HANCOCK
IRON ORE

Sanjiv Ridge Pit Expansion, Stage 1 Below Groundwater Table Mining

THIS DOCUMENT IS UNCONTROLLED IN HARD COPY FORMAT

Rev	Document #	Authors	Authors Title	Approver	Approver Title	Issue Date
0	179-EN-REP-0039	L. Barber; M. Pezzaniti; and T. Stone.	Specialist Approvals & Compliance; Approvals & Compliance Advisor; and Approvals & Compliance Advisor.	Mark Alchin	Manager Environment & Approvals	22/01/2026

Revision Register

Rev	Date	Name	Description of Changes
0	21/01/2026	L. Byrne M. Pezzaniti T. Stone	Document developed

Table of Contents

Tables

Figures

Appendices

Glossary

Term	Definition
GL176960	5C Groundwater Licence
Hancock Iron Ore	For the purpose of this document, a reference to 'Hancock Iron Ore' or 'HIO' is a reference to Atlas Iron Pty Ltd. Refer part 1.3 'Proponent Details'.
Project	Sanjiv Ridge Operations
Proponent	Atlas Iron Pty Ltd
Proposal	The proposed expansion, including mining below the water table, three additional above water table pits, and mine dewatering.
R 11409	Waterway reserve
R 13663	Timber Reserve
CO-CA-03 and CO-CA-01	Reference numbers for important identified caves requiring buffers under MS 1125

Abbreviations

Abbreviation	Term
ADWG	Australian Drinking Water Guidelines
AWT	Above Water Table
AMD	Acidic and metalliferous drainage
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BCM	Bank Cubic Metre
BC Act	*Biodiversity Conservation Act 2016* (WA)
BIF	Banded Iron Formation
BoM	Bureau of Meteorology
BWT	Below Water Table
CEO	Chief Executive Officer
CSEP	Community and Stakeholder Engagement Plan
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DMPE	Department of Mines Petroleum and Exploration (Previously known as Department of Energy, Mining, Industry Regulation and Safety)
DMA	Decision Making Authority
DPLH	Department of Planning, Lands and Heritage
DSEWPAC	Department of Sustainability, Environment, Water, Population and Communities
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EN	Endangered
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ERD	Environmental Review Document
ESA	Environmentally Sensitive Area
FBA	Fractured Bedrock Aquifer

Abbreviation	Term
GDV	Groundwater Dependant Vegetation
GHG	Greenhouse Gas
GL	Gigalitre
GWL	Groundwater Licence
GWOS	Groundwater Operating Strategy
ha	Hectares
HIO	Hancock Iron Ore
IBRA	Interim Biogeographical Regionalisation for Australia
IRP	Impact Reconciliation Procedure
LOR	Limit of Reporting
LGOS	Low Grade Ore Stockpiles
MCP	Mine Closure Plan
MDE	Mine Development Envelope
mg/L	Milligrams per litre
MNES	Matters of National Environmental Significance
MOC	Mine Operations Centre
MS 1125	Ministerial Statement 1125
MS1197	Ministerial Statement 1197
Mtpa	Million tonnes per annum
NAC	Nyamal Aboriginal Corporation RNTBC
NAG	Net Acid Generation
NAF	Non-Acid Forming
NPI	National Pollutant Inventory
OS	Other Specially Protected Species
OTU	Operational Taxonomic Unit
P1, P2, P3, P4	Priority 1, 2, 3, 4
PAF	Potentially Acid Forming Material
PEOF	Pilbara Environmental Offsets Fund
PEC	Priority Ecological Community
PER	Public Environmental Review

Abbreviation	Term
PJAC	Palyku Jartayi Aboriginal Corporation
RNTBC	Registered Native Title Body Corporate
RIWI Act	*Rights in Water and Irrigation Act 1914* (WA)
SRE	Short Range Endemic
SRK	SRK Consulting (context: hydrogeological consultant)
SSMP	Significant Species Management Plan
TEC	Threatened Ecological Community
TFA	Threatened Fauna Authorisation
TS	Total Sulfur
µS/cm	Microsiemens per centimetre
VU	Vulnerable
WA	Western Australia
WIC	Waste Inpit Cell
WMP	Water Management Plan
WRL	Waste Rock Landform
ZOI	Zone of Instability

Executive Summary

Hancock Iron Ore (HIO) owns and operates the Sanjiv Ridge Direct Shipping Ore (DSO) Project in the Pilbara region of Western Australia (WA), approximately 33 km south of Marble Bar. The Project comprises of two stages: Stage 1 (north-south alignment) approved under MS 1125 and EPBC 2017/7861, and Stage 2 (western spur) approved under MS 1197 and EPBC 2021/8885.

HIO is seeking approval for a significant amendment to Stage 1 under Section 38 of the *Environmental Protection Act 1986* (EP Act). The Proposal includes:

- Below water table (BWT) mining in four existing pits (Sparrow, Shark Gully, Runway North and Runway South);
- Development of two new shallow above water table pits (Pedmore and CD15);
- Increase in groundwater abstraction from 1.1 GL to 2.4 GL /annum;
- Potential for surplus water management;
- Management of Potentially Acid Forming Material (PAF); and
- Additional clearing for expanded mining areas and other supporting infrastructure.

This document has been prepared to support a Section 38 Referral under Part IV of the EP Act. It details the proposed activities comprising the Proposal and assesses potential impacts on Environmental Factors. HIO has identified the following Environmental Factors as being potentially relevant to the implementation of the Proposal:

- Flora and vegetation;
- Terrestrial environmental quality;
- Terrestrial fauna;
- Subterranean fauna;
- Inland waters;
- Greenhouse Gas Emissions; and
- Social Surroundings.

Proposed mitigation strategies are outlined, and an assessment of the likely outcomes is provided in the following sections. Technical studies are ongoing and the outcomes and recommendations from these studies will inform further refinement of management strategies where required.

This document also provides information on the Proposal's potential impacts to Matters of National Environmental Significance (MNES) that require assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Proposal was referred to Department of Climate Change, Energy, the Environment and Water (DCCEEW) on the 30 June 2025 (EPBC 2025/10228) and it was determined a 'controlled action' on 15 August 2025 and will be assessed via Public Environment Report.

A brief overview of the Proposal has been summarised in Table 0-1.

Table 0-1: Proposal Summary

Project Title	Sanjiv Ridge Pit Expansion, Stage 1 Below Groundwater Table Mining
Type of Proposal	Significant amendment to Project Approval (MS 1125)
Proponent Name	Atlas Iron Pty Ltd
Short Description	Expansion of the existing Stage 1 Project to allow mining below the water table and associated mine dewatering, development of additional above water table open pits, and additional clearing of native vegetation for expanded WRLs and other supporting infrastructure.
Mine and associated infrastructure	An additional 196.8 ha within the existing 2,257.6 ha MDE. The cumulative clearing will result in an increase from the approved clearing under MS 1125 of 423.11 ha to 619.91 ha.
Groundwater Abstraction	Abstraction of up to 2.4 GL/annum of groundwater for mine dewatering within the MDE.
Surplus Water Management	Controlled discharge of surplus water to the environment.
Waste Material Management	Full encapsulation of sulfidic waste material associated with the Shale rock located within Sparrow Pit only as mining extends beyond the groundwater table.

1. Introduction

1.1 Project Overview

Hancock Iron Ore (HIO) owns and operates the Sanjiv Ridge DSO Project in the Pilbara region of WA, approximately 33 km south of Marble Bar. The Project comprises two stages: Stage 1 (north-south alignment) approved under Ministerial Statement (MS) 1125 and EPBC 2017/7861, and Stage 2 (western spur) approved under MS 1197 and EPBC 2021/8885 (Figure 1-1). Mining uses conventional drill and blast, load and haul methods to produce an expected production rate of approximately 36.7 million tonnes through to life of mine 2027.

1.1.1 Stage 1 Approval Area

Mining within the Stage 1 area commenced in 2021 and consists of five AWT open pits (Sparrow, Razorback, Shark Gully, Runway North and Runway South), two waste rock landforms (WRLs), a mine operations centre (MOC), a borefield and an accommodation camp. Stage 1 currently operates under two primary approvals: EPBC 2017/7861 and MS 1125.

The Project was previously referred to DCCEEW on the 10 January 2017 and was granted on 23 February 2018 (EPBC 2017/7861) with a variation to conditions relating to the requirements surrounding the monitoring strategy dated 29 October 2020 with another variation approved on 14 December 2021 relating to required offsets. MS 1125 was granted on 12 March 2020, and no variations have been undertaken since initial approval. The Stage 1 area is still being developed in accordance with existing approvals.

1.1.2 Stage 2 Approval Area

Mining within the Stage 2 area commenced in 2023 and consists of three AWT open pits (Glen Herring, Little Hero, Bobb Dazzler), four WRL's and transport corridors. Stage 2 was referred to DCCEEW in 2021, with the action being approved in 2022 under EPBC 2021/8885. Stage 2 was referred to the State Environmental Protection Authority (EPA) in 2021 with approval issued under MS 1197 in 2022. The Stage 2 area is still being developed in accordance with existing approvals and does not form part of this Proposal.

The Project utilises the Hillside-Marble Bar Road route across to Corunna Downs Road and through to Limestone-Marble Bar Road for haulage of final product to Utah Point Bulk Commodities Berth at Port Hedland for export.

1.2 Purpose and Scope

This Proposal is to support the expansion of the existing Stage 1 approval area only to facilitate mining below the groundwater table within four existing open pits (Sparrow, Shark Gully, Runway North and

Runway South) and requires the addition of two above groundwater table pits (CD-15 and Pedmore)[1]. Razorback pit will not be mined to extend below the groundwater table.

The Proposal will require an increase to the approved clearing allocation under MS 1125 by approximately 196.8 ha, increasing the previous allocation from 423.11 ha to 619.91 ha. HIO is also seeking to increase the groundwater abstraction limit to allow for pit dewatering including surplus water management. All proposed activities will be located within the existing approved Mine Development Envelope (MDE) (Figure 1-3).

The following does not form part of this Proposal:

- Razorback Pit within the Stage 1 operational area will not be mined below the groundwater table to avoid impacts to nearby sensitive environmental features protected under MS 1125; and
- The Stage 2 operational area (Glen Herring) is currently not being developed to extend below the groundwater table at this time.

The proposed amendment will allow access to additional ~ 20 M tonnes of iron ore extending the life of mine to 2032.

1.3 Proponent Details

As of 1 July 2025, Atlas Iron Pty Ltd, Roy Hill Holdings Pty Ltd and their respective subsidiaries now operate under a shared 'Hancock Iron Ore' brand. Whilst this integration has introduced centralised management, a unified vision and set of values, and alignment of core processes and procedures, it does not affect the ownership or corporate structure of the underlying legal entities.

There is no change of name and/or proponent details required as a result of the Hancock Iron Ore integration. Atlas Iron Pty Ltd remains the appropriate legal entity for all environmental approvals associated with its assets including the Sanjiv Ridge Project. Details for the Proponent and the nominated contact for this Proposal is provided in Table 1-1.

Table 1-1: Proponent Details

Proponent Details	Key Contact
Atlas Iron Pty Ltd 1314 Hay Street, West Perth WA 6005 PO Box 7071, Cloisters Square PO, WA 6850 Phone: +61 8 6228 8000 Email: info@hio.com.au Website: www.hancockironore.com.au	Larissa Barber Specialist Approvals and Compliance Hancock Iron Ore Phone: +61 8 6228 8235 Email: larissa.byrne@hio.com.au

[1] These mine voids are dependent on resource definition drilling results and may not be viable to mine.

650,000 mE 700,000 mE 750,000 mE 800,000 mE

7,750,000 mN 7,700,000 mN 7,650,000 mN 7,600,000 mN

Port Hedland
Great Northern Hwy
North West Coastal Hwy
Great Northern Hwy
Marble Bar Road

MUNDABULLANGANA
BOODARIE
PIPPINGARRA
WALLAREENYA
DE GREY
PARDOO
COONGAN
INDEE
KANGAN
STRELLEY
EGINBAH
MUCCAN
CORUNNA DOWNS
PANORAMA
HILLSIDE

Miralga Creek
Abydos
Marble Bar
Sanjiv Ridge
Mt Webber

- Points of Interest
- HIO Projects
- Mine Development Envelope
- Atlas Tenements
- Railways
- State Road
- Local Road
- Crown Reserves

650,000 mE 700,000 mE 750,000 mE 800,000 mE

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Figure No:
	Date: 14/08/2025	0 10 20 Kilometres	1.1
	Drawn: justin.venables	N	Proposal Location
	Doc No:	Scale 1:600,000 Page size: A3	

775,000 mE
780,000 mE
785,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN
7,620,000 mN

L 45/410
L 45/407
G 45/339
L 45/408
M 45/1257-I

Approved Disturbance Footprint
Mine Development Envelope
Atlas Tenements
Project Stages
Stage 1 - MS 1125
Stage 2 - MS 1197

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50		Figure No:
	Date: 2/09/2025	0 0.5 1 2 kilometres	N	Project Stages and Land Tenure — 1.2
	Drawn: sam.nikora			
	Doc No:	Scale 1:100,000 Page size: A4		

770,000 mE
775,000 mE
780,000 mE
785,000 mE

7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

L 45/410
L 45/407
G 45/339
L 45/408
M 45/1257-I

Approved Disturbance Footprint - MS 1125
Proposed Disturbance Footprint
Mine Development Envelope
Atlas Tenements

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Figure No: 1.3
	Date: 2/09/2025	0 1 2 Kilometres	
	Drawn: sam.nikora		
	Doc No:	Scale 1:60,000 Page size: A3	

Mine Development Envelope and Proposed Disturbance Footprint

1.4 Proposed Expansion

1.4.1 Key Mine Activities

Additional iron ore resources have been identified within existing open mine voids within the Stage 1 development, which will result in mining of ore and waste materials BWT within the Sparrow, Shark Gully, Runway North and Runway South pits. In addition, two new AWT mine voids are proposed and include Pedmore and CD 15 (Figure 1-4).

Key Mine Activities for the Project include mine voids, Class 1 low grade ore stockpiles (LGOS), run of mine pads and waste rock landforms:

- Sparrow, Shark Gully, Runway North and Runway South mine voids will expand slightly in surface footprint and depth to extend below the groundwater table;
- The existing Razorback pit will slightly increase in surface footprint and will remain above the groundwater table;
- Pedmore and CD15 are new shallow mine voids that will remain above the water table;
- Runway and Sparrow WRL will increase in surface footprint to allow for the storage of additional waste material;
- Runway and Shark Gully LGOS will increase in surface footprint to allow for additional storage capacity;
- Mine voids will be backfilled and/or partially backfilled with waste material where possible;
- An in-pit waste dump will be constructed within the Shark Gully mine void to encapsulate Potential Acid Forming (PAF) material;
- A PAF cell will be constructed within the Sparrow WRL to accommodate the storage of PAF; and
- No PAF material will be stored in Razorback Pit.

1.4.2 Other Mining Activities

Other mining activities to support the expansion of the Project include the increase in surface footprint to the following existing supporting infrastructure which may include but are not limited to:

- Borefields
- Borrow pits
- Camp
- Communication Tower
- Administrative Buildings
- Magazine
- Fresh Water Dams
- Irrigation Spray Field
- Surface water management infrastructure
- Landfill site
- Laydown or hardstand area
- Low-grade ore stockpiles (Class 1 and 2)
- Topsoil stockpiles
- Transport or service infrastructure corridors
- Access Roads and haul roads
- Workshops

1.4.3 Additional Clearing

Additional clearing is required to allow expansion of key mine activities and other supportive mining infrastructure. The Proposal will require an increase to the currently approved clearing allocation under MS 1125 by approximately 196.8 ha, increasing the previous allocation from 423.11 ha to 619.91 ha. All clearing will take place in the existing Mine Development Envelope (MDE) of 2,257.6 ha.

Table 1-2: Combined Impacts of Mine and Associated Infrastructure

Proposal Element	Approved Proposal (MS 1125)	Proposed Amendment	Combined Impact
Mine and associated infrastructure	Clearing no more than 423.11 ha of native vegetation within the 2,257.6 ha development envelope	196.8 ha	619.91 ha

1.4.4 Mine Dewatering

Water licensing is managed by Department of Water Environmental Regulation (DWER) under the *Rights in Water and Irrigation Act* 1914 (RiWI Act). The Project currently has an existing groundwater licence 5C (GWL 176960) with an abstraction limit of 1,100,000 kL (1.1 GL), which is required to be amended to support expansion of the mine and facilitate mine dewatering.

The simulated dewatering rates suggest a surplus of water at the Project starting from year one as advanced dewatering increases abstraction volumes ahead of mining below the water table. The magnitude of the surplus will fluctuate over time as pit progression rates vary, and the aquifer is dewatered. Dewatering optimisation is currently being completed to minimise or eliminate the surplus abstraction volumes.

Feasibility modelling and an impact assessment have been completed (SRK, 2025), although optimisation of the dewatering strategy for the proposed BWT pits and options for discharge have not yet been finalised. Consultants (SRK) have completed a number of studies and assessments including groundwater and surface water modelling, water quality and pit lake water balance assessments and a H3-level report, which characterises the hydrological and hydrogeological settings and estimates the potential impacts of the Proposal. These studies will further inform the proposed management actions.

All water produced from dewatering activities will be used on site as a priority (e.g., for ore processing, dust suppression and other operational needs). Should dewatering volumes exceed site requirements, the excess water is likely to be discharged to the environment. Ecohydrological investigations and discharge modelling are being undertaken and further defined. Initial modelling results indicate that surplus volumes will vary over time, influenced by changes in pit progression rates (faster progression generating higher inflow rates) and by the dewatering of the aquifer itself (with initially high inflows declining during periods of reduced pit advancement). Groundwater abstraction for dewatering will vary over the course of the mine life peaking at approximately 71 L/s. By contrast, usage requirements are likely to remain relatively consistent. Work is under way to determine the site water demand and estimates range between 30 to 45 L/s. Peak surplus dewatering equates to approximately 31 L/s (SRK 2025).

The outcomes and recommendations from these studies will guide any further investigations or adaptive management required.

Table 1-3: Combined Impacts of Groundwater Abstraction

Proposal Element	Approved Proposal (MS 1125)	Proposed Amendment	Combined Impact
Groundwater Abstraction	No more than 1.1 gigalitres per annum from borefields.	1.3 GL*	2.4 GL*

Note: * Indicative maximum extraction scenario based on current modelling results and potentially will change as a result of further studies.

Table 1-4: Schedule of Hydrogeology Studies

Description of Study	Anticipated Commencement
Dewatering optimisation	In Progress
Surface water discharge modelling	In Progress
H3 Report (optimised)	In Progress
Tracer testing	October 2025
Eco hydrological assessment	October 2025

1.4.5 Waste Material Management

Sulfidic material has only been identified in Sparrow Pit, with majority of the waste material being non-acid-forming (NAF), with 85.4% of intervals recorded in the drilling database containing less than 0.1% sulfur (S). The remaining waste material (14.6%) is conservatively classified as potentially acid forming (PAF), requiring appropriate management. The primary sulfur-bearing lithology is shale, with sulfur concentrations ranging from <0.01% to 5.2% and a median sulfur content of 0.08%. Shale makes up ~12% of the total pit material and 26% of the waste material, though only 8% of the shale intervals have a sulfur content above the conservative cut-off value of 0.1% S.

The volume of PAF material requiring management in cells based on the drilling database is estimated at 396,463 BCM, however this will be redefined with additional drilling scheduled later in 2026. As PAF material management has not been required previously a PAF Material Management Plan has been prepared to guide waste rock sampling, geochemical characterisation, classification, handling, and disposal of PAF materials.

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Proposed Expansion Site Plan
	Date: 7/01/2026	0 500 1,000 metres	Figure No: 1.4
	Drawn: sam.nikora	N	
	Doc No:	Scale 1:35,000 Page size: A3	

SANJIV RIDGE HANCOCK IRON ORE

1.5 The Cultural Landscape

1.5.1 Native Title

The Project is located within the Nyamal-Palyku Proceeding (no 7) [2023] FCA 528 and the Nyamal-Palyku Proceeding (no 8) [2024] FCA 11 Native Title Claim Determination Area. Both the Nyamal People and the Palyku People have native title interests within the approved MDE (Figure 1-5).

1.5.1.1 The Nyamal People

The Proponent has a Deed of Agreement with the Nyamal People, signed on 5 December 2008. This Deed of Agreement includes (but is not limited to) consultation, heritage survey requirements and protocols, provision of environmental assessments, accountability schedules and compensation. The Proponent conducts all activities in accordance with these prescribed and agreed protocols resulting in a sound working relationship with the Nyamal People and their representative body, the Nyamal Aboriginal Corporation RNTBC (NAC).

All consultation with the Nyamal People is through the NAC and incudes attendance at Monitoring and Liaison Committee (MALC) meetings, project update meetings with the Nyamal Chief Executive Officer and regular correspondence. Nyamal heritage surveys have also been completed within the approved MDE and were focussed on identifying the location and nature of Aboriginal Cultural Heritage (ACH) within the MDE. Ongoing consultation with the Nyamal People will be undertaken to advise in relation to the development of the Proposal.

1.5.1.2 The Palyku People

Following the 16 January 2024 Federal Court judgment in the Palyku-Nyamal Proceeding, the Proponent and the Palyku People (through its representative body the Palyku-Jartayi Aboriginal Corporation RNTBC) signed in November 2024 a Heritage Agreement that provides prescribed protocols and provisions to manage Palyku Aboriginal Cultural Heritage (ACH) located within the MDE. The Proponent is also in the process of finalising a Tripartite Agreement between HIO, Palyku People and the Nyamal People which, among other things, provides compensation and benefits for the Palyku People from the Sanjiv Ridge mining operations, including in respect of the area the subject of the Referral. The Tripartite Agreement is reflective of arrangements agreed between the Nyamal People and the Palyku People as part of the determination of the Federal Court of Australia in The Nyamal Palyku Proceeding (No 8) [2024] FCA 11. HIO is progressing with the required heritage surveys and engagement with the Palyku People to understand the significance of heritage values within their determination area.

1.5.1.3 Cultural Values

The Coongan River, located outside the application area approximately 5 km west of, and 9 km downstream from, the Project is of high cultural significance in the context of the broader cultural landscape for Traditional Owners. The Coongan River acted as a trading network and supported surrounding heritage sites (e.g., hunting areas, camping places, tool making sites, grinding areas, ceremonial places and mythological sites), by providing water, faunal and botanical resources (Terra

Rosa, 2021a). The Coongan River is also related to foundational mythological stories of Traditional Owners and is central to contemporary Aboriginal culture (Terra Rosa, 2021a).

Traditional Owners have identified a number of other social and cultural places and activities of significance that also require consideration (Terra Rosa, 2021a).

Water sources are considered foundational to both traditional and contemporary Aboriginal culture and it's important to preserve these values and maintain their physical condition (i.e., water quality and quantity) and cultural health. Particular water sources of interest are CO-WS-16 and CO-WS-19 located within heritage site CRD-72-22 and the Coongan River. The Coongan was repeatedly described by the Traditional Owners in terms that showed it was central to contemporary cultural life and water sources along the Coongan as being related to foundational mythological stories of Aboriginal society.

Maintaining access and connection to, and the ability to transmit culture on country is considered a fundamental right as a TO important to maintain cultural health of country and support cultural transmission. Maintaining the ability to transmit culture on country was described as both a process, and a value of Aboriginal culture that needs to be preserved within the development area.

Landscape features are deeply integrated into the mythology, traditions and culture of Aboriginal people. A mythological site encompassing a Mesa forms part of an important Songline. Waterways acted as highways busy with human traffic and subsequent hunting, camping, food preparation and tool production activities. Ridgelines would have provided good vantage points to observe approaching groups as well as hunting. Fauna could be ambushed from the ridgeline and easily corralled into a trap in the gully, increasing the likelihood of a successful hunt.

Cultural objects, such as artefact scatters, provide tangible evidence of how ancestors lived on-Country and the traditional practices that they undertook in the area. Objects depict a complex territorial organisation centred around the procurement of raw materials and the use of locally available water sources by groups of people travelling through the country. Ochre sources enable Traditional Owners to interact with the same source of ochre that their ancestors have been visiting and using for potentially thousands of years.

The importance of understanding and supporting the persistence of culturally significant flora and fauna values, specifically the use of culturally significant flora species in rehabilitation to preserve hunting and gathering activities is ongoing.

770,000 mE
775,000 mE
780,000 mE
785,000 mE

7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

Nyamal Aboriginal Corporation RNTBC

Palyku-Jartayi Aboriginal Corporation RNTBC

Approved Disturbance Footprint
Proposed Disturbance Footprint
Development Envelope
Atlas Tenements
Registered Native Title Bodies Corporate
Nyamal Aboriginal Corporation RNTBC
Palyku-Jartayi Aboriginal Corporation RNTBC

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Native Title Determination
	Date: 19/09/2025	0 1 2 Kilometres	Figure No: 1.5
	Drawn: sam.nikora	N	
	Doc No:	Scale 1:60,000 Page size: A3	

SANJIV RIDGE HANCOCK IRON ORE

1.6 Justification

Current approvals will exhaust mining of the existing iron ore deposits by 2027 which will put the Project into care and maintenance. This Proposal is to enable mining below the groundwater table which is critical in extending the life of mine to 2032, ensuring the continued viability of the Project.

The Stage 1 expansion will enable HIO to meet the growing global demand for high-quality iron ore, supporting the steel industry worldwide, which is essential for infrastructure development and economic growth, especially in key market areas. The expansion enhances Australia's iron ore production capabilities, which plays a vital role in the nation's economy. Iron ore remains one of Australia's largest export commodities, contributing significantly to national GDP, employment, and trade relationships.

The expansion will also result in significant local economic benefits, including job creation, stakeholder opportunities and infrastructure development. By progressing with the expansion, HIO will ensure that the Project continues to contribute to Australia's economic prosperity while maintaining a strong commitment to responsible environmental stewardship.

1.6.1 Alternatives

Alternatives have been considered, with the current iteration of the mine expansion selected to minimise potential impacts to environmental, heritage and culturally sensitive areas. The expansion considered proximity to the existing mining operations and its suitability to support future development of the Project. Considerations to an alternative mine design was constrained by the existing operations, MDE, tenure boundaries and location of the ore body. To not mine below the groundwater table was not a feasible option and alternative options for continued growth were not possible.

The following are key mine design considerations to avoid and or minimise impacts:

- Mining ore below the groundwater table at Razorback pit area has not been proposed under this Proposal to avoid impacts to sensitive receptors adjacent to the mine void;
- Relevant mine voids will be backfilled and or partially backfilled to minimise clearing and surface disturbance;
- No problematic material will be backfilled into mine voids that could potentially impact nearby sensitive receptors (e.g. Razorback);
- Existing exclusion zones surrounding CO-CA-01 and CO-CA-03 will not be impacted by the expansion and all other exclusion zones around sensitive features will be retained;
- The expansion will remain within the existing approved MDE; and
- The mine design has been established to avoid major waterways and minimise the amount of clearing required.

1.7 Local and Regional Context

1.7.1 Location

The Proposal is situated in the Pilbara region of WA, 33 km south of Marble Bar townsite and 240 km from Port Hedland. The Local Government Area is the Shire of East Pilbara.

1.7.2 Land Tenure

A summary of all tenements associated with the Proposal, including ownership and expiration details is provided in Table 1-5, with the extent of tenure shown in Figure 1-2.

Table 1-5: Proposal Tenements

Tenement	Area (ha)	Holder	Granted	Expiry
M45/1257-I	16,443	Atlas Iron Pty Ltd	27/05/2016	26/05/2037
L 45/410	702	Atlas Iron Pty Ltd	09/11/2016	08/11/2037
L 45/408	140	Atlas Iron Pty Ltd	09/11/2016	08/11/2037
L 45/407	115	Atlas Iron Pty Ltd	09/11/2016	08/11/2037
G 45/339	48.955	Atlas Iron Pty Ltd	16/11/2016	15/11/2037

1.7.3 Local Land Use

The land use surrounding the MDE and Proposal area is predominately a combination of mining and pastoral activities. The MDE encompasses five tenements as previously mentioned in Table 1-5. The majority of the Project is situated on allocated Crown land, with a portion on unallocated Crown land.

Adjacent to the MDE are several land uses which include pastoral leases, Crown reserves and a geo heritage site (Table 1-6). The only land use that intersects the MDE are the two pastoral leases Eginbah and Panorama stations. All other land uses are located outside of the MDE and are not anticipated to be directly impacted by this Proposal.

Table 1-6: Surrounding Land Uses

Type/Classification	Surrounding Local Land Use	Distance and Direction to MDE
Pastoral Leases	Eginbah Station	Located within the MDE.
	Panorama Station	Located within the MDE.
	Corunna Downs Station	Located 484 m east.
Crown Reserve	Waterway Reserve – Designated for waterway purposes:	Waterway Reserve – Designated for waterway purposes:
	R 11409	Located 4.30 km west
	R 12773	Located 8.75 km north east

Type/Classification	Surrounding Local Land Use	Distance and Direction to MDE
	Timber Reserve - Designated for timber purposes: R 13663 R 13672 R 13676	Timber Reserve - Designated for timber purposes: Located 3.68 km west Located 7.57 km south east Located 3.99 km north east
Geo heritage Site	Camel Creek – Site ID 22: Columnar rhyolite; rare physiographic feature.	Located 6.79 km east.
Townsite	Marble Bar residential area	Located ~ 33 km north of the Project
Native Title	Nyamal Aboriginal Corporation Palyku-Jartayi Aboriginal Corporation	Located within the MDE.

770,000 mE
780,000 mE
790,000 mE
7,650,000 mN
7,640,000 mN
7,630,000 mN
7,620,000 mN

R 12762
R 2906
R 13676
R 12773
Hillside - Marble Bar Rd
R 13675
R 12763
EGINBAH
Camel Creek
R 41716
Coongan River
R 4974
R 13672
R 13663
R 11409
R 10977

Development Envelope
Atlas Tenure
Watercourses
Surrounding Land Uses
Geoheritage Sites
Crown Reserves
Corunna Downs Station
Eginbah Station
Panorama Station

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GCS GDA 1994	Figure No: 1.6
	Date: 12/09/2025	0 2 4 Kilometres	
	Drawn: sam.nikora		
	Doc No:	Scale 1:110,000 Page size: A3	

Surrounding Land Uses

1.8 Bioregion

The Proposal is located wholly within the Chichester (PIL01) subregion of the Pilbara bioregion as defined by the interim Biogeographic Regionalisation of Australia (IBRA) (Thackway & Cresswell, 1995). The Chichester subregion is characterised by undulating archaean granite and basalt plains and include significant areas of basaltic ranges (Kendrick & McKenzie, 2003). Vegetation in this subregion is characterised by a shrub steppe containing *Acacia inaequilatera* over *Triodia wiseana* on the plains, while *Eucalyptus leucophloia* tree steppes occur on the ranges (Kendrick & McKenzie, 2003). Drainage throughout the Chichester occurs to the North through numerous rivers (e.g. Shaw, Nullagine, Sherlock etc) (Kendrick & McKenzie, 2003).

A characteristic feature of the Chichester is the Chichester Range that extends 400 km west of the Millstream-Chichester National Park to Balfour Downs station in the east (McKenzie et al., 2009). This region also contains the Marble Bar – Nullagine mineral province with its geological complexity (Kendrick & McKenzie, 2003).

The Pilbara bioregion is comprised of semi-desert tropical climate, with active drainage occurring within the Ashburton, Fortescue and De Grey River systems (McKenzie, May, & McKenna, 2002). A combination of invasive weeds, altered fire regimes, feral predators and grazing by introduced herbivores has resulted in ecosystem degradation, leading to loss of vegetation and of native species (McKenzie, May, & McKenna, 2002).

1.9 Climate

The climate in the Project area is characterised as an arid tropical climate with predominantly summer rainfall (Beard, 1990) and is strongly influenced by ‘summer’ (December – April) cyclones. The nearest operational weather station is 33 km north at Marble Bar. A summary of the long-term climate data available from 2000 to 2025 is presented in Figure 1-7.

The maximum monthly rainfall in the area generally varies from 0 mm to over 300 mm during intense summer storms. Rainfall is erratic and sparse, with most falling between December and March. The annual average rainfall ranges from less than 200 mm to over 700 mm, with an average volume of approximately 400 mm per annum (BoM, 2025). Although the region experiences relatively low annual rainfall, the recent trend in rainfall volumes show an increase in annual yields since data has been collected (Figure 1-8).

Wind direction and speed data presented in Figure 1-9 have been sourced from the Nullagine Weather station (044027) as the closest station in proximity to the Project (Marble Bar, weather station 004106) does not have wind speed and direction data available.

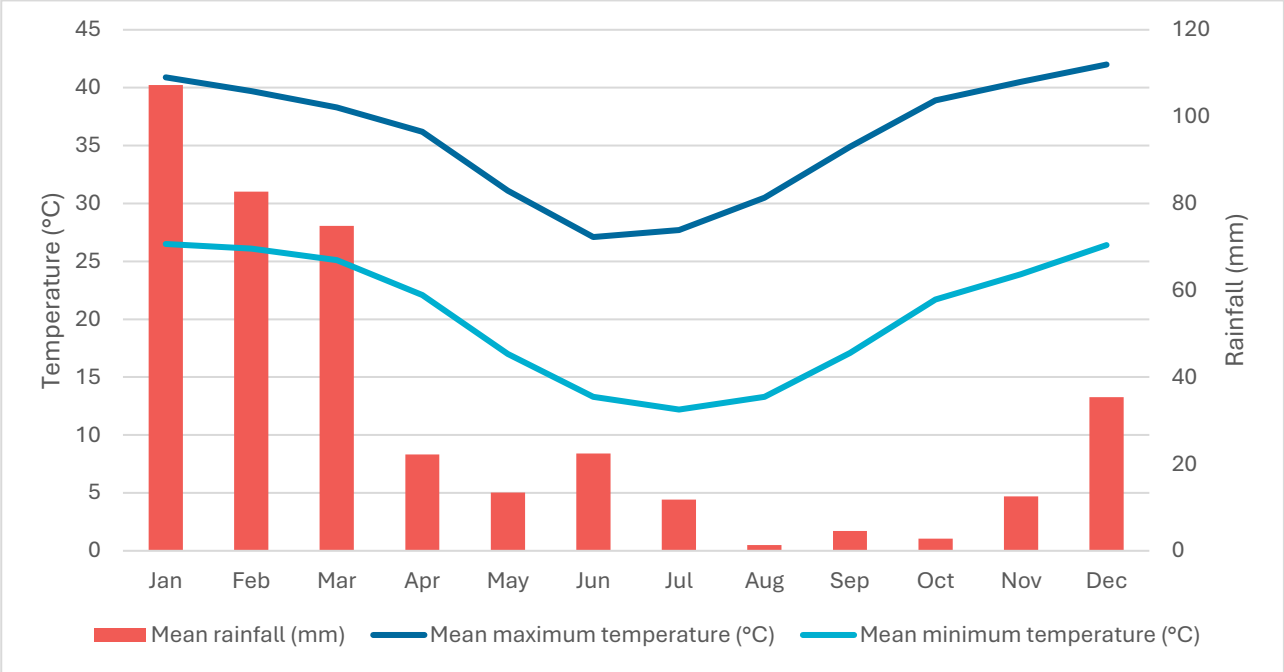


Figure 1-7: Marble Bar (Weather Station 004106) Climate (BoM, 2025)

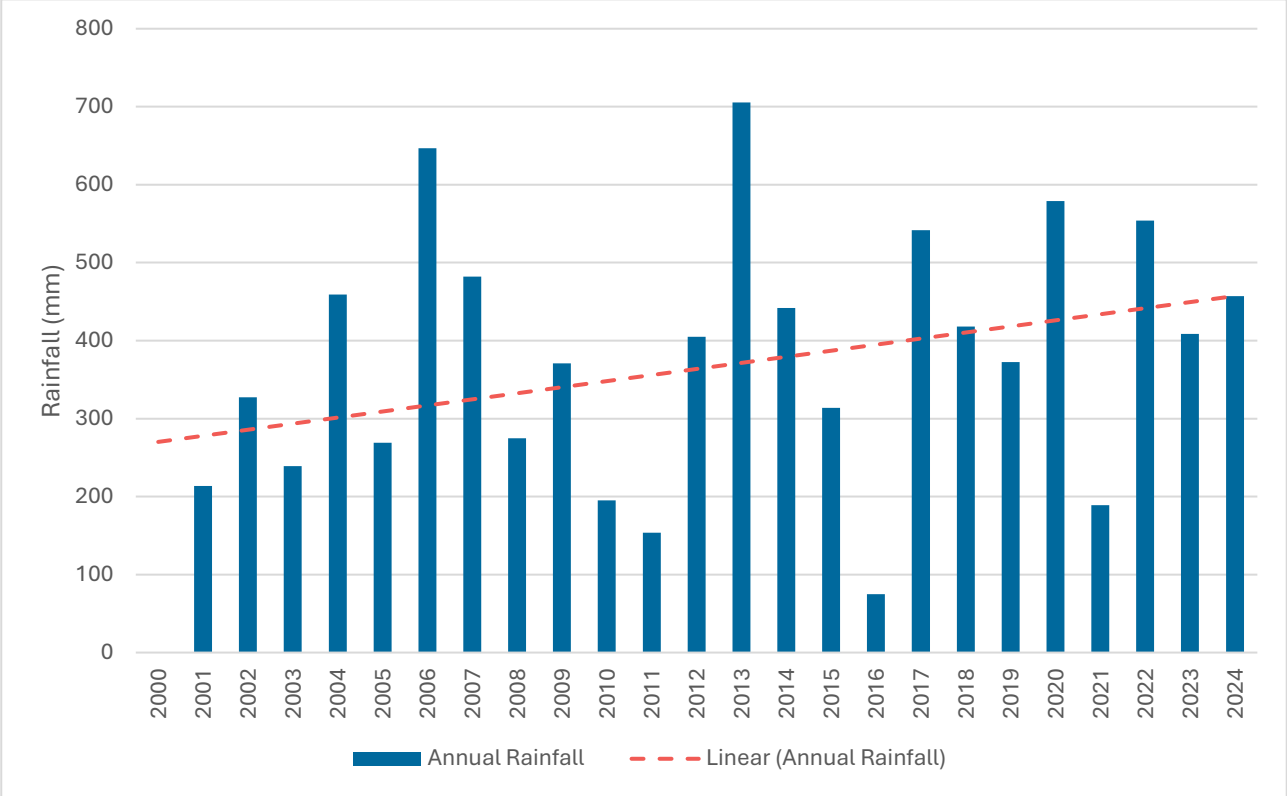


Figure 1-8: Marble Bar (Weather Station 004106) Annual Rainfall Trend (BoM, 2025)

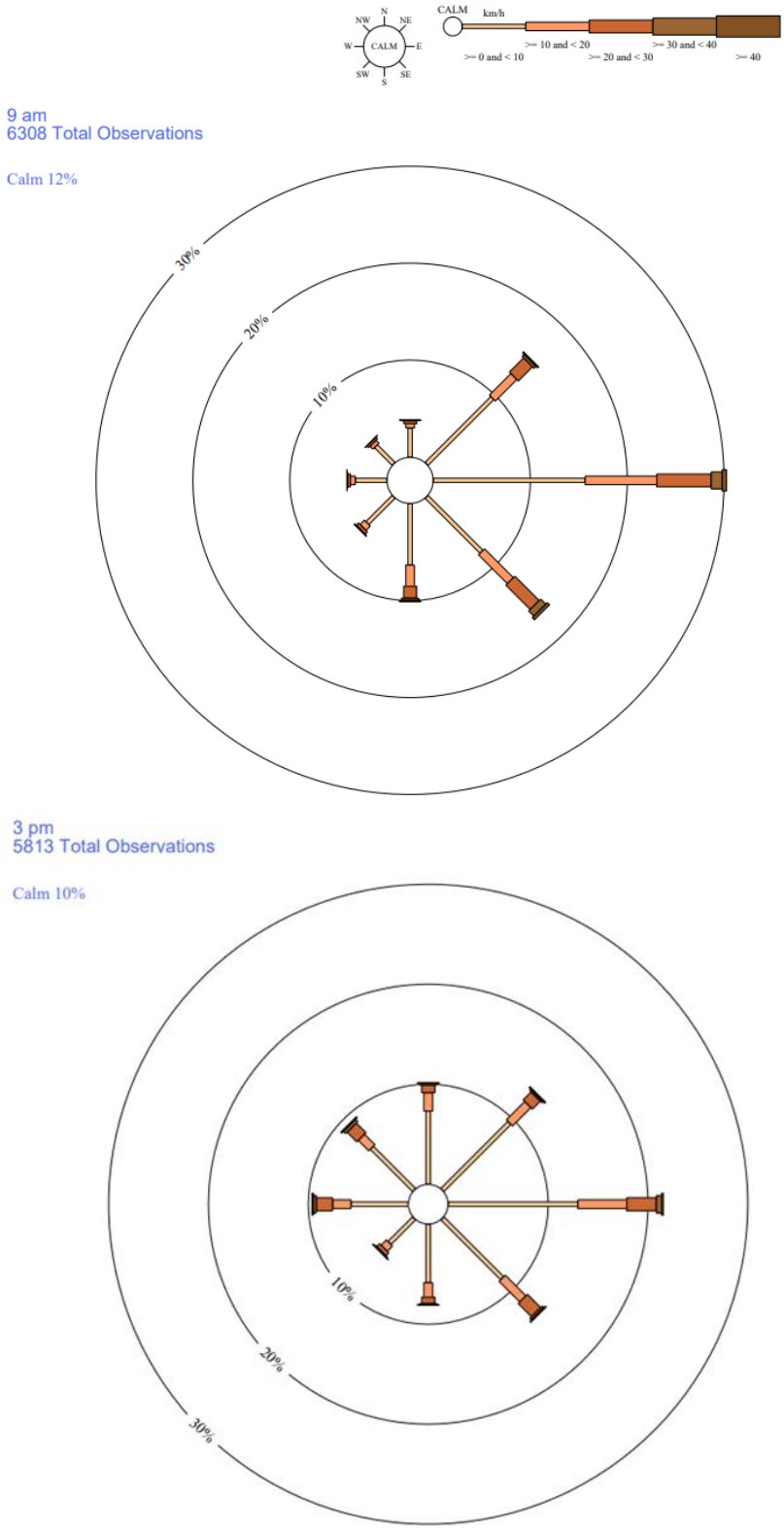


Figure 1-9: Nullagine (Weather Station 004027) Wind Direction Versus Wind Speed in km/h

Rev	Document #	Author	Author Title	Approver	Approver Title	Issue Date
0	179-EN-REP-0039	L. Barber; M. Pezzaniti; and T. Stone.	Specialist Approvals & Compliance; Approvals & Compliance Advisor; and Approvals & Compliance Advisor.	Mark Alchin	Manager Environment & Approvals	22/01/2026

2. Legislative Framework

2.1 Environmental Impact Assessment Process

This document contains information to support a Section 38 Referral to the EPA under Part IV of the EP Act to enable the EPA to determine the appropriate level of assessment. The Referral is for a significant amendment to the current Sanjiv Ridge Direct Shipping Ore (DSO) Project approved under MS 1125. This document outlines the proposed activities that constitute the Proposal, as well as any potential impacts on Environmental Factors as a result of implementation of the Proposal.

This document has been prepared in consideration of the EPA guideline documents, Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures (EPA, 2024), Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA, 2024), and Instruction: How to Prepare an Environmental Review Document (EPA, 2024).

2.2 Previous Assessments and Proposals

2.2.1 Part IV *Environmental Protection Act 1986*

The Project was previously referred to the EPA on the 29 of May 2019 and was approved on the 12 March 2020 for the development and operation of an open cut, above water table iron ore mine and associated mining infrastructure, waste rock landform, borefield and accommodation camp. The original approval allowed for clearing of no more than 423.11 ha of native vegetation within the 2,257.6 ha mine development envelope, and groundwater abstraction of no more than 1.1 GL per annum.

Three key Environmental Factors were identified during the original EPA assessment of the Stage 1 Project:

- Inland Waters;
- Flora and Vegetation; and
- Terrestrial Fauna.

The MS 1125 approval included conditions and environmental outcomes to be met for the mitigation of impacts and protection of the Pilbara leaf-nosed bat. These environmental outcomes were to:

- Maintain a 50-metre buffer around the lateral extend of cave CO-CA-03;
- Maintain a 340-metre buffer around the lateral extend of cave CO-CA-01; and
- These buffers will be retained and will not be impacted by this Proposal due to Razorback pit not being mined to extend below the groundwater table.

2.2.2 Combined Effects

Key environmental factors that did not form part of the previous assessment under the approved MS 1125 and will form part of this Proposal include:

- Social Surroundings.

- Subterranean Fauna
- Terrestrial environmental quality; and
- Greenhouse gas emissions.

This Proposal considers the combined effects on all the relevant key environmental factors in the context of the existing approved proposal. HIO seeks to consolidate the existing Ministerial Statement 1125 with any new ministerial statement received as a result of this Proposal.

2.2.3 Review of Existing MS 1125 Conditions and Compliance

The MS 1125 approval contains a number of conditions for the Sanjiv Ridge operation to ensure the Proposal is able to meet the EPA objectives for all Environmental Factors. The Proponent remains in compliance with all of these conditions, with no major changes to conditions required as part of this Proposal. The most recent Compliance Assessment Report for MS 1125 is included as Appendix A.

HIO has reviewed all existing MS 1125 Conditions to understand whether any condition changes will be required on approval of the Proposal. The review of the MS 1125 conditions is provided in Table 2-1.

Table 2-1: MS 1125 Condition and Compliance Review

Condition Number	Condition	Relevance to Proposal	Compliance History
1-1	When implementing the proposal, the proponent shall not exceed the authorised extent of the proposal as defined in Schedule 1, unless amendments to the proposal and the authorised extent of the proposal have been approved under the EP Act.	The authorised extent of the Proposal as defined in Schedule 1 will require amendment; however this condition will remain relevant to the Proposal.	No non-compliances reported against this condition.
2-1	The proponent shall notify the CEO of any change of its name, physical address or postal address for the serving of notices or other correspondence within twenty-eight (28) days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.	Condition will remain relevant.	No non-compliances reported against this condition.
3-1	The proponent shall not commence implementation of the proposal after five (5) years from the date of this Statement, and any commencement, prior to this date, must be substantial.	The original Proposal substantially commenced 26 April 2020. No changes to this condition will be required.	No non-compliances reported against this condition.

Condition Number	Condition	Relevance to Proposal	Compliance History
3-2	Any commencement of implementation of the proposal, on or before five (5) years from the date of this Statement, must be demonstrated as substantial by providing the CEO with written evidence, on or before the expiration of five (5) years from the date of this Statement.	The original Proposal substantially commenced 26 April 2020. No changes to this condition will be required.	No non-compliances reported against this condition.
4-1	The proponent shall prepare and maintain a Compliance Assessment Plan which is submitted to the CEO at least six (6) months prior to the first Compliance Assessment Report required by condition 4-6, or prior to implementation of the proposal, whichever is sooner	Condition will remain relevant.	No non-compliances reported against this condition.
4-2	The Compliance Assessment Plan shall indicate: (1) the frequency of compliance reporting; (2) the approach and timing of compliance assessments; (3) the retention of compliance assessments; (4) the method of reporting of potential non-compliances and corrective actions taken; (5) the table of contents of Compliance Assessment Reports; and (6) public availability of Compliance Assessment Reports.	Condition will remain relevant.	No non-compliances reported against this condition.
4-3	After receiving notice in writing from the CEO that the Compliance Assessment Plan satisfies the requirements of condition 4-2, the proponent shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 4-1.	Condition will remain relevant.	No non-compliances reported against this condition.
4-4	The proponent shall retain reports of all compliance assessments described in the Compliance Assessment Plan required by condition 4-1 and shall make those reports available when requested by the CEO.	Condition will remain relevant.	No non-compliances reported against this condition.
4-5	The proponent shall advise the CEO of any potential non-compliance within seven (7) days of that non-compliance being known.	Condition will remain relevant.	No non-compliances reported against this condition.

Condition Number	Condition	Relevance to Proposal	Compliance History
4-6	The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO. The Compliance Assessment Report shall: (1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf; (2) include a statement as to whether the proponent has complied with the conditions; (3) identify all potential non-compliances and describe corrective and preventative actions taken; (4) be made publicly available in accordance with the approved Compliance Assessment Plan; and (5) indicate any proposed changes to the Compliance Assessment Plan required by condition 4-1.	Condition will remain relevant.	No non-compliances reported against this condition.
5-1	Subject to condition 5-2, within a reasonable time period approved by the CEO of the issue of this Statement and for the remainder of the life of the proposal, the proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (e.g. maps)), management plans and reports relevant to the assessment of this proposal and implementation of this Statement.	Condition will remain relevant.	No non-compliances reported against this condition.
5-2	If any data referred to in condition 5-1 contains particulars of: (1) a secret formula or process; or (2) confidential commercially sensitive information, the proponent may submit a request for approval from the CEO to not make these data publicly available. In making such a request the proponent shall provide the CEO with an explanation and reasons why the data should not be made publicly available.	Condition will remain relevant.	No non-compliances reported against this condition.

Condition Number	Condition	Relevance to Proposal	Compliance History
6-1	The proponent must design and implement the proposal to meet the following environmental outcomes to minimise impacts on the Pilbara leaf-nosed bat: (1) maintain a 50-metre buffer around the lateral extent of cave CO-CA-03 as shown in Figure 3 of Schedule 1; and (2) maintain a 340-metre buffer around the lateral extent of cave CO-CA-01 as shown in Figure 4 of Schedule 1.	Condition will remain relevant.	No non-compliances reported against this condition.
6-2	The proponent shall provide the CEO with copies of all reports and data relating to the Pilbara leaf-nosed bat required under conditions 1, 2, 3 and 4 of the Final Approved Decision Notice 2017/7861 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* within one (1) month of their provision to the Commonwealth Government.	Condition will remain relevant.	No non-compliances reported against this condition.
7-1	The proponent shall provide the CEO with copies of all reports, data and proof of money paid into a conservation offset fund, relating to the Pilbara leaf-nosed bat required under condition 5 of the Final Approved Decision Notice 2017/7861 under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* within one (1) month of their provision to or receipt from the Commonwealth Government.	Condition will remain relevant. Additional offsets are likely to be required as part of the Proposal implementation.	No non-compliances reported against this condition.

2.2.4 Summary of MS 1125 Compliance

Since the implementation of the Compliance Assessment Plan required by condition 4-1 of MS 1125 in 2020, annual Compliance Assessment Reports have been submitted to the Department of Water and Environmental Regulation (DWER). To date, no non-compliances or partial non-compliances have been recorded against any MS 1125 conditions.

2.2.5 Environment Protection and Biodiversity Conservation Act 1999

The Project was previously referred to DCCEEW on the 10 January 2017 and was granted on 23 February 2018 under EPBC 2017/7861 with a variation to conditions relating to the requirements surrounding the Monitoring Strategy dated 29 October 2020. Another variation was approved on 14 December 2021 relating to required offsets.

Conditions under EPBC 2017/7861 specifically regulate the protection of the Pilbara Leaf Nose Bat at Cave CO-CA-03 and water hole CO-WS-14. A monitoring strategy has been developed and implemented specifically to manage potential impacts at these sites. The EPBC approval also required the implementation of a Significant Species Management Plan to mitigate risks associated with Threatened Species. The Project remains to operate the site in accordance with requirements under the EPBC approval.

