



Orebody 29/30/35 Significant Amendment

**Environmental Review Document –
referral supplementary report**

November 2024

Document amendment record

Version	Description of version	Key changes	Date
Version 0	Draft for Traditional Owner review	Original document	02/09/2024
Version 1	Final version for referral to EPA	Updated in response to KNAC comments	29/11/2024

Abbreviations

Term	Meaning
AER	Annual Environmental Review
AH Act	<i>Aboriginal Heritage Act 1972 (WA)</i>
AHD	Australian Height Datum
AMD	Acid and/or Metalliferous Drainage
ARI	Assess - Referral Information
AUD	Australian Dollars
AWT	Above Water Table
BC Act	<i>Biodiversity Conservation Act 2016 (WA)</i>
BHP	BHP Iron Ore Pty Ltd
BWT	Below Water Table
BAM Act	<i>Biosecurity and Agriculture Management Act 2007 (WA)</i>
CEO	Chief Executive Officer
CHMP	Cultural Heritage Management Plan
CS Act	<i>Contaminated Sites Act 2003 (WA)</i>
DBCA	Department of Biodiversity, Conservation and Attractions
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety (previously the Department of Mines and Petroleum, and the Department of Mines, Industry Regulation and Safety).
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DMP	Department of Mines and Petroleum (Now Department of Energy, Mines, Industry Regulation and Safety)
DMIRS	Department of Mines, Industry Regulation and Safety (Now Department of Energy, Mines, Industry Regulation and Safety)
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
DOW	Department of Water (Now Department of Water and Environmental Regulation)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EP Act	<i>Environmental Protection Act 1986 (WA)</i>

Term	Meaning
EPA	Western Australian Environmental Protection Authority
EPAS	EPA Services (previously the Office of the Environmental Protection Authority)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)
EPWRMP	Eastern Pilbara Water Resource Management Plan
ERD	Environmental Review Document
FY	financial year
GDV	Groundwater Dependant Vegetation
GL	Gigalitres
GL/a	Gigalitres per annum
GST	Goods and Services Tax
GWL	Groundwater Licence
ha	hectare
IBRA	Interim Biogeographic Regionalisation for Australia
IBSA	Index of Biodiversity Surveys for Assessments
ICROA	International Carbon Reduction & Offset Alliance
ICVCM	Integrity Council for the Voluntary Carbon Market
ILUA	Indigenous Land Use Agreement
JTSI	Department of Jobs, Tourism, Science and Innovation
kL	kilolitre
km	kilometre
km ²	square kilometre
KNAC	Karlka Nyiyaparli Aboriginal Corporation (Registered Native Title Prescribed Body Corporate) KNAC (RNTBC)
LAA	<i>Land Administration Act 1997</i> (WA)
m	metres
mAHD	Metres above Australian Height Datum
MAR	managed aquifer recharge

Term	Meaning
mbgl	metres below ground level
MMSA	<i>Iron Ore (McCamey's Monster) Agreement Authorisation Act 1972 (WA)</i>
MCP	Mine Closure Plan
mg/L	milligrams per litre
Mining Act	<i>Mining Act 1978 (WA)</i>
µg/m ³	Microgram per metre cubed
ML/a	mega litres per annum
ML/d	mega litres per day
MNES	Matters of National Environmental Significance
mRL	metres Reduced Level
MS	Ministerial Statement
MtCO ₂ -e	million tonnes of carbon dioxide equivalent (measure of Greenhouse Gas emissions)
Mtpa	million tonnes per annum
NEPM	National Environment Protection Measure
MNSA	<i>Iron Ore (Mount Newman) Agreement Act 1964 (WA)</i>
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007 (Cth)</i>
NVCP	Native Vegetation Clearing Permit
NPI	National Pollution Inventory
OB	Orebody
OEPA	Office of the Environmental Protection Authority (Now EPA Services)
OSA	overburden storage area
%	percent
PDWSA	Public Drinking Water Source Area
PEC	Priority Ecological Community
PEOF	Pilbara Environmental Offsets Fund
PFAS	Per- and polyfluoroalkyl substances

Term	Meaning
PM _{2.5}	Particulate Matter with a size of less than 2.5 micrometres
PM ₁₀	Particulate Matter with a size of less than 10 micrometres
RiWI Act	<i>Rights in Water and Irrigation Act 1914</i> (WA)
SRE	short-range endemic
tCO ₂ -e	tonnes of carbon dioxide equivalent (measure of Greenhouse Gas emissions)
tCO ₂ -e/t	tonnes of carbon dioxide equivalent per tonne of Iron Ore
TEC	Threatened Ecological Community
TDS	total dissolved solids
UCL	Upper confidence level
WA	Western Australia
WAIO	Western Australia Iron Ore
WPMP	Water (PFAS) Management Plan
WS Act	<i>Water Services Act 2012</i> (WA)

Glossary

Term	Meaning
Amended Proposal	The existing Approved Proposal as amended by the Significant Amendment
Approved Proposal	The existing Orebody 29/30/35 Below Water Table mine, approved under Ministerial Statement 963
BHP	BHP Iron Ore Pty Ltd, as manager and agent for and on behalf of BHP Minerals Pty Ltd, BHP Iron Ore (Jimblebar) Pty Ltd, BHP Direct Reduced Iron Pty Ltd, the participants of the Mount Goldsworthy Joint Venture, Mount Newman Joint Venture and Yandi Joint Venture
Cleared Area	The indicative total area that has been cleared for the Approved Proposals, based on BHP spatial data as at 30 June 2023 (FY23)
Combined Proposal	The combination of the Significant Amendment together with the Approved Proposal
Commonwealth Strategic Approval	The approval of the taking of an action or class of actions within the Strategic Assessment Area, granted by the (Federal) Minister for the Environment on 19 June 2017 in accordance with the Program given under section 146B of the EPBC Act
Development Envelope	The maximum area within which the Combined Proposal will be located
Indicative Footprint	The location where the Proposal elements are planned to occur
Ministerial Statement	Approval conditions under Part IV of the <i>Environmental Protection Act 1986</i> (EP Act)
Notifiable action	An activity that is considered likely to have a relevant impact on a Program Matter based on an assessment of the proposed activity against the thresholds defined for Program Matters in the Assurance Plan. In relation to the voluntary part of the Program, this includes an activity that is considered likely to have a relevant impact on a New Listing or a New Matter
Program Matters	Means the listed threatened species Pilbara Leaf-nosed Bat (<i>Rhynonictis aurantius</i>), Northern Quoll (<i>Dasyurus hallucatus</i>), Greater Bilby (<i>Macrotis lagotis</i>), Ghost Bat (<i>Macroderma gigas</i>), Olive Python (Pilbara subspecies) (<i>Liasis olivaceus barroni</i>), Grey Falcon (<i>Falco hypoleucos</i>) and Night Parrot (<i>Pezoporus occidentalis</i>)
Proposal	The Orebody 29/30/35 Significant Amendment
Significant Amendment	An amendment to an Approved Proposal that is significant according to the definition in the EP Act and requires referral under s38 of the EP Act

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Executive summary

Table 1: General Proposal Content Description

Proposal title	Orebody 29/30/35 Significant Amendment
Proponent name	BHP Iron Ore Pty Ltd (BHP)
Short description	The Proposal is to construct and operate the Orebody 29/30/35 mine, located approximately 7 kilometres (km) west-south-west of Newman in the Shire of East Pilbara (Appendix 1 - Figure 1). The Proposal includes, but is not limited to the following activities and elements: • mine pit excavation above and below the water table • groundwater abstraction to dewater mine deposits and for water supply • dewatering, water supply and surplus water infrastructure including bores and pipelines • surplus water management and discharge of surplus water to Ophthalmia Dam • mineral waste management including overburden storage areas (OSAs). The Proposal is located within a 1,346 hectares (ha) Development Envelope and will require the clearing of up to 116 ha of native vegetation. Existing approved facilities at Mt Whaleback will be used to support the proposal, including processing facilities, machinery fleet, support services and facilities and OSAs for waste rock.

Table 2: Proposal content elements

Element	Location / description	Existing proposal maximum extent, capacity or range (Approved Proposal)	Proposed amendment extent, capacity or range (the Proposal – Significant Amendment)	Combined maximum extent, capacity or range (Combined Proposal)
Physical elements				
Mine elements, including: Open pits Overburden Storage Area (OSA)	Appendix 1 - Figure 2	Part IV approved (MS963) Development Envelope of 456 ha Part V approved (Native Vegetation Clearing Permit (NVCP 5617/6)) Clearing of 2,010.3 ha of native vegetation within the NVCP boundary	Clearing of 116 ha of native vegetation Additional Development Envelope area of 890 ha	Clearing of up to 116 ha of native vegetation within a 1,346 ha Development Envelope
Operational elements				
Groundwater abstraction	Appendix 1 - Figure 2	Part IV approved (MS963) Groundwater abstraction of up to 8 GL/a	Additional groundwater abstraction for mine pit dewatering of up to 16.5 GL/a	Groundwater abstraction of up to 24.5 GL/a
Surplus water management – discharge to Ophthalmia Dam	Appendix 1 - Figure 2	Part IV approved (MS963) Discharge of up to 8 GL/a	Additional discharge of up to 12.8 GL/a	Discharge of up to 20.8 GL/a
Mine voids and pit lakes	Appendix 1 - Figure 2	Not specified	No change	Option for open voids and formation of pit lakes
Ore processing		Not specified, not assessed under Part IV Part V approved Mt Whaleback/Orebody 29/30/35 Part V L4503/1975/14 Processing or beneficiation of metallic or non-metallic ore 80 Million tonnes per annum (Mtpa)	No change	Up to 80 Mtpa

Element	Location / description	Existing proposal maximum extent, capacity or range (Approved Proposal)	Proposed amendment extent, capacity or range (the Proposal – Significant Amendment)	Combined maximum extent, capacity or range (Combined Proposal)
Greenhouse Gas Emissions				
Peak annual				
Scope 1	Diesel consumption and land clearing (mining)	Not specified; not assessed under Part IV	48,649 tCO ₂ -e per annum (2028)	Up to 119,091 tCO ₂ -e per annum (2028)
Scope 1	Electricity demand ¹	Not specified; not assessed under Part IV	14,285 tCO ₂ -e per annum (2043)	Up to 24,618 tCO ₂ -e per annum (2030)
Scope 1	Rail iron ore transport (including rail and port) ¹	Not specified; not assessed under Part IV	17,992 tCO ₂ -e per annum (2043)	Up to 33,022 tCO ₂ -e per annum (2030)
Scope 3	Downstream emissions (including port, iron ore shipping and steel making)	Not specified; not assessed under Part IV	12,988,954 tCO ₂ -e per annum (2043)	24,193,467 tCO ₂ -e per annum (2030)
Annual average life of mine²				
Scope 1	Diesel consumption and land clearing (mining)	Not specified; not assessed under Part IV	-2,601 tCO ₂ -e per annum (Decrease in Scope 1 emissions)	Up to 47,870 tCO ₂ -e per annum
Scope 1	Electricity demand ¹	Not specified; not assessed under Part IV	712 tCO ₂ -e per annum	Up to 10,336 tCO ₂ -e per annum
Scope 1	Rail iron ore transport ¹	Not specified; not assessed under Part IV	0 tCO ₂ -e per annum	Up to 13,332 tCO ₂ -e per annum

¹ In the context of BHP's Regional GHG Management Plan, emissions which occur outside of the Development Envelope associated with Yarnima Power Station and Rail transport operations, these are identified as Scope 1 emissions. Although these emissions are from sources outside of the Development Envelope for the Proposal, they occur within BHP's Regional GHGMP boundary. BHP takes a regional approach to the management of GHG emissions, and as such these emissions are classified as Scope 1.

² Annual excludes periods of relatively low emissions from land-use change after cessation of mining activity to better represent average operational emissions of mining activity. For the Proposal and the Amended Proposal, the average is over FY2025 to FY2049.

Element	Location / description	Existing proposal maximum extent, capacity or range (Approved Proposal)	Proposed amendment extent, capacity or range (the Proposal – Significant Amendment)	Combined maximum extent, capacity or range (Combined Proposal)
Scope 3	Downstream emissions (including port, iron ore shipping and steel making)	Not specified; not assessed under Part IV	0 tCO ₂ -e per annum	9,787,488 tCO ₂ -e per annum
Total (based on annual average Scope 1)² – 25 year life of mine			-1,889 tCO ₂ -e (Decrease in Scope 1 emissions to life of mine by 25 years)	71,538 tCO ₂ -e (25 years life of mine)
Other elements which affect extent of effects on the environment				
Maximum project life		Not specified; not assessed under Part IV	Additional 5 years of operations	Total estimated mine life of 50 years from the date of issue of the statement, including: • construction and mine operation: 40 years³ • decommissioning and closure: 10 years
Commissioning				
Commissioning of the additional dewatering infrastructure will be undertaken subject to the operational elements above				
Rehabilitation and closure				
Progressive rehabilitation will be undertaken, where practicable, when disturbed areas are no longer required for operations. Any permanent pit lake that forms following the permanent cessation of dewatering (if backfilling above the water table cannot be achieved) will be designed and managed to be safe and non-polluting.				

³ Dewatering for BWT mining is planned for 40 years, but additional time is required for other elements and activities associated with the Combined Proposal.

Table 3: Summary of potential impacts, proposed mitigation and proposed environmental outcomes

Inland Waters	
Potential impacts	• changes to groundwater regimes from additional groundwater abstraction for mine pit dewatering at Orebody 29/30/35 (direct) • changes to surface water regimes from mine pit excavation and infrastructure (including OSAs), and discharge of surplus water to Ophthalmia Dam (direct) • changes to water quality from mine pit excavation and infrastructure (including OSAs), from dewatering (including from post-mining pit lakes) and discharge of surplus water to Ophthalmia Dam (indirect)
Mitigation hierarchy	• limit groundwater abstraction and discharge of surplus water to Ophthalmia Dam • continue to minimise the potential impacts of surplus water discharge from BHP's mines on groundwater quality according to the management in the Eastern Pilbara Water Resource Management Plan • minimise the potential impacts to groundwater quality according to the proposed Water (PFAS) Management Plan • continue to manage rehabilitation and closure according to the measures in the updated Orebody 29/30/35 Mine Closure Plan
Residual impacts, including assessment of significance	Residual impacts on Inland Water following application of the mitigation hierarchy: 1. Increase in groundwater abstraction for dewatering. Decrease in groundwater levels (drawdown) in the orebody and regional aquifer from additional dewatering 2. If any Orebody 29/30/35 pit voids are left open post-mining, pit lakes will form. Recovery of groundwater levels lower than pre-development levels 3. Reduction in surface water availability from loss of catchment less than 1.14% 4. Increase in surplus water discharge to Ophthalmia Dam. Ophthalmia Dam storage capacity may be reached in peak discharge years from additional surplus water from Orebody 29/30/35 5. Potential increase in groundwater salinity in Ethel Gorge aquifer from cumulative discharge to Ophthalmia Dam (including additional surplus water discharge from Orebody 29/30/35) 6. Migration of PFAS contaminants from Orebody 29/30/35 dewatering and discharge of surplus water to Ophthalmia Dam 7. Potential changes to water quality from erosion and sedimentation, and Acid and Metalliferous Drainage. Increased salinity in pit lakes remaining at closure

Proposed environmental outcomes	Environmental outcomes for the residual impacts on Inland Waters: 1. Groundwater levels in the regional aquifer will be maintained outside the predicted drawdown extent. Groundwater levels in the Ethel Gorge aquifer will remain within historical levels to support the stygofauna habitat of the Ethel Gorge TEC 2. Post-mining reduction in groundwater levels in the orebody and regional aquifers in the Orebody 29/30/35 mine area. Groundwater levels in the Ethel Gorge aquifer will remain within historical levels to support the stygofauna habitat of the Ethel Gorge TEC 3. Surface water availability will remain within natural variation of seasonal runoff at the local and regional scale 4. The current (altered) ephemeral surface water regime to the Fortescue River downstream of Ophthalmia Dam will be maintained 5. Groundwater salinity in the Ethel Gorge aquifer will be maintained within historical levels to support the stygofauna habitat of the Ethel Gorge TEC 6. PFAS concentrations in the combined surplus dewatered groundwater from Orebody 29/30/35 discharged to Ophthalmia Dam and in surface water within Ophthalmia Dam will remain below 30% of the human health (drinking water) guideline value and 10% of the ecological 95% guideline value published in the PFAS NEMP 2.0 (HEPA 2020) 7. Water quality at environmental receptors is likely to be below site-specific limits of concern and remain within acceptable ranges
Assessment of offsets (if relevant)	N/A: No significant residual impacts after mitigation
Flora and Vegetation	
Potential impacts	• loss of vegetation from clearing (direct) • changes to vegetation from changes to groundwater regimes (indirect) • changes to vegetation and flora from dust, fire and weeds (indirect)
Mitigation hierarchy	• limit clearing for the Proposal to 116 ha of native vegetation • minimise clearing by locating the project in already cleared areas • continue to manage rehabilitation and closure according to the measures in the Orebody 29/30/35 Mine Closure Plan
Residual impacts, including assessment of significance	Residual impact on Flora and Vegetation following application of the mitigation hierarchy: 1. Clearing of up to 104 ha of native vegetation in Good to Excellent condition (of which 100 ha is within the Pilbara IBRA region) (significant) 2. Clearing of less than 0.01% of each Beard vegetation association (not significant) 3. Clearing of 1.23 ha of major drainage line vegetation and 2.48 ha of possible restricted vegetation, representing less than 1% of the mapped extent (not significant)

Proposed environmental outcomes	Environmental outcomes for the residual impacts on Flora and Vegetation: 1. Contributes to the cumulative clearing of Good to Excellent condition vegetation in the Pilbara bioregion 2. The representation of each Beard vegetation association in the Pilbara and Gascoyne bioregions will be maintained 3. No impacts to TECs and PECs; significant vegetation will be maintained to an extent that ecological integrity is not threatened
Assessment of offsets (if relevant)	Clearing of vegetation in Good to Excellent condition for the Proposal is a significant residual impact due to the cumulative impacts of clearing in the Pilbara and requires an offset. BHP proposes to contribute funds to the Pilbara Environmental Offsets Fund for the clearing of up to 100 ha of Good to Excellent condition vegetation in the Pilbara IBRA region
Terrestrial Fauna	
Potential impacts	• loss of fauna habitats and species from clearing (direct) • impacts to fauna individuals from mining activities (indirect) and infrastructure (direct) • impacts to fauna habitat and individuals from dust emissions (indirect) • interactions with (direct) and changes to (indirect) fauna habitat from introduced species • changes to fauna habitats from fire (indirect)
Mitigation hierarchy	• limit clearing for the Proposal to 116 ha of native vegetation • minimise clearing by locating the project in already cleared areas • continue to manage rehabilitation and closure according to the measures in the Orebody 29/30/35 Mine Closure Plan
Residual impacts, including assessment of significance	Residual impact on Terrestrial Fauna following application of the mitigation hierarchy: 1. Clearing of up to 14 ha of critical foraging habitat for Ghost Bat 2. No direct impact to known records of Threatened fauna species, and direct impact of no more than 0.1% of known records of Priority fauna species 3. No direct impact to known records of Confirmed short range endemic fauna species, and direct impact to only one record of a Potential short range endemic fauna species
Proposed environmental outcomes	Environmental outcomes for the residual impacts on Terrestrial Fauna: 1. Clearing of critical foraging habitat for Ghost Bat in the Pilbara bioregion 2. The viability of the Threatened and Priority fauna known from the Development Envelope will be maintained 3. The viability of the Potential short range endemic fauna known from within the Development Envelope will be maintained

Assessment of offsets (if relevant)	Potential significant residual impact to critical foraging habitat for Ghost Bat requires an offset. BHP proposes to contribute funds to the Pilbara Environmental Offsets Fund for the clearing of up to 14 ha of critical foraging habitat for Ghost Bat
Subterranean Fauna	
Potential impacts	- changes to stygofauna habitat and species assemblage from changes to groundwater regimes (direct) and quality (indirect) - loss of troglofauna habitat from mine pit excavation (direct)
Mitigation hierarchy	- continue to manage the potential impacts of surplus water discharge from BHP's mines (including from Orebody 29/30/35) on the stygofauna habitat in the Ethel Gorge TEC according to the Eastern Pilbara Water Resource Management Plan - continue to manage rehabilitation and closure according to the measures in the Orebody 29/30/35 Mine Closure Plan
Residual impacts, including assessment of significance	Residual impact on Subterranean Fauna following application of the mitigation hierarchy: - Loss of stygofauna habitat in the Orebody 29/30/35 groundwater drawdown extent (not significant) - No expected change in the stygofauna habitat of the Ethel Gorge aquifer or TEC (not significant) - Loss of troglofauna habitat from the expansion of mine pits in the Orebody 29/30/35 mine area (not significant)
Proposed environmental outcomes	Environmental outcomes for the residual impacts on Subterranean Fauna: - Stygofauna habitat will be maintained at the regional level; no impact to the representation of stygofauna species in the local area - Stygofauna habitat in the Ethel Gorge TEC will be maintained - Minimal loss of troglofauna habitat in the local area
Assessment of offsets (if relevant)	N/A: No significant residual impacts after mitigation
Social Surroundings	
Potential impacts	- while there are no known Aboriginal cultural heritage sites within the Development Envelope (outside of the Approved Proposal), the Proposal could lead to disturbance of unknown cultural heritage sites and values (direct and indirect) - impacts to access, landscape, and amenity (direct) - degradation of cultural heritage places and values (indirect)
Mitigation hierarchy	- avoid any impacts to known Aboriginal cultural heritage sites through the design of the Proposal - implement the measures in the relevant environmental management plans to minimise impacts to cultural heritage values, including water values - continue to manage rehabilitation and closure according to the measures in the Orebody 29/30/35 Mine Closure Plan

Residual impacts, including assessment of significance	Residual impact on Social Surroundings following application of the mitigation hierarchy: 1. Potential indirect impact to Aboriginal social, cultural and heritage values
Proposed environmental outcomes	Environmental outcomes for the residual impacts on Social Surroundings: 1. No direct impact to heritage sites; identification of potential impacts on values in consultation with the Nyiyaparli Traditional Owners
Assessment of offsets (if relevant)	N/A: No significant residual impacts after mitigation
Greenhouse Gases	
Potential impacts	cumulative greenhouse gas emissions are a contributor to climate change. The cumulative emissions from the Combined Proposal will contribute to contribute to WA's greenhouse gas emissions
Mitigation hierarchy	- avoid Scope 1 emissions through the design of the Proposal by minimising land clearing through the use of existing mine processing infrastructure and the use of existing cleared tracks and roads - reduce greenhouse gas emissions through the measures in the Pilbara Regional Greenhouse Gas Management Plan, including emissions reduction - implement offsets according to the Pilbara Regional Greenhouse Gas Management Plan
Residual impacts, including assessment of significance	Residual impact on Greenhouse Gases following application of the mitigation hierarchy: 1. Generation of GHG emissions (significant)
Proposed environmental outcomes	Environmental outcomes for the residual impacts on Greenhouse Gases: 1. Contribution of Scope 1 and Scope 3 greenhouse gas emissions from the Combined Proposal
Assessment of offsets (if relevant)	Potential significant residual impacts for the contribution of Scope 1 and Scope 3 greenhouse gas emissions from the Combined Proposal. BHP proposes to implement offsets according to the Pilbara Regional Greenhouse Gas Management Plan
Air Quality	
Potential impacts	- Airborne particulate emissions (direct) - Reduction in ambient air quality (direct)
Mitigation hierarchy	- Avoid airborne particulate dust from designing the Proposal to use existing haul roads and reducing truck cycle time - Minimize airborne particulate emissions by implementing a range of controls

Residual impacts, including assessment of significance	Residual impact on Air Quality following application of the mitigation hierarchy: 1. Generation of dust and reduction of air quality from construction and operation activities
Proposed environmental outcomes	Environmental outcomes for the residual impacts on Air Quality: 1. No significant residual impacts to Air Quality from the Proposal (in isolation) or from the Combined Proposal (in isolation); implementation of the Proposal will result in a reduction in the predicted number of exceedances of PM₁₀ and PM_{2.5} for the cumulative scenario, therefore, the predicted number of exceedances for PM₁₀ and PM_{2.5} will be lower than for the Existing scenario
Assessment of offsets (if relevant)	N/A: No significant residual impacts after mitigation

1 Introduction

1.1 Purpose and scope of this document

The purpose of this document is to present the environmental impact assessment undertaken by BHP Iron Ore Pty Ltd (BHP) for the Orebody 29/30/35 Significant Amendment (the Proposal). The Proposal is part of the Mt Whaleback mining operations, located in the Eastern Pilbara region of Western Australia (Figure 1-1).

This document is provided as a supplementary report to the referral of a significant amendment of the Approved Proposal under Ministerial Statement 963 (MS963) for the Orebody 29/30/35 Below Water Table (BWT) Mining Proposal. As provided for in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual* (EPA 2021a), where a proponent aims to provide sufficient information with the referral to enable the Environmental Protection Authority (EPA) to set 'Referral Information' as the level of assessment, the proponent may prepare a supplementary report/s for the referral consistent with the requirements of an Environmental Review Document (ERD).

The scope of this document is an assessment of the potential significant environmental impacts from the Proposal, in the context of the Approved Proposal (i.e. the Combined Proposal), to increase the rate of groundwater abstraction for mine dewatering at Orebody 29/30/35 from the authorised extent of 8 gigalitres per annum (GL/a) under MS963 to 24.5 GL/a. This change in groundwater abstraction will also result in an increase in discharge of surplus water to Ophthalmia Dam from 8 GL/a authorised under MS963 to 20.8 GL/a. The Proposal also includes the construction and operation of a new surplus water pipeline from Orebody 29/30/35 to Ophthalmia Dam and expansion of mine pits, additional overburden storage areas (OSAs) and a ramp. This document and supporting information comprises the following:

- Environmental Review Document for the Proposal - Main document
- Proposal Content Document (Appendix 1)
- Significant Amendment requirements:
 - Analysis of the Ministerial Statement for the Approved Proposal (Appendix 2)
 - Compliance with Approved Proposal Ministerial Statement (Section 2.1.2)
 - Environmental Performance Report (Section 2.1.3)
- Proposed implementation conditions for the Proposal (Appendix 3)
- Supporting study and survey reports (Appendix 4, Appendix 9, Appendix 11, Appendix 12 and Appendix 15)
- Environmental Management Plans (Appendix 5, Appendix 6, Appendix 7 and Appendix 13)
- Index of Biodiversity Surveys for Assessments (IBSA) data package (Appendix 16)
- Offsets template and draft Impact Reconciliation Procedure (Section 15 and Appendix 17).

BHP has considered guidance in the Procedures Manual (EPA 2021a), including the following EPA Instructions, to prepare this document:

- *Referral of a proposal under section 38 of the Environmental Protection Act 1986: Instructions* (Referral Instructions) (EPA 2024a)
- *How to prepare an Environmental Review Document: Instructions* (ERD Instructions) (EPA 2024b)

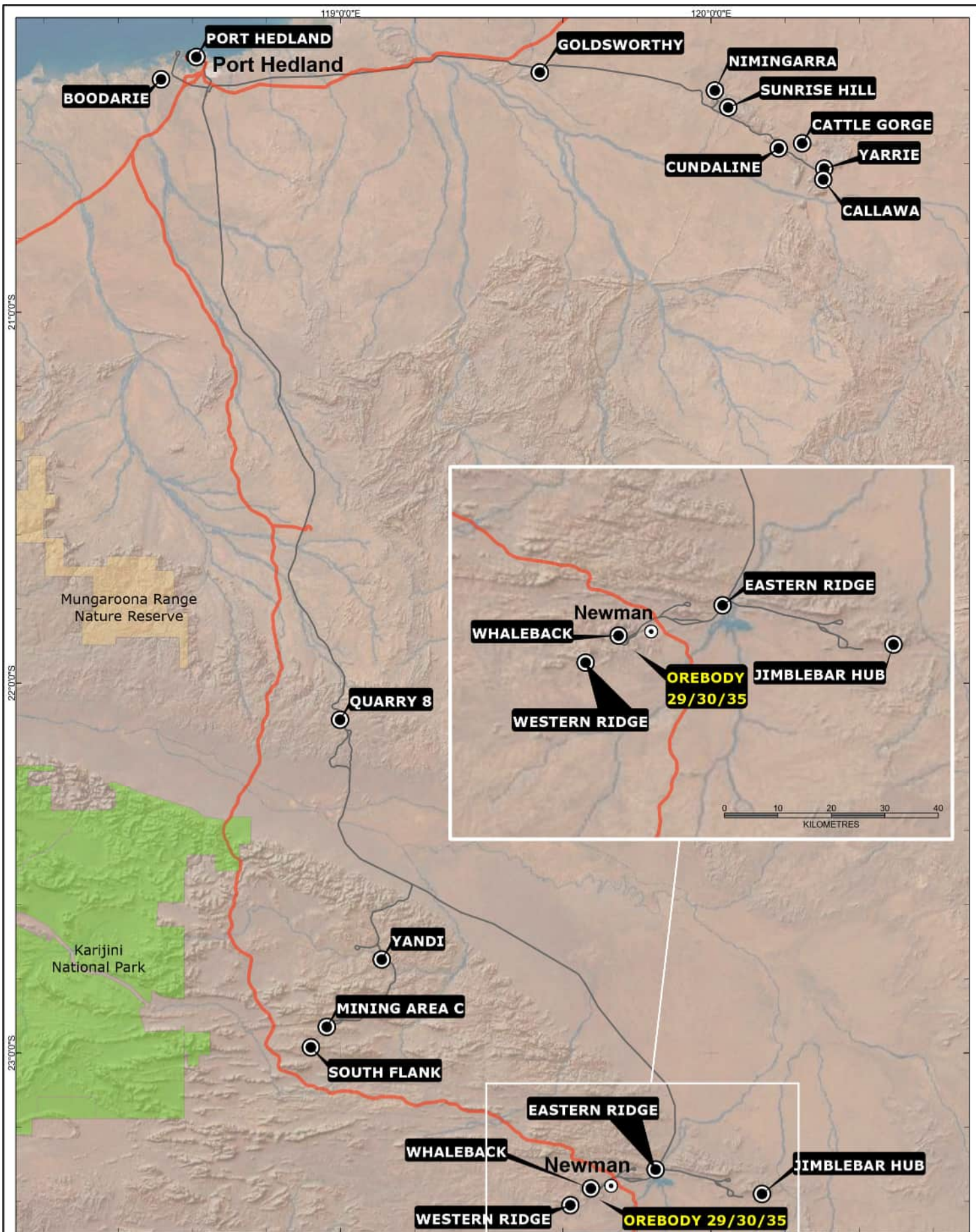
- *How to identify the content of a Proposal: Instructions and template* (Proposal Content Instructions) (EPA 2024c)
- *How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: Instructions* (EMP Instructions) (EPA 2024d)
- EPA factor guidelines and technical guidance (see details under relevant factor).

1.2 Significant Amendment requirements

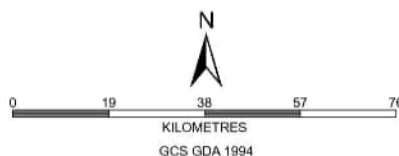
Table 1-1 outlines where in this document BHP has addressed the additional requirements for Significant Amendments, as required by the EPA's Referral Instructions (EPA 2024a).

Table 1-1: Significant Amendment requirements

Significant Amendment requirement	Location in document
1. Type of significant amendment	Section 3.1.1.1
2. Information of the Approved Proposal	Section 2.1
3. Combined effects	Sections 7.4 and 7.6, 8.4 and 8.6, 9.4 and 9.6, 10.4 and 10.6, 11.4 and 11.6, 12.4 and 12.6, 13.4 and 13.6
4. Existing implementation conditions	Section 3.1.1.2 and Appendix 2, Sections 7.7, 8.7, 9.7, 10.7, 11.7, 12.7 and 13.7
5. Previous changes to the Proposal and / or implementation conditions	Section 2.1.1
6. Compliance	Section 2.1.2
7. Environmental performance	Section 2.1.3
8. Control of implementation of significant amendment	Sections 7.5.4 and 7.7, 8.5.4 and 8.7, 9.5.4 and 9.7, 10.5.4 and 10.7, 11.5.4 and 11.7, 12.5.4 and 12.7, 13.5.3 and 13.7, and Appendix 3



- BHP mine
- National Park
- Nature Reserve
- Highway
- Rail



BHP

PUBLIC

OREBODY 29/30/35 SIGNIFICANT AMENDMENT Regional Location

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:1,500,000 PREPARED: GEOMATICS FIGURE: 1-1
DATE: 3/09/2024 REQUESTOR: ENV. APPROVALS NO: A929_042G

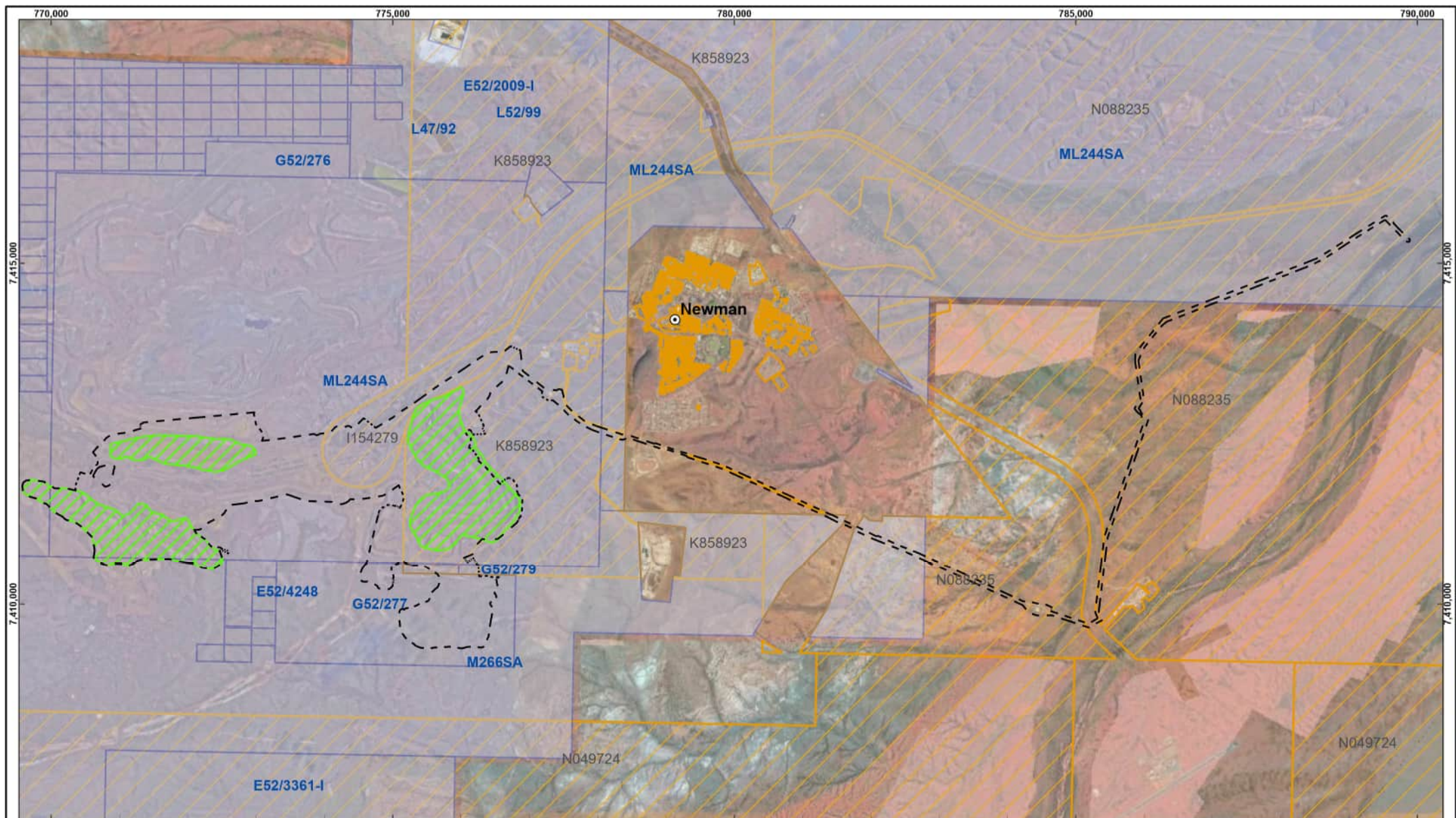
2 Proposal

2.1 Approved Proposal

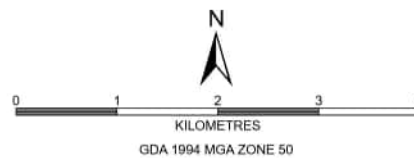
Mining BWT at Orebody 29/30/35 was approved under MS963 on 18 March 2014. The approved Part IV boundary for MS963 and BHP's tenure is shown on Figure 2-1.

The key activities and elements of the Approved Proposal as set out in MS963 are summarised below:

- extend mining BWT at existing above water table (AWT) pits
- abstraction of groundwater to dewater the deposits
- surplus water management - discharge of surplus water to Ophthalmia Dam.



-  Development Envelope
-  Ministerial Statement 963
-  BHP Tenements - Granted
-  BHP Freehold Leasehold Easements



BHP

PUBLIC

OREBODY 29/30/35
SIGNIFICANT AMENDMENT
 Approved Proposal, Ministerial
 Statement and Tenure
PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:75,000	PREPARED:	GEOMATICS	FIGURE:	2-1
DATE:	21/11/2024	REQUESTOR:	ENV. APPROVALS		

NO: A929_043E

2.1.1 Previous changes to the Approved Proposal and implementation conditions

As required by the Referral Instructions (EPA 2024a) and ERD Instructions (EPA 2024b), Table 2-1 summarises the environmental approval history for Orebody 29/30/35. No amendments have been approved since the amendments to the *Environmental Protection Act 1986* (EP Act) came into force in 2021.

Table 2-1: Part IV Approved Proposals and summary of changes

Date	EP Act Section	Summary of Approved Proposal and changes / amendments
Current Approved Proposals		
Orebody 35 above water table (AWT) iron ore mine		
19 December 2011	s38	Referred under s38 of the EP Act in November 2011. EPA decision (December 2011) was 'Not Assessed – Advice Given'
Orebody 29/30/35 below water table (BWT)		
18 March 2014	s38	To allow BWT mining only
11 November 2015	S46C	Amendment to Condition 4 (Compliance Reporting)

2.1.2 Compliance

BHP reports annually on compliance in Annual Environmental Reports (AERs) submitted to the Department of Water and Environmental Regulation (DWER), with a separate chapter for each MS Compliance Assessment Report. As required by the Referral Instructions (EPA 2024a), BHP has provided the current status and history of compliance with the MS for the current Approved Proposal in Table 2-2.

Table 2-2: Current status and history of compliance

Year	AER	Summary of compliance
MS963: Orebody 29/30/35 Below Water Table (BWT) Mining		
Current		
2023-2024	AER 2024 (BHP 2024a)	There were no non-compliances or potential non-compliances identified
History		
2022-2023	AER 2023 (BHP 2023a)	There were no non-compliances or potential non-compliances identified
2021-2022	AER 2022 (BHP 2022a)	There were no non-compliances or potential non-compliances identified
2020-2021	AER 2021 (BHP 2021a)	A minor non-compliance was identified this financial year to date (BHP 2021a) Notification of change of name was provided to DWER, but not within the required time frame. An administration process review has been undertaken to ensure prevention of re-occurrence.

Year	AER	Summary of compliance
2019-2020	AER 2020 (BHP 2020a)	There were no non-compliances or potential non-compliances identified
2018-2019	AER 2019 (BHP 2019a)	There were no non-compliances or potential non-compliances identified

2.1.3 Environmental performance

BHP includes reporting on environmental performance in AERs. As required by the Referral Instructions (EPA 2024a), BHP has provided a report on the environmental performance of the Approved Proposal against the EPA's objectives for environmental factors relevant to the Significant Amendment, and any Ministerial Statement implementation condition environmental outcomes and/or objectives in Table 2-3.

BHP considers that Inland Waters is the key environmental factor relevant to the existing Approved Proposal. As discussed in Table 2-3, BHP considers that BHP's performance against the EPA's objective for the environmental factors relevant to the Significant Amendment (the Proposal) have been met in relation to the Approved Proposal.

Table 2-3: Environmental performance report (for the Approved Proposal)

Ministerial Statement conditions and environmental outcomes/objective	Summary of current environmental performance
Inland Waters: <i>To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected</i>	
MS963: Orebody 29/30/35 BWT Mining Condition 1: Proposal implementation Condition 1-1: When implementing the Proposal, the proponent shall not exceed the authorised extent of the Proposal as defined in Column 3 of Table 2 in Schedule 1, unless amendments to the Proposal and the authorised extent of the Proposal has been approved under the EP Act	MS963 MS963 has no conditions specifically related to Inland Waters, however, Schedule 1 identifies a groundwater abstraction limit of up to 8 GL/a and a limit of dewater disposal to Ophthalmia Dam of up to 8 GL/a. Abstraction and disposal have been within authorised limit since the Approved Proposal was implemented. BHP considers that the EPA's objective for the Inland Waters factor has been met.
MS963: Orebody 29/30/35 BWT Mining Condition 6: Rehabilitation and Closure Condition 6-1: The proponent shall ensure that the mines are closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed post-mining outcomes and land uses for a Priority 1 Public Drinking Water Source Area, and without unacceptable liability to the State of Western Australia	MS963 Mining of ore BWT commenced in Orebody 29 in December 2016. The Orebody 29/30/35 MCP was prepared and submitted to the DWER (then OEPA) on 30 May 2017. A revised Plan, addressing comments from DWER was submitted on 4 July 2018. The MCP was approved on 14 November 2018 and mining is being undertaken in a manner consistent with the plan. Orebody 29/30/35 MCP was prepared in consultation with DMP and DOW, and in accordance with the 2015 revision of the Guidelines for Preparing Mine Closure Plans, June 2011 (Department of Mines and Petroleum, and Environmental Protection Authority). BHP considers that the EPA's condition for Rehabilitation and Closure has been met.

2.2 Proposal content

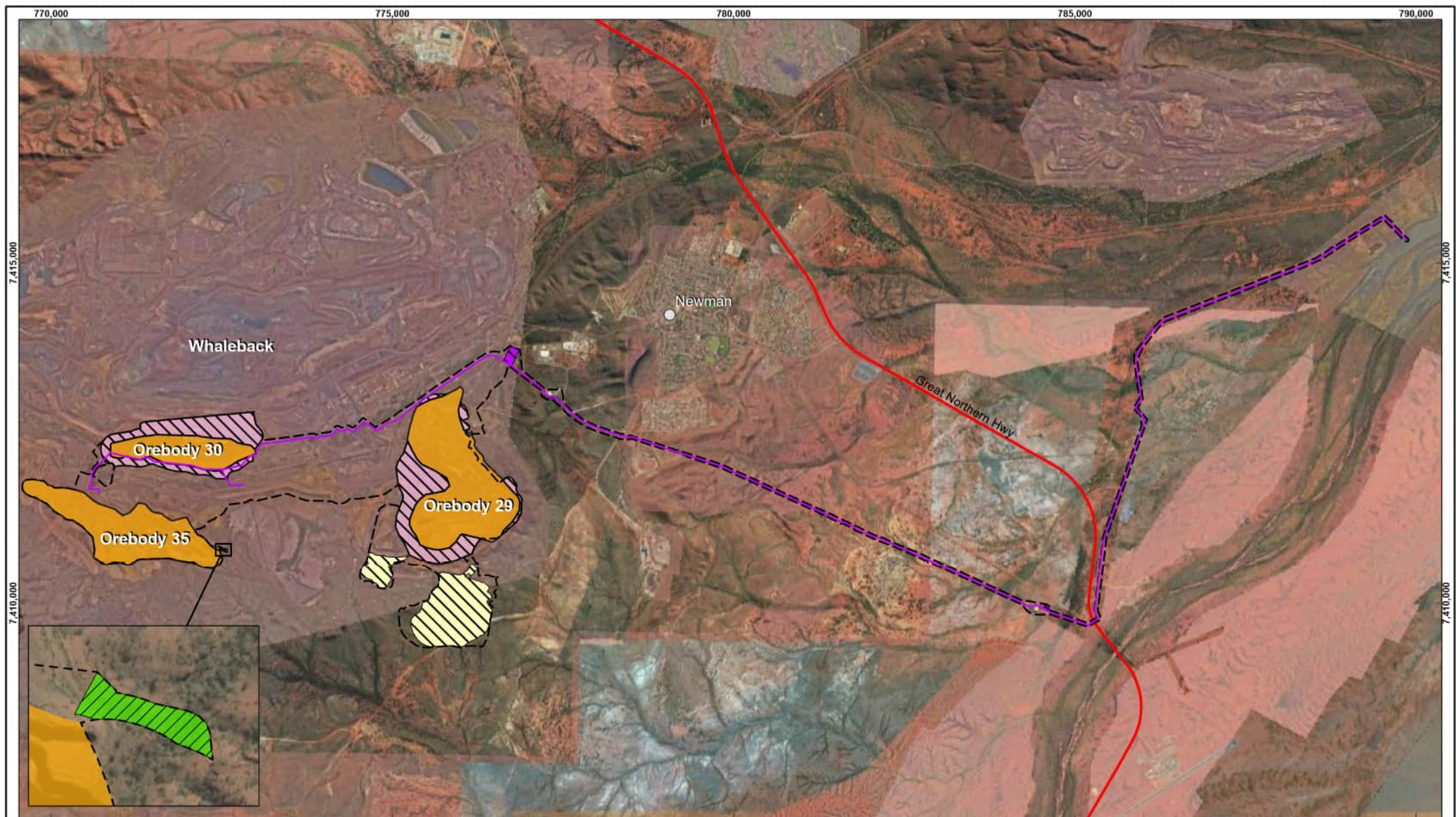
As required by the Proposal Content Instructions (EPA 2024c), the general Proposal content description and Proposal content elements are described in the separate Orebody 29/30/35 Significant Amendment *Proposal Content Document* (Appendix 1). This section does not include the full Proposal Content Document information, as the EPA notes in the Instructions that the Proposal content cannot be identified in other information (such as supplementary reports) provided at or during the referral or assessment stage.

As the Proposal is a Significant Amendment, the Proposal Content Document describes and tabulates the existing proposal (Approved Proposal), the proposed Significant Amendment (the Proposal) and their combined maximum extent, capacity or range (Combined Proposal). As the Approved Proposal was for BWT mining, including groundwater abstraction and the discharge of surplus dewater into Ophthalmia Dam only, the Combined Proposal is only relevant to the Inland Waters factor. For all other factors the combined effect will be discussed under the Cumulative Impacts section.

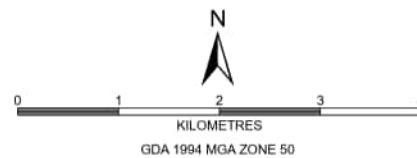
2.2.1 Proposed significant amendment (the Proposal)

The Proposal (Figure 2-2) includes the following key activities and elements:

- to increase the rate of groundwater abstraction for mine dewatering at Orebody 29/30/35 from the authorised extent of 8 GL/a under MS963 to 24.5 GL/a
- to increase the discharge of surplus water to Ophthalmia Dam from 8 GL/a authorised under MS963 to 20.8 GL/a
- the construction and operation of a new surplus water pipeline to distribute additional surplus water to Ophthalmia Dam
- clearing of up to 116 hectares (ha) for the expansion of mine pits, additional OSAs, construction of pipeline and associated laydown areas, and a ramp.



- Pipeline and Laydown Areas
- Development Envelope
- Indicative Footprint
- Ministerial Statement 963
- Pit Expansion
- OSA
- OB35 ramp
- Highways



BHP

PUBLIC

OREBODY 29/30/35
SIGNIFICANT AMENDMENT
 Development Envelope
 and Indicative Footprint
 PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:75,000 PREPARED: GEOMATICS FIGURE: 2-2
 DATE: 2/08/2024 REQUESTOR: ENV. APPROVALS
 NO: **A929_041E**

2.3 Assessment areas

The Development Envelope and the Indicative Footprint are shown in Figure 2-2. The Development Envelope includes the Approved Proposal, noting that a portion (6 ha) of the Approved Proposal area at Orebody 29 has been removed from the Development Envelope. The Indicative Footprint encompasses the proposed areas of new activity and disturbance occurring outside the Approved Proposal. Table 2-4 shows the breakdown of these areas (shown in Figure 2-2) within the Indicative Footprint and the Development Envelope. A large portion of the Development Envelope (82%) and Indicative Footprint (63%) has already been disturbed as part of the existing operations (Table 2-5).

Table 2-4: Assessment areas

Proposal area	Development Envelope (ha)	Indicative Footprint (ha)	Proposed Clearing (ha)
Approved Proposal	456.12	0 ¹	0 ¹
Additional Areas: • Expansion of pits, OSAs, pipeline and ramp	889.59	311.40	116.02
Total	1,345.71	311.40	116.02
Total (Rounded)	1,346	312	116

1. No clearing approved under Part IV of the EP Act. Clearing within the Approved Development Envelope was approved under a Part V Native Vegetation Clearing Permit (NVCP 5617/6).

Table 2-5: Existing cleared areas

Component	Development Envelope (ha)	Development Envelope (%)	Indicative Footprint (ha)	Indicative Footprint (%)
Cleared Area (as at FY2023) ¹	1,100.13	81.75	195.38	62.74
Proposed Clearing ²	-	-	116.02	37.26
Total	1,345.71	100	311.40	100

1. Includes cleared areas authorised under Part V of the EP Act and other approvals, as at FY2023 (latest dataset available at time of ERD preparation).
2. Proposed Clearing area for the Proposal is the Indicative Footprint area minus the Cleared Area (as at FY2023).

As required by the Proposal Content Instructions, to provide project flexibility, BHP has assessed potential impacts within the Indicative Footprint and within the Development Envelope. This provides flexibility for the location of proposal elements, to allow for changes to the project design and/or to avoid or minimise impacts.

2.4 Proposal alternatives

The Proposal will use existing and approved mine, transportation and processing elements at the Mt Whaleback mining operations (Appendix 1). The use of existing and approved elements will reduce the disturbance for the Proposal, with new disturbance required only within the Development Envelope for the OSAs, ramp and portions of the surplus water pipeline. The addition of the OSAs south of Orebody 29 will reduce the haul distance from that of the existing Orebody 35 OSA reducing GHG emissions and impacts from dust. The pipeline will be largely located within cleared/disturbed areas (Figure 2-2). BHP considered two potential pipeline alignment options for the surplus water pipeline route from Orebody 29/30/35 to Ophthalmia Dam. The selected pipeline route that was chosen (Figure

2-2) requires the least amount of native vegetation clearing, runs parallel to the existing pipeline and avoids all known heritage sites and buffers.

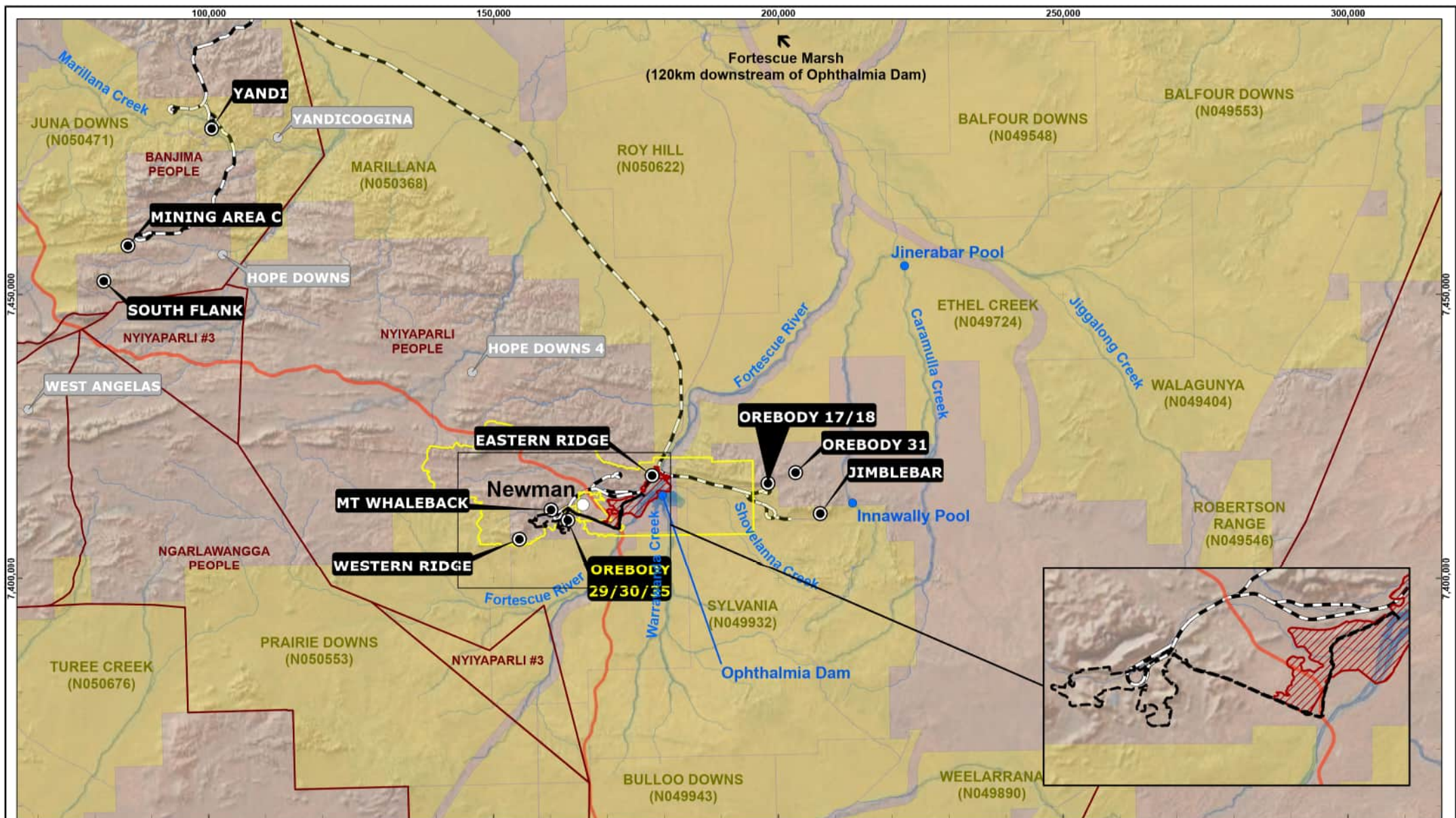
2.5 Local and regional context

The Proposal is located in the Eastern Pilbara region, approximately 7 kilometres (km) west-south-west of the town of Newman. It is located immediately south and southwest of the existing Mt Whaleback mining operations and north of the approved Western Ridge mine (Figure 1-1). The dominant land uses are iron ore mining operations and pastoral activities. The nearest third-party iron ore mining operation is Rio Tinto's Hope Downs 4, located approximately 30 km northwest in the central Pilbara (Figure 2-3). The nearest National Park or conservation reserve is Karijini National Park, located approximately 103 km northwest of the Proposal (Figure 1-1).

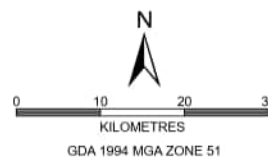
The Proposal is located wholly within the Upper Fortescue River catchment (Whaleback Creek and Fortescue regional subcatchments), which drains to the Fortescue Marsh (Figure 7-1). Within the Development Envelope, Whaleback Creek flows in an easterly direction to its confluence with Fortescue River, about 20 km east of the Proposal and upstream of Ophthalmia Dam.

The Proposal is partially located within the Newman Water Reserve Priority 1 Public Drinking Water Source Area (PDWSA) (Figure 2-3). Ophthalmia Dam is located approximately 15 km east of the eastern boundary of the Development Envelope (Figure 2-3). Ophthalmia Dam was commissioned in 1981 as a managed aquifer recharge (MAR) scheme, to maintain groundwater levels within the Ethel Gorge aquifer, to support the Ophthalmia Borefield for town water supply. The Ethel Gorge aquifer is known to support the Ethel Gorge Aquifer Stygobiont Community Threatened Ecological Community (Ethel Gorge TEC), with the extent of the community extending north and southwest of the dam. The Ophthalmia Dam system continues to maintain groundwater levels within the Ethel Gorge aquifer and maintain habitat for the Ethel Gorge TEC and provides a location for the discharge of surplus water from BHP mines (currently Eastern Ridge, Orebody 29/30/35, Jimblebar and Orebody 31 (OB31)). Discharge is also authorised from the Western Ridge mine and OB32 BWT mine (part of Eastern Ridge) however, discharge has not yet commenced from these mines.

The Development Envelope intersects seven land systems as categorised by the Western Australia Department of Agriculture (van Vreeswyk *et al* 2004). The mine portion of the Development Envelope is dominated by Newman and Rocklea land systems, and the pipeline portion is dominated by the Elimunna land system. The Proposal is located wholly within the boundary of the Nyiyaparli Native Title determination area (Native Title file No. WCD2018/008).



- BHP mine
- Other mining operations
- Development Envelope
- Native Title Determinations
- BHP rail
- Highway
- Newman Water Reserve Priority 1 Public Drinking Water Source Area
- Ethel Gorge TEC
- Pastoral lease



BHP

PUBLIC

OREBODY 29/30/35 SIGNIFICANT AMENDMENT Local and Regional Context

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:900,000 PREPARED: GEOMATICS FIGURE: 2-3
DATE: 3/09/2024 REQUESTOR: ENV. APPROVALS NO:

A929_044_RevF

3 Legislative context

3.1 Environmental impact assessment process

3.1.1 Part IV of the *Environmental Protection Act 1986*

BHP has determined that the Proposal is potentially significant and requires referral to the EPA under Part IV, s38 of the EP Act. BHP considers that the Significant Amendment pathway (as provided for under s40AA) is appropriate as the Proposal includes environmental factors not previously assessed and/or conditioned under the Approved Proposal.

Should the EPA decide to assess the Proposal, BHP considers that a level of assessment of 'Assess - Referral Information' is appropriate. BHP has undertaken a comprehensive environmental impact assessment, which is documented in this report and supporting appendices.

3.1.1.1 Type of significant amendment

The type of significant amendment is an amendment to the Approved Proposal and an amendment to implementation conditions of the Approved Proposal.

3.1.1.2 Existing implementation conditions

As required by the Referral Instructions (EPA 2024a) and ERD Instructions (EPA 2024b), BHP has undertaken an analysis of the existing implementation conditions relating to the Approved Proposal (Appendix 2). BHP considers that the existing conditions require amendments to ensure consistency of the ongoing elements of the Proposal with the EPA's environmental factor objectives. Therefore, as provided for under s40AA(3), BHP considers that the EPA should inquire into and report on the implementation conditions as part of the assessment of the significant amendment (the Proposal). As part of the analysis, BHP has also reviewed the extents of the Proposal elements in the Ministerial Statement for the Approved Proposal (Appendix 2). As provided for as an option in the ERD Instructions (EPA 2024b), BHP has proposed conditions for the EPA's consideration, in Appendix 3.

If the agreement or decision under s45 is that the Proposal may be implemented, BHP requests that the MS for the Approved Proposal (MS963) is superseded and one new MS is issued for the Amended Proposal (Approved Proposals as amended by the Significant Amendment), as provided for under s40AA(6)(b).

3.1.2 State Agreement

The Orebody 29/30/35 operations are conducted under the Newman State Agreement (*Iron Ore (Mount Newman) Agreement Act 1964 (WA)*) (MNSA) and McCamey's State Agreement (*Iron Ore (McCamey's Monster) Agreement Authorisation Act 1972 (WA)*) (MMSA). The significance of the proposed works warrants the submission of a State Agreement Integration Proposal due to the OB35 pit development overlap with *Mount Newman* and *McCameys Monster*.

3.1.3 Commonwealth EPBC Strategic Approval

BHP has a strategic approval (the Commonwealth Strategic Approval) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The *BHP Billiton Iron Ore Pilbara Strategic Assessment Program* (BHP Billiton 2017) was endorsed by the Minister for the Environment and Energy on 11 May 2017 and an Approval Decision (with conditions) for taking actions in accordance with the Program was issued on 19 June 2017. The approval covers future activities (actions) within the Strategic Assessment Area, which is the same as the State Strategic Proposal boundary. The relevant Program Matters are Matters of National Environmental Significance (MNES) and include the following listed threatened fauna species: Pilbara Leaf-nosed Bat (*Rhinonicteris aurantius*),

Northern Quoll (*Dasyurus hallucatus*), Greater Bilby (*Macrotis lagotis*), Ghost Bat (*Macroderma gigas*), Olive Python (Pilbara subspecies) (*Liasis olivaceus barroni*), Grey Falcon (*Falco hypoleucos*) and Night Parrot (*Pezoporus occidentalis*).

All actions within the scope of the strategic approval must be taken in accordance with the endorsed Program. BHP administers a non-statutory validation decision process under Part C of the endorsed Program to decide whether an action will have an impact on Program Matters. BHP has determined that the Proposal is a Notifiable Action, given the Notifiable Action Trigger is met for the Proposal and BHP will prepare a Validation Notice for the Proposal.

3.2 Other approvals and regulation

3.2.1 Tenure

BHP manages tenure holdings and legal structures on behalf of BHP Iron Ore (Jimblebar) Pty Ltd, as the party to the *Iron Ore (McCamey's Monster) Agreement Authorisation Act 1972* (McCamey's State Agreement) (MMSA); and the Mount Newman Joint Venture as the party to the *Iron Ore (Mount Newman) Agreement Act 1964* (Newman State Agreement) (MNSA).

The Orebody 29/30/35 mining operations are situated on the tenure listed in Table 3-1. Figure 2-1 shows tenure boundaries.

Table 3-1: Orebody 29/30/35 tenure

Lease	Description	Legislation
ML244SA	Mineral Lease 244SA	Newman State Agreement (MNSA) and <i>Mining Act 1978</i> (WA) (Mining Act)
M266SA	Mining Lease 266SA	McCamey's State Agreement (MMSA) and Mining Act
G52/279	General Purpose Lease 52/279	MNSA and Mining Act
G52/277	General Purpose Lease 52/277	MNSA and Mining Act
I150289	Crown Lease (Newman Dust Suppression Pipeline)	MNSA and <i>Land Administration Act 1997</i> (WA) (LAA)
N088235	Crown Lease (Newman Water Supply)	MNSA and LAA
I154279	Crown Lease (Newman Main Line) – co-exists	MNSA and LAA
K858923	Crown Lease (Newman Town Common) – co-exists	MNSA and LAA

3.2.2 Other approvals

Table 3-2 outlines other state approvals that are required for mining operations at Orebody 29/30/35 for the Proposal.

Table 3-2: Other approvals

Decision-making authority	Legislation or Agreement regulating the activity	Approval required (and relevant proposal element)	Statutory decision-making process can mitigate impacts on the environment?
Chief Executive Officer (CEO)	EP Act – Part V	Works Approval and/or amended Licence	Yes

Decision-making authority	Legislation or Agreement regulating the activity	Approval required (and relevant proposal element)	Statutory decision-making process can mitigate impacts on the environment?
Department of Water and Environmental Regulation (DWER)		(surplus water management – surplus water discharge, dust management)	Licence contains limits and conditions to mitigate certain impacts on the environment relevant to prescribed premises. Regulated through amendment to existing Whaleback/Orebody 29/30/35 licence L4503/1975/14 which covers the Mt Whaleback mining operations (Whaleback and Orebody 29/30/35 mines)
Minister for Water	<i>Rights in Water and Irrigation Act 1914</i> (RiWI Act)	s5C Licence to take water (groundwater abstraction, including for dewatering) 26D Licence to construct or alter wells (Installation of new groundwater bores)	Yes Abstraction licence contains limits and conditions (including Groundwater operating strategy) to mitigate impacts on the environment
Minister for Aboriginal Affairs	<i>Aboriginal Heritage Act 1972</i> (AH Act)	AH Act s18 consent to disturb, if previously unidentified sites are recorded and cannot be avoided	Yes S18 of the AH Act authorises impacts to Aboriginal sites
Minister for State Development	Newman State Agreement (MNSA) McCamey's State Agreement	State Agreement Act Approval under State Agreement Act for development and operation of mine and associated infrastructure	No
Chief Dangerous Goods Officer Department of Energy, Mine, Industry Regulation and Safety (DEMIRS)	<i>Dangerous Goods Safety Act 2004</i> (WA)	Dangerous Goods licence	No
State Mining Engineer DEMIRS	<i>Mines Safety and Inspection Act 1994</i> (WA)	Approval to commence mining operations	No
Minister for State Development, Minister for Mines and Minister for Land Department of Jobs, Tourism, Science and Innovation (JTSI) and DEMIRS Department of Planning, Lands and Heritage (DPLH)	MNSA and/or LAA and/or Mining Act	Approval for new tenure	Yes Conditions of grant may contain limits and conditions to mitigate certain impacts on the environment.

4 Stakeholder engagement

4.1 Key stakeholders

During the development of the Proposal, BHP undertook targeted stakeholder engagement based on interest and proximity to the Proposal location. The key stakeholders for the Proposal are summarised in Table 4-1.

Table 4-1: Key stakeholders

Stakeholder group	Stakeholder
State Government	DWER Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) (formerly DMIRS) Department of Biodiversity, Conservation and Attractions (DBCA) Department of Jobs, Tourism, Science and Innovation (JTSI) Department of Planning, Lands and Heritage (DPLH)
Traditional Owners, Native Title Claimants and Representative Bodies	Niyiyaparli Traditional Owners, through Karlka Niyiyaparli Aboriginal Corporation (KNAC)
Commonwealth Government	Department of Climate Change, Energy, the Environment and Water (DCCEEW)
Local Government	Shire of East Pilbara

4.2 Stakeholder engagement process

BHP meets regularly with the key stakeholders identified in Table 4-1 to facilitate regular, open and honest dialogue to understand expectations, concerns and interests of stakeholders and to consider them into business planning.

4.3 Stakeholder consultation outcomes

Table 4-2 summarises stakeholder consultation undertaken specifically for the Proposal.

Table 4-2: Stakeholder engagement

Stakeholder	Date	Topics/issues raised	BHP response / outcome
DWER EPA Services (EPAS)	27 November 2024	Pre referral meeting to introduce the Proposal, discuss key factors, predicted impacts and Proposal management measures.	BHP aims to refer the Proposal in December 2024.
DWER Water licensing	22 October 2024	On site visit to Mt Whaleback mine, Orebody 29/30/35 mine and Western Ridge. BHP presented a basic overview of the Orebody 29/30/35 Proposal.	BHP requested if DWER could assess the 5C amendment application in parallel with the Part IV assessment. DWER advised that BHP should target a 12 month approval timeframe for the 5C assessment as the Groundwater Operating Strategy would also need to be amended.
KNAC	3 September 2024	BHP provided draft Orebody 29/30/35 Significant Amendment Proposal documentation (ERD and EMPs) to KNAC for review (40 business day review).	Comments received 24 October 2024.
KNAC	20 August 2024	BHP attended the Implementation Committee meeting and raised the upcoming KNAC review of the Orebody 29/30/35 ERD and Management Plans.	Committee endorsed KNAC review of documentation.
KNAC	25 June 2024	BHP presented on the proposal at the Implementation Committee meeting. KNAC queried the intersection of the pipeline with a site buffer. BHP presented the different pipeline alignment options considered and the selected route which avoids all heritage sites. BHP confirmed that cultural monitors will be engaged during pipeline installation.	BHP advised that the pipeline route had been modified to avoid all known heritage sites and buffers.
Nyiyaparli representatives, KNAC, Preston Consulting, Stevens Heritage Services	14-16 May 2024	Social surroundings engagement including project overview, identification of existing values, potential impacts and proposed environmental management. On country discussion of water management, visit to Orebody 29/30/35 operations, proposed pipeline route and proposed OSAs.	BHP and KNAC agreed to a modified pipeline route to avoid newly identified archaeological and ethnographic sites and the recommendations made. KNAC provided a report detailing the actions and recommendations arising from the engagement. BHP has responded to KNAC and commits to the recommendations.
DWER EPAS and DBCA	26, 27 March 2024	On site visit to Mt Whaleback mine and Orebody 29/30/35 mine to introduce the Proposal location, key components and existing land uses and environmental values. BHP presented an overview of the Orebody 29/30/35 Proposal. DWER raised queries in relation to Traditional Owner Values.	BHP explained that the Social Surroundings engagement was scheduled for May 2024.

Stakeholder	Date	Topics/issues raised	BHP response / outcome
Niyaparli Implementation Committee Meeting with KNAC and Niyaparli representatives	12 March 2024	Introduction to the Proposal. Comments raised regarding the Archaeological and Ethnographic surveys to be undertaken.	BHP agreed to ensure the survey design considers the comments raised.
DPLH	20 February 2024	A brief overview of the off-tenure pipeline area was provided and advice sought of preferred types of tenure and process involved.	BHP agreed to apply for new tenure in line with the advice provided.
Shire of East Pilbara	23 January 2024	BHP presented an overview of the new pipeline and likely route. BHP explained that the pipeline is to replicate the existing trunk main and discussed the expected timelines.	The Shire noted the requirement and nominated a contact, Malcolm Somers (Acting Director Aviation & Regulatory Services), for tenure discussions going forward.

5 Object and principles of the EP Act

The Object of the EP Act (s4A) is to protect the environment of the State, having regard to the principles in s4A of the EP Act. Table 5-1 outlines BHP's consideration of the Object and principles of the EP Act in relation to the Proposal.

Table 5-1: Object and principles of the EP Act

Principle	Consideration
1. The precautionary principle <i>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.</i> <i>In application of this precautionary principle, decisions should be guided by:</i> (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.	BHP has undertaken hydrological studies and biodiversity surveys (Appendix 4, Appendix 9, Appendix 11 and Appendix 12) to provide scientific information to inform the assessment of risks and potential impacts on the environment from the Proposal (Section 7 to 13). In designing the Proposal, BHP has considered this information by considering different alternatives (Section 2.4) and applying the mitigation hierarchy (Sections 7.5, 8.5, 9.5, 10.5, 11.5, 12.5 and 13.5) to avoid and minimise impacts on the environment to ensure that the EPA's objective for each key environmental factor will be met. BHP considers that there will not be a threat of serious or irreversible damage if the mitigation measures are applied.
2. The principle of intergenerational equity <i>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</i>	BHP has demonstrated how it has applied the mitigation hierarchy to avoid, minimise and rehabilitate environmental impacts, to maintain the health, diversity and productivity of the environment into the future. BHP has undertaken social surroundings engagement with Nyiyaparli representatives (through KNAC) to understand the aspects of the environment that are important to the Nyiyaparli Traditional Owners. This includes commitments for ongoing engagement throughout life of the Proposal including in relation to rehabilitation. BHP has also updated the Orebody 29/30/35 MCP (Appendix 7) which has an overarching closure objective to develop a safe, stable, non-polluting and sustainable landscape that is consistent with social and environmental values agreed by key stakeholders. This includes considering closure issues of interest to the Nyiyaparli people and returning the site to a post-mining land use that is consistent with the pre-mining environment, where practicable and is viable for future generations.
3. The principle of the conservation of biological diversity and ecological integrity <i>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</i>	BHP has considered biodiversity and hydrological information from recent surveys and studies completed for this Proposal and from extensive knowledge gained from numerous surveys and studies completed for the Orebody 29/30/35 BWT Mine since the early 1970s, when BHP acquired the Newman operations. This principle is a key consideration for the Proposal as it is also part of the EPA's objectives for the land biodiversity factors of Flora and Vegetation, Terrestrial Fauna and Subterranean Fauna. BHP has considered this principle through the assessment of these factors (Sections 8, 9 and 10). Through the Proposal design and application of the mitigation hierarchy, BHP considers that biological diversity and ecological integrity will be conserved.
4. Principles relating to improved valuation, pricing and incentive mechanisms (1) <i>Environmental factors should be included in the valuation of assets and services.</i>	BHP accepts that it is responsible for the costs relating to the management of waste and pollution, including avoidance, containment, decommissioning, rehabilitation and closure. BHP recognises that cumulative greenhouse gas emissions are a contributor to climate change and that the cumulative emissions from the Proposal will contribute to WA's greenhouse gas emissions. BHP will bear

Principle	Consideration
(2) <i>The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i> (3) <i>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.</i> (4) <i>Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.</i>	the cost of emission reduction and offset strategies to minimise BHP's contribution to greenhouse gas emissions over the life of the Proposal. The storage, treatment, movement and disposal of waste is a key consideration for the Proposal, as the minimisation of waste provides an environmental and financial benefit. BHP's Life of Mine waste strategy is informed by the Orebody 29/30/35 MCP (Appendix 7).
5. The principle of waste minimisation <i>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</i>	Standard waste management measures are a key element for the implementation of this Proposal. It is standard practice for BHP to apply the waste management hierarchy to all sites and this will be the case in relation to this Proposal (i.e. avoidance, reuse, recycling, recovery of energy, treatment, containment and disposal). BHP has outlined the measures to minimise greenhouse gas emissions in Section 12.5. BHP's closure approach for Orebody 29/30/35 is to minimise ex-pit waste through the partial backfill of waste into Orebody 29 and Orebody 35, as outlined in the Orebody 29/30/35 MCP (Appendix 7). This will help to achieve partial backfill AWT and minimise additional disturbance.
Description of how the object of the EP Act has been considered: BHP has considered the object of this Act, which is to protect the environment of the State, by having regard to the principles of the EP Act above. BHP has considered this Object by addressing each of the Principles above, in terms of potential impacts that the Proposal, in consideration of the Combined Proposal could have on the environment of the State.	

6 Environmental factors

BHP considered the various matters that the EPA may have regard to in considering the significance of potential impacts, as outlined in the EPA's Procedures Manual (EPA 2021a) and *Statement of environmental principles, factors, objectives and aims of EIA* (EPA 2023a). Table 6-1 summarises whether BHP has identified that an environmental factor is a preliminary key environmental factor (i.e. those factors that may be significantly impacted by the Proposal) for the assessment.

Table 6-1: Identification of preliminary key environmental factors

Environmental factor	Potential environmental impacts	Preliminary key environmental factor for the Proposal
Land		
Flora and Vegetation	- loss of vegetation from clearing - changes to vegetation from changes to groundwater regimes - changes to vegetation from dust, fire and weeds	Yes (Section 8)
Terrestrial Fauna	- loss of fauna habitats and species from clearing - impacts to fauna individuals from mining activities and infrastructure - impacts to fauna habitats and individuals from dust emissions - interactions with (direct) and changes to fauna habitat from introduced species - changes to fauna habitats from fire	Yes (Section 9)
Subterranean Fauna	- changes to stygofauna habitat and species assemblage from changes to groundwater regimes and quality - loss of troglafauna habitat from mine pit excavation	Yes (Section 10)
Landforms	- modification of natural landforms - erosion of natural landforms	No (Section 14)
Terrestrial Environmental Quality	- increased erosion, including of waste structures - contamination of land	No (Section 14)
Water		
Inland Waters	- changes to groundwater regimes from additional groundwater abstraction for mine pit dewatering at Orebody 29/30/35 - changes to surface water regimes from mine pit excavation and infrastructure (including OSAs), and discharge of surplus water to Ophthalmia Dam - changes to water quality from mine pit excavation and infrastructure (including OSAs), from dewatering (including from post-mining pit lakes) and discharge of surplus water to Ophthalmia Dam	Yes (Section 7)
Air		
Greenhouse Gas Emissions	cumulative greenhouse gas emissions are a contributor to climate change. The cumulative emissions from the Combined Proposal will contribute to WA's greenhouse gas emissions	Yes (Section 12)

Environmental factor	Potential environmental impacts	Preliminary key environmental factor for the Proposal
Air Quality	- airborne particulate emissions - reduction in ambient air quality	Yes (Section 13)
People		
Social Surroundings	- disturbance of cultural heritage sites and values - impacts to access, landscape, and amenity - degradation of cultural heritage places and values	Yes (Section 11)

BHP's assessment of the preliminary key environmental factors is detailed in Sections 7 to 13.

BHP's evaluation of 'other environmental factors is summarised in Section 14. This includes justification as to why BHP considers that they are not preliminary key environmental factors.

7 Inland Waters

7.1 EPA environmental factor and objective

The EPA's objective for the Inland Waters factor is:

To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.

7.2 Relevant policy and guidance

BHP assessed this environmental factor considering the following EPA policies and guidance, as outlined in Table 7-1.

Table 7-1: Inland Waters - policy and guidance

EPA (and other State and Commonwealth) policy and guidance	Consideration of EPA policy and guidance
<i>Environmental Factor Guideline – Inland Waters</i> (EPA 2018a)	- Considered the links with other environmental factors - Applied the relevant considerations for environmental impact assessment - Considered the environmental values supported by or dependent on Inland Waters, and their significance - Undertook investigations and studies consistent with the Information required for EIA
<i>Use of mine dewatering surplus</i> (DWER 2020)	- Determined the mine dewatering surplus - Considered regulatory requirements - Considered use of surplus water, including cumulative impacts and water quality
<i>Western Australian Water in Mining Guideline</i> (Department of Water 2013)	Undertook the following consistent with the guideline: - consultation, project scoping, investigations, validation of impacts and post-closure management - considered options for surplus water from mine dewatering and potential impacts, including cumulative impacts

7.3 Receiving environment

7.3.1 Studies and surveys

Table 7-2 summarises the specific studies undertaken by BHP to support the assessment of Inland Waters for the Proposal. Other supporting information is referenced in these documents, where relevant.

BHP considers that the studies meet the relevant EPA guidance to support the assessment of Inland Waters for the Proposal.

