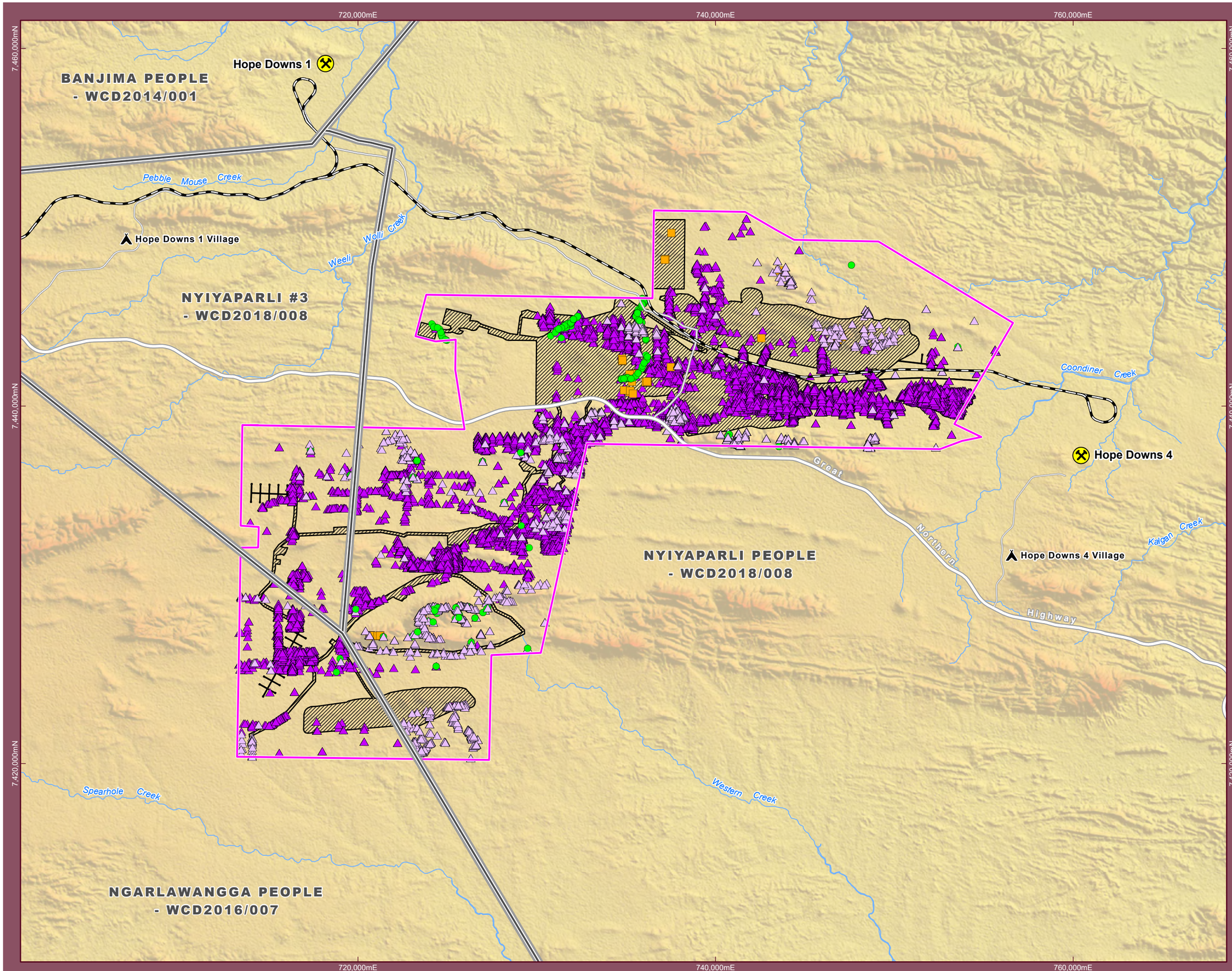
Figure 6-3: Mapped Vegetation Types within the Development Envelope

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N




## Legend

*Priority Flora*

- P2
- P3
- P3 - Rhagodia
- P4

- Proposed Development Envelope
- Conceptual Disturbance Footprint
- Native Title Determination Area
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

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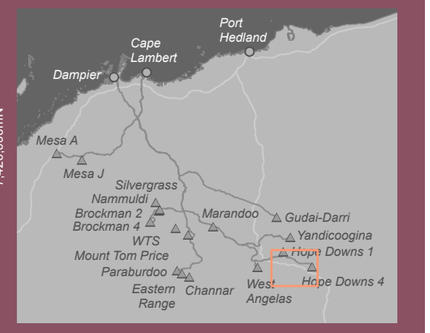


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# Figure 6-4: Priority Flora within the Development Envelope

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N

## 6.4. Potential Environmental Impacts

A detailed environmental impact assessment is currently in preparation for this Proposal. Potential impacts to Flora and Vegetation are summarised below.

### 6.4.1. Direct Impacts

- Clearing of native vegetation (including riparian vegetation associated with waterways e.g. ephemeral watercourses
- Removal of individuals of Priority flora species.

### 6.4.2. Indirect Impacts

- Degradation of vegetation due to increased abundance and diversity of weeds
- Degradation of vegetation through dust deposition and altered bushfire regimes
- Changes to vegetation structure and condition due to altered hydrological regimes
- Fragmentation of vegetation.

### 6.4.3. Cumulative Impacts

- Cumulative impacts on native vegetation of significance from direct and indirect impacts at a local and regional scale.
- Cumulative impacts on Priority flora from direct impacts at a local and regional scale.

## 6.5. Mitigation

The Proponent has extensive experience developing and operating mines and related infrastructure in the Pilbara, through which it has developed and refined strategies to manage and mitigate potential environmental impacts in an adaptive manner. Mitigation measures being considered during the development of the Proposal include:

### 6.5.1. Avoidance

- As far as practicable, the disturbance footprint has been designed to avoid significant populations of Priority flora species.
- Mining Exclusion Zones (MEZs) will be established to areas of significant vegetation and/or flora where they are identified to comprise of high environmental and/or cultural value warranting specific protection.

### 6.5.2. Minimise

- Potential impacts to recorded areas of significant vegetation will be limited through the application of clearing limits where necessary.
- Limit the spread of existing weeds by implementing the Iron Ore (WA) Pilbara Weed Management Strategy
- Manage the potential degradation of vegetation through dust deposition:
    - Adopt dust suppression techniques, such as water carts
    - Limit the amount of disturbed land at one time to active operational areas
    - Implement speed limits on unsealed roads and tracks

- Manage the potential degradation of vegetation as a result of increased fire risk:
    - Manage and monitor hot works, vehicle movement and disposal of fire-starting waste
    - Ensure firefighting equipment is available in vehicles and around the site
    - Ensure all personnel on-site have been adequately trained on fire prevention and management
- The Proponent will minimise impacts to vegetation from discharge of surplus water to the environment by maximising the use on-site, aquifer re-injection[3], and transfer offsite to other operations.
- The Proponent will minimise impacts to vegetation from groundwater abstraction by limiting drawdown to that required to ensure safe access for mining and will implement monitoring programs where appropriate (e.g. if potential impacts to GDEs are identified).

#### 6.5.3. Rehabilitate/Revegetate

- The Proponent will prepare and implement a MCP, in accordance with the *Statutory Guidelines for Mine Closure Plans* (DMIRS 2020b) for the Proposal.
- Rehabilitation activities will be undertaken progressively over the life of the mine as opportunities arise.

#### 6.5.4. Offset

The Proponent will develop offsets for any significant residual environmental impacts, including offsets for disturbance of vegetation in Good to Excellent condition, in consultation with DWER - EPA Services and DCCEEW.

### 6.6. Assessment and Significance of Residual Impacts

An assessment of the potential residual impacts resulting from Proposals implementation and their significance will be presented in the ERD.

### 6.7. Likely Environmental Outcomes

The environmental outcomes to be achieved by the Proponent through the implementation of the Proposal will be presented in the ERD.

[3] If aquifer reinjection is determined to be a viable option for surplus water management, potential impacts to vegetation as a result of aquifer reinjection being implemented (e.g. groundwater mounding) will be investigated and appropriate mitigation applied.

# 7. KEY ENVIRONMENTAL FACTOR – TERRESTRIAL FAUNA

## 7.1. EPA Objective

The EPA's objective for terrestrial fauna is to protect terrestrial fauna so that biological diversity and ecological integrity are maintained (EPA 2023a).

## 7.2. Policy and Guidelines

**Table 7-1** presents relevant policy and guidance for Terrestrial Fauna and demonstrates how they have been considered for the Proposal.

**Table 7-1: Relevant Policy and Guidance for Terrestrial Fauna**

| Policy or Guidance | Explain How the Policy and Guidance has been Considered |
|---|---|
| **Environmental Protection Authority** | |
| Statement of Environmental Principles, Factors and Objectives (EPA 2023a) | The EPA objective for terrestrial fauna forms the basis of this assessment. This assessment has regard to the aims of EIA, consideration of significance and the application of the mitigation hierarchy. |
| Environmental Factor Guideline: Terrestrial Fauna (EPA 2016c) | Considered in the design (methods and approach) of fauna surveys (previous guidelines were used where surveys were undertaken before current guidelines). |
| Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna (EPA 2016d) – updated 2020 | |
| Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020a) | |
| Technical Guidance: Sampling of Short-Range Endemic Invertebrate Fauna (EPA 2016e) | |
| Environmental Impact Assessment (Part IV Divisions 1 And 2) Administrative Procedures (EPA 2021a) | Considered in preparation of the referral and impact assessment. |
| Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2021b) | |
| Instructions on how to prepare an Environmental Review Document (EPA 2021c) | This document forms the basis of the headings and content to be provided in the ERD, to be prepared by WA EIA practitioners |
| Instructions on how to prepare EP Act Part IV Environmental Management Plans (EPA 2021d) | The EMP will be prepared in accordance with the guidance and addresses, amongst other things, matters related to fauna and habitat |
| Instructions on how to prepare *Environmental Protection Act 1986* Part IV Impact Reconciliation Procedures and Impact Reconciliation Reports (EPA 2021e) | Considered in the impact assessment and offset approach for terrestrial fauna. |
| Template for EP Act Part IV Reconciliation Procedures (2021f) | |

| Policy or Guidance | Explain How the Policy and Guidance has been Considered |
|---|---|
| **Other State or Commonwealth** | |
| Summary of knowledge for six faunal species that are Matters of National Environmental Significance in the Pilbara, Western Australia (DBCA 2023) | The Department of Biodiversity, Conservation and Attractions (DBCA) undertook a review of existing information on six Pilbara fauna species that are classified as Matters of National Environmental Significance (MNES). The report identifies potential management actions and research priorities which will be considered during the assessment of this proposal. |
| Mine Closure Plan Guidance – How to Prepare in accordance with Part 1 of the Statutory Guidelines (DMIRS 2020a) | The MCP will be prepared in accordance with the guidance and addresses matters related to terrestrial fauna. |
| Statutory Guidelines for Mine Closure Plans (DMIRS 2020b) | |
| WA Environmental Offsets Policy (GoWA 2011) | Considered in the determination of significant residual impacts and offset strategy for terrestrial fauna. |
| WA Environmental Offsets Guidelines (GoWA 2014). | |
| EPBC Act Environmental Offsets Policy (DSEWPaC 2012) | |
| EPBC Act referral guideline for the endangered northern quoll *Dasyurus hallucatus* (DoE 2016) | Considered in the design (methods and approach) of the fauna surveys. |
| Interim guideline for the preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia (DPaW 2017) | |
| Survey guidelines for Australia's threatened bats (DEWHA 2010a) | |
| Survey guidelines for Australia's threatened birds (DEWHA 2010b) | |
| Survey guidelines for Australia's threatened mammals (DSEWPaC 2011a) | |
| Survey guidelines for Australia's threatened reptiles (DSEWPaC 2011b) | |
| Survey guidelines for Australia's threatened frogs (DEWHA 2010c) | |
| Matters of National Environmental Significance Significant Impact Guidelines 1.1 (DoE 2013) | Considered in the impact assessment for MNES fauna. |

## 7.3. Receiving Environment

### 7.3.1. Studies and Survey Effort

Terrestrial fauna surveys undertaken within the Development Envelope are summarised in **Table 7-2**.

**Table 7-2: Terrestrial fauna surveys undertaken for the Proposal**

| Survey consultant and date | Survey title | Description |
|---|---|---|
| Rio Tinto (2019) | Ghost Bats at Rhodes Ridge JV tenements, July to August 2018 | Site visit was conducted specifically as a targeted survey to determine usage by Ghost Bats (*Macroderma gigas*) and Pilbara Leaf-nosed Bats (*Rhinonicteris aurantia*) within the 8 adits on the Rhodes Ridge JV tenements |
| Astron (2021) | Rhodes Ridge. Targeted Northern Quoll Fauna Assessment | Two-phase targeted Northern Quoll fauna assessment of the Rhodes Ridge Proposal.<br>Objective was to undertake an assessment through desktop review and field survey, and to incorporate data from previous biological surveys conducted in the vicinity of the Development Envelope. |
| Biologic (2022a) | Rhodes Ridge: Integrated Aquatic Memo | Integrated aquatic sampling within the Rhodes Ridge Study Area, to provide an understanding of the aquatic ecosystems present and some early indications of aquatic values and species' distributions. Sampling comprised the collection of creek bed and claypan sediments to conduct rehydration-emergence trials in the laboratory, and sampling of the hyporheic zone adjacent to inundated pools. |
| eDNA frontiers for Astron (2022) | Detection of the Pilbara Olive Python in a series of persistent pools and gorge/gullies in the Pilbara using eDNA metabarcoding | Analysed water samples using environmental DNA (eDNA) testing for the presence of *Liasis olivaceus barroni* (Pilbara Olive Python) at five pools across the Rhodes Ridge region |
| Astron (2022c) | Species Distribution Models Rhodes Ridge Priority and Threatened Fauna | Develop species distribution models for six priority or threatened taxa (four mammals and two reptiles) recorded within the survey area to support future biological surveys and improve biographical knowledge. |
| Astron (2022d) | Rhodes Ridge Project. Matters of National Environmental Significance Fauna and Habitat Assessment | Details the current understanding of MNES fauna habitats, and the presence/absence of MNES fauna within the project area. |
| Astron (2023b) | Rhodes Ridge Project. Detailed Fauna Survey. | Detailed two-phase vertebrate fauna and SRE invertebrate fauna survey of the Rhodes Ridge project area. The objective was to undertake assessment through desktop review and field survey, and to incorporate data from previous biological surveys to understand and contextualise the terrestrial fauna and their habitats within the Development Envelope.<br>Surveys consisted of:<br>• 1 x reconnaissance survey (4 days)<br>• 3 x set-up trips (22 days total)<br>• 4 x targeted surveys (helicopter trips) (25 days total)<br>• 7 x dry season detailed trapping surveys (77 days total)<br>• 8 x post-wet season detailed trapping surveys (84 days total) |

### 7.3.2. Future Studies and Survey Effort

Ongoing investigations are planned for 2024 onwards to inform the preparation of the Environmental Review Document **(Table 7-3**). A summary of the key fauna and habitat values identified within the Development Envelope is provided in following sections.