This Proposal has been referred to the Department of Climate Change, Energy, the Environment and Water under the Commonwealth EPBC Act on the 30 June 2025 (EPBC 2025/10228) to assess potential impacts to Matters of National Environmental Significance (MNES). The Proposal was determined a 'controlled action' on 15 August 2025 and will be assessed via Public Environment Report.

2.2.6 Summary of EPBC 2017/7861 Compliance

Since the implementation of the Project all Compliance Assessment Reports have been submitted to the Department of Climate Change, Energy, Environment and Water. The most recent Annual Compliance Report for EPBC 2017/7861 is included in Appendix B.

2.3 Other Approvals and Regulation

HIO is seeking other Federal, State and Local Government approvals and regulatory requirements to support this Proposal and are identified in Table 2-2.

Table 2-2: Other Required Approvals

Decision Making Authority	Legislation Regulating the Activity	Approval Required	Justification for approval	Approval Required
DMPE	*Mining Act 1978*	A Mine Development and Closure Proposal.	Approval will be required to enable the mine void to extend beyond the groundwater table, including increasing the allocated surface disturbance to support the expansion.	Yes Amendment to existing MP REG ID 126959
DWER	Part V *Environmental Protection Act 1986*	Prescribed Premise Licence and/or Works Approval.	Approval is required to regulate any new emissions and or discharge points associated with the expansion, including mine dewatering and discharge.	Yes Amendment to existing licence L9280/2012/1
	Rights in Water and Irrigation Act 1914	5C Licence to take water – increase in abstraction allocation	Approval is required to increase the allocation for groundwater abstraction and potential groundwater abstraction points.	Yes Amendment to existing licence 5C GWL 176960

Decision Making Authority	Legislation Regulating the Activity	Approval Required	Justification for approval	Approval Required
DPLH	*Aboriginal Heritage Act 1972*	Section 18 Approval	Approval may be required for any potential disturbance or impacts to Aboriginal Heritage or Cultural places or sites.	Yes
DBCA	*Biodiversity Conservation Act 2016*	Section 40 (Authorisation to take or disturb threatened species) Regulation 28 (Fauna taking (relocation licence)	Approval may be required to authorise the taking and or disturbance of threatened species and authorise relocation of fauna species.	Yes TFA 2324-0028 TFA 2425-0028 TFA 2324-0080 FR28000376

3. Stakeholder Engagement

3.1 Stakeholder Engagement

The Project is an existing operation and has an established stakeholder engagement program. Relevant Stakeholders are consulted in relation to Project plans and changes as required by the engagement program. The principal objectives of the stakeholder consultation program were to:

- Identify interested and potentially affected individuals and groups and to understand the nature of stakeholders' interest in the Project;
- Ensure that stakeholders are properly informed about the Project and that there are adequate and timely opportunities for stakeholders to provide input and raise issues;
- Ensure that any stakeholder issues or concerns are managed with respect, are given due consideration and are responded to in a timely manner; and
- Meet the relevant regulatory requirements with regard to appropriate stakeholder input to the impact assessment and approvals process.

HIO maintains an open communication channel with key government stakeholders, including submission of annual compliance reports to inform and update agencies on activities and compliance of the Project with existing approvals and relevant conditions. Any planned changes to approved activities and/or new increased risks that require changes to approvals have been and will continue to be submitted to the relevant governing body.

HIO recognises that ongoing stakeholder engagement relating to Project activities is required. Ongoing stakeholder engagement will aim to ensure key stakeholders are kept informed of Project plans and that any concerns which arise are addressed.

Key engagement methods identified within the Stakeholder Engagement Plan include:

- One-on-one meetings, phone calls and written correspondence with neighbouring landholders, government agencies, non-Government organisations, members of Parliament and local Government;
- Regular articles in the local newspaper and community newsletters (available in hard copy or online);
- Presentations and or posters at Marble Bar Community Resource Centre;
- Email distribution list to provide updates, including site bulletins, and seek feedback (generated from community meetings, site tours and public submissions);
- Questionnaires or surveys to seek community feedback on community concerns and expectations regarding the Proposal;
- HIO website (publish frequently asked questions relating to the expansion and the Project, site bulletins and approval documentation); and
- Community information sessions (open to the public).

A specific Community and Stakeholder Engagement Plan (CSEP) regarding the Stage 1 expansion is being developed to ensure that all potential stakeholders are identified and appropriately engaged for all stages of the process, and community concerns are recorded and taken into consideration during planning processes.

3.2 Key Stakeholders

Table 3-1 provides a list of key stakeholders and groups that may have interest in the Project. Stakeholder engagement that has been undertaken specifically regarding the expansion of the Stage 1 Proposal has been provided as Appendix C.

Table 3-1: Project Stakeholders

Interest Group	Stakeholder	Key Interests
Pastoral Stations	Panorama/Hillside Station (Hillside Station (WA) Pty Ltd)	Management and use of water and associated impacts Access and use of pastoral land
	Eginbah Pastoral Station	Potential economic impacts (e.g. cattle strike, groundwater drawdown)
Mining Tenure Holders	Whim Creek Mining Pty Ltd	Management of cumulative impacts Understanding of operations (e.g. road access)
Native Title Groups	Nyamal Native Title Group	Native Title Rights
	Palyku Native Title Group	Land access agreement Use of and access to Traditional Owner land Impacts to/ protection of sites of cultural and social significance Operational interactions, including traffic, road quality, noise and amenity issues Potential socio-economic opportunities associated with the Project.
Shire and Local Governments	Shire of East Pilbara	Rates
	Town of Port Hedland	Benefits to local economy and community Safety of locals and road users Use of public roads and infrastructure Compliance with local government regulations Local employment, training and business development opportunities Social investment opportunities

Interest Group	Stakeholder	Key Interests
State Government Agencies	Department of Mining, Petroleum and Exploration	Administers the *Mining Act* 1978 (WA) Administers the *Mining Regulations* 1981 (WA) Administers the *Work Health and Safety Act* 2020 (WA) and Work Health and Safety (Mines) Regulations 2022
	Department of Water and Environmental Regulation	Administers RiWI Act Administers Part V (EP Act), industry regulation and licensing Water abstraction licences Quality and quantity of groundwater
	Department of Biodiversity, Conservation and Attractions	Administers BC Act Flora, fauna and habitat conservation Flora and fauna surveys
	Environmental Protection Authority	Environmental Impact Assessments (EIA) under Part IV (EP Act)
	Pilbara Ports Authority	Port usage and berth planning
	Main Roads Western Australia	Road safety and compliance Road usage, maintenance and future planned development Heavy vehicle access
	Department of Planning, Lands and Heritage	Administers AH Act Native Title requirements Heritage, cultural, ethnographic and archaeological aspects
Federal Government Agency	Department of Climate Change Energy Environment and Water	Environmental impact assessments under the EPBC Act
Local and Regional Communities and Groups	Marble Bar and Nullagine Community Resource Centre	Social investment / partnerships Employment and training opportunities Business development and contracting Potential socio-economic and environmental impacts
	Marble Bar Progress Association	
	Marble Bar	
	Nullagine	
	Irrungadi	

3.3 Stakeholder Engagement Summary

3.3.1 Traditional Owners

The Proponent has maintained consistent engagement with the Nyamal Traditional Owners since the early planning stages of the Project in 2020. Engagement with the Nyamal People is governed by a Deed

of Agreement signed in December 2008, which prescribes consultation protocols, heritage survey requirements, and cultural heritage management measures. Regular Monitoring and Liaison Committee (MALC) meetings are held three times per year, supplemented by regular meetings with the Nyamal Aboriginal Corporation's (NAC) CEO. Following the Federal Court determination in January 2024, HIO commenced negotiations with the Palyku Jartayi Aboriginal Corporation (PJAC) to establish a heritage agreement and a Native Title agreement. The purpose of these engagements has been to ensure compliance with the *Native Title Act* 1993 (Cth) and the *Aboriginal Heritage Act* 1972 (WA), identify and protect cultural heritage, and agree on protocols for below-water-table mining. Issues raised include the protection of significant sites, project water management, mitigation of rockfall risks near Razorback Pit, and commitments to avoid disturbance without consent under the Aboriginal Heritage Act 1972. HIO has ongoing engagement with PJAC to discuss operational matters as they relate to the management and protection of Aboriginal Cultural Heritage.

3.3.2 Pastoral Stations

Engagement with pastoral stakeholders, including Panorama/Hillside Station and Eginbah Station, has been ongoing since Project commencement. The nature of engagement has involved quarterly meetings and direct consultation to address operational impacts and maintain compliance with pastoral agreements. Discussions have focused on land access requirements, infrastructure development, and measures to prevent cattle strikes. Pastoralists have raised concerns regarding livestock safety and the need for timely communication about planned activities.HIO has committed to maintaining open lines of communication and implementing agreed mitigation measures to address these concerns.

3.3.3 State and Federal Government

The Proponent has engaged extensively with regulatory bodies such and Department of Mines, Petroleum and Exploration (DMPE), Department of Water and Environmental Regulation (DWER), Environmental Protection Authority (EPA), Department of Biodiversity, Conservation and Attractions (DBCA), and the Department of Planning, Lands and Heritage (DPLH) throughout the approvals process and operational phases. Engagement has primarily taken the form of formal submissions, compliance reporting, and targeted consultations to secure approvals under the EP Act 1986 (WA), EPBC Act 1999 (Cth), and other relevant legislation. The purpose of these interactions has been to ensure adherence to environmental and heritage obligations, particularly in relation to biodiversity management, groundwater abstraction, and cultural heritage compliance for below-water-table mining. Issues raised by regulators include the need for robust environmental management plans, monitoring programs, and clear strategies for mitigating heritage impacts.

3.3.4 Local Government

Engagement with Local Government, including the Shire of East Pilbara and the Town of Port Hedland, has been ongoing. The nature of this engagement has included formal meetings, participation in Local Emergency Management Committee sessions, and consultation on infrastructure and road maintenance requirements. The purpose of engagement has been to ensure alignment with regional

planning objectives, address road safety concerns, and maintain compliance with local by-laws. To date, issues raised by the Shire of East Pilbara and the Town of Port Hedland have included traffic management during haulage operations, coordination on emergency response planning, and communication regarding Project timelines.

3.3.5 Local and Regional Groups and Communities

To date, community engagement has focused on groups such as the Marble Bar Community Resource Centre and the Marble Bar Progress Association. The Proponent has conducted annual community meetings, provided Project updates, and sponsored local programs to foster community development. The purpose of these engagements has been to maintain transparency, address amenity concerns, and support local employment and training opportunities. Feedback from community has highlighted interest in employment opportunities, clarity on Project timelines, and assurance regarding environmental performance. HIO continues to respond to these concerns through regular communication and community investment initiatives.

3.3.6 Ongoing Stakeholder Engagement

Stakeholder engagement is ongoing and will continue throughout the lifecycle of the Project. This will be guided by the CSEP, which is currently under development and will include the following levels of engagement:

- Information provision: HIO will ensure the continued distribution of information to relevant stakeholders;
- Consultation: HIO will continue to provide the opportunity for two-way exchange of information;
- Participation: HIO will continue to facilitate active, multi-directional and in-depth engagement; and
- Negotiation: HIO will continue to facilitate face-to-face discussions with the intent of reaching an agreement for specific issues/ concerns.

4. Objectives and Principles of the EP Act

Section 4A of the EP Act establishes the five principles to be considered throughout the Environmental Impact Assessment process. These five principles are outlined in Table 4-1 below, including detail of how the principles have been applied to the development of this Proposal and existing operations at Sanjiv Ridge.

Table 4-1: EP Act Principles

Principle	Application
The Precautionary Principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by: a. Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and b. An assessment of the risk-weighted consequences of various options.	HIO has an Environmental Management System in place, which will be implemented to ensure environmental risks associated with all Proposal activities are evaluated to demonstrate risks cam be mitigated as low as reasonably practicable (ALARP). Various technical studies associated with below the groundwater mining have been undertaken to determine the potential impacts associated with the proposal which have informed further studies and or other design changes to avoid and or minimise impacts. Several hydrogeological studies have been completed to date including updated surface water and ground water studies to determine drawdown impacts on environmental receptors. A revised geochemistry study has been undertaken to characterise the sub surface material below the groundwater table and associated impacts. Additional baseline and impact assessment surveys for terrestrial fauna, groundwater dependent vegetation, aquatic ecology, short range endemics and subterranean fauna are currently progressing and will continue throughout development of the Proposal to ensure all potential risks to these factors are adequately understood and appropriate mitigation measures can be implemented. Outcomes from these initial studies will also be used to inform mine planning, as well as development of additional or alternative mitigation strategies to prevent environmental harm. Careful evaluation of these potential impacts has been made to avoid environment risks where possible and specific examples of these include: • No BWT mining will occur within the Razorback mine void to ensure groundwater seepage to cave CO-CA-03 and CO- WS-14 is maintained, ensuring the habitability of the cave is maintained throughout the life of the project; • Backfilling of existing mine voids will be undertaken to minimize overall footprints of existing WRL, and only non-problematic material will be used during backfill; • Management Plans will be amended and/or new ones developed to set the management framework to avoid and minimise risk to sensitive environmental receptors; • A Social Cultural Heritage Management Plan (SCHMP) will be developed with the Palyku People to protect and manage identified cultural heritage values within the MDE; and • Where impacts to the environment are uncertain, HIO adopts a precautionary approach.
The Principle of Intergenerational Equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	HIO will manage their impact to Environmental Factors, through careful planning based on the outcomes of environmental impact studies. HIO will implement the Proposal to ensure that the health, diversity and productivity of the environment is maintained for the benefit of future generations. Rehabilitation and closure planning is fully integrated into operational mine planning. This approach, along with the Proposal's short mine life, support a return of disturbed areas to self-sustaining ecosystems. The Proposal infrastructure as well as the wider Sanjiv Ridge Project area will be rehabilitated progressively following operations, in accordance with a Mine Closure Plan (MCP) approved by DMPE. HIO has a long-standing record of undertaking progressive rehabilitation across its mining operations and rehabilitation of existing sites to date demonstrate HIO commitment to continuing this practice across its project.

Principle	Application
The Principle of the Conservation of Biological Diversity and Ecological Integrity. Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The value of biological diversity and ecological integrity are recognised by HIO and are key to the management of the Proposal development. Where possible and practicable, decisions have been made regarding infrastructure locations to reduce the potential ecological impact. A key example of this is the adjusted and refined MDE prior to the construction of the mine site to exclude various significant caves and surface water resources. These habitats are integral to supporting the biological diversity of threatened fauna found within the Proposal. Minimising impacts to these significant habitat types and associated landforms ensures the ecological integrity of the area can support this diversity at the end of the Proposals life. HIO will continue to undertake recommendations from proposed biological studies to minimise environmental impact on the biodiversity of the Project area. Disturbed areas at the Project will be rehabilitated to support a self-sustaining ecosystem it is anticipated that ecological diversity and biological integrity will be established post mining. Not mining Razorback Pit conserves the biological diversity and ecological integrity of cave CO-CA-03 and waterhole CO-WS-14.
Principles Relating to Improved Valuation, Pricing and Incentive Mechanisms. a. Environmental Factors should be included in the valuation of assets and services; b. The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement; c. The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and d. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.	Costs of environmental management have been factored into all stages of Project planning and will continue to be accounted for during further studies and implementation. Annual budgets contain provisions for environmental management and monitoring, as well as provision for site rehabilitation and closure costs. Predicted closure costs are updated annually and have been factored into the financial assessment of the Proposal. Cost savings associated with minimisation of environmental impact have also been considered and implemented. Examples include minimisation of vegetation clearing which reduces earthworks costs, minimisation of material consumption, identifying options for recycling, and investigation into processes that may reduce water usage.
The Principle of Waste Minimisation. All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	HIO is committed to implementation of waste minimisation practices at the Sanjiv Ridge operation. This is achieved through adoption of a long-term strategy that aims to reduce solid waste going into landfill, re-use potential waste materials whenever possible, and minimise packaging waste. Key considerations for waste minimisation in this Proposal include: • Minimising mine waste volumes through optimisation of the resource; • Backfilling of mine voids to return sub surface material and avoid surface stockpiling • Strategic management of surplus water from dewatering will be used for dust suppression activities, minimising the need to discharge to the environment; and • Waste generated onsite will be segregated and reused or recycled where possible.

5. Environmental Factors

HIO has identified the following Environmental Factors as being potentially relevant to the implementation of the Proposal:

- Flora and vegetation;
- Terrestrial environmental quality;
- Terrestrial fauna;
- Subterranean fauna;
- Inland waters;
- Greenhouse Gas Emissions; and
- Social Surroundings.

The approach to determine whether a proposal has a significant impact and or significant effect the EPA may have regard to the various matters, they may include the following (EPA 2023):

1. *"the object and principles of the Act*
2. *values, sensitivity and quality of the environment which is likely to be impacted*
3. *all stages and components of the proposal (such as any infrastructure required for the proposal to be practicably implemented, or a proposal life cycle)*
4. *extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts*
5. *resilience of the environment to cope with the impacts or change (including considering pressures such as climate change)*
6. *consequence of the application of the mitigation hierarchy to the proposal*
7. *consequence of the likely impacts (or change), including off-site impacts (such as impacts on a wetland from chemicals discharged into upstream river systems) and indirect impacts (such as reduced fish harvest due to decreased water quality)*
8. *likely environmental outcomes, and whether these are consistent with the EPA Environmental Factor objectives*
9. *cumulative effects, taking into account cumulative environmental impacts – the successive, incremental and interactive impacts on the environment of a proposal with one or more past, present and reasonably foreseeable future activities*
10. *holistic impacts – connections and interactions between impacts, and the overall impact of the proposal on the environment as a whole*
11. *level of confidence in the prediction of residual impacts and the success of proposed mitigation (see section 7 for further information on the mitigation hierarchy)*
12. *public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and relevant public information."*

A brief summary of the classification of Environmental Factors relevant to the Proposal is listed in Table 5-1. Given the inland location of the Proposal, marine-related Environmental Factors were not

considered. Similarly, three other factors – Landforms, Air Quality and Human Health – do not appear to be relevant to the Proposal and have not been considered beyond this section.

Table 5-1: Environmental Factor Review

Environmental Factor	Classification	Basis of Classification
Flora and Vegetation	Preliminary Environmental Factor	Native vegetation that is good to excellent condition will be cleared as a result of the Proposal. The native vegetation also provides suitable and or critical habitat to threatened fauna species.
Landforms	Not relevant	No significant landforms are located within the MDE, the known landform (Mesa) has been excised from the MDE therefore no landforms will be impacted by the Proposal. Therefore "Landforms" has not been considered a key Environmental Factor.
Terrestrial Environmental Quality	Preliminary Environmental Factor	Management of waste materials is required given PAF materials have been identified in BWT ore and waste. This has not been previously assessed.
Terrestrial Fauna	Key Environmental Factor	A number of terrestrial fauna species listed under the BC Act and the EPBC Act are potentially impacted by the Proposal due to loss of habitat.
Subterranean Fauna	Key Environmental Factor	The Proposal scope includes mining below the ground water table which has the potential to impact subterranean fauna and their habitats, through groundwater drawdown. This has not been previously assessed.
Inland Waters	Key Environmental Factor	Mining BWT has the potential to alter natural surface water and groundwater regimes. This has the potential to impact inland waters of cultural and environmental significance. The discharge of surplus groundwater may impact cultural values and or inland waters important for threatened fauna species.
Air Quality	Not relevant	The Proposal is not likely to have a significant impact on the region's air quality, given the short mine life. No fibrous material is present, and dust management is adequate to prevent dust impacts to nearby receptors. GHG emissions estimates are below the threshold of 100,000 tCO2-e /year and the nearest residential area is over 30km away. Air quality is unlikely to be a key Environmental Factor and can likely be managed under existing operating procedures.
Greenhouse Gas Emissions	Preliminary Environmental Factor	Existing GHG emissions are not likely to exceed 100,000 t CO_2-e of Scope 1 or Scope 2 emissions, there is no increase in the mining rate and or haulage fleet to what has been previously assessed, therefore, the proposed expansion is not likely to significantly increase the Project GHG emissions.

Environmental Factor	Classification	Basis of Classification
Social Surroundings	Key Environmental Factor	The project is located within an area of cultural and environmental significance. Engagement with external stakeholders is required to ensure all reasonable endeavours are taken to protect social surrounds.
Human Health	Not relevant	The nearest residential area is more than 30km from the Project and it is unlikely the Proposal will have a significant impact on human health. Factors that contribute to human health (dust, noise, vibration and GHG emissions) can be regulated under existing approvals and operating procedures.

5.1 Flora and Vegetation

5.1.1 EPA Objective

The relevant EPA objective for Flora and Vegetation is "*To protect flora and vegetation so that biological diversity and ecological integrity are maintained.*"

5.1.2 EPA Policies and Guidelines

The following EPA policies and guidelines are considered relevant to the flora and vegetation Environmental Factor:

- Environmental Factor Guideline – Flora and Vegetation (EPA 2016);
- Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a); and
- Guidance Statement No. 6 – Rehabilitation of Terrestrial Ecosystems (EPA 2006).

5.1.3 Receiving Environment

5.1.3.1 Relevant Studies

The following flora and vegetation studies have been completed over parts of the MDE since the Project was established.

Table 5-2: Summary of Technical Studies for Flora and Vegetation Environmental Factor

Study	Study Purpose
Corunna Downs Proposal, Level 2 Flora and Vegetation Assessment (Woodman Environmental, 2016a)	The aim of the study was to undertake a detailed flora and vegetation assessment for the Project area to determine broad scale vegetation mapping, vegetation condition, conservation significant flora location and significant vegetation types.
Flora and Vegetation Impact Assessment (Woodman Environmental, 2016b)	This study was conducted to determine the overall potential impact of the disturbance footprint of Stage 1 would have on significant flora and local conservation significant vegetation.
Investigation of Relationship between Vegetation and Hydrology – "Soak": Area (Woodman, 2018)	This study investigated the relationship between the hydrology of the soak and associated vegetation, the likelihood of impacts to vegetation health as a result of the proposed groundwater abstraction.
Assessment of Groundwater Drawdown Impacts of Vegetation (Woodman Environmental, 2019)	The aim of this study assesses the likelihood of GDV being present in the vicinity of the Project, the potential for groundwater abstraction to impact such vegetation and assess the risk of any such impacts occurring. This report includes an assessment of the potential groundwater-dependence of vegetation associated with specific surface water features (pools) identified in the vicinity of the Project that may be maintained by groundwater.

Study	Study Purpose
Updated Flora and Vegetation Assessment (Woodman Environmental, 2021)	This study looked at updating and expanding the detailed flora and vegetation assessment in 2016 assessing its impact to from the proposed Stage 2 development. This included updated vegetation mapping, additional targeted flora surveys, and updated impact assessments to understand potential impacts from the disturbance footprint from the Stage 2 proposal.
BWT Groundwater Dependant Vegetation (Biologic, 2025a)	HIO commissioned Biologic Environmental Survey Pty Ltd to undertake a desktop assessment and targeted riparian vegetation survey. The survey was conducted between the 10 to 14 June 2024.The survey concentrated specifically on perennial and ephemeral pools, and areas of riparian vegetation previously categorised at high risk from groundwater drawdown impacts.
BWT GDV Risk Assessment (Biologic, 2025b)	In addition to completing an assessment of groundwater dependent vegetation within the study area and a risk assessment was completed to determine impacts from potential groundwater drawdowns. This report examined how the modelled groundwater drawdown would impact the surrounding ground water levels. This was then used to determine the potential impact that could occur to the surrounding ecosystems.

The following sections primarily draw upon findings from these studies and associated impact assessments. The most relevant studies to Flora and Vegetation have been provided in Appendix E.

5.1.3.2 Regional Vegetation Context

Under the Interim Biogeographical Regionalisation for Australia (IBRA) classification system, the Proposal is situated within the Chichester subregion of the Pilbara Biogeographic Zone (Kendrick & Mckenzie, 2001). The basalt plains of this subregion, contain a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on the ranges (Woodman Environmental, 2021).

The Proposal is located within the Fortescue District of the Eremaean botanical province (Beard, 1990). The Fortescue botanical district is characterised by tree (*Eucalyptus* spp. and *Corymbia* spp.) and shrub (*Acacia* spp., *Hakea* spp., *Grevillea* spp. and *Senna* spp.) steppe communities and *Triodia* spp. hummock grasslands (Beard, 1975). Four vegetation associations as described by Shepherd *et al.* (2002) occur within the MDE, as outlined below. All vegetation associations present within the MDE have over 99% of their pre-European extent remaining (WA Local Government Association, 2020).

Table 5-3: Vegetation Associations within the Mine Development Envelope

Vegetation System Association	Description	Extent Within the Chichester Subregion			Pre-European Extent with Formal Protection (%)	Extent Within Mine Development Envelope ha (% of MDE)
		Pre-European (ha)*	Current (ha)*	Remaining (%)		
Abydos Plain (93)	Hummock grasslands, shrub steppe; kanji over soft spinifex.	2,940,348	360,324	99.88	0.46	137.9 (6.1)
George Ranges (82)	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*.	360,667	2,936,732	99.90	0	1159.6 (51.4)
George Ranges (587)	Mosaic: Hummock grasslands, open low tree-steppe; snappy gum over *Triodia wiseana* / Hummock grasslands, shrub-steppe; kanji over *Triodia pungens*.	570,997	570,965	99.99	21.24	746 (33)
George Ranges (619)	Medium woodland; river gum (*Eucalyptus camaldulensis*).	85,543	85,521	99.97	0.28	214 (9.5)
Total						**2257.5**

Note: *Extent rounded to nearest ha. The information presented in the table is accurate as of 2019 (Government of Western Australia 2019)

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Figure No: 5.1
	Date: 2/10/2025	0 1 2 Kilometres	Pre-European Vegetation Associations
	Drawn: sam.nikora	N	
	Doc No:	Scale 1:60,000 Page size: A3	

SANJIV RIDGE — HANCOCK IRON ORE

5.1.3.3 Local Vegetation Types

Fifteen local vegetation types have been identified within the MDE, as determined by Woodman in 2016 and reassessed in 2021. Table 5-4 provides a description for these vegetation types and Figure 5-2 shows the distribution of vegetation types within the MDE.

5.1.3.4 Significant Vegetation Types

No vegetation types mapped within the MDE meet the classification criteria for any Threatened Ecological Communities (TEC) by DBCA or endorsed by the Western Australian Minister for Environment. Additionally, none are listed under the EPBC Act. Furthermore, no vegetation types within the MDE are considered a DBCA-classified Priority Ecological Community (PEC) (Woodman, 2021). The majority of vegetation types are of limited local conservation significance, as each comprises more than 1% of the MDE and occurs on landforms or soil types that are locally common and widespread (Woodman Environmental, 2021). However, vegetation types 3, 6 7 and 8 have a higher local conservation significance as they occur on landforms or soil types that are locally uncommon or restricted and are less extensive throughout the MDE and surrounding area (Table 5-4).

The nearest Environmentally Sensitive Area (ESA) is the De Grey River, located approximately 90 km to the north of the MDE. No impacts to ESAs from the implementation of the Proposal are anticipated.

Table 5-4: Vegetation Types within the MDE

Vegetation Type	Description	Extent in Survey Area (ha)	Area Within the MDE (ha)
1	Mid spare shrubland dominated by mixed *Acacia* species over low sparse shrubland of mixed species including *Acacia stellaticeps, Pluchea tetranthera* and *Eremophila latrobei* subsp. *glabra* over low hummock grassland dominated by *Triodia epactia* on grey to brown sand to clay loam with occasional granite outcropping, on stoney plains, low hills or sandy dunes.	349.6	8.1
2	Tall to mid open shrubland dominated by mixed Acacia species including *Acacia eriopoda* and *Acacia maitlandii* and over low sparse shrubland of mixed species including *Acacia stellaticeps, Corchorus parviflorus* and *Corchorus laniflorus* over low hummock grassland dominated mainly by *Triodia epactia* on red-brown sandy clay to clay loam, on granite outcrops to stoney plains and drainage lines with exposed granite.	334.2	71.0
3	Low open woodland of mixed species dominated by species including *Corymbia ferriticola, Ficus brachypoda, Terminalia canescens* over tall sparse shrubland usually dominated by *Acacia pruinocarpa* and *Acacia tumida var. pilbarensis* over low open mixed grassland dominated by *Triodia epactia, Cymbopogon ambiguous* and *Eriachne mucronata,* on red to brown sand to clay loam on ironstone or metamorphosed granite outcropping, in steep gorges, often with semi-permanent water.	47.7	13.0
4	Low open woodland usually dominated by *Corymbia hamersleyana* over Tall Sparse shurbland dominated by mixed *Acacia* species including *A. trachycarpa* and *A. ancistrocarpa* with *Dichrostachys spicata* over Low Hummock Grassland dominated by species including *Triodia wiseana* and *T. epactia* with *Eragrostis eriopoda* on brown sandy loams on plains and drainage lines.	591.3	127.7
5	Mid Sparse Shrubland of mixed Acacia species usually dominated by *A. synchronicia* over Low Hummock Grassland dominated by various *Triodia* species including *T. epactia, T. wiseana* and *T. longiceps* on brown clay loams on stony plains and base of low hills.	844.4	255.0
6	Tall hummock grassland dominated by *Triodia longiceps* with tall isolated shrubs of *Acacia synchronicia* on red or brown sandy to clay loams on stony plains, interspersed with low sparse forbland of mixed species including *Sida fibulifera*, *Rhynchosia minima*, *Tephrosia* sp. Clay soils (S. van Leeuwen et al. PBS 0273), *Crotalaria dissitiflora* subsp. *benthamiana*, *Cullen graveolens* and *Eriachne flaccida* on brown cracking clay in clay pans.	273.0	76.3
7	Tall sparse shrubland dominated by species including *Acacia bivenosa*, *A. synchronicia* and *Dichrostachys spicata* over mid hummock grassland dominated by *Triodia longiceps* over low sparse tussock grassland and chenopod shrubland dominated by *Cenchrus ciliaris* and *Sclerolaena hostilis* on brown clay loam on flats in open depressions.	124.9	50.9
8	Low isolated shrubs dominated by *Melaleuca glomerata* over mid hummock grassland dominated by *Triodia longiceps* over low mixed sedgeland, grassland and forbland of mixed species including *Schoenus falcatus*, *Trianthema cusackianum* and *Stemodia grossa* on white to brown clay to clayey sand with occasional calcrete and dolerite stones, at the head of drainage lines.	65.6	6.7
9	Low open woodland to isolated trees of *Eucalyptus leucophloia* subsp. *leucophloia* and/or *Corymbia hamersleyana* over tall sparse shrubland of mixed species usually dominated by *Acacia orthocarpa*, *A. monticola*, *A. tumida* var. *pilbarensis* and *Grevillea wickhamii* over low shrubland to sparse shrubland of mixed species dominated by *Acacia ptychophylla*, *A. spondylophylla*, *Goodenia stobbsiana*, *Dampiera candicans* and *Ptilotus calostachyus* over low hummock grassland dominated by *Triodia epactia* and occasionally *Triodia brizoides* on red to brown clay loam usually over ironstone or metamorphosed granite outcropping, on hill crests or occasionally low rises.	2,695.4	691.0
10	Isolated trees dominated by *Eucalyptus leucophloia* subsp. *leucophloia* and occasionally *Corymbia hamersleyana* over tall to mid sparse shrubland dominated by species including *Acacia bivenosa*, *A. inaequilatera*, *A. pyrifolia* var. *pyrifolia* and *Grevillea wickhamii* over low open to sparse shrubland of mixed species including *Indigofera monophyla*, *Acacia ptychophylla* and *Senna* spp. over low hummock grassland dominated by *Triodia brizoides*, *T. epactia* and/or *T. wiseana* over low sparse tussock grassland dominated by *Eriachne mucronata* on red or brown clay loam, usually over metamorphosed granite or occasionally dolerite, quartz or ironstone outcropping, on the upper slopes and crests of steep hills and ridges, or occasionally on low hills, undulating plains and outwashes.	6,625.7	221.3

Vegetation Type	Description	Extent in Survey Area (ha)	Area Within the MDE (ha)
11	Low isolated trees of *Corymbia hamersleyana* over tall sparse shrubland dominated by *Acacia inaequilatera* and often *Grevillea pyramidalis* subsp. *leucadendron* over low sparse shrubland dominated by *Corchorus parviflorus*, *Indigofera monophyla* and *Senna glutinosa* subsp. *glutinosa* over low hummock grassland dominated by *Triodia wiseana* and/or *T. epactia* on red to brown clay loam often with dolerite or occasionally quartz or metamorphosed granite outcropping, on low hills, ridges and occasionally undulating plains.	9,783.2	414.4
12	Low open woodland of *Corymbia hamersleyana* over mid sparse shrubland dominated by *Acacia bivenosa* over low sparse shrubland of mixed species including *Corchorus parviflorus*, *Heliotropium cunninghamii*, *Indigofera monophyla* and *Pluchea ferdinandi-muelleri* over low hummock grassland dominated by *Triodia longiceps* on brown clay loam on the stony undulating plains and low rises often with calcrete outcropping.	1,457.7	190.0
13	Isolated trees dominated by *Corymbia hamersleyana* over tall to mid sparse shrubland dominated by *Grevillea wickhamii* and *Acacia bivenosa* over low open to sparse shrubland dominated by *Acacia arrecta*, *Goodenia stobbsiana*, *Corchorus parviflorus* and *Heliotropium ovalifolium* over low hummock grassland dominated by *Triodia angusta* and often *T. wiseana* on brown clay loam on stony undulating plains, low hills and ridges with concrete or ironstone outcropping.	694.9	5.0
14	Mid open woodland of mixed species including *Eucalyptus victrix* and *Corymbia hamersleyana* over tall open to sparse shrubland of mixed species including *Acacia coriacea* subsp. *pendens*, *A. trachycarpa*, *A. pyrifolia* var. *pyrifolia*, *A. tumida* var. *pilbarensis* and *Melaleuca glomerata* over low sparse shrubland of mixed species including *Pluchea ferdinandi-muelleri*, *Cajanus pubescens* and *Stemodia grossa* over mid open grassland and sedgeland of mixed species dominated by **Cenchrus ciliaris*, *Triodia longiceps*, *T. epactia*, *Chrysopogon fallax* and *Cyperus vaginatus* and red to brown sand to sandy loam with riverstones in minor to medium drainage lines.	1,420.5	88.2
15	Mid open forest to woodland dominated by *Eucalyptus camaldulensis* subsp. *refulgens* and occasionally *Eucalyptus victrix* over tall open shrubland dominated by species including *Acacia ampliceps*, *Melaleuca glomerata* and *Acacia pyrifolia* var. *pyrifolia* over mixed mid open grassland and sedgeland dominated by **Cenchrus ciliaris*, *Cyperus vaginatus* and *Triodia longiceps* on red to brown sandy to clay loam with riverstone in major drainage lines.	517.5	23.0
Total		**25,825.6**	**2,257.5**

770,000 mE
775,000 mE
780,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

Vegetation Types (VT)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Cleared
Not Surveyed

Mine Development Envelope
Proposed Disturbance Footprint
Approved Disturbance Footprint
Flora Study Area

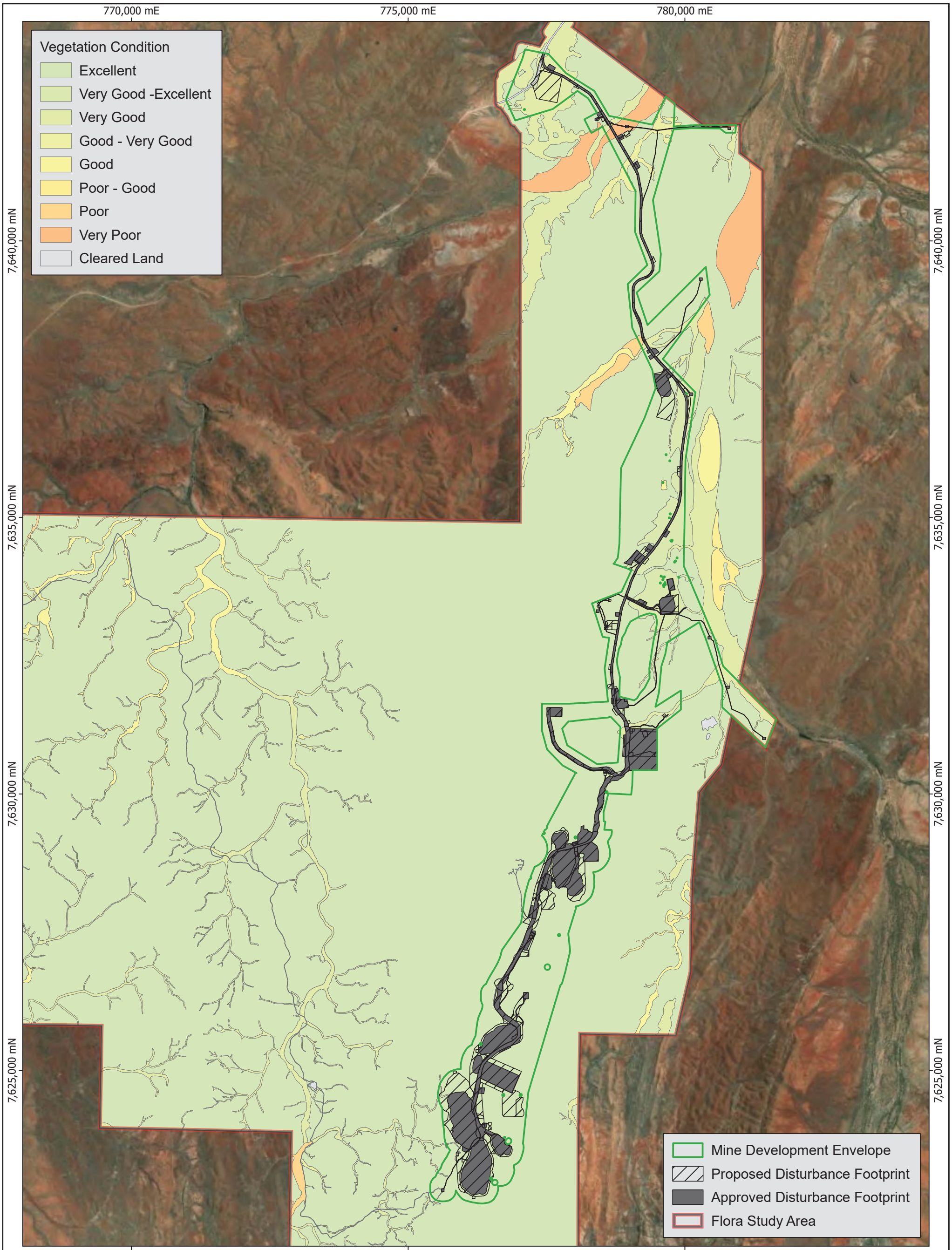
HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Flora and Vegetation Study Areas and Vegetation Types
	Date: 24/07/2025	0 0.5 1 2 kilometres	Figure No: 5.2
	Drawn: justin.venables	N	
	Doc No:	Scale 1:90,000 Page size: A4	

5.1.3.5 Vegetation Condition

The vegetation condition within the MDE was assessed by Woodman Environmental in 2021 and is predominantly in "Excellent" condition (Table 5-5). These areas exhibit minimal human disturbance and low levels of invasive species (Woodman Environmental, 2021). However, the condition of vegetation in larger drainage features, such as creeks and flow lines, is generally poorer. These areas are heavily impacted by the presence of aggressive introduced species, as well as overgrazing and trampling by cattle. As a result, the vegetation condition in these drainage features ranged from "Very Good" to "Poor", with the variability largely depending on the density of invasive flora and the extent of trampling damage. Notable, larger drainage features such as major creeks and rivers are more likely to have lower condition scores compared to smaller flow lines and creeks, indicating an inverse relationship between the size of the drainage feature and its vegetation condition. Additionally, the vegetation condition tends to be worse in the northern part of the MDE, particularly closer to Marble Bar, where the impacts of grazing and invasive species are more pronounced.

Table 5-5: Condition of Vegetation within the MDE

Vegetation condition	Extent within MDE (ha)	Percentage within the MDE (%)
Cleared Land	11.9	0.53
Excellent	1872.8	82.96
Good	1.6	0.07
Good - Very Good	23.5	1.04
Poor	1.6	0.07
Very Good	151.9	6.73
Very Good -Excellent	181.2	8.03
Very Poor	12.9	0.57
Total	**2257.5**	**100**



HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Figure No:
	Date: 24/07/2025	0 0.5 1 2 kilometres	5.3
	Drawn: justin.venables	N	Vegetation Condition
	Doc No:	Scale 1:90,000 Page size: A4	

5.1.3.6 Conservation Significant Flora

No Threatened flora taxa listed under the BC Act or Threatened species listed under the EPBC Act were recorded within the MDE (Figure 5-4). Three currently DBCA-classified Priority species have been identified within the MDE:

- *Heliotropium murinum* (P3);
- *Rothia indica* subsp. *australis* (P3); and
- *Swainsona thompsoniana* (P3).

An additional seven Priority listed species were located within the vicinity of the MDE, including:

- *Cochlospermum macnamarae* (P1);
- *Schoenus coultasii* (P1);
- *Acacia levata* (P3);
- *Nicotiana umbratica* (P3);
- *Rostellularia adscendens* var. *latifolia* (P3);
- *Stylidium weeliwolli* (P3); and
- *Ptilotus mollis* (P4).

A further five species were considered significant as per EPA Guidance Statement No. 51 due to the identification of a taxa having anomalous features (*Abutilon* aff. *hannii*, *Dolichocarpa* sp. and *Portulaca* sp.) or representing a range of extension or outlier of the main range (*Acrostichum speciosum* and *Eriocaulon pusillum*) (Woodman Environmental, 2021).

5.1.3.7 Introduced Species

Six introduced pests have been recorded in the study area. One species, Rubber bush (*Calotropis procera*) is a Declared Pest s22(2) under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) in Western Australia. None of the species identified are listed as Weeds of National Significance.

- *Aerva javanica* (Kapok bush);
- *Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy);
- *Calotropis procera* (Rubber bush);
- *Cenchrus ciliaris* (Buffel Grass);
- *Cynodon dactylon* (Couch); and
- *Vachellia farnesiana* (Mimosa Bush).

Buffel Grass (*Cenchrus ciliaris*), introduced as a pastoral species, has affected native vegetation condition, mainly in riparian vegetation types. The presence and impact of this species is not a result of mining activities, and mining is unlikely to significantly increase the impact. Other identified introduced species currently occur sporadically and are having little effect on vegetation condition.

775,000 mE
780,000 mE
785,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

Swainsona thompsoniana

Heliotropium murinum

Heliotropium murinum

Rothia indica subsp. australis

Mine Development Envelope
Proposed Disturbance Footprint
Approved Disturbance Footprint
Significant Flora Species
Heliotropium murinum (P3)
Nicotiana umbratica (P3)
Ptilotus mollis (P4)
Rostellularia adscendens var. latifolia (P3)
Rothia indica subsp. australis (P3)
Swainsona thompsoniana (P3)
Themeda sp. Panorama (P1)

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Figure No: 5.4
	Date: 31/07/2025	0 1 2 Kilometres	Conservation Significant Flora
	Drawn: justin.venables	N	
	Doc No:	Scale 1:60,000 Page size: A3	

5.1.3.8 Groundwater Dependant Vegetation

Unless otherwise referenced, the following section is based on information from the BWT Groundwater Dependant Vegetation Assessment and Risk Assessment (Appendix D).

5.1.3.8.1 Flora

One-hundred and forty confirmed vascular flora taxa were recorded during the survey with an additional four indeterminable taxa (Appendix D). Combined, 144 vascular flora taxa from 39 families and 95 genera were recorded from the Survey Area. One-hundred and thirty-three were native taxa and eleven were introduced or non-native taxa. Eighty of these species can be classified as riparian flora, or taxa that are mostly associated with drainage lines, floodplains and watercourses.

5.1.3.8.2 Groundwater Indicator Species

Thirty-six taxa were identified as groundwater indicator species. These taxa are a combination of nine phreatophytic flora, 15 hydrophytes and 12 mesophytes. Depending upon the presence, density and combination these taxa informed the GDV assessment.

5.1.3.8.3 Riparian Vegetation

Ten riparian vegetation types from five broad GDV ratings were described from the Survey Area. Vegetation types were primarily differentiated based upon the key phreatophytic tree species presence/ absence and density. Middle and understorey were similar between several vegetation types e.g. *Melaleuca glomerata*, *M. linophylla*, and *Atalaya hemiglauca* were common mid-level taxa across seven vegetation types. *Cyperus vaginatus* and *Schoenoplectus subulatus* were common sedges across seven vegetation types. Mapping has been more finely defined from the mapping provided prior to mobilisation (Woodman, 2016), creating new sub-types of riparian vegetation based on locations and density of key indicator species as per the internal Biologic GDV assessment framework.

5.1.3.8.4 Groundwater Dependence

Two vegetation types were determined to have a high dependence on the groundwater (D1 and D3), and two vegetation types had a Moderate to High rating (D2 and D5). These areas predominately occur to the east of the MDE, associated with the Coongan River. The remaining six vegetation types had a rating of Low to Moderate, Low, Negligible or no dependence on groundwater.

Vegetation type D1 occurs in three small patches in the main tributary of the Coongan River (south). It is primarily rated as High for the abundance of *Melaleuca argentea*, and presence of *Eucalyptus camaldulensis*, *Melaleuca linophylla*, *Sesbania formosa*, and mesophyte *Acacia ampliceps*. This, combined with the diversity of several other hydrophytic taxa suggesting high soil moisture content in line with groundwater availability. Two locations intersect with the area of moderate risk for groundwater drawdown impacts. The location furthest south intersects the area of low risk.

D3 occurs in one small area associated with previously known perennial pool, CO-WS-16 and is in an area at low risk of groundwater drawdown impacts. This vegetation type has affinities with the Pilbara Pools Priority Ecological Communities (PEC). The Pilbara Pools PEC is listed as Priority 2 and occurs sporadically throughout the Pilbara, with several occurrences in Karijini National Park and other springs

and river pools with high water permanence of the Pilbara. The presence of phreatophytic flora, permanent to semi-permanent pools, as well as several of the key relictual/ indicator understorey species suggests that portions of the Survey Area may represent the PEC, but particularly this vegetation type. Additionally, many pools occurring in the Survey Area are in a gorge, gully or valley wetland landform that is coupled with significant shading, in line with the description of this PEC.

The flora species recorded from D3 includes *Imperata cylindrica*. This taxon is almost exclusively restricted to riparian zones of permanent wetlands with high soil moisture maintained by groundwater flows and is an indicator species for the PEC. The vegetation type D3, supports species composition consistent with persistently high soil moisture. Including an upper strata of obligate and facultative phreatophytes, including *Melaleuca argentea* and *Eucalyptus camaldulensis* with lower strata of *Imperata cylindrica* and diverse hydrophytic/ mesophytic flora taxa.

In the vegetation types D2 and D5 there are respectively three and one location(s) of High GDV rating from the survey. D2 forms the largest vegetation type associated within the main tributary of the Coongan River; this intersects with the high, moderate and low risk areas of drawdown impacts. D5 is a smaller vegetation type of the Coongan River and intersects with the areas of moderate and low risk areas of drawdown impacts. The areas of High GDV rating of vegetation type D2 all occur within the area at highest risk of impacts from drawdown.

Seventeen sites were recorded within the area at high risk of drawdown impacts, with eleven of these forming the vegetation type D2. Eight of the D2 sites show features of consistent with high soil moisture content, indicating High GDV rating. The remaining three are considered High to Moderate GDV rating (two sites) and Moderate GDV rating (one site).