Table 7-2: Inland Waters - studies

Title	Date	Summary	Appendix
Surface water			
Orebody 29/30/35 Significant Amendment: Surface Water Impact Assessment (BHP 2024b)	August 2024	Assessment of potential surface water-related environmental impacts associated with the expansion of Orebody 29/30/35 pits and additional OSAs	Appendix 4
Groundwater			
Orebody 29, 30 and 35 Detailed Hydrogeological Assessment (BHP 2024c)	May 2024	Hydrogeological analysis and modelling to predict potential impacts from the increase in dewatering at the Orebody 29/30/35 mine	Appendix 4
Orebody 29/30/35 Significant Amendment: Groundwater Impact Assessment (BHP 2024d)	November 2024	Assessment of potential groundwater-related environmental impacts, including cumulative impacts, from the increase in dewatering at the Orebody 29/30/35 mine	Appendix 4
Orebody 29/30/35/WR dewatering and per- and polyfluoroalkyl substances mixing assessment (WSP Golder 2023)	March 2023	Groundwater modelling to evaluate the potential for PFAS to migrate towards orebodies during Orebody 29/30/35 dewatering activities	Appendix 4
OB29 Hydraulic Test 2023-2024: Hydraulic test analysis and per- and polyfluoroalkyl substances (PFAS) mixing assessment (WSP 2024)	June 2024	Analysis of data collected during aquifer pumping test at Orebody 29, to inform the conceptual hydrogeological model, update of the groundwater model and mixing assessment to evaluate the validity of the methodology to predict PFAS concentrations at dewatering bores	Appendix 4
Ophthalmia Dam surplus water			
Eastern Pilbara Hub Water Balance - 2024 Forecast Surplus Discharge Assessment (EMM 2024)	May 2024	Update of the Ophthalmia Dam water balance modelling for the 2024 forecast discharge from the Orebody 29/30/35 mine	Appendix 4
Orebody 29/30/35 Significant Amendment: Ophthalmia Dam surplus water impact assessment (BHP 2024e)	November 2024	Assessment of potential impacts of discharge of surplus mine dewater to Ophthalmia Dam, including from the proposed increase in surplus water from the Orebody 29/30/35 mine	Appendix 4

7.3.2 Existing environment

7.3.2.1 Climate

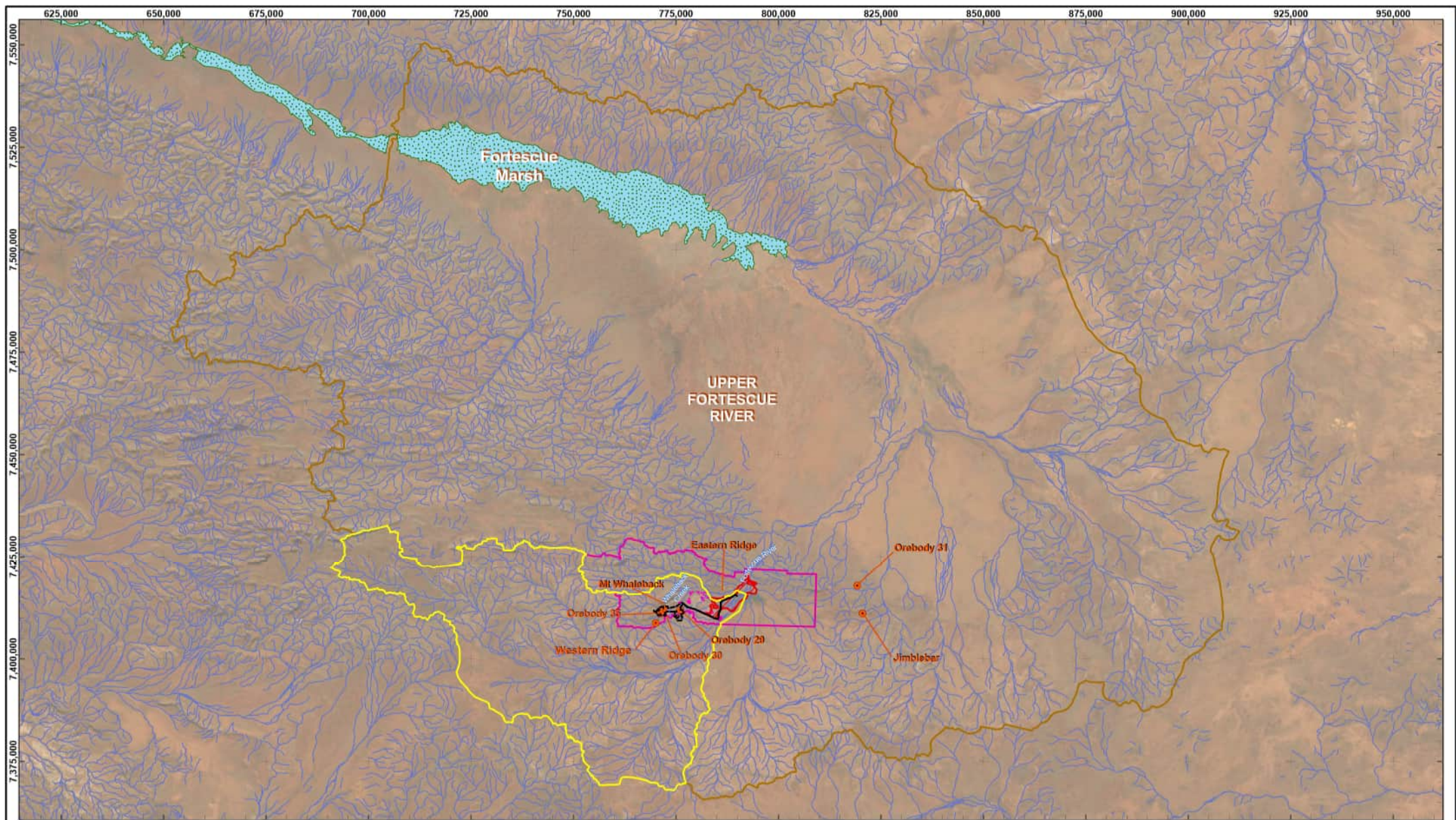
The Orebody 29/30/35 mine is located in the Eastern Pilbara region, which has an arid to semi-arid climate with hot summers and mild winters. The regional climate is typically dominated by the influence of subtropical highs located to the south of the Pilbara. Rainfall throughout the year is variable. Most rainfall (approximately 70%) occurs from December to March ('wet season'), with reduced rainfall occurring during the remainder of the year ('dry season'). Data from the Newman Airport and Wittenoom Bureau of Meteorology stations indicates that there is not a declining trend in rainfall to date. The Pilbara is characterised by high local evaporation rates and a generally low soil infiltration capacity. This results in groundwater recharge occurring exclusively during major rainfall events. Within the Upper Fortescue region, this is thought to occur primarily through leakage from streambeds (BHP 2024c).

7.3.2.2 Surface water

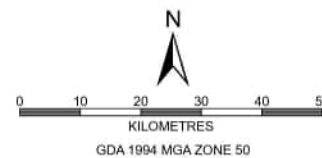
At the regional scale, the Proposal is located within the Upper Fortescue River catchment (Whaleback Creek and Fortescue regional subcatchments) (Figure 7-1). For water management, the Upper Fortescue River catchment falls within BHP's Eastern Pilbara region. Whaleback Creek drains into the Upper Fortescue River which drains in a northeasterly direction into Ophthalmia Dam. In addition to inflows from the Whaleback Creek and Fortescue subcatchments, Ophthalmia Dam also receives inflows from the Warrawanda Creek subcatchment (together these three subcatchments make up the DWER Ophthalmia Dam hydrographic subcatchment). Approximately 4 km downstream of Ophthalmia Dam, at the entrance of the Fortescue River to the Fortescue River Valley (Ethel Gorge), there is a major deltaic feature. The Fortescue River terminates at the Fortescue Marsh 128 km downstream of Ophthalmia Dam (Figure 7-1).

At the local scale, the Development Envelope extends into the Whaleback Creek and Fortescue River at Ophthalmia Dam subcatchments (Figure 7-2). Whaleback Creek is ephemeral with typically one to three flow events per year. These events are usually short, with little post-rainfall flow persistence.

The pH of Fortescue River is neutral and typically between 6 and 8. The water quality in the Fortescue River is fresh (less than 250 milligrams per litre (mg/L) TDS) (RPS 2015). Data from Whaleback Creek upstream of the Orebody 29/30/35 mine indicates that the pH is slightly basic (approximately 8) and the water quality is fresh (average of approximately 140 mg/L) (BHP 2022b).



- BHP operations
- ▭ Development Envelope
- ▨ Ethel Gorge TEC
- ▭ Newman Drinking Water Reserve P1
- ▭ Newman Drinking Water Reserve P3
- ▭ Fortescue River at Ophthalmia Dam Catchment
- ▭ Upper Fortescue River Catchment
- ▨ Fortescue Marsh
- Waterways



BHP

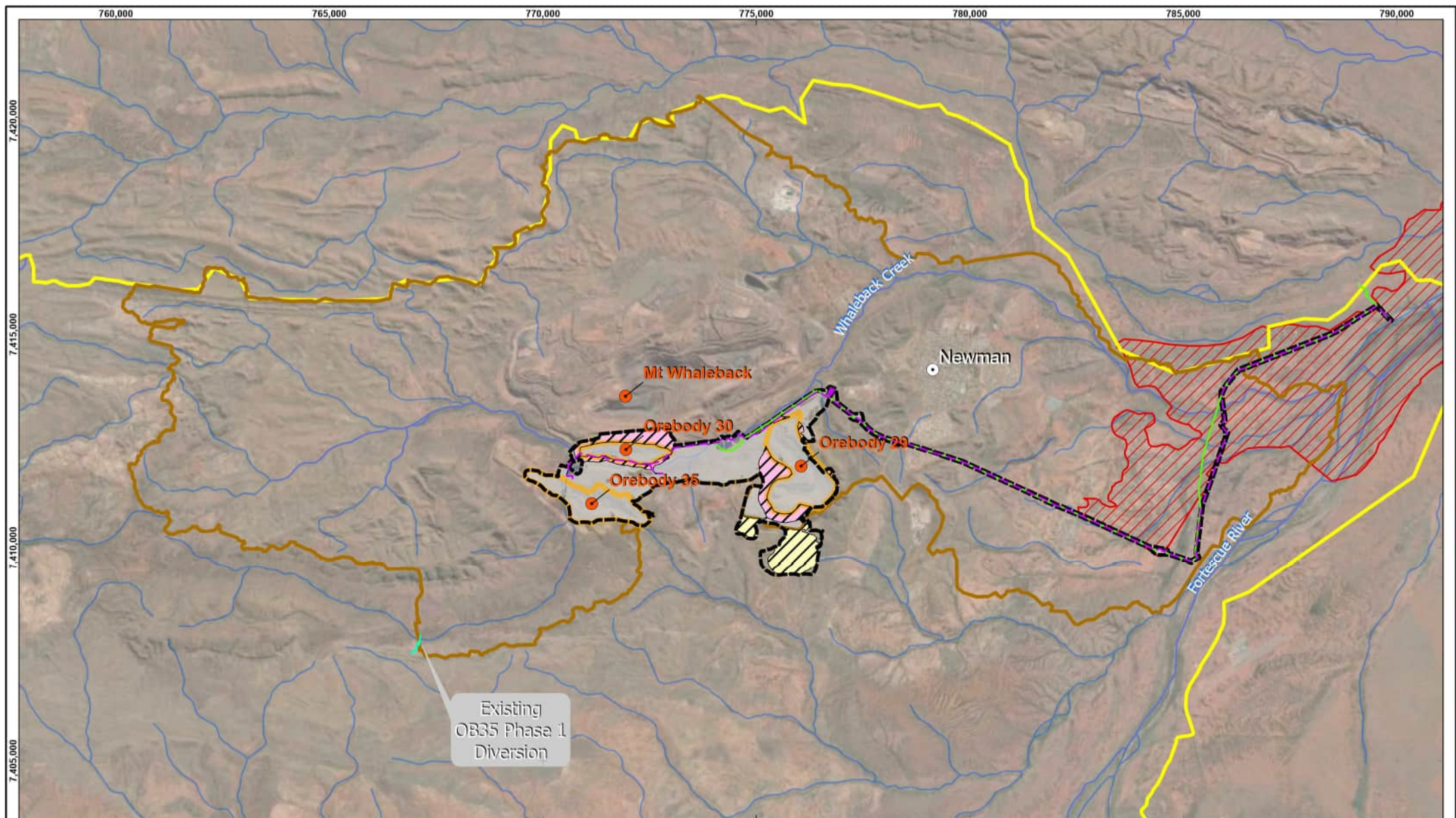
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OREBODY 29/30/35 SIGNIFICANT AMENDMENT Regional Hydrology

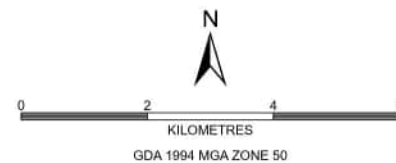
PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:1,250,000	PREPARED:	GEOMATICS	FIGURE:	7-1
DATE:	21/11/2024	REQUESTOR:	ENV. APPROVALS	NO:	
		REVIEWED:			

A929_092_RevB



- BHP operations
- Watercourse
- - - Proposed Orebody 29/30/35 Surplus Water Pipeline
- Existing Orebody 29/30/35 Surplus Water Pipeline
- Indicative Footprint
- Development Envelope
- Ministerial Statement 963 Boundary
- Proposed Pit Expansion
- Ethel Gorge TEC
- Whaleback Creek Catchment
- Fortescue River at Ophthalmia Dam Catchment
- Existing Orebody 35 Phase 1 Diversion
- Proposed OSA
- Cleared Area



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OREBODY 29/30/35 SIGNIFICANT AMENDMENT Local Hydrology

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:120,000	PREPARED: GEOMATICS	FIGURE: 7-2
DATE: 21/11/2024	REQUESTOR: ENV. APPROVALS	NO: 929_093_RevB
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7.3.2.3 Groundwater

The existing Orebody 29/30/35 mine is part of the Mt Whaleback mining operations (Mt Whaleback and Orebody 29/30/35 mines) in BHP's Newman Hub, in the Eastern Pilbara region of Western Australia (WA), which also includes the existing Eastern Ridge mining operations and the approved Western Ridge mine. The groundwater regime in the Newman area has been altered by groundwater abstraction for water supply and to dewater orebodies to access BWT ore. Groundwater abstraction for mine dewatering activities at Orebody 29/30/35 was approved in 2014 and started at Orebody 29 (OB29) in 2015 and OB35 in 2016. As at November 2024, dewatering of OB30 and the Western Ridge orebodies has not started (BHP 2024d).

Hydrogeology

Figure 7-3 shows the conceptual groundwater system in the Orebody 29/30/35 area during operations (i.e. with groundwater abstraction activities). As the Orebody 29/30/35 and Western Ridge area forms a larger semi-continuous aquifer compartment, the Western Ridge area is also included in the conceptualisation.

Orebody 29/30/35 mine area conceptualisation

There are two main aquifer types in the Orebody 29/30/35 and Western Ridge area:

- The regional aquifers generally comprise weathered dolomite of the Paraburdoo Member of the Wittenoom Formation which occurs in sub-crop along the Whaleback and Southern Creek valleys. The overlying Tertiary detritals are above the water table through much of the area, but where they are saturated, they also form part of the regional aquifer system. The thickest sequence of Tertiary detritals (in excess of 150 m) is found to the west of the Mt Whaleback pit with other notable areas of thickness occurring south of the Mount Helen deposit (Western Ridge) and northeast of OB29.
- The orebody aquifers comprise the mineralised Brockman that make up the Whaleback, Bill's Hill and Mount Helen orebodies and the mineralised Marra Mamba that make up the Orebody 29/30/35, Silver Knight and Eastern Syncline orebodies. The orebody aquifers are usually well delineated by the extent of the high-grade ore (assumed high permeability), with a halo of lower grade ore (assumed moderate permeability) around it (BHP 2024d).

The Orebody 29/30/35 and Western Ridge area is characterised by hydraulically connected regional (weathered dolomite and some tertiary detritals) and Marra Mamba orebody aquifers, and less well connected Brockman orebody aquifers. The connection of the regional aquifer to the Marra Mamba orebodies (Orebody 29, 30, 35 deposits and the Eastern Syncline and Silver Knight deposits at Western Ridge) is either through mineralisation or absence of the West Angela Shale. The regional dolomite aquifer over much of the area is likely to have both high storage (most likely karstic) and high hydraulic conductivity.

The Marra Mamba orebody aquifers and the regional dolomite aquifer are bounded by the low permeability Mt Sylvia Formation and Mt McRae Shale to the north (isolating this system from Whaleback orebody aquifer) and the low permeability Jeerinah Formation to the south. There is no evidence of any significant connection between the Whaleback orebody aquifer and the regional aquifers. The Mt Sylvia Formation and Mt McRae Shale appear to be less of a barrier to flow in the west however, allowing some flow between the regional aquifer and the Brockman orebody aquifers (Bills Hill and Mt Helen at Western Ridge).

The regional aquifer system appears to be interrupted by at least two leaky flow barriers. One between Orebody 30 and Orebody 35 and the other just to the east of Orebody 29 (Figure 7-3). The western side of the Whaleback Fault consists of the Jeerinah Formation which is considered very low permeability and presents a no flow boundary (BHP 2024d).

Regional conceptualisation from Orebody 29/30/35 to Ethel Gorge area

The regional Tertiary Detrital / dolomite aquifers are conservatively assumed to be continuous from Orebody 29 to the Ethel Gorge aquifer system. The aquifers pass north of Newman then turn southeast, passing to the south of Orebody 25 and merging with the western side of the Ethel Gorge aquifer system (west of Ophthalmia Dam) (Figure 7-3). It seems likely that groundwater flow within the regional aquifer is inhibited (i.e. within the low transmissivity area between the local Western Ridge and Orebody 29/30/35 aquifer compartment in the west and Ethel Gorge aquifer compartment in the east (Figure 7-3). The western boundary of this low transmissivity area is formed by the leaky flow barrier that exists just to the east of Orebody 29 and the eastern boundary is formed by the leaky flow barrier that exists southwest of Orebody 25 (BHP 2024d).

Historical and current groundwater levels

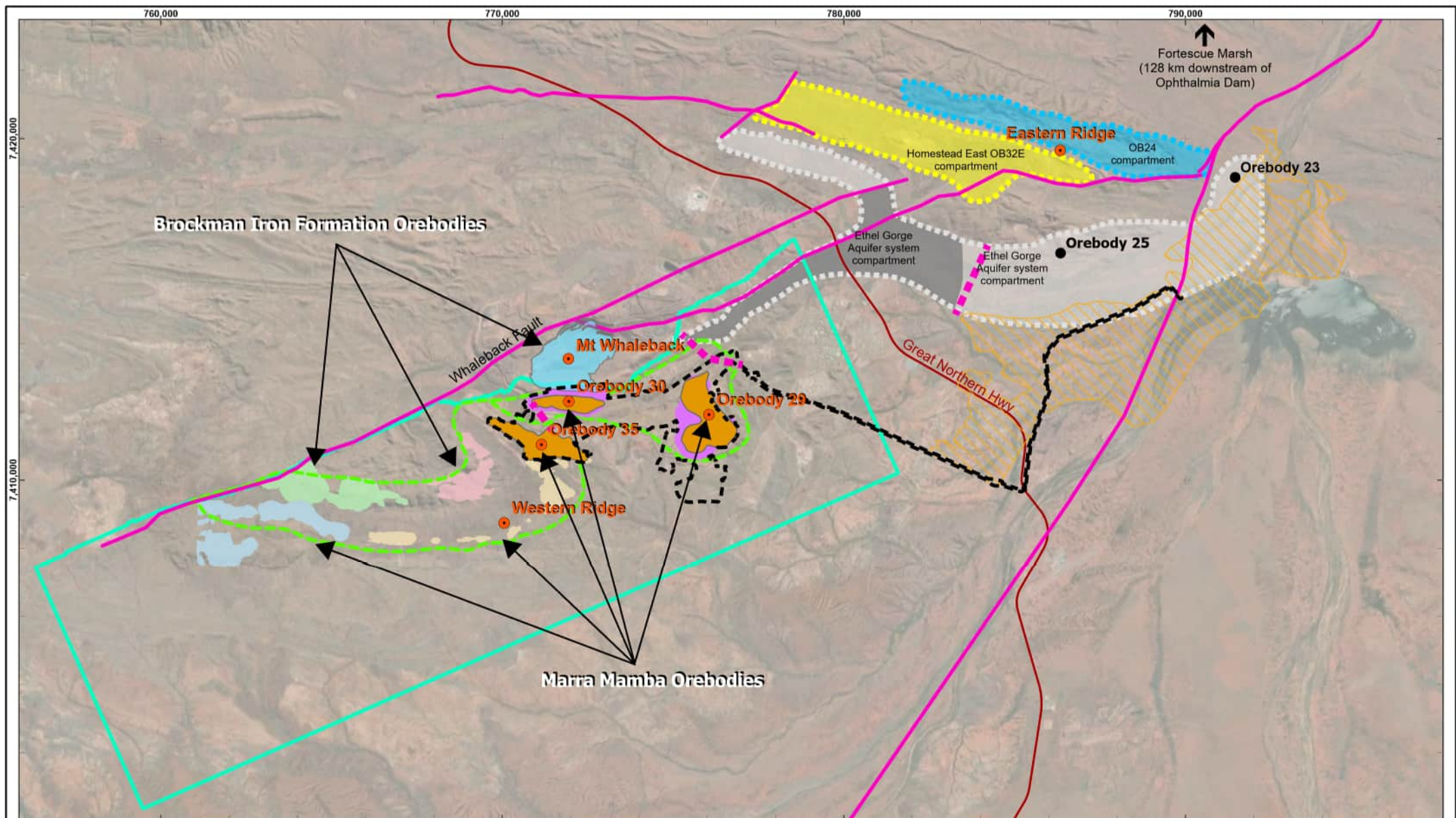
Orebody 29/30/35 area groundwater levels

Pre-development groundwater levels in the orebody and regional aquifers in the Orebody 29/30/35 area varied between 519 metres above Australian Height Datum (mAHD) and approximately 526 mAHD. This is likely the result of natural fluctuations (local rainfall recharge and long-term trends) as well as water supply pumping. The pre-development depth to groundwater in the regional aquifers ranged from a minimum of about 30 metres below ground level (mbgl) around OB29 to greater than 50 metres (m) at the western edge of OB35, which suggests that groundwater/surface water interaction and evapotranspiration do not occur in this area (BHP 2024d). Therefore, it is not expected that these aquifers support near surface and groundwater dependent ecosystems.

Since dewatering commenced at the Orebody 29/30/35 mine in 2015, groundwater level decline (drawdown) at OB29 is about 35 m. Groundwater levels at OB35 have declined by approximately 40 m and groundwater levels at OB30 have declined by approximately 20 m due to dewatering at OB29 and OB35. Figure 7-4 shows the current depth to groundwater in the Orebody 29/30/35 area, compared to the original ground level, as the ground level has changed due to mining. The current depths to groundwater in the orebody aquifer are generally greater than 70 mbgl at OB29 and greater than 90 mbgl at OB35. Current depths to groundwater in the regional aquifer are greater than 90 mbgl west of OB35 and are shallower to the northeast of OB29 across the leaky flow barrier north of Newman (approximately 20 mbgl to 24 mbgl).

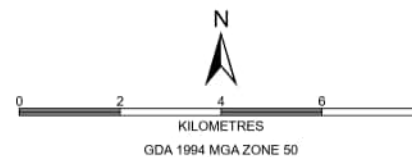
Ethel Gorge aquifer groundwater levels

Groundwater levels in the Ethel Gorge aquifer (north of the dam) have varied between 487 and 505 mAHD between the first observations in 1968 and the present (2024). Groundwater levels in the Ethel Gorge aquifer declined during the 1970s due to abstraction from the Ophthalmia Borefield for the Newman town water supply and recovered following the commissioning of Ophthalmia Dam in 1981. Since then, infiltration of water from the dam has helped maintain groundwater levels in the Ethel Gorge aquifer that are similar to pre-development groundwater levels, even with continued water supply abstraction from the Ophthalmia Borefield and dewatering of OB23 and OB25 (which are located within the Ethel Gorge aquifer compartment). Groundwater levels in the Ethel Gorge aquifer do not show any response to the groundwater abstraction in the Orebody 29/30/35 area. This is mainly due to the infiltration of water from the dam and the distance of Orebody 29/30/35 from the Ethel Gorge aquifer (greater than 10 km). The depth to groundwater is less than 10 mbgl in the Ethel Gorge aquifer in the TEC (BHP 2024d).



- BHP operations
- Western Ridge and Orebody 29/30/35 aquifer compartment
- Flow Barrier
- Leaky Flow Barrier
- Model domain
- Ethel Gorge Threatened Ecological Community
- Development Envelope
- Orebody 29/30/35 BWT MS963

- Orebody 29/30/35 Proposed Pit Expansion
- Whaleback Pit
- Western Ridge Deposits**
- Bill's Hill
- Eastern Syncline
- Mount Helen
- Silver Knight



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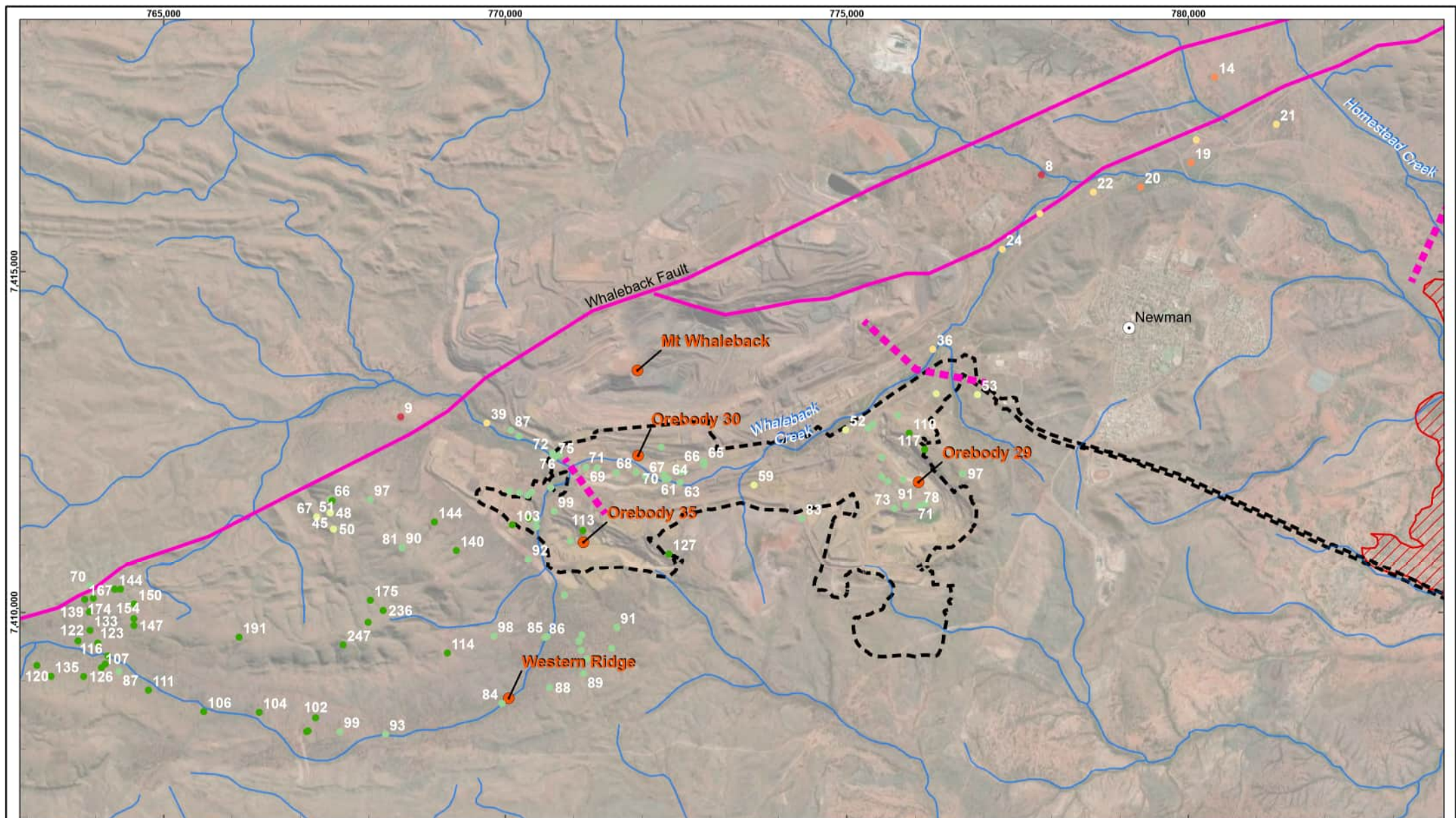
OREBODY 29/30/35

SIGNIFICANT AMENDMENT

Conceptual groundwater system - operations

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:150,000	PREPARED: GEOMATICS	FIGURE: 7-3	
DATE: 27/08/2024	REQUESTOR: ENV. APPROVALS	NO: 929/094_RevA	
	REVIEWED:		



- BHP operations
- Development Envelope
- ▨ Ethel Gorge TEC
- Waterways
- Leaky Flow Barrier
- Flow Barrier

Current Depth to Groundwater (mbgl)

- 0 - 10
- 10 - 20
- 20 - 40
- 40 - 60
- 60 - 100
- > 100



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**OREBODY 29/30/35
SIGNIFICANT AMENDMENT**

Current depth to groundwater

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:75,000	PREPARED: GEOMATICS	FIGURE: 7-4
DATE: 27/08/2024	REQUESTOR: ENV. APPROVALS	NO: 929/095_RevA
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Groundwater quality

Recent (April 2023) groundwater quality data (laboratory results) from groundwater bores indicates that groundwater at the Orebody 29/30/35 mine is generally fresh, ranging between 520 and 530 mg/L total dissolved solids (TDS). Sampling indicates that pH is neutral, at 7.7 (BHP 2023b).

The Proposal is part of the broader Newman hub, which includes the existing Mt Whaleback mine. Mt Whaleback is classified as a contaminated site under the *Contaminated Sites Act 2003* (CS Act), due to groundwater contamination from historical activities. Recent groundwater sampling at the Mt Whaleback and Orebody 29/30/35 mines has identified that certain PFAS species have been detected. Groundwater sampling at Orebody 29/30/35 undertaken since 2020 has detected PFAS at concentrations above PFAS National Environmental Management Plan (NEMP) (HEPA 2020) guideline values. PFAS was detected above the NEMP human health drinking water quality guideline value of 0.07 µg/L Sum (PFOS+PFHxS) in monitoring bores located closer to known PFAS source areas north of OB29, with spatially limited and isolated detections above the NEMP ecological freshwater 95% species protection guideline value for Perfluoro octane sulfonate (PFOS) (0.13 µg/L). All PFAS detections were below the NEMP human health recreational use guideline value of 2 µg/L Sum (PFOS+PFHxS). PFAS was detected in groundwater in monitoring bores located to the west and north of OB29 at levels above the NEMP human health drinking water quality guideline value of 0.07 µg/L Sum (PFOS+PFHxS). The sum (PFOS+PFHxS) concentrations in the groundwater abstraction bores located near OB29 were well below the NEMP human health drinking water quality guideline value of 0.07 µg/L.

PFAS has also been detected at very low levels in the Ethel Gorge aquifer (within the Ethel Gorge TEC and adjacent to the Fortescue River) close to Ophthalmia Dam. The 95% upper confidence level (UCL) average PFOS concentration within the Ethel Gorge TEC is 0.0009 µg/L with a recorded maximum concentration of 0.0046 µg/L, which is above the NEMP 99% species protection guideline value but is well below the NEMP ecological freshwater 95% species protection guideline value.

7.3.2.4 Ophthalmia Dam

The Ophthalmia Dam system is located approximately 15 km east of the Orebody 29/30/35 mine. Ophthalmia Dam was commissioned in 1981 as a MAR scheme, to maintain groundwater levels within the Ethel Gorge aquifer, to support the Ophthalmia Borefield for the Newman town water supply. The Ophthalmia Dam system comprises the dam, infiltration basins and recharge ponds (Figure 7-1). The MAR scheme is passive where water from the dam infiltrates into the underlying aquifers. The Ophthalmia Dam system is adjacent to and partially overlies the Ethel Gorge aquifer system, which supports the Ethel Gorge TEC.

The dam has also received surplus mine water from BHP's eastern mines since 2006. It currently receives surplus mine water from the approved Orebody 29/30/35 BWT mine and other approved, operational BHP eastern mines (currently Eastern Ridge, Jumblebar and OB31). Discharge is also authorised from the Western Ridge mine and OB32 BWT mine (part of Eastern Ridge) however, discharge has not started from these mines as dewatering has not yet started. Surplus water is discharged to the Ophthalmia Dam system via pipelines and water from the dam infiltrates into the Ethel Gorge aquifer (i.e. there is no direct discharge of surplus water to creeks). The total annual volume of surplus water discharged to the dam has increased since 2006 but is well below the average and annual natural surface water flows to the dam, which are the major contributor to dam inflows (BHP 2024e).

The construction of Ophthalmia Dam has altered the natural flow regime of the Upper Fortescue River and appears to have prevented or reduced medium-sized flows (recurrence interval of one to three years) from reaching the downstream floodplain and natural flows emanating from the upper catchment have been partially attenuated (BHP 2019b). Uncontrolled releases of water to the Upper Fortescue River tributaries occur when the dam fills from rainfall events and overtops the spillway. BHP also undertakes controlled releases of water from Ophthalmia Dam to the Upper Fortescue River tributaries for environmental management or for dam safety and maintenance purposes, and most releases have been less than three months per year. Controlled releases are usually via the outlet valve at C

Wall to Shovelanna Creek and into the downstream Fortescue River (BHP 2024e). Controlled releases via the outlet pipe are likely to emulate low flow events downstream of the dam (BHP 2019b).

There is a large variation in surface water salinity in the dam under natural conditions which is influenced by rainfall, inflow from surface water catchments as well as evaporation and infiltration processes. Salinity increases during the dry season due to evaporation, then decreases following major rainfall events in the wet season. The salinity of surface water in the dam was fresh (less than 500 mg/L) prior to 2006. The addition of surplus water from BHP mines since 2006 has increased the dry season salinity due to the higher salinity of the mine discharge water compared to rainfall and natural streamflow. Since the start of regular salinity measurements in 2013, the measured dam surface water salinity is typically less than 50 mg/L TDS shortly after filling of the dam, however, the variability in antecedent conditions (i.e. dam storage and surplus water discharge) can influence dam water quality post surface flow events. Salinity is generally less than 800 mg/L TDS (with short periods up to 1,200 mg/L). Despite increasing discharge since 2013, there is no trend in increasing surface water salinity and the key driver of the salinity fluctuation is rainfall (and streamflow) as the salinity reduces more in wet years and stays elevated in dry years (BHP 2024e).

PFAS has also been detected at very low levels in Ophthalmia Dam. The 95% UCL average PFOS concentration within Ophthalmia Dam is 0.001 µg/L with a maximum concentration of 0.0054 µg/L, which is above the NEMP 99% species protection guideline value but is well below the NEMP ecological freshwater 95% species protection guideline value, similar to recorded concentrations in the Ethel Gorge aquifer (see Section 7.3.3.2). The results of the post-rain sampling events indicated minor increases in PFAS concentrations within the dam, which suggests that there is a PFAS contribution from surface water flows from upstream areas, which include mining and non-mining sources, which include but are not necessarily limited to Newman Township and Newman Airport (Tetrattech 2023).

7.3.3 Environmental values

7.3.3.1 Newman Water Reserve PDWSA

As discussed in Section 2.5, the Proposal is partially located within the Newman Water Reserve PDWSA (Figure 7-1). The reserve was proclaimed to protect the Newman town water supply, which is currently sourced from groundwater from the BHP operated Homestead and Ophthalmia Borefields.

7.3.3.2 Ethel Gorge aquifer (and TEC)

As discussed in Section 7.3.2.4, the Ophthalmia Dam system is adjacent to and partially overlies the Ethel Gorge aquifer system, which supports the Ethel Gorge TEC (Figure 7-1). Ethel Gorge is located approximately 10 km northeast of Newman and is an important feature of the Eastern Pilbara ecohydrological system, located at the convergence of surface and groundwater flows from the upstream catchment. The gorge itself is a valley incised into the Ophthalmia Range by the Fortescue River although the name is also used to refer to the alluvial and palaeochannel aquifers in the area. The area is characterised as a receiving environment, comprising channels, flood plains and calcretes of the river and land systems that dissect ridges of bedrock. Groundwater levels are less than 10 mbgl (BHP 2024d). The shallow alluvial and calcrete aquifers of Ethel Gorge support the unique and diverse stygofauna assemblage of the Ethel Gorge TEC.

Ophthalmia Dam, approximately 5 km upstream of Ethel Gorge, has an important influence on the hydrological condition in the Ethel Gorge aquifer. Recharge to the shallow groundwater system occurs as seepage from Ophthalmia Dam and associated infiltration structures as well as direct infiltration from channel flow events. The hydraulic behaviour of the Ethel Gorge groundwater system has been dominated by Ophthalmia Dam since its commissioning in 1981. The dam system impounds and retards flood waters in the Fortescue River to allow larger volumes of infiltration over a prolonged period. Consequently, Ophthalmia Dam has maintained groundwater levels nearer natural conditions, as groundwater levels would have declined without the dam due to the operation of the Ophthalmia Borefield and dewatering of OB23 and OB25 (which are located within the Ethel Gorge aquifer compartment (Figure 7-3)) (BHP 2024d).

PFAS has also been detected at very low levels in the Ethel Gorge aquifer. The 95% UCL average PFOS concentration within the Ethel Gorge aquifer (and TEC) is 0.0009 µg/L with a maximum concentration of 0.0046 µg/L, which is above the NEMP 99% species protection guideline value but is well below the NEMP ecological freshwater 95% species protection guideline value (Tetrattech 2023).

7.3.3.3 Local surface water features

Nankunya (formerly known as Afghan Springs) is a significant surface water feature and comprises a number of pools and seeps located in a narrow, deeply incised gorge (BHP 2024f). Nankunya is located within the Whaleback Creek catchment on a tributary of Whaleback Creek approximately 2.4 km west of the western boundary of the Development Envelope (Figure 7-2). Nankunya was mapped during surveys in 2019 as part of investigations for the Western Ridge mine.

Hydrological investigations and monitoring demonstrate that Nankunya is supported by shallow groundwater (potential perched aquifer) that is hydraulically disconnected from the orebody aquifers that are currently being dewatered (Orebody 29/30/35 mine) and proposed to be dewatered (Western Ridge). The elevation of the Nankunya surface water features ranges between 616 m Australian Height Datum (AHD) and 645 mAHD within the gorge, which is approximately 50 to 70 m above the deep groundwater levels (approximately 567 mAHD) in the Nankunya area. Although groundwater levels at OB35 have declined by approximately 40 m, the groundwater level in the regional aquifer system between OB35 and Nankunya which is hydraulically isolated from the orebody aquifer, has remained stable at approximately 570 mAHD, similar to the deep groundwater levels at Nankunya. Therefore, BHP considers that the Proposal will not impact Nankunya and Nankunya is not discussed further in this section.

7.4 Potential environmental impacts

BHP has considered the potential impacts outlined in the EPA's *Environmental Factor Guideline – Inland waters* (2018a) and considers that those relevant to the Proposal are:

- changes to groundwater regimes from additional groundwater abstraction for mine pit dewatering at Orebody 29/30/35 (direct)
- changes to surface water regimes from mine pit excavation and infrastructure (including OSAs), and discharge of surplus water to Ophthalmia Dam (direct)
- changes to water quality from mine pit excavation and infrastructure (including OSAs), from dewatering (including from post-mining pit lakes) and discharge of surplus water to Ophthalmia Dam (indirect).

BHP has provided information on the Approved Proposal so that the EPA can consider the environmental effects of the Proposal in the context of the Approved Proposal. BHP has outlined the combined effects which the implementation of the Approved Proposal and the Proposal (Combined Proposal) might have on the environment. BHP has also considered the cumulative impacts of the Proposal and the Approved Proposal on Inland Waters.

Unless specified otherwise, the potential impacts discussed in this section are unmitigated (i.e. potential impacts before mitigation measures are applied, if required).

7.4.1 Changes to groundwater regimes

7.4.1.1 Groundwater abstraction (dewatering)

As discussed in Section 2.2.1, the Proposal includes an increase in dewatering at the Orebody 29/30/35 mine. The additional groundwater abstraction (for mine dewatering) for the Proposal has the potential to change the groundwater regime by extending groundwater drawdown (lateral and vertical) from the Orebody 29/30/35 mine.

The groundwater model was run for 53 years to assess the impacts of dewatering. The model outputs from the 2024 Orebody 29/30/35 groundwater modelling represent the predicted combined effects of groundwater abstraction and drawdown for the Combined Proposal (the Approved Proposal and the Proposal).

As the 2024 Orebody 29/30/35 modelling includes predicted groundwater abstraction and drawdown from the Combined Proposal, it is necessary to understand the previously assessed abstraction and drawdown for the Orebody 29/30/35 mine, to determine the predicted change in the groundwater regime for the Proposal (i.e. from the increase in groundwater abstraction for dewatering). The *Orebody 29/30/35 Significant Amendment: Groundwater impact assessment* (BHP 2024d) details the results from previous groundwater assessments and the results from the 2024 Orebody 29/30/35 numerical modelling to quantify the changes in the Orebody 29/30/35 mine groundwater abstraction and drawdown.

Operations

Proposal (Significant Amendment): Changes to groundwater regimes from abstraction

The 2024 groundwater modelling predicts a peak combined dewatering rate of 67 mega litres per day (ML/d) (24.5 GL/a) at the Orebody 29/30/35 mine, representing an increase of 45.1 ML/d (16.5 GL/a) for the Proposal compared to the groundwater abstraction rate of 8 GL/a (21.9 ML/d) for the Orebody 29/30/35 Approved Proposal, authorised in 2014 under MS963.

Therefore, the proposed change for the Proposal is an increase in abstraction for dewatering of up to 45.1 ML/d (16.5 GL/a).

Drawdown for the Approved Proposal was assessed in 2013 (BHP 2024d). The 2024 modelling results (Figure 7-5b) show that the predicted lateral extent of drawdown for the Proposal is similar to the predicted drawdown for the Approved Proposal (Figure 7-5a), to the north, east and south, but extends approximately 6 km further to the west. This is because since the 2013 Orebody 29/30/35 modelling, there is now data in the Western Ridge area which indicates that the regional aquifer in the Western Ridge area is connected to the OB35 area and bound by the Whaleback Fault in the north and west and the Jeerinah Formation to the south. The predicted drawdown in the orebody aquifer at the end of dewatering for the Proposal is greater than the predicted drawdown for the Approved Proposal by up to 60 m. The predicted drawdown for the Proposal compared to the Approved Proposal in the regional aquifer is similar in the south, but is deeper to the west, north and east within the 2024 model domain by up to approximately 80 m (BHP 2024d).

Combined effect: Changes to groundwater regimes from abstraction

The proposed groundwater abstraction (for dewatering) for the Combined Proposal is 24.5 GL/a comprising 8 GL/a for the Approved Proposal and an additional 16.5 GL/a for the Proposal (see Appendix 1).

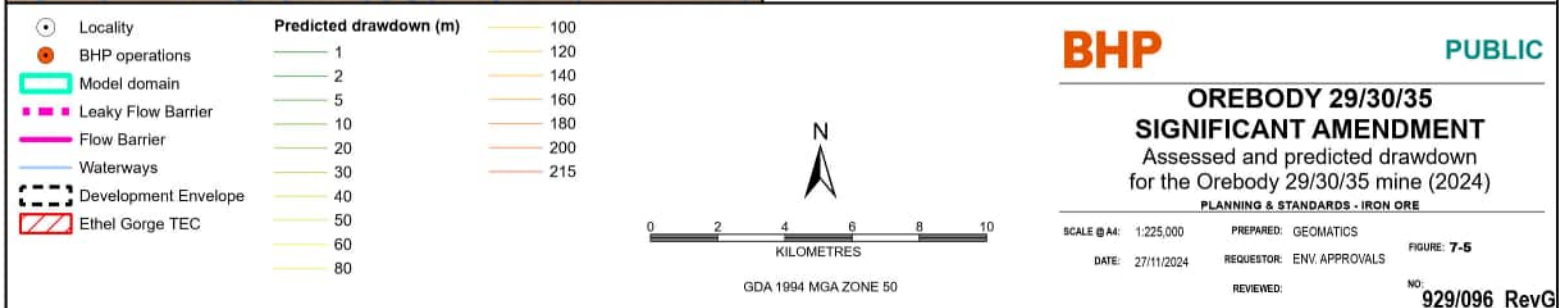
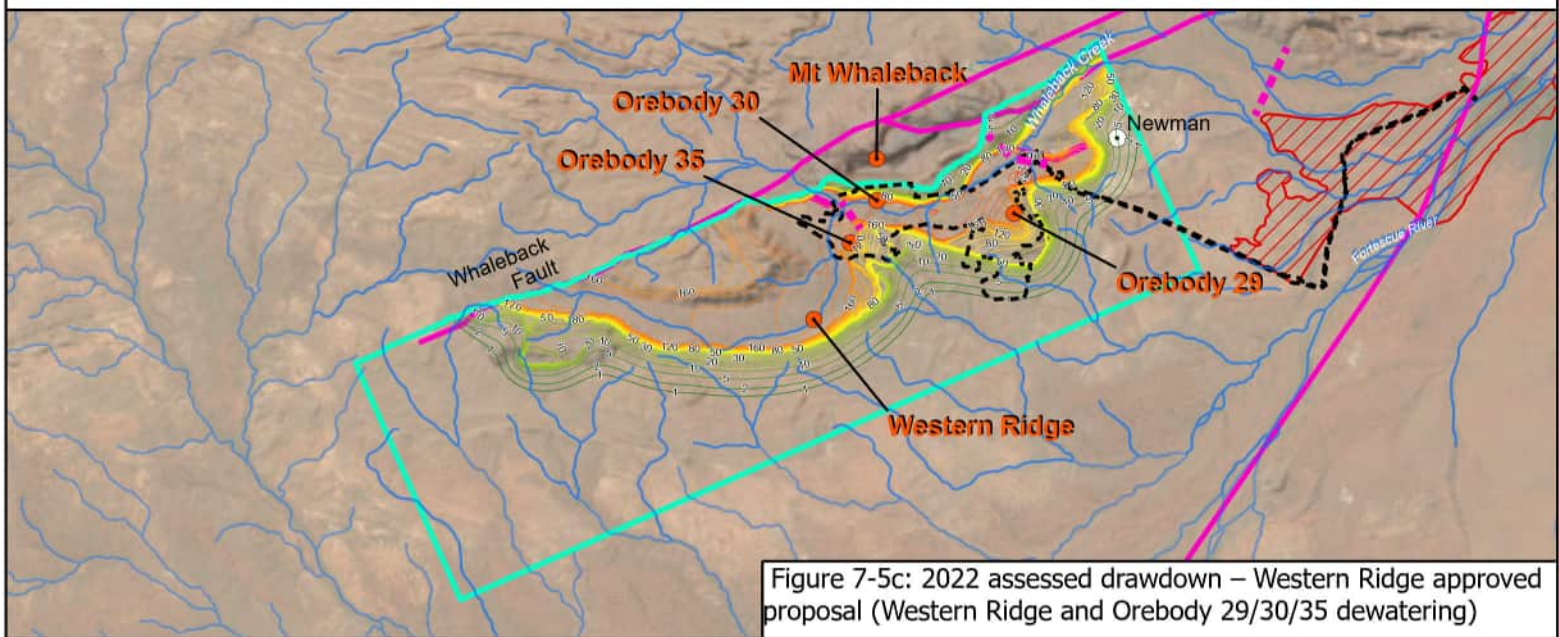
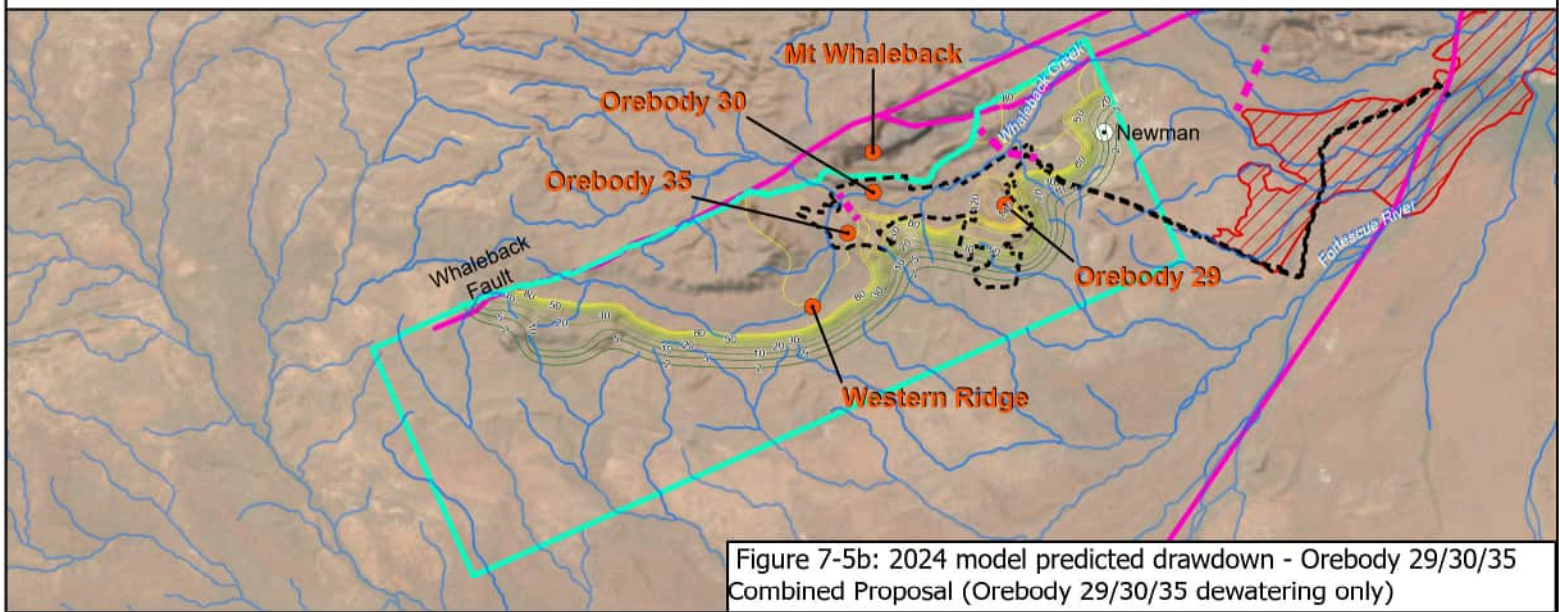
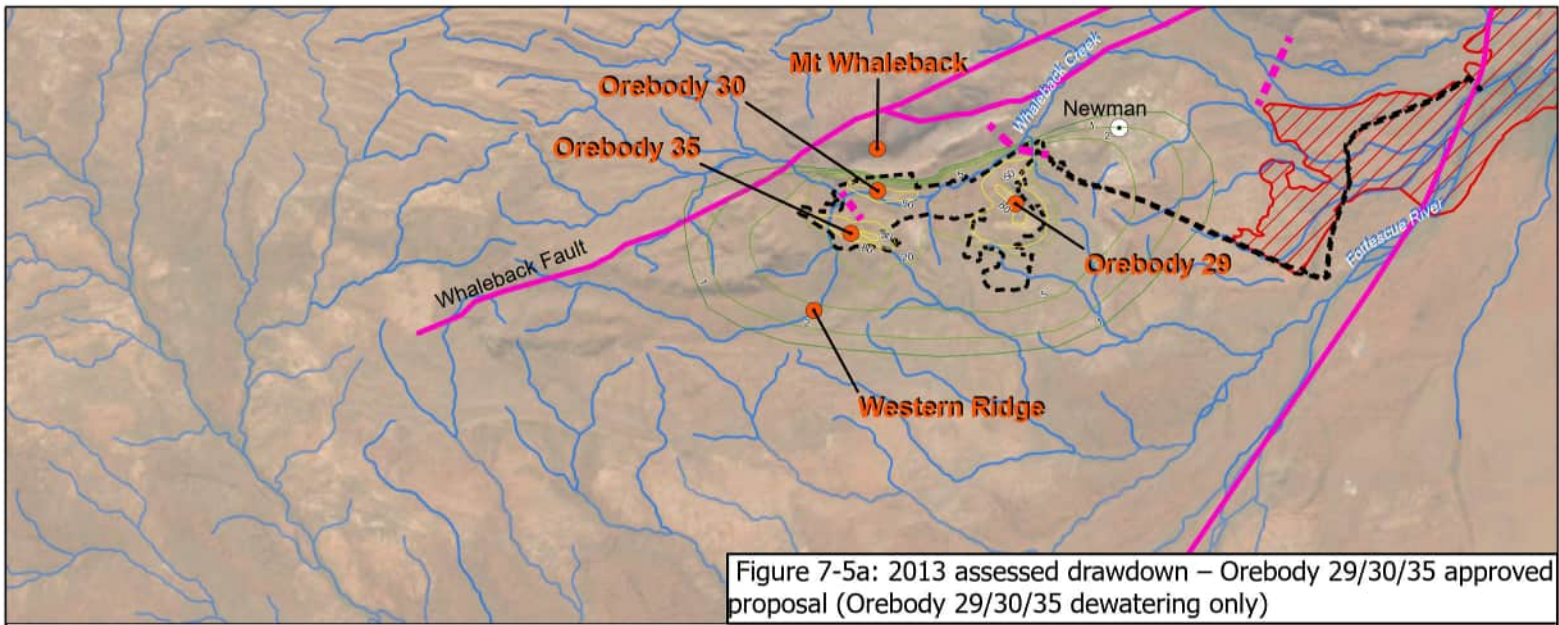
As discussed above, the results from the 2024 Orebody 29/30/35 mine modelling represent the combined effect of predicted drawdown from dewatering assessed for the Approved Proposal and the increase in dewatering for the Proposal.

The 2024 groundwater model predicts that dewatering of up to 67 ML/d will be required (to lower groundwater levels by up to 150 m from pre-development levels to dewater the Orebody 29/30/35 orebodies). The groundwater model predicts that drawdown in the orebody aquifer at the end of dewatering (2065) will reach a maximum depth of 150 m at OB29. At the end of dewatering, the vertical drawdown in the regional aquifer to the southern and western boundaries of the model domain reduces to less than 2 m, but is predicted to be up to 80 m at the northern boundary and up to 80-90 m at the eastern boundary (Figure 7-5b) (BHP 2024d).

Since the Orebody 29/30/35 BWT mine was approved in 2014, increased groundwater abstraction from Orebody 29/30/35 (for deeper target dewatering depths) was assessed as part of the Western Ridge Approved Proposal. Compared to the predicted drawdown for the Western Ridge Approved Proposal (which included dewatering of Western Ridge and Orebody 29/30/35) (Figure 7-5c), the 2024 modelling results for Orebody 29/30/35 only (Figure

7-5b) show that the predicted lateral extent of drawdown for the Combined Proposal is slightly less than the drawdown extent assessed for the Western Ridge Approved Proposal.

The predicted vertical drawdown in the orebody aquifer at the end of dewatering (150 m) for the 2024 Orebody 29/30/35 dewatering is less than the predicted drawdown for the 2022 Western Ridge and Orebody 29/30/35 dewatering (200 m) due to the shallower target dewatering depths). The predicted vertical drawdown in the regional aquifer for the 2024 Orebody 29/30/35 dewatering is similar to the predicted drawdown for the 2022 Western Ridge and Orebody 29/30/35 dewatering at the southern, western and most of the eastern boundaries of the model domain. Drawdown is less in the vicinity of Western Ridge, as the 2024 Orebody 29/30/35 modelling does not include dewatering from Western Ridge). Predicted drawdown is up to 70 m deeper for the Combined Proposal close to the northern boundary of the model domain north and east of OB35. This is likely due to changes made to the groundwater model in this area (increased the hydraulic conductivity of the Mt Sylvia / Mt McRae Shale Formations), to support a groundwater modelling mixing assessment for PFAS (BHP 2024d).



Cumulative drawdown

As discussed in Section 7.3.2.3, Orebody 29/30/35 is located in the Newman Hub where there are existing approved groundwater abstraction activities (for water supply from the Ophthalmia and Homestead borefields and for mine dewatering at Whaleback, Orebody 29/30/35 and Eastern Ridge) and the Ophthalmia Dam MAR system. The conceptual hydrological model and monitoring data indicates that there is no direct connection between Orebody 29/30/35 and Western Ridge (which are part of the same aquifer compartment), and the other operations (Mt Whaleback and Eastern Ridge mines, and Ophthalmia and Homestead borefields). However, the predicted drawdown from Eastern Ridge (including from OB32), Western Ridge and Orebody 29/30/35 is predicted to overlap in the lower transmissivity area (shown in Figure 7-3) (BHP 2024d).

Therefore, to understand the cumulative drawdown BHP has considered the predicted drawdown from Orebody 29/30/35 in the context of assessed drawdown for the Orebody 29/30/35, Western Ridge and Eastern Ridge (including Orebody 32 BWT) Approved Proposals (which considered the impacts of water supply abstraction, where relevant). Figure 7-6 shows the following:

- 2013 Orebody 29/30/35 1 m drawdown contour: represents the assessed drawdown extent for the Orebody 29/30/35 Approved Proposal (from Figure 7-5a)
- 2022 Western Ridge and Orebody 29/30/35 1 m drawdown contour: represents the estimated maximum lateral extent of the predicted drawdown from the 2022 Western Ridge and Orebody 29/30/35 dewatering assessment for the Western Ridge Approved Proposal
- 2022 Cumulative Eastern Ridge 2 m drawdown contour: represents the estimated maximum lateral extent of the cumulative effect of assessed drawdown for the Eastern Ridge Approved Proposals
- 2024 Orebody 29/30/35 1 m drawdown contour: represents the estimated maximum lateral extent of the predicted drawdown from the 2024 Orebody 29/30/35 dewatering assessment (Combined Proposal)
- 2024 additional Orebody 29/30/35 drawdown extent: represents the predicted drawdown extent from the Orebody 29/30/35 Proposal in addition to the assessed drawdown for the Orebody 29/30/35 Approved Proposal.

Within the model domain, the area of drawdown is as predicted by the model. The numerical model domain does not extend to the east to the Ethel Gorge TEC. The regional aquifer is however continuous between the edge of the eastern model boundary to the Ethel Gorge TEC. The potential for drawdown from Orebody 29/30/35 to reach the Ethel Gorge TEC was extrapolated from both the predicted drawdown from Orebody 29/30/35 at the model boundary (as shown in Figure 7-5b), and monitoring and drilling data the area between the model boundary and the TEC.

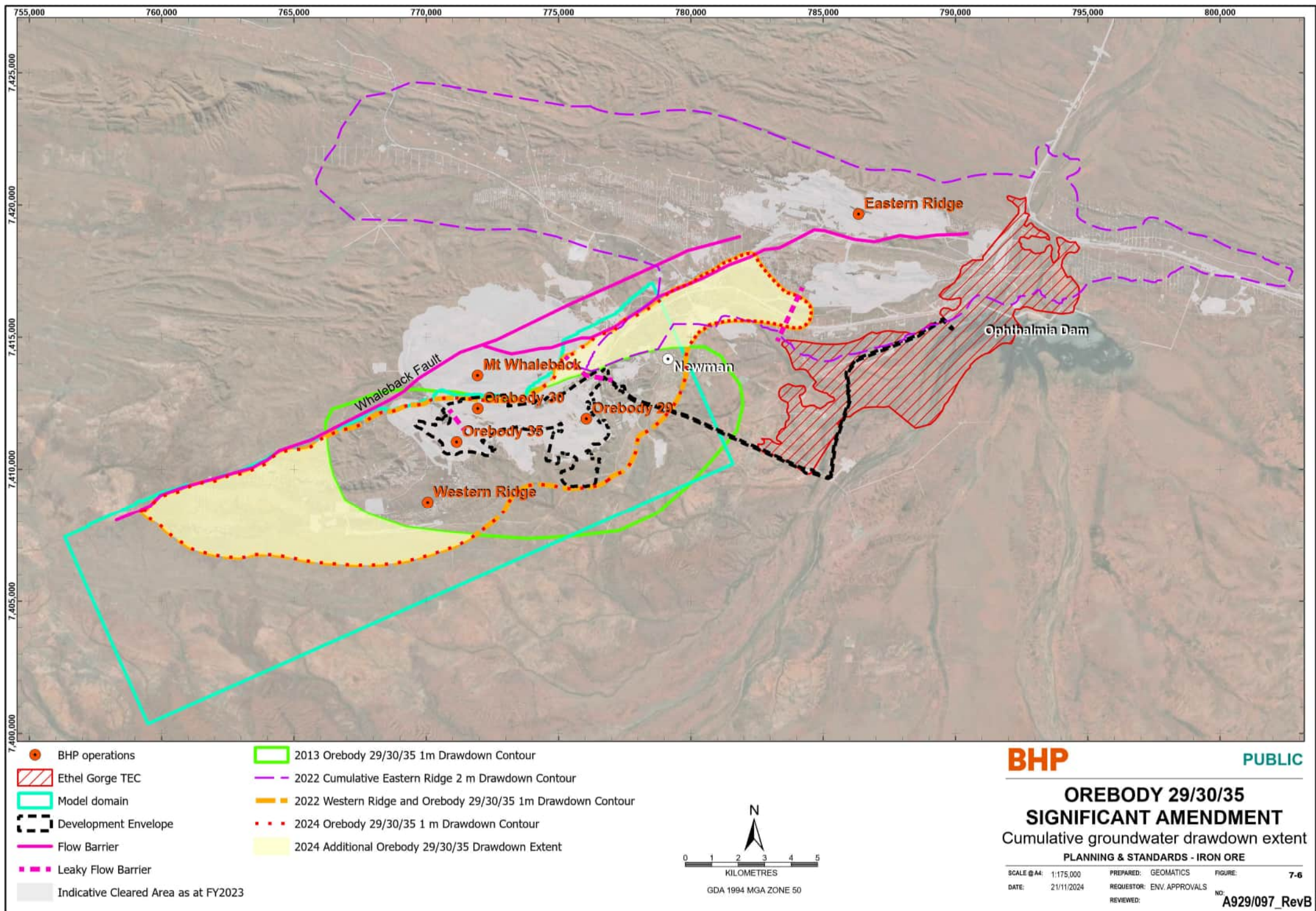
The migration of drawdown towards the Ethel Gorge TEC will be controlled by three main factors:

- the transmissivity of the aquifer between OB29 and the Ethel Gorge TEC, which monitoring strongly suggests is moderate to low
- the presence of at least one leaky flow barrier along the flow path (located to the south of OB25)
- the buffering effect of the Ophthalmia Dam MAR system, which will continue to capture surface water flows from the creeks that flow into it and the surplus water discharge from BHP's eastern mines.

An estimate of the final lateral extent of drawdown from Orebody 29/30/35, based on all of the above, is shown in Figure 7-6 (as the 2024 Orebody 29/30/35 1 m drawdown contour). As for the 2022 Western Ridge dewatering assessment (BHP 2022c), the results of the modelling, together with the drawdown controls above, suggest that the drawdown from the combined dewatering of Orebody 29/30/35 (Combined Proposal) will not extend further east than the leaky flow barrier located south of OB25 and will not reach the Ethel Gorge TEC, located approximately 15 km northeast of the Orebody 29/30/35 aquifer system, and will not increase the drawdown footprint associated with Eastern Ridge. The Ethel Gorge TEC and the Newman water supply borefields (Ophthalmia and Homestead) are located outside of the estimated groundwater drawdown extent of the proposed Orebody 29/30/35 dewatering and therefore are unlikely to be impacted by drawdown (BHP 2024d).

The predicted lateral extent of drawdown for the 2024 Orebody 29/30/35 assessment (red dotted line on Figure 7-6) extends to the south-west and north-west compared to the assessed drawdown extent for the Orebody 29/30/35 Approved Proposal (2013 Orebody 29/30/35 1 m drawdown contour (green solid line). This is represented as the 2024 Additional Orebody 29/30/35 drawdown extent (yellow fill).

However, the predicted extent of drawdown for the 2024 Orebody 29/30/35 assessment for the Combined Proposal is the same as the predicted drawdown extent for the 2022 assessment for the Western Ridge Approved Proposal (orange dashed line). There is no additional lateral drawdown extent from the Proposal as shown on Figure 7-6 in addition to the assessed drawdown for the above approved proposals). This is because the drawdown at the eastern boundary is roughly the same with or without Western Ridge dewatering, as OB29 dewatering has the greatest control on the drawdown in that location. Therefore, the impacts from drawdown in this additional area were considered for the Western Ridge Approved Proposal and the cumulative groundwater drawdown extent for the Newman area (shown in Figure 7-6) is the same as the for Western Ridge Approved Proposal assessment (BHP 2022c).



Post-mining

Mine voids are created during mining operations. Depending on the material movement strategy, there may be no backfill of material into the mine void, partial backfill where a portion of the void is backfilled, or complete backfill, where the void is backfilled to the void crest. Residual voids remain where the resultant surface is below the crest.

Proposal: Post-mining changes to groundwater regimes

The results from the 2024 modelling represent the predicted groundwater level recovery from the combined effect of the dewatering assessed for the Approved Proposal and the increase in dewatering for the Proposal (i.e. for the Combined Proposal). The 2013 assessment for the Approved Proposal did not include a groundwater recovery assessment (BHP 2024d), therefore BHP is not able to quantify the change in predicted groundwater level recovery from the Proposal compared to the Approved Proposal.

Combined effect: Post-mining changes to groundwater regimes

The model was run for 600 years to predict the recovery of post-mining groundwater levels for the following two closure scenarios, based on the potential backfill strategy when the groundwater modelling was undertaken in early 2024 (see Section 7.5.3 for the discussion of the current backfill strategy):

1. Backfill: assumes all pit voids are backfilled (to above the pre-development groundwater level) with similar material that was mined out
2. Partial backfill: assumes that the OB35 void is backfilled and the OB29 and OB30 pit voids are not backfilled.

For the backfill scenario, groundwater levels are predicted to recover to approximately 522 mAHD (i.e. pre-development level) 219 years after dewatering ceases.

For the partial backfill scenario (voids remain in OB29 and OB30), the water levels in the voids are predicted to rise to between 476 and 480 mAHD in OB29, and 480 and 483 mAHD in OB30, forming pit lakes. The system is predicted to reach this equilibrium approximately 144 years after dewatering ceases (BHP 2024d). As the equilibrium pit lake water levels will be lower than the pre-development groundwater level, the pit voids would remain groundwater sinks. Groundwater will flow east to west from the Ethel Gorge aquifer to the Orebody 29/30/35 pit voids. However, with the continued operation of the Ophthalmia Dam system, groundwater levels in the Ethel Gorge aquifer would remain within historical levels.

For the backfill scenario, the 2024 Orebody 29/30/35 modelling predicts a faster groundwater level recovery (219 years) at Orebody 29/30/35 than for the modelling for the 2022 Western Ridge Approved Proposal (350 years). The 2024 Orebody 29/30/35 modelling for the partial backfill scenario predicts pit lake levels at Orebody 29/30/35 will reach equilibrium by a similar time (144 years) compared to the 2022 no-backfill scenario for the Western Ridge Approved Proposal (150 years) but will recover closer to the pre-development level (BHP 2024d).

7.4.2 Changes to surface water regimes

7.4.2.1 Pit excavation and infrastructure

The excavation of pits and construction of infrastructure has the potential to change surface water regimes by disrupting natural surface flows and reducing the availability of surface water (runoff) downstream.

Proposal: Changes to surface water availability

As discussed in Section 2.2.1, the Proposal includes expansion of mine pits, additional OSAs, a new surplus water pipeline and a ramp (at OB35). No drainage diversions are planned as part of the Proposal.

The Proposal is located within the Whaleback and Fortescue subcatchments (Figure 7-2). Any flows to the north of the OB30 pit will drain predominately north, with only the north-western perimeter draining south-west into Whaleback Creek. Any flows along the eastern perimeter of OB29 will drain north-east towards the unnamed tributary and flows

along the western perimeter will drain north-east towards Whaleback Creek. Runoff from the additional OSAs (south of OB29) will drain south via minor tributaries towards the Fortescue River.

The Proposal will reduce the catchment area contributing to runoff. This is mainly due to the footprints of the pit expansions and additional OSAs, as well as any upstream catchment areas which are intercepted by the pits and OSAs. The proposed surplus water pipeline within the mine area of the Development Envelope will be above-ground but flows will only be partially restricted, which will have a negligible impact on catchment areas and surface water availability. Outside of the mine area, the proposed pipeline is to be below ground, and as such will have no impact on catchment areas and surface water availability (BHP 2024b).

The potential reduction in catchment area was calculated for closure conditions, as this represents the long-term impact of the development. This was based on the potential backfill strategy when the surface water availability assessment was undertaken, which assumed partially backfilled pit footprints for OB29 and OB35, a pit lake footprint for OB30 and the rehabilitated OSA footprint (see Section 7.5.3 for the discussion of the current backfill strategy). A catchment reduction factor of 0.7 was assumed for the rehabilitated OSAs, as they will be mostly internally draining. A catchment reduction factor of 1.0 was assumed for the partially backfilled pit footprints and pit lake footprint, as even a partially backfilled pit will capture the runoff and cause filling combined with seepage within the pit, removing the runoff from the catchment (BHP 2024b).

Table 7-3 presents the potential reduction in catchment area (surface water availability) for the Proposal. The Proposal is estimated to result locally in the reduction of the Whaleback catchment area by 1.14%, the Fortescue River at Ophthalmia Dam catchment area by 0.10%, and regionally in the reduction of the Upper Fortescue River catchment area by 0.01%.

Table 7-3: Inland Waters - Potential reduction in surface water availability

Catchment	Catchment area (km ²)	Reduction in catchment area				
		Existing (km ²)	Proposal (km ²)	Proposal (%)	Combined (Existing + Proposal) (km ²)	Combined (Existing + Proposal) (%)
Whaleback Creek subcatchment	193	5.4	2.2	1.14%	7.6	3.94%
Fortescue River at Ophthalmia Dam ¹	3,072	5.4	3.1	0.10%	8.5	0.28%
Upper Fortescue River²	29,757			0.01%		0.03%

1. Includes Whaleback Creek subcatchment

2. Catchment of upper Fortescue River tributary, located within Fortescue subcatchment (see Figure 7-1)

Combined effect: Changes to surface water availability

As the Approved Proposal relates to BWT mining only (which did not include an assessment of surface water availability), BHP has calculated the combined effects of the existing mine and the Proposal (Table 7-3). The combined reduction is estimated to be a reduction in the Whaleback catchment area by 3.94%, the Fortescue River at Ophthalmia Dam catchment area by 0.28% and regionally the Upper Fortescue River catchment area by 0.03%.

7.4.2.2 Discharge of surplus water to Ophthalmia Dam

As discussed in Section 2.2.1, the Proposal includes an increase in surplus water from the increase in mine dewatering at Orebody 29/30/35. There is the potential to further change the current (altered) ephemeral surface water regime in the Fortescue River from additional discharge of surplus water to Ophthalmia Dam, if the dam

capacity is exceeded more frequently, resulting in more frequent overtopping of the dam spillway and/or changes to the current releases of water from the dam.

Proposal: Changes to surface water regimes from discharge to Ophthalmia Dam

The forecast peak rate of discharge of surplus water from Orebody 29/30/35 to Ophthalmia Dam is 57 ML/d (20.8 GL/a), based on a high case dewatering rate of 67 ML/d (see Section 7.4.1.1) and assuming a peak demand of 10 ML/d at the Mt Whaleback mining operations (Whaleback and Orebody 29/30/35 mines). This represents an increase of 35.1 ML/d (12.8 GL/a) for the Proposal compared to the discharge rate of 8 GL/a (21.9 ML/d) for the Orebody 29/30/35 Approved Proposal, authorised in 2014 under MS963.

Therefore, the proposed change for the Proposal is an increase in discharge of surplus water to Ophthalmia Dam of up to 35.1 ML/d (12.8 GL/a).

Figure 7-7 shows the 2024 forecast discharge for all BHP's eastern mines. This includes the 2023 forecast for all approved mines and the increase in forecast discharge from Orebody 29/30/35 based on the 2024 modelled high case dewatering predictions and 2024 forecast water demand at Mt Whaleback mining operations, compared to the 2023 Orebody 29/30/35 forecast discharge assessed for the Jumblebar Hub Iron Ore Mining Operations Significant Amendment (Jumblebar Hub Proposal) (BHP 2023c). The 2024 forecast discharge and dates are indicative for modelling purposes only. The forecast discharge (including an increase in OB29/30/35 discharge) starts in 2024 as that is the start of the modelling period. The actual discharge to the dam will depend on the mine plans that are updated regularly (and will also depend on if and when the Proposals to increase discharge (i.e. from Jumblebar Hub and Orebody 29/30/35) are approved).

The addition of the forecast increase from Orebody 29/30/35 indicates that the theoretical dam capacity may be exceeded for a few years once the increase in dewatering at Orebody 29/30/35 starts. The theoretical dam capacity is the capacity of the dam to accept surplus water without overtopping the spillway, with up to a three month controlled release in the dry season when there are no natural surface water flows.

The potential impacts from the contribution of additional Orebody 29/30/35 surplus water discharge were evaluated using the Eastern Pilbara Hub (EPH) integrated water balance model (EMM 2024). The water balance model is an integrated model as it includes surplus water discharge from all contributing BHP mines and the effects of nearby groundwater abstraction (water supply and dewatering). The 2024 water balance modelling assessment considered the additional surplus water from Orebody 29/30/35 relative to the 2023 assessment for the Jumblebar Hub Proposal (BHP 2023c).

The difference between the results of 2024 assessment compared to the 2023 assessment represents the additional contribution from Orebody 29/30/35 and the 2024 assessment represents the current cumulative discharge scenario (BHP 2024e).

The main change from the Proposal is that the additional discharge from Orebody 29/30/35 will result in higher simulated (modelled) dam storage during the corresponding period of high discharge to Ophthalmia Dam.

Combined effects: Changes to surface water regimes from discharge to Ophthalmia Dam

As Ophthalmia Dam receives surplus water from multiple BHP mines at any time, potential changes to the surface water regime in the Fortescue River were not determined for the Combined Proposal in isolation.

Cumulative: Changes to surface water regimes from discharge to Ophthalmia Dam

As shown in Figure 7-7 and discussed above, the 2024 forecast cumulative discharge from BHP's eastern mines (including from the Combined Proposal) indicates that the theoretical dam capacity (135 ML/d) may be exceeded for a few years once the increase in dewatering at Orebody 29/30/35 starts. This predicted dam storage is higher during the corresponding period of high discharge to Ophthalmia Dam, which could result in changes to the duration and frequency of flows to the Fortescue River (BHP 2024e).

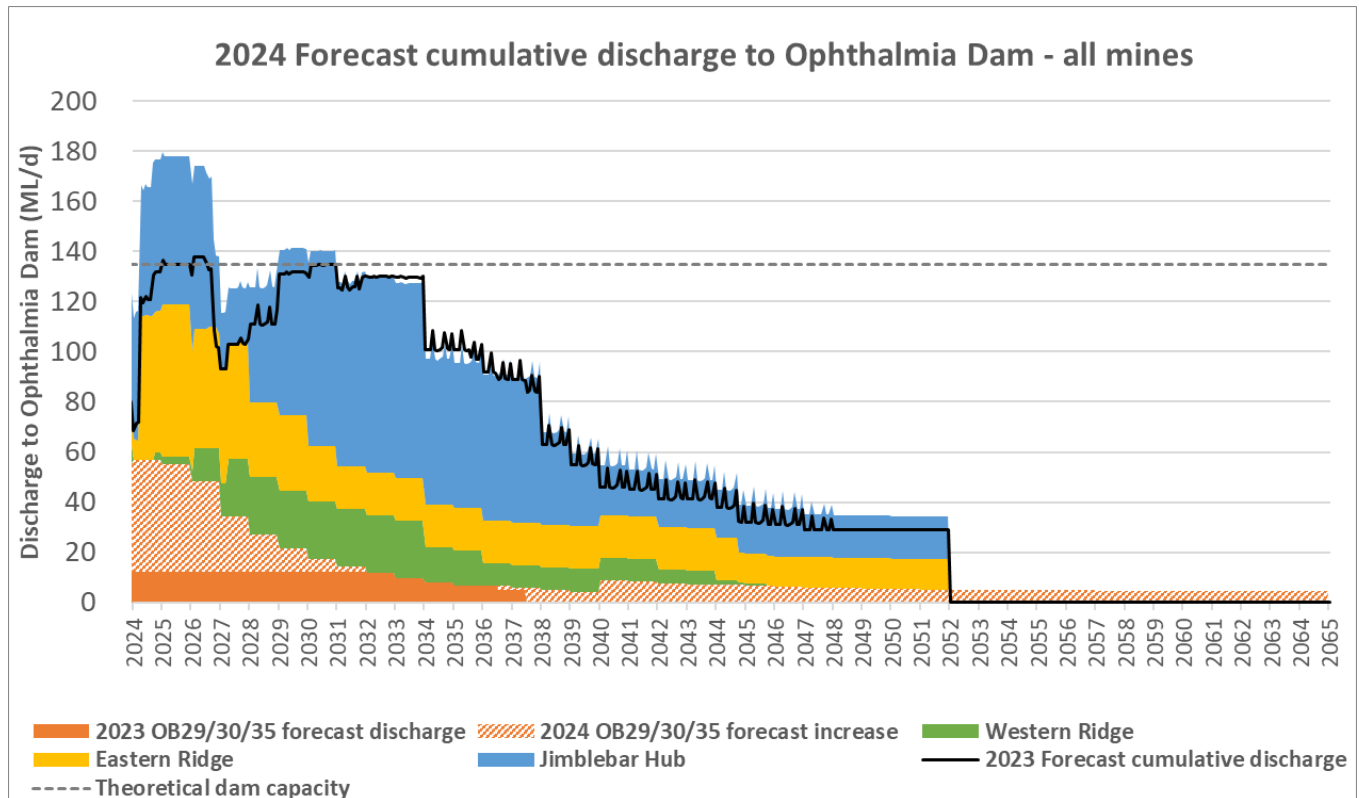


Figure 7-7: Forecast cumulative discharge to Ophthalmia Dam

7.4.3 Changes to water quality

7.4.3.1 Pit excavation and infrastructure, and dewatering

Erosion and sedimentation

The Proposal may increase the risk of sediment loading to downstream drainage lines due to ground disturbance. One of the main sources of potential increased sediment is runoff from the OSAs. Increased erosion from infrastructure (e.g. culverts or spoon drains) which results in flow velocities above natural conditions may be another potential source of sediment.

Acid and metalliferous drainage (AMD)

Changes to groundwater quality during operations and/or post mining may occur from the Proposal where alterations to landforms through mine pit excavation and construction of OSAs may expose acidic and/or metalliferous material. An AMD risk assessment was undertaken for Orebody 29/30/35 in 2021 based on the volume of waste rock and pit wall exposure. The AMD risk assessment identified that there was a low risk of generating AMD at OB29 and OB35 and negligible risk at OB30 (BHP 2021b).

Other contaminants – PFAS

During operations, there is the potential for the migration of PFAS contaminants in the groundwater from abstraction of groundwater for the dewatering of Orebody 29/30/35.

