BHP

Ministers North

Derived Proposal Request
Ministerial Statement 1105

15 SEPTEMBER 2025

Document amendment record

Version	Description of version	Key changes	Date
0a	Draft Derived Proposal Request (ERD)	Draft for BHP internal review	04/07/2025
0b	Draft Derived Proposal Request (ERD)	Draft for BNTAC review	04/08/2025
1	Final Derived Proposal Request (ERD)	Feedback from SME and BNTAC addressed, submitted to the EPA	15/09/2025

Glossary

Term	Meaning
Derived Proposal	A future proposal identified in the Strategic Proposal, that has been referred under s38 and is declared to be a derived proposal by the EPA under s38E of the EP Act
Development Envelope	The maximum area within which the Indicative Footprint will be located
Indicative Footprint	The location within the Development Envelope where the physical project elements of the Derived Proposal are planned to occur
Relevant environmental factor	EPA environmental factor where BHP has identified potential significant impacts to a factor that requires further consideration for the Derived Proposal and for which BHP has undertaken a comprehensive validation process
Scope 1 emissions	Greenhouse gas emissions released to the atmosphere as a direct result of an activity, or a series of activities at a facility level
Scope 2 emissions	Indirect greenhouse gas emissions from the generation of purchased electricity
Scope 3 emissions	All other indirect emissions that occur in within the value chain, both upstream and downstream
Strategic Proposal	BHP's planned development of future iron ore mining and associated activities and operations (as approved under Part IV of the EP Act, Ministerial Statement 1105)
Strategic Proposal Boundary	The boundary within which future proposals identified in the Strategic Proposal are located (as set out in Schedule 1 of Ministerial Statement 1105)
Verification	BHP internal process to verify the potential impacts to the environmental factors that were assessed for the Strategic Proposal using updated and/or project-specific information (e.g. using baseline or targeted surveys, site-specific models, studies etc.)
Validation	BHP internal process to demonstrate how relevant environmental factors for a derived proposal meet the environmental outcomes defined through the assessment of the Strategic Proposal

Abbreviations

Term	Meaning
30CDS	30% Conceptual Development Scenario
ACCU	Australian Carbon Credit Units
ACHC	Aboriginal Cultural Heritage Committee
ACHMP	Aboriginal Cultural Heritage Management Plan
AH Act	*Aboriginal Heritage Act 1972*
AMD	Acid and Metalliferous Drainage
BC Act	*Biodiversity Conservation Act 2016*
BHP	BHP Iron Ore Pty Ltd (ABN 46 008 700 981)
BNTAC	Banjima Native Title Aboriginal Corporation
CEO	Chief Executive Officer
CER	Clean Energy Regulator
CH_4	Methane
CHMP	Cultural Heritage Management Plan
CO_2	Carbon dioxide
CPHSW	BHP's proposed Central Pilbara Hub Surplus Water Proposal
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBCA	Department of Biodiversity, Conservation and Attractions (WA)
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DEED	Department of Energy and Economic Diversification (WA) (formerly DJTSI)
DMA	Decision-Making Authority
DMPE	Department of Mines, Petroleum and Exploration (formerly DEMIRS)
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EFE	Eastern Front End
EMP	Environmental Management Plan
EPA	Environmental Protection Authority (WA)
EP Act	*Environmental Protection Act 1986* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (C'th)
ERF	Emissions Reduction Fund
FCDS	Full Conceptual Development Scenario
FEL	Front-End Loader
GHG	Greenhouse gas
GL/a	gigalitres per annum
ha	hectares

Term	Meaning
IBRA	Interim Biogeographic Regionalisation for Australia
IBSA	Index of Biodiversity Surveys for Assessments
ICROA	International Carbon Reduction and Offset Alliance
ILUA	Indigenous Land Use Agreement
km	kilometre
LULUCF	Land use, Land Use Change and Forestry (GHG Emissions)
m	metre
mbgl	metres below ground level
MCP	Mine Closure Plan
MEZ	Mining Exclusion Zone
mg/L	milligrams per litre
µg/m^3	micrograms per metre cubed
ML/d	megalitres per day
MNES	Matters of National Significance
MP	Management plan
Mtpa	million tonnes per annum
NEPM	National Environmental Protection Measure
NGER Act	*National Greenhouse and Energy Reporting Act 2007* (C'th)
NVCP	Native vegetation clearing permit
OHP	ore handling plant
OSA	overburden storage area
P	Priority listed flora or fauna
PAF	potentially acid forming
PEC	Priority Ecological Community
PEOF	Pilbara Environmental Offsets Fund
$PM_{2.5}$	particulates sized less than 2.5 microns
PM_{10}	particulates sized less than 10 microns
PMP	Project Management Plan
RECs	Renewable energy certificates
RET	Renewable Energy Target
RiWI Act	*Rights in Water and Irrigation Act 1914* (WA)
SMC	Safeguard Mechanism Credit
SRE	Short-range endemic
TDS	total dissolved solids
TEC	Threatened Ecological Community

Term	Meaning
tpa	tonnes per annum
TSP	total suspended particulates
WAIO	Western Australian Iron Ore operations of BHP
WC Act	*Wildlife Conservation Act 1950* (repealed)

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Executive summary

This document supports BHP's request to the Environmental Protection Authority (EPA) under section 38E of the *Environmental Protection Act 1986* (EP Act) that the Ministers North referred proposal be declared a derived proposal. The Proposal is consistent with section 38E of the EP Act to support the EPA declaring the referred proposal to be a derived proposal and meets the following requirements:

- MS1105 Guidelines for submitting a derived proposal
- MS1105 Schedule 1 location and authorised extent of physical and operational elements
- *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures* (EIA Procedures) (EPA 2016).

The Proposal content is provided in Table 1 and Table 2 below.

Table 1: General Proposal content description

Proposal title	Ministers North (Derived Proposal)
Proponent name	BHP Iron Ore Pty Ltd
Short description	The Proposal is for iron ore mining operations at Ministers North, as a Derived Proposal considered as part of the BHP Pilbara Expansion Strategic Proposal under the Ministerial Statement 1105 approval. The Derived Proposal comprises a Development Envelope of 5,556.6 hectares (ha) and an Indicative Footprint of up to 2,360 ha with clearing of up to 1,848 ha of native vegetation. The location and extent of the Derived Proposal is identified by Figure 1-1. The Derived Proposal is located approximately 15 km south-east of BHP's existing Yandi Mining Operations (Yandi). The Derived Proposal includes the following main elements and activities: • Above water table mining in open mine pits. • Stockpiling of ore on a Run of Mine (RoM) pad prior to transport of ore to Yandi. • A Central Overburden Storage Area (OSA) and in-pit backfilling of the mine pits. • Infrastructure corridor connecting Ministers North to Yandi. • A new primary crusher at Yandi to accommodate the Brockman-type ore supply. • Mine access roads and tracks to connect various mining infrastructure. • Borrow pits, laydown areas, stockpiles (topsoil, subsoil, vegetation). • Surface water management infrastructure. • Water supply pipelines (including requirement for pump stations and turkey's nests). • Ground disturbance and earthworks. • Drilling and blasting. • Associated infrastructure to support the mine construction and operation, including, but not limited to, administration, workshops, warehouse/storage, vehicle parking, vehicle and equipment wash-down, fuel and explosives storage, power generation and transmission lines, services infrastructure, pipelines, wastewater treatment, and communications. • Rehabilitation and decommissioning activities.

Table 2: Proposal content elements

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Mine and associated infrastructure for construction and operation	Figure 1-2	Indicative Footprint of up to 2,360 ha, including up to 1,848 ha of native vegetation clearing, within a 5,556.6 ha Development Envelope
Operational elements		
Production capacity (crushed ore)	-	Up to 25 million tonnes per annum (Mtpa)
Overburden storage (ex-pit storage)	-	Up to 30 Mtpa, cumulative of 160 Mt
Water supply	-	Water supply will be sourced from other users including BHP operations and third parties
Max pit depth (at closure)	-	569mAHD (minimum 5m separation from groundwater table)
Proposal elements with greenhouse gas emissions		
Peak emissions		
Mining and associated activities (including land use change)	Scope 1 – 123,524 t CO_2-e annual emissions (maximum)	
Electricity demand	Scope 1 – 31,288 t CO_2-e annual emissions (maximum)	
Rail transport	Scope 1 – 38,052 t CO_2-e annual emissions (maximum)	
Electricity demand[1]	Scope 2 – Nil	
Downstream emissions (including port, iron ore shipping and steel making)	Scope 3 – 27,075,066 t CO_2-e annual emission (maximum)	
Annual average emissions		
Mining and associated activities (including land use change)	Scope 1 – 101,735 t CO_2-e annual emissions (average) for a total of 1,538,460 t CO_2-e over the operational life of the Derived Proposal	
Electricity demand	Scope 1 – 25,226 t CO_2-e annual emissions (average) for a total of 378,388 t CO_2-e over the operational life of the Derived Proposal	
Rail transport	Scope 1 – 30,691 t CO_2-e annual GHG emissions (average) for a total of 460,358 t CO_2-e over the operational life of the Derived Proposal	
Downstream emissions (including port, iron ore shipping and steel making)	Scope 3 – 21,837,456 t CO_2-e annual GHG emissions (average) for a total of 327,561,834 t CO_2-e over the operational life of the Derived Proposal	
Rehabilitation		
Rehabilitation (as a component of mine closure) will be undertaken for all cleared land areas excluding the pit voids at closure (which are unable to be rehabilitated due to the consolidated rock substrate). Rehabilitation works will be completed progressively where practicable.		
Commissioning		
Commissioning will be undertaken in accordance with the requirements of approvals under the *Environmental Protection Act 1986.*		
Decommissioning		
Mine closure for the Derived Proposal will be implemented in accordance with a Mine Closure Plan (MCP). The overarching implementation objective of the MCP is to ensure the site is decommissioned and rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner to allow for a post-mining land use.		

[1] In the context of BHP's Strategic Assessment boundary, emissions which occur outside of the Development Envelope associated with Yarnima Power Station and Rail transport operations are identified as Scope 1 emissions

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

Environmental Factor – Inland Waters	
Environmental objective	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.
Potential impacts	The excavation of mine pits and the construction of infrastructure (including borrow pits) have the potential to change surface water regimes through catchment reductions, altering natural surface flows and reducing the availability of surface water downstream. The Derived Proposal has the potential to impact surface water quality due to potential releases into the environment through accidental spills (including hydrocarbons), sediment laden runoff from mining operations and/or the OSA. During construction an increase in sediment runoff and scour may occur because of the additional ground disturbance and vegetation removal. Changes to groundwater quality may occur where alterations to landforms and construction of infrastructure (including OSA) expose acidic and/or metalliferous material. During construction and operation, the Derived Proposal, has a potential for groundwater contamination to occur due to hazardous materials and waste.
Mitigation hierarchy	• Groundwater abstraction (mine dewatering and water supply) has been excluded from this Derived Proposal and as such significant direct impacts to the groundwater regime are avoided. • A minimum 5-m separation distance from the base of mine pit to groundwater table to prevent the formation of pit lakes on closure. • Consistent with the mining 'hub' approach provided for under the Strategic Proposal (MS1105) and the *Policy: Use of mine dewatering surplus* (DWER 2020), the Derived Proposal will utilise mine dewater from other operations where available. • Removal of the eastern mine pit and OSA to avoid potential impacts to Yandicoogina Creek and Yandicoogina Gorge. • Protection of ephemeral surface water features within a Mining Exclusion Zone (MEZ) to avoid direct impacts. • Borrow pits will be rehabilitated and left in a free draining state. • Surface water flow paths that intersect roads (haul or light vehicle) will be maintained through the use of culverts. • Hydrological studies have been undertaken and critical infrastructure and the OSA will be located outside the 1% Annual Exceedance Probability (AEP) floodplain of major drainage lines. • Sediment basins will be installed and maintained to minimise the movement of sediment from operations to waterways. • Hydrocarbons and hazardous materials will be managed to avoid leaks and spills. Wastewater at washdown bay/pads will be captured and treated through an oily water separator. • BHP has phased out PFAS at its operations and commits to continuing not to use PFAS containing chemicals in the Development Envelope. • AMD risks have been assessed as low and will not require any specific management. • The Ministers North Mine Closure Plan (MCP) (Appendix 12) will be implemented and the Proposal rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.
Residual impacts, including assessment of significance	The expected catchment reduction in Marillana Creek is approximately 0.64%, and an expected catchment reduction in Weeli Wolli Creek is approximately 0.35%. A small portion of the local Yandicoogina Gorge sub catchment will be impacted, with a catchment reduction of approximately 1%. Whilst the Development Envelope crosses into the Yandicoogina Creek floodplain the surface water flow path is not impacted by the Indicative Footprint.

	BHP considers that there will not be any significant residual impact from the Derived Proposal to Inland Waters values.
Proposed environmental outcomes	No impacts are expected to occur to significant Inland Waters values, including proclaimed Public Drinking Water Source Areas and Ramsar-listed wetlands. The Derived Proposal has placed strong emphasis on the identification and consideration of ephemeral waterways, permanent and ephemeral rock pools, and their associated ecosystems, which support conservation-significant species and are connected to Social Surroundings values. Avoidance and mitigation measures have been proposed to protect these values. Subject to the application of the implementation conditions outlined in Ministerial Statement 1105, the EPA's objective for the Environmental Factor of Inland Waters can be met.
Assessment of offsets (if relevant)	BHP considers that there will not be any significant residual impact from the Derived Proposal to Inland Waters values. Accordingly, environmental offsets for the Derived Proposal in relation to Inland Waters are not proposed.
Environmental Factor – Flora and Vegetation	
Environmental objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Potential impacts	Clearing of native vegetation (up to 1,848 ha) will be required for the Derived Proposal, including: • Impacts to riparian vegetation. • Impacts to 'Good to Excellent' condition vegetation. • Impacts to Priority flora. Mine infrastructure may alter surface water flows to vegetation reliant on the surface water flows. The Derived Proposal has the potential to introduce and/or spread weeds, which could impact native vegetation.
Mitigation hierarchy	• Groundwater abstraction (mine dewatering and water supply) has been excluded from this Derived Proposal and as such impacts to vegetation reliant on groundwater will not occur because of groundwater abstraction. • The use of infrastructure at Yandi will result in a reduction in the extent of land disturbance required for the Derived Proposal. • Protection of a Priority flora species (*Sida* sp. Barlee Range) within a Mining Exclusion Zone (MEZ). • BHP will implement the BHP Environmental Weed Management in Western Australia Procedure, within the Development Envelope. • BHP will investigate development of strategies to collect seed from a range of Priority flora to determine suitability for propagation and rehabilitation utilising these species. • All areas of new land disturbance by the Derived Proposal will be rehabilitated with native vegetation, with the exception of the final pit voids.
Residual impacts, including assessment of significance	Residual impacts on flora and vegetation following application of the mitigation hierarchy: • Clearing of approximately 33.7 ha of riparian vegetation. • Clearing of approximately 1,826.8 ha of 'Good to Excellent' condition vegetation. • Clearing of approximately <0.1% of regional records of *Aristida lazaridis* (P3). • Clearing of approximately 0.6% of regional records of *Ipomoea racemigera* (P3). • Clearing of approximately 0.5% of regional records of *Rostellularia adscendens* var. *latifolia* (P3). • Clearing of approximately 3.5% of regional records of *Acacia bromilowiana* (P4). • Clearing of approximately 9.8% of regional records of *Sida* sp. Barlee Range (P4).

	Clearing of vegetation in 'Good to Excellent' condition and riparian vegetation for the Derived Proposal has been identified as a significant residual impact.
Proposed environmental outcomes	Impacts to flora and vegetation have been minimised. No change to the conservation status of any Priority flora will occur, with all impacts predicted to be less than 10% of known individuals. No Threatened flora or Threatened Ecological Communities will be impacted as a result of the Derived Proposal. As such, a dedicated Flora and Vegetation Environmental Management Plan is not proposed. The significant residual impact caused by the clearing of vegetation in 'Good to Excellent' condition and riparian vegetation will be counterbalanced through the application of appropriate offsets, so that the environmental outcome is consistent with the EPA objective.
Assessment of offsets (if relevant)	BHP will contribute funds to the Pilbara Environmental Offsets Fund (PEOF) for the clearing of up to 1,826.8 ha of 'Good to Excellent' condition vegetation in the Pilbara IBRA region, and clearing of up to 33.7 ha of riparian vegetation.
Environmental Factor – Terrestrial Fauna	
Environmental objective	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Potential impacts	Development of the Derived Proposal will require clearing of up to 1,848 ha of fauna habitat including: • Critical and supporting habitat for the Ghost Bat, Northern Quoll and Pilbara Olive Python. • Habitat features such as caves and Western Pebble-mound Mouse mounds. • Habitats suitable for Short-range Endemic (SRE) fauna. Of the potential SRE fauna identified within the Development Envelope, four taxa are currently only known from the Indicative Footprint. Mine infrastructure for the Derived Proposal may alter surface water flows to fauna habitat that is reliant on surface water flows (including those utilised by aquatic fauna). The Derived Proposal has the potential both during construction and operations for contamination events to occur impacting on terrestrial and aquatic fauna habitat through contamination of soils and/or water. Habitat clearing can enhance the ability of feral predators to move through the landscape and prey on native fauna. Operations may also attract introduced species (e.g. attracted to domestic waste, artificial water sources etc.). Dust deposition resulting from air emissions of particulate dust may have a potential to impact fauna habitat and fauna taxa in proximity to the Derived Proposal. The Derived Proposal will generate noise, light and vibration during construction and mining operations. Additionally, potential exists for fauna taxa to interact with mining areas and infrastructure (e.g. cleared land, vehicles).

Mitigation hierarchy	• Utilising existing disturbed lands to minimise overall clearing to fauna habitat.
	• Re-alignment of a mine road so that it does not travel between two Category 3 Ghost Bat caves.
	• Provision of a Ghost Bat Mining Exclusion Zone (MEZ) to protect:
	  ○ two Category 3 Ghost Bat caves
	  ○ four waterholes
	  ○ 7 ha of Gorge/Gully habitat.
	• Management of blasting (vibrations) within 500 m of Category 3 cave (named 'CMN-02').
	• Provision of exclusion zones for Western Pebble-mound Mouse mounds.

	• Implementing the Ministers North Terrestrial Fauna Environmental Management Plan (EMP).

Residual impacts, including assessment of significance	Residual impacts on terrestrial fauna following application of the mitigation hierarchy:
	• Clearing of up to 269.2 ha of critical habitat for the Ghost Bat, Northern Quoll and Pilbara Olive Python, including:
	  ○ 86 ha of Gorge/Gully
	  ○ 14 ha of Breakaway/Cliff
	  ○ 16 ha of Major Drainage Line.
	• Clearing of up to 1,539.2 ha of supporting habitat for the Ghost Bat, Northern Quoll and Pilbara Olive Python.
	• Clearing of habitat suitable for SREs, however, as the species were recorded in habitat types (e.g. Undulating Low Hills and Hilllcrest/Hillslope) that extend outside of the Indicative Footprint and Development Envelope, no significant residual impact to SRE fauna is anticipated.
	• Clearing of Western Pebble-mound Mouse mounds within the Indicative Footprint.
	• Clearing of three Category 4 Ghost Bat caves.
	• Potential to impact an additional four Ghost Bat caves (within 50-100 m of the Indicative Footprint) (three Category 4 roosts and one Unsuitable cave).
	Clearing critical and supporting habitat for conservation significant fauna (Ghost Bat, Northern Quoll and Pilbara Olive Python) has been identified as a significant residual impact.

Proposed environmental outcomes	Impacts to terrestrial fauna including Threatened and Priority fauna have been minimised such that the local and regional populations are maintained. The significant residual impacts to critical and supporting habitat for the Ghost Bat, Northern Quoll and Pilbara Olive Python will be counterbalanced through the application of appropriate offsets. Subject to application of the implementation conditions of the MS1105 approval (including implementing the Terrestrial Fauna Environmental Management Plan and application of offsets), the EPA's objective of the Environmental Factor Terrestrial Fauna can be met.
Assessment of offsets (if relevant)	BHP proposes to contribute funds to the PEOF for clearing up to 269.2 ha of critical habitat, and 1,539.2 ha of supporting habitat.
Environmental Factor – Subterranean Fauna	
Environmental objective	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.
Potential impacts	Mining operations will result in the loss of troglofauna habitat and individuals due to excavation activities associated with the mine pits. Mine pit blasting and construction of artificial landforms, such as the OSA, may degrade potential subterranean fauna habitat and result in indirect impacts to troglofauna and stygofauna. Subterranean fauna habitats may also be affected by potential contamination of soil and groundwater, which could alter habitat conditions and reduce ecological suitability for troglofauna and stygofauna.
Mitigation hierarchy	Groundwater abstraction (mine dewatering and water supply) has been excluded from this Derived Proposal and as such direct impacts to stygofauna are avoided. No specific avoidance measures for troglofauna values are proposed for the Derived Proposal, given that habitat modelling demonstrates that an extensive interconnected network of suitable troglofauna habitat is predicted to remain intact within and surrounding the mine pits. Management actions to reduce contamination and water quality risks to subterranean fauna are addressed under the Inland Waters values section.
Residual impacts, including	Of the 47 troglofauna taxa known only from the Development Envelope, 19 taxa are currently only known from the mine pits.

assessment of significance	The Derived Proposal is predicted to have a low impact on 11 of the 19 troglofauna taxa known only from the mine pits, as suitable habitat at the locations of each of these taxa will remain intact post-mining. This habitat is characterised by its thickness and strong connectivity to a broader extent of non-impacted, suitable habitat outside the pit boundaries. For eight troglofauna species, the Derived Proposal is predicted to have a medium impact. Habitat modelling shows that mining will remove the local extent of suitable habitat at the known record locations. In each of these cases, however, there is a broader extent of non-impacted, suitable habitat outside the pit boundaries. For these reasons, no significant residual impacts to troglofauna are expected from the implementation of the Derived Proposal.
Proposed environmental outcomes	While the Derived Proposal will remove some known troglofauna habitat, an extensive interconnected network of suitable habitat is predicted to remain intact beneath and surrounding the pits following the proposed mining. The remaining interconnected network of suitable habitat is predicted to continue to provide habitat for the local troglofauna assemblage recorded within the Development Envelope. Subject to application of the implementation conditions of the MS1105 approval, the EPA's objective for the Environmental Factor of Subterranean Fauna can be met.
Assessment of offsets (if relevant)	BHP considers that the implementation of the Derived Proposal will not result in any significant residual impacts to subterranean fauna values. Accordingly, environmental offsets specific to subterranean fauna are not proposed.
Environmental Factor – Air Quality	
Environmental objective	To maintain air quality and minimise emissions so that environmental values are protected.
Potential impacts	Mining operations can generate particulate air emissions through activities such as land clearing and earthworks, blasting, mining, materials loading/unloading, ore processing and transport, which may impact sensitive receptors and/or visual amenity.
Mitigation hierarchy	• Limit the extent of vegetation clearing and exposed land to the minimum necessary. • Progressive clearing and rehabilitation to reduce the area of exposed land. • Apply water to exposed land areas, including haul roads and mine access roads, to minimise dust lift. Where appropriate, incorporate dust suppression additives into the water to enhance effectiveness. • Limit vehicle speeds on unsealed roads, including the provision for further reduction in speed during windy conditions. • Dust generated from iron ore processing activities will be managed in accordance with the conditions of the site's Part V licence under the *Environmental Protection Act 1986*, as regulated by the Department of Water and Environmental Regulation (DWER). • Implementing the Ministers North Air Quality Environmental Management Plan (EMP).
Residual impacts, including assessment of significance	An air dispersion modelling assessment was undertaken to determine the potential impact of particulate air emissions associated with the Derived Proposal in isolation and cumulatively, including background air quality. Dust deposition rates and concentrations of total suspended particulates (TSP) and particulates as PM_{10} and $PM_{2.5}$ were predicted at identified sensitive receptors (i.e., mining camps, environmental sites and cultural heritage areas) for comparison to applicable air quality assessment criteria. Air quality impacts associated with the Derived Proposal in isolation are predicted to remain below the applicable air quality criteria for TSP, PM_{10} and $PM_{2.5}$ at each sensitive receptor location, except for Yandicoogina Gorge, for which there are three predicted exceedances of the 24-hr average TSP guideline over the modelled year.