Table 5-6: Riparian Vegetation Types within the Survey Area

Vegetation Code	Vegetation Description	Key GDV species
GDV Rating: High		
D1 Ma Ml Cv	*Melaleuca argentea* low woodland over *Melaleuca linophylla* tall sparse shrubland over *Cyperus vaginatus* mid sparse sedgeland	*Melaleuca argentea* (High) *Melaleuca linophylla* (Moderate) *Cyperus vaginatus* (Low)
D3 MaEc(±Fb) AciAtp(±AtFv) Ic TdEg	*Melaleuca argentea*, *Eucalyptus camaldulensis* (±*Ficus brachypoda*) low-mid open woodland over *Acacia colei* var. *ileocarpa*, *Acacia tumida* var *pilbarensis* (±*Adriana tomentosa*, *Flueggea virosa*) tall shrubland over *Imperata cylindrica* mid tussock grassland over *Typha domingensis*, *Eleocharis geniculata* low-mid isolated sedges	*Imperata cylindrica* (High) *Adriana tomentosa* (Moderate) *Eleocharis geniculata* (Moderate) *Eucalyptus camaldulensis* (Moderate) *Flueggea virosa* (Moderate) *Melaleuca argentea* (Moderate) *Typha domingensis* (Low)
GDV Rating: Moderate to High		
D2 EcMa(±Ev) MlMgAcpAh CvSs(±Td)	*Eucalyptus camaldulensis*, *Melaleuca argentea* (±*Eucalyptus victrix*) mid open woodland to open forest over *Melaleuca linophylla*, *Melaleuca glomerata*, *Acacia coriacea* subsp. *pendens*, *Atalaya hemiglauca* tall open shrubland over *Cyperus vaginatus*, *Schoenoplectus subulatus* (±*Typha domingensis*) mid sparse sedgeland	*Eucalyptus camaldulensis* (Moderate to High) *Melaleuca argentea* (Moderate to High) *Atalaya hemiglauca* (Moderate) *Eucalyptus victrix* (Low to Moderate) *Melaleuca linophylla* (Moderate) *Schoenoplectus subulatus* (Moderate) *Acacia coriacea* subsp. *pendens* (Low) *Cyperus vaginatus* (Low) *Melaleuca glomerata* (Low) *Typha domingensis* (Low)
D5 Ec MgAhMl(±Aa) CvSs EbCc	*Eucalyptus camaldulensis* mid open woodland to open forest over *Melaleuca glomerata*, *Atalaya hemiglauca*, *Melaleuca linophylla* (±*Acacia ampliceps*) mid open shrubland over *Cyperus vaginatus*, *Schoenoplectus subulatus* mid sparse sedgeland over *Eriachne benthamii*, **Cenchrus ciliaris* low open tussock grassland	*Acacia ampliceps* (High) *Eucalyptus camaldulensis* (Moderate to High) *Atalaya hemiglauca* (Moderate) *Melaleuca glomerata* (Moderate) *Melaleuca linophylla* (Moderate) *Schoenoplectus subulatus* (Moderate) *Cyperus vaginatus* (Low)
GDV Rating: Low to Moderate		
D4 MaEc MgMl Cv(±Ss)	*Melaleuca argentea*, *Eucalyptus camaldulensis* low isolated trees to clumps of trees over *Melaleuca glomerata*, *Melaleuca linophylla* mid isolated shrubs over *Cyperus vaginatus* (±*Schoenoplectus subulatus*) low isolated clumps of sedges	*Melaleuca linophylla* (Moderate) *Schoenoplectus subulatus* (Moderate) *Cyperus vaginatus* (Low) *Eucalyptus camaldulensis* (Low) *Melaleuca argentea* (Low) *Melaleuca glomerata* (Low)

Vegetation Code	Vegetation Description	Key GDV species
D6 EcEv MgMlAh(±At) CvSs CcEbEm	*Eucalyptus camaldulensis*, *Eucalyptus victrix* mid open woodland to forest over *Melaleuca glomerata*, *Melaleuca linophylla*, *Atalaya hemiglauca* (±*Acacia trachycarpa*) tall open shrubland over *Cyperus vaginatus*, *Schoenoplectus subulatus* mid isolated sedges over **Cenchrus ciliaris*, *Eriachne benthamii*, *Eriachne mucronata* low sparse tussock grassland	*Eucalyptus camaldulensis* (High) *Atalaya hemiglauca* (Moderate) *Eucalyptus victrix* (Moderate) *Melaleuca glomerata* (Moderate) *Melaleuca linophylla* (Moderate) *Schoenoplectus subulatus* (Moderate) *Cyperus vaginatus* (Low)
D8 Ev MgMl(AcpAa) Cv Cc	*Eucalyptus victrix* low open woodland to isolated trees over *Melaleuca glomerata*, *Melaleuca linophylla*, (±*Acacia coriacea* subsp. *pendens*, *Acacia ampliceps*) tall shrubland over *Cyperus vaginatus* mid sparse sedgeland over **Cenchrus ciliaris* low sparse tussock grassland	*Acacia ampliceps* (High) *Melaleuca glomerata* (Moderate) *Melaleuca linophylla* (Moderate) *Acacia coriacea* subsp. *pendens* (Low) *Eucalyptus victrix* (Low) *Cyperus vaginatus* (Low)
GDV Rating: Low		
D7 TcEv(±Ec) MgAhFb Cv EmTspCa Te	*Terminalia circumalata*, *Eucalyptus victrix* (±*Eucalyptus camaldulensis*) low open woodland over *Melaleuca glomerata*, *Atalaya hemiglauca*, *Ficus brachypoda* tall open shrubland over *Cyperus vaginatus* mid isolated sedges over *Eriachne mucronata*, *Themeda* sp. indet, *Cymbopogon ambiguus* low sparse tussock grassland over *Triodia epactia* low isolated hummock grasses	*Atalaya hemiglauca* (Moderate) *Eucalyptus camaldulensis* (Moderate) *Cyperus vaginatus* (Low) *Eucalyptus victrix* (Low) *Melaleuca glomerata* (Low) *Terminalia circumalata* (Low)
GDV Rating: Negligible		
D9 AtAhPl Te Cc	*Acacia trachycarpa*, *Atalaya hemiglauca*, *Petalostylis labicheoides* tall sparse shrubland over *Triodia epactia* mid sparse hummock grassland over **Cenchrus ciliaris* low isolated clumps of tussock grasses	*Atalaya hemiglauca* (Low)
D10 El AtpAcEs Em Te	*Eucalyptus leucophloia* low isolated trees over *Acacia tumida* var. *pilbarensis*, *Acacia citrinoviridis*, *Ehretia saligna* tall sparse shrubland over *Eriachne mucronata* low isolated tussock grasses over *Triodia epactia* low isolated hummock grasses	*Acacia citrinoviridis* (Negligible to Low)

770,000 mE
775,000 mE
780,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

- Pools
- Mine Development Envelope
- Study Area
- Proposed Disturbance Footprint
- Approved Disturbance Footprint

Map Code
- D1
- D2
- D3
- D4
- D5
- D6
- D7
- D8
- D9
- D10

Mapping Unit
- Cleared
- Upland

CO-WS-26
CO-WS-25
CO-WS-27
CO-WS-28
CO-WS-16
CO-WS-34
CO-WS-12
CO-WS-05
CO-WS-14

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Potential Groundwater Dependent Vegetation Types
	Date: 1/10/2025	0 1 2 Kilometres	Figure No: 5.5
	Drawn: sam.nikora	N	
	Doc No:	Scale 1:60,000 Page size: A3	

SANJIV RIDGE HANCOCK IRON ORE

770,000 mE
775,000 mE
780,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

Pools
Mine Development Envelope
Study Area
Proposed Disturbance Footprint
Approved Disturbance Footprint
GDV Rating
High
Moderate to High
Moderate
Low to Moderate
Low
Negligible to Low
Negligible
None
Cleared

CO-WS-26
CO-WS-25
CO-WS-27
CO-WS-28
CO-WS-16
CO-WS-34
CO-WS-12
CO-WS-05
CO-WS-14

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Figure No: 5.6
	Date: 1/10/2025	0 1 2 Kilometres	Groundwater Dependent Vegetation Rating
	Drawn: sam.nikora		
	Doc No:	Scale 1:60,000 Page size: A3	

SANJIV RIDGE
HANCOCK IRON ORE

5.1.4 Potential Impacts

The Project has the potential to impact Flora and Vegetation through:

- Clearing of native vegetation in "very good" to "excellent condition";
- Direct loss of an individual priority listed flora species;
- Direct and/or indirect loss of groundwater dependant vegetation;
- Introduction and/or spread of weeds;
- Dust deposition; and
- Groundwater drawdown associated with water abstraction/dewatering activities.

These impacts have the potential to change the local composition and/or regional representation of flora species and vegetation communities.

5.1.4.1 Clearing of Native Vegetation

The Proposal requires additional clearing of up to 196.8 ha, (total clearing of native vegetation for the Project to 619.91 ha). All vegetation types with the exception of vegetation types 1 and 13 (Table 6.4) will be impacted by the proposed clearing, however, the cumulative disturbance for the Proposal represents less than 12 % of the mapped extent of each vegetation type. A summary of the vegetation types mapped by Woodman Environmental in 2021 are presented in Table 5-7, with a breakdown of total area per vegetation type and the how they will be impacted by the Proposal, and how much of each will remain post clearing.

Vegetation types that were deemed to be locally significant (vegetation types 3, 6, 7 and 8) will still have more than 89% of their total mapped extent remaining once the proposed clearing has been undertaken (Table 5-7). At a regional scale, the proposed clearing will not significantly reduce the remaining extent of any of the identified Beard vegetation associations (WA Local Government Association, 2020).

5.1.4.2 Vegetation Condition

The majority (99%) of native vegetation mapped by Woodman Environmental in 2021 falls within Very Good" to "Excellent" ratings and clearing required for the Proposal will remove an additional 194.6 ha of the "Very Good" to "Excellent" condition ratings out of the proposed 196.8 ha to be cleared (Table 5-8).

5.1.4.3 Clearing of Priority Flora Species

The Proposal will result in the clearing of one individual of *Swainsona thompsoniana* out of the total 3 identified within the survey area. The other two priority species are located outside of the proposed expansion area. While this is likely to have a moderate level of local impact to one population within the survey area, on a regional scale it is considered to have a lower impact as larger numbers of populations are known to occur outside the survey area.

No additional impacts have been identified to the remaining population of flora species of conservation significance within the proposed disturbance, and to protect these species from direct impacts a 10 m exclusion zones have been applied around each individual.

Table 5-7: Proposed and Approved Disturbances to Vegetation Types within the MDE

Vegetation Type	Extent in Survey Area (ha)	Extent in MDE (ha)	Extent in Approved Disturbance Footprint (ha)	Extent in Proposed Disturbance Footprint (ha)	Area Remaining in Flora and Vegetation Survey Area (%)	Area Remaining in MDE (%)
1	349.6	8.09	0.2	0.0	99.95	97.72
2	334.2	70.99	12.8	4.9	94.70	75.07
3	47.7	13	1.5	0.3	96.27	86.35
4	591.3	127.89	10.7	3.0	97.68	89.26
5	844.4	254.8	25.7	5.9	96.25	87.59
6	273	76.42	6.9	22.5	89.22	61.46
7	124.9	50.89	0.8	0.7	98.80	97.06
8	65.6	6.71	0.1	0.3	99.35	93.60
9	2695.4	691.01	203.6	97.7	88.82	56.40
10	6625.7	221.09	54.5	35.5	98.64	59.29
11	9783.2	414.13	66.0	11.0	99.21	81.40
12	1457.7	189.97	17.4	10.7	98.07	85.20
13	694.9	5.03	0.0	0.0	100	100
14	1420.5	88.18	14.5	2.4	98.81	80.91
15	517.5	23.19	0.1	0.0	99.97	99.33
Total	**25825.6**	**2257.5**	**423.11**	**196.79**	**97.60**	**72.54**

Note: Cells highlighted grey are vegetation types that were determined to be locally significant.

Table 5-8: Proposed Disturbance by Vegetation Condition within the MDE

Vegetation condition	Extent within MDE (ha)	Percentage within the MDE (%)	Extent in Approved Disturbance Footprint (ha)	Extent in Proposed Disturbance Footprint (ha)	Approximate Percentage of Vegetation Impacted by the Proposal (%)
Cleared Land	11.9	0.53	7.9	1.8	0.43
Excellent	1872.8	82.96	373.0	161.9	23.70
Good	1.6	0.07	0	0	0
Good - Very Good	23.5	1.04	0.6	0.2	0.03
Poor	1.6	0.07	0.4	0.0	0.02
Very Good	151.9	6.73	13.6	24.1	1.67
Very Good -Excellent	181.2	8.03	26.4	8.5	1.55
Very Poor	12.9	0.57	1.2	0.2	0.06
Total	**2257.5**	**100**	**423.11**	**196.79**	**27.46**

Note: Cells highlighted grey are vegetation conditions that will primarily be impacted by the proposed disturbance.

5.1.4.4 Introduction or Spread of Weeds

Weeds are a significant threat to natural and agricultural landscapes in Australia. Their ability to establish after disturbance and the risk that they may spread into adjacent, otherwise undisturbed areas represent potentially long-lasting impacts on biodiversity. Early intervention, involving the prevention, detection and eradication of new weed species before they become widely established is generally the most cost-effective approach to managing weeds. Vehicle hygiene practices (particularly for machinery arriving from off-site), ongoing monitoring for new weed species and the eradication of any new weed species should be high priority in the overall weed management strategy.

Ground disturbance and vehicle and machinery movements all have the potential to spread and introduce weeds. Several introduced flora species are already known to occur within or adjacent to the MDE, including *Aerva javanica*, *Calotropis procera*, *Cenchrus ciliaris*, *Chloris barbata*, *Cynodon dactylon*, *Echinochloa colona* and *Passiflora foetida* var. *hispida* (Woodman Environmental, 2021). All of these taxa are known to colonise and proliferate in post-disturbance environments (Woodman Environmental, 2021) and pose a potential risk to the existing flora and vegetation within the MDE.

5.1.4.5 Groundwater Drawdown

The proposed dewatering activities for the Proposal have been evaluated to determine the potential risk to GDV from groundwater drawdown Table 5-9. The proposed drawdown impacts have the potential to further impact on vegetation types which have a high dependence on groundwater.

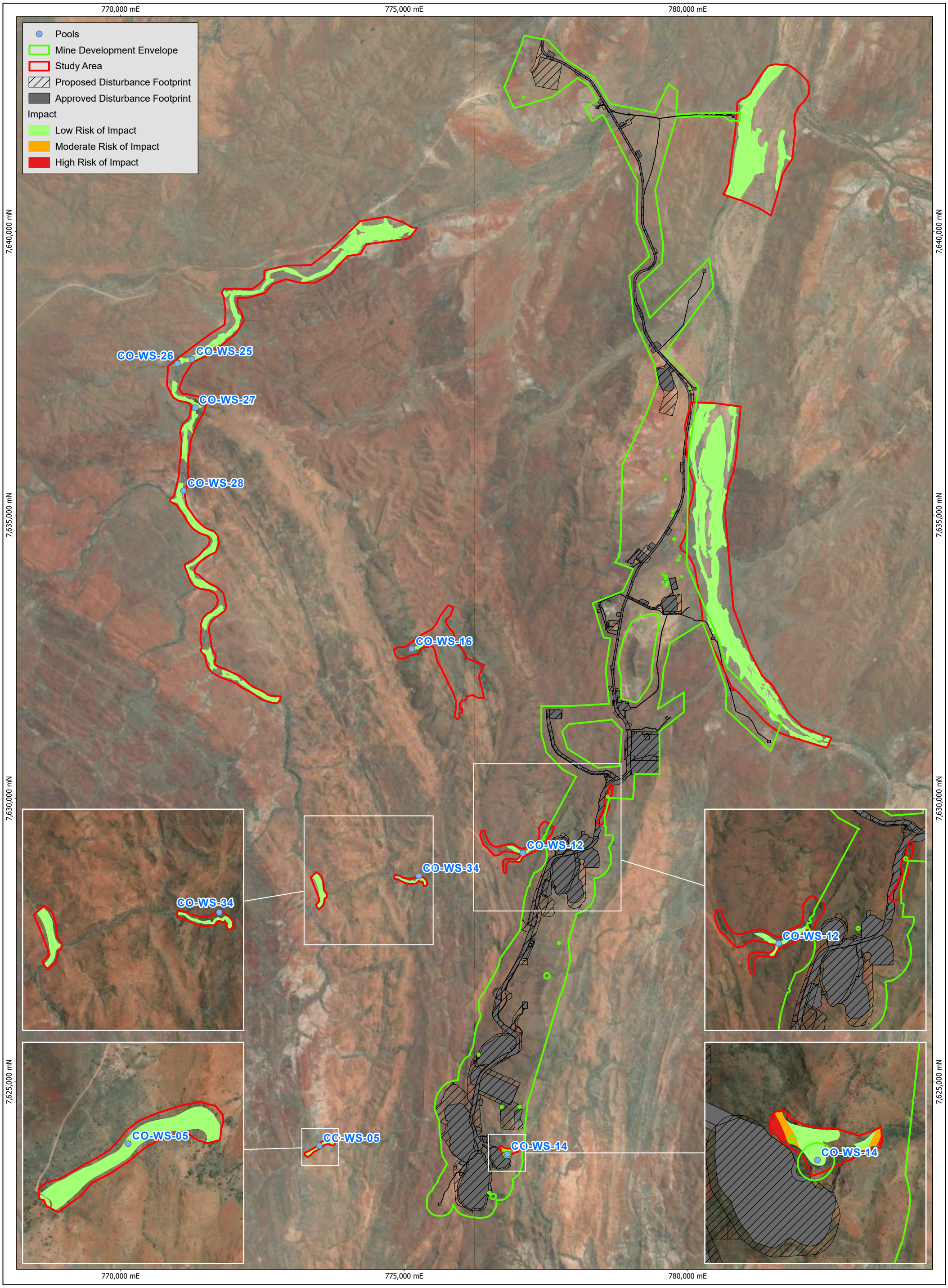
The majority of vegetation assigned a Moderate to High GDV rating was assessed as being at Low risk of impact from drawdown, predominantly due to 99.9% of the vegetation rated as Moderate to High GDV vegetation occurring in areas with <0.5 m projected drawdown (Table 5-9). A total of 0.4 ha was assessed as having moderate risk of impact (0.5 – 1 m projected drawdown) and 0.2 ha assessed as High risk of impact (1 – 10 m projected drawdown). Vegetation type D3 (Pilbara Pools PEC) was assessed as being at low risk of impact from drawdown. None of the other vegetation types assessed at Moderate or High risk of impact needed to be considered under the EPA factor guidelines.

Table 5-9: Risk of Impact for Vegetation with Moderate - High GDV Rating

GDV rating (Biologic, 2025b)	Vegetation Code Type	Risk of drawdown impact	Area at Risk of Impact (ha)
High	D1 Ma Ml Cv *Melaleuca argentea* low woodland over *Melaleuca linophylla* tall sparse shrubland over *Cyperus vaginatus* mid sparse sedgeland	Low	2.0
Moderate – High	D2 EcMa(±Ev) MlMgAcpAh CvSs(±Td)	Low	113.9

GDV rating (Biologic, 2025b)	Vegetation Code Type	Risk of drawdown impact	Area at Risk of Impact (ha)
	Eucalyptus camaldulensis, *Melaleuca argentea* (±*Eucalyptus victrix*) mid open woodland to open forest over *Melaleuca linophylla*, *Melaleuca glomerata*, *Acacia coriacea* subsp. *pendens*, *Atalaya hemiglauca* tall open shrubland over *Cyperus vaginatus*, *Schoenoplectus subulatus* (±*Typha domingensis*) mid sparse sedgeland	Moderate	0.4
		High	0.2
High	D3 MaEc(±Fb) AciAtp(±AtFv) Ic TdEg *Melaleuca argentea*, *Eucalyptus camaldulensis* (±*Ficus brachypoda*) low-mid open woodland over *Acacia colei* var. *ileocarpa*, *Acacia tumida* var *pilbarensis* (±*Adriana tomentosa*, *Flueggea virosa*) tall shrubland over *Imperata cylindrica* mid tussock grassland over *Typha domingensis*, *Eleocharis geniculata* low-mid isolated sedges	Low	0.2
Low – Moderate	D4 MaEc MgMl Cv(±Ss) *Melaleuca argentea*, *Eucalyptus camaldulensis* low isolated trees to clumps of trees over *Melaleuca glomerata*, *Melaleuca linophylla* mid isolated shrubs over *Cyperus vaginatus* (±*Schoenoplectus subulatus*) low isolated clumps of sedges	Low	45.9
Moderate – High	D5 Ec MgAhMl(±Aa) CvSs EbCc *Eucalyptus camaldulensis* mid open woodland to open forest over *Melaleuca glomerata*, *Atalaya hemiglauca*, *Melaleuca linophylla* (±Acacia *ampliceps*) mid open shrubland over *Cyperus vaginatus*, *Schoenoplectus subulatus* mid sparse sedgeland over *Eriachne benthamii*, **Cenchrus ciliaris* low open tussock grassland	Low	74.0
Moderate – High	D6 EcEv MgMlAh(±At) CvSs CcEbEm *Eucalyptus camaldulensis*, *Eucalyptus victrix* mid open woodland to forest over *Melaleuca glomerata*, *Melaleuca linophylla*, *Atalaya hemiglauca* (±*Acacia trachycarpa*) tall open shrubland over *Cyperus vaginatus*, *Schoenoplectus subulatus* mid isolated sedges over **Cenchrus ciliaris*, *Eriachne benthamii*, *Eriachne mucronata* low sparse tussock grassland	Low	77.9

GDV rating (Biologic, 2025b)	Vegetation Code Type	Risk of drawdown impact	Area at Risk of Impact (ha)
Moderate – High	D8 Ev MgMl(AcpAa) Cv Cc *Eucalyptus victrix* low open woodland to isolated trees over *Melaleuca glomerata*, *Melaleuca linophylla*, (±*Acacia coriacea* subsp. *pendens*, *Acacia ampliceps*) tall shrubland over *Cyperus vaginatus* mid sparse sedgeland over **Cenchrus ciliaris* low sparse tussock grassland	Low	53.9
Moderate	D9 AtAhPl Te Cc *Acacia trachycarpa*, *Atalaya hemiglauca*, *Petalostylis labicheoides* tall sparse shrubland over *Triodia epactia* mid sparse hummock grassland over **Cenchrus ciliaris* low isolated clumps of tussock grasses	Low	38.4



HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Groundwater Dependent Vegetation Risk Areas
	Date: 1/10/2025	0 1 2 Kilometres	Figure No: 5.7
	Drawn: sam.nikora	N	
	Doc No:	Scale 1:60,000 Page size: A3	

SANJIV RIDGE HANCOCK IRON ORE

5.1.4.6 Dust Deposition

The development and operation of the Proposal will result in fugitive dust emissions associated with ground disturbance and construction, blasting, haulage and general traffic activities. Dust emissions have the potential to affect surrounding flora and vegetation through either a physical (such as blocking stomata, or physically smothering leaves), or chemical reaction. This can be through direct impacts to the individuals themselves or through contact with the soil (Woodman Environmental, 2021).

5.1.5 Mitigation

The EPA hierarchy of mitigation has been considered in developing the management strategies for potential environmental impacts from the Proposal. Mitigation measures that will be implemented for the protection of flora and vegetation throughout the Proposal implementation are outlined below. Additional mitigation measures may be implemented as new information becomes available from further studies.

5.1.5.1 Avoid

Avoidance measures proposed to protect flora and vegetation include:

- Site infrastructure designed to avoid disturbance to conservation significant flora where possible;
- The proposal designed to reduce the extent of clearing required for the expansion;
- No clearing will occur outside of the Mine Development Envelope;
- No TEC, PEC's or threatened flora species will be impacted by clearing activities;
- All exclusion zones and avoidance buffers around environmental sensitive features will not be impacted; and
- Infrastructure has been located to minimise the impact to native vegetation, through placement on previously cleared areas where possible.

5.1.5.2 Minimise

Actions proposed to minimise the potential impacts to flora and vegetation are:

- Implementation of HIO management plans, internal processes and procedures;
- All PAF material will be either backfilled into mine voids and or PAF cells within WRLs with an appropriate separation distance from the surface to avoid acid mine drainage;
- Introduction of new weeds and spread of existing weeds will be avoided through the implementation of hygiene procedures and a weed management program;
- Compliance to the EPBC Act 1999 to minimise potential impacts to MNES;
- Disturbance footprint has been designed to minimise impacts to Priority flora as far as reasonably practicable;
- Clearing of no more than 196.8 ha within a Development Envelope of 2,257.6 ha;
- Weed control will be undertaken annually specifically targeting high risk weed areas;

- Off-road driving will be prohibited;
- Topsoil will be segregated and stored separately for the use during rehabilitation;
- Standard dust management measures will be utilised to minimise dust emissions and subsequent deposition on retained native vegetation in proximity to disturbance;
- Groundwater and surface-water management measures (refer to Inland Waters) will also indirectly protect riparian vegetation and groundwater-dependent ecosystems;
- Surface-water management measures (see Inland Waters) will also indirectly protect riparian vegetation and flora dependent on natural sheet-flow patterns; and
- Staff and contractors will be appropriately trained to identify, manage and protect relevant conservation significant flora and vegetation assemblages.

5.1.5.3 Rehabilitate

HIO has an approved Mine Closure Plan (MCP) for the Project that outlines the closure and rehabilitation tasks required for the safe abandonment of the mine. The MCP details how the Project will be rehabilitated to reinstate environmental values consistent with agreed stakeholder outcomes. The MCP will be updated to incorporate the Proposal and any other requirements as a result of ongoing stakeholder engagement.

The following actions will assist in rehabilitation of flora and vegetation:

- Topsoil will be recovered and stockpiled to a maximum height of 2 m to preserve the soil physical/chemical properties and seedbank;
- Topsoil will be progressively re-spread over temporary construction areas or utilised for future rehabilitation;
- Waste dumps will be rehabilitated at closure to ensure they are safe, stable and revegetated;
- Self-sustaining native vegetation will be established on disturbed areas;
- Rehabilitation of disturbed areas to establish habitat suitable for fauna species;
- Rehabilitation will occur with vegetation comprised of native species of local provenance; and
- Adaptive management practices will be employed to adjust mitigation measures based on monitoring results.

5.1.6 Assessment of Residual Impacts

Residual impacts for flora and vegetation will predominately be through direct impacts from clearing 196.8 ha of native vegetation in excellent condition that co-occurs as suitable habitat to MNES. Indirect residual impacts to flora and vegetation may result from the drawdown of groundwater.

Following the application of the proposed mitigation measures, the Proposal has the potential for the following residual impacts:

- Potential direct impacts to *Heliotropium murinum* and one *Swainsona thompsoniana* (P3);

- Clearing up to 196.8 ha of native vegetation in Good to Excellent condition, which co-occurs with significant MNES habitat;
- Combined (approved/proposed) clearing of 619. 91 ha native vegetation in Good to Excellent condition, which co-occurs with significant MNES habitat; and
- Majority of vegetation assigned a Moderate to High GDV rating was assessed as being at Low risk of impact from drawdown, predominantly due to 99.9% of the vegetation rated as Moderate to High GDV vegetation occurring in areas with <0.5 m projected drawdown.

This residual impact is proposed to be offset via monetary contribution to the PEOF at the relevant rate.

5.1.7 Predicted Outcome

Potential predicted outcomes from the implementation of the Proposal include:

- No PEC's or TEC's will be cleared or impacted by this Proposal;
- Direct loss of one individual priority listed flora species *Swainsona thompsoniana* (P3);
- Known records of Priority species will have a 10 m exclusion zone to prevent impacts;
- No direct disturbance to groundwater dependent flora species;
- No more than 196.8 ha of native vegetation will be cleared within the existing approved MDE
- No more than 619. 91 ha of combined clearing of native vegetation will occur within the existing approved MDE;
- Disturbed areas will be rehabilitated to promote self-sustaining native vegetation and establish habitat suitable for fauna species;
- PAF material placement and encapsulation is expected to prevent acid and metalliferous drainage, ensuring no adverse impacts to terrestrial fauna or surrounding vegetation;
- Dust levels in areas surrounding the disturbance footprint are predicted to remain consistent with current operations, with no material impacts to native vegetation or fauna habitat, due to implementation of standard dust management measures;
- Unauthorised off-road vehicle disturbance is not expected to occur, therefore reducing the risk of fauna mortality, habitat damage and soil degradation;
- The spread and establishment of weeds is predicted to remain consistent with baseline, with no significant impacts to fauna habitat quality, supported by ongoing weed surveillance and control; and
- Residual impacts will be offset via monetary contribution to the PEOF at the relevant rate.

Through the implementation of key mitigation, management and offset strategies, it is considered that the Proposal can be managed to meet the EPA objective for objective to protect flora and vegetation so that biological diversity and ecological integrity are maintained.

5.2 Terrestrial Fauna

5.2.1 EPA Objective

The relevant EPA objective for Terrestrial Fauna is "*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained*".

5.2.2 EPA Policies and Guidelines

The following EPA policies and guidelines are considered relevant to the terrestrial fauna Environmental Factor:

- Environmental Factor Guideline – Terrestrial Fauna (EPA 2016b);
- Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020f);
- Technical Guide – Sampling of short-range endemic invertebrate fauna (EPA 2016g);
- Guidance Statement No. 6 – Rehabilitation of Terrestrial Ecosystems (EPA 2006);
- Survey guidelines for Australia's threatened birds (Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) 2010a);
- Survey guidelines for Australia's threatened mammals (Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC) 2011); and
- Some assessments relevant to this factor were conducted under older guidelines that have since been replaced.

Historical guidance relevant to surveys conducted for this Proposal includes:

- EPA Guidance Statement No. 20, Sampling of Short-Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia (EPA, 2009);
- EPA Guidance Statement No. 56, Terrestrial Fauna Surveys for Environmental Impact Assessment in WA (EPA, 2004b);
- EPA Position Statement No. 3, Terrestrial Biological Surveys as an element of Biodiversity Protection (EPA, 2002);
- Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA and DEC 2010).
- Several guidelines referred to by DCCEEW are also of relevance for species listed under the EPBC Act, including:
- Survey Guidelines for Australia's Threatened Bats (DEWHA, 2010b);
- Survey Guidelines for Australia's Threatened Birds (DEWHA, 2010a);
- Survey Guidelines for Australia's Threatened Mammals (DSEWPAC, 2011a); and
- Survey Guidelines for Australia's Threatened Reptiles (DSEWPAC, 2011b).

5.2.3 Receiving Environment

5.2.3.1 Relevant Studies

The following fauna studies have been undertaken within the Proponent's mining leases, which have informed this baseline assessment (Table 5-10).

Table 5-10: Summary of Technical Studies for Terrestrial Fauna Environmental Factor

Study	Study Purpose
Corunna Downs, Terrestrial SRE Invertebrate Fauna Survey (Outback Ecology, MWH Australia Pty Ltd, 2014)	This study was conducted to collate an inventory of all the SRE for the Project as well as conducted broad scale habitat assessments to determine which were more likely to support SREs.
Corunna Downs Proposal: Vertebrate Fauna Impact Assessment (MWH Australia Pty Ltd, Stantec, 2016c)	This report identified and assessed the potential impact of the Project on broad fauna habitats, vertebrate fauna assemblages and vertebrate fauna of conservation significance. Included within this was an assessment to the impact of matters of national environmental significance, which for the purposes of this Assessment, were defined as fauna that are listed under the *Environment Protection and Biodiversity Conservation Act* 1999.
Corunna Downs Proposal, Terrestrial SRE Invertebrate Fauna Impact Assessment (MWH Australia Pty Ltd, Stantec, 2016b)	The overarching objective of this report was to assess the potential impacts of the Project on terrestrial SRE invertebrate fauna and invertebrate fauna habitats. The assessment was informed by data obtained during a terrestrial SRE invertebrate fauna trapping survey conducted between March and May 2014. This survey was supplemented by collection of specimens from broad fauna habitats during a two-phase vertebrate fauna trapping survey conducted in February/March 2014 (Phase 1) and during September/October 2016 (Phase 2).
Echolocation Survey of Bat Activity at caves CO-CA-01 and CO-CA-03 (Bat Call WA Pty Ltd, 2017a)	The Proponent commissioned Bat Call WA to undertake species presence, with an estimate of activity level for two caves (CO-CA-01 and CO-CA-03) using full spectrum Songmeter SM2 bat detectors.
Corunna Downs Cave Co-CA-03 Pilbara Leaf-nosed bat roost census (Bat Call WA Pty Ltd, 2017b)	The purpose of this survey was to conduct a census of the Pilbara Leaf-nosed Bats at cave and CO-CA-03 determine is category as a non-permanent roost.
Corunna Downs Proposal: Terrestrial Vertebrate Fauna Survey (MWH Australia Pty Ltd;Stantec, 2018)	The objective of this survey was to gather background biological information on the terrestrial vertebrate fauna, fauna assemblages and fauna habitats of the Study Area, and to identify presence and importance to conservation significant species.
Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Biologic, 2024a).	The objective of the review was to consolidate data on the significant species recorded (or likely to occur) within the Study Area and identify broad fauna habitats present to determine the importance of the Study Area to these species. A total of 78

Study	Study Purpose
	survey reports were reviewed, including 22 that occurred within or overlapped the Study Area and 56 reports within 43 km of the Study Area. Sampling effort for significant species within the Study Area included diurnal and nocturnal searches, hand searching, avifauna censuses, cave and habitat assessments, trapping (camera, harp, mist, pitfall, funnel, elliot and cage), ultrasonic and acoustic recorders, scat monitoring, cave microclimate monitoring, hormone analysis, annual monitoring, and opportunistic observations. There were no substantial limitations or constraints documented during these surveys.
Sanjiv Ridge Significant Species Monitoring (Biologic, 2025c; Biologic, 2025d)	The purposes of these reports are to satisfy the significant species monitoring conditions listed in the Stage 1 approved Significant Species Management Plan required under EPBC approval 2017/7861. The annual reporting is comprised of a field survey conducted in during the Pilbara dry period and analyses monitoring data collected throughout the year to determine any patterns or trends with three significant species (Ghost Bat, Pilbara leaf-nosed Bat and the Northern Quoll. The summary of reports is provided as follows in Appendix E: • Ghost Bat Monitoring 2024; • Pilbara Leaf-nosed Bat Monitoring 2024; and • Northern Quoll Monitoring 2024.
Short-range Endemic Invertebrate Fauna Desktop Assessment (Biologic, 2025e)	The Proponent commissioned Biologic to undertake a renewed desktop assessment for short-range endemic (SRE) invertebrate fauna in the Study Area. The objective of the review was to consolidate data on the significant species recorded (or likely to occur) within the Study Area and identify broad fauna habitats present to determine the importance of the Study Area to these species.
Short-range Endemic Invertebrate Fauna Risk Assessment (Biologic, 2025f)	The purpose of this risk assessment was to provide a review of existing fauna habitat mapping and occurrence of SRE taxa in habitat types mapped throughout the MDE and the occurrence of SRE taxa in relation to Proposed Disturbance Footprint. A Risk Assessment of SRE species values and habitat values in relation to potential impacts of the Proposal, as much as practicable within the constraints of available data.

The studies most relevant to terrestrial fauna have been provided as Appendix E. Significant species annual monitoring reports for the current reporting period (2025) have not been provided as they are still under preparation by the consultant. These reports will be made available throughout the referral process as they are received.

5.2.3.2 Conservation Significant Fauna

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Of the 31 significant species identified during the desktop assessment, eight have been confirmed in the Study Area (ghost bat, greater bilby, northern quoll, peregrine falcon, Pilbara leaf-nosed bat, Pilbara olive python, spectacled hare-wallaby and western pebble-mound mouse). Based on known species' distribution, previous records and the habitats present, three significant species are considered likely to occur (brush-tailed mulgara, long-tailed dunnart and spotted *Ctenotus*), five considered possible (fork-tailed swift, grey falcon, northern short-tailed mouse, oriental plover and Pilbara flat-headed blind-snake), one considered unlikely and the remaining 14 are considered highly unlikely to occur within the Study Area.

Those species confirmed to occur within the Study Area, along with those considered 'highly likely' or 'likely' and 'possible' to occur have been discussed in greater detail below (Table 5-11). For the remaining species considered 'unlikely' and 'highly unlikely', the Study Area and habitats within are unlikely to be solely relied upon by any of these species for their long-term persistence at a local and/or regional scale, there is an absence of suitable habitat and/or the Study Area occurs outside the known distribution for the species. The species considered unlikely or highly unlikely to occur have not been discussed further in the report. The locations of known conservation significant fauna species recorded within the MDE are shown in Figure 5-8.

Table 5-11: Conservation Significant Fauna Likelihood of Occurrence Within the Study Area

Species	EPBC Act	BC Act	Likelihood of Occurrence	Key Habitats
Ghost bat (*Macroderma gigas*)	Vulnerable	Vulnerable	Previously recorded and confirmed within the study area.	Rocky Ridges and Gorge; Drainage Lines; and Caves.
Greater bilby (*Macrotis lagotis*)	Vulnerable	Vulnerable	Previously recorded and confirmed within the study area.	Spinifex Sandplains; Riverine; and Drainage Lines.
Northern quoll (*Dasyurus hallucatus*)	Endangered	Endangered	Previously recorded and confirmed within the study area.	Rocky Ridge and Gorge; Rocky Foothill; Ironstone Ridgetop; Granite Outcrop; Drainage lines; and Riverine.

Species	EPBC Act	BC Act	Likelihood of Occurrence	Key Habitats
Peregrine falcon (*Falco peregrinus*)	-	Specially Protected	Previously recorded and confirmed within the study area.	Rocky Ridge and Gorge; Spinifex Stony Plains; Drainage Lines; and Granite Outcrop.
Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	Vulnerable	Vulnerable	Previously recorded and confirmed within the study area.	Rocky Ridge and Gorge; Caves; and Pools.
Pilbara olive python (*Liasis olivaceus barroni*)	Vulnerable	Vulnerable	Previously recorded and confirmed within the study area.	Rocky Ridge and Gorge; Rocky Foothill; Ironstone Ridgetop; Granite Outcrop; Drainage Lines; and Riverine.
Spectacled hare-wallaby (*Lagorchestes conspicillatus leichardti*)	-	P4	Previously recorded and confirmed within the study area.	Stony Rise; Spinifex Stony Plains; and Calcrete.
Western pebble-mound mouse (*Pseudomys chapmani*)	-	P4	Previously recorded and confirmed within the study area.	Spinifex Stony Plain; Ironstone Ridgetop Rocky Foothill; and Stony Rise.
Brush-tailed mulgara (*Dasycercus blythi*)	-	P4	Likely to occur in the Study area.	Spinifex Stony Plain; and Drainage Lines.
Long-tailed dunnart (*Antechinomys longicaudatus*)	-	P4	Likely to occur in the Study area.	Rocky Ridge and Gorge; and Spinifex Stony Plain.
Spotted *Ctenotus* (*Ctenotus uber johnstonei*)	-	P2	Likely to occur in the Study area.	Spinifex Stony Plain.

Species	EPBC Act	BC Act	Likelihood of Occurrence	Key Habitats
Fork-tailed swift (*Apus pacificus*)	Migratory	Migratory	Possible to occur in the study area	Airspace; and Various Habitats.
Grey falcon (*Falco hypoleucos*)	Vulnerable	Vulnerable	Possible to occur in the study area	Drainage Lines; and Open Plains.
Northern short-tailed mouse (*Leggadina lakedownensis*)	-	P4	Possible to occur in the study area	Drainage Lines; Riverine; and Seasonally Inundated Soils.
Oriental plover (*Charadrius veredus*)	Migratory	Migratory	Possible to occur in the study area	Ephemeral Wetlands; and Open Ground.
Pilbara flat-headed blind-snake (*Anilios gianei*)	-	P1	Possible to occur in the study area	Rocky Ridge; and Gorge.

775,000 mE
780,000 mE
785,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

Approved Disturbance Footprint
Proposed Disturbance Footprint
Mine Development Envelope

Fauna Records

- Pilbara leaf-nosed bat - VU
- Ghost bat - VU
- Northern quoll - EN
- Greater bilby - VU
- Pilbara olive python - VU
- Spectacled hare-wallaby (mainland) - P4
- Western pebble-mound mouse - P4

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Figure No:
	Date: 4/11/2025	0 1 2 Kilometres	Conservation Significant Fauna
	Drawn: sam.nikora		5.8
	Doc No:	Scale 1:60,000 Page size: A3	

5.2.3.3 Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*)

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Within the Pilbara, the Pilbara leaf-nosed bat is recognised as a geographically isolated population of the orange leaf nosed bat distributed across northern Australia and separated from the Pilbara population by approximately 400 km of the Great Sandy Desert. The Pilbara population is regarded as representing a single interbreeding population comprising multiple colonies.

Pilbara leaf-nosed bats typically roost in undisturbed caves, deep fissures or abandoned mine shafts. The species' limited ability to conserve heat and water means they require warm (28 – 32ºC) and very humid (85–100%) roost sites to persist in arid and semi-arid climates. Roost sites with such attributes are relatively uncommon in the Pilbara and the limiting factor of the species' distribution. During the dry season (June to November), individuals are believed to aggregate in roosts that provide a suitably warm, humid microclimate. While in the wet season (December to May), when conditions are generally wetter and more humid, individuals typically disperse roosting in seasonally suitable features. Foraging sites surrounding known or suspected roosts can be critical to the survival of the species as the species forages within the vicinity of roost caves and more broadly along waterbodies with suitable fringing vegetation supporting prey species. The species is predicted to travel up to 20 km from roost caves during nightly foraging in the dry season and up to 50 km during the wet season.

Pilbara leaf-nosed bats have been recorded within the vicinity of the Study Area since 2014. The species has been subject to annual monitoring at eight sites (caves and water features) within the Study Area and three sites (Lalla Rookh, Mt Webber and CO-CA-18) outside the Study Area since 2017. Of the known 43 caves and 40 water features within the Study Area, the species have previously been recorded at 20 caves and 10 water features in Rocky Ridge and Gorge, Ironstone Ridgetop, Rocky Foothill and Drainage Line habitat.

Habitat critical to the survival of the Pilbara leaf-nosed bat include category 1, 2 and 3 caves, as well as suitable foraging and dispersal habitat proximal (within 20 km) to critical roost caves. Of the 43 caves within the Study Area, a total of 30 have been classified as category 1- 4 Pilbara leaf-nosed roosts, including one category 1 (CO-CA-01), one category 2 (CO-CA-03) and two category 3 (CO-CA-04 and CO-CA-05) caves in Rocky Ridge and Gorge, Ironstone Ridgetop and Rocky Foothill habitats. Sixteen category 4 caves and nine potential category 4 caves are located in Rocky Ridge and Gorge, Ironstone Ridgetop, Rocky Foothill and Stony Rise habitats within the Study Area and these provide supporting roosting habitat for the Pilbara leaf-nosed bat. All habitats in the Study Area where within 20 km of these critical roosts that provide critical foraging and dispersal habitat for the species. Critical roosting habitat is also located within the vicinity of the Study Area, with regular records of the species at two category 1 caves, 45 km and 54 km from the Study Area.

Water features are often considered critical habitat for the species as they provide suitable foraging habitat and allow for dispersal, particularly along drainage lines. Pilbara leaf-nosed bats have been regularly recorded at up to 10 water features (ranging from permanent to temporarily persisting) within

the Study Area, demonstrating they provide critical or supporting habitat for the species, where proximal to roosting caves.

Overall, the combined results from the baseline, targeted, detailed and monitoring surveys confirm the presence of Pilbara leaf-nosed bats and its roosts within the Study Area. The species are regularly observed within the Study Area at caves and water features and individuals that utilise the habitats within the Study Area and immediate surrounds contribute to the larger regional Pilbara 'important' population of Pilbara leaf-nosed bats.

Annual Monitoring

Unless otherwise referenced, the following section is based on information from the Pilbara Leaf-nosed Bat Monitoring Report 2024 (Appendix E).

The annual monitoring program, continuous monitoring of bat activity and microclimate has been underway at two key monitoring sites since 2020 (CO-CA-01 and CO-CA-03). The 2024 report is the eighth annual monitoring survey undertaken of Pilbara leaf-nosed bat for the Project. The monitoring program incorporates 11 monitoring sites, comprising six impact sites located within 1 km of the Project's indicative disturbance envelope, and five control sites located more than 1 km from the Project's indicative disturbance envelope. These sites include diurnal roosts, nocturnal refuges and potential foraging habitat.

The overarching objective of this survey was to assess changes in the levels of Pilbara leaf-nosed bat activity at 11 monitoring sites which comprise roosting and foraging habitat. Any changes in bat activity levels is then discussed in relation to Project developments, seasonal fluctuations in bat activity, and environmental variables (such as rainfall and fire events).

Pilbara leaf-nosed bat calls were recorded at all six impact monitoring sites. Activity levels at all sites were lower than previously recorded in 2023. CO-CA-01, CO-CA-03 and CO-CA-05 are continuing to be used in 2024 as diurnal roosts and CO-WS-01 and CO-WS-03 continue to be visited during foraging. When compared to average baseline (pre-mining) activity levels (2014-2019), bat activity during the current monitoring period were statistically (50-98%) lower than overall baseline levels at all six impact monitoring sites. While this could indicate a response to mining activity, the level of activity recorded at all control sites was also statistically (91-100%) lower than the baseline levels, indicating there has been no difference when compared the sites closer to the mining activity.

A comparison between the baseline (2014-2019) and grouped active mining (2020-2024) monitoring periods also showed that bat activity levels recorded during active mining were 30-94% lower than those recorded during the baseline period for all 11 monitoring sites. It should be noted that the levels of activity recorded at control roosts during active mining were also (35-94%) lower than those recorded during the baseline period. As control sites also recorded significantly lower activity levels compared with baseline levels, it is likely regional environmental factors such as higher ambient and cave temperatures, rainfall and wildfire events are influencing Pilbara leaf-nosed activity within the Study Area.

760000 770000 780000

7640000 7630000 7620000

Average Calls 2024

Control

0 - 4

5 - 20

21 - 60

61 - 310

Impact

0 - 4

5 - 20

21 - 60

61 - 310

CO-CA-18

CO-WS-03

CO-WS-01

CO-CA-01

CO-CA-10

CO-CA-05

CO-WS-08

CO-WS-13

CO-CA-03

LR-MI-01

Marble Bar

MW-CA-02

LEGEND

Study Area

Wildfire December 2022

Development Envelope

Stage 1

Disturbance at end of July 2024

Disturbance at end of July 2023

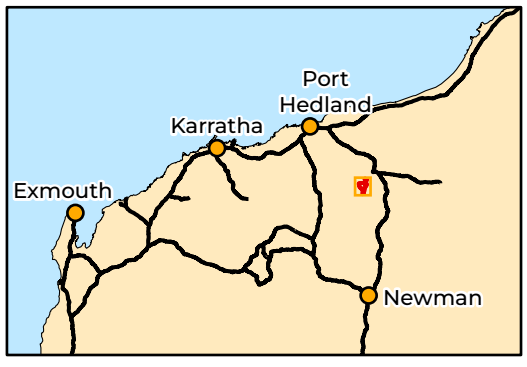
Stage 2

Disturbance at end of July 2024

Scale 1:110,000

0 2 4 Km

Coordinate System: GDA2020 MGA Zone 50
Transverse Mercator Created: 19/11/2024



Biologic

ATLAS IRON PTY LTD

Sanjiv Ridge Pilbara leaf-nosed bat Monitoring 2024

Figure 5.9: Average nightly Pilbara leaf-nosed bat activity

5.2.3.4 Ghost Bat (*Macroderma gigas*)

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Ghost bats have been commonly recorded within the vicinity of the Study Area since 2014. The species has been subject to annual monitoring at 18 caves within the Study Area and one cave (Lalla Rookh) outside the Study Area since 2017.

The Pilbara population of ghost bats is estimated to be between 1,300 and 2,000 individuals occurring over four subregions across the Pilbara, with the largest population in the Chichester subregion. The distribution of ghost bats in the Pilbara is determined by the presence of suitable roosting sites. Natural roosts generally comprise deep, complex caves beneath bluffs or low rounded hills. Centralised breeding sites in the Pilbara are largely restricted to abandoned mines in the Chichester Ranges. Ghost bats are known to move between a number of caves seasonally, or as dictated by weather conditions, and require a range of cave sites. Outside the breeding season, male bats are known to disperse widely, most likely during the wet season when conditions would allow bats to use caves that would otherwise not be suitable. Genetic studies indicate that females are likely to stay close to the maternity roosts. Recent studies show that ghost bats, both male and female, forage over much larger areas up to 12 km from their diurnal roost. It also appears that bats generally return to the same area each night, although it has been suggested that ghost bats in the arid zone are semi-transient through most areas and will readily travel large distances (>4 km). Ghost bats have a 'sit and inspect' foraging strategy; whereby they hang on a perch and visually inspect their surroundings for movement. Once their prey is detected it may be captured in the air, gleaned (i.e. taken from the surface of a substrate by a flying bat) from the ground or vegetation, or dropped on from a perch.

Critical habitat for the ghost bat includes category 1, 2 and 3 caves (where adjacent to category 1 and 2 caves), as well as suitable foraging and dispersal habitat within 12 km of critical roost caves. Of the 43 caves known within the Study Area, 40 have been classified as category 2-4 ghost bat roosts, with no category 1 roosts present. All nine of the category 2 roosts present in the Study Area and category 2 roosts in the vicinity of the Study Area, have consistently recorded ghost bat activity over time. Of these, four caves within the Study Area are considered potential maternity roosts due to the presence of pregnant females, indicated from hormone scat analysis. All category 2 caves are described as critical to the persistence of the regional population and should be considered an 'important population' in accordance with relevant guidance.

The habitats that these critical caves are located within (and up to 12 km surrounding the caves) are also considered critical foraging and dispersal habitat for the species. These habitats include Rocky Ridge and Gorge, Ironstone Ridgetop and Rocky Foothill habitat. Six additional habitats, Stony Rise, Spinifex Stony Plain, Drainage Line, Spinifex Sandplain, Riverine and Calcrete provide critical dispersal and/or foraging habitat for the species, when located within 12 km from critical roosting habitat.

The remaining 34 caves located within Rocky Ridge and Gorge, Ironstone Ridgetop, Rocky Foothill and Stony Rise habitat within the Study Area are not considered critical roosting habitat. Twenty-one of these caves provide supporting roosting habitat and include six category 3 diurnal roosts (not critical as

not nearby category 1 and 2 caves) and 15 category 4 nocturnal roosts (of which five are potential diurnal roosts due to cave characteristics and usage). An additional 10 caves are considered to potentially provide supporting roosting habitat as potential category 4 roosts, while the remaining three caves are without a roost classification and therefore provide neither critical nor supporting ghost bat roosting habitat.

The species occurrence within the Study Area represents part of an important population and the species is likely to be reliant upon critical roosting, foraging and dispersal habitat within the Study Area for the long-term persistence of the species at a local and regional scale.

Annual Monitoring

Unless otherwise referenced, the following section is based on information from the Ghost Bat Monitoring Report 2024 (Appendix E).

The 2024 survey represents the eighth annual monitoring survey of ghost bat for the Stage 1 area (and the fourth annual survey since mining development commenced). The monitoring program incorporates 19 monitoring sites, comprising 15 Impact sites located within 1 km of the Sanjiv Ridge disturbance envelope and four Control these located more than 1 km from the indicative disturbance envelope. These sites include diurnal roosts and nocturnal roosts.

For the 15 impact sites where short-term (i.e. only over duration of field survey) microclimate is monitored, cave temperatures remained relatively stable, with most caves. Diurnal roosting was recorded at sites where temperatures approximated the range preferred by ghost bats. Overall, cave microclimates at both Control and Impact sites largely mirrored fluctuations in ambient conditions.

Ghost bat calls were recorded at 13 of the 18 sites during the annual survey. No calls were recorded at CO-CA-01, CO-CA-03, CO-CA-10, or CO-CA-21. Among the sites where calls were detected, the range of calls per night varied from zero to greater than 15. Based on the timing of calls, diurnal roosting was indicated at five of the 18 sites across the seven nights of monitoring. Roosting was observed throughout the sampling period at CO-CA-05, CO-CA-33, CO-CA-35 and LR-MI-01. At CO-CA-18, roosting was indicated on most nights (five of the seven nights monitored). Overall, any observed differences across monitoring periods and between Impact and Control sites are likely to be natural variation in cave usage, rather than directly attributable to mining activity. There have been no direct impacts to the caves affecting their structure, or suitability as roosts and the current monitoring period indicates similar results recorded before mining commenced in 2020.

760000 770000 780000

7640000 7630000 7620000

Average Calls 2024

Control

0 - 4

5 - 14

15 and above

Impact

0 -4

5 - 14

15 and above

CO-CA-18

CO-CA-22

CO-CA-27

CO-CA-26

CO-CA-20

CO-CA-30

CO-CA-21

CO-CA-10

CO-CA-05

CO-CA-35

CO-CA-03

CO-CA-33

LR-MI-01

Marble Bar

CO-CA-18

CO-CA-27

CO-CA-05

CO-CA-35

CO-CA-03

CO-CA-33

LEGEND

Study Area

Wildfire December 2022

Development Envelope

Stage 1

Disturbance at end of July 2024

Disturbance at end of July 2023

Stage 2

Disturbance at end of July 2024

Scale 1:110,000

0 2 4 Km

Coordinate System: GDA2020 MGA Zone 50
Transverse Mercator Created: 09/10/2025

Biologic

Port Hedland

Karratha

Exmouth

Newman

ATLAS IRON PTY LTD

Sanjiv Ridge ghost bat monitoring 2024

Figure 5.10: Average nightly Ghost bat activity

5.2.3.5 Northern Quoll (*Dasyurus hallucatus*)

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Northern quoll has been targeted in 10 surveys across the Study Area since 2013 and within the vicinity of the Study Area since 2010. Northern quoll has been regularly recorded within the vicinity of the Study Area (within 42 km) since 2014. The species has been subject to annual monitoring at up to nine sites (including two water features CO-WS-01 and CO-WS-08) within the Study Area since 2017. The species has been recorded within Stony Rise, Spinifex Stony Plain, Rocky Ridge and Gorge, Drainage Line, Ironstone Ridgetop and Riverine habitats in the Study Area. This also includes four caves (CO-CA-24, CO-CA-30, CO-CA-33 and CO-CA-38) and three water features, two permanent (CO-WS-01 and CO-WS-16) and one semi-permanent (CO-WS-08).