**Table 7-3: Future Planned Terrestrial Fauna Surveys**

| Proposed Survey | Survey Scope | Commencement Date |
|---|---|---|
| Bat VHF tracking and scat work | Targeted survey for Threatened bat species across the Development Envelope and broader region. | H1 2024 |
| Targeted fauna survey | Targeted survey within the Development Envelope for significant fauna species identified in previous surveys of the broader survey area. | H2 2024 |
| Targeted SRE fauna survey | Targeted survey within the Development Envelope for SRE fauna species identified in previous surveys of the broader survey area. | H2 2024 |
| Detailed fauna survey | Two-phase detailed fauna survey within previously unsurveyed area (L47/1092). | H1 2024 |
| Detailed SRE fauna survey | Two-phase detailed SRE fauna survey within previously unsurveyed area (L47/1092). | H1 2024 |
| Aquatic ecosystem survey | Detailed aquatic ecosystem survey, comprising habitat assessments and sampling of water quality, macrophytes, hyporheos fauna, macroinvertebrates, fish and any other aquatic fauna. Surveys undertaken in April and October 2023.<br>Continuation of the aquatic ecosystem surveys in 2024, focused within the proposal Development Envelope. | H1 2024 |

### 7.3.3. Fauna Habitat

The Development Envelope comprises of eleven broad fauna habitat types (Astron, 2023b):

- Major Drainage
- Minor Drainage
- Gorge/Gully
- Breakaway/Cliff
- Rocky Hill;
- Low Hill and Slopes;
- Mulga Woodland;
- Clay Plain (non-cracking);
- Clay Plain (cracking);
- Stony Plain; and
- Alluvial Plain.

The extent of these habitat types within the Development Envelope and Disturbance Footprint is summarised in **Table 7-4** and presented in **Figure 7-1**.

**Table 7-4: Fauna habitat within the survey area and Development Envelope**

| Habitat Type | Description | Representative Photo | Extent (ha) | | |
|---|---|---|---|---|---|
| | | | Survey area (ha (%)) | Development Envelope (ha) | Disturbance Footprint (ha) |
| Major Drainage | Moderately common habitat in the Pilbara region and considered to be of high value to a wide spectrum of fauna species including MNES species Pilbara Olive Python and Northern Quoll. The Major Drainage habitat typically comprised a large drainage channel over 10 m in width which is seasonally inundated and contained mature Eucalyptus and Corymbia trees, a large diversity of microhabitats including seasonal pools, tree hollows, roosting sites for birds and woody debris (logs and leaf litter). The woody debris provides foraging and sheltering potential to ground dwelling reptiles and mammals. Ground dwelling fauna are likely to utilise the linear nature of this habitat for dispersal and to traverse between habitats. |  | 252.5 (0.2%) | 11 | 2.7 |
| Minor Drainage | Commonly recorded habitat for the Pilbara region and considered to be of moderate value to a wide spectrum of fauna species. The Minor Drainage habitat typically exhibited a moderate diversity of microhabitats, with some tree hollows and woody debris (logs and leaf litter). The woody debris provides foraging and sheltering potential to ground dwelling reptiles and mammals. Ground dwelling fauna are likely to utilise the linear nature of this habitat to traverse between habitats.<br>This habitat is common in surrounding areas and throughout the Pilbara region |  | 2,598.8 (2.3%) | 863.4 | 318.9 |
| Gorge/Gully | One of the more restricted habitats in the broader survey area. Gorges are a common feature of the Pilbara; however, as they tend to be narrow, linear features, gorges represent a small proportion of the total land area. In addition, they represent important shelter or roosting habitat for several MNES species including the Pilbara Olive Python, Ghost Bat, Pilbara Leaf-nosed Bat and Northern Quoll. They may also support priority listed species such as the blind snake *Anilios ganei*. Occasional deep caves and semi-permanent rock pools are features within this habitat that can provide refuge for fauna during harsher seasonal conditions.<br>This habitat was considered of high value as it contains a complexity of microhabitats and potentially supports significant fauna species but was generally limited within the broader survey area (<2%). This habitat is well represented in surrounding areas and throughout the Pilbara region. |  | 1,452.6 (1.3%) | 470.2 | 54.3 |
| Breakaway/Cliff | Common feature of the Pilbara but because they tend to be narrow, linear features, they represent a small proportion of the total land area. The Breakaways of the broader survey area were often associated with the drop off areas of the Rocky Hill habitat. Breakaway habitat contained microhabitats such as crevices, overhangs and shallow caves that provide shelter opportunities for MNES species. The caves have the potential to be used as diurnal roosts and nocturnal feeding roosts for the Ghost Bat, and potential denning sites for the Northern Quoll and Pilbara Olive Python. Although it was considered of high importance for fauna, it was generally limited within the broader survey area (<1%). This habitat is well represented in surrounding areas and throughout the Pilbara region |  | 399.1 (0.3%) | 105.9 | 36.7 |
| Rocky Hill | Common and widespread throughout the Pilbara. This habitat had low vegetation complexity and low diversity of microhabitats; however, MNES species (such as the Northern Quoll) are considered likely to traverse and forage within these habitats. Other significant species such as the Western Pebble-mound Mouse, *Anilios ganei* and the Pilbara Barking Gecko may also utilise this habitat. The soils were generally stony and compact, reducing the potential opportunities for burrowing species. Therefore, this habitat was considered of moderate value for fauna |  | 4,760.5 (4.2%) | 1,344.6 | 132.8 |
| Low Hill and Slopes | The most common fauna habitat type within the broader survey area. This habitat is widespread and common throughout the Pilbara region and although there are several significant species that may utilise this habitat on occasion, they are unlikely to be restricted to it. This habitat generally had low vegetation complexity and low diversity of microhabitats available for fauna species to exploit. The soils were generally stony and compact, reducing potential opportunities for burrowing species. This habitat was considered low value (non-critical) for a broad spectrum of fauna species generally |  | 58,294.1 (51.4%) | 26,497.5 | 7,625.3 |
| Mulga Woodland | Characterised by vegetation units dominated by Mulga (*Acacia aneura*) on a stony mantle. The open to moderately dense woodlands consisted of an understorey composed of sparse tussock or hummock grasses. The woodlands provide nesting and shelter habitats for birds and reptiles, and the tussocks and hummocks provide habitat for small birds, reptiles and mammals. Mulga Woodlands are also subject to sheet water flow after rainfall and vegetation is often densely clumped or banded due to the sheet flow. However due to a low diversity of microhabitats present (generally the understorey and leaf litter were considered sparse), this habitat type was considered of low value to a wide spectrum of fauna species |  | 19,639.0 (17.3%) | 14,965.6 | 3,626.8 |

| Habitat Type | Description | Representative Photo | Extent (ha) | | |
|---|---|---|---|---|---|
| | | | Survey area (ha (%)) | Development Envelope (ha) | Disturbance Footprint (ha) |
| Clay Plain (non-cracking) | Well represented within the broader survey area and considered to be of moderate value to a wide spectrum of fauna species as this habitat exhibited a moderate diversity of microhabitats, with some tree hollows and logs, and some areas of sandy soils suitable for burrowing. At the time of the survey, the tree hollows of this habitat supported nesting potential for small passerines such as pardalotes, thornbills and multiple species of honeyeaters, but with an absence of large eucalypts and hollows.<br>This habitat may also provide some limited foraging opportunities for Ghost Bats and Pilbara Leaf-nosed Bats. This habitat is widespread and common in surrounding areas and throughout the Pilbara region. |  | 14,522.5 (12.8%) | 10,439.6 | 2,231.8 |
| Clay Plain (cracking) | Cracking clay units are of regional significance and likely important for the maintenance of the West Angelas Cracking-Clays P1 Priority Ecological Community (PEC). Similar to non-cracking Clay Plain habitat, it is considered to be of moderate value to a wide spectrum of fauna species due to the moderate diversity of microhabitats. At the time of the survey, the tree hollows of this habitat supported nesting potential for small passerines such as pardalotes, thornbills and multiple species of honeyeaters, but with an absence of large eucalypts and hollows. This habitat may also provide some limited foraging opportunities for Ghost Bats and Pilbara Leaf-nosed Bats. |  | 148.1 (0.1%) | 7.7 | 0 |
| Stony Plain | Widespread and common throughout the Pilbara region and although there are a few species of significance that may utilise it, they are not restricted to this habitat type.<br>Significant fauna considered likely to occur in this habitat type within the broader survey area also include the Western Pebble-mound Mouse. This habitat generally had low vegetation complexity and microhabitat diversity and was generally of low value for fauna |  | 11,088.8 (9.8%) | 4,358.7 | 789.8 |
| Alluvial Plain | Associated closely with drainage landforms of the Pilbara as it is often formed from the sediment overflow from drainage systems during flooding events. The Alluvial Plain habitat was considered of moderate value to a wide spectrum of fauna species as this habitat typically exhibited a moderate diversity of microhabitats, with some tree hollows and logs and some areas of sandy soils suitable for burrowing.<br>There was very limited Alluvial Plain habitat within the broader survey area and the vegetation of this habitat was generally less complex when compared to Major and Minor Drainage Line habitats, with the absence of large eucalypts. This habitat may provide limited foraging opportunities for Ghost Bats and Pilbara Leaf-nosed Bats. |  | 202.6 (0.2%) | 3.9 | 0 |
| Disturbed | | | 133.4 (0.1%) | 49.1 | 31.4 |
| Not yet surveyed | | | N/A | 2,183.8 | N/A |
| **TOTAL** | | | **113,491.9** | **61,301** | **14,850.5** |

720,000mE
740,000mE
760,000mE
7,460,000mN
7,440,000mN
7,420,000mN

BANJIMA PEOPLE
- WCD2014/001

NYIYAPARLI #3
- WCD2018/008

NYIYAPARLI PEOPLE
- WCD2018/008

NGARLAWANGGA PEOPLE
- WCD2016/007

Hope Downs 1
Hope Downs 1 Village
Hope Downs 4
Hope Downs 4 Village

Pebble Mouse Creek
Weeli Wolli Creek
Coondiner Creek
Great Northern Highway
Kalgan Creek
Spearhole Creek
Western Creek

## Legend

*Fauna Habitat*

- Alluvial Plain
- Breakaway/Cliff
- Clay Plain (cracking)
- Clay Plain (non-cracking)
- Disturbed
- Gorge/Gully
- Low Hills and Slopes
- Major Drainage
- Minor Drainage
- Mulga Woodland
- Rocky Hill
- Stony Plain

*Significant Microhabitats*

- Cave
- Semi-permanent Pool

- Proposed Development Envelope
- Native Title Determination Area
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

**Drawn:** A.Coulson
**Plan:** RTIO-1023043v2
**Date:** December 2023

**Checked by:** M.Buck
**Proj:** GDA 1994 MGA Zone 50
***GIS.Team@riotinto.com***

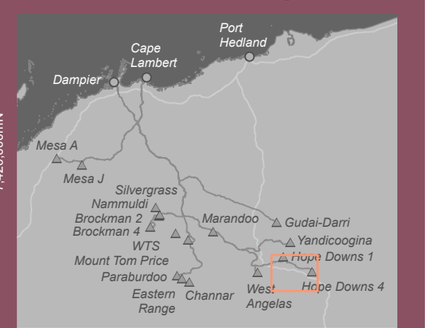


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Figure 7-1: Fauna Habitat in the Development Envelope

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N

### 7.3.4. Significant Fauna

A total of 232 vertebrate fauna species were recorded across the survey area, comprising four amphibians, 96 reptiles, 98 birds and 34 mammals (including 6 introduced species). The fauna species assemblage recorded during the survey is considered comprehensive and typical of similar surveys within the Hamersley subregion.

Seven vertebrate species of significance have been recorded within the broader survey area (BC Act/ EPBC Act/ DBCA conservation listing) (**Table 7-5**):

- Northern Quoll *(Dasyurus hallucatus)* (Endangered (EN); EN)
- Pilbara Leaf-nosed Bat *(Rhinonicteris aurantia)* (VU; VU)
- Ghost Bat *(Macroderma gigas)* (VU; VU)
- Pilbara Olive Python *(Liasis olivaceus barroni)* (VU; VU)
- Gane's Blind Snake *(Anilios ganei)* (P2)
- Western Pebble-mound Mouse *(Pseudomys chapmani)* (P4), and
- Peregrine Falcon *(Falco peregrinus)* (OS).

Four of these species (Northern Quoll, Pilbara Leaf-nosed Bat, Pilbara Olive Python and Ghost Bat) are classified under the EPBC Act as MNES. See **Section 13** for additional discussion on MNES.

Within the Development Envelope, all of the above listed species, with the exception of the Northern Quoll, were recorded (**Figure 7-2**).

The Western Pebble-mound mouse was largely recorded through secondary evidence (mounds). Seventy-nine pebble-mounds (55 active, 24 inactive) were recorded within the broader survey area during the current surveys (Astron 2023b). Of which 35 were identified within the Development Envelope. Most pebble-mounds occurred within Low Hills and Slopes or Rocky Hill habitat, and one individual Pebble-mound Mouse was captured in a cage trap within Gorge/Gully habitat.

Gane's Blind Snake is often poorly collected in vertebrate fauna surveys but is known from the Hope Downs area. This species was recorded three times during the current survey (one record in the Development Envelope) via pitfall trapping in Major Drainage Line, and Low Hills and Slopes habitat types (Astron 2023b).

The Peregrine Falcon is considered a cosmopolitan hunter and will hunt in a variety of habitats. This species was recorded three times during the current survey through direct observation within Gorge/Gully and Breakaway habitat types, including one record within the Development Envelope (north of Giles Mini) (Astron 2023b). No nesting sites were observed within the Development Envelope or broader survey area.

Six additional species were identified during the desktop review as having a high likelihood of occurrence in the Development Envelope. These include three MNES listed species, the Grey Falcon (*Falco hypoleucos*) (VU), Fork-tailed Swift (Pacific Swift) (*Apus pacificus*) (Migratory (MI)) and the Oriental Plover (*Charadrius veredus*) (MI) (see Chapter 1 for additional discussion on MNES), and three Priority fauna, including:

- Pilbara Barking Gecko (*Underwoodisaurus seorsus*) (P2)
- *Lerista macropisthopus remota* (P2), and
- Letter-winged Kite (*Elanus scriptus*) (P4).

The Pilbara Barking Gecko (*Underwoodisaurus seorsus*) is a rock-inhabiting, restricted-range species encountered at mid elevations. in the Hamersley Ranges This species was recorded at Greater West Angelas and nearby records are detailed within DBCA's Threatened and Priority Fauna Database (Astron 2023b). This species is likely to be found in elevated fauna habitats such as Rocky Hill habitat recorded within the Proposal area.

*Lerista macropisthopus remota* was recorded from a recent fauna survey conducted within the vicinity of the Development Envelope within Mulga Woodland habitat. In addition, three other records exist in the area in DBCA's Threatened and Priority Fauna Database (Astron 2023b). This species is likely to be found in the Mulga Woodland and Clay Plain habitats recorded within the Development Envelope.