	When considering cumulative (background) emissions, modelling indicates: • Exceedances of the 24-hour average TSP air quality criteria at Yandicoogina Gorge (14 days), Khargoonha 1 (2 days) and Yandi Camp 1 (2 days). • Exceedances of the 24-hour average PM_{10} air quality criteria at the Yandicoogina Gorge (11 days) and Yandi Camp 1 (2 days). • No exceedances of the $PM_{2.5}$ air quality criteria at any of the identified sensitive receptors. • TSP and PM_{10} concentrations remain below the corresponding air quality criteria at the Weeli Wolli Spring, Khargoonha 2, Khargoonha 3, Khargoonha 4, Yandi Camp 2 and Rio Tinto Yandi Camp receptors. In the absence of background dust deposition monitoring data, dust deposition impacts were assessed for the Derived Proposal in isolation only. The predicted dust deposition rates remain well below (i.e.<15%) the relevant air quality assessment criteria at all sensitive receptors. The results of the air dispersion modelling assessment are considered conservative as the modelling is based on the highest potential mining year, representing the greatest total annual movement of ore and waste. The modelled exceedances at the Yandicoogina Gorge and Khargoonha 1 are viewed in the context of these receptors being social cultural heritage locations containing ecological values, with short-term human visitation. In the absence of documented criteria for assessing air quality impacts on ecological values, the ambient air quality assessment criteria established to protect human health and amenity are conservatively assumed to also be protective of ecological / environmental values. Predicted exceedances of air quality criteria therefore represent an indication that results may need further consideration for the sensitive receptor location, rather than a predicted impact or loss of values. To this end, BHP has prepared an Air Quality EMP for the Derived Proposal.
Proposed environmental outcomes	The Air Quality EMP includes a range of controls to minimise particulate air emissions. Subject to application of the implementation conditions specified in the MS1105 approval and the site's Part V Licence, the EPA's objective of the Environmental Factor Air Quality can be met.
Assessment of offsets (if relevant)	BHP considers that the Derived Proposal will not result in any significant residual impacts to air quality. Accordingly, environmental offsets specific to air quality are not proposed for the Derived Proposal.
Environmental Factor – Greenhouse Gas Emissions	
Environmental objective	To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.
Potential impacts	Greenhouse gas (GHG) emissions from the Derived Proposal (Scope 1 and Scope 2 emissions) will contribute to the total greenhouse gas emissions from Western Australia.
Mitigation hierarchy	The Derived Proposal has considered avoidance and minimisation of greenhouse gas emissions in its design, including: • The position of W5 landbridge resulting in a reduction in operating hours and fuel consumption. • Haul truck payload uplift reducing the number of trips and fuel consumption. • Front End Loader (FEL) with enhanced fuel efficiency. • The Ministers North fuel farm to complement the existing fuel infrastructure at the Yandi Hub is estimated to reduce transit distances for refuelling improving diesel use efficiency. • Haul road gradient optimisation, reducing diesel consumption. The Scope 1 emissions from the Derived Proposal are expected to decrease by 110,891 t CO_2-e over the life of the project through the implementation of these proposed avoidance and minimisation measures. Compliance with the Derived Proposal's Safeguard Mechanism obligations is further anticipated to reduce Scope 1 GHG emissions.
Residual impacts, including	• Scope 1 – 192,864 t CO_2-e annual emissions (maximum), 157,652 t CO_2-e annual emissions (average) for a total of 2,377,206 t CO_2-e over the operational life of the Derived Proposal

assessment of significance	• Scope 2 – Nil • Scope 3 – 27,075,066 t CO_2-e annual emission (maximum), 21,837,456 t CO_2-e annual GHG emissions (average) for a total of 328,020,884 t CO_2-e over the operational life of the Derived Proposal.
Proposed environmental outcomes	BHP considers that the application of conditions from Strategic Proposal MS1105 is not required for the Derived Proposal. Aligned with recent amendments to the WA Greenhouse Gas Emissions Policy for Major Projects and the EPA's Greenhouse Gas Emissions Environmental Factor Guideline, BHP will manage its GHG emissions through compliance with the Safeguard Mechanism and is not proposing to develop a GHG Management Plan.
Assessment of offsets (if relevant)	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'. Where structural abatement of emissions is insufficient to meet the Derived Proposal emissions reduction trajectory, BHP will ensure that these targets are met by either using banked Safeguard Mechanism Credits (SMCs) from prior years, transferring SMCs from other BHP facilities and/or retiring eligible carbon 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.
Environmental Factor – Social Surroundings	
Environmental objective	To protect social surroundings from significant harm.
Potential impacts	Mining operations may directly impact cultural heritage values through physical presence, which may involve clearing vegetation, direct alteration of waterways or landscape impacts. Mining operations may indirectly impact cultural heritage values through alteration of the landscape, limiting access, changes to water values, indirect impacts to vegetation and fauna. Key concerns raised during Social Surroundings engagements included impacts relating to: • Permanent alteration of landscapes. • Changes to catchments, surface water regimes and risks to water quality. • Dust management. • Loss of access to country. • Loss of visual and general amenity. • Permanent alteration to and loss of tangible and intangible cultural heritage values. • Potential impacts to Khargoonha and Yandicoogina Gorge. • Mine closure, including mine pit depths and rehabilitation.
Mitigation hierarchy	BHP modified the Development Envelope and Indicative Footprint to avoid direct impacts to values and sites which are recognised as being of cultural heritage significance, where possible. Where this has not been possible BHP have, and will, consult with Banjima and follow the *Aboriginal Heritage Act 1972* (AH Act) process. BHP has prepared a confidential Project Management Plan (PMP) in consultation with Banjima Traditional Owners through Banjima Native Title Aboriginal Corporation (BNTAC). The Ministers North PMP sets out how the construction and operation of the Ministers North operations will occur and be managed to avoid, minimise or mitigate the effect of the operation on Aboriginal, cultural, heritage and social environmental values. The PMP includes overarching commitments including, but not limited to: • Protection of cultural and environmental values of Yandicoogina Gorge, including sediment control and water quality monitoring. • Protection of Khargoonha from direct and indirect impacts (e.g. land disturbance, flyrock, vibration), and access to be retained.

	• Protection of the Western Pebble-mound Mouse. BHP has made the following key rehabilitation and closure commitments in consideration of feedback from the Banjima Traditional Owners: • Implement a geomorphic design on the southern pit wall of South Pit (against Khargoonha). • Central OSA (if required at closure) to be blended with southern pit landform. • Progressive rehabilitation and partial pit backfill • Surface water management will be designed, so no pit lake will form post closure. BHP will ensure final pit voids are a minimum of 5 m above the groundwater table. • Haul road to be rehabilitated, including removal of culverts and all other infrastructure associated with the haul road, with the aim of returning land to pre-disturbance drainage and topography where possible. • Opportunities for Banjima People involvement in rehabilitation monitoring will be explored by BHP with BNTAC. BHP is committed to ongoing engagement with Banjima Traditional Owners in relation to closure outcomes of the Derived Proposal, through ongoing consultation on the Ministers North Mine Closure Plan (MCP).
Residual impacts, including assessment of significance	The Derived Proposal will cause some impacts to Social Surroundings values, however, sites significant to the Banjima Traditional Owners being Khargoonha and Yandicoogina Gorge have been avoided. BHP will continue to engage with Banjima Traditional Owners, through BNTAC, throughout the life of operation, in relation to Aboriginal, cultural, heritage and social environmental values and interests
Proposed environmental outcomes	BHP considers with the implementation of the PMP (confidential) and the management actions outlined within this ERD, the EPA's objective for Social Surroundings can be met without the need for a MS1105 Condition 13 Cultural Heritage Management Plan.
Assessment of offsets (if relevant)	BHP considers that there will not be any significant residual impact from the Derived Proposal to Social Surroundings values; hence, offsets are not proposed.

Derived Proposal implementation conditions

BHP's view is that the following conditions set out in the Strategic Proposal Ministerial Statement 1105 should apply to the Proposal:

- Administrative conditions 1 to 5
- Condition 6 Environmental Management Plans
- Condition 8 Terrestrial Fauna Environmental Management Plan
- Condition 11 Air Quality Environmental Management Plan
- Condition 15 Rehabilitation and decommissioning
- Condition 16 Offsets.

BHP's view is that none of the implementation conditions in Ministerial Statement 1105 should be changed.

1 Proposal

1.1 Proposal content

The Ministers North Derived Proposal is for above water table iron ore mining operations in the area identified by Figure 1-1. BHP has referred the Ministers North Derived Proposal (Derived Proposal) with a request that it be declared a Derived Proposal, subject to Strategic Proposal Ministerial Statement 1105 (MS1105).

The Derived Proposal is positioned within a Development Envelope of 5,556.6 ha, with an Indicative Footprint of 2,360 ha (Figure 1-2). The Indicative Footprint requires clearing of 1,848 ha of native vegetation and 512 ha of existing cleared/ disturbed land.

Mining will be undertaken through standard open pit mining techniques (drill, blast, load, haul) with the extracted ore from the mine pits temporarily stockpiled, prior to transport of the ore to the existing Yandi Mining Operations (Yandi) for processing[2]. Waste rock extracted from the mine pits will be disposed of through a combination of a central Overburden Storage Area (OSA) and the in-pit backfilling of the mine pits.

Generally, the Derived Proposal includes the following main elements and activities:

- mining above the groundwater level in two mine pits (north and south)
- stockpiling of ore on a Run of Mine (RoM) pad (including mobile crushing units, if required)
- waste rock disposal to Central Overburden Storage Area (OSA), and in-pit backfilling of the mine pits
- infrastructure corridor connecting Ministers North to Yandi, including:
  - a dual lane Haul Road with an overpass over a third-party railway
  - land bridge over Yandi W5 Mine Pit (existing approved pit) and
  - a widening of an existing creek crossing over Marillana Creek watercourse and crossings of other minor watercourses (includes disturbance to watercourse bed/banks)
- infrastructure changes at the existing Yandi Ore Handling Plant (OHP) including a new primary crusher to accommodate the Brockman-type ore supply
- mine access roads to connect various mining infrastructure
- borrow pits[3] to supply civil construction works (roads, RoM)
- laydown areas for equipment storage and construction
- stockpiles for cleared rehabilitation materials (topsoil, subsoil, vegetation)
- temporary and localised minor diversion of drainage lines / watercourses comprising earthworks, earthen bunds, swale drains and/or culverts
- water supply pipelines including water storage (e.g. turkey's nest) and pump stations
- associated infrastructure to support the mine construction and operation including but not limited to administration, workshops, warehouse/storage, vehicle parking, vehicle and equipment wash-down, fuel storage and transfer, explosives storage, power generation and transmission powerlines, services infrastructure, wastewater treatment, and communications.

The proposal content description and proposal content elements are described in the separate *Proposal Content Document* (Appendix 1) (prepared in accordance with EPA 2024a).

[2] The Yandi Mining Operations are excluded from the Derived Proposal. Refer to *Derived Proposal Exclusions.*

[3] Suitable areas for borrow pits have been identified and accounted for within the current Development Envelope and Indicative Footprint. However, if constructability requirements identify potential borrow deficits, BHP may seek additional borrow material from outside the Derived Proposal area. Any additional borrow requirements that are identified would be subject to separate Government approvals process.

1.1.1 Haul road fill material sources

The construction of the haul road requires substantial fill volumes which will be sourced through a number of options which may include borrow pits, Ministers North mine waste, Yandi mine waste and material from the Yandi OSA (C1 OSA rehabilitated). Sources such as mine waste and existing OSA allows for minimising overall disturbance to native vegetation and minimises the extent of out of pit waste dumps.

The Yandi OSA C1 (see *Marillana Creek (Yandi) Closure Plan*, Rev 6 (BHP 2025a)) has been rehabilitated, with the exception of a small landfill[4] adjacent to the OSA. The closure strategy for this OSA was to remain as a landform at Yandi at closure given the rehabilitation status (nearing completion criteria) and given that monitoring indicates the OSA will remain stable at closure (BHP 2025a). Despite the above, given the fill required for the Ministers North haul road, the opportunity may arise to optimise closure outcomes and minimise the extent of landforms at closure by utilising the material at OSA C1, if required, for the purposes of road base for the haul road.

Prior to implementation, testing of the material at the Yandi C1 OSA[5] will be undertaken to ensure the material, if required, will be suitable for road base and be non-polluting.

1.1.2 Connection to Yandi (W5 landbridge and Marillana Creek crossing)

In order to enable vehicle movements to the Yandi OHP, the haul road will require traversing across the Yandi W5 Mine Pit. BHP has included provision to build a landbridge across the W5 Pit within the Derived Proposal. The landbridge will subsequently connect the haul road to an existing crossing over the Marillana Creek watercourse (as described below). BHP is currently backfilling W5 pit in accordance with the *Marillana Creek (Yandi) Closure Plan*. Backfilling of the Yandi W5 Mine Pit has previously been approved to an elevation of approximately 545 mAHD (see Exclusions from the Derived Proposal - Section 1.1.6.6). As part of the Derived Proposal, BHP proposes to raise the central section of the pit to an elevation of nominally 575 mAHD to form the basis of the landbridge.

In order to connect the Derived Proposal to BHP's Yandi, crossing over the Marillana Creek will be necessary. The Marillana Creek traverses in a generally east to west direction through Yandi, with the Ore Handling Plant, ore stockpiles and the railway infrastructure all being located on the northern side of the Marillana Creek. In planning for the Derived Proposal, BHP considered options for both a new (additional) purpose-built crossing over the Marillana Creek, or alternatively, to seek to modify an existing crossing location over the Marillana Creek. Having regard to the recorded environmental and cultural values of the Marillana Creek, BHP has selected the option to modify an existing crossing location over the Marillana Creek for the Derived Proposal. The selected crossing over the Marillana Creek will require widening to enable dual-lane ore transport in support of the Derived Proposal. The disturbance for this widening has been included within the Ministers North Derived Proposal.

1.1.3 Primary crusher at Yandi Ore Handling Plant (OHP)

Whilst the existing approved infrastructure at the Yandi OHP will be utilised to the greatest extent practicable (see Exclusions from the Derived Proposal - 1.1.6.6), the OHP will require changes to accommodate Brockman-type ore supply from the Derived Proposal. The Derived Proposal includes installation of a new primary crusher at the Eastern Front End (EFE) crushing facility and has made provision for the clearing associated with these works within the Indicative Footprint.

1.1.4 Mobilisation of fleet

Initial mobilisation of fleet will occur from BHP's Mining Area C – Southern Flank (MAC/SF) operations, utilising an existing rail access road. An access road from Ministers North, connecting to the existing rail access road has been incorporated into the Derived Proposal to facilitate this fleet movement.

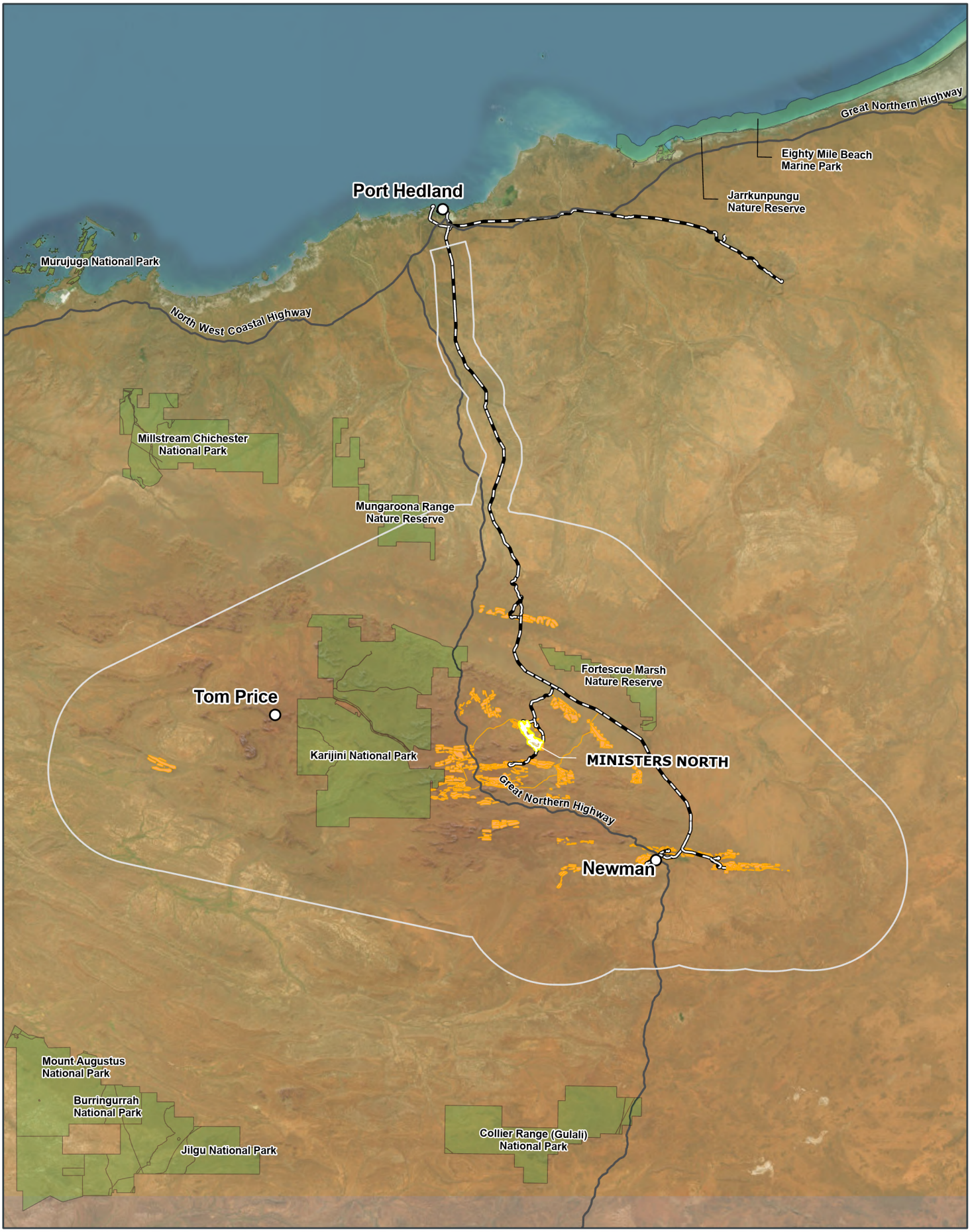
[4] The landfill is excluded from the Indicative Footprint and does not form part of the Derived Proposal

[5] Testing of Contaminants of Potential Concern (COPC) including PFAS, Hydrocarbons, Asbestos, BTEX, PCBs, and Heavy metals

1.1.5 Water supply

In relation to water supply for the Derived Proposal, as mining is above water table only, the water requirements for the Derived Proposal will be met by supply from other BHP and/or third-party water supplies. The following infrastructure to support water supply is included:

- provision of a temporary above ground, raw water pipeline to be constructed, connecting Ministers North into BHP Yandi existing water network alignment to support supply of Yandi raw water to Ministers North for early construction and pre-strip activities
- the construction of a permanent raw water pipeline to tie-into the water supply pipeline that originates from BHP's Mining Area C – Southern Flank (MAC/SF) operations. The permanent pipeline will tie to the Ministers NPI precinct and then follow the haul road to connect to Yandi. The water from MAC/SF will then feed both Ministers North mine and Yandi (via Ministers North). The water transfer to Yandi will initially be for the purposes of processing Ministers North ore at the OHP/EFE but will then subsequently feed into the broader Yandi water network.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Strategic Proposal Area (7,650,074 ha)
- Strategic Proposal Full Conceptual Development Scenario (98,500 ha)
- Conservation Area
- Townsite
- Major Roads
- Rail (BHP)