As discussed in Section 7.3.2.3, PFAS has been detected at Orebody 29/30/35 due to historical activities at the Mt Whaleback mine, particularly from known PFAS sources north of OB29. In 2022, BHP commissioned a mixing assessment to evaluate the potential for PFAS to migrate towards orebodies during Orebody 29/30/35 dewatering activities (WSP Golder 2023). The mixing assessment used the base case groundwater model and original target dewatering depths discussed in the *Orebody 29/30/35 Significant Amendment: Groundwater impact assessment* (BHP 2024d) and a PFAS plume map. The predicted PFAS concentrations did not exceed the PFAS NEMP human

health drinking water quality guideline value of 0.07 µg/L PFOS+PFHxS or the NEMP ecological freshwater 95% species protection guideline value of 0.13 µg/L PFOS during the entire modelled dewatering period (to 2056). PFOS concentrations may transiently exceed the 99% species protection guideline value of 0.00023 µg/L PFOS in the combined dewater from OB29 and OB30. PFOS concentrations are predicted to remain below the 99% species protection guideline value of 0.00023 µg/L in the combined dewater from OB35. The 2022 mixing assessment supported the position that concentrations of PFAS in the surplus dewatered groundwater discharged from the Orebody 29/30/35 mine will remain within current ambient PFAS levels observed within the receiving environment (Ophthalmia Dam and Ethel Gorge aquifer) and is unlikely to alter the existing water quality conditions or increase the risk profile within the receiving environment.

BHP commissioned a large-scale groundwater hydraulic pump test at OB29 during 2023 and 2024 to improve the understanding of the conceptual hydrogeologic model and PFAS flow paths. The information from the hydraulic test was used in a PFAS mixing assessment to evaluate the validity of the methodology to predict PFAS concentrations at dewatering bores (WSP 2024). The 2023 modelling indicated that the PFAS concentrations in combined surplus groundwater are likely to remain within the current ambient PFAS concentration ranges in Ophthalmia Dam (except possibly some transient exceedances in the first one to two years of dewatering). The results of the 2024 mixing assessment indicate that the simulated (predicted) PFAS concentrations from the groundwater model overestimate the observed concentrations of PFAS from the OB29 pump test, indicating that the groundwater model is conservative. The 2024 mixing assessment indicates that the concentration of PFAS in the combined dewatered groundwater from Orebody 29/30/35 production bores (of which the surplus will be discharged to Ophthalmia Dam) is likely to be below existing PFAS concentration ranges in Ophthalmia Dam and the Ethel Gorge aquifer.

Post-mining water quality

The current closure strategy for Orebody 29/30/35 assumes that at least one open void will remain, resulting in the formation of a pit lake/s. As all pit lakes will be groundwater sinks, groundwater will flow into the pit lakes, away from the regional aquifers and any sensitive receptors. Therefore, saline water (and any contaminants) present in pit lakes are not expected to migrate from the pit lake into the groundwater system.

7.4.3.2 Discharge of surplus water to Ophthalmia Dam

Proposal: Changes to groundwater salinity from discharge to Ophthalmia Dam

The Eastern Pilbara Hub (EPH) integrated water balance model was also used to evaluate the potential impact to groundwater quality (salinity) in the Ethel Gorge aquifer from the 2024 forecast cumulative discharge to Ophthalmia Dam from BHP's Eastern Pilbara mines (including additional surplus water from Orebody 29/30/35).

The results show that there will be negligible changes in predicted groundwater salinity from the the additional discharge from Orebody 29/30/35 (i.e. comparing the results of the 2024 water balance modelling assessment to the 2023 assessment (BHP 2024e)).

Combined effects: Changes to groundwater salinity from discharge to Ophthalmia Dam

As Ophthalmia Dam receives surplus water from multiple BHP mines at any time, potential changes to groundwater salinity were not determined for the Combined Proposal in isolation.

Cumulative: Changes to groundwater salinity from discharge to Ophthalmia Dam

The water balance modelling for the 2024 forecast cumulative surplus discharge to Ophthalmia Dam from BHP's Eastern mines (including surplus water discharge from the Combined Proposal) indicates that the predicted groundwater salinity in the Ethel Gorge aquifer will remain below 2,000 mg/L for the high hydraulic conductivity scenario (which is the recommended hydraulic conductivity (EMM 2023)), which is within the range of observed groundwater salinity. The extended modelling (to 2065 compared to 2053 for the 2023 assessment) shows that the predicted groundwater salinity stabilises and declines after approximately 2050, coinciding with declining surplus water discharge (BHP 2024e).

7.5 Mitigation

7.5.1 Avoid

There are no specific avoidance measures proposed for the Proposal as no significant surface water values are present within the Development Envelope.

Water quality - PFAS

The use of chemicals containing PFAS ceased at the existing Orebody 29/30/35 mine in 2022. No chemicals containing PFAS will be used for the Proposal, to avoid the risk of increasing PFAS contamination at Orebody 29/30/35 and potential impacts to groundwater quality.

7.5.2 Minimise

Groundwater regimes – Orebody 29/30/35 orebody and regional aquifers

The current *Rights in Water and Irrigation Act 1914* (RiWI Act) 5c Licence to Take Water Ground Water Licence (GWL) 160418(8) limits the volume of groundwater abstraction (including for dewatering) at Orebody 29/30/35, and contains groundwater monitoring and operating requirements in the associated Operating Strategy (BHP 2020b) (see Section 7.5.4). BHP will seek an amendment to the Orebody 29/30/35 5c licence to increase the abstraction entitlement from 8 GL/a to 24.5 GL/a, and will update the Operating Strategy.

Water regimes and water quality - Ethel Gorge aquifer and Fortescue River

BHP manages the Ethel Gorge aquifer at the regional scale due to the potential for cumulative impacts to the Ethel Gorge TEC from multiple BHP mines. BHP proposes to continue to manage surplus water discharge from BHP's eastern mines (including from the Orebody 29/30/35 mine), in accordance with the EPWRMP. The EPWRMP is an outcomes-based Environmental Management Plan (EMP) and BHP has prepared the EPWRMP in accordance with the EPA's EMP Instructions (EPA 2024d). The endorsed version of the EPWRMP is currently Version 6.0 (BHP 2018a). BHP has included a revised version of the EPWRMP (Version 8.1) to add the Orebody 29/30/35 mine (BHP 2024g; Appendix 5). As at November 2024, Version 8.0 of the EPWRMP (prepared for the Jimblebar Hub Proposal) is currently under assessment by the EPA as part of the assessment of the Jimblebar Hub Proposal.

The EPWRMP includes groundwater level and groundwater salinity criteria (triggers and thresholds), to maintain groundwater levels and salinity in the Ethel Gorge aquifer within historical levels of variation. Response actions in the EPWRMP to manage groundwater levels and/or groundwater salinity include a seasonal controlled release (following a wet season, typically December through April) from Ophthalmia Dam to upper Fortescue River tributaries. BHP notes in the EPWRMP that three months of controlled release into the Upper Fortescue River following the wet season is considered appropriate and unlikely to develop permanent or ponding water downstream in the Fortescue River or have an impact on riparian vegetation. In correspondence to the EPAS of the DWER (BHP 2019b), BHP also considered that biannual releases of water from the dam may be undertaken.

As discussed in Section 7.4.2.2, Ophthalmia Dam is likely to have sufficient capacity to receive the total surplus discharge from approved operations and the Proposal (i.e. cumulative discharge), except during the estimated peak discharge years (for approximately 3 years) when the planned increase in dewatering at Orebody 29/30/35 starts. However, the forecast discharge is indicative only and the actual discharge (including from Orebody 29/30/35 will depend on the mine plans which are updated regularly. If future detailed surplus water forecasts indicate that the capacity of Ophthalmia Dam could be reached, BHP will manage the surplus discharge volumes from its operations and the operation of the dam according to the EPWRMP to avoid overtopping of the dam spillway and uncontrolled surface flows to the Fortescue River in the dry season (i.e. when there are typically no natural flows).

The EPWRMP includes a threshold to limit releases to the Fortescue River during natural no-flow conditions (i.e. the dry season). Management options to limit releases to the Fortescue River in the dry season include the management measures and controls outlined in the EPWRMP, e.g. release of water from the dam during or following wet season

(i.e. natural) flow events or alter the surplus water discharge regime (amount of water discharged) from BHP mines to the Ophthalmia Dam system (BHP 2024g). Where controlled releases are required, BHP will maintain the current release approach (total duration of up to three months in the dry season). The volume of water released would be similar to historical releases of approximately three months duration, as the release rate is controlled by the capacity of the outlet valve (BHP 2024e).

The current Part V licence L4503/1975/14 for the Mt Whaleback mining operations (Mt Whaleback and Orebody 29/30/35 mines) also contains requirements in relation to the discharge of mine dewater in excess of site demand (surplus water) to Ophthalmia Dam, including monitoring of discharge rates into the Ophthalmia Dam system, monitoring of discharge water quality (salinity and other parameters) and annual reporting (of exceedances of trigger values and details of investigations conducted, including outcomes, environmental impacts and remedial actions) (see Section 7.5.4). BHP will seek an amendment to the licence to increase the limit of discharge to Ophthalmia Dam (Category 6: Mine dewatering) from 8,000,000 tonnes per annual period (8 GL/a) to 20,800,000 tonnes per annual period (20.8 GL/a) equivalent to the Part IV increase to 20.8 GL/a sought.

Surface water regimes and quality – mine site drainage

BHP will design and construct mine infrastructure according to applicable Australian Standards and standard internal management practices, to minimise potential impacts to surface water regimes and surface water quality.

As discussed in Section 7.4.2.1, no drainage diversions are planned for the Proposal. Due to the relatively small area of the catchments intercepted by the OSAs and pits, runoff captured at the OSA toes is likely to infiltrate quickly and water draining into the proposed pits will be managed via in-pit stormwater pumping. BHP will review the need for minor flood protection infrastructure as pit designs and pushback sequencing are developed and refined over time. In addition, where feasible, the OSAs will be designed and constructed to reduce catchment loss.

To limit the potential for erosion, OSAs will be designed to remain outside at least the 100-year floodplain of major drainage lines during operations, and where possible also outside the 10,000-year floodplain so the OSA may be suitable for closure without the need for additional flood protection measures. Increased erosion from infrastructure which increase flow velocities above natural conditions may be another potential source of sediment. BHP will install infrastructure (e.g. culverts and spoon drains) with rip rap (or other energy dissipation structures) to reduce flow velocities and erosion potential (BHP 2024b).

Water quality – AMD

As discussed in Section 7.4.3.1, there is a negligible to low risk of generating AMD at Orebody 29/30/35. BHP will manage the risk of AMD during operations in accordance with internal AMD standards and procedures (BHP 2021b).

Water quality - PFAS

As discussed in Section 7.4.3.1, the groundwater mixing assessments predict that the concentration of PFAS in the combined Orebody 29/30/35 dewatered groundwater may be higher than the PFAS NEMP ecological freshwater 99% species protection guideline value, but will remain within the range of observed ambient levels of PFAS in the environment (i.e. Ophthalmia Dam, Ethel Gorge aquifer and Fortescue River), except possibly in the first two years of dewatering). The PFOS concentrations will also remain below the recently promulgated draft 99% ecological species protection level of 0.0091 ug/L (ANZG 2023). However, given the presence of PFAS sources at the Mt Whaleback mining operations BHP has taken a precautionary approach and proposed comprehensive PFAS monitoring and measures, to ensure that PFAS concentrations in the environment remain below acceptable levels with the implementation of the Proposal.

BHP has prepared a draft outcomes-based Water (PFAS) Management Plan (WPMP) for the Proposal (BHP 2024h, Appendix 6) that details the proposed measures to minimise the impacts of PFAS on groundwater quality from the implementation of the Orebody 29/30/35 Combined Proposal and specifies water quality outcomes to be met. The WPMP is consistent with the EPA's EMP Instructions (EPA 2024d) and BHP's other WMP (PFAS) for proposals in

the Newman Hub (OB32 BWT and Western Ridge, noting that the Orebody 29/30/35 WPMP contains different PFAS criteria to reflect the local PFAS concentrations at OB29 and improved understanding of PFAS).

BHP's approach to understanding, monitoring and mitigating the impacts of PFAS are the same as for other potential impacts on groundwater quality and are consistent with standard management practices and targeted management measures required under the CS Act and Part V of the EP Act for other contaminants (e.g. hydrocarbons).

BHP has proposed a multi-level control system to monitor and mitigate PFAS to ensure there are no unacceptable risks to environmental values:

- multi-level monitoring of PFAS in groundwater and surface water:
 - Level 1: Pathway monitoring bores (between potential PFAS sources and Orebody 29/30/35 dewatering bores). This monitoring will provide an 'early warning' of PFAS migration in groundwater. Monitoring results will be compared against historical trends, trigger and threshold criteria to inform response actions
 - Level 2: Orebody 29/30/35 dewatering bores
 - Level 3: Combined Orebody 29/30/35 dewatered groundwater (prior to discharge to Ophthalmia Dam)
 - Level 4: Receptor monitoring - Ophthalmia Dam (surface water quality)
- PFAS concentration criteria for relevant PFAS compounds (for groundwater and surface water) based on PFAS NEMP human health and ecological protection concentration guideline values (and/or scientifically derived site-specific criteria) - early response indicators, triggers and thresholds
- response actions to be undertaken if PFAS criteria are exceeded.

BHP will develop an internal operational monitoring plan and associated Trigger and Response Plan (TARP) for Level 1 and Level 2 monitoring of groundwater in the Orebody 29/30/35 mine area. The Level 1 and Level 2 monitoring and TARP will provide early warning and response actions to minimise PFAS concentrations in surplus water discharged to Ophthalmia Dam. The Level 1 and 2 monitoring and related actions will inform the Level 3 and Level 4 monitoring for the combined dewatered groundwater and surface water in Ophthalmia Dam (and associated indicators, response actions and reporting) proposed for the WPMP (BHP 2024h).

BHP also undertakes monitoring specifically related to drinking water quality for the Newman town water supply (Level 5 Water supply borefield and Level 6 Water treatment plant monitoring) under the *Water Services Act 2012* (WS Act) (see Section 7.5.4).

PFAS contamination is also regulated under the CS Act and impacts to water quality from emissions and discharges to surface and groundwater are regulated under Part V of the EP Act (see Section 7.5.4). BHP considers that Part V of the EP Act is the most appropriate statutory decision-making process to manage the potential impacts of PFAS from the Proposal. Part V regulates emissions and discharges, including other substances that have the potential to contaminate surface and groundwater (e.g. hydrocarbons). BHP proposes to seek amendments to the existing Part V licence for the Mt Whaleback mining operations (L4503/1975/14) to add PFAS as a chemical parameter and add PFAS monitoring and triggers.

7.5.3 Rehabilitate

Rehabilitation at the Orebody 29/30/35 mine is addressed in the *Orebody 29/30/35 Mine Closure Plan* (MCP) (BHP 2024i) (Appendix 7). The MCP has been revised to include the Proposal.

The MCP addresses how pits and constructed landforms (principally OSAs) will be designed, constructed and rehabilitated, to ensure they are safe, stable and non-polluting. This includes potential management strategies and processes for monitoring the risk indicators for surface water and groundwater quality.

Management approaches in the MCP relating to Inland Waters for the Combined Proposal include (BHP 2024i):

- undertake AMD management during operations
- conduct surface water studies (including rainfall and surface water monitoring, investigating the foundations of flood bunds and investigating operations to improve channel morphology) to inform closure requirements
- review and revise surface water modelling as the mine approaches closure
- upgrade permanent creek diversions to accommodate conditions that could occur post-closure, as required
- conduct detailed mine void stability analysis to determine whether stability controls such as backfilling or buttressing need to be incorporated to prevent failure of creek diversions post-closure
- refine conceptual and numerical groundwater models based on monitoring of the drawdown pathway during operations
- refine mine void closure strategies based on updated groundwater modelling and mine plans.

BHP prioritises backfill to mine voids, taking into account:

- the potential for residual groundwater drawdown to impact ecohydrological receptors and pose an unacceptable risk to the environment or to address stakeholder expectations
- the potential impact to water quality from PAF materials (if present)
- the potential to reduce the footprint of out-of-pit OSAs.

The backfill strategy for Orebody 29/30/35 has evolved as BHP has refined the Proposal. The backfill strategy as at November 2024 is no backfill at OB30, partial backfill in the south of the OB29 pit void and partial backfill above the water table at Orebody 35. This would result in pit lakes forming at OB29 and OB30, with a smaller pit lake at OB35 in the portion below the water table. Backfill options are currently under review and are dependent on waste rock availability.

7.5.4 Other statutory decision-making processes

Table 7-4 summarises whether another statutory decision-making process can mitigate the potential environmental impacts of the Proposal on Inland Waters, considering the EPA's *Taking decision making processes into account in EIA: Interim Guidance* (EPA 2021b). Table 7-4 also provide reasons, including how, in relation to the specific potential impacts of the Proposal, the decision-making process takes the EP Act object and principles, and the EPA's objective for Inland Waters, into account.

Table 7-4: Inland Waters - other statutory decision-making processes

Potential impact from the Proposal	Statutory decision-making process can mitigate impacts on the environment?	Reasons (if Yes)
Changes to groundwater regimes (drawdown) from groundwater abstraction (dewatering)	Yes	RiWI Act section 5C licence to take water • Process provides opportunity for public comment on the proposed licence/licence amendment • Licence specifies approved location of groundwater abstraction, maximum abstraction rate and compliance requirements • Operating Strategy (licence condition) specifies abstraction, monitoring and reporting details • Licence contains outcome-based conditions (including operating strategy) that can maintain the hydrological regimes of surface

Potential impact from the Proposal	Statutory decision-making process can mitigate impacts on the environment?	Reasons (if Yes)
		water to protect environmental values, to meet the EPA's objective for Inland Waters
Changes to surface water regimes from discharge of surplus water to Ophthalmia Dam	Yes	EP Act Part V licence • Process provides appeal right • Provides for the regulation of emissions and discharges • Licence specifies location of surplus discharge, discharge rate limit, monitoring locations and parameters, triggers, reporting and compliance requirements • Licence contains outcomes-based conditions that can maintain the hydrological regimes of groundwater and surface water to protect environmental values to meet the EPA's objective for Inland Waters
Changes to water quality from groundwater abstraction (dewatering)	No	(Water quality monitoring is undertaken as a requirement of the RiWI Act section 5C Operating Strategy, but the Operating Strategy does not contain water quality triggers or thresholds to mitigate potential impacts)
Changes to water quality from discharge of surplus water	Yes	EP Act Part V licence • Process provides appeal right • Provides for the regulation of emissions and discharges • Licence specifies location of surplus discharge, discharge rate limit, monitoring locations and parameters, triggers, reporting and compliance requirements • Licence contains outcomes-based conditions that can maintain the hydrological regimes of groundwater and surface water to protect environmental values to meet the EPA's objective for Inland Waters
Changes to water quality from discharge of surplus water	Yes	WS Act licence • Licences issued to Water Corporation for the provision of water services to Newman (including drinking water) • Licence requires risk management approach from source (BHP operated Homestead and Ophthalmia borefields) to consumption point (Newman town) including definition of treatment critical control points, monitoring, and response actions

7.6 Assessment and significance of residual impacts

7.6.1 Changes to groundwater regimes

Changes to groundwater levels groundwater abstraction (dewatering)

As discussed in Section 7.4.1.1, the Proposal includes an increase in dewatering at the Orebody 29/30/35 mine. The proposed groundwater abstraction rate for the Combined Proposal is 24.5 GL/a comprising 8 GL/a for the Approved Proposal and an additional 16.5 GL/a for the Proposal.

Drawdown in the regional aquifer from the Proposal is predicted to increase laterally (approximately 6 km to the west) and vertically (by approximately 80 m at the western, northern and eastern model boundaries) compared to the assessed drawdown for the Approved Proposal, due to the deeper target dewatering depths and changes to the conceptual model, which indicates that the regional aquifer is connected and bound by the Whaleback Fault in the north and west and the Jeerinah Formation to the south.

The predicted lateral extent of drawdown in the regional aquifer from the Combined Proposal is the same as the drawdown extent assessed for the Western Ridge Approved Proposal, therefore there is no change in the predicted lateral drawdown extent for the Combined Proposal. The vertical drawdown in the regional aquifer near the northeastern and northern boundaries is predicted to be deeper by up to 70 m, likely due to changes made to the groundwater model in this area for the PFAS mixing assessment.

As discussed in Section 7.3.2.3, observed data indicates that dewatering for the Approved Proposal has not resulted in a response in groundwater levels in the Ethel Gorge aquifer. From the cumulative assessment, the Ethel Gorge TEC and the Newman water supply borefields (Ophthalmia and Homestead) are located outside of the estimated groundwater drawdown extent and therefore are unlikely to be impacted by drawdown. Therefore, groundwater levels in the Ethel Gorge aquifer would remain within historical levels, to support the stygofauna habitat of the Ethel Gorge TEC.

As discussed in Section 7.4.1.1, if all the Orebody 29/30/35 pits are backfilled to above the pre-development groundwater level (closure backfill model scenario), groundwater levels at the Orebody 29/30/35 mine (i.e. the Combined Proposal) will recover to pre-development levels. If some or all of the pits remain as voids (closure partial backfill model scenario), pit lakes will form and the 2024 Orebody 29/30/35 modelling predicts that the equilibrium pit lake water levels and groundwater levels at Orebody 29/30/35 will be between 476 and 483 mAHD, approximately 39 to 46 m lower than the pre-mining groundwater level of approximately 522 mAHD, but closer to the pre-development level than predicted for the Western Ridge Approved Proposal no-backfill scenario. As discussed in Section 7.5.3, the backfill strategy as at November 2024 is no backfill at OB30, partial backfill to the south in OB29 and partial backfill above the water table at OB35, which is slightly different to the partial backfill scenario modelled (no backfill at OB29 and OB30 and backfill at OB35). This may result in different equilibrium pit lake water levels and groundwater levels.

As the final pit lake level is predicted to be lower than the surrounding groundwater level (for any backfill strategy where full or partial voids below the water table remain), groundwater will flow east to west from the Ethel Gorge aquifer to the Orebody 29/30/35 pit voids. However, with the continued operation of the Ophthalmia Dam system, groundwater levels in the Ethel Gorge aquifer would remain within historical levels, to support the stygofauna habitat of the Ethel Gorge TEC. As discussed in Section 7.5.3, impacts from mine voids on groundwater levels at key receptors post-closure will be managed (if required) through the MCP.

Therefore, there is unlikely to be any significant impacts on groundwater regimes from the combined effects of dewatering from the Approved Proposal and the Proposal (i.e. the Combined Proposal), and the combined effects can continue to be managed under the RiWI Act and Part IV of the EP Act (Limitations and Extent of Proposal and MCP) to be consistent with the EPA's objective for Inland Waters.

7.6.2 Changes to surface water regimes

Changes to surface water availability from pit excavation and OSAs

The maximum potential reduction in surface water availability from loss of catchment is predicted to be up to 1.14% of the Whaleback Creek catchment for the Proposal and up to 3.94% of the Whaleback Creek catchment for the Combined Proposal. A reduction in catchment area of less than 5% is within the natural variation of seasonal runoff.

Therefore, there is unlikely to be any significant impacts on surface water availability from the combined effects of from the Approved Proposal and the Proposal (i.e. the Combined Proposal), and the combined effects can be managed according to standard management practices to be consistent with the EPA's objective for Inland Waters.

Changes to surface water flows from discharge of surplus water to Ophthalmia Dam

As discussed in Section 7.4.2.2, the Proposal includes an increase in surplus water from the increase in mine dewatering at Orebody 29/30/35. The proposed rate of surplus water discharge to Ophthalmia Dam for the Combined Proposal is 20.8 GL/a comprising 8 GL/a for the Approved Proposal and 12.8 GL/a for the Proposal.

It is possible that the cumulative discharge from BHP's eastern mines (including surplus water from the Combined Proposal) may exceed the theoretical storage capacity of Ophthalmia Dam during the estimated peak discharge years (for approximately 3 years). As discussed in Section 7.5.2, if required, BHP will manage the surplus discharge volumes from its operations and the operation of the dam according to the EPWRMP to avoid overtopping of the dam spillway and uncontrolled surface flows to the Fortescue River in the dry season (i.e. when there are typically no natural flows). BHP will maintain the current release approach in the EPWRMP (total duration of up to three months in the dry season), to maintain the current (altered) ephemeral surface water regimes in the Fortescue River in the dry season (i.e. when there are typically no natural flows) from the Proposal.

Therefore, there is unlikely to be any significant impacts on surface water regimes from the combined effects of the discharge of surplus water to Ophthalmia Dam from the Approved Proposal and the Proposal (i.e. the Combined Proposal), and the combined effects can continue to be managed under Part IV (EPWRMP) of the EP Act, to be consistent with the EPA's objective for Inland Waters.

7.6.3 Changes to water quality

Changes to water quality from pit excavation and OSAs, and dewatering

As discussed in Sections 7.4.3.1 and 7.5.2, the risk of generating erosion and sedimentation from pits and OSAs, and AMD from waste rock and pit wall exposure from the Proposal is considered to be low. With the application of standard management practices and implementation of the MCP during operations and post-closure (see Sections 7.5.2 and 7.5.3), the risk to water quality from erosion and sedimentation, and AMD for the Proposal and the Combined Proposal is expected to be low.

As discussed in Sections 7.4.3.1 and 7.5.2, the concentration of PFAS in the combined Orebody 29/30/35 dewatered groundwater (i.e. the water from all dewatering bores that is discharged to Ophthalmia Dam) may be higher than the PFAS NEMP ecological freshwater 99% species protection guideline value, but is likely to remain within the range of observed ambient levels of PFAS in ranges in Ophthalmia Dam (except possibly some transient exceedances in the first one to two years of dewatering). PFAS concentrations in the combined surplus dewatered groundwater from Orebody 29/30/35 discharged to Ophthalmia Dam and in surface water within Ophthalmia Dam will remain below 30% of the human health (drinking water) guideline value and 10% of the ecological 95% guideline value published in the PFAS NEMP 2.0 (HEPA 2020). However, PFAS concentrations in the environment (i.e. Ophthalmia Dam, Ethel Gorge aquifer and Fortescue River) are likely to remain within historic maximum concentrations. Given the presence of PFAS sources at the Mt Whaleback mining operations, BHP will monitor and manage the potential impacts of PFAS from the Proposal and Combined Proposal according to the monitoring and criteria proposed in the WPMP (BHP 2024h) to maintain the water quality at environmental receptors.

As discussed in Section 7.4.3.1, post-mining, any Orebody 29/30/35 pit voids that remain open at the completion of mining and dewatering will result in the formation of pit lakes, which will be groundwater sinks. The pit lakes will become more saline over time due to evaporation, however it is not expected that saline water (and any contaminants) would migrate from the pit lakes into the groundwater system.

Therefore, impacts on water quality from pit excavation and infrastructure, and dewatering for the Proposal and Combined Proposal are unlikely to be significant and can be managed according to standard management practices, and under Part V (licence), Part IV (WPMP) and MCP of the EP Act, to be consistent with the EPA's objective for Inland Waters.

Changes to groundwater quality from discharge of surplus water to Ophthalmia Dam

As discussed in Section 7.4.3.2, the modelled groundwater salinity in the Ethel Gorge aquifer for the cumulative surplus water discharge (including surplus water discharge from the Combined Proposal) is predicted to remain below 2,000 mg/L, which is within the range of historical observed groundwater salinity. It is also within the EPWRMP criteria, i.e. below the groundwater salinity early response indicator of 2,500 mg/L TDS (BHP 2024g). As discussed in Section 7.5.2, BHP will continue to manage the potential impacts to groundwater salinity according to the EPWRMP.

Therefore, groundwater salinity in the Ethel Gorge aquifer will be maintained to support the stygofauna habitat of the Ethel Gorge TEC. There is unlikely to be any significant impacts on groundwater quality from the combined effects of the discharge of surplus water to Ophthalmia Dam from the Approved Proposal and the Proposal (i.e. the Combined Proposal), and the combined effects can continue to be managed under Part IV (EPWRMP) and Part V (licence) of the EP Act, to be consistent with the EPA's objective for Inland Waters.

7.6.4 Significant residual impacts

Following the application of the mitigation hierarchy (Section 7.5) and applying the Residual Impact Significance Model in the *WA Offsets Guidelines* (Government of Western Australia 2014), BHP considers that there is no significant residual impact to Inland Waters from the Proposal. See Section 7.7 for the discussion on the outcomes relating to the identified residual impacts and BHP's proposed assurance (regulation) and monitoring, where required.

7.7 Environmental outcomes

Table 7-5 summarises the environmental outcomes, proposed assurance (regulation) and proposed monitoring (if required) for each residual impact of the Proposal for Inland Waters. Detail of the proposed monitoring is set out in the Part IV environmental management plans and other relevant statutory decision-making documents discussed in Section 7.5. Table 7-5 demonstrates how the proposed environmental outcomes for the Proposal, together with the proposed regulation and monitoring, are consistent with the EPA's objective for Inland Waters (Section 7.1).

There are no specific conditions relating to Inland Waters in MS963 for the Approved Proposal. As provided for as an option in the EPA's ERD Instructions, BHP has proposed conditions for the Combined Proposal (including outcome-based conditions related to Inland Waters), for the EPA's consideration, in Appendix 3.

Table 7-5: Inland Waters - Proposal environmental outcomes, proposed regulation and monitoring

Residual impact ¹		Environmental outcome	Proposed regulation (Condition or other statutory decision-making process)	Proposed monitoring	Consistency with EPA's objective
1.	Increase in groundwater abstraction for dewatering. Decrease in groundwater levels (drawdown) in the orebody and regional aquifer from additional dewatering (Section 7.6.1)	Groundwater levels in the regional aquifer will be maintained outside the predicted drawdown extent. Groundwater levels in the Ethel Gorge aquifer will remain within historical levels to support the stygofauna habitat of the Ethel Gorge TEC.	Condition A1 Limitations and Extent of Proposal Limit on rate of annual groundwater abstraction for the Orebody 29/30/35 mine (increase of 16.5 GL/a from 8 GL/a to 24.5 GL/a) RiWI Act s5C licence to take water Amendment to existing Orebody 29/30/35 mine licence GWL160418(8): • limit on rate of annual groundwater abstraction (increase in annual entitlement to 24,500,000 kilolitres (kL)) • condition - Groundwater Operating Strategy • condition - groundwater monitoring reviews	Condition D1 Non Compliance Reporting and Condition D2 Compliance Reporting Non-compliance and compliance reporting and actions RiWI Act s5C licence to take water Continue monitoring in amended Groundwater Operating Strategy (see Table 7-4)	Subject to regulation (EP Act Part IV Condition and RiWI Act Licence), the environmental outcome is likely to be consistent with the EPA's objective
2.	If any Orebody 29/30/35 pit voids are left open post-mining, pit lakes will form. Recovery of groundwater levels lower than pre-development levels (<i>but closer to the pre-development level than predicted for the Western Ridge Approved Proposal</i>) (Section 7.6.1)	Post-mining reduction in groundwater levels in the orebody and regional aquifers in the Orebody 29/30/35 mine area. Groundwater levels in the Ethel Gorge aquifer will remain within historical levels to support the stygofauna habitat of the Ethel Gorge TEC.	Condition B3 Rehabilitation and closure Implementation of the MCP (BHP 2024i)	Condition B3 Rehabilitation and closure Continue monitoring outlined in the MCP (BHP 2024i)	Subject to regulation (EP Act Part IV Condition), the environmental outcome is likely to be consistent with the EPA's objective
3.	Reduction in surface water availability from loss of Whaleback Creek catchment less than 1.14% (Section 7.6.2)	Surface water availability will remain within natural variation of seasonal runoff at the local and regional scale	Standard management practices Design and construct infrastructure (including OSAs) according to applicable Australian Standards and standard		Subject to standard management practices, the environmental outcome is likely to be consistent with the EPA's objective

Residual impact ¹	Environmental outcome	Proposed regulation (Condition or other statutory decision-making process)	Proposed monitoring	Consistency with EPA's objective
		internal management practices, to minimise the impacts of catchment loss on surface water flows		
4. Increase in surplus water discharge to Ophthalmia Dam. Ophthalmia Dam storage capacity may be reached in peak discharge years from additional surplus water from Orebody 29/30/35 (Section 7.6.2)	The current (altered) ephemeral surface water regime to the Fortescue River downstream of Ophthalmia Dam will be maintained	Condition B1 Inland Waters EPWRMP (BHP 2024g): Limit on total annual duration of controlled release of water from Ophthalmia Dam during the dry season	Condition B1 Inland Waters Monitor opening and closing of dam valve to Upper Fortescue tributaries, to track release durations (EPWRMP; BHP 2024g)	Subject to regulation (EP Act Part IV Condition), the environmental outcome is likely to be consistent with the EPA's objective
5. Potential increase in groundwater salinity in Ethel Gorge aquifer from cumulative discharge to Ophthalmia Dam (including additional surplus water discharge from Orebody 29/30/35) (Section 7.6.3)	Groundwater salinity in the Ethel Gorge aquifer will be maintained within historical levels to support the stygofauna habitat of the Ethel Gorge TEC	Condition A1 Limitations and Extent of Proposal Limit on rate of annual discharge of surplus water from the Orebody 29/30/35 to Ophthalmia Dam (increase of 12.8 GL/a from 8 GL/a to 20.8 GL/a) Condition B1 Inland Waters Implementation of the EPWRMP (BHP 2024g): - groundwater salinity criteria in the Ethel Gorge aquifer - groundwater salinity monitoring EP Act Part V licence Amendment to existing Mt Whaleback mining operations licence (L4503/1975/14): - limit on surplus discharge from Orebody 29/30/35 to Ophthalmia Dam (Category 6: Mine dewatering) (increase to 20,800,000 tonnes per annual period) - monitoring conditions related to surplus discharge from Orebody 29/30/35	Condition B1 Inland Waters Continue groundwater level and salinity monitoring outlined in the EPWRMP (BHP 2024g) EP Act Part V licence Continue monitoring in Licence (see Table 7-4)	Subject to regulation (EP Act Part IV Condition and Part V Licence), the environmental outcome is likely to be consistent with the EPA's objective

Residual impact ¹		Environmental outcome	Proposed regulation (Condition or other statutory decision-making process)	Proposed monitoring	Consistency with EPA's objective
6.	Migration of PFAS contaminants from Orebody 29/30/35 dewatering and discharge of surplus water to Ophthalmia Dam (Section 7.6.3)	PFAS concentrations in the combined surplus dewatered groundwater from Orebody 29/30/35 discharged to Ophthalmia Dam and in surface water within Ophthalmia Dam will remain below 30% of the human health (drinking water) guideline value and 10% of the ecological 95% guideline value published in the PFAS NEMP 2.0 (HEPA 2020)	Condition B1 Inland Waters Implementation of the WPMP (BHP 2024h): - PFAS groundwater and surface water (Ophthalmia Dam) monitoring - PFAS concentration criteria in groundwater and surface water (Ophthalmia Dam) EP Act Part V Amendment to existing Mt Whaleback mining operations licence (L4503/1975/14): - PFAS groundwater and surface water (Ophthalmia Dam) monitoring - PFAS concentration criteria in groundwater and surface water (Ophthalmia Dam)	EP Act Part V licence Amend Licence conditions setting out monitoring requirements (see Table 7-4)	Subject to regulation (EP Act Part V Licence and (if required) a Part IV Condition), the environmental outcome is likely to be consistent with the EPA's objective
7.	Potential changes to water quality from erosion and sedimentation, and AMD. Increased salinity in pit lakes remaining at closure	Water quality at environmental receptors is likely to be below site-specific limits of concern and remain within acceptable ranges	Standard management practices Design and construct infrastructure (including OSAs) according to applicable Australian Standards and standard internal management practices, to minimise the impacts on water quality Condition B3 Rehabilitation and closure Implementation of the MCP (BHP 2024i)	Condition B3 Rehabilitation and closure Continue management of AMD and pit voids in the MCP (BHP 2024i)	Subject to standard management practices and regulation (EP Act Part IV Condition), the environmental outcome is likely to be consistent with the EPA's objective

1. This table is for the Proposal only unless otherwise specified. See the Proposal Content Document (Appendix 1) and the proposed implementation conditions (Appendix 3) for proposed implementation conditions for the Amended Proposal (Approved Proposal and Proposal).

8 Flora and Vegetation

8.1 EPA environmental factor and objective

The EPA's objective for the Flora and Vegetation factor is:

To protect flora and vegetation so that biological diversity and ecological integrity are maintained.

8.2 Relevant policy and guidance

BHP assessed this environmental factor considering the following relevant EPA policies and guidance, as outlined in Table 8-1.

Table 8-1: Flora and Vegetation - policy and guidance

EPA, other State and Commonwealth policy and guidance	Consideration of EPA policy and guidance
<i>Environmental Factor Guideline - Flora and Vegetation</i> (EPA 2016a)	- Applied the relevant considerations for environmental impact assessment - Identified the values of flora and vegetation, and their significance - Identified activities that can impact on flora and vegetation - Considered the links with other environmental factors
<i>Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment</i> (EPA 2016b)	Surveys described in Section 8.3.1 were undertaken in accordance with this guidance
<i>WA Environmental Offsets Policy</i> (Government of Western Australia 2011) <i>WA Environmental Offsets Guidelines</i> (Government of Western Australia 2014)	- Applied avoidance and mitigation measures to the Proposal - Considered cumulative impacts in the regional context in determining significant residual impact - Quantified the significant residual impact

8.3 Receiving environment

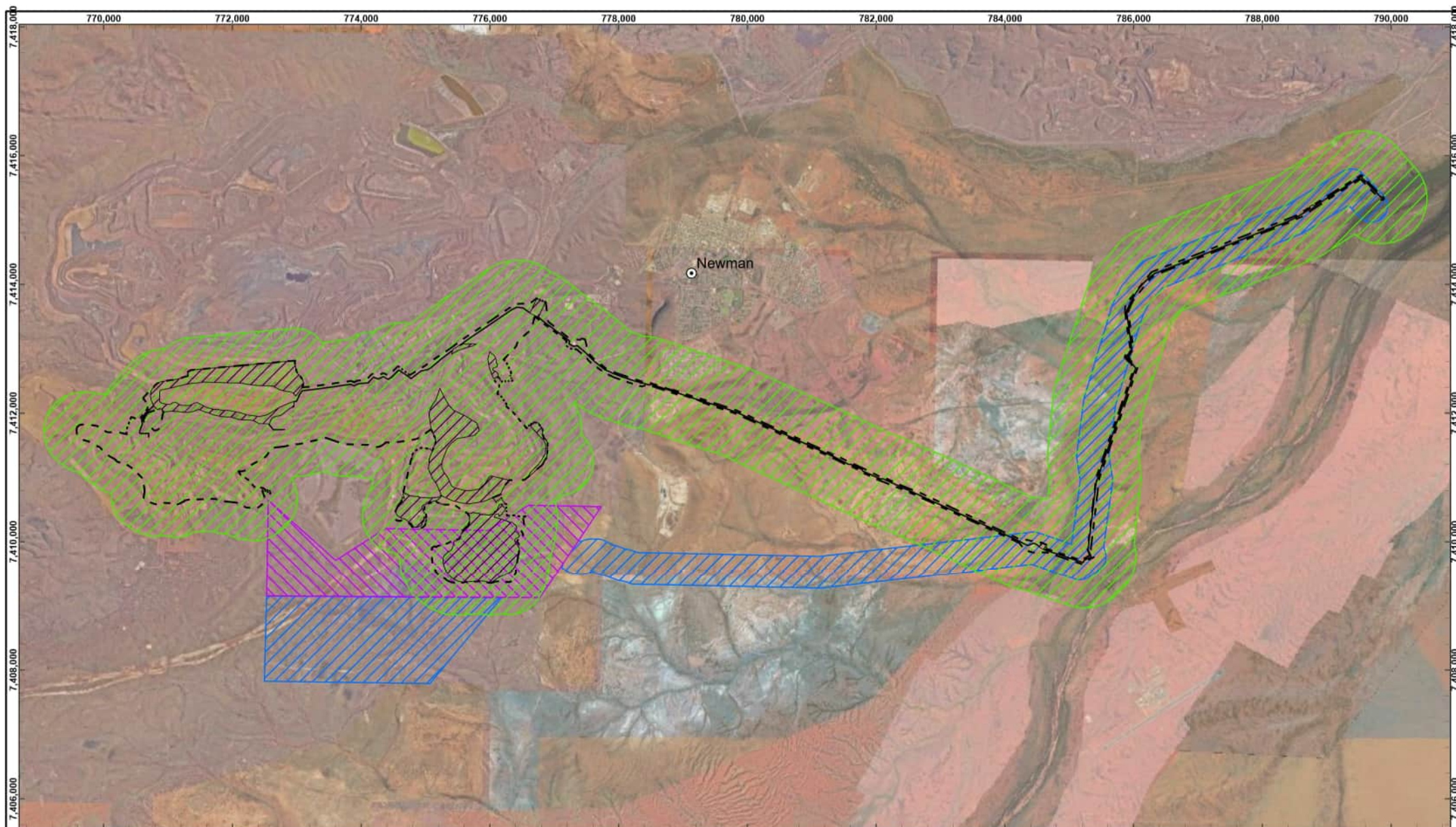
8.3.1 Studies and surveys

A total of 23 flora and vegetation surveys have been undertaken wholly or partially within the Development Envelope and extending into the surrounding areas. These surveys cover the entire Development Envelope, and comprise 11 detailed surveys, nine reconnaissance surveys (with the most recent three also being combined targeted surveys), two targeted surveys and one desktop assessment. All surveys were completed in accordance with the EPA guidance (relevant at the time of surveying). Surveys undertaken post-2009 have also been completed in accordance with BHP's *Vegetation and Flora Survey Procedure* (BHP 2018b) that was developed in consultation with the DBCA to ensure a consistent approach for all surveys undertaken for BHP.

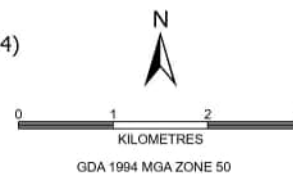
Table 8-2 summarises the more recent and relevant surveys undertaken across the Development Envelope to support the assessment of Flora and Vegetation for the Proposal, and Figure 8-1 shows the location of these surveys. Recent flora and vegetation surveying occurs across the entire Development Envelope and immediate surrounds. BHP has provided the data for the recent surveys as part of the IBSA data package (see Appendix 16). A complete list and summary of all surveys across the Development Envelope is provided in Appendix 8.

Table 8-2: Flora and Vegetation - recent studies and surveys

Title	Date	Summary	Appendix
OB29, 30 and 35 Expansion and Newman Surplus Water Reconnaissance Flora and Vegetation Survey (Spectrum 2024)	Mar 2024	Single phase reconnaissance and targeted flora and vegetation survey of the Development Envelope and immediate (approximately 500 m) surrounds. The survey comprised 67 relevés and 75.6 km of traverses, to identify and map the vegetation associations and conditions of the survey area, and search for the presence of significant flora.	Appendix 9
Western Ridge Pipeline Reconnaissance Flora and Vegetation Survey (Biologic 2022a)	Mar 2021 Mar 2022	Reconnaissance and targeted flora and vegetation survey that covers the eastern portion of the pipeline section of the Development Envelope. The survey area was sampled with 148 relevés, 46 mapping notes and opportunistic sampling, with all major vegetation communities sampled. Vegetation associations and condition of the survey area were delineated and mapped, and searches undertaken for significant flora.	Appendix 9
Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey (Biologic 2022b)	Mar 2021	Single phase reconnaissance and targeted flora and vegetation survey covering the southern portion of the Development Envelope (specifically the OSA expansion) and surrounds. A total of 21 relevés and traverses were sampled across the area, with all major vegetation communities sampled. Vegetation associations and condition of the survey area were delineated and mapped, and searches undertaken for significant flora.	Appendix 9



- Indicative Footprint
- Development Envelope
- OB29, 30 and 35 Expansion and Newman Surplus Water Reconnaissance Flora and Vegetation Survey (Spectrum 2024)
- Western Ridge Pipeline Reconnaissance Flora and Vegetation Survey (Biologic 2022a)
- Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey (Biologic 2022b)



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**OREBODY 29/30/35
SIGNIFICANT AMENDMENT
FLORA AND VEGETATION SURVEYS**

PLANNING & STANDARDS - IRON ORE

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DATE:	21/11/2024	REQUESTOR:	ENV APPROVALS	NO:	
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8.3.2 Environmental values

8.3.2.1 Regional values

The Proposal is located on the boundary between the Pilbara and Gascoyne bioregions as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) (DCCEEW 2023). The Hamersley subregion (PIL3) of the Pilbara bioregion dominates the Development Envelope, with the Augustus subregion (GAS3) of the Gascoyne bioregion occurring across the eastern extent of the pipeline portion of the Development Envelope (Figure 8-2).

According to broad scale regional vegetation mapping of the Pilbara, the Development Envelope occurs within the Fortescue Botanical District, which is part of the Eremaean Botanical Province (Beard 1990). The Fortescue Botanical District is dominated by tree and shrub steppe communities consisting mainly of *Eucalyptus* and *Acacia* species with *Triodia pungens* and *Triodia wiseana*; some Mulga (*Acacia aptaneura*) occurs in valley areas and short grass plains on alluvia.

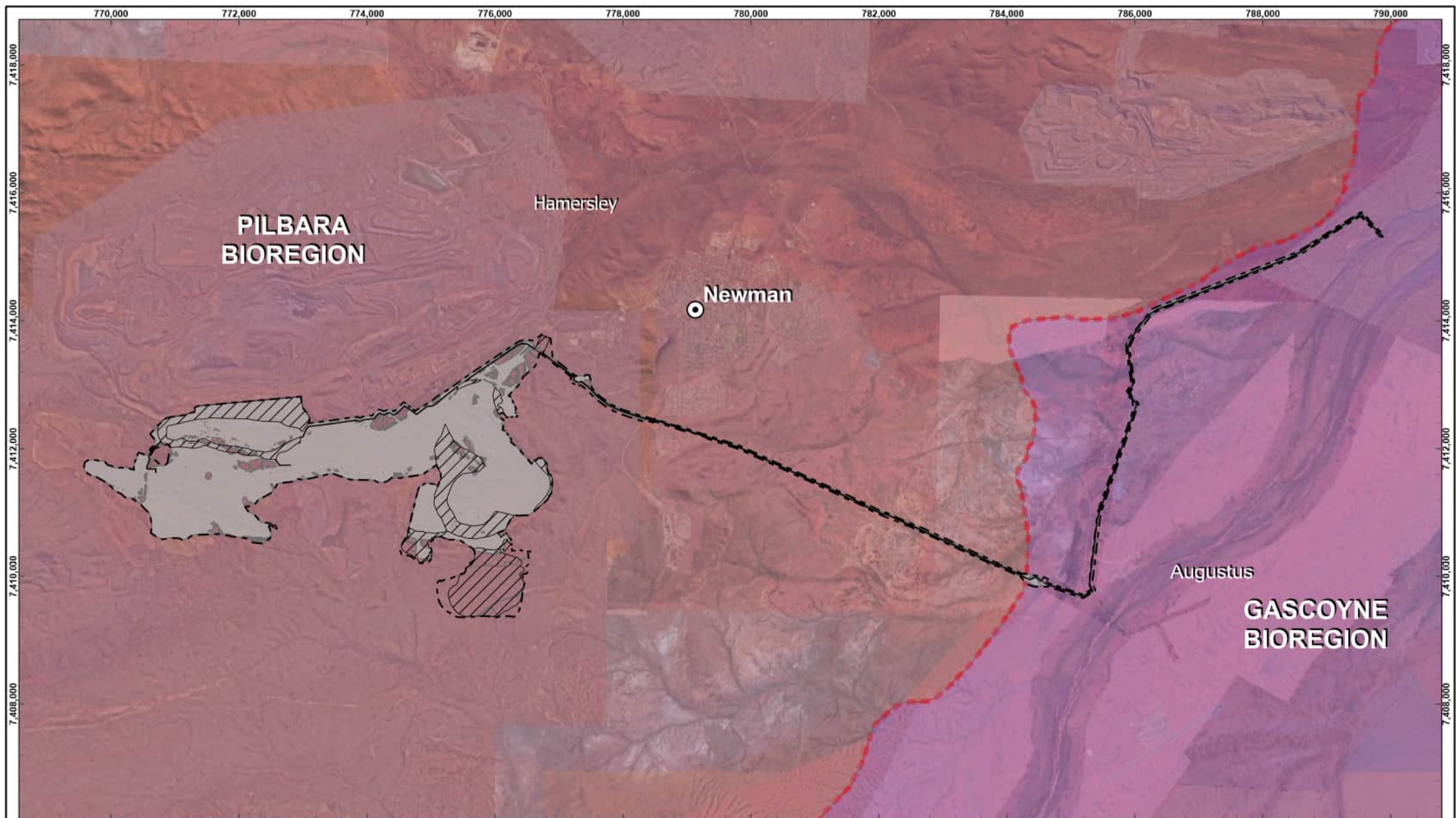
The vegetation of the Development Envelope, as mapped by Beard (1975) and refined by Shepherd *et al.* (2002), is classified as the following three associations occurring across the Pilbara and Gascoyne bioregions (Figure 8-3):

- Association 18 – low woodland; mulga (*Acacia aneura*)
- Association 29 – sparse low woodland; mulga, discontinuous in scattered groups
- Association 82 – hummock grasslands, low tree steppe; Snappy gum over *Triodia wiseana*.

Association 82 is the dominant association within the Development Envelope, occurring across approximately 85% of the areas of remaining native vegetation (noting 82% of the Development Envelope is already cleared/disturbed) (Figure 8-3). The regional vegetation associations that occur within the Development Envelope all have over 99% of their pre-European extent remaining in Western Australia and occur broadly within, or extending beyond, the Pilbara and Gascoyne bioregions.

The Ethel Gorge Threatened Ecological Community (TEC) and its 2 km buffer overlap the eastern extent of the pipeline portion of the Development Envelope (Figure 7-3). This TEC is listed as a Critically Endangered community in Western Australia, under the *Biodiversity Conservation Act 2016* (BC Act). It is a subterranean community occurring in the alluvium calcrete aquifer on the Fortescue River and is listed due to the unique and diverse assemblage of stygofaunal species. As this subterranean community is not relevant to the assessment of Flora and Vegetation, it is not discussed further in this section.

No Priority Ecological Communities (PECs) have been recorded from within, or adjacent to, the Development Envelope.



--- Development Envelope

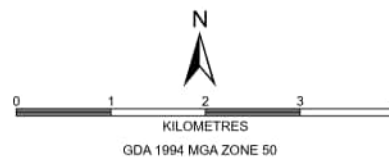
▨ Indicative Footprint

■ Cleared Area

IBRA Subregions

■ Augustus Subregion

■ Hamersley Subregion



BHP

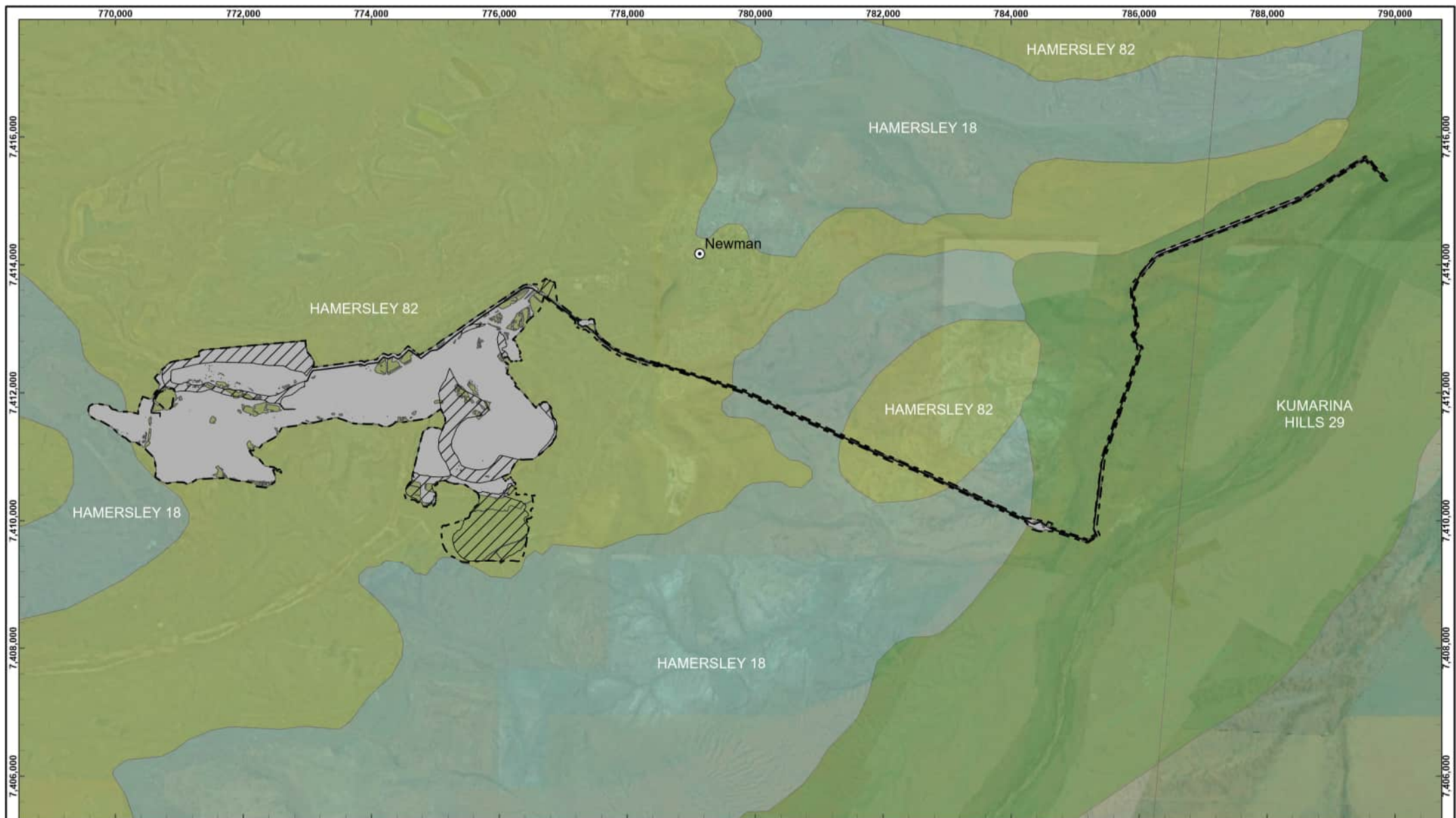
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**OREBODY 29/30/35
SIGNIFICANT AMENDMENT
IBRA BIOREGIONS AND SUBREGIONS**

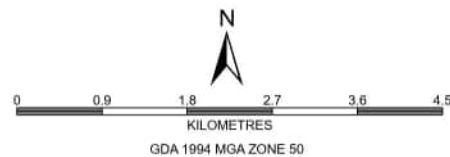
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- | | | | |
|--|----------------------|---|---------------------------|
|  | Cleared Area |  | Vegetation Association 18 |
|  | Development Envelope |  | Vegetation Association 82 |
|  | Indicative Footprint |  | Vegetation Association 29 |



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**OREBODY 29/30/35
SIGNIFICANT AMENDMENT
BEARD VEGETATION ASSOCIATIONS**

PLANNING & STANDARDS - IRON ORE

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8.3.2.2 Vegetation

Detailed vegetation mapping across the Development Envelope was completed by Spectrum (2024). A total of nine vegetation associations were described and mapped, eight of which occur within the Development Envelope (Table 8-3, Figure 8-4). The dominant vegetation association of the Development Envelope is *Triodia* hummock grassland with *Eucalyptus* woodland and mixed *Acacia* shrubland occurring on hill crests (Spectrum 2024).

Table 8-3: Flora and Vegetation - vegetation associations

Vegetation code	Vegetation association description	Significance
HC TwTvTp Ell AmaAbAi	Hummock Grassland of <i>Triodia wiseana</i> , <i>Triodia vanleeuwenii</i> and <i>Triodia pungens</i> with a Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> with an Open Shrubland of <i>Acacia maitlandii</i> , <i>Acacia bivenosa</i> and <i>Acacia inaequilatera</i> on red-orange loam on hill crests.	
FS TpTvCc AaAprAin AsiAteAme	Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia vanleeuwenii</i> with a Tussock Grassland of <i>*Cenchrus ciliaris</i> , with a Woodland of <i>Acacia aptaneura</i> , <i>Acacia pruinocarpa</i> and <i>Acacia incurvaneura</i> with Scattered Tall Shrubs of <i>Acacia sibirica</i> , <i>Acacia tetragonophylla</i> and <i>Acacia melleodora</i> on red-orange clay loam soils on gravel foot slopes.	
FP TpCc AmaAsyAb AaHallCh	Hummock Grassland of <i>Triodia pungens</i> with Sparse Tussock Grassland of <i>*Cenchrus ciliaris</i> , with Open Shrubland of <i>Acacia maitlandii</i> , <i>Acacia synchronicia</i> and <i>Acacia bivenosa</i> with Low Open Woodland of <i>Acacia aptaneura</i> , <i>Hakea lorea</i> subsp. <i>lorea</i> and <i>Corymbia hamersleyana</i> on red-orange clay loam to sandy loam floodplain.	Associated with Elimunna land system – possible restricted distribution
MI AaCocAci CcTp AteAprAsy	Low Woodland of <i>Acacia aptaneura</i> , <i>Corymbia candida</i> and <i>Acacia citrinoviridis</i> with Open Tussock Grassland of <i>*Cenchrus ciliaris</i> with Very Open Hummock Grassland of <i>Triodia pungens</i> with High Open Shrubland of <i>Acacia tetragonophylla</i> , <i>Acacia pruinocarpa</i> and <i>Acacia synchronicia</i> on red orange to red-brown clay to clay loam soils on minor drainage lines.	
MA EvEcAci CcErbTp AsyPIAa	Woodland of <i>Eucalyptus victrix</i> , <i>Eucalyptus camaldulensis</i> and <i>Acacia citrinoviridis</i> with Open Tussock Grassland of <i>*Cenchrus ciliaris</i> and <i>Eriachne benthamii</i> with Open Hummock Grassland of <i>Triodia pungens</i> with High Open Shrubland of <i>Acacia synchronicia</i> and <i>Acacia aptaneura</i> on red-orange clay loam to sandy clay loam on major drainage lines.	Major drainage line riparian vegetation – Ecosystem at risk in the Hamersley subregion
FS TpTv EgAprAi AmeSalAsi	Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia vanleeuwenii</i> with Low Open Woodland of <i>Eucalyptus gamophylla</i> , <i>Acacia pruinocarpa</i> and <i>Acacia inaequilatera</i> with Scattered Shrubs of <i>Acacia melleodora</i> , <i>Santalum lanceolatum</i> and <i>Acacia sibirica</i> on red-orange loam soils on minor drainage of lower foot slopes.	
CY CyconDishsv PtgoOpa Seo	Tussock Grassland of <i>Cynodon convergens</i> , <i>Dichanthium sericeum</i> subsp. <i>humilis</i> and <i>Iseilema vaginiflorum</i> with Very Open Herbs of <i>Ptilotus gomphrenoides</i> and <i>Operculina aequisejala</i> with Low Scattered Shrubs of <i>Senna artemisioides</i> subsp. <i>oligophylla</i> on red-orange clay loam on cracking clay plains.	
SP AsyAteAb Tp HapAaGrst	High Open Shrubland of <i>Acacia synchronicia</i> , <i>Acacia tetragonophylla</i> and <i>Acacia bivenosa</i> with Very Open Hummock Grassland of <i>Triodia pungens</i> and Low Open Woodland of <i>Hakea preissii</i> , <i>Acacia aptaneura</i> and <i>Grevillea striata</i> on red orange to red-brown sandy loam to sandy clay loam soils on gravel plains.	Associated with Spearhole land system – possible restricted distribution

1. Asterisk on flora species denotes introduced flora (weed) species

Significant vegetation

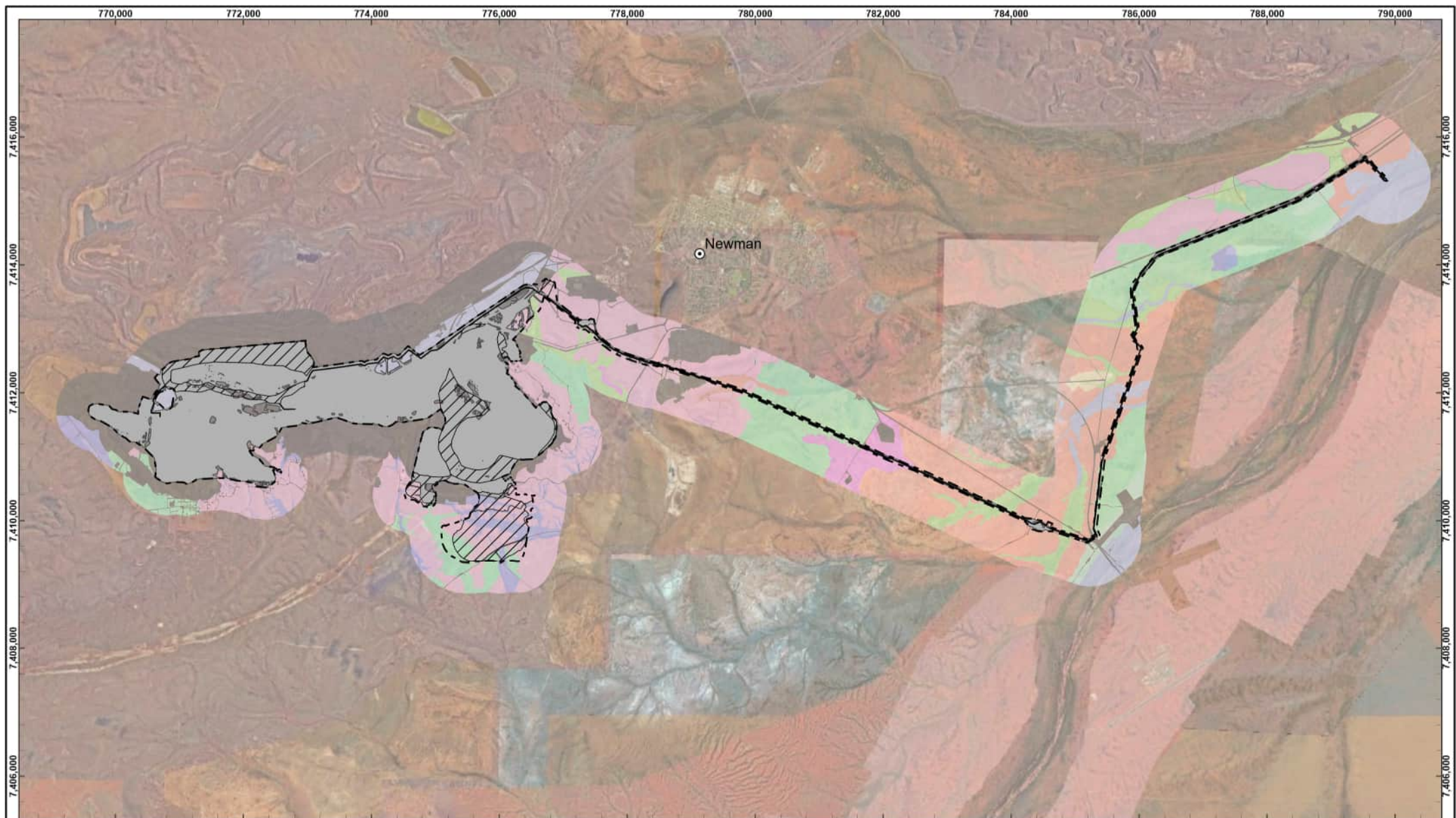
None of the vegetation associations described from the Development Envelope align with any TECs and PECs known to occur in the Pilbara or Gascoyne bioregions. While Spectrum (2024) identified vegetation association CY CyconDishIsv PtgoOpa Seao as sharing some similarities with the Priority 1 PEC West Angeles Cracking-Clays, the association lacked some of the characteristic species of the PEC and does not align with the Jeerinah formation on which this PEC occurs. Therefore, this vegetation association was assessed as unlikely to represent the West Angeles Cracking-Clays PEC (Spectrum 2024) and is not considered significant.

In the Hamersley subregion, all major ephemeral water courses are listed as 'ecosystems at risk' by the DBCA due to threats from grazing and weed invasion, as described by Kendrick (2001). Spectrum (2024) mapped major drainage line vegetation (association MA EvEcAci CcErbTp AsyPIAa) within the Hamersley subregion occurring in Whaleback Creek and tributaries of the Fortescue River (occurring on the boundary of the subregion) (Table 8-3, Figure 8-5). This riparian vegetation contains *Eucalyptus camaldulensis* in association with *Eucalyptus victrix*. *Eucalyptus camaldulensis* is a facultative phreatophyte tree species and may utilise groundwater when it is at an accessible depth (i.e. groundwater shallow enough for tree roots to reach). *Eucalyptus victrix* is a vadophyte, or in certain situations a facultative phreatophyte. Therefore, this major drainage line vegetation association may be groundwater dependent.

Based on the definitions of significant vegetation in the EPA guidance (EPA 2016a) and the likely occurrence of the vegetation associations within the region, Spectrum (2024) identified two vegetation associations within the Development Envelope that may be considered significant. Association SP AsyAteAb Tp HapAaGrst occurs on the Spearhole land system and association FP TpCc AmaAsyAb AaHallCh occurs on the Elimunna land system, with both land systems having limited regional extents (Spectrum 2024) (Table 8-3). These association occur within the pipeline portion of the Development Envelope (Figure 8-5).

Vegetation condition

Spectrum mapped the vegetation condition of the Development Envelope in 2024 (Spectrum 2024). A large portion (82%) of the Development Envelope has already been disturbed as part of existing operations. Of the native vegetation mapped in the Development Envelope (comprising approximately 246 ha of the Development Envelope), most (52%) is rated as being in Excellent condition (Figure 8-6). Poorer vegetation condition within the Development Envelope is primarily related to areas adjacent to existing infrastructure, and the occurrence of cattle grazing and weed species in low lying areas (Spectrum 2024).

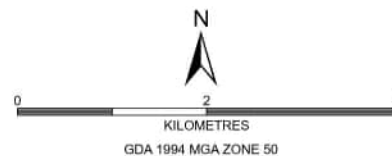


- Development Envelope
- Indicative Footprint
- Cleared Area

Vegetation Association Code

- CY CyconDishlv PtgoOpa Seao
- FP TpCc AmaAsyAb AaHallCh
- FS TpTv EgAprAi AmeSalAsi
- FS TpTvCc AaAprAin AsiAteAme
- HC TwTvTp Ell AmaAbAi
- HS Tv Me

- MA EvEcAci CcErbTp AsyPIAa
- MI AaCocAci CcTp AteAprAsy
- SP AsyAteAb Tp HapAaGrst
- Cleared



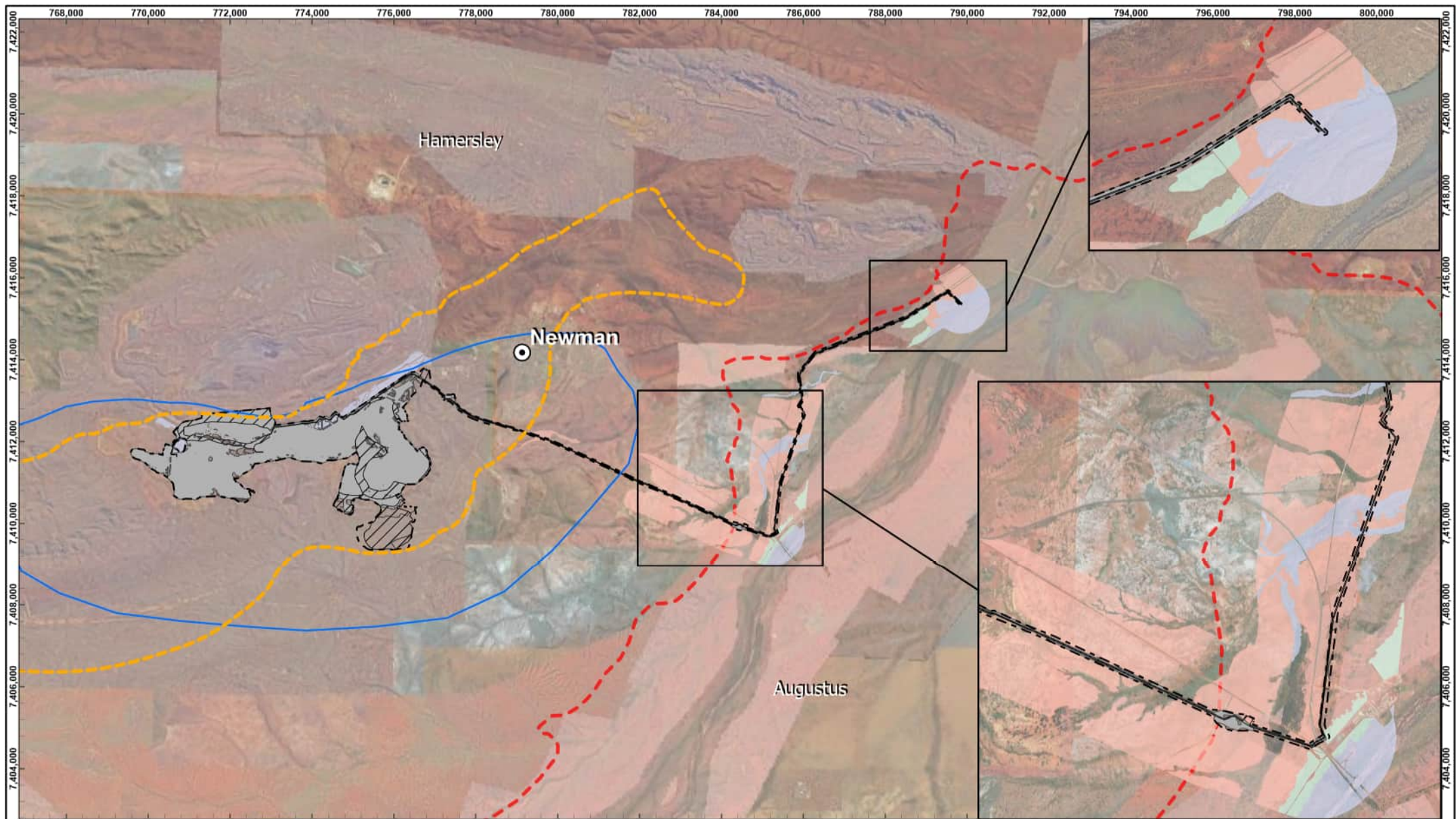
BHP

PUBLIC

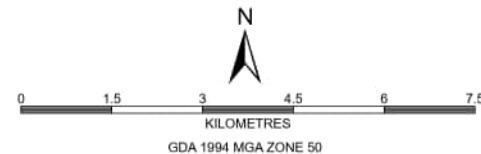
OREBODY 29/30/35 SIGNIFICANT AMENDMENT VEGETATION ASSOCIATION MAPPING

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:80,000 PREPARED: GEOMATICS FIGURE: 8-4
DATE: 21/11/2024 REQUESTOR: ENV APPROVALS NO:
REVIEWED: A929_055-RevE



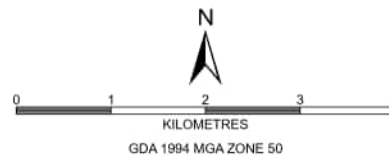
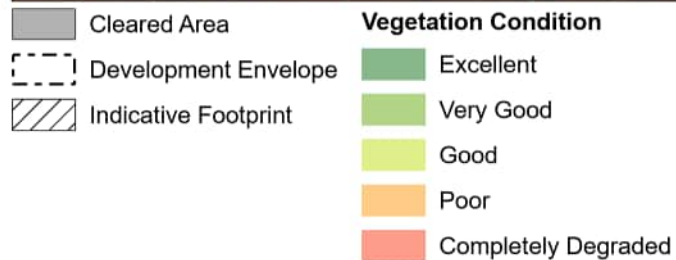
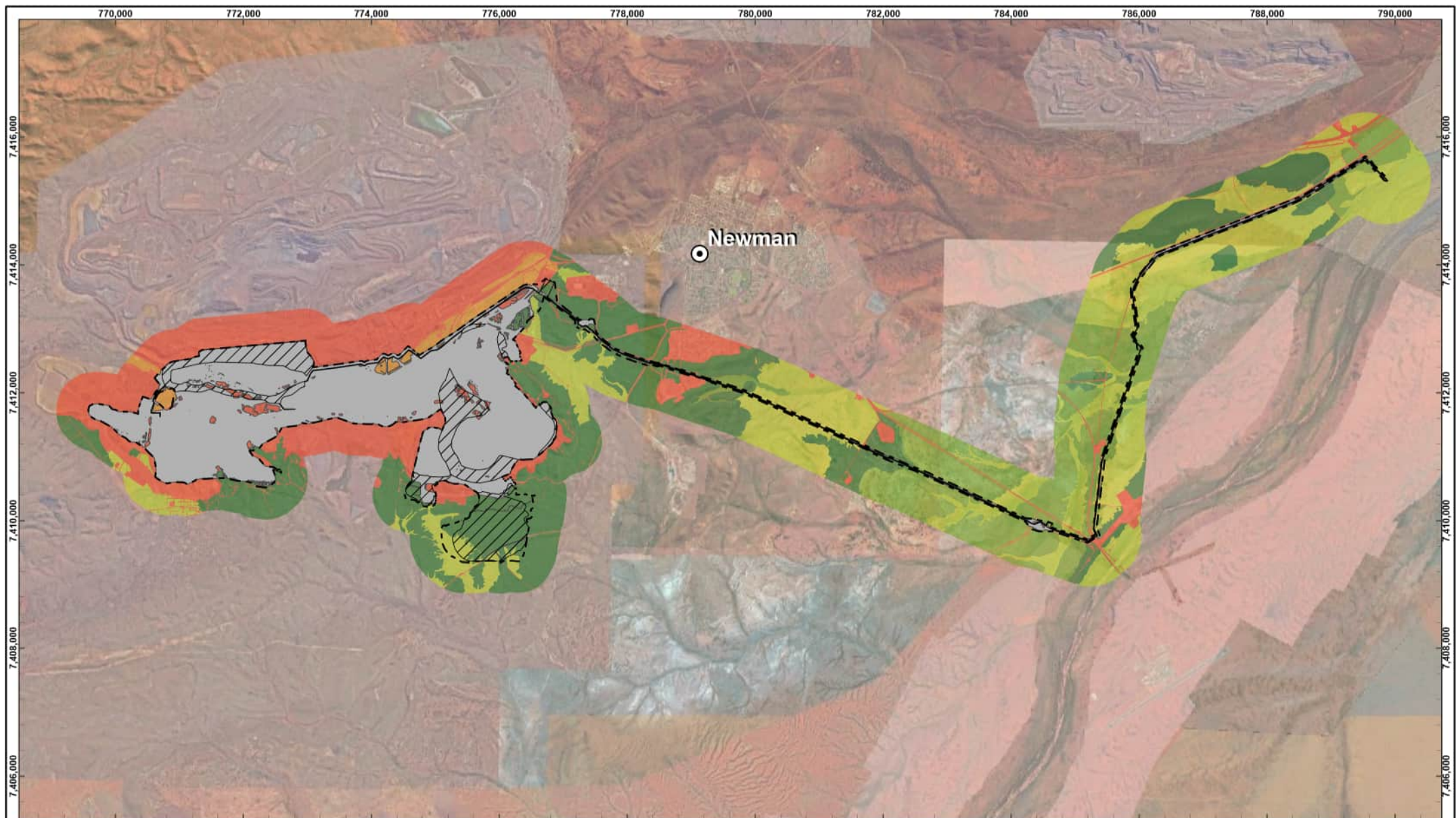
- - - Development Envelope
 / / / Indicative Footprint
 ■ Cleared Area
 - - - IBRA Subregion Border
- 2013 Orebody 29/30/35 assessed groundwater drawdown
 2024 Orebody 29/30/35 predicted groundwater drawdown
- Vegetation Association Code**
 FP TpCc AmaAsyAb AaHallCh
 MA EvEcAci CcErbTp AsyPIAa
 SP AsyAteAb Tp HapAaGrst



BHP PUBLIC

OREBODY 29/30/35
SIGNIFICANT AMENDMENT
SIGNIFICANT VEGETATION
ASSOCIATIONS
PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:125,000 PREPARED: GEOMATICS FIGURE: 8-5
 DATE: 12/09/2024 REQUESTOR: ENV APPROVALS NO:
 REVIEWED: A929_056-RevD






OREBODY 29/30/35 SIGNIFICANT AMENDMENT VEGETATION CONDITION

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:80,000	PREPARED: GEOMATICS	FIGURE: 8-6
DATE:	16/08/2024	REQUESTOR: ENV APPROVALS	NO:
		REVIEWED:	A929_057-RevC

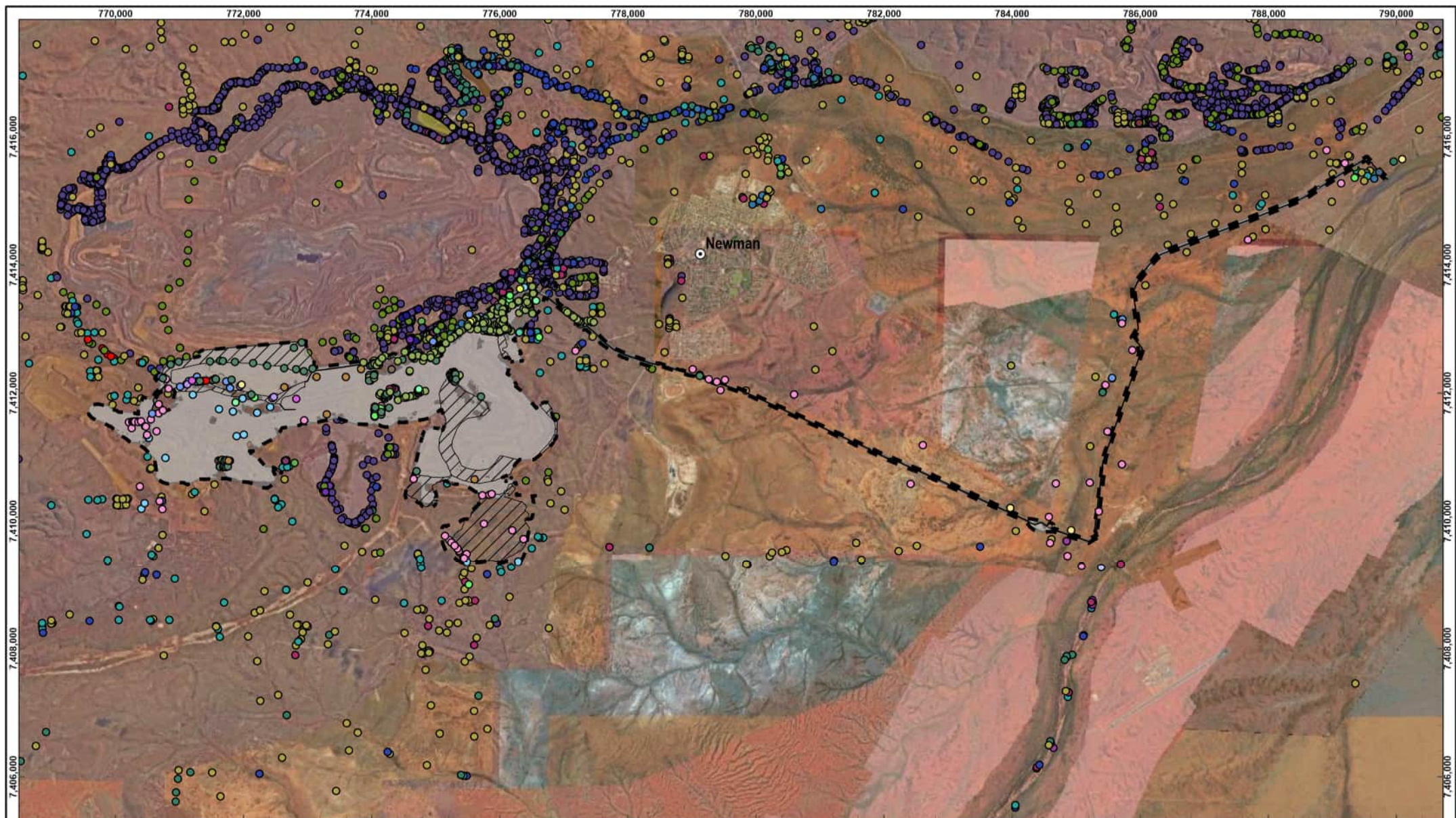
8.3.2.3 Significant flora

Targeted surveying completed by Spectrum in 2024 recorded two Priority 3 flora species, *Ipomoea racemigera* and *Eremophila naaykensis* (Spectrum 2024), both of which occur more than 200 m from the Development Envelope. No plant taxon gazetted as Threatened Flora under the BC Act or under the EPBC Act, or Priority flora as listed by the DBCA, have been recorded within the Development Envelope. Significant flora will therefore not be discussed further.