The Letter-winged Kite (*Elanus scriptus*) is classified as an infrequent non-breeding visitor to Western Australia. This species was recorded during a recent fauna survey conducted within the vicinity of the survey area within Major Drainage Line habitat (Astron 2023b). This species is therefore considered likely to also occur over the Development Envelope, but not to be reliant on any habitats within.

**Table 7-5: Conservation significant fauna recorded or with a high likelihood of occurrence within the Development Envelope**

| Species | Conservation Code (BC Act/EPBC Act) | Preferred habitat | Likelihood of occurrence |
|---|---|---|---|
| Ghost Bat<br>*(Macroderma gigas)* | VU / VU | The preferred habitat of Ghost Bats is rocky gorges and breakaways that support caves and crevices used as maternity roosts. The Ghost Bat uses different natural formations for various purposes and for groups to persist. Transient roosts and feeding sites are used by small number of Ghost Bats, whereas maternity roosts are used by larger colonies. Ghost Bats require shelter (particularly caves but also abandoned mine workings) of varying shapes and sizes to fulfil each of its ecological requirements. | Recorded.<br>The Ghost Bat was recorded on 81 occasions within the broader survey area, through acoustic recordings, scats, and individual sightings (11 records of live individuals; two records of remains, and one individual observed foraging during spotlighting). Ghost Bats have also been recorded from within old relict mine adits within the Development Envelope (including four adits at Rhodes Ridge main deposit, and two adits are Giles Mini deposits). The numbers of bats identified as roosting suggest that at least one group of 15 to 20 bats were present and diurnally roosting at the Rhodes Ridge adits during the monitoring period. |
| Pilbara Leaf-nosed Bat<br>*(Rhinonicteris aurantia)* | VU / VU | Pilbara Leaf-nosed Bats are known to require deep caves characterised by high levels of humidity and stable temperatures. Caves deep enough to create this environment are relatively uncommon in the Pilbara. Foraging habitat for the Pilbara Leaf-nosed Bat is diverse and includes riparian vegetation, hummock grassland, and sparse tree and shrub savannah. | Recorded (acoustics only).<br>This species was detected from recordings at three adits (at Rhodes Main deposit), however, activity level was classified as low, with less than 20 calls per night recorded. Call timings were representative of foraging bats only, with all calls recorded near midnight, consistent with the species dispersing from distant permanent roosts during the autumn months. |
| Pilbara Olive Python<br>*(Liasis olivaceus barroni)* | VU / VU | The Pilbara Olive Python prefers escarpments, deep gorges, water holes and rock piles associated with permanent pools in rocky areas in the ranges of the Pilbara region. Microhabitat preferences of the Pilbara Olive Python are under rock piles, on top of rocks or under spinifex. Individuals spend the cooler winter months within | Recorded.<br>This species was recorded seven times within the broader project area from direct observations (one individual record and one remains record), eDNA sampling, motion camera and secondary evidence of a recent |

| Species | Conservation Code (BC Act/EPBC Act) | Preferred habitat | Likelihood of occurrence |
|---|---|---|---|
| | | caves and rock crevices away from water sources. In the warmer summer months, the pythons are found to move around widely, usually in close proximity to water and rock outcrops | skin shed. Only one record was from within the Development Envelope. |
| Western Pebble-mound Mouse<br>*(Pseudomys chapmani)* | P4 / N/A | Western Pebble-mound Mouse populations are widespread in the extensive ranges of the central and southern Pilbara region. Colonies occur on the gentler slopes of rocky ranges where the ground is covered by stony mulch and vegetated by hard spinifex, often with a sparse overstory of eucalypts and scattered shrubs, typically *Senna*, *Acacia* and *Ptilotus.* | Recorded.<br>The Western Pebble-mound mouse was largely recorded through secondary evidence (mounds). Seventy-nine pebble-mounds (55 active, 24 inactive) were recorded within the broader project area during the current surveys. Of which 35 were identified within the Development Envelope. |
| Gane's Blind Snake<br>*(Anilios ganei)* | P2 / N/A | Gane's Blind Snake is often poorly collected in vertebrate fauna surveys. This species has been associated with moist gorges and gullies, but potentially occurs over a wide range of other stony habitats. Given its cryptic fossorial habit this species is rarely encountered, and little is known of this species' ecology. | Recorded.<br>This species was recorded three times during the current survey (one record in the Development Envelope) via pitfall trapping in Major Drainage Line, and Low Hills and Slopes habitat types (Astron 2023b). |
| Peregrine Falcon<br>*(Falco peregrinus)* | OS / N/A | The Peregrine Falcon is considered a cosmopolitan hunter and will hunt in a variety of habitats. The species nests on rocky ledges in tall, vertical cliff faces and tall trees associated with drainage lines. | Recorded.<br>This species was recorded three times during the current survey through direct observation within Gorge/Gully and Breakaway habitat types, including one record within the Development Envelope (north of Giles Mini). |
| Northern Quoll<br>(*Dasyurus hallucatus*) | EN / EN | The Northern Quoll occurs in a variety of habitats but is commonly found in open lowland savannah forest and rocky escarpments. Rocky areas are a particularly important zone for Northern Quolls in the Pilbara as these areas retain water and provide a diversity of microhabitats. These areas also tend to have greater floristic diversity and productivity resulting in greater prey. | High.<br>To date, no Northern Quolls have been captured within the project area as part of the current Detailed fauna survey or Targeted Northern Quoll Assessment (Astron 2023b). The Northern Quoll was only recorded four times during the current surveys (outside of the Proposed Development Envelope) via opportunistic scat observations. |

| Species | Conservation Code (BC Act/EPBC Act) | Preferred habitat | Likelihood of occurrence |
|---|---|---|---|
| Grey Falcon (*Falco hypoleucos*) | VU / VU | The Grey Falcon is the rarest Australian Falcon and one of the least common raptors. This species is a scarce visitor to the Pilbara where it is found mostly on the coastal plains between the De Grey and Ashburton rivers. The Grey Falcon prefers lightly wooded coastal and riverine plains | High.<br>Two Grey Falcons were recorded perched upon a powerline tower within BHP's powerline corridor directly to the east of the project area and the species is likely to be found foraging within most of the habitats present in the project area, particularly the different plain and drainage line habitats. |
| Fork-tailed Swift (Pacific Swift) (*Apus pacificus*) | MI / MI | The Fork-tailed Swift is largely an aerial species independent of the terrestrial environment. | High.<br>One record of this species was recorded adjacent to the project area within the Hope Downs 4 village where two individuals were observed opportunistically flying overhead and it is considered likely to also occur over the project area. |
| Oriental Plover (*Charadrius veredus*) | MI / MI | The Oriental Plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia. Most records are along the north-western coast, between Exmouth Gulf and Derby in Western Australia. This species occupies sparsely vegetated plains, beaches and tidal flats, and saltworks and sometimes sewage ponds. | High.<br>One individual was opportunistically sighted at the nearby Hope Downs 1 village camp during a recent survey, likely due to the presence of water at the camp. This species is therefore considered likely to also occur over the project area on occasion but not to be reliant on any habitats within. |
| Pilbara Barking Gecko (*Underwoodisaurus seorsus*) | P2 / N/A | The Pilbara Barking Gecko is a rock-inhabiting, restricted-range species encountered at mid elevations in the Hamersley Ranges (confined in the Pilbara from Tom Price to Newman). Occurs in rocky areas with spinifex and low tree cover. | High.<br>This species was recorded at Greater West Angelas and nearby records are detailed within DBCA's Threatened and Priority Fauna Database. This species is likely to be found in elevated fauna habitats such as Rocky Hill habitat recorded within the project area. |

| Species | Conservation Code (BC Act/EPBC Act) | Preferred habitat | Likelihood of occurrence |
|---|---|---|---|
| *Lerista macropisthopus remota* | P2 / N/A | This species favours sandy to sandy loam soils which support Acacia shrubland or woodland. It inhabits loose soil under leaf litter at the base of shrubs | High.<br>This species was previously recorded from a recent fauna survey conducted within the vicinity of the project area within Mulga Woodland habitat. This species is also likely to be found in the Mulga Woodland and Clay Plain habitats recorded within the project area. |
| Letter-winged Kite<br>(*Elanus scriptus*) | P4 / N/A | The Letter-winged Kite is classified as an infrequent non-breeding visitor to Western Australia. This species inhabits open country and grasslands across arid and semiarid Australia. When a dry spell follows a number of good seasons, single individuals or small groups of this appear in northern Western Australia, outside of their core range and generally do not stay long in these areas | High.<br>This species was previously recorded during a recent fauna survey conducted within the vicinity of the survey area within Major Drainage Line habitat. This species is therefore considered likely to also occur over the project area. |

720,000mE
740,000mE
760,000mE
7,460,000mN
7,440,000mN
7,420,000mN

BANJIMA PEOPLE
- WCD2014/001

NYIYAPARLI #3
- WCD2018/008

NYIYAPARLI PEOPLE
- WCD2018/008

NGARLAWANGGA PEOPLE
- WCD2016/007

Hope Downs 1
Hope Downs 1 Village
Hope Downs 4
Hope Downs 4 Village

Pebble Mouse Creek
Weeli Creek
Weeli
Coondiner Creek
Great Northern Highway
Kalgan Creek
Spearhole Creek
Western Creek

## Legend

*Significant Fauna*

- Gane's Blind Snake (Pilbara)
- Ghost Bat
- Peregrine Falcon
- Pilbara Olive Python
- Pilbara Leaf-nosed Bat
- Western Pebble-mound Mouse

- Proposed Development Envelope
- Conceptual Disturbance Footprint
- Native Title Determination Area
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

**Drawn:** A.Coulson
**Plan:** RTIO-1023045v3
**Date:** January 2024

**Checked by:** M.Buck
**Proj:** GDA 1994 MGA Zone 50
***GIS.Team@riotinto.com***

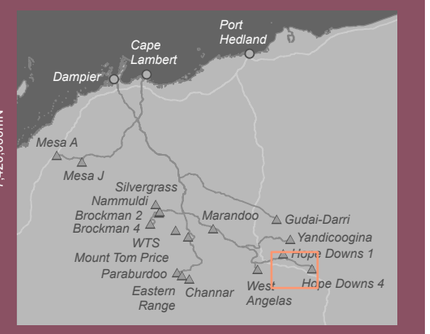


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Figure 7-2: Significant Fauna in the Development Envelope

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N

### 7.3.5. Aquatic Fauna

Sediment sampling for rehydration trials was undertaken to obtain information on the types of aquatic fauna resident in the survey area, by identifying the taxa that emerged from desiccation-resistant resting stages (e.g. eggs or cysts) following inundation and rehydration (Biologic 2022a).

The rehydration trials were highly productive, yielding over 10,000 specimens and 46 taxa across the broader survey area. None of the aquatic invertebrate taxa recorded during the rehydration trials are restricted to the survey area or listed as Threatened or Priority taxa under the BC or EPBC Acts. The majority of aquatic taxa recorded from rehydration trials are common species with widespread distributions. However, one taxa endemic to the Pilbara was recorded, the Spinicaudatan *Limnadopsis pilbaraensis* (west of the proposed Development Envelope in the Weeli Wolli Creek catchment). This species is a relatively uncommon temporary wetland specialist (Biologic 2022a).

A single specimen of the Notostracan *Triops australiensis* was recorded from the survey area near Western Creek (within the Development Envelope - northeast of Giles Mini). Although *Triops australiensis* is a common inhabitant of temporary wetlands across Australia, the taxon is known to contain several cryptic species.

*Ozestheria packardi* (Spinicaudata) was recorded from within the broader survey area from Spearhole Creek (outside of the Proposed Development Envelope, west of Giles Mini – potential interaction due to consideration of temporary discharge to Spearhole Creek). This taxon was previously considered a widespread specialist taxon of temporary wetlands. However, recent molecular studies have found this taxon represents a species complex (Biologic 2022a). Therefore, additional genetic sequencing is likely required (Biologic 2022a).

Several of the Ostracoda operational taxonomic units (OTUs) that emerged from sediments collected from the survey area are known only from the Pilbara region (Biologic 2022a). However, the taxonomy of Pilbara ostracods is currently unresolved, with a general paucity of comparative material for morphological and molecular analysis. As such, it is possible that these taxa may have wider distributions (Biologic 2022a).

### 7.3.6. Short-range Endemic Fauna

A desktop assessment was undertaken to assess whether any conservation listed invertebrate species or SRE invertebrate species were likely to occur within the survey area. For SRE invertebrates, the review focused on invertebrate groups with a known high proportion of SRE species (the SRE groups): centipedes (Chilopoda), harvestmen (Opiliones), millipedes (Diplopoda), non-marine snails (Gastropoda), pseudoscorpions (Pseudoscorpiones), scorpions (Scorpiones), terrestrial slaters (Isopoda) and spiders (Araneae).

The database searches yielded a total of 15,500 records from within the search area. Of these, 5,315 records were attributed to SRE and potential SRE species. The SRE and potential SRE groups were represented by 314 taxa of which 13 (4%) were named species, 214 (68%) were morphospecies and 87 (28%) were undetermined taxa. Only five records that were attributed to SRE and potential SRE species were recorded within the Rhodes Ridge survey area; three Nemesiidae records and two Idiopidae records (both are Mygalomorph trapdoor spiders).

Following the desktop assessment, a number of field surveys have been undertaken. To date, a total of 631 potential Short-Range Endemic (SRE) terrestrial invertebrate specimens, comprising 77 nominal taxa have been recorded by Astron during Detailed fauna surveys within the Rhodes Ridge project area (May 2019 – May 2022). Of these, 229 are considered widespread, 393 are (currently) considered Potential SREs (Data Deficient) and nine are ambiguous awaiting additional determination.

Whilst all of the identified fauna habitats have the potential to support Short-range endemic (SRE) fauna, seven habitats were considered more conducive to supporting SREs: Mulga Woodland, Clay Plain, Rocky Hill, Minor Drainage, Gorge/Gully, Breakaway and Major Drainage habitats. The most important of these are likely to be the Gorge/Gully and Breakaway habitats.

Additional surveys and morphological and DNA-barcoding work is currently underway, and the results will be presented in the ERD.

#### 7.3.7. Culturally Significant Fauna

The Proponent acknowledges that a variety of fauna species, not listed under legislation, are significant to both the Nyiyaparli and Ngarlawangga People. Animals are understood to be utilised for a number of purposes including:

- Bush tucker
- Ceremonial and artefact
- Other purposes

The Proponent is committed to undertaking targeted engagement and surveys, in collaboration with the Traditional Owners, to increase knowledge and understanding of the species important to the Traditional Owners and how Proposal development can be undertaken, through the application of the mitigation hierarchy to avoid and minimise impacts to the identified values.

The results from these surveys will be incorporated into the impact assessment of the Proposal that will be presented in the ERD.

### 7.4. Potential Environmental Impacts

A detailed environmental impact assessment is currently in preparation for this Proposal. Potential impacts to Terrestrial Fauna are detailed below.