The northern quoll is restricted to isolated populations in the Pilbara, Kimberley, Northern Territory, and Queensland. Northern quolls are opportunistic omnivores, consuming a wide range of invertebrates and small vertebrates also in addition to fruit, nectar, carrion and human refuse. The northern quoll is both arboreal and terrestrial, inhabiting ironstone and sandstone ridges, scree slopes, granite boulders and outcrops, drainage lines, riverine habitats, dissected rocky escarpments, open forest of lowland savannah and woodland. Rocky habitats tend to support higher densities, as they offer protection from predators and are generally more productive in terms of availability of resources. Other microhabitat features important to the species include rock cover, proximity to permanent water, and time-since last fire. Dens occur in a wide range of habitat features, including rock overhangs, tree hollows, hollow logs, termite mounds, goanna burrows and human dwellings/infrastructure, where individuals usually den alone. At present, northern quolls are relatively common in the northern Pilbara region (generally within 150 km of the coast) but are much less common in southern and south-eastern parts of the region.

In the Pilbara, abundance is lowest toward the end of winter into early spring after the mating season, as a significant proportion of adult males die off and young have not yet begun to forage independently. Conversely, the population density is thought to be highest in the summer months, prior to the mating season and when juveniles have begun foraging independently. They are reported to have relatively small home ranges in rugged habitat in the Kimberley (i.e. 2.3 ha for females and 1.8 ha for males), whereas in the western Pilbara, minimum activity areas are 75 – 443 ha for females and 5 –1,109 ha for males.

The ongoing presence of northern quoll within the Study Area is confirmed from the combined results from previous baseline, targeted, detailed and monitoring surveys. Rocky Ridge and Gorge, Rocky Foothill, Ironstone Ridgetop, Drainage Line, Riverine and Granite Outcrop habitats are considered critical habitat for northern quoll, as they provide necessary habitat for breeding, denning, and/or foraging and dispersal.

Critical foraging and dispersal habitat is defined as vegetated land occurring adjacent to (within 1 km) and connecting nearby important breeding and denning habitat. Drainage Line and Riverine habitats are likely to provide critical foraging and dispersal habitat, but only where located within 1 km of critical denning habitat. The species has previously been recorded within each of these six habitats, confirming

their importance in the Study Area and that the northern quoll utilises a variety of habitats to forage and reach critical shelter and denning habitat across the Study Area. It is likely that other habitats within the Study Area (e.g. species has also been previously recorded in Spinifex Stony Plain habitat) provide supporting foraging and/or dispersal habitat for the species. Occurrence of the northern quoll within the Study Area represents a population that is important for the long-term survival of the species. The species is likely to be reliant upon the refuge rich habitats within the Study Area, particularly Rocky Ridge and Gorge (although widespread through the region, it is of high quality in the Study Area), Rocky Foothill and Granite Outcrop habitats. These critical habitats, along with critical foraging and dispersal habitat within 1 km, are required for the long-term persistence of the species at a local and regional scale.

Annual Monitoring

Unless otherwise referenced, the following section is based on information from the Northern Quoll Monitoring Report 2024 (Appendix E).

This survey was the seventh annual monitoring survey of northern quoll for the Project. The overarching objective of this survey was to monitor the presence of northern quolls at monitoring sites and to compare this to Project developments, seasonal fluctuations and other environmental variables. A total of nine sites were monitored via deployment of camera traps over four consecutive nights during the field survey including five impact sites and four control sites.

A total of 37 individual northern quolls were identified from 61 capture events on camera traps at six of the nine monitoring sites. This included 16 capture events at three (out of five) impact sites and 45 capture events at three (out of four) control sites. The total number of individuals captured is consistent with the previous northern quoll abundances at monitoring sites, where quoll numbers ranged between 14 (2018 baseline survey) and 44 (2021 monitoring survey). None of the individuals captured during the current survey were observed at more than one site, with 62% of individuals recorded as single capture events. This suggests they were more likely transiting through monitoring sites, than residing or spending long periods of times in each location. The estimated population size at each of the sites ranged from 2.41 at NQ-MC-02 to 22.88 individuals at NQ-TR-01.

At four of the five impact sites, northern quolls were recorded at lower or similar numbers during the current survey as previously observed throughout the monitoring program. The proportion of quolls captured at grouped impact sites (n = 9, 24 %), relative to the total number captured at all monitoring sites is considerably lower than observed in previous years (51.72–68% of total individuals captured at impact sites). In summary, the results indicate that the abundance and distribution of northern quolls using the Study Area has not been adversely affected by mining activity within the area.

760000 770000 780000

7640000 7630000 7620000

Minimum Number of Individuals Recorded

2017 2018 2019 2020 2021 2022 2023 2024

NQ-SY-SL
NQ-MC-01
CO-SY-0M
NQ-TR-01
CO-WS-01
NQ-MC-02
CO-WS-08
NQ-MC-03
NQ-MC-07

LEGEND

- Study Area
- Disturbance Footprint July 2023
- Disturbance Footprint July 2023-July 2024

Fauna Habitat

- Calcrete
- Drainage Line
- Granite Outcrop
- Granitic Upland
- Ironstone Ridgetop
- Riverine
- Rocky Foothill
- Rocky Ridge and Gorge
- Sandy Plain
- Spinifex Stony Plain
- Stony Rise

Monitoring Site

- Control
- Impact

Scale 1:110,000
0 2 4 Km

Coordinate System: GDA2020 MGA Zone 50
Transverse Mercator Created: 08/10/2024

Biologic

Port Hedland
Karratha
Exmouth
Newman

ATLAS IRON PTY LTD
Sanjiv Ridge 2024 Northern Quoll Monitoring

Figure 5.11: Northern quoll activity

5.2.3.6 Greater Bilby (*Macrotis lagotis*)

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Greater bilby has been targeted in five baseline and detailed surveys across the Study Area since 2013 and 11 targeted, baseline and detailed surveys within the vicinity of the Study Area since 2010. The greater bilby has commonly been recorded within the vicinity of the Study Area on at least 169 occasions within 50 km in the previous 50 years. There is one record within the Study Area, a deceased individual observed on the Camp Access Road in 2021. Three records of the species occur within 15 km (1984-1985), 135 records between 15-30 km (1977-2022) and at least 34 records between 30-42 km (1984-2023) of the Study Area.

The greater bilby is semi-fossorial and nocturnal, remaining in their burrows during the day and intermittently during the night for rest and refuge. Greater bilby populations naturally occur as scattered solitary individuals or small groups. They are regarded as having low site fidelity and high mobility; males regularly move 3-5 km between burrows on consecutive days and have been recorded moving up to 15 km in a few weeks. This high mobility, together with low population density, ensures that the area of occupancy is often far less than the extent of occurrence. As greater bilbies are solitary in nature, lack territoriality and have large home ranges, it is likely that males adopt a roving strategy to find receptive females, consistent with an overlapping promiscuous mating system and may move in response to foraging potential.

Populations of greater bilby exist in the Pilbara bioregion (particularly within the Chichester subregion, along the Fortescue River and north-east to Goldsworthy and Shay Gap), in the Dampier bioregion (along 80 Mile Beach north to Beagle Bay) and in the Central Kimberley and Ord-Victoria Plains bioregions south of the Fitzroy and Margaret Rivers (Southgate, 1990a). The species' distribution within the Pilbara region is highly fragmented.

Greater bilbies occupy three major vegetation types - open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas. Laterite and rock feature substrates are an important part of their habitat as they support shrub species, such as *Acacia kempeana*, *A. hilliana* and *A. rhodophylla*, which have root-dwelling larvae that support a constant food source. These habitats also contain spinifex hummocks, which are quite uniform and discrete, providing runways between hummocks and enabling easier movement and foraging. Minimal ground cover is a common feature in greater bilby habitats, as it allows easy foraging. Habitat within the Pilbara bioregion seems to consist mostly of spinifex sand plain associated with major drainage line sandy terraces. In general, the distribution of greater bilbies can be limited by the availability of suitable burrowing habitat, such as dunes where burrow excavation is easier and are not found in predominantly rocky areas or mountains where they would be unable to dig suitable burrow systems or dig for food.

Greater bilby can forage broadly across habitats and can be highly mobile in response to resource availability, particularly in response to fire and post-fire regeneration. Fire has been identified as an important process in the species ecology and occurrence, particularly due to many plant species that

make up the species' diet or host prey species are fire-germinated species. As such, the species is known to utilise mosaic habitats comprising unburnt areas and areas at various stages of post-fire regeneration, often primarily utilising unburnt areas but venturing into burnt areas during foraging and dispersal movements. The utilisation of burnt areas however is often associated with post-fire regeneration of vegetation, which is heavily dependent on rainfall events to occur successfully. As rainfall throughout a large portion of the species distribution is relatively inconsistent and often associated with cyclonic activity to the north and northwest, the occurrence of rainfall, and therefore timeframes during which habitat utilisation is likely to occur on a regular basis, can be difficult to ascertain.

The single greater bilby record within the Study Area was observed in Spinifex Sandplain habitat, which represents critical breeding, foraging and dispersal habitat for the species. Riverine and Drainage Line habitats within the Study Area provide supporting breeding, foraging and dispersal habitat for the species. The low number of greater bilby records within the Study Area indicates the species is likely present in low numbers in the Study Area. This is due to the limited availability of suitable burrowing habitat such as that present within Spinifex Sandplain, Riverine and Drainage Line habitats.

Based on previous records and the ecology of the greater bilby, the species occurrence within the Study Area is unlikely to represent an important population. The species is not likely to be reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

5.2.3.7 Pilbara Olive Python (*Liasis olivaceus barroni*)

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Pilbara olive python has been targeted in five baseline and detailed surveys across the Study Area since 2013 and nine targeted, baseline and detailed surveys within the vicinity of the Study Area since 2010. The Pilbara olive python has been previously recorded on 22 occasions within the vicinity of the Study Area, in a variety of habitats including caves and water features. This includes 14 records in Drainage Line, Rocky Foothill, Rocky Ridge and Gorge, Ironstone Ridgetop and Spinifex Stony Plain habitats within the Study Area. There are eight records outside the Study Area, with one record within a cave immediately adjacent to the Study Area (75 m west) and the remaining seven records occurring between 19-60 km from the Study Area.

The Pilbara olive python is Western Australia's largest snake, averaging 2.5 metres (m), with records up to 4.5 m. The species has a dull olive-brown upper surface and is pale cream below. This species is endemic to the Pilbara and northern parts of the Gascoyne bioregions, distributed from Burrup Peninsula, Ord Ranges and Meentheena south to Nanutarra and Newman in the Pilbara, with an isolated population occurring at Mt Augustus in the Gascoyne region. This species is primarily nocturnal and tends to shelter amongst rocky habitats, in small caves or under vegetation during the day. During summer months they will emerge from daytime shelters soon after dark and continue to move until the early hours of the morning. In the winter months, the species is primarily nocturnal, although adult pythons can sometimes be found basking in the morning sun. The breeding season of the Pilbara olive python takes place in the cooler months, which extends from June to August, and males will travel up

three kilometres in search of a mate. The species is a well-adapted opportunistic ambush predator, and common prey items include rock-wallabies, small euros, fruit bats, waterbirds, doves/pigeons and is also likely to include instances of northern quoll and other small mammals.

The species commonly inhabits moist areas such as gorges, rivers, pools and surrounding hills, but can be found in a range of habitats. In the Hamersley region, the Pilbara olive python is most often encountered in the vicinity of permanent waterholes in rocky ranges or among riverine vegetation. The species is likely to be attracted to these areas due to the productivity and abundance of suitably sized prey.

The species have been recorded in the critical breeding, foraging and dispersal Rocky Ridge and Gorge habitat, along with supporting foraging and dispersal Rocky Foothill, Ironstone Ridgetop and Drainage Line habitats, often in association with caves and water features. Granite Outcrop and Riverine habitats also provide supporting foraging and dispersal habitat following significant rainfall events. Where the species has been recorded within other habitats in the Study Area (e.g. Spinifex Stony Plain), they are likely utilising this habitat to disperse to critical or supporting breeding, foraging and dispersal habitat within the Study Area.

The species occurrence within the Study Area is unlikely to represent an important population, however the species is likely to be reliant upon critical habitat present within the Study Area, particularly the high-quality Rocky Ridge and Gorge habitat, for the long-term persistence of the species at a local, but not regional, scale.

5.2.3.8 Peregrine Falcon (*Falco peregrinus*)

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Peregrine falcon has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010. The peregrine falcon has been recorded previously on seven occasions in the vicinity of the Study Area between 2001 and 2020, including three records in Rocky Ridge and Gorge and Spinifex Stony Plain habitats within the Study Area. The remaining records occur between 5-43 km from the Study Area.

The peregrine falcon is a medium-sized raptor found throughout Australia. It preys almost entirely on birds, but will occasionally take small reptiles, mammals or insects. Suitable habitat includes cliffs, gorges, and timbered watercourses or in association with rivers, wetlands, plains, open woodlands, pylons, spires and buildings. Preferred nesting sites are on tall cliffs, although they may occasionally use tall trees along drainage lines and abandoned nests of other large bird species.

The species has been recorded on three separate occasions in Rocky Ridge and Gorge and Spinifex Stony Plain habitats within the Study Area. The Rocky Ridge and Gorge, Granite Outcrop and Drainage Line habitats provide potentially important nesting, foraging and dispersal habitat for the species, where tall cliffs or large trees are present, and particularly areas in association with major watercourses. Most other habitat types within the Study Area are also likely to be important for foraging and dispersal to varying extents, particularly Stony Rise, Rocky Foothill, Spinifex Sandplain and Riverine

habitats; however, the species' presence is likely to be dependent upon the availability of nesting sites. While nesting habitat is present within the Study Area, the species has not been confirmed. Although it is likely the Study Area doesn't support an important population of peregrine falcon. In summary, the survey results indicate that the Study Area does not support an important population of peregrine falcon. The species may occur locally within the Study Area at opportunistic nesting sites.

5.2.3.9 Western Pebble-mound Mouse (*Pseudomys chapmani*)

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Biologic Environmental Survey Pty Ltd, 2024) (Appendix E).

Western pebble-mound mouse has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010.

The western pebble-mound mouse has experienced a significant decline in their range through the Gascoyne and Murchison and is now considered endemic to the Pilbara. This species almost exclusively occurs on the gentler slopes of rocky ranges and low undulating hills where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs.

The western pebble-mound mouse was recorded via primary (i.e. direct observation) and secondary (i.e. active and inactive mounds) evidence on 29 occasions within the vicinity of the Study Area from 1993 to 2016. This includes 19 records within the Study Area in Spinifex Stony Plain, Ironstone Ridgetop and Stony Rise habitats. Three records were within 15 km of the Study Area, four records within 30 km and the remaining three records of the species occurred within 43 km of the Study Area. The western pebble-mound mouse has been confirmed to occur from the combined results of previous baseline and targeted surveys in the Study Area, including within Spinifex Stony Plain, Ironstone Ridgetop and Stony Rise habitats. The presence of small stones required for mound building within these habitats (and Rocky Foothill) make them important to the survival of the species. However, these four habitats are generally widespread throughout the Pilbara bioregion and common within the Study Area.

The number of records in the surrounding area and extent of the preferred habitats outside the Study Area suggests it is unlikely the Study Area supports an important population of the western pebble-mound mouse nor are habitats within required for the species local or regional persistence.

5.2.3.10 Spectacled Hare-Wallaby (*Lagorchestes conspicillatus leichardti*)

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Spectacled hare-wallaby has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010. The spectacled hare-wallaby occupies *Triodia* spp. hummock grasslands, tussock grasslands and *Acacia* shrublands. This species is nocturnal, often solitary and breeding continuously through the year, with peaks in March and September.

The spectacled hare-wallaby has been recorded on six occasions within the vicinity of the Study Area These include five records (scats, shelter and individuals) in 2014 within Stony Rise habitat in the Study Area, and one record of the species 16 km west-south-west of the Study Area in 1986.

Previous records of the species within Stony Rise habitat indicate this habitat is important breeding, foraging and dispersal habitat within the Study Area. Although there are no records of the species in Rocky Foothill, Spinifex Stony Plain, Spinifex Sandplain and Calcrete habitats, these also provide potentially important habitat for the species, particularly where proximal to breeding habitat. The species has been recorded in a small patch of long unburnt hummock grasses, surrounded by large expanses of habitat burnt in 2013. It is likely that these important breeding and/or foraging and dispersal habitats provide suitable habitat for the spectacled hare-wallaby in areas, primarily where the spinifex is long unburnt.

Based on previous records and ecology of the spectacled hare-wallaby, the species occurrence within the Study Area is unlikely to represent an important population. The species is not likely to be reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

5.2.3.11 Broad Fauna Habitat

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Eleven broad vertebrate fauna habitat types have previously been identified across the Study Area (MWH, 2016a) and comprising, in decreasing order of extent:

- Stony Rise (7,303 ha, 41%);
- Rocky Foothill (4,458 ha, 24%);
- Spinifex Stony Plain (1,876 ha, 10%);
- Rocky Ridge and Gorge (1,766 ha, 9%);
- Ironstone Ridgetop (1,543 ha, 8%);
- Drainage Line (502 ha, 3%);
- Granite Upland (238 ha, 1%);
- Calcrete (235 ha, 1%);
- Spinifex Sandplain (195 ha, 1%);
- Riverine (167 ha, 1%); and
- Granite Outcrop (163 ha, 1%).

Stony Rise (41%) and Rocky Foothill (24%) were the dominant broad fauna habitats within the Study Area, with Granite Upland, Calcrete, Spinifex Sandplain, Riverine and Granite Outcrop making up 1% each of the total Study Area (Table 5-12).

All 11 habitats are considered locally significant as they provide critical or important roosting, breeding, foraging and/or dispersal habitat for several significant species and have the potential to support permanent, semi-permanent or seasonally inundated water sources. Taking into consideration the occurrence of critical roosting habitat and proximal foraging habitat surrounding critical roost sites, the number of locally significant habitats within the Study Area has increased from those previously identified (Rocky Ridge and Gorge, Drainage Line, Riverine and Granite Outcrop) in earlier studies (MWH, 2018) to include all habitats. Similar to MWH (2018), one habitat, Rocky Ridge and Gorge are considered of regional significance, due to the quality of the habitat within the Study Area and presence of habitat features such as caves and water features critical to the survival of several significant species. Caves within the Study Area classified category 1, 2 and 3 (where applicable) Pilbara leaf-nosed bat and/or ghost bat roosts, are also considered regionally significant as they provide critical roosting habitat for the two species' Pilbara population.

Table 5-12: Broad Fauna Habitats

Habitat	Distinguishing Habitat Characteristics	Extent of Habitat	Habitat for Significant Species	Representative Photo
Stony Rise 7,303 ha (41%)	Scattered *Corymbia hamersleyana* trees over scattered-open shrubland dominated by *Grevillea wickhamii*, *Acacia inaequilatera* and/or *Hakea lorea* over open to dense hummock grassland on skeletal soils of brown clay-loam. Habitat Condition: Very Good – Excellent Observed Disturbance: Fire, cattle grazing and trampling.	Widespread throughout the Pilbara bioregion. Most common habitat present within the Study Area, providing transitionary habitat between Spinifex Stony Plain and Rocky Foothill habitats. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Ghost bat – foraging and dispersal where proximal (<12 km) to critical roosting habitat; and • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat for: • Peregrine falcon – foraging and dispersal; • Spectacled hare wallaby – breeding, foraging and dispersal (where long unburnt); • Spotted *Ctenotus* – breeding and foraging; and • Western pebble-mound mouse – breeding, foraging and dispersal. Supporting habitat for: • Fork-tailed swift – foraging and dispersal; and • Northern quoll – foraging and dispersal.	
Rocky Foothill 4, 458 ha (24%)	Scattered *Corymbia hamersleyana* trees over scattered- open shrubland dominated by *Grevillea wickhamii* and/or *Acacia inaequilatera* over hard spinifex on stony red clay loam. Habitat Condition: Good – Excellent Observed Disturbance: Fire, tracks.	Widespread throughout the Pilbara bioregion. Commonly occurs in the Study Area as transitionary habitat between Stony Rises and Rocky Ridge and Gorge habitats. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Ghost bat – roosting, along with foraging and dispersal where proximal (<12 km) to critical roosting habitat; • Northern quoll – breeding (where outcropping occurs), foraging and dispersal; and • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat for: • Long-tailed dunnart – breeding, foraging and dispersal; • Peregrine falcon – foraging and dispersal; • Pilbara flat-headed blind-snake – breeding and foraging; • Spectacled hare wallaby – breeding, foraging and dispersal (where long unburnt); • Spotted *Ctenotus* – breeding and foraging; and • Western pebble mound mouse – breeding, foraging and dispersal. Supporting habitat for: • Fork-tailed swift – foraging and dispersal; and • Pilbara olive python – foraging and dispersal.	

Habitat	Distinguishing Habitat Characteristics	Extent of Habitat	Habitat for Significant Species	Representative Photo
Spinifex Stony Plain 1,876 ha (10%)	Sparse woodland of *Corymbia hamersleyana* over mixed open shrubland dominated by *Acacia pyrifolia*, *Acacia inaequilatera*, *Senna* spp, and *Grevillia wickhamii* over dense hummock grassland of *Triodia* spp. and herbs on reddish brown sandy loam. Habitat Condition: Very Good – Excellent Observed Disturbance: Fire, historical mining, tracks.	Widespread throughout the Pilbara bioregion. Relatively common within the Study Area, predominantly in the eastern section of Study Area and isolated sections along the western boundary. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Ghost bat – foraging and dispersal habitat where proximal (<12 km) to critical roosting habitat; • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat for: • Brush-tailed mulgara – breeding, foraging and dispersal; • Spectacled hare wallaby – foraging and dispersal (where long unburnt); • Spotted *Ctenotus* – breeding and foraging; and • Western pebble mound mouse – breeding, foraging and dispersal. Supporting habitat for: • Fork-tailed swift – foraging and dispersal; and • Grey falcon – foraging and dispersal.	
Rocky Ridge and Gorge 1,766 ha (9%)	Gorges dominated by *Eucalyptus camaldulensis* and/or *Melaleuca argentea* with scattered *Ficus* spp. over mixed *Acacia* spp. shrubland and *Triodia* and *Eriachne* grasses. Ridges with scattered *Eucalyptus leucophloia* and *Ficus* spp. with scattered *Acacia* spp. over *Triodia* spp. hummock grassland. Contain significant microhabitats including permanent and semi-permanent water sources, outcropping ironstone, gorges, caves, crevices and fallen boulders. Habitat Condition: Very Good – Excellent Observed Disturbance: Fire, mining exploration.	Widespread throughout the Pilbara bioregion. Similar habitat of similar value not common within the Chichester subregion. Relatively common within the Study Area, often in association with Ironstone Ridgetop habitat. Significant habitat within Study Area. Regionally significant due to habitat quality.	Critical habitat for: • Ghost bat – roosting, along with dispersal where proximal (<12 km) to critical roosting habitat; • Northern quoll – breeding, foraging and dispersal; • Pilbara leaf-nosed bat – roosting, along with foraging and dispersal where proximal (<20 km) to critical roosting habitat; and • Pilbara olive python – breeding, foraging and dispersal. Important habitat for: • Long-tailed dunnart – breeding, foraging and dispersal; and • Peregrine falcon – nesting, foraging and dispersal. Supporting habitat for: • Fork-tailed swift - foraging and dispersal; and • Pilbara flat-headed blind-snake – breeding and foraging.	

Habitat	Distinguishing Habitat Characteristics	Extent of Habitat	Habitat for Significant Species	Representative Photo
Ironstone Ridgetop 1, 543 ha (8%)	Sparse woodland and mallee woodland of *Eucalyptus leucophloia* scattered trees, over shrubland dominated by *Grevillea wickhamii*, *Acacia orthocarpa* and mixed *Acacia* spp. over open dense *Triodia* spp. hummock grassland on red brown skeletal soils. Habitat Condition: Good – Excellent Observed Disturbance: Fire, mining exploration.	Widespread throughout the Pilbara bioregion. Relatively common in the Study Area, primarily found in the central/ eastern section of the Study Area and represents the most elevated habitat within the Study Area. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Ghost bat – roosting; • Northern quoll – breeding, foraging and dispersal; and • Pilbara leaf-nosed bat – roosting, along with foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat for: • Long-tailed dunnart – breeding, foraging and dispersal; and • Western pebble mound mouse – breeding, foraging and dispersal. Supporting habitat for: • Fork-tailed swift - foraging and dispersal; and • Pilbara olive python – foraging and dispersal.	
Drainage Line 502 ha (3%)	Open woodland dominated by *Eucalyptus victrix* and/or *E. camaldulensis*, over open-dense shrubland of *Acacia tumida* and/or *Melaleuca glomerata* with scattered/clumps of tussock grasses, *Cenchrus ciliaris*, *Eriachne* spp. and *Triodia* hummock grasses on river sand and alluvial loam. Many microhabitats occur in this habitat including permanent to semi-permanent water sources, large trees and hollows, suitable burrowing substrate and an accumulation of leaf litter. Habitat Condition: Good Observed Disturbance: Cattle grazing and trampling, weeds and fire.	Widespread, yet uncommon in the Pilbara bioregion, as they occur as linear corridors (small in overall area) that wind through the landscape connecting multiple habitat types. Widespread distribution, yet uncommon throughout the Study Area. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Ghost bat – foraging and dispersal where proximal (<12 km) to critical roosting habitat; • Grey falcon – nesting, foraging and dispersal; • Northern quoll – foraging and dispersal where proximal (<1 km) to critical denning habitat; and • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat for: • Northern short-tailed mouse – breeding, foraging and dispersal; • Peregrine falcon – nesting, foraging and dispersal; • Pilbara flat-headed blind-snake – breeding and foraging; and • Spotted *Ctenotus* – breeding and foraging. Supporting habitat for: • Fork-tailed swift - foraging and dispersal; • Greater bilby – foraging and dispersal; • Migratory waterbirds – foraging and dispersal (following significant rainfall events); and • Pilbara olive python – foraging and dispersal.	

Habitat	Distinguishing Habitat Characteristics	Extent of Habitat	Habitat for Significant Species	Representative Photo
Granite Upland 238 ha (1%)	Very open shrubland of slender *Acacia* spp. over *Triodia* spp. on shallow sandy soils over sheets and outcropping of granite stones and boulders. Habitat Condition: Very Good – Excellent Observed Disturbance: Fire, cattle trampling and grazing, tracks.	Limited extent throughout the Pilbara bioregion. Limited occurrence within the Study Area, restricted to small areas in the western and north-east sections of the Study Area. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Supporting habitat for: • Fork-tailed swift - foraging and dispersal.	
Calcrete 235 ha (1%)	Scattered *Corymbia hamersleyana* over scattered *Acacia inaequilatera* shrubland over low hard hummock grassland of *Triodia* spp. on clay-loam with calcrete. Habitat Condition: Very Good Observed Disturbance: Fire, cattle trampling and grazing, tracks.	Limited extent throughout the Pilbara bioregion. Limited to small areas in the western and central sections of the Study Area. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Ghost bat – foraging where proximal (<12 km) to critical roosting habitat; and • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat for: • Spectacled hare wallaby – foraging and dispersal (where long unburnt). Supporting habitat for: • Fork-tailed swift - foraging and dispersal.	

Habitat	Distinguishing Habitat Characteristics	Extent of Habitat	Habitat for Significant Species	Representative Photo
Spinifex Sandplain 195 ha (1%)	Low dense *Acacia* spp. shrubland over dense soft *Triodia* spp. hummock grassland on shallow red/orange sand with underlying hardpan Habitat Condition: Very Good – Excellent Observed Disturbance: No disturbance observed.	Limited extent throughout the Pilbara bioregion. Limited occurrence within the Study Area, restricted to the north-east section. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Ghost bat – foraging and dispersal where proximal (<12 km) to critical roosting habitat; • Greater bilby – breeding, foraging and dispersal; and • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat: • Brush-tailed mulgara – breeding, foraging and dispersal; • Peregrine falcon – foraging and dispersal; and • Spectacled hare wallaby – foraging and dispersal (where long unburnt). Supporting habitat for: • Fork-tailed swift - foraging and dispersal; and • Grey falcon – foraging and dispersal.	
Riverine 167 ha (1 %)	Woodland of *Eucalyptus victrix*, *E. camaldulensis* and/or *Melaleuca argentea* over shrubland of *Hakea lorea*, *Melaleuca glomerata* and/or *Grevillea pyramidalis* with pockets of *Triodia* spp. hummock grassland and **Cenchrus* ciliaris tussock grassland on brown sandy river sands and brown sandy loam. Contains significant microhabitats to support vertebrate fauna assemblages including permanent and semi-permanent water sources, large trees and hollows, suitable burrowing substrate and accumulation of leaf litter. Habitat Condition: Very Good to Degraded Observed Disturbance: Cattle grazing and trampling and camel grazing, weeds.	Limited extent throughout the Pilbara bioregion. Limited occurrence within the Study Area, isolated to the north-east and eastern margins. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Ghost bat – foraging and dispersal where proximal (<12 km) to critical roosting habitat; • Grey falcon – nesting, foraging and dispersal; • Northern quoll – foraging and dispersal where proximal (<1 km) to critical denning habitat; and • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat for: • Peregrine falcon – foraging and dispersal; • Pilbara flat-headed blind-snake – breeding and foraging; • Northern short-tailed mouse – breeding, foraging and dispersal; and • Spotted *Ctenotus* – breeding and foraging. Supporting habitat for: • Fork-tailed swift - foraging and dispersal; • Greater bilby – breeding, foraging and dispersal; • Migratory waterbirds – foraging and dispersal (following significant rainfall events); and • Pilbara olive python – foraging and dispersal (following significant rainfall events, where proximal to Drainage Line or Rocky Ridge and Gorge habitats).	

Habitat	Distinguishing Habitat Characteristics	Extent of Habitat	Habitat for Significant Species	Representative Photo
Granite Outcrop 163 ha (1%)	Very sparse *Acacia* spp. woodland over shrubland of *Acacia* spp. and *Triodia* spp. hummock grassland on stony red sand, interspersed with substantial granite boulder piles. Contains significant microhabitats including crevices, cracks and boulders. Habitat Condition: not assessed	Limited extent throughout the Pilbara bioregion. Limited occurrence within the Study Area, isolated to the southern section. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • Northern quoll – breeding, foraging and dispersal habitat; and • Pilbara leaf-nosed bat – foraging and dispersal where proximal (<20 km) to critical roosting habitat. Important habitat: • Peregrine falcon – nesting, foraging and dispersal. Supporting habitat for: • Fork-tailed swift - foraging and dispersal; and • Pilbara olive python – foraging and dispersal (following significant rainfall events, where proximal to Drainage Line or Rocky Ridge and Gorge habitats).	

770,000 mE
775,000 mE
780,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

Mine Development Envelope
Proposed Disturbance Footprint
Approved Disturbance Footprint
Fauna Study Area
Broad Fauna Habitat
Calcrete
Drainage Line
Granitic Uplands
Ironstone Ridgetop
Riverine
Rocky Foothills
Rocky Ridge and Gorge
Spinefex Stony Plain
Stony Rise
Sandy Plain

HANCOCK IRON ORE

File Name: GIS_3874.aprx
Date: 30/07/2025
Drawn: justin.venables
Doc No:

Projection: GDA 1994 MGA Zone 50
0 0.5 1 2
kilometres
Scale 1:90,000 Page size: A4

N

Broad Fauna Habitats

Figure No: 5.12

5.2.3.12 Habitat Features

A number of important microhabitats are present within the MDE, including caves and water sources (i.e., pools). These features provide important sources of shelter, food and water for species of conservation significance. Many of these features are located within the Rocky Ridge and Gorge habitat and are not commonly recorded in other broad habitat types of the Proposal area. Further detail on significant habitat features is provided in the following sections.

5.2.3.12.1 Caves

Forty-three caves with the potential to provide roosting habitat for ghost bats and/or Pilbara leaf-nosed bats are known within the Study Area to date. An additional four caves are present within 12 km of the Study Area. Rock shelters that may provide some protection for ghost bat and Pilbara leaf-nosed bats within the Study Area have not been included as they are unlikely to provide critical or important roosting habitat for the species. Additional caves are known to occur within the broader Pilbara bioregion that provide critical and supporting habitat for the ghost bat population and further information regarding these caves and ghost bat usage can be found from surveys detailed in Appendix E.

Of the total 43 caves known to occur within the Study Area, 11 are currently subject to long-term monitoring for ghost bat and/or Pilbara leaf-nosed bat activity as part of the Sanjiv Ridge ghost bat and Pilbara leaf-nosed bat monitoring program. An additional three caves (CO-CA-18, Lalla Rookh and Mt Webber) are located outside the Study Area and are included as control caves for the annual monitoring program. Of the 43 caves within the Study Area, 26 occur within Rocky Ridge and Gorge habitat, nine within Rocky Foothill, seven in Ironstone Ridgetop and one in Stony Rise habitat. Previous cave searching survey effort focussed mostly on the areas of Rocky Ridge and Gorge and Ironstone Ridgetop habitats most likely to have the highest quality caves.

Table 5-13: Monitoring Sites Subject to Long Term Monitoring

Site	Site Type	Roost Category	Description
Impact Sites			
CO-CA-01	Cave	Category 1: permanent diurnal roost	Cave located at top of rocky ridge face in rocky ridge and gorge habitat. A spring system is located ~40m from the entrance. The cave contains two main chambers connected by a constriction, with Pilbara leaf-nosed bats observed roosting in the rear chamber
CO-CA-03	Cave	Category 2: non-permanent maternity roost	Cave located at the bottom of a major gorge in rocky ridge and gorge habitat. The cave is located next to water seepage which feeds a water source at the cave entrance. The cave is characterised by two main chambers connected by a constriction, with Pilbara leaf-nosed bats observed roosting in

Site	Site Type	Roost Category	Description
			rear chamber. Water seepage has been observed intermittently from the cave walls.
CO-CA-05	Cave	Category 3: transitory diurnal roost	Cave in rocky ridge and gorge habitat.
CO-CA-10	Cave	Category 4: nocturnal refuge	Cave in rocky ridge and gorge habitat.
CO-WS-01	Foraging/drinking location	-	Permanent water source in rocky ridge and gorge habitat
CO-WS-03	Foraging/drinking location	-	Semi-permanent water source in rocky ridge and gorge habitat
Control Sites			
CO-CA-18	Cave	Category 4: nocturnal refuge	Cave in rocky ridge and gorge habitat
MW-CA-02	Cave	Category 1: permanent diurnal roost	Cave situated along ridge in rocky ridge and gorge habitat. Entrance is small leading to a wide, shallow chamber divided by low ceiling. Cave reaches back to an unknown distance (view obscured by ceiling). Bats observed roosting in rear of cave
LR-MI-01	Mine Adit	Category 1: permanent diurnal roost	Abandoned mine adit in undulating grassland plain at the base of a large ironstone ridge system. Old vertical mine adit in plains serves as entrance to roost. Surrounding vegetation mainly consists of *Triodia* under sparse *Acacia inaequilatera*.
CO-WS-08	Foraging/drinking location	-	Semi-permanent water source in rocky ridge and gorge habitat
CO-WS-13	Foraging/drinking location	-	Semi-permanent water source in rocky ridge and gorge habitat

760000 770000 780000

7640000 7630000 7620000

CO-CA-18
CO-CA-46 CO-CA-45
CO-CA-49 CO-CA-48
CO-CA-43 CO-CA-06
CO-CA-36
CO-CA-37
CO-CA-22 CO-CA-31
CO-CA-25 CO-CA-29
CO-CA-20
CO-CA-30
CO-CA-32 CO-CA-38
CO-CA-19
CO-CA-21 CO-CA-17
CO-CA-07
CO-CA-01
CO-CA-15
CO-CA-39
CO-CA-35 CO-CA-05
CO-CA-40 CO-CA-16
CO-CA-42
CO-CA-12
CO-CA-02 CO-CA-13
CO-CA-03
CO-CA-04
CO-CA-47
CO-CA-11
CO-CA-41
CO-CA-33

Hillside - Marble Bar Rd

Lalla Rookh
Marble Bar
Mt Webber

LEGEND

Study Area
Local Road

Cave Category

Ghost Bat
- Category 2
- Category 3
- Category 4
- Potential Category 4
- Not classified

Pilbara Leaf-nosed Bat
- Category 1
- Category 2
- Category 3
- Category 4
- Potential Category 4
- Not classified

Scale 1:110,000
0 2 4 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 11/09/2024

Port Hedland
Karratha
Exmouth
Newman

Biologic

ATLAS IRON PTY LTD
Sanjiv Ridge Project
Consolidated Significant Species Vertebrate Fauna Assessment

Figure 5.13: Known caves recorded in the Study Area

760000
770000
780000
7640000
7630000
7620000

IBRA Region
Pilbara
IBRA Subregion
Chichester
Fortescue
Hamersley
Roebourne
Port Hedland
Karratha
Newman

CO-CA-18
CO-WS-03
CO-WS-01
CO-CA-01
CO-CA-10
CO-CA-05
CO-WS-08
CO-WS-13
CO-CA-03

LR-MI-01
Marble Bar
MW-CA-02

LEGEND

Study Area

Fauna Habitat

Calcrete
Drainage Line
Granite Outcrop
Granitic Upland
Ironstone Ridgetop
Riverine
Rocky Foothill
Rocky Ridge and Gorge
Sandy Plain
Spinifex Stony Plain
Stony Rise

Monitoring Site

Control
Impact

Scale 1:110,000
0 2 4 Km
Coordinate System: GDA2020 MGA Zone 50
Transverse Mercator Created: 12/11/2024

Port Hedland
Karratha
Exmouth
Newman

Biologic

ATLAS IRON PTY LTD

Sanjiv Ridge Pilbara leaf-nosed bat Monitoring 2024

Figure 5.14: Caves Under Long Term Monitoring

5.2.3.12.2 Pools

Unless otherwise referenced, the following section is based on information from the Consolidated Desktop Vertebrate Fauna Assessment – Significant Species (Appendix E).

Forty water features are known within the Study Area, including eight permanent, four potentially permanent, nine semi-permanent, 17 likely semi-permanent, one temporary and one unknown. Of these, 19 occur within Rocky Ridge and Gorge habitat, seven within Drainage Line, six in Rocky Foothill, five within Stony Rise and three are located in Ironstone Ridgetop habitat. Five water features are currently being monitored in accordance with the Sanjiv Ridge Significant Species Management Plan and Monitoring Strategy, including CO-WS-01, CO-WS-03, CO-WS-08, CO-WS-13 and CO-WS-14. An additional eight water features are known to occur within 5 km of the Study Area, including one semi-permanent, two potentially permanent and five likely semi-permanent.

Water features are typically considered to provide critical or supporting habitat for significant species. For ghost bat and Pilbara leaf-nosed bat, they can provide significant drinking and foraging sources when located within 12 and 20 km, respectively, of a critical roost site. For Pilbara olive python, water features can often act as primary foraging locations and for that reason the species is more often than not associated with such features, both natural and artificial (Pearson, 1993). Additionally, water features may also provide foraging habitat for migratory waterbirds on occasions of inundation following periods of significant rainfall events. This occurrence is likely to be seasonal and irregular.

760000 770000 780000

7650000 7640000 7630000 7620000

CO-WS-21
CO-WS-22
CO-WS-23
CO-WS-24
CO-WS-25
CO-WS-26
CO-WS-27
CO-WS-28
CO-WS-44
CO-WS-29
CO-WS-45
CO-WS-03
CO-WS-43
CO-WS-20
CO-WS-04
CO-WS-15
CO-WS-40
CO-WS-30
CO-WS-46
CO-WS-38
CO-WS-47
CO-WS-37
CO-WS-06
CO-WS-36
CO-WS-32
CO-WS-48
CO-WS-35
CO-WS-01
CO-WS-18
CO-WS-10
CO-WS-33
CO-WS-12
CO-WS-34
CO-WS-11
CO-WS-08
CO-WS-05
CO-WS-13
CO-WS-14
CO-WS-09
CO-WS-07
CO-WS-02
Hillside - Marble Bar Rd

CO-WS-29
CO-WS-03
CO-WS-42
CO-WS-43
CO-WS-41
CO-WS-19
CO-WS-04
CO-WS-16
CO-WS-20
CO-WS-40
CO-WS-30
CO-WS-15
CO-WS-39
CO-WS-38
CO-WS-46
CO-WS-47
CO-WS-37
CO-WS-36
CO-WS-06
CO-WS-48
CO-WS-35
CO-WS-31
CO-WS-32
CO-WS-01
CO-WS-10
CO-WS-18
CO-WS-12
CO-WS-17
CO-WS-33
CO-WS-34

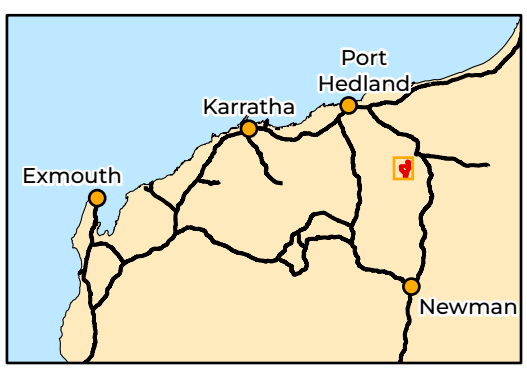
LEGEND

Study Area
Local Road

Water Feature
Permanent
Potentially Permanent
Semi-permanent
Likely Semi-permanent
Temporary
Unknown

Scale 1:125,000
0 2 4 6 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 11/09/2024



Biologic

ATLAS IRON PTY LTD
Sanjiv Ridge Project
Consolidated Significant Species Vertebrate Fauna Assessment

Figure 5.15: Known water features recorded in the Study Area

770,000 mE
775,000 mE
780,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

CO-CA-06
CO-WS-03
CO-WS-19
CO-WS-16
CO-WS-04
CO-WS-15
CO-CA-22
CO-CA-26
CO-CA-27
CO-CA-29
CO-CA-24
CO-CA-20
CO-WS-06
CO-CA-17
CO-CA-09
CO-CA-07
CO-CA-10
CO-CA-01
CO-CA-08
CO-CA-15
CO-CA-05
CO-CA-21
CO-WS-17
CO-WS-18
CO-WS-14
CO-CA-03
CO-WS-11
CO-WS-08
CO-CA-12
CO-CA-02
CO-CA-13
CO-WS-05
CO-WS-13
CO-WS-14
CO-CA-04
CO-WS-09

Mine Development Envelope
Fauna Study Area
Approved Disturbance Footprint
Proposed Disturbance Footprint
Significant Habitat
Ephemeral Pool
Perennial Pool
Caves

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Figure No:
	Date: 11/08/2025	0 1 2 Kilometres	5.16
	Drawn: justin.venables		
	Doc No:	Scale 1:60,000 Page size: A3	

Key Terrestrial Fauna Habitat Features

5.2.3.13 Short Range Endemic Invertebrate Fauna

Unless otherwise referenced, the following section is based on information from the Sanjiv Ridge Stage 1 SRE Desktop Assessment (Appendix E).

Five databases were searched for SRE invertebrate fauna records and relevant ecological communities, within and surrounding the Study Area up to a 40 km radius. Records of mygalomorph spiders, selenopid spiders, harvestmen, pseudoscorpions, scorpions, centipedes, millipedes, land snails, and terrestrial isopods were extracted. A list of 70 taxa representing Confirmed and Potential SRE including indeterminate records was generated from this data. Four taxa are considered Confirmed SRE (three millipedes and one pseudoscorpion), while the remaining 66 are considered Potential SRE based on the records available and knowledge of higher taxonomy where species designation is indeterminate.

Ten Potential SRE taxa were collected from within the boundaries of the Study Area, comprising two spiders, two pseudoscorpions, two scorpions, one snail and three isopods. The likelihood of occurrence analysis found a further seven Potential SRE taxa were considered Highly Likely to occur, and seven considered Likely to occur, while the remaining 42 taxa were considered Possible or Unlikely to occur within the Study Area.

Records of the Confirmed SRE millipede taxa *Antichiropus apricus, Antichiropus cunicularis* and *Antichiropus nicholasi* all occur within 40 km of the Study Area. Two were considered Possible to occur, *A. apricus* (14.70 km) *and A. nicholasi* (~11.55 km) and *A. cunicularis* was considered Unlikely. *Antichiropus* millipedes are known to inhabit restricted habitat types, such as rocky outcrops or deep gorges, and their above ground activity is limited to narrow time periods where the moisture levels allow for foraging and mating.

Table 5-14: Confirmed SRE Taxa with Likelihood of Occurrence in the Study Area

Higher Taxon	Taxon	SRE status	Distance from Study Area (km)	Likelihood of occurrence
Anamidae	*Aname* `sp. indet`	Potential	1.43	Highly Likely
Barychelidae	*Aurecocrypta* `sp. indet`	Potential	2.35	Likely
Selenopidae	*Karaops* `sp. 2`	Potential	Within	Recorded
Selenopidae	*Karaops* `sp. indet.`	Potential	0.02	Likely
Feaellidae	*Feaella tealei*	Confirmed	6	Possible
Olpiidae	*Austrohorus* `sp. indet.`	Potential	2.97	Likely
Olpiidae	*Beierolpium* `8/3`	Potential	1.92	Highly Likely
	Beierolpium `sp. indet.`	Potential	2.61	Likely
	Indolpium `sp. indet.`	Potential	Within	Recorded
	Indolpium `sp. CRD01`	Potential	0.43	Highly Likely
	Indolpium `sp. CRD02`	Potential	1.06	Highly Likely

Higher Taxon	Taxon	SRE status	Distance from Study Area (km)	Likelihood of occurrence
	Xenolpium `sp. indet.`	Potential	Within	Recorded
	Xenolpium `sp. CRD01`	Potential	1.06	Highly Likely
Buthidae	*Lychas* `bituberculatus complex`	Potential	Within	Recorded
	Lychas `gracilimanus`	Potential	2.35	Likely
	Lychas `hairy tail complex`	Potential	Within	Recorded
	Urodacus `Pilbara 16`	Potential	2.33	Likely
Oryidae	Oryidae `sp. indet.`	Potential	2.73	Likely
Paradoxosomatidae	*Antichiropus apricus*	Confirmed	14.7	Unlikely
	Antichiropus cunicularis	Confirmed	31.59	Highly Unlikely
	Antichiropus nicholasi	Confirmed	11.55	Unlikely
Camaenidae	*Rhagada*` sp. indet.`	Potential	0.08	Likely
	Rhagada MWH cf. Radleyi n.sp.	Likely Widespread	0.02	Likely
Armadillidae	*Buddelundia* `sp. 11`	Potential	Within	Recorded
	Buddelundia `sp. 86`	Potential	Within	Recorded
	Buddelundiinae`sp. mw`	Potential	0.01	Highly Likely
Philosciidae	Philosciidae `sp. corunna`	Potential	0.05	Highly Likely

The 14 taxa presented in the desktop assessment that were either Recorded, Highly Likely or Likely to occur within the MDE. All but two taxa considered in the assessment are morphospecies and have not undergone molecular analysis. All SRE taxa considered were designated a risk rating of Low, as there is unlikely to be any impact to their current known distribution based on the proposed expansion of disturbance in the MDE (Biologic 2025f).

770000

780000

7640000

7630000

Hillside - Marble Bar Rd

Potential SRE

- *Aname* `sp. indet.'
- *Aurecocrypta* `sp. indet.`
- *Karaops* `sp. 2`
- *Karaops* `sp. indet.`
- *Austrohorus* `sp. indet.`
- *Beierolpium* `8/3`
- *Beierolpium* `sp. indet.`
- *Indolpium* `sp. CRD01`
- *Indolpium* `sp. CRD02`
- *Indolpium* `sp. indet.`
- *Xenolpium* `sp. CRD01`
- *Xenolpium* `sp. indet.`
- *Lychas* `bituberculatus complex`
- *Lychas* `gracilimanus`
- *Lychas* `hairy tail complex`
- *Urodacus* `Pilbara 16`
- Oryidae `sp. indet.`
- *Rhagada* `sp. indet.`
- *Rhagada* MWH cf. Radleyi n.sp.
- *Buddelundia* `sp. 11`
- *Buddelundia* `sp. 86`
- *Buddelundinae* `sp. mw`
- Philosciidae `sp. corunna`

LEGEND

- Study Area
- Existing Approved Disturbance
- Proposed Disturbance
- Local Road

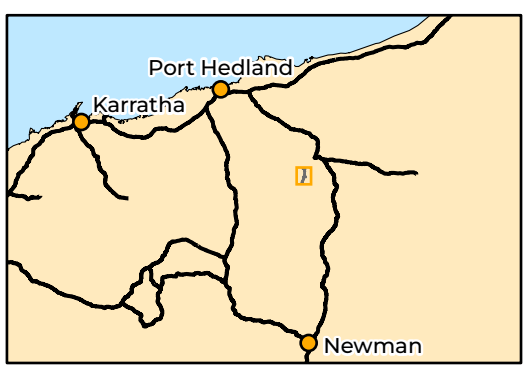
Confirmed SRE

- *Antichiropus apricus*
- *Antichiropus cunicularis*
- *Antichiropus nicholasi*
- *Feaella tealei*

Scale 1:70,000

0 1 2 3 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 15/07/2025



Biologic

ATLAS IRON
Sanjiv Ridge Stage 1
SRE Invertebrate Fauna
Desktop Assessment

Figure 5.17: SRE Taxa Recorded in the Study Area

5.2.4 Potential Impacts

The Proposal has the potential to impact terrestrial fauna through both direct and indirect mechanisms. These include:

- Clearing of native vegetation, which will result in the direct loss of fauna habitat, potentially leading to habitat fragmentation and a reduction in breeding, foraging and shelter resources;
- Fauna injury or mortality from interactions with vehicles, machinery, infrastructure, or the workforce during construction and operations;
- Blasting activities associated with mining pits may pose a risk to the structural integrity of caves used by the Pilbara leaf-nosed bat and ghost bat;
- Altered hydrological regimes due to dewatering or changes in groundwater levels could affect the health and persistence of permanent and ephemeral pools. These changes may affect riparian vegetation, local food webs, and species reliant on surface water;
- Water quality changes, including seepage of hydrocarbons or increased total dissolved solids (TDS) into groundwater, could impact groundwater dependent ecosystems such as pools which are important for drinking, foraging, and dispersal for many fauna species;
- Spread of environmental weeds, either through vehicle movements or the introduction of new species via construction equipment, may degrade habitat quality and outcompete native vegetation. Such changes may alter habitat structure, which could adversely affect local terrestrial fauna species;
- Increased light, noise, vibration and dust emissions may cause behavioural changes in fauna, particularly nocturnal and conservation significant species;
- Introduction and spread of feral species, attracted by water, water sources, and increased human presence may result in predation, disease transmission, and competition for resources with native fauna;
- Inappropriate storage of PAF material that could impact habitat important to conservation significant fauna; and
- Inappropriate handling and storage of hydrocarbons and or hazardous materials.

5.2.5 Mitigation

The EPA hierarchy of mitigation has been considered in developing the management strategies for potential environmental impacts from the Proposal. Mitigation measures that will be implemented for the protection of Terrestrial Fauna are provided throughout the Proposal implementation and are outlined below. Additional mitigation measures may be implemented as new information becomes available from further studies.

Specific mitigation strategies have been developed to protect significant habitat features within the MDE, in particular the caves identified as important habitat for the Pilbara leaf-nosed bat and ghost bat.