N

0 25 50 75 100

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
STRATEGIC PROPOSAL AND MINISTERS NORTH DERIVED PROPOSAL

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:2,607,553	REQUESTOR:	PROJECTS	FIGURE:	1-1
DATE:	27/08/2025	PREPARED:	GEOMATICS	NO:	A1317-007 RevE
		REVIEWED:			

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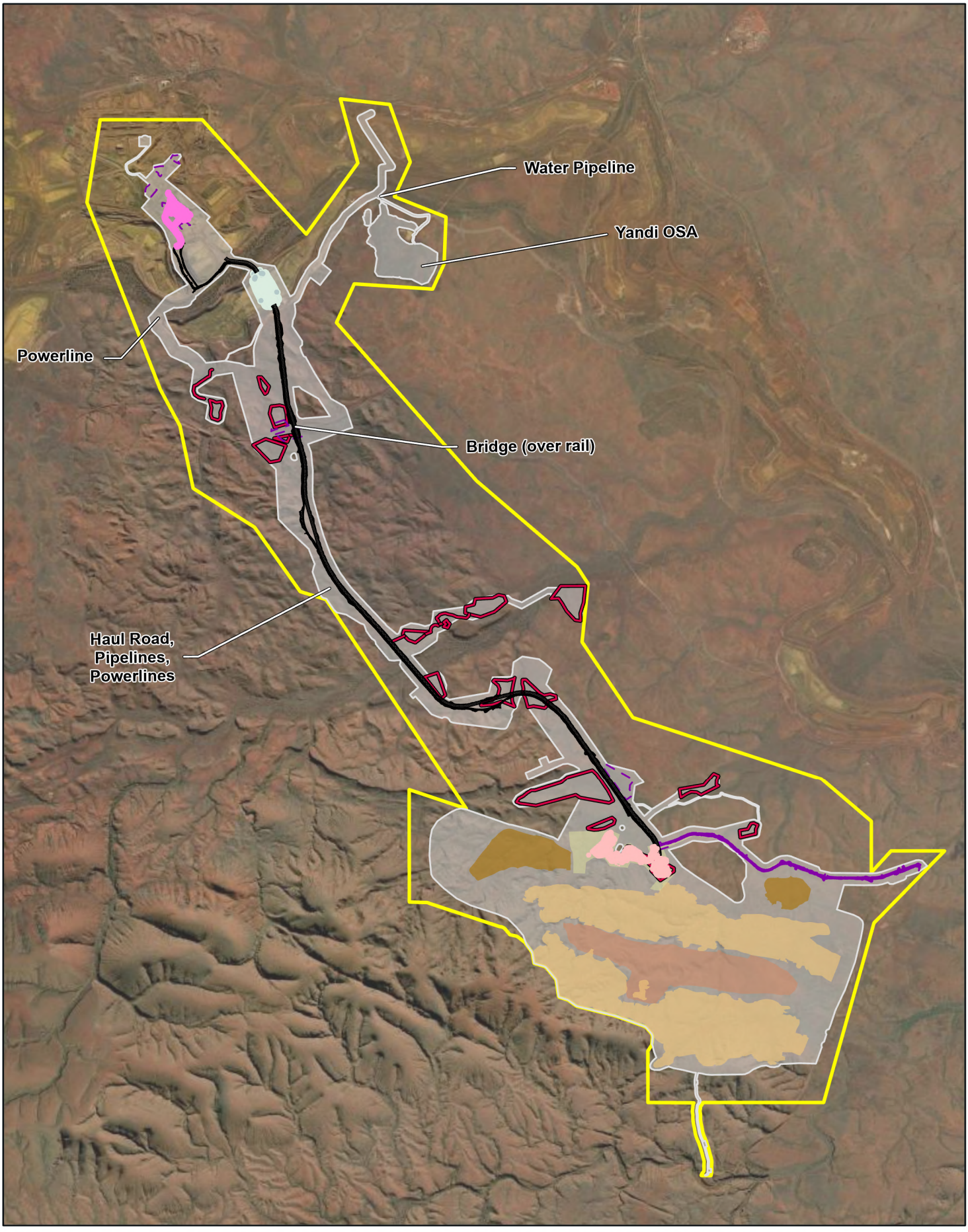

Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)

Indicative Mine Layout

- Non-Process Infrastructure
- Stockpile
- OSA
- Pit
- Non Process Infrastructure Layout
- Yandi OHP
- Borrow Pits
- Road
- Pipelines Access Road

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MINISTERS NORTH
DEVELOPMENT ENVELOPE AND INDICATIVE FOOTPRINT

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:70,000	REQUESTOR:	PROJECTS	FIGURE:	1-2
DATE:	8/09/2025	PREPARED:	GEOMATICS	NO:	A1317-003 RevI
		REVIEWED:			

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1.1.6 Exclusions from the Derived Proposal

1.1.6.1 *Mining below water table*

While the ore resource extends both above and below the groundwater level, BHP proposes to mine above the water table only. Mining of the Ministers North ore deposits below the groundwater table and associated dewatering, is excluded from this Derived Proposal and accessing below water table ore is not within BHP's current life of asset plan for the Ministers North Operation.

1.1.6.2 *Water extraction at existing operations and/or third parties*

The long-term operational water requirement for the Derived Proposal is anticipated to be sourced from BHP's proposed Central Pilbara Hub Surplus Water Proposal (CPHSW) which is currently under assessment by the EPA as the Mining Area C – Southern Flank (MAC/SF) Significant Amendment. Dewatering and abstraction from MAC/SF will be undertaken consistent with existing Part IV approval (MS1072 and subsequently as amended by the Significant Amendment) and groundwater licences issued by the Department of Water and Environmental Regulation (DWER) in accordance with the *Rights in Water and Irrigation Act 1914* (WA) and are excluded from this Derived Proposal.

As discussed in Section 1.1.5, the Derived Proposal also provides for a pipeline connecting Ministers North into BHP Yandi's existing water network alignment to support supply of Yandi raw water to Ministers North for early construction and pre-strip activities. Whilst this is included, the abstraction of water at Yandi does not form part of the Derived Proposal. Dewatering and abstraction from Yandi will be consistent with groundwater licences issued by the DWER in accordance with the *Rights in Water and Irrigation Act 1914* (WA) and are excluded from this Derived Proposal.

As discussed in Section 1.1, in the event that the construction and/or operational water supply to the Derived Proposal is not sourced from the BHP assets identified above, water supply to the Derived Proposal may be sought from other BHP operations or from other third-party sources, as required.

1.1.6.3 *Power infrastructure relocation*

Powerlines operated by both BHP and third-party miner Rio Tinto occur over the eastern extent of the mine pits for the Derived Proposal. Accordingly, these powerlines will require relocation to enable the implementation of the Derived Proposal.

In relation to BHP's 132 kV powerline, the relocation will be subject to separate Government assessment and approval processes, and consequently, it has been excluded from the Derived Proposal. The Indicative Footprint for the Derived Proposal has made no provision for the area of native vegetation clearing required for the BHP powerline relocation.

It is also anticipated that Rio Tinto will submit (or has submitted) separate applications for Government assessment and approval for the relocation in advance of BHP's application for the Derived Proposal. As the powerlines are operated by Rio Tinto (not BHP), the powerlines are excluded from the scope of the Derived Proposal. The Indicative Footprint for the Derived Proposal has accordingly made no provision for the area of native vegetation clearing required for the Rio Tinto powerline relocation.

1.1.6.4 *Fibre optic relocation*

Fibre optic cables in the vicinity of the existing rail line and proposed haul road, require relocation to enable implementation of the Derived Proposal. The fibre optic cables are owned and operated by the third-party miner Rio Tinto. As the fibre optic cables are utilised by Rio Tinto (not BHP) these are excluded from the scope of the Derived Proposal. The Indicative Footprint for the Derived Proposal has accordingly made no provision for the area of native vegetation clearing required for these works.

1.1.6.5 *Communications tower and trailers*

BHP has previously identified a need to upgrade its communications infrastructure that services the existing operations at Yandi, existing BHP-operated railway, and the Derived Proposal. These upgrades involve an additional

communications tower adjacent to an existing communications tower, with the area of native vegetation clearing required being less than 1 ha.

Whilst the area of the communications tower occurs within the Development Envelope, this communications tower is excluded from the scope of the Derived Proposal given its intended use is for BHP's mining operations generally (i.e. not exclusively for use by the Derived Proposal). A number of supporting communications trailers located inside the Development Envelope also require minor vegetation clearing. Clearing for these works will be authorised by other approvals and are consequently excluded from the Derived Proposal.

1.1.6.6 *Yandi Mining Operations*

Consistent with the 'Hub' approach proposed as part of the Strategic Proposal, the Derived Proposal will utilise the existing infrastructure and areas of Yandi where practicable. Existing operations at Yandi have been assessed and approved under separate Government processes, and accordingly, the operations at Yandi do not require re-assessment or re-approval to enable their continued use in supporting the Derived Proposal. These separate Government approvals include the MS 679 granted under the *Environmental Protection Act 1986* (WA) (EP Act).

The currently approved *Marillana Creek (Yandi) Closure Plan*[6] notes that infrastructure at Yandi will be utilised beyond the completion of mining, including processing infrastructure, camps, water pipelines, roads and rail infrastructure. This will enable Yandi to operate as a regional ore processing hub. The use of existing infrastructure and areas will minimise the extent of new land disturbance required for the Derived Proposal (and thereby minimise the potential environmental impacts of the Derived Proposal).

W5 Pit Backfilling

The Yandi W5 Mine Pit is a cleared open mine void within BHP's Yandi, operated in accordance with existing Government approvals for both above and below groundwater level mining operations. BHP is currently backfilling W5 pit in accordance with the *Marillana Creek (Yandi) Closure Plan*. Backfilling of the Yandi W5 Mine Pit has previously been approved to an elevation of approximately 545 mAHD. The proposed continuation of backfilling of the Yandi W5 pit to these approved levels is excluded from this Derived Proposal as these works are already authorised under existing approvals.

Yandi Ore Handling Plant

The existing infrastructure at the Yandi OHP will be utilised to the greatest extent practicable, including stockpile areas, conveyors, stackers, train load-out facilities, access roads, workshops, equipment storage, fuel storage, communications, power supply and water supply. The operation of existing approved infrastructure at Yandi OHP are excluded from the Derived Proposal.

Marillana Creek (Yandi) Life of Mine Proposal Significant Amendment

The Marillana Creek (Yandi) Life of Mine Proposal Significant Amendment (BHP 2025) is currently under assessment by the EPA. This Derived Proposal does not include any proposal aspects being considered as part of the Significant Amendment to Yandi.

1.1.6.7 *Mining Area C Southern Flank Operations*

The MAC/SF Significant Amendment includes Minsters North as a beneficial water use as part of the proposed surplus water management by allocating 15 ML/day for operational uses. CPHSW includes the infrastructure (including turkey's nests, break tanks, pipelines) to deliver the water supply to the Ministers North Derived Proposal. These elements are therefore not included in this Derived Proposal and will be assessed under the significant amendment. This Derived Proposal does not include any proposal aspects being considered as part of the Significant Amendment to MS1072.

[6] The Marillana Creek (Yandi) Closure Plan May 2025 Rev 6 (BHP 2025) has recently been submitted for assessment as part of the Marillana Creek (Yandi) Life of Mine Proposal Significant Amendment and once approved will supersede Rev 5 (BHP 2020).

To avoid doubt, the MAC/SF Operations will continue to operate separately in accordance with these existing authorisations (and any future amendments), and do not form part of the Ministers North Derived Proposal. The environmental management and monitoring measures that apply to the existing MAC/SF Operations are not applicable to the Derived Proposal.

1.2 Proposal alternatives

In accordance with the EPA (2021a) guidance document *How to Prepare and Environmental Review Document*, BHP has considered a number of alternatives in relation to the Derived Proposal. The alternatives considered include a no development scenario, mine pit backfilling and ore transport options, as outlined below. The alternatives considered below do not form part of the Derived Proposal.

1.2.1 Backfilling strategies

Waste rock excavated from the mine pits will be disposed of to a combination of an ex-pit Central OSA (approximately 50 %) and in-pit backfilling of the mine pits (approximately 50 %). The purpose of the in-pit backfilling is to minimise the extent of ex-pit land disturbance required for OSA. As part of mine planning, two ex-pit OSA were considered (western and central), however, through optimisation, the western OSA was subsequently removed from the design. The location of the western OSA is now concurrent with the western stockpile.

BHP will continue to investigate opportunities to minimise the extent of ex-pit disturbance required for the OSA and maximise opportunities for in-pit backfilling.

1.2.2 Overland conveyor for ore transport

The initial design considered ore transport via an overland conveyor to Yandi, in lieu of ore transport by a haul road. Ore transport by overland conveyor is an option utilised at multiple iron ore operations in the Pilbara region (including by BHP), with the benefits of an overland conveyor including reduced particulate air emissions and reduced greenhouse gas emissions (when compared to road haulage). However, noting conveyors are typically less flexible forms of linear infrastructure, and as such make it difficult to navigate between areas of sensitivities (e.g. environmental and cultural) which has been a dominant driver for the current haul road design.

Pre-feasibility assessment determined the preferred development scenario to be ore haulage by road due to lower capital cost of establishment, lower operational costs for maintenance, and readiness for integration with the existing operations at Yandi (which also utilises ore haulage by road). Accordingly, an overland conveyor has not been selected as the ore transport solution for the Derived Proposal.

1.2.3 Alternative haul road alignment

Stakeholder consultation undertaken with the Banjima People in September 2024 (as part of consultation for the Environmental Factor of Social Surroundings) requested BHP to consider an alternate haul road alignment to minimise the potential impact to cultural heritage values and to align to existing infrastructure disturbance (to minimise the potential for landscape fragmentation). BHP tested the feasibility of multiple alternate alignments, including via Yandi E7/E8, and following rail alignments. However, after consideration of these alternatives, no alternatives were demonstrated to be feasible for BHP. BHP ultimately maintained the current haul road alignment, which has been designed with avoidance of cultural heritage sites as a key consideration. Banjima provided non-objection to BHP's position on the preferred haul road alignment.

1.3 Local and regional context

The Derived Proposal is located in the Central Pilbara region, approximately 85 km north-west of Newman (Figure 1-3). The dominant land use is pastoral and iron ore mining operations (see Figure 1-4), including existing operations at BHP's Yandi Hub. Existing and approved third-party mining operations also occur in proximity to the Derived Proposal.

The Derived Proposal is located within the Marillana Creek sub-catchment of the Upper Fortescue River catchment. Similarly, BHP's Yandi also occurs within the Marillana Creek sub-catchment. Marillana Creek occurs within the northern extent of the Development Envelope, with the Derived Proposal including a widening of an existing crossing location over the Marillana Creek. Yandicoogina Creek occurs within the southern extent of the Development Envelope for the Derived Proposal (however, occurs outside of the Indicative Footprint) and flows in a north-easterly direction.

The Derived Proposal is not located within a Public Drinking Water Source Area (PDWSA), with the nearest PDWSA located approximately 55 km to the south-east to service the Newman townsite (DWER 2023b).

The Development Envelope sits wholly within the external boundaries of the Banjima Native Title Determination Area (WCD 2014/001). Records (sites and objects) of Aboriginal heritage significance have been recorded across the local area, including stone artefact scatters, rock shelters, scarred trees and human-made structures.

The Derived Proposal does not coincide with any conservation area. Approximately 30 km north of the Derived Proposal is the Fortescue Marsh Nature Reserve (DBCA 2024). The nearest National Park is the Karijini National Park, located approximately 45 km west of the Derived Proposal. Parts of the Juna Downs Pastoral Lease excised in 2015 (now with a land tenure of Unallocated Crown Land) are located approximately 25 km west of the Derived Proposal and have been proposed for an easterly extension to the Karijini National Park (DBCA 2019a).

The Development Envelope occurs within three land systems as mapped by DPIRD (2022); the majority (> 80%) coinciding with the McKay System and the remaining extents coinciding with the Robe System and the Boolgeeda System. The land systems provide habitat for a variety of flora, vegetation and fauna; including taxa of listed conservation significance.

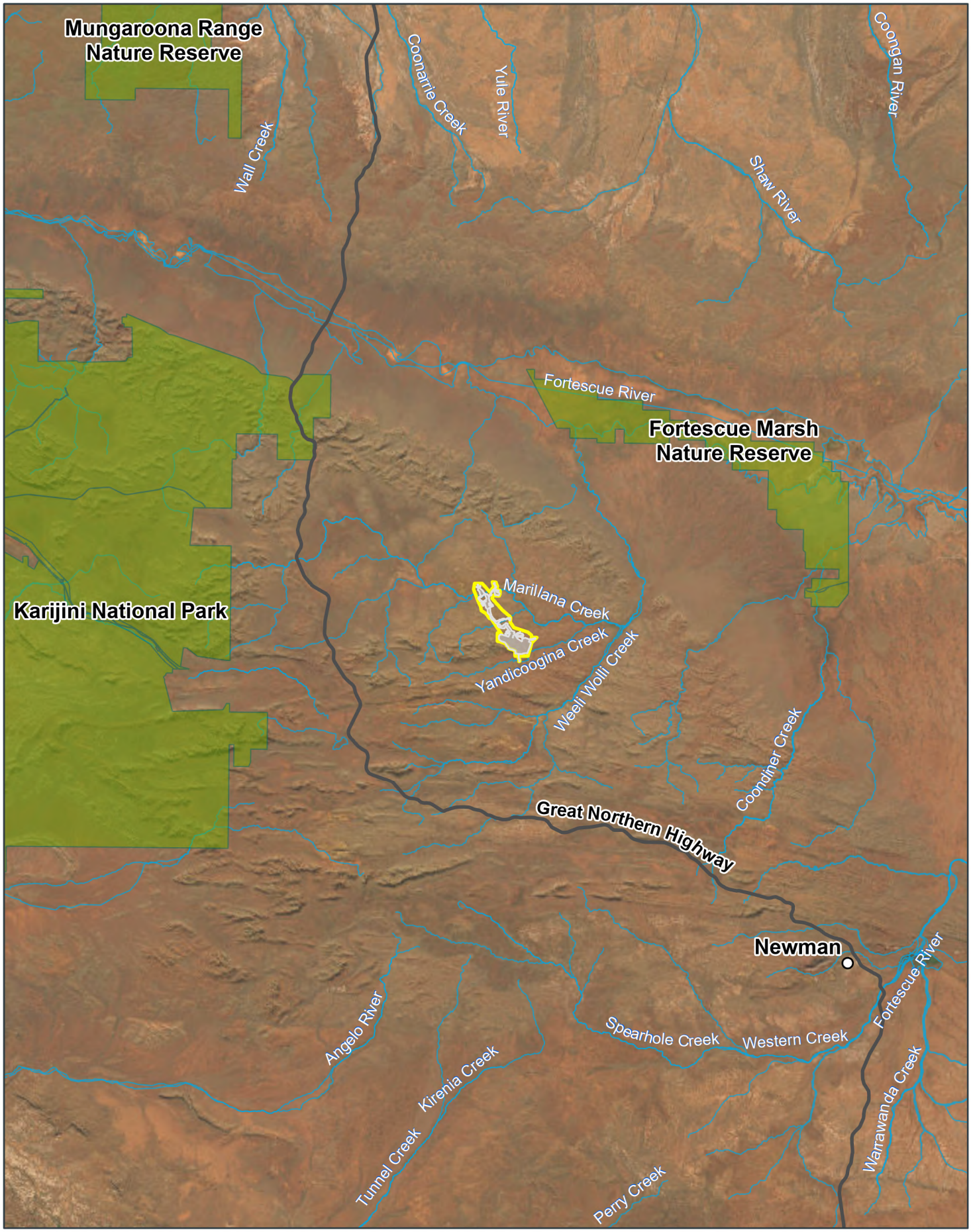
1.3.1 Regional threats to environmental values

The EPA discussed the following threats to the regional environmental values in the Pilbara in EPA Report 1619 (EPA 2018a):

- clearing of native vegetation
- invasive plants
- introduced fauna
- fire regimes
- hydrologic changes.

BHP has addressed the above threats, as relevant to the Derived Proposal, under the validation of the relevant environmental factor/s (see Sections 5 to 11).

BHP will manage potential significant impacts relevant to the threats, in accordance with MS1105 through the relevant Condition Environmental Management Plans (EMPs), or through other statutory decision-making processes. Where BHP has not proposed an EMP or other statutory decision-making process, BHP will continue to manage these threats using BHP's regional management approach and standard business management practices outlined in the Pilbara Public Environmental Review Strategic Proposal (PERSP) (BHP 2016a).