#### 7.4.1. Direct Impacts

- Clearing of fauna habitat and habitat fragmentation
- Loss of fauna individuals

#### 7.4.2. Indirect Impacts

- Degradation or alteration of habitat as a result of altered hydrological regimes
- Habitat degradation associated with construction, operational and closure activities, including dust and altered fire regimes
- Disturbance from light, noise and/or vibration, resulting in the displacement of fauna associated with construction, operational and closure activities
- Disturbance resulting from an increase in abundance and diversity of weeds and feral species.

#### 7.4.3. Cumulative Impacts

- Cumulative impacts on fauna habitat
- Cumulative impacts on fauna individuals

## 7.5. Mitigation

Rio Tinto has extensive experience developing and operating mines and related infrastructure in the Pilbara through which it has developed and refined strategies to manage and mitigate potential environmental impacts in an adaptive manner. The Proponent will apply the mitigation hierarchy to the Proposal to ensure it meets the EPA objective in relation to terrestrial fauna. Mitigation measures being considered during the development of the Proposal include:

### 7.5.1. Avoid

- The Proponent is aware that a number of Ghost Bat Caves and adits are within the Development Envelope and conceptual footprint, as well as potential high value habitat. The Proponent will continue to undertake surveys and research to further understand the significance of these features and will provide appropriate avoidance measures within the ERD.
- As far as practicable, infrastructure and waste landforms will be placed to avoid disturbance of natural surface water flows.

### 7.5.2. Minimise

- Ground disturbance will be managed to ensure the Proposal is developed in accordance with any regulatory approvals and that ground disturbance is minimised. This will include (but is not limited to) ensuring:
    - All areas subject to disturbance are within approved boundaries (i.e. Development Envelope) and covered by biological surveys;
    - Clearing does not exceed prescribed clearing limits; and
    - Any exclusion areas (if present) are clearly noted on mine plans.
- Where it cannot be avoided, clearing of significant habitat areas will be minimised through the establishment of upper clearing limits.
- Implementation of light, noise and vibration measures to minimise indirect impacts to potential Ghost Bat roosting habitat
- The Proponent is investigating appropriate surface water management structures to minimise impacts to the catchment of ephemeral pools

### 7.5.3. Rehabilitate

- The Proponent will prepare and implement a MCP, in accordance with the *Statutory Guidelines for Mine Closure Plans* (DMIRS 2020b) for the Proposal.
- Rehabilitation activities will be undertaken progressively over the life of the mine as opportunities arise

### 7.5.4. Offset

The Proponent will develop an offset approach for any significant residual environmental impacts, including offsets for disturbance of significant habitat or habitat critical for the survival of significant species, in consultation with DWER - EPA Services and DCCEEW.

## 7.6. Assessment and Significance of Residual Impacts

An assessment of the potential residual impacts resulting from Proposals implementation and their significance will be presented in the ERD.

## 7.7. Likely Environmental Outcomes

The environmental outcomes to be achieved by the Proponent through the implementation of the Proposal will be presented in the ERD.

# 8. KEY ENVIRONMENTAL FACTOR – INLAND WATERS

## 8.1. EPA Objective

The EPA's objective for Inland Waters is to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected (EPA 2023a).

## 8.2. Policy and Guidelines

**Table 8-1** presents the relevant policy and guidance for Inland Waters and demonstrates how they have been considered for the Proposal.

**Table 8-1: Relevant Policy and Guidance for Inland Waters**

| Relevant policy and guidance | Consideration of EPA policy and guidance |
|---|---|
| **Environmental Protection Authority** | |
| Statement of Environmental Principles, Factors and Objectives (EPA 2023a) | The EPA objective for Inland Waters forms the basis of this assessment. This assessment has regard to the aims of EIA, consideration of significance and the application of the mitigation hierarchy. |
| Environmental Factor Guideline: Inland Waters (EPA 2018a) | The information required for impact assessment has been considered in the scope of this section. |
| Environmental Impact Assessment (Part IV Divisions 1 And 2) Administrative Procedures (EPA 2021a) | Considered in preparation of the referral and impact assessment. |
| Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2021b) | |
| Instructions on how to prepare an Environmental Review Document (EPA 2021c) | This document forms the basis of the headings and content to be provided in the ERD. |
| Instructions on how to prepare EP Act Part IV Environmental Management Plans (EPA 2021d) | The EMP will be prepared in accordance with the guidance and addresses, amongst other things, matters related to inland waters |
| Evaluating the environmental condition of Weeli Wolli Creek (EPA 2018b) | The report has been considered with respect to those elements of the Proposal that intersect the Weeli Wolli Creek catchment. |
| **Other State or Commonwealth** | |
| Mine Closure Plan Guidance – How to Prepare in Accordance with Part 1 of the Statutory Guidelines (DMIRS 2020a) | The MCP will be prepared in accordance with the guidance and addresses matters related to Inland Waters. |
| Statutory Guidelines for Mine Closure Plans (DMIRS 2020b) | |
| Use of Mine Dewatering Surplus (DWER 2020) | A water management strategy will be developed with consideration of this guidance. |

| Relevant policy and guidance | Consideration of EPA policy and guidance |
|---|---|
| Western Australian Water in Mining Guidelines (DoW 2013) | Discharge of surplus water is subject to the DWER Water in Mining guideline (DoW 2013) and licence requirements. It is noted that the Proponents undertaking of dewatering will not be permitted to discharge to the environment where there is a likelihood that it will cause impacts on other land users (including inundation of land) or significant environmental damage (including water quality, acidification, erosion, damage to riverbed and/or banks and altered water levels at sites with ecological and cultural assets) (DoW 2013). Water licence conditions may be applied to any groundwater abstraction licence to reduce and, where possible, eliminate risks and require monitoring, management and mitigation. |
| Pilbara Water in Mining Guidelines (DoW 2009a) | The water management strategy has been prepared with consideration of this guidance. |
| Operational Policy 5.12 – Hydrogeological reporting associated with a groundwater well licence (DoW 2009b) | Groundwater abstraction will be licenced, and monitoring undertaken in accordance with operating strategy. This provides confidence that DWER is regulating monitoring and review of aquifer performance. |
| Use of operating strategies in the water licencing process (DWER 2020) | |
| Water Quality Protection Notes (DOW, various) | Several of the Water Quality Protection Notes (WQPN) published by the WA Govt are very relevant to the Proposal and have been used to inform the impact assessment and well as mitigation approaches. |
| Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018 (ANZG 2018) | Australia's National Water Quality Management Strategy (WQMS) provides guidance on the management of water quality in Australia and New Zealand. This guidance has been used in consideration of surface water management and setting appropriate water quality targets. |
| National Water Quality Management Strategy (ANZECC and ARMCANZ 1994) | |

## 8.3. Receiving Environment

### 8.3.1. Studies and Survey Effort

There have been a number of studies undertaken within the Development Envelope to support the Proposal. Work undertaken to date includes, but is not limited to, aquifer test pumping; groundwater conceptualisation; and flood modelling for the existing (pre-development) and the conceptual surface water drainage structures for the Life of Mine pits plan (post-development) to highlight potential flooding risk to mining and potential mitigation options.

As the assessment progresses, additional studies and modelling will be undertaken. This will include but is not limited to:

- Detailed surface water modelling with a focus on; quantifying changes to flow patterns, water levels, depths and velocities, and flood estimation for the development options
- Continuation of existing baseline monitoring programs, and the processing of the information derived from these investigations to identify and understand system dynamics and impacts
- Development of a surface water management plan
- Developing a detailed hydrogeological conceptualisation of the local deposits and conceptualisations of key Groundwater Dependent Ecosystems (GDEs)

- Developing a groundwater model based on the dewatering strategy, including the preparation of the detailed water balance informed by mine planning and development, and the development of a LoM Water Management Strategy

The results from these studies, and an assessment of the potential impacts resulting from Proposal's implementation will be presented in the ERD.

### 8.3.2. Geology

The Rhodes Ridge area is situated at the south-eastern corner of the Pilbara Craton. The cratonic basement comprises Archean granite-greenstone and is overlain by the Archean-Proterozoic rocks of the Hamersley Basin. These rocks can be divided into three stratigraphic groups: the Fortescue, Hamersley and Turee Creek groups, with the Hamersley Group forming the outcrop across RR. The Hamersley Group is a thick sedimentary sequence comprising banded iron formations, shales and dolomites, with minor felsic volcanic and extensive dolerite dykes and sills. The group contains the Brockman Iron Formation and the Marra Mamba Iron Formation (MMIF), which together, host most of the known major iron ore deposits in the Pilbara,

### 8.3.3. Surface Water

The Development Envelope spans across upper sub-catchments of the Weeli Wolli Creek and Coondiner Creek, with the disturbance footprint being wholly contained to the Weeli Wolli Creek sub-catchment. The two major creeks of relevance to the Proposal are the Weeli Wolli Creek and Coondiner Creek, located approximately 10 km northwest and 3 km southeast of the Development Envelope respectively. The upper reaches of Western Creek and Spearhole Creek are located within the southwest of the Development Envelope. These creeks drain generally south-east, before joining with the Fortescue River. Both creeks have been identified as potential options for temporary surplus water discharge.

The disturbance footprint at Arrowhead is located immediately north of the Coondiner endorheic basin, an internally draining basin with a catchment area of 507 $km^2$. This basin ponds and contains runoff up to a level of 684.5 mAHD, above which surface water overflows from the eastern edge to the main Coondiner Creek.

Three ephemeral water features were identified within the vicinity of the Proposal, RRPL4, Baker's Lake and Rhodes Ridge Lakes. These water bodies accumulate water during heavy rainfalls and dry out during the dry season. Only RRPL4 falls within the Development Envelope.

Hydrological investigations are ongoing to inform understanding of the local and regional surface water regimes. Further detail on the receiving environment will be presented in the ERD.

### 8.3.4. Groundwater

The Rhodes Ridge deposits lie within the eastern area of the Hamersley Basin, east of the Pamelia Syncline, Wonmunna and Weeli Wolli Anticlines. Conceptually, four main hydrostratigraphic units have been identified within the study area, which are representative of the Pilbara Region:

- Tertiary Detritals: Unconsolidated sedimentary groundwater system, which typically include alluvial/colluvial valley infill and calcrete deposits.
- Wittenoom Formation (regional aquifer): Weathered members of the Wittenoom Formation occur in the strike orientated valley floors between ridges of Brockman and Marra Mamba Iron formations. This aquifer can show extensive karstification leading to areas of high permeability and is often hydraulically connected to the overlying Tertiary Detritals to form an important groundwater system. The West Angela Member comprises shaley dolomite and interbedded banded iron formation, while

the Bee Gorge and Paraburdoo members tend to contain mostly dolomite with the highest permeability where karstified.

- Mineralised Brockman Iron Formation (Joffre and Dales Gorge members) and mineralised Marra Mamba Iron Formation (Mt Newman Member): These local aquifer systems occur where secondary porosity has developed in basement rock due to fracturing, weathering or mineralisation. They can be in direct or partial hydraulic connection with the regional aquifer (Tertiary Detritals and Wittenoom Formation).
- Mount McRae Shale/Mount Sylvia Formation (MCS/MTS) forms the hanging wall of the regional aquifer and consists of the overlying Mt Sylvia and Mt McRae Shale Formations which comprise low permeability shale and can be considered aquitards.

At a regional scale, the groundwater hydraulic gradient across the Development Envelope predominantly mimics the surface water drainage system with groundwater flow to the main creek systems of Weeli Wolli Creek and Coondiner Creek. Depth to groundwater across the Development Envelope varies between ~70 m to ~30 m.

Ben's Oasis and Mindy Mindy Spring, located 10 km north-west and 7 km north of Development Envelope respectively, have been identified as high value regional groundwater receptors in the context of the Proposal. Ben's Oasis is a system of surface water pools located along a 200 m reach of Weeli Wolli Creek. The pools, which persist throughout the dry season, are a significant environmental feature and hold cultural values for the Nyiyaparli Traditional Owners.

It is anticipated that Ben's Oasis is supported via a mix of surface water flow and groundwater expression. Targeted investigations are planned in 2024 and 2025 to refine the understanding and conceptualisation of the systems supporting Ben's Oasis.

Detailed hydrogeological investigations are ongoing to inform detailed conceptualisation of the local and regional groundwater system. The ERD will detail the findings of these investigations.

#### 8.3.5. Interactions with other factors

It is acknowledged that Inland Waters has close interactions with other factors such as Subterranean Fauna (due to presence of stygofauna and troglofauna), Terrestrial Fauna (due to consideration of aquatic fauna and links to terrestrial fauna habitat within this factor), Flora and Vegetation (due to the presence of GDV) and Social Surroundings (due to the significant cultural values often associated with water features). An assessment of the connections and interactions between environmental factors or values will be presented in the ERD as part of a holistic impact assessment.

## 8.4. Potential Environmental Impacts

A detailed environmental impact assessment is in preparation for this Proposal. Potential impacts to Inland Waters are listed below:

#### 8.4.1. Direct Impacts

- Modification to groundwater levels through abstraction (e.g. pit dewatering) and aquifer reinjection (e.g. surplus water management option to be investigated)
- Reduction in water levels and/or water quality at sensitive receptors
- Reduction in surface water catchment area
- Changes to surface water flows through the implementation of pits, drainage diversions and flood control measures

- Increased surface water flows as a result of surplus water discharge to Western and/or Spearhole Creeks (surplus water management options to be investigated)

#### 8.4.2. Indirect Impacts

- Potential impacts to groundwater quality as a result of leaks or spills (including in-pit tailings storage)
- Potential impacts to surface water quality as a result of leaks or spills
- Potential interaction with per- and polyfluoroalkyl substances (PFAS)
- Reduction or degradation of native vegetation (including riparian vegetation) and fauna habitats from alteration to hydrological regimes (surface water and groundwater)
- Permanent modification to existing catchments and associated impacts to flow paths of surface water systems
- Sediment erosion and transport as a result of altered hydrological regimes
- Potential for pit-lakes at closure

#### 8.4.3. Cumulative Impacts

- Potential interactions with other surface water and groundwater users in the area (for example, other mine sites, pastoral stations etc)

### 8.5. Mitigation

Rio Tinto has extensive experience developing and operating mines and related infrastructure in the Pilbara, through which it has developed and refined strategies to manage and mitigate potential environmental impacts in an adaptive manner. The Proponent will apply the mitigation hierarchy to the Proposal to ensure it meets the EPA objective in relation to inland waters. Mitigation measures being considered during the development of the Proposal include:

#### 8.5.1. Avoid

- Where possible, surface water management structures will be designed to redirect flows to maintain continuation of natural surface water flows.
- Hydrocarbon storage facilities and all associated connections will be located within appropriately contained areas.

#### 8.5.2. Minimise

- The Proponent will minimise impacts to the flow paths of major creek lines and tributaries.
- Cumulative water balance modelling and hydrogeological modelling has been and will continue to be undertaken to facilitate understanding of:
    - current and future operational water demands; and
    - dewatering requirements.
- Surplus water generated from groundwater dewatering will be used on-site in the first instance to supply water for operational purposes. Only surplus water exceeding the operational requirements will be managed through a number of other surplus water management options currently being investigated. Current options may include, but are not limited to; aquifer recharge, transfer to a third-party operations and other users, and temporary and limited discharge of excess water to the environment (into existing creeklines).