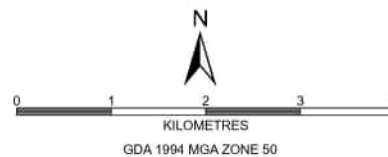
8.3.2.4 Introduced flora

A total of 18 introduced flora (weed) species have been recorded within the Development Envelope (Figure 8-7). The most commonly recorded introduced flora species is *Aerva javanica* (Kapok Bush). Introduced flora species occur predominantly in existing disturbance and infrastructure areas (Figure 8-7).

None of the introduced flora species are listed as Weeds of National Significance or as a Declared Pest under the *Biosecurity and Agriculture Management Act 2007* (WA) (BAM Act).



- | | | |
|------------------------------|--------------------------------|-------------------------------|
| Cleared Area | * <i>Chloris virgata</i> | * <i>Solanum nigrum</i> |
| Development Envelope | * <i>Cynodon dactylon</i> | * <i>Sonchus oleraceus</i> |
| Indicative Footprint | * <i>Echinochloa colona</i> | * <i>Vachellia farnesiana</i> |
| * <i>Aerva javanica</i> | * <i>Erigeron bonariensis</i> | |
| * <i>Argemone ochroleuca</i> | * <i>Euphorbia hirta</i> | |
| * <i>Bidens bipinnata</i> | * <i>Lactuca serriola</i> | |
| * <i>Cenchrus ciliaris</i> | * <i>Malvastrum americanum</i> | |
| * <i>Cenchrus setiger</i> | * <i>Rumex vesicarius</i> | |
| * <i>Chloris barbata</i> | * <i>Sisymbrium orientale</i> | |



BHP

PUBLIC

OREBODY 29/30/35 SIGNIFICANT AMENDMENT INTRODUCED FLORA

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:80,000	PREPARED:	GEOMATICS	FIGURE:	8-7
DATE:	25/11/2024	REQUESTOR:	ENV APPROVALS	NO:	
		REVIEWED:			

A929_059-RevH

8.4 Potential environmental impacts

BHP has considered the development activities that have the potential to impact on flora and vegetation outlined in the EPA's *Environmental Factor Guideline – Flora and Vegetation* (EPA 2016a) and considers that those relevant to the Proposal are:

- loss of vegetation from clearing (direct)
- changes to vegetation from changes to groundwater regimes (indirect)
- changes to vegetation from dust, fire and weeds (indirect).

As the potential impacts to surface water flows from the proposed surplus water pipeline will be negligible (Section 7.4.2.1) and the estimated reduction of surface water availability in the Whaleback Creek catchment is within the natural variation of seasonal runoff (Section 7.6.2), BHP considers there will be no potential impact to vegetation from changes to surface water regimes from the Proposal.

A large portion (82%) of the Development Envelope has been cleared for the Approved Proposal and mining at Mt Whaleback (Section 2.3; Figure 2-2), in accordance with existing approval mechanisms. BHP has focused the discussion of potential impacts of the Proposal on the areas within the Indicative Footprint that support vegetation and are required to be cleared for the Proposal.

As the Approved Proposal is for mining of Orebody 29/30/35 below the water table only (i.e. abstraction of groundwater and discharge of surplus water), potential impacts on flora and vegetation assessed as part of the Approved Proposal were limited to the potential impact on groundwater dependent vegetation (GDV) from the abstraction of groundwater resulting in drawdown. Assessment of the effect of the Combined Proposal will therefore be limited to the potential impact on GDV.

Other potential impacts on flora and vegetation associated with the Approved Proposal were assessed under the Mt Whaleback Native Vegetation Clearing Permit (NVCP) (5617/6), which approved the clearing of native vegetation for the mining of Orebody 29/30/35 and associated activities. As such, there are no other combined effects on flora and vegetation from the implementation of the Approved Proposal and the Proposal. The cumulative impacts of the Proposal and existing operations at Orebody 29/30/35, as well as the adjacent Mt Whaleback and Western Ridge operation, are considered under Section 17 for the cumulative environmental impact assessment.

Unless specified otherwise, the potential impacts discussed in this section are unmitigated (i.e. potential impacts before mitigation measures are applied, if required).

8.4.1 Loss of vegetation from clearing

The Proposal will result in the direct clearing of up to 116 ha of native vegetation in the Indicative Footprint (312 ha) (Section 2.3).

Clearing of native vegetation for the Proposal has the potential to affect the ecological integrity of vegetation at the regional and local scale (Section 8.4.1.1 and Section 8.4.1.2) and reduce the condition of vegetation, particularly where the existing vegetation is in Good to Excellent condition (Section 8.4.1.2).

8.4.1.1 Regional values

Three vegetation associations (as described by Beard (1975)) are located within the Development Envelope (Figure 8-3). Table 8-4 shows the area of each association within the Development Envelope and Indicative Footprint.

Based on the Indicative Footprint, the potential impact of the Proposal on any association is less than 0.01% of the current extent for the associations in the Pilbara or Gascoyne bioregions (Table 8-4).

Table 8-4: Flora and Vegetation - potential impacts to Beard (1975) vegetation units

Beard Vegetation Association	Pre-European Extent (ha) ¹	Current Extent (ha) ¹	% of Association remaining	Area in Development Envelope (ha) ²	Area in Indicative Footprint (ha) ²	% of Association remaining ³	% reduction as a result of the Proposal
Pilbara bioregion							
18	676,557	671,843	99.30	11.08	0.16	99.30	0.002
82	2,563,583	2,550,888	99.50	208.1	111.2	99.50	0.008
Gascoyne bioregion							
29	3,802,460	3,799,636	99.93	26.4	4.7	99.93	<0.001

2. Pre-European Extent and Current Extent based on latest available (2018) DBCA data for the extent occurring within the Pilbara bioregion for association 18 and 82, or Gascoyne bioregion for association 29 (Government of Western Australia 2019a)
3. Area within the Development Envelope and Indicative Footprint minus areas already cleared under the Mt Whaleback NVCP 5617/6 or other approval mechanisms
4. Current Extent within the bioregion minus area of proposed clearing within the Indicative Footprint, as a percentage of Pre-European Extent

8.4.1.2 Vegetation

As detailed in Section 8.3.2.2, eight vegetation associations have been mapped within the Development Envelope, three of which have been identified as potentially significant (Table 8-3). Table 8-5 shows the area of each of these vegetation associations within the Development Envelope and Indicative Footprint.

Vegetation association MA EvEcAci CcErbTp AsyPIAa has been mapped within the major drainage line Whaleback Creek and within tributaries of Fortescue River (Figure 8-5) and represents riparian vegetation. This vegetation is considered to represent an 'ecosystem at risk' in the Hamersley subregion. Spectrum mapped this vegetation association occurring across 294 ha of the survey area (Spectrum 2024). Within the Development Envelope, this vegetation association occurs across approximately 14 ha (Table 8-5), with 11.5 ha occurring in the Hamersley subregion. Less than 0.5 ha of this vegetation association within the Hamersley subregion occurs in the Indicative Footprint, representing 0.17% of the extent mapped by Spectrum (2024) (Table 8-5).

Two vegetation associations were considered to potentially be regionally significant as they occur in association with land systems that have a limited distribution across the Pilbara and Gascoyne bioregions, FP TpCc AmaAsyAb AaHallCh and SP AsyAteAb Tp HapAaGrst. Both vegetation associations occur within the pipeline portion of the Development Envelope (Figure 8-5). Vegetation association FP TpCc AmaAsyAb AaHallCh occurs across 18.5 ha of the Development Envelope and 2.4 ha in the Indicative Footprint. Spectrum (2024) mapped this floodplain vegetation association across 694.3 ha of the survey area. Vegetation association SP AsyAteAb Tp HapAaGrst occurs across less than 1 ha of the Development Envelope and Indicative Footprint and was mapped by Spectrum (2024) across 56.8 ha of the survey area. The potential impact to these two vegetation associations (based on the Indicative Footprint) is less than 1% of the extent mapped by Spectrum (2024) (Table 8-5).

Table 8-5: Flora and Vegetation - potential impacts to significant vegetation associations

Detailed Vegetation Association	Area in Development Envelope (ha) ¹	Area in Indicative Footprint (ha) ¹	% of mapped extent in Indicative Footprint ²
Represents major ephemeral water course in the Hamersley subregion			
MA EvEcAci CcErbTp AsyPIAa	14.08	1.23 (<0.5 in Hamersley subregion)	0.42 (0.17)
Possible restricted distribution			
FP TpCc AmaAsyAb AaHallCh	18.50	2.44	0.35
SP AsyAteAb Tp HapAaGrst	0.45	0.04	0.07

1. Area within the Development Envelope and Indicative Footprint minus areas already cleared under the Mt Whaleback NVCP 5617/6 or other approval mechanisms.
2. The mapped extent of the vegetation association based on Spectrum (2024) vegetation mapping of the survey area.

As discussed in Section 8.3.2.2, a large portion (82%) of the Development Envelope has already been disturbed as part of existing operations. Of the native vegetation mapped in the Development Envelope, most (52%) is rated as being in Excellent condition. Areas mapped as Poor or Completely Degraded condition (22% of the native vegetation mapped in the Development Envelope) are generally adjacent to existing mining operations and infrastructure (e.g. roads/tracks and pipelines) or low lying areas where grazing and weeds are present (Table 8-6, Figure 8-6). The Indicative Footprint for the Proposal overlaps areas that have previously been disturbed for existing operations (Figure 8-6). Collectively, these areas represent approximately 195 ha or 63% of the Indicative Footprint (Table 8-6). A total of 116 ha of native vegetation remains, of which 104 ha (rounded from 104.16 ha) is in Good to Excellent condition. This comprises of 99.60 ha (rounded up to 100 ha) in the Pilbara bioregion and 4.56 ha in the Gascoyne bioregion. The condition of vegetation proposed to be cleared is provided in Table 8-6.

Table 8-6: Flora and Vegetation - potential impacts to vegetation condition

Vegetation Condition	Area in Development Envelope (ha)	% of Development Envelope	Area in Indicative Footprint (ha)	% of Indicative Footprint
Excellent	127.43	9.47	87.79	28.19
Very Good	19.74	1.47	2.63	0.85
Good	44.31	3.29	13.73	4.41
Poor	11.54	0.86	0.43	0.14
Degraded	0	0	0	0
Completely Degraded	42.56	3.16	11.44	3.67
Cleared Areas ¹	1,100.13	81.75	195.38	62.74
TOTAL	1,345.71	100	311.40	100
TOTAL (rounded)	1,346	-	312	-

1. Areas already cleared under the Mt Whaleback NVCP 5617/6 or other approval mechanisms.

8.4.2 Changes to vegetation from changes to groundwater regimes

As discussed in Section 7.4.1, the increase in dewatering for the Proposal will result in an increase in the lateral extent of drawdown and depth of drawdown compared to the drawdown assessed for the Approved Proposal (Figure 7-5a and b). The increase in drawdown has the potential to impact GDV by lowering the groundwater table beyond the rooting depth of vegetation.

Proposal: Changes to vegetation from changes to groundwater regimes

Based on Spectrum (2024) vegetation mapping, areas identified as potential GDV within the Development Envelope have been identified along Whaleback Creek and tributaries of Fortescue River (association MA EvEcAci CcErbTp AsyPIAa) (Figure 8-5). This riparian vegetation contains *Eucalyptus camaldulensis* in association with *Eucalyptus victrix*. *Eucalyptus camaldulensis* is a facultative phreatophyte tree species and may utilise groundwater when it is at an accessible depth (i.e. groundwater shallow enough for tree roots to reach). Root systems of *Eucalyptus* species have been confirmed to reach a maximum depth of approximately 21 m (Muir Environmental 1995). *Eucalyptus victrix* is a vadophyte, or in certain situations a facultative phreatophyte (when occurring in association in shallow groundwater).

The areas of potential GDV mapped within the tributaries of Fortescue River occur outside of the predicted groundwater drawdown extent (Figure 8-5) and therefore will not be impacted from the proposed dewatering for the Proposal.

Whaleback Creek is located north and adjacent to the existing OB29 mine pit and extends northeast of the Development Envelope. Within the drawdown extent assessed for the Approved Proposal (2013 Orebody 29/30/35 drawdown extent) (Figure 8-5), vegetation north of OB29 mine pit occurs where groundwater levels are too deep for the roots of the *Eucalyptus* species to access (i.e. pre-development groundwater depths were approximately 30 mbgl; Section 7.3.2.3) and there has been observed groundwater drawdown in this area since dewatering commenced in 2015 at OB29. Therefore, the vegetation in this portion of Whaleback Creek is not considered to be groundwater dependent.

Whaleback Creek riparian vegetation extends outside the assessed drawdown extent for the Approved Proposal to the northeast of OB29 (Figure 8-5). This area of vegetation is also located within the assessed drawdown extents for the Western Ridge Approved Proposal (which included increased dewatering at the Orebody 29/30/35) and the existing Eastern Ridge mine. The current groundwater levels in this area range between greater than 20 mbgl and 36 mbgl (becoming deeper towards the OB29 pit) (Figure 7-4). Due to the depth of groundwater in this area, it is considered unlikely that the vegetation would utilise groundwater and therefore are not considered to represent GDV.

Combined effect: Changes to vegetation from changes to groundwater regimes

The potential impact to vegetation from groundwater drawdown was assessed for the Approval Proposal. The assessment of GDV for the Approved Proposal identified vegetation occurring along drainage channels and adjacent floodplains containing *Eucalyptus camaldulensis* and *Eucalyptus victrix* to be at moderate risk from groundwater drawdown. However, the assessment noted that pre-abstraction groundwater levels beneath these areas of vegetation (and within the majority of the area) were greater than 30 mbgl, and groundwater at this depth was unlikely to be accessible for plant uptake (Onshore Environmental 2013). As such, the assessment for the Approved Proposal also concluded that the vegetation in the area of Whaleback Creek is not considered to be groundwater dependent or at risk from groundwater drawdown.

No areas of GDV were identified within the predicted drawdown extent for the Approved Proposal or the additional drawdown extent predicted for the Proposal, and the combined effect is that no vegetation is considered to be at risk from groundwater drawdown from the Combined Proposal.

8.4.3 Changes to vegetation from dust, fire and weeds

Dust

Increased levels of airborne dust have the potential to impact vegetation health in instances where leaf physiology is affected. This could occur along unsealed roads and adjacent to OSAs, and can be more pronounced during dry seasonal conditions. Studies from the Pilbara, such as Butler (2009), have not recorded evidence of negative impacts on plant function resulting from inert particulate matter deposition. Most arid plant species have much of their stomata closed during dry periods, when the potential for dust is greatest. This would limit the potential for dust generated during the dry season to have effects on the stomatal conductance of the plants (i.e. plant function) and therefore on the health of the plant. In high rainfall periods, when most species experience new growth and stomata are open, dust levels tend to be significantly less due to the wet conditions (Grierson 2015). Long-term observations of vegetation in close proximity to mine sites across the Hamersley Ranges have demonstrated the resilience of vegetation to extremely high levels of dust exposure (Grierson 2015).

The Proposal may result in the generation of airborne dust due to clearing activities and the expansion of pits and OSAs; however, dust levels are not predicted to increase beyond existing operations (Section 13.6). Therefore, the potential impact on vegetation from dust resulting from the Proposal is expected to be minimal.

Fire

There is the potential to change the frequency of fire by actively extinguishing fires or by causing them through mining activities. This may result in fire in some parts of the landscape being too frequent or in other parts being not frequent enough, which may result in fire being intensified when it does occur. Altered fire regimes can encourage weeds at a landscape level and alter the ecological characteristics of communities through the dominance of early successional species. The Proposal is not expected to change the frequency of fire within the local area, and BHP considers that the Proposal will have a negligible impact to vegetation from the potential alteration of fire regimes.

Weeds

A total of 18 introduced flora species (weeds) have been recorded within the Development Envelope (Section 8.3.2.4). While domestic stock, such as cattle, are typically significant vectors for weeds within lowland areas of the Pilbara, the main factor influencing weed establishment within the Development Envelope is access and existing

disturbance. Increasing vehicular movement combined with disturbance such as clearing for roads and other infrastructure, has the potential to introduce and/or spread weed species. The current distribution of introduced flora species within the Development Envelope largely reflect this, with higher weed presence adjacent to existing infrastructure and disturbance (Figure 8-7).

The presence of introduced flora species within the Development Envelope has the potential to impact on the condition and structure of native vegetation present, with operational activity potentially increasing the occurrence and spread of weeds. The occurrence of weeds within the Development Envelope is not expected to impact on any regionally significant vegetation or significant flora species (as none occur within or immediately adjacent to the Development Envelope).

The Proposal may result in the spread of weeds into areas of proposed new disturbance (mainly via vehicle movement); however, the Proposal is located within areas of existing disturbance or operations, and therefore not expected to significantly increase the occurrence of weeds within the Development Envelope. It is expected that the Proposal will have a negligible impact to vegetation from the potential spread of weeds.

8.5 Mitigation

BHP considers that there are no potentially significant impacts to flora and vegetation from the Proposal; however, BHP proposes to implement avoidance and minimisation measures to further reduce potential impacts on flora and vegetation from the Proposal. The proposed mitigation for the Proposal is discussed below.

BHP will continue to implement mitigation measures (including standard management practices) for the Approved Proposal (summarised in Appendix 2) as part of the Amended Proposal if approved.

8.5.1 Avoid

During the design phase of the Proposal, the Development Envelope and Indicative Footprint were designed to avoid areas of native vegetation as much as possible. The original preferred pipeline alignment was designed to be predominantly placed adjacent to the existing surplus water pipeline to Ophthalmia Dam and to avoid previously known heritage sites. During social surroundings engagement with Niyaparli Traditional Owners in May 2024, BHP and Niyaparli Traditional Owners considered alternative alignments to avoid recently identified heritage sites and codesigned the final preferred alignment for the Proposal that meets Niyaparli requirements. The Proposal design resulted in a slight decrease in clearing requirements and still achieved placement of the pipeline in predominantly cleared areas and ensures avoidance of all heritage sites.

This change to the pipeline alignment also resulted in the avoidance of a vegetation association that was identified as potentially regionally significant. Vegetation HS Tv Me was mapped by Spectrum occurring on calcrete areas and associated with the Elimunna land system, which has a limited extent within the Pilbara bioregion (Spectrum 2024). This vegetation association is not located within the Development Envelope or Indicative Footprint, and impacts from the Proposal on this vegetation association have been avoided.

Approximately 82% of the Development Envelope and 63% of the Indicative Footprint are situated in areas that have already been cleared for existing operations, specifically Orebody 29/30/35 and Mt Whaleback mining operations. The proposed surplus water pipeline is largely located on existing disturbed areas.

As no significant flora and vegetation values occur within the Development Envelope, and BHP considers that there are no potentially significant impacts to flora and vegetation from the Proposal, no further avoidance measures are proposed.

8.5.2 Minimise

The Proposal will use existing and approved mine, transportation and processing elements at Mt Whaleback, minimising the amount of clearing required to support the Proposal (Section 2.2).

As discussed above, the proposed surplus water pipeline to Ophthalmia Dam will be located within predominantly cleared areas minimising disturbance of native vegetation. The proposed pipeline route follows the existing pipeline to the extent possible (noting operational, tenure and heritage constraints) and will almost entirely be buried along the length of the pipeline corridor outside mining areas.

8.5.3 Rehabilitate

Rehabilitation at Orebody 29/30/35 is addressed in the MCP (BHP 2024i) (Appendix 7). The MCP covers the Approved Proposal and has been revised to include the Proposal.

Management approaches relating to Flora and Vegetation for the Proposal include:

- undertake progressive rehabilitation in areas no longer required for operations
- design the revegetation program to establish native vegetation that blends with the surrounding areas
- undertake growth media management in accordance with standard business procedures
- use specified seed mix, including the use of local provenance native seed and species of ethnobotanical value, where possible.

8.5.4 Other statutory decision-making processes

BHP's view is that there is no other statutory decision-making process to mitigate the potential environmental impacts of the Proposal on Flora and Vegetation, considering the EPA's *Taking decision making processes into account in EIA: Interim Guidance* (EPA 2021b).

8.6 Assessment and significance of residual impacts

BHP has considered the EPA's *Environmental Factor Guideline – Flora and Vegetation* (EPA 2016a) when assessing the significance of the impacts to Flora and Vegetation from the Proposal. The assessment of potential impacts discussed in this section are following the application of mitigation as documented in Section 8.5.

8.6.1 Loss of vegetation from clearing

8.6.1.1 Regional values

As discussed in Section 8.4.1.1, the Proposal will result in clearing of less than 0.01% of the regional vegetation associations in the Pilbara and Gascoyne bioregions. The regional vegetation associations potentially impacted from the Proposal clearing are not regionally significant and will continue to have more than 99% of their pre-European extent remaining (Table 8-4). The associations are well represented within Western Australia occurring broadly within, or extending beyond, the Pilbara and Gascoyne bioregions. BHP considers that the direct impact from the Proposal on regional vegetation associations will not be significant.

8.6.1.2 Vegetation

Three vegetation associations within the Development Envelope are considered to be potentially significant (Section 8.4.1.2). Vegetation association MA EvEcAci CcErbTp AsyPIAa is considered to represent an 'ecosystem at risk' in the Hamersley subregion and has been mapped as occurring within major drainage lines. This vegetation association occurs across 1.23 ha within the Indicative Footprint (of which less than 0.5 ha occurs in the Hamersley subregion) and proposed to be directly impacted by the Proposal. Based on Spectrum (2024) vegetation mapping, this impact represents less than 1% of the mapped extent of this vegetation association (Table 8-5). The drainage lines in which this vegetation occurs extend beyond the Development Envelope, therefore this vegetation association is expected to occur more broadly along the major drainage lines in the local area outside of the Development Envelope and beyond the current mapped extent (specifically along Whaleback Creek and the tributaries of Fortescue River).

Spectrum (2024) did not identify any vegetation associations mapped within drainage lines to be locally or regionally significant. Drainage line landforms and the dominant species recorded within them are widespread throughout the region (Spectrum 2024).

Two other vegetation associations were considered to be potentially significant in a regional context as they occur on land systems that have a limited distribution across the Pilbara and/or Gascoyne regions. Association FP TpCc AmaAsyAb AaHallCh occurs on the Elimunna land system. This land system has a limited regional extent occurring across 62,850 ha in the Pilbara and 2,697 ha in the Gascoyne (Spectrum 2024). FP TpCc AmaAsyAb AaHallCh occurs across 2.44 ha in the Indicative Footprint, representing less than 1% of its mapped extent (based on Spectrum (2024) mapping). Association SP AsyAteAb Tp HapAaGrst occurs on the Spearhole land system which has been mapped occurring across 132,535 ha in the Pilbara and 31,880 ha in the Gascoyne (Spectrum 2024). SP AsyAteAb Tp HapAaGrst occurs across less than 1 ha in the Indicative Footprint, representing less than 1% of its mapped extent (Table 8-5). Due to the minimal proposed clearing to these vegetation associations, BHP considers that the Proposal will not significantly reduce the representation of any of the vegetation associations in the Pilbara and Gascoyne bioregions and therefore the direct impact on significant vegetation from the Proposal is not considered to be a significant impact.

As discussed in Section 8.5, the Proposal has been designed to avoid areas of native vegetation as much as possible and will use existing infrastructure at Mt Whaleback, aiding in reducing the amount of clearing required to support the Proposal. A large portion (63%) of the Indicative Footprint overlaps areas that have previously been disturbed as part of existing operations. Of the areas of native vegetation remaining within the Indicative Footprint (comprising approximately 116 ha), the majority (52%) has been mapped as being in Excellent condition (87.79 ha or 28% of the Indicative Footprint) (Table 8-6). The Proposal will result in clearing of up to 116 ha of native vegetation, of which up to 104 ha is in Good to Excellent condition. BHP does not consider this to be a significant impact.

8.6.2 Changes to vegetation from changes to groundwater regimes

As discussed in Section 8.4.2, none of the vegetation within the predicted extent of drawdown for the Proposal or the Combined Proposal are considered to support GDV. The vegetation occurring along Whaleback Creek, while containing *Eucalyptus camaldulensis* and *Eucalyptus victrix*, occur in areas where the groundwater levels are considered too deep to support GDV (i.e. current groundwater levels range from greater than 20 mbgl to more than 50 mbgl near the OB29 pit).

Additionally, as discussed in Section 7.4.1.1 and Section 8.4.2, changes to groundwater regimes from increased dewatering at Orebody 29/30/35 were assessed as part of the Western Ridge Approved Proposal. There is no additional lateral drawdown extent from the Orebody 29/30/35 Proposal compared to the Western Ridge Approved Proposal assessment, and the cumulative groundwater drawdown extent for the Newman area including the Eastern Ridge mine (shown in Figure 7-6) is the same as the Western Ridge Approved Proposal assessment.

As such, the Proposal is not predicted to result in further potential impacts to the vegetation from the changes to groundwater levels, in addition to those already assessed and approved for Western Ridge.

8.6.3 Changes to vegetation from dust, fire and weeds

As discussed in Section 8.4.3, the potential indirect impact of dust emissions on vegetation are predicted to be minimal and not a significant increase from that of the Approved Proposal and existing operations, with only the extension of the pits and OSAs predicted to result in the generation of dust from the Proposal.

The potential indirect impacts associated with the alteration of fire regimes from the implementation of the Proposal is not considered a significant risk to the vegetation of the Development Envelope or surrounds. BHP considers that there will not be a significant impact to vegetation from the potential alteration of fire regimes from the Proposal beyond that associated with the Approved Proposal.

Introduced flora species (weeds) are present within the Development Envelope. The Proposal is located within existing operational areas with the Indicative Footprint largely located on areas of existing disturbance to minimise impacts to native vegetation (Section 8.5). The Proposal is therefore not expected to increase the occurrence or spread of weeds beyond that of the existing operations and associated supporting infrastructure. As such, the Proposal is not considered a significant risk to the flora or vegetation from the presences of weeds. The occurrence of introduced flora species within the Development Envelope will continue to be managed for Orebody 29/30/35 operations in accordance with standard weed management practices.

8.6.4 Significant residual impacts

Following the application of the mitigation hierarchy (Section 8.5) and applying the Residual Impact Significance Model in the *WA Offsets Guidelines* (Government of Western Australia 2014), BHP considers that there is no significant residual impact to Flora and Vegetation from the Proposal. However, the EPA considers that the clearing of vegetation in Good to Excellent condition is a significant residual impact due to the cumulative impacts of clearing in the Pilbara, based on the EPA's advice to the Minister under Section 16(e) of the EP Act (EPA 2014).

The detailed assessment of offsets is discussed in Section 15, including how the proposed offsets will counterbalance the significant residual impact on Flora and Vegetation (i.e. the clearing of native vegetation in Good to Excellent condition within the Pilbara bioregion).

For the other impacts assessed, BHP considers that the residual impacts are not significant. See Section 8.7 for the discussion on the outcomes relating to the identified residual impacts and BHP's proposed assurance (regulation) and monitoring, where required.

8.7 Environmental outcomes

Table 8-7 summarises the environmental outcomes, proposed assurance (regulation) and proposed monitoring (if required) for each residual impact for flora and vegetation from the Proposal. Table 8-7 demonstrates how the proposed environmental outcomes for the Proposal, together with the proposed regulation and monitoring, are consistent with the EPA's objective for Flora and Vegetation (Section 8.1).

There are no conditions relating to Flora and Vegetation in MS963 for the Approved Proposal. As provided for as an option in the EPA's ERD Instructions, BHP has proposed conditions for the Combined Proposal (including conditions related to Flora and Vegetation) for the EPA's consideration, in Appendix 3. This includes limits on clearing of vegetation and proposed offsets for significant residual impacts to vegetation in Good to Excellent condition.

Table 8-7: Flora and Vegetation - Proposal environmental outcomes, proposed regulation and monitoring

Residual impact		Environmental outcome	Proposed regulation (Condition or other statutory decision-making process) ¹	Proposed monitoring	Consistency with EPA's objective
1.	Clearing of up to 104 ha of native vegetation in Good to Excellent condition (of which up to 100 ha is within the Pilbara IBRA region) (Section 8.6.1.2)	Contributes to the cumulative clearing of Good to Excellent condition vegetation in the Pilbara bioregion	Condition A1 Limitations and extent of Proposal Up to 116 ha of native vegetation clearing within the Development Envelope Clearing of no more than 100 ha of native vegetation in Good to Excellent condition in the Pilbara bioregion Condition B3 Rehabilitation and Decommissioning Implement the MCP (BHP 2024i) Condition B4 Offsets Offsets via contribution to PEOF	Standard management practices: - internal land disturbance approval process to manage ground disturbance - annual land disturbance reporting against approved limits/extents Condition B3 Rehabilitation and Decommissioning Implement monitoring outlined in the MCP (BHP 2024i) Condition B4 Offsets Impact Reconciliation Procedure and Impact Reconciliation Report	The potential significant residual impact of the proposed clearing to cumulative clearing in the Pilbara bioregion can be counterbalanced by offsets, so that the environmental outcome is consistent with the EPA's objective
2.	Clearing of less than 0.01% of each Beard vegetation association (Section 8.6.1.1)	The representation of each Beard vegetation association in the Pilbara and Gascoyne bioregions will be maintained	Condition A1 Limitations and extent of Proposal Up to 116 ha of native vegetation clearing within the Development Envelope	Standard management practices: - internal land disturbance approval process to manage ground disturbance - annual land disturbance reporting against approved limits/extents	The representation of regional vegetation and locally significant vegetation will not be significantly impacted, consistent with the EPA's objective
3.	Clearing of 1.23 ha of major drainage line vegetation and 2.48 ha of possible restricted vegetation, representing less than 1% of the mapped extent (Section 8.6.1.2)	No impacts to TECs and PECs Significant vegetation will be maintained to an extent that ecological integrity is not threatened			

1. This table is for the Proposal only; see the Proposal Content Document (Appendix 1) and the proposed implementation conditions (Appendix 3) for the regulation for the Combined Proposal

9 Terrestrial Fauna

9.1 EPA environmental factor and objective

The EPA's objective for the Terrestrial Fauna factor is:

To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

9.2 Relevant policy and guidance

BHP assessed this environmental factor considering the following relevant EPA policies and guidance, as outlined in Table 9-1.

Table 9-1: Terrestrial Fauna - policy and guidance

EPA, other State and Commonwealth policy and guidance	Consideration of EPA policy and guidance
<i>Environmental Factor Guideline - Terrestrial Fauna</i> (EPA 2016c)	- Applied the relevant considerations for environmental impact assessment - Identified the values of terrestrial fauna, and their significance - Identified activities that can impact on terrestrial - Considered the links with other environmental factors
<i>Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment</i> (EPA 2020b) <i>Technical Guidance - Sampling of short range endemic invertebrate fauna</i> (EPA 2016d)	Surveys described in Section 9.3.1 were undertaken in accordance with the guidance
<i>WA Environmental Offsets Policy</i> (Government of Western Australia 2011) <i>WA Environmental Offsets Guidelines</i> (Government of Western Australia 2014)	- Applied avoidance and mitigation measures to the Proposal - Considered cumulative impacts in the regional context in determining significant residual impact - Quantified the significant residual impact

9.3 Receiving environment

9.3.1 Studies and surveys

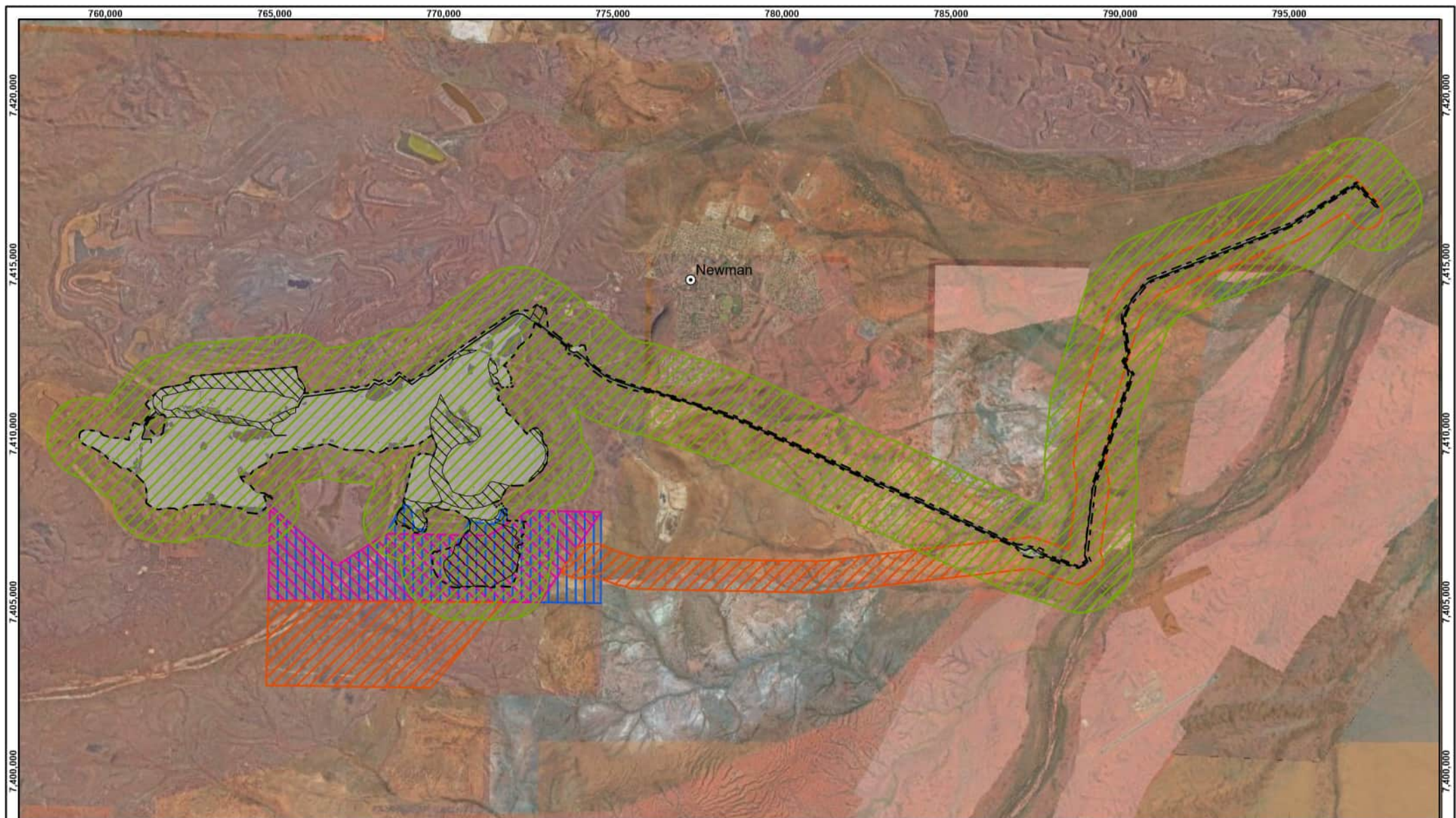
A total of 20 vertebrate fauna surveys and four short range endemic (SRE) invertebrate fauna surveys have been undertaken wholly or partially within the Development Envelope and extending into the surrounding area. These surveys comprise seven detailed surveys, 11 basic surveys (with the most recent two also being combined with targeted surveys), five targeted surveys and one desktop assessment. All surveys were completed in accordance with the EPA guidance (relevant at the time of surveying). Surveys undertaken post-2009 have also been completed in accordance with BHP's *Guidance for Terrestrial Vertebrate Fauna Surveys in the Pilbara* (BHP 2023d) or *Short-range Endemic Invertebrate Fauna Assessment Methods Procedure* (BHP 2022d) that were developed in consultation with the DBCA to ensure a consistent approach for all surveys undertaken for BHP.

Table 9-2 summarises the more recent and relevant surveys undertaken across the Development Envelope to support the assessment of Terrestrial Fauna for the Proposal, and Figure 9-1 shows the location of these surveys. Recent vertebrate fauna surveying occurs across the entire Development Envelope and immediate surrounds, while SRE invertebrate fauna surveying focused on the OSA extension where new disturbance is proposed. The mine area and pipeline portion of the Development Envelope were not covered by recent SRE invertebrate fauna surveying, as these areas are already highly disturbed. BHP has provided the data for the recent surveys as part of the IBSA data package (see Appendix 16). A complete list and summary of all surveys across the Development Envelope is provided in Appendix 10.

Table 9-2: Terrestrial Fauna - recent studies and surveys

Title	Date	Summary	Appendix
Vertebrate Fauna			
OB29, 30 and 35 Expansion and Newman Surplus Water Targeted Significant Fauna Survey (Astron 2024)	Sep – Oct 2023	Targeted significant vertebrate fauna survey of the Development Envelope and immediate (approximately 500 m) surrounds. The survey comprised 69 habitat assessment sites to identify, assess and map fauna habitat types. Targeted search methods for significant vertebrate fauna were undertaken including 16 motion sensor camera sites (particular focus on Northern Quoll and Pilbara Olive Python), eight acoustic bat recorder sites, two autonomous recording unit sites (for Night Parrot), four plot/transect search sites (for Bilby), cave assessments and other visual observations.	Appendix 11
Western Ridge Pipelines Vertebrate Fauna Survey (Biologic 2022c)	Mar 2021 Mar 2022	Two-season basic and targeted vertebrate fauna survey that covers the eastern portion of the pipeline section of the Development Envelope. The survey comprised 92 habitat assessment sites to identify, assess and map fauna habitat types. The assessment of three water features was also undertaken. Targeted search for significant vertebrate fauna were completed throughout the survey area, including two nocturnal surveying sites, 13 acoustic recorder sites (for bat species), one motion sensor camera site (for Northern Quoll), six plot search sites (for Bilby), 15 acoustic recording sites (for Night Parrot), one environmental DNA (eDNA) sampling site (for Pilbara Olive Python) and other visual observations.	Appendix 11
Western Ridge Project Paddy Bore Area Vertebrate Fauna Assessment (Biologic 2022d)	Mar 2021	Single season basic and targeted vertebrate fauna survey covering the southern portion of the Development Envelope, specifically the OSA expansion and surrounds. The survey comprised the completion of 21 habitat assessment sites to identify, assess and map fauna habitat types. Targeted searches for significant vertebrate fauna were undertaken throughout the survey area, including two acoustic bat recorder sites, three motion sensor camera sites (for Northern Quoll), one plot search site (for Bilby), one acoustic recording site (for Night Parrot) and other visual observations.	Appendix 11
Short-range Endemic Invertebrate Fauna			
OB29, 30, 35 Expansion Short-range Endemic Invertebrate Fauna Survey (Biologic 2024a)	Apr 2023 Nov 2023	Two-season SRE invertebrate fauna survey covering the southern portion of the Development Envelope (specifically the OSA expansion) and surrounds. The survey comprised the completion of 37 habitat assessment sites to determine	Appendix 11

Title	Date	Summary	Appendix
		the suitability of habitat to support SRE invertebrate fauna and map fauna habitat types. Sampling was undertaken at 25 sites comprising assessment of the habitat, active foraging, leaf litter and soil sifting, and/or borrow excavation.	



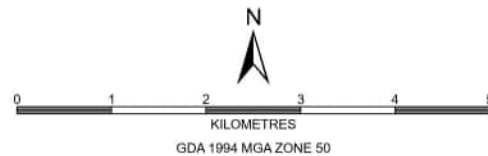
- Development Envelope
- Indicative Footprint
- Cleared Area

Vertebrate Fauna

- OB29, 30 and 35 Expansion and Newman Surplus Water Targeted Significant Fauna Survey (Astron 2024)
- Western Ridge Pipelines Vertebrate Fauna Survey (Biologic 2022c)
- Western Ridge Project Paddy Bore Area Vertebrate Fauna Assessment (Biologic 2022d)

SRE Invertebrate Fauna

- OB29, 30, 35 Expansion Short-range Endemic Invertebrate Fauna Survey (Biologic 2024)



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OREBODY 29/30/35 SIGNIFICANT AMENDMENT TERRESTRIAL FAUNA SURVEYS

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:80,000	PREPARED:	GEOMATICS	FIGURE:	9-1
DATE:	21/11/2024	REQUESTOR:	ENV APPROVALS	NO:	A929_047_RevF
		REVIEWED:			

9.3.2 Environmental values

9.3.2.1 Regional values

As described in Section 8.3.2.1, the Development Envelope is located on the boundary between the Pilbara and Gascoyne bioregions, and falls within the Hamersley (PIL3) subregion of the Pilbara bioregion and the Augustus (GAS3) subregion of the Gascoyne bioregion (Table 8-4).

The Ethel Gorge TEC (listed as Critically Endangered) and 2 km buffer overlap the eastern extent of the proposed pipeline route (Section 8.3.2.1). As this TEC is a subterranean community, it is not relevant to the assessment of Terrestrial Fauna and is not discussed further in this section. No TECs or PECs relating to Terrestrial Fauna have been recorded from within or adjacent to the Development Envelope.

9.3.2.2 Fauna habitats

Detailed fauna habitat mapping of the Development Envelope was completed by Astron in 2023 (Astron 2024). This survey described and mapped 11 fauna habitat types within the Development Envelope (Table 9-3; Figure 9-2). As discussed in Section 2.3, a large portion (82%) of the Development Envelope has been cleared for existing operations. The remaining native vegetation is mapped predominantly as Undulating Low Hills (Astron 2024). A number of habitat types within the Development Envelope are considered to be of value for terrestrial fauna as they may support significant fauna species, specifically Ghost Bat (Table 9-3).

Table 9-3: Terrestrial Fauna - fauna habitat types

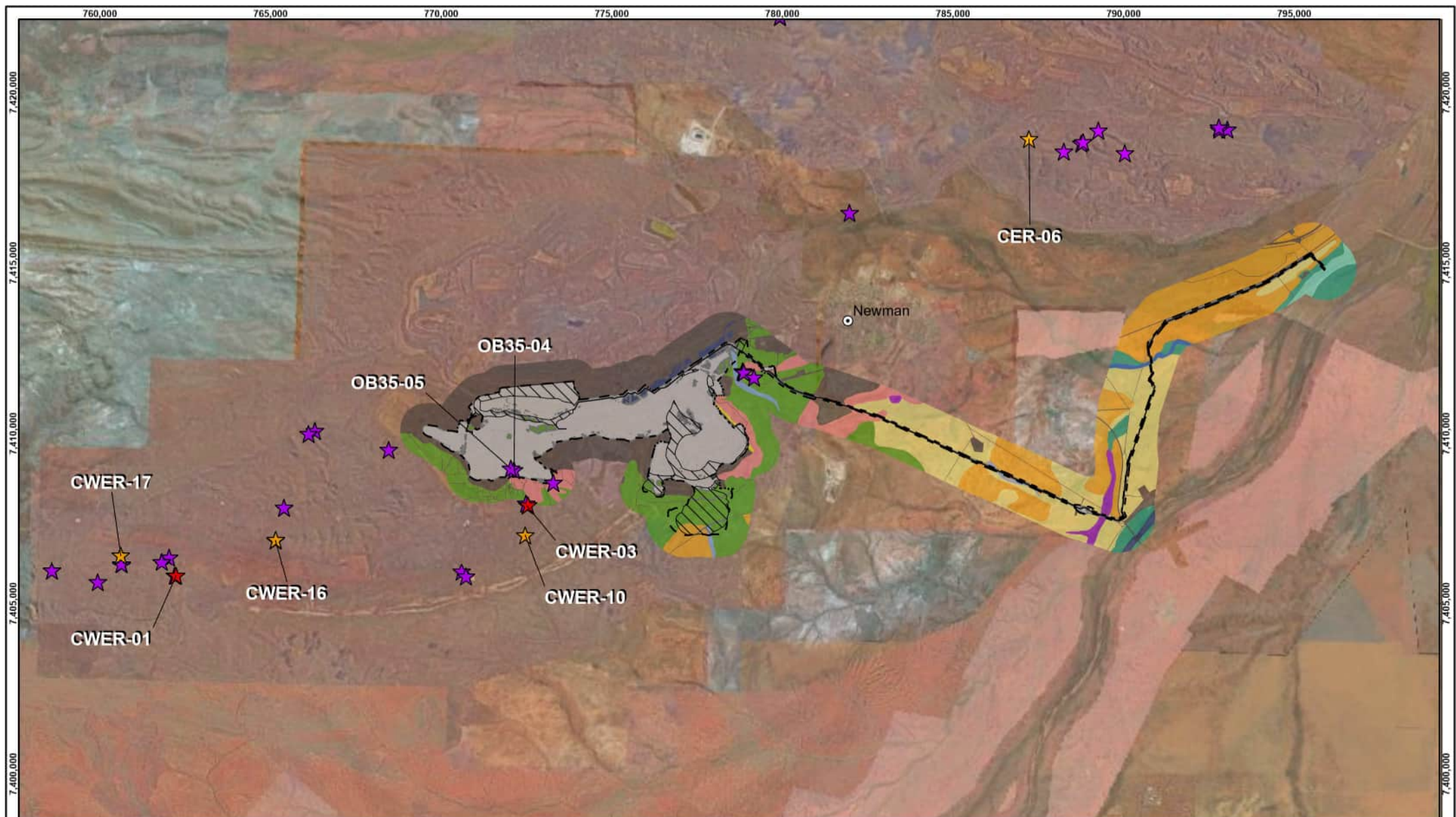
Habitat Type	Description (Astron 2024)	Value to significant fauna ¹
Breakaway/Cliff	Exposed rock formations often associated with Hillcrest/Hillslope, Gorge/Gully or Drainage lines.	Provides limited potential roosting habitat for Ghost Bat (where this habitat occurs within the Development Envelope it is in close proximity to existing active mining operations)
Drainage Area/Floodplain	Flat plains next to drainage lines, often grasslands and or woodlands with soft/clay soils. Often mixed shrubland with emergent <i>Eucalyptus/Corymbia</i> species over <i>Triodia</i> hummock grassland.	Supporting foraging habitat for Ghost Bat
Hillcrest/Hillslope	Characterised by large open rocky areas with open grasslands, predominantly <i>Triodia</i> hummock grasslands with emergent <i>Eucalyptus</i> trees, <i>Acacia</i> stands and mixed shrubs.	Provides limited potential roosting habitat for Ghost Bat (caves)
Major Drainage Line	Large drainage channel. Rocky substrate often washed away. Presence of mature <i>Eucalyptus/Corymbia</i> trees over mixed shrubs and tussock and <i>Triodia</i> grasses.	Unlikely to support Ghost Bat foraging where within 12 km of a critical roosting cave ² (as this habitat is fragmented and adjacent to active mining); beyond this area it provides supporting foraging habitat for Ghost Bat
Medium Drainage Line	Medium drainage channel often with thick <i>Acacia</i> growth along banks.	Supporting foraging habitat for Ghost Bat

Habitat Type	Description (Astron 2024)	Value to significant fauna ¹
Minor Drainage Line	Small drainage channel. Often with thick <i>Acacia</i> growth along banks and is less likely to support surface water or long following rainfall.	Critical foraging habitat for Ghost Bat where within 12 km of a critical roosting cave ²
Mulga Woodland	Stands of mulga over clay or stony substrate.	Supporting foraging habitat for Ghost Bat ³
Sandy/Stony Plain	Stands of <i>Acacia</i> or other shrubs over <i>Triodia</i> hummock grassland over clay or stony substrates.	Critical foraging habitat for Ghost Bat where within 12 km of a critical roosting cave ²
Stony Plain	Broad flat low-lying plains to undulating plain in soft loamy soils. Scattered <i>Acacia</i> stands over <i>Triodia</i> hummock and tussock grassland.	Critical foraging habitat for Ghost Bat where within 12 km of a critical roosting cave ²
Undulating Low Hills	Low stony hills and slopes with dissected valleys and drainage on stony soils. Scattered <i>Acacia</i> and <i>Hakea</i> species over low <i>Triodia</i> hummock grassland.	No value to significant fauna
Wetland	Permanent water, often with reeds present. Presence of large <i>Eucalyptus</i> and <i>Corymbia</i> trees in areas.	Supporting foraging habitat for Ghost Bat

1. Value to significant fauna relates to Threatened fauna species known to have records within the Development Envelope (i.e. Ghost Bat) and is discussed further for each fauna species in Section 9.3.2.3.
2. A critical roosting cave is classified as a Category 1 or 2 roost, or Category 3 roost adjacent to a Category 1 or 2 roost (Bat Call 2022).
3. Astron (2024) identified Mulga Woodland as critical Ghost Bat foraging habitat; however, Mulga Woodland habitat within the Development Envelope is more than 12 km from a critical roosting cave and as such classified as supporting foraging habitat.

No surface water features have been mapped within the Development Envelope; however, the eastern end of the Development Envelope (the proposed surplus water pipeline route) extends into the inundated area of the Ophthalmia Dam. This area of permanent water has been mapped as Wetland habitat (Table 9-3; Figure 9-2).

Two cave structures have been identified within the Development Envelope, OB35-04 and OB35-05 (Figure 9-2). Both caves are located adjacent to existing clearing associated with the OB35 mine pit in Hillcrest/Hillslope habitat. Several cave structures also occur outside of the Development Envelope. Further details on the classification of the caves and their usage by Ghost Bat is discussed in Section 9.3.2.3.



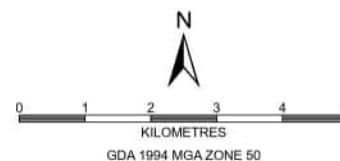
- Development Envelope
- Indicative Footprint
- Cleared Area

Ghost Bat Cave Category

- Category 2
- Category 3
- Category 4

Habitat Type

- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sandy/ Stony Plain
- Stony Plain
- Undulating Low Hills
- Wetland



BHP

PUBLIC

OREBODY 29/30/35 SIGNIFICANT AMENDMENT FAUNA HABITATS AND CAVE FEATURES PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:115,000	PREPARED:	GEOMATICS	FIGURE:	9.2
DATE:	21/11/2024	REQUESTOR:	ENV APPROVALS	NO:	
		REVIEWED:			

A929_048 RevF

9.3.2.3 Significant vertebrate fauna

Two significant vertebrate fauna species have been recorded within the Development Envelope:

- Ghost Bat (*Macroderma gigas*) – listed as Vulnerable under the BC Act and EPBC Act, and is a MNES
- Western Pebble-mound Mouse (*Pseudomys chapmani*) – listed as Priority 4 by the DBCA.

Records of the two significant vertebrate fauna species within the Development Envelope and in the surrounding area are shown on Figure 9-3.

Ghost Bat

Ghost Bats roost in deep, complex caves beneath bluffs or low rounded hills. The distribution of Ghost Bats in the Pilbara is determined by the presence of suitable roosting sites. Two caves have been recorded within the Development Envelope (OB35-04 and OB35-05) (Figure 9-2). These caves are shallow, structurally simple and may be used opportunistically for feeding or nocturnal use by bat species (Biologic 2011a). The caves are considered to be Category 4 roosts for Ghost Bat (Table 9-4). Previous evidence (scats) of the Ghost Bat has been recorded from within the caves (Figure 9-3). There is an additional historical scat record from a third cave within the Development Envelope; however, this location has been cleared and no longer provides suitable habitat for the Ghost Bat (clearing of this cave was undertaken for the OB35 mine pit under the Mt Whaleback NVCP 5617/6) (Figure 9-3).

Two cave structures located within 12 km of the Development Envelope (i.e. the expected foraging distance for Ghost Bats from a diurnal roost) are classified as Category 2 roosts (CWER-01 and CWER-03) (Table 9-4; Figure 9-2). These caves are deep (35-40 m) with multiple dark chambers and hold a stable microclimate suitable for diurnal use by Ghost Bat (Biologic 2022e). These caves are located to the southwest within the approved Western Ridge Development Envelope (Figure 9-2), and have numerous records of the Ghost Bat, comprising direct observations, ultrasonic recordings and scats.

There are four caves in the vicinity of the Development Envelope that have been classified as Category 3 roosts for Ghost Bat (Table 9-4). Caves CWER-10, CWER-16 and CWER-17 have features that make them suitable for diurnal use by Ghost Bats; however, they are not as deep and/or complex in comparison to CWER-01 and CWER-03, with only a single chamber or shallower (Biologic 2022e) (Table 9-4). These three caves are also located within the approved Western Ridge Development Envelope (Figure 9-2). A newly recorded cave (CER-06) located approximately 5 km to the north of the Development Envelope (Figure 9-2) is considered suitable for diurnal use by Ghost Bat and classified as a Category 3 roost (Biologic 2024c) (Table 9-4).

Other caves located in proximity to the Development Envelope are classified as Category 4 roosts (including the five caves visited by Astron in 2024); these caves are less complex and may be used opportunistically for feeding or nocturnal use by Ghost Bat (Astron 2024; Biologic 2022e, 2024c).

Table 9-4: Terrestrial Fauna - Ghost Bat cave classification and evidence of use

Cave ID	Roost category	Roost classification	Evidence of use by Ghost Bat	Proximity to Development Envelope
Caves within the Development Envelope				
OB35-04	Category 4	Feeding or nocturnal roost	Yes – old scats	Outside the Indicative Footprint - adjacent OB35 pit
OB35-05	Category 4	Feeding or nocturnal roost	Yes – old scats	Outside the Indicative Footprint - adjacent OB35 pit

Cave ID	Roost category	Roost classification	Evidence of use by Ghost Bat	Proximity to Development Envelope
Category 2 caves within 12 km the Development Envelope				
CWER-01	Category 2	Confirmed maternity roost	Yes – individuals observed, recent and old scats	7.0 km southwest of OB35 pit
CWER-03	Category 2	Potential maternity roost, confirmed diurnal roost	Yes – individuals observed, acoustic calls, recent and old scats	0.6 km south of OB35 pit
Category 3 caves within the vicinity of the Development Envelope				
CER-06	Category 3	Potential diurnal roost	Yes – recent and old scats	5.0 km north of pipeline
CWER-10	Category 3	Potential diurnal roost	Yes – old scats	1.3 km south of OB35 pit
CWER-16	Category 3	Potential diurnal roost	Yes – recent scats	4.1 km southwest of OB35 pit
CWER-17	Category 3	Potential diurnal roost	No	7.3 km southwest of OB35 pit

Studies using VHF tracking and GPS/satellite tracking technologies show that Ghost Bats can forage over areas up to 12 km from a diurnal roost (Augusteyn *et al.* 2018; Bat Call WA 2021). Bats have also been recorded travelling between 20 km and 30 km from diurnal roosts in a single night (Biologic 2019; Bat Call WA 2021). Unpublished satellite tracking data suggests Ghost Bats preferentially forage in areas of sparse, mature woodland over patchy and/or clumped *Triodia* hummock grasslands. Ghost Bats are believed to use vantage points including tall, isolated trees on the edge of these woodlands and grasslands, as well as along watercourses to search for prey (Bat Call WA 2021).

The presence of Category 2 roosts and records of Ghost Bats from areas adjacent to the Development Envelope (specifically to the southwest), demonstrate a continued presence of Ghost Bat, and that Ghost Bats are likely resident in the local area and may forage across suitable habitats within the Development Envelope. Critical foraging habitat types in the Development Envelope which are within 12 km of Category 2 roosts include Minor Drainage Line, Sandy/Stony Plain and Stony Plain in Poor or better condition (Astron 2024) (Table 9-3, Figure 9-4).

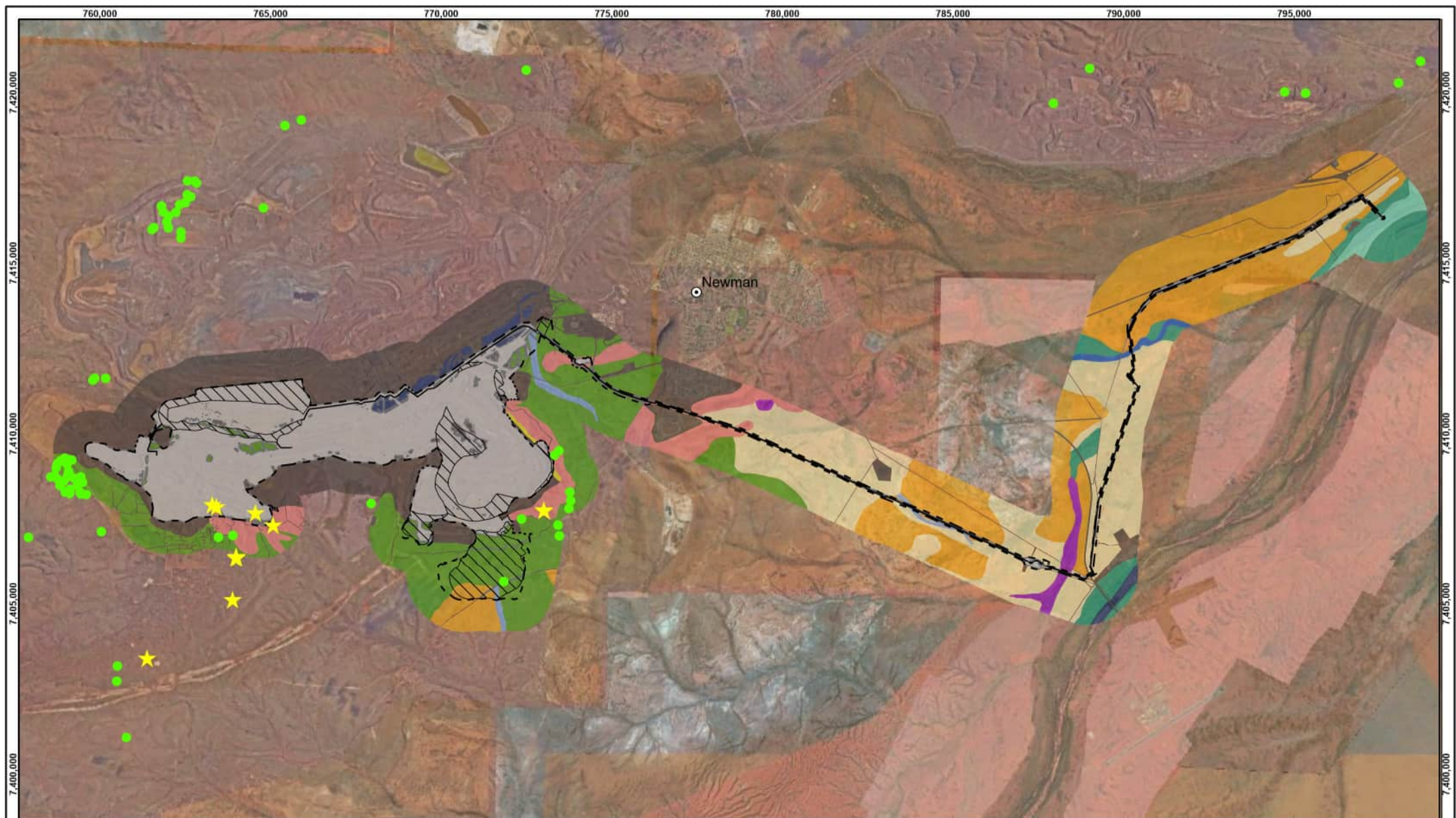
These habitats represent 'productive plain areas with thin mature woodland over patchy or clumped tussock or hummock grass on sand or stony ground' and/or contain 'isolated trees and trees on the edge of thin thickets on the plains' and 'trees along the edges of watercourse woodlands' (as defined by Bat Call WA 2021). The extent of these habitat types which are Degraded or Completely Degraded are excluded given that they are highly unlikely to provide the key features required to support foraging (i.e. treed vegetation that provides foraging perches) and/or are significantly less productive than the surrounding critical foraging habitat within the Development Envelope. Similarly, the Major Drainage Line habitat within 12 km of Category 2 roosts is in Poor condition and highly fragmented, occurring within the Mt Whaleback rail loop and surrounded by active mining operations. Therefore, the Major Drainage Line habitat in this area of the Development Envelope is unlikely to support Ghost Bat foraging and is not considered to be critical foraging habitat. Where this habitat occurs outside of the 12 km, it is considered to provide supporting foraging habitat (Table 9-3).

Of the remaining habitats within the Development Envelope, Drainage Area/Floodplain, Medium Drainage Line, Mulga Woodland and Wetland habitat types are considered supporting foraging habitat for Ghost Bat (Table 9-3). These supporting foraging habitats do not contain the features required to provide critical foraging habitat or are not located within 12 km of a critical roost; however, in areas where scattered trees are present, they may provide some foraging opportunities. The classification as supporting foraging habitat is a conservative classification, as the presence of trees and vegetation within these habitats are variable across the Development Envelope.

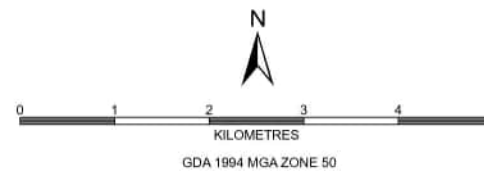
Western Pebble-mound Mouse

The Western Pebble-mound Mouse (*Pseudomys chapmani*) is known to occur from within the Undulating Low Hills habitat of the Development Envelope, based on a record of an inactive mound (Biologic 2011b) (Figure 9-3). This Pilbara endemic species is known to occur on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Start *et al.*, 2000).

Numerous records (mounds) of this species exist from Hillcrest/Hillslope or Stony Plain habitat types adjacent to the Development Envelope (Figure 9-3). The species is also known to occur in conservation reserves in the Pilbara (EPA 2018c).



- Western Pebble-mound Mouse (*Pseudomys chapmani*)
- ★ Ghost Bat (*Macroderma gigas*)
- Development Envelope
- Indicative Footprint
- Cleared Area
- Habitat Type**
- Breakaway/ Cliff
- Drainage Area/ Floodplain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sandy/ Stony Plain
- Stony Plain
- Undulating Low Hills
- Wetland
- Cleared/ Disturbed



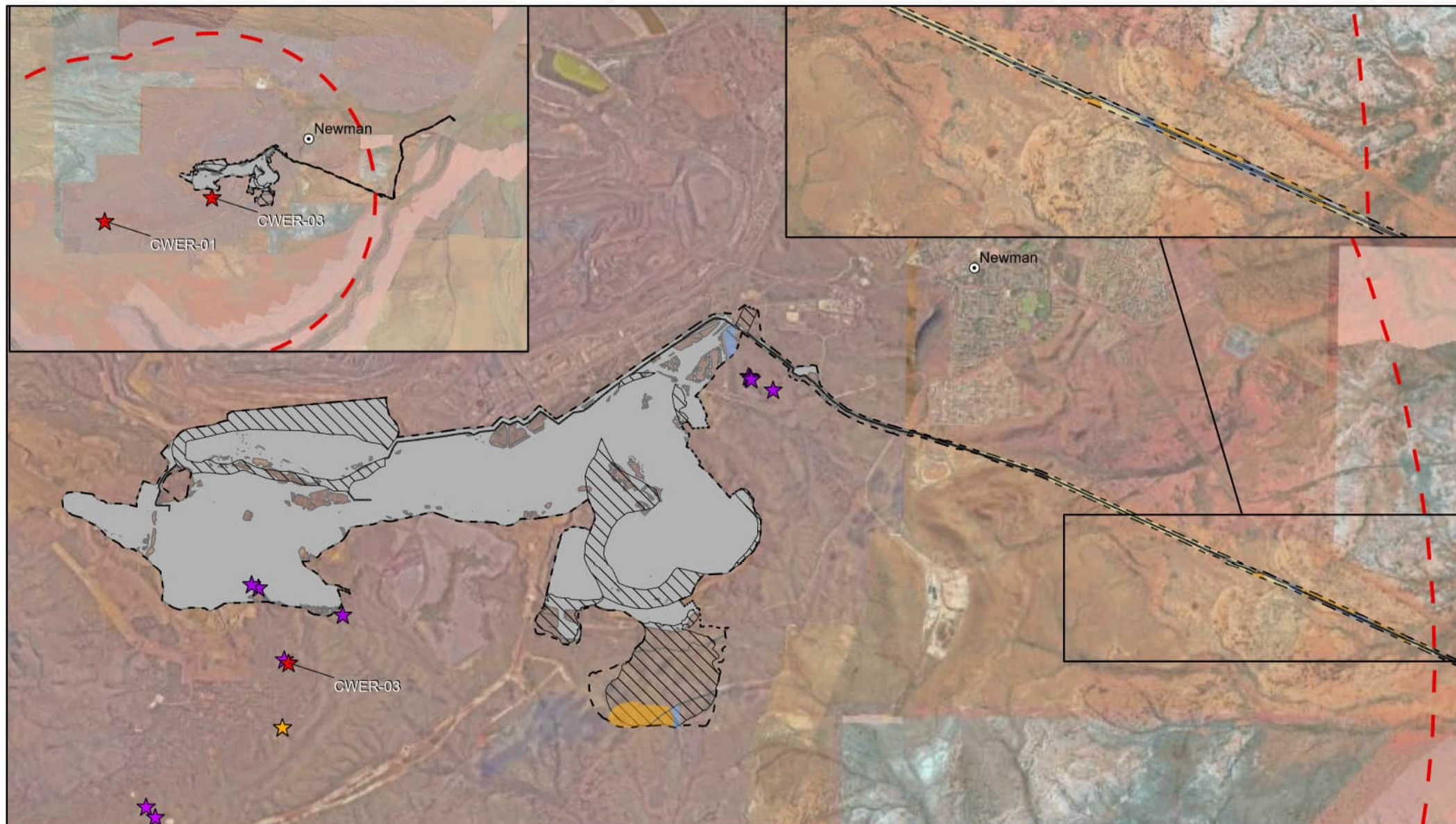
BHP

PUBLIC

**OREBODY 29/30/35
SIGNIFICANT AMENDMENT
SIGNIFICANT VERTEBRATE
FAUNA SPECIES**

PLANNING & STANDARDS - IRON ORE

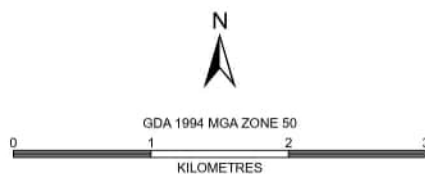
SCALE @ A4: 1:80,000 PREPARED: GEOMATICS FIGURE: **9-3**
DATE: 21/11/2024 REQUESTOR: ENV APPROVALS NO: **A929_049_RevD**
REVIEWED:



- Indicative Footprint
- Development Envelope
- Cleared Area
- 12km Foraging Range

- Habitat Type**
- Minor Drainage Line
 - Sandy/ Stony Plain
 - Stony Plain

- Ghost Bat Cave Category**
- Category 2
 - Category 3
 - Category 4



BHP

PUBLIC

**OREBODY 29/30/35
SIGNIFICANT AMENDMENT
GHOST BAT CRITICAL
FORAGING HABITAT
PLANNING & STANDARDS - IRON ORE**

SCALE @ A4:	1:55 000	PREPARED:	GEOMATICS	FIGURE:	9-4
DATE:	26/11/2024	REQUESTOR:	ENV APPROVALS	NO:	A929_050_RevH
		REVIEWED:			

9.3.2.4 Short-range endemic invertebrate fauna

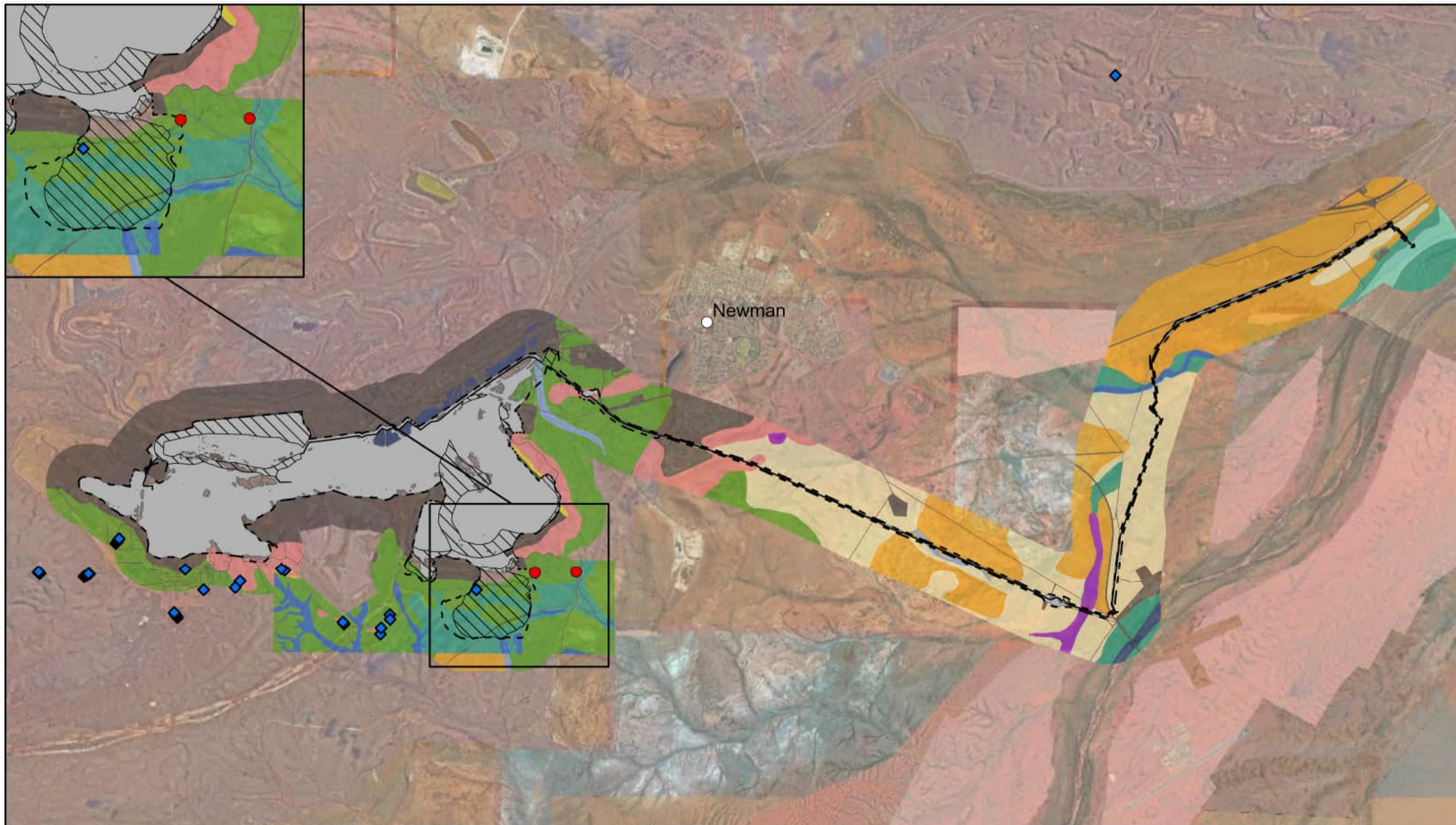
No Confirmed SRE invertebrate fauna species are known to occur within the Development Envelope. Surveying completed by Biologic in 2023 recorded 13 Potential SRE invertebrate fauna species (Biologic (2024a), two of which occur within the Development Envelope:

- *Buddelundia* sp. 'OBE001'
- *Indolpium* sp. indet.

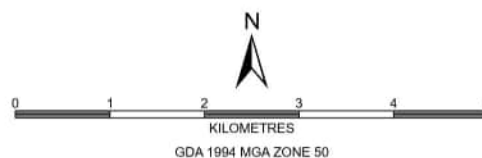
One record of the isopod *Buddelundia* sp. 'OBE001' was from Undulating Low Hills habitat within the southern portion of the Development Envelope (Biologic 2024a) (Figure 9-5). There is also a record of this species from adjacent Drainage Area/Floodplain habitat outside of the Development Envelope. Additionally, this taxon is likely to be the same as the sequenced taxon *Buddelundia* sp. 'Biologic-ISOP138' (Biologic 2024a), which is known from two records from Medium Drainage Line habitat outside of the Development Envelope.

A single record of the pseudoscorpion *Indolpium* sp. indet was recorded from Drainage Area/Floodplain within the southern portion of the Development Envelope (Biologic 2024a) (Figure 9-5). This taxon is also known from a variety of habitat types outside of the Development Envelope. The specimen from within the Development Envelope is likely to represent one of the sequenced Olipiidae or *Indolpium* taxa known from adjacent areas or the Coombanbunna area (southwest of the Development Envelope) (Biologic 2024a).

The majority of habitat types within the Development Envelope are of low significance to SRE invertebrate fauna species. The habitats are widespread and/or interconnected, and while they may be used by SRE invertebrate taxa for dispersal they do not offer the isolation and protection of habitats that SRE invertebrate taxa are often found in (Biologic 2024a). The fauna habitats mapped across the Development Envelope by Astron (2024) are shown on Figure 9-5. As part of the recent SRE survey across the southern portion of the Development Envelope (in relation to the proposed OSA expansion), Biologic (2024a) completed detailed SRE habitat mapping and this mapping is also shown on Figure 9-5. The Hillcrest/Hillslope habitat is considered moderately suitable for SRE invertebrate fauna (Biologic 2024a). This habitat was characterised by open slopes with a rocky substrate and scattered trees and shrubs over low hummock grasslands. Important habitat features include old-growth spinifex, fallen boulders and outcropping ironstone containing overhangs and crevices. Instances of Breakaway/Cliff habitat were contained within the Hillcrest/Hillslope habitat and comprised microhabitats that were uncommon in other habitat types, such as rocky overhangs, caves and crevices. This habitat is considered of high suitability for SRE invertebrate fauna (Biologic 2024a). Both these habitat types are restricted in the landscape providing the isolation that is often associated with SRE taxa.



- *Buddelundia* sp. 'OBE001'
 - ◆ *Indolpium* sp. indet.
 - ▨ Indicative Footprint
 - - - Development Envelope
 - Cleared Area
- Habitat Type**
- Breakaway/ Cliff
 - Cleared/ Disturbed
 - Drainage Area/ Floodplain
 - Hillcrest/ Hillslope
 - Major Drainage Line
 - Medium Drainage Line
 - Minor Drainage Line
 - Mulga Woodland
 - Sandy/ Stony Plain
 - Stony Plain
 - Undulating Low Hills
 - Wetland



BHP PUBLIC

OREBODY 29/30/35
SIGNIFICANT AMENDMENT
POTENTIAL SRE INVERTEBRATE
FAUNA SPECIES

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:80,000	PREPARED:	GEOMATICS	FIGURE:	9-5
DATE:	26/11/2024	REQUESTOR:	ENV APPROVALS	NO:	A929_051_RevG
		REVIEWED:			

9.4 Potential environmental impacts

BHP has considered the development activities that have the potential to impact on Terrestrial Fauna outlined in the EPA's *Environmental Factor Guideline - Terrestrial Fauna* (EPA 2016c) and considers that those relevant to the Proposal are:

- loss of fauna habitats and species from clearing (direct)
- impacts to fauna individuals from mining activities (indirect) and infrastructure (direct)
- impacts to fauna habitats and individuals from dust emissions (indirect)
- interactions with (direct) and changes to (indirect) fauna habitat from introduced species
- changes to fauna habitats from fire (indirect).

As there are no potential impacts to vegetation from changes to groundwater regimes from the Proposal (Section 8.6.2), and there are no water features known from within the Development Envelope, BHP considers there are no potential impacts to fauna or fauna habitats from changes to water regimes from the Proposal.

A large portion (82%) of the Development Envelope has been cleared for the Approved Proposal and mining at Mt Whaleback (Section 2.3; Figure 2-2), in accordance with existing approval mechanisms. There are no terrestrial fauna values remaining within cleared areas of the Development Envelope. BHP has focused the discussion of potential impacts of the Proposal on the areas containing native vegetation and habitat that are proposed to be cleared for the Proposal.

As the Approved Proposal is for mining of Orebody 29/30/35 below the water table only (i.e. abstraction of groundwater and discharge of surplus water), potential impacts on terrestrial fauna were not assessed as part of the Approved Proposal; therefore, there are no combined effects from the implementation of the Approved Proposal and the Proposal on Terrestrial Fauna. Potential impacts on Terrestrial Fauna associated with the existing operations were assessed under the Mt Whaleback NVCP (5617/6), which approved the clearing of native vegetation for the mining of Orebody 29/30/35 and associated activities. The cumulative impacts of the Proposal and existing operations at Orebody 29/30/35, as well as the adjacent Mt Whaleback and Western Ridge operation, are considered under Section 17 for the cumulative environmental impact assessment.

Unless specified otherwise, the potential impacts discussed in this section are unmitigated (i.e. potential impacts before mitigation measures are applied, if required).

9.4.1 Loss of fauna habitats and species from clearing

The Proposal will result in the direct clearing of up to 116 ha of fauna habitat in the Indicative Footprint of 312 ha within the Development Envelope (Section 2.3).

Direct clearing of fauna habitats has the potential to impact the representation of habitats present in the area (Section 9.4.1.1) and the representation of significant fauna species (Section 9.4.1.2) and SRE invertebrate fauna species (Section 9.4.1.3) that may be present.

9.4.1.1 Fauna habitats

Habitat mapping within the Development Envelope identified 11 fauna habitat types (Astron 2024), 10 of which occur within the Indicative Footprint (Table 9-5, Figure 9-2). Table 9-5 shows the area of each habitat type within the Development Envelope and Indicative Footprint.

Detailed habitat mapping occurs over a limited extent within the Pilbara; however, BHP has consolidated detailed fauna habitat mapping undertaken across their Pilbara tenure, which provides a unique database to assess the representation of the habitats across the Pilbara. Based on the Indicative Footprint, the potential impact to any fauna

habitat type (as a percentage of the habitat types within the consolidated database) is less than 0.1%, with the exception of the Undulating Low Hills at 0.71% and Wetland at 0.35% (Table 9-5).