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Conservation Area
- Watercourse
- Townsite
- Road

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KILOMETRES

GDA 1994 MGA ZONE 50

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MINISTERS NORTH
REGIONAL CONTEXT - CONSERVATION AREAS

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:950,000	REQUESTOR:	PROJECTS	FIGURE:	1-3
DATE:	27/08/2025	PREPARED:	GEOMATICS	NO:	A1317-018 RevE
		REVIEWED:			

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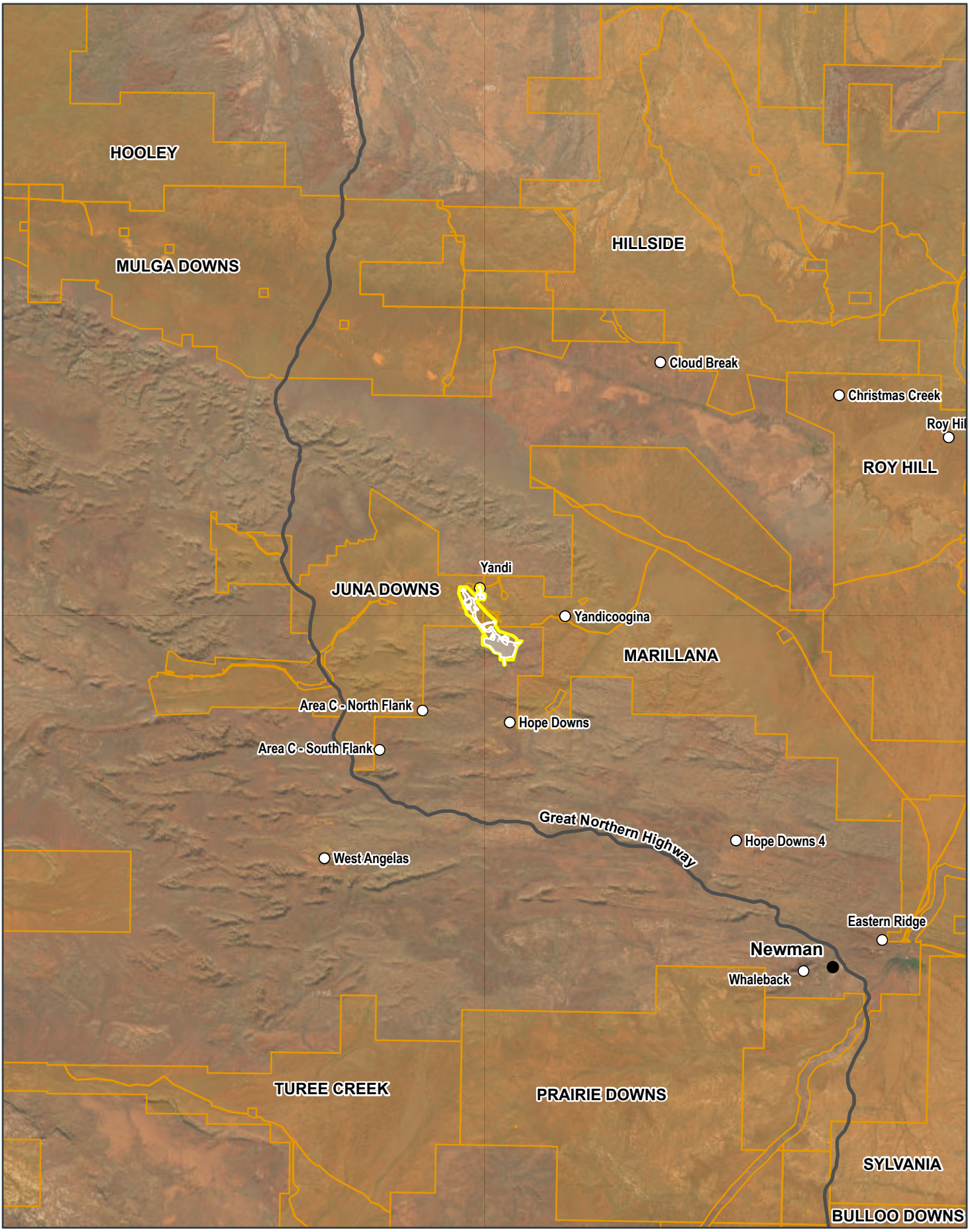

Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Pastoral Leases
- Road
- Townsite
- Mining Operations

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MINISTERS NORTH

REGIONAL CONTEXT - MINING OPERATIONS AND PASTORAL LEASES

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:950,000	REQUESTOR:	PROJECTS	FIGURE:	1-4
DATE:	28/05/2025	PREPARED:	GEOMATICS	NO:	A1317-019 RevF
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2 Legislative Context

2.1 Strategic Proposal approval

BHP referred the Pilbara Expansion Strategic Proposal (Strategic Proposal) to the EPA under Part IV of the EP Act on 6 July 2012. Having devised a long-term mine development plan, BHP's aim was to consider a more regional approach to environmental management across all its current and future operations. The Strategic Proposal included new mining operations and future expansions to existing mining operations, and associated infrastructure and activities in the Pilbara. The EPA assessed the Strategic Proposal at the level of Public Environmental Review and published its report on 9 July 2018 (EPA Report 1619, EPA 2018a).

The Minister for Environment issued MS1105 for the Strategic Proposal on 11 July 2019. The Statement states that in the event that the EPA declares a future proposal as identified in EPA Report 1619 and described in Schedule 1 of MS1105 under section 38E to be a derived proposal, the derived proposal may be implemented, subject to the Minister for Environment's identification of relevant conditions under section 45B(3) from the conditions set out in the Statement.

2.1.1 Validation process

BHP proposed an internal, non-statutory validation process in the PERSP as part of the assurance framework for derived proposals (BHP 2016a - Sections 10 and 11). The purpose of the validation process is to demonstrate how the Proposal meets the environmental outcomes defined through the assessment of the Strategic Proposal for the relevant environmental factors.

BHP's validation process includes, but is not limited to, reviewing the following:

- contemporary legislation, policy and guidance, including the EPA environmental factor guidelines
- the Strategic Proposal impact assessment and outcomes discussed in the PERSP (BHP 2016a)
- environmental issues and outcomes discussed in the EPA report 1619 on the Strategic Proposal (EPA 2018a)
- whether existing information is sufficient or whether BHP has undertaken additional verification (e.g. through surveys or studies) or validation work (including MS1105 requirements)
- updated data, and detailed mine planning and design
- whether targeted management is required in addition to standard management practices.

2.1.2 Verification process

BHP has used project-specific information for the Derived Proposal (including, but not limited to, the mine plan and design, baseline and targeted surveys, models and studies, and other up to date local and regional information) to verify the potential impacts of the Derived Proposal to the environmental factors that were assessed for the Strategic Proposal.

2.1.3 Strategic Proposal development scenarios

BHP presented two future scenarios in the PERSP for the impact assessment: 30% Conceptual Development Scenario (30CDS) and Full Conceptual Development Scenario (FCDS) (BHP 2016a - Section 7.4). The two scenarios are conceptual only and were used for the assessment of the potential cumulative impacts of the Strategic Proposal. Given the Derived Proposal was included in the FCDS (BHP 2016a), BHP has compared the potential impacts of the Derived Proposal against the predicted Strategic Proposal outcomes for the FCDS.

2.1.4 Derived Proposal environmental outcomes

For the Strategic Proposal, BHP proposed regional outcome-based objectives for each factor aligned to the EPA's objectives (BHP 2016a - Table 2), 'to mitigate risks (in accordance with the mitigation hierarchy) to an acceptable level'.

BHP discussed in the PERSP, targeted management may be required in addition to standard management practices. For the Derived Proposal, each relevant environmental factor, BHP has provided the following information relating to environmental outcomes:

- the Derived Proposal residual impact
- identification of the proposed environmental outcomes for the Derived Proposal
- proposed mitigation and monitoring of environmental outcomes
- application of limits on the extent of a proposal element/s, relevant Strategic Proposal MS1105 condition, and/or other statutory decision-making processes that can mitigate the potential impacts of the Derived Proposal
- how the Derived Proposal meets environmental objectives specified in the relevant conditions (as required by 2(b) of MS1105 Table 2, Column 3 Description of limits/extent).

2.2 Derived Proposal request

In requesting that a Proposal be declared a Derived Proposal, subject to MS1105, BHP is required to demonstrate compliance with:

- MS1105 Guidelines for submitting a derived proposal
- MS1105 Schedule 1 location and authorised extent of physical and operational elements
- *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures* (EIA Procedures) (EPA 2021b)

The following Tables (Table 2-1 to Table 2-3) demonstrate compliance with these requirements.

Table 2-1: Demonstration that the Derived Proposal meets MS1105 Guidelines

MS1105 Guidelines requirement	Requirement	Addressed? Yes/No	Section and Appendix number
1(a)	Targeted surveys identifying conservation significant flora and vegetation, terrestrial fauna and subterranean fauna species	Yes	Sections 6.3.1, 7.3.1 and 8.3.1 Appendix 6, Appendix 7 and Appendix 8
1(b)	A demonstration of how the results of the targeted surveys have been used to apply the mitigation hierarchy to the proposal.	Yes	Sections 6.5, 7.5 and 8.5
1(c)	A report that details the following information: i. The types of ecosystems and total area of rehabilitation that the proponent with be required to rehabilitate across their iron ore tenure including the derived proposal	Yes	Rehabilitation Report Appendix 4

MS1105 Guidelines requirement	Requirement	Addressed? Yes/No	Section and Appendix number
	ii. An analysis of the history of rehabilitation that the proponent has undertaken in the Pilbara and the demonstrated success of this rehabilitation. iii. The likely success of future rehabilitation activities in establishing self-sustaining areas of rehabilitation		
1(d)	Draft management plans: - Terrestrial Fauna Environmental Management Plan - Air Quality Environmental Management Plan - Mine Closure Plan	Yes	Appendix 10 to Appendix 12

Table 2-2: Consistency with MS1105 Schedule 1, Table 2

Requirement	Consistent? (Yes/No)
Developments Iron ore mines and associated activities and operations, being new operations at the locations identified in MS1105 Schedule 1 Table 2 and future expansions to new mining operations listed and existing mining operations.	Yes New mining operation at Ministers North.
Location Associated activities and operations will be located within the Strategic Proposal boundary as identified in MS1105 Figures 1 and 2.	Yes The Derived Proposal is located within the Strategic Proposal boundary (see Figure 1-1).
Description of limits/extent Clearing (as defined in s51A of the *Environmental Protection Act 1986*), caused by or likely to be caused by all future proposals identified in Column 1 of Table 2, shall not exceed 98,500 hectares (ha).	**Yes** The Ministers North Derived Proposal will require up to 1,848 ha of native vegetation clearing. The Ministers North Derived Proposal, together with other approved derived proposals, will not cause the authorised limit of 98,500 ha to be exceeded (see Appendix 2).
Planned, designed and managed (demonstrated in the referral of future proposal and draft management plans submitted at the time of referral of future proposals) to ensure:	**Yes** The Derived Proposal has been designed to minimise impacts and draft management plans have been submitted (where relevant). See Sections 5.5, 7.5 and 9.5 (Appendix 10 to Appendix 11).
Cumulative impacts to key environmental factors are minimised through use, where practicable, of existing mine infrastructure, rail, road and associated developments and do not exceed cumulative impact limit of 98,500 ha specified above	**Yes** Cumulative impacts have been minimised by using existing infrastructure where practicable and total clearing will not exceed 98,500 ha.
The environmental objectives specified in the relevant conditions will be met	**Yes** See Sections 5.6, 6.6, 7.6, 8.6, 9.6, 10.6 and 11.6
Scientifically verifiable estimates of the likely success of future rehabilitation have been made.	**Yes** See Appendix 4 *BHP Strategic Proposal: Rehabilitation Report*

Table 2-3: Consistency with EIA procedures (EPA 2024)

Section	Requirement	Consistent? (Yes/No)
2.5.2 EPA to decide whether a declare a derived proposal		
The EPA must declare a referred proposal to be a derived proposal if it considers that -		
(a)	The referred proposal was identified in the Strategic Proposal (s 38E(4)(a)	Yes. The Derived Proposal is within the scope of the Strategic Proposal as identified in BHP's PERSP (BHP 2016a) and in the EPA's assessment report (EPA Report 1619) on the Strategic Proposal (EPA 2018a).
(b)	In the statement mentioned in s,38E(1)9b), it was agreed or decided under s.45 that the referred proposal could be implemented, or could be implemented subject to conditions (s.38(E0(4)(b))	Yes The Minister for Environment issued MS1105 for the Strategic Proposal on 11 July 2019. The Statement states that the future derived proposals that meet the limitations and extent detailed in Schedule 1 may be implemented subject to the conditions and guidelines set out in the Statement. The Derived Proposal is located within the Strategic Proposal Boundary identified in Figure 1 and is consistent with activities identified in Schedule 1 (Tables 2 and 3) of MS1105.
The EPA may refuse to declare the referred proposal to be a derived proposal if it considers that -		
(a)	The environmental issues raised by the referred proposal were not adequately assessed in the strategic assessment (s,38E(5)(a)	No The EPA assessed the Strategic Proposal through a Public Environmental Review process. BHP addressed all potential impacts to all environmental factors. In EPA Report 1619, the EPA identified all environmental factors as key environmental factors relevant to the Strategic Proposal. The potential environmental issues related to the Derived Proposal were adequately assessed for the Strategic Proposal.
(b)	There is significant new or additional information that justifies the reassessment of the issues raised by the proposal (s.38E(5)(b)	No BHP has reviewed EPA guidance, relevant publicly available information and has undertaken proposal specific studies and consultation for the Derived Proposal, to validate the impacts of the Derived Proposal against the Strategic Proposal. The validation of these factors confirmed that there is no significant new or additional information that justifies reassessment.
(c)	There has been a significant change in the relevant environmental factors since the strategic assessment was completed (s.38E(5)(c)	No The relevant factors for the Derived Proposal were identified as key factors for the Strategic Assessment (EPA Report 1619, EPA 2018a).

2.3 Commonwealth Strategic Approval

On 18 September 2012, the Australian Government and BHP Billiton Iron Ore Pty Ltd agreed to undertake a strategic assessment in accordance with section 146(1) of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The *BHP Billiton Iron Ore Pilbara Strategic Assessment Program* (BHP 2017) was endorsed by the then 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 activities within the Strategic Assessment Area, which is the same as the State Strategic Proposal Boundary and within the scope of the Strategic Program. The following Matters of National Environmental Significance (MNES) Threatened fauna species are relevant to the Strategic Program:

- Ghost Bat (*Macroderma gigas*)
- Pilbara Leaf-nosed Bat (*Rhinonicteris aurantius*)
- Northern Quoll (*Dasyurus hallucatus*)
- Greater Bilby (*Macrotis lagotis*)
- Pilbara Olive Python (Pilbara subspecies) (*Liasis olivaceus barroni*)
- Night Parrot (*Pezoporus occidentalis*)
- Grey Falcon (*Falco hypoleucos*)

BHP administers a non-statutory validation process under Part C of the Strategic Program to decide whether an activity will have an impact on Program Matters. Where a Program Matter trigger is met and are therefore notifiable, BHP will prepare a Validation Notice or amend and re-issue an existing Validation Notice. Actions that do not exceed the trigger for a Program Matter (and therefore are not notifiable actions), BHP will prepare a Decision Report.

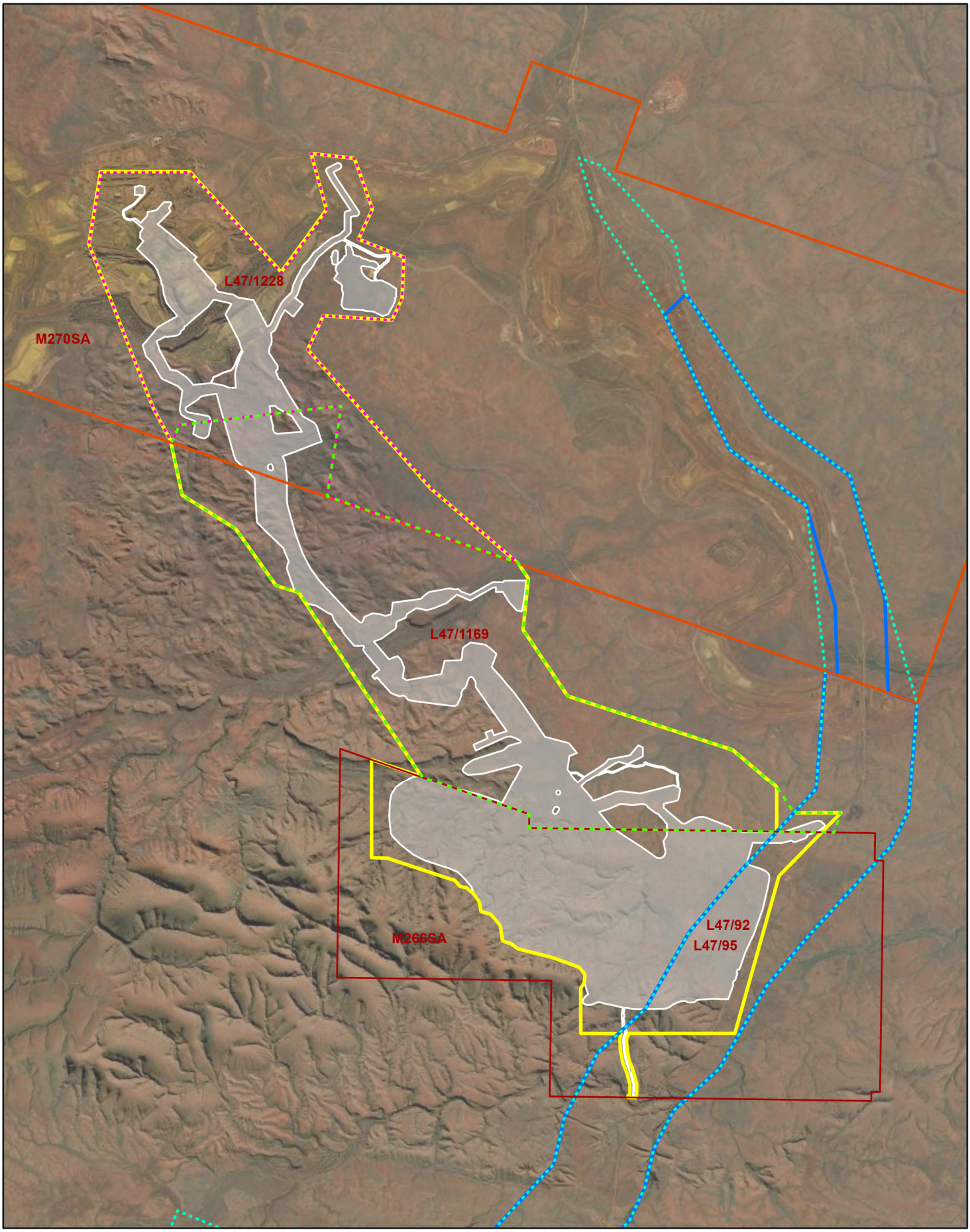
BHP has assessed the Derived Proposal in accordance with the Pilbara Strategic Assessment Assurance Plan and Offsets Plan and the Pilbara Strategic Assessment Program. BHP has determined the Ministers North proposed action to be a Notifiable Action with a requirement to prepare and submit a Validation Notice to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) prior to implementation of the Ministers North proposed action.

2.4 Tenure

The proposed Ministers North Development Envelope is situated partly on existing tenure held under the *Iron Ore (McCamey's Monster) Agreement Authorisation Act 1972* (McCamey's State Agreement) and the *Iron Ore (Marillana Creek) Agreement Act 1991* (Marillana State Agreement) (as identified by Table 2-4 and Figure 2-1). A portion of the proposed Development Envelope (part of the proposed infrastructure corridor) requires a new Miscellaneous Licence, the application for which under the McCamey's State Agreement and the *Mining Act 1978* has been submitted by BHP.

Table 2-4: Ministers North tenure and State Agreement Act summary

***Mining Act 1978* (WA) Tenure**	**Status**	**Holder**	**Agreement Act** (State Agreement)
Mining Lease 266SA (M266SA)	Granted	BHP Iron Ore (Jimblebar) Pty Ltd	*Mining Act 1978* (WA) *& Iron Ore McCamey's Monster Agreement Authorisation Act 1972* (WA)
Mining Lease 270SA (M270SA)	Granted	BHP Minerals Pty Ltd Itochu Minerals & Energy of Australia Pty Ltd Mitsui Iron Ore Corporation Pty Ltd	*Mining Act 1978* (WA) *& Iron Ore (Marillana Creek) Agreement Act 1991* (WA)
Miscellaneous Licence 47/1169 (L47/1169)	Pending	BHP Iron Ore (Jimblebar) Pty Ltd	*Mining Act 1978* (WA) *& Iron Ore McCamey's Monster Agreement Authorisation Act 1972* (WA)
Miscellaneous Licence 47/1228 (L47/1228)	Pending	BHP Iron Ore (Jimblebar) Pty Ltd	*Mining Act 1978* (WA) *& Iron Ore McCamey's Monster Agreement Authorisation Act 1972* (WA)



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)

Tenure

- M266SA
- M270SA
- L47/1228
- L47/1169
- L47/92
- L47/95

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MINING TENURE

WAIO PLANNING, TECHNICAL & ENVIRONMENT

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2.5 State Agreement

The operations for the Derived Proposal are held subject to the *Iron Ore McCamey's Monster Agreement Authorisation Act 1972* (WA) (herein termed the 'McCamey's State Agreement') and the *Iron Ore (Marillana Creek) Agreement Act 1991* (WA) (herein termed the 'Marillana State Agreement').

The Derived Proposal will be subject to assessment and approval of additional State Agreement Proposal(s) in accordance with the relevant State Agreement Acts.

2.6 Other approvals and regulation

2.6.1 Other approvals required for the Derived Proposal

Table 2-5 outlines other state approvals that are required for the Derived Proposal.