- Dewatering will be minimised to that required to access the below water table resource.
- Water management structures will be constructed in key risk areas to minimise discharge of sediment-laden run-off from the site.
- As far as practicable, infrastructure, waste dumps and stockpiles will be placed to minimise disturbance of natural surface water flows.
- The Proponent will undertake a geochemical assessment to determine if any material is expected that may result in acid and/or metalliferous drainage and develop management strategies for such material as required.

#### 8.5.3. Rehabilitate

- The Proponent will prepare and implement a Closure Plan in accordance with the DMIRS *Statutory Guidelines for Mine Closure Plans* (DMIRS 2020b) for the Proposal.
- Rehabilitation activities will be undertaken progressively over the life of the mine as opportunities arise.

## 8.6. Assessment and Significance of Residual Impacts

An assessment of the potential residual impacts resulting from Proposals implementation and their significance will be presented in the ERD.

## 8.7. Likely Environmental Outcomes

The environmental outcomes to be achieved by the Proponent through the implementation of the Proposal will be presented in the ERD.

# 9. KEY ENVIRONMENTAL FACTOR – SUBTERRANEAN FAUNA

## 9.1. EPA Objective

The EPA objective for subterranean fauna is to protect subterranean fauna so that biological diversity and ecological integrity are maintained (EPA 2023a).

## 9.2. Policy and Guidelines

**Table 9-1** presents relevant policy and guidance for subterranean fauna and demonstrates how this has been considered for the Proposal.

**Table 9-1: Relevant Policy and Guidelines for Subterranean Fauna**

| Policy or Guidance | Explain how the Policy and Guidance has been Considered |
|---|---|
| **Environmental Protection Authority** | |
| Statement of Environmental Principles, Factors and Objectives (EPA 2023a) | The EPA objective for subterranean fauna forms the basis of this assessment. This assessment has regard to the aims of EIA, consideration of significance and the application of the mitigation hierarchy. |
| Environmental Factor Guideline: Subterranean Fauna (EPA 2016f) | Considered in the design (methods and approach) of the subterranean fauna surveys. |
| Technical Guidance – Sampling methods for subterranean fauna (EPA, 2016g) – updated 2021 | |
| Technical Guidance – Subterranean fauna surveys for Environmental Impact Assessment (EPA 2021g) | |
| Environmental Impact Assessment (Part IV Divisions 1 And 2) Administrative Procedures (EPA 2021a) | Considered in preparation of the referral and impact assessment. |
| Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2021b) | |
| Instructions on how to prepare an Environmental Review Document (EPA 2021c) | This document forms the basis of the headings and content to be provided in the ERD, to be prepared by WA EIA practitioners |
| Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans (EPA 2021d) | The EMP will be prepared in accordance with the guidance and addresses, amongst other things, matters related to subterranean fauna |
| **Other State or Commonwealth** | |
| Mine Closure Plan Guidance – How to Prepare in Accordance with Part 1 of the Statutory Guidelines (DMIRS 2020a) | The MCP will be prepared in accordance with the guidance and addresses matters related to subterranean fauna |
| Statutory Guidelines for Mine Closure Plans (DMIRS 2020b) | |

## 9.3. Receiving Environment

### 9.3.1. Studies and Survey Effort

Subterranean fauna surveys undertaken to date within the Development Envelope are summarised in **Table 9-2**. The subterranean fauna survey coverage is provided in **Figure 9-1**.

**Table 9-2: Subterranean fauna surveys undertaken for the Proposal**

| Survey consultant and date | Survey title | Description |
|---|---|---|
| Stantec (2020) | Rhodes Ridge Baseline Subterranean Fauna 2019 Sampling Program for EPA Level 2 Stygofauna and Troglofauna Assemblage Survey | • Trip 1 (October 2019) and 68 in Trip 2 (December 2019)<br>• 112 stygofauna haul net samples were collected from 80 sites<br>• 181 net scrape samples (inclusive of stygofauna net hauls from uncased bores) and 178 litter trap samples from 181 sites |
| Biologic Environmental Survey (2022b) | Rhodes Ridge: Level 2 Subterranean Fauna Assessment – Preliminary Results | • Two phases of sampling conducted from June 2020 to February 2021<br>• 1,240 samples were collected from 673 sites (623 bores and 50 surface aquatic)<br>• Molecular sequencing conducted on 467 specimens at 92% success rate producing 172 Operational Taxonomic Units (OTUs) |

Based on the survey effort to date (three phases from 2020 - 2022) and comprehensive use of DNA sequencing, Rhodes Ridge hosts a diverse subterranean assemblage. Further detailed surveys are underway to a greater understanding of the species assemblage and habitat, including regional occurrences and distribution.

### 9.3.2. Future Studies and Survey Effort

Detailed investigations for subterranean fauna are ongoing and anticipated to be completed in 2024 (**Table 9-3**).

**Table 9-3: Future Planned Subterranean Fauna Surveys**

| Proposed Survey | Survey Scope | Commencement Date |
|---|---|---|
| Targeted subterranean fauna survey | Detailed subterranean fauna surveys completed throughout 2023 (Phase 4 and 5).<br>Continuation of these surveys proposed in 2024. Targeted surveys to be undertaken within the Conceptual Disturbance Footprint and potential groundwater drawdown propagation zones | H1 2024 |

### 9.3.3. Stygofauna

#### 9.3.3.1. Stygofauna Habitat

The broader survey area is characterised by a series of east-west trending synclines and anticlines. Brockman Iron Formation typically forms the major synclinal structures, with Marra Mamba Iron and Jeerinah Formations comprising the major anticlinal structures (Rio Tinto 2010). Aquifers associated

with the Wittenoom Formation and tertiary detritals (e.g. alluvium and colluvium) occur within the flat-lying valleys between the Brockman and Marra Mamba/Jerrinah ridges (Rio Tinto 2010).

The standing water levels (SWL) within the sampling areas ranged from 17.1 to 85.2 m bgl. The properties of the groundwater can influence the occurrence and distribution of stygofauna. A number of basic groundwater physicochemical parameters (electrical conductivity (EC), pH, water temperature, dissolved oxygen (DO) and reduction-oxidation (Redox) potential) were recorded in the field (Stantec 2020). The groundwater properties recorded to date, represented by a basic suite of physicochemical parameters, were within the ranges known to support stygofauna. Groundwaters were predominantly fresh (90.8 to 2110 µS/cm) and generally circumneutral (ranged from pH 6.4 to 7.6) with variable dissolved oxygen concentrations (ranged from 0.47 mg/L to 7.43 mg/) and are not considered to represent a barrier to stygofauna habitation (Stantec 2020). DO concentrations are often patchy in the subterranean environment, commonly ranging from suboxic (<0.3 mg/L) to oxic (>3 mg/L) over temporal and spatial scales. Given this variability, stygofauna tend to be relatively resistant to low levels of oxygen.

Subterranean habitat modelling and distributions are currently being mapped and informed via geological and hydrogeological investigations. Habitat features will be described in detail within the ERD.

#### 9.3.3.2. Stygofauna Species

A desktop review identified that a number of stygofauna studies have been completed within a 75 km radius of the broader survey area (Stantec 2020). From those that intersected the current survey area, a total of 139 amphipods, four ispods, four thermosbaenaceans, 18 syncarids and one ostracod were collected, however, no information regarding stygofauna habitat (surface or underlying geology) was provided (Stantec 2020).

During the survey in 2019 (Stantec 2020) a total of 319 stygofauna or potential stygofauna specimens were recorded within the survey area. These represented at least 14 species from three higher level taxonomic groups; Oligochaeta and the crustacean orders Amphipoda and Isopod.

Stygofauna were recorded from 27 of 80 sites (34%) and 29 of the 112 samples (26%) during the Survey. Oligochaetes accounted for 75% of stygofauna recorded during the survey (239 specimens). Amphipoda was the most abundant crustacean group, representing 24.7% of the stygofauna collected (79 specimens). Isopods contributed to a lesser extent, with one specimen, equating to 0.3% of stygofauna material from the survey.

Additional surveys and taxonomic work are underway (Biologic, 2022b). Based on the preliminary findings, Rhodes Ridge appears hosts a highly diverse subterranean assemblage. To date, 4,514 stygofauna/amphibious specimens have been collected, of which 914 specimens were identified as belonging to 63 stygofauna/amphibious species using a combination of morphology and genetics.

An assessment of the final values, potential residual impacts resulting from Proposal's implementation and their significance will be presented in the ERD.

### 9.3.4. Troglofauna

#### 9.3.4.1. Troglofauna Habitat

Prospective habitat for subterranean fauna is dependent on the presence of sub-surface crevices, fractures and voids of suitable size and connectivity to satisfy biological requirements. Troglofauna habitat is supported by geological units with rock types or regolith deposits occurring above the water table that have secondary porosity including vuggy, weathered or cavernous rock formations, including but not limited to those present in karst, channel iron deposits, banded iron formations, calcretes, and weathered or fractured basalt and sandstone (EPA 2021g). Humidity is also a key requirement for

troglofauna existence (EPA 2016g). However, there is still relatively little information on their distribution compared to stygofauna (EPA 2016g).

Subterranean habitat modelling and distributions area currently being mapped and informed via geological and hydrogeological investigations. Habitat features will be described in the detail within the ERD.

#### 9.3.4.2. Troglofauna Species

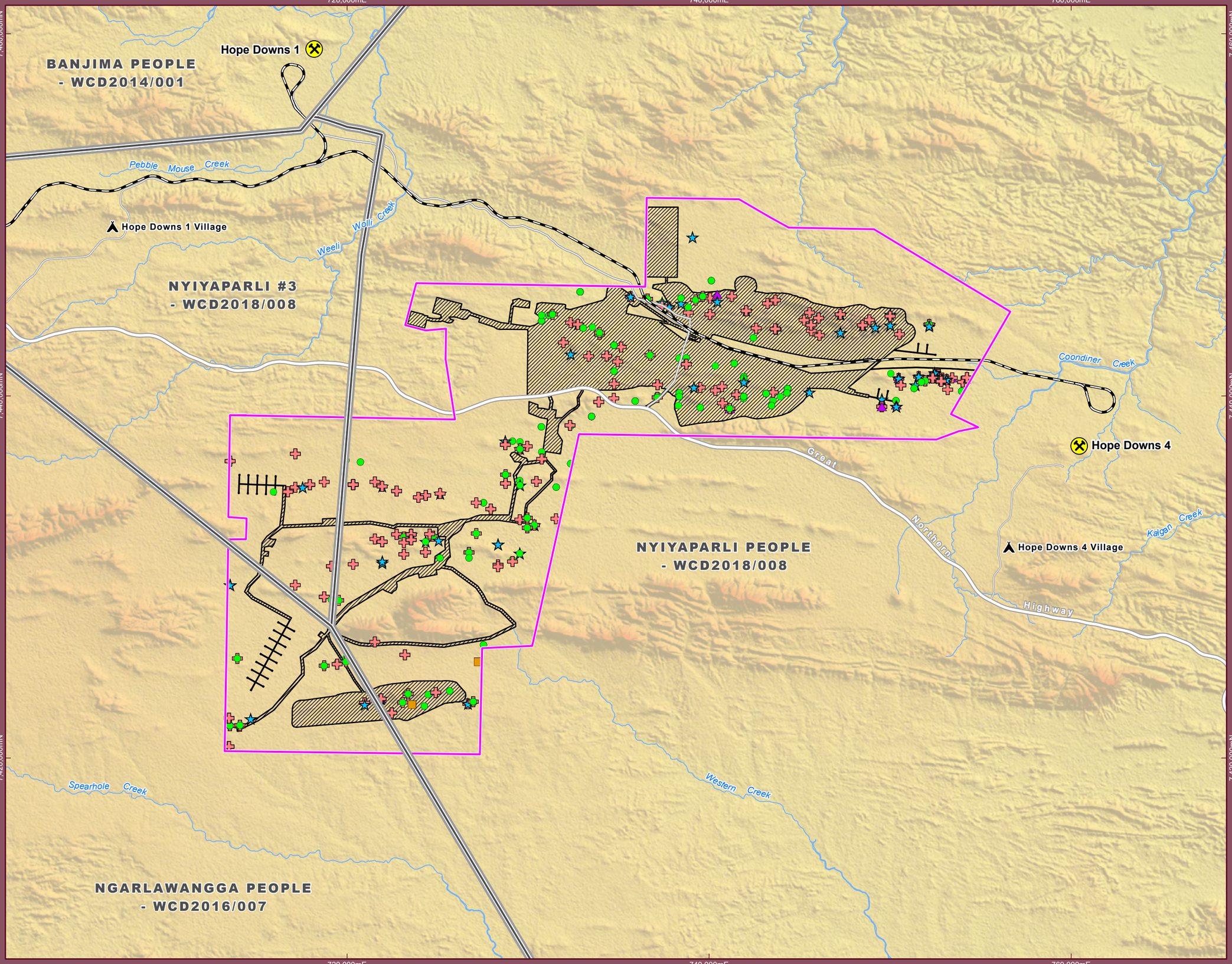
A desktop review identified a number of troglofauna studies have been undertaken within a 75 km radius of the survey area (Stantec 2020). The most diverse troglofauna assemblages have typically occurred within weathered and mineralised areas of Brockman Iron Formation, Marra Mamba Formation or CID, provided that voids and cavities are present. A study of troglofauna assemblages immediately adjacent to the survey area, within the Wonmunna Iron Ore Deposit, yielded a high diversity of troglofauna (35 species and eight higher level taxa), including 38 taxa which were considered likely or potential SREs (Stantec 2020). Other studies of troglofauna within 75 km of the survey area have recorded troglofauna assemblages ranging from moderately diverse to depauperate (Stantec 2020).

A total of 49 troglofauna or potential troglofauna (troglofauna) specimens were recorded during the Stantec (2020) survey. The specimens represented 14 species and two indeterminate taxa from nine higher level taxonomic groups including Palpigradi, Pseudoscorpiones, Oligochaeta, Polyxenida, Diplura, Hemiptera, Zygentoma, Pauropoda and Symphyla. The oligochaetes assigned as troglofauna were collected from troglofauna litter traps and/or scraping of dry holes.

During the Stantec (2020) survey, troglofauna were recorded from 14 of 181 sites (8%) and 14 of the 359 samples (4%). Oligochaeta was the most abundant group, equating to 67% of the troglofauna records from the survey.

Additional surveys and taxonomic work are underway (Biologic, 2022b). Based on the preliminary findings, Rhodes Ridge appears hosts a highly diverse subterranean assemblage. To date, 1,159 troglofauna/edaphic fauna specimens have been identified, of which 408 were identified as belonging to 102 troglofauna/edaphic species using a combined approach of morphology and genetics.

An assessment of the potential residual impacts resulting from the Proposal’s implementation and the significance of these impacts will be presented in the ERD.