To address the risks associated with drilling and blasting activities, specialist advice has been sought, incorporating geotechnical and hydrogeological assessments, blast modelling and review of HIO's other operations. This advice indicates that a combination of physical separation, blast management, and monitoring measures can be implemented to preserve the structural integrity of the caves ensuring they remain habitable for bats after mining concludes. HIO has demonstrated expertise in managing blasting impacts on sensitive caves located 20 to 50 metres from open pits at the Abydos, Miralga and Sanjiv Ridge mines. This experience has been utilised to develop a monitoring strategy for cave CO-CA-03 and pool CO-WS-14.

To ensure blast vibrations remain within acceptable limits, trigger and threshold values for ground vibrations have been established in the Significant Species Management Plan (SSMP). The SSMP also includes additional triggers and thresholds aimed at protecting cave structures, maintaining microclimates and safeguarding bat populations (Atlas Iron Pty Ltd, 2017).

5.2.5.1 Avoid

Avoidance measures proposed to protect terrestrial fauna include:

- The proposal has been designed to reduce the extent of clearing required for the expansion;
- All exclusions zones and avoidance buffers around environmental sensitive features will not be impacted;
- Site infrastructure designed to avoid disturbance to conservation significant flora, that supports habitat for significant fauna species where possible;
- No clearing will occur outside of the Mine Development Envelope; and
- No more than 10 % of habitat suitable to Short Range Endemics (SRE) will be impacted by the expansion and no more than 32.2 % combined (approved/proposed) habitat suitable to SRE will be impacted.

5.2.5.2 Minimise

Actions proposed to minimise the potential impacts to terrestrial fauna are:

- Implementation of HIO management plans, internal process and procedures;
- Preclearance inspections by a trained fauna spotter prior to all clearing;
- A trained fauna spotter to be present to observe clearing where required and safe to do so;
- All vegetation clearing will be undertaken in accordance with the Ground Disturbance Permit Procedure (950-HSE-EN-PRO-0001), and no clearing will occur outside approved areas;
- Habitat suitable for Matters of National Environmental Significance (MNES) will be managed and regulated under the EPBC Act 1999;
- A Section 40 authorisation under the *Biodiversity Conservation Act* 2016 will regulate potential disturbance or relocation of threatened fauna species;
- Imposed speed limits to minimise the potential for vehicle and fauna interactions;

- Blasting operations are limited to daytime only, to limit disturbance to fauna including bats;
- Noise, dust and light emissions will be controlled where possible to avoid excessive disturbance to native fauna, including directing lights to working areas, shielding lights to reduce flow, and using conventional dust suppression techniques (i.e. water trucks);
- Barbed-wire fencing will be avoided where possible; where unavoidable, reflectors will be installed to reduce risk to bats;
- Staff and contractors will be appropriately trained to identify, manage and protect relevant conservation significant flora and vegetation assemblages;
- Off-road driving will be prohibited, where required, to protect fauna and their habitats;
- All PAF material will be either backfilled into mine voids and or PAF cells within WRLs with an appropriate separation distance from the surface to avoid acid mine drainage;
- Feral animal management will be undertaken, including secure storage of putrescible waste, feral fauna recording, and implementing feral cat control where required;
- Introduction of new weeds and spread of existing weeds into fauna habitat will be avoided through the implementation of hygiene procedures and a weed management program; and
- Ensuring all chemical or hydrocarbon spills are immediately cleaned up, and contaminated materials are appropriately disposed of.

5.2.5.3 Rehabilitate

Rehabilitation will be undertaken in accordance with an MCP approved by DMPE This MCP has been developed in consultation with local stakeholders. The MCP will be updated to incorporate the proposed changes to the disturbance footprint as part of the Proposal, and the rehabilitation plans for the Stage 1 open mine pit expansion.

The MCP includes consideration of post mining land uses with regard to fauna habitat and contains appropriate closure outcomes to support local fauna populations, including conservation significant fauna. This includes specific selection of flora species to be used in rehabilitation as future fauna habitat or foraging material, as well as consideration of the inclusion of artificial fauna habitat or hollows that may aid in supporting re-introduction of the species into the area. Monitoring to ensure the closure criteria are met will also be undertaken.

The following rehabilitation measures will be implemented where relevant:

- All disturbed areas other than the open pits will be progressively rehabilitated as soon as practicable and as required by the MCP;
- Topsoil will be recovered and stockpiled to a maximum height of 2 m to preserve the soil physical/chemical properties and seedbank;
- Topsoil will be progressively re-spread over temporary construction areas or utilised for future rehabilitation;
- Waste dumps will be rehabilitated at closure to ensure they are safe, stable and revegetated;

- Self-sustaining native vegetation will be established on disturbed areas; and
- Rehabilitation of disturbed areas to establish habitat suitable for fauna species.

The MCP will be updated triennially or as required when significant changes are made to the Proposal. A detailed MCP, which will contain further information on rehabilitation works, will be prepared approximately one year to six months prior to the cessation of mining as stated in the MCP.

5.2.6 Assessment of Residual Impacts

The Proposal has the potential to result in short to medium term impacts on terrestrial fauna. The Proposal requires clearing of critical habitat for a number of conservation significant species, as outlined in Table 5-15 below.

Table 5-15: Residual Impact to Fauna Habitat

Habitat type	Critical Habitat for Significant Species	Clearing Required for this Proposal (ha)	Total Clearing (Including Existing Operations) (ha)	Percentage of Mapped Area (%)
Rocky Ridge and Gorge	Ghost bat Pilbara leaf-nosed bat Northern quoll Pilbara olive python	26.48	75.96	4.31
Stony Rise	Ghost bat Pilbara leaf-nosed bat	34.72	115.50	1.50
Rocky Foothills	Ghost bat Pilbara leaf-nosed bat Northern quoll	1.02	11.87	0.24
Spinifex Stony Plain	Ghost bat Pilbara leaf-nosed bat	46.14	111.83	5.97
Ironstone Ridgetop	Ghost bat Pilbara leaf-nosed bat Northern quoll	77.46	238.45	15.48
Riverine	Ghost bat Pilbara leaf-nosed bat Northern quoll Grey falcon	0.48	1.75	1.05
Drainage Line	Ghost bat Pilbara leaf-nosed bat Northern quoll Grey falcon	0.95	4.60	0.92

Habitat type	Critical Habitat for Significant Species	Clearing Required for this Proposal (ha)	Total Clearing (Including Existing Operations) (ha)	Percentage of Mapped Area (%)
Calcrete	Ghost bat Pilbara leaf-nosed bat	0.03	6.70	2.86
Spinifex Sandplain	Ghost bat Pilbara leaf-nosed bat Greater bilby	7.59	25.03	12.85

Rehabilitation of the area will be undertaken on mine closure and will include targeted actions to support re-introduction of conservation significant fauna to the area.

The proposal has the potential to disturb habitat considered important to MNES including:

- 79.3 ha of Ironstone Ridge Top habitat;
- 46.2 ha of Spinifex Stony plain habitat;
- 34.8 ha of Stony Rise habitat;
- 26.5 ha of Rocky Ridge/Gorge;
- 7.6 ha of Sandy Plain habitat;
- 1.0 ha of Rocky Foothills habitat;
- 1.0 ha Drainage lines; and
- 0.5 ha of Riverine.

A total of 10 % of habitat suitable to Short Range Endemics (SRE) will potentially be impacted by the expansion, but has been assessed as unlikely to impact SRE species due to the habitat types mostly being widespread. The combined (approved/proposed) habitat disturbance suitable to SRE is 32.2 %.

5.2.7 Predicted Outcome

Predicted outcomes from the implementation of the Proposal include:

- Potential direct disturbance to habitat considered important to MNES:
    - 79.3 ha of Ironstone Ridge Top habitat;
    - 46.2 ha of Spinifex Stony plain habitat;
    - 34.8 ha of Stony Rise habitat;
    - 26.5 ha of Rocky Ridge/Gorge;
    - 7.6 ha of Sandy Plain habitat;
    - 1.0 ha of Rocky Foothills habitat;
    - 1.0 ha Drainage lines; and
    - 0.5 ha of Riverine.

- Bat caves and other environmentally sensitive features will retain their ecological function due to the application of spatial avoidance measures;
- No significant adverse effects to pools and or other surface water resources;
- Caves are predicted to remain structurally intact and suitable for ongoing habitation as a result of controlled blasting and vibration management;
- The disturbance will be rehabilitated to promote a self-sustaining native vegetation;
- Disturbed areas will be rehabilitated to establish habitat suitable for fauna species;
- PAF material placement and encapsulation is expected to prevent acid and metalliferous drainage, ensuring no adverse impacts to terrestrial fauna or surrounding vegetation;
- The spread and establishment of weeds is predicted to remain consistent with baseline, with no significant impacts to fauna habitat quality, supported by ongoing weed surveillance and control; and
- Residual impacts will be offset via monetary contribution to the PEOF at the relevant rate.

Through the implementation of key mitigation, management and offset strategies, it is considered that the Proposal can be managed to meet the EPA objective for Terrestrial Fauna, which is to protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

5.3 Terrestrial Environmental Quality

5.3.1 EPA Objective

The relevant EPA objective for Terrestrial Environmental Quality is "*To maintain the quality of land and soils so that environmental values are protected*".

5.3.2 EPA Policies and Guidelines

The following EPA policies and guidelines are considered relevant to the terrestrial environmental quality Environmental Factor:

- Environmental Factor Guideline – Terrestrial Environmental Quality (EPA 2016e); and
- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2023).

5.3.3 Receiving Environment

5.3.3.1 Relevant Studies

The following studies have been undertaken within the Proponent's mining leases, which have informed this baseline assessment of the terrestrial environmental quality (Table 5-16).

Table 5-16: Summary of Technical Studies for Terrestrial Environmental Quality Factor

Study	Study Purpose
Soil Resource Assessment and Waste Characterisation (MWH, 2013)	The aim of the assessment was to characterise the soil and mine waste materials associated with future mining activities at the Project, to facilitate the development of an initial soil and mine waste inventory, to identify preliminary rehabilitation and landform design requirements.
Soil Resource Assessment and Waste Characterisation (MWH, 2016a)	This soil assessment and mine waste characterisation aimed to assess the potential soil resources, and mine waste materials present to identify potentially problematic materials and identify materials that may be suitable for use as a rehabilitation resource. It combined information from the original assessment with new information available to assist with rehabilitation, mine waste handling, landform design and mine closure planning.
Waste Rock Geochemical Assessment (Mine Earth, 2018)	Mine Earth undertook a smaller mine waste geochemical assessment to verify the findings of the 2016 assessment. The objectives were: To identify shale samples from the Sparrow deposit that were representative of the two shale units to be mined. To identify additional samples from the Razorback, Runway and Shark Gully deposit that are representative of the waste rock to be mined. Undertake laboratory analysis on the selected sample zones to better understand their geochemical character and, in the case of Sparrow, the stability and solubility of Hg.

Study	Study Purpose
	Review the testwork results and develop appropriate recommendations for waste rock management during mining, if required.
Revised Mine Waste Characterisation Assessment (Mine Earth, 2020)	The objectives of this assessment were to: Resolve issues with previous studies raised by DMPE. Work with the Proponent's personnel to plan a series of drillholes to complement the historic sampling. Conduct a desktop assessment of the geological database to provide context for the current analysis. Undertake Phase 1 (screening) and Phase 2 (detailed) laboratory analysis on samples to identify any potentially problematic mine waste materials from both geochemical and physical perspectives. Provide management recommendations for all mine waste materials based upon the historic and current results and incorporate the findings in a risk assessment for the Project. The investigation also incorporated and consolidated the results of the 2016 and 2018 waste characterisation assessments. This assessment supersedes the mine waste characterisation results in MWH (2013, 2016) and Mine Earth (2018).
Waste Rock Characterisation Assessment – Stage 2 (Mine Earth, 2021)	Mine Earth undertook a mine waste characterisation assessment for the Stage 2 pits Glen Herring, Little Hero and Bobby Dazzler. The objectives of the assessment were to: Conduct a desktop assessment of the geological database to provide context for the assessment. Select appropriate drillholes from each deposit and coordinate Phase 1 analysis. Review the Phase 1 dataset to define the likely geochemical characteristics of the key waste rock units in relation to deposit geology. Based upon the Phase 1 dataset, select representative samples for more detailed Phase 2 geochemical and physical testwork, and coordinate this testwork to determine the environmental geochemical properties of key waste rock units including the potential for acid generation, metal enrichment and solubility, weathering behaviour and salinity. Determine the likely erosion stability properties of key waste rock units. Develop recommendations for waste rock management and conceptual landform closure design.
Sanjiv Ridge Stage 4 Waste Rock Assessment – Detailed Geochemical Characterisation (Mine Earth, 2024b)	Mine Earth undertook a waste rock characterisation assessment for the Sanjiv Ridge Stage 4 project. The study considered the Sparrow and Runway South pit and combined the analysis of the drillhole database review with the detailed geochemical analysis of samples collected from six geochemical drillholes.

Study	Study Purpose
SMR Stage 4 PAF Management Memo (Mine Earth, 2024a)	The aim of this memo was to present the findings of the Sanjiv Ridge Resource Models and the sample material testing conducted in 2023/2024 for the proposed Runways and Sparrow pit stage 4 pit expansions. The memo also outlined the operational management measures which will be utilised by the Proponent to identify the physical location of the PAF material present within the expansion areas.
Sanjiv Ridge Stage 5 – Waste Rock Assessment, Interim Report – Preliminary Geochemical Characterisation (Mine Earth, 2024c).	This Stage 5 preliminary study review focused on the total sulfur data contained in the drilling database and preliminary geochemical characterisation tests run on 34 samples collected from three drillholes positioned on the edge of the Runway pit and three drillholes positioned on the edge of the Sparrow pit. These six drillholes traversed the pits from the surface to below Stage 5 and were tested for preliminary geochemical characterisation.
Sanjiv Ridge Stage 5 Waste Rock Geochemical Characterisation – Sparrow Pit Update (Mine Earth, 2025).	This report presents the findings for the updated lithological distribution resulting from the additional drilling and geochemical characterisation conducted to address the knowledge gaps. The information will be used to assist with the waste management strategy and the closure strategies.
Sanjiv Ridge-Sparrow Stage 5 – PAF Material Management Plan (Mine Earth, 2025a)	This document outlines the management for potentially acid-forming (PAF) materials at the Sanjiv Ridge mine site, focusing on waste rock handling and disposal strategies.
O2 Consumption – report in preparation by Mine Earth 2026.	Oxygen consumption tests are a form of kinetic testwork designed to directly measure the rate of sulfide oxidation in geological materials. This method tracks the decrease in oxygen concentration as an indicator of sulfide oxidation, the Oxygen consumption test completed as a rapid test identifies worst case acid generation. The primary objective of oxygen consumption testwork is to rapidly and accurately determine the sulfide oxidation rate of a material under controlled or field-representative conditions.
Kinetic Testing - report in preparation by Mine Earth 2026.	Geochemical kinetic tests, particularly column tests, are used to determine relative rates of acid generation, neutralisation and metal depletion; to compare leaching behaviour of different mine rock classes and types; predict drainage water quality; select or confirm mine rock management and control options. The intent is it best reflects the environmental conditions on site to determine factors controlling acid mine drainage (AMD).

The most recent studies relevant to terrestrial environmental quality to support the mining below the groundwater table have been provided as Appendix F.

5.3.3.2 Regional Soil Landscape Systems

Surveys undertaken have provided a comprehensive description of the biophysical resources and the vegetation composition of soil condition within the region (MWH, 2016c). This information was used by Van Vreeswyk et al (2004) to classify and map the land systems of the Pilbara according to similarities

in landform, soil, vegetation, geology and geomorphology MWH, 2016c). The MDE is comprised of five land systems, of which the Rocklea and Capricorn Land Systems occupy the most area (Figure 5-18). Table 5-17 provides a description of the land systems within the MDE.

Table 5-17: Land Systems Within the MDE

Land System	Description
Rocklea	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard (and occasionally soft spinifex) grasslands
Capricorn	Hills and ridges of sandstone and dolomite supporting shrubby hard and soft spinifex grassland
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands
Satirist	Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands
River	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex

770,000 mE
775,000 mE
780,000 mE
785,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

Approved Disturbance Footprint - MS 1125
Proposed Disturbance Footprint
Mine Development Envelope
Soil Landscape Mapping - Systems (DPIRD-064)
Map unit name
Black system
Boolgeeda system
Calcrete system
Capricorn system
Macroy system
River system
Rocklea system
Satirist system
Talga system

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50
	Date: 11/08/2025	0 1 2 Kilometres
	Drawn: justin.venables	
	Doc No:	Scale 1:60,000 Page size: A3

Land Systems within the MDE

Figure No: 5.18

5.3.3.3 Soils

The Cleaverville formation is the dominant geologic feature within the MDE. This is overlain by weathered iron-rich regolith and/or thin, loose tertiary soils. The soils were broadly characterised as follows (MWH, 2016c):

- Generally shallow (particularly within the 'scree slopes' and 'ridgelines' landform associations);
- Typically classed as 'sandy loams' or 'sandy clay loams';
- Generally, contain a high percentage of coarse material (>2 mm);
- Predominantly single-grained to weakly-aggregated in structure;
- Exhibit partial clay dispersion upon severe disturbance;
- Prone to hard setting;
- 'Moderate' to 'moderately rapid' drainage class;
- 'Low' to 'moderate' water holding capacity;
- Neutral pH and predominantly non-saline;
- Typically, low in organic carbon and moderate in plant-available nutrients; and
- Non-sodic.

The majority of the Proposal area is characterised by shallow, dissected stony soils (Oa11) and brown loams (Gf1)(Table 5-18). Some of the western section of the study area is characterised by the hard red (Fa12) soil units (Table 5-18).

Table 5-18: Soil Units in the Study Area

Soil Unit Code	Summary Description	Location
Fa12	Earthy loams and coarse sands overlying granite. In topographical lows, red earths may dominate, with hard red soils and coarse soils along creek lines. Minor areas of calcareous loams are associated with calcrete.	Project area and study area
Gf1	Soils are generally shallow and stony, with large areas of no soil over exposed rock outcrop. Dominant soils are brown loams with earthy loams. Slightly thicker soils may occur on lower slopes and valley floors.	Project area and study area
Oa11	Dissected stony pediments and hills occurring at the foot of unit Gf1. Soils comprise hard alkaline red soils with remnant residual mesas of basement rock. Shallow soils are associated with rock outcrops, with cracking clays and calcareous loams over basic basement rocks.	Study area

5.3.3.4 Local Geology

The Project is hosted by the Cleaverville Formation, part of the Gorge Creek Group located in the Coongan Greenstone Belt. The dominant lithologies at the Project are banded iron formation (BIF), chert and sediments including sandstones, siltstones and shales. The BIF rocks are associated with jaspillites and interbedded cherts. Shales can contain variable iron contents and can be sulfidic and carbonaceous below the weathering horizon (Mine Earth, 2020). The iron ore mineralisation is distributed through most BIF units as goethititic or hematitic ironstone (with hypogene magnetite-martite mineralisation) and displays massive to vuggy textures. Silica leaching and supergene enrichment have further concentrated the ore mineralisation (Mine Earth 2020).

5.3.3.4.1 Sparrow Pit

The geology of the Sparrow deposit consists of westerly-dipping, sub-vertical beds of alternating BIF and chert, bounded on the east and west by shale. Several major shears converge at the deposit, resulting in high-strain zones and hydrothermal brecciation (Mine Earth 2020). Sparrow is structurally complex, with several major shear zones converging at the deposit location. The effects of these shear zones can be observed in outcrop with hydrothermal breccia and high strain zones associated with local enrichment within the surrounding BIF (Mine Earth 2018).

Due to the presence of carbonaceous shale additional materials characterisation test work was undertaken to determine the potential risk associated with sulfidic material.

Mineralisation

At Sparrow the mineralisation has been found to be related to steeply plunging folds, shear zones and cross-cutting brittle faults (Teitler, 2013). Hematite enrichment is present at depth in the west and northeast of the deposit, which is interpreted to be related to hypogene alteration along these structures and lithological contacts (Teitler, 2014). This can be observed along the contact with reducing carbonaceous shales to the east of Sparrow. Crystalline hypogene magnetite (now mostly oxidised to martite) replacement structures are further evidence for this hypogene alteration (Teitler et al., 2014).

At surface and concentrated along bedding planes, mineralisation largely consists of goethite which has replaced the hypogene related alteration minerals and further leached the hypogene enrichment of silica (Teitler, 2014). This later supergene enrichment has largely overprinted the hypogene mineralisation in the upper portion of the deposit due to the reactivation of shear zones.

The final stage of mineralisation at Sparrow was the late stage via infilling by ochreous goethite. This also replaced areas of vitreous goethite but is not commonly seen outcropping at surface due to its low hardness (Teitler, 2014).

Proximal to the mineralisation at Sparrow there is evidence for hypogene magnetite alteration in the protolith jaspilitic BIF, with hydrothermal breccia and high strain shear zones associated with local enrichment observed in outcrop (Teitler et al., 2014). It is theorised that a convergence of the major

shear zones observed at the Sparrow deposit could have resulted in the more extensive high-grade mineralisation (Teitler, 2013; Teitler, 2014).

5.3.3.4.2 Razorback Pit

Razorback is situated within a kilometre of the Sparrow deposit to the northeast. The stratigraphic sequence at Razorback comprises a mineralised series of westerly dipping sub vertical beds of alternating BIF and ferruginous chert units, bounded to the west by a steeply dipping normal fault zone. The sequence is underlain by a volcaniclastic unit and bounded to the east by another volcaniclastic unit of the Kelly greenstone belt (Mine Earth 2018).

Mineralisation

The mineralisation at Razorback is concentrated along the edge of a steep sided gully with goethite mineralisation dominant at surface extending to depths of beyond 100 m. The deposit is located along the same orientation as a late-stage fault splay which is likely to be a controlling influence on the enrichment at Razorback.

As Razorback Pit will not be extended below the water table no additional materials characterisation was required.

5.3.3.4.3 Shark Gully Pit

The Shark Gully deposit is contained entirely within the Cleaverville formation and is bounded on all sides by un-mineralised, high-magnesium BIF. Mineralisation is hosted by a single BIF unit that is locally interpreted as forming a synclinal fold (Mine Earth 2020). In addition to the BIF unit, clays and cherts are present through the fold hinge. These are interpreted to be largely fault related, with a high density of faults through the hinge zone (Mine Earth 2018).

The deposit contrasts with Sparrow and Razorback in that it has a NE-SW orientation. This orientation is in the same plane as small shear zones (associated with hydraulic breccia) that are visible in the surrounding jaspilitic BIF (Mainwaring et al., 2015). At Sparrow, these shear zones form along the hinge of parasitic folds and along bedding within the jaspilitic BIF and are associated with minor enrichment. It is believed that Shark Gully represents a larger version of this. This is supported by structural evidence suggesting a large-scale fold with the deposit at its core.

Mineralisation

The mineralisation at Shark Gully is the result of hypogene enrichment along the shear zone creating a deep zone of hematite–martite alteration which is associated with significant carbonate alteration in the BIF beneath (Teitler et al., 2014). This has been replaced by goethite in the upper 40 to 80m through supergene replacement from concentrated meteoric fluids in the topographic lows caused by silica leaching. The mineralisation thickens significantly to the west where the highest-grade material exists.

Shark Gully Pit is predominantly BIF and due to the absence of other lithologies specifically shale no additional materials characterisation was required.

5.3.3.4.4 Runway Pit

The Runway deposit is located in a relative topographic low, bound to the west by a normal fault with a large offset, and to the east by carbonaceous shale, a thick chert unit and the Farrel Quartzite of the Gorge Creek group (Mine earth 2018). Bedding dips to the west and is shallower than at Sparrow, with two main BIF units separated by an un-mineralised chert unit. In some areas it is possible to see bedding–parallel shearing along fold hinges and at fold limbs (Teitler et al., 2014). Zones of hydrothermal breccia in the west of the deposit are also visible within the jaspilitic BIF.

The westerly-dipping Runway deposit consists of two BIF units separated by an unmineralised chert, bound to the west by a fault and to the east by carbonaceous shale. Zones of hydrothermal breccia have been identified in the west of the deposit (Mine Earth 2020).

Mineralisation

The presence of hydrothermal breccia within the jaspilitic BIF in the west of the Runway deposit suggests that hypogene alteration of the protolith led to the initial mineralisation at Runway. Within the deposit, crystalline martite alteration has been overprinted by supergene goethite at surface. This can also be seen at depth in core samples and petrographic images (Teitler et al., 2014). At depth there is increased hematite–martite alteration and distal carbonate alteration to the east (Teitler et al., 2014). The majority of the surface enrichment has been replaced by supergene goethite, with bedded hematite outcropping along the east of the deposit.

Due to the presence of carbonaceous shale additional materials characterisation test work was undertaken to determine the potential risk associated with sulfidic material.

5.3.3.4.5 CD15

Located proximally to the Shark Gully deposit the CD15 deposit is contained entirely within the Cleaverville formation and is bounded on all sides by un-mineralised, BIF and Cherts. Mineralisation is hosted by a single BIF unit that is locally interpreted as forming a synclinal fold (Mine Earth 2020). In addition to the BIF unit, clays and cherts are present through a structurally deformed zone. These are interpreted to be largely fault related.

Mineralisation

The mineralisation at CD15 is predominantly a result of supergene enrichment of the associated Cleaverville BIF. There are areas of enriched hardcap leading to a thin veneer of goethite dominant hardcap. Deeper holes also intersected some transitional oxide fresh zones intersecting magenetite mineralisation which is known to occur across the greater range beyond the limits of the hypogene and supergene enrichment zones.

5.3.3.4.6 *Pedmore Runway*

Located proximally to the Runway deposit the Pedmore deposit is contained entirely within the Cleaverville formation and is bounded on all sides by un-mineralised, BIF and Cherts. Mineralisation is hosted by a single BIF unit that is locally interpreted as forming a synclinal fold (Mine Earth 2020). In

addition to the BIF unit, clays and cherts are present through a structurally deformed zone. These are interpreted to be largely fault related.

Mineralisation

The mineralisation at Pedmore is the result of hypogene enrichment along a theorised shear zone creating a shallow zone of hematite–martite alteration. However, this has been replaced by goethite in the upper 40 to 80m through supergene replacement from concentrated meteoric fluids in the topographic lows caused by silica leaching.

Table 5-19: Major Lithologies of the Stage 1 Mine Voids

Lithology (%)	Sparrow	Runway	Shark Gully	Razorback	CD15*	Pedmore*
Goethite	25	31	60	36	27	24
Hematite/ Goethite	15	12	21	30	24	20
Hematite	5	5	5	3	8	15
Chert	39	37	12	24	17	19
Shale	12	3	1	3	9	6
BIF	1	5	1	3	15	16

Note:* the above splits are indicative only for CD15 and Pedmore with final mineral resource estimations are required to provide greater confidence in these proportional splits.

5.3.3.5 Materials Characterisation

5.3.3.5.1 Historical materials characterisation

Mine Earth incorporated earlier waste characterisation test work with further test work conducted in 2019 to produce consolidated materials characterisation assessments for the Project (Mine Earth, 2020). Materials characterisation for lithologies associated with the Razorback and Shark Gully Pits remains consistent with the original assessments therefore no additional testwork was required.

Historical characterisation of Razorback and Shark Gully Pits provides the following:

- All sulfur content across both Pits was below 0.1 % S, the risk of acidic and metalliferous drainage (AMD) is considered low;
- All material from both Pits can be classified as non-acid forming;
- Shark Gully contains 100% BIF and is likely to display high erosional stability;
- Razorback contains chert and BIF and is likely to display high erosional stability;
- All samples displayed circum-neutral pH (5–9 pH) and low salinity potential; and
- Water extraction analysis showed negligible release of elements in solution.

Historical materials characterisation for Runway and Sparrow Pits relevant to above groundwater mining are:

- All sulfur content across both Pits was below 0.1 % S, the risk of AMD is considered low;
- All material from both Pits can be classified as non-acid forming;
- All samples displayed circum-neutral pH (6–9 pH) and low salinity;
- Mercury (Hg) enrichment greater than 1 ppm was identified in a small number of Phase 1 and Phase 2 samples. One BIF sample with minor Hg enrichment (1.06 ppm) was observed within the Runway North pit shell. Two samples with Hg enrichment (1.63 and 4.19 ppm) were observed within the 10 m buffer outside of the Sparrow Pit shell;
- Water extraction testwork identified that enriched Hg occurs as geochemically stable forms with restricted solubility (typically below detection limit) at circum-neutral pH, consistent with the hydro geochemistry of Hg;
- There was a general association observed between Hg enrichment and the occurrence of carbonaceous shale at Sparrow Pit;
- Siltstones are likely to display moderate erosional stability; and
- Shales are likely to display low erosional stability.

5.3.3.5.2 Interim Assessment of Runway and Sparrow Pits

The preliminary study focused on the total sulfur data contained in the drilling database and preliminary geochemical characterisation tests run on samples collected from drillholes positioned on the edge of the Runway pit and drillholes positioned on the edge of the Sparrow pit. These drillholes traversed the pits from the surface to below Stage 5 depths and were tested for preliminary geochemical characterisation (Appendix F).

The data review and further analytical work indicates that the waste material presents a low risk of AMD:

- 90% of the sulfur data recorded for Sparrow is below the conservative cut-off value of 0.1%;
- 100% of the sulfur data recorded for Runway is below 0.1%; all waste materials at the Runway pit can be classed as NAF and is unlikely to generate saline drainage (Table 5-20);
- The Sparrow pit contains some pockets of sulfurous material that may be sulfidic;
- The highest sulfur content is found in the shale and the chert, along the eastern side of the pit;
- All shale samples except one had pH values less than pH 5.5, NAGpH values less than 4.5 and Total Sulfur (TS) above 0.2%, indicating that shale and some mineralisation in this area of the pit contain existing acidity and sulfidic materials which could potentially generate AMD; and
- EC1:2 for the low pH samples ranged from 173 to 1027 µS/cm, indicating that some salts/metals are likely to be released.

Table 5-20: Sulfur Comparison of Block Model and Drilling for Sparrow and Runway Pits.

Total Sulfur (%)	Sparrow		Runway	
	Drilling Database	Block Model	Drilling Database	Block Model
< 0.1	90.5%	83.5%	100%	95%
0.1-0.3	3.2%	9.9%		1%
0.3-0.5	0.8%	3.1%		0%
> 0.5	5.6%	3.6%		4%

5.3.3.5.3 Waste Rock Geochemical Characterisation Sparrow Pit

Due to differences between the sulfur data presented in the block model and the sulfur data collected in the drillhole database additional materials characterisation was undertaken focusing on Sparrow Pit only. The updated material characterisation study confirms the need for appropriate PAF material management measures to be implemented when mining Sparrow Pit, including encapsulation.

The findings from the updated study are summarised as follows:

- The waste material from Sparrow pit is mostly classed as non-acid forming (NAF), with 85.4 % of the samples containing less than 0.1% sulfur. This is confirmed by the detailed geochemical analysis, which shows that most samples fall into the NAF quadrant. However, over 10% of the waste material has a sulfur content above 0.3% and, as a precautionary measure, should be considered PAF with appropriate management measures;
- Total sulfur content ranges from 0.01 S% to 5.2 S%;
- The volume of PAF material requiring management in cells is estimated at 396,463 BCM;
- Shale is the source of existing and potential acidity. All other lithologies are classed as NAF except when close to a sulfur halo (SPWL002); and
- Saline and neutral metalliferous drainage are not considered a risk.

5.3.3.5.4 Saline and metalliferous drainage potential

Saline and neutral metalliferous drainage potential was evaluated using 1:2 rock:water extraction followed by a comprehensive analysis of major ions and metal(loid)s. A summary of the leach extraction laboratory results for key parameters is shown below. Only values greater than the Limit of Reporting (LOR) in one or more locations are shown.

The analysis of the EC1:2 results indicate the following:

- Median and mean EC1:2 values are below 1,600 µS/cm across all lithologies, showing that the pit material is unlikely to generate saline drainage;

The analysis of the metalliferous data indicates the following:

- The materials contain salts with the following metal(loid)s Al, B, Cd, Cr, Co, Cu, Li, Mn, Mo, Ni, Se, Sr and Zn. These were detected in over 50% of the rock/water 1:2 leachate samples;

- Mean metal(loid) concentrations in the various leachate samples were all below their respective Livestock Drinking Water Guideline values (ANZECC and ARMCANZ, 2000) and draft guideline values (Department of Agriculture, Water and the Environment,2023), except for the Al and Se measurements in the shale samples;
- Maximum metal(loid) concentrations of Se in BIF, chert, shale, and regolith samples, as well as Al, Ni, and SO4 in shale, exceed the Livestock Drinking Water Guideline Values;
- All samples have near neutral to alkaline pH1:2 values and low metal(loid)s detected (As, Cd, Cr, Co, Cu, Pb, Li, Ni and Zn), except for the shale samples; and
- Twelve shale samples had an acidic pH between 3 and 5.5, with Ficklin metal concentrations greater than 1 mg/L up to 34.4 mg/L. The highest Ficklin metal concentration is found in the southeast area of the pit.

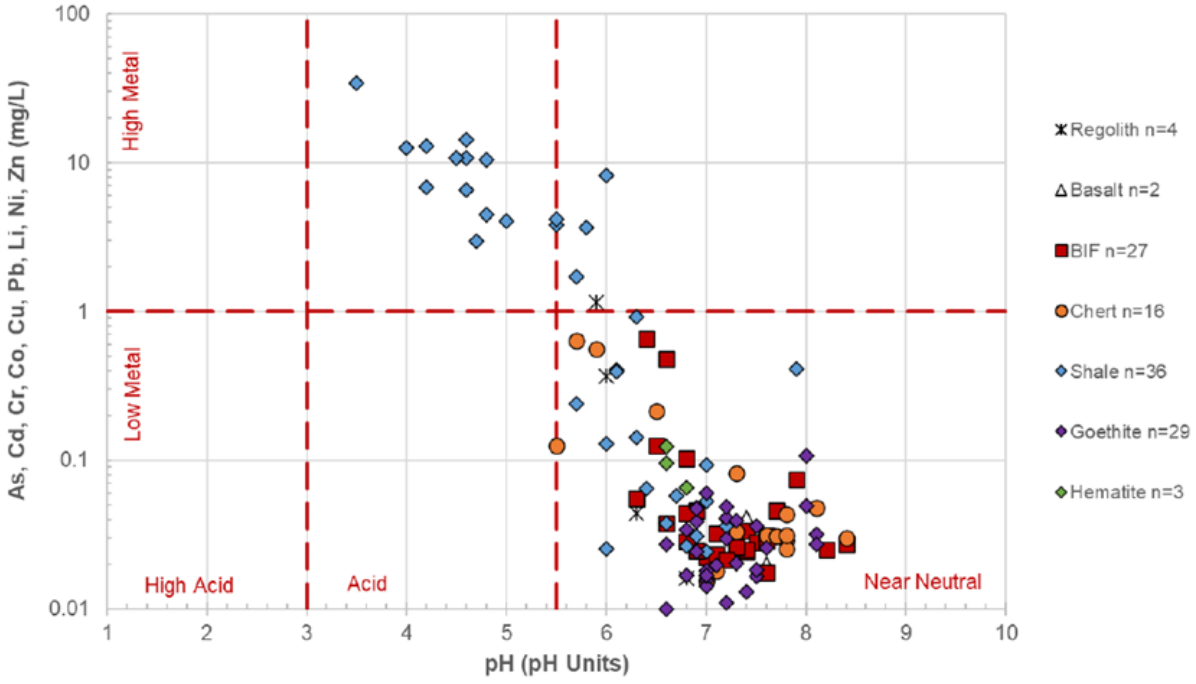


Figure 5-19: Ficklin Diagram for Rock Water 1:2 Extraction

5.3.3.5.5 Ore and Waste Materials

Note, CD15 and Pedmore ore and Waste material estimates are not final, Resource estimates are still in progress to validate final tonnages of ore and waste. The below figures are only indicative off high level modelling as at time of writing. Further drilling activities are planned to be completed prior to resource estimates being completed.

Table 5-21: Material Inventory

Deposit/Pit	Indicative Volume to be Mined (mt)		
	Ore	Waste Material	Total
Sparrow Pit	13.833	18.484	32.317
Razorback	2.419	1.143	3.562
Runway (North and South)	4.934	4.440	9.374
Shark Gully	3.607	5.259	8.866
CD15	0.7	0.4	1.1
Pedmore	1.0	0.4	1.5
Total	**26.5**	**30.1**	**56.6**

5.3.3.6 PAF Management

The management of PAF by HIO will occur in two phases, 'Active Mining' and 'Storage'. Please refer to the PAF Management Plan (Appendix F).

5.3.3.6.1 Active Mining

The location of the modelled PAF lithotypes within the Sparrow expansion area will be identified through routine geological pit mapping (wall/floor/face mapping) and blast hole sampling;

This data will be imputed into the geological models to assist with isolating areas which require follow-up PAF field testing. These tests will only be undertaken within the modelled PAF shale lithotypes where Iron content is ≤45 wt% and sulfur is ≥0.1 wt%;

Test-work indicates only the Shale units contain the risk of PAF, thus a cut-off of 45% Iron has been used to best limit the field checks to units of risk for material that will be stored long term. The Shale units are not expected to contain mineable volumes, where the iron content is greater than 45% Fe.

This multi-stage identification process will be used to create detailed digging and storage/processing instructions, which will be provided to all relevant stakeholders.

5.3.3.6.2 Storage

All PAF material will be stored within defined PAF cells within the Sparrow WRL and shark gully inpit dump. The PAF material will be deposited using an advancing tiphead to maximise storage volume;

- All PAF material will be either backfilled into mine voids and or PAF cells within WRLs with an appropraite separation distance from the surface to avoid acid mine drainage impacting flora and vegetation;
- The WRL will be constructed with back slopping berms, with the slope angle being ≤18º. The landforms will also be contour ripped, rock armoured and have topsoil applied where required to minimise erosion and exposure of PAF material; and

- The upper surface of the filled PAF cells will be covered shortly after dumping. However, in the event that mining of PAF material ceases thus leaving PAF material exposed then a layer of NAF material will be used to cover the exposed material.
- Cells have been designed within Sparrow WRLs to contain 2,577,000 m^3 of PAF, far in exceedance of the conservatively estimated 2,300,000 m^3 output. The volumes of these cells are shown in Table 5-22 below.

Table 5-22: Volumes of PAF Cells Compared to Design Capacity

Dump	Cell	Design Capacity (m3)
Sparrow WRL	452.5	393,846
	432.5	909,511
	412.5	883,361
	392.5	390,215
Sparrow Total	ALL	2,576,933
Total		2,576,933
Required Capacity		2,300,000
Extra Contingency		276,933

5.3.3.6.3 Sparrow Waste Rock Landform

The Sparrow WRL was designed to incorporate closure objectives, with PAF cells strategically located within the core of the landform to minimise risk, as shown in Figure 5-20.

Key features include:

- A basal layer, with a minimum thickness of 2 m, constructed of run-of-mine NAF waste rock to restrict the potential for increased seepage inflows along the interface with natural ground.
- At closure a store-and-release cover system (designed to achieve a target net-percolation of <10%). is planned to be constructed over the Waste Inpit Cell (WIC) to limit net-percolation through the cover and seepage to the problematic material.
- Positioning of the WIC to limit the potential for future exposure by erosion
- The WIC designed with sufficient capacity for forecast problematic waste types (PAF waste and low stability waste) with an appropriate degree of contingency available. The WIC design may be amended throughout mining as certainty in volumes around problematic materials evolves.
- Surface water runoff during operations to be contained on the WIC cell, and the top surface graded at closure with a minimum slope of 2% to limit the potential for net-percolation directly above the WIC and facilitate run-off and drainage retention / evapotranspiration in alternative areas.

- Waste placement by paddock dumping and traffic compaction or by low <2 m thick tip heads, to ensure tight construction and reduce seepage potential within the WIC.

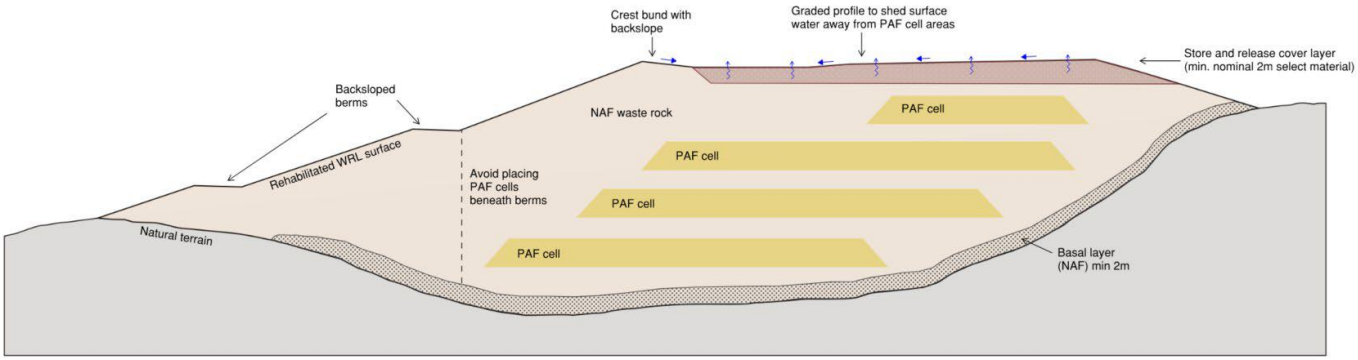


Figure 5-20: Sparrow WRL WIC Conceptual Design

5.3.3.6.4 Shark Gully Pit

An ideal pit backfill design for Shark Gully Pit is presented. The pit backfill design will incorporate the same PAF encapsulation principles applied to the WIC, with additional requirements specific to in-pit placement.

Key features include:

- PAF material will not be placed in zones subject to fluctuating water tables, where cycles of wetting and drying could promote oxidation;
- PAF placed below the final water table will be maintained in a permanently saturated condition, well beneath the zone of seasonal fluctuation;
- Backfilling will be carried out in controlled lifts to reduce differential consolidation, minimise preferential flow pathways, and restrict seepage through the PAF;
- At closure, a store-and-release cover system will be constructed across the final surface to limit net-percolation and seepage to the problematic material. The store and release cover should be designed to achieve a target net-percolation of <10%;
- The final surface will be graded with a minimum slope of 2% to promote surface drainage, reduce infiltration, and minimise erosion risk, consistent with WIC encapsulation principles;
- Surface water management will ensure runoff is directed away from encapsulated PAF zones and onto stable, non-reactive surfaces;
- Backfill capacity and configuration will be planned to accommodate forecast PAF volumes with contingency for uncertainty; and
- Construction records and survey data will document the location, extent, and encapsulation of PAF in the backfill for closure verification.

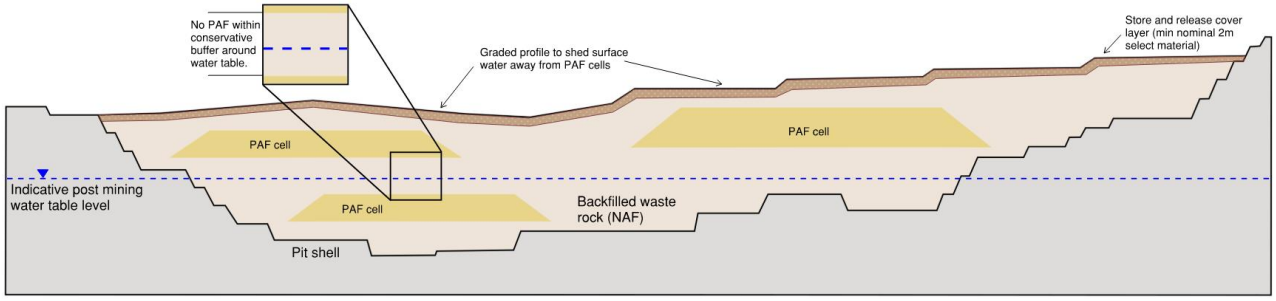


Figure 5-21: Shark Gully Schematic Pit Backfill Design

5.3.4 Potential Impacts

The Project has the potential to impact the Terrestrial Environmental Quality through:

- Direct soil disturbance associated with clearing and construction activities;
- Exposure of PAF material leading to acidification of local soils and water sources;
- Contamination of soils through unintended hydrocarbon and or other chemical spills;
- Scouring and or erosion of the soils and/or the land from stormwater flow;
- Poor material stockpiling methods leading to displacement of sediments; and
- Mobilisation of metals/metalloids received in soils and or water sources.

5.3.5 Mitigation

The EPA hierarchy of mitigation has been considered in developing the management strategies for potential environmental impacts from the Proposal. Mitigation measures that will be implemented for the protection of terrestrial environmental quality are provided throughout the Proposal implementation and are outlined below. Additional mitigation measures may be implemented as new information becomes available from further studies.

5.3.5.1 Avoid

Avoidance measures proposed to protect terrestrial environmental quality include:

- All waste material with a Sulfur Content > 0.1% S will be managed as PAF and will be encapsulated within the Pit and or WRL;
- Shale waste rock with iron ≤45 wt% and sulfur ≥0.1 wt% will be managed as PAF to minimise acid generation risk;
- No problematic material or PAF will be backfilled in the Razorback Pit to avoid potential impacts to nearby environmental and/or other sensitive receptors;
- PAF material will not be placed in zones subject to fluctuating water tables, where cycles of wetting and drying could promote oxidation;

- The expansion has been designed to avoid heritage and environmental sensitive features and their avoidance buffer and or exclusion zones;
- No siltstone and or shale waste material will be used on landform slopes, and
- Only BIF and Chert will be used for rock armouring.

5.3.5.2 Minimise

Actions proposed to minimise the potential impacts to terrestrial environmental quality are:

- Management of materials in accordance with the site PAF Management Plan;
- All PAF material will be stored within defined PAF cells within the Sparrow WRL and Shark Gully Pit;
- All PAF material will be either backfilled into mine voids and or PAF cells within WRLs with an appropriate separation distance from the surface to avoid acid mine drainage;
- The WRL will be constructed with back slopping berms, with the slope angle being ≤18º. The landforms will also be contour ripped, rock armoured and have topsoil applied where required to minimise erosion and exposure of PAF material;
- The upper surface of the filled PAF cells will be covered after dumping. However, in the event that mining of PAF material ceases thus leaving PAF material exposed then a layer of NAF material will be used to cover the exposed material;
- Ongoing testing during operations to identify sulfidic materials requiring management;
- Ongoing monitoring of potential changes in surrounding soils and drainage lines will be undertaken; and
- Appropriate storage and handling of hazardous materials will ensure risk of spills are minimised, and spills that do occur are cleaned up appropriately.

5.3.5.3 Rehabilitate

Rehabilitation will be undertaken in accordance with an MCP approved by DMPE. Rehabilitation efforts will prioritise planting native vegetation species characteristics of original land systems, particularly spinifex grasslands and mulga shrublands, to restore ecological functions, enhance soil stability, and facilitate habitat restoration. Regular monitoring will be conducted at rehabilitated sites to ensure successful vegetation establishment, erosion control, and soil salinity management. The following rehabilitation measures will be implemented where relevant:

- Tracking and management of soils stockpiled for rehabilitation will be undertaken to ensure viability source for rehabilitation;
- Direct soil return for site rehabilitation projects will be undertaken where possible;
- Rehabilitation efforts will prioritise planting native vegetation species characteristics of original land systems, particularly spinifex grasslands and mulga shrublands, to restore ecological functions, enhance soil stability, and facilitate habitat restoration;

- Regular monitoring will be conducted at rehabilitated sites to ensure successful vegetation establishment, erosion control, and soil salinity management;
- Landform will be recontoured, reshaped and profiled to blend in with the surrounding landscape;
- Landfill designs will be in accordance with the recently approved Mine Closure Plan for the site; and
- Constructed landforms and infrastructure will be located outside of the zone of instability (ZOI) around open pits.

5.3.6 Assessment of Residual Impacts

Following the implementation of the outlined mitigation strategies, residual impacts for terrestrial environmental quality are anticipated to be minimal, primarily restricted to the areas disturbed by mining activities. Impacts will include minor localised changes to soil profiles due to excavation and storage practices. With appropriate management and rehabilitation, the likely impacts from the Proposal are expected to be low, temporary, and within acceptable limits defined by environmental regulatory guidelines, and are unlikely to have a significant long-term effect on the landscape.

5.3.7 Predicted Outcome

Predicted outcomes from the implementation of the Proposal include:

- Stormwater management will be managed to ensure no erosion, sedimentation or turbidity adversely impact, land, soil and water resources;
- Environmental values surrounding Razorback will be protected as no PAF material will be backfilled or stored within the mine void;
- Shale waste containing elevated sulfur and/or low iron content will be fully encapsulated to not cause degradation of soil or land quality;
- PAF materials are predicted to remain geochemically stable and isolated from receptors due to encapsulation;
- Sulfidic materials will be identified during operations via ongoing testing to verify the predicted PAF volumes requiring management;
- No PAF materials will be stored within a saturated zone and an appropriate separation distance to groundwater levels will be implemented;
- Topsoil resources required for rehabilitation are predicted to remain viable, with seedbank integrity maintained through appropriate stockpile handling and management;
- Direct return of topsoil, where feasible, is expected to support successful rehabilitation and maintain soil biological function; and
- The appropriate storage, containment and handling of hazardous material will prevent soil contamination.

Therefore, through the implementation of key mitigation, management and offset strategies, it is considered that the Proposal can be managed to meet the EPA objective for Terrestrial Environmental Quality, which is to maintain the quality of land and soils so that environmental values are protected.

5.4 Subterranean Fauna

5.4.1 EPA Objective

The relevant EPA objective for Subterranean Fauna is "*To protect subterranean fauna so that biological diversity and ecological integrity are maintained*".

5.4.2 EPA Policies and Guidelines

The following EPA policies and guidelines are considered relevant to the subterranean fauna Environmental Factor:

- Environmental Factor Guideline — Subterranean Fauna (EPA 2016c); and
- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2023).

5.4.3 Receiving Environment

5.4.3.1 Relevant Studies

The following subterranean fauna studies have been completed over the Sanjiv Ridge tenure relevant to the Proposal.

Table 5-23: Summary of Technical Studies for Subterranean Fauna Factor

Study	Study Purpose
Corunna Downs Subterranean Fauna Assessment (MWH Australia Pty Ltd, Stantec, 2016)	The objectives of this assessment were to investigate the subterranean fauna values of the Project Study Area and to assess if the potential direct impacts associated with the proposed Project will place any species of stygofauna or troglofauna at risk. The scope of this study encompassed a literature review, database searches, assessment of subterranean habitat, a comprehensive Level 2 troglofauna baseline survey, a Level 1 stygofauna pilot survey, and an environmental impact assessment.
Corunna Downs Subterranean Fauna EIA re-assessment (Stantec, 2019)	This report included a risk assessment for troglofauna that focused on the proposed direct impacts: habitat removal through AWT pit excavation; and drying of habitat via groundwater abstraction from the proposed camp production borefield. This revised environmental impact assessment for subterranean fauna, in the context of the modelled groundwater drawdown contours based on hydrogeological drilling and testing.
Sanjiv Ridge BWT Stygofauna Baseline Survey (Biologic, 2025g)	The Proponent commissioned Biologic Environmental Survey to conduct a stygofauna survey within the Project to provide clarity regarding the potential impact on stygofauna associated with groundwater extraction. The survey was undertaken across three trips between May and November in 2024. All available pastoral wells, production and monitoring bores were sampled, and a total of 141 samples were taken across the three trips.