Table 2-5: Other approvals

Decision-making Authority	Legislation or Agreement	Approval Required (and relevant proposal element)	Whether and how statutory decision-making process can mitigate environmental impacts?
Minister for State Development (on the advice of DEED)	McCamey's State Agreement) / Marillana State Agreement	Additional State Agreement Proposals required under the relevant legislation (that being McCamey's State Agreement and Marillana State Agreement) to authorise the development and operation of Ministers North, which includes the grant of tenure as noted in Table 2-4.	**No** The additional State Agreement Proposal(s) are not intended to control the environmental impacts of the Derived Proposal.
Minister for Mines (on the advice of DMPE, or as delegated to DMPE for approval)	*Mining Act 1978* (WA) – Section 82A	No Mining Act approvals are required for Ministers North	**No** Following the proclamation of the Mining Amendment Act 2022 on the 09 September 2025 s103AI(1) to (5) do not apply to Miscellaneous Licences granted or held under a government agreement in accordance with proposals approved, taken to be approved or determined under the agreement [s103AI(6). As the new Miscellaneous Licence for Ministers North will be granted pursuant to State Agreements, no Mining Act approval is required.
Department of Water and Environmental Regulation (DWER)	*Environmental Protection Act 1986* (WA) – Section 59 (Part V)	A Works Approval and Licence approval for Ministers North for: (a) Category 12 *'Screening etc. of material'* (or Category 70 *'Screening etc. of material'*) to allow for mobile crushing and screening units (b) Category 73 '*Bulk storage of chemicals, etc.'* to allow for chemical storage at Ministers North.	**Yes** The Licence L6168 approval specifies environmental limits and management practices to mitigate the potential impacts to the environment. The changes to the Licence L6168 approval to incorporate Ministers North are

Decision-making Authority	Legislation or Agreement	Approval Required (and relevant proposal element)	Whether and how statutory decision-making process can mitigate environmental impacts?
		New works approval and/or amendment of the Licence L6168 approval (DWER 2023a) for Yandi to: (a) Authorise changes at the Yandi Ore Handling Plant (OHP) for existing Category 5 '*Processing or beneficiation of metallic or non-metallic ore*' to enable the processing of Brockman-type ores. Subject to discussions with DWER, the Works Approval and Licence required for Ministers North may alternatively be authorised as part of an amendment of the Licence L6168 approval (DWER 2023a).	not anticipated to introduce any new or different environmental impacts not otherwise addressed through the current Licence L6168 approval. BHP submits an annual Compliance Report to DWER on the operations, including the provision of environmental monitoring and management actions required by the implementation conditions.
Minister for Water (on the advice of DWER, or as delegated to DWER for approval)	*Rights in Water and Irrigation Act 1914* (WA) – Section 5C *Rights in Water and Irrigation Act 1914 - Beds and Banks Permit*	Amendment to the Groundwater Licence GWL89501 approval (DWER 2018) applying to Yandi, to incorporate additional mining tenure for Ministers North area (i.e. addition of M266SA and Miscellaneous Licence L47/1169 and L47/1228) to allow for the use of abstracted groundwater (use of groundwater from water sources outside of the Derived Proposal). Permit to interfere with bed and banks (creek crossing for haul roads and access tracks).	**Yes** The Groundwater Licence GWL89501 approval includes conditions to comply with a Groundwater Operating Strategy (including limits on groundwater abstraction volumes and abstraction locations), report on groundwater monitoring results each year, and submit a groundwater monitoring review each 3 years. Bed and banks permit contains terms, conditions and limits relating to the design and construction of proposed works.
Minister for Environment (on the advice of the Department of Biodiversity, Conservation and Attractions (DBCA), or as delegated to DBCA for approval)	*Biodiversity Conservation Act 2016* (WA) - Section 40	A Licence to take (or disturb) Threatened fauna for Ministers North may be required in accordance with Section 40 of the *Biodiversity Conservation Act 2016* (WA). BHP will liaise with DBCA as to the appropriate class(es) of Licence that may be required for the Derived Proposal.	**Yes** A Licence under Section 40 can include conditions to relating to the taking of, and disturbance to, Threatened fauna. The conditions can include specified actions be taken, or not to be taken, in interactions with Threatened fauna.
Minister for Aboriginal Affairs (on the advice of the Aboriginal Cultural Heritage Committee (ACHC) and the Banjima Native Title Aboriginal	*Aboriginal Heritage Act 1972* (WA) – Section 18	Consent to interfere with an Aboriginal heritage site(s) concurrent with Ministers North will be required in accordance with Section 18 of the *Aboriginal Heritage Act 1972* (WA). The Ministers North Derived Proposal has been designed to avoid and/or minimise the potential impacts to identified locations of Aboriginal cultural heritage (where possible) and has	**Yes** To the extent that the environmental values under 'Social Surroundings' relate to Aboriginal heritage places and objects, the Section 18 Consent may include conditions which manage or limit disturbance to

Decision-making Authority	Legislation or Agreement	Approval Required (and relevant proposal element)	Whether and how statutory decision-making process can mitigate environmental impacts?
Corporation (BNTAC))		included extensive consultation with the Banjima People on the residual impacts to the recorded values.	the recorded biological and cultural values.

2.6.2 Other Part IV approvals relating to the Derived Proposal

2.6.2.1 *Yandi Mining Operations (MS679)*

The northern extent of the Development Envelope overlaps the existing operations at Yandi. Yandi has been assessed and approved under separate Government processes, and accordingly, does not require re-assessment or re-approval (via Part IV of the EP Act) to enable the continued use (see further discussion in Section 1.1.6.6). However, interactions with a number of elements at Yandi may require consideration post-approval, including but not limited to:

- The removal of Yandi OSA C1 for the purposes of fill material for the Ministers North haul road (if required) will be reflected in future updates to the *Marillana Creek (Yandi) Closure Plan*
- The processing of Brockman-type ore at the Yandi OHP from Ministers North will warrant an amendment of Licence L6168 for Category 5 'Processing or beneficiation of metallic or non-metallic ore'
- Amendment to the Yandi Groundwater Licence GWL89501 to incorporate additional mining tenure for Ministers North to allow for the use of abstracted groundwater (use of groundwater from water sources outside of the Derived Proposal).

2.6.2.2 *Mining Area C – Southern Flank (MS1072)*

As discussed in Section 1.1 the long-term operational water requirement for the Derived Proposal is anticipated to be sourced from BHP's proposed CPHSW which is currently under assessment by the EPA as the MAC/SF Significant Amendment. The significant amendment for MS1072 does not include any elements being considered for the Derived Proposal and will not require any post-approval amendments to provide for the Derived Proposal. However, modifications to other existing approvals at MAC/SF will be required including, but not limited to, an amendment to the RiWi Act 5C Licenses (and groundwater operation strategy (GWOS)) for MAC/SF.

3 Stakeholder Engagement

3.1 Key stakeholders

Table 3-1: Key stakeholders

Stakeholder group	Stakeholder
State Government	Department of Water and Environmental Regulation (DWER) Department of Mines, Petroleum and Exploration (DMPE) (formerly DEMIRS) Department of Biodiversity, Conservation and Attractions (DBCA) Department of Energy and Economic Diversification (DEED) (formerly JTSI) Department of Planning, Lands and Heritage (DPLH)
Traditional Owners, Native Title Claimants and Representative Bodies	Banjima Traditional Owners, through Banjima Native Title Aboriginal Corporation (BNTAC)
Commonwealth Government	Department of Climate Change, Energy, the Environment and Water (DCCEEW)
Local Government	Shire of East Pilbara

3.2 Stakeholder engagement process

As discussed in the PERSP (BHP 2016a), BHP aims to facilitate regular, open and honest dialogue with the key stakeholders identified in Table 3-1 to understand expectations, concerns and interests of stakeholders and to consider them in business planning.

The stakeholder engagement addresses the requirements of MS1105 *Guidelines for submitting a derived proposal*: specifically, 1(e) stakeholder engagement.

3.3 Stakeholder consultation outcomes

Table 3-2 summarises stakeholder consultation undertaken specifically for the Derived Proposal.

Table 3-2: Stakeholder consultation

Stakeholder	Date	Matters Discussed	BHP Response and Outcome
Banjima People **(via Banjima Native Title Aboriginal Corporation (BNTAC))**	Ongoing consultation (see Chapter 11 Social Surroundings Validation for detailed consultation summary).		
Environmental Protection Authority (EPA) **(includes EPA Services division of DWER)**	August 2025	Pre-referral discussion providing the EPA Services an overview of the Derived Proposal, including key infrastructure elements, use of existing infrastructure at BHP's Yandi as a 'Hub', key environmental factors, and how BHP has applied the mitigation hierarchy in response to the findings of studies/surveys undertaken for the Derived Proposal. Traditional Owner engagement and how this has been considered in the design of the Derived Proposal was also a key topic of discussion.	BHP considered feedback provided during the engagement in relation to several factors, including short range endemic (SRE) fauna, consideration of overall "protection" of values (as opposed to minimisation) and conditional management plans. In response, BHP has assessed impacts to SRE fauna, committed to several mining exclusion zones for key environmental values, and provided several fit-for-purpose conditional management plans.
Department of Water and Environmental Regulation (DWER)	August 2025	Continued discussions on Part V licensing requirements for Yandi and Ministers North	BHP to provide additional information at the next DWER-BHP licensing meeting
	July 2025	BHP introducing the scope of the upcoming Ministers North Works Approvals, noting two works approvals may be required. One for the crusher replacement at Yandi and associated tie ins to Ore Handling Plant 3 and the other for works associated with the Ministers North haul road / infrastructure corridor.	BHP sought confirmation on parallel processing for these scopes.
Department of Mines, Petroleum and Exploration (DMPE) (formerly DEMIRS)	August 2025	Pre-lodgement information session for the Ministers North MCP	BHP sought confirmation of new closure guidance (*Mining Amendment Act 2022* commencing 9 September 2025).
	June 2025	BHP discussed two NVCP amendments at Ministers North currently under assessment with DMPE.	BHP provided an update that the final IBSA number was provided 9 June 2025.
	May 2025	BHP discussed one NVCP amendment for Ministers North currently under assessment.	DEMIRS noted this had been allocated to an officer for assessment.
Department of Climate Change, Energy, the Environment and Water (DCCEEW)	TBC	Meeting to be scheduled pre-submission of Validation Notice to discuss the Derived Proposals impacts on relevant Program Matters.	*To be completed – meeting date to be confirmed*

Department of Energy and Economic Diversification (DEED) (formerly DJTSI)	September 2024	BHP presented a high-level overview of Ministers North project, with a focus on the BHP 132kV powerline relocation scope.	A 'non-significant letter' was agreed as the appropriate State Agreement approval pathway for 132kV powerline scope of works, with BHP to provide DEED with further information on the Project when available.
Rio Tinto	2006 – 2024+	Multiple consultations (as required) to facilitate access across Rio Tinto tenure (mining and pastoral) for the purpose of biological surveys, heritage surveys, social surroundings engagements and mineral exploration activities. Consultation to coordinate the relocation of Rio Tinto powerlines currently over the Ministers North mining area, including the sharing of biological survey information to enable Rio Tinto to seek required Government approvals.	Rio Tinto has cooperatively facilitated access by BHP across the Rio Tinto tenure. BHP and Rio Tinto continue to work cooperatively to facilitate the realignment of the Rio Tinto powerlines.

4 Objects and Principles of the EP Act

4.1 Consideration of 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. In undertaking its assessment of the Strategic Proposal, the EPA had regard for the Object and principles contained in s4A of the EP Act to the extent relevant to the particular matters that were considered (EPA Report 1619, EPA 2018a). The EPA's consideration of the EP Act principles in its assessment of the Strategic Proposal is detailed in EPA Report 1619 (EPA 2018a). There have been no changes to the Object and principles of the EP Act since the Strategic Proposal was assessed.

BHP considers that the Derived Proposal is consistent with the Strategic Proposal, therefore, the EPA's consideration for the Strategic Proposal applies to the Derived Proposal.

4.2 Key environmental factors

BHP has identified the following relevant environmental factors for the Derived Proposal (Table 4-1):

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

For each relevant environmental factor, BHP has undertaken a validation process (Sections 5 to 11).

Table 4-1 also presents other factors that were assessed as part of the Strategic Proposal, but BHP does not consider are relevant factors for the Derived Proposal. Where BHP has identified some environmental issues relating to an 'other' factor, BHP has summarised the screening information (Section 12 Other environmental factors).

Table 4-1: Identification of relevant environmental factors

Environmental factor	Key environmental factor in EPA Report 1619 on Strategic Proposal	Relevant Strategic Proposal MS condition/s	Relevant associated activities / operations for the Derived Proposal	Environmental issues relating to the Derived Proposal	Potential significant impacts from the Derived Proposal	Relevant factor requiring validation for the Derived Proposal
Land						
Flora and Vegetation	**Yes** Loss of flora and vegetation, including cumulative impacts (together with other proposals)	**Yes** • Clearing limit (Schedule 1, Table 2) • Mine Closure Plan (Condition 15) • Environmental Offsets (Condition 16) • BHP considers that a Flora and Vegetation Environmental Management Plan (Condition 7) is not required for the Derived Proposal.	• Ground disturbance resulting in the clearing of native vegetation • Construction of infrastructure, excavation of mine pits, construction of an OSA • Rehabilitation and decommissioning activities	• Loss of flora and vegetation values • Cumulative impact of native vegetation clearing in the Pilbara region • Potential changes to native vegetation from altered local hydrological regimes	• Cumulative clearing of native vegetation in 'Good' to 'Excellent' condition • Impacts to riparian vegetation from clearing	**Yes** Section 5 *Flora and Vegetation*
Terrestrial Fauna	**Yes** Loss of fauna habitat, including habitat for fauna taxa of listed conservation significance	**Yes** • Clearing limit (Schedule 1, Table 2) • Terrestrial Fauna Environmental Management Plan (Condition 8) • Mine Closure Plan (Condition 15) • Environmental Offsets (Condition 16)	• Ground disturbance resulting in the clearing of fauna habitat • Construction of infrastructure, excavation of mine pits, construction of an OSA • Rehabilitation and decommissioning activities	• Loss of terrestrial fauna habitat • Potential for direct and indirect impacts to terrestrial fauna individuals	• Loss of terrestrial fauna habitat, including habitat for fauna taxa of listed conservation significance • Potential for direct and indirect impacts to terrestrial fauna individuals (including vertebrate and invertebrate terrestrial fauna)	**Yes** Section 7 *Terrestrial Fauna*
Subterranean Fauna	**Yes** Loss of, or changes to, habitat for	**Yes** • Mine Closure Plan (Condition 15)	• Excavation of mine pits (loss of habitat) • Construction of an OSA and stockpiles	• Loss of and/or changes to habitat for troglofauna (above the groundwater level)	• Loss of and/or changes to habitat for troglofauna	**Yes** Section 8 *Subterranean Fauna*

Environmental factor	Key environmental factor in EPA Report 1619 on Strategic Proposal	Relevant Strategic Proposal MS condition/s	Relevant associated activities / operations for the Derived Proposal	Environmental issues relating to the Derived Proposal	Potential significant impacts from the Derived Proposal	Relevant factor requiring validation for the Derived Proposal
	subterranean fauna (troglofauna and stygofauna)	• BHP considers that a Subterranean Fauna Environmental Management Plan (Condition 9) is not required for the Derived Proposal.	(materials placement over habitat)	• Potential for direct and indirect impacts to troglofauna individuals • Potential impacts to stygofauna are insignificant as an above water table mine.	• Potential for direct and indirect impacts to troglofauna	
Landforms	**Yes** Alteration of landforms, including cumulative impacts (together with other proposals)	**Yes** • Mine Closure Plan (Condition 15)	• Excavation of mine pits (removal of landforms) • Construction of an OSA (construction of a landform)	• Modification of natural landforms through excavation of mine pits (including backfilling) and construction of an OSA	• Not significant – notable landforms have been avoided, with the residual impact affecting landforms that are more broadly represented both locally and regionally.	**No** Section 12 *Other Environmental Factors*
Terrestrial Environmental Quality	**Yes** Potential for discharge of pollutants and/or contaminants into the environment, including from mine closure activities.	**Yes** • Mine Closure Plan (Condition 15)	• Excavation of mine pits (exposure of potentially reactive materials) • Construction of an OSA (storage of potentially reactive materials) • Surface water management (potential for transport of contaminants) • Rehabilitation and decommissioning activities	• Surface erosion of materials from land and landforms • Contamination of land through the generation of acidic drainage, metalliferous drainage and/or the accumulation of naturally occurring contaminants	• Not significant – risk of potential impacts to Terrestrial Environmental Quality are low. • The EPA (2018a) in Report 1619 concluded for Terrestrial Environmental Quality that "*the impacts to this factor are manageable and would no longer be significant, provided that for derived proposals there is implementation of a mine closure plan so that future proposals are rehabilitated in an*	**No** Section 12 *Other Environmental Factors*

Environmental factor	Key environmental factor in EPA Report 1619 on Strategic Proposal	Relevant Strategic Proposal MS condition/s	Relevant associated activities / operations for the Derived Proposal	Environmental issues relating to the Derived Proposal	Potential significant impacts from the Derived Proposal	Relevant factor requiring validation for the Derived Proposal
					ecologically appropriate and sustainable manner"	
Water						
Inland Waters[7]	**Yes** Changes to hydrological regimes and water quality as a result of water abstraction, use and disposal of excess water)	**Yes** • Mine Closure Plan (Condition 15) • BHP considers that a Water Environmental Management Plan (Condition 10) is not required for the Derived Proposal.	• Surface water management (including creek diversions)	• Changes to surface water regimes • Potential alteration to groundwater and surface water quality	• Changes to surface water regimes (localised increases and decreases) • Alteration to local surface water quality	**Yes** Section 5 *Inland Waters*
Air						
Air Quality	**Yes** Particulate emissions (dust) associated with land clearing, construction works and mining operations, including cumulative impacts (together with other proposals)	**Yes** • Air Quality Environmental Management Plan (Condition 11)	• Ground disturbance (land clearing) and civil earthworks • Mining operations including blasting, drilling, excavation, transport and processing	• Emission of particulates (dust) • Reduction of local ambient air quality at sensitive receptors	• Reduction in local ambient air quality from air emission of particulates (dust) with a potential for impacts to sensitive receptors	**Yes** Section 9 *Air Quality*

[7] Inland Waters was previously two factors (Hydrological Processes and Inland Waters Environmental Quality) during the preparation of the PERSP and EPA Report 1619. The EPA amalgamated these factors in June 2018.

Environmental factor	Key environmental factor in EPA Report 1619 on Strategic Proposal	Relevant Strategic Proposal MS condition/s	Relevant associated activities / operations for the Derived Proposal	Environmental issues relating to the Derived Proposal	Potential significant impacts from the Derived Proposal	Relevant factor requiring validation for the Derived Proposal
Greenhouse Gas Emissions (GHG)	**Yes** (Increased emissions of greenhouse gases)	**No** GHG emission outcomes can be met without a Greenhouse Gas Management Plan (Condition 12) as Scope 1 emissions will be reduced under the Safeguard Mechanism. This is aligned with recent amendments to the WA Greenhouse Gas Emissions Policy for Major Projects and the EPA's Greenhouse Gas Emissions Environmental Factor Guideline.	• Land use changes (clearing of stored carbon in native vegetation, loss of future carbon storage) • Mining operations including blasting, drilling, excavation, transport and processing	• Emission of greenhouse gases, including cumulative impacts (together with other proposals)	• Contribution to Western Australia's greenhouse gas emissions (modelled emissions meeting threshold for environmental assessment)	**Yes** Section 10 *Greenhouse Gas Emissions*
People						
Social Surroundings	**Yes** Potential impacts to sites of Aboriginal heritage significance and areas where traditional cultural activities are undertaken	**Yes** • Clearing limit (Schedule 1, Table 2) • Mine Closure Plan (Condition 15) • BHP considers that with the implementation of a confidential Project Management Plan (PMP) developed in consultation with Traditional Owners, a Cultural Heritage Management Plan (Condition 13) does not	• Ground disturbance (land clearing) and civil earthworks • Mining operations including blasting, drilling, excavation, transport and processing • Excavation of mine pits (removal of landforms) and construction of an OSA (construction of a landform)	• Direct disturbance to areas of Aboriginal heritage and cultural significance (including heritage sites) • Clearing of native vegetation • Changes to local water regimes • Altered land access and amenity • Rehabilitation and closure	• Direct disturbance to (loss of) areas of Aboriginal cultural heritage • Altered land access, landscape and amenity	**Yes** Section 11 *Social Surroundings*

Environmental factor	Key environmental factor in EPA Report 1619 on Strategic Proposal	Relevant Strategic Proposal MS condition/s	Relevant associated activities / operations for the Derived Proposal	Environmental issues relating to the Derived Proposal	Potential significant impacts from the Derived Proposal	Relevant factor requiring validation for the Derived Proposal
		need to apply to the Derived Proposal.	• Rehabilitation and decommissioning activities			

5 Inland Waters Validation

5.1 EPA environmental factor and objective

The EPA (2023a) objective for the Environmental Factor of 'Inland Waters' is:

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

Inland Waters was previously two factors (Hydrological Processes and Inland Waters Environmental Quality) during the preparation of the PERSP and EPA Report 1619. The EPA amalgamated these factors (and objectives) in June 2018 (EPA 2018b).

BHP recognises that there are inherent links between Inland Waters and other environmental factors (as discussed in the EPA guidance). For example, changes to the quality or quantity of Inland Waters can potentially affect flora and vegetation, terrestrial fauna, subterranean fauna, and social surroundings. While impacts to these environmental values has been considered under each relevant factor, BHP has considered the impacts to Inland Waters holistically with these other factors, where appropriate, in order to assess impacts on an ecosystem's integrity as a whole.

5.2 Relevant policy and guidance

BHP has validated this environmental factor considering the policies and guidance outlined in Table 5-1. Since the EPA (2018a) assessment of the Strategic Proposal there has been no change to the EPA's guidance on the Environmental Factor of Inland Waters aside from that discussed above.

Table 5-1: Inland Waters - policy and guidance

Policy or Guidance	Consideration of Policy or Guidance
Environmental Factor Guideline - Inland Waters (EPA 2018b)	• Considered the links with other environmental factors • 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
Western Australian Water in Mining Guideline (DoW 2013a)	Undertook the following consistent with the guideline: • Consultation, project scoping, investigations, validation of impacts and post-closure management • Considered all possible water sources in planning for water supply • Ensured fit-for-purpose water is used wherever possible • Ensured the cumulative effects of mining operations are considered and managed
Policy: Use of Mine Dewatering Surplus (DWER 2020)	The following items are important to the proposal: • Considered regulatory requirements • Considered fit for purpose use of mine dewatering volumes from interconnected operations • Considered cumulative impacts,water quality and availability of water after mine closure.

5.3 Receiving environment

5.3.1 Studies and surveys

In assessment of the Strategic Proposal, BHP (2016a) considered the following information sources for the assessment of the potential impacts to flora and vegetation values:

- BHP (2016d) *SEA Hydrology: Ecohydrological Change Assessment*.

BHP (2016a) identified that additional surveys and studies would be necessary to verify the potential impacts of the Strategic Proposal to Inland Waters. BHP has since completed a number of Proposal-specific studies to inform the validation of Inland Waters for the Derived Proposal. These are discussed below in Table 5-2.

Table 5-2: Inland Waters - supporting studies

Title	Survey date	Survey summary	Appendix
Surface Water			
Stantec (2024) Ministers North Trucking Surface Water Impact Assessment Report	N/A	Stantec Australia Pty Ltd was engaged to undertake an updated surface water assessment for the development of a new mining area consisting of two pits, a transport corridor connecting Ministers North to Yandi, and new mine site infrastructure. Stantec previously undertook the Surface Water Environmental Impact Assessment in 2018.	Appendix 5
Groundwater			
Ptg Consulting (2025) Yandicoogina Gorge PFAS Summary Technical Memorandum.	2024	The information gathered since groundwater monitoring commenced in 2024 provides baseline data on the occurrence of PFAS at Ministers North and Yandicoogina Gorge. Overall, the concentrations and diversity of PFAS compounds is low/limited.	Appendix 5
BHP (2024a) Ministers North Aquifer Numerical groundwater modelling	N/A	Groundwater levels in the Ministers North aquifer have been declining since approximately 2018. Groundwater Consulting Pty Ltd (GWC) was engaged by BHP to undertake numerical groundwater flow modelling.	Appendix 5

5.3.2 Survey assumptions and limitations

In the assessment of the Strategic Proposal, the EPA (2018a) identified that studies would be required to inform future Derived Proposals. BHP has undertaken a number of studies for the Derived Proposal as described in Section 5.3.1. In addition to those listed above, several studies have been undertaken to support the development of the Mine Closure Plan (MCP) (Appendix 12), identified as a key requirement to minimise risks related to Inland Waters (e.g. pit lakes, acid mine drainage).

The most recent study, Stantec (2024) Ministers North Trucking Surface Water Impact Assessment Report, has identified potential limitations for the surface water modelling including but not limited to:

- An assessment of cyclonic activity is not included in the study.
- Assessment of the Marillana Creek influences is excluded from the study. The peak discharge rates for Marillana Creek were based on a flood frequency assessment included in the Marillana Creek Baseline Hydrology Report (Advisian, 2023).
- Climate change uplift is based on draft updated guidance as of March 2023 and was considered best available information at the time of project commencement. Updates to Australian Rainfall and Runoff in August 2024 impacted these assumptions and have been included as sensitivity analysis.

- Loss of catchment area due to borrow pits have not been included in the assessment.

Nevertheless, these limitations are not considered significant, and the breadth of work undertaken for the Derived Proposal is deemed adequate to inform the assessment of Inland Waters, and consistent with the requirements identified under the Strategic Proposal approval.

5.3.3 Environmental values

5.3.3.1 Climate

The eco-hydrological change assessment undertaken for the Strategic Proposal (BHP 2016a) provides a summary of climate and climate variability in the Pilbara, based on the CSIRO Pilbara Water Resource Assessment (WRA), for which a number of reports were published in 2015. The analyses undertaken for the Strategic Proposal included data up to 2013.

The Pilbara region which has a semi-arid to arid climate with hot summers and mild winters. Rainfall is variable, most rainfall occurs from December to March (‘wet season’) through tropical lows and cyclones, with reduced rainfall occurring during the remainder of the year (‘dry season’).

DWER has operated the Marillana Creek Flat Rocks rainfall station (505011) (upstream of the Development Envelope) since 1972. Rainfall varies year to year, with a minimum of 85 mm recorded in 1972 and a maximum of 975 mm in 2000 (DWER 2024). Average annual rainfall at the station between 1972 to present is recorded as 389 mm (DWER 2024). Analysis of annual rainfall indicates that the Marillana Creek catchment is generally wetter than the Weeli Wolli Creek catchment, receiving on average 6% more rainfall on an annual basis (Stantec 2024). This suggests a spatial variation in rainfall, which is commonly experienced across the Pilbara.

The annual potential evaporation for the Marillana Creek region is estimated as 2,000 mm (Stantec 2024). Annual average evaporation potential exceeds the annual average rainfall in the Marillana Creek region which creates a moisture deficit in the environment. This demonstrates that there is typically a net deficit of rainfall to support runoff to surface water bodies and also highlights the importance of high rainfall events to recharge groundwater.

Future Climate Predictions

As part of BHP’s Strategic Assessment (BHP 2016a), future climate considerations were presented. With regards to projected annual rainfall, the models produced a large range of results, with some indicating a decrease in rainfall and others an increase in rainfall. In general, the high-emission scenario resulted in a drier climate in comparison to existing and lower-emission scenarios. The median results showed that future climate rainfall projections to 2050 do not vary by more than 5% from current levels.

Australia’s climate has warmed on average by 1.74 +/- 0.24°C since national records began in 1910, leading to an increase in the frequency of extreme heat events. For the Northern Rangelands, mean temperatures have increased by about 1.0 °C since 1910 (DWER 2021b). Rainfall and streamflow have increased across parts of northern Australia since the 1970s. Year-to-year variability is strongly influenced by the El Niño Southern Oscillation (DWER 2021b). There has been a decrease in the number of tropical cyclones observed in the Australian region since 1982. In the coming decades northern Western Australia can expect to experience:

- Continued warming, with more extremely hot days and fewer extremely cool days
- More intense short-duration heavy rainfall events
- Fewer tropical cyclones but a greater proportion to be of high intensity, with ongoing large variations from year to year; (BoM and CSIRO 2022).

By 2030, the mean annual warming across all emissions scenarios in the Northern Rangelands is proposed to be about 0.6 to 1.4 °C above the climate of 1986–2005 (DWER 2021b). CSIRO projections suggested that mining companies (as well as local communities) would need to adapt practices to improve water use efficiency and to cope in the hotter extremes.

Stantec (2024) incorporated future climate into the surface water modelling study, specifically, the 1 in 10,000 AEP closure conditions analysis includes a Climate Change uplift consideration and was adopted as per the *Draft Updates to the ARR2019 Climate Change Guidelines* (Engineers Australia and DCCEEW 2024).

5.3.3.2 Surface Water Hydrology

Regional Hydrology

At the regional scale, the Derived Proposal is located within the Upper Fortescue Region of the Fortescue River Basin, in Weeli Wolli Creek catchment and the Marillana Creek subcatchment (Figure 5-1). Weeli Wolli Creek is approximately 70 km in length and has a catchment area of 4,100 km^2 occurring across an elevation range of 495 - 1160 mAHD. A dense network of ephemeral tributaries is associated with the system. Weeli Wolli Creek flows to the north, where it drains into the Fortescue River at the Fortescue Marsh. However, the two systems are only connected during flooding associated with intense cyclonic events.

DWER operate a streamflow gauging station at Weeli Wolli Creek - Tarina (708014) in the regional Weeli Wolli Creek catchment approximately 11 km east of the Development Envelope. Streamflow data is available from 1984 to present. Total annual discharge from the stream varies, from a maximum of 88,490 ML/a in 1999 to a minimum of 244 ML/a in 1994 (excluding years in which 0 ML/a were recorded – 1985, 1986, 1987, 1989, 1991 and 1996) (DWER 2024). As described in EPA (2018a), increased discharge of surplus dewater to creeks increased the flow to the creek in the area downstream of Weeli Wolli Spring extending the distance of permanent flow to Tarina Gauging station. This is reflected in the records from Tarina Station with a permanent water presence rather than an ephemeral system that is common in the Pilbara.

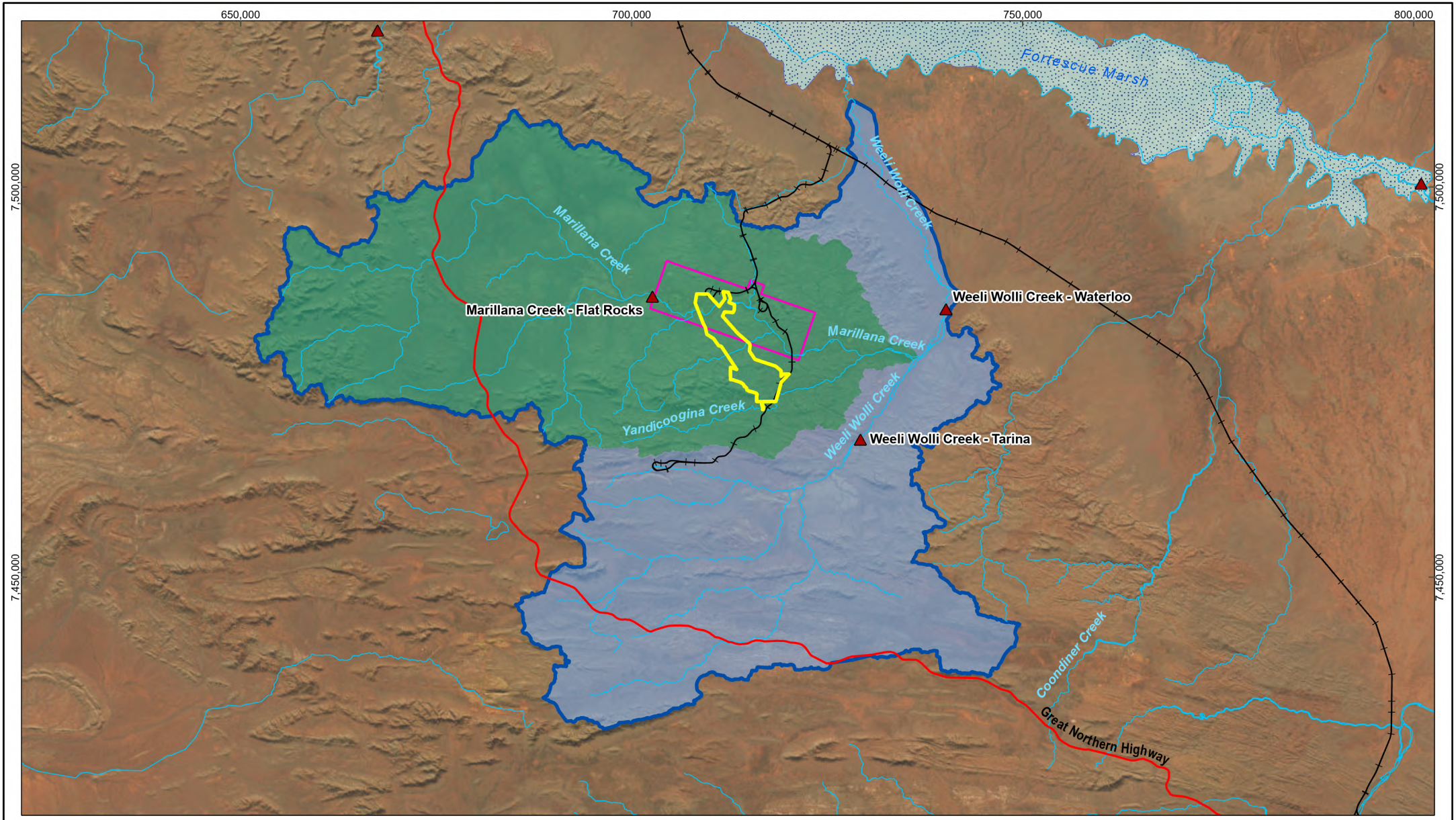
The Marillana Creek Catchment covers an area of approximately 2,050 km^2. The Marillana Creek headwaters rise from the high relief areas of Hamersley Range, draining into the Munjina Claypan upstream of the Derived Proposal area, occurring across an elevation range of 485 - 1170 mAHD. While Marillana creek is naturally ephemeral, there are a number of semi-permanent and permanent pools upstream of Yandi. The confluence of Marillana Creek and Weeli Wolli Creek is approximately 17 km downstream of the proposed Development Envelope.

DWER operate a streamflow gauging station at Marillana Creek - Flat rocks (708001), located upstream of the existing mining activities by BHP (and other parties) in the Marillana Creek catchment. Streamflow data is available from 1967 to present and indicates that flow in Marillana Creek is driven by cyclonic rainfall events with little to no flow outside these events. Total annual discharge from the stream varies widely from a maximum of 144,500 ML/a in 1975 to a minimum of 5.8 ML/a in 2023 (DWER 2024).

Local hydrology

At the local scale within the Development Envelope, the northern local catchments (Central Tributary catchment and Mungadoo Tributary catchment – as described in Stantec (2024)) drain via minor drainage lines in a northerly direction towards Marillana Creek. These local tributary catchments have an area of approximately 50 km^2 (Central) and 24 km^2 (Mungadoo). The Central Tributary occurs across an elevation range of 568 - 1080 mAHD and the Mungadoo Tributary occurs across an elevation range of 550 - 940 mAHD.

The southern local catchment (Yandicoogina Creek catchment) drains in a south-easterly direction to Yandicoogina Creek. Yandicoogina Creek (a tributary of Marillana Creek) is approximately 42 km in length and flows in a northeasterly direction east of the Development Envelope (partially intersecting). The upper reaches of Yandicoogina Creek comprise a relatively broad, un-defined channel, however, in the mid to lower reaches, the creek flows through a gorge system and becomes well defined, occurring across an elevation range of 505 - 1060 mAHD. Yandicoogina Creek joins Marillana Creek approximately 10 km downstream of the Development Envelope (Figure 5-2).



Legend

- Development Envelope (5,557 ha)
- Fortescue Marsh
- Marillana Creek Subcatchment
- Weeli Wolli Creek Subcatchment
- Weeli Wolli Creek Catchment
- BHP Yandi (MS679 as amended by MS1039)
- BHP Rail
- Major Roads
- Watercourse
- DWER Stream Gauging Station

N

0 5 10 15 20

kilometres

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
REGIONAL HYDROLOGY

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:650,000	REQUESTED:	PROJECTS	FIGURE:	5-1
DATE:	27/08/2025	PREPARED:	GEOMATICS		

A1317-041 RevC

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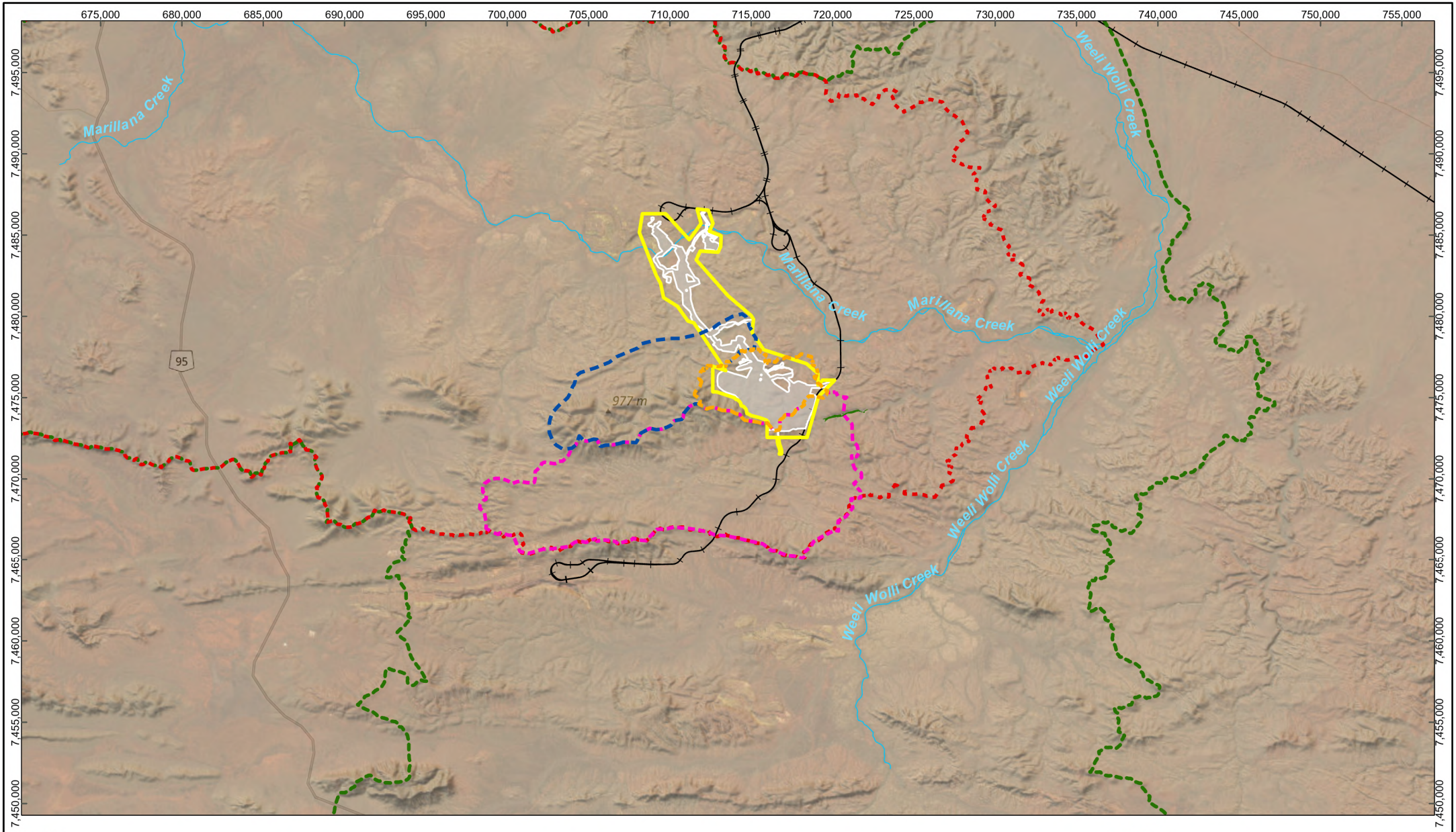


Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Groundwater Dependent Ecosystem
- BHP Rail
- Watercourse

Name1

- Central Tributary Catchment
- Mungadoo Tributary Catchment
- Yandicoogina Creek Catchment

Regional Catchment

- Marillana Creek Subcatchment
- Weeli Wolli Creek Subcatchment

N

0 2 4 6 8

Kilometers

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
LOCAL HYDROLOGY

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:312,500	REQUESTED:	PROJECTS	FIGURE:	5-2
DATE:	3/09/2025	PREPARED:	GEOMATICS		

A1317-042 RevD

Document Path: Y:\Jobs\A1001_A1500\A1317\3Project\A1317_042_E_MNERD_InlandWatter_LocalHydrology_RevA.aprx

Surface Water Features

Watercourses in the Development Envelope are ephemeral and flow in response to seasonal rainfall events, coinciding with the December to March wet season. There are four ephemeral watercourses within the Development Envelope including Marillana Creek, Central Tributary, Mungadoo Tributary and Yandicoogina Creek. The creeks and river systems support riparian vegetation and water values which are of cultural importance to the Banjima Traditional Owners.

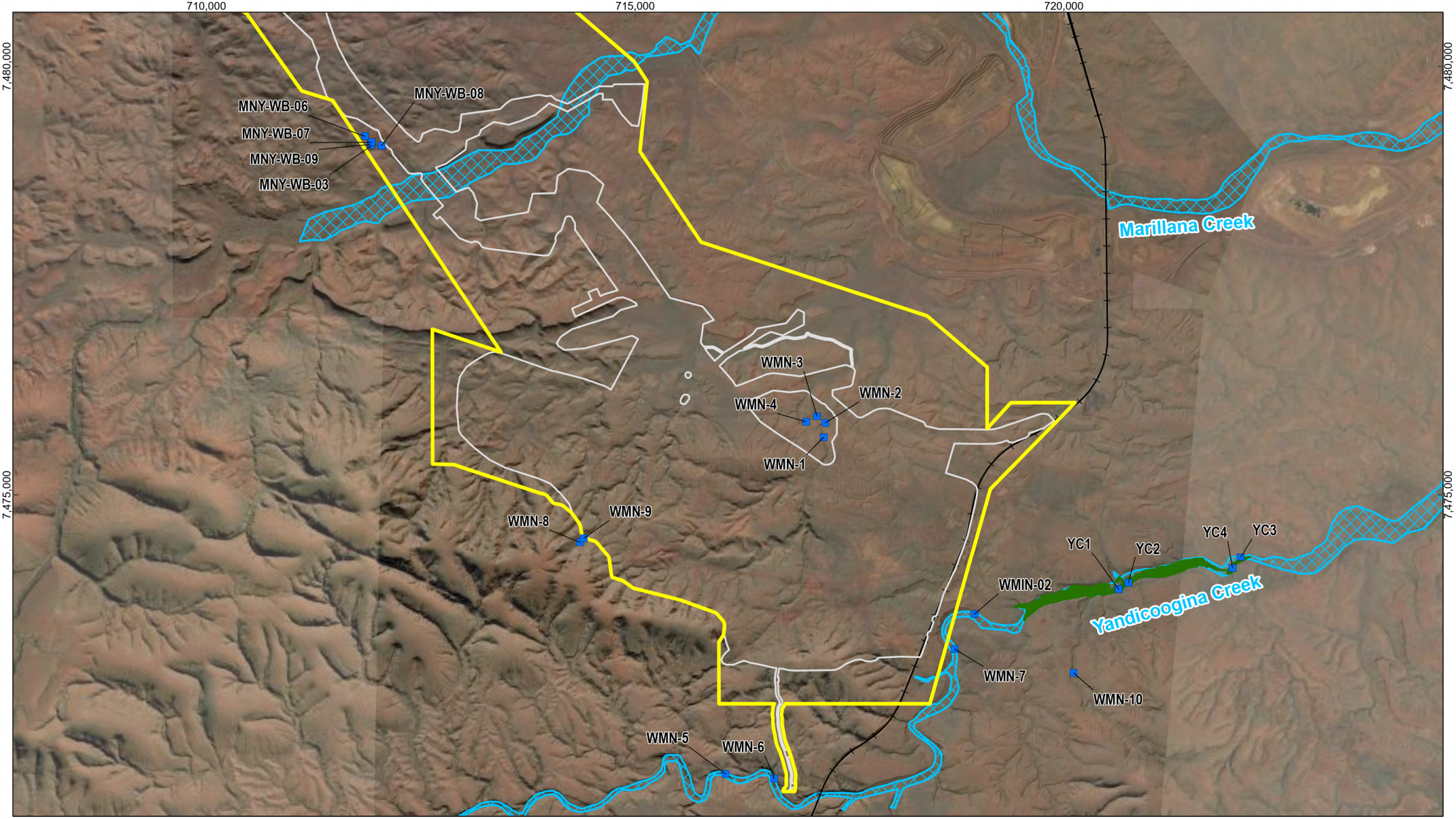
The hydrology of Pilbara pools is shaped by the region's arid climate and ephemeral, high-intensity rainfall events, often associated with tropical cyclones. These pools are typically located along watercourses and are sustained by surface water from rainfall, groundwater discharge or a combination of both. Pool persistence can range from permanent, semi-permanent or ephemeral. Their persistence is influenced by factors such as depth, shading, bedrock barriers, and groundwater, which help retain water during dry periods. This hydrological resilience makes them critical refuges during droughts and key components of the region's water-dependent ecosystems.