## Legend

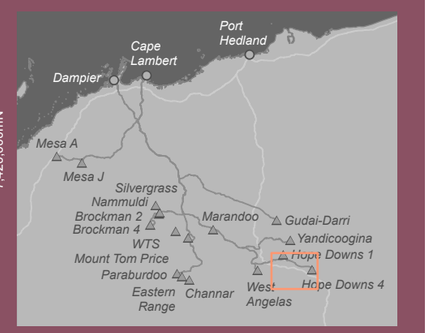
*Subterranean Fauna Survey Coverage*

- Hauling
- Karaman
- Roots
- Scraping
- Trapping

- Proposed Development Envelope
- Conceptual Disturbance Footprint
- Native Title Determination Area
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

**Drawn:** A.Coulson
**Plan:** RTIO-1023042v2
**Date:** December 2023

**Checked by:** M.Buck
**Proj:** GDA 1994 MGA Zone 50
***GIS.Team@riotinto.com***

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# Figure 9-1: Subterranean Fauna Survey Coverage in the Development Envelope

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N

## 9.4. Potential Environmental Impacts

A detailed environmental impact assessment is currently in preparation for this Proposal. Potential impacts to Subterranean Fauna are provided below.

### 9.4.1. Direct Impacts:

- Removal or reduction of subterranean fauna habitat (physical removal and loss through groundwater drawdown)
- Loss of subterranean fauna individuals

### 9.4.2. Indirect Impacts:

- Modification of subterranean fauna habitat as a result of surplus water management (e.g. discharge, aquifer recharge)
- Degradation of subterranean fauna habitat (including contamination from spills, leaching and environmental incidents)
- Changes to surface water infiltration
- Changes to the structure and presence of underground voids from sedimentation and fill (beneath waste landforms, stockpiles and WFSFs) and compaction, blasting/shock and vibration
- Fragmentation of previously connected/contiguous habitat by excavation

### 9.4.3. Cumulative Impacts:

- Cumulative impacts to subterranean fauna habitat from surrounding land uses and other mining operations
- Cumulative impacts to subterranean taxa from surrounding land uses and other mining operations

## 9.5. Mitigation

Rio Tinto has extensive experience developing and operating mines and related infrastructure in the Pilbara through which it has developed and refined strategies to manage and mitigate potential environmental impacts in an adaptive manner. The Proponent will apply the mitigation hierarchy to the Proposal to ensure it meets the EPA objective in relation to subterranean fauna. Mitigation measures being considered during the development of the Proposal include:

### 9.5.1. Avoid

- Subterranean fauna surveys will identify the presence, if any, of conservation significant subterranean fauna and supporting habitat which may be able to be avoided during the detailed design of the Proposal.
- Resource drilling will be undertaken to further define the area of resource and develop pit shells to avoid unnecessary disturbance and excavation of material.

### 9.5.2. Minimise

- The Proponent is currently developing geological and hydrogeological models for the Proposal in order to characterise the subterranean habitats and enable potential impacts to be quantified, including consideration of habitat connectivity.

- Ground disturbance will be managed to ensure the Proposal is developed in accordance with any regulatory approvals and that ground disturbance is minimised. This will include (but is not limited to) ensuring:
    - all areas subject to disturbance are within approved boundaries (i.e. Development Envelope);
    - clearing does not exceed prescribed clearing limits; and
    - any exclusion areas (if present) are clearly noted on mine plans.

#### 9.5.3. Rehabilitate

- The Proponent will prepare and implement a Closure Plan in accordance with the *Statutory Guidelines for Mine Closure Plans* (DMIRS 2020b) for the Proposal.
- Rehabilitation activities will be undertaken progressively over the life of the mine as opportunities arise.

## 9.6. Assessment and Significance of Residual Impacts

An assessment of the potential residual impacts resulting from Proposals implementation and their significance will be presented in the ERD.

## 9.7. Likely Environmental Outcomes

The environmental outcomes to be achieved by the Proponent through the implementation of the Proposal will be presented in the ERD.

# 10. KEY ENVIRONMENTAL FACTOR – SOCIAL SURROUNDINGS

## 10.1. EPA Objective

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

## 10.2. Policy and Guidelines

**Table 10-1** presents the relevant policy and guidance for Social Surroundings and demonstrates how they have been considered for the Proposal.

**Table 10-1: Relevant Policy and Guidelines for Social Surroundings**

| Policy or Guidance | Explain how the Policy and Guidance has been Considered |
|---|---|
| **Environmental Protection Authority** | |
| Statement of Environmental Principles, Factors and Objectives (EPA 2023a) | The EPA objective for social surroundings forms the basis of this assessment. This assessment has regard to the aims of EIA, consideration of significance and the application of the mitigation hierarchy. |
| Environmental Factor Guideline – Social Surroundings (EPA 2023b) | The Social Surroundings Guideline has informed the consultation and engagement process with relevant Aboriginal people of the area to understand Aboriginal cultural associations with the environment. |
| Interim Technical Guidance Environmental impact assessment of Social Surroundings – Aboriginal Cultural Heritage (EPA 2023c) | Considered in preparation of the referral and impact assessment. |
| Environmental Impact Assessment (Part IV Divisions 1 And 2) Administrative Procedures (EPA 2021a) | Considered in preparation of the referral and impact assessment. |
| Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2021b) | |
| Instructions on how to prepare an Environmental Review Document (EPA 2021c) | This document forms the basis of the headings and content to be provided in the ERD. |
| Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans (EPA 2021d) | The EMP will be prepared in accordance with the guidance and addresses, amongst other things, matters related to social surroundings |
| **Other State or Commonwealth** | |
| Mine Closure Plan Guidance – How to Prepare in Accordance with Part 1 of the Statutory Guidelines (DMIRS 2020a) | The MCP will be prepared in accordance with the guidance and addresses matters related to social surroundings |
| Statutory Guidelines for Mine Closure Plans (DMIRS 2020b) | |
| Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999 (DCCEEW 2023a) | This document outlines statutory obligations for proponents, and the Department of Climate Change, Energy, the Environment and Water's expectations of proponents, regarding respectful and effective engagement with First Nations People and Communities as part of the environment referral, assessment and approval process under Chapter 4 of the EPBC Act. |

## 10.3. Receiving Environment

The Proposal is located on the traditional lands of the Nyiyaparli and Ngarlawangga People. The Proposal intersects the Nyiyaparli Native Title Determination Area (WCD2018/008) and the Ngarlawangga Native Title Determination Area (WCD2016/007). Karlka Nyiyaparli Aboriginal Corporation (KNAC) are the Registered Native Title Body Corporate representing Nyiyaparli Common Law Holders, while the Ngarlawangga Aboriginal Corporation (NAC) is the Registered Native Title Body Corporate and holds Native Title in trust for the Ngarlawangga People.

Heritage surveys have been undertaken within the Development Envelope since the 1970s for exploration drilling. Review of the Aboriginal Heritage Inquiry System (AHIS) has identified the following Aboriginal heritage values area known to occur (**Figure 10-1**):

- 50 Registered sites
- 103 Lodged sites

Additional stakeholders within the broader receiving environment include neighbouring pastoralists, Shire of East Pilbara and Newman community.

### 10.3.1. Studies and Survey Effort

Archaeological and ethnographic surveys have occurred within, and in the vicinity of, the Development Envelope over several decades but were largely for drilling purposes. The Proponent is aware of a number of significant cultural heritage sites in both Nyiyaparli and Ngarlawangga Country, however many of these locations will need to be re-assessed with KNAC and NAC as part of additional engagement, consultation and detailed surveys in the field in order to confirm boundaries and identify any additional sites.

Detailed social surroundings and heritage (archaeological and ethnographical) surveys for mining purposes will commence within the Development Envelope during-2024 and ongoing throughout 2025 with both Traditional Owner Groups. The findings of which will inform detailed Proposal design and will be described within the ERD and the two Social and Cultural Heritage Management Plans (SCHMPs) prepared in consultation with KNAC and NAC.

### 10.3.2. Cultural Values

Heritage management for the Proposal considers both small and large-scale cultural heritage values present within the landscape that may be impacted by the Proposal. Tangible cultural heritage, such as individual artefact scatters, are discrete locations and can be managed on a project-by-project basis. Intangible cultural heritage, as associated with landscape features like ranges, creeks and aquifers, can cross over multiple project areas and multiple Traditional Owners' Country and a broader understanding of social and cultural values and perceived impacts is required to manage these.

Landmarks and places such as Mt Newman, Eagle Rock Falls, and Kalgan Pool are part of Nyiyaparli Country and have ongoing significance to the Nyiyaparli People. It is noted that these fall outside of the Proposal but are provided for regional context. Parts of the Ophthalmia Range are significant to Nyiyaparli people. The north-western sections of the Range are located within the Development Envelope. Giles Point (a place located on Ngarlawangga Country) is identified as highly significant to Ngarlawangga and Nyiyaparli People.

Within the semi-arid environment of the Pilbara; 'Water is life and it is blood'. It sustains not only the people who call the land Country, it supports the rich plant and animal life found across all bioregions. Beyond this, water is also ascribed spiritual potency. The Water Snake *Yuturrpa* in Nyiyaparli (often called *Warlu* in other inland parts of the Pilbara), is the Dreaming being who shaped the land when the

world was forming. As *Yuturrpa* travelled underground, his path created all the subterranean voids where water flows or is stored. When he poked his head out to see where he was, he marked the landscape, creating a permanent waterhole in creek lines, or a void or sinkhole in the land. *Yuturrpa* permeates and energises Country. Damage to a water source is damage to *Yuturrpa*, and a high degree of damage could cause *Yuturrpa* to leave and the Country to lose its spiritual heart.

Aboriginal People practice a canon of ceremonial activity concerned with the maintenance of water. These include specific rituals to call (or increase) rain or to stop rain (a protective aspect in cyclone season), and cultural protocols around approaching or avoiding particular water places. In the Aboriginal schema, all water is important, be it rain, surface water or sub-surface water; permanent or ephemeral; flowing or still. Aboriginal cultural maintenance of water to care for Country has occurred for millennia, and these include cultural obligations to maintain water for neighbouring and downstream peoples.

Nyiyaparli and Ngarlawangga Peoples retain a high level of knowledge about water systems and continue to use locations along the creek systems for communal camping, fishing and hunting. They rely on ground water to supply permanent pools. These are places where elders teach children about Country and Culture.

The majority of the Development Envelope is located within the Weeli Wolli, Mindy Mindy and Coondiner Creek catchments, all of which drain generally northwards into Fortescue Marsh. The Marsh is a highly significant feature for Nyiyaparli People. Whilst the Fortescue Marsh is not within the Development Envelope, concerns around impacts to the catchment which feeds the Marsh have already been raised.

720,000mE
740,000mE
760,000mE
7,460,000mN
7,440,000mN
7,420,000mN

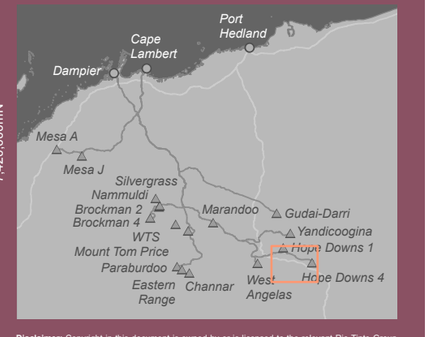
Hope Downs 1
BANJIMA
Pebble Mouse Creek
Hope Downs
1 Village
Wolli Creek
Weeli
Great Northern Highway
Coondiner Creek
Hope Downs 4
NYIYAPARLI
Hope Downs
4 Village
Kalgan Creek
Spearhole Creek
NGARLAWANGGA
Western Creek

## Legend

- Proposed Development Envelope
- DPLH Site
- Agreement with Rio Tinto Iron Ore
- Rio Tinto Mine
- Rio Tinto Camp
- Rio Tinto Railway
- Highway
- Minor Road
- Site Access Road
- Major Creek

**Drawn:** A.Coulson
**Plan:** RTIO-1023046v1
**Date:** January 2024

**Checked by:** M.Jacob
**Proj:** GDA 1994 MGA Zone 50
***GIS.Team@riotinto.com***

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RioTinto

# Figure 10-1: Aboriginal Heritage Sites in the Development Envelope

0 1 2 3 4 5
kilometres
**Scale:** 1:200,000 @A3

N

## 10.4. Potential Environmental Impacts

A detailed environmental impact assessment is in preparation for this Proposal, which will be informed by consultation with relevant stakeholders. Potential impacts to Social Surroundings include:

### 10.4.1. Direct Impacts

- Direct loss of heritage sites
- Changes to landscape and topography (reduced cultural recognition and connection)
- Impacts to cultural water values and water-related cultural sites
- Loss of culturally significant fauna and flora species
- Impacts to and disruption of cultural practices, rituals and/or customs
- Temporary or permanent loss of access to country
- Loss of sense of place and amenity
- Impacts to recreational activities and tourism
- Loss of ability to conduct native title rights in areas permanently inaccessible or unable to rehabilitate

### 10.4.2. Indirect Impacts

- Indirect loss of heritage sites and values due to mining activities including, but not limited to, vibrations and blasting impacts
- Alteration of cultural values and heritage sites as a result of groundwater abstraction, altered surface water regimes, and sedimentation and dust deposition
- Degradation of water quality
- Changes in vegetation – increased invasive and weed species and lower water availability
- Increased dust, noise, light, personnel, waste management and traffic

### 10.4.3. Cumulative Impacts

Rio Tinto operations on Nyiyaparli Country comprise Hope Downs 1, Hope Downs 4, and Yandicoogina. In addition, Nyiyaparli Country also supports mining operations including but not limited to those operated by BHP, FMG, and Roy Hill. Ngarlawangga Country interacts with the Rhodes Ridge project and several of Rio Tinto's other operations and areas of interest including West Angelas, Hope Downs 2, Angelo River and the Pilbara Renewable Energy Project. It is necessary to consider the cumulative impacts the Proposal may have to the physical and biological surroundings, which may impact heritage sites and values. These must be considered in terms of the broader cultural heritage knowledge base and inventory of the wider Rhodes Ridge region.

An assessment of the potential cumulative impacts and their significance will be presented in the ERD.

## 10.5. Mitigation

The Proponent has agreed heritage engagement processes in respect of this proposal with KNAC, and NAC. Engagement and consultation are ongoing with both Traditional Owner groups in respect of the identification, management and mitigation of potential impacts to cultural values within the proposed Development Envelope.

The identification and management of cultural heritage within the proposed Development Envelope will also be undertaken in accordance with the principles and practices outlined within:

- the Proponent's Communities and Social Performance (CSP) Guidelines
- the Proponent's Cultural Heritage Group Procedure and agreed Heritage Protocols
- Local Implementation Committee (LIC) and Life of Mine Planning (LoMP) forums

In line with the heritage engagement processes agreed with KNAC, and NAC, statutory requirements and these internal CSP and Heritage management standards, CVLM, archaeological, ethnographic and Social Surroundings surveys will be undertaken over the proposed Development Envelope. The LIC and LoMP forums allow RTIO to meet regularly with KNAC and NAC to discuss design options, management and mitigation measures.