Study	Study Purpose
Molecular Systematics Analysis (Biologic, 2025h)	The purpose of this analysis was to further refine the genetic sequencing of specimens collected during the 2025 baseline survey.
Additional Stygofauna Survey work and Molecular Analysis (pending)	Outcomes from the subterranean fauna survey completed in 2024, indicate there may be a restricted stygofauna community within the area encompassing Sparrow Lake and Shark Gully pits. The outcomes from the 2024 survey are potentially due to the sampling efforts being restricted and or limited by the distribution, accessibility, and suitability of bores within the Study Area. Therefore, to obtain a better understanding of the occurrence of stygofauna /stygofauna habitat that may be impacted by the operations a much larger sampling effort is required to achieve survey completeness due to relatively low detection rates and high proportions of infrequently detected species.

Studies most relevant to subterranean fauna have been provided as Appendix G. Further studies regarding characterisation of the subterranean fauna within the Proposal area and surrounds are currently ongoing. The outcomes and recommendations from these studies will guide any further investigations or adaptive management required.

5.4.3.2 Stygofauna

The desktop assessment revealed only 102 records of stygofauna within 50 km of the Study Area, predominantly around Mount Webber, Miralga Creek and McPhee Creek, with a few specimens from regional pastoral bores. No stygofauna have been previously recorded within 25km of the Study Area. Most of these stygofauna records were morphological identifications, identified only to higher order, morphospecies or to species complex (Appendix G)

From the stygofauna survey, of the 141 stygofauna samples collected during the survey, 54 yielded stygofauna (3,018 specimens from nine stygofauna orders). Initial morphological identification followed by molecular analyses determined 47 distinct stygofauna operational taxonomic units (OTUs), comprising annelids (7 OTUs), amphipods (8 OTUs), syncarids (6 OTUs), isopods (7 OTUs), copepods (11 OTUs) and ostracods (8 OTUs). Leftover material from subsampling for molecular identification, as well as regional specimens not selected for subsampling and a few specimens that failed during molecular analysis represented a further 25 indeterminate higher-level taxa (Appendix G).

Based on currently known linear ranges, the 45 stygofauna taxa recorded from the current survey can be broken into four groups according to their currently known distributions:

- Regionally widespread throughout the Pilbara (100 – 1,000 km linear range) – 4 taxa;
- Locally widespread within/beyond the Study Area (10 – 100 km linear range) – 8 taxa;
- Locally restricted within/nearby the Study Area (linear range <10 km) – 8 taxa; and
- Known from a single site within/nearby the Study Area – 25 taxa.

Seventeen taxa are currently known to occur within the Study Area, and six of the 47 taxa recorded in the current survey were matched to an external sequence. This indicates that 41 taxa have not been recorded previously (Table 5-24; Appendix G).

With the present sampling effort and the current molecular results, it appears there may be a restricted stygofauna community within the area encompassing Sparrow Lake and Shark Gully pits. This is based on the current known range of OTU Bathynellidae `sp. Biologic-BATH038`, which extends from just west of Shark Gully to just north of Sparrow Lake, a distance of just over 1.5 km. Four other potentially restricted stygofauna OTUs (Phreodrilidae `sp. Biologic-OLIG185`, *Atopobathynella* `sp. Biologic-PBAT081`, Microcerberidae `sp. Biologic-ISOP221` and *Parastenocaris* `sp. Biologic-HARP106) have not been recorded outside of the Sparrow Lake and Shark Gully areas.

No stygofauna were detected around the Runway pits to the north of this area despite 24 samples being taken there. No stygofauna have been detected at the Glen Herring pits.

Table 5-24: Stygofauna Limited to the MDE

Higher Taxon	Taxon	Linear Range of Samples
Phreodrilidae	Phreodrilidae sp. Biologic-OLIG185	0.01 km
Bogidiellidae	Bogidiellidae sp. Biologic-AMPH112	Singleton
Eriopisidae	*Pilbarana* sp. Biologic-AMPH115	10.70 km
Paramelitidae	Paramelitidae sp. Biologic-AMPH111	11.90 km
Bathynellidae	Bathynellidae sp. Biologic-BATH038	1.54 km
Parabathynellidae	*Atopobathynella* sp. Biologic-PBAT081	0.01 km
	Atopobathynella sp. Biologic-PBAT084	Single site
Microcerberidae	Microcerberidae sp. Biologic-ISOP210	Single site
	Microcerberidae sp. Biologic-ISOP212	Single sample
	Microcerberidae sp. Biologic-ISOP221	Single site
Tainisopidae	*Pygolabis* sp. Biologic-ISOP213	Single sample
Parastenocarididae	*Parastenocaris* sp. Biologic-HARP104	Single sample
	Parastenocaris sp. Biologic-HARP105	Single sample
	Parastenocaris sp. Biologic-HARP106	Single sample
Candonidae	*Leicacandona* sp. Biologic-OSTR140	1.76 km
	Leicacandona sp. Biologic-OSTR142	Single sample
Limnocytheridae	*Gomphodella* sp. Biologic-OSTR143	1.83 km

The groundwater chemistry measured throughout the Study Area was typical of Pilbara groundwater, namely circumneutral pH, fresh to brackish salinity, and positive/near-positive Oxidation Reduction Potential (ORP). These conditions are considered suitable for stygofauna communities (Halse *et al.*,

2014; Humphreys, 2008). Mean groundwater temperatures for all areas were within a narrow range of approximately 30–32°C, with small standard errors, indicating stable temperatures across seasons and years.

Dissolved oxygen (DO) levels were generally low for all areas, however still within range suitable for stygofauna (Hose *et al.*, 2015). There was a slight difference between areas in terms of pH, electrical conductivity (EC) and salinity. Those areas up on the main ridge (Sparrow Lake, Shark Gully and Runway) tended towards lower pH, EC and salinity than those at lower elevations.

5.4.3.3 Troglofauna

The 2016 study focused on troglofauna identification and impacts. A total of thirteen species from nine higher level taxonomic groups (*Blattodea*, *Coleoptera*, *Diplura*, *Isopoda*, *Polydesmida*, *Polyxenida*, *Pseudoscorpiones*, *Scolopendromorpha* and *Symphyla*) were identified from the samples undertaken.

Two species were recorded in potential impact locations (Curculionidae OES11 and Prosopodesmus OES8). The geological (physical) and genetic (biological) evidence presented clearly indicate that the proposed Runway and Shark Gully pits do not represent isolated habitats. Instead, the distributions of both Curculionidae OES11 and Prosopodesmus OES8 are considered highly likely to extend throughout much of the main ironstone ridge and to exist in non-impact areas. Therefore, the proposed mining of the Runway and Shark Gully pits are not considered to pose a conservation risk to Curculionidae OES11 and Prosopodesmus OES8.

The troglofauna assemblage recorded from the Study Area was found to be distributed along much of the ironstone ridge that hosts the target deposits with distributions appearing to extend to, and possibly throughout the adjoining hills within the associated range system. Of the 13 species recorded, eight (62%) have been found to occur in two or more Project Areas. The remaining five species that were recorded from a single Project Area only were all singletons (Stantec, 2016).

The geological assessment of the main ironstone ridge hosting the deposits indicated that the inhabited subterranean habitats are contiguous along the ridge system. The results of the genetic analysis were congruent with the geological evidence that clearly demonstrated that the distributions of four troglofauna species, including Curculionidae OES11, extended along the main ridge from Runway deposit area to Split Rock. The low genetic divergence (0.4%) exhibited between the recorded locations of Curculionidae OES11 indicated that the Runway and the Shark Gully areas do not represent isolated populations. In addition, DNA data showed the distribution of Tenebrionidae OES1 to extend from Shark Gully to the northern Reference area (6.5 km north), thereby demonstrating that the relatively deep cutting valley present between the deposit areas and the northern Reference area does not act as a geographical barrier to gene flow.

5.4.4 Potential Impacts

The Proposal has the potential to impact on subterranean fauna through:

- Excavation of mine voids to extend beyond the groundwater table;

- Mine dewatering resulting in lowering of the groundwater impacting subterranean fauna and their habitat, particularly within the Sparrow and Shark Gully pits;
- An increase in groundwater abstraction causing a cone of depression around the pits, reducing available groundwater resources for subterranean fauna species and their habitat; and
- Potential alteration to groundwater quality resulting from chemical and/or hydrocarbon spills, reducing the suitability of subterranean fauna habitat within the MDE and surrounds.

Direct and permanent impacts will be localised to within the pit footprint, where excavation will physically remove stygofauna habitat and individuals.

Indirect impacts from groundwater drawdown are expected to be short to medium term, as groundwater is expected to recharge following the cessation of mining operations.

The impacts to stygofauna in particular may be considered significant, given the potential that the species identified within the MDE may be part of a restricted stygofauna community. Additional studies will be undertaken to further the understanding of the potential impacts to these species.

5.4.5 Mitigation

The EPA hierarchy of mitigation has been considered in developing the management strategies for potential environmental impacts from the Proposal. Mitigation measures that will be implemented for the protection of Subterranean Fauna throughout the Proposal implementation are outlined below. Additional mitigation measures may be implemented as new information becomes available from further studies.

5.4.5.1 Avoid

Avoidance measures proposed to protect subterranean fauna include:

- Minimising the pit footprints. For existing pits this has been achieved by deepening the existing excavations within areas that have already been mined;
- Optimising pit shells to only cover areas of viable resource, and
- Not mining Razorback Pit beyond the groundwater table (avoidance of Stygofauna habitat).

5.4.5.2 Minimise

Actions proposed to minimise the potential impacts to subterranean fauna are:

- Minimising pit dewatering to that required to safely access below water table resources;
- Ensuring all groundwater abstraction and dewatering is undertaken in accordance with regulatory approvals;
- Updating the groundwater models at least annually for the first three years reducing to tri-annual should no significant adverse change be observed between the predicted and actual model;
- Construction and maintenance of surface water drainage systems to control and contain runoff from mining areas and divert clean stormwater away from pits and other mining disturbance;

- Monitoring of groundwater quality during operations;
- Utilising water from pit dewatering as a priority for operations, to minimise the requirement for additional groundwater abstraction; and
- Ensuring all chemical or hydrocarbon spills are immediately cleaned up and contaminated materials are appropriately disposed of.

5.4.5.3 Rehabilitate

Rehabilitation will be undertaken in accordance with an MCP approved by DMPE. Rehabilitation efforts will prioritise planting native vegetation species characteristics of original land systems, particularly spinifex grasslands and mulga shrublands, to restore ecological functions, enhance soil stability, and facilitate habitat restoration. Mine voids will be backfilled where possible to ensure that the final landform is stable and considers hydrological factors. This will assist in reestablishing nutrient flows into the subterranean environment.

5.4.6 Assessment of Residual Impacts

The Proposal is likely to have an impact on subterranean fauna, particularly stygofauna given the proposed groundwater abstraction and mine dewatering requirements. However, further studies are required to fully understand the impacts on the local and regional subterranean fauna communities.

5.4.7 Predicted Outcome

Predicted outcomes from the implementation of the Proposal include:

- Groundwater levels and quality are expected to remain within ranges that avoid significant impacts to subterranean fauna habitat, with abstraction managed under existing licensed limits;
- Stygofauna habitat beneath Razorback Pit will remain intact, as Razorback Pit development will not intersect groundwater;
- Localised changes to hydrology at Shark Gully and Sparrow Lake may occur, but stygofauna populations are expected to persist, with no significant loss of suitable habitat predicted, and
- The understanding of stygofauna presence and habitat suitability will continue to improve, allowing any remaining uncertainties to be resolved and ensuring that residual impacts remain low.

Through further studies and the implementation of key mitigation, management and offset strategies, it is considered that the Proposal can be managed to meet the EPA objective for Subterranean fauna, which is to protect Subterranean fauna so that biological diversity and ecological integrity are maintained.

5.5 Inland Waters

5.5.1 EPA Objective

The relevant EPA objective for Inland Waters is "*To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*".

5.5.2 EPA Policies and Guidelines

The following EPA policies and guidelines are considered relevant to the inland waters Environmental Factor:

- Environmental Factor Guideline — Inland Waters (EPA 2018a);
- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2023);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Department of Agriculture, Water and the Environment, 2018);
- Western Australian water in mining guideline (DoW 2013); and
- Use of Mine Dewatering Surplus (DWER, 2020c).

5.5.3 Receiving Environment

5.5.3.1 Relevant Studies

The following studies have been completed over the Sanjiv Ridge tenure relevant to the Proposal.

Table 5-25: Summary of Technical Studies for Inland Water Factor

Study	Study Purpose
Corunna Downs Project Surface Water Environmental Impact Assessment (Stantec, 2018)	This study included a hydrological and conceptual surface water assessment for the Project. It also provided recommended management measures which may reduce potential surface water impacts from the development of specific infrastructure.
Corunna Downs Proposal – Hydrogeological Investigation (Stantec, 2018)	This study was performed in response to queries from the DEMIRS and DWER requesting additional hydrogeological information and an assessment of potential impacts to environmental features.
Corunna Downs H2 Hydrogeological Study (Stantec, 2018)	This study identified groundwater resources and established a network of production bores to supply groundwater for the projects initial six year mine life. It was prepared to support an application for a 5C licence to abstract groundwater.
Corunna Downs Mine Water Supply – H3 Hydrogeological Assessment (SRK, 2019)	This hydrogeological investigation established baseline conditions and assessed potential impacts to local groundwater resources and environmental features.

Study	Study Purpose
Sanjiv Ridge BWT Aquatic Ecology Assessment (Biologic, 2025i)	This comprehensive, two season aquatic ecology survey documented baseline values within pools which may be impacted by potential dewatering and discharge operations.
Aquatic Ecology Risk Assessment (Biologic, 2025j)	The purpose of this risk assessment was to review the document baseline values from the two season aquatic survey and review them against the modelled ground water drawdown.
H3 Hydrogeological Assessment (SRK Consulting, 2025)	This updated H3 hydrogeological assessment was undertaken to support the approvals required to transition from AWT to BWT mining operations. The primary objectives were to characterise the groundwater regime through field investigations and numerical modelling to assess potential impacts on groundwater dependent ecosystems, in particular the identified permanent pools.

Studies relevant to inland waters have been provided as Appendix H.

Mining below the water table has the potential to alter groundwater behaviour, therefore understanding the risk and predicting the physical and chemical responses of the local and regional environment to dewatering and earthworks is critical. Not just during operations but at closure and beyond.

The current understanding of the occurrence of groundwater and surface water resources at Sanjiv Ridge evolved and developed in stages. Below is a summary of the current understanding of the conceptual hydrogeology and hydrology of the Proposal area at Sanjiv Ridge.

5.5.3.2 Groundwater

Unless otherwise referenced, the following section is based on information from the H3 Hydrogeological Assessment (SRK Consulting, 2025), Sanjiv Ridge BWT Aquatic Ecology Assessment (Biologic, 2025i) and Aquatic Ecology Risk Assessment (Biologic, 2025j) (Appendix H).

The Proposal is located within the Pilbara Groundwater Province of Western Australia, which covers an area of 200,000 km^2. This region's geology is dominated by faulted granitoid formations and folded Archaean greenstone rocks, which create structurally controlled permeability. Groundwater is typically found where secondary porosity and permeability have developed, such as in fractures, weathered zones, bedding planes, joints and partings. As a result, groundwater in the area tends to be compartmentalised (Appendix H).

Groundwater resources within the Proposal area are primarily contained in two distinct units: the fractured bedrock aquifer (FBA), and the ephemeral alluvial systems associated with surface water drainage lines. Groundwater levels exhibit significant variability, with depths ranging from 3 to 80 meters below ground level (Appendix H).

The groundwater system at Sanjiv Ridge is characterised by a complex, compartmentalised fractured rock aquifer hosted within banded iron formation (BIF) ridgelines and variably overlain by thin,

discontinuous alluvial deposits. The hydrogeological environment exhibits strong anisotropy, limited regional connectivity, and highly variable hydraulic properties controlled by discrete fracture zones.

The complex nature of the fractured bedrock aquifer means that drawdown can influence groundwater-fed surface pools where hydraulic connectivity exists. These effects may manifest as reduced groundwater discharge, altered pool permanency, diminished dry-season inflows and changes to aquatic habitat conditions.

This system is surrounded by more transmissive regional aquifers within basaltic and sedimentary units that are overlain by alluvial deposits. The regional aquifers comprise both fractured bedrock and the overlying variably saturated alluvial systems. The fractured bedrock of the regional aquifer system is separate from the fractured bedrock of the FBA yet both the FBA and the regional fractured bedrock are variably overlain by alluvial deposits.

5.5.3.2.1 Fractured Bedrock Aquifer (BIF Ridge)

The fractured bedrock aquifer is hosted within a number of rock formations, with flow inferred to be dominated by structurally controlled secondary permeability, leading to a highly compartmentalised system with storage within areas of secondary porosity such as fault zones, fractures and contacts between different geological units. The compartments have varying degrees of hydraulic connectivity, and variable responses to seasonal patterns.

Recharge to the fractured bedrock aquifer is primarily by direct rainfall recharge from exposed outcrops, with enhanced recharge in areas of well-developed weathered zones, shallow fracture zones or lithological contacts. Recharge may also occur from contact and infiltration from alluvial sediments, particularly in areas with ephemeral watercourses. The high evaporation rates within the region result in recharge generally being limited to episodic, heavy rainfall events.

Groundwater gradients within the fractured bedrock aquifer are generally associated with surface topography, with the main groundwater flow interpreted to be in a north-south direction. Groundwater within the fractured bedrock aquifer is also recognised to be associated with a number of surface pools within the MDE (Appendix H).

5.5.3.2.2 Groundwater Quality

Groundwater within the BIF ridges occurs in a fractured bedrock aquifer (FBA) that is highly compartmentalised. Background hydraulic conductivity is very low (approximately 1E-5 to 1E-3 m/day), resulting in steep hydraulic gradients and elevated groundwater levels across the ridge. Groundwater flow pathways preferentially follow the strike of the BIF ridges, with markedly higher transmissivity in the north–south direction compared with the east–west direction.

The FBA contains discrete high-flow features—narrow fracture zones with significantly higher hydraulic conductivity and very low storage. These features dominate groundwater movement and govern the response of the system to abstraction. Operational and aquifer-testing data demonstrate that drawdown propagates rapidly along these fracture pathways, while across-strike propagation is limited. The FBA is overlain by discontinuous, thin patches of the alluvial aquifer system.

Recharge to fractured bedrock aquifers is primarily by direct rainfall recharge from exposed outcrops, with enhanced recharge in areas of well-developed weathered zones, shallow fracture zones or lithological contacts. Recharge may also occur from contact and infiltration from alluvial sediments, particularly in areas with ephemeral watercourses. The high evaporation rates within the region results in recharge generally being limited to episodic, heavy rainfall events.

Groundwater gradients within the fractured bedrock aquifer are generally associated with surface topography, with the main groundwater flow interpreted to be in a north-south direction. Groundwater within the fractured bedrock aquifer is also recognised to be associated with a number of surface pools within the mine development envelope (Appendix H).

Groundwater discharge from the BIF ridge occurs slowly and is largely restricted to incised gorges. Within these gorges permanent or semi-permanent pools may occur. Some pools may receive input from deeper groundwater, while others may be supported by perched or semi-perched systems that have limited connection to the deeper FBA.

5.5.3.2.3 Alluvial Groundwater System

The alluvial groundwater system is mainly linked to the Coongan River and its tributaries, some of which originate along the flanks of the Corunna Downs ridgeline (Appendix H).The alluvial aquifer system is comprised of thin successions of unconsolidated colluvial and alluvial deposits associated with surface water drainage channels, with varying hydraulic connectivity. The alluvial aquifer system overlies the regional fractured bedrock as well as small and discontinuous portions of the FBA. The alluvial and colluvial sediments are ephemeral and are not considered to form a viable long-term water supply aquifer, however they may provide limited source of storage and recharge when saturated and during periods of low evaporation (Appendix H).

Recharge to the alluvial groundwater system occurs via infiltration from accumulated runoff during creek flows and via direct infiltration from rainfall. Consequently, groundwater levels in the alluvial sediment tend to reflect short term precipitation patterns. The alluvial groundwater is spatially associated with the Coongan River and is not present within the Proposal footprint. However, recharge to the fractured bedrock aquifer through leakage from the alluvial system may play a significant role in local groundwater dynamics (Appendix H).

5.5.3.2.4 Regional Aquifers

Outside the ridge, groundwater occurs within the Mt Roe Basalt, Euro Basalt, Duffer Formation and Hardy Formation. These formations have higher hydraulic conductivity, gentler groundwater gradients, and exhibit more responsive behaviour following rainfall events. These regional aquifers are better connected hydrologically but have limited hydraulic connection with the low-permeability BIF ridges, except where major structural features intersect.

5.5.3.2.5 Groundwater Observations and Behaviour

Five years of operational abstraction data confirm the conceptual model of a strongly anisotropic and heterogeneous system. Drawdown monitoring shows:

- rapid and deep drawdown along-strike from pumping locations;
- variable hydraulic connectivity exists across-strike;
- slow groundwater level recovery in high-flow fracture zone; and
- limited hydraulic response in low-permeability portions of the ridge.

Some areas, including parts of Sparrow Lake and Razorback, contain low-yield or dry intervals consistent with localised aquitard zones that impede groundwater movement.

5.5.3.2.6 Conceptual Hydrological Model Summary

The key characteristics of the Sanjiv Ridge groundwater system are:

- a highly compartmentalised fractured rock aquifer within BIF ridges
- dominant groundwater movement through discrete fracture zones
- strong anisotropy, with preferential flow along geological strike
- limited hydraulic connection between ridge aquifers and regional groundwater systems
- recharge concentrated on exposed BIF surfaces during intense rainfall events
- groundwater discharge primarily into gorge-hosted pools
- potential for perched or semi-perched systems feeding some surface water features; and
- slow equilibration of the system following perturbation due to low background permeability.

This conceptualisation forms the basis of the numerical groundwater model used to assess dewatering requirements, drawdown impacts, and long-term pit lake behaviour for the Stage 5 Below Water Table mining activities at Sanjiv Ridge.

5.5.3.2.7 Groundwater Quality

A review of groundwater quality trends between 2014 and 2025 generally showed physical parameters such as pH, EC, TDS and water hardness, as well as element concentrations remained stable over time, with no significant differences between pre-mining conditions and post-mining conditions (SRK, 2025).

The pH values across the mine development envelope generally range between pH 6.5 and pH 8.0, with water generally characterised as very hard water. Most dissolved metals concentrations were below detectable limits, and within the thresholds established by ANZECC guidelines and ADWG, with the notable exception of iron. In some locations iron levels exceeded the Australian Drinking Water Guidelines (ADWG) aesthetic threshold, however this is consistent with the site's geological context, as most iron exceedances were located within the Banded Iron Formation areas within the Cleaverville Formation (Appendix H).

Additional elements that recorded elevated concentrations at certain locations include selenium, fluoride, manganese and silica. Manganese is often associated with BIF composition and is expected to be present in the groundwater system. Elevated silica values were associated with the camp,

processing and road areas and may reflect dissolution of transported silica-rich material. Alkaline groundwater conditions may also contribute to the elevated silica concentrations.

Potential pathways for changes to surface and groundwater quality are also informed by the distribution of potentially acid-forming (PAF) materials, erodible waste rock and areas where chemicals or hydrocarbons are stored or handled. If not appropriately managed, these materials represent potential sources of contaminant mobilisation during rainfall events or through accidental releases. Although such events are avoidable through standard operational controls, their presence forms part of the receiving environment context for assessing water quality risk.

5.5.3.3 Surface Hydrology

This section provides an overview of the received environment with respect to Surface Water and is a summary of Smith Hydro (2025).

5.5.3.3.1 Rainfall

Rainfall over the Project area and surrounds can be defined as:

- Highly variable spatially even within short distances. As can be seen comparing rainfall records at Marble Bar, McPhee Creek, Miralga Creek, Mt Webber and Sanjive Ridge weather stations; and
- Highly variable year to year. With Cyclonic activity a major contributor to annual rainfall.

The majority of rainfall events within a year fall within the wet season and are of moderate to high intensity, usually associated with cyclones and storms.

Runoff occurs during these irregular intense events which floods the steep well defined rocky drainage lines in the upper reaches and spreads out over the gently sloped broad lowlands or follows established drainages towards the Coongan River.

5.5.3.3.2 Project Hydrology

The terrain of the Project area is characterised by rugged topography featuring steep-sided, rocky ridges and hills. These landforms are predominantly composed of various hard rock outcrops such as greenstone, chert, sandstone, and dolomite. A significant geological characteristic of the area is the Banded Iron Formation (BIF). Well-developed drainage lines have deeply carved into the ridge areas, forming gorges and gullies made of ironstone and sandstone. Soils have been characterised previously (MWH, 2016a) as being generally shallow, classed as sandy loams prone to hard setting, and of moderately rapid drainage class with low water holding capacity. The elevation within the Project area varies from around 460 meters above Australian Height Datum (mAHD) at the catchment divide close to the Sparrow Lake pit, to about 190 mAHD at the Marble Bar Flow Gauge location. The landscape transitions from the steep slopes associated with the ridges to more gentle and undulating slopes, valleys, and broad river floodplains at the base of these ridges.

Runoff in the Project area sheds both sides of the north-south ridge line, ultimately towards the Coongan River. Steep gradients in the higher areas gradually flatten along the valley floors. The deeply incised drainage paths within the ridges and hill areas indicate high magnitude discharge in well-

defined channels. Conversely, the flatter areas extending from the ridges show evidence of wide floodplains, suggesting out-of-bank flooding during high flow events.

Changes to local surface water catchments may occur as a result of expanding mine infrastructure, including the construction of additional waste rock landforms. These facilities can alter natural runoff patterns, redirect surface flows and increase the potential for runoff capture where contact with PAF material requires management. Such modifications are relevant to understanding surface hydrology within the receiving environment, as they influence flow pathways and sediment transport during rainfall events.

Surface water modelling was undertaken using the HEC-HMS Linear Deficit and Constant model to quantify changes in runoff behaviour across catchments associated with sensitive pools. The modelling assesses predicted changes to peak flows and annual flow volumes under existing and proposed mining conditions. Figure 5-22 summarises the percentage reductions in average peak flow and flow volume for each assessed pool catchment, providing context for understanding hydrological variability and the relative scale of potential project-related changes.

When climate change scenarios are incorporated into the hydrological model, substantially greater reductions in surface water yield are projected, including decreases of 32–35 percent in average peak flows and 38–41 percent in annual volumes. These projections indicate that climate variability is expected to exert a far stronger influence on long-term hydrological conditions than any changes associated with the proposed development.

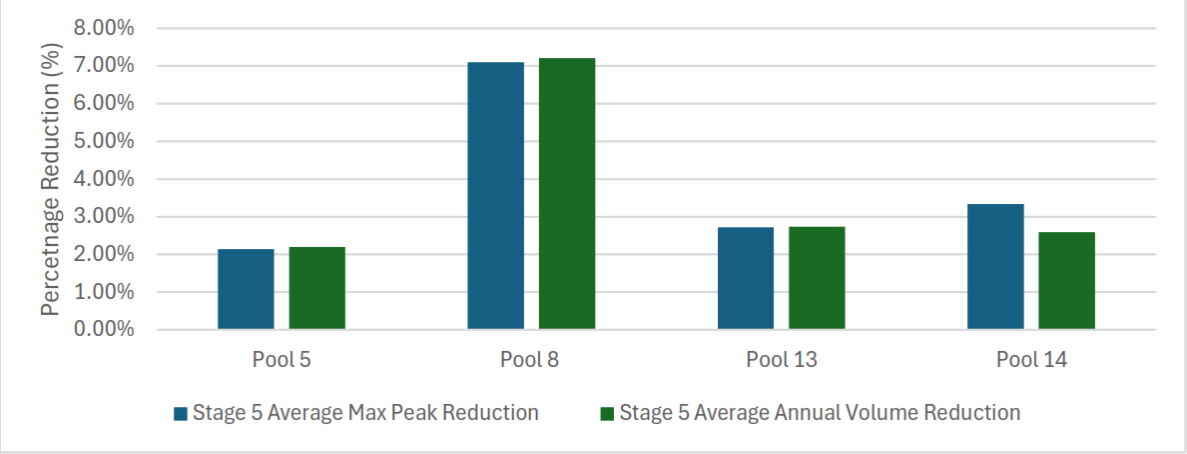


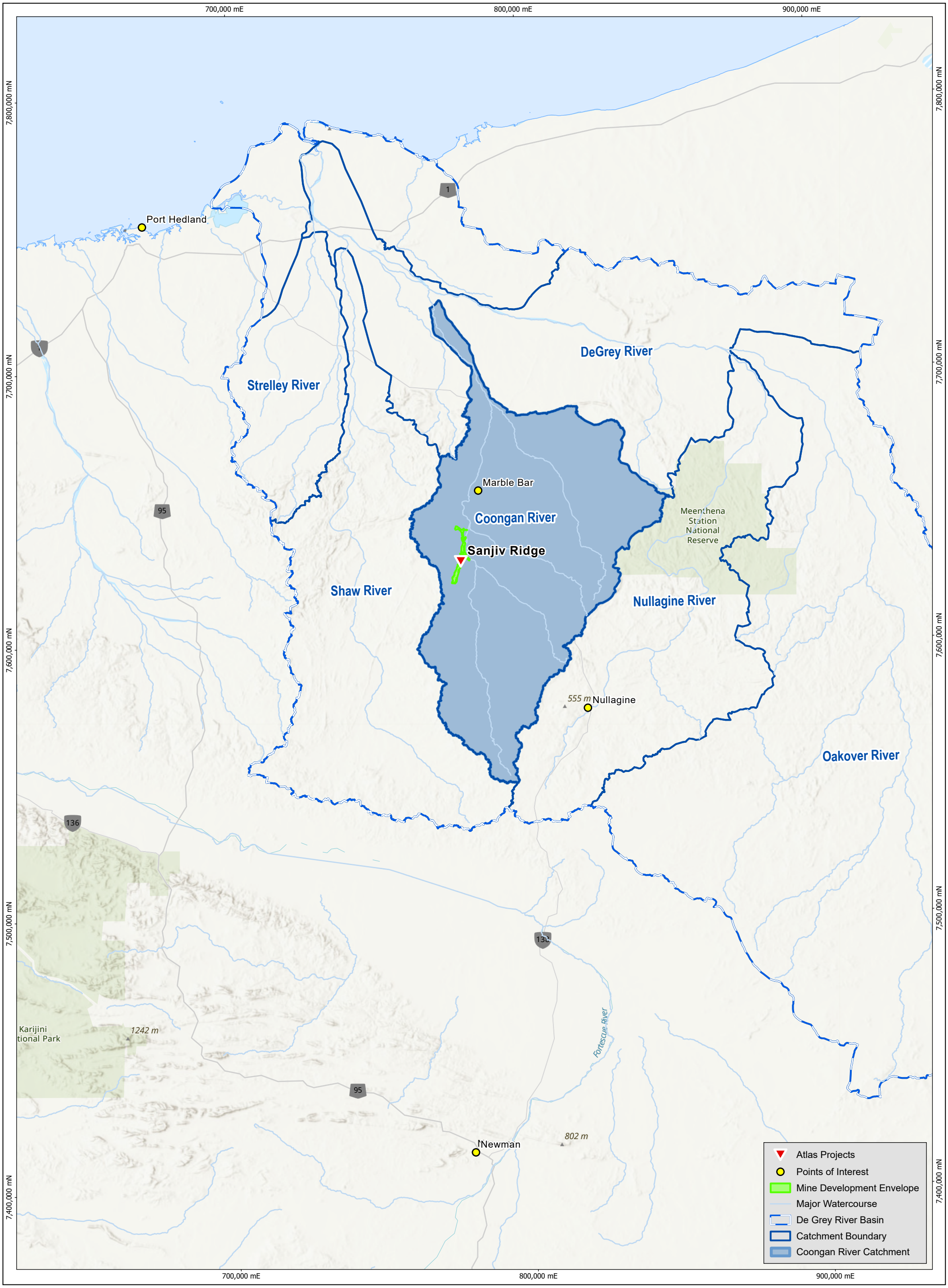
Figure 5-22: Below Water Table Mining Pool Impacts: Percent reduction in average peak flow and volume (SRK, 2025)

5.5.3.3.3 Regional Hydrology

Regionally the Project area is located in the mid-sections of the Coongan River catchment. The Coongan River is ephemeral, however, is sustained by shallow groundwater baseflow contributions for

periods following rainfall events (Figure 5-23). In contrast, the headwater catchments are ephemeral and respond directly to rainfall events only, due to the shallow, free-draining stony soils and steep catchments. While all rivers in the broader headwater region are ephemeral, surface water remains present year-round in pools along the main rivers and creeks, as well as within protected gullies and gorges (Smith Hydro, 2025).

Surface waters are generally fresh, although brackish conditions have previously been recorded in both the wet and dry seasons due to evapo-concentration effects (Appendix H).



HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GCS GDA 1994	Regional Surface Water Catchments
	Date: 11/08/2025	0 25 50 kilometres	Figure No: 5.23
	Drawn: justin.venables		
	Doc No:	Scale 1:1,250,000 Page size: A3	

5.5.3.3.4 Identified Surface Water Features

Several pools (Figure 5-25) have been identified occurring along the ridge within the Project Area or within downstream drainages. While recharge to these pools is primarily via rainfall, several are expected to have some groundwater contribution (SRK, 2019).

Eleven permanent or semi permanent potential sources of water for vertebrate species were identified previously within the Project area (MWH, 2018). These pools were classified as ephemeral or perennial based on presence of upstream seeps and flora species known to occur as phreatophytes. Five of the eleven pools were judged as perennial and four of these were also considered groundwater dependent (SRK, 2019).

Pool CO-WS-14 is linked to cave CO-CA-03 and the associated Pilbara Leaf-nosed Bat's breeding habitat (MWH, 2018). Water level monitoring at pool CO-WS-14 suggests flushing occurs during storms and large rainfall events, while year round maintenance of water levels within the pool suggest a perennial recharge from groundwater.

Pool CO-WS-12 demonstrates a similar trend with a gradual decline in water level consistent with evaporative losses and diminishing groundwater replenishment.

Water level hydrographs from pools CO-WS-01, CO-WS-02, CO-WS-08, CO-WS-10, CO-WS-11 and CO-WS-13 suggest that whilst these pools may receive some minor contribution from groundwater, there is a steep antecedent trend indicative of a dominant evaporative influence following cessation of rainfall runoff response. All pools clearly show the influence of rainfall-runoff response forming a significant component of pool water recharge during the wet season.

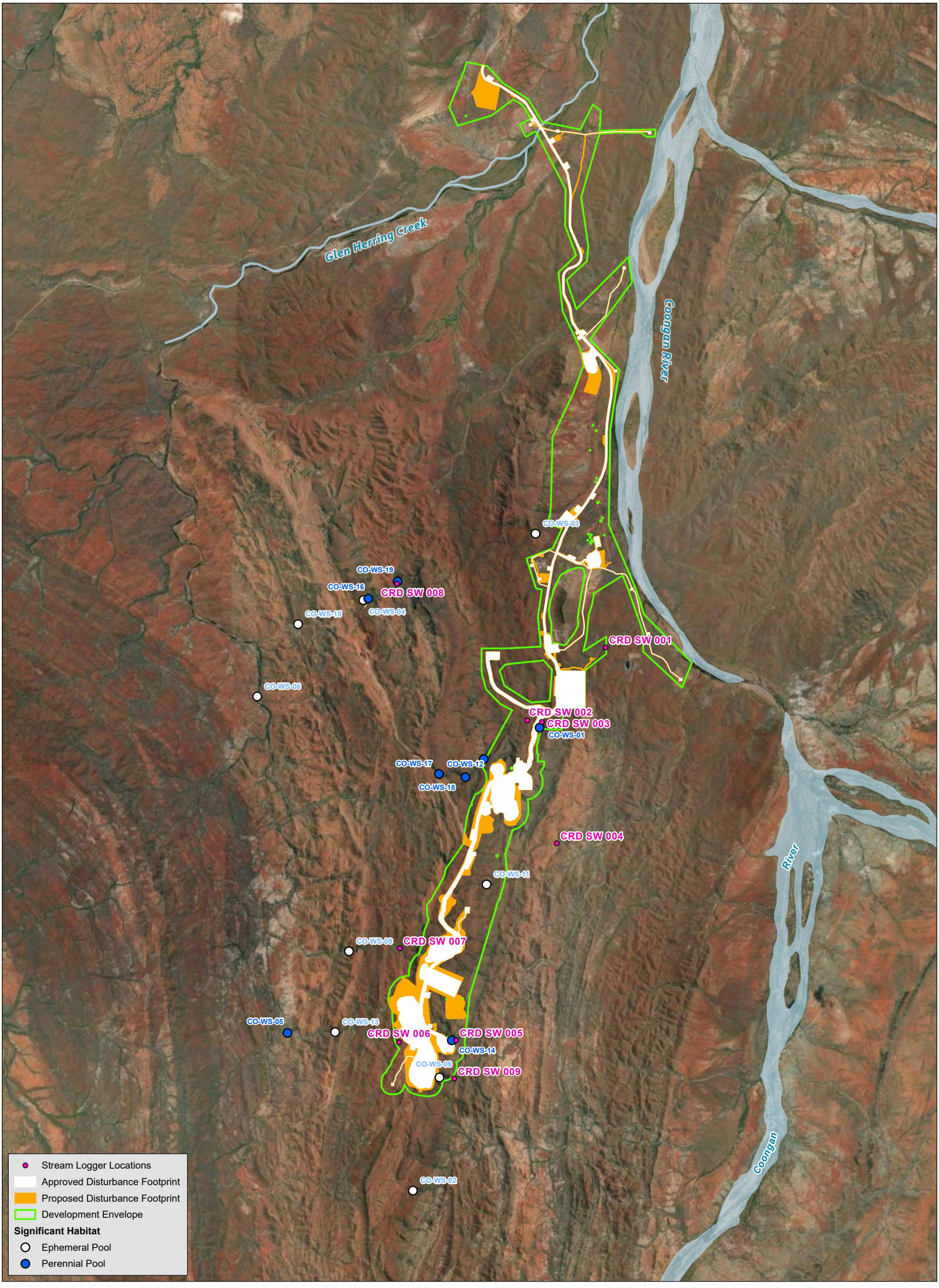
Table 5-26: Significant Pools Within the Vicinity of the MDE

Pool ID	Location	Permanency	Groundwater Dependency
CO-WS-01	Within MDE, outside indicative Disturbance Footprint approximately 20 m downstream of the haul road	Perennial	Likely
CO-WS-02	Outside Development Envelope Approximately 2 km south of the Sparrow pit	Ephemeral	Unlikely
CO-WS-03	Outside Development Envelope Approximately 430 m upstream of borrow pit	Ephemeral	Unlikely
CO-WS-05	Outside Development Envelope Approximately 2.2 km downstream of Sparrow waste dump	Perennial	Likely

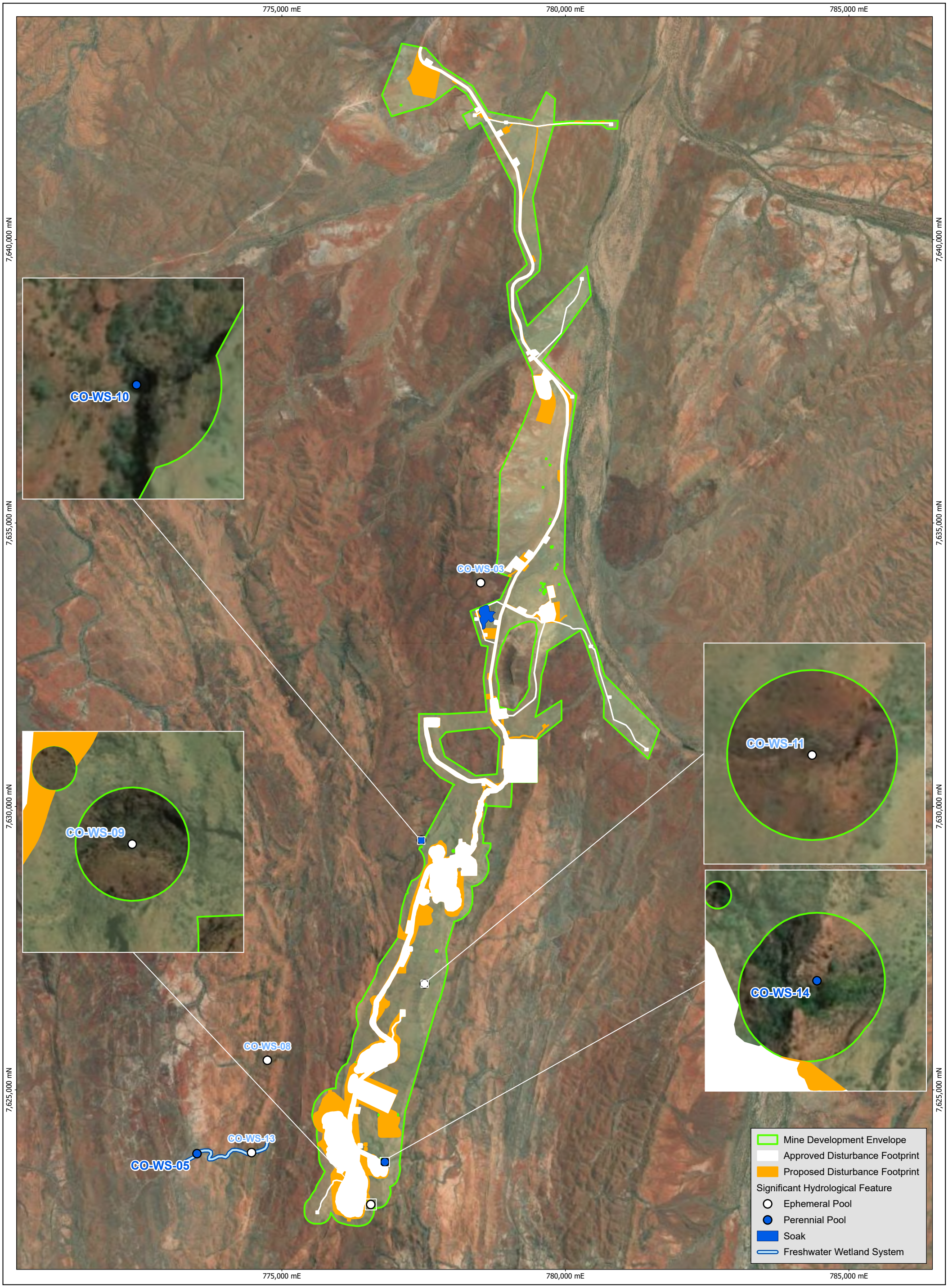
Pool ID	Location	Permanency	Groundwater Dependency
CO-WS-08	Outside Development Envelope Approximately 1.4 km downstream of the Shark Gully pit	Ephemeral	Potential seasonal contribution
CO-WS-09	Outside Development Envelope Approximately 185 m downstream of pit and 175 m downstream of topsoil stockpile	Ephemeral	Unlikely
CO-WS-10	Outside Development Envelope Approximately 280 m downstream of the Runway North pit	Perennial	Potential seasonal contribution
CO-WS-11	Outside Development Envelope Approximately 500 m downstream of a waste rock dump, 600 m downstream of haul road and 200 m upstream of minor infrastructure corridor	Ephemeral	Likely
CO-WS-12	Outside Development Envelope	Perennial	Likely
CO-WS-13	Outside Development Envelope Approximately 1.1 km downstream of the Sparrow waste rock dump	Ephemeral	Potential seasonal contribution
CO-WS-14	Outside Development Envelope Approximately 70 m downstream of the Razorback pit	Perennial	Likely

Water quality for significant pools within the MDE and surrounds was investigated as part of Aquatic Ecology studies undertaken by Biologic in 2024. Widespread impacts from cattle grazing and trampling, as well as invasive weeds were observed at pools associated with the Coongan River east of the MDE, while pools within the MDE were extremely fresh, with low dissolved metal and nutrient concentrations, and fewer disturbances (Appendix H).

Hydrological monitoring within the Proposal area is supported by a network of surface water monitoring locations situated across key catchments. These sites capture flow behaviour, water levels and water quality data that characterise baseline hydrological conditions and support ongoing assessment of surface water responses to rainfall events. Figure 5-24 identifies the locations of these monitoring sites relative to major drainage lines, surface pools and the broader Coongan River catchment.



HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Catchment Monitoring Locations
	Date: 23/01/2026	0 1 2 kiliometres	Figure No: 5.24
	Drawn: sam.nikora		
	Doc No:	Scale 1:70,000 Page size: A3	



HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Hydrological Features
	Date: 11/08/2025	0 1 2 Kilometres	Figure No: 5.25
	Drawn: justin.venables	N	
	Doc No:	Scale 1:60,000 Page size: A3	

SANJIV RIDGE HANCOCK IRON ORE

Surplus groundwater generated through dewatering may be discharged into downstream drainage systems where appropriate. The behaviour of discharged water within these ephemeral channels depends on seasonal conditions, channel morphology and existing water quality. Differences between the chemistry of surplus water and that of receiving environments can influence nutrient and metal concentrations locally, although significant downstream persistence is limited due to infiltration and rapid dissipation under dry conditions. Ongoing hydrological studies are being undertaken to refine the understanding of discharge volumes and expected hydrological responses.

5.5.3.4 Ground and Surface Water Dependent Ecosystems

Groundwater-dependent ecosystems associated with permanent and semi-permanent pools is discussed here in the context of groundwater hydrology, consistent with the EPA Inland Waters guideline. Broader floristic values and vegetation community assessments are addressed in the Flora and Vegetation Factor (Section. 5.1.3.8).

Water dependent ecosystems occur within and adjacent to the Project area, including riverine pools on the Coongan River and Glen Herring Creek, as well as semi-permanent and permanent rock pools located on minor tributaries and drainages throughout the area (Appendix H). Several of these surface water pools are known to support obligate groundwater dependent vegetation (Woodman Environmental, 2019).

5.5.3.4.1 Permanent and Ephemeral Pools

Water features observed in the Study Area are described as permanent (or potentially permanent pools) or as ephemeral (or likely ephemeral pools).

Of these water features identified, three pools were assessed at a High GDV rating, including two permanent pools (CO-WS-14 and CO-WS-16), and one ephemeral pool (CO-WS-26). Six pools were assessed as Moderate to High GDV rating. These pools were considered to be at low risk of impact from drawdown (Biologic, 2025b). Table 5-27 lists high and moderate to high GDV pools.

Pool CO-WS-14 is of particular environmental significance due to its hydrological connection with cave CO-CA-03, which is known to function as a non-permanent breeding roost for the Pilbara leaf-nosed bat. While shallow groundwater support to CO-WS-14 is evident, the degree of hydraulic connection to the deeper fractured bedrock aquifer targeted for dewatering remains uncertain and is proposed to be investigated further. Any reduction in groundwater discharge to CO-WS-14 has the potential to affect the cave's internal microclimate, including humidity, which is an important parameter influencing breeding suitability for this species.

The majority of ephemeral and perennial pools are located in areas at low risk of impact from drawdown. One perennial pool (CO-WS-10) is located in an area at moderate risk of impact from drawdown and assessed to have a moderate GDV rating (Biologic, 2025b).

Table 5-27: High and Moderate to High GDV Pools in the Study Area

Pool feature ID	Assessment Sites	Vegetation Type and Notable Features	Biologic GDV Rating
Perennial or Potentially Permanent Pools			
CO-WS-14	SRGR-009	D2 Perched wetland above pool; Deeply incised gully; Flowing water	High

Pool feature ID	Assessment Sites	Vegetation Type and Notable Features	Biologic GDV Rating
CO-WS-16	SRGR-036 SRGR-108 SRGM-035	D3 Confirm High GDV; Rockface seepage; Permanent pool; Flowing water; Deeply incised gully	High
CO-WS-05	SRGR-055	D8 Surface water present; Mature *Melaleuca* and sedges	Moderate to High
CO-WS-12	SRGR-015	D2 Deeply incised gully; Mature *Melaleuca argentea*	Moderate to High
CO-WS-27	SRGR-005	D8 Non-porous substrate; Potentially permanent pool; Steep gully sides	Moderate to High
CO-WS-28	SRGR-006	D5 Pool quite deep, 2-4m; Mature *Melaleuca argentea* though infrequent	Moderate to High
Ephemeral or Likely Ephemeral Pools			
CO-WS-26	SRGR-064 SRGR-077	D5 Pool quite deep, < 5m; water flowing with seepage present; Suggests perennial groundwater fed (though classed Ephemeral from HIO data)	High
CO-WS-25	SRGM-068	D6 Water flowing with seepage present; Becoming incised.	Moderate to High
CO-WS-34	SRGR-110 SRGM-066	D5 Surface water present in perched pools, ephemeral; Species composition suggests good soil moisture availability.	Moderate to High

5.5.3.5 Aquatic Ecology

Several aquatic habitats occur within and adjacent to the Project area, including riverine pools on the Coongan River and Glen Herring Creek, as well as semi-permanent and permanent rock pools located on minor tributaries and drainages throughout the general area (Biologic 2025i).

A combined database search and literature review identified 604 records of aquatic fauna taxa and 60 records of groundwater dependent or aquatic flora taxa within the Search Area. Of these, 541 were invertebrates. Insects accounted for over 44% of all fauna identified from the desktop assessment. Other aquatic and semi-aquatic fauna records included frogs, turtles, snakes (Pilbara olive python), and waterbirds (Biologic 2025i).

5.5.4 Potential Impacts

Potential impacts on the inland waters of the Proposal include:

Direct impacts:

- Groundwater drawdown caused by dewatering and abstraction;
- Reduced groundwater discharge to groundwater-fed pools (e.g., CO-WS-12, CO-WS-14, CO-WS-16);
- Changes to pool characteristics, including:
    - altered pool permanency;
    - reduced dry-season inflows; and
    - changes to aquatic habitat conditions.
- Potential drawdown influence on CO-WS-14 affecting hydrological support to cave CO-CA-03;
- Physical modification of catchments from additional mine infrastructure, including waste rock landforms; and
- Post-closure formation of pit lakes due to groundwater rebound.

Indirect impacts:

- Changes to cave microclimate (e.g., humidity) that may affect Pilbara leaf-nosed bat breeding suitability;
- Altered downstream hydrology where surplus groundwater is discharged;
- Changes in nutrient or metal concentrations in receiving environments if discharge chemistry differs from natural surface water;
- Potential impacts on water quality from contact with PAF or erodible materials, or chemical spills or hydrocarbons;
- Hydrological changes predicted by modelling, including modest reductions in peak flows and annual volumes (range 2–7%);
- Localised, temporary downstream flow changes (e.g., at SW009), dissipating with distance;
- Minor regional-scale catchment-scale influence (<0.02% reduction in contributing area);
- Increasing pit lake salinity over time due to evaporation (secondary to pit lake formation); and
- Persistence of a groundwater depression around pits (not extending to the Coongan River).

5.5.5 Mitigation

The EPA hierarchy of mitigation has been considered in developing the management strategies for potential environmental impacts from the Proposal. Mitigation measures that will be implemented for the protection of Inland waters throughout the Proposal implementation are outlined below. Additional mitigation measures may be implemented as new information becomes available from further studies.