There are 21 surface water pools within the catchments that intersect the Development Envelope. Of which, no pools are located within the Indicative Footprint and nine are located within the Development Envelope as summarised in Table 5-3 (and shown in Figure 5-3). There are four pools located in the Mining Exclusion Zone (MEZ).

There are a number of pools located upstream of the Development Envelope on Marillana Creek, that will not be impacted by the Derived Proposal and as such are not discussed here. The pools include permanent pools assumed to have a strong groundwater dependence, semi-permanent pools reliant on both surface water and groundwater and ephemeral pools created in response to rainfall events.

Within Yandicoogina Creek, Pool YC4 (located at the eastern end of Yandicoogina Gorge) is the remaining permanent pool, measuring approximately 40m by 8m, with an estimated depth of approximately 4m at its peak. The pool is well shaded, abutting the southern wall of Yandicoogina Gorge and is understood to be supported by a localised or perched aquifer within the creek alluvium. Water levels within YC4 have been continuously monitored since 2020, which has observed seasonal variations of approximately 1.5 – 2.0 m which correlate with surface water flows within Yandicoogina Creek. Since commencement of monitoring water levels in YC4 there has been a general decline of dry season water levels (approximately 1 m), however, the pool has remained permanent.

Previous observations in pools YC1-YC3 indicated that groundwater near surface kept the pools either permanent or semi-permanent and characterised by groundwater dependent vegetation (further discussed in Section 6). The decline in groundwater levels noted above has had an impact on the water permanence of these pools and they are no longer considered permanent and are dry during the dry season.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Groundwater Dependent Ecosystem
- BHP Rail
- Surface Water Features

N

0 1 2 3

Kilometers

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
SURFACE WATER FEATURES

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:60,000	REQUESTED:	PROJECTS	FIGURE:	5-3
DATE:	10/09/2025	PREPARED:	GEOMATICS		

A1317-052 RevD

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Table 5-3: Inland Waters – surface water features

Water feature ID	Description	Location	Approximate Depth to Groundwater	Surface Water Hydrology
Inside Development Envelope				
WMN-1	Tiny seep	Within MEZ	22 m	Mungadoo Tributary
WMN-2	Ephemeral rock pool	Within MEZ	19 m	Mungadoo Tributary
WMN-3	Ephemeral rock pool	Within MEZ	17 m	Mungadoo Tributary
WMN-4	Ephemeral rock pool	Within MEZ	17m	Mungadoo Tributary
MNY-WB-09	Series of three semi permanent rock pools	Development Envelope, outside Indicative Footprint	23 m	Central Tributary
MNY-WB-03	Series of three semi permanent rock pools	Development Envelope, outside Indicative Footprint	20 m	Central Tributary
MNY-WB-08	Series of three semi permanent rock pools	Development Envelope, outside Indicative Footprint	20 m	Central Tributary
MNY-WB-06	Semi-permanent pool	Development Envelope, outside Indicative Footprint	28 m	Central Tributary
MNY-WB-07	Semi-permanent rock pool	Development Envelope, outside Indicative Footprint	27 m	Central Tributary
Outside Development Envelope				
WMIN-02	Semi-permanent pool	Yandicoogina Creek, west of Development Envelope	7 m	Yandicoogina Creek
WMN-5 (WMIN-04)	Semi-permanent pool	Yandicoogina Creek, 150 m west of Development Envelope	Near surface	Yandicoogina Creek

Water feature ID	Description	Location	Approximate Depth to Groundwater	Surface Water Hydrology
WMN-6 (WMIN-03)	Semi-permanent river pool	Yandicoogina Creek, 200 m south east of Development Envelope	Less than 1m	Yandicoogina Creek
WMN-7 (WMIN-01)	Semi-permanent pool	Yandicoogina Creek 90m east of Development Envelope	10 m	Yandicoogina Creek
WMN-8	Small rock pool	On boundary of north western edge of Development Envelope	150 m	Mungadoo tributary (Upstream of Proposed mine pits)
WMN-9	1m deep rock pool	On boundary of north western edge of Development Envelope	150 m	Mungadoo tributary (Upstream of Proposed mine pits)
WMN-10	5m x3.5m wide pool, approximately 0.5m deep, at base of Breakaway/Cliff	Yandicoogina Creek 1.5 km east of Development Envelope	42 m	Yandicoogina Creek
Yandicoogina Gorge Pools (outside Development Envelope)				
YC1	Small, shallow seep	Yandicoogina Creek, 1.8 km east of Development Envelope	At surface	Yandicoogina Creek
YC2	Small, shallow seep	Yandicoogina Creek, 1.8 km east of Development Envelope	At surface	Yandicoogina Creek
YC3	Small, shallow seep	Yandicoogina Creek, 3.1 km east of Development Envelope	At surface	Yandicoogina Creek
YC4	Permanent, spring-fed creek pool	Yandicoogina Creek, 3.1 km east of Development Envelope	At surface	Yandicoogina Creek

Existing Alterations to Surface Water Regimes

A number of operating mines are located within the Marillana Creek Catchment and are in close proximity to Marillana Creek. BHP Yandi has altered the natural pathway of Marillana Creek via creek diversions to enable access to orebodies. The Derived Proposal does not require further diversion of Marillana Creek. The existing diversion is managed through the Marillana Creek Diversion Management Plan which was a condition of approval in MS 679 and MS 1039 (BHP 2016a).

The DWER Licence to Operate L6168/1991/11 for the Yandi Mine includes approval to discharge up to 15,000,000 tonnes of mine dewater per annum (tpa) (41.1 ML/day). In FY2023, total surplus water generated from mine dewatering discharged into Marillana Creek was approximately 6,932,000 tpa, well within the allowable licensed rate. The near permanent flow has created an artificial pool on the eastern side of BHP tenure.

The Mungadoo Tributary has also been altered by Rio Tinto Yandicoogina operations with a mine pit intercepting the natural pathway of the tributary and its confluence with Marillana Creek and diverting it around the mine pit towards an undefined channel on BHP tenure.

Surface Water Quality

Water quality naturally changes temporally and spatially in ephemeral creeks. Water quality during high rainfall flows is driven by the large volumes of catchment run-off.

Surface water quality monitoring is undertaken at Marillana Creek as part of the Marillana Creek Water Resource Management Plan and L6168/1991/11 for the Yandi Mine. Two surface water monitoring sites are located along Marillana Creek and monitored following rain events for physical parameters, nutrients, metals and total recoverable hydrocarbons. In FY 2023 and 2024 annual reporting there were no significant rain events to generate enough volume for sampling to be undertaken, as a result no samples were analysed. In FY 2022, three samples were collected, the results show that surface water generated in Marillana Creek was slightly alkaline with pH between 7.5 and 7.8 and samples were fresh with an average TDS of 206 mg/L.

Water Quality sampling has been undertaken in the pools of Yandicoogina Creek (east of the Development Envelope) as part of aquatic fauna surveys (Biologic 2020b). Water quality within Yandicoogina Creek was characterised by fresh, clear waters, with low dissolved oxygen saturation, neutral pH, and generally low nitrogen nutrient and dissolved metals concentrations (Biologic 2020b). Several water quality characteristics confirmed a connection with groundwater.

5.3.3.3 Groundwater

Hydrogeology

Conceptualisation of the ecohydrology of the Marillana Creek region for the Strategic Proposal identified that the Ministers North orebody was likely to be partially connected to either saturated Tertiary detritals or fault structures that may be in connection with the Ministers North aquifer (Golder Associates 2015).

The Ministers North orebody is primarily located within the mineralised Dales Gorge Member of the Brockman Iron Formation. Groundwater is present within and surrounding the orebody such that it constitutes a fractured rock aquifer. An anticline hinged in the Mt McRae Shale dividing the orebody has resulted in a preferential flow path forming along-strike of the orebodies controlled by the lower permeability units (i.e. McRae Shale, unmineralized Joffre and Weeli Wolli formations) that sit adjacent to the Dales Gorge members. The Keystone Fault is a prominent regional structural feature that is steeply dipping and propagates in a northeast to southwest direction and has displaced the stratigraphy up to 60m along the fault plane (Plate 1).

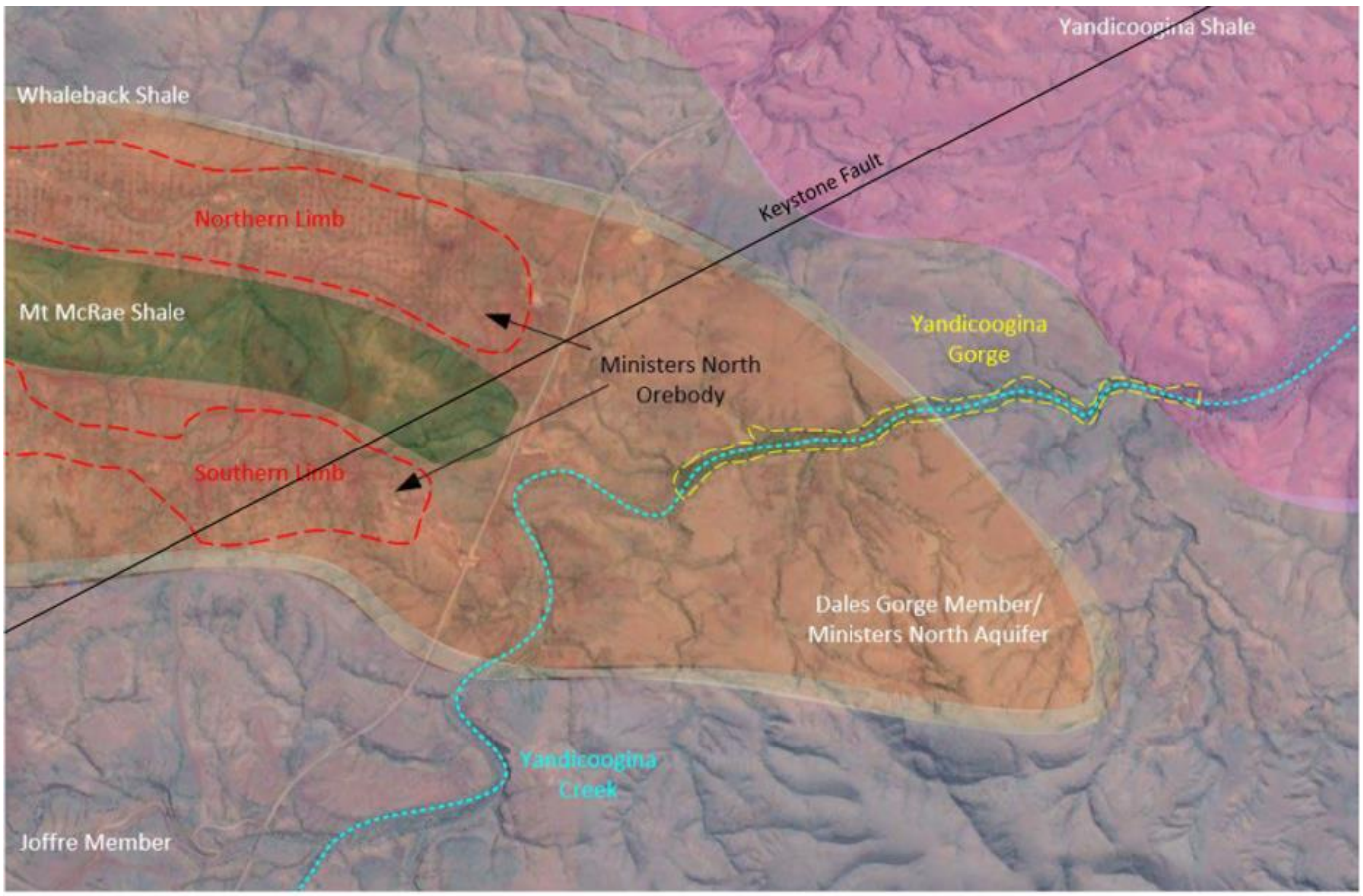


Plate 1: Conceptual Hydrogeology

Groundwater Levels

During the preparation of the Strategic Proposal assessment, depth to groundwater across the Ministers North area was estimated to be between 30 and 100 mbgl (Golder Associates 2015). Large soil moisture deficits generally prevent/minimise recharge where groundwater levels are greater than 30 mbgl. Recharge is therefore typically by rainfall infiltration during years of high cyclonic rainfall (Golder Associates 2015).

Hydrogeological investigations commenced in 2018 to assess future mining operations, including establishment of the groundwater bore network. BHP installed groundwater monitoring bores in the Development Envelope and surrounding area. Groundwater monitoring has identified groundwater levels across the Ministers North aquifer have a flat gradient with groundwater level at approximately 560 mAHD in September 2024 and depth to groundwater is more than 60 m across most of the deposit (Figure 5-4).

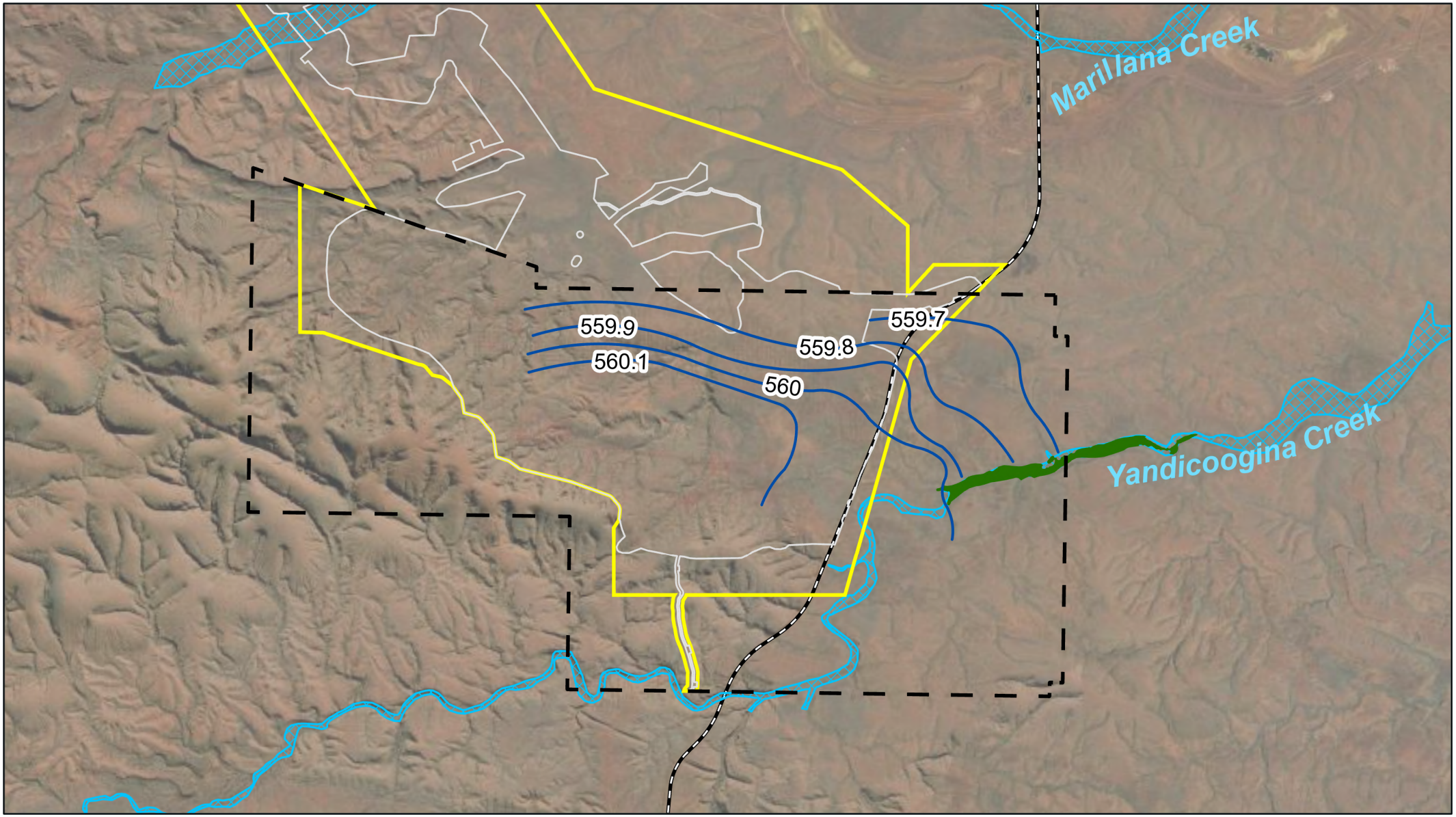
Figure 5-5 shows historic groundwater levels commencing in 2002 in two bores and from 2018 in a greater number of bores. The hydrograph shows water level decline from 2018 when more rigorous monitoring commenced.

- groundwater levels were relatively stable between 2002 and 2018. At bore RAILGWLM322.7P for example, they generally varied between a maximum of 564.4 mAHD and a minimum of 563.0 mAHD.
- Monitoring data collected since March 2018 indicates that groundwater levels have declined. The decline is between 3.7 and 4.6 m from March 2018- July 2025

In terms of seasonal variation, groundwater levels increase during the wet season from recharge events, with bores near Yandicoogina Gorge showing the greatest increases, and bores to the northwest the least. After recharge events water levels revert to a declining trend as the aquifer stabilises, becoming relatively flat across the Development Envelope.

During on-ground investigations and surveys in proximity to Ministers North in 2017-2019, BHP identified a section of Yandicoogina Creek within Yandicoogina Gorge that contains pools that are potentially groundwater-dependent (see Figure 5-3 (pools YG1- YG4)). The elevation of Yandicoogina Creek at the head of the gorge (west) is similar to water levels within Ministers North aquifer (560 – 562 mAHD), diverging to the east as the topography of the Gorge declines from 563 mAHD to 547 mAHD. Conceptually, Yandicoogina Creek is connected to the Ministers North aquifer near the head of the gorge, where the creek intersects the mineralised Dales Gorge aquifer. This connection is likely to reduce as Yandicoogina Creek moves eastward within the Gorge. This is supported by the seasonal variations within pool YC4, which is located approximately 10m below the Ministers North aquifer and exhibits seasonal water level changes of 1.6 – 2.0m following rainfall.

Based on the current hydrogeological conceptualisation, groundwater along the eastern extent of the Ministers North orebody aquifer connects with shallow alluvial deposits within Yandicoogina Gorge (see further discussion in Section 5.3.3.7).



Development Envelope (5,557 ha)
Indicative Footprint (2,360 ha)
Sensitive Pilbara Drainage
Groundwater Dependent Ecosystem
Ministers North Project Area
Rail (BHP)
Sep 2024 WL contour

N

0 1 2
KILOMETERS

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
GROUNDWATER LEVELS

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:55,039	REQUESTOR:	PROJECTS	FIGURE:	5-4
DATE:	9/09/2025	PREPARED:	GEOMATICS	NO:	A1317-062RevB
		REVIEWED:	Name		

Document Path: Y:\Jobs\A1001_A1500\A1317\3Project\A1317_062_E_GroundwaterContours_RevA.aprx\A1317_062_E_GroundwaterLevels_RevB

Figure 5-5: Groundwater levels 2002 to 2025

Groundwater Quality

The Strategic Proposal reported that groundwater is fresh to marginally brackish being less than 1,500 mg/L total dissolved solids with localised areas of slightly elevated groundwater salinity associated with evapotranspiration by phreatophytic vegetation (e.g. at Ethel Gorge and Weeli Wolli Spring).

Monitoring of basic groundwater quality parameters has been conducted infrequently at the long-term monitoring bores RAILGWLM323.3P (2010 to 2021) and RAILGWLM322.7P (2009 to 2014) with ad hoc samples taken at the completion of airlift development at six reinjection bores and a shorter duration and frequency at 31 of the monitoring bores installed in the Ministers North aquifer within the last few years.

Groundwater monitoring data is summarised below and in Table 5-4:

- average pH is slightly basic
- average electrical conductivity (EC) is 486 µs/cm which is fresh
- chromium concentrations are slightly above Australia and New Zealand Guidelines (ANZG) design guideline value (DGV) 95% level of species protection but within the 90% level of species protection (0.006 mg/L)
- zinc concentrations are above the ANZG DGV 95% level of species protection but above the 80% level of species protection (0.031 mg/L)
- the remaining analytes are within the 95% protection of species DGV (where available).

Sampling of Per- and poly-fluoroalkyl substances (PFAS) at various times and locations was undertaken in early 2025 (ptg Consulting 2025, Appendix 5). At Ministers North the concentrations and diversity of PFAS compounds is low/limited. While there are exceedances of the current Freshwater 99% Australian and New Zealand Guidelines (ANZG) Toxicant design guideline values (DGV), concentrations would be below the proposed draft Freshwater 99% Toxicant DGV (0.0091 µg/L) (ANZG 2023), and on most occasions, an order of magnitude lower (ptg Consulting, 2025). The ambient concentrations of PFAS detected is not unexpected and is likely from exploration drilling practices at the time which would have included fire suppression systems change outs on drill pads and potentially contaminated source water for drilling and drill muds which may have contained PFAS compounds (ptg Consulting, 2025).