Table 9-5: Terrestrial Fauna - potential impacts to fauna habitat types

Habitat type	Area within Development Envelope (ha)	Area within Indicative Footprint (ha)	Area within BHP Consolidated Mapping (ha) ³	Area within Indicative Footprint as % of Consolidated Mapping
Breakaway/Cliff	<0.01	<0.01	2,846.1	<0.01
Drainage Area/Floodplain	0.55	0.41	66,285.2	<0.01
Hillcrest/Hillslope	5.78	0.40	230,358.6	<0.01
Major Drainage Line	8.31	0.17	26,672.2	<0.01
Medium Drainage Line	0.37	0.07	1,331.9	<0.01
Minor Drainage Line	5.69	1.44	12,040.4	0.01
Mulga Woodland	0.61	0	71,424.6	0
Sandy/Stony Plain	32.88	4.05	14,833.9	0.03
Stony Plain	20.69	12.63	89,601.1	0.01
Undulating Low Hills	107.68	73.04	10,245.0	0.71
Wetland	0.35	0.05	14.1	0.35
Cleared/Disturbed ¹	62.67	23.75	-	-
Cleared Areas ²	1,100.13	195.38	-	-
TOTAL	1,345.71	311.40	-	-
TOTAL (rounded)	1,346	312	-	-

1. Areas mapped as disturbed during the fauna survey and habitat mapping
2. Areas already cleared under the Mt Whaleback NVCP 5617/6 or other approval mechanisms
3. Based on consolidated data within BHP's database, covering an area of approximately 694,984 ha

9.4.1.2 Significant vertebrate fauna

The Proposal has the potential to affect the representation and distribution of significant fauna species resulting from direct clearing of fauna habitats. As discussed in Section 9.3.2.3, two significant fauna species have been recorded within the Development Envelope. Table 9-7 shows the potential impact on each species, with consideration of all identified records from the Pilbara bioregion.

Table 9-6: Terrestrial Fauna - potential impacts to significant fauna

Species	Known records within Pilbara ¹	Records within Development Envelope	Records within Indicative Footprint	% of known records within Indicative Footprint
Ghost Bat (<i>Macroderma gigas</i>)	2,797	3	0	0
Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>)	3,665	1	1	0.03

1. Records are based on the BHP database current as at the time of writing, comprising of BHP survey data, publicly available data and data sourced from DBCA. Multiple individuals may be present at a single record. Records have been presented as the number of individuals were not always counted.

There are three records of Ghost Bat (scats) from caves within the Development Envelope, including one record from a cave that is now cleared. As discussed in Section 9.3.2.2, the two caves within the Development Envelope (OB35-04 and OB35-05) are not located within the Indicative Footprint, and therefore will not be directly impacted from the Proposal.

As detailed in Section 9.3.2.3, critical Ghost Bat foraging habitat present in the Development Envelope (where they occur within 12 km of the Category 2 roosts CWER-01 and CWER-03) has been identified as Minor Drainage Line, Sandy/Stony Plain and Stony Plain (Figure 9-4). These habitats are considered to provide critical foraging habitat where the vegetation is in Poor or better condition. A total of 33 ha (rounded from 32.52 ha) of critical Ghost Bat foraging habitat occurs within the Development Envelope (Table 9-7). Based on the Indicative Footprint, up to 14 ha (rounded from 13.69 ha) of the critical foraging habitat is proposed to be directly cleared for the Proposal; representing 0.02% of the total foraging area for CWER-01 and CWER-03 (Table 9-7).

Table 9-7: Terrestrial Fauna - critical Ghost Bat foraging habitat

Habitat type	Area within Development Envelope (ha) ¹	Area within Indicative Footprint (ha) ¹	Area within Indicative Footprint as % of total foraging area ²
Minor Drainage Line	5.57	1.37	<0.01
Sandy/Stony Plain	9.81	0.12	<0.01
Stony Plain	17.14	12.20	0.02
TOTAL	32.52	13.69	0.02
TOTAL (rounded)	33	14	0.02

1. Amount of habitat within the 12 km foraging range of the Category 2 roosts CWER-01 and CWER-03, and in Poor or better condition.
 2. The total foraging area (based on 12 km radius from CWER-01 and CWER-03) is 64,330 ha.

The Western Pebble-mound Mouse (Priority 4) is known from a single inactive mound within the Development Envelope. This mound is located within the Indicative Footprint and will be impacted by the Proposal. This impact represents a potential loss of less than 1% of known records of the Western Pebble-mound Mouse from the Pilbara bioregion (Table 9-6).

9.4.1.3 Short-range endemic invertebrate fauna

Two Potential SRE invertebrate fauna species are each known from a single record within the Development Envelope (Section 9.3.2.4). The other Potential SRE invertebrate fauna species recorded by Biologic (2024a) occur outside of the Development Envelope and therefore will not be impacted by the Proposal.

The single record of *Buddelundia* sp. 'OBE001' is located from within Undulating Low Hills habitat (Biologic 2024a), less than 3 m inside the boundary of the Development Envelope (Figure 9-5) but outside of the Indicative Footprint. The location of this record is not expected to be impacted from the Proposal.

The pseudoscorpion *Indolpium* sp. indet is known from a single record in Drainage Area/Floodplain habitat in the proposed OSA area of the Indicative Footprint (Biologic 2024a). Based on the Indicative Footprint, the potential impact to this species is less than 1% of the known records from the Pilbara region (Table 9-8). It should be noted that it is unlikely that all the *Indolpium* sp. indet specimens known from the Pilbara (based on BHP internal database) are representative of the same species; however, due to the uncertainty around the taxonomy of the record from the Development Envelope, the assessment of potential impacts is limited.

Table 9-8: Terrestrial Fauna - potential impacts to short-range endemic invertebrate fauna

Species	Known records within Pilbara ¹	Records within Development Envelope	Records within Indicative Footprint	% of known records within Indicative Footprint
<i>Buddelundia</i> sp. 'OBE001'	2	1	0	0
<i>Indolpium</i> sp. indet	329	1	1	0.3

1. Based on BHP internal database and publicly available data

Most of the fauna habitats occurring within the Development Envelope are rated as low suitability for SRE invertebrate fauna. Both Potential SRE species were collected from habitat that are generally considered to be less prospective for SRE invertebrate fauna (Undulating Low Hills and Drainage Area/Floodplain) as they are less isolated and protected than rocky microhabitats, and are continuous throughout the landscape.

The habitat considered to be of greatest likelihood to support SRE invertebrate fauna species is the rocky microhabitats within the Hillcrest/Hillslope (moderate suitability) and Breakaway/Cliff habitats (high suitability) (Biologic 2024a). The extent of Hillcrest/Hillslope habitat within the Indicative Footprint is 0.4 ha, while less than 0.01 ha of the Breakaway/Cliff habitat occurs within the Indicative Footprint (Table 9-5).

9.4.2 Impacts to fauna individuals from mining activities and infrastructure

While the Indicative Footprint avoids direct impacts to caves, there is potential for terrestrial fauna, specifically Ghost Bat, to be indirectly impacted by noise, vibration and light due to mining activities. There are no critical roost caves within the Development Envelope. The two Category 4 caves within the Development Envelope are located adjacent to the existing OB35 mine pit (Figure 9-2). The Proposal is not seeking any expansion to the OB35 pit, with the exception of a small access ramp on eastern end of the pit approximately 1 km from the caves. As there is no proposed expansion to mining at OB35 mine pit, it is expected that there will be only minimal increases in the noise, vibration and light in the vicinity of the caves resulting from the Proposal.

There is also potential for terrestrial fauna interactions with vehicles, mining equipment and infrastructure, which may result in injury or mortality of individuals. The Proposal is unlikely to increase vehicle and machinery movements in the area, as it is within an existing operational area.

9.4.3 Impacts to fauna habitats and individuals from dust emissions

Clearing of vegetation, blasting, excavation and haulage can create dust in proximity to these activities. Dust generation from the pipeline is expected to be limited to the construction phase only.

Increased levels of dust have the potential to impact vegetation health and therefore fauna habitats. As assessed in Section 8.4.3, the potential impact on vegetation (and fauna habitats) from dust resulting from the Proposal is expected to be minimal.

The generation of dust can impact fauna species by interfering with vision and the ability to capture prey with foraging, this is particularly relevant to Ghost Bats that may intermittently forage habitats within or near to the mine area of the Development Envelope (Section 9.3.2.3). Dust levels are not predicted to increase beyond existing operations (Section 13.6). The potential impact for the Proposal to impact fauna individuals from dust is expected to be minimal and similar to that previously assessed for the surrounding existing operations.

9.4.4 Interactions with and changes to fauna habitat from introduced species

Mining activities have the potential to introduce and spread weed species that can potentially alter vegetation composition and fauna habitat condition. There is also potential for the introduction or increase of feral animals resulting from increased disturbance and activity in the area. Introduced fauna species may affect native fauna through a range of factors including predation, competition for food and shelter, habitat destruction and the spread of diseases.

The Proposal is located within existing operational areas and is not expected to result in an increase to interactions with fauna or changes to fauna habitats from introduced weed species.

9.4.5 Changes to fauna habitat from fire

The Proposal has the potential to change the frequency and intensity of fire by implementing controls to avoid fire, actively extinguishing fires or by unintentionally causing fire through mining activities. An increased risk of fire could impact on terrestrial fauna directly through injury or death, or indirectly through loss or alteration of fauna habitats.

None of the vegetation associations (and therefore fauna habitat) within the Development Envelope are considered to be sensitive to fire. Native fauna and fauna habitats in the Pilbara have adaptive to natural fire regimes. The Proposal is not expected to change the frequency of fire within the existing operational area, therefore will have a negligible impact to fauna habitats from the potential alteration of fire regimes.

9.5 Mitigation

BHP considers that there are no potentially significant impacts to Terrestrial Fauna from the Proposal; however, BHP proposes to implement avoidance and minimisation measures to further reduced potential impacts on Terrestrial Fauna from the Proposal. The proposed mitigation for the Proposal is discussed below.

BHP will continue to implement mitigation measures (including standard management practices) for the Approved Proposal (summarised in Appendix 2) as part of the Amended Proposal if approved.

9.5.1 Avoid

During the design phase of the Proposal, the Development Envelope and Indicative Footprint were designed to avoid areas of native vegetation (fauna habitat) as much as possible. As discussed in Section 8.5.1, the surplus water pipeline alignment was redesigned as part of the engagement within the Niyaparli Traditional Owners, which resulted in a slight decrease in clearing requirements.

Approximately 82% of the Development Envelope and 63% of the Indicative Footprint are situated in areas that have already been cleared for existing operations, specifically Orebody 29/30/35 and Mt Whaleback mining operations. The proposed surplus water pipeline largely located on existing disturbed areas.

As BHP considers that there are no potentially significant impacts to Terrestrial Fauna from the Proposal, there are no specific avoidance measures proposed (beyond the avoidance measures implemented during the design phase). There are no direct avoidance measures proposed for the two Category 4 roosts within the Development Envelope (which have no recent evidence of use by Ghost Bat). These caves are shallow and structurally simple and are not suitable for diurnal usage and are considered to provide potential feeding or nocturnal roosting only. These caves are located within the existing approved OB35 mine pit area and outside of the Indicative Footprint for the Proposal.

9.5.2 Minimise

The Proposal will use existing and approved mine, transportation and processing elements at Mt Whaleback to minimise the amount of clearing required for the Proposal (Section 2.2). As discussed above, the proposed surface water pipeline to Ophthalmia Dam will also be located within cleared areas as much as practical, minimising the disturbance of fauna habitats required for the Proposal.

To minimise dust emissions for the Proposal, BHP will continue to manage dust as per the existing Part V licence for Mt Whaleback/Orebody 29/30/35 (L4503/1975/14), which includes a range of controls to minimise emissions (as detailed in Section 13.5.2).

BHP will continue to implement standard management practices to minimise the impacts from feral fauna, including recording observations of feral animals and implement control measures in response to observations. BHP is currently investigating options to implement ongoing feral cat monitoring across operational areas, to enhance detection and control measures.

9.5.3 Rehabilitate

Rehabilitation at Orebody 29/30/35 is addressed in the MCP (BHP 2024i) (Appendix 7). The MCP covers the Approved Proposal and has been revised to include the Proposal.

Management approaches relating to Terrestrial Fauna for the Proposal include:

- undertake progressive rehabilitation
- revegetation designed to establish native vegetation and provide habitat and foraging area for fauna
- diversity of vegetation types used in rehabilitation to improve habitat value and encourage colonisation by a range of fauna
- at closure, fauna habitats will be constructed into rehabilitated areas, where practicable.

9.5.4 Other statutory decision-making processes

BHP's view is that there is no other statutory decision-making process to mitigate the potential environmental impacts of the Proposal on Terrestrial Fauna, considering the EPA's *Taking decision making processes into account in EIA: Interim Guidance* (EPA 2021b).

9.6 Assessment and significance of residual impacts

BHP has considered the EPA's *Environmental Factor Guideline – Terrestrial Fauna* (EPA 2016c) when assessing the significance of the impacts to Terrestrial Fauna from the Proposal. The assessment of potential impacts discussed in this section are following the application of mitigation as documented in Section 9.5.

9.6.1 Loss of fauna habitats and species from clearing

9.6.1.1 Fauna habitats

As discussed in Section 9.4.1.1, potential impact to any fauna habitat type (as a percentage of the mapped extent of the habitat types within BHP's consolidated database) is less than 1%. None of the fauna habitats occurring within the Development Envelope have been assessed as being regionally under-represented or of local importance, with the exception of the Wetland habitat (Astron 2024). The Wetland habitat is associated with the inundated area of the Ophthalmia Dam and is considered part of an important habitat due to the rarity of Wetland habitats within the Pilbara (Astron 2024). All other habitats are known to be widespread in the Pilbara and Gascoyne bioregions. While these fauna habitat types are considered widespread and well represented regionally, some are known to provide important habitat for significant fauna species (Ghost Bat) and are discussed further in Section 9.6.1.2.

9.6.1.2 Significant vertebrate fauna

Ghost Bat

Ghost Bat scats have historically been recorded from the Category 4 roosts within the Development Envelope. These caves are structurally simple and may only be used opportunistically for feeding or nocturnal use by bat species. The caves are located adjacent to the OB35 mine pit and are not expected to be impacted by the Proposal as they occur outside of the Indicative Footprint. BHP referred the *OB35 Above Water Table (AWT) Iron Ore Mine Proposal* (BHP Billiton 2011) to the EPA on 19 December 2011, which included potential impacts to the Category 4 roosts within the OB35 mine pit area. The EPA determined the level of assessment to be 'Not Assessed – Advice Given'. As such, the proposed impact to these caves was not considered to be significant.

As discussed in Section 9.4.1.2, critical foraging habitat for Ghost Bat (occurring within 12 km of the two Category 2 roosts) includes Minor Drainage Line, Sandy/Stony Plain and Stony Plain, when this habitat occurs in Poor or better condition. The Proposal will result in the clearing of up to 14 ha of critical foraging habitat for Ghost Bat within the Development Envelope. While this clearing is within the foraging range of Category 2 roosts, it is not expected to impact the local population of Ghost Bat given the areas to be cleared are adjacent to existing mining operations and are unlikely to be solely relied upon by Ghost Bat for foraging purposes. Rather these areas are expected to only be used intermittently.

Western Pebble-mound Mouse

As discussed in Section 9.4.1.2, the Proposal is predicted to impact one inactive Western Pebble-mound Mouse mound (based on the Indicative Footprint). From the surrounding area, the Western Pebble-mound Mouse is known to occur within Hillcrest/Hillslope, Undulating Low Hills and Stony Plain habitat types, which occur extensively in the local area and Pilbara region. There are numerous records of this species beyond the Development Envelope (including records from within conservation reserves), with over 3,600 records of this species known from the Pilbara region (Table 9-6). BHP considers that the potential impact from the Proposal to one inactive mound, and 86.07 ha of suitable habitat (Hillcrest/Hillslope, Undulating Low Hills and Stony Plain), is not a significant impact to this species at a local or regional scale, when considering the extensive occurrence of this species' preferred habitat in the region and lack of active mounds in the Development Envelope.

9.6.1.3 Short-range endemic invertebrate fauna

As discussed in Section 9.4.1.3, the Proposal has the potential to impact one Potential SRE, *Indolpium* sp. indet which is present within the Indicative Footprint. One record of the indeterminate pseudoscorpion was recorded from Drainage Area/Floodplain habitat within the southern portion of the Development Envelope (Figure 9-5). It is difficult to provide an accurate assessment of potential impacts to an indeterminate taxon; however, the specimen is considered likely to represent one of the sequenced Olipiidae or *Indolpium* taxa known from adjacent areas outside of the Development Envelope or from the Coombarbunna area (southwest of the Development Envelope and south of Western Ridge) (Biologic 2024a). Other *Indolpium* sp. indet records are known from a variety of habitat types

outside of the Development Envelope, with the distribution of this taxa extending outside of the Indicative Footprint and Development Envelope. This taxon was recorded from Drainage Area/Floodplain habitat type. This habitat is considered to be of low significance to SRE invertebrate fauna as it is widespread and/or interconnected, and while it may be used by SRE invertebrate fauna for dispersal it does not offer the isolation and protection of habitats that SRE invertebrate taxa are often found in (Biologic 2024a).

Based on the Indicative Footprint, the record of the isopod *Buddelundia* sp. 'OBE001' is not expected to be impacted by the Proposal. As the Indicative Footprint is only an indication of likely disturbance, there is potential (while unlikely) for disturbance to occur anywhere in the Development Envelope and for the single record of *Buddelundia* sp. 'OBE001' to be impacted. This taxon was recorded adjacent to the proposed OSA outside the Indicative Footprint, from within Undulating Low Hills habitat less than 3 m from the Development Envelope boundary. A second record of this species is known from Drainage Area/Floodplain habitat east and outside of the Development Envelope (Figure 9-5). Both habitats are considered to be of low significance to SRE invertebrate fauna as they are widespread and/or interconnected, and do not offer the isolation and protection for SRE invertebrate taxa (Biologic 2024a). Additionally, this taxon was assessed as likely to be the same as the sequenced taxon *Buddelundia* sp. 'Biologic-ISOP138' (Biologic 2024a), further extending its known range and occurrence, as *Buddelundia* sp. 'Biologic-ISOP138' is known from two records outside of the Development Envelope.

Due to the extensive and continuous occurrence of habitat outside of the Development Envelope, and the occurrence of the Potential SRE taxa beyond the Indicative Footprint (and wider beyond the Development Envelope), BHP considers that the Proposal will not have a significant impact on the local SRE invertebrate fauna species or the availability of habitats considered high or moderately suitable for SRE fauna.

9.6.2 Impacts to fauna individuals from mining activities and infrastructure

The potential indirect impacts of mining activities, mining equipment and infrastructure on terrestrial fauna have the potential to alter fauna behaviour or result in avoidance of an area. These impacts are often temporary.

Due to the lack of important Ghost Bat roosts within the Development Envelope and limited records of Ghost Bat use of the Development Envelope, any indirect impacts from the Proposal are expected to be minimal. Light emissions will be managed through Proposal design to ensure light is directed into operational areas as far as practicable, reducing the potential indirect impact to significant fauna. As discussed in Section 9.4.2, there is potential for increased vehicle/machinery or infrastructure interaction with fauna. Certain species are considered to be at a higher risk of impact, including Ghost Bats which tend to fly low to the ground while foraging. With the continued implementation of standard operational measures, it is considered that the risk of interactions from the Proposal will not significantly increase from that of the Approved Proposal. Therefore, BHP considers that there will not be a significant impact to fauna from interactions with mining activities and mining infrastructure.

9.6.3 Impacts to fauna habitats and individuals from dust emissions

There is limited potential for dust to have an indirect impact on Ghost Bat given they are anticipated to only utilise habitats in the Development Envelope intermittently (Section 9.4.3). The potential indirect impact of dust emissions on fauna species are not predicted to greatly increase from that of the Approved Proposal, with the Proposal predicted to result in a minimal increase to the generation of dust.

9.6.4 Interactions with and changes to fauna habitat from introduced species

The occurrence and potential increase of introduced flora (weed) species within the Development Envelope are not expected to alter fauna habitats to an extent that would result in an impact to any fauna species of significance. The Proposal is not expected to increase the abundance or diversity of introduced fauna species in the local area. Therefore, BHP considers that there will not be a significant impact to native fauna from introduced fauna or flora species beyond that associated with the Approved Proposal.

9.6.5 Changes to fauna habitat from fire

The Proposal is not expected to change the frequency of fire within the existing operational area, and therefore BHP considers that there will not be a significant impact to fauna from the implementation of the Proposal.

9.6.6 Significant residual impacts

Following the application of the mitigation hierarchy (Section 9.5) and applying the Residual Impact Significance Model in the *WA Offsets Guidelines* (Government of Western Australia 2014), BHP considers that there is potential significant residual impact to Terrestrial Fauna from the Proposal, comprising the clearing of up to 14 ha of critical foraging habitat for Ghost Bat.

The detailed assessment of offsets is discussed in Section 15, including how the proposed offset/s will counterbalance the significant residual impact on Terrestrial Fauna (i.e. the clearing critical Ghost Bat foraging habitat).

For the other impacts assessed, BHP considers that the residual impacts are not significant. See Section 9.7 for the discussion on the outcomes relating to the identified residual impacts and BHP's proposed assurance (regulation) and monitoring, where required.

9.7 Environmental outcomes

Table 9-9 summarises the environmental outcomes, proposed assurance (regulation) and proposed monitoring (if required) for each residual impact for Terrestrial Fauna from the Proposal. Table 9-9 demonstrates how the proposed environmental outcomes for the Proposal, together with the proposed regulation and monitoring, are consistent with the EPA's objective for Terrestrial Fauna (Section 9.1).

There are no conditions relating to Terrestrial Fauna in MS963 for the Approved Proposal. As provided for as an option in the EPA's ERD Instructions, BHP has proposed conditions for the Combined Proposal (including conditions related to Terrestrial Fauna) for the EPA's consideration, in Appendix 3. This includes limits on clearing of critical Ghost Bat foraging habitat and proposed offsets for significant residual impacts to critical Ghost Bat foraging habitat.

Table 9-9: Terrestrial Fauna - Proposal environmental outcomes, proposed regulation and monitoring

Residual impact		Environmental outcome	Proposed regulation (Condition or other statutory decision-making process) ¹	Proposed monitoring	Consistency with EPA's objective
1.	Clearing of up to 14 ha of critical foraging habitat for Ghost Bat (Section 9.6.1.2)	Clearing of critical foraging habitat for Ghost Bat in the Pilbara bioregion	Condition A1 Limitations and extent of Proposal Up to 116 ha of native vegetation clearing within the Development Envelope Clearing of no more than 14 ha of Ghost Bat critical foraging habitat Condition B3 Rehabilitation and Decommissioning Implement the MCP (BHP 2024i) Condition B4 Offsets Offsets via contribution to PEOF	Standard management practices: - internal land disturbance approval process to manage ground disturbance - annual land disturbance reporting against approved limits/ extents Condition B3 Rehabilitation and Decommissioning Implement monitoring outlined in the MCP (BHP 2024i) Condition B4 Offsets Impact Reconciliation Procedure and Impact Reconciliation Report	The significant residual impact of the clearing of critical foraging habitat for Ghost Bat in the Pilbara bioregion can be counterbalanced by offsets, so that the environmental outcome is consistent with the EPA's objective
2.	No direct impact to known records of Threatened fauna species, and direct impact of no more than 0.1% of known records of Priority fauna species (Section 9.6.1.2)	The viability of the Threatened and Priority fauna known from the Development Envelope will be maintained	Condition A1 Limitations and extent of Proposal Up to 116 ha of native vegetation clearing within the Development Envelope	Standard management practices: - internal land disturbance approval process to manage ground disturbance - annual land disturbance reporting against approved limits/ extents	The extent of significant fauna will be maintained, which is consistent with the EPA's objective
3.	No direct impact to known records of Confirmed SRE fauna species, and direct impact to only one record of a Potential SRE fauna species (Section 9.6.1.3)	The viability of the Potential SRE fauna known from within the Development Envelope will be maintained			

1. This table is for the Proposal only; see the Proposal Content Document (Appendix 1) and the proposed implementation conditions (Appendix 3) for the regulation for the Combined Proposal

10 Subterranean Fauna

10.1 EPA environmental factor and objective

The EPA's objective for the Subterranean Fauna factor is:

To protect subterranean fauna so that biological diversity and ecological integrity are maintained.

10.2 Relevant policy and guidance

BHP assessed this environmental factor considering the following relevant EPA policies and guidance, as outlined in Table 10-1.

Table 10-1: Subterranean Fauna - policy and guidance

EPA, other State and Commonwealth policy and guidance	Consideration of EPA policy and guidance
<i>Environmental Factor Guideline - Subterranean Fauna</i> (EPA 2016e)	- Applied the relevant considerations for environmental impact assessment - Identified the values of subterranean fauna, and their significance - Identified activities that can impact on subterranean fauna - Considered the links with other environmental factors
<i>Technical Guidance - Subterranean Fauna Surveys for Environmental Impact Assessment</i> (EPA 2021e)	Surveys described in Section 10.3.1 were undertaken in accordance with the guidance

10.3 Receiving environment

10.3.1 Studies and surveys

Historical sampling throughout the area has been undertaken as part of a regional sampling programme carried out by Bennelongia and Ecowise in 2009 to 2011. Additional studies and surveys have been undertaken more recently in 2019 to 2023 to supplement the subterranean fauna knowledge of the area. Sampling was completed in accordance with the EPA guidance (relevant at the time of surveying). Table 10-2 summarises the more recent and relevant studies and surveys undertaken to support the assessment of Subterranean Fauna for the Proposal.

Table 10-2: Subterranean Fauna - recent studies and surveys

Title	Survey Date	Summary	Appendix
Orebody 29, 30, 35 Expansion Stygofauna Desktop Assessment and Survey (Bennelongia 2024)	Feb 2023 Jun 2023 Oct 2023	A desktop assessment and detailed stygofauna sampling program. The desktop assessment and sampling focused on the northern portion of the Orebody 29/30/35 groundwater drawdown area and surrounds, to supplement previous survey results from the area. A total of 42 stygofauna samples from 19 bore holes were collected from the three rounds of sampling.	Appendix 12

Title	Survey Date	Summary	Appendix
Orebody 29/30/35 Significant Amendment: troglofauna supplementary information (BHP 2024j)	N/A	A technical memorandum summarising the troglofauna sampling and known troglofaunal values (species and habitat) of the OB29 and OB30 area.	Appendix 12
Ethel Gorge TEC Stygofauna Monitoring 2022/2023 (Stantec 2024)	Nov 2022 May 2023	Ongoing biannual monitoring program to assess groundwater quality and stygofauna abundance and species richness in the Ethel Gorge TEC.	Appendix 12
Eastern Ridge and Jimblebar Stygofauna Monitoring 2021/2022 (Stantec 2022)	Dec 2021 May 2022	Ongoing biannual monitoring program to assess groundwater quality and stygofauna abundance and species richness in the Ethel Gorge TEC.	Appendix 12
Western Ridge Subterranean Fauna Survey and Habitat Assessment (Bennelongia 2021)	Sep-Nov 2019 Jan-Apr 2020	A desktop assessment and subterranean fauna survey. The desktop assessment of literature and invertebrate databases was conducted for the groundwater drawdown area for Western Ridge and Orebody 29/30/35. The assessment results then informed a two-season subterranean fauna survey, which collected 123 troglofauna and 38 stygofauna samples to supplement previous survey results from the area.	Appendix 12

10.3.2 Environmental values

10.3.2.1 Ethel Gorge TEC

The Ethel Gorge aquifer is recognised as stygofauna habitat that supports the Ethel Gorge TEC, which occurs in the shallow alluvial and calcrete aquifers from an area on the Fortescue River floodplain approximately 2 km upstream of the gorge to approximately 4 km downstream of the gorge entrance (Stantec 2022). As discussed in Section 7.4.1.1, Ethel Gorge is located approximately 15 km northeast of Orebody 29/30/35 operations (Figure 7-2) and is an important feature of the Eastern Pilbara hydrological system, where the surface water and groundwater flows from the upstream catchment area converge. The area comprises channels, floodplains and calcretes of the river and calcrete land systems dissected by ridges of bedrock.

Groundwater levels in the Ethel Gorge aquifer are shallow (less than 10 mbgl) and salinity is historically in the fresh to brackish range. Stygofauna are mostly recorded in fresh to brackish groundwater. As discussed in Sections 7.3.2.3 and 7.3.2.4, PFAS has also been detected at very low levels in the Ethel Gorge aquifer (within the Ethel Gorge TEC and adjacent to the Fortescue River) close to Ophthalmia Dam.

The Ethel Gorge TEC is listed as a Critically Endangered TEC, under the BC Act, due to the diverse assemblage of stygofaunal species present (Government of Western Australia 2023). Surveys and monitoring undertaken to date have recorded 82 stygofauna species in the Ethel Gorge aquifer and/or adjacent local groundwater in the Newman area, most of which occur within the TEC (Stantec 2024). Of these species, 39 'core species' have been recognised from the Ethel Gorge area from monitoring programs conducted annually since 2009 (Bennelongia 2013a; Stantec 2024). The 'core species' are characterised by copepods and ostracods, with oligochaetes, amphipods and bathynellids also prominent (Bennelongia 2013a). While copepods have been numerically abundant, ostracods, amphipods and bathynellaceans have contributed considerably to the taxonomic diversity of the assemblage (Stantec 2024).

10.3.2.2 Stygofauna

The groundwater at Orebody 29/30/35 and across most of the surrounding area is considered to be of low prospectivity for stygofauna due to the depth to the water table (the exception being the Ethel Gorge aquifer which supports a unique stygofauna community and shallow alluvial and calcrete aquifers, as discussed above). As discussed in Section 7.3.2.3, the groundwater levels in the Newman area have been lowered by groundwater abstraction for water supply and to dewater orebodies, since the 1970s.

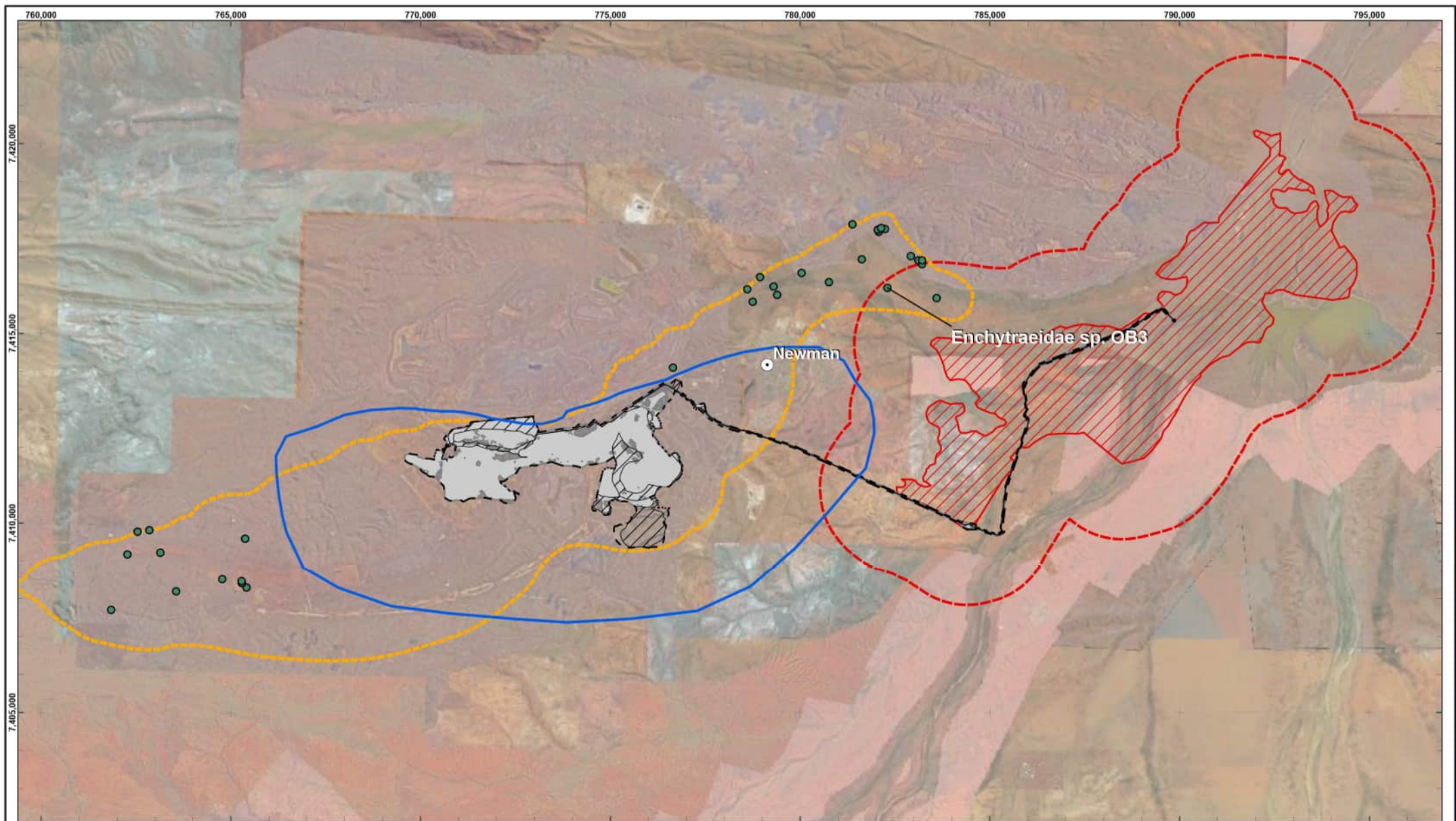
As discussed in Section 7.3.2.3, the Orebody 29/30/35 area is characterised by hydraulically connected regional (weathered dolomite and some tertiary detritals) and Marra Mamba orebody aquifers. The pre-development depth to groundwater in the regional aquifers ranged from a minimum of about 30 mbgl around OB29 to greater than 50 mbgl at the western edge of OB35. Since dewatering commenced at the Orebody 29/30/35 mine in 2015, groundwater levels in the orebody aquifers have been lowered by up to 40 m. Current depths to groundwater in the regional aquifer are greater than 90 mbgl west of OB35 and are shallower to the northeast of OB29 across the leaky flow barrier north of Newman (approximately 20 mbgl to 24 mbgl). Groundwater in the Orebody 29/30/35 area is fresh, typically less than 800 mg/L (BHP 2024c). While the geology and salinity are considered suitable for stygofauna to inhabit, groundwater in the Orebody 29/30/35 area is generally considered to be at a depth unlikely to support a rich stygofauna community.

Stygofauna surveying undertaken in 2019 and 2020 across the southern portion of the 2024 Orebody 29/30/35 drawdown extent only recorded five species of stygofauna from 60 specimens (Bennelongia 2021) (Figure 10-1). The species included earth worms and one species of bathynellid crustacean from the superorder Syncarida (*Pilbaranella* sp. C), as well as an uncertain number of species of nematodes (which are not formally assessed in the impact assessment process due to a lack of ecological knowledge and unresolved taxonomy). This relatively low diversity of stygofauna is reflective of the depth to groundwater in the area (greater than 90 mbgl), which makes conditions inhospitable for stygofauna (Bennelongia 2021).

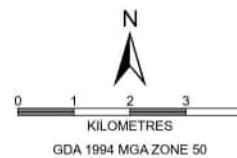
More recent surveying undertaken to the north of Orebody 29/30/35 (to supplement previous sampling), recorded a more abundant stygofauna community with a total of 16 species of stygofauna from 345 specimens collected (Bennelongia 2024), of which 13 occur within the northern portion of the 2024 Orebody 29/30/35 drawdown extent (Figure 10-1). Stygofauna species collected were mostly arthropods and annelids, as well as a number of nematodes, which is consistent with stygofauna communities in the Pilbara (Bennelongia 2024).

In addition, a number of species are also known from the northern extent of the 2024 Orebody 29/30/35 drawdown extent based on historical sampling. Figure 10-1 shows all stygofauna records within the additional lateral extent of the 2024 Orebody 29/30/35 drawdown.

None of the stygofauna species collected from within the 2024 Orebody 29/30/35 drawdown extent are potentially significant, and all are widespread or have been collected elsewhere within the Eastern Pilbara region, except the enchytraeid worm *Enchytraeidae* sp. OB3 (Figure 10-1). *Enchytraeidae* sp. OB3 was collected from a single bore during historical sampling in 2012 and was assessed as likely to inhabit the saturated detritals (Bennelongia 2024).



- ▬ Ethel Gorge TEC
- ▬▬ Ethel Gorge TEC (buffer)
- ▬▬▬ Development Envelope
- ▬▬▬ Indicative Footprint
- ▬▬▬ Cleared Area
- ▬ 2013 Orebody 29/30/35 assessed groundwater drawdown (1m contour)
- ▬▬▬ 2024 Orebody 29/30/35 predicted groundwater drawdown (1m contour)
- Stygofauna Species



BHP

PUBLIC

**OREBODY 29/30/35
SIGNIFICANT AMENDMENT
Stygofauna Records**

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:135,000	PREPARED:	GEOMATICS	FIGURE:	10-1
DATE:	21/11/2024	REQUESTOR:	ENV. APPROVALS	NO:	929/067_RevF
		REVIEWED:			

10.3.2.3 *Troglofauna*

Troglofauna most commonly occur within the mineralised Brockman Iron Formation and Marra Mamba Formation within the Ophthalmia area in which the Development Envelope is located. The Orebody 29/30/35 area can be generally characterised as consisting of the sequence of Tertiary Detritals (mostly alluvium) that occur in association with creek lines and valleys, and the underlying Hamersley Group bedrock that consists of the Brockman Iron Formation, Mount McRae Shale, Mount Sylvia Formation, Wittenoom Formation and Marra Mamba Iron Formation. This is underlain by Jeerinah Formation of the Fortescue Group (Bennelongia 2013b).

Orebody 29/30/35 mine is mostly hosted by the upper members of the Marra Mamba Iron Formation (MacLeod and Mount Newman) although mineralisation extends to the lower Nammuldi Member and into the overlying West Angelas Member of the Wittenoom Formation (Bennelongia 2013b). Potentially suitable habitat for troglofauna within the Development Envelope aligns to areas of Tertiary Detritals and bedrock geologies (Bennelongia 2021). There are areas of folding, faulting and weathering throughout the Orebody 29/30/35 area resulting in heterogeneity of the habitat throughout the area (Bennelongia 2013b).

OB35 is part of the same syncline that includes the proposed Eastern Syncline mine pit at Western Ridge. OB30 is part of a lower syncline and OB29 lies within a large-scale north-west plunging open syncline. The geology to the east and southeast of OB29 is similar to that around OB30 and OB35. The Tertiary Detrital sequence of the orebodies extends to the south with a similar geology characterised throughout the Western Ridge (Bennelongia 2013b). More specifically, the geology of OB29 is a Marra Mamba type consisting of a conformable sequence of Jeerinah, Marra Mamba Iron and Wittenoom Formations. The structural geology of OB29 is relatively simple, with no major modelled faults and good continuity, with the geology extended beyond the proposed pit to the north-east and west through to OB30 (BHP Billiton 2016a). The main stratigraphic units encountered in OB30 are the Jeerinah Formation overlain by the younger Hamersley Group sequence of the Marra Mamba Iron and Wittenoom Formations. There is a southeast-northwest trending fold which is part of the syncline running through OB30, which is also a continuation of the Whaleback and OB29 structure (BHP Billiton 2013a). Based on geological modelling, the West Angelas, Mount Newman, MacLeod, and Nammuldi members extend beyond the OB30 pit to the east, and these members also extend beyond the OB29 pit to the west and to the north-east (Figure 10-2) (BHP 2024j).

Due to the historical activities at Orebody 29/30/35 (mining above the water table commenced 50 years ago in 1974) there is limited troglofauna sampling across the mine pits and surrounds. Based on sampling that has occurred within the Development Envelope, the species composition and abundance is similar to that of other areas of the Ophthalmia Range and species appear to be relatively wide-ranging (Bennelongia 2011); specifically with a number of widespread species known from the OB29 and OB35 mine pits or species known from other areas in the Eastern Pilbara (BHP 2024j).

10.4 Potential environmental impacts

BHP has considered the development activities that have the potential to impact on Subterranean Fauna outlined in the EPA's *Environmental Factor Guideline - Subterranean Fauna* (EPA 2016e) and considers that those relevant to the Proposal are:

- changes to stygofauna habitat and species assemblage from changes to groundwater regimes (direct) and quality (indirect)
- loss of troglofauna habitat from mine pit excavation (direct).

The relevant activities of the Proposal that have the potential to impact Subterranean Fauna are the proposed increase to groundwater abstraction, increase to discharge of surplus water to Ophthalmia Dam and the expansion of mine pits at OB29 and OB30.

As the Approved Proposal is for mining of Orebody 29/30/35 below the water table only (i.e. abstraction of groundwater and discharge of surplus water), potential impacts on Subterranean Fauna assessed as part of the Approved Proposal were limited to the potential impact on stygofauna from the abstraction of groundwater resulting in drawdown and from the discharge of surplus dewater to Ophthalmia Dam. Assessment of the combined effect from the Approved Proposal together with the Proposal (i.e. Combined Proposal) will therefore be limited to the potential impact on stygofauna. The potential impacts to stygofauna from the cumulative discharge of surplus water from all BHP mines to Ophthalmia Dam are discussed in Section 17.

Mining above the water table at Orebody 29/30/35 commenced 50 years ago in 1974 and was approved under the Newman State Agreement (MNSA). Above water table mining at OB29 and OB30 commenced prior to the recognition of subterranean fauna as an environmental factor by the EPA, and therefore impacts to troglofauna from these mine pits were not assessed. Potential impacts to troglofauna were assessed for the OB35 mine pit as part of the *OB35 Above Water Table (AWT) Iron Ore Mine Proposal* (BHP Billiton 2011) referred to the EPA in 2011. The EPA determined the level of assessment to be 'Not Assessed – Advice Given'. The Approved Proposal did not assess potential impacts to troglofauna as it assessed mining below the water table only, where troglofauna and troglofauna habitat do not occur. As potential impacts on troglofauna were not assessed as part of the Approved Proposal, there are no combined effects on troglofauna from the implementation of the Approved Proposal and the Proposal (i.e. the Combined Proposal).

Unless specified otherwise, the potential impacts discussed in this section are unmitigated (i.e. potential impacts before mitigation measures are applied, if required).

10.4.1 Changes to stygofauna habitat and species assemblage from changes to groundwater regimes and quality

10.4.1.1 Ethel Gorge TEC

The Ethel Gorge TEC is outside of the estimated groundwater drawdown extent for the Proposal and is unlikely to be impacted by drawdown. Post-mining (assuming the formation of pit lakes), groundwater levels in the Ethel Gorge aquifer (and TEC) would remain within historical levels with the continued operation of the Ophthalmia Dam system (Section 7.4.1.1).

As discussed in Section 7.4.3.1, the concentration of PFAS in the combined dewatered groundwater from Orebody 29/30/35 from all production bores (of which the surplus will be discharged to Ophthalmia Dam) is likely to be below existing PFAS concentration ranges in Ophthalmia Dam and the Ethel Gorge aquifer (and TEC).

The increased discharge of surplus mine water to Ophthalmia Dam from the Proposal has the potential to indirectly change the groundwater quality of the Ethel Gorge aquifer (i.e. Ethel Gorge TEC habitat) and affect the stygofauna species assemblage that occurs there. As discussed in Section 7.4.3.2, groundwater salinity in the Ethel Gorge

aquifer (and TEC) is predicted to remain within the observed (fresh to brackish) range from the cumulative surplus water discharge to Ophthalmia Dam (including surplus water discharge from the Combined Proposal).

10.4.1.2 Stygofauna

As discussed in Section 7.4.1, the increase in dewatering for the Proposal will result in an increase in the lateral extent of drawdown (2024 Orebody 29/30/35 drawdown extent) and depth of drawdown compared to the drawdown assessed for the Approved Proposal (2013 Orebody 29/30/35 drawdown extent) (Figure 10-1). The increase in drawdown will reduce potential stygofauna habitat.

Proposal: Changes to stygofauna habitat from changes to groundwater regimes

As discussed in Section 10.3.2.2, the existing groundwater at Orebody 29/30/35 and surrounds is mostly at a depth considered unlikely to support a rich stygofauna community. Significant stygofauna communities are rarely found at depth to groundwater much greater than 30 m (Bennelongia 2021). This is reflected in the depauperate stygofauna community recorded within the Orebody 29/30/35 and Western Ridge areas. A slightly more abundant stygofauna community was recorded to the northeast of Orebody 29/30/35 where groundwater levels are shallower and in proximity to the Ethel Gorge aquifer.

All stygofauna species recorded from the additional lateral drawdown extent of the Proposal, compared to the Approved Proposal, are known to be widespread or have ranges extending to other areas of the Eastern Pilbara (Bennelongia 2021, 2024), with the exception of *Enchytraeidae* sp. OB3 which is only known from a single bore within the northern portion of the additional drawdown extent (Figure 10-1). The potential impact to this species from groundwater drawdown was previously assessed in 2015 as part of the Eastern Ridge mining operation (approved under MS1037). *Enchytraeidae* sp. OB3 was found to inhabit the saturated detritals which are considered to extend beyond the area of potential impact from groundwater drawdown and therefore the range of this species was also considered to extend beyond the area of potential impact (Bennelongia 2024). As shown in Figure 7-6, the northern portion of the additional lateral drawdown extent of the Proposal (where this species was recorded) is within the assessed drawdown extents for the Western Ridge Approved Proposal (which included increased dewatering at the Orebody 29/30/35) and the existing Eastern Ridge mine.

Combined effect: Changes to stygofauna habitat from changes to groundwater regimes

While the depth of drawdown is predicted to increase for the Combined Proposal, the potential impacts to stygofauna from groundwater drawdown were assessed for the Approved Proposal (within 2013 Orebody 29/30/35 drawdown extent). The assessment assumed there would be an impact to any species known to occur within the area of drawdown of greater than 2 m, regardless of the predicted depth of drawdown. The assessment of stygofauna for the Approved Proposal found a depauperate stygofauna community compared to the wider Newman area. This was considered likely due to the poorer quality stygofauna habitat of the Orebody 29/30/35 area (Bennelongia 2013b). There is only a small area of saturated Tertiary Detritals and no calcrete within the area, with the main habitat of the area being banded iron formation which is less prospective for stygofauna (Bennelongia 2013b). Bennelongia (2013b) concluded that none of the stygofauna species known from within the predicted groundwater drawdown extent for the Approved Proposal are considered likely to be restricted to, or have a substantial proportion of its population within, the area of predicted groundwater drawdown (i.e. area of drawdown of greater than 2 m).

Therefore, the predicted increase to the depth of groundwater drawdown and lateral extent of drawdown resulting from the Combined Proposal will not result in any additional impacts to stygofauna from those previously assessed for the Approved Proposal or adjacent Western Ridge and Eastern Ridge mines.

10.4.2 Loss of troglifauna habitat from mine pit excavation

The Proposal may result in direct impacts to troglifauna through the removal of potential habitat from the proposed expansion of OB29 and OB30 mine pits. There is no proposed expansion to the OB35 mine pit. The area of the mine

pits for the Approved Proposal is approximately 456 ha, with the Proposal seeking to expand the mine pits by approximately 169 ha (the expansion representing 27% of the proposed expanded mine pits).

As discussed in Section 10.3.2.3, suitable habitat within the OB29 and OB30 areas potentially occurs within the Tertiary Detrital sequence and the underlying members of the Marra Mamba Iron Formation (BHP 2024j). The geology surrounding the mine pits is similar through the broader Orebody 29/30/35 area, with geological modelling showing the West Angelas, Mount Newman, MacLeod, and Nammuldi members of the Marra Mamba Iron Formation extending beyond the OB30 pit to the east and beyond the OB29 pit to the west and the north-east (BHP 2024j).

The troglofauna species composition and abundance at Orebody 29/30/35 is considered similar to other areas of the Ophthalmia Range and are generally wide-ranging (BHP 2024j). The assessment of suitable troglofauna habitat at OB29 and OB30 suggests that there is connectivity of habitat beyond the proposed pit expansions, and it is considered likely that if troglofauna occur that the community would extend beyond the proposed mine pits and species will not be restricted to the areas of proposed impact.

10.5 Mitigation

BHP considers that there are no potentially significant impacts to Subterranean Fauna from the Proposal, and therefore no specific avoidance and minimisation measures are proposed to be implemented. BHP will continue to implement mitigation measures for the Approved Proposal (summarised in Appendix 2) as part of the Amended Proposal if approved.

10.5.1 Avoid

No significant Subterranean Fauna values occur within the Development Envelope or predicted groundwater drawdown extent and BHP considers that there are no potentially significant impacts to Subterranean Fauna from the Proposal, therefore there are no specific avoidance measures proposed.

10.5.2 Minimise

As discussed in Section 7.5.2, BHP manages the Ethel Gorge aquifer (the habitat for the Ethel Gorge TEC) at the regional scale due to the potential for cumulative impacts to the Ethel Gorge TEC from multiple BHP mines. There is not expected to be any impacts to the stygofauna habitat in the Ethel Gorge TEC from the Proposal (or cumulative impacts including from the Combined Proposal) (Section 10.4.1.1); however, in recognition of the significance of the Ethel Gorge TEC, BHP will continue to manage potential impacts to the Ethel Gorge aquifer from surplus water discharge from the Combined Proposal, in accordance with the management approach in the EPWRMP (BHP 2024g). As provided for in *Environmental outcomes and outcomes-based conditions Interim Guidance* (EPA 2021c), BHP has used surrogate outcomes for stygofauna in the EPWRMP to manage potential impacts from dewatering and surplus water discharge on the Ethel Gorge TEC. The groundwater regimes and quality outcomes in the Ethel Gorge aquifer (representing stygofauna habitat condition) in the EPWRMP are an appropriate surrogate for the condition of the stygofauna community. The current groundwater level and salinity criteria (triggers and thresholds) in the EPWRMP have been established to maintain groundwater levels and salinity in the Ethel Gorge aquifer within historical variation, to maintain the stygofauna habitat of the Ethel Gorge TEC. The regular stygofauna monitoring program for the Ethel Gorge TEC also includes sampling of the stygofauna assemblage, to confirm that the indicators for maintaining the stygofauna habitat (groundwater level and salinity) are appropriate.

The results from the stygofauna monitoring program at Ethel Gorge (Stantec 2024, 2022), along with previous monitoring rounds, indicate that current groundwater management practices have been successful in mitigating potential impacts to the Ethel Gorge TEC from BHP Western Australian Iron Ore (WAIO) operations. It is also considered that adequate saturation of the core habitat has been maintained, enabling persistence of stygofauna (Stantec 2024, 2022). Therefore, no changes were made to the management in the EPWRMP for the Proposal.

As discussed in Section 7.4.3.2, the implementation of the Proposal is not expected to increase the concentrations of PFAS in the Ethel Gorge aquifer. Given the high environmental value of the Ethel Gorge TEC, the detection of trace levels of PFAS in the Ethel Gorge TEC and the range of BHP and other third party activities in the Newman area, BHP commissioned an independent study to investigate the toxicity of PFAS to stygofauna (CRC CARE 2022). The peer reviewed study found that the stygofauna species studied can tolerate a range of PFAS concentrations, many orders of magnitude above the maximum level of PFAS detected in the Ethel Gorge TEC. BHP is continuing work with CRC Care to further understand the toxicity of stygofauna to PFAS. BHP has taken a precautionary approach and proposed comprehensive PFAS monitoring and measures in the WPMP (BHP 2024h). The multi-level control system proposed to monitor and mitigate PFAS in groundwater and surface water (Section 7.5.2) has been designed to maintain PFAS concentrations below acceptable levels, so there are no unacceptable risks to the Ethel Gorge TEC from the Proposal and Combined Proposal.

The proposed ecological PFAS criteria (trigger and threshold) will be applied to water within Ophthalmia Dam, which infiltrates to the Ethel Gorge aquifer/TEC. As discussed in Section 7.7, the outcome for the Proposal and the proposed ecological PFAS threshold criteria (BHP 2024h) is 10% of the published PFAS NEMP ecological freshwater 95% species protection guideline value (0.013 µg/L PFOS).

As outlined in the WPMP (BHP 2024h), if PFAS criteria are exceeded, BHP will initiate response actions including:

- reduce, cease or redirect groundwater dewatered from affected production bore/s
- re-direct water from the impacted production bore(s) for mining re-use
- implement management/ remediation strategies that are practicable to reduce PFAS concentrations in the combined dewatered groundwater from Orebody 29/30/35.

10.5.3 Rehabilitate

Rehabilitation at Orebody 29/30/35 is addressed in the MCP (BHP 2024i) (Appendix 7). The MCP covers the Approved Proposal and has been revised to include the Proposal.

BHP will implement the MCP to ensure that the Combined Proposal is decommissioned, and the site rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.

10.5.4 Other statutory decision-making processes

BHP's view is that there is no other statutory decision-making process to mitigate the potential environmental impacts of the Proposal on Subterranean Fauna, considering the EPA's *Taking decision making processes into account in EIA: Interim Guidance* (EPA 2021b).

BHP notes that under the BC Act, modification of the occurrence of a TEC requires authorisation under s45 from the Minister for Environment. The *Guidance note – Modification of an occurrence of a threatened ecological community* (DBCA 2019) states that if the likely outcome of the action is not known with certainty and potential impacts on the TEC are serious or irreversible, then an authorisation should be applied for. As there is no change predicted to the stygofauna habitat of the Ethel Gorge TEC from the Proposal (Section 10.4.1.1), there is not expected to be any serious or irreversible impacts. Therefore, an application for modification of the Ethel Gorge TEC is not required.

10.6 Assessment and significance of residual impacts

BHP has considered the EPA's *Environmental Factor Guideline – Subterranean Fauna* (EPA 2016e) when assessing the significance of the impacts to Subterranean Fauna from the Proposal. The assessment of potential impacts discussed in this section are following the application of mitigation as documented in Section 10.5.

10.6.1 Changes to stygofauna habitat and species assemblage from changes to groundwater regimes and quality

Ethel Gorge TEC

As discussed in Section 10.4.1.1, groundwater levels and groundwater salinity in the Ethel Gorge aquifer will remain within historical levels, therefore the stygofauna habitat in the Ethel Gorge aquifer will be maintained and there is not expected to be any impacts to the Ethel Gorge TEC from the Proposal. However, as discussed in Section 10.5.2, due to the recognised high biodiversity (stygofauna) value of the Ethel Gorge TEC, BHP will continue to manage the potential impacts groundwater levels and salinity in the Ethel Gorge aquifer according to the EPWRMP.

As discussed in Section 10.4.1.1, the concentration of PFAS in the combined dewatered groundwater from Orebody 29/30/35 from all production bores (of which the surplus will be discharged to Ophthalmia Dam) is likely to be below existing PFAS concentration ranges in Ophthalmia Dam and the Ethel Gorge aquifer. Therefore, the implementation of the Proposal is not expected to increase the concentrations of PFAS in the environment, including the Ethel Gorge aquifer. PFAS concentrations in groundwater will be monitored and managed (if required) through the mitigation outlined in the WPMP (BHP 2024h), so that PFAS concentrations in the Ethel Gorge TEC remain below acceptable levels. Therefore, there is not expected to be any change to the stygofauna habitat of the Ethel Gorge TEC from the Proposal, due to PFAS concentrations in the Ethel Gorge aquifer.

Stygofauna

Significant impacts to stygofauna from the increase in drawdown are unlikely (Section 10.4.1.2). The stygofauna community in the predicted groundwater drawdown extent is generally depauperate due to the deep groundwater levels and less prospective habitat for stygofauna, with the community becoming more abundant in the shallower groundwater levels in the northern extent of proposed groundwater drawdown.

All the stygofauna species known from the additional lateral drawdown extent (compared to the Approved Proposal) are known to, or in the case of Enchytraeidae sp. OB3 are considered likely to, occur elsewhere (Bennelongia 2013b, 2021, 2024) (noting that impacts to Enchytraeidae sp. OB3 from groundwater drawdown were previously assessed for the Eastern Ridge mine). As no stygofauna species are considered to be restricted to the drawdown extent for the Combined Proposal, the increase in drawdown as a result of the Proposal will not significantly impact stygofauna.

While the Combined Proposal will result in an increase to the depth and lateral extent of groundwater drawdown (compared to the Approved Proposal), as discussed in Section 7.4.1.1 there is no additional lateral drawdown extent from the Orebody 29/30/35 Proposal compared to the Western Ridge Approved Proposal assessment, and the cumulative groundwater drawdown extent for the Newman area (shown in Figure 7-6) is the same as the Western Ridge Approved Proposal assessment.

10.6.2 Loss of troglafauna habitat from mine pit excavation

The Proposal will result in the loss of potential troglafauna habitat from the proposed expansion to the mine pits at OB29 and OB30. Available information for the mine pit areas suggests the geology extends beyond the Orebody 29/30/35 area (BHP 2024j). The proposed area of pit expansion at OB30 is largely disturbed as a result of adjacent mining at Mt Whaleback, therefore reducing the potential of the area to support troglafauna. While limited (due to the historical nature of the operation), sampling throughout the area suggests the troglafauna community at Orebody 29/30/35 is wide-ranging and species are not considered likely to be restricted to the proposed mine pit expansion areas.

10.6.3 Significant residual impacts

Following the application of the mitigation hierarchy (Section 10.5) and applying the Residual Impact Significance Model in the *WA Offsets Guidelines* (Government of Western Australia 2014), BHP considers that there is no significant residual impact to Subterranean Fauna from the Proposal. See Section 10.7 for the discussion on the

outcomes relating to the identified residual impacts and BHP's proposed assurance (regulation) and monitoring, where required.

10.7 Environmental outcomes

Table 10-3 summarises the environmental outcomes, proposed assurance (regulation) and proposed monitoring (if required) for each residual impact for Subterranean Fauna from the Proposal. Table 10-3 demonstrates how the proposed environmental outcomes for the Proposal, together with the proposed regulation and monitoring, are consistent with the EPA's objective for Subterranean Fauna (Section 10.1).

There are no conditions relating to Subterranean Fauna in MS963 for the Approved Proposal. As provided for as an option in the EPA's ERD Instructions, BHP has proposed conditions for the Combined Proposal (including outcome-based conditions related to Subterranean Fauna) for the EPA's consideration, in Appendix 3.

Table 10-3: Subterranean Fauna - Proposal environmental outcomes, proposed regulation and monitoring

Residual impact		Environmental outcome	Proposed regulation (Condition or other statutory decision-making process) ¹	Proposed monitoring	Consistency with EPA's objective
1.	Loss of stygofauna habitat in the Orebody 29/30/35 groundwater drawdown extent	Stygofauna habitat will be maintained at the regional level No impact to the representation of stygofauna in the local area	Refer to Inland Waters Section 7.7 (Table 7-5, Residual impact 1)		Stygofauna species representation and habitat will be maintained, which is consistent with the EPA's objective for Subterranean Fauna
2.	N/A ¹ (no expected change in the stygofauna habitat of the Ethel Gorge aquifer)	Stygofauna habitat in the Ethel Gorge TEC will be maintained	Refer to Inland Waters Section 7.7 (Table 7-5, Residual impact 5) Condition B2 Subterranean Fauna Implement the EPWRMP (BHP 2024g)	Refer to Inland Waters Section 7.7 (Table 7-5, Residual impact 5) Condition B2 Subterranean Fauna Implement monitoring outlined in the EPWRMP (BHP 2024g)	Stygofauna habitat will be maintained to protect the stygofauna assemblage in the Ethel Gorge TEC, which is consistent with the EPA's objective for Subterranean Fauna
3.	Loss of troglofauna habitat from the expansion of mine pits in the Orebody 29/30/35 area	Minimal loss of troglofauna habitat in the local area	None	Standard management practices: - internal land disturbance approval process to manage ground disturbance - annual land disturbance reporting against approved limits/extents	Troglofauna habitat will be maintained at the local level, which is consistent with the EPA's objective for Subterranean Fauna

1. Although no residual impacts are predicted from the Proposal, due to the high environmental value of the Ethel Gorge TEC and the potential cumulative impact from all BHP's Eastern Pilbara mines, BHP has proposed regulation and monitoring currently applicable to its other Eastern Pilbara mines to ensure that the Proposal environmental outcome is achieved.

11 Social Surroundings

11.1 EPA environmental factor and objective

The EPA's objective for the Social Surroundings factor is:

To protect social surroundings from significant harm.

11.2 Relevant policy, guidance and management approach

BHP assessed this environmental factor consistent with the following relevant EPA policies and guidance, as outlined in Table 11-1.

Table 11-1: Social Surroundings - policy and guidance

EPA, other State and Commonwealth policy and guidance	Consideration of EPA policy and guidance
<i>Environmental factor Guideline – Social Surroundings</i> (EPA 2023e)	- Identified the values which may be impacted, and their significance - Identified activities that can impact social surroundings - Applied the mitigation hierarchy to avoid or minimise impacts on social surroundings, where possible - Undertaken consultation with the Nyiyaparli representatives through KNAC on the Proposal (Significant Amendment)

In November 2023, the EPA published updated Environmental Factor Guideline – Social Surroundings and supporting Technical Guidance EIA of Social Surroundings – Aboriginal Cultural Heritage. The guidance defines Social Surroundings and considerations for impact assessment. This guidance was updated to reflect the repeal of the *Aboriginal Cultural Heritage Act 2021* (WA) and amendments to the AH Act.

BHP recognises that Aboriginal and Torres Strait Islander People have an intrinsic link to land, water, culture and heritage and is committed to agreement making with Traditional Owners and facilitating local decision making with Traditional Owners. BHP has undertaken consultation and engagement with Nyiyaparli Traditional Owners, through Karlka Nyiyaparli Aboriginal Corporation (KNAC), in relation to the Proposal, to understand the social, cultural and heritage values of the Development Envelope and surrounds, to ensure that these values are managed in a consultative and holistic manner, in accordance with the current EPA Social Surroundings objective, legislative requirements, the Comprehensive Agreement and Traditional Owner expectations.

11.3 Traditional Owners, engagement and values

11.3.1 Nyiyaparli Native Title determination area

The Nyiyaparli People are the Traditional Owners of the land that underlies Orebody 29/30/35. The Development Envelope sits wholly within the external boundaries of the Nyiyaparli Native Title determination area (WCD2018/008). BHP has an ongoing relationship with the Nyiyaparli Traditional Owners which is formalised through a Comprehensive Agreement and associated registered Indigenous Land Use Agreement (ILUA). The Comprehensive Agreement includes a heritage protocol supporting the identification and management of heritage sites within the determination area. As part of the Comprehensive Agreement, representatives from both BHP and Nyiyaparli representatives (through KNAC), meet at the Implementation Committee and Heritage Sub-Committee. This enables

sharing of information, identification and discussion of concerns, and decision-making in relation to matters including heritage and environment.

KNAC represents the Niyiyaparli Traditional Owners and BHP maintains a relationship and ongoing, regular communication with KNAC through regular communication and the pathways described in the Comprehensive Agreement.

11.3.2 Engagement with Niyiyaparli Traditional Owners and KNAC

BHP has consulted with Niyiyaparli representatives through KNAC through a social surroundings engagement in May 2024. BHP provided the draft Orebody 29/30/35 significant amendment referral documents to KNAC for review in September 2024. BHP reviewed the comments received and provided written responses to KNAC and updated the approval documentation where relevant, prior to submission of the referral to the EPA.

A summary of engagement undertaken to date is provided in Table 4-2.

11.3.3 Surveys, values and interests

BHP and Niyiyaparli representatives have been jointly conducting heritage surveys and consultations within the Development Envelope since mid 1990s with a high focus on field work and in field consultation during the early to mid 2000s. Work has included baseline surveys to identify and avoid heritage values; and detailed investigations and ethnographic consultations to understand significance, define management strategies, and support approval processes. As described in section 11.3.1, BHP has an established ILUA with the Niyiyaparli Traditional Owners to undertake ongoing consultation.

The following Section 18 consents under the AH Act have been developed over time and granted to enable mining activities within the operational area:

- 1975 – Section 18 relating to OB29 (DAA Ref: RAS 230/74)
- 2012 – Section 18 relating to OB35 (DAA Ref 34-23733).

More recently (2023), BHP has worked with the Niyiyaparli representatives through KNAC, to develop the Whaleback Cultural Heritage Management Plan (CHMP) which covers the existing approved Orebody 29/30/35 mine. The Whaleback CHMP was endorsed through the Heritage Sub Committee in June 2023 and has undergone final technical review by KNAC. The plan identifies site specific values, significance and management measures for heritage sites that may be impacted by the 5 Year Mine Plan. The CHMP is due to be reviewed and updated at least every two years to capture any changes or additional required management measures as the mine plan progresses.

During social surroundings engagement for the Proposal, Niyiyaparli representatives identified several values and interests including flora and fauna of cultural value, impacts that may arise from abstraction, transport and discharge of water, impacts to heritage sites, access to country, rehabilitation, and closure. These are described in more detail below.

Lands within the Development Envelope are known to support plant species which hold cultural significance to Niyiyaparli Traditional Owners. Desktop mapping of these species has been undertaken by BHP and indicates widespread distribution of numerous species across the Development Envelope and that these species are known to be common. Species identified include *Triodia pungens* (known as Giddi), which has a sticky resin and is used for fire starting and smoking ceremonies. Other plants include plants with edible berries, gum and seeds, and plants for soothing ailments. BHP is committed to working with the Niyiyaparli Traditional Owners to incorporate ethnobotanical species in rehabilitation programs. During the social surroundings engagements, Niyiyaparli representatives expressed interest in rehabilitation, particularly in relation to flora species to provide shade and providing shelter for fauna and the preference to have nice places for people and animals that hold water after rainfall.

Water is a key value of Nyiyaparli Traditional Owners and the management of water is a key interest. As discussed in Section 7.3.2.2, at a regional scale, the Orebody 29/30/35 Proposal is located within the Upper Fortescue River Catchment (Whaleback Creek and Fortescue regional subcatchments). Whaleback Creek drains into the Upper Fortescue River which drains in a northeasterly direction into Ophthalmia Dam. Whaleback Creek is ephemeral with typically one to three flow events per year. The Fortescue River which is outside the Development Envelope has high cultural and heritage importance to the Nyiyaparli Traditional Owners.

Nyiyaparli Traditional Owners expressed interest in the discharge of surplus water to Ophthalmia Dam and potential impacts of this discharge on water quality in the dam, dam water levels and potential downstream impacts on the Fortescue River from releases of water from the dam. Nyiyaparli representatives through KNAC also queried the potential impact of increased dewatering on groundwater flow in the local area during operations and closure.

No surface water pools have been identified in the close vicinity of Orebody 29/30/35. One feature of significance to the Nyiyaparli Traditional Owners which is located outside the Development Envelope is Nankunya, a series of potential semi-permanent to permanent surface water pools within a narrow gorge approximately 2.4 km west of the western boundary of the Development Envelope.

Nankunya is a significant heritage place for the Nyiyaparli Traditional Owners and will not be impacted by the Proposal. As discussed in Section 7.3.3.3, Nankunya is supported by a shallow perched groundwater aquifer that is hydraulically disconnected from the deeper regional aquifer to be dewatered for this Proposal.

Ongoing access to country is a key interest of Nyiyaparli Traditional Owners. While access to the Development Envelope will be restricted for safety reasons during construction and operation of the mine, BHP will continue to enable access to the site, where practicable, as per the BHP and Nyiyaparli Comprehensive Agreement Land Access Protocol Entry.

Nyiyaparli representatives through KNAC have expressed interest in rehabilitation and closure including final landforms, the types of plant species to be used in seeding for revegetation, options for providing shade for fauna, changes to surface and groundwater regimes following cessation of mining and dewatering and safety.

11.3.4 Approved Proposal

The Social Surroundings factor was not identified as a key environmental factor for the Orebody 29/30/35 Mining BWT Proposal, approved under MS963 in 2014, prior to the introduction of the Social Surroundings EPA guidance in 2016. Heritage was considered and it was concluded that no heritage sites would be disturbed given the Approved Proposal is wholly located within previously disturbed and active mining areas.

There are no specific conditions relating to disturbance of heritage sites and values in MS963 as the Approved Proposal only relates to below watertable mining and Orebody 29/30/35 had already been disturbed from existing AWT mining operations. Table 2 of MS963 is of relevance to Aboriginal Cultural Heritage as it applies a limit to the discharge of surplus water to Ophthalmia Dam, which in turn discharges to Fortescue River which is of significance to Nyiyaparli Traditional Owners.

Under the existing Section 18 consent, sites across Orebody 29/30/35 have been impacted for existing AWT mining. Conditions as set out in the Section 18 consent have been discharged accordingly. Since the development of the Whaleback CHMP no further sites have been impacted within the Development Envelope.

11.4 Potential impacts

BHP has considered the potential impacts outlined in the EPA's *Environmental factor guideline – Social Surroundings* (EPA 2023e) and considers that those relevant to the Proposal are:

- disturbance of cultural heritage sites and values (direct)
- impacts to access, landscape, and amenity (direct)

- degradation of cultural heritage places and values (indirect).

BHP has provided information on the Approved Proposal so that the EPA can consider the environmental effects of the Proposal in the context of the Approved Proposal. BHP has also outlined the combined effects which the implementation of the Approved Proposal and the Proposal (Combined Proposal) might have on the environment. Unless specified otherwise, the potential impacts discussed in this section are unmitigated (i.e. potential impacts before mitigation measures are applied, if required).

11.4.1 Disturbance of social, cultural and heritage sites and values

Implementation of the Proposal will involve clearing of up to 116 ha of native vegetation for the installation of infrastructure, excavation of mine pits and establishment of OSAs. This has the potential to directly disturb Aboriginal, social, cultural and heritage values located within the proposed Development Envelope.

As detailed in Section 11.3.4 detailed significance assessments of known heritage sites within the Development Envelope have been undertaken for the Orebody 29/30/35. As described in Section 11.3.1, BHP has an established ILUA with the Nyiyaparli Traditional Owners to undertake ongoing consultation. Aboriginal Cultural Heritage will be managed in accordance with existing heritage approvals and agreements. There are currently no identified impacts to cultural heritage associated with the Proposal. As there will be no direct impacts to heritage sites due to the Proposal, a change to the CHMP is not required. Historically, disturbance to heritage sites has been managed through Section 18 of the AH Act.

Clearing for the Proposal may result in the removal of some ethnobotanically significant flora and the removal of some habitat which supports native fauna of cultural value. As detailed in Section 11.3.3, desktop mapping indicates that the following species occur within the Indicative Footprint of the Proposal:

- Mulga (*Acacia aptaneura*)
- *Acacia bivenosa*
- Gigjee (*Acacia pruinocarpa*)
- Bloodwood (*Corymbia hamersleyana*)
- Emu Bush (*Eremophila cuneifolia*)
- Giddi (*Triodia pungens*).

11.4.2 Impacts to access, landscape and amenity

The installation of infrastructure and mine operations may alter the experience for Nyiyaparli Traditional Owners when on country, through altered access, landscape, and amenity.

Implementation of the Proposal may alter Nyiyaparli Traditional Owner access to heritage places or to conduct traditional practices, particularly to places and areas in proximity to active mining and related infrastructure within the Development Envelope.

Heritage values extend beyond discrete identified heritage places and are understood to be embedded in the combination of values which come together to form a landscape. The excavation of mine pits, construction of OSAs and installation of infrastructure may alter the utilisation of the landscape across the Development Envelope. Progressive rehabilitation will be undertaken over the life of the Combined Proposal where practicable, however, permanent alteration of the landscape will occur as a result of mine pits and OSAs. As communicated by the Nyiyaparli representatives through KNAC during social surroundings engagement, it is the Nyiyaparli Traditional Owners preference for the avoidance of pit lakes. Based on the current backfill strategy, pit lakes would be expected to form in all three pits, however a portion of OB35 will be backfilled above the water table reducing the size of the pit lake.

Construction and operation of the Proposal will result in noise and vibration. Noise and vibration are expected to be greatest during daylight hours, in relation to construction of infrastructure and active mining, including drilling and blasting. Exposure to noise and vibration will be greatest near construction activities and active mining and will decrease with increasing distance from mining operations. Noise and vibration have the potential to alter or obscure the natural background sounds of the local environment and impact the enjoyment and experience when on country in proximity to the Development Envelope.

The Proposal has the potential to generate dust from vegetation clearing, vehicle and machinery use, construction of the OSA and infrastructure, active mining and transport of ore. Dust emissions have the potential to cause visual disturbance and impact amenity and experience when on country. The potential impact to amenity from dust is considered to be greatest in close proximity to dust sources such as active mining and operational areas. Potential impacts to amenity from dust will decrease with increasing distance from sources.

11.4.3 Degradation of social, cultural and heritage values

BHP has long standing agreed management and buffer zones for registered sites at Orebody 29/30/35. The majority of buffer zones are 30 m with the exception two sites with a buffer of 100 m.

All heritage sites and buffers are located outside of the Development Envelope with the exception of one site located within the existing Approved Proposal at OB35 (No expansion of pits will occur at OB35) and a buffer that is located immediately adjacent to the OB29 existing pit. BHP continue work with the Nyiyaparli representatives through KNAC to ensure that there is appropriate mitigation and management of these sites through a CHMP.

11.4.3.1 *Impacts from dust emissions*

Construction and operation of the Proposal has the potential to generate dust emissions. When dust is emitted into the air, it may subsequently deposit on surfaces including vegetation, with dust deposition decreasing with increasing distance from the source. Dust deposition has the potential to degrade Aboriginal social, cultural and heritage values, including the condition of native vegetation including ethnobotanically significant flora.

Increased levels of airborne dust have the potential to impact vegetation health in instances where leaf physiology is affected. This could occur along unsealed roads and adjacent to OSAs and can be more pronounced during dry seasonal conditions. Studies from the Pilbara, such as Butler (2009), have not recorded evidence of negative impacts on plant function resulting from inert particulate matter deposition. Most arid plant species have much of their stomata closed during dry periods, when the potential for dust is greatest. This would limit the potential for dust generated during the dry season to have effects on the stomatal conductance of the plants (i.e. plant function) and therefore on the health of the plant. In high rainfall periods, when most species experience new growth and stomata are open, dust levels tend to be significantly less due to the wet conditions (Grierson 2015). Long-term observations of vegetation in close proximity to mine sites across the Hamersley Ranges have demonstrated the resilience of vegetation to extremely high levels of dust exposure (Grierson 2015). Dust deposition has the potential to impact the desirability of plants that have ethnobotanical significance and therefore reduce the opportunity to utilise these plants.

11.4.3.2 *Changes to groundwater and surface water values*

The Proposal is located within the Upper Fortescue River Catchment (Whaleback Creek and Fortescue regional subcatchments). The construction of infrastructure (including OSAs and a new surplus water pipeline) and excavation of mine pits has the potential to directly alter surface water flows and reduce catchments, reducing surface water availability. Section 7.5 provides further detail on surface water management. As discussed in Sections 7.6.2 and 7.6.3, these changes for the Proposal are not predicted to significantly impact surface water flows or water quality.

As discussed in Section 7.4.1, the Proposal will increase mine dewatering at Orebody 29/30/35 to enable BWT mining. This may result in changes to the vertical extent of groundwater drawdown. There are no groundwater receptors of significance to the Nyiyaparli Traditional Owners that could be potentially impacted by groundwater drawdown. Surplus water will be used on site for operational purposes, where possible, and surplus water in excess

of operational requirements will be discharged via the new pipeline to Ophthalmia Dam. BHP understands that the Nyiyaparli interests include the potential impacts of the Orebody 29/30/35 Proposal on water values from the discharge of surplus water into the dam and also from dam releases.

Pits that are not backfilled to above the water table are expected to form pit lakes which will act as terminal sinks and as such are not expected to impact the water quality of the surrounding groundwater.

11.5 Mitigation

11.5.1 Avoid

The Proposal has been designed to maximise the use of existing disturbed areas and avoid direct impact to heritage sites. The pipeline route was designed to be adjacent to the existing pipeline route and to be located on cleared areas where possible. During the heritage surveys, additional archaeological and ethnographic sites were identified which intersected the proposed pipeline route. During the Social Surroundings engagement BHP identified several alternate pipeline options to avoid all heritage sites of which one was agreed by the Traditional Owners. As a result of this design work, the following has been achieved for the Proposal:

- no heritage sites are located within the Development Envelope of the Proposal in addition to those previously disturbed in active mining areas. The existing OB29 pit overlaps the heritage site DAA Ref: RAS 230/74 for which BHP has a Section 18. BHP has modified the Development Envelope to avoid this site. The existing OB35 pit overlaps the heritage site DAA Ref 34-23733 for which BHP has a Section 18.
- a minimum of a 30 m buffer is maintained between the Development Envelope and heritage sites with the exception of one buffer located to the east of OB29. This buffer relates to the site DAA Ref: RAS 230/74 for which BHP has a Section 18.

11.5.2 Minimise

As far as practicable, the Proposal has been designed within existing disturbed areas, to reduce the amount of clearing required. KNAC monitors will be engaged during ground disturbing activities for pipeline construction between Great Northern Highway and Marble Bar Road to ensure there are no indirect impacts to heritage sites which have been identified outside the Development Envelope.

Table 11-2 below identifies supporting management plans which will assist in minimising potential indirect impacts to social surroundings and cultural heritage values.

Table 11-2: Social Surroundings - summary of other relevant management plans

Management Plan	Purpose
Eastern Pilbara Water Resource Management Plan (BHP 2024g) (Appendix 5)	Maintain groundwater levels and salinity within the Ethel Gorge aquifer to support the stygofauna habitat of the Ethel Gorge TEC Maintain the stygofauna habitat of the Ethel Gorge TEC Maintain the current (altered) ephemeral surface water regime to the Fortescue River downstream of Ophthalmia Dam
Water (PFAS) Management Plan (BHP 2024h) (Appendix 6)	Limit PFAS concentration in surplus water discharge into Ophthalmia Dam
Orebody 29/30/35 MCP (BHP 2024i) (Appendix 7)	To ensure that the Development Envelope is rehabilitated in a manner that is safe, stable and non-polluting and in an ecologically sustainable manner

11.5.3 Rehabilitate

BHP is committed to the rehabilitation of land no longer required for operational purposes and understands that mine closure is an important issue for Nyiyaparli Traditional Owners. In addition to mine closure commitments relevant to flora and vegetation, terrestrial fauna and inland waters, BHP commits to consulting with the Nyiyaparli representatives through KNAC, to identify post-mining land uses.

BHP will aim to include ethnobotanical species in rehabilitation seed mixes and/or the propagation of ethnobotanical species for planting in rehabilitation areas.

BHP will implement the MCP (BHP 2024i) (Appendix 7) to meet the following environmental objectives:

- ensure that the Combined Proposal is decommissioned and rehabilitated to be safe, stable, and non-polluting and in an ecological sustainable manner
- undertake rehabilitation in a progressive manner, where practicable.