5.5.5.1 Avoid

Avoidance measures proposed to protect Inland waters include:

- The Proposal has been designed to remain within the existing MDE boundary, which was originally established to avoid all significant water sources;
- The original MDE boundary provides protection for key hydrological features through strategic avoidance; and
- All exclusions zones and avoidance buffers around environmental sensitive features will not be impacted.

5.5.5.2 Minimise

Actions proposed to minimise the potential impacts to inland waters are:

- Clearing will be undertaken only as required to minimise open areas and potential for increased erosion on site;
- Maintenance of a site water balance model to inform site management of water;
- Minimisation of discharge by utilising dewatered sources as a priority, minimising additional groundwater abstraction;
- Selection of dewatering discharge location will consider significance of impacts to water sources;
- Management of potentially problematic materials within the WRLs to ensure any PAF materials are adequately managed;
- Storage and handling of hazardous materials to ensure risk of spills are minimised, and spills that do occur are cleaned up appropriately;
- Regular monitoring of groundwater levels and quality will be undertaken to track changes and ensure early detection of any adverse impacts. Implementation of trigger levels will allow for initiation of management actions if these thresholds are exceeded;
- Reinstatement of surface water drainage south of Sparrow Lake Pit into the catchment feeding SW009 monitoring location; and
- Placement of sedimentation traps within catchments feeding pools CO-WS-09 and CO-WS-14.

5.5.5.3 Rehabilitate

Rehabilitation measures will focus on the restoration of hydrological regimes post-mining to ensure natural drainage patterns and groundwater recharge processes are restored. Key rehabilitation strategies will include:

- Reshaping disturbed landforms to reinstate original drainage configurations where possible;
- Stabilising surface soils to reduce erosion;
- Re-establishing native vegetation species to promote natural hydrological function and ecological recovery; and

- Ongoing post-rehabilitation monitoring will verify that groundwater levels, water quality, and aquatic habitats return to baseline conditions.

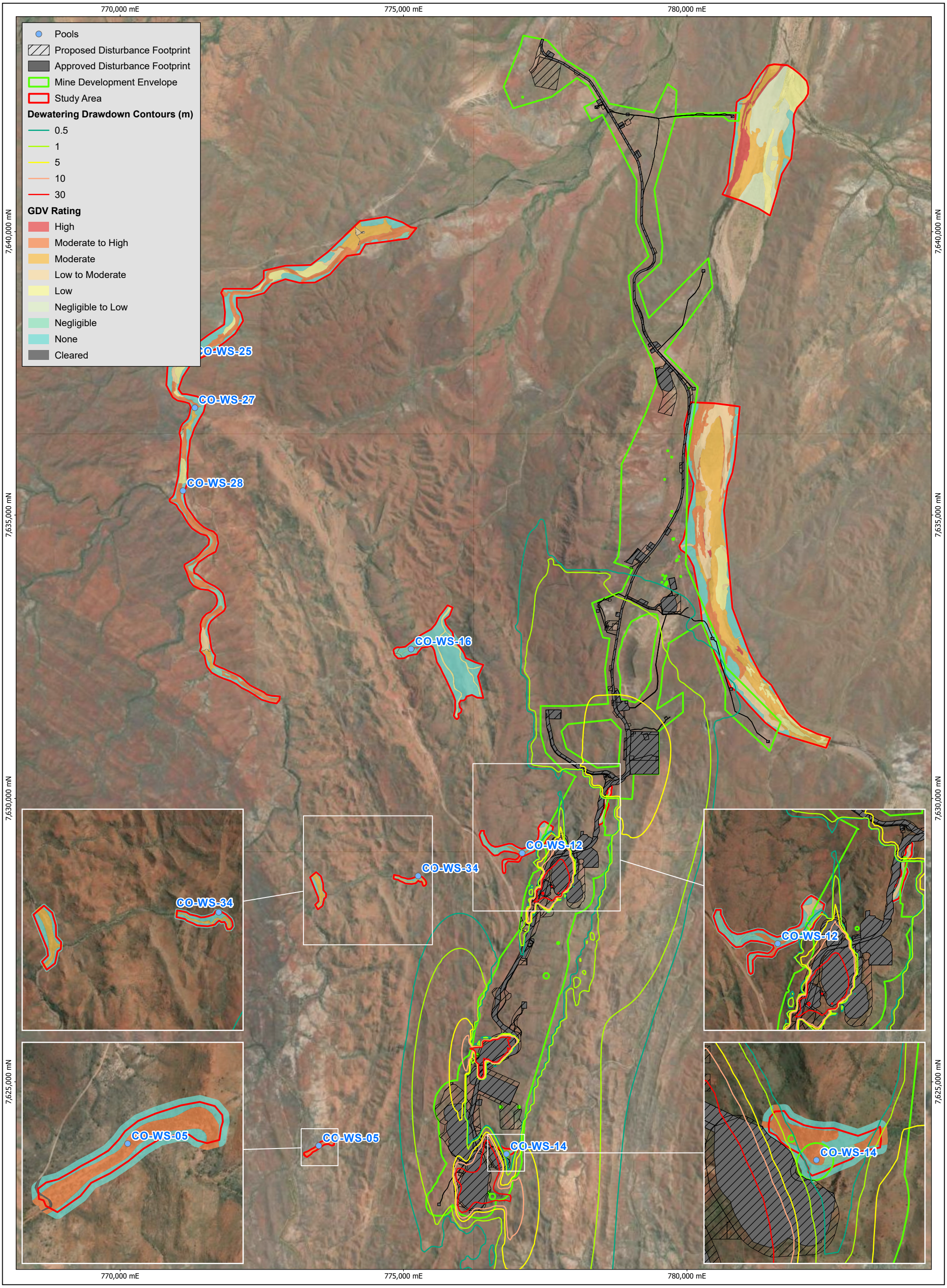
5.5.6 Assessment of Residual Impacts

Residual impacts of the Proposal on the inland waters of the area will include localised groundwater drawdown within the vicinity of pits and active abstraction areas, and temporary alterations to local groundwater-dependent ecosystems, notably around several sensitive perennial pools. These impacts are expected to be limited in magnitude and duration. The integrity and functionality of regional hydrological and ecological systems are anticipated to remain intact, with no significant long-term degradation expected.

At closure, and following cessation of pumping, groundwater is modelled to re-enter the pit voids and begin to accumulate. Figure 5-26 presents the predicted extent and magnitude of groundwater drawdown at the end of mining. This inflow, combined with minor amounts of rainfall and surface water runoff, will form pit lakes. Preliminary modelling indicates the pits will act as groundwater sinks, drawing in groundwater that will subsequently evaporate. Chemical modelling is underway to evaluate the expected evolution of pit lake water quality. Figure 5-27 illustrates the modelled extent of this long-term groundwater depression, demonstrating that it remains contained within the immediate mine area and does not extend to the Coongan River or other identified environmental values.

Early modelling results also show that although a long-term groundwater depression will persist, the extent of drawdown will not reach the Coongan River nor any of the environmental values associated with the river.

Further detail on the likely residual impacts of the Proposal will be presented in the ERD following additional hydrological studies.



HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	Predicted Groundwater Dewatering and Supply Drawdown at Life of Mine
	Date: 27/01/2026	0 1 2 Kilometres	Figure No: 5.26
	Drawn: sam.nikora	N	
	Doc No:	Scale 1:60,000 Page size: A3	

SANJIV RIDGE HANCOCK IRON ORE

770,000 mE
775,000 mE
780,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN

- Pools
- Mine Development Envelope
- Proposed Disturbance Footprint
- Approved Disturbance Footprint
- Study Area

Dewatering Drawdown Contours (m)

- 0.5
- 1
- 5
- 10
- 30

GDV Rating

- High
- Moderate to High
- Moderate
- Low to Moderate
- Low
- Negligible to Low
- Negligible
- None
- Cleared

CO-WS-25
CO-WS-27
CO-WS-28
CO-WS-16
CO-WS-34
CO-WS-12
CO-WS-34
CO-WS-12
CO-WS-05
CO-WS-05
CO-WS-14
CO-WS-14

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50	
	Date: 23/01/2026	0 1 2 Kilometres	N
	Drawn: sam.nikora		
	Doc No:	Scale 1:60,000 Page size: A3	

Post-Closure Groundwater Drawdown

Figure No: 5.27

5.5.7 Predicted Outcome

Predicted outcomes from the implementation of the Proposal include:

The integrity of significant hydrological features will be maintained through avoidance of key inland water systems within the MDE where possible.

- Regional groundwater levels and quality are expected to remain stable, supported by regular monitoring throughout the life of the Proposal;
- Residual impacts, including localised groundwater drawdown around the pits and temporary changes to groundwater-dependent ecosystems, are predicted to be of low significance and limited duration;
- Post-mining rehabilitation is expected to support re-establishment of natural hydrological functions across disturbed areas;
- The adaptive management framework will enable timely responses to any unforeseen changes in groundwater conditions or hydrological processes; and
- Overall, the Proposal is expected to meet the EPA objective for Inland Waters by maintaining the hydrological and ecological values of inland water systems.

Through the implementation of key mitigation, management and offset strategies, it is considered that the Proposal can be managed to meet the EPA objective for Inland Waters, which is to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.

5.6 Social Surroundings

5.6.1 EPA Objective

The EPA objective for social surroundings is "*To protect social surroundings from significant harm*". For the purposes of the definition of environment, the social surroundings of man are the aesthetic, cultural, economic and social surroundings to the extent that those surroundings directly affect or are affected by a person's physical or biological surroundings (EPA, 2023a).

5.6.2 EPA Policies and Guidelines

The following EPA policies and guidelines are considered relevant to the social surroundings Environmental Factor:

- Environmental Factor Guideline — Social Surroundings (EPA 2023a);
- EPA Statement of Environmental Principles, Factors and Objectives (EPA, 2023);
- Technical Guidance – Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage (EPA, 2023b);
- Aboriginal Heritage Due Diligence Guidelines (Department of Aboriginal Affairs and Department of Premier and Cabinet 2013); and
- DWER Draft Guideline - Assessment of environmental noise emissions (DWER 2021).

5.6.3 Receiving Environment

5.6.3.1 Regional Context

The Proposal is located in the Pilbara region of WA, approximately 240 km southeast of Port Hedland and 33 km south of Marble Bar. The land use in the area is predominately pastoral, with a number of mining operations located within the broader area. Project access from the mine access road, utilises the Hillside-Marble Bar Road route across to Corunna Downs Road and through to Limestone-Marble Bar Road for haulage of final product to Utah Point Bulk Commodities Berth at Port Hedland for export.

5.6.3.2 Local Context

The land use surrounding the MDE and Proposal area is predominately a combination of mining and pastoral activities. The majority of the Project is situated on allocated Crown land, with a portion on unallocated Crown land. Adjacent to the MDE are several land uses which include pastoral leases, Crown reserves and a geo heritage sites. The only land uses that intersect the MDE are the two pastoral leases Eginbah and Panorama stations. All other land uses are located outside of the MDE and will not be impacted by the mining and clearing activities proposed.

A desktop review indicates there are no other sensitive social and or other environmental features within and or near vicinity of the MDE.

Table 5-28: Surrounding Land Use

Type/Classification	Surrounding Local Land Use	Distance and Direction to MDE
Pastoral Leases	Eginbah Station;	Located within the MDE.
	Panorama Station	Located within the MDE.
	Corunna Downs Station	Located 484 m east.
Crown Reserve	Waterway Reserve – Designated for waterway purposes: R 11409 R 12773	Waterway Reserve – Designated for waterway purposes: Located 4.30 km west Located 8.75 km north east
	Timber Reserve - Designated for timber purposes: R 13663 R 13672 R 13676	Timber Reserve - Designated for timber purposes: Located 3.68 km west Located 7.57 km south east Located 3.99 km north east
Geo heritage Site	Camel Creek – Site ID 22: Columnar rhyolite; rare physiographic feature.	Located 6.79 km east.
Townsite	Marble Bar residential area	Located ~ 33 km north of the Project
Native Title	Nyamal Aboriginal Corporation	Located within the MDE.
	Palyku-Jartayi Aboriginal Corporation	

770,000 mE
780,000 mE
790,000 mE
7,650,000 mN
7,640,000 mN
7,630,000 mN
7,620,000 mN

R 12762
R 2906
R 13676
R 12773
Hillside - Marble Bar Rd
R 13675
R 12763
EGINBAH
Camel Creek
R 41716
Coongan River
R 4974
R 13672
R 13663
R 11409
R 10977

Development Envelope
Atlas Tenure
Watercourses
Surrounding Land Uses
Geoheritage Sites
Crown Reserves
Corunna Downs Station
Eginbah Station
Panorama Station

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GCS GDA 1994	Figure No: 5.28
	Date: 12/09/2025	0 2 4 Kilometres	
	Drawn: sam.nikora		
	Doc No:	Scale 1:110,000 Page size: A3	

Surrounding Land Uses

5.6.3.3 Native Title

The Project is located within the Nyamal-Palyku Proceeding (no 7) [2023] FCA 528 and the Nyamal-Palyku Proceeding (no 8) [2024] FCA 11 Native Title Claim Determination Area. Both the Nyamal People and the Palyku People have native title interests within the approved MDE. HIO conducts all activities in accordance with these prescribed and agreed protocols resulting in a sound working relationship with the representative bodies.

5.6.3.4 Aboriginal Heritage Sites

Aboriginal heritage sites have been provided based on publicly available information provided by Department of Planning Lands and Heritage. The nearest registered Aboriginal heritage site is located approximately 3 km from the Proposal boundary (Place ID 39170) (Figure 5-29). The Native Title groups have requested the details for all other heritage sites identified within the Project to be kept confidential.

Table 5-29: Publicly Lodged Heritage Sites

Name	ID	Type	Status
CRD-07-13	36957	Artefacts / Scatter	Lodged
CRD-43-16	36958	Quarry	Lodged
CRD-50-16	38586	Artefacts / Scatter Ritual / Ceremonial Hunting Place	Lodged
CRD-41-16	38587	Camp Grinding areas / Grooves	Lodged
CRD-27-16	38588	Artefacts / Scatter Grinding areas / Grooves	Lodged
CRD-04-13B	38680	Artefacts / Scatter Plant Resource Rock Shelter Water Source	Lodged
CRD-70-20	38697	Grinding areas / Grooves Rock Shelter Water Source	Lodged
CRD-71-20	39170	Artefacts / Scatter Ritual / Ceremonial Historical Landscape / Seascape Feature	Lodged
CRD-03-13B	39171	Artefacts / Scatter	Lodged

Name	ID	Type	Status
		Grinding areas / Grooves Ochre Rock Shelter Water Source	
CRD-72-22	40339	Grinding areas / Grooves Water Source	Lodged
CRD 01-12B	40863	Artefacts / Scatter Ochre Rock Shelter Water Source	Lodged

id	name
11081	TEN PIN POOL
11084	CORUNNA HOMESTEAD: HILL B
11085	CORUNNA HOMESTEAD: HILL C
11086	CORUNNA HOMESTEAD: HILL D
11087	CORUNNA HOMESTEAD: HILL E
11088	CORUNNA HOMESTEAD: HILL F
11957	DJUGUBUNYA MUNDA
11089	CORUNNA AERODROME

id	name
39170	CRD-71-20
39171	CRD-03-13B
40337	CRD-73-22
40339	CRD-72-22
38586	CRD-50-16
38587	CRD-41-16
38588	CRD-27-16
38680	CRD-04-13B
38697	CRD-70-20 - Ngulyimunya
36957	CRD-07-13
36958	CRD-43-16
40863	CRD 01-12B

Registered Heritage Site
Lodged Heritage Site
Mine Development Envelope
Proposed Disturbance Footprint
Approved Disturbance Footprint - MS 1125

HANCOCK IRON ORE	File Name: GIS_3874.aprx	Projection: GDA 1994 MGA Zone 50		Figure No: 5.29
	Date: 2/09/2025	0 1 2 kiliometres	N	
	Drawn: sam.nikora			
	Doc No:	Scale 1:70,000 Page size: A3		

Aboriginal Cultural Heritage

5.6.3.5 Aboriginal Heritage Surveys

Archaeological and ethnographic surveys (Figure 5-30 and Figure 5-31) have been undertaken across the whole of the Development Envelope, with the full participation and involvement of the Palyku and Nyamal People, to identify any sites that may constitute an Aboriginal site under the *Aboriginal Heritage Act* 1972 (WA) (AH Act). Further archaeological surveys with Palyku People are agreed.

Table 5-30: Summary of Aboriginal Heritage Surveys and on Country Consultation for the Proposal

Survey Report Details	Timing	Method	Archaeological (Arch)/ Ethnographic (Ethno)
Indigenous Heritage Survey Report (Work Program Clearance) Gondwana Resources Ltd Proposed Exploration Drilling Program Corunna Downs Iron Project Tenement E45/2585	April 2010	Site Avoidance (Exploration)	Arch/Ethno
Work Program and Work Area Heritage Assessment, Nominated Areas within the Corunna Downs Project, Pilbara, Western Australia	December 2012	Site Avoidance (Exploration)	Arch
Work Program Heritage Assessment (Site Avoidance level), Tenement E45/2585---1, within the Corunna Downs Exploration Project, East Pilbara, Western Australia	May 2013	Site Avoidance (Exploration)	Arch
Work Area and Work Program Heritage Assessment, Corunna Downs Exploration Drilling Program, Tenements E45/3320, E45/3321, E45/3579 and E45/2585,within the Corunna Downs Project, East Pilbara, Western Australia	August – September 2013	Site Avoidance (Exploration)	Arch/Ethno
Report on an Aboriginal Heritage Assessment – Ethnographic Site Identification - of the Coruna Downs Project Areas (AI-115) located near Marble Bar in the Eastern Pilbara, in Western Australia for Yamatji Marlpa Aboriginal Corporation	May 2014	Site Identification Survey (Mining)	Ethno
Report of an Aboriginal archaeological survey of the Corunna Downs Exploration CD32 Survey Area, Pilbara, Western Australia	May – June 2014	Site Avoidance (Exploration)	Arch
Report of an Aboriginal archaeological survey of Corunna Downs Exploration - Shark Gully South and CD12 Survey Area, Pilbara, Western Australia	June 2014	Site Avoidance (Exploration)	Arch
Report of an Aboriginal archaeological survey of the Corunna Downs Exploration CD32 EIS Survey Area, Pilbara, Western Australia	July 2014	Site Avoidance (Exploration)	Arch/Ethno
Report on an archaeological and ethnographic site avoidance and site identification heritage survey of the Corunna Downs (AI145) Project Area, conducted by the Nyamal Traditional Owners and Terra Rosa Consulting	July – November 2016	Site Avoidance and Site Identification Survey (Mining)	Arch/Ethno
Report on an Aboriginal Archaeological and Ethnographic Site Avoidance Work Area Assessment of the Corunna Downs Survey Areas, the Mount Webber telemetry and tracks Survey Areas, and a Site Identification Work Area Assessment and Cultural Salvage of selected Aboriginal archaeological sites, in the Pilbara, Western Australia	September 2017	Site Identification Survey (Mining and Salvage	Arch/Ethno
Archaeological and ethnographic site avoidance heritage survey of the AI163 Corunna Downs Project Area, with the Nyamal Traditional Owners	July 2019	Site Avoidance (Mining)	Arch/Ethno
Archaeological site identification assessment within Corunna Downs AI171 project area with the Nyamal Traditional Owners	May 2020	Site Identification Survey (Mining)	Ethno
Corunna Downs CRD-51-16 Site Salvage, Archaeological and Ethnographic Site ID Assessment of CRD 01-12A and CRD 04-13 and Archaeological and Ethnographic Site Avoidance Assessment of Water Exploration Bore CRD0108	August 2020	Site Avoidance and Site Identification Survey (Mining and Exploration)	Arch/Ethno
Corunna Downs CRD-51-16 Site Salvage and Archaeological and Ethnographic Site ID Assessment of CRD-04-13 and CRD-70-20	August 2020	Site Identification Survey (Mining)	Arch/Ethno
Archaeological and ethnographic site avoidance heritage survey and site identification assessment of CRD-03-13A within the Corunna Downs AI173 project area with the Nyamal Traditional Owner	December 2020 – January 2021	Site Avoidance (Mining)	Arch/Ethno
A site identification level assessment of CRD-69-20 and CRD-71-20, and an ethnographic site avoidance assessment of Areas A to G, with the Nyamal Traditional Owners	May 2021	Site Avoidance and Site Identification Survey (Mining)	Arch/Ethno
Assessment of the Social Surrounds values within the proposed Sanjiv Ridge Iron Ore Stage 2 Project Area with Nyamal Traditional Owners	August – September 2021	Consultation	

Survey Report Details	Timing	Method	Archaeological (Arch)/ Ethnographic (Ethno)
Aboriginal Heritage Act 1972 Site Visit and Consultation: CRD-01- 12B And CRD-70-20 Consultation with Nyamal Traditional Owners	September 2021	Consultation	
Archaeological and ethnographic Site Avoidance Survey of AI194 – Sanjiv Ridge Runway Expansion and Ethnographic Gap Survey areas with Nyamal Traditional Owners	May 2022	Site Avoidance (Mining)	Arch/Ethno
Sanjiv Ridge Stage 2 – Archaeological and Ethnographic Site Avoidance Survey of 200 m Wide Area surrounding the Development Envelope with Nyamal Traditional Owners	August 2022	Site Avoidance (Mining)	Arch/Ethno
Palyku-Jartayi Aboriginal Corporation RNTBC – Sanjiv Ridge Project Visit	May 2024	Consultation	
The ethnographic site identification assessment of the Sanjiv Ridge Sparrow Development project area conducted with the Palyku Traditional Owners	April 2025	Identification Survey (Mining)	Ethno
An archaeological site identification and site avoidance heritage survey of the Sanjiv Ridge Project Area conducted with the Palyku Traditional Owners	July 2025	Site Avoidance and Site Identification Survey (Mining)	Arch
Palyku-Jartayi Aboriginal Corporation (PJAC) Board SMR Site Visit	28 – 30 May 2024	Consultation	
Social Surroundings Consultation (Trip 1 of 3) of Stage 5 Below Water Table mining operations at the Sanjiv Ridge Project with Palyku Traditional Owners, prepared for Hancock Iron Ore	November 2025	Consultation	
Aboriginal Heritage Act 1972 Consultation of the Priority 1 Arch Heritage Survey Area within the Sanjiv Ridge Project tenement M45/1257-I with Palyku Traditional Owners, prepared for Hancock Iron Ore	November 2025	Consultation	
An archaeological site identification heritage survey of the AI248 Razorback and Sparrow East project area conducted with the Palyku Traditional Owners, prepared for Hancock Iron Ore	November 2025	Site Identification Surve	Arch

770,000 mE
775,000 mE
780,000 mE
785,000 mE
7,640,000 mN
7,635,000 mN
7,630,000 mN
7,625,000 mN
Nyamal
Palyku
Development Envelope
Native Title Boundary
Ethnographic Heritage Survey
Archaeological Heritage Survey

HANCOCK IRON ORE	File Name: GIS_3888.aprx	Projection: GDA 1994 MGA Zone 50	Figure No: 5.30
	Date: 20/01/2026	0 1 2 Kilometres	Ethnographic and Archaeological Heritage Survey Coverage - Nyamal Surveys Pre 2024
	Drawn: sam.nikora		
	Doc No:	Scale 1:60,000 Page size: A3	

775,000 mE

7,625,000 mN

Nyamal
Palyku

Development Envelope
Native Title Boundary
Ethnographic Heritage Survey
Archaeological Heritage Survey

HANCOCK IRON ORE	File Name: GIS_3888.aprx	Projection: GDA 1994 MGA Zone 50	Ethnographic and Archaeological Heritage Survey Coverage - Palkyu Surveys Post 2024
	Date: 29/01/2026	0 0.25 0.5 Kilometres	Figure No: 5.31
	Drawn: sam.nikora		
	Doc No:	Scale 1:15,000 Page size: A3	

5.6.3.6 Future Studies

The details of ongoing or planned studies, surveys and or investigations for social surrounds specifically pertaining to heritage will be used to inform the assessment process.

5.6.3.7 Noise Studies

Noise studies were undertaken for the existing mine in 2016 (Talis Consultants, 2016), with a reassessment undertaken in 2019 following proposed changes to machinery selection and operational controls (Talis Consultants, 2019). The noise assessments found that the noise impacts of the mine are expected to be minimal for the nearest sensitive receptors, being the Marble Bar Roadhouse, Marble Bar Residence and the Historic Gold Mine. The study also included an assessment of road noise, which following the proposed changes was expected to comply with the State Planning Policy 5.4 "*Road and Rail Transport Noise and Freight Considerations in Land Use Planning limits*".

The Proposal is not likely to significantly alter the outcomes of this study, given the minimal changes to mine layout. The haulage route and operation are also not expected to change as a result of Proposal implementation, and noise impacts are not expected to require further assessment.

5.6.4 Potential Impacts

Potential impacts on the social surroundings of the Proposal include:

Direct Impacts:

- Disturbance and or loss of heritage places;
- Restricted access to land for cultural purposes;
- Unauthorised access to Aboriginal Cultural Heritage Places;
- Loss of culturally significant flora and fauna species; and
- Reduced visual amenity and other aesthetic values due to mining activities infrastructure.

Indirect Impacts:

- Alteration of heritage sites and values from mining activities (light, vibration, noise, dust, sedimentation);
- Alteration of cultural and heritage values, due to groundwater abstraction, impacting surface water and groundwater regimes; and
- Potential impacts on unknown Aboriginal Cultural Heritage sites.

5.6.5 Mitigation

The EPA hierarchy of mitigation has been considered in developing the management strategies for potential environmental impacts from the Proposal. Mitigation measures that will be implemented for the protection of Social Surroundings throughout the Proposal implementation are outlined below. Additional mitigation measures may be implemented as new information becomes available from further studies.

5.6.5.1 Avoid

Avoidance measures proposed to protect Social Surroundings include:

- Continued avoidance of known and lodged heritage and or culturally significant sites, where possible; and
- Exclusion zones and avoidance buffers surrounding known Aboriginal Cultural Heritage sites will be retained and not impacted.

5.6.5.2 Minimise

Actions proposed to minimise the potential impacts to social surroundings are:

- Implementing the following plans, procedures and mitigation measures:
    - Ground Disturbance Permit (GDP) Procedure (950-HSE-EN-PRO-0001);
- Adherence to Native Title agreements;
- Should any new sites be identified within the proposed disturbance footprint that meets the definition of a registered Aboriginal site under Section 5 of the *Aboriginal Heritage Act* 1972, obtain Section 18 consent prior to disturbance;
- Ongoing stakeholder consultation will be undertaken for the Proposal with potentially affected stakeholders, including Traditional Owners, pastoralists, government departments and the local community of Marble Bar;
- Implement a speed limit restriction across haulage routes where possible;
- An Aboriginal Cultural Heritage Management Plan will be developed with Traditional Owners;
- Improved understanding obtained by additional heritage studies where required to confirm location of potential new sites of significance;
- Where safe to do, ongoing access to the Mine Development Envelope will be provided to relevant external stakeholders during the life of mine;
- Standard dust management measures will be implemented to minimise potential airborne dust emissions and reduce visual amenity impacts;
- Tradition Owner monitors appointed for all vegetation clearing activities; and
- Repatriation of salvaged cultural materials where agreed.

5.6.5.3 Rehabilitate

Rehabilitation will be undertaken in accordance with an MCP approved by DMPE. Rehabilitation of the site will aid in reducing the potential long-term impacts of the Proposal. This includes rehabilitating disturbance to promote self-sustaining native vegetation and establish fauna habitat.

The post-mining landform will remain consistent with features of the broader Pilbara landscape. As such, impacts to visual amenity are expected to be minor and can be appropriately managed through rehabilitation.

The following rehabilitation measures will be implemented in relation to social surroundings:

- Post-closure access to sites of cultural significance will be maintained; and
- Seed collection prior to/during construction and operations for use in the rehabilitation (including Traditional Owner representatives). Department of Aboriginal Affairs and Department of Premier and Cabinet

5.6.6 Assessment of Residual Impacts

The Proposal is expected to result in limited residual impacts to social surroundings and are primarily related to Aboriginal cultural heritage and changes to the visual landscape. These impacts are anticipated to remain low due to the avoidance of known heritage sites, the absence of nearby sensitive receptors, and the continuation of existing management measures. Ongoing archaeological and ethnographic surveys, together with continued consultation with the Nyamal and Palyku People, will further refine the understanding of any remaining impacts and ensure they are appropriately managed.

HIO considers that potential impacts to heritage values can be effectively managed under the *Aboriginal Heritage Act 1972*, supported by ongoing engagement with Traditional Owners through existing agreements.

5.6.7 Predicted Outcome

Predicted outcomes from the implementation of the Proposal include:

- Access to culturally important areas outside the disturbance footprint will be maintained, and consultation with Traditional Owners will support continued recognition and protection of cultural values;
- Ongoing compliance with Native Title and Aboriginal heritage legislation;
- Cultural use of land is maintained where applicable within the Proposal;
- Indirect impacts to heritage places from dust, noise, light, vibration and sedimentation are not anticipated to be significant due to compliance with relevant legislation;
- Visual amenity impacts are expected to be minor, due to limited external viewpoints, the absence of sensitive receptors in proximity to the MDE, and the rehabilitation of landforms and vegetation to mimic surrounding Pilbara landscapes;
- Any previously unknown Aboriginal Cultural Heritage sites identified during ongoing surveys will be appropriately managed, ensuring residual impacts remain low through avoidance or statutory heritage processes; and
- Long-term impacts to social surroundings will be further reduced through progressive rehabilitation, reinstating native vegetation, habitat and improving landscape integration as mining areas are closed.

With the lack of sensitive receptors in the vicinity of the MDE and through the implementation of key mitigation, management and offset strategies, it is considered the Proposal can be managed to meet

the EPA objective for Social Surroundings, which is to protect Social Surroundings from significant harm.

5.7 Greenhouse Gas Emissions

5.7.1 EPA Objective

The relevant EPA objective for Greenhouse Gas (GHG) Emissions is "*To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable*".

5.7.2 EPA Policies and Guidelines

The following EPA policies and guidelines are considered relevant to the greenhouse gas emissions environmental factor:

- Environmental Factor Guideline – Greenhouse Gas Emissions (EPA, 2024).
- This guideline provides that generally the EPA will have regard to the GHG Emissions environmental factor where the emissions from a project are likely to exceed 100,000 tonnes CO2-e of either Scope 1 or Scope 2 emissions in any year.

5.7.3 Receiving Environment

5.7.3.1 Relevant Studies

HIO engaged a consultant to undertake GHG modelling to determine the extent of the Proposals GHG emissions.

Table 5-31: Summary of Technical Studies for Greenhouse Gas Emissions Factor

Study	Study Purpose
Sanjiv Ridge Project Greenhouse Gas Assessment Summary Report 2024 (Greenbase, 2024)	This GHG assessment and emissions intensities estimates has been prepared based on the expansion of operations at Sanjiv Ridge anticipated for Stage 5 of the Project.

Existing mining operations in the Pilbara generate greenhouse gas (GHG) emissions from fuel combustion and electricity generation. HIO has well established procedures for the reporting of GHG emissions from its Pilbara operations in accordance with the *National Greenhouse and Energy Reporting Act* 2007 and is committed to an ongoing program of reporting and review to identify opportunities to further reduce energy consumption and reduce GHG emissions. Studies most relevant to GHG emissions have been provided as Appendix J.

5.7.4 Potential Impacts

The main source of Scope 1 GHG emissions identified in the Project is diesel combustion. The total estimated Scope 1 GHG emissions over the life of project (LOP) is 395,613 tCO^2-e. The average Scope 1 emissions is estimated to be 79,123 tCO^2-e/year. On average the Sanjiv Ridge Project currently reports 25,258 tCO^2-e/year. The expansion will increase GHG emissions by approximately 53,865 tCO^2-e/year.

Table 5-32: Key Project Inputs and Estimated Emissions

Input	Value (over LOP)	Scope 1 Emissions (t CO^2 – e)
LOP	5 years	N/A
Total material moved	27,120,431 tonnes	N/A
Total diesel consumption	144,404 kL	391,957
Total Oil and Grease Usage	2,128.54 kL	1,033
Cleared area	154 ha	2,623
Total	**-**	**395,613**

The estimated scope 1 GHG emissions trajectory over the LOP are displayed in Figure 5-32. The highest year of scope 1 emissions is expected to be year 1 of the stage, with 89,068 tCO2-e of emissions. The lowest year is expected to be year 5 of the stage, with 56,287 tCO2-e of emissions.

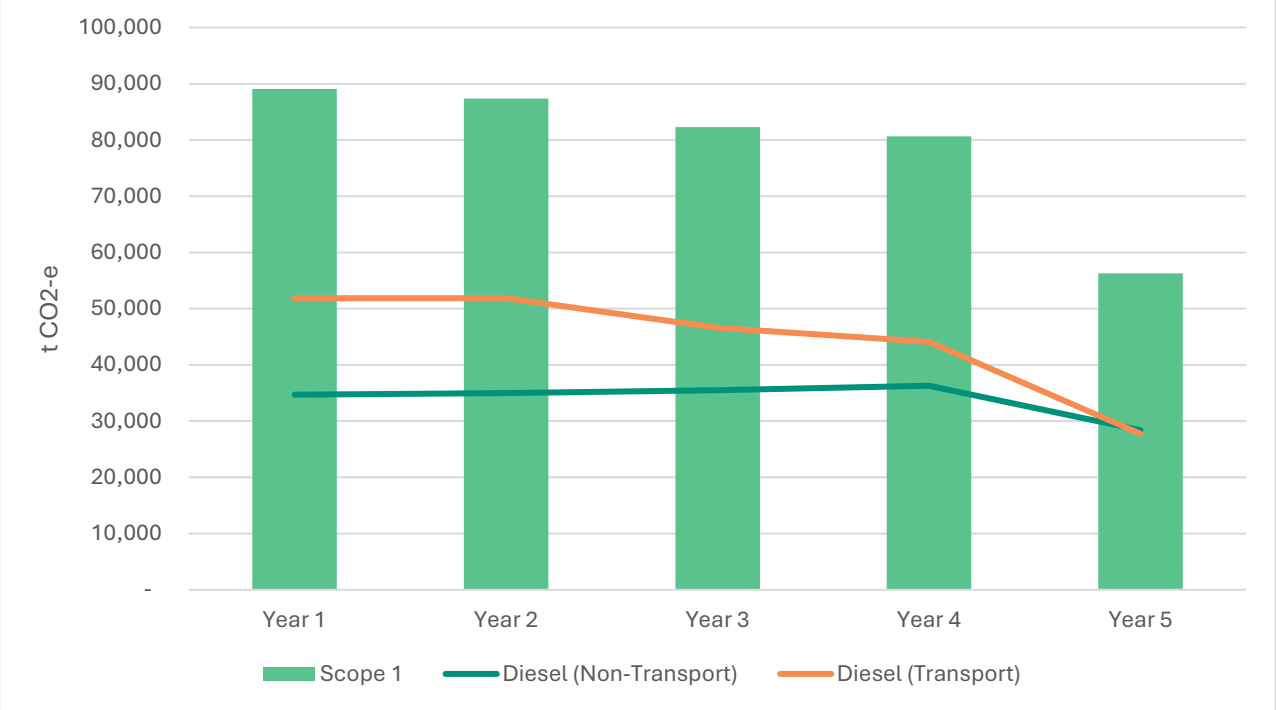


Figure 5-32: Estimated GHG Emissions Trajectory for the Expansion

5.7.5 Mitigation

The EPA hierarchy of mitigation has been considered in developing the management strategies for potential environmental impacts from the Proposal. Mitigation measures that will be implemented to minimise the risk of environmental harm associated with greenhouse gas emissions are outlined below:

5.7.5.1 Avoid

Avoidance measures proposed relating to greenhouse gases are:

- The proposal being designed to reduce the extent of clearing required for the expansion; and
- The proposal not increasing production rate and or road train fleet to what is being utilised already.

5.7.5.2 Minimise

Actions proposed to minimise the potential impacts to greenhouse gases are:

- Minimising clearing of native vegetation as much as possible;
- Optimisation of haul routes and truck operation;
- Selection of energy-efficient technology where available and practical;
- All machinery and mobile equipment will be maintained in accordance with manufacturers' requirements and operated appropriately by competent and trained personnel;
- Undertake rehabilitation where practicable to facilitate carbon uptake by revegetation;
- Diesel and electricity requirements will be reassessed regularly to provide more accurate estimates and optimise their use to reduce emissions;
- Emissions will be monitored and reported in accordance with the National Greenhouse and Energy Reporting Act 2007 and the National Pollutant Inventory (NPI);
- Utilisation of solar power for production bores where practicable;
- Selection of energy efficient mobile equipment where practicable;
- Optimise blasting techniques to improve dig rates which subsequently increases digger utilisation and reduces truck idle times, resulting in reduced fuel use;
- Limit double handling to reduce the total material transported;
- Use buses/carpooling to transport personnel between airport and site;
- Regular inspection, maintenance and replacement of equipment so that energy efficiency is maximised during the life of the item; and
- Compliance to reporting requirements under the Clean Energy Regulator and the National Greenhouse and Energy Reporting Act 2007 and the National Pollutant Inventory (also subject to the NGER Emissions Reduction Fund Safeguard).

5.7.6 Assessment of Residual Impacts

The significant sources of Scope 1 GHG emissions resulting from the activities identified from the project are as follows:

- Diesel consumption by the mining fleet, power generators and support equipment (non-transport);
- Oils and greases consumption; and
- Land clearing.

The Proposal is expected to result in the following residual impacts:

- The Proponent will contribute to greenhouse gas emissions, primarily from diesel consumption, from stationary and mobile equipment;
- The expected GHG emissions from the expansion will not exceed 100,000 t CO2-e/year; and
- Combined GHG emissions for the Proponent could exceed 100,000 t CO2-e/year in the short term.

As other HIO sites approach closure < 2yrs it is anticipated GHG emissions will remain below 100,000 t CO2-e/year.

5.7.7 Predicted Outcome

The Proposal will contribute to greenhouse gas emissions, primarily from diesel consumption, stationary and mobile equipment.

Predicted outcomes from the implementation of the Proposal include:

- Annual greenhouse gas emissions from the Proposal are expected to remain below 100,000 t CO_2-e per year and therefore are not predicted to contribute significantly to regional or national emissions profiles; and
- Greenhouse gas emissions and reportable pollutants are expected to remain transparently monitored and publicly reported, ensuring emissions performance remains consistent with national reporting frameworks and regulatory expectations.

HIO considers that compliance with the Safeguard Mechanism will result in the business achieving target GHG emissions. Through the implementation of key mitigation, management and offset strategies the Proposal can be managed to meet the EPA objective for Greenhouse Gases, which is to minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.

6. Offsets

Environmental offsets are actions that provide environmental benefits which counterbalance the significant residual impacts of a proposal. The following offset policies have been considered and apply to the proposal:

- WA Environmental Offsets Policy (EPA, 2011);
- EPBC Act Environmental Offsets Policy (DSEWPC, 2012);
- Western Australian Government's Environmental Offsets Guideline (Government of Western Australia 2014);
- EPBC Act Offsets Assessment Guide for use in determining offsets under the EPBC Act, (October 2012); and
- Public Advice – Considering environmental offsets at a regional scale (EPA, 2024a).

Mitigation measures described in this document were developed and applied based on the following hierarchy:

- Avoid;
- Minimise;
- Rehabilitate; and
- Offset.

As noted in WA Environmental Offsets Guidelines, "Environmental offsets address significant environmental impacts that remain after on-site avoidance and mitigation measures have been undertaken. Environmental offsets will only be considered after strategies to avoid and mitigate significant environmental impacts have been applied." As such, all reasonable and feasible actions under the mitigation hierarchy should be considered to address residual significance prior to considering offsets.

Significant Residual Impacts include those that:

- Affect rare and endangered plants and animals (such as declared rare flora and threatened species that are protected by statute);
- Areas within the formal conservation reserve system;
- Important environmental systems and species that are protected under international agreements (such as Ramsar listed wetlands); and
- Areas that are already defined as being critically impacted in a cumulative context.

Impacts may also be significant if, for example, they could cause plants or animals to become rare or endangered, or they affect vegetation which provides important ecological functions (Government of Western Australia, 2014).

6.1 Offsets Strategy

Offsets for the Proposal are to be primarily managed through contributions to the Pilbara Environmental Offsets Fund (PEOF). The PEOF is a combined fund with the purpose of delivering environmental offsets in the Pilbara, through a strategic landscape-scale approach. This enables efficiency in delivery of offsets, by enabling larger scale projects due to funding from a number of projects within the area (Government of Western Australia, 2023).

The contribution from the Proposal is determined through an assessment of the impact of the Proposal on the environmental values of the area, as well as the Interim Biogeographic Regionalisation of Australia (IBRA) subregion of the impacted area. The entire Proposal lies within the Chichester subregion of the Pilbara. The environmental values included in the offsets calculation for the Proposal relate to critical habitat for the Threatened species identified within the MDE. The actual annual contribution to the PEOF will be determined as per the Impact Reconciliation Procedure (IRP), which will be developed for the Proposal, and will be included with submission of the ERD.

Impact Reconciliation reporting will be undertaken as per the requirements of the IRP, consisting of a biennial report outlining the impacts undertaken in the proceeding reporting period. Monitoring will be undertaken annually to ensure the correct fund contribution rate is applied to the measured impacts of the Proposal.

Further offsets are yet to be confirmed, however, establishment of habitat structures to support the populations of northern quoll, ghost bat and Pilbara leaf-nosed bat will be considered as part of the Mine close plan submitted to DMPE.

These proposed offsets have been developed in line with the EPBC Offsets Policy (DSEWPC, 2012). After applying the proposed mitigation measures, and following the review of previous approvals, it is expected that the following residual impacts will require offsets under the EPBC Act:

A base rate for impacts to native vegetation within the Chichester IBRA region in ‘good’ to ‘excellent’ condition, cleared as a result of the Proposal

A higher rate for impacts to native vegetation within the Chichester IBRA region in ‘good’ to ‘excellent’ condition which represents critical habitat for Threatened Species.

It is expected that the EPA objective for each of the preliminary key factors and other environmental factors or matters can be met, and other than the contributions for clearing of native vegetation described above, and no offsets are proposed under the EP Act.

7. Holistic Impact Assessment

A holistic impact assessment considers the connections and interactions between impacts, and the overall impact of the proposal on the environment as a whole. A holistic impact assessment considers the connections and interactions between the parts of the environment (environmental factors) and the predicted outcomes in relation to the environmental principles and the EPA's environmental objectives. The key environmental factors relevant to this Proposal are:

- Flora and Vegetation;
- Terrestrial Fauna;
- Terrestrial Environmental Quality;
- Subterranean Fauna;
- Inland Waters;
- Social Surroundings; and
- Greenhouse Gas Emissions.

The Proposal has been developed to minimise the impacts on all Environmental Factors possible. Each mitigation measure while predominantly implemented for a specific purpose, will then act to minimise impacts of the Proposal as a whole. The mitigation hierarchy plays a key role in ensuring the mitigation strategies are effective across all Environmental Factors, with avoidance of impacts being the preferred option. Where this is not possible, measures to minimise impacts will be implemented, and rehabilitation plans will be developed to ensure the land is returned to the agreed post mining land use as soon as practicable.

The Proponent considers that the EPA objectives can be met for all seven environmental factors by applying appropriate mitigation and management actions where relevant and through the provision of funding into the PEOF.

A holistic assessment and interconnectedness of environmental factors is provided, with a detailed assessment provided in Table 7-1. HIO considers that the majority of potential impacts have been adequately investigated, and appropriate management measures are defined.

Table 7-1: A Holistic Assessment and Interconnectedness of Environmental Factors

Environmental Factor	Connection and Interaction pathway	Key mitigation and management measures	Predicted outcome
Flora and Vegetation *"To protect flora and vegetation so that biological diversity and ecological integrity are maintained."*	• Provides habitat to terrestrial fauna • Contribution to maintenance of subterranean fauna habitat • Maintenance of soil heath and composition • Contribution to maintenance of inland water quality, terrestrial environmental quality and landforms (e.g. through erosion prevention, sediment management, dust reduction) • Important for biological diversity and ecological integrity, supporting various functions and processes of ecosystems. • Contribution to social surroundings (e.g. visual amenity, access, aesthetics and inherent Aboriginal heritage and cultural values)	**Avoidance** Avoidance measures proposed to protect flora and vegetation include: • Site infrastructure designed to avoid disturbance to conservation significant flora where possible; • The proposal designed to reduce the extent of clearing required for the expansion; • No clearing will occur outside of the Mine Development Envelope; • No TEC, PEC's or threatened flora species will be impacted by clearing activities as they do not occur within the MDE; • All exclusions zones and avoidance buffers around environmental sensitive features will not be impacted; and • Infrastructure has been located to minimise the impact to native vegetation, through placement on previously cleared areas where possible. **Minimisation** Actions proposed to minimise the potential impacts to flora and vegetation are: • Implementation of HIO management plans, internal process and procedures; • All PAF material will be either backfilled into mine voids and or PAF cells within WRLs with an appropriate separation distance from the surface to avoid acid mine drainage; • Introduction of new weeds and spread of existing weeds will be avoided through the implementation of hygiene procedures and a weed management program; • Compliance to the EPBC Act 1999 to minimise potential impacts to MNES; • Disturbance footprint has been designed to minimise impacts to Priority flora as far as reasonably practicable; • Clearing of no more than 196.8 ha within a Mine Development Envelope of 2,257.6 ha; • Weed control will be undertaken annually specifically targeting high risk weed areas; • Off-road driving will be prohibited; • Topsoil will be segregated and stored separately for the use during rehabilitation; • Standard dust management measures will be utilised to minimise dust emissions and subsequent deposition on retained native vegetation in proximity to disturbance; • Groundwater and surface-water management measures (refer to Inland Waters) will also indirectly protect riparian vegetation and groundwater-dependent ecosystems; • Surface-water management measures (see Inland Waters) will also indirectly protect riparian vegetation and flora dependent on natural sheet-flow patterns; and • Staff and contractors will be appropriately trained to identify, manage and protect relevant conservation significant flora and vegetation assemblages. **Rehabilitate** HIO has an approved Mine Closure Plan (MCP) for the Project that outlines the closure and rehabilitation tasks required for the safe abandonment of the mine. The MCP details how the Project will be rehabilitated to reinstate environmental values consistent with agreed stakeholder	Following the application of the proposed mitigation measures, the Proposal is expected to result in the following residual impacts: • No PEC's or TEC's will be cleared or impacted by this Proposal; • Direct loss of one individual priority listed flora species *Swainsona thompsoniana* (P3); • Known records of Priority species will have a 10m exclusion zone to prevent impacts; • No direct impacts to groundwater dependent flora species; • No more than 196.8 ha of native vegetation will be cleared within the existing approved MDE; • No more than 619. 91 ha of combined clearing of native vegetation will occur within the existing approved MDE; • Disturbed areas will be rehabilitated to promote self-sustaining native vegetation and establish habitat suitable for fauna species; • PAF material placement and encapsulation is expected to prevent acid and metalliferous drainage, ensuring no adverse impacts to terrestrial fauna or surrounding vegetation; • Dust levels in areas surrounding the disturbance footprint are predicted to remain consistent with current operations, with no material impacts to native vegetation or fauna habitat, due to implementation of standard dust management measures; • Unauthorised off-road vehicle disturbance is not expected to occur, therefore reducing the risk of fauna mortality, habitat damage and soil degradation; • The spread and establishment of weeds is predicted to remain consistent with baseline, with no significant impacts to fauna habitat quality, supported by ongoing weed surveillance and control; and • Residual impacts will be offset via monetary contribution to the PEOF at the relevant rate. Through the implementation of key mitigation, management and offset strategies, it is considered that the Proposal can be managed to meet the EPA objective for objective to protect flora and vegetation so that biological diversity and ecological integrity are maintained.

Environmental Factor	Connection and Interaction pathway	Key mitigation and management measures	Predicted outcome
		outcomes. The MCP will be updated to incorporate the Proposal and any other requirements as a result of ongoing stakeholder engagement. The following actions will assist in rehabilitation of flora and vegetation: • Topsoil will be recovered and stockpiled to a maximum height of 2 m to preserve the soil physical/chemical properties and seedbank; • Topsoil will be progressively re-spread over temporary construction areas or utilised for future rehabilitation; • Waste dumps will be rehabilitated at closure to ensure they are safe, stable and revegetated; • Self-sustaining native vegetation will be established on disturbed areas; • Rehabilitation of disturbed areas to establish habitat suitable for fauna species; • Rehabilitation will occur with vegetation comprised of native species of local provenance; and • Adaptive management practices will be employed to adjust mitigation measures based on monitoring results.	