The Proponent will apply the mitigation hierarchy to the Proposal to ensure it meets the EPA's objective in relation to Social Surroundings. Mitigation measures being considered during the development of the Proposal include:

### 10.5.1. Avoid

- The Proponent is aware that cultural values and heritage sites are located within the Development Envelope and conceptual footprint. The Proponent will continue to undertake the appropriate and necessary surveys and consultation with KNAC and NAC to further understand these cultural features. The Proponent will endeavour to design projects and other business activities to avoid impacts wherever practicable.
- Social Surroundings engagement and consultation will be undertaken with relevant stakeholders to inform the environmental impact assessment for this Proposal.
- Engagement and consultation (including surveys) with KNAC and NAC will inform the Proposal design, with the aim of avoiding impacts to culturally significant sites and values.
- Engagement, consultation and surveys with KNAC and NAC will be completed prior to project development to inform any additional project design considerations.
- The Proposal will avoid, as far as practicable, interactions with significant water features and impacts to surface water flows.
- Disturbance will be managed using internal Approvals Request Coordination System (ARCS) to avoid unauthorised ground disturbance.

### 10.5.2. Minimise

- SCHMPs will be developed for the Proposal in consultation with KNAC and NAC.
- The Proponent will continue to minimise, mitigate and offset direct, indirect and cumulative impacts to known heritage sites within the proposed Development Envelope as far as practicable. However, if heritage sites or cultural values are likely to be disturbed by the Proposal, the Proponent will consult with the relevant Prescribed Body Corporate (PBC) in accordance with the agreed processes. Where avoidance is not possible, the Proponent will provide design options to the relevant PBC for consideration, with a view to agreeing the approach that best minimises harm, and/or identifying appropriate impact mitigation strategies. In instances where agreement regarding management or protection of heritage sites and cultural values cannot be reached, the Proponent may still seek heritage approvals under statutory processes as required where it is considered significant to RTIO Pilbara Operations. Traditional Owners are under no obligation to support any such heritage approvals.

- A visual impact assessment (VIA) will be completed to inform mine design and to assess potential impacts to visual amenity as viewed from sites and places of cultural significance as determined in conjunction with KNAC and NAC.
- Engage and consult with other relevant stakeholders to understand their concerns and possible options to address these.
- Ongoing monitoring of culturally significant sites and values to maintain good health or address any deterioration early and enact strategies to improve management of the sites and values.

#### 10.5.3. Rehabilitate

- The Proponent will prepare and implement a MCP in accordance with the *Statutory Guidelines for Mine Closure Plans* (DMIRS 2020b) for the Proposal
- Ongoing engagement and consultation with KNAC and NAC on closure and rehabilitation and the application of design and closure principles to the Proposal if endorsed by the relevant Group and practicable
- KNAC and NAC review of MCP and incorporation of relevant closure and rehabilitation related aspects into each of their SCHMPs
- Rehabilitation activities will be undertaken progressively over the life of the mine and opportunities to involve KNAC and NAC in the rehabilitation of their country will be explored.

## 10.6. Assessment and Significance of Residual Impacts

An assessment of the potential residual impacts resulting from Proposals implementation and their significance will be presented in the ERD.

## 10.7. Likely Environmental Outcomes

The environmental outcomes to be achieved by the Proponent through the implementation of the Proposal will be presented in the ERD.

# 11. KEY ENVIRONMENTAL FACTOR – GREENHOUSE GAS EMISSIONS

## 11.1. EPA Objective

The EPA's objective for Greenhouse Gas Emissions is to minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable (EPA 2023a).

## 11.2. Policy and Guidelines

**Table 11-1** presents the relevant policy and guidance for greenhouse gas emissions and demonstrates how they have been considered for the Proposal.

**Table 11-1: Relevant Policy and Guidance for Greenhouse Gas Emissions**

| Policy or Guidance | Explain how the Policy and Guidance has been Considered |
|---|---|
| **Environmental Protection Authority** | |
| Statement of Environmental Principles, Factors and Objectives (EPA 2023a) | The EPA objective for greenhouse gas emissions forms the basis of this assessment. This assessment has regard to the aims of EIA, consideration of significance and the application of the mitigation hierarchy. |
| Environmental Factor Guideline – Greenhouse Gas Emissions (EPA 2023d) | Considered in preparation of the referral and impact assessment. |
| Environmental Impact Assessment (Part IV Divisions 1 And 2) Administrative Procedures (EPA 2021a) | Considered in preparation of the referral and impact assessment. |
| Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA 2021b) | |
| Instructions on how to prepare an Environmental Review Document (EPA 2021c) | This document forms the basis of the headings and content to be provided in the ERD. |
| Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA 2021d) | The EMP will be prepared in accordance with the guidance and addresses, amongst other things, matters related to greenhouse gas emissions |
| **Other State or Commonwealth** | |
| Mine Closure Plan Guidance – How to Prepare in Accordance with Part 1 of the Statutory Guidelines (DMIRS 2020a) | The MCP will be prepared in accordance with the guidance and addresses matters related to greenhouse gas emissions |
| Statutory Guidelines for Mine Closure Plans (DMIRS 2020b) | |
| *National Greenhouse and Energy Reporting Act 2007* (NGER Act). | The Safeguard Mechanism applies baselines to large GHG-emitting facilities to ensure that net emissions are kept below a defined baseline. The Safeguard Mechanism applies to facilities with Scope 1 emissions of more than 100,000 t $CO_2$-e per year. Emissions from this Proposal will be required to be reported under this Act. |

## 11.3. Receiving Environment

Australia currently contributes around 1.3 per cent of global GHG emissions. There has been a steady increase in GHG emissions from WA since the 1990s, and emissions growth is generally expected to continue in the short and medium term (EPA 2023d). In 2021, WA contributed 80.23 million tonnes $CO_2$- e to national emissions (down from 81.7 million tonnes of $CO_2$-e in 2020) (DCCEEW, 2023b). This represents 17.3 per cent of Australia's emissions (DCCEEW, 2023b).

## 11.4. Potential Environmental Impacts

Proposal activities (typical of iron ore mines) that have the potential to impact greenhouse gas emissions include:

- Clearing of native vegetation;
- Production of greenhouse gases from electricity generation;
- Diesel combustion by fixed and mobile equipment;
- Scope 3 indirect emissions (other than Scope 2 emissions) as a consequence of the activities of the Proponent's customers, from sources not owned or controlled by the Proponent's business.

Preliminary forecasted emissions for the Proposal will exceed 100,000 tonnes $CO_2$-e of Scope 1 emissions per annum during the life of the project:

- Estimated peak Scope 1 emissions of 370,000 t $CO_2$-e.
- Estimated peak Scope 2 emissions of 160,000 t $CO_2$-e.
- Estimated peak Scope 3 emissions of 70,000,000 t $CO_2$-e

As a result, Greenhouse Gas Emissions will be considered a Key Environmental Factor. Emissions forecasts will be refined as part of the assessment process and an assessment will be presented in the ERD.

## 11.5. Mitigation

Rio Tinto has extensive experience developing and operating mines and related infrastructure in the Pilbara through which it has developed and refined strategies to manage and mitigate potential environmental impacts in an adaptive manner. The Proponent will apply the mitigation hierarchy to the Proposal to ensure it meets the EPA objective in relation to Greenhouse Gas Emissions. Rio Tinto has established a Climate Action Plan and clear Decarbonisation Strategy that seeks to reduce our emissions impact on the physical climate.

The Proponent will utilise well established procedures through the Joint Venture partners for the reporting of greenhouse gas emissions at its Pilbara operations. In accordance with the NGER Act, the Proponent reports annually on energy production and consumption, and Scope 1 and 2 emissions.

The Proponent is committed to an ongoing program of reporting, benchmarking and review to identify opportunities to further reduce energy consumption and minimise greenhouse gas emissions via the Rhodes Ridge Greenhouse Gas Management Plan being prepared.

## 11.6. Assessment and Significance of Residual Impacts

An assessment of the potential residual impacts resulting from Proposals implementation and their significance will be presented in the ERD.

## 11.7. Likely Environmental Outcomes

The environmental outcomes to be achieved by the Proponent through the implementation of the Proposal will be presented in the ERD.

# 12. OTHER ENVIRONMENTAL FACTORS

During stakeholder consultation as part of the design process for the Proposal, Other Environmental Factors were identified as requiring potential consideration. These include:

- Terrestrial Environmental Quality
- Air Quality, and
- Landforms

Discussion on these factors, including the receiving environment and the potential significance to the Proposal is provided in **Table 12-1**.

**Table 12-1: Other Environmental Factors**

| Other Factor | Receiving Environment | Significance to Proposal |
|---|---|---|
| Terrestrial Environment Quality | The EPA's objective for Terrestrial Environmental Quality is "*to maintain the quality of land and soils so that environmental values are protected"* (EPA, 2016f). The RRIOP contains both Brockman Iron Formation and Marra Mamba Iron Formation. Studies undertaken indicate that Potential Acid Forming Materials (PAF) is expected, and that the Acid Mine Drainage (AMD) risk across all three deposits is moderate.<br>Potential impacts resulting from the Proposal may include:<br>• Construction and operations of waste rock landforms and tailings storage facilities<br>• Waste rock materials have the potential to generate AMD resulting in the contamination of soils<br>• Direct disturbance to the soils and their structures through mining operations<br>• Contamination of soils due to the use of, and storage of hydrocarbons<br>Rio Tinto has extensive experience developing and operating mines through the implementation of refined strategies to manage and mitigate potential environmental impacts in an adaptive manner. The Proponent will apply the mitigation hierarchy to the Proposal to ensure it meets the EPA objective in relation to Terrestrial Environmental Quality. Mitigation measures include but are not limited to:<br>• The Proponent is developing the RRIOP MCP. The MCP will address the potential impacts on soils (structure, stability and quality) and provide detail on how waste storage areas (principally overburden storage areas) will be constructed and rehabilitated, to minimise erosion. | During stakeholder consultation, Terrestrial Environmental Quality and potential impacts to soils was identified as a concern, particularly for Traditional Owners.<br>A number of studies and investigations are underway, including detailed waste materials characterisation. The findings of these investigations will inform detailed management and mitigation measures.<br>Potential impacts can be readily managed through the application of appropriate management measures to meet the EPA's objective. |

| Other Factor | Receiving Environment | Significance to Proposal |
|---|---|---|
| | • Investigations will be ongoing into the geochemical and physical properties of Brockman Iron and Marra Mamba Iron waste material, to confirm the appropriate erosion and AMD management requirements.<br>• Proposed TSFs will be subject to detailed investigations and can be regulated under Part V of the EP Act as required. | |
| Air Quality | The EPA's objective for Air Quality is *"to maintain air quality and minimise emissions so that environmental values are protected"* (EPA 2020b).<br>The Pilbara region is a naturally dusty environment, with wind-blown dust a significant contributor to particulate loading. The Proposal occurs in a sparsely populated area, with no towns or communities nearby. The nearest town is Newman, approximately 40 km to the southeast of the Proposal.<br>The leading dust emissions sources expected from the Proposal are:<br>• Vegetation clearing<br>• Drilling and blasting<br>• Handling and transfer of ore and waste materials<br>• Roads and haul road traffic<br>• Wind erosion from stockpiles and open areas<br>Rio Tinto has extensive experience developing and operating mines and related infrastructure in the Pilbara through which it has developed and refined strategies to manage and mitigate potential environmental impacts in an adaptive manner. The Proponent will apply the mitigation hierarchy to the Proposal to ensure it meets the EPA objective in relation to air quality. Mitigation measures include but are not limited to:<br>• Minimising clearing as far as practicable<br>• Using dust suppressants or water on roads, working surfaces and stockpiles as required<br>• Using dust collection systems and enclosed screenhouses<br>• Restricting vehicles to designated roads and tracks, and<br>• Implementing speed limits to minimise traffic-generated dust<br>Baseline dust monitoring will be undertaken within the Development Envelope and surrounds to inform detailed dust modelling which will inform potential impacts to sensitive receptors. These will be discussed | During stakeholder consultation as part of the design process, Air Quality was identified as a potential factor largely due to impacts from dust. Potential impacts from dust will be adequately addressed in the respective chapters of the ERD (e.g. Flora and Vegetation, Terrestrial Fauna, Inland Waters, Social Surroundings).<br>Not considered significant. |

| Other Factor | Receiving Environment | Significance to Proposal |
|---|---|---|
| | in the respective chapters of the ERD (e.g. Flora and Vegetation, Terrestrial Fauna, Inland Waters and Social Surroundings). | |
| Landforms | The EPA's objective for Landforms is *"to maintain the variety and integrity of significant physical landforms so that environmental values are protected"* (EPA 2018c).<br>Under the EPA factor guidelines, the following criteria may be used to determine if a Landform is significant:<br>• **Variety**: The landform is a particularly good or important example of its type. The landform is not well represented over the local, regional or national scale or differs from other examples at these scales, either naturally or as a result of cumulative impacts from existing and reasonably foreseeable activities, developments and land uses.<br>• **Integrity**: The landform is intact, being largely complete or whole and in good condition.<br>• **Ecological importance**: The landform has a distinctive or exclusive role in maintaining existing ecological and physical processes; for example, by providing a unique microclimate, source of water flow, or shade. The landform supports endemic or highly restricted plants or animals.<br>• **Scientific importance**: The landform provides evidence of past ecological processes or is an important geomorphological or geological site. The landform is of recognised scientific interest as a reference site or an example of where important natural processes are operating.<br>• **Rarity**: The landform is rare or relatively rare, being one of the few of its type at a national, regional or local level.<br>• **Social importance**: The landform supports significant amenity, cultural or heritage values linked to its defining physical features.<br>It is also noted that the landform does not have to meet all criteria, and may only meet one, to be considered a significant landform.<br>Landmarks and places such as Mt Newman and Eagle Rock Falls, are part of Nyiyaparli Country and have ongoing significance to the Nyiyaparli People. It is noted that these fall outside of the Proposal, but are provided for regional context.<br>Parts of the Ophthalmia Range are significant to Nyiyaparli people. The north-western sections of the Range are located within the Development Envelope. Giles Point (a place located on Ngarlawangga Country) is identified as highly significant to Ngarlawangga and Nyiyaparli People. Although Giles Point and parts of Ophthalmia Range are within the Development Envelope, these do not fall within the proposed disturbance footprint. | The Landforms in the Development Envelope do not meet a number of the criteria of significance under the EPA Factor Guideline. However, the Proponent notes the potential significance of Landforms to the Traditional Owner groups and the cultural and heritage values associated with these landforms. The potential significance of Landforms has been expressed during consultation with Traditional Owners.<br>Cultural and heritage values, and visual amenity, will largely be captured under Social Surroundings, however, Landforms has been identified as an Other Factor while further engagement and survey is undertaken to further understand the significance of these Landform features.<br>The significance is currently unknown at this time, however, potential impacts to landforms could be adequately captured under other factors (for example, Social Surroundings). |

# 13. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The EPBC Act is the primary Commonwealth environmental legislation protecting Matters of National Environmental Significance (MNES) and is administered by the DCCEEW. The Proposal has yet to be referred to DCCEEW, however, referral will be required. It is anticipated that DCCEEW will determine that the Proposal may have a significant impact on the listed protected matters ('Nationally threatened species and ecological communities'), and that a detailed assessment is required. In making this determination, DCCEEW will declare the Rhodes Ridge Project a 'Controlled Action' with the subsequent assessment undertaken in accordance with instructions issued by the DCCEEW.