BHP notes that Nyiyaparli representatives through KNAC have expressed a clear preference for the avoidance of pit lakes at closure. Based on the current backfill strategy, pit lakes would be expected to form in all three pits. BHP will implement the MCP to meet condition 6 of MS963 that the Proposal is closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed post-mining outcomes and land uses for a Priority 1 Public Drinking Water Source Area, and without unacceptable liability to the State. BHP is also committed to ongoing engagement with Nyiyaparli representatives in relation to closure outcomes of the Proposal, through ongoing consultation on the MCP and in line with the Nyiyaparli Closure Principles.

11.5.4 Other statutory decision-making processes

Table 11-3 summarises whether another statutory decision-making process can mitigate the potential environmental impacts of the Proposal on Social Surroundings considering the EPA's *Taking decision making processes into account in EIA: Interim Guidance* (EPA 2021b). Table 11-3 also provides reasons, including how, in relation to the specific potential impacts of the Proposal, the decision-making process takes the EP Act object and principles, and the EPA's objective for Social Surroundings, into account.

Table 11-3: Social Surroundings - other statutory decision-making processes

Potential impact	Statutory decision-making process can mitigate impacts on the environment?	Reasons (if Yes)
Impacts to heritage sites	Yes	AH Act Approval under the AH Act is required prior to impact to registered Aboriginal sites

11.6 Assessment and significance of residual impacts

11.6.1 Disturbance of social, cultural and heritage sites and values

As discussed in Section 11.4.1, the Proposal has the potential to directly impact social, cultural and heritage sites and values through clearing, installation of infrastructure, excavation of mine pits and establishment of OSAs. No heritage sites have been identified within the Development Envelope of the Proposal in addition to those impacted by existing operations.

The clearing of native vegetation and loss of habitat for plants and animals of cultural value represents an impact on social surroundings. BHP will aim to include ethnobotanical species in rehabilitation seed mixes and/or the propagation of ethnobotanical species for planting in rehabilitation areas.

BHP has long standing agreed management and buffer zones for registered sites at Orebody 29/30/35. The majority of buffer zones are 30 m with the exception of two sites with a 100 m buffer zone.

The 30 m separation distance is met for all pits and infrastructure except for the buffer for the heritage site located adjacent to the OB29 pit. The Approved Proposal for the OB29 pit overlaps the heritage site DAA Ref: RAS 230/74 for which BHP has a Section 18. BHP has modified the Development Envelope to avoid this site, however impacts do occur in the buffer zone.

There will be no changes to OB35 from this Proposal, other than the addition of a ramp to the eastern boundary. This addition of the ramp does not impact any sites within the wider OB35 area. Existing sites which are within the Approved Proposal are avoided, and buffers are maintained around those sites.

Through the development and implementation of management plans, it is expected that impacts to social, cultural and heritage sites and values can be managed such that impacts are not significant.

11.6.2 Impacts to access, landscape and amenity

As discussed in Section 11.4.2 through the installation of infrastructure, construction of OSAs and mine operation, the Proposal has the potential to impact access, landscape and amenity within the Development Envelope.

BHP engaged with the Nyiyaparli representatives through KNAC to understand and identify cultural heritage values including and beyond tangible sites and establish an approach to managing access to the Development Envelope. BHP will continue to enable access to the site for Nyiyaparli Traditional Owners as per the BHP and Nyiyaparli Comprehensive Agreement Land Access Protocol Entry.

No targeted noise management measures are proposed for the Proposal, given that the Proposal is located within an existing operational mine.

Implementation of the management plans detailed in Table 11-2 will offer benefits to Aboriginal cultural and heritage values by:

- maintaining the quality of the surplus water discharged to Ophthalmia Dam and limiting releases of surplus water to the Fortescue River in the dry season
- ensuring that the Combined Proposal is rehabilitated in an ecologically sustainable manner.

As detailed in Section 11.5.3, BHP will undertake progressive rehabilitation, where practicable. BHP has a priority focus on progressive backfilling into mined out pits and this is expected to minimise the extent of post-closure pit lakes where practicable.

Through the development and implementation of management plans and rehabilitation processes, it is expected that the Proposal will be appropriately managed such that access, landscape, and amenity are not significantly impacted.

11.6.3 Degradation of social, cultural and heritage values

As detailed in Section 11.4.3, BHP has designed the Proposal to ensure that there are no heritage sites within the Development Envelope with the exception of one site located within the Approved Proposal at OB35.

As discussed in Section 11.4.2, dust has the potential to indirectly impact social, cultural and heritage values through the degradation of native vegetation including ethnobotanically significant plants that may be used for bush tucker and bush medicine within the Development Envelope.

To avoid and minimise dust emissions for the Proposal, BHP will continue to manage dust as per the existing Part V licence for Mt Whaleback/Orebody 29/30/35 (L4503/1975/14), which includes a range of controls to minimise emissions.

As discussed in Section 7.4.2.2 and Section 11.4.3.2, the current (altered) ephemeral surface water regimes in the Fortescue River will be maintained, by limiting the release of water from Ophthalmia Dam into the upper Fortescue River tributaries (to 3 months total following the wet season), using the current release approach in the EPWRMP. The Proposal is not predicted to result in significant impacts to surface water values from the discharge of surplus water. In addition, the Proposal will not result in any additional impact to the ephemeral Whaleback Creek located within the Development Envelope and there are no surface water pools within the Development Envelope.

As detailed in Section 11.4.3, there are no groundwater receptors of significance to the Nyiyaparli Traditional Owners that could be potentially impacted by groundwater drawdown.

As detailed in the Orebody 29/30/35 MCP, BHP's progressive closure philosophy for Orebody 29/30/35 include progressive backfilling into mined out pits where practicable. The backfill strategy as at November 2024 is no backfill at OB30, partial backfill to the south in OB29 and partial backfill above the water table at OB35. This would result in pit lakes forming at OB29 and OB30, with a smaller pit lake at OB35 in the portion below the water table. Pit lakes are predicted to be terminal sinks and are not expected to impact surrounding groundwater quality

11.6.4 Significant residual impacts

Following the application of the mitigation hierarchy (Section 11.5), BHP considers that there is no significant residual impact to Social Surroundings from the Proposal. See Section 11.7 for the discussion on the outcomes relating to the identified residual impacts and BHP's proposed assurance (regulation) and monitoring, where required.

11.7 Environmental outcomes

Table 11-4 summarises the environmental outcomes, proposed assurance (regulation) and proposed monitoring (if required) for each residual impact for Social Surroundings from the Proposal. Table 11-4 demonstrates how the proposed environmental outcomes for the Proposal, together with the proposed regulation and monitoring, are consistent with the EPA's objective for Social Surroundings (Section 11.1).

There are no specific conditions relating to Social Surroundings in MS963 for the Approved Proposal. BHP considers that a specific condition related to Social Surroundings is not required for the Combined Proposal as heritage sites will be avoided. BHP has proposed conditions relating to water and rehabilitation and decommissioning, which will assist in minimising potential indirect impacts to social surroundings and cultural heritage values.

Table 11-4: Social Surroundings - Proposal environmental outcomes, proposed regulation and monitoring

Residual impact from the Proposal		Environmental outcome	Proposed regulation (Condition or other statutory decision-making process)	Proposed Monitoring	Consistency with EPA's objective
1.	Potential indirect impact to Aboriginal social, cultural and heritage values	No impact to heritage sites Identification of potential impacts on values in consultation with the Nyiyaparli Traditional Owners	Condition B1 - Inland Waters - Implementation of the EPWRMP (BHP 2024g) (Refer to Inland Waters Section 7.7 (Table 7-5, Residual impact 4)) - Implementation of the WPMP (BHP 2024h) (Refer to Inland Waters Section 7.7 (Table 7-5, Residual impact 6)) Condition B3 Rehabilitation and Decommissioning Prepare and implement a Rehabilitation and Decommissioning environmental management plan: - Implementation of management measures to ensure the Orebody 29/30/35 mine is rehabilitated and decommissioned in an ecologically sustainable manner and to undertake closure planning and rehabilitation in a progressive manner. Implement the Orebody 29/30/35 MCP (BHP 2024i) (Appendix 7) required under the Mining Act: - Implementation of management measures to ensure Orebody 29/30/35 is safe, stable and non-polluting at closure	Monitoring of heritage places and values: Monitoring of cultural heritage sites and values in accordance with the existing CHMP Condition B1 – Inland Waters Implementation of the EPWRMP (BHP 2024g) Implementation of monitoring measures to monitor opening and closing of dam valve to Upper Fortescue tributaries, to track release durations and monitoring of groundwater level and salinity outlined in the EPWRMP. Implementation of the WPMP BHP 2024h) Implementation of monitoring measures to monitoring PFAS in groundwater and surface water (Ophthalmia Dam)	BHP will continue to engage with Nyiyaparli representatives, through KNAC, throughout the life of the Proposal in relation to the management of cultural heritage values, surplus water management, closure and other matters related to social surroundings, via the existing CHMP (where required). The environmental outcome is consistent with the EPA's objective for Social Surroundings.

12 Greenhouse Gas Emissions

12.1 EPA environmental factor and objective

The EPA's objective for the Greenhouse Gas Emissions factor is:

To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.

12.2 Relevant policy and guidance

BHP assessed this environmental factor considering the following EPA policies and guidance, as outlined in Table 12-1.

Table 12-1: Greenhouse Gas Emissions - policy and guidance

EPA (and other State and Commonwealth) policy and guidance	Consideration of EPA policy and guidance
<i>Environmental Factor Guideline - Greenhouse Gas Emissions</i> (EPA 2023b, 2024e)	BHP has considered the guideline and has addressed the requirements as follows: - Credible estimates of GHG emissions: The estimated Scope 1 and Scope 3 emissions (annual and total) are presented in Section 12.4.4. There are no Scope 2 emissions associated with the Proposal (see Section 12.4.4) - Scope 1 emissions estimates include all emissions caused as a direct result of activities within the Development Envelope, including emissions associated with the clearing of vegetation - A breakdown of GHG emissions (Scope 1) by source over the life of Proposal is provided in Section 12.4.4 - Projected emissions intensity of the Proposal is provided in Section 12.4.5 - Demonstration of the application of the mitigation hierarchy to avoid, reduce or offset greenhouse gas (GHG) emissions is provided in Section 12.5 - The indicative interim and long-term emissions reduction targets consistent with the requirements of the Safeguard Mechanism are provided in Section 12.5.2 - Justification for the emissions baseline used and the alternative approaches that were considered to calculating baselines (including an explanation why these were not adopted) - A BHP Pilbara Regional Greenhouse Gas Management Plan (GHGMP), updated to consider the Proposal is provided as Appendix 13
<i>Greenhouse Gas Environmental Management Plan Template</i> (EPA 2023c)	BHP has provided a Greenhouse Gas Management Plan (GHGMP) consistent with the EPA's GHG EMP template, for information only
<i>Greenhouse Gas Environmental Management Plan – Summary Plan Template</i> (EPA 2023d)	A summary plan will be produced if required that is consistent with the EPA summary plan template

EPA (and other State and Commonwealth) policy and guidance	Consideration of EPA policy and guidance
<i>Greenhouse gas emissions Policy for major projects</i> (Government of Western Australia 2024)	Where proposals with significant greenhouse gas emissions are adequately dealt with by other regulatory measures such as the strengthened Safeguard Mechanism, those emissions should not be regulated by the State. Where the greenhouse gas emissions of a major proposal assessed under Part IV of the EP Act will be subjected to alternative regulatory measures, the State will no longer apply conditions to reduce net greenhouse gas emissions. Given the uncertainty around Commonwealth regulation of greenhouse gas emissions over the last decade, a standard condition will be applied that requires proponents to notify the State of a substantial change to its obligations under the Safeguard Mechanism.
<i>Western Australian Climate Policy</i> (Government of WA 2020)	BHP supports and is aligned with this policy as implementation of the Proposal will enable the business to transition to the goal of net zero emissions by 2050
<i>National Greenhouse and Energy Reporting Act 2007</i>	The GHGMP details requirements of the <i>National Greenhouse and Energy Reporting Act 2007</i> (Cth) (NGER Act) and Safeguard Mechanism, its application to Newman Operations, the aggregation of Mt Whaleback and Eastern Ridge, of which the Combined Proposal's activities are included. The NGER Act includes an emissions budget and 5-year rolling average reduction requirements to limit emissions from Safeguard Mechanism facilities through to FY2050. The emissions reduction for Safeguard Mechanism facilities will facilitate the EPA's objective of minimising the risk of environmental harm associated with climate change by reducing GHG emissions as far as practicable for the Combined Proposal.

12.3 Receiving environment

12.3.1 Studies and surveys

Table 12-2 summarises the specific studies undertaken by BHP to support the assessment of Greenhouse Gas (GHG) emissions for the Proposal. Other supporting information is referenced in these documents, where relevant.

BHP considers that the studies meet the EPA's *Environmental Factor Guideline - Greenhouse Gas Emissions* (EPA 2023b and superseded by EPA 2024e published on 27 November 2024) to support the assessment of Greenhouse Gas Emissions for the Proposal. BHP notes that the November 2024 guideline (EPA 2024e) does not require a GHGMP, however, proponents may continue to provide information in this form. BHP provides a GHGMP for this Proposal for information only.

Table 12-2: Greenhouse Gas Emissions - studies

Title	Date	Summary	Appendix
Pilbara Regional Greenhouse Gas Management Plan – Schedule 3: Orebody 29/30/35	November 2024	BHP's GHGMP provides a summary of results and the approach used to estimate Scope 1 and Scope 3 emissions from the Proposal and the Combined Proposal. Methodologies used for Scope 1 emissions estimates are consistent with those developed and used by the DCCEEW in National and State climate change inventory reporting. Scope 3 emissions estimates have been estimated based on the most material sources (processing of	Appendix 13 Appendix 14

Title	Date	Summary	Appendix
		sold products, and downstream shipping of sold products). The Scope 1 and Scope 3 GHG emission sources, calculations, assumptions, methodology and resultant emissions have been independently peer reviewed by KPMG (KMPG 2024).	

BHP considers that these studies meet the relevant EPA guidance to support the assessment of the GHG emissions factor for the Proposal.

12.3.2 Environmental values

The Proposal is located approximately 7 km from Newman town in the Shire of East Pilbara. Iron ore mining is the dominant land use in the local area. Existing local contributors to GHG emissions include but are not limited to power generation for town and mine supply, diesel consumption for mining and vehicle users.

12.4 Potential environmental impacts

BHP has considered the development activities that have the potential to contribute to GHG emissions, as outlined in the EPA's *Environmental Factor Guideline - Greenhouse Gas Emissions* (EPA 2023b and EPA 2024e) when considering the potential impacts relevant to the Proposal.

BHP has provided information on GHG emissions for the Proposal, the Approved Proposal and the Combined Proposal. Consistent with the guideline, BHP has estimated Scope 1 and Scope 3 GHG emissions for the Approved Proposal and the Proposal (Combined Proposal). There are no Scope 2 emissions for the Proposal or Combined Proposal (See Section 12.4.4).

Cumulative GHG emissions are a contributor to climate change. The cumulative emissions from the Combined Proposal will contribute to WA's GHG emissions. Consistent with BHP's *National Greenhouse and Energy Reporting Act 2007* (Cth) (NGER Act) reporting, the main gases emitted from iron ore operations are largely related to diesel combustion emissions and therefore tend to comprise of predominantly carbon dioxide (CO₂), with the remainder as methane (CH₄) and nitrous oxide (N₂O), which are incidental.

Unless specified otherwise, the potential impacts discussed in this section are unmitigated (i.e. potential impacts before mitigation measures are applied, if required).

12.4.1 GHG emissions sources

12.4.1.1 Scope 1 emissions (mining)

Scope 1 (direct emissions) from the Proposal will be generated through:

- diesel used for heavy haulage, primarily movement of ore and waste material using haul trucks
- diesel used for ancillary equipment such as excavators, drills, and other equipment used to support mine development
- diesel energy powering dewatering activities, including abstraction of groundwater and movement of water across the operation
- oil and greases, primarily used by heavy equipment
- land clearing, made up of embodied emissions association with vegetation clearing.

The largest source of Scope 1 GHG emissions is associated with diesel consumed by heavy haulage and ancillary equipment. Assumptions regarding diesel and electricity consumption rates are provided in Appendix 13. Oils and greases are consumed for use in haul truck and ancillary equipment use.

Land clearing activities are progressive with clearing peaking in 2026 and concluding in 2027.

12.4.1.2 Scope 1 emissions (electricity generation and rail transport)

Emissions which occur outside of the Development Envelope associated with Yarnima Power Station and BHP's rail operations are identified as Scope 1 emissions. BHP takes a regional approach to the management of GHG emissions, and as such these emissions are classified as Scope 1.

Electricity supply for the Proposal will be from Yarnima Power Station, an existing natural gas fired power generation plant located 2 km north-west of Newman. Yarnima Power Station supplies power to BHP's iron ore mining operations in the Pilbara region and to Newman town and is operated in accordance with operational Licence L8803/2015/1 issued under Part V of the EP Act.

Yarnima Power Station is covered by both the Safeguard Mechanism and Renewable Energy Target. BHP is required to report Scope 1 emissions associated with electricity generation at Yarnima Power Station, and electricity used by BHP mines is not reportable as Scope 2 emissions under the NGER Act.

Iron ore is transported to Port Hedland via BHP's owned and operated rail operations for export by sea. Rail operations are considered Scope 1 emissions for the purposes of this assessment.

12.4.1.3 Scope 3 emission sources

BHP's downstream emissions associated with ship loading activities at Port Hedland (outside the Development Envelope) are considered as Scope 3 emissions.

Scope 3 emissions are also associated with the iron ore value chain including the shipping of iron ore to BHP's customers and the emissions associated with the production of steel, using coal to reduce iron ore. Each of these activities is undertaken by third parties.

BHP estimates that the most significant contribution to Scope 3 emissions associated with the Proposal will be from the shipping of products to customers and customer's processing of iron ore in steelmaking. Scope 3 estimates are not necessarily representative of the specific activities taking place within BHP's value chain, nor reflective of the quality of BHP's products, as they are based on industry average emission factors or proxy input data or assumptions.

12.4.2 Assessed emissions for the Approved Proposal

The ERD for the Approved Proposal (BHP 2013c) evaluated the environmental impacts associated with the development of Orebody 29/30/35 BWT Mining. GHG emissions were not quantified or assessed by the EPA as part of any of these assessments as they pre-date the introduction of Greenhouse Gas Emissions as an EPA factor in 2019.

12.4.3 Historical emissions reporting

The activities associated with the Approved Proposal (MS963) are a subset of the Newman Operations NGER facility, which is subject to NGER Act energy and emissions reporting. Newman Operations covers mining and mineral processing activities which include Mt Whaleback, Eastern Ridge, Western Ridge and Orebody 29/30/35. The National Greenhouse and Energy Reporting Regulations 2008 (Cth) provide the framework for the determination of grouping of energy use, energy generation and emission generating activities into NGER Act facilities.

BHP is required to prepare and report emissions consistent with methodologies and emission factors associated with the NGER (Measurement) Determination 2008 every financial year, reporting emissions to the Clean Energy Regulator (CER) by 31 October, following the relevant reporting period.

NGER Act facilities with Scope 1 emissions which exceed 100,000 tCO₂-e will have their Scope 1 emissions reported separately in on the CER's website. Table 12-3 summarises the Scope 1 emissions from Newman Operations NGER facility reported through the NGER Act.

Table 12-3: Greenhouse Gas Emissions - recent NGER Act reported emissions – Newman Operations (including the OB29/30/35 Approved Proposal)

Year	Scope 1 emissions tCO ₂ -e	Scope 2 emissions tCO ₂ -e ¹
FY2020	352,174	N/A
FY2021	349,146	N/A
FY2022	305,076	N/A
FY2023	294,760	N/A

1. To avoid double-counting of Scope 1 and Scope 2 emissions, the NGER Act requires WAIO to report the Scope 1 emissions associated with electricity generation at Yarnima Power Station and in turn, electricity use at WAIO's mines are not reportable as Scope 2 emissions through NGER Act reporting obligations. However, the Proposal's emissions associated with electricity use have been represented in this GHGMP as Scope 2, to allow the net emissions of various scenarios to be properly considered.

12.4.4 Emissions estimates

12.4.4.1 GHG modelling scenarios

Three scenarios have been modelled to support the assessment of the Proposal:

- Approved Proposal Scenario
- The Proposal Scenario
- Combined Proposal Scenario.

12.4.4.2 Scope 1 emissions estimates

Scope 1 emissions are predicted to vary over the life of the Proposal as iron ore production will vary with the mine plan. BHP has estimated annual Scope 1 emissions for the Proposal, Approved Proposal and the Combined Proposal. Emissions calculation methodologies used in these estimates are detailed in Appendix 13.

Table 12-4, Table 12-5 and Table 12-6 provide a breakdown of the estimated annual Scope 1 emissions for the Proposal, Approved Proposal and Combined Proposal.

Emission estimates of mining activities within the Development Envelope are summarised in Table 12-4 with peak annual Scope 1 emissions estimated to occur in FY2028 for the Combined Proposal. The average annual Scope 1 GHG emissions for the Proposal are a net reduction of -2,601 tCO₂-e and the peak is 48,649 tCO₂-e (FY2028). The reduction of average annual Scope 1 GHG emissions from the Proposal are associated with the construction of a new OSA, which is located closer to mining activity, this reduces the average haul truck cycle time and reduces GHG emissions, when compared to the Approved Proposal Scenario. Section 12.5 provides a detailed summary of the measures included in this Proposal to reduce GHG emissions.

Table 12-4: Greenhouse Gas Emissions - Scope 1 GHG emissions (mining)

Financial year ¹	Scope 1 GHG emissions (tCO ₂ -e)		Combined Proposal
	Approved Proposals	Proposal	
2025	104,253	-10,040	94,214
2026	55,772	-11,817	43,955
2027	60,535	-11,955	48,581
2028	70,442	48,649	119,091
2029	82,672	-404	82,269
2030	147,263	-67,748	79,515
2031	102,422	-58,973	43,448
2032	67,945	-45,582	22,364
2033	65,122	-38,687	26,435
2034	41,122	40,313	81,435
2035	40,229	-2,778	37,452
2036	33,968	4,088	38,056
2037	52,993	-1,766	51,228
2038	87,729	-2,646	85,083
2039	48,089	-1,176	46,913
2040	76,832	-29,284	47,548
2041	61,516	-19,793	41,724
2042	61,024	-15,397	45,627
2043	1,834	44,208	46,042
2044	-	33,432	33,432
2045	-	30,674	30,674
2046	-	20,674	20,674
2047	-	13,108	13,108
2048	-	10,468	10,468
2049	-	7,416	7,416
2050	-	6,903	6,903
2051	-	6,896	6,896
2052	-	5,347	5,347
2053	-	5,341	5,341
2054	-	3,793	3,793
2055	-	3,788	3,788

Financial year ¹	Scope 1 GHG emissions (tCO ₂ -e)		
	Approved Proposals	Proposal	Combined Proposal
2056	-	3,783	3,783
2057	-	3,778	3,778
2058	-	3,774	3,774
2059	-	2,228	2,228
2060	-	1,851	1,851
2061	-	1,851	1,851
2062	-	1,851	1,851
2063	-	1,851	1,851
2064	-	925	925
2065	-	925	925
Annual Average²	66,409	-2,601	47,870
Total	1,261,765	-10,132	1,251,633

1. Mining for the Proposal is anticipated to conclude in 2049. However, FullCAM model emissions from clearing continues beyond cessation of mining and therefore emissions have been predicted to 2059. This is due to the carbon content of biological material decomposing at different rates. Dewatering activities are also anticipated to continue through to 2065.
2. Annual excludes periods of relatively low emissions from land-use change after cessation of mining activity to better represent average operational emissions of mining activity. For the Proposal and the Combined Proposal, the average is over FY2025 to FY2049. For the Approved Proposal is FY25 to FY43.

Table 12-5: Greenhouse Gas Emissions - Scope 1 GHG emissions (electricity demand)

Financial year	Estimated Scope 1 emissions (tCO ₂ -e)		
	Approved Proposal	Proposal	Combined Proposal
2025	13,018	18	13,036
2026	12,276	-	12,276
2027	12,669	2,069	14,738
2028	15,792	323	16,116
2029	18,748	-2,670	16,079
2030	27,733	-3,114	24,618
2031	18,137	-3,708	14,429
2032	11,721	-2,652	9,069
2033	12,589	-3,994	8,595
2034	7,183	-5,140	2,043
2035	8,430	-5,204	3,226
2036	6,310	-2,994	3,316
2037	10,372	-2,472	7,900
2038	16,166	-1,179	14,987

Financial year	Estimated Scope 1 emissions (tCO ₂ -e)		
	Approved Proposal	Proposal	Combined Proposal
2039	8,716	-916	7,800
2040	14,947	605	15,552
2041	12,043	930	12,973
2042	13,045	2143	15,188
2043	723	14,285	15,009
2044	-	10,450	10,450
2045	-	9,030	9,030
2046	-	5,034	5,034
2047	-	2,697	2,697
2048	-	2,902	2,902
2049	-	1,348	1,348
2050	-	787	787
2051	-	787	787
2052	-	608	608
2053	-	608	608
2054	-	429	429
2055	-	429	429
2056	-	429	429
2057	-	429	429
2058	-	429	429
2059	-	250	250
2060		215	215
2061		215	215
2062		215	215
2063		215	215
2064		107	107
2065		107	107
Annual Average¹	12,664	712	10,336
Total	240,618	24,052	264,670

1. Annual excludes periods of relatively low emissions from land-use change after cessation of mining activity to better represent average operational emissions of mining activity. For the Proposal and the Combined Proposal, the average is over FY2025 to FY2049. For the Approved Proposal is FY25 to FY43.

Table 12-6: Greenhouse Gas Emissions - Scope 1 GHG emissions (rail transport)

Financial year	Estimated Scope 1 emissions (tCO ₂ -e)		
	Approved Proposal	Proposal	Combined Proposal
2025	27,777	-	27,777
2026	18,596	-	18,596
2027	17,800	3,022	20,821
2028	21,644	-12	21,632
2029	25,555	-4,403	21,152
2030	38,090	-5,067	33,022
2031	24,853	-6,000	18,854
2032	15,783	-4,563	11,220
2033	16,890	-6,467	10,424
2034	9,167	-8,100	1,067
2035	10,841	-8,205	2,636
2036	7,760	-5,099	2,661
2037	13,442	-4,477	8,965
2038	21,482	-2,514	18,968
2039	11,143	-2,207	8,935
2040	19,163	-195	18,968
2041	15,241	-	15,241
2042	17,292	1,490	18,782
2043	777	17,992	18,769
2044	-	12,504	12,504
2045	-	10,767	10,767
2046	-	5,329	5,329
2047	-	2,512	2,512
2048	-	2,917	2,917
2049	-	777	777
2050	-	-	-
2051	-	-	-
2052	-	-	-
2053	-	-	-
2054	-	-	-
2055	-	-	-

Financial year	Estimated Scope 1 emissions (tCO ₂ -e)		
	Approved Proposal	Proposal	Combined Proposal
2056	-	-	-
2057	-	-	-
2058	-	-	-
2059	-	-	-
2060	-	-	-
2061	-	-	-
2062	-	-	-
2063	-	-	-
2064	-	-	-
2065	-	-	-
Annual Average¹	17,542	0	13,332
Total	333,294	0	333,294

1. Annual excludes periods of relatively low emissions from land-use change after cessation of mining activity to better represent average operational emissions of mining activity. For the Proposal and the Combined Proposal, the average is over FY2025 to FY2049. For the Approved Proposal is FY25 to FY43.

A summary of estimated GHG emissions (Scope 1) for the Proposal and Combined Proposal is provided in Table 12-7 and Table 12-8 which includes the following:

- estimated peak annual emissions
- estimated total emissions
- estimated average annual emissions.

Table 12-7: Greenhouse Gas Emissions - Proposal Scope 1 GHG emissions summary

Emissions estimate	Scope 1 emissions tCO ₂ -e (mining)	Scope 1 emissions tCO ₂ -e (electricity generation)	Scope 1 emissions tCO ₂ -e (rail transport)
Peak annual emissions	48,649 (FY28)	14,285 (FY43)	17,992 (FY43)
Total emissions over the life of Proposal	-10,132	24,052	0
Average annual emissions	-2,601	712	0

The average annual Scope 1 GHG emissions for the Combined Proposal is estimated to be approximately 45,692 tCO₂-e (Table 12-8).

Table 12-8: Greenhouse Gas Emissions - Combined Proposal Scope 1 GHG emissions summary

Emissions estimate	Scope 1 emissions tCO ₂ -e (mining)	Scope 1 emissions tCO ₂ -e (electricity generation)	Scope 1 emissions tCO ₂ -e (rail transport)
Peak annual emissions	119,091 (FY28)	24,618 (FY30)	33,022 (FY30)
Total emissions over the life of Proposal	1,251,633	264,670	333,294
Average annual emissions	47,870	10,336	13,332

A summary of the total Scope 1 emissions for the Approved Proposal, Proposal and Combined Proposal are detailed in Table 12-9.

Table 12-9: Greenhouse Gas Emissions - Total Scope 1 emissions (mining, electricity, and rail) summary for Approved Proposal, Proposal, and Combined Proposal

Emissions estimate	Approved Proposal	Proposal	Combined Proposal
Peak annual emissions	213,086 (FY30)	76,486 (FY43)	156,838 (FY28)
Average annual emissions ¹	96,615	-1,889	71,538
Total emissions over the life of Proposal	1,835,677	13,920	1,849,597

1. Annual excludes periods of relatively low emissions from land-use change after cessation of mining activity to better represent average operational emissions of mining activity. For the Proposal and the Combined Proposal, the average is over FY2025 to FY2049. For the Approved Proposal is FY25 to FY43.

Details of the sources of annual and lifetime Scope 1 emission for the Combined Proposal are presented in Table 12-10.

Heavy haulage and ancillary equipment that use diesel generate most of the GHG emissions for the Combined Proposal. The Scope 1 emissions profile (including by source) of the Combined Proposal is illustrated in Figure 12-1.

Table 12-10: Greenhouse Gas Emissions - Combined Proposal Scope 1 (mining) by source

Year	Combined Proposal Scope 1 emissions estimates (tCO ₂ -e)				
	Heavy haulage & ancillary (diesel)	Dewatering (diesel)	Oils & greases	Land-use change ¹	Total
2025	90,364	3,849	1	-	94,214
2026	40,112	3,842	0	-	43,955
2027	43,173	4,125	1	1,282	48,581
2028	111,392	6,991	1	707	119,091
2029	73,241	8,392	1	635	82,269
2030	70,010	8,931	1	573	79,515
2031	33,458	9,471	0	519	43,448
2032	11,882	10,011	0	471	22,364
2033	15,455	10,550	0	429	26,435

Year	Combined Proposal Scope 1 emissions estimates (tCO2-e)				
	Heavy haulage & ancillary (diesel)	Dewatering (diesel)	Oils & greases	Land-use change ¹	Total
2034	69,953	11,090	1	391	81,435
2035	25,463	11,630	0	358	37,452
2036	25,558	12,170	0	329	38,056
2037	38,216	12,709	0	302	51,228
2038	73,385	11,418	1	279	85,083
2039	35,083	11,572	0	257	46,913
2040	35,738	11,572	0	238	47,548
2041	29,931	11,572	0	220	41,724
2042	33,850	11,572	0	205	45,627
2043	34,961	10,891	0	190	46,042
2044	22,363	10,891	0	177	33,432
2045	20,639	9,869	0	165	30,647
2046	10,650	9,869	0	154	20,647
2047	5,870	7,094	0	144	13,108
2048	3,549	6,785	0	135	10,468
2049	504	6,785	0	126	7,416
2050	-	6,785	-	118	6,903
2051	-	6,785	-	111	6,896
2052	-	5,243	-	104	5,347
2053	-	5,243	-	98	5,341
2054	-	3,701	-	92	3,793
2055	-	3,701	-	87	3,788
2056	-	3,701	-	82	3,783
2057	-	3,701	-	77	3,778
2058	-	3,701	-	73	3,774
2059	-	2,159	-	69	2,228
2060	-	1,851	-	-	1,851
2061	-	1,851	-	-	1,851
2062	-	1,851	-	-	1,851

Year	Combined Proposal Scope 1 emissions estimates (tCO ₂ -e)				
	Heavy haulage & ancillary (diesel)	Dewatering (diesel)	Oils & greases	Land-use change ¹	Total
2063	-	1,851	-	-	1,851
2064	-	925	-	-	925
2065	-	925	-	-	925
Average²	38,192	9,346	0	345	47,870
Total	954,802	287,624	11	9,196	1,251,633

1. Mining for the Proposal is anticipated to conclude in 2049. However, FullCAM model emissions from clearing continues beyond cessation of mining and therefore emissions have been predicted to 2059. This is due to the carbon content of biological material decomposing at different rates. Dewatering activities are also anticipated to continue through to 2065.
2. Annual excludes periods of relatively low emissions from land-use change after cessation of mining activity to better represent average operational emissions of mining activity. For the Proposal and the Combined Proposal, the average is over FY2025 to FY2049. For the Approved Proposal is FY25 to FY43.

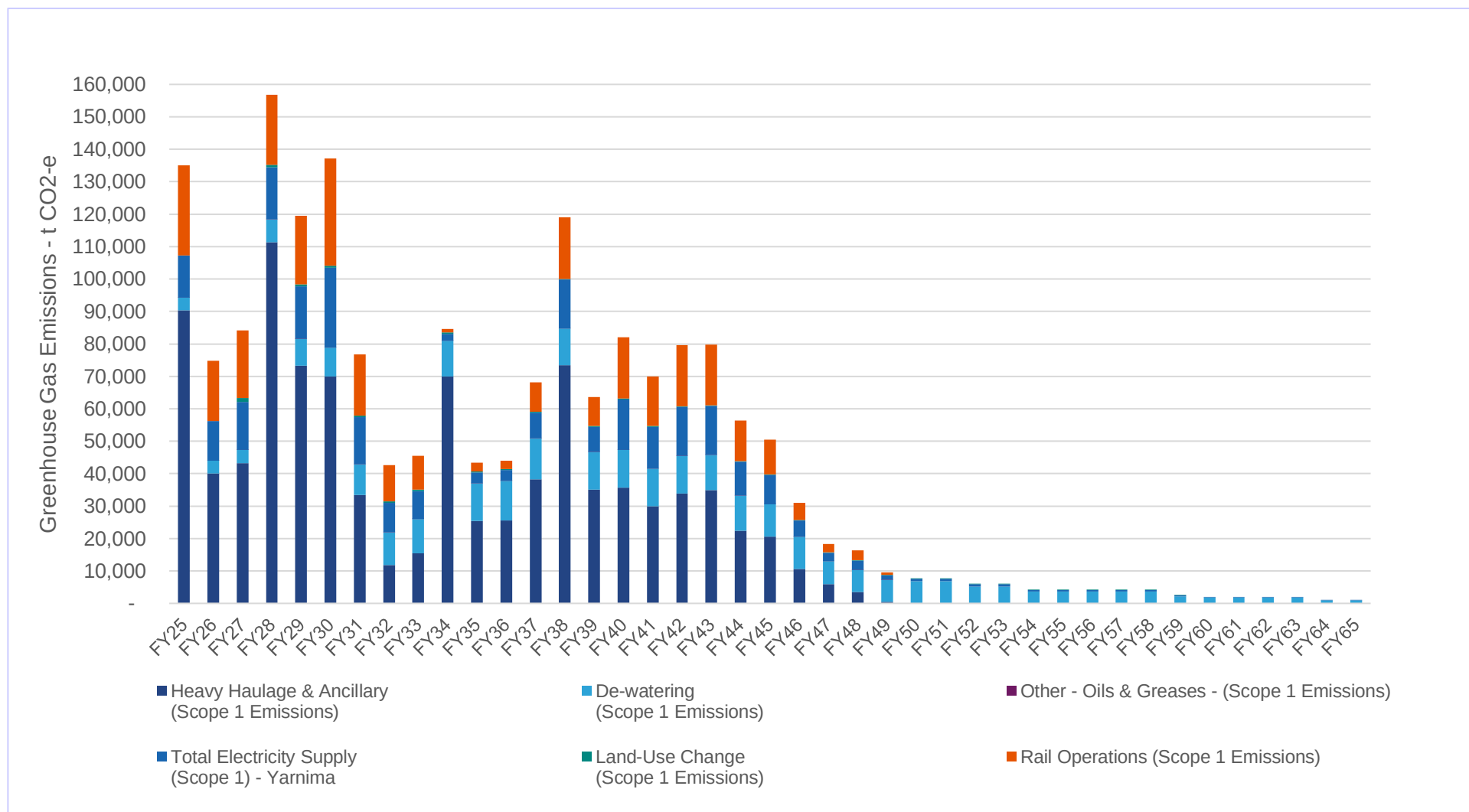


Figure 12-1: Combined Proposal Scope 1 GHG emissions profile

12.4.4.3 Scope 2 emissions estimate

There are no Scope 2 emissions associated with this Proposal or the Combined Proposal as described in Section 12.4.1 (Scope 1 emissions - electricity generation and rail transport).

12.4.4.4 Scope 3 emissions estimate

A summary of estimated Scope 3 GHG emissions is provided in Table 12-11 and includes the following for the Combined Proposal.

- estimated peak annual emissions
- estimated total emissions
- estimated average annual emissions.

Table 12-11: Greenhouse Gas Emissions - Combined Proposal Scope 3 GHG emissions summary

Emissions estimate	Steel-making (tCO ₂ -e)	Shipping (tCO ₂ -e)	BHP Port: Downstream (tCO ₂ -e)	Total (tCO ₂ -e)
Peak annual emissions ¹	23,945,465	227,860	20,143	24,193,467
Total emissions over the life of the Combined Proposal	239,884,313	2,299,789	203,299	242,387,401
Average annual emissions	9,687,364	91,992	8,132	9,787,488

1. Peak total Scope 3 emissions are estimated in 2030

The total Scope 3 emissions have been estimated to be 9,787,488 tCO₂-e (annual average) and 242,387,401 tCO₂-e (total life of Combined Proposal). This is comprised of:

- BHP's downstream emissions associated with ship loading activities at Port Hedland relevant to the Combined Proposal are estimated to average 8,132 tCO₂-e per year or total 203,299 tCO₂-e for the life of the Proposal⁴
- International shipping of iron ore associated with the Combined Proposal is estimated to average 91,992 tCO₂-e per year or total 2,299,789 tCO₂-e for the life of the Proposal.
- Steelmaking of products associated with the Combined Proposal is estimated to average 9,687,364 tCO₂-e per year or total 239,884,313 tCO₂-e for the life of the Proposal.

12.4.5 Emissions intensity

GHG intensity is the measure used to benchmark the Proposal against other facilities and industry standards. GHG intensity represents the quantity of GHG emissions emitted per unit of production. For the iron ore mining sector, GHG intensity is calculated as tonnes of carbon dioxide equivalent per tonne of iron ore (tCO₂-e/t), on a wet basis, that is produced and is of a saleable quality, consistent with the Safeguard Mechanism.

The Safeguard Mechanism 'default' emissions intensity for iron ore mining is 0.00476 tCO₂-e/t iron ore, which represents the Australian industry average Scope 1 emissions of iron ore production. The default emissions intensity

⁴ The Clean Energy Regulator defines "Scope 3 emissions are indirect greenhouse gas emissions other than scope 2 emissions that are generated in the wider economy. They occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business". Although activities associated with operations at Port Hedland and rail beyond the Regional GHGMP boundary, are controlled by BHP, from the perspective of the Orebody 29/30/35 Proposal they occur outside the Development Envelope, and therefore are neither Scope 1 nor Scope 2 emissions associated with the Proposal

was determined by the DCCEEW based on reported Scope 1 emissions and iron ore production over the five-year period FY2013 to FY2017.

These default emissions intensities are published in Schedule 2 of the *Safeguard Mechanism Rule (NGER Regulations (Safeguard Mechanism) Rule 2015)*. The iron ore mining default emissions intensity includes all Scope 1 NGER-reported facility emissions, excluding on-site electricity generation and processes that do not occur within the facility.

The emissions intensity for Scope 1 emissions associated with the Combined Proposal (averaged over the life of the mine) is estimated to be approximately 0.0071 tCO₂-e/t iron ore (mining emissions). Figure 12-2 presents the emissions intensity benchmarking of the Combined Proposal compared to other WA iron ore mines.

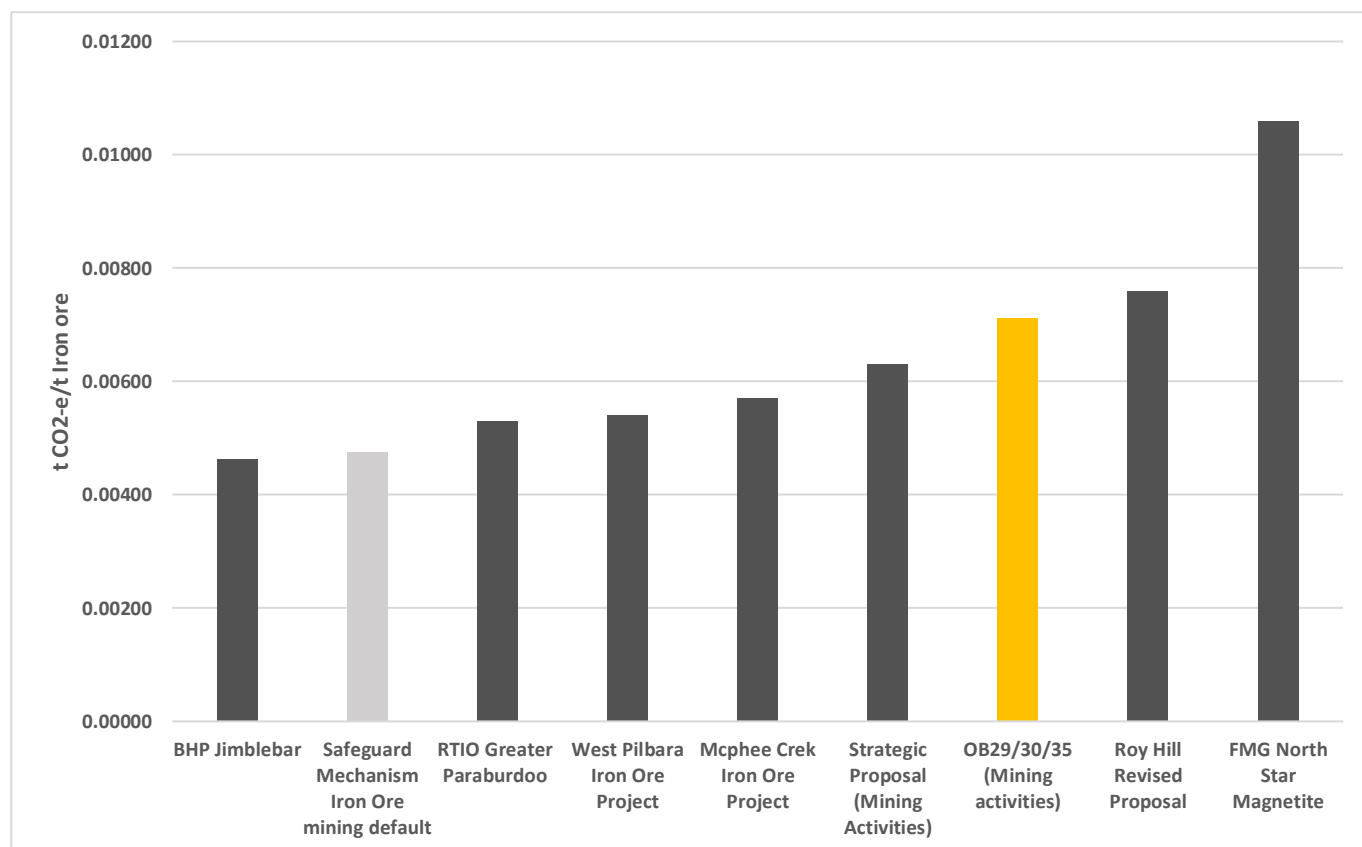


Figure 12-2: Scope 1 emissions intensity benchmarking of WA iron ore mines

12.5 Mitigation

12.5.1 Avoid

The emissions from the Combined Proposal are estimated to increase by 13,920 tCO₂-e, which represents an approximately 0.8% increase in emissions compared to the Approved Proposal. Initiatives to avoid emissions included in this Proposal may be further enhanced over the Proposal's life as BHP's decarbonisation strategies to electrify its mines and increase the proportion of renewable electricity progress.

The Combined Proposal and the Approved Proposal are estimated to produce equal quantities of iron ore. Key characteristics of the Combined Proposal is an increase in the rate of dewatering at Orebody 29/30/35, decreasing the time required to access BWT iron ore deposits, and to establish a new OSA closer to mining activity at OB29, reducing trip time for haul truck waste movements from approximately 31 minutes per cycle to approximately 21 minutes per cycle.

BHP estimates that 217,611 tCO₂-e of emissions would be avoided over the life of the Proposal, through a reduction in cycle time to haul overburden to a proposed OSA, closer to mining activity. These estimated reductions are based on the operation of diesel-powered haul trucks and could be further increased through the adoption of electric haul trucks. Additionally, BHP has avoided Scope 1 emissions where possible by minimising land clearing through the use of existing infrastructure where practicable to support the development and operation of the Proposal, including the use of existing cleared tracks and roads and mine processing infrastructure.

Figure 12-3 summarises the Total Scope 1 emissions from mining, power generation and rail transport activities for both the Combined Proposal and Approved Proposal, and the estimated emissions associated with dewatering, land clearing and mining equipment.

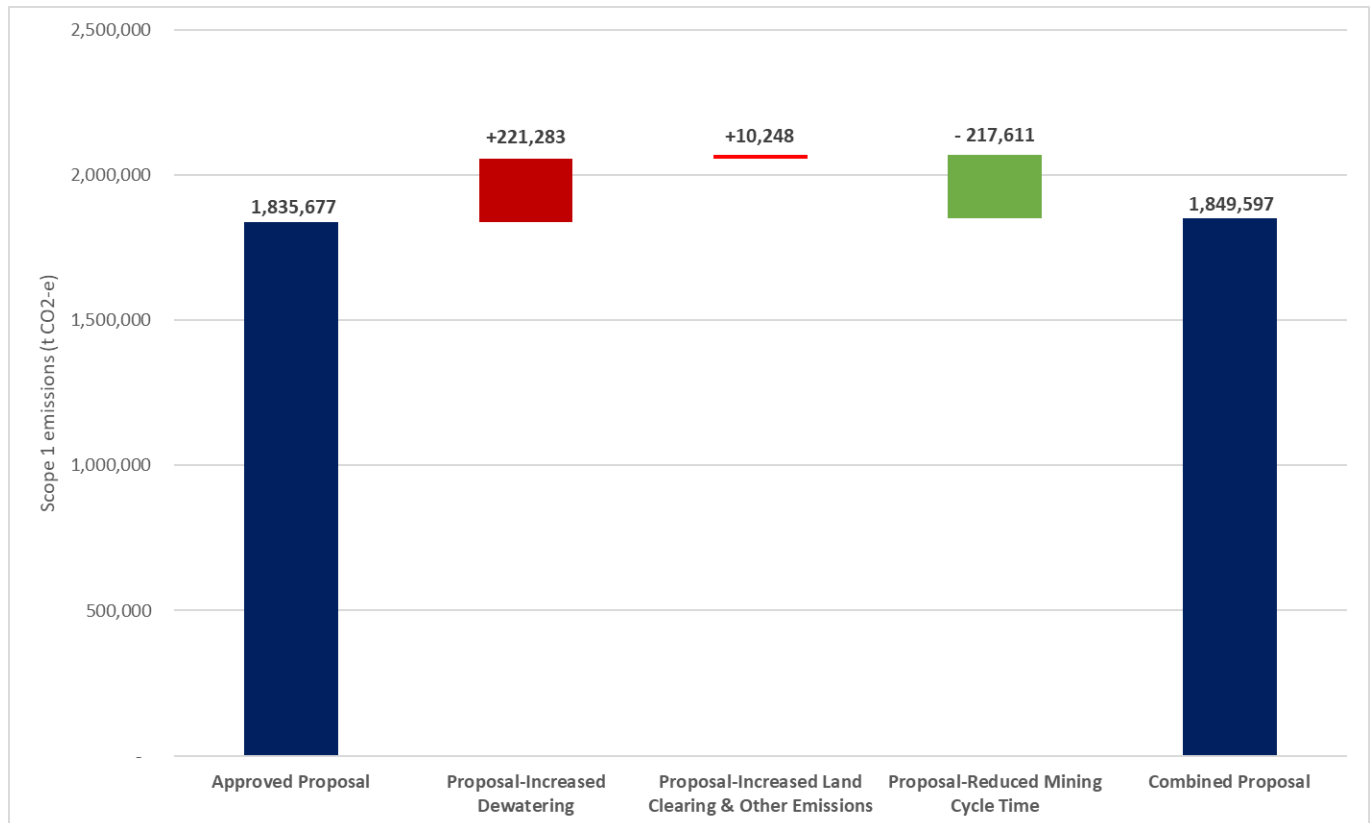


Figure 12-3: Combined Proposal GHG emissions comparison for operational scenarios

12.5.2 Reduce

BHP Regional Greenhouse Gas Management Plan (GHGMP)

BHP will reduce GHG emissions in accordance with the NGER Act and Safeguard Mechanism, as described below. BHP also provides a Regional GHGMP (BHP 2024k) (Appendix 13) which demonstrates the following:

- BHP's contribution towards the Western Australian and Commonwealth Governments aspiration of net zero emissions by 2050
- the consideration given to evolving Western Australian and Commonwealth legislative and policy settings, including new international commitments, through which the net zero emissions by 2050 aspiration is intended to be delivered
- progressive reduction of Scope 1 emissions for the Combined Proposal through the setting of an indicative emissions reduction trajectory aligned with the Safeguard Mechanism and incorporates the enforceable annual baselines

- that all reasonable and practicable measures have been considered to avoid, reduce, and offset the Scope 1 emissions from the Combined Proposal
- that consideration has been given to opportunities for reducing BHP's downstream and other Scope 3 emissions associated with the Combined Proposal where reasonably practicable.

This GHGMP outlines requirements that apply to the Combined Proposal including how GHG emissions will be monitored and managed to minimise the Orebody 29/30/35 contribution to global GHG emissions.

NGER Act and Safeguard Mechanism – Production-adjusted baselines

The activities associated with the Approved Proposal broadly align with the Newman Operations NGER facility, which is subject to NGER Act energy and emissions reporting. BHP is also required to report on both Scope 1 and Scope 2 emissions annually by NGER facility.

The NGER Act and Safeguard Mechanism provide contemporary, robust, transparent, and enforceable requirements to deliver GHG emissions reductions commensurate to Australia's international obligations. These mechanisms apply to GHG emissions associated with the Combined Proposal and enable the objectives of the EPA to be met (EPA 2024e), as well as the WA Government's Greenhouse Gas (GHG) Emissions Policy for Major Projects (Government of Western Australia 2024).

From 1 July 2023 the Safeguard Mechanism requires all facility baselines to be 'production-adjusted'. Production adjusted baselines, are primarily determined by the function of three components:

- 1) **Safeguard Mechanism Decline Rate:** provides an overview of the decline rate expected to apply to NGER Act facilities (other than Trade Exposed Baseline Adjusted facilities). The Combined Proposal is not likely to be considered a Trade Exposed Baseline Adjusted facility so the rates in Table 9 of the GHGMP will apply to the Combined Proposal. Decline rates are subject to periodic review by Government.
- 2) **Emissions Intensity:** The Safeguard Mechanism is transitioning all facilities towards using the 'default emissions intensity' or 'industry best practice emissions intensity' on a 100% basis from 2030, when calculating baselines. The relative proportion from FY2024 to FY2030 will vary based on the Safeguard Mechanism:
 - a) **Default Emissions Intensity:** Representative of the Government assessed industry average for the production of specific commodities, including iron ore, electricity and net tonne kilometres of iron ore transported by rail.
 - b) **Site-Specific Emissions Intensity:** Historic emissions intensity for an NGER facility between FY2018 to FY2022, selecting the mid-point.
 - c) **Industry Best Practice Emissions Intensity:** Continues to be developed by Government, aims to consider international best practice, aligning to local conditions.
- 3) **Actual Production:** The NGER Act will require companies to report production associated with emissions intensities, in addition to existing emissions and energy reporting to the CER.

Production-adjusted baselines are determined by the CER once emissions and production data has been reported through the NGER Act, which are due 31 October preceding a financial compliance year. Production-adjusted baselines compensate for the potential for actual production to vary, ensuring that emissions limits remain relative to actual production, limiting issues of discrepancy between estimated production and emissions, and those which occur in practice. As a result, the GHGMP provides an estimate of the applicable baseline, which will be determined annually by the CER and operate as a net GHG emissions limit for that year.

The *Climate Change Act 2022* (Cth) (CC Act) enshrines into law Australia's updated nationally determined contribution under Article 4 of the Paris Agreement. The emissions reduction targets are 43% below 2005 levels by 2030 and net zero by 2050.

Significant reforms have been undertaken to the NGER Act and Safeguard Mechanism which took effect from 1 July 2023. The reforms are directed at ensuring covered facilities achieve a proportionate share of Australia's emissions reduction target.

Key components of the NGER Act and Safeguard Mechanism reform framework are:

- 1) New legal objects in the NGER Act, including:
 - a) ensuring that total net Safeguard emissions (emissions from all covered facilities) for all of the financial years between 1 July 2020 and 30 June 2030 do not exceed a total of 1,233 MtCO₂-e (known as the 'hard cap')
 - b) ensuring that net total Safeguard emissions decline to no more than 100 MtCO₂-e for the financial year beginning on 1 July 2029
 - c) the 5-year rolling average of total Safeguard emissions for each financial year that begins
 - d) after 30 June 2024 are lower than the past 5-year rolling average Safeguard emissions for that financial year.
- 2) Requiring the Safeguard Mechanism Rule to be consistent with the above objects. There are triggers for the Minister to have to consider amending the Rules (including a public consultation process) if the Climate Change Authority (CCA) or the Secretary to DCCEEW advises the Minister that emissions are not declining consistently with the trajectory listed above, or in line with Australia's emissions reduction target and net-zero by 2050 commitment.
- 3) Change to the manner in which facility baselines are set, with all facilities subject to a production adjusted baseline. For existing facilities, site specific emissions intensity values will initially be used in the baseline calculation for existing facilities, with a gradual transition to industry benchmark emissions intensity values during the period through to 2030. International best practice emissions intensity will be required immediately for new facilities or new outputs from existing facilities.
- 4) An annual baseline decline rate for all facilities through until 2050. The default annual baseline decline rate is set at 4.9% for financial years commencing 1 July 2023 to 1 July 2029. From 1 July 2030, the decline rate has been notionally set at 3.285%, which represents a linear trajectory to net zero by 2050. Emission limits will be periodically monitored and updated by Government to ensure the scheme remains effective.
- 5) Baselines operate as a compliance limit and facilities must undertake abatement activities at site and/or use carbon credits to meet the declining baseline. Only Australian Carbon Credit Units (ACCU) or Safeguard Mechanism Credits (SMC) may be used. Any use of carbon credits in excess of 30% will trigger the requirement for a public statement explaining why more onsite abatement has not been undertaken.
- 6) Transparency in respect of all key aspects of the regime. This including publishing of facility baselines, Scope 1 emissions data and ACCUs and/or SMCs surrendered by the CER each year. In addition, CCA must provide an independent report as part of the Annual Climate Change Statement. The statement reports Australia's progress against emission reduction goals, factoring both existing Safeguard Mechanism participants and proposed expansions, identified.

Significant penalties and other enforcement options apply for failure to comply with the NGER Act and Safeguard Mechanism. The CER and Government also have wide ranging tools to monitor compliance.

Scope 1 emissions reduction trajectory

Figure 12-4 shows the Scope 1 emissions baseline and indicative emissions reduction trajectory (applying the Safeguard Mechanism decline rate (Table 9 of the GHGMP)) for the Combined Proposal. Reductions in GHG emissions will be achieved through structural abatement, primarily through low carbon and renewable power and fleet electrification which are discussed further below.

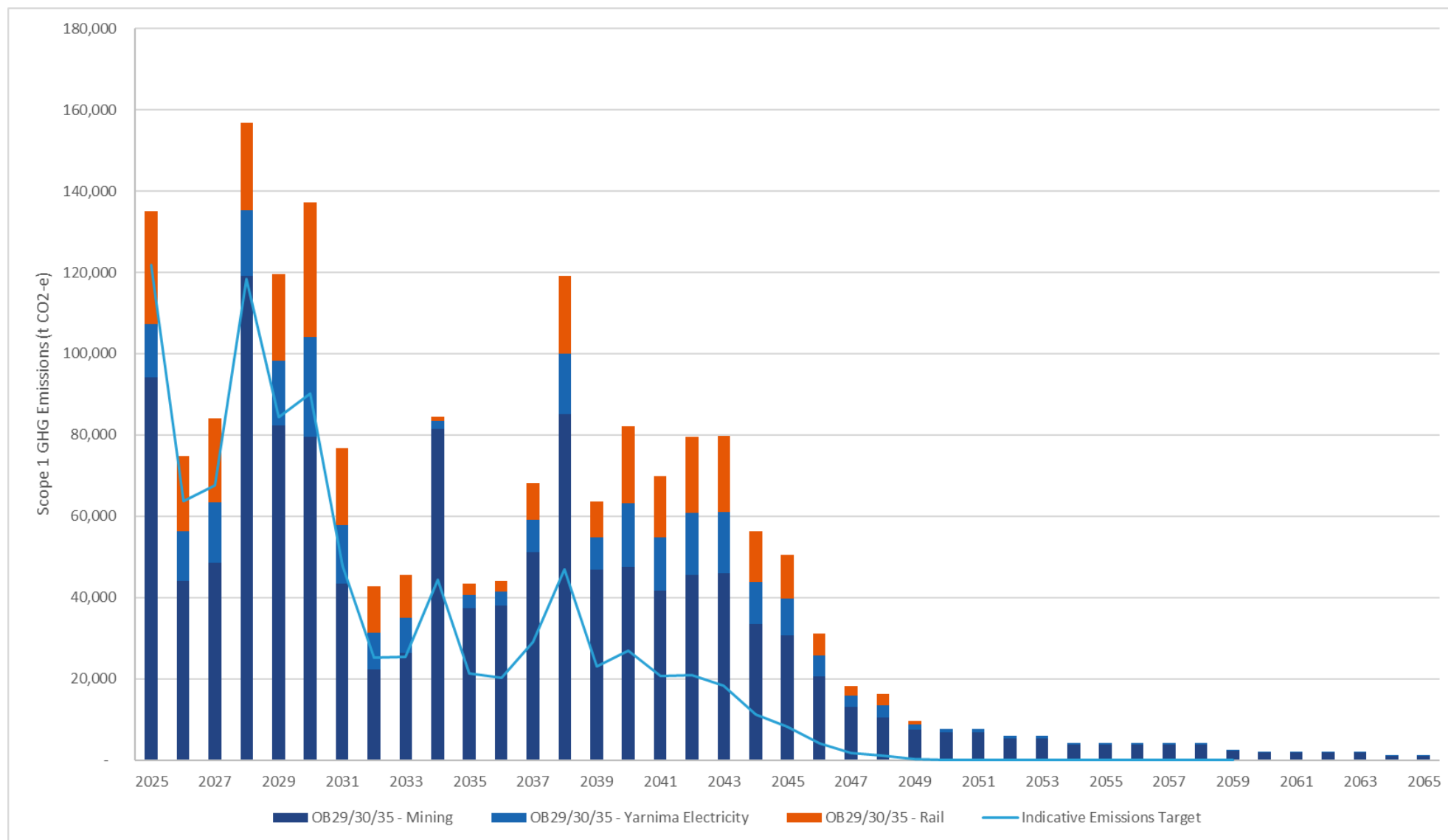


Figure 12-4: Combined Proposal Scope 1 emissions baseline and indicative emissions reduction trajectory

Reduction of Scope 1 emissions through fleet electrification

Displacing diesel as an energy source requires a transformation of mining operations through an integrated abatement program. The decarbonisation pathway is non-linear and will rely heavily on development of technologies that are not currently commercially available, with each component needing to reach maturity in line with the transformation program.

BHP has partnered with Caterpillar and Komatsu to develop commercially viable zero emissions trucks. Trials are planned to begin in 2024, with commercial release expected to follow in the subsequent five years. While it is not yet possible to be definitive on timelines, the first electric haul trucks are expected to be operational on selected BHP sites by 2027 and all trucks are planned to be electric by the mid-2030s.

Replacing diesel as a fuel source requires a new operational ecosystem, impacting mine planning, haulage networks, and reconsideration of safety and operational factors. BHP is part of the Charge on Challenge, an initiative that has identified potential innovations to expedite the commercialisation of charging solutions for electric haul trucks. In FY2022, BHP became a founding member of the mining taskforce at CHARIN, an association dedicated to promoting interoperability of charging systems. The taskforce aims to ensure that any truck charging interfaces across the industry will be standard, regardless of the manufacturer.

Studies of electric fleet at BHP, including at the Orebody 29/30/35, will contribute to these industry initiatives. Implementation is intended to be in line with any industry standards set.

Reduction of Scope 1 emissions through low carbon and renewable energy⁵

The Combined Proposal, together with the rest of BHP's Pilbara operations, will initially be powered by an islanded network that is supplied primarily by power from Yarnima Power Station. Yarnima is a highly efficient combined cycle gas turbine power station which emits approximately 35% less CO₂ than the Australian average, achieved through waste-heat recovery.

As BHP moves to displace diesel with electricity, an estimated further 900 MW of power will be required to support operations at WAIO by 2040 BHP plans to source that additional power from renewable sources.

As the proportion of renewable power available to the Pilbara network grows, the Scope 1 emissions related to electricity generation for the Combined Proposal will decrease accordingly.

Yarnima Power Station is an NGER facility and will be subject to Safeguard Mechanism Decline Rate. As such, no emissions reduction trajectory is proposed for Scope 2 emissions as part of this assessment.

Reduction of downstream and Scope 3 emissions

BHP is pursuing the long-term goal of net zero Scope 3 GHG emissions by 2050. Achievement of this goal is uncertain, particularly given the challenges of a net zero pathway for our customers in steelmaking, and BHP cannot ensure the outcome alone. Due to the hard to abate emissions sources outlined below in steelmaking and shipping and the need to develop new low GHG emissions technology pathways, material decarbonisation opportunities in these sectors will take time to realise.

Scope 3 decarbonisation opportunities are managed primarily at the Group level by the functions of BHP's business with the technical expertise, accountability for decision making, and the greatest ability to influence segments of our value chain. BHP's global marketing team partners with our downstream customers in steelmaking on decarbonisation studies and pilots and ore quality trials, the maritime team works to reduce the emissions intensity

⁵ In the context of BHP's Regional GHG Management Plan, emissions which occur outside of the Development Envelope associated with Yarnima Power Station are identified as Scope 1 emissions. Although these emissions are from sources outside of the Development Envelope for the Proposal, they occur within BHP's Regional GHGMP boundary. BHP takes a regional approach to the management of GHG emissions, and as such these emissions are classified as Scope 1.

of shipping, and the procurement team engages with suppliers to increase the proportion targeting net zero for their operational emissions by 2050. The Scope 3 emissions and mitigation measures for the Combined Proposal will be managed by these functions as part of the whole-of-company approach to Scope 3. Further detail is described in Section 3.7.2 of the GHGMP.

An exception to this approach is the downstream emissions which are the operational emissions of other BHP controlled facilities, such as Port Hedland. These will be managed through BHP's operational decarbonisation strategies described in Section 3.7 of the GHGMP.

12.5.3 Offset

BHP prioritises GHG emissions reduction at its operated assets to achieve our Scope 1 and 2 targets and goals, with investments in external carbon offset projects considered complementary to this 'structural abatement'.

The proposed GHG emissions reduction trajectory for the Combined Proposal aligns to the recently reformed Safeguard Mechanism. The reformed Safeguard Mechanism allows for a range of flexible compliance arrangements, including the generation of SMCs when emissions are below baselines (and which can be banked or traded within safeguard facilities), the purchase and surrender of ACCUs to reduce net emissions.

Although BHP prioritise internal emissions reduction at the Combined Proposal, BHP acknowledge a role for the use of flexible compliance arrangements as allowed under the reformed Safeguard Mechanism.

This means that where structural abatement of emissions is insufficient to meet the Combined Proposal emissions reduction trajectory, BHP will ensure that these targets are met by either using banked SMC's from prior years, transferring SMCs from other BHP facilities (to allow decarbonisation to be optimised across BHP, for example displacing diesel trucks progressively by mine, rather than a smaller proportion of trucks at all mines in parallel), and/or retiring eligible, high-quality offsets in a temporary or transitional capacity while abatement options are being studied, as well as for 'hard to abate' emissions with limited or no current technological solutions, and where access to renewable energy is constrained.

BHP mitigate the risk of offsets being unavailable at the proposed time of surrender by building a portfolio of offsets using a variety of short-term and long-term sourcing approaches, including (but not limited to):

- spot markets
- forward or long-term offtakes with guaranteed supplies upon project delivery
- pre-payment for future guaranteed supplies
- project origination, both within and outside of BHP's tenure.

Offsets will be sourced, held and retired from the portfolio as needed to meet our anticipated demand for offsets over time, as BHP work to decarbonise our business. The specific volumes sourced from each approach will be responsive to the prevailing offset landscape, both domestically and internationally (if the use of internationally sourced credits is allowed under the Safeguard Mechanism in the future, given the implementation of Article 6.4 of the Paris Agreement (A6.4 of PA)), to ensure BHP have continued access to security of supplies.

In the context of BHP's operations in Western Australia, including Orebody 29/30/35, our preference is to source offsets in line with our operational footprint in WA and in recognition of the WA state government's preference for locally generated offsets. BHP may also source offsets from international markets, in accordance with EPA guidance on the use of offsets within WA, if the use of international credits to meet Safeguard Mechanism obligations becomes allowed in the future, given the implementation of A6.4 of PA. Domestic sourcing of offsets may be from the domestic market or through offset generation from BHP's tenure or other locations in WA, in partnership with reputable project developers under ERF methodologies. BHP is currently undertaking an opportunity assessment to better understand the potential to generate offsets on our tenure (including mineral carbonation and natural climate solutions), as well as exploring opportunities outside of our tenure with project developers in WA.

Considering the types of offsets that are currently available on the market (i.e. predominantly avoidance type) and the value in mobilising carbon finance to incentivise offset supply, BHP sources offsets from solutions that remove atmospheric carbon as well as avoid emissions where these have high integrity, with a planned shift towards removal of offsets over time. Whilst BHP prioritise the acquisition of offsets from nature-based solutions that deliver long-term environmental, social and economic value (i.e. sustainability co-benefits) BHP also consider the sourcing of offsets from engineered solutions. The specific offset types sourced and used within the WA context and for the Combined Proposal, will depend on the acceptable offset criteria set by the WA EPA, the prevailing market dynamics and the availability and accessibility of offsets.

BHP's procurement of carbon credits, includes due diligence to ensure that BHP invest in carbon offsets that meet the following minimum quality standards:

- **Satisfies national carbon offset standards** for compliance offsets (i.e. ACCUs and other eligible regulatory offset instruments), including ACCUs that are established under (and meet the integrity standards of) the *Carbon Credits (Carbon Farming Initiative) Act 2011* (Cth) and/or **Registered in an internationally recognised standard** that independently verifies and issues voluntary carbon credits (including but not limited to Verra and Gold Standard) that is accredited by and compliant to the International Carbon Reduction & Offset Alliance (ICROA) Code of Best Practice.
- **Adheres to a robust emissions reduction accounting methodology**, to provide assurance of the volume of emissions reduced through a project.
- **Meets additional criteria** to ensure that the emissions reduction would not have occurred in the absence of a carbon offset market.
- **Has a high likelihood of permanence** to ensure that the emissions reduction is ongoing and not reversed (e.g. in the case of forestry projects, the trees are not cut down or destroyed by a natural disaster).
- **Provides robust mitigation against leakage**, ensuring an offsetting project does not increase emissions elsewhere (e.g. an area is protected from deforestation through offsetting but another forest area is destroyed).
- **Demonstrates high environmental and social integrity**, ensuring no broader social or environmental harm (e.g. hydropower projects that require forest clearing and community displacement).
- **Limit offset vintage to the last five years of offset generation**, to avoid claiming emissions reduction from activities that occurred a long time ago.

BHP regularly review our minimum sourcing standards and sourcing strategy to verify alignment with global best practice, including the outcomes of initiatives such as The Integrity Council for the Voluntary Carbon Market's (IC-VCM) Core Carbon Principles and the Chubb review into the integrity of ACCUs (DCCEE 2022).

BHP supports action to increase the availability of carbon offsets in the near-term and long-term, by addressing barriers to offset supply through grant funding, research and development, and market and policy advocacy. For example, in 2022 BHP launched a grants program to help drive the development of the Australian blue carbon market and have provided over AUD\$5million to support emerging blue carbon methods and projects.

12.5.4 Other statutory decision-making processes

Table 12-12 summarises whether another statutory decision-making process can mitigate the potential environmental impacts of the Orebody Combined Proposal on Greenhouse Gas Emissions, considering the EPA's Taking decision making processes into account in EIA: Interim Guidance (EPA 2021b). Table 12-12 also provide reasons, including how, in relation to the specific potential impacts of the Proposal, the decision-making process takes the EP Act object and principles, and the EPA's objective for Greenhouse Gas Emissions, into account.

Table 12-12: Greenhouse Gas Emissions - other statutory decision-making processes

Potential impact	Statutory decision-making process can mitigate impacts on the environment?	Reasons (if Yes)
Generation of GHG	Yes	NGER Act - provides for reporting of emissions and where these emissions exceed the defined thresholds, BHP will be required to undertake action to manage these emissions NGER Safeguard Mechanism - imposes limits and annual reporting requirements on large GHG emitting facilities to keep net emissions below a defined baseline Renewable Energy Target - provides the mechanism for achieving emissions targets through creation and trading of renewable energy certificates Emissions Reduction Fund - allows for the purchase and surrender of offsets to counterbalance GHG emissions

12.6 Assessment and significance of residual impacts

12.6.1 Emissions intensity

The emissions intensity for Scope 1 emissions associated with the Combined Proposal is estimated to be approximately 0.0071 tCO₂-e/t iron ore. This is broadly comparable to the default emissions intensity (0.00476 tCO₂-e/t iron ore) as illustrated in Figure 12-2.

The emissions intensity for the Combined Proposal is higher than the Safeguard Mechanism Default Emissions Intensity, which represents the Australian average between FY2013 and FY2017, noting this average includes a range of iron ore operations above and below the average, influenced by factors including geology and distance from supporting infrastructure. The Combined Proposal's emissions intensity sits within the emissions intensity range of other iron ore mines referred to the EPA and industry benchmarks, 0.0463 to 0.0106 tCO₂-e per tonne of iron ore produced. Figure 12-2 (0.0069 tCO₂-e/t iron ore) and used in the benchmarking assessment (Appendix 13).

12.6.2 Change in GHG emissions (unmitigated) as a result of the Proposal

The ERD for the Approved Proposal (BHP 2013c) evaluated the environmental impacts associated with the development of Orebody 29/30/35 BWT Mining. GHG emissions were not quantified or assessed by the EPA as part of the assessment as it pre-dated the introduction of Greenhouse Gas Emissions as an EPA factor.

Using the Scope 1 mining emissions forecasting data presented in Appendix 13, the:

- total Scope 1 mining emissions for the Approved Proposal are 1,261,765 tCO₂-e
- the Proposal is estimated to reduce emissions to 10,132 tCO₂-e mining Scope 1 emissions which represents a 0.80% decrease in Scope 1 mining emissions when compared to the emissions of the Approved Proposal (1,261,765 tCO₂-e)
- the Combined Proposal is estimated to generate a total of 1,251,633 tCO₂-e Scope 1 mining emissions.

Using the electricity demand Scope 1 emissions forecasting data presented in Appendix 13, the:

- total Scope 1 electricity demand emissions for the Approved Proposal is 240,618 tCO₂-e

- the Proposal is estimated to generate a total of 24,052 tCO₂-e of Scope 1 electricity demand emissions which represents a 10.0% increase when compared to the emissions of the Approved Proposals (240,618 tCO₂-e)
- the Combined Proposal is estimated to generate a total of 264,670 tCO₂-e of Scope 1 electricity demand emissions.

Using the rail iron ore transport (Scope 1) emissions forecasting data presented in Appendix 13, the:

- total Scope 1 rail transport emissions for the Approved Proposal is 333,294 tCO₂-e
- the Proposal is estimated to generate no incremental change to Scope 1 rail transport emissions. Both the Approved Proposal and Combined Proposal produce and transport the same quantity of iron ore.
- the Combined Proposal is estimated to generate a total of 333,294 tCO₂-e of Scope 1 rail transport emissions.

Table 12-13 shows the Scope 1 emissions for the Proposal, Approved Proposal and Combined Proposal for the life of the Project.

Table 12-13: Greenhouse Gas Emissions - Scope 1 Greenhouse Gas Emissions Summary

Scope 1 emissions	Estimated Scope 1 emissions (tCO ₂ -e)		
	Proposal	Approved Proposal	Combined Proposal
Scope 1 emissions (mining)	-10,132	1,261,765	1,251,633
Scope 1 emissions (electricity)	24,052	240,618	264,670
Scope 1 emissions (rail)	0	333,294	333,294

Using the forecasting data presented in Appendix 13, the Combined Proposal is estimated to generate a total of 242,387,401 tCO₂-e Scope 3 emissions. There are no incremental changes to Scope 3 emissions generated as a result of the Proposal, both the Approved Proposal and Combined Proposal produce the same quantity of iron ore for shipping and steel making.

12.6.3 Comparison of GHG emissions (residual) against State and National GHG emissions

Based on 2022 Western Australian emissions and 2022 National emissions reported by DCCEEW and the Combined Proposal estimated average Scope 1 mining emissions (47,870 tCO₂-e), the estimated percentage contribution of the Combined Proposal average Scope 1 emissions to State and National GHG emissions is 0.058% and 0.011% respectively.

The average emissions of the Combined Proposal including mining, electricity generation emissions and rail transport emission sources (71,538 tCO₂-e) is estimated to represent 0.087% of the 2022 Western Australian emissions inventory, and 0.017% of the 2022 National emissions inventory.

12.6.4 GHG emissions following application of the mitigation hierarchy

For the purposes of this assessment, the indicative Safeguard Mechanism decline rate expected to be applied to NGER facilities (Orebody 29/30/35, Yarnima Power Station and Rail) has been used to calculate the residual Scope 1 GHG emissions which are shown in Table 12-14 and described as follows:

- with mitigation, the Combined Proposal would result in estimated net Scope 1 GHG emissions up to:
 - 635,102 tCO₂-e from Orebody 29/30/35

- 130,321 tCO₂-e from Yarnima Power Station, on a pro-rata basis
- 177,845 tCO₂-e from Rail, on a pro-rata basis
- with mitigation, the lifetime Scope 1 GHG emissions for the Combined Proposal will reduce by:
 - 616,531 tCO₂-e from Orebody 29/30/35 (approximately 49% reduction of emissions over the life of the Combined Proposal)
 - 134,349 tCO₂-e from Yarnima Power Station, on a pro-rata basis (approximately 51% reduction of emissions over the life of the Combined Proposal)
 - 155,449 tCO₂-e from Rail, on a pro-rata basis (approximately 47% reduction of emissions over the life of the Combined Proposal)

Table 12-14: Greenhouse Gas Emissions - Residual Scope 1 Greenhouse Gas emissions using application of Safeguard Mechanism decline rate

Scope 1 emission sources	Estimated Combined Proposal Scope 1 emissions (tCO ₂ -e)		Percentage (%) reduction in emissions over the life of the Combined Proposal
	With mitigation - estimated net Scope 1 GHG emissions	With mitigation - lifetime Scope 1 GHG Emissions reduction	
Orebody 29/30/35	635,102	616,531	49
Yarnima Power Station	130,321	134,349	51
Rail	177,845	155,449	47

12.6.5 Significant residual impacts

Following the application of the mitigation hierarchy (Section 12.5), and utilising the indicative emissions reduction trajectory for Scope 1 emissions aligned to the Safeguard Mechanism, the potential significant residual impacts are:

- contribution of 635,102 tCO₂-e of Scope 1 emissions (residual using the indicative Safeguard Mechanism decline rate from Orebody 29/30/35) over the life of the Combined Proposal
- contribution of 130,321 tCO₂-e of electricity demand (Scope 1) emissions (residual using the indicative Safeguard Mechanism decline rate from Yarnima Power Station) over the life of the Combined Proposal
- contribution of 177,845 tCO₂-e of rail iron ore transport (Scope 1) emissions (residual using the indicative Safeguard Mechanism decline rate from Rail) over the life of the Combined Proposal
- contribution of 242,387,401 tCO₂-e of Scope 3 emissions (residual) over the life of the Combined Proposal.

As detailed in Section 12.5 electricity continues to be generated by BHP's existing power generation infrastructure (high efficiency gas turbines coupled with waste-heat recovery), increasing the proportion of renewable electricity supplied to the Combined Proposal will increase the net GHG emissions reduction.

The detailed assessment of offsets is discussed in Section 12.5.3, including how the proposed offset/s will counterbalance the significant residual impacts of Greenhouse Gas Emissions. Details of the proposed offsets are presented in the GHGMP (Appendix 13).

12.7 Environmental outcomes

Table 12-15 summarises the environmental outcomes, proposed assurance (regulation) and proposed monitoring (if required) for each residual impact for Greenhouse Gas Emissions. Detail of the proposed monitoring is set out in the

Part IV environmental management plans and other relevant statutory decision-making documents discussed in Section 12.5 (Mitigation). Table 12-15 demonstrates how the proposed environmental outcomes for the Proposal, together with the proposed regulation and monitoring, are consistent with the EPA's objective for Greenhouse Gas Emissions (Section 12.1).

There are no conditions relating to Greenhouse Gas Emissions in MS963 for the Approved Proposal. Given BHP will manage GHG emissions in accordance with the NGER Act and Safeguard Mechanism, BHP has not proposed a condition for GHG emissions.