Terrestrial fauna
 	
"To protect terrestrial fauna so that biological diversity and ecological Integrity are maintained."
	• Disperse and pollinate flora
	• Important for biological diversity and ecological integrity, supporting various ecosystem functions and processes
	• Inherent scientific and cultural value
	• Matters of national environmental significance
	• Contribution to social surroundings (e.g. visual amenity, access, aesthetics and inherent Aboriginal heritage and cultural values)
		Avoidance
		Avoidance measures proposed to protect terrestrial fauna include:
		• The proposal has been designed to reduce the extent of clearing required for the expansion;
		• All exclusions zones and avoidance buffers around environmental sensitive features will not be impacted;
		• Site infrastructure designed to avoid disturbance to conservation significant flora, that supports habitat for significant fauna species where possible;
		• No clearing will occur outside of the Mine Development Envelope; and
		• No more than 10 % of habitat suitable to Short Range Endemics (SRE) will be impacted by the expansion and no more than 32.2 % combined (approved/proposed) habitat suitable to SRE will be impacted.
		Minimisation
		Actions proposed to minimise the potential impacts to terrestrial fauna include:
		• Implementation of HIO management plans, internal process and procedures;
		• Preclearance inspections by a trained fauna spotter prior to all clearing;
		• A trained fauna spotter to be present to observe clearing where required and safe to do so;
		• Habitat suitable for Matters of National Environmental Significance (MNES) will be managed and regulated under the EPBC Act 1999;
		• A Section 40 authorisation under the *Biodiversity Conservation Act* 2016 will regulate potential disturbance or relocation of threatened fauna species;
		• Imposed speed limits to minimise the potential for vehicle and fauna interactions;
		• Blasting operations are limited to daytime only, to limit disturbance to fauna including bats;
		• Noise, dust and light emissions will be controlled where possible to avoid excessive disturbance to native fauna, including directing lights to working areas, shielding lights to reduce flow, and using conventional dust suppression techniques (i.e. water trucks);
		• Barbed-wire fencing will be avoided where possible; where unavoidable, reflectors will be installed to reduce risk to bats;
			Following the application of the proposed mitigation measures, the Proposal is expected to result in the following residual impacts:
			• Direct loss of habitat considered important to MNES:
			  ○ 79.3 ha of Ironstone Ridge Top habitat;
			  ○ 46.2 ha of Spinifex Stony plain habitat;
			  ○ 34.8 ha of Stony Rise habitat;
			  ○ 26.5 ha of Rocky Ridge/Gorge;
			  ○ 7.6 ha of Sandy Plain habitat;
			  ○ 1.0 ha of Rocky Foothills habitat;
			  ○ 1.0 ha Drainage lines; and
			  ○ 0.5 ha of Riverine.
			• Bat caves and other environmentally sensitive features will retain their ecological function due to the application of spatial avoidance measures;
			• No significant adverse effects to pools and or other surface water resources;
			• Caves are predicted to remain structurally intact and suitable for ongoing habitation as a result of controlled blasting and vibration management;
			• The disturbance will be rehabilitated to promote a self-sustaining native vegetation;
			• Disturbed areas will be rehabilitated to establish habitat suitable for fauna species;
			• PAF material placement and encapsulation is expected to prevent acid and metalliferous drainage, ensuring no adverse impacts to terrestrial fauna or surrounding vegetation;
			• The spread and establishment of weeds is predicted to remain consistent with baseline, with no significant impacts to fauna

Environmental Factor	Connection and Interaction pathway	Key mitigation and management measures	Predicted outcome
		• All exclusions zones and avoidance buffers around environmental sensitive features will not be impacted; • Staff and contractors will be appropriately trained to identify, manage and protect relevant conservation significant flora and vegetation assemblages; • Off-road driving will be prohibited; • All PAF material will be either backfilled into mine voids and or PAF cells within WRLs with an appropriate separation distance from the surface to avoid acid mine drainage; • Feral animal management will be undertaken, including secure storage of putrescible waste, feral fauna recording, and implementing feral cat control where required; • Introduction of new weeds and spread of existing weeds into fauna habitat will be avoided through the implementation of hygiene procedures and a weed management program; and • Ensuring all chemical or hydrocarbon spills are immediately cleaned up, and contaminated materials are appropriately disposed of. **Rehabilitation** The following rehabilitation measures will be implemented where relevant: • All disturbed areas other than the open pits will be progressively rehabilitated as soon as practicable and as required by the MCP; • Topsoil will be recovered and stockpiled to a maximum height of 2 m to preserve the soil physical/chemical properties and seedbank; • Topsoil will be progressively re-spread over temporary construction areas or utilised for future rehabilitation; • Waste dumps will be rehabilitated at closure to ensure they are safe, stable and revegetated; • Self-sustaining native vegetation will be established on disturbed areas; • Rehabilitation of disturbed areas to establish habitat suitable for fauna species; • The MCP will be updated triennially or as required when significant changes are made to the Proposal. A detailed MCP, which will contain further information on rehabilitation works, will be prepared approximately one year to six months prior to the cessation of mining as stated in the MCP.	habitat quality, supported by ongoing weed surveillance and control; and • Residual impacts will be offset via monetary contribution to the PEOF at the relevant rate. Through the implementation of key mitigation, management and offset strategies, it is considered that the Proposal can be managed to meet the EPA objective for Terrestrial Fauna, which is to protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Subterranean fauna *"To protect subterranean fauna so that biological diversity and ecological integrity are maintained."*	• Contribute to maintenance of water quality • Inherent scientific and cultural value	**Avoidance** Avoidance measures proposed to protect subterranean fauna are: • Minimising the pit footprints. For existing pits this has been achieved by deepening the existing excavations within areas that have already been mined; • Optimising pit shells to only cover areas of viable resource; and • Not mining Razorback Pit beyond the groundwater table (avoidance of Stygofauna habitat). **Minimisation** Actions proposed to minimise the potential impacts to subterranean fauna are: • Minimising pit dewatering to that required to safely access below water table resources; • Ensuring all groundwater abstraction and dewatering is undertaken in accordance with regulatory approvals; • Updating the groundwater models at least annually for the first three years reducing to tri-annual should no significant adverse change be observed between the predicted and actual model;	The Proposal is likely to have an impact on subterranean fauna, particularly stygofauna given the proposed groundwater abstraction and mine dewatering requirements. However, further studies are required to fully understand the impacts on the local and regional subterranean fauna communities. Any residual impacts are proposed to be offset via monetary contribution to the PEOF at the relevant rate. Therefore, it is anticipated that the proposal can be managed to meet the EPA objective for subterranean fauna through the implementation of key mitigation, management and offset strategies. The Proposal can be managed to meet the EPA objective for subterranean fauna through the implementation of key mitigation, management and offset strategies.

Environmental Factor	Connection and Interaction pathway	Key mitigation and management measures	Predicted outcome
		• Construction and maintenance of surface water drainage systems to control and contain runoff from mining areas and divert clean stormwater away from pits and other mining disturbance; • Monitoring of groundwater quality during operations; • Utilising water from pit dewatering as a priority for operations, to minimise the requirement for additional groundwater abstraction; and • Ensuring all chemical or hydrocarbon spills are immediately cleaned up and contaminated materials are appropriately disposed of. **Rehabilitation** The following rehabilitation measures will be implemented where relevant: • The MCP will include a closure objective to ensure that the final landform is stable and considers ecological and hydrological factors, and that vegetation is self-sustaining; and • Rehabilitation will be undertaken to assist in re-establishing nutrient flows into the subterranean environment.	
Terrestrial Environmental Quality *"To maintain the quality of land and soils so that environmental values are protected."*	Soil quality and soil composition is important for biological diversity and ecological integrity, supporting various functions and processes of ecosystems	**Avoidance** Avoidance measures proposed to protect terrestrial environmental quality include: • All waste material will a Sulfur Content > 0.1% S will be managed as PAF and will be encapsulated within the Pit and or WRL. • Shale waste rock with iron ≤45 wt% and sulfur ≥0.1 wt% will be managed as PAF to minimise acid generation risk. • No PAF will be backfilled in the Razorback Pit to avoid potential impacts to nearby environmental and/or other sensitive receptors; • PAF material will not be placed in zones subject to fluctuating water tables, where cycles of wetting and drying could promote oxidation; • The expansion has been designed to avoid heritage and environmental sensitive features and their avoidance buffer and or exclusion zones; • No siltstone and or shale waste material will be used on landform slopes; and • Only BIF and Chert will be used for rock armouring. **Minimisation** Actions proposed to minimise the potential impacts to terrestrial environmental quality are: • Management of materials in accordance with the site PAF Management Plan; • All PAF material will be stored within defined PAF cells within the Sparrow WRL and Shark Gully Pit; • All PAF material will be either backfilled into mine voids and or PAF cells within WRLs with an appropriate separation distance from the surface to avoid acid mine drainage; • The WRL will be constructed with back slopping berms, with the slope angle being ≤18º. The landforms will also be contour ripped, rock armoured and have topsoil applied where required to minimise erosion and exposure of PAF material; • The upper surface of the filled PAF cells will be covered shortly after dumping. However, in the event that mining of PAF material ceases thus leaving PAF material exposed then a layer of NAF material will be used to cover the exposed material; • Ongoing testing during operations to identify sulfidic materials requiring management;	Following the implementation of the outlined mitigation strategies, residual impacts for terrestrial environmental quality are anticipated to be: • Stormwater management will be managed to ensure no erosion, sedimentation or turbidity adversely impact, land, soil and water resources; • Environmental values surrounding Razorback will be protected as no PAF material will be backfilled or stored within the mine void; • Shale waste containing elevated sulfur and/or low iron content will be fully encapsulated to not cause degradation of soil or land quality; • PAF materials are predicted to remain geochemically stable and isolated from receptors due to encapsulation; • Sulfidic materials will be identified during operations via ongoing testing to verify the predicted PAF volumes requiring management; • No PAF materials will be stored within a saturated zone and an appropriate separation distance to groundwater levels will be implemented; • Topsoil resources required for rehabilitation are predicted to remain viable, with seedbank integrity maintained through appropriate stockpile handling and management; • Direct return of topsoil, where feasible, is expected to support successful rehabilitation and maintain soil biological function; and • The appropriate storage, containment and handling of hazardous material will prevent soil contamination. Therefore, through the implementation of key mitigation, management and offset strategies, it is considered that the

Environmental Factor	Connection and Interaction pathway	Key mitigation and management measures	Predicted outcome
		• Ongoing monitoring of potential changes in surrounding soils and drainage lines will be undertaken; and • Appropriate storage and handling of hazardous materials will ensure risk of spills are minimised, and spills that do occur are cleaned up appropriately. **Rehabilitation** The following rehabilitation measures will be implemented where relevant: • Tracking and management of soils stockpiled for rehabilitation will be undertaken to ensure viability source for rehabilitation; • Direct soil return for site rehabilitation projects will be undertaken where possible; • Rehabilitation efforts will prioritise planting native vegetation species characteristics of original land systems, particularly spinifex grasslands and mulga shrublands, to restore ecological functions, enhance soil stability, and facilitate habitat restoration. Regular monitoring will be conducted at rehabilitated sites to ensure successful vegetation establishment, erosion control, and soil salinity management; • Landform will be recontoured, reshaped and profiled to blend in with the surrounding landscape; • Landfill designs will be in accordance with the recently approved Mine Closure Plan for the site; and • Constructed landforms and infrastructure will be located outside of the zone of instability (ZOI) around open pits.	Proposal can be managed to meet the EPA objective for Terrestrial Environmental Quality, which is to maintain the quality of land and soils so that environmental values are protected.
Inland water *"To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected."*	Hydrological regimes support terrestrial and subterranean fauna, flora and vegetation; contribute to inland water quality and consequent provision of safe water for people; and are culturally and ecologically significant. Contribution to social surroundings (e.g. visual amenity, access, aesthetics and inherent Aboriginal heritage and cultural values)	**Avoidance** Avoidance measures proposed to protect Inland waters include: • The Proposal has been designed to remain within the existing MDE boundary, which was originally established to avoid all significant water sources; • The original MDE boundary provides protection for key hydrological features through strategic avoidance; and • All exclusions zones and avoidance buffers around environmental sensitive features will not be impacted. **Minimisation** Actions proposed to minimise the potential impacts to inland waters are: • Maintenance of a site water balance model to inform site management of water; • Minimisation of discharge by utilising dewatered sources as a priority, minimising additional groundwater abstraction; • Selection of dewatering discharge location will consider significance of impacts to water sources; • All PAF material will be either backfilled into mine voids and or PAF cells within WRLs with an appropriate separation distance from the surface to avoid acid mine drainage; • Storage and handling of hazardous materials to ensure risk of spills are minimised, and spills that do occur are cleaned up appropriately; • Regular monitoring of groundwater levels and quality will be undertaken to track changes and ensure early detection of any adverse impacts. Implementation of trigger levels will allow for initiation of management actions if these thresholds are exceeded;	Following the implementation of the outlined mitigation strategies, residual impacts for inland waters are anticipated to be: • The integrity of significant hydrological features will be maintained through avoidance of key inland water systems within the MDE where possible. • Regional groundwater levels and quality are expected to remain stable, supported by regular monitoring throughout the life of the Proposal; • Residual impacts, including localised groundwater drawdown around the pits and temporary changes to groundwater-dependent ecosystems, are predicted to be of low significance and limited duration; • Post-mining rehabilitation is expected to support re-establishment of natural hydrological functions across disturbed areas; • The adaptive management framework will enable timely responses to any unforeseen changes in groundwater conditions or hydrological processes; and • Overall, the Proposal is expected to meet the EPA objective for Inland Waters by maintaining the hydrological and ecological values of inland water systems. Through the implementation of key mitigation, management and offset strategies, it is considered that the Proposal can be

Environmental Factor	Connection and Interaction pathway	Key mitigation and management measures	Predicted outcome
		• Reinstatement of surface water drainage south of Sparrow Lake Pit into the catchment feeding SW009 monitoring location; and • Placement of sedimentation traps within catchments feeding pools CO-WS-09 and CO-WS-14. **Rehabilitation** The following rehabilitation measures will be implemented in relation to inland waters: • Rehabilitation measures will focus on the restoration of hydrological regimes post-mining to ensure natural drainage patterns and groundwater recharge processes are restored. Reshaping disturbed landforms to reinstate original drainage configurations where possible; • Stabilising surface soils to reduce erosion; • Re-establishing native vegetation species to promote natural hydrological function and ecological recovery; and • Ongoing post-rehabilitation monitoring will verify that groundwater levels, water quality, and aquatic habitats return to baseline conditions.	managed to meet the EPA objective for Inland Waters, which is to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.
Social Surroundings *"To protect social surroundings from significant harm."*	Contribution to social surroundings (e.g. visual amenity, access, aesthetics and inherent Aboriginal heritage and cultural values)	**Avoidance** Avoidance measures proposed to protect Social Surroundings include: • Continued avoidance of known and lodged of heritage and or culturally significant sites, where possible; and • Exclusion zones and avoidance buffers surrounding known Aboriginal Cultural Heritage sites will be retained and not impacted. **Minimisation** Actions proposed to minimise the potential impacts to social surroundings are: • Implementation of HIO management plans, internal process and procedures; • Adherence to Native Title agreements; • Should any new sites be identified within the proposed disturbance footprint that meets the definition of a registered Aboriginal site under Section 5 of the *Aboriginal Heritage Act* 1972, obtain Section 18 consent prior to disturbance; • Ongoing stakeholder consultation will be undertaken for the Proposal with potentially affected stakeholders, including Traditional Owners, pastoralists, government departments and the local community of Marble Bar; • Implement a speed limit restriction across haulage routes where possible; • An Aboriginal Cultural Heritage Management Plan will be developed with Traditional Owners as required; • Improved understanding obtained by additional heritage studies where required to confirm location of potential new sites of significance; • Where safe to do, ongoing access to the Mine Development Envelope will be provided to relevant external stakeholders during the life of mine; • Standard dust management measures will be implemented to minimise potential airborne dust emissions and reduce visual amenity impacts;	Predicted outcomes from the implementation of the Proposal include: • Access to culturally important areas outside the disturbance footprint will be maintained, and consultation with Traditional Owners will support continued recognition and protection of cultural values; • Ongoing compliance with Native Title and Aboriginal heritage legislation; • Cultural use of land is maintained where applicable within the Proposal; • Indirect impacts to heritage places from dust, noise, light, vibration and sedimentation are not anticipated to be significant due to compliance with relevant legislation; • Visual amenity impacts are expected to be minor, due to limited external viewpoints, the absence of sensitive receptors in proximity to the MDE, and the rehabilitation of landforms and vegetation to mimic surrounding Pilbara landscapes; • Any previously unknown Aboriginal Cultural Heritage sites identified during ongoing surveys will be appropriately managed, ensuring residual impacts remain low through avoidance or statutory heritage processes; and • Long-term impacts to social surroundings will be further reduced through progressive rehabilitation, reinstating native vegetation, habitat and improving landscape integration as mining areas are closed.

Environmental Factor	Connection and Interaction pathway	Key mitigation and management measures	Predicted outcome
		• Tradition Owner monitors appointed for all ground clearing activities; and • Repatriation of salvaged cultural materials where agreed. **Rehabilitation** The following rehabilitation measures will be implemented in relation to social surroundings: • Post-closure access to sites of cultural significance will be maintained; and • Seed collection prior to/during construction and operations for use in the rehabilitation (including Traditional Owner representatives).	With the lack of sensitive receptors in the vicinity of the MDE and through the implementation of key mitigation, management and offset strategies, it is considered the Proposal can be managed to meet the EPA objective for Social Surroundings, which is to protect Social Surroundings from significant harm.
Greenhouse gases *"To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable. "*	Amenity	**Avoidance** Avoidance measures proposed relating to greenhouse gases are: • The proposal has been designed to reduce the extent of clearing required for the expansion; and • No increase in production rate and or road train fleet to what is being utilised already. **Minimisation** Actions proposed to minimise the potential impacts relating to greenhouse gases are: • Minimising clearing of native vegetation as much as possible; • Optimisation of haul routes and truck operation; • Selection of energy-efficient technology where available and practical; • All machinery and mobile equipment will be maintained in accordance with manufacturers' requirements and operated appropriately by competent and trained personnel; • Undertake rehabilitation where practicable to facilitate carbon uptake by revegetation.; • Diesel and electricity requirements will be reassessed regularly to provide more accurate estimates and optimise their use to reduce emissions; • Emissions will be monitored and reported in accordance with the *National Greenhouse and Energy Reporting Act* 2007 and the National Pollutant Inventory (NPI); • Utilisation of solar power for production bores where practicable; • Selection of energy efficient mobile equipment where practicable; • Optimise blasting techniques to improve dig rates which subsequently increases digger utilisation and reduces truck idle times, resulting in reduced fuel use; • Limit double handling to reduce the total material transported; • Use buses/carpooling to transport personnel between airport and site; • Regular inspection, maintenance and replacement of equipment so that energy efficiency is maximised during the life of the item; and • Compliance to reporting requirements under the Clean Energy Regulator and the *National Greenhouse and Energy Reporting Act* 2007 and the National Pollutant Inventory (also subject to the NGER Emissions Reduction Fund Safeguard).	The Proposal will contribute to greenhouse gas emissions, primarily from diesel consumption, stationary and mobile equipment. Following the application of the proposed mitigation measures predicted outcomes from the implementation of the Proposal include: • Annual greenhouse gas emissions from the Proposal are expected to remain below 100,000 t CO_2-e per year and therefore are not predicted to contribute significantly to regional or national emissions profiles; • Greenhouse gas emissions and reportable pollutants are expected to remain transparently monitored and publicly reported, ensuring emissions performance remains consistent with national reporting frameworks and regulatory expectations; and • HIO considers that compliance with; the Safeguard Mechanism will result in the business achieving target GHG emissions. Through the implementation of key mitigation, management and offset strategies the Proposal can be managed to meet the EPA objective for Greenhouse Gases, which is to minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.

8. Cumulative Impact Assessment

Cumulative environmental impacts are the successive, incremental and interactive impacts on the environment of a proposal with one or more past, present and reasonably foreseeable future activities (EPA, 2023).

The Proposal is located in the Pilbara region of WA, which is predominantly used as pastoral land, with a number of significant mining activities occurring in the region. Cumulative impacts can be imposed through similar mining activities, or alternatively through other land use activities that have the potential to impact on the Environmental Factors within the region.

The cumulative environmental impacts of the Proposal with other significant projects within the region have the potential to increase the significance of the Proposal impacts. While there are a number of referred significant proposals within the Chichester subregion of the Pilbara, only seven Proposals are located within 50 km of the Proposal MDE. These proposals and the relevant Key Environmental Factors assessed are outlined in Table 8-1 below.

Table 8-1: Referred Significant Proposals Within 50 km of the MDE

Proposal Title	Ministerial Statement	Key Environmental Factors	Cumulative Impact
Sanjiv Ridge Stage 2 Glen Herring Deposit	MS 1197	• Social Surroundings • Flora and Vegetation • Terrestrial Fauna • Inland waters	Yes
Miralga Creek Direct Shipping Ore (EPA, 2020c)	MS 1154	• Flora and Vegetation • Terrestrial Fauna	No
Warawoona Gold Project (EPA,2020b)	MS1150	• Inland Waters • Flora and Vegetation • Terrestrial Fauna • Subterranean Fauna	No
McPhee Creek Iron Ore (EPA, 2023c)	MS 1224	• Flora and Vegetation • Terrestrial Fauna • Inland Waters • Subterranean Fauna • Greenhouse Gas Emissions • Social Surroundings	No

Proposal Title	Ministerial Statement	Key Environmental Factors	Cumulative Impact
Sulphur Springs Zinc-Copper Project	MS 1134	• Inland Waters • Terrestrial Environmental Quality • Flora and Vegetation • Subterranean Fauna	No
Turner River Hub Project Linear Infrastructure	Not assessed	N/A	No
BHP Pilbara Expansion Strategic Proposal (EPA, 2018)	MS 1105	• Flora and Vegetation • Terrestrial Fauna • Subterranean Fauna • Inland Waters • Social Surroundings • Air Quality • Landforms • Terrestrial Environmental Quality	No

The sections below provide preliminary additional detail on the potential cumulative impacts on the key Environmental Factors in this assessment. The cumulative impact assessment provided within the ERD will be updated following outcomes of additional studies currently being conducted.

8.1 Flora and Vegetation

All of the assessed referred proposals within the vicinity of the MDE include Flora and Vegetation as a key Environmental Factor, primarily due to the impacts of clearing of native vegetation required for the various projects. Table 8-2 below outlines the impacts of the Proposals as referred.

Table 8-2: Flora and Vegetation Impacts of Referred Proposals

Proposal	Proposed Clearing of Native Vegetation	Potential Direct Impacts
Saniv Ridge Stage 2 Glen Herring Deposit	125 ha	No more than 125 hectares of native vegetation clearing Fauna Habitat Limits • Ironstone Ridgetop shall not exceed 89.1 ha; • Rocky Ridge and Gorge shall not exceed 25 ha; • Stony Rises shall not exceed 5.8 ha; and • Rocky Foothills shall not exceed 4.6 ha.
Miralga Creek Direct Shipping Ore	219.8 ha	Potential habitat for Threatened species *Quoya zonalis* (previously named *Pityrodia* sp. Marble Bar) may be impacted. Two Priority 3 species to be impacted by clearing - *Euphoribia celmentii* and *Triodia basitrichia*. Potential impacts to one vegetation type that potentially supports groundwater dependant vegetation, and one vegetation type that is regionally significant.
Warawoona Gold Project	398 ha	One Priority 3 species (*Heliotropium murinum*) and one Priority 4 species (*Ptilotus mollis*) to be impacted by clearing. Potential impacts to one vegetation type that potentially supports groundwater dependant vegetation.
McPhee Creek Iron Ore	1,912 ha	One Priority 3 species (*Eragrostis crateriformis*) and one Priority 4 species (*Ptilotus mollis*) to be impacted by clearing. Potential impacts to one vegetation type that potentially supports groundwater dependant vegetation (riparian vegetation).
Sulphur Springs Zinc-Copper Project (EPA, 2020a)	313.6 ha	One Priority 4 species (*Ptilotus mollis*) to be impacted by clearing. Potential impacts to riparian vegetation considered to have a moderate to high likelihood of groundwater dependence.

Proposal	Proposed Clearing of Native Vegetation	Potential Direct Impacts
BHP Pilbara Expansion Strategic Proposal	98,500 ha	Potential impacts to Priority species: • *Synostemon hamersleyensis* (Endangered) • *Acacia* sp. East Fortescue (Priority 1) • *Eremophila* sp. Hamersley Range (Priority 1) • *Josephinia* sp. Marandoo (Priority 1) • *Oxalis* sp. Pilbara (Priority 2) • *Isotropis parviflora* (Priority 2) • *Eremophila magnifica* subsp. *magnifica* (Priority 4) Potential impacts to one Threatened Ecological Community (TEC) and two PECs: • Ethel Gorge (TEC) • Vegetation of sand dunes of Hamersley Range/ Fortescue Valley (PEC) • (Coondewanna Flats and Wanna Munna Flats (PEC)

The Proposal does not impact any Threatened flora or TECs and PECs , and does not involve any further clearing of any Priority species other than one individual (*Swainsona thompsoniana* (P3)).

Indirect impacts on Flora and Vegetation are also likely to be cumulative, however the impact from indirect impacts is not expected to be significant given management strategies employed by HIO and other project proponents. Indirect impacts include impacts from the potential spread of weeds, dust generation, and groundwater drawdown.

HIO is not aware of any additional Proposals likely to be referred in the future within the MDE vicinity. As such, cumulative impacts relating to Flora and Vegetation within the MDE and surrounds are not considered to be significant.

8.2 Terrestrial Fauna

Four of the assessed referred proposals include Terrestrial Fauna as a Key Environmental Factor during assessment (Table 8-3). As the Proposals are located within similar landscape types, the species impacted are the same, with the exception of the spectacled hare-wallaby.

Table 8-3: Terrestrial Fauna Impacts of Referred Proposals

Proposal	Species Impacted	Potential Impacts
Sanjiv Ridge Stage 2 Glen Herring Deposit	• Northern Quoll • Ghost Bat • Pilbara Leaf-nosed Bat • Pilbara Olive Python Western • Peregrine Falcon • Spectacled hare-wallaby • Western pebble-mound mouse	The proposal has the potential to impact terrestrial fauna by the: • Loss of 89.1 ha of ironstone ridgetop terrestrial fauna habitat; • Loss of 25.0 ha of rocky ridge and gorge terrestrial fauna habitat; • Loss of 5.9 ha of stony rises terrestrial fauna habitat; • Loss of 4.6 ha of rocky foothills terrestrial fauna habitat potential impacts to several ghost bat roosts including caves defined as critical habitat; • Cave CO-CA-34 (category 4) potential to be directly impacted due to its proximity (10 m) to the indicative footprint; • Potential indirect impact to ghost bat and Pilbara leaf-nosed bat roosting in certain caves – from noise, vibration, dust and lighting; • Potential indirect risk of vehicle strikes on native fauna; • Potential increase of introduced fauna; • Potential impacts to fauna from injury and/or mortality due to construction and operation; and • Altered fire regimes.
Miralga Creek Direct Shipping Ore	• Ghost bat; • Pilbara leaf-nosed bat; • Northern quoll; • Western pebble mound mouse; • Northern brushtail possum; • Grey falcon; and • Peregrine falcon.	• Loss of one nocturnal ghost bat roost; • Potential impact to structural integrity of diurnal roosts; • Indirect impacts on due to blasting leading to potential abandonment, and potential reliance on Lalla Rookh roost; • Clearing of foraging and dispersal habitat for the ghost and Pilbara leaf-nosed bat. (219.8 ha); • Clearing of high quality denning and foraging habitat for the northern quoll (86.7 ha); • Impacts to habitat for other conservation significant species; • Potential behaviour modification due to increased light, noise and vibration;

Proposal	Species Impacted	Potential Impacts
Warawoona Gold Project	• Ghost bat; • Pilbara leaf-nosed bat; • Northern quoll; • Pilbara olive python; • Brush tailed mulgara; and • Western pebble mound mouse.	• Clearing of foraging and dispersal habitat for the ghost bat and Pilbara leaf-nosed bat; • Loss of 5 temporary refuge sites; • Indirect impacts on Klondyke Queen roost leading to potential abandonment; • Clearing of high density denning and foraging habitat for the northern quoll (0.8 ha); • Clearing of 11.1 ha of sandplain habitat supporting the brush tailed mulgara, and is potential habitat for the night parrot and greater bilby; and • Potential behaviour modification due to increased light, noise and vibration.
McPhee Creek Iron Ore	• Ghost bat; • Pilbara leaf-nosed bat; • Northern quoll; • Greater bilby; • Long-tailed dunnart; • Western pebble mound mouse; • Fork-tailed swift; • Grey falcon; • Pilbara olive python; and • Gane's blind snake.	• Clearing of 1,913 ha of terrestrial fauna habitat including 13 caves and 12 surface water pools; • Habitat fragmentation and barriers to fauna dispersal; • Potential behaviour modification due to increased light, noise and vibration; and • Habitat degradation due to indirect impacts.

Proposal	Species Impacted	Potential Impacts
BHP Pilbara Expansion Strategic Proposal	Fifty conservation significant species were listed. The species at most risk from the project include: • Ghost bat • Night parrot • Northern quoll • Pilbara leaf-nosed bat • Pilbara olive python • Western pebble-mound mouse • Pilbara barking gecko • Pilbara flat-headed blindsnake	• Loss of breeding and/or foraging habitat; • Loss of isolated habitats that contain Threatened or Priority species (destruction of local populations); • Fragmentation of habitat; • Loss of fauna habitat corridors (e.g. dispersal habitat, migration routes); • Creation of pit-lakes, in turn encouraging population booms of introduced species and entraining native fauna; conversely, these may also provide permanent water sources for some native species to use; • Degradation of habitat, such as riparian vegetation; • Disturbance of permanent and semi-permanent waterholes that fauna rely on; • Alteration of fire regimes; and • Increased noise, light and vehicular movements, which may affect fauna species.

Cumulative impacts will be particularly significant for the Threatened species with critical habitat impacted by the Proposal, including the northern quoll, the ghost bat and the Pilbara leaf-nosed bat. As such, the proposed offsets will focus on ensuring the establishment and protection of habitat for these conservation significant fauna, to minimise cumulative impacts to these species.

8.3 Terrestrial Environmental Quality

The potential impacts on Terrestrial Environmental Quality through soil disturbance and exposure to PAF materials are expected to be highly localised and are not expected to be significant following implementation of the proposed management measures. Only the Sulphur Springs Zinc-Copper Project and the BHP Pilbara Expansion Strategic Proposal have also been considered to impact on Terrestrial Environmental Quality and given the distance from these proposals to the Sanjiv Ridge MDE, the cumulative impacts are not expected to be significant.

8.4 Subterranean Fauna

Subterranean fauna was considered a key Environmental Factor for four of the assessed proposals within 50 km of the Sanjiv Ridge MDE. Table 8-4 outlines the broad impacts on subterranean fauna from these proposals.

Table 8-4: Subterranean Fauna Impacts of Referred Proposals

Proposal	Stygofauna Impacts	Troglofauna Impacts
Sanjiv Ridge Stage 2 Glen Herring Deposit	No stygofauna were recorded	Minor local impacts on three troglofaunal species (16 individuals) which were recorded in the development envelope, all species are recorded more widely in the fauna study area
Warawoona Gold Project	Impacts to stygofauna not considered to be significant following implementation of management measures.	Troglofaunal assemblies considered depauperate, with no significant impact.
McPhee Creek Iron Ore	The Proposal impacted a number of stygofauna species understood to be widely distributed or known outside the proposed impact areas.	Significant impact to troglofauna species in the Crescent Moon pit area.
Sulphur Springs Zinc-Copper Project	No stygofauna were identified within the pit areas, meaning impacts are likely to be minimal.	The Proposal area is not likely to be troglofauna habitat, however one species with troglomorphic features was identified.
BHP Pilbara Expansion Strategic Proposal	Areas prospective for stygofauna are approximately 200 km from the Sanjiv Ridge MDE. No conservation listed species have been identified.	Areas prospective for troglofauna are approximately 200 km from the Sanjiv Ridge MDE.

The impacts to subterranean fauna from the other referred proposals within 50 km of the Sanjiv Ridge MDE are not likely to significantly contribute to the impacts from the Proposal. The nearest Proposal is the Warawoona Gold Project, located approximately 20 km to the east of the Sanjiv Ridge MDE. The most significant impact to subterranean fauna from the Proposal is the potential impact on a restricted stygofauna community, which is not likely to be exacerbated through additional impacts relating to other referred proposals given the geographic restriction of this community.

The Proposal is not likely to significantly impact on troglofauna habitat, and as such cumulative impacts for these species are not considered to be significant.

8.5 Inland Waters

Four of the assessed proposals within 50 km of the Sanjiv Ridge MDE included inland waters as a key Environmental Factor. Table 8-5 provides a brief outline of the assessed impacts of these proposals.

Table 8-5: Inland Water Impacts of Referred Proposals

Proposal	Groundwater Impacts	Surface Water Impacts
Sanjiv Ridge Stage 2 Glen Herring Deposit	Glen Herring pit sits above the water table. The main potential groundwater risk relates to contamination, with spills or leaks within the pits potentially infiltrating and moving along existing natural groundwater flow paths towards sensitive receptors, including the spring-fed permanent pool CO-WS-16 and nearby groundwater dependent vegetation (GDV A). risks to groundwater levels, aquifer storage and GDV are considered very low, provided spill management and monitoring programs are implemented.	• Direct loss of significant pools due to clearing; • Indirect impacts on significant hydrological features due to change in groundwater levels and quality; • Alteration to surface water flows; and • Alteration to surface water quality due to increased sediment load and runoff, and potential hydrocarbon and chemical contamination.
Warawoona Gold Project	Potential groundwater drawdown resulting from abstraction, however given a short mine life the impacts are expected to be short-term. Potential impacts to groundwater from spills of chemicals and hydrocarbons.	• Located in the Coongan River catchment. No impact to pools; • Pit lakes likely to form; and • Potential reduction in surface water quality from contaminated runoff.
McPhee Creek Iron Ore	Groundwater drawdown is predicted to extend around mine pits, with a post closure residual drawdown area estimated at 58 km^2. Drawdown is considered unlikely to result in a detectable influence on surface water pools of the main range or downstream along the creek lines.	• Reduction in catchment areas at McPhee Creek and Sandy Creek, unlikely to impact peak creek flows; • Loss of surface water pools; • Reduced surface water quality; and • Groundwater discharge to McPhee Creek, Branch of McPhee Creek and Lionel Creek.
Sulphur Springs Zinc-Copper Project	Potential impact to groundwater from low pH seepage from pit void walls, PAF encapsulation cells or PAF material stored in the TSF.	Potential impact to ephemeral creeks and pools along Sulphur Springs Creek and Minnieritchie Creek from contamination with low pH seepage.

Proposal	Groundwater Impacts	Surface Water Impacts
BHP Pilbara Expansion Strategic Proposal	Key environmental assets that may rely on groundwater within the project boundary include: • Fortescue Marsh; • Lake Robinson/ Coondewanna Flats; • Weeli Wolli Creek and in particular the Weeli Wolli Springs PEC; and • Ophthalmia Dam and the Ethel Gorge Aquifer Stygobiont Community. Potential impacts to these areas include: • Groundwater drawdown resulting in reduced water availability; and • Changes in groundwater quality.	The Proposal is located almost entirely within the Upper Fortescue River Basin; Potential impacts include: • Reduced surface water availability; • Surplus water management (discharge of excess dewatering); • Changes to surface water quality and • Development of pit lakes.

Given the location within local catchments and distance from other proposals, the only listed proposal that may have cumulative impacts with the Sanjiv Ridge Proposal is the Warawoona Gold Project. The Warawoona Gold Project is located in the upper reaches of the Coongan River and is not likely to impact on peak surface water flows. Surface water quality impacts can be adequately managed through appropriate mitigation measures implemented by both proponents, meaning cumulative impacts to inland waters are not expected to be significant.

8.6 Social Surroundings

The cumulative impacts of the Proposal on Social Surroundings have been assessed in the context of all existing and reasonably foreseeable activities across the region.

The Proposal is expected to avoid direct impacts to heritage sites and maintain access for Traditional Owners, with management measures in place to address indirect impacts to flora, vegetation, fauna and inland waters. Given the minor cumulative impacts anticipated for native vegetation and fauna, which hold cultural importance, no significant cumulative impacts to culturally significant biological values are expected. HIO acknowledges the potential for cumulative effects associated with clearing but has designed the Proposal to avoid sensitive values, and its progressive closure strategy prioritises backfilling to minimise pit lake formation, consistent with Traditional Owner preferences where practicable.

Overall, when implemented in accordance with the relevant environmental management plans and ongoing engagement with Traditional Owners, the Proposal is not expected to result in significant cumulative impacts to Social Surroundings.

9. Conclusion

This document supports a Section 38 Referral to the EPA under Part IV of the EP Act for a significant amendment to the approved Sanjiv Ridge DSO Project (MS 1125). It outlines the proposed activities, potential impacts on environmental factors, proposed mitigation measures, and expected outcomes.

The Proposal is located in an area of environmental and cultural heritage significance and has the potential to impact several key environmental factors. To ensure these impacts align with EPA objectives, effective mitigation strategies must be integrated into the Proposal's design and operation.

HIO believes that, with application of the mitigation hierarchy, the Proposal can proceed in a way that sufficiently protects the surrounding environment and/or cultural heritage values with the understanding additional studies are still in progress to inform the assessment of impacts on environment and or cultural heritage values.

Operational requirements and mitigation measures will be further refined based on additional studies and stakeholder engagement.

10. References

Atlas Iron Pty Ltd (2017). Sanjiv Ridge Significant Species Management Plan.

Bat Call WA Pty Ltd (2017a) Echolocation Survey of Bat Activity at caves CO-CA-01 and CO-CA-03.

Bat Call WA Pty Ltd (2017b) Corunna Downs Cave Co-CA-03 Pilbara Leaf-nosed bat roost census.

Beard (1975). Vegetation Survey of Western Australia, Pilbara 1:1 000 000. Map and Explanatory Notes to Sheet 7. Published by University of Western Australia Press, Perth.

Beard, J. S. (1990). Plant Life of Western Australia. Kangaroo Press, Kenthurst, New South Wales.

Biologic (2024a). Consolidated Desktop Vertebrate Fauna Assessment – Significant Species 2024 Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Biologic (2025a). Groundwater Dependant Vegetation Assessment 2024 Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Biologic (2025b). Groundwater Dependant Vegetation Risk Assessment 2024 Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Biologic (2025c). Sanjiv Ridge Pilbara Leaf-nosed Bat and Ghost Bat Monitoring Survey 2024. Prepared by Biologic Environmental, East Perth, Western Australia.

Biologic (2025d). Sanjiv Ridge Northern Quoll Monitoring Survey 2024. Prepared by Biologic Environmental, East Perth, Western Australia.

Biologic (2025e). Short – range Endemic Invertebrate Fauna Desktop Assessment 2024 Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Biologic (2025f). Short-range Endemic Invertebrate Fauna Risk Assessment 2024 Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Biologic (2025g). Sanjiv Ridge Stygofauna Baseline Survey 2024. Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Biologic (2025h). Sanjiv Ridge Molecular Systematics Analysis Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Biologic (2025i). Sanjiv Ridge Aquatic Ecology Assessment 2024. Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Biologic (2025j). Sanjiv Ridge Aquatic Ecology Risk Assessment 2024. Prepared by Biologic Environmental Survey, East Perth, Western Australia.

Bureau of Meteorology (BOM) (2025) Climate Data Online. Data retrieved for sites 044027 and 004106.

Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010a), Survey guidelines for Australia's threatened birds.

Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010b), Survey guidelines for Australia's threatened bats.

Commonwealth Department of Sustainability, Environment, Water, Population and Communities (2011a), Survey guidelines for Australia's threatened mammals.

Commonwealth Department of Sustainability, Environment, Water, Population and Communities (2011b), Survey guidelines for Australia's threatened reptiles.

Department of Aboriginal Affairs and Department of Premier and Cabinet (2013) Aboriginal Heritage Due Diligence Guidelines.

DSEWPC (2012), EPBC Act Environmental Offsets Policy.

Department of Water and Environmental Regulation (DWER) (2021) Draft Guideline - Assessment of environmental noise emissions.

Department of Agriculture, Water and the Environment, (2018) Australian and New Zealand guidelines for fresh and marine water quality (ANZG).Available at: https://www.waterquality.gov.au/guidelines/anz-fresh-marine

Department of Agriculture, Water and the Environment.(DAWE) (2023) Draft Livestock Drinking Water Guideline Values, Water Quality Australia. Available at: https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/primary-industries/stock-water-guidance.

Department of Water (DoW). (2013), Western Australian water in mining guideline, Government of Western Australia, Perth, available at: https://www.wa.gov.au/government/publications/western-australian-water-mining-guideline.

Department of Water and Environmental Regulation (DWER) (2020c), Use of Mine Dewatering Surplus, Government of Western Australia, Perth, available at: https://www.wa.gov.au/government/publications/use-of-mine-dewatering-surplus.

Department of Water and Environmental Regulation (DWER). (2021), Draft Guideline: Assessment of Environmental Noise Emissions, Government of Western Australia, Perth, available at: https://www.wa.gov.au/government/publications/draft-guideline-assessment-environmental-noise-emissions

Environmental Protection Authority (EPA). (2006) Guidance Statement No. 6 — Rehabilitation of Terrestrial Ecosystems.

Environmental Protection Authority (EPA). (2011) WA Environmental Offsets Policy.

Environmental Protection Authority (EPA). (2016). Environmental Factor Guideline – Flora and Vegetation, EPA, Western Australia.

Environmental Protection Authority (EPA). (2016a), Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment, EPA, Western Australia.

Environmental Protection Authority (EPA). (2016b), Environmental Factor Guideline: Terrestrial Fauna, EPA, Western Australia.

Environmental Protection Authority (EPA). (2020f), Technical Guide — Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment, EPA, Western Australia.

Environmental Protection Authority (EPA).(2016c), Environmental Factor Guideline - Terrestrial Environmental Quality, EPA, Western Australia.

Environmental Protection Authority (EPA). (2016e), Environmental Factor Guideline — Subterranean Fauna, EPA, Western Australia.

Environmental Protection Authority (EPA). (2016g), Technical Guide — Sampling of short range endemic invertebrate fauna.

Environmental Protection Authority (EPA). (2018a), Environmental Factor Guideline: Inland Waters EPA, Western Australia.

Environmental Protection Authority (EPA). (2018), Report and recommendations of the Environmental Protection Authority - Pilbara Expansion Strategic Proposal.

Environmental Protection Authority (EPA). (2020f), Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment, EPA, Western Australia.

Environmental Protection Authority (EPA). (2020a), Report and recommendations of the Environmental Protection Authority - Sulphur Springs Zinc-Copper Project.

Environmental Protection Authority (EPA).(2020b), Report and recommendations of the Environmental Protection Authority - Warrawoona Gold Project.

Environmental Protection Authority (EPA). (2020c), Miralga Creek DSO Project, EPA Report 1689.

Environmental Protection Authority (EPA). (2023). Statement of environmental principles, factors, objectives and aims of EIA, EPA, Western Australia.

Environmental Protection Authority (EPA). (2023a) Environmental Factor Guideline: Social Surroundings, EPA, Western Australia.

Environmental Protection Authority. (EPA). (2023b), Technical Guidance – Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage, EPA, Western Australia.

Environmental Protection Authority. (EPA). (2023c), McPhee Creek Iron Ore Project, EPA Report 1750.

Environmental Protection Authority. (EPA). (2024) Environmental Factor Guideline: Greenhouse Gas Emissions. EPA, Western Australia.

Environmental Protection Authority. (EPA). (2024a) Considering environmental offsets at a regional scale.

Government of Western Australia. (2014), Western Australian Government's Environmental Offsets Guideline.

Government of Western Australia. (2019) State Planning Policy 5.4 *Road and Rail Transport Noise and Freight Considerations in Land Use Planning limits*. Halse, S. A., Scanlon, M. D., Cocking, J. S., Barron, H. J., Richardson, J. B., & Eberhard, S. (2014). Pilbara stygofauna: deep groundwater of an arid landscape contains globally significant radiation of biodiversity. *Records of the Western Australian Museum, Supplement, 78*, 443-483.

Greenbase. (2024) Sanjiv Ridge Project Greenhouse Gas Assessment Summary Report 2024. Unpublished report.

Hose, G. C., Sreekanth, J., Barron, O., & Pollino, C. (2015). *Stygofauna in Australian groundwater systems: extent of knowledge*. CSIRO

Humphreys, W. F. (2008). Rising from Down Under: developments in subterranean biodiversity in Australia from a groundwater fauna perspective. *Invertebrate Systematics, 22*, 85-101.

Kendrick, P. & McKenzie, N. (2001) A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002 - Pilbara 1 (PIL1 – Chichester Subregion). Published by the Department of Conservation and Land Management, November 2001.

Kendrick, P., & McKenzie, N. L. (2003). Pilbara 1 (PIL1 - Chichester subregion). In J. E. May & N. L. McKenzie (Eds.), A biodiversity audit of Western Australia's 53 biogeographic subregions in 2002 (pp. 547-558). Department of Conservation and Land Management

McKenzie, May, & McKenna (2002) A biodiversity audit of Western Australia's biogeographical subregions in 2002.

McKenzie, N. L., van Leeuwen, S., & Pinder, A. M. (2009). Introduction to the Pilbara biodiversity survey, 2002-2007. Records of the Western Australian Museum Supplement, 78, 3-89.

Mine Earth, 2018, Waste Rock Geochemical Assessment, Unpublished report.

Mine Earth, 2020, Revised Mine Waste Characterisation Assessment. Unpublished report.

Mine Earth, 202, Characterisation Assessment – Stage 2. Unpublished report.

Mine Earth (2024a), Sanjiv Ridge Stage 4 – Waste Rock Assessment, Detailed Geochemical Characterisation. Unpublished report.

Mine Earth (2024b), Sanjiv Ridge Stage 4 – PAF Material Management Plan. Unpublished report.

Mine Earth (2024c), Sanjiv Ridge Stage 5 – Waste Rock Assessment, Interim Report – Preliminary Geochemical Characterisation.

Mine Earth (2025), Sanjiv Ridge Stage 5 – Waste Rock Geochemical Characterisation – Sparrow Pit Update.

Mine Earth, (2025a), Sanjiv Ridge-Sparrow Stage 5 – PAF Material Management Plan. Unpublished report.

MWH Australia Pty Ltd, Stantec (2016c) Corunna Downs Proposal: Vertebrate Fauna Impact Assessment. Unpublished report.

MWH Australia Pty Ltd and Stantec (2016b) Corunna Downs Proposal, Terrestrial SRE Invertebrate Fauna Impact Assessment. Unpublished report.

MWH, Stantec (2016a), Corunna Downs Proposal, Soil Resource Assessment and Waste Characteristics. Unpublished report.

MWH Australia Pty Ltd, Stantec (2018) Corunna Downs Proposal: Terrestrial Vertebrate Fauna Survey. Unpublished report.

Outback Ecology, MWH Australia Pty Ltd. (2014) Corunna Downs, Terrestrial SRE Invertebrate Fauna Survey. Unpublished report.

Pearson, D. J. (1993), Distribution, ecology and conservation of pythons in Western Australia, Western Australian Department of Conservation and Land Management (CALM), Perth.

Shepherd, D., Beeston, G. & Hopkins, A. (2002) Native Vegetation in Western Australia. Extent, Type and Status. Resource Management Technical Report 249. Department of Agriculture.

Smith Hydro (2025), Hydrology Baseline and Impact Assessment 2025. Unpublished report.

SRK (2019), Corunna Downs Mine Water Supply – H3 Hydrogeological Assessment. Unpublished report.

SRK (2025), Groundwater Quality Report – Sanjiv Ridge Below Water Table Mining Hydrogeology Study. Unpublished report.

Stantec (2016), Corunna Downs Subterranean Fauna Assessment. Unpublished report.

Stantec (2018), Corunna Downs Proposal – Hydrogeological Investigation. Unpublished report.

Stantec (2019), Corunna Downs Subterranean Fauna EIA re-assessment. Unpublished report.

Talis Consultants (2016), Environmental Noise Impact Assessment – Corunna Downs. Unpublished report.

Talis Consultants (2019), Briefing Note - Corunna Downs. Unpublished report.

Teitler, Y., (2013). Structural control on BIF mineralisation at Corunna Downs, Unpublished report prepared for MERIWA: Centre for Exploration Targeting.

Teitler, Y., (2014). Exploration outcomes for iron ore exploration in the Pilbara (Project P426), s.l.: Unpublished report prepared for MERIWA.

Teitler, Y., Duuring, P. & Hagemann, S., (2014). Controls and distribution of alteration styles at Corunna Downs, s.l.: Unpublished report prepared for MERIWA.

Thackway, R., & Cresswell, I. D. (1995). An interim biogeographical regionalisation for Australia: A framework for setting priorities in the National Reserves System Cooperation Plan. Australian Nature Conservation Agency.

van Vreeswyk, A M, Leighton, K A, Payne, A L, and Hennig, P. (2004), An inventory and condition survey of the Pilbara region, Western Australia. Department of Agriculture, Western Australia, Perth.

WA Local Government Association. (2020) Vegetation retention status for Beard Associations and by IBRA Regions. Dataset.

Woodman Environmental (2016a), Corunna Downs Proposal, Level 2 Flora and Vegetation Assessment. Unpublished report.

Woodman Environmental (2016b), Flora and Vegetation Impact Assessment. Unpublished report.

Woodman Environmental (2018), Investigation of Relationship between Vegetation and Hydrology – "Soak": Area. Unpublished report.

Woodman Environmental (2019), Assessment of Groundwater Drawdown Impacts of Vegetation. Unpublished report.

Woodman Environmental (2021) Updated Flora and Vegetation Assessment. Unpublished report.

Appendix A MS 1125 Annual Compliance Assessment Report 2024-2025

Appendix B EPBC-Annual-Compliance-Report-2025

Appendix C Stakeholder Engagement Register

Date	Stakeholder	Stakeholder representatives	HIO representative/s	Consultation Method	Key subject matter	Consultation Summary
28–30 May 2024	Palyku	CEO Palyku	Louisa Kopa	Meeting	Heritage	PJAC Board visit to SMR: discussions included SMR current and future state, including below-water-table mining on Palyku country
17 December 2024	DCCEEW	Thao Bui and Carina Daly	Larissa Barber Theo Sprenkels	Meeting	Environment	Scoping meeting to discuss the proposed Stage 5 below water table expansion, studies, impacts and management including timeline and approval pathway
18 December 2024	EPA Services	Dave Abdo and Lomas Capelli	Larissa Barber	Meeting	Environment	Scoping meeting to discuss the proposed Stage 5 below water table expansion, studies, impacts and management including timeline and approval pathway
6 February 2025	Nyamal	CEO Nyamal	Louisa Kopa	Email	Heritage	Request sent to NAC to discuss Sanjiv Ridge (Sparrow Pit) expansion and BWT approvals pathway
6 March 2025	Palyku	PJAC Heritage Manger/Coordinator and Operations manager	Brian Banda	Email	Heritage	Heritage notice and scope issued to PJAC for Archaeological and Ethnographic surveys relating to BWT mining
15 April 2025	Nyamal	CEO Nyamal and Board Co-Chair	Louisa Kopa Theo Sprenkels Lee Powell Katie McKinnon Bill Lamb Frida Blom Kiarrah Wickramage	Meeting	Heritage	Atlas provided a comprehensive overview Atlas projects/operations on Traditional Owner Country which included details about production and life of mine for site and Sanjiv Ridge – included BWT mining at SMR
19 September 2025	EPA Services	Dave Abdo and Lomas Capelli	Larissa Barber Michael Pezzaniti	Meeting	Environment	Meeting was held with EPA team leaders to discuss upcoming referral submission for SMR BWT expansion.
23–24 September 2025	Palyku	Palyku T.O's	HIO SMEs	Meeting	Heritage	Palyku Social Surrounds consultations (BWT discussed)
25 September 2025	Palyku	Palyku T.O's	HIO SMEs	Meeting	Heritage	Engagement with Palyku regarding access arrangements.
7 October 2025	Nyamal	CEO Nyamal and Consultant Advisor	Louisa Kopa	Email	Heritage	HIO sent an email to NAC representative requesting a meeting to discuss the Sanjiv Ridge Mine Expansion – Stage 5 Below Water Table Project
3 December 2025	Palyku	Palyku T.O's	HIO SMEs	Meeting	Heritage	Presentation include discussion regarding BWT mining mine plan at Palyku board meeting.
30 January 2026	Nyamal	Nyamal T.O's	Louisa Kopa	Email	Heritage	Request sent to Nyamal for to discuss BWT approvals and to co design a social surrounds process and engagement framework.

Date	Stakeholder	Stakeholder representatives	HIO representative/s	Consultation Method	Key subject matter	Consultation Summary
Proposed February 2026	Nyamal	NAC Board	Louisa Kopa	Meeting	Heritage	Meeting the NAC board to discuss BWT approvals and to co design a social surrounds process and engagement framework
Proposed February 2026	Palyku	PJAC Board	Louisa Kopa	Meeting	Heritage	Meeting to discuss BWT approvals
Proposed May 2026	Palyku	PJAC representatives	Louisa Kopa	Meeting	Heritage	Second Social Surrounds consultation
Proposed May 2026	Nyamal	NAC representatives	Louisa Kopa	Meeting	Heritage	Social Surrounds consultation
Proposed August 2026	Palyku	PJAC representatives	Louisa Kopa	Meeting	Heritage	Final Social Surrounds consultation

Appendix D Flora and Vegetation Studies

Appendix E Terrestrial Fauna Studies

Appendix F Terrestrial Environmental Quality Studies

Appendix G Subterranean Fauna Studies

Appendix H Inland Waters Studies

Appendix I Social Surroundings Studies

Appendix J Greenhouse Gas Emissions Studies