Details of relevant policy and guidance; potential impacts and mitigation are detailed in Section 7. This section specifically describes the relevant listed threatened species for the assessment.

## 13.1. Flora

A desktop assessment returned two Commonwealth-listed threatened flora species, *Pityrodia augustensis* (VU) and *Thryptomene wittweri* (VU) (Astron 2023a). All collections of *P. augustensis* lodged at the WA Herbarium are from the Mount Augustus National Park in the Gascoyne bioregion, >200 km south-west from the survey area. It is considered unlikely to occur in the survey area. There are eight specimens of *T. wittweri* lodged at the WA Herbarium, known from three locations, the closest being approximately 36 km from the survey area, on the southern spur of Mount Meharry in Karijini National Park. Due to its distance from the survey area, it was also considered unlikely to occur (Astron 2023a).

No Commonwealth or State listed Threatened Ecological Communities (TECs) have been recorded within the Development Envelope or the broader survey area.

No Threatened flora species have been recorded within the proposed Development Envelope and based on the results of desktop assessments, no Threatened flora are expected to occur.

## 13.2. Fauna

### 13.2.1. Terrestrial Fauna

Four vertebrate fauna species classified under the EPBC Act as MNES have been recorded in the broader survey area, including:

- Northern Quoll (*Dasyurus hallucatus*) (EN)
- Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) (VU)
- Ghost Bat (*Macroderma gigas*) (VU)
- Pilbara Olive Python (*Liasis olivaceus barroni*) (VU)

Within the Development Envelope, only the Ghost Bat, Pilbara Leaf-nosed Bat and Pilbara Olive Python were recorded. To date, no Northern Quolls have been captured within the Development Envelope as part of the current detailed fauna survey (23,681 trap nights) or Targeted Northern Quoll Assessment ((6,350 trap nights) (Astron 2023b). The Northern Quoll was only recorded four times during the current surveys (outside of the proposed Development Envelope) via opportunistic scat observations.

In relation to the Pilbara Leaf-nosed Bat, this species was detected from acoustic recordings, however, activity level was classified as low, with less than 20 calls per night recorded. Call timings were representative of foraging bats only, with all calls recorded near midnight, consistent with the species dispersing from distant permanent roosts during the autumn months.

The Ghost Bat was recorded on 81 occasions through acoustic recordings, scats, and individual sightings (11 records of live individuals; two records of remains, and one individual observed foraging during spotlighting). Fifty-one Ghost Bat roost caves were recorded within the greater survey area, comprising four Category 2 roost caves; 15 Category 3 roost caves; 30 Category 4 roost caves and two unconfirmed category ratings. Ghost Bats have also been recorded from within old relict mine adits within the Development Envelope (including four adits at Rhodes Ridge main deposit, and two adits are Giles Mini deposits). Timing of the echolocation calls detected from the mine adits suggested diurnally roosting bats at several adits. The numbers of bats identified as roosting suggest that at least one group of 15 to 20 bats were present and diurnally roosting at the Rhodes Ridge adits during the monitoring period. In the first instance, Rio Tinto are proposing avoidance of the adits while additional survey work is underway to determine the significance of the adits and caves within the Development Envelope.

The Pilbara Olive Python was recorded on seven occasions within the broader survey area from direct observations, eDNA sampling, motion camera and secondary evidence via skin shed. One individual was recorded on a motion camera where a feral cat was recorded attacking the individual. All observations were recorded from within Gorge/Gully and Major Drainage Line habitats. Only one record of the species occurs within the Development Envelope.

Additional species were identified during the desktop review as having a high likelihood of occurrence in the Development Envelope. These include:

- Grey Falcon (*Falco hypoleucos*) (VU)
- Fork-tailed Swift (Pacific Swift) (*Apus pacificus*) (MI)
- Oriental Plover (*Charadrius veredus*) (MI)

The Grey Falcon is a scarce visitor to the Pilbara where it is found mostly on the coastal plains between the De Grey and Ashburton Rivers. Two Grey Falcons were recorded perched upon a powerline tower within BHP's powerline corridor east of the Development Envelope and therefore has the potential to utilise habitats within the Development Envelope for foraging.

The Fork-tailed Swift is largely an aerial species independent of the terrestrial environment, and one record of this species was recorded adjacent to the Development Envelope within the Hope Downs 4 village where two individuals were observed opportunistically flying overhead. It therefore has the potential to occur within the Development Envelope.

The Oriental Plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia. One individual was opportunistically sighted at the nearby Hope Downs 1 village camp during a recent survey, likely due to the presence of water at the camp however the species is not likely to be reliant on any habitats within the Development Envelope.

The desktop assessment identified the Night Parrot (*Pezoporus occidentalis*) as having a low likelihood of occurrence in the Development Envelope. None of the habitats of the Development Envelope support old, large and unburnt Triodia clumps that are considered the primary 'core' habitat required for the Night Parrot. The Night Parrot is unlikely to occur within the Development Envelope due to the quality and attributes of the habitat present. No recent or historical records of Night Parrot occur in the vicinity of the Development Envelope, and no calls have been recorded on recent acoustic surveys for the Proposal.

Since the initial survey work was undertaken, the Proponent has been made aware for the potential for the Southern Whiteface (*Aphelocephala leucopsis*) (VU) to occur within the Development Envelope. In the Pilbara this species would typically be found in Mulga Woodlands and on the Plains habitats (stony or clay) that have a solid mid or understorey of vegetation. However, the Pilbara is at the northern extent of this species distribution, so records are sparse. In locations where this species has been identified as potentially or likely occurring during a desktop analysis, systematic bird surveys will be undertaken in suitable habitats.

# 14. HOLISTIC IMPACT ASSESSMENT

The Proponent acknowledges that the environment is a dynamic complex of connections and interactions, and while an effect on a particular factor(s) may be perceived as minor in isolation, its impact across these interconnections may result in a significant impact.

The EPA defines holistic impacts as the “Connections and interactions between impacts, and the overall impact of the proposal on the environment as a whole”. The Proponent continues to seek to understand the environment as a whole, developing an integrated regional approach, using information derived from technical surveys and investigations of the environment, and the views and concerns raised through consultation with relevant stakeholders, including KNAC and NAC. Traditional Owners have intimate knowledge of their Country and have a deep time understanding of the intricate relationships that exist within the environment, both tangible and intangible. Their inputs and perspectives continue to be vital in growing this understanding of the whole environment and the balance between its many interconnected elements.

## 14.1. Connections and Interactions Between Environmental Factors

The environmental surveys and studies undertaken for the Proposal have identified key values at both a local and regional scale. The results of these surveys and studies will continue to inform the assessment of impacts as a result of the Proposal implementation and guide the development of appropriate mitigation measures.

While the Proposal’s predicted outcomes will be considered independently in relation to the environmental principles and the EPA’s environmental objectives for each environmental factor, the Proponent recognises the complex linkages between Flora and Vegetation, Terrestrial Fauna, Inland Waters, Subterranean Fauna (and associated habitat), Social Surroundings and Landforms.

In the Pilbara, the most important cultural values often coincide with features of the landscape with high visual amenity, botanical diversity and fauna habitat values; therefore, additional combined environmental effects may become significant and require additional mitigation. The high level of connectivity between the environmental factors of Inland Waters, Flora and Vegetation, Terrestrial Fauna and Social Surroundings will be described within the ERD (see **Figure 14-1**).

## 14.2. Consideration of Holistic Effects

In developing the ERD, the Proponent will consider the Proposal's effects on the environment as a whole to determine whether any additional considerations for assessment arise. For this holistic assessment, the following considerations will be applied:

1. Where an impact(s) has been completely avoided, it will not contribute to holistic environmental effects and does not require consideration
2. Where an impact is already considered potentially significant and the mitigation hierarchy applied in relation to one factor, additional mitigation measures to address combined environmental effects are unlikely to be required
3. Where an impact(s) has been considered to likely result in a significant impact across two or more factors, and the mitigation hierarchy has been applied in isolation per factor, consideration will be given if further measures are required to mitigate this combined impact
4. Where there are multiple overlapping minor impacts, or a minor impact affects multiple values and has been assessed as insignificant in the context of an individual factor, these may require further holistic consideration.

5. The environmental principles of intergenerational equity, and conservation of biological diversity and ecological integrity are considered the most relevant and have been a foundation when considering potential significance of the holistic effect of the Proposal.

Where holistic effects on the environment have been identified, their potential impacts on the environment as a whole have been considered in accordance with Section 4.1 of the Environmental Impact Assessment Procedures Manual (EPA, 2021b).

The ERD will outline and discuss these holistic effects as it relates to the implementation of the Proposal.

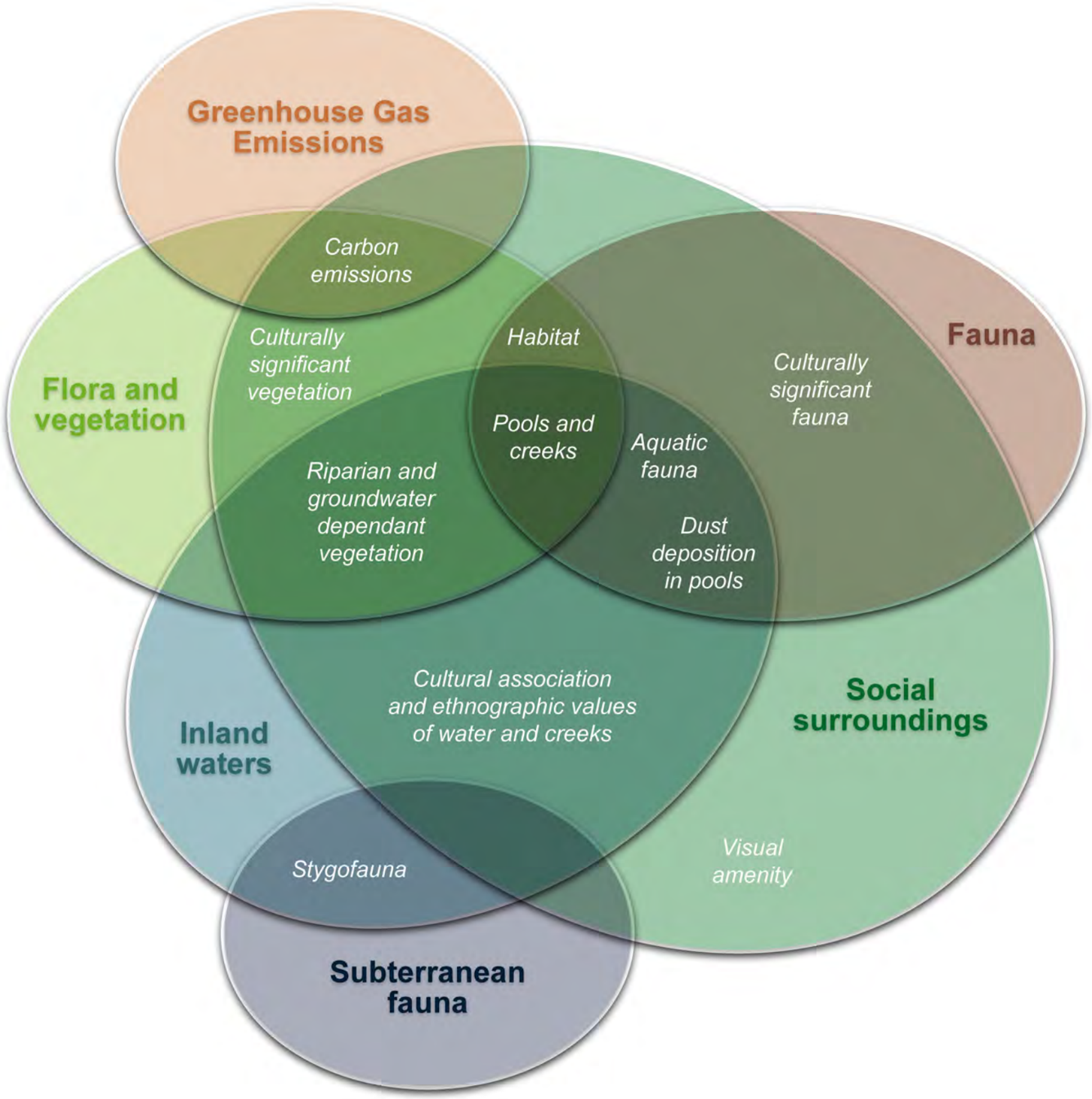


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Figure 14-1: Holistic View of Links between Environmental Factors and Values

# 15. CUMULATIVE IMPACT ASSESSMENT

## 15.1. Overview

Following amendments to the EP Act, specifically, section 3(2)(1B), the EPA is required to considered cumulative impacts in its assessment of the likely effects of a proposal on the environment. While the EP Act does not define cumulative effects, the EPA defines cumulative impacts as the successive, incremental and combined impacts of one or more activities on the environment, arising from past, present and reasonably foreseeable future actions (EPA, 2021b).

The Proposal is located within the Fortescue Marsh Catchment area of the East Pilbara region. This region, known for its high biotic diversity and significant environmental and culture features, is also an area of significant mining and development. Up to 255,000 ha of disturbance, associated with major mining development, has been approved or is currently under assessment by the EPA within this region (**Table 15-1**).

Figures quoted in this disturbance area do not account for clearing approved under Part V of the EP Act, or land degradation as a result of grazing or other anthropogenic factors.

**Table 15-1: Cumulative Mining Disturbance – Major Mining Development**

| Existing and Reasonably Foreseeable Project | Approved Disturbance (Ha) |
|---|---|
| **Rio Tinto Operations** | |
| Rio Tinto Operations (Gudai-Darri, Yandicoogina, Hope Downs Operations, West Angelas) | 48,066 ha |
| **Other Third-party Operations** | |
| Third Party Mining Operations – BHP, FMG and Mineral Resource | 205,153 ha |
| **TOTAL** | **253,219 ha** |

## 15.2. Cumulative Effects Assessment

The Proponent, in acknowledgement of large scale nature of the Proposal, and the multitude of significant resource developments surrounding the Proposal will undertake a detailed impact assessment of the cumulative effects within the Fortescue Marsh catchment area. These cumulative effects assessment (CEA) will be prepared in accordance with a set of guiding principles and a defined framework which will be outlined in the Proposal's Environmental Scoping Document (ESD).

The CEA will be developed utilising publicly available information, and regional survey efforts to assist in establishing historical and current trends in identified key receptors, identified as most at risk to effects of cumulative impacts. Opportunities to engage and collaborate with key stakeholders will be explored.

Cumulative impacts on the environment are often experienced more severely by Traditional Owners. The incremental and prolonged loss of country can impact values not generally considered in traditional EIA, including, but not limited to:

- Dispersal of key fauna species and loss of hunting grounds
- Loss of connection to country though altered landscapes, and access to ceremonial grounds
- Loss in flora species and vegetation used for medicinal and ceremonial purposes
- Amendments to landscapes, such as waste rock landforms and pit voids.

The Proponent in undertaking a detailed CEA will engage and work closely with Traditional Owners to understand, consider and manage these impacts in the context of the CEA.

This detailed consideration of cumulative Impacts, in the context of the Proposal, will be provided in the ERD.

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