Table 12-15: Greenhouse Gas Emissions - Proposal environmental outcomes, proposed regulation and monitoring

Residual impact from the Proposal		Environmental outcome	Proposed regulation (Condition ¹ or other statutory decision-making process)	Proposed Monitoring	Consistency with EPA's objective
1.	Generation of GHG emissions	Contribution of 635,102 tCO₂-e of Scope 1 mining emissions (residual using the indicative Safeguard Mechanism decline rate from Orebody 29/30/35) over the life of the Combined Proposal. Contribution of 130,321 tCO₂-e of Scope 1 (electricity demand) emissions residual using the indicative Safeguard Mechanism decline rate from Yarnima Power Station) over the life of the Combined Proposal. Contribution of 177,845 tCO₂-e of Scope 1 (rail transport) emissions residual using the indicative Safeguard Mechanism decline rate from Rail) over the life of the Combined Proposal. Contribution of 242,387,401 tCO₂-e of Scope 3 emissions (residual) over the life of the Combined Proposal.	NGER Act - reporting of emissions from the Orebody 29/30/35 (Combined Proposal) NGER Facility - Reporting of emissions from the Yarnima Power Station NGER Facility - reporting of emissions from the Rail NGER Facility - emissions decline in accordance with the indicative Safeguard Mechanism Decline Rates Renewable Energy Target - defined emissions targets for purchase and surrender of renewable energy certificates CC Act - requirements for facilities to be on a broad trajectory to net zero emissions by 2050	Annual monitoring will be conducted in accordance with the NGER measurement determination, with a summary of Scope 1 emissions and any surrendered offsets published as part of the Safeguard Mechanism by the Clean Energy Regulator. On a 5-yearly interval, BHP will also report on: - total and net Scope 1 GHG emissions from Combined Proposal - carbon offsets surrendered against the Orebody 29/30/35 for the reporting period - the Combined Proposal performance against the emissions reduction trajectory outlined in the GHGMP - the emissions intensity of the Combined Proposal benchmarking emissions intensity against comparable facilities - a summary of GHG emission reduction and abatement measures implemented and delivered to avoid or reduce GHG emissions - technology and initiatives under development relevant to the Orebody 29/30/35 Combined Proposal	The significant residual impact of contribution of GHG emissions from the Combined Proposal (Section 12.6.5) will be counterbalanced by appropriate abatement measures. GHG emissions will also be avoided and reduced over the life of the project, in accordance with the NGER Act and the Safeguard Mechanism

13 Air Quality

13.1 EPA environmental factor and objective

The EPA's objective for the Air Quality factor is:

To maintain air quality and minimise emissions so that environmental values are protected.

13.2 Relevant policy and guidance

BHP assessed this environmental factor consistent with the following relevant EPA policies and guidance, as outlined in Table 13-1.

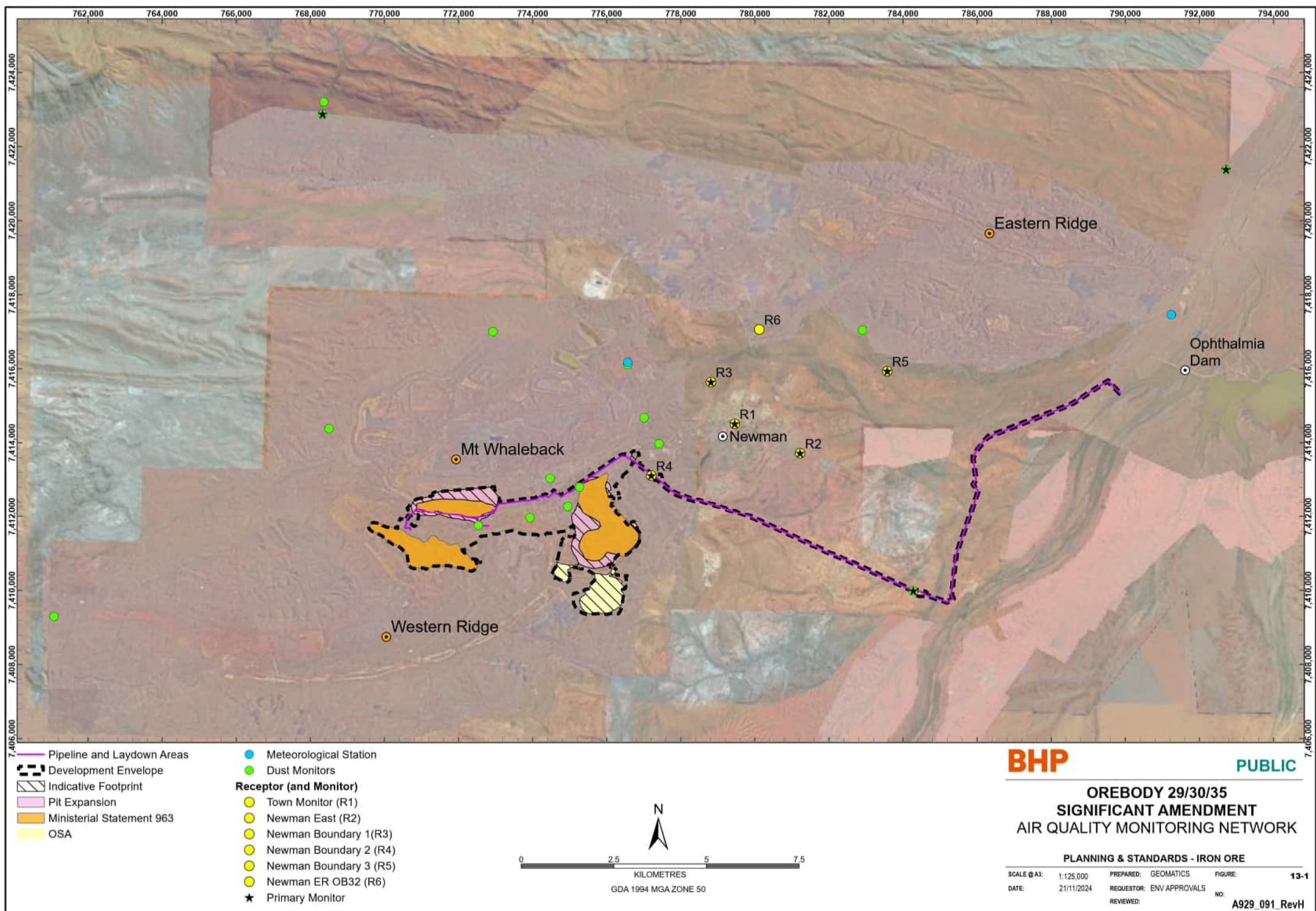
Table 13-1: Air Quality - policy and guidance

EPA, other State and Commonwealth policy and guidance	Consideration of EPA policy and guidance
<i>Environmental Factor Guideline – Air Quality (EPA 2020a)</i>	• Considered the links with other environmental factors • Considered the values of air quality, and their significance • Applied the relevant considerations for Environmental Impact Assessment (EIA) • Undertook investigations and studies consistent with the information required for EIA
<i>Guideline Dust Emissions July 2021. Activities regulated under the Environmental Protection Act 1986, Environmental Protection Regulations 1987 - Draft for external consultation (DWER 2021)</i> <i>National Environment Protection Measure for Ambient Air Quality (NEPC 2021)</i> <i>Port Hedland Air Quality and Noise Management Plan (DSD 2010)</i>	Air quality estimates provided have been assessed against the ambient air quality policies and guidelines (Section 13.4.2)

13.3 Receiving environment

13.3.1 Studies and Surveys

BHP has an existing ambient air quality monitoring network in and around Newman town, to measure background dust concentrations, potential impacts of dust at sensitive receptors and to improve dust management in the region. This comprises a primary dust monitoring network and secondary dust monitoring network. The primary network includes eight fixed monitoring stations plus two operational weather stations (Figure 13-1). The secondary network comprises additional monitoring across Mt Whaleback and Eastern Ridge, the locations of which are subject to review and change according to analytical needs and understanding of high-risk weather conditions. Air quality performance of existing approved Newman operations is reported in the Annual Environmental Report.



BHP completed atmospheric modelling to estimate ground level concentrations for PM₁₀ and PM_{2.5} at key sensitive receptors and the magnitude of potential impacts (ETA 2024, Appendix 15). The modelling report identified the main particulate generating activities associated with the Proposal; model inputs, model configuration, assumptions, summary of meteorological data and details of background air quality used; emission estimates per year for all sources of emissions; and predicted air quality impacts for the following four scenarios:

- **Existing** – existing baseline for Newman (Mt Whaleback, including Orebody 29/30/35) and Eastern Ridge operations, with current dust controls, including background concentrations
- **Proposal (in isolation)** – modelled results for the Proposal (in isolation), incorporating proposed future dust controls
- **Combined Proposal (in isolation)** - modelled results for the Combined Proposal (in isolation), incorporating current and proposed future dust controls
- **Cumulative** – modelled results for the Combined Proposal, plus future state Newman (Mt Whaleback and Western Ridge) and Eastern Ridge operations including background concentrations and incorporating current and proposed future dust controls.

13.3.2 Environmental values

The Proposal is located in the Pilbara region of Western Australia, which experiences a semi-arid climate with two distinct seasons. The wet season, generally from December to April, is dominated by high temperatures and high evaporation rates with isolated intense rainfall and cyclonic activity. The dry season, from May to September, is relatively dry with mild temperatures.

The Pilbara is a naturally dusty environment with wind-blown dust being a significant contributor to the airborne dust levels. Within the aggregated emission inventory for the Pilbara, undertaken by SKM in 2000 (SKM 2003) for the 1999 to 2000 financial year (FY), it was calculated that approximately 170,000 tonnes (t) of dust were emitted as a result of wind erosion. Wildfires also account for a significant amount of the emissions with approximately 195,000 tonnes or particulates emitted. Patterns of dust in Newman and the region vary daily and seasonally. High dust levels are predominately recorded during the dry summer months, although during the winter months of July and August, the occurrence of inversion layers reduces the area in which particulates can disperse, contributing to short-term elevated concentrations of airborne dust. Daily influencing factors include temperature, wind direction and wind speed.

Mining is an existing prevalent land use in the area, with Newman town built around the Mt Whaleback mine. Mt Whaleback mining operations (incorporating Mt Whaleback mine and Orebody 29/30/35) is located approximately 2 km west of Newman and Eastern Ridge operations (incorporating OB32, OB24 and OB25) is located approximately 4.5 km northeast of Newman. These existing operations employ conventional open cut mining methods, including drilling, blasting and loading on to haul trucks.

Annual average dust levels (PM₁₀) reported for Newman are variable, with levels influenced by naturally occurring dust levels and operations. The FY16 and FY17 annual average PM₁₀ levels were lower than the long-term (10 year) mean (with FY17 having recorded the lowest annual average PM₁₀ levels since FY12 and lowest number of dust target exceedance days). Higher than average annual dust levels were recorded between FY18 and FY20, before dropping below the long-term average in FY21, FY22 and FY23. The annual average dust levels recorded in FY24 were marginally above the long-term mean. The number of mining-related dust target (PM₁₀) exceedance days follow a similar trend. For FY24 the number of mining related exceedance days (21 days) was higher than FY23 (15 days), which in turn was higher than FY22 (5 days), and FY21 (12 days). These figures all remain lower than the number of mining-related dust target exceedance days recorded in FY19 (38 days) and FY20 (27 days). Analysis shows that high rainfall has an impact on PM₁₀ levels, as does mixing height. FY16, FY17 and FY21 were above average rainfall years, which may in part explain reduced dust levels in those years. Long term trends show that most mining related

dust target exceedances over the past few years occur between July and October (i.e. dry season), during which time the occurrence of lower mixing heights is more common.

Native vegetation in the region generally has a high degree of resilience to dust loading, further discussed in Section 8.4.3. Regionally vegetation comprises tree and shrub communities consisting mainly of *Eucalyptus* and *Acacia* species with hummock grasslands. Following heavy rainfall, red-brown soils can develop a hard surface crust, which can reduce the impact of wind erosion; however, disturbance of this crust through clearing combined with sustained levels of low rainfall can place these areas at risk of wind erosion, resulting in increased levels of airborne dust locally.

13.4 Potential environmental impacts

BHP has considered the potential impacts outlined in the EPA's Environmental Factor Guideline - Air Quality (EPA 2020a) and considers that those relevant to the Proposal are:

- airborne particulate emissions (direct)
- reduction in ambient air quality (direct).

13.4.1 Airborne particulate emissions

13.4.1.1 Emission sources

The Proposal will involve clearing of up to 116 ha of native vegetation for construction and operation. Clearing will be undertaken in a staged approach starting in the OB29 OSA area followed by the pipeline construction. The construction of the pipeline has not been included in the dust modelling due to its intermittent and short-term construction.

Dust generation from the direct clearing of vegetation and associated machinery movements is generally not long term; however, the resulting unsealed exposed surfaces may be subject to wind erosion.

The Proposal has the potential to generate dust emissions from open pit mining of iron ore including drilling, blasting, crushing, loading/unloading ore and waste, stockpiling, waste storage and the transport of materials. Haul roads are recognised as the single largest potential dust source. Ore will continue to be trucked back to Mt Whaleback via existing haul roads as per current operations and approvals. Waste rock from OB29 is proposed to be trucked to the proposed OSA south of OB29 rather than to the existing OSA at OB35, in order to reduce haul distances.

13.4.1.2 Emissions estimates

BHP undertook emissions modelling (ETA 2024) for the Proposal, including the application of standard emission controls for most sources. The modelling is based on Year 2036 which represents the maximum mining tonnage over the life of the Proposal, therefore the results are considered to be the worst case scenario. Further detail on assumed dust abatement measures and estimated emissions reductions are identified in Appendix 15.

Table 13-2 provides a summary of the estimated PM₁₀ and PM_{2.5} from all sources for the year of maximum mining tonnage in 2036.

Table 13-2: Air Quality - estimated PM₁₀ and PM_{2.5} emissions

Source	Process	Year 2036 ¹	
		PM ₁₀ emission tpa (kg/y)	PM _{2.5} emission tpa (kg/y)
Mining	Drilling	1.08 (1,084)	0.2 (163)
	Blasting	47.2 (47,182)	7.1 (7,077)
	Loading	234.4 (234,384)	35.2 (35,158)
	Unloading	49.8 (49,804)	7.5 (7,471)
	Bulldozers	41.4 (41,358)	6.2 (6,204)
Wind erosion	Wind erosion	57.2 (57,168)	8.6 (8,575)
Haul Roads	Haul Roads	436.8 (436,764)	65.5 (65,515)
Total		867.7 (867,744)	130.2 (130,163)

1. Note that depending on timing of approval and implementation, peak tonnages may be mined in a later year.

Haul roads are the single largest potential source of all forms of dust assessed, contributing over 50% of total estimated PM₁₀ and PM_{2.5}. The next largest potential sources are loading and unloading (ETA 2024).

13.4.2 Reduction in ambient air quality

As described in 13.3.1, modelling has been undertaken (ETA 2024) for four scenarios: Existing, Proposal (in isolation), Combined Proposal (in isolation) and Cumulative. Modelling utilises emissions estimates identified in Table 13-2. Air quality has been assessed against a number of air quality assessment criteria identified below.

The Air NEPM is applied for both PM_{2.5} (24 hour and annual) and PM₁₀ (annual only). The PM_{2.5} 24 hour average is used to assess potential short term health impacts and the annual averages (PM_{2.5} and PM₁₀) are used to assess potential longer term impacts. The Air NEPM allows for the exclusion of exceptional events related to bushfire, jurisdiction authorised hazard reduction burning, or continental scale windblown dust when assessing compliance against the 24 hour average standard.

The Port Hedland Dust Management Taskforce (Taskforce) recommended in their final report to government (DSD 2016) that the interim guideline of 70 Microgram per metre cubed (µg/m³) for PM₁₀ (24 hour average and excluding natural events) should continue to be applied to residential areas. This is consistent with the current operating licence for existing approved Newman (Mt Whaleback/Orebody 29/30/35) and Eastern Ridge operations (L4503/1975/14 and L6942/1997/13).

Ambient air quality criteria adopted in this assessment are summarised in Table 13-3.

Table 13-3: Air Quality - ambient air quality assessment criteria

Pollutant	Air Quality Assessment Criteria			Reference
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging period	Allowable exceedances	
PM ₁₀	25	annual	Nil	DWER 2021 consistent with NEPM (NEPC 2021)
	70	24 hour	10 per year	Taskforce criteria (DSD 2016)
PM _{2.5}	25	24 hour	Exceptional event	DWER 2021 consistent with NEPM (NEPC 2021)
	8	annual	Nil	

Modelling predicted concentrations at each of the six receptor locations (Figure 13-1) where existing ambient air quality monitoring is undertaken. It should be noted that only Receptor 1 (Town Monitor) and Receptor 2 (Newman East) are classified as 'sensitive receptors' as they are within residential areas. The other four locations are BHP boundary monitors and are located outside of residential areas. The location of the receptors is described and mapped in Appendix 15. Modelling predicts that the Proposal (in isolation) and the Combined Proposal (in isolation) will not result in exceedances of the relevant air quality criteria at Town Monitor and Newman East. In addition, the Cumulative scenario which includes the Proposal and future state Newman (Mt Whaleback, Orebody 29/30/35 and Western Ridge) and Eastern Ridge operations inclusive of background concentrations will not result in exceedances greater than the Existing scenario at all receptors. Full results for the modelled scenarios are provided in Appendix 15 and detailed in Section 13.4.2.1 and Section 13.4.2.2.

13.4.2.1 PM₁₀

For PM₁₀, modelled concentrations are compared against the Air NEPM annual average of 25 $\mu\text{g}/\text{m}^3$ and the Taskforce 24 hour average of 70 $\mu\text{g}/\text{m}^3$.

For the existing scenario, the maximum predicted 24 hour concentration of PM₁₀ is 177 $\mu\text{g}/\text{m}^3$ at Newman Boundary 2 receptor. Town Monitor has a maximum 24 hour concentration of approximately 121 $\mu\text{g}/\text{m}^3$ and Newman East has a maximum 24 hour concentration of approximately 112 $\mu\text{g}/\text{m}^3$. The annual average criterion is exceeded at all receptors, with the highest predicted annual average of 43 $\mu\text{g}/\text{m}^3$ at Newman Boundary 3 (Table 13-4).

Table 13-4 summarises modelled PM₁₀ concentrations at sensitive receptors for the existing Newman (Mt Whaleback/Orebody 29/30/35) and Eastern Ridge operations (including background), with current dust controls.

Table 13-4: Air Quality - modelled PM₁₀ concentrations (Existing)

Receptor number	Receptor name	Max 24-hour PM ₁₀ concentration (70 µg/m ³)	Annual average (AIR NEPM 25 µg/m ³)	Number of days > 70 µg/m ³
R1	Town Monitor (Residential)	121	31	12
R2	Newman East (Residential)	112	29	11
R3	Newman Boundary 1	120	32	15
R4	Newman Boundary 2	177	37	45
R5	Newman Boundary 3	170	43	65
R6	Newman Eastern Ridge OB32	114	35	12

The Proposal (in isolation) is not predicted to result in exceedances of either assessment criteria at any receptor (Table 13-5). The maximum 24 hour concentration is 33 µg/m³ at Newman Boundary 2. The maximum modelled 24 hour concentration at Town Monitor is 19 µg/m³ and the maximum modelled 24 hour concentration at Newman East is 10 µg/m³. The annual average criterion is not expected to be exceeded at any receptor (Table 13-5) (ETA 2024).

Table 13-5 summarises the modelled PM₁₀ concentrations at sensitive receptors for the Proposal (in isolation).

Table 13-5: Air Quality - modelled PM₁₀ concentrations - Proposal (in isolation)

Receptor number	Receptor name	Max 24-hour PM ₁₀ concentration (70 µg/m ³)	Annual average (AIR NEPM 25 µg/m ³)	Number of days > 70 µg/m ³
R1	Town Monitor (Residential)	19	2	0
R2	Newman East (Residential)	10	1	0
R3	Newman Boundary 1	13	1	0
R4	Newman Boundary 2	33	5	0
R5	Newman Boundary 3	5	1	0
R6	Newman Eastern Ridge OB32	9	1	0

The Combined Proposal (in isolation) is not predicted to result in exceedances of either assessment criteria at any receptor (Table 13-6). The maximum 24 hour concentration is 48 µg/m³ at Newman Boundary 2. The maximum modelled 24 hour concentration at Town Monitor is 29 µg/m³ and the maximum modelled 24 hour concentration at Newman East is 16 µg/m³. The annual average criterion is not expected to be exceeded at any receptor (Table 13-6) (ETA 2024).

Table 13-6 summarises the modelled PM₁₀ concentrations at sensitive receptors for the Combined Proposal (in isolation).

Table 13-6: Air Quality - modelled PM₁₀ concentrations - Combined Proposal (in isolation)

Receptor number	Receptor name	Max 24-hour PM ₁₀ concentration (70 µg/m ³)	Annual average (AIR NEPM 25 µg/m ³)	Number of days > 70 µg/m ³
R1	Town Monitor (Residential)	29	3	0
R2	Newman East (Residential)	16	2	0
R3	Newman Boundary 1	19	2	0
R4	Newman Boundary 2	48	8	0
R5	Newman Boundary 3	10	1	0
R6	Newman Eastern Ridge OB32	14	1	0

The Cumulative scenario results are predicted to result in exceedances of the Air NEPM annual average concentration of 25 µg/m³ and the Taskforce 24 hour guideline of 70 µg/m³ at a number of receptors (Table 13-7). The maximum modelled cumulative 24 hour concentration is 190 µg/m³ at Newman Boundary 2. The maximum modelled cumulative 24 hour concentration at the Town Monitor is 126 µg/m³ and the maximum modelled cumulative 24 hour concentration at Newman East is 114 µg/m³. The annual average criterion is predicted to be exceeded at all receptors except for Newman East (Table 13-7).

The maximum concentrations for the Cumulative scenario are lower than the maximum concentrations for the Existing scenario with the exception of Town Monitor, Newman East and Newman Boundary 2. The annual average concentrations for the Cumulative scenario are all lower than the annual average concentrations for the Existing scenario (Table 13-4). In addition, the number of days exceeding the criteria for the Cumulative scenario is lower than for the Existing scenario.

Table 13-7 summarises the cumulative PM₁₀ concentrations at sensitive receptors for the Proposal (including background) and future state Newman (Mt Whaleback, Orebody 29/30/35 and Western Ridge) and Eastern Ridge operations.

Table 13-7: Air Quality - modelled PM₁₀ concentrations (Cumulative)

Receptor number	Receptor name	Max 24-hour PM ₁₀ concentration (70 µg/m ³)	Annual average (AIR NEPM 25 µg/m ³)	Number of days > 70 µg/m ³
R1	Town Monitor (Residential)	126	26.8	4
R2	Newman East (Residential)	114	24.8	3
R3	Newman Boundary 1	109	26.7	2
R4	Newman Boundary 2	190	33.5	26
R5	Newman Boundary 3	126	34.6	31
R6	Newman Eastern Ridge OB32	100	29.5	6

13.4.2.2 *PM_{2.5}*

For PM_{2.5}, modelled concentrations are compared against the Air NEPM 24 hour average of 25 µg/m³ and the annual average of 8 µg/m³.

For the existing scenario, the maximum modelled 24 hour average concentration is 24 µg/m³ at Newman Boundary 2. Town Monitor has a maximum predicted 24 hour average concentration of 17 µg/m³ and Newman East has a maximum predicted 24 hour concentration of 15 µg/m³. The annual average criterion is expected to be met at all receptors, with the highest annual average predicted to be 5 µg/m³ at Newman Boundary 3 (Table 13-8).

Table 13-8 summarises modelled PM_{2.5} concentrations at sensitive receptors for the existing Mt Whaleback (including Orebody 29/30/35) and Eastern Ridge operations (including background), with current dust controls.

Table 13-8: Air Quality - modelled PM_{2.5} concentrations (Existing)

Receptor number	Receptor name	Max 24-hour PM _{2.5} concentration (25 µg/m ³)	Annual average (8 µg/m ³)	Number of days > 25 µg/m ³
R1	Town Monitor (Residential)	17	3.5	0
R2	Newman East (Residential)	15	3.4	0
R3	Newman Boundary 1	15	3.6	0
R4	Newman Boundary 2	24	3.9	0
R5	Newman Boundary 3	19	5	0
R6	Newman Eastern Ridge OB32	14	4.1	0

The Proposal (in isolation) is not predicted to result in exceedances of either criteria at any receptor, including Town Monitor and Newman East (Table 13-9). The maximum modelled 24 hour average concentration is 5 µg/m³ at Newman Boundary 2. The maximum modelled 24 hour average concentration at Town Monitor is 2.9 µg/m³ and the maximum modelled 24 hour average concentration at Newman East is 1.5 µg/m³. The maximum annual average of 0.8 µg/m³ is predicted at Newman Boundary 2 (Table 13-9).

Table 13-9 summarises the modelled PM_{2.5} concentrations at sensitive receptors for the Proposal (in isolation).

Table 13-9: Air Quality - modelled PM_{2.5} concentrations - Proposal (in isolation)

Receptor number	Receptor name	Max 24-hour PM _{2.5} concentration (25 µg/m ³)	Annual average (8 µg/m ³)	Number of days > 25 µg/m ³
R1	Town Monitor (Residential)	2.9	0.3	0
R2	Newman East (Residential)	1.5	0.2	0
R3	Newman Boundary 1	2	0.2	0
R4	Newman Boundary 2	5	0.8	0
R5	Newman Boundary 3	0.8	0.2	0
R6	Newman Eastern Ridge OB32	1.4	0.2	0

The Combined Proposal (in isolation) is not predicted to result in exceedances of either criteria at any receptor, including Town Monitor and Newman East (Table 13-10). The maximum modelled 24 hour average concentration is 7.2 µg/m³ at Newman Boundary 2. The maximum modelled 24 hour average concentration at Town Monitor is 4.3 µg/m³ and the maximum modelled 24 hour average concentration at Newman East is 2.5 µg/m³. The maximum annual average of 1.2 µg/m³ is predicted at Newman Boundary 2 (Table 13-10).

Table 13-10 summarises the modelled PM_{2.5} concentrations at sensitive receptors for the Combined Proposal (in isolation).

Table 13-10: Air Quality - modelled PM_{2.5} concentrations - Combined Proposal (in isolation)

Receptor number	Receptor name	Max 24-hour PM _{2.5} concentration (25 µg/m ³)	Annual average (8 µg/m ³)	Number of days > 25 µg/m ³
R1	Town Monitor (Residential)	4.3	0.4	0
R2	Newman East (Residential)	2.5	0.2	0
R3	Newman Boundary 1	2.9	0.3	0
R4	Newman Boundary 2	7.2	1.2	0
R5	Newman Boundary 3	1.5	0.1	0
R6	Newman Eastern Ridge OB32	2.1	0.2	0

The Cumulative scenario results in predicted exceedance of the Air NEPM maximum 24 hour average concentration criteria of 25 µg/m³ at Newman Boundary 2 (Table 13-11). The maximum modelled 24 hour average concentration at Town Monitor is 19 µg/m³ and the maximum modelled 24 hour average concentration at Newman East is 17 µg/m³. The annual average criterion is expected to be met at all receptors, with the highest annual average predicted to be 5.2 µg/m³ is at Newman Boundary 3 (Table 13-11).

The maximum and annual average concentrations for the Cumulative scenario (Table 13-11) are slightly higher than the maximum concentrations for the Existing scenario (Table 13-8). The Cumulative scenario results are predicted to result in an exceedance of the maximum modelled 24 hour average concentration of 29 µg/m³ at Newman

Boundary 2 only. In addition, the number of days exceeding the criteria for the Cumulative scenario is higher than for the Existing scenario at Newman Boundary 2 only. Table 13-11 summarises the modelled cumulative PM_{2.5} concentrations at receptors for the Proposal (including background) and the future state Newman (Mt Whaleback, Orebody 29/30/35 and Western Ridge) and Eastern Ridge operations.

Table 13-11: Air Quality - modelled PM_{2.5} concentrations - Cumulative

Receptor number	Receptor name	Max 24-hour PM _{2.5} concentration (25 µg/m ³)	Annual average (8 µg/m ³)	Number of days > 25 µg/m ³
R1	Town Monitor (Residential)	19	4	0
R2	Newman East (Residential)	17	3.7	0
R3	Newman Boundary 1	16	4	0
R4	Newman Boundary 2	29	5	1
R5	Newman Boundary 3	19	5.2	0
R6	Newman Eastern Ridge OB32	15	4.4	0

To enable comparison, Table 13-12 provides a summary of all modelled results for the four scenarios (Existing, Proposal (in isolation), Combined Proposal (in isolation) and Cumulative) at Town Monitor and Newman East. The Town Monitor and Newman East receptors are used for indicative comparison here as they are residential. These results demonstrate the Cumulative scenario for the number of days of exceedance will result in a decrease for PM₁₀ and PM_{2.5} at both residential receptors when compared to the Existing scenarios.

Table 13-12: Air Quality - indicative comparison of air quality at Town Monitor and Newman East

Scenario	PM ₁₀				PM _{2.5}			
	Max 24-hr concentration (70 µg/m ³)		No. of days >70 µg/m ³		Max 24-hr concentration (25 µg/m ³)		No. of days >25 µg/m ³	
	Town Monitor	Newman East	Town Monitor	Newman East	Town Monitor	Newman East	Town Monitor	Newman East
Existing	121	112	12	11	17	15	0	0
Proposal (in isolation)	19	10	0	0	2.9	1.5	0	0
Combined Proposal (in isolation)	29	16	0	0	4.3	2.5	0	0
Cumulative	126	114	4	3	19	17	0	0

13.5 Mitigation

BHP considers that there are no potentially significant impacts to Air Quality from the Proposal requiring targeted management measures, however the proposed mitigation (including standard management practices) for the Proposal is discussed below.

13.5.1 Avoid

BHP has designed the Proposal to avoid emissions and impacts to air quality as far as practicable through using existing processing facilities at the Mt Whaleback mining operations and existing haul roads. The processing rate of iron ore remains the same as the Approved Proposal. The Proposal includes a new OSA closer to the mining activity at OB29, reducing haul truck waste movements from approximately 31 minutes per cycle to approximately 21 minutes per cycle. Reducing cycle time will reduce haul road usage which is recognised as the single largest potential source of airborne particulates. In turn, this will minimise potential dust generation.

13.5.2 Minimise

BHP will minimise impacts from the Proposal by continuing to implement existing control already being applied for the Orebody 29/30/35 Approved Proposal to minimise emissions:

- operating drills with water
- watering of haul roads
- reducing vehicle speeds (if required, under high dust conditions)

Although not part of the Proposal, BHP will implement additional controls at the existing Whaleback operation to reduce cumulative impacts to Newman. BHP will implement infrastructure in accordance with Australian Standards and will continue to manage dust as per the existing Part V licence for Mt Whaleback/Orebody 29/30/35 (L4503/1975/14), which includes a range of controls to minimise emissions. L4503/1975/14 has recently been amended (DWER 2023) to include additional measures to minimise dust, including:

- installation of tipping hopper sprays to minimise dust generated during the transfer of ore from the tipping haul truck to the gyratory crusher hopper
- Replacing screen top covers to improve the enclosure of the screens and minimise dust escape
- Installation of ore conditioning sprays at the train load out infrastructure
- Installation of a partial enclosure at the M101 shuffle transfer
- Installation of an additional dust monitor between the fixed west plant and Newman townsite
- Structural and electrical design upgrades to some infrastructure
- Relocation of dust spray on conveyor CV603
- Installation of water sprays on the mobile screening plant.

These measures are expected to achieve a 15-90% reduction in emission generation at source.

13.5.3 Other statutory decision-making processes

Table 13-13 summaries whether another statutory decision-making process can mitigate the potential environmental impacts of the Proposal on Air Quality, considering the EPA's Taking decision making processes into account in EIA: Interim Guidance (EPA 2021b). Table 13-13 also provides reasons, including how, in relation to the specific potential impacts of the Proposal, the decision-making process meets the EPA's objective for Air Quality. Industrial premises with the potential to cause emissions and discharges to air, land or water are known as 'prescribed premises' and trigger regulation under Part V of the EP Act. The Proposal will use existing facilities at Mt Whaleback/Orebody

29/30/35 which are approved under licence L4503/1975/14. The existing Mt Whaleback/Orebody 29/30/35 licence may be amended to incorporate the operations associated with the Proposal which contribute airborne particulate emissions.

Table 13-13: Air Quality - other statutory decision-making processes

Potential impact from the Proposal	Statutory decision making process can mitigate the potential impacts on the environment?	Reasons (if Yes)
Direct impact to air quality from generation of airborne particulate emissions	Yes	EP Act Part V licence - provides for the regulation of discharges to air associated with an activity prescribed in Schedule 1 of the <i>Environmental Protection Regulations 1987</i> (e.g. ore processing) - details monitoring of dust emissions associated with a prescribed activity

13.6 Assessment and significance of residual impacts

13.6.1 Airborne particulate emissions

As discussed in Section 13.4.1.2 the estimated annual PM₁₀ emissions for the Proposal (in isolation) with dust controls in place is approximately 867.7 tpa (Table 13-2).

This represents a small proportion (approximately 9.2%) of the total PM₁₀ emissions of 9,400 tpa estimated for the Whaleback/Orebody 29/30/35 existing operation in FY2022 as reported to the National Pollution Inventory (NPI).

The estimated annual PM_{2.5} emissions for the Proposal (in isolation) with dust controls in place is approximately 130.2 tpa (Table 13-2).

No comparison with reported data can be made as NPI PM_{2.5} data is only reportable for combustion sources and excludes fugitive wind-blown or mechanically generated PM_{2.5} emissions.

13.6.2 Reduction in ambient air quality impacts

13.6.2.1 PM₁₀

Modelling for the existing scenario for Newman (Mt Whaleback, including Orebody 29/30/35) and Eastern Ridge operations, with current dust controls, including background concentrations predicted that the Taskforce guideline (24 hour average of 70 µg/m³) would be exceeded 12 days per annum at Newman Town Centre Monitor and 11 days per annum at Newman East.

Modelling for the Proposal (in isolation) and the Combined Proposal (in isolation) predicted that the Taskforce guideline (24 hour average of 70 µg/m³) would not be exceeded at the Newman Town centre Monitor or Newman East.

Modelling for the Cumulative scenario, including the Proposed Orebody 29/30/35, Mt Whaleback (includes existing Orebody 29/30/35), Eastern Ridge and future Western Ridge with background concentrations predicted that the Taskforce guideline (24 hour average of 70 µg/m³) would be exceeded 4 days per annum at Newman Town Centre Monitor and 3 days per annum at Newman East. These results demonstrate the Cumulative scenario will result in a reduction in the number of predicted PM₁₀ exceedances in comparison to the existing scenario.

Modelled exceedances were attributed to mine activities and the occurrence of meteorological conditions which are known to exacerbate airborne particulates. The existing scenario and airborne particulate concentrations were not considered to have a significant impact on human health or visual amenity.

13.6.2.2 *PM_{2.5}*

Modelling for the existing scenario for Newman (Mt Whaleback, including Orebody 29/30/35) and Eastern Ridge operations, with current dust controls, including background concentrations predicted that the Air NEPM for $PM_{2.5}$ (24 hour average of $25 \mu\text{g}/\text{m}^3$) would not be exceeded at any receptor.

Modelling for the Proposal (in isolation) and the Combined Proposal (in isolation) predicted that the Air NEPM (24 hour average of $25 \mu\text{g}/\text{m}^3$) would not be exceeded at any receptor.

Modelling for the Cumulative scenario, including the Proposed Orebody 29/30/35, Mt Whaleback (includes existing Orebody 29/30/35), Eastern Ridge and future Western Ridge with background concentrations predicted that the Air NEPM (24 hour average of $25 \mu\text{g}/\text{m}^3$) would not be exceeded at any receptor except Newman Boundary 2.

13.6.3 Significant residual impacts

Following mitigation (Section 13.5), BHP considers that there will not be any significant residual impacts to Air Quality from the Proposal when considered in isolation (Proposal (in isolation)) or from the Combined Proposal (Combined Proposal (in isolation)). When considered cumulatively, a reduction in the number of exceedances of PM_{10} concentrations are predicted. The modelling indicates that while there will be a slight increase in the maximum PM_{10} concentration at the Newman Town Centre Monitor and Newman East, there will be a reduction in the total number of days per annum when dust exceeds the relevant criteria, compared to the existing scenario.

For the cumulative scenario for $PM_{2.5}$, the modelling predicts no exceedances of guideline values at residential receptors Town Monitor and Newman East. A slight increase in the maximum $PM_{2.5}$ concentrations at the Newman Town Centre Monitor and Newman East is predicted, however dust levels will be below the relevant guideline levels, such that there remains no predicted exceedances at these receptors, as per the existing scenario. BHP is committed to minimising the potential additional exceedances of air quality criteria attributed to the Proposal through ongoing monitoring and review of air quality and efficacy of management measures.

13.7 Environmental outcomes

Table 13-14 summarises the environmental outcomes, proposed regulation and proposed monitoring for each residual impact to Air Quality. Detail of the proposed monitoring is set out for other relevant statutory decision-making documents discussed in Section 13.5. As discussed in Section 13.6, the impacts (following the application of the mitigation hierarchy outlined in Section 13.5), demonstrates that the predicted impacts of the Proposal on Air Quality are not considered to be significant. Table 13-14 demonstrates how the proposed environmental outcomes for the Proposal, together with the proposed regulation and monitoring, meet the EPA's objective for Air Quality (Section 13.1).

There are no conditions relating to Air Quality in MS963 for the Approved Proposal. BHP considers that a specific condition related to Air Quality is not required for the Combined Proposal as the predicted impacts are not considered to be significant. BHP considers that impacts to Air Quality can be adequately regulated under Part V of the EP Act, through an amendment to the Mt Whaleback/Orebody 29/30/35 licence (L4503/1975/14).

Table 13-14: Air Quality - Proposal environmental outcomes, proposed regulation and monitoring

Residual impact from the Proposal		Environmental outcome	Proposed regulation (Condition ¹ or other statutory decision-making process)	Proposed Monitoring	Consistency with EPA's objective
1.	Generation of dust and reduction of air quality from construction and operation activities	No significant residual impacts to Air Quality from the Proposal (in isolation) or from the Combined Proposal (in isolation) Implementation of the Proposal will result in a reduction in the predicted number of exceedances of PM₁₀ and PM_{2.5} for the cumulative scenario, therefore, the predicted number of exceedances for PM₁₀ and PM_{2.5} will be lower than for the Existing scenario (Section 13.6.3)	EP Act Part V licence - provides for the regulation of discharges to air associated with an activity prescribed in Schedule 1 of the Environmental Protection Regulations 1987 (e.g. ore processing) - details monitoring of dust emissions associated with a prescribed activity - BHP will amend the existing Mt Whaleback/Orebody 29/30/35 licence (L4503/1975/14) to incorporate the relevant activities of the Proposal	EP Act Part V licence Licence conditions will set out monitoring requirements (see Table 13-13)	BHP will amend the existing Mt Whaleback/Orebody 29/30/35 licence (L4503/1975/14) to incorporate the relevant activities of the Proposal and manage air quality emissions so that the EPA's objectives are met

14 Other environmental factors

Table 14-1 presents BHP's evaluation of 'other factors'. This includes justification as to why BHP considers that they are not preliminary key environmental factors. To support BHP's position that an environmental factor is not a preliminary key environmental factor for the Proposal, BHP has included supporting information as appendices, where relevant.

Table 14-1: Other environmental factors

Relevant activities for the Proposal	Potential impacts	Justification for why factor is not considered to be a preliminary key environmental factor
LAND		
Landforms EPA's objective: <i>To maintain the variety and integrity of significant physical landforms so that environmental values are protected</i>		
Ground disturbance and earthworks Drainage and stormwater management	Permanent modification of natural landforms from the construction and operation of mines and associated infrastructure Erosion of natural landforms as a result of altered surface water regimes	Significance considerations BHP has reviewed the potential impacts of Proposal on Landforms, considering the <i>Environmental factor guideline – Landforms</i> (EPA 2018b), with the findings summarised below: - No significant landforms (consistent with the description in <i>Environmental factor guideline – Landforms</i> (EPA 2018b)) are located within the proposed Development Envelope. - No major modifications to creeks (drainage diversions) will be undertaken. Proposed mitigation - BHP has developed the <i>Orebody 29/30/35 MCP</i> (BHP 2024i). The updated Mine Closure Plan (MCP) addresses the potential impacts on natural landforms. This includes interface with constructed landforms and managing surface water flows to limit sheet and rill erosion from rehabilitated constructed landforms. - BHP proposes that mine closure and rehabilitation is regulated under Part IV of the EP Act. Environmental outcome - The implementation of the Proposal will maintain the variety and integrity of significant physical landforms.
Terrestrial Environmental Quality EPA's objective: <i>To maintain the quality of land and soils so that environmental values are protected</i>		
Mine pit excavation Ground disturbance and earthworks Drainage and stormwater management Waste storage (OSAs) Rehabilitation and decommissioning activities	Increased erosion, including of waste structures Contamination of land, through the generation of AMD Contamination of land, through the movement of material containing PFAS	Significance considerations BHP has reviewed the potential impacts of the Proposal on Terrestrial Environmental Quality, considering the <i>Environmental factor guideline – Terrestrial Environmental Quality</i> (EPA 2016f), with the findings summarised below: - An Acid and Metalliferous Drainage (AMD) risk assessment was undertaken for Orebody 29/30/35 in 2021 based on the volume of waste rock and pit wall exposure. The AMD risk assessment identified that there was a low risk of generating AMD at OB29 and OB35 and negligible risk at OB30 (BHP 2021b). - Multiple contaminated site investigations and environmental investigations have been undertaken at known and potential PFAS source areas identified at the Mt Whaleback mine site, which partially overlaps the Orebody 29/30/35 Development Envelope. A former fire training ground which contains PFAS residues is located within the OB29 indicative footprint. PFAS containing compounds are no longer used by BHP. Proposed mitigation - BHP has developed the <i>Orebody 29/30/35 MCP</i> (BHP 2024i). The updated MCP addresses the potential impacts on soils (structure, stability and quality) and details how waste storage areas (principally OSAs) will be constructed and rehabilitated, to minimise erosion. - BHP continues to undertake studies of the geochemical and physical properties of waste material at Orebody 29/30/35 to confirm the appropriate erosion and AMD management requirements. - BHP proposes that mine closure and rehabilitation is regulated under Part IV of the EP Act. - BHP has developed the <i>Contaminated sites PFAS Interim Site Management Plan Whaleback</i> (BHP 2023e). The objective of the plan is to implement a suitable and rationalised approach to site works to ensure that the disturbance of soil potentially containing PFAS does not result in unacceptable risk to human health or ecological receptors. Environmental outcome - The implementation of the Proposal will maintain the quality of land and soils so that environmental values are protected.
PEOPLE		
Social Surroundings EPA's objective: <i>To protect social surroundings from significant harm</i>		

Relevant activities for the Proposal	Potential impacts	Justification for why factor is not considered to be a preliminary key environmental factor
Amenity (Noise and Visual Amenity)		
Blasting, drilling, and extraction Ground disturbance and earthworks for mine infrastructure (including OSAs and surplus water/ drainage management) Ongoing implementation of rehabilitation and decommissioning activities	Noise emissions and visual changes to the landscape	Significance considerations BHP has reviewed the potential impacts of Social Surroundings (Amenity), considering the <i>Environmental factor guideline – Social surroundings</i> (EPA 2023^e), with the findings summarised below: • No sensitive receptors will be affected by the Proposal. The nearest permanently occupied receptor is the town of Newman which is 3.5 km to the north east. • A visual assessment undertaken for the Strategic Proposal (BHP Billiton 2016b) predicted for the Eastern Pilbara Zone, which is the area surrounding Newman, there is likely to be intensification of mining as an existing land use however this does not alter the viewing experience. The OB29 OSA will be lower than the ridge line to the east of OB29 and would not be visible form Newman townsite. The pipeline to Ophthalmia Dam would be buried and would not impact the visual amenity of Ophthalmia Dam. • There is unlikely to be an increase in visual impact above the existing Orebody 29/30/35 operations and at the Ophthalmia Dam Wall viewpoint. • The Proposal will not impact on any significant landforms. The OB29 OSA will be 50m high, which is lower that the ridge to the east of OB29. • The Proposal will not be in the viewshed of locations with high amenity values (panoramic viewpoints, lookouts, gorges and rockpools). • The Proposal will not increase the throughput of ore processing approved. • A noise assessment undertaken for the OB35 pit in 2011 indicated that cumulative noise impacts at sensitive receptors in and around Newman from Mt Whaleback Operations will decrease as a result of OB35 when compared to the existing environment. In addition noise levels as a result of the Orebody will remain at or below the relevent noise level criteria assigned by the Environmental Protection (Noise) Regulations 1997. • Noise emissions from the Proposal are not expected to be any different or greater than the Approved Proposal. Proposed mitigation • BHP will minimise visual impacts from permanent modification of landforms via visual screening methods, which may include screening structures, vegetation or engineering controls. The MCP (BHP 2024i) details how constructed landforms (principally OSAs) will be constructed and rehabilitated, including contouring, incorporation of screening structures and revegetation of waste rock landforms. • BHP proposes that mine closure and rehabilitation is regulated under Part IV of the EP Act. • Examples of existing noise management measures at the Approved Proposal that will be applied to the Proposal include the following: – use of low-noise equipment where practicable – use of silencers, where necessary – use of exhaust mufflers – regular service of machinery • The provisions of the <i>Environmental Protection (Noise) Regulations 1997 (WA)</i> (Noise Regulations) are applicable, and BHP notes that Noise can be regulated under the Noise Regulations, if required. Environmental outcome The implementation of the Proposal will protect Social Surroundings (Amenity) from significant harm.

15 Offsets

15.1 Biodiversity factors

15.1.1 Identification of and quantification of significant residual impacts for the Proposal

Table 15-1 identifies the significant residual impacts according to the residual impact significance model in the *WA Environmental Offsets Guidelines* (Government of Western Australia 2014).

Following the assessment of the significance of residual impacts (Sections 7.6, 8.6, 9.6 and 10.6) and as summarised in Table 15-1 and Table 15-2, BHP concluded that offsets are required for the following significant residual impacts:

- clearing of up to 100 ha of Good to Excellent condition vegetation in the Pilbara IBRA region (Section 8.6.4)
- clearing of up to 14 ha of critical foraging habitat for Ghost Bat (Section 9.6.6).

Figure 8-6 shows the areas of Good to Excellent condition vegetation within the IBRA bioregions and subregions and the likely areas of significant residual impact (i.e. the Indicative Footprint). BHP notes that the Proposal is located on the boundary of the Pilbara bioregion and that a portion of the proposed Development Envelope is situated within the Gascoyne bioregion (Augustus subregion); however, offsets for the clearing of vegetation in Good to Excellent condition in the Gascoyne bioregion (4 ha) do not apply.

Critical foraging habitat for Ghost Bat within the proposed Development Envelope has been identified as Minor Drainage Line, Sandy/Stony Plain and Stony Plain where the habitats occur within 12 km of the two Category 2 roosts (CWER-01 and CWER-03), and when they occur in Poor or better condition. Figure 9-4 shows the critical foraging habitats within the proposed Development Envelope and the likely areas of impact (i.e. the Indicative Footprint). Offsets for the clearing of critical Ghost Bat foraging habitat only applies for the Pilbara bioregion, with none of the critical foraging habitat occurring on the Gascoyne subregion.

A completed *Offsets Template* is provided in Table 15-2, which identifies and quantifies the significant residual impacts and proposed offsets.

Table 15-1: Residual Impact Significance Model

Part IV Environmental Factors	Vegetation and Flora						
				Terrestrial Fauna			
					Subterranean Fauna		
Part V Clearing Principals	Rare flora	Threatened ecological communities	Remnant vegetation	Wetlands & waterways	Conservation areas	High biological diversity	Habitat for fauna
Residual impact that is environmentally unacceptable or cannot be offset	None	None	None	None	None	None	None
Significant residual impacts that will require an offset All significant residual impacts to species and ecosystems protected by statute or where the cumulative impact is already at a critical level	None	None	Clearing of up to 100 ha of native vegetation in Good to Excellent condition in the Pilbara IBRA region (Section 8.6.4)	None	None	None	Clearing of up to 14 ha of critical Ghost Bat foraging habitat (i.e. within 12 km of Category 2 roosts) in the Pilbara IBRA region (Section 9.6.6)
Significant residual impacts that may require an offset Any significant residual impact to potentially threatened species and ecosystems, areas of high environmental value or where the cumulative impact may reach critical levels if not managed	None	None	None	None	None	None	None
Residual impacts that are not significant	None No plant taxon gazetted as Threatened Flora under the BC Act or EPBC Act have been recorded within the Development Envelope (Section 8.3.2.3)	The Ethel Gorge TEC is outside of the Orebody 29/30/35 groundwater drawdown extent (Section 7.4.1.1) There are no potential impacts on the groundwater quality at the Ethel Gorge aquifer and TEC from discharge of surplus water to Ophthalmia Dam from the Proposal (Section 7.4.3.2)	Each Beard vegetation association will have more than 99% of their pre-European extent remaining (Section 8.6.1.1)	No significant wetlands (e.g. Ramsar) occur within the Development Envelope No impact to potential groundwater dependent vegetation from the Proposal (Section 8.6.2) Clearing of 1.23 ha of major drainage line vegetation (Section 8.6.1.2)	None The nearest conservation area to the Development Envelope is located approximately 103 km northwest (Section 2.5)	No clearing of known records or populations of Priority flora species (Section 8.3.2.3) Potential impact to one Western Pebble-mound Mouse mound (Section 9.6.1.2) No Confirmed SRE invertebrate fauna species have been recorded within the Development Envelope (Section 9.3.2.4) Potential impact to a single record of a Potential SRE invertebrate fauna (with records still known from beyond the Development Envelope) (Section 9.6.1.3)	No direct impact to known records of Threatened fauna species (Section 9.6.1.2) No direct impact to the two Category 4 caves known within the Development Envelope (Section 9.6.1.1)

Table 15-2: Offsets Template

Orebody 29/30/35 BWT Mining Significant Amendment (the Proposal)										
Existing environment/ impact	Mitigation			Significant residual impact	Offsets calculation methodology					
	Avoid and minimise	Rehabilitation type	Likely rehabilitation success		Type	Risk	Likely offset success	Time lag	Offset quantification	
Flora and Vegetation										
Clearing of up to 100 ha of native vegetation in Good to Excellent condition in the Pilbara IBRA region	The use of existing and approved mine, transportation and processing elements at Mt Whaleback aids in minimising the amount of clearing required for the Proposal BHP designed the Proposal to avoid area of native vegetation as much as possible, with 63% of the Indicative Footprint situated on areas of existing clearing; specifically, the proposed pipeline almost entirely located on areas of existing disturbance	BHP undertakes site specific rehabilitation approach with disturbed areas progressively rehabilitated in accordance with the MCP	<u>Can the environmental values be rehabilitated/evidence?</u> Yes, native vegetation can be rehabilitated. Orebody 29/30/35 is an operating mine and BHP has progressively rehabilitated available areas. BHP provides evidence on rehabilitation in its Annual Environmental Reports. <u>Operator experience in undertaking rehabilitation?</u> BHP started rehabilitation at its WA Iron Ore operations in the Pilbara in the 1990s. From the early 2000s onwards, BHP made landform improvements, including integrating OSAs into the landscape, altering slopes to minimise erosion and use of covers to prevent acid and gas hazards. From 2015 onwards, BHP made revegetation improvements including understanding of seed biology and improvements in collection, dormancy breaking, and seeding methods. <u>What is the type of vegetation being rehabilitated?</u> Detailed vegetation association mapping was completed with eight vegetation associations occurring within the Development Envelope and Indicative Footprint. The dominant vegetation association of the Development Envelope is <i>Triodia</i> hummock grassland with <i>Eucalyptus</i> woodland and <i>Acacia</i> shrubland. <u>Time lag?</u> BHP's review of rehabilitation indicates that it will usually take 15-20 years after an area is rehabilitated before it can be assessed against completion criteria. This will depend on climatic conditions when rehabilitation commenced and during the rehabilitation period. <u>Credibility of the rehabilitation proposed (evidence of demonstrated success)</u> As discussed above, BHP has experience in rehabilitation and makes continual improvements in rehabilitation practices. BHP considers that the rehabilitation proposed in the MCP is credible and the current Annual Environmental Reports provide evidence of rehabilitation success.	<u>Extent</u> Clearing of up to 100 ha is in Good to Excellent condition in the Pilbara IBRA region <u>Quality</u> Good to Excellent condition <u>Conservation Significance</u> Nil <u>Land Tenure</u> Unallocated crown land or pastoral <u>Time Scale</u> 15-20 years post closure, for areas able to be rehabilitated Applying the Residual Impact Significance Model in the WA Offsets Guidelines, significant residual impacts require an offset where the cumulative impact is already at a critical level; therefore, an offset is required for the cumulative clearing of native vegetation in the Pilbara (IBRA) region	Monetary contribution to the Pilbara Environmental Offsets Fund (PEOF)	Low	The WA Government will make decisions on specific offsets projects proposed through the PEOF, focusing on on-ground projects. The operation of the fund will use relevant environmental information and knowledge from the WA and Commonwealth governments, natural resource management groups, Traditional Owners, conservation groups, industry and the research sector.	BHP will contribute funding to the PEOF. The PEOF allows for multiple offset payments to be combined to deliver larger conservation projects or expand successful initiatives in the region to maximise the value of financial offsets. This approach enables strategic landscape scale projects with much greater environmental benefits to be implemented, rather than multiple smaller activities.	N/A	Base rate of \$986 Australian Dollars (AUD) (excluding GST) per ha within the Hamersley IBRA subregion
Terrestrial Fauna										
Clearing of up to 14 ha of critical Ghost Bat foraging habitat in the Pilbara IBRA region	The use of existing and approved mine, transportation and processing elements at Mt Whaleback aids in minimising the amount of clearing required for the Proposal	BHP undertakes site specific rehabilitation approach with disturbed areas progressively rehabilitated and fauna habitats incorporated into the rehabilitation process in accordance with the MCP	<u>Can the environmental values be rehabilitated/evidence?</u> Yes, Ghost Bat foraging habitat can be rehabilitated via the rehabilitation of native vegetation (and inclusion of perch trees). Orebody 29/30/35 is an operating mine and BHP has progressively rehabilitated available areas. BHP provides evidence on rehabilitation in its Annual Environmental Reports. <u>Operator experience in undertaking rehabilitation?</u> BHP started rehabilitation at its WA Iron Ore operations in the Pilbara in the 1990s. BHP has continued to make revegetation improvements including the incorporation of fauna habitats into rehabilitated areas.	<u>Extent</u> Clearing of up to 14 ha of critical foraging habitat in the Pilbara IBRA region <u>Quality</u> Poor to Excellent condition <u>Conservation Significance</u> Threatened species (Ghost Bat) habitat <u>Land Tenure</u> Unallocated crown land or pastoral	Monetary contribution to the Pilbara Environmental Offsets Fund (PEOF)	Low	The WA Government will make decisions on specific offsets projects proposed through the PEOF, focusing on on-ground projects. The operation of the fund will use relevant	BHP will contribute funding to the PEOF. The PEOF allows for multiple offset payments to be combined to deliver larger conservation projects or expand successful initiatives in the region to maximise the	N/A	Higher rate of \$1,972 AUD (excluding GST) per ha within the Hamersley IBRA subregion

Orebody 29/30/35 BWT Mining Significant Amendment (the Proposal)									
Existing environment/ impact	Mitigation			Significant residual impact	Offsets calculation methodology				
	Avoid and minimise	Rehabilitation type	Likely rehabilitation success		Type	Risk	Likely offset success	Time lag	Offset quantification
	BHP designed the Proposal to avoid area of native vegetation (i.e. habitat) as much as possible, with 63% of the Indicative Footprint situated on areas of existing clearing; specifically, the proposed pipeline almost entirely located on areas of existing disturbance No disturbance from the Proposal to the Category 4 caves that occur within the Development Envelope		<u>What is the type of vegetation being rehabilitated?</u> Critical foraging habitat within the Development Envelope comprises Minor Drainage Line, Sandy/Stony Plain and Stony Plain. Habitats that generally include scattered <i>Eucalyptus</i> or <i>Corymbia</i> trees with <i>Acacia</i> shrubland. <u>Time lag?</u> BHP's review of rehabilitation indicates that it will usually take 15-20 years after an area is rehabilitated before it can be assessed against completion criteria. This will depend on climatic conditions when rehabilitation commenced and during the rehabilitation period. <u>Credibility of the rehabilitation proposed (evidence of demonstrated success)</u> As discussed above, BHP has experience in rehabilitation and has made improvements in rehabilitation practices. BHP considers that the rehabilitation proposed in the MCP is credible and the current Annual Environmental Reports provide evidence of rehabilitation success.	<u>Time Scale</u> 15-20 years post closure, for areas able to be rehabilitated As per the significant framework, the residual impact is considered to be significant because it is habitat for a Threatened species		environmental information and knowledge from the WA and Commonwealth governments, natural resource management groups, Traditional Owners, conservation groups, industry and the research sector.	value of financial offsets. This approach enables strategic landscape scale projects with much greater environmental benefits to be implemented, rather than multiple smaller activities.		

BHP has considered the six principles in the *WA Environmental Offsets Policy* (Government of WA 2011), to determine the proposed offset and to demonstrate that the proposed offset through the Pilbara Environmental Offsets Fund (PEOF) is appropriate to counterbalance the significant residual impact (Table 15-3).

Table 15-3: Consideration of PEOF offset against offset policy principles

Offset principle	Consideration
1. Environmental offsets will only be considered after avoidance and mitigation options have been pursued	BHP has discussed avoidance and mitigation options in Sections 7.5, 8.5, 9.5 and 10.5, for potential significant impacts to the preliminary key environmental factors. These options include utilising existing and approved mine, transportation and processing elements at Mt Whaleback and designing the Proposal to avoid area of native vegetation as much as possible (e.g. through the alignment of the proposed surplus water pipeline), aiding in minimising the amount of clearing required to support the Proposal. The significant residual impact that remains is the unavoidable impact of the clearing of native vegetation.
2. Environmental offsets are not appropriate for all projects	Consistent with other projects in the Pilbara, BHP considers that offsets (for the cumulative impact of clearing of vegetation in Good to Excellent condition in the Pilbara IBRA region and of critical Ghost Bat foraging habitat) are appropriate for this Proposal.
3. Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted	Consistent with offsets applied to recent Pilbara mining projects, BHP's proposed offset is to contribute funds to the PEOF. BHP considers that the base contribution rate is appropriate and proportionate to counterbalance the significant residual impact of the cumulative clearing of native vegetation in Good to Excellent condition in the Pilbara IBRA region. The higher contribution rate is proposed for the clearing of critical Ghost Bat foraging habitat.
4. Environmental offsets will be based on sound environmental information and knowledge	The WA Government will make decisions on specific offsets projects proposed through the PEOF, focusing on on-ground projects. The operation of the fund will use relevant environmental information and knowledge from the WA and Commonwealth governments, Tradition Owners, natural resource management organisations, conservation groups, industry and the research sector. As outlined in the Pilbara Environmental Offsets Implementation Plan (DWER 2019a), a monitoring and evaluation process will involve annual reviews to ensure the latest science and lessons learnt from on-ground projects inform management priorities and appropriate implementation actions.
5. Environmental offsets will be applied within a framework of adaptive management	An adaptive management framework is outlined in the Pilbara Environmental Offsets Implementation Plan. BHP understands that this will ensure that offsets projects delivered through the PEOF improve native vegetation condition and habitat for threatened species, and deliver enhanced species and ecosystem resilience, consistent with the adaptive management principle in the Pilbara Conservation Strategy (Government of Western Australia 2017).
6. Environmental offsets will be focused on longer term strategic outcomes	BHP will contribute funding to the PEOF. As outlined in the Pilbara Environmental Offsets Implementation Plan, the PEOF allows for the combining of money from multiple offset to deliver larger and more strategic landscape-scale projects, leading to better biodiversity conservation outcomes. Projects will be designed so that outcomes endure in the longer term (DWER 2019a).

BHP proposes to contribute funds to the PEOF at the rates detailed in Table 15-4, calculated on the 2023-2024 financial year.

Table 15-4: Environmental values relevant to the Proposal that require offset

Environmental value/s	IBRA Subregion	Proposed offset rate (\$/ha)
Native vegetation in Good to Excellent condition within the Development Envelope	Hamersley	Base rate of \$986 AUD (excluding GST) per ha, or the contribution rate for the relevant financial year as published for the Pilbara Environmental Offsets Fund
Critical foraging habitat for the Ghost Bat within the Development Envelope	Hamersley	Higher rate of \$1,972 AUD (excluding GST) per ha, or the contribution rate for the relevant financial year as published for the Pilbara Environmental Offsets Fund

15.1.2 Significant residual impacts for the Combined Proposal

No significant residual impacts were identified for the Approved Proposal, and therefore the significant residual impacts for the Combined Proposal are the same as that identified above for the Proposal (Section 15.1.1).

Table 15-5 presents the extent of the significant residual impacts from the Combined Proposal. Different offset payment rates apply depending on the value impacted, with higher payment rates required for critical habitat for listed threatened species. To avoid duplication of offsets, the extent of residual impact to be offset for clearing of native vegetation in Good to Excellent condition will exclude the extent to be offset for critical foraging habitat (i.e. 14 ha). While the total clearing of vegetation in Good to Excellent condition is up to 104 ha, 4 ha occurs within the Gascoyne bioregion for which offsets do not apply.

Table 15-5: Combined Proposal significant residual impacts

Significant residual impacts	Values	Combined Proposal significant residual impact (ha)	Combined extent to be offset (ha)
Clearing of native vegetation in Good to Excellent condition in the Pilbara IBRA region	Native vegetation in Good to Excellent condition within the Indicative Footprint	100	86 ¹
Clearing of critical foraging habitat for Ghost Bat	Minor Drainage Line, Sandy/Stony Plain and Stony Plain habitat within 12 km of Category 2 roosts	14	14
Total extent to be offset			100

1. This extent excludes the extent to be offset for critical habitat; therefore 14 ha is excluded from the extent to be offset for native vegetation in Good to Excellent condition.

BHP has prepared the *Orebody 29/30/35 Impact Reconciliation Procedure* (BHP 2024l), provided in Appendix 17.

As part of the Commonwealth strategic validation process, if required, BHP will also prepare an Offsets Proposal to address residual adverse impacts on relevant Program Matters (MNES) and implement the Offsets Proposal in accordance with the approved Pilbara Strategic Assessment Assurance Plan and Offsets Plan (BHP 2023f).

15.2 Greenhouse Gas Emissions factor

Offsets will be sourced, held and retired from the portfolio as needed to meet our anticipated demand for offsets over time, as BHP work to decarbonise our business. The specific volumes sourced from each approach will be responsive to the prevailing offset landscape, both domestically and internationally (if the use of internationally sourced credits is allowed under the Safeguard Mechanism in the future, given the implementation of Article 6.4 of the Paris Agreement (A6.4 of PA)), to ensure BHP have continued access to security of supplies.

In the context of BHP's operations in Western Australia, including the Orebody 29/30/35, our preference is to source offsets in line with our operational footprint in Western Australia and in recognition of the WA state government's preference for locally generated offsets. BHP may also source offsets from international markets, in accordance with EPA guidance on the use of offsets within WA, if the use of international credits to meet Safeguard Mechanism obligations becomes allowed in the future, given the implementation of A6.4 of PA. Domestic sourcing of offsets may be from the domestic market or through offset generation from BHP's tenure or other locations in WA, in partnership with reputable project developers under ERF methodologies. BHP is currently undertaking an opportunity assessment to better understand the potential to generate offsets on our tenure (including mineral carbonation and natural climate solutions), as well as exploring opportunities outside of our tenure with project developers in WA.

Considering the types of offsets that are currently available on the market (i.e. predominantly avoidance type) and the value in mobilising carbon finance to incentivise offset supply, BHP source offsets from solutions that remove atmospheric carbon as well as avoid emissions where these have high integrity, with a planned shift towards removal offsets over time. Whilst BHP prioritise the acquisition of offsets from nature-based solutions that deliver long-term environmental, social and economic value (i.e. sustainability co-benefits) BHP also consider the sourcing of offsets from engineered solutions. The specific offset types sourced and used within the WA context and for the Jimblebar Hub, will depend on the acceptable offset criteria set by the WA EPA, the prevailing market dynamics and the availability and accessibility of offsets.

BHP's procurement of carbon credits, includes due diligence to ensure that BHP invest in carbon offsets that meet the following minimum quality standards:

- Satisfies national carbon offset standards for compliance offsets (i.e. Australian Carbon Credit Units and other eligible regulatory offset instruments), including ACCUs that are established under (and meet the integrity standards of) the Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth) and/or Registered in an internationally recognised standard that independently verifies and issues voluntary carbon credits (including but not limited to Verra and Gold Standard) that is accredited by and compliant to the International Carbon Reduction & Offset Alliance (ICROA) Code of Best Practice.
- Adheres to a robust emissions reduction accounting methodology, to provide assurance of the volume of emissions reduced through a project.
- Meets additionality criteria to ensure that the emissions reduction would not have occurred in the absence of a carbon offset market.
- Has a high likelihood of permanence to ensure that the emissions reduction is ongoing and not reversed (e.g. in the case of forestry projects, the trees are not cut down or destroyed by a natural disaster).
- Provides robust mitigation against leakage, ensuring an offsetting project does not increase emissions elsewhere (e.g. an area is protected from deforestation through offsetting but another forest area is destroyed).
- Demonstrates high environmental and social integrity, ensuring no broader social or environmental harm (e.g. hydropower projects that require forest clearing and community displacement).
- Limit offset vintage to the last five years of offset generation, to avoid claiming emissions reduction from activities that occurred a long time ago.

BHP regularly review our minimum sourcing standards and sourcing strategy to verify alignment with global best practice, including the outcomes of initiatives such as The Integrity Council for the Voluntary Carbon Market's (ICVCM) Core Carbon Principles and the Chubb review into the integrity of ACCUs (DCCEEW 2022).

BHP supports action to increase the availability of carbon offsets in the near-term and long-term, by addressing barriers to offset supply through grant funding, research and development, and market and policy advocacy. For example, in 2022 BHP launched a grants program to help drive the development of the Australian blue carbon market and have provided over AUD\$5million to support emerging blue carbon methods and projects.

16 Holistic impact assessment

BHP has assessed the impacts of the Proposal for the relevant environmental factors and environmental values individually (Sections 7 to 13). However, given the link between Inland Waters, Flora and Vegetation, Terrestrial Fauna, Subterranean Fauna, Social Surroundings, Greenhouse Gas Emissions and Air Quality, consistent with the EPA's *How to prepare an Environmental Review Document: Instructions* (EPA 2024b), BHP has also considered connections and interactions between the relevant environmental factors to inform a holistic view of impacts to the whole environment.

Figure 16-1 illustrates the connections and interactions between the key environmental factors to inform the holistic assessment.

There are inherent links between the factors of Inland Waters and Social Surroundings, and Inland Waters and Subterranean Fauna (stygo fauna). Increased groundwater abstraction for the Proposal (compared to the abstraction assessed for the Approved Proposal) has the potential to change groundwater levels and quality, which can affect the ecosystems, beneficial uses and cultural and heritage values that are dependent on these aquifers. BHP considers that the proposed mitigation and regulation (proposed conditions, environmental management plans and other statutory decision-making processes) for Inland Waters will maintain the inter-related key environmental values of the Ethel Gorge TEC as well as other water values.

There are inherent links between the factors of Flora and Vegetation and Terrestrial Fauna. Vegetation provides habitat for terrestrial fauna, including significant fauna (including fauna listed under the BC Act and EPBC Act), and SRE invertebrate fauna species. Flora, vegetation and terrestrial fauna rely on waters to sustain and maintain growth. For the Proposal, no interaction occurs between vegetation and groundwater (due to the depth of the groundwater in the regional aquifers). BHP considers that the proposed mitigation and regulation (limits on clearing, environmental management plans) will maintain the inter-related key environmental values of flora and vegetation and terrestrial fauna.

There is an established link between GHG emissions and the risk of climate change (EPA 2023b). Climate change has the potential to impact on the environmental values of WA. Implementation of the GHGMP (BHP 2024k) and regulation under the Safeguard Mechanism, will also mean that the other environmental factor values (flora and vegetation, terrestrial fauna, subterranean fauna, inland waters, air quality and cultural and heritage values) will be protected.

While implementation of the Proposal will avoid direct disturbance to heritage sites, there are other potential impacts to social, cultural and heritage values such as ethnoecologically important species, water values and changes to landscape and access). BHP is committed to ongoing engagement with the Nyiyaparli Traditional Owners and KNAC in relation to rehabilitation and closure of the Combined Proposal.

BHP considers that when the relevant environmental factors are considered together, for the holistic assessment, the Proposal (in the context of the Approved Proposal) and the Combined Proposal, is still consistent with the EPA's objectives.



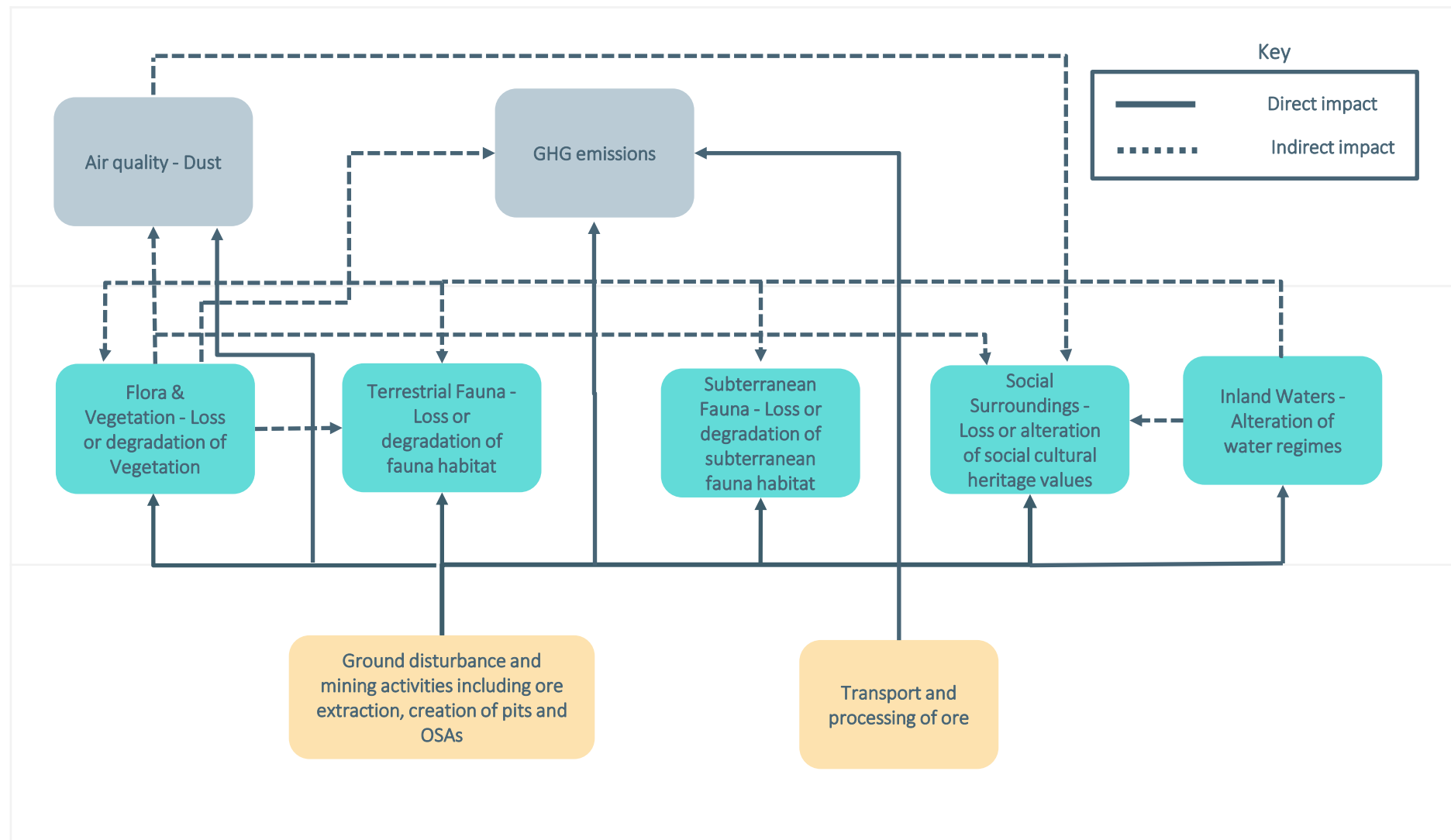
Emissions



Values potentially impacted



Key activities



17 Cumulative environmental impact assessment

As discussed in Section 2.5, the Proposal is located in the Eastern Pilbara region. Major projects in the Eastern Pilbara region are limited to BHP operations (see Figure 2-3), therefore BHP has focused the cumulative impact assessment (of successive, incremental and interactive impacts on the environment of the Proposal with one or more past, present and reasonably foreseeable future activities) on major BHP projects in the Eastern Pilbara region. The mines are the Orebody 29/30/35 Combined Proposal, other approved projects in operations (Whaleback Hub, Eastern Ridge and Jimblebar (including the proposed Significant Amendment at Jimblebar which is currently under assessment)), and approved projects not yet in operations (OB32 BWT and Western Ridge). The other major projects (both in operations) are BHP's Ophthalmia and Homestead borefields, which supply potable water to Newman.

Inland Waters and Subterranean Fauna (Ethel Gorge TEC)

Cumulative changes to groundwater regimes from groundwater abstraction

As discussed in Section 7.6.1, the groundwater drawdown from the Combined Proposal is not predicted to extend further than the cumulative drawdown extent assessed for the Western Ridge Approved Proposal. However, the vertical drawdown in the regional aquifer near the northeastern and northern boundaries of the model domain is predicted to be deeper by up to 70 m, likely due to changes made to the groundwater model in this area for the PFAS mixing assessment.

Groundwater levels in the Ethel Gorge aquifer (and TEC) will be maintained within historical levels. Due to the significant environmental value of the Ethel Gorge TEC (and the proximity of the Eastern Ridge mining operations to the TEC), the EPWRMP includes groundwater criteria relating to groundwater level decline. As the management in the EPWRMP applies to all BHP's approved eastern mines, the groundwater level criteria will also apply to the Combined Proposal. Groundwater levels in the Ethel Gorge aquifer will be managed (if required) at the regional scale through the existing mitigation in the EPWRMP.

Cumulative changes from discharge of surplus water to Ophthalmia Dam

As discussed in Sections 7.6.2 and 7.6.3, there are potential changes to surface water regimes and groundwater quality, from the discharge of surplus water to Ophthalmia Dam.

Due to the proposed increase in Orebody 29/30/35 dewatering, the Eastern Pilbara water balance (and the forecast cumulative discharge to Ophthalmia Dam has changed from the 2023 cumulative forecast discharge discussed in the Jimblebar Hub Proposal (BHP 2023c).

Surface water regimes

As discussed in Section 7.6.2, it is possible that the 2024 forecast cumulative discharge from BHP's eastern mines (including surplus water from the Combined Proposal) may exceed the theoretical storage capacity of Ophthalmia Dam (135 ML/d) during the estimated peak discharge years (for approximately 3 years). Similar to the forecast cumulative discharge, the 2024 forecast cumulative discharge includes a period of higher surplus water discharge from all BHP's eastern mines to Ophthalmia Dam (at or above 100 ML/d until approximately FY2037) (Figure 7-7), with an associated increase in water volumes within the dam during those periods. However, natural surface water flows to the dam are likely to continue to be the major contributor to dam volumes, as they are much greater than the cumulative forecast surplus discharge from BHP's eastern mines. The EPWRMP includes a threshold to limit releases to the Fortescue River to three months total during natural no-flow conditions (i.e. the dry season). The controls in the EPWRMP apply to all BHP's approved eastern mines and will also apply to the Combined Proposal. BHP will manage the surplus discharge volumes from its operations and the operation of the dam according to the EPWRMP to avoid overtopping of the dam spillway and uncontrolled surface flows to the Fortescue River in the dry season (i.e. when there are typically no natural flows).

Groundwater salinity

The water balance modelling for the 2024 forecast cumulative surplus discharge to Ophthalmia Dam (including from the Combined Proposal) indicates that the groundwater salinity in the Ethel Gorge aquifer is predicted to remain below 2,000 mg/L, which is within the range of historical observed groundwater salinity and below the EPWRMP Early Response Indicator of 2,500 mg/L TDS.

Therefore, groundwater salinity in the Ethel Gorge aquifer will be maintained to support the stygofauna habitat of the Ethel Gorge TEC.

Subterranean Fauna

As discussed in Section 10.6.1, due to the recognised high biodiversity (stygofauna) value of the Ethel Gorge TEC, BHP manages the potential cumulative impacts on the Ethel Gorge TEC from its Eastern Pilbara mines through the implementation of the EPWRMP. The cumulative assessment indicates that stygofauna habitat in the Ethel Gorge aquifer will be maintained as there is not expected to be any significant changes to groundwater levels and salinity in the Ethel Gorge aquifer. BHP will continue to implement the Ethel Gorge TEC stygofauna monitoring program, including of the stygofauna assemblage, which is outlined in the EPWRMP.

Flora and Vegetation

As discussed in Section 8.4, a large portion (1,100.13 ha, representing 82%) of the Development Envelope has been cleared for the Approved Proposal and mining at Mt Whaleback. Impacts on flora and vegetation associated with the Approved Proposal were assessed under the Mt Whaleback NVCP (5617/6), which approved the clearing of native vegetation for the mining of Orebody 29/30/35 and associated activities. The Proposal will result in clearing of up to 116 ha of native vegetation, representing an increase of approximately 10%. The Proposal will not impact any significant flora, and therefore does not contribute to the cumulative impact to flora values.

The Proposal occurs within the Fortescue Botanical District, which is part of the Eremaean Botanical Province (Beard 1990). Broad scale regional mapping of Western Australia was undertaken by Beard (1975) to map the pre-European state of the vegetation. Shepherd *et al.* (2002) later refined and updated the vegetation association mapping to account for the extensive clearing that had occurred since the Beard (1975) mapping was completed. Three regional vegetation associations from the Pilbara and Gascoyne bioregions are located within the Development Envelope. As discussed in Section 8.6.1.1, the impact to the regional vegetation associations from the Proposal is less than 0.01% and all associations will have more than 99% of their pre-European extent remaining. Vegetation associations 18 and 82 occur across other BHP projects in the Eastern Pilbara region, including the adjacent Mt Whaleback and Western Ridge operations. There are no cumulative impacts to vegetation association 29 from other BHP projects in the Eastern Pilbara. Association 18 occurs more broadly across the State with a current extent of over 19,842,830 ha across 12 bioregions. Association 82 occurs only within the Pilbara and Gascoyne bioregions with a current extent of approximately 2,553,206 ha (Government of Western Australia 2019). While the extent of these two associations in the Pilbara is predicted to decrease due to cumulative impacts, the impact that the Proposal is contributing to the cumulative impact is minimal (impact of less than 0.01% to each association; Table 8-4). The Proposal will have no cumulative impact to the extent of these association in the Gascoyne bioregion.