Table 5-4: Ministers North baseline groundwater water quality

Ministers North Aquifer				
Parameter	**Min**	**Max**	**Average**	**ANZ DGV Level of Protection 95%**
pH	7.07	8.31	7.82	6-8
EC (µs/cm)	229	707	486	250
TDS (mg/L)	149	460	316	
TSS (mg/L)	-	-	-	
Na (mg/L)	21	53	32	
K (mg/L)	5	13	9	
Ca (mg/L)	6	69	36	
Mg (mg/L)	9	38	22	1.9
Cl (mg/L)	20	78	37	
Carbonate (mg/L)	<1	<1	<1	
Bicarbonate (mg/L)	60	325	187	
Sulphate (mg/L)	2	57	23	
Nitrate (NO_3) (mg/L)	0.01	1.33	0.26	38[1]
Al (mg/L)	0.005	0.005	0.005	0.055
B (mg/L)	0.10	0.21	0.14	0.37
Fe (mg/L)	0.003	0.46	0.043	0.94
Cu (mg/L)	0.0005	0.008	0.0009	0.0014
Zn (mg/L)	0.003	0.29	0.019	0.008
As (mg/L)	<0.001	0.003	0.0007	0.024
Cr (mg/L)	<0.001	0.003	0.0013	0.001
Cd (mg/L)	<0.0001	0.0003	<0.0001	0.0002
Hg (mg/L)	<0.00005	<0.00005	<0.00005	
Ni (mg/L)	<0.001	0.001	0.001	0.011
Se (mg/L)	<0.001	0.001	<0.001	
Mn (mg/L)	<0.001	0.910	0.051	1.9
TRH (C_{10} - C_{36}) (mg/L)	<50	<50	<50	

1. Value listed apply to nitrate in hard water (>150 mg/L $CaCO_3$)

5.3.3.4 *Existing water use and management*

Groundwater Users

The Development Envelope is located within the East Pilbara sub area of the Pilbara groundwater area (DWER 2023b). Groundwater in proclaimed groundwater areas is subject to compliance with RiWI Act including licensing for abstraction. Groundwater abstraction in proximity to the Development Envelope occurs predominantly to enable below water table mining and other mining related water uses.

The water source for the Derived Proposal is anticipated to be sourced from mine dewater from nearby BHP mines, however, as discussed in Section 1.1.5, if water is not sourced from these, BHP may seek water from other sources. These would be subject to separate impact assessment and approvals processes to ensure any risks of transfer of water are assessed accordingly. The following describes the existing groundwater licences issued under the RIWI Act that are anticipated to supply water to the Derived Proposal.

The BHP Operations at Yandi currently abstract water, licensed under GWL89501 with a total allocation of 20,650,520 kilolitres (Kl) per annum. The licence provides authorisation for the following purposes; to meet site and aerodrome water demands, dewatering, dust suppression, mineral ore processing, exploration activities, earthworks,

construction, mining camp and potable water supply. Yandi is proposed to provide a short term water source for the Derived Proposal.

South of the Derived Proposal groundwater is also abstracted at MAC/SF which is another potential future source of water supply for the Derived Proposal. Currently, BHP is authorised to (as per MS1072) dewater up to 37.3 GL/a and dispose of 34.48 GL/a of surplus water. MAC currently operates under four Section 5C licences to take groundwater, amounting to the 37.3 GL/a allocated under Schedule 1 of MS1072, including:

- GWL110044(12) for up to 36.5 GL/a for mine dewatering and associated mining purposes within ML70/281
- GWL166389(9) for up to 21.9 GL/a for mine dewatering and associated purposes within ML70/249, ML70/281, E47/13, E47/1540, and P47/1611. It is noted that this licence is used in conjunction with GWL11044(12) in that the total combined abstraction is 36.5GL/a
- GWL178477(4) for up to 0.75 GL/a from Juna Downs borefield for earthwork and campsite purposes within ML70/281
- GWL174613 for up to 0.05 GL/a from the Mulla Mulla camp borefield for campsite purposes. It is noted that the abstraction bore for this licence is not currently operational.

A Significant Amendment to MS1072 was submitted to the EPA on 21 February 2025 (APP-0027595), which includes an increase to dewatering volumes.

5.3.3.5 Water Supply

In relation to water supply for the Derived Proposal, as mining is above water table only, the water requirements for the Derived Proposal will be met by supply from other BHP and/or third-party water supplies that may be subject to separate Government assessment and approvals processes (as appropriate).

As described in Section 1.1.5, the Derived Proposal includes provision of a temporary (e.g. approximately 300 mm wide HDPE), above ground, raw water pipeline to be constructed, connecting Ministers North into Yandi's existing water network (via W4 pit dewatering infrastructure). The pipeline will have capacity of ~ 5-6 ML/day, and support supply of Yandi raw water to Ministers North for up to 12-months for early construction and pre-strip activities. The long-term operational water requirement for the Derived Proposal is anticipated to be sourced from BHP's proposed CPHSW Project (MAC/SF). The Derived Proposal includes the construction of a permanent raw water pipeline to tie-in to the CPHSW North-Eastern scheme. The permanent pipeline will tie CPHSW to the Ministers NPI precinct and then follow the haul road to connect to Yandi. The water from CPHSW will then feed both Ministers North mine and Yandi (via Ministers North).

Given the transfer of water from these sites, consideration of the water quality at the source has been investigated.

Groundwater from Yandi Operations has a mean pH of 7.01 (ranging from 6.1 to 8.8), electrical conductivity mean of 1000 µS/cm and boron concentrations were within the ANZ DG 80% species protection. Boron concentrations at Yandi are thought to be high baseline concentrations due to underlying geology. No values of metals exceeded the ANZ DG 95% species protection.

Groundwater from MAC/SF (CPHSW) has a mean pH of 7.6 (ranging from 5.6 – 8.8), electrical conductivity mean of 610 µS/cm, and no values of metals exceeding ANZ DG 95% protection of species.

5.3.3.6 *Key Environmental Values*

As part of the BHP Strategic Proposal, BHP acknowledged the importance of rock pools in the Pilbara and committed to managing rock pools at the same level as TECs for permanent rock pools (Tier 1) and the same level as PECs for ephemeral rock pools (Tier 2). The only permanent rock pools (water holes) in relation to the Derived Proposal occur east of the Development Envelope (within Yandicoogina Gorge). Ephemeral rock pools (water holes) occur within the Development Envelope and are considered further within this chapter.

In addition to these considerations, it is also noted that key environmental values relating to Inland Waters can be water-dependent ecosystems that have other ecological, cultural (see Social Surroundings chapter) or recreational value.

Groundwater Dependent Ecosystems

Ecosystems that rely on groundwater for some or all of their water requirements are classified as GDEs. Within inland Australia, there are three key types of GDEs:

- Aquatic ecosystems; that rely on the surface expression of groundwater – this includes surface water ecosystems that have a groundwater component, such as rivers, wetlands and springs.
- Terrestrial ecosystems; that rely on the subsurface presence and proximity of groundwater – this includes groundwater dependent vegetation (GDV) (e.g. facultative phreatophytes that require groundwater at some stage of their life cycle, and obligate phreatophytes requiring continuous access as do obligate).
- Subterranean ecosystems; stygofauna communities in aquifers (discussed in Section 8).

These GDEs rely on either below ground access to water tables (via the capillary fringe) or surface water expression of groundwater to provide at least some of the community's environmental water needs. GDEs are often typified by the presence of GDV but can include aquatic ecosystems with a surface/groundwater component. These ecosystems can present in the form of creeks, rivers, pools, wetlands and springs (along with more hydrophytic or aquatic vegetation).

An area along Yandicoogina Creek (outside of the Development Envelope) appears to have high ecological values, with traits and characteristics similar to other spring sites in the Pilbara, as it exhibits affinity with the Pilbara Pools PEC (Biologic 2020a). The upper reaches of Yandicoogina Creek comprise a relatively broad, undefined channel, however, in the mid to lower reaches, the creek flows through a gorge system and becomes well defined. The groundwater appears to intercept the surface through this section, forming a series of seeps and pools (of which one pool is identified as permanent) along approximately 3.5 km of the creek.

Characteristics of Yandicoogina Creek include a regionally significant forest of the groundwater dependent tree, *Melaleuca argentea*, a high diversity of aquatic macroinvertebrates, several stygofauna species that are unique to the gorge, and significant habitat for conversation significant species. *Melaleuca argentea* is restricted to areas around perennial pools, coexisting with *E. camaldulensis* which extended further upstream towards the area of transient pools where they are interspersed with *E. victrix*.

Ephemeral surface water flows in Marillana Creek support riparian vegetation characterised by *E. camaldulensis*, *E. victrix* and *M. argentea*. *E. camaldulensis* and *E. victrix* are facultative phreatophytes and *M. argentea* is an obligate phreatophyte (Onshore Environmental 2015). Further discussion in relation to riparian vegetation and groundwater dependent vegetation are provided in Section 5.

5.3.3.7 Ministers North aquifer and Yandicoogina Gorge

The Ministers North aquifer is assumed to support groundwater levels in Yandicoogina Gorge and associated groundwater dependent ecosystems. Yandicoogina Gorge is located approximately 800 m east of the Development Envelope and is an important feature of the Pilbara ecohydrological system, located at the convergence of surface and groundwater flows from the upstream catchment.

Since 2018, groundwater levels in the Ministers North aquifer have demonstrated a consistent decline in all bores. In the period from March 2018 to February 2023, groundwater levels in all bores demonstrated a consistent decline of almost 3.5 m. The causation for regional groundwater decline is still unclear nor can be attributed to regional or a single mining operation or climate process. BHP is currently working with Traditional Owners, Rio Tinto, EPA and DWER to mitigate further groundwater decline to the Gorge through initiating a groundwater supplementation trial.

The supplementation is proposed to run as a short-term mitigation trial (facilitated through an amendment to the existing 5C Licence GWL89501 and Part V Licence L6168/1991/11) with potential extension pending results and stakeholder feedback. The trial's objectives are to:

- Stabilise groundwater levels within the Ministers North aquifer at the head of the Gorge, specifically to abate further groundwater decline. The infrastructure to support the trial has been designed to provide flexibility with supplementation rates, while maintaining practicability.
- Improve understanding of the interactions between the Ministers North aquifer and Yandicoogina Gorge GDV, specifically how regional groundwater is supporting the GDV and to test hydraulic properties.

The proposed trial does not form part of the Derived Proposal and is subject to separate approvals.

It is important to note that the Derived Proposal is above water table mining only and as such will not contribute to dewatering impacts to the local aquifers and connected ecosystems (including to Yandicoogina Gorge). As such the information above is provided for regional context and impacts as a result of dewatering are not discussed further in this chapter.

The potential for impacts to the Yandicoogina Gorge attributable to the Derived Proposal from a surface water catchment perspective are considered within this chapter.

5.4 Potential environmental impacts

In the PERSP (BHP 2016a), BHP identified and described potential impacts from the Strategic Proposal on Inland Waters. Table 5-5 identifies whether the Strategic Proposal potential impacts are relevant to the Derived Proposal.

Table 5-5: Inland Waters - relevant impacts identified in the Strategic Proposal

Strategic Proposal Potential impact	Strategic Proposal impact relevant to Ministers North Derived Proposal	Potential impacts from Ministers North Derived Proposal
Groundwater drawdown (direct)	No The Derived Proposal is above water table only. Groundwater abstraction (mine dewatering) does not form part of the Derived Proposal and as such no significant impacts to the groundwater regime are anticipated as a result of the implementation of the Derived Proposal.	N/A
Changes to groundwater quality (indirect)	Yes	Changes to groundwater quality could occur from Acid and Metalliferous Drainage (AMD), increases in groundwater contamination
Reduced surface water availability (indirect)	Yes	Changes to surface water availability due to mine pits, overburden storage areas and creek diversions that will alter surface water flows
Surplus water management (indirect)	No The Derived Proposal is AWT only and no dewatering or surplus water management is proposed other than receiving surplus water from other sites. Potential risks associated with this are address under groundwater quality.	N/A
Changes to surface water quality (indirect)	Yes	Changes to surface water quality could occur from sedimentation and contamination
Pit lakes (indirect)	No The Derived Proposal does not involve mining below the groundwater level, and accordingly, the Derived Proposal will not result in post-mining permanent surface water within the mine pits. Pit voids will remain and during heavy rainfall some ponding may occur in the pit voids. This will dissipate through evaporation with no salinity issues anticipated.	N/A

5.4.1 Reduced surface water availability

The excavation of mine pits and the construction of infrastructure (including borrow pits) have the potential to change surface water regimes by altering natural surface flows and reducing the availability of surface water downstream.

Loss of surface water catchment

Stantec was engaged by BHP to undertake a surface water assessment for the development of the Derived Proposal the report is attached as Appendix 5 (Stantec 2024). Three hydrological models were generated for the Derived Proposal to assess peak flow rates, water elevation and velocity for the for 50% annual exceedance probability (AEP) and 1% AEP events and 1 in 10,000 AEP events under three scenarios; baseline, LoM, and Closure.

The key objective of Stantec's study is to assess the flood impacts between the baseline scenario and the LoM scenario and the closure scenario. Impacts to the study area were considered in relation to the loss of catchment area, changes in flood level, velocity and flow rates to inform environmental impact assessment (Stantec 2024).

The Derived Proposal will result in the loss of catchment areas and reduction in surface water flow to downstream receptors. The pits and OSA within the Development Envelope are primarily located in the broader Marillana Creek Catchment and the Yandicoogina Creek Catchment and the local catchments (Mungadoo and Yandicoogina Creek catchments) (Figure 5-2). The Derived Proposal will alter local flow paths and runoff volumes.

The expected regional catchment reduction in Marillana Creek is approximately 0.64%, and an expected catchment reduction in Weeli Wolli Creek of approximately 0.35% (Stantec 2024) (see Table 5-6).

The reductions in local catchments, of Yandicoogina Gorge, Central Tributary and Mungadoo catchment are described as follows: A small portion of the local Yandicoogina Gorge subcatchment will be impacted, with a catchment reduction of approximately 1.0% (Table 5-6). The catchment reduction results in a change in peak flow rates of less than 2% at the Yandicoogina Creek between Baseline, LOM and Closure in the 50% and 1% AEP events (Table 5-7).

The Central Tributary catchment will be reduced by 0.3% as a result of the Derived Proposal (Table 5-6). There is a corresponding reduction in peak flow of 6-15% in the 1% AEP and 50% AEP respectively, through catchment loss and impediment to flows from infrastructure. However, at closure the reduction is 0% noting after rehabilitation flows will be maintained.

The largest changes are seen in the Mungadoo Tributary catchment. The cumulative 1% AEP and 50% AEP peak flow rates in the Mungadoo Tributary are reduced by 71% and 56% in the LoM and Closure scenarios respectively compared to baseline conditions. The changes in the Mungadoo Tributary catchment peak flows and volumes are due to a catchment reduction of 52% from the proposed pit and OSA of the local catchment area. As the pits (partially backfilled) and OSA are maintained in the closure scenario, the changes are also to be expected to occur at closure.

Despite this impact, it should be noted that the Mungadoo Tributary is a relatively small tributary to the Marillana Creek. The catchment area of Mungadoo is 24km^2 compared to the Marillana Creek catchment area of 2,228 km^2. Mungadoo Tributary catchment is highly disturbed downstream due to existing operations (e.g. BHP and RTIO). The Tributary watercourse is currently diverted around the Rio Tinto mine pits and flows across BHP Tenure towards its current confluence with Marillana Creek. The existing confluence is approximately 1 km downstream of its pre-mining confluence.

It is unlikely that peak flows in Marillana will be significantly impacted by the reductions in the Mungadoo Tributary as the occurrence of the peak flow from Mungadoo is going to occur in a shorter duration than in Marillana Creek (i.e. the incidences of the peak flows will not coincide due to the relative size of their catchments). As such, the changes in peak flow rate, time to peak, and flow volume are not considered to be significant on a regional scale.

No diversions are planned for the Derived Proposal, the largest individual catchment area intercepted by a pit is approximately 3 km^2. This is a relatively small area and it is common practice at BHP's WAIO sites for catchment areas this size to drain into the pit and managed via in-pit stormwater pumping. It should also be noted that the mine pits within this Derived Proposal are located high in the catchment and do not receive runoff from a large upstream catchment.

The loss of catchment from the Derived Proposal will result in loss of surface water flows for some of the surface water features identified in Section 5.3.3.2. Surface water pools MNY-WB 3, MNY-WB 6 to MNY-WB 9, WMN5, WMN6, WMN8 to WMN10 are located on the upstream side of the Derived Proposal and will not have any reduction in their catchment area, as such they are not discussed further.

Surface water features WMN1-WMN4 are located within a MEZ, as such they will not be directly impacted by mining operations. However, these pools will have a loss of catchment immediately upstream, which will impact the flow volumes that intersect the pools. Stantec (2024) generated a series of water surface elevation afflux maps comparing

the baseline (existing) condition to the life of mine and closure conditions. A 50% (AEP) is a rainfall event that occurs approximately every 1.4 years and is important for evaluating environmental changes to catchments and waterways. The baseline condition for the 50% AEP indicates that water depth in the waterway supporting WMN1-WMN4 is approximately 1 m, implementation of the Derived Proposal is estimated to reduce the depth in the waterway by approximately 0.2 m during operations and closure. Based on observations by Astron (2025), the WMN1-4 are shallow in depth and approximately 0.5 m, as such the reduced flow depth would still be able to fill the pools during rainfall events and maintain an ephemeral pool in these locations.

Pools within Yandicoogina Creek (WMN-7, WMN-2 and YC1-YC4) will be impacted by a loss in catchment of approximately 1%-2% for the 50% AEP (Table 5-6). Rainfall in the Pilbara is highly unpredictable and can vary widely year to year, CSIRO (2015) states that in general, a 1% change in rainfall can translate to about a 3% change in runoff therefore a 1%-2% change in catchment area is equivalent to rainfall reduction of less than 4 mm in a location that has historically varied between 85 mm and 975 mm.

Table 5-6: Catchment reduction (adapted from Stantec 2024)

Local Catchment	Central Tributary	Mungadoo Tributary	Yandicoogina Catchment	Total
Total Catchment size (ha)	5,000	2,400	15,000	22,400
Proposed reduction in catchment area (ha)	14.0	1236.1	149.8	1399.9
Local catchment reduction	0.3%	52%	1.0%	6%[1]
Marillana Creek catchment reduction (%)	0.01%	0.55%	0.07%	0.63%
Weeli Wolli Creek Catchment reduction (%)	0.003%	0.3%	0.04%	0.34%
Upper Fortescue Catchment reduction (%)	0.0004%	0.04%	0.005%	0.05%

1. represents the relative proposed reduction in the total catchment area in the Development Envelope

Table 5-7: Comparison of peak discharge rates at outlets (adapted from Stantec 2024)

	Peak Flow (m^3/s)					
Outlet	50% AEP Baseline	50% AEP LOM	50% AEP Closure	1% AEP Baseline	1% AEP LOM	1% AEP Closure
Central Tributary	26.3	22.3	26.3	370.1	349.3	370.1
Difference to Baseline	-	-15%	0%	-	-6%	0%
Mungadoo Tributary	22.2	6.4	9.8	218.6	64.4	94.9
Difference to Baseline	-	-71%	-56%	-	-71%	-57%
Yandicoogina Creek	47.7	46.9	47.2	841.8	840.8	841.0
Difference to Baseline	-	-2%	-1%	-	-0.1%	-0.1%
Marillana Creek	103	103	103	2162	2162	2162
Difference to Baseline	-	0%	0%	-	0%	0%

Impacts from infrastructure

The Derived Proposal includes the provision for a haul road between the Ministers North mine pits and the existing Yandi ore processing and transport facilities. The haul road route crosses Marillana Creek, the Central Tributary and Mungadoo Tributary.

Stantec (2024) compared the baseline condition to the life of mine and closure conditions. The largest potential impact is ponded water that accumulates in low areas against the landforms. Where landforms block flow paths, ponded water would be subject to infiltration and evaporation which has not been modelled, providing a conservative approach for the model.

During the construction staging and operation, sediment basins will be impemented to retain sediment-laden rainfall runoff to allow for the settling of sediments before runoff enters the environment, minimising the risk of sediment levels exceeding natural conditions. Any excess water that passes through or around sediment ponds is assumed to have been attenuated sufficiently to avoid impacting flood events. Reduced water levels occur downstream of pits, landforms, and flow constrictions that attenuate peak flows (e.g. downstream of culverts).

5.4.2 Changes to surface water quality

BHP noted in the Strategic Proposal assessment that the impacts to surface water quality are generally local in scale and therefore were not assessed further, and that the ability to mitigate potential impacts to acceptable levels would be validated as part of any Derived Proposal referral (BHP 2016a). Consistent with this approach, BHP has assessed the potential impacts to surface water quality as a result of the Derived Proposal.

During construction and operations, the Derived Proposal has the potential to impact surface water quality due to potential releases into the environment through accidental spills (including hydrocarbons), sediment laden runoff from mining operations and/or OSA. During construction an increase in sediment runoff and scour may occur because of the additional ground disturbance and vegetation removal.

Erosion, sediment transport and sediment deposition have potential to occur in areas where there is a change in velocity due to the introduction of waterway crossings. Stantec (2024) reported velocity reductions are likely to occur upstream of culverts where flow is restricted and sediment deposition may occur. Conversely, localised increases in velocities occur immediately downstream of culvert outlets which may lead to scouring.

The proposed waterway crossings result in flow attenuation, reducing peak discharges and lowering the energy and sediment transport carrying capacity of the systems downstream. The increased potential for sedimentation upstream of the major crossing locations decreases the sediment load and potential for settlement downstream. Some adjustment of the bed material in the primary channels and in the reaches upstream and downstream of culverts would be expected over time, particularly in the temporary basins that form upstream of the major crossing locations.

One of the main sources of potential long term increased sediment is runoff from the OSA as high