As outlined in the *Cumulative environmental impacts of development in the Pilbara region* (EPA 2014), the EPA considers that the clearing of vegetation in Good to Excellent condition in the Pilbara is a significant residual impact. Based on this, clearing of vegetation in Good to Excellent condition has been identified as residual impact in the environmental approvals under Part IV of the EP Act for other BHP projects within the Eastern Pilbara region. The Proposal is estimated to contribute to the cumulative impact of clearing of vegetation in Good to Excellent condition. BHP has proposed an offset for the clearing of up to 100 ha of native vegetation in Good to Excellent condition in the Hamersley subregion from the Proposal.

Terrestrial Fauna

The fauna habitat types mapped within the Development Envelope are considered widespread and well represented regionally, with the exception of the Wetland habitat, which is considered part of an important habitat due to the rarity of Wetland habitats within the Pilbara (Astron 2024). The Wetland habitat is associated with the inundated area of Ophthalmia Dam which is considered an artificial habitat formed as a result of construction of the dam in the early 1980s. While a small amount (less than 0.05 ha) of the Wetland habitat occurs within the Indicative Footprint, where the surplus water pipeline meets the dam, the Proposal will not result in any direct or indirect impacts to this regionally significant habitat. The proposed surplus water pipeline route will follow the existing surplus water pipeline route, to the extent practicable, with no additional cumulative impacts to this habitat association with the Proposal. Substantial areas of all other habitat types will remain available within BHP tenure and habitats will not be impacted to the extent that ecological integrity will be impacted.

Although the fauna habitat types are known to occur more broadly, fauna habitat features (caves) are of importance to significant fauna species within the Pilbara bioregion; specifically for the Ghost Bat. The Proposal will not have any direct impact to the two known Category 4 caves within the Development Envelope, and therefore will not contribute to any cumulative impacts to Ghost Bat roost caves within the Eastern Pilbara region.

While there are no proposed impacts to Ghost Bat roosts from the Proposal, there will be impacts to Ghost Bat foraging habitat. As discussed in Section 9.3.2.3, critical foraging habitat for Ghost Bat present in the Development Envelope has been identified as Minor Drainage Line, Sandy/Stony Plain and Stony Plain. The cumulative impact to critical Ghost Bat foraging habitats within the 12 km of CWER-01 and CWER-03 is limited to the potential impacts from the Proposal, and the adjacent Mt Whaleback operation and proposed Western Ridge. None of the critical foraging habitat for Ghost Bat identified for the Proposal have been mapped as occurring within the Mt Whaleback operations area (based on the *Mount Whaleback Strategic NVCP* application (BHP Billiton 2013b)). Western Ridge Approved Proposal identified critical Ghost Bat foraging habitat present in the Development Envelope as Drainage Area/Floodplain, Mulga Woodland, Stony Plain and Minor Drainage Line (BHP 2023g). Therefore, there will be cumulative impacts to Stony Plain and Minor Drainage Line habitat types within the foraging range of CWER-01 and CWER-03 from the Proposal and Western Ridge Approved Proposal. Cumulatively, direct impacts are estimated to be 57.4 ha of Minor Drainage Line habitat and 1,481.5 ha of Stony Plain habitat, representing less than 0.1% and 2.3%, respectively, of the total foraging area for CWER-01 and CWER-03 (Table 17-1). Of this impact, less than 1% is attributed to the Proposal.

Table 17-1: Cumulative impacts - critical Ghost Bat foraging habitat

Habitat type impacted by the Proposal	Area within Indicative Footprint (ha) ¹	Area within Western Ridge Indicative Footprint (ha) ¹	Total cumulative area (ha)	Cumulative area as % of total foraging area ²
Minor Drainage Line	1.37	56.0	57.37	0.09
Sandy/Stony Plain	0.12	-	0.12	<0.01
Stony Plain	12.20	1,469.3	1,481.50	2.30

1. Amount of habitat within the 12 km foraging range of the Category 2 roosts CWER-01 and CWER-03, and in Poor or better condition.
2. The total foraging area (based on 12 km radius from CWER-01 and CWER-03) is 64,330 ha.

Looking more broadly than the Proposal and its immediate surrounds, other BHP projects in the Eastern Pilbara region (namely, Jumblebar Hub) also propose to impact on critical Ghost Bat foraging habitat. In recognition of the cumulative impacts to Ghost Bat foraging habitat, BHP undertake monitoring of the local Ghost Bat populations and roosts across its Eastern Pilbara operations including Western Ridge, Jumblebar Hub, and surrounds. This monitoring commenced in September 2021 (Biologic 2024b) and is proposed to continue to monitor the presence of Ghost Bat in BHP operational areas (and surrounds) within the Eastern Pilbara region.

The direct impact to Ghost Bat critical foraging habitat from the Proposal are minimal; however, BHP considers that this represents a potential significant residual impact and therefore BHP has proposed an offset for the Proposal for the clearing of up to 14 ha of critical foraging habitat for Ghost Bat.

As discussed in Section 9.6.1.2, the Proposal has the potential to impact one inactive mound of the Priority 4 Western Pebble-mound Mouse. Four inactive mounds have previously been impacted for the Approved Proposal, with clearing activities authorised under the *Mount Whaleback Strategic NVCP* (BHP Billiton 2013b). This species is known to occur on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex. Western Pebble-mound Mouse occurs extensively throughout the Pilbara region including within conservation reserves. Potential impacts to this species were assessed for Whaleback Hub, Eastern Ridge, Jimblebar and Western Ridge. The potential impact from the Proposal to one inactive mound is not considered to significantly contribute to the cumulative impact on this species within the Eastern Pilbara region.

A single occurrence of the Potential SRE species, *Indolpium* sp. indet, has the potential to be impacted from the Proposal. Records of this indeterminate taxon were also known from disturbed areas that have been impacted for the Approved Proposal, specifically within the OB35 mine pit area. SRE assessments completed to support the *OB35 Above Water Table (AWT) Iron Ore Mine Proposal* (BHP Billiton 2011) consider the records of this taxon unlikely to represent a SRE species, with similar specimens having been collected elsewhere in Western Australia. As a precautionary approach, the taxon within the Development Envelopment is assessed as a Potential SRE due to the lack of data with Olipiidae taxonomy poorly developed making identification even to genus difficult, and molecular analysis for this genus can be polyphyletic (Biologic 2024a). It is considered however, that *Indolpium* sp. indet is likely to represent one of the sequenced Olipiidae or *Indolpium* taxa known from the surrounding area. Three *Indolpium* taxa were recorded from the adjacent Western Ridge and Coombanbunna areas, all of which are locally widespread and do not represent SRE species. While it is difficult to provide an accurate assessment of potential impacts to an indeterminate taxon, it is considered that the potential impact to one record of *Indolpium* sp. indet from the Proposal will not significantly contribute to the cumulative impact of the Olipiidae or *Indolpium* taxa within the local area.

Social Surroundings

BHP recognises that the additional clearing of up to 116 ha of native vegetation has the potential to cumulatively affect social, cultural and heritage values. The Proposal has been designed to avoid direct impacts to heritage sites and water values. Through the implementation of the EMPs, it is expected that impacts from the Proposal will be appropriately managed so that social, cultural and heritage values are not significantly impacted.

BHP notes that Nyiyaparli representatives through KNAC have expressed interest in mine closure and rehabilitation, including cumulative impacts and have expressed a preference for the avoidance of pit lakes at closure. The ability to backfill pit voids AWT is dependent on the availability of waste rock material which remains after mining. Based on the current mine plan, pit lakes would be expected to form in all of the pits but with a reduced surface area in OB35 due to these pits being partially backfilled. This is related to the modelled volume of waste rock that will be available at closure. BHP's progressive closure philosophy for the Orebody 29/30/35 Proposal includes a priority focus on progressive backfilling into mined-out pits. Mined overburden will be backfilled into mined-out pits at OB29 and OB35, where practicable, to minimise the cumulative impacts of pit lakes.

Greenhouse Gas Emissions

Cumulative GHG emissions are a contributor to climate change. The cumulative emissions from the Combined Proposal have the potential to contribute to WA's GHG emissions. As discussed in Section 12.6.3, the estimated percentage contribution of the Combined Proposal average Scope 1 emissions (mining, power supply and rail) to State and National GHG emission is 0.087% and 0.017% respectively. BHP will implement the decarbonisation strategy outlined in the GHGMP (BHP 2024k), including progressive reduction of Scope 1 emissions in accordance with the Safeguard Mechanism. However, potential significant residual impacts will remain for Scope 1 and 3 emissions. Details of the proposed offset to counterbalance the significant residual impact are outlined in the GHGMP (BHP 2024k).

Air Quality

Air Quality modelling undertaken for the Proposal also included modelling for the Cumulative scenario (including background) and future state Newman (Mt Whaleback, Orebody 29/30/35 and Western Ridge) and Eastern Ridge operations for PM₁₀ and PM_{2.5} (ETA 2024). BHP considers that there are no other existing or reasonably foreseeable projects close enough to the Proposal to be considered a significant contributor to potential cumulative impacts to air quality. As discussed in Section 13.6.3, for the Cumulative scenario for PM₁₀ the modelling indicates that there will be a slight increase in the maximum PM₁₀ concentration at the Town Monitor and Newman East, however there will be a reduction in the number of exceedances of criteria compared to the existing scenario. For PM_{2.5} the modelling indicated that there will be a slight increase in the maximum PM_{2.5} concentrations at the Town Monitor and Newman East, however, there remains no predicted exceedances of criteria at sensitive receptors, as per the existing scenario.

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Appendices

Appendix 1 Proposal Content Document

The *Orebody 29/30/35 Proposal Content Document* (Version 1, November 2024) is provided separately.

Appendix 2 Analysis of Approved Proposal Ministerial Statement 963

As required by the Referral Instructions (EPA 2024a) and ERD Instructions (EPA 2024b), BHP has undertaken an analysis of the existing implementation conditions relating to the Approved Proposal.

Analysis of authorised extents

Where BHP proposes to retain an existing authorised extent of an Approved Proposal for the Amended Proposal (if approved), see the proposed conditions for the Amended Proposal (Appendix 3).

Table A2-1: Orebody 29/30/35 Mining Below Watertable MS963 (Schedule 1)

Element	Authorised Extent	Amended Proposal
Dewatering	Groundwater abstraction up to 8 GL/a	Rate included in Condition A1 Limitations and Extent of Proposal
Dewater Disposal	Discharge to Ophthalmia Dam up to 8 GL/a	Rate included in Condition A1 Limitations and Extent of Proposal

Analysis of existing implementation conditions

BHP has analysed the existing implementation conditions. Where changes are proposed, BHP has evaluated the proposed changes to ensure that the Amended Proposal can be implemented consistently with the EPA's objectives (Tables A2-2). Where BHP proposes to retain an existing condition for an Approved Proposal for the Amended Proposal, see the proposed conditions for the Amended Proposal (Appendix 3).

Table A2-2: Orebody 29/30/35 Mining Below Watertable MS963 – Significant Amendment. MS963

Condition	Environmental factor	Proposed change	Proposed Amended Proposal condition (and evaluation of proposed changes)
1 Proposal Implementation	N/A	Delete and replace with contemporary condition	Condition A1 Limitations and Extent of Proposal Amended to include relevant proposal extents, consistent with the contemporary condition setting approach recommended by the EPA
2 Contact Details	N/A	Delete and replace with contemporary condition	Condition D3 Contact Details The requirements of this condition are still relevant and are retained consistent with the contemporary condition setting approach recommended by the EPA
3 Time Limit for Proposal Implementation	N/A	Delete condition	No condition The requirements of this condition are no longer required, as BHP has substantially commenced the project
4 Compliance Reporting	N/A	Delete and replace with contemporary conditions	Condition D1 Non-compliance Reporting, Condition D2 Compliance Reporting The requirements of this condition are still relevant and are retained consistent with the contemporary condition setting approach recommended by the EPA
5 Public Availability of Data	N/A	Delete and replace with contemporary condition	Condition D5 Public Availability of Data The requirements of this condition are still relevant and are retained consistent with the contemporary condition setting approach recommended by the EPA
6 Rehabilitation and Closure	Inland Waters	Delete and replace with contemporary condition	Condition B3 Rehabilitation and Decommissioning The requirements of this condition are still relevant and are retained consistent with the contemporary condition setting approach recommended by the EPA.

Condition	Environmental factor	Proposed change	Proposed Amended Proposal condition (and evaluation of proposed changes)
			BHP proposes to continue to manage rehabilitation, decommissioning and closure according to the measures in the submitted <i>OB29/30/35 MCP</i> (Revision 6.0; BHP 2021c), which BHP has amalgamated and updated into the new <i>Orebody 29/30/35 MCP</i> for the Combined Proposal (BHP 2024i); Appendix 7). BHP has prepared the <i>Orebody 29/30/35 MCP</i> consistent with the <i>Statutory Guidelines for Mine Closure Plans: Mining Act 1978</i> (DMIRS 2023a) and <i>Mine Closure Plan Guidance - How to prepare in accordance with Part 1 of the Statutory Guidelines for Mine Closure Plans</i> (DMIRS 2023b).

Appendix 3 Amended Proposal: Proposed implementation conditions

As provided for in the EPA's ERD Instructions (EPA 2024b), BHP has provided a draft set of proposed implementation conditions for the Amended Proposal for the EPA's consideration, consistent with the contemporary condition setting approach recommended by the EPA (introduced in 2022), which contain the following:

- proposed limitations and maximum extents of relevant Proposal elements (Part A: Proposal Extent, Condition A1 Limitations and Extent of Proposal)
- the proposed environmental conditions for each of the relevant key environmental factors in the Environmental outcomes (Sections 7.7, 8.7, 9.7, 10.7, 11.7, 12.7, 13.7) (Part B: Environmental Outcomes, Prescriptions and Objectives and Part C: Environmental Management Plans and Monitoring)
- proposed general/administrative conditions (Part D: Compliance, time limits, audits and other conditions).

DRAFT PROPOSED CONDITIONS

OREBODY 29/30/35

Proposal: The proposal is to construct and operate the Orebody 29/30/35 mine, located approximately 7 km west-south-west of Newman, in the Shire of East Pilbara. The proposal includes above and below water table mining, dewatering of mine pits and discharge of surplus water to Ophthalmia Dam, and associated mining activities and infrastructure, including overburden storage areas, a ramp and surplus water pipeline to Ophthalmia Dam.

Proponent: BHP Iron Ore Pty Ltd
Australian Company Number: 008 700 981

Proponent address: 125 St Georges Terrace, PERTH WA 6000

Assessment number: XXXX

Report of the Environmental Protection Authority: XXXX

Introduction: The Proposal is a significant amendment to the existing Orebody 29/30/35 Mining Below Watertable, which was agreed to be implemented under Ministerial Statement 963. The EPAs Report for the existing Orebody 29/30/35 Mining Below Water Table is Report 1501, EPA Assessment Number 1982.

Pursuant to section 45 of the *Environmental Protection Act 1986*, it is now agreed that:

1. the significant amendment proposal described and documented in the proponent's Proposal Content Document (Version 1, November 2024), may be implemented;
2. Ministerial Statement 963 for the existing Orebody 29/30/35 Mining Below Water Table proposal is superseded under section 40AA(6)(b) of the *Environmental Protection Act 1986*; and
3. the implementation of the significantly amended proposal (being the existing approved proposal as amended by the significant amendment proposal) is subject to the following implementation conditions and procedures.

Conditions and procedures:**Part A: Proposal extent****Part B: Environmental outcomes, prescriptions and objectives****Part C: Environmental management plans and monitoring****Part D: Compliance and other conditions****PART A: PROPOSAL EXTENT****A1 Limitations and Extent of Proposal**

A1-1 The proponent must ensure that the Proposal is implemented in such a manner that the following limitations or maximum extents/capacities/ranges are not exceeded:

Proposal element	Location	Maximum Extent
Physical elements		
Development Envelope	Figure 1	Development Envelope of 1,346 ha
Direct disturbance of native vegetation	Figure 1	Clearing of no more than 116 ha of native vegetation within the Development Envelope
Direct disturbance of native vegetation in 'good' to 'excellent' condition	Figure 1	Clearing of no more than 104 ha within the Development Envelope
Direct disturbance of Ghost Bat critical foraging habitat	Figure 2	Clearing of no more than 14 ha within the Development Envelope
Operational elements		
Groundwater abstraction - mine pit dewatering and water supply	-	Groundwater abstraction of up to 24.5 GL/a
Surplus water management	Figure 1	Discharge of up to 20.8 GL/a surplus water to the Ophthalmia Dam system
Mine pit voids and pit lakes	-	Option for open voids and formation of pit lakes
Timing elements		
Project life	-	Up to 50 years (construction, operation, decommissioning and closure (to rehabilitate execution)) from the date of issue of the statement

PART B: ENVIRONMENTAL OUTCOMES, PRESCRIPTIONS AND OBJECTIVES**B1 Inland Waters**

B1-1 The proponent must implement the Proposal to meet the following environmental **outcomes**:

- (1) maintain groundwater levels and salinity in the **Ethel Gorge aquifer** to support the stygofauna habitat of the **Ethel Gorge TEC**; and
- (2) maintain the current (altered) ephemeral surface water regime to the Fortescue River downstream of Ophthalmia Dam as a result of releases of water from Ophthalmia Dam.

B1-2 The proponent must implement the Eastern Pilbara Water Resource Management Plan with the purpose of ensuring the environmental outcomes in condition B1-1 are achieved, monitored and substantiated.

B1-3 The proponent must implement the Proposal to achieve the following environmental outcomes:

- (1) Per-and Poly-fluoro Alkyl Substances (PFAS) concentrations in the combined surplus dewatered groundwater from Orebody 29/30/35 discharged to Ophthalmia Dam and in surface water within Ophthalmia Dam will remain below 0.021 µg/L Sum (PFOS+PFHxS) and 0.013 µg/L PFOS.

B1-4 The proponent must implement the Orebody 29/30/35 Water (PFAS) Management Plan, with the purpose of ensuring the environmental outcome in condition B1-3 is achieved, monitored and substantiated.

B2 Subterranean Fauna

B2-1 The proponent must implement the Proposal to achieve the following environmental outcome:

- (1) maintain the stygofauna habitat of the Ethel Gorge TEC.

B2-2 The proponent must implement the Eastern Pilbara Water Resource Management Plan, with the purpose of ensuring the environmental outcome in condition B2-1 is achieved, monitored and substantiated.

B3 Rehabilitation and Decommissioning

B3-1 The proponent must implement the Proposal to achieve the following environmental objectives:

- (1) rehabilitate and decommission the Proposal in an **ecologically sustainable manner**; and
- (2) undertake closure planning and rehabilitation in a progressive manner.

B3-2 The proponent must implement the Orebody 29/30/35 Mine Closure Plan, with the purpose of ensuring the environmental objectives in condition B3-1 are achieved, monitored and substantiated.

B3-3 The proponent must review and revise the environmental management plan (Mine Closure Plan) required by condition B3-2 at intervals not exceeding five (5) years, or as otherwise specified by the CEO, and submit the environmental management plan (Mine Closure Plan) to the CEO at the agreed intervals.

B4 Offsets

B4-1 The proponent must contribute funds to the Pilbara Environmental Offsets Fund calculated pursuant to condition B4-2, to achieve the objective of counterbalancing the significant residual impacts to:

- (1) **Good to Excellent condition native vegetation**
- (2) **Ghost Bat critical foraging habitat**

B4-2 The proponent's contribution to the Pilbara Environmental Offsets Fund must be paid biennially, with the amount to be contributed calculated based on the clearing undertaken in each year of the biennial reporting period in accordance with the rates in condition B4-3. The first biennial reporting period must commence from clearing activities of the environmental value(s) identified in condition B4-3.

B4-3 Calculated on the 2023-2024 financial year, the contribution rates are:

- (1) \$986 AUD (excluding GST) per **ha** of the following environmental values cleared as a result of the Proposal within the Hamersley **IBRA** subregion:
 - (a) **Good to Excellent condition native vegetation.**
- (2) \$1,972 AUD (excluding GST) per **ha** of the following environmental values cleared as a result of the Proposal within the Hamersley **IBRA** subregion:

(a) **Ghost Bat critical foraging habitat.**

- B4-4 The rates in condition B4-3 change annually each subsequent financial year in accordance with the percentage change in the CPI applicable to that financial year.
- B4-5 To achieve the objective in condition B4-1, the proponent must implement the Orebody 29/30/35 Impact Reconciliation Procedure:
- (1) spatially define the environmental value(s) identified in condition B4-1;
 - (2) spatially define the areas where offsets required by condition B4-1 are to be exempt;
 - (3) include a methodology to calculate the amount of clearing undertaken during each year of the biennial reporting period for each of the **environmental values** identified in condition B4-3;
 - (4) state that clearing calculation for the first biennial reporting period will commence from **ground disturbing activities** in accordance with condition B4-2 and end on the second 30 June following commencement of **ground disturbing activities**;
 - (5) state that clearing calculations for each subsequent biennial reporting period will commence on 1 July of the required reporting period, unless otherwise agreed by the CEO;
 - (6) indicate the timing and content of the Impact Reconciliation Reports; and
 - (7) be prepared in accordance with Instructions on how to prepare *Environmental Protection Act 1986* Part IV Impact Reconciliation Procedures and Impact Reconciliation Reports (or any subsequent revisions).
- B4-6 The proponent must submit an Impact Reconciliation Report in accordance with the confirmed Impact Reconciliation Procedure in condition B4-5.
- B4-7 The Impact Reconciliation Report required pursuant to condition B4-6 must provide the location and spatial extent of the clearing undertaken as a result of the Proposal during each year of each biennial reporting period.
- B4-8 The proponent may apply in writing and seek the written approval of the CEO to reduce all or part of the contribution payable under condition B4-2 where:
- (1) a payment has been made to satisfy a condition of an approval under the *Environment Protection and Biodiversity Conservation Act 1999* in relation to the Proposal; and
 - (2) the payment is made for the purpose of counterbalancing impacts of the Proposal on matters of national environmental significance.
- B4-9 The CEO may grant approval to discount the amount payable under condition B4-2, if the CEO is satisfied that the payment will offset the significant residual impacts of the Proposal.
- B4-10 Condition C2 applies to the confirmed Impact Reconciliation Procedure required by condition B4-5 as if it were an environmental management plan.
- B4-11 Failure to implement a confirmed Impact Reconciliation Procedure or submit an Impact Reconciliation Report as required by condition B4-6 represents a non-compliance with these conditions.

PART C: ENVIRONMENTAL MANAGEMENT PLANS AND MONITORING**C1 Environmental Management Plans: Conditions Relating to Approval, Implementation, Review and Publication**

- C1-1 Upon being required to implement an environmental management plan under Part B, the proponent must:
- (1) implement the most recent version of the **confirmed** environmental management plan; and
 - (2) continue to implement the **confirmed** environmental management plan referred to in condition C1-1(1) other than for any period which the **CEO** confirms by notice in writing that it has been demonstrated that the relevant requirements for the environmental management plan have been met, or are able to be met under another statutory decision-making process, in which case the implementation of the environmental management plan is no longer required for that period.
- C1-2 The proponent:
- (1) may review and revise a **confirmed** environmental management plan provided it meets the relevant requirements of that environmental management plan, including any consultation that may be required when preparing the environmental management plan;
 - (2) must review and revise a **confirmed** environmental management plan and ensure it meets the relevant requirements of that environmental management plan, including any consultation that may be required when preparing the environmental management plan, as and when directed by the **CEO**; and
 - (3) must revise and submit to the **CEO** the **confirmed** Environmental Management Plan if there is a material risk that the **outcomes** or **objectives** it is required to achieve will not be complied with, including but not limited to as a result of a change to the Proposal.
- C1-3 Despite condition C1-1, but subject to conditions C1-4 and C1-5, the proponent may implement minor revisions to an environmental management plan if the revisions will not result in new or increased **adverse impacts** to the environment or result in a risk to the achievement of the limits, **outcomes** or **objectives** which the environmental management plan is required to achieve.
- C1-4 If the proponent intends to implement minor revisions to an environmental management plan under condition C1-3, the proponent must provide the **CEO** with the following at least twenty (20) business days before it implements the revisions:
- (1) the revised environmental management plan clearly showing the minor revisions;
 - (2) an explanation of and justification for the minor revisions; and
 - (3) an explanation of why the minor revisions will not result in new or increased **adverse impacts** to the environment or result in a risk to the achievement of the limits, **outcomes** or **objectives** which the environmental management plan is required to achieve.
- C1-5 The proponent must cease to implement any revisions which the **CEO** notifies the proponent (at any time) in writing may not be implemented.
- C1-6 **Confirmed** environmental management plans, and any revised environmental management plans under condition C1-4(1), must be published on the proponent's website and provided to the **CEO** in electronic form suitable for online publication by the Department of Water and Environmental Regulation within twenty (20) business days of being implemented, or being required to be implemented (whichever is earlier).
- C2 Conditions Related to Monitoring**
- C2-1 The proponent must undertake monitoring capable of:
- (1) substantiating whether the Proposal limitations and extents in Part A are exceeded; and

- (2) detecting and substantiating whether the environmental **outcomes** identified in Part B are achieved (excluding any environmental **outcomes** in Part B where an environmental management plan is expressly required to monitor achievement of that **outcome**).

C2-2 The proponent must submit as part of the Compliance Assessment Report required by condition D2-1, a compliance monitoring report that:

- (1) outlines the monitoring that was undertaken during the implementation of the Proposal;
- (2) identifies why the monitoring was capable of substantiating whether the Proposal limitation and extents in Part A are exceeded;
- (3) for any environmental **outcomes** to which condition C2-1(2) applies, identifies why the monitoring was scientifically robust and capable of detecting whether the environmental **outcomes** in Part B are met;
- (4) outlines the results of the monitoring;
- (5) reports whether the Proposal limitations and extents in Part A were exceeded and (for any environmental **outcomes** to which condition C2-1(2) applies) whether the environmental **outcomes** in Part B were achieved, based on analysis of the results of the monitoring; and
- (6) reports any actions taken by the proponent to remediate any potential non-compliance.

C3 Environmental Management Plans: Conditions Relating to Monitoring and Adaptive Management for Outcomes Based Conditions

C3-1 The environmental management plans required under condition B1-2, condition (1), and condition B2-2, must contain provisions which enable the substantiation of whether the relevant **outcomes** of those conditions are met, and must include:

- (1) **threshold criteria** that provide a limit beyond which the environmental **outcomes** are not achieved;
- (2) **trigger criteria** that will provide an early warning that the environmental outcomes are not likely to be met;
- (3) monitoring parameters, sites, control/reference sites, methodology, timing and frequencies which will be used to measure **threshold criteria** and **trigger criteria**. Include methodology for determining alternative monitoring sites as a contingency if proposed sites are not suitable in the future;
- (4) baseline data;
- (5) data collection and analysis methodologies;
- (6) adaptive management methodology;
- (7) **contingency measures** which will be implemented if **threshold criteria** or **trigger criteria** are met; and
- (8) reporting requirements.

C3-2 Without limiting condition C1-1, failure to achieve an environmental outcome, or the exceedance of a **threshold criteria**, regardless of whether threshold **contingency measures** have been or are being implemented, represents a non-compliance with these conditions.

C4 Environmental Management Plans: Conditions Related to Management Actions and Targets for Objective Based Conditions

- C4-1 The environmental management plans required under condition B3-2 must contain provisions which enable the achievement of the relevant objectives of those conditions and substantiation of whether the objectives are reasonably likely to be met, and must include:
- (1) **management actions**;
 - (2) **management targets**;
 - (3) **contingency measures** if **management targets** are not met; and
 - (4) reporting requirements.
- C4-2 Without limiting condition C1-1, the failure to achieve an environmental objective, or implement a **management action**, regardless of whether **contingency measures** have been or are being implemented, represents a non-compliance with these conditions.

PART D: COMPLIANCE, TIME LIMITS, AUDITS AND OTHER CONDITIONS

D1 Non-compliance Reporting

- D1-1 If the proponent becomes aware of a potential non-compliance, the proponent must:
- (1) report this to the **CEO** within seven (7) days;
 - (2) implement **contingency measures**;
 - (3) investigate the cause;
 - (4) investigate environmental impacts;
 - (5) advise rectification measures to be implemented;
 - (6) advise any other measures to be implemented to ensure no further impact;
 - (7) advise timeframe in which contingency, rectification and other measures have and/or will be implemented; and
 - (8) provide a report to the **CEO** within twenty-one (21) days of being aware of the potential non-compliance, detailing the measures required in conditions D1-1(2) to D1-1(7) above.
- D1-2 Failure to comply with the requirements of a condition, or with the content of an environmental management plan required under a condition, constitutes a non-compliance with these conditions, regardless of whether the **contingency measures**, rectification or other measures in condition D1-1 above have been or are being implemented.

D2 Compliance Reporting

- D2-1 The proponent must provide an annual Compliance Assessment Report to the **CEO** for the purpose of determining whether the implementation conditions are being complied with.
- D2-2 Unless a different date or frequency is approved by the **CEO**, the first annual Compliance Assessment Report must be submitted within fifteen (15) months of the date of this Statement, and subsequent reports must be submitted annually from that date.
- D2-3 Each annual Compliance Assessment Report must be endorsed by the proponent's Chief Executive Officer, or a person approved by proponent's Chief Executive Officer to be delegated to sign on the Chief Executive Officer's behalf.

D2-4 Each annual Compliance Assessment Report must:

- (1) state whether each condition of this Statement has been complied with, including:
 - (a) exceedance of any Proposal limits and extents;
 - (b) achievement of environmental **outcomes**;
 - (c) achievement of environmental **objectives**;
 - (d) requirements to implement the content of environmental management plans;
 - (e) monitoring requirements;
 - (f) implement **contingency measures**;
 - (g) requirements to implement adaptive management; and
 - (h) reporting requirements.
- (2) include the results of any monitoring (inclusive of any raw data) that has been required under Part C in order to demonstrate that the limits in Part A, and any **outcomes** or any **objectives** are being met;
- (3) provide evidence to substantiate statements of compliance, or details of where there has been a non-compliance;
- (4) include the corrective, remedial and preventative actions taken in response to any potential non-compliance;
- (5) be provided in a form suitable for publication on the proponent's website and online by the Department of Water and Environmental Regulation; and
- (6) be prepared and published consistent with the latest version of the Compliance Assessment Plan required by condition D2-5 which the **CEO** has confirmed by notice in writing satisfies the relevant requirements of Part C and Part D of this Statement.

D2-5 The proponent must prepare 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 D2-2.

D2-6 The Compliance Assessment Plan must include:

- (1) what, when and how information will be collected and recorded to assess compliance;
- (2) the methods which will be used to assess compliance;
- (3) the methods which will be used to validate the adequacy of the compliance assessment to determine whether the implementation conditions are being complied with;
- (4) the retention of compliance assessments;
- (5) the table of contents of Compliance Assessment Reports, including audit tables; and
- (6) how and when Compliance Assessment Reports will be made publicly available, including usually being published on the proponent's website within sixty (60) days of being provided to the **CEO**.

D3 Contact Details

D3-1 The proponent must 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.

D4 Time Limit for Proposal Implementation

- D4-1 The Significant Amendment described in the proponent's Proposal Content Document (Revision 1, November 2024) must be substantially commenced within five (5) years from the date of this Statement.
- D4-2 The proponent must provide to the **CEO** documentary evidence demonstrating that they have complied with condition D4-1 no later than fourteen (14) days after the expiration of period specified in condition D4-1.
- D4-3 If the Significant Amendment has not been substantially commenced within the period specified in condition D4-1, implementation of the Proposal must not be commenced or continued after the expiration of that period.

D5 Public Availability of Data

- D5-1 Subject to condition D5-2, within a reasonable time period approved by the **CEO** upon the issue of this Statement and for the remainder of the life of the Proposal, the proponent must make publicly available, in a manner approved by the **CEO**, all validated environmental data collected before and after the date of this Statement relevant to the Proposal (including sampling design, sampling methodologies, monitoring and other empirical data and derived information products (e.g. maps)), environmental management plans and reports relevant to the assessment of this Proposal and implementation of this Statement.
- D5-2 If:
 - (1) any data referred to in condition D5-1 contains trade secrets; or
 - (2) any data referred to in condition D5-1 contains particulars of confidential information (other than trade secrets) that has commercial value to a person that would be, or could reasonably be expected to be, destroyed or diminished if the confidential information were published, the proponent may submit a request for approval from the **CEO** to not make this data publicly available and the **CEO** may agree to such a request if the **CEO** is satisfied that the data meets the above criteria.
- D5-3 In making such a request the proponent must provide the **CEO** with an explanation and reasons why the data should not be made publicly available.

D6 Independent Audit

- D6-1 The proponent must arrange for an independent audit of compliance with the conditions of this Statement, including achievement of the environmental outcomes and/or the environmental objectives and/or environmental performance with the conditions of this Statement, as and when directed by the **CEO**.
- D6-2 The independent audit must be carried out by a person with appropriate qualifications who is nominated or approved by the **CEO** to undertake the audit under condition D6-1.
- D6-3 The proponent must submit the independent audit report with the Compliance Assessment Report required by condition D2-1, or at any time as and when directed in writing by the **CEO**. The audit report is to be supported by credible evidence to substantiate its findings.
- D6-4 The independent audit report required by condition D6-1 is to be made publicly available in the same timeframe, manner and form as a Compliance Assessment Report, or as otherwise directed by the **CEO**.

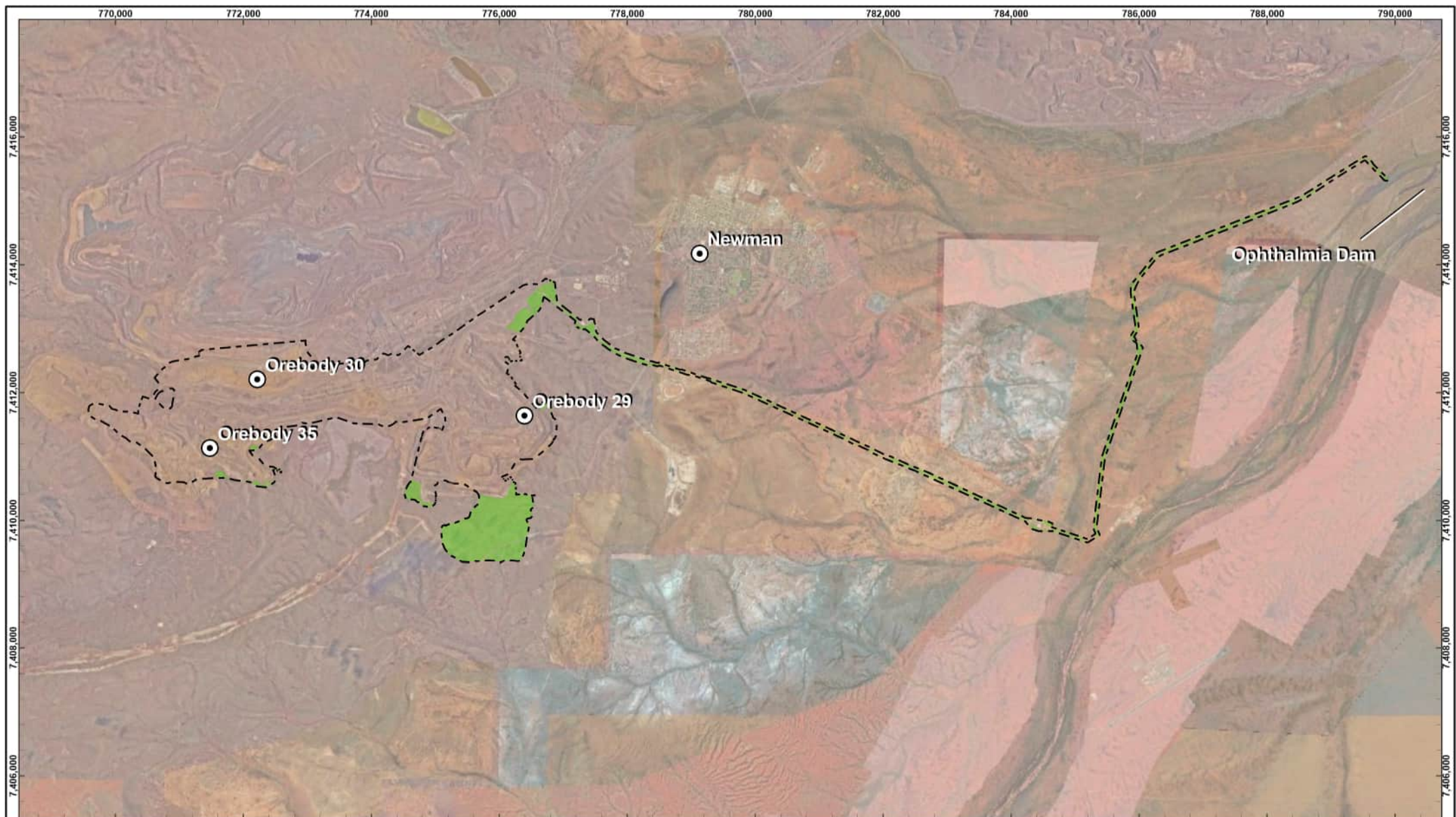
Figures (attached)

Figure 1 Development Envelope and vegetation condition

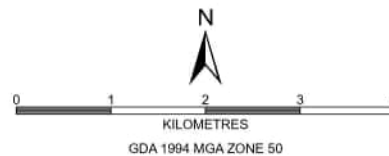
Figure 2 Development Envelope and critical foraging habitat

Schedule 1

Coordinates defining the Development Envelope are provided electronically.



- Development Envelope
- Good to Excellent



BHP

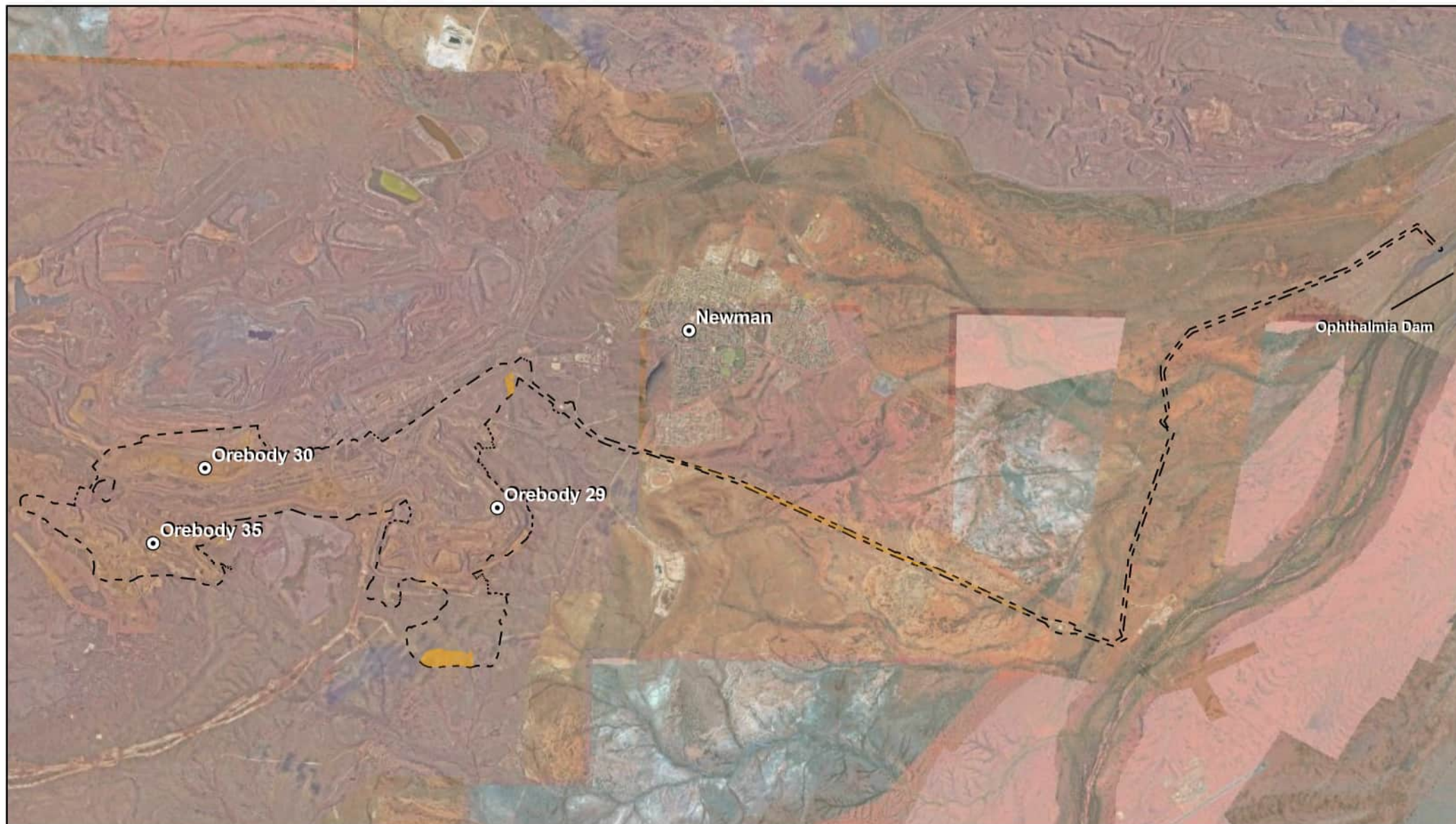
PUBLIC

OREBODY 29/30/35
DEVELOPMENT ENVELOPE
AND VEGETATION CONDITION

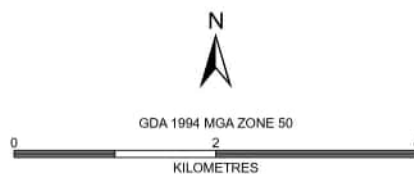
PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:80,000	PREPARED:	GEOMATICS	FIGURE:	1
DATE:	21/11/2024	REQUESTOR:	ENV APPROVALS	NO:	
		REVIEWED:			

A929_089 RevC



- Development Envelope
- Critical Ghost Bat Foraging Habitat



BHP

PUBLIC

**OREBODY 29/30/35
DEVELOPMENT ENVELOPE AND
CRITICAL FORAGING HABITAT
PLANNING & STANDARDS - IRON ORE**

SCALE @ A4:	1:75,000	PREPARED: GEOMATICS	FIGURE: 2
DATE:	21/11/2024	REQUESTOR: ENV APPROVALS	NO: A929_090_RevB
		REVIEWED:	

Appendix 4 Inland Waters study reports

The following studies undertaken to support the assessment of Inland Waters for the Proposal are provided separately:

- *Orebody 29/30/35 Significant Amendment: Surface Water Impact Assessment* (BHP 2024b)
- *Orebody 29, 30 and 35 Detailed Hydrogeological Assessment* (BHP 2024c)
- *Orebody 29/30/35 Significant Amendment: Groundwater Impact Assessment* (BHP 2024d)
- *Orebody 29/30/35/WR dewatering and per- and polyfluoroalkyl substances mixing assessment* (WSP Golder 2023)
- *OB29 Hydraulic Test 2023-2024: Hydraulic test analysis and per- and polyfluoroalkyl substances (PFAS) mixing assessment* (WSP 2024)
- *Eastern Pilbara Hub Water Balance – 2024 Forecast Surplus Discharge Assessment* (EMM 2024)
- *Orebody 29/30/35 Significant Amendment: Ophthalmia Dam surplus water impact assessment* (BHP 2024e)

Appendix 5 Eastern Pilbara Water Resource Management Plan

The *Eastern Pilbara Water Resource Management Plan* (Version 8.1, November 2024) (BHP 2024g) is provided separately.

Appendix 6 Orebody 29/30/35 Water (PFAS) Management Plan

The *Orebody 29/30/35 Water (PFAS) Management Plan* (Version 1, Final, November 2024) (BHP 2024h) is provided separately.

Appendix 7 Orebody 29/30/35 Mine Closure Plan

The *Orebody 29/30/35 Mine Closure Plan* (Revision 7, December 2024) (BHP 2024i) is provided separately.

Appendix 8 Flora and Vegetation survey summary

Table A8 presents a summary of Flora and Vegetation information used in the assessment of the Proposal.

Table A8: Flora and Vegetation studies and surveys

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (Referred to in survey report and applicable at time of survey)	Vegetation	Significant Flora ¹	Introduced Flora	Attached
OB29, 30 and 35 Expansion and Newman Surplus Water Reconnaissance Flora and Vegetation Assessment (Spectrum 2024)	Reconnaissance & Targeted	21-27 Mar 2024	67 releves	Environmental Factor Guideline Flora and Vegetation (EPA 2016) Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)	Nine vegetation associations across five landforms None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act Two Priority flora were recorded: <i>Ipomoea racemigera</i> (P2) and <i>Eremophila naaykensis</i> (P3)	Nine introduced species were recorded	Appendix 9
Western Ridge Pipeline Reconnaissance Flora and Vegetation Survey (Biologic 2022)	Reconnaissance & Targeted	24-31 Mar 2021 12-14 Mar 2022	148 releves	Environmental Factor Guideline Flora and Vegetation (EPA 2016) Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)	29 vegetation associations classified into 18 broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act Two Priority flora were recorded: <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) (P3) and <i>Ipomoea racemigera</i> (P2)	11 introduced species were recorded	Appendix 9
Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey (Biologic 2022)	Reconnaissance & Targeted	24-31 Mar 2021	21 releves	Environmental Factor Guideline Flora and Vegetation (EPA 2016) Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)	12 vegetation associations classified into seven broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	Four introduced species were recorded	Appendix 9
OB32 Surplus Water and Homestead Creek Wetting Front Detailed Flora and Vegetation Assessment (Spectrum 2022)	Detailed	3-9 Mar 2021 30 Aug-4 Sep 2021 17-18 Feb 2022	51 quadrats 59 releves	Environmental Factor Guideline Flora and Vegetation (EPA 2016) Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)	13 vegetation associations classified into seven broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act Three Priority flora were recorded: <i>Crotalaria smithiana</i> (P3), <i>Gymnanthera cunninghamii</i> (P3) and <i>Eremophila youngii</i> subsp. <i>lepidota</i> (P4)	12 introduced species were recorded, one listed as a Declared Pest under the BAM Act: <i>*Calotropis procera</i>	Not attached
Western Ridge Single Season Detailed Flora and Vegetation Survey (Biologic 2021)	Detailed	16-22 Apr 2020	80 quadrats 1 releve	Environmental Factor Guideline Flora and Vegetation (EPA 2016) Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)	21 vegetation associations classified into 10 broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act Four Priority flora were recorded: <i>Isotropis parviflora</i> (P3), <i>Eremophila naaykensis</i> (P3), <i>Gymnanthera cunninghamii</i> (P3) and <i>Indigofera gilesii</i> (P3)	11 introduced species were recorded	Not attached
Targeted Flora Survey <i>Acacia</i> sp. East Fortescue (Onshore Environmental 2015)	Targeted	25-31 Mar 2015 2-6 Aug 2015	N/A	None reported	Not recorded	Three populations of <i>Acacia corusca</i> (P1) (previously known as <i>A. sp. East Fortescue</i>) were recorded	Not recorded	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (Referred to in survey report and applicable at time of survey)	Vegetation	Significant Flora ¹	Introduced Flora	Attached
Flora and Vegetation and Vertebrate Fauna Review Mt Whaleback AML 7/244 (Onshore Environmental 2013)	Desktop	N/A	Consolidation of results from 40 previous flora and vegetation surveys	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	20 vegetation associations classified into six broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act Three Priority flora were recorded: <i>Lepidium catapycnon</i> (P4), <i>Euphorbia inappendiculata</i> (P2) and <i>Eremophila magnifica</i> subsp. <i>magnifica</i> (P4)	19 introduced species were recorded	Not attached
Orebody 37 Flora and Vegetation Assessment (Syrinx Environmental 2012)	Detailed	15-28 Mar 2012	30 quadrats 16 releves	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	13 vegetation associations classified into eight broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	18 introduced species were recorded	Not attached
Newman Power Line Corridor Level 1 Flora and Fauna Survey (Eco Logical 2011)	Reconnaissance	15-17 Aug 2011	14 releves	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	14 vegetation associations classified into eight broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	Three introduced species were recorded	Not attached
Orebody 35 and Surrounds Flora and Vegetation Survey (GHD 2011)	Detailed	20-28 May 2010 2-6 Aug 2010	88 quadrats 36 releves	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	22 vegetation associations classified into 10 broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Pristine	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act Two Priority flora were recorded: <i>Indigofera gilesii</i> (P3), and <i>Gymnanthera cunninghamii</i> (P3)	13 introduced species were recorded	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (Referred to in survey report and applicable at time of survey)	Vegetation	Significant Flora ¹	Introduced Flora	Attached
Mt Whaleback East Flora, Vegetation and Fauna Assessment (ENV Australia 2011)	Detailed	17-21 Jan 2011	15 quadrats 3 releves	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	Eight vegetation associations classified into two broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Pristine	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	Seven introduced species were recorded	Not attached
Orebody 35 Vegetation Clearing Permit Area Flora and Fauna Assessment (ENV Australia 2010)	Detailed	11-14 Dec 2009	28 quadrats 1 releve	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	10 vegetation associations classified into three broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Pristine	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	Three introduced species were recorded	Not attached
Flora and Vegetation Survey and Fauna Assessment Mt Whaleback Mine Site (Onshore Environmental 2009)	Detailed	22-25 Jun 2009	30 quadrats	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	Nine vegetation associations classified into seven broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	17 introduced species were recorded	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (Referred to in survey report and applicable at time of survey)	Vegetation	Significant Flora ¹	Introduced Flora	Attached
Newman Power Network Level 2 Flora and Level 1 Fauna Survey (Biologic 2009)	Detailed	6-16 Jul 2009	Transects	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	10 vegetation associations classified into nine broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Completely Degraded to Good	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	14 introduced species were recorded	Not attached
Newman Water Pipeline Enhancement Project: Vegetation and Flora Survey (Ecologia Environmental 2008)	Reconnaissance	18-23 Apr 2008	69 quadrats 12 transects	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	14 vegetation associations classified into eight landform units None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Degraded to Pristine	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act One Priority flora was recorded: <i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431) (P3)	14 introduced species were recorded	Not attached
RGP4 Newman Hub Topsoil Stockpile and Borrow Areas for Construction Flora and Vegetation Assessment (ENV Australia 2006)	Detailed	66-20 Oct 2006	41 quadrats 4 transects	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	42 vegetation associations classified from eight broad landforms None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Very Poor to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act One Priority flora was recorded: <i>Acacia kenneallyi</i> (P3) ²	13 introduced species were recorded	Not attached
RGP4 Newman Hun Infrastructure Area Flora and Vegetation Assessment (ENV Australia 2006)	Reconnaissance	25-29 Sep 2006	9 quadrats 1 releve	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	11 vegetation associations identified across seven broad landforms None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Very Poor to Very Good	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	Eight introduced species were recorded	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (Referred to in survey report and applicable at time of survey)	Vegetation	Significant Flora ¹	Introduced Flora	Attached
Mount Whaleback Flora and Vegetation Assessment Phase III – Summary Report (ENV Australia 2006)	Detailed	2-13 Aug 2006	81 quadrats 1 releve	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	Nine vegetation associations classified into seven broad floristic formations None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Degraded to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act One Priority flora was recorded: <i>Lepidium catapycnon</i> (P4)	Seven introduced species were recorded	Not attached
BHPBIO Rail Sidings Flora and Vegetation Assessment (Ecologia Environmental 2005)	Reconnaissance	21-24 Mar 2005	Transects	None reported	Broad vegetation associations and condition reported	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	Four introduced species were recorded	Not attached
Western Ridge Exploration Project Biological Survey (Ecologia Environmental 2005)	Reconnaissance	25-29 May 2005	7 quadrats	Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	Three vegetation associations classified from four major landforms None aligned with Federal or State listed TECs or State listed PECs Vegetation condition ranged from Very Good to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	No introduced species were recorded	Not attached
BHP Billiton Ongoing Works Newman Hub (Ecologia Environment 2004)	Targeted	22 Jun 2004	Transects	Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No. 51 (EPA 2004)	Five vegetation associations identified None aligned with Federal or State listed TECs or State listed PECs Vegetation condition not reported	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	Four introduced species were recorded	Not attached
Baseline Biological and Soil Survey and Mapping for ML244SA West of the Fortescue River (Biota Environmental Sciences 2001)	Detailed	28 Sep - 8 Oct 2000	60 quadrats	None reported	27 vegetation associations classified from four major landforms None aligned with Federal or State listed TECs or State listed PECs Vegetation condition was generally Very Good to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act One Priority flora was recorded: <i>Lepidium catapycnon</i> (P4)	14 introduced species were recorded	Not attached
Orebody 30 and Orebody 35 Soil and Biological Survey (Halpern Glick Maunsell 1999)	Reconnaissance	23-24 Aug 1999	10 quadrats	None reported	Five vegetation associations identified TECs and PECs not reported Vegetation condition was generally described as Moderate to Excellent	No plant taxa gazetted as Threatened Flora pursuant to the BC Act or listed under EPBC Act No Priority flora were recorded	Four introduced species were recorded	Not attached

1. Based on current conservation status of taxa

2. This species only occurs in the Kimberley bioregion and is likely to be a mis-identification

Appendix 9 Flora and Vegetation survey reports

The following studies undertaken to support the assessment of Flora and Vegetation for the Proposal are provided:

- *OB29, 30 and 35 Expansion and Newman Surplus Water Reconnaissance Flora and Vegetation Survey* (Spectrum 2024)
- *Western Ridge Pipeline Reconnaissance Flora and Vegetation Survey* (Biologic 2022a)
- *Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey* (Biologic 2022b)

Appendix 10 Terrestrial Fauna survey summary

Table A10 presents a summary of Terrestrial Fauna information used in the assessment of the Proposal.

Table A10: Summary of Terrestrial Fauna studies and surveys

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (applicable at time of survey)	Habitats	Significant Fauna ¹	Appendix
Vertebrate Fauna							
OB29, 30 and 35 Expansion and Newman Surplus Water Targeted Significant Fauna Survey (Astron 2024)	Targeted	26 Sep - 5 Oct 2023	69 habitat assessments Survey sites: 16 motion sensor camera sites, eight acoustic bat recorder sites, two autonomous recording sites, four plots/transect searches, cave assessments and other visual observations	Environmental Factor Guideline Terrestrial Fauna (EPA 2016) Technical Guidance Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020)	Eleven broad fauna habitat types identified: Stony Plain, Sandy/ Stony Plain, Undulating Low Hills, Hillcrest/ Hillslope, Drainage Area/ Floodplain, Major Drainage Line, Mulga Woodland, Wetland, Minor Drainage Line, Medium Drainage Line, and Breakaway/ Cliff	No Threatened fauna listed under the EPBC Act or the BC Act, and no Priority fauna species recorded	Appendix 11
Western Ridge Paddy Bore Area Vertebrate Fauna Survey Memo (Biologic 2022)	Basic & Targeted	24-31 Mar 2021	21 habitat assessments Survey sites: two acoustic bat recorder sites, three motion sensor camera sites, one plot search, one acoustic recording site and other visual observations	Technical Guidance Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020)	Five broad fauna habitat types identified: Stony Plain, Drainage Area/ Floodplain, Mulga Woodland, Hillcrest/ Hillslope, and Breakaway/ Cliff	No Threatened fauna listed under the EPBC Act or the BC Act One Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4)	Appendix 11
Western Ridge Pipelines Vertebrate Fauna Survey (Biologic 2022)	Basic & Targeted	24-31 Mar 2021 9-19 Mar 2022	92 habitat assessments Survey sites: two nocturnal surveying sites, 13 acoustic recorder sites, one motion sensor camera site, six plot search sites, 15 acoustic recording sites, three water feature assessments, one eDNA sampling site and other visual observations	Technical Guidance Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020)	Six broad fauna habitat types identified: Stony Plain, Drainage Area/ Floodplain, Mulga Woodland, Hillcrest/ Hillslope, Major Drainage Line, and Medium Drainage Line	One Threatened fauna species listed under the EPBC Act and the BC Act recorded: Pilbara Olive Python (<i>Liasis olivaceus barroni</i>) (VU) One Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4)	Appendix 11
Orebody 32 Surplus Water Targeted MNES Vertebrate Fauna Survey (Biota Environmental Science 2022)	Targeted	7-16 Apr 2021 13-23 Sep 2021 13-15 July 2021 9-11 Feb 2022	62 habitat assessments Survey sites: 22 targeted search sites, eight nocturnal sites, eight motion sensor camera sites, 19 echolocation bat recorder sites, eight acoustic call recorder sites, active foraging and other visual observations	Technical Guidance Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020)	Four broad fauna habitat types identified: Vegetated sandy/ stony drainage systems, Sandy <i>Triodia</i> plains, Floodplains open shrubland with patches of Mulga, and Undulating low hills and ironstone outcrops	Three Threatened fauna species listed under the EPBC Act and/or the BC Act recorded: Pilbara Leaf-nosed Bat (<i>Rhinioncteris aurantia</i> Pilbara form) (VU), Grey Falcon (<i>Falco hypoleucos</i>) (VU), and Fork-tailed Swift (<i>Apus pacificus</i>) (MI) No Priority fauna species recorded	Not attached
Western Ridge Matters of National Environmental Significance Fauna Study (Biologic 2021)	Targeted	24-31 Aug 2020 14-15 Sep 2020 9-14 Oct 2020 26-30 Nov 2020	110 habitat assessments Survey sites: 10 motion sensor camera sites, 54 ultrasonic bat recorder sites (21 sites within the Survey Area and 33 regional sites), seven eDNA sample sites, targeted searches (diurnal and nocturnal), cave assessments, and scat monitoring and analysis	Technical Guidance Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020)	Seven broad fauna habitat types identified: Breakaway/ Cliff, Drainage Area/ Floodplain, Gorge/ Gully, Mulga Woodland, Hillcrest/ Hillslope, Minor Drainage Line, and Stony Plain	Two Threatened fauna species listed under the EPBC Act and the BC Act recorded: Ghost Bat (<i>Macroderma gigas</i>) (VU) and Pilbara Olive Python (<i>Liasis olivaceus barroni</i>) (VU) One Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4)	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (applicable at time of survey)	Habitats	Significant Fauna ¹	Appendix
Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2020)	Targeted	11-16 Mar 2020	52 habitat assessments Survey sites: five motion sensor camera sites, 17 ultrasonic bat recorder sites, 12 acoustic call recorder sites, targeted searches (diurnal and nocturnal), cave assessments and scat monitoring, water feature assessments and eight eDNA sampling sites	Technical Guidance Sampling Methods for Terrestrial Vertebrate Fauna (EPA 2016) Technical Guidance Terrestrial Fauna Surveys (EPA 2016)	Seven broad fauna habitat types identified: Hillcrest/ Hillslope, Stony Plain, Mulga Woodland, Drainage Area/ Floodplain, Gorge/ Gully, Minor Drainage Line and Breakaway/ Cliff	Four Threatened fauna species listed under the EPBC Act and/or the BC Act recorded: Ghost Bat (<i>Macroderma gigas</i>) (VU), Pilbara Olive Python (<i>Liasis olivaceus barroni</i>) (VU), Northern Quoll (<i>Dasyurus hallucatus</i>) (EN), and Peregrine Falcon (<i>Falco peregrinus</i>) (OS) One Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4)	Not attached
Ophthalmia Dam Avian Fauna Survey (MWH 2015)	Targeted	7-12 Dec 2014 12-17 Mar 2015	32 habitat assessments Survey sites: nine point-count census and systematic search sites, nocturnal spotlight searches including call playback, targeted searches, and opportunistic records	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004) Technical Guide Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010)	Ten broad fauna habitat types identified: Mulga Woodland, Drainage Area, Sandy Plain, Major Drainage Line, Low Hills, Stony Plain, Hillcrest/ Hillslope, Artificial habitats, Minor Drainage Line and Breakaway/ Cliff	Thirteen Threatened fauna species listed under the EPBC Act and/or the BC Act recorded: Curlew Sandpiper (<i>Calidris ferruginea</i>) (CR & MI), Common Greenshank (<i>Tringa nebularia</i>) (EN), Black-tailed Godwit (<i>Limosa limosa</i>) (EN), Sharp-tailed Sandpiper (<i>Calidris acuminata</i>) (VU), and Migratory birds, Little Ringed Plover (<i>Charadrius dubius</i>), Barn Swallow (<i>Hirundo rustica</i>), Common Sandpiper (<i>Actitis hypoleucos</i>), Pectoral Sandpiper (<i>Calidris melanotos</i>), Long-toed Stint (<i>Calidris subminuta</i>), Ruff (<i>Philomachus pugnax</i>), Wood Sandpiper (<i>Tringa glareola</i>), Marsh Sandpiper (<i>Tringa stagnatilis</i>) and Glossy Ibis (<i>Plegadis falcinellus</i>) No Priority fauna species recorded	Not attached
Flora and Vegetation and Vertebrate Fauna Review Mt Whaleback AML 7/224 (Onshore Environmental 2013)	Desktop	N/A	Consolidation of results from 27 previous vertebrate fauna surveys	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004) Technical Guide Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010)	Seven broad fauna habitat types identified: Hillcrest/ Hillslope, Gorge/ Gully, Major Drainage Line, Drainage Area, Mulga Woodlands, Sandy Plains and Rehabilitated Areas/ Artificial habitats	Eight Threatened fauna species listed under the EPBC Act and/or the BC Act previously recorded: Ghost Bat (<i>Macroderma gigas</i>) (VU), Northern Quoll (<i>Dasyurus hallucatus</i>) (EN), Common Greenshank (<i>Tringa nebularia</i>) (EN), Peregrine Falcon (<i>Falco peregrinus</i>) (OS), and Migratory birds, Wood Sandpiper (<i>Tringa glareola</i>), Marsh Sandpiper (<i>Tringa stagnatilis</i>), Common Redshank (<i>Tringa tetanus</i>) and Common Sandpiper (<i>Actitis hypoleucos</i>) Two Priority fauna species previously recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4) and Long-tailed Dunnart (<i>Sminthopsis longicaudata</i>) (P4)	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (applicable at time of survey)	Habitats	Significant Fauna ¹	Appendix
Orebody 37 Level 1 Vertebrate Fauna Assessment (Eco Logical 2012)	Basic	15-16 Mar 2012 23-25 Apr 2012	15 habitat assessments Survey sites: three motion sensor camera sites, two acoustic bat recorder sites, active foraging/searches and opportunistic searches	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004) Technical Guide Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010)	Five broad fauna habitat types identified: Plains, Stony gentle slopes and low hills, Stony/ rocky hill tops and ridges, Rivers and major creek lines, and Broad alluvial lowlands	No Threatened fauna listed under the EPBC Act or the BC Act, and no Priority fauna species recorded	Not attached
Newman Power Line Corridor Level 1 Flora and Fauna Survey (Eco Logical 2011)	Basic	15-17 Aug 2011	Habitat assessments and opportunistic searches	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004) Technical Guide Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010)	Five broad fauna habitat types identified: Plains of open mixed <i>Acacia</i> woodland over mixed low shrubs and <i>Triodia</i> hummock grasses on red loamy clay, Plains of open mixed <i>Eucalyptus</i> and <i>Acacia</i> woodland over mixed low shrubs and <i>Triodia</i> hummock grasses on red loamy clay, Stony pebble plains with sparse <i>Acacia</i> shrubs and occasional mixed low shrubs, Stony and rocky hill slopes and rises with poorly formed shallow clay soils supporting mixed open shrublands with <i>Triodia</i> and occasional <i>Eucalyptus</i> trees, and Creek lines with open River Red Gums, open <i>Acacia</i> woodland over mixed low native and exotic shrubs and grasses	No Threatened fauna listed under the EPBC Act or the BC Act, and no Priority fauna species recorded	Not attached
Mt Whaleback East Flora, Vegetation and Fauna Assessment (ENV Australia 2011)	Basic	17-21 Jan 2011	18 habitat assessments Survey sites: four acoustic bat recorder sites, and opportunistic searches	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004) Technical Guide Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010)	Five broad fauna habitat types identified: Alluvial Plain, Breakaway, Low Hill, Hill Crest, and Hill Slope	No Threatened fauna listed under the EPBC Act or the BC Act, and no Priority fauna species recorded	Not attached
Orebody 35 and Western Ridge Vertebrate Fauna Survey (Biologic 2011)	Detailed	4-15 Mar 2010 27 Jul - 6 Aug 2010	25 habitat assessments Survey sites: six trapping sites (each comprising 10 pitfall traps, 20 funnel traps, 20 Elliott traps, two cage traps), four hair trap sites, bird census sites, 20 acoustic bat recorder sites, 16 motion sensor camera sites, targeted searches (diurnal and nocturnal), and other visual observations	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004)	Eight broad fauna habitat types identified: Ironstone Hills and Ridges, Stony lower slopes and plains below hill systems, Basalt hills lower slopes and mine stony plains, Mulga Woodland, Major Drainage Line, Valley and Gully systems, Gorge systems, and Artificial Water Storages	Five Threatened fauna species listed under the EPBC Act and/or the BC Act recorded: Ghost Bat (<i>Macroderma gigas</i>) (VU), Pilbara Olive Python (<i>Liasis olivaceus barroni</i>) (VU), Common Greenshank (<i>Tringa nebularia</i>) (EN), Peregrine Falcon (<i>Falco peregrinus</i>) (OS), and Wood Sandpiper (<i>Tringa glareola</i>) (MI) Two Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4), and Gane's blind snake (<i>Anilius ganei</i>) (P1)	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (applicable at time of survey)	Habitats	Significant Fauna ¹	Appendix
Orebody 35 Vegetation Clearing Permit Area Flora and Fauna Assessment (ENV Australia 2010)	Basic	11-14 Dec 2009	Habitat assessments and opportunistic searches	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004)	Seven broad fauna habitat types identified: gully, breakaway, alluvial plain, scree slopes, drainage line, hill crest, and cleared/developed	No Threatened fauna listed under the EPBC Act or the BC Act One Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4)	Not attached
Newman Power Network Level 2 Flora and Level 1 Fauna Survey (Biologic 2009)	Basic	6-16 Jul 2009	Habitat assessments, acoustic bat recorder sites, bird census sites, and opportunistic searches	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004)	One broad fauna habitat type identified: degraded grassland with occasional intrusion of spinifex and shrubs	No Threatened fauna listed under the EPBC Act or the BC Act, and no Priority fauna species recorded	Not attached
Flora and Vegetation Survey and Fauna Assessment Mt Whaleback Mine Site (Onshore Environmental 2009)	Basic	22-25 Jun 2009	Habitat assessments, acoustic bat recorder sites, bird census sites, and opportunistic searches	Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas, Position Statement No. 2 (EPA 2000) Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004)	Five broad fauna habitat types identified: Riverine, Spinifex Sandplain, Spinifex Hilltop/ Slopes, Mulga Woodland, and Rehabilitation areas	No Threatened fauna listed under the EPBC Act or the BC Act, and no Priority fauna species recorded	Not attached
Mount Whaleback Fauna Assessment Survey Phase III (ENV Australia 2006)	Detailed	1-11 Sep 2006	Habitat assessments Survey sites: six trapping sites (comprising pit traps, funnel traps, Elliot traps and cage traps), 11 acoustic bat recorder sites, cave searches, bird transects, targeted searches (diurnal and nocturnal), and opportunistic searches	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004)	Five broad fauna habitat types identified: Range Crests, Valley Plains, Riverine, Range Slopes, Gorge/ Gully	No Threatened fauna listed under the EPBC Act or the BC Act, and no Priority fauna species recorded	Not attached
Western Ridge Exploration Project Biological Survey (Ecologia Environmental 2005)	Basic	25-29 May 2005	Survey sites: Seven fauna sites comprising bird census, hand foraging and opportunistic searches, and nocturnal searches	Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004)	Two broad fauna habitat types identified: <i>Acacia</i> and <i>Eucalyptus</i> ridgelines, and <i>Acacia</i> and <i>Eucalyptus</i> drainage gullies	No Threatened fauna listed under the EPBC Act or the BC Act One Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4)	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (applicable at time of survey)	Habitats	Significant Fauna ¹	Appendix
Baseline Biological and Soil Survey and Mapping for ML244SA West of the Fortescue River (Biota Environmental Sciences 2001)	Basic	28 Sep - 1 Oct 2000	Habitat assessments, and targeted searches	Survey undertaken prior to EPA guidelines being available	Eight broad fauna habitat types identified: Creek lines and Tributaries, Minor Drainages and Gullies, Alluvial Flats, Gorges and Gullies, Calcrete Plains, Mulga Woodland, Hills and Footslopes, and Sand plain	Two Threatened fauna species listed under the EPBC Act and/or the BC Act recorded: Pilbara Olive Python (<i>Liasis olivaceus barroni</i>) (VU), and Peregrine Falcon (<i>Falco peregrinus</i>) (OS) Two Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4) and Long-tailed Dunnart (<i>Sminthopsis longicaudata</i>) (P4)	Not attached
Orebody 30 and Orebody 35 Soil and Biological Survey (Halpern Glick Maunsell 1999)	Basic	23-24 Aug 1999	Habitat assessments, and targeted searches	Survey undertaken prior to EPA guidelines being available	Five broad fauna habitat types identified: Riverine, Mulga Woodland, Gorge, Scree Slope, and Spinifex Steppe	No Threatened fauna listed under the EPBC Act or the BC Act, and no Priority fauna species recorded	Not attached
Whaleback Fauna Monitoring Programme: Baseline Sampling 1997 – 1998 (Ecologia Environmental 1998)	Detailed	28 Jul - 14 Aug 1997 1-30 Mar 1998	Survey sites: 12 trapping sites (comprising pit traps and Elliot traps) each phase, 12 microhabitat search sites and bird census each phase, 11 nocturnal searches, seven mist netting and opportunistic searches	Survey undertaken prior to EPA guidelines being available	Seven broad fauna habitat types identified: Riverine, Low Shrubland, Scree Slope, Samphire Plain, Gorge, Mulga Woodland, and Spinifex Steppe	No Threatened fauna listed under the EPBC Act or the BC Act Two Priority fauna species recorded: Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4) and Long-tailed Dunnart (<i>Sminthopsis longicaudata</i>) (P4)	Not attached
Short-range Endemic Invertebrate Fauna							
OB29, 30, 35 Expansion Short-range Endemic Invertebrate Fauna Survey (Biologic 2024)	Detailed	26-28 Apr 2023 1-3 Nov 2023	37 habitat assessment sites Survey sites: 25 sites comprising active foraging, leaf litter and soil sifting, and/or borrow excavation	Environmental Factor Guideline Terrestrial Fauna (EPA 2016) Technical Guidance Sampling of Short-range Endemic Invertebrate Fauna (EPA 2016)	Five broad fauna habitat types identified: Undulating Low Hills, Drainage Area/Floodplain, Medium Drainage Line, Hillcrest/ Hillslope and Breakaway/ Cliff Hillcrest/ Hillslope assessed as Moderate suitability and Breakaway/ Cliff assessed as High suitability	No confirmed SRE taxa Thirteen potential SRE taxa: Barychelidae sp. indet., Buddelundiinae sp. indet., <i>Buddelundia</i> sp. 'OBE001', <i>B.</i> sp. 'OBE004', <i>B.</i> sp. 'Biologic-ISOP138', <i>B.</i> sp. 'Biologic-ISOP139', <i>B.</i> sp. 'SJ_10ts_DNA', <i>Cryptops</i> sp. 'Biologic-CHIL063', Geophilidae sp. 'Biologic-CHIL064', <i>Indolpium</i> sp. indet., <i>Lychas</i> sp. indet., Olpiidae sp. 'Biologic-PSEU164', and Olpiidae sp. 'Biologic-PSEU165'	Appendix 11
Western Ridge Short-range Endemic Invertebrate Fauna Survey (Bennelongia 2021)	Detailed	12-21 Feb 2020	82 habitat assessment sites Survey sites: 47 active foraging and litter/ soil sifting sites, and 13 dry pitfall trapping sites	Environmental Factor Guideline Terrestrial Fauna (EPA 2016) Technical Guidance Sampling of Short-range Endemic Invertebrate Fauna (EPA 2016)	Seven broad fauna habitat types identified: Stony Plain, Drainage area/ Flood plain, Minor Drainage Line, Hillcrest/ Hillslope, Mulga Woodland, Gorge/ Gully and Breakaway/ Cliff Drainage Areas and Mulga Woodland assessed as Moderate suitability, and Hillcrest/ Hillslope, Gorge/ Gully and Breakaway/ Cliff assessed as High suitability	One confirmed SRE taxa: <i>Antichiropus verutus</i> Nineteen potential SRE taxa: <i>Acanthodillo</i> 'BIS379', <i>Afrosteronophorus</i> 'BPS268', <i>Amblyolpium</i> 'BPS273', Atemnidae 'BPS270', <i>Austrochthonius</i> 'BPS264', <i>Buddelundia</i> 'BIS374', <i>B.</i> 'BIS376', <i>B.</i> 'BIS377', <i>B.</i> 'BIS380', <i>B.</i> 'BIS381', ?Cheliferidae 'BPS279', <i>Cryptops</i> 'BSCOL067', Garypinidae 'BPS263', <i>Hanseniella</i> 'BSYM099', <i>Lychas</i> 'BSCO057', <i>Synsphyronus</i> 'BPS258', <i>Trogarmadillo</i> 'ISO005', <i>T.</i> 'BIS383', and <i>Urodacus</i> 'BSCO045'	Not attached

Report	Survey Level	Survey Timing	Survey Effort	EPA Guidance (applicable at time of survey)	Habitats	Significant Fauna ¹	Appendix
OB35 Short-range Endemic Invertebrate Survey Report (Biologic 2012)	Detailed		30 habitat assessment sites Survey sites: 30 site comprising active foraging, leaf litter searching and/or soil searching	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Sampling of Short Range Endemic Fauna for Environmental Impact Assessment in Western Australia, No. 20. (EPA 2009) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004)	Two broad fauna habitat types targeted for surveying: South facing ridges and hills, and Gully Habitats assessed as low level of prospectivity	No confirmed or potential SRE taxa	Not attached
Assessment of Terrestrial Short-range Endemic Invertebrates in the OB35 – Western Ridge Area near Newman, Western Australia (Australian Museum Business Services 2011)	Detailed	13-15 Mar 2010 13-20 Aug 2010	30 habitat assessment sites Survey sites: across the two surveys comprised 20 wet pitfall trap sites, 15 dry pitfall trap sites, 50 diurnal search sites, 50 soil sample sites	Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002) Guidance for the Assessment of Environmental Factors: Sampling of Short Range Endemic Fauna for Environmental Impact Assessment in Western Australia, No. 20. (EPA 2009) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56 (EPA 2004)	Three broad fauna habitat types identified: Gorges/deep gullies, Steep south to east facing slopes, and Open floodplain Steep south to east facing slopes assessed as High suitability	Two confirmed SRE taxa: <i>Antichiropus verutus</i> and <i>A. cristatus</i> One potential SRE taxa: <i>Austrochthonius</i> sp. indet.	Not attached

1. Based on current conservation status of taxa

Appendix 11 Terrestrial Fauna survey reports

The following studies undertaken to support the assessment of Terrestrial Fauna for the Proposal are provided:

- *OB29, 30 and 35 Expansion and Newman Surplus Water Targeted Significant Fauna Survey* (Astron 2024)
- *Western Ridge Pipelines Vertebrate Fauna Survey* (Biologic 2022c)
- *Western Ridge Project Paddy Bore Area Vertebrate Fauna Assessment* (Biologic 2022d)
- *OB29, 30, 35 Expansion Short-range Endemic Invertebrate Fauna Survey* (Biologic 2024a)

Appendix 12 Subterranean Fauna survey reports

The following studies undertaken to support the assessment of Subterranean Fauna for the Proposal are provided:

- *Orebody 29, 30, 35 Expansion Stygofauna Desktop Assessment and Survey* (Bennelongia 2024)
- *Orebody 29/30/35 Significant Amendment: troglafauna supplementary information* (BHP 2024j)
- *Ethel Gorge TEC Stygofauna Monitoring 2022/2023* (Stantec 2024)
- *Eastern Ridge and Jimblebar Stygofauna Monitoring 2021/2022* (Stantec 2022)
- *Western Ridge Subterranean Fauna Survey and Habitat Assessment* (Bennelongia 2021)

Appendix 13 Schedule 3: Orebody 29/30/35 in Pilbara Regional Greenhouse Gas Management Plan

The *Schedule 3: Orebody 29/30/35* (Version 1, November 2024) in *Pilbara Regional Greenhouse Gas Management Plan* (Version 1, December 2023) (BHP 2024k) is provided separately for information only.

Appendix 14 Review of Schedule 3: Orebody 29/30/35 in Pilbara Regional Greenhouse Gas Management Plan

The *Review of the OB29/30/35 Greenhouse Gas Management Plan* (in the BHP Pilbara Regional Greenhouse Gas Management Plan) (November 2024) (KPMG 2024) is provided separately.

Appendix 15 Orebody 29/30/35 Significant Amendment Air Quality Assessment

The following studies undertaken to support the assessment of Air Quality for the Proposal are provided:

- *Whaleback OB29/30/35 Significant Amendment Air Quality Assessment* (Version 3, October 2024) (ETA 2024)

Appendix 16 IBSA data

BHP has provided biodiversity data and reports as part of the IBSA data package, prepared consistent with the EPA's *Instructions for the preparation of data packages for the Index of Biodiversity Surveys for Assessments (IBSA)* (EPA 2021d).

BHP has provided the following IBSA data packages via the online IBSA Submission portal:

- *OB29, 30 and 35 Expansion and Newman Surplus Water Reconnaissance Flora and Vegetation Survey* (Spectrum 2024) - IBSA-2024-0475 (submitted November 2024)
- *OB29, 30 and 35 Expansion and Newman Surplus Water Targeted Significant Fauna Survey* (Astron 2024) - IBSA-2024-0300 (submitted July 2024)
- *OB29, 30, 35 Expansion Short-range Endemic Invertebrate Fauna Survey* (Biologic 2024a) - IBSA-2024-0321 (submitted July 2024)
- *Orebody 29/30/35 Stygofauna Desktop Assessment and Survey* (Bennelongia 2024) - IBSA-2024-0465 (submitted November 2024)
- *Western Ridge Pipeline Reconnaissance Flora and Vegetation Survey* (Biologic 2022a) - IBSA-2023-0082 (submitted February 2023)
- *Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey* (Biologic 2022b) - IBSA-2023-0086 (submitted February 2023)
- *Western Ridge Pipelines Vertebrate Fauna Survey* (Biologic 2022c) - IBSA-2023-0085 (submitted February 2023)
- *Western Ridge Project Paddy Bore Area Vertebrate Fauna Assessment* (Biologic 2022d) - IBSA-2023-0087 (submitted February 2023)
- *Western Ridge Subterranean Fauna Survey and Habitat Assessment* (Bennelongia 2021) - IBSA-2024-0299 (submitted July 2024).

Appendix 17 Orebody 29/30/35 Impact Reconciliation Procedure

The *Orebody 29/30/35 Impact Reconciliation Procedure* (Version 1, November 2024) (BHP 2024I) is provided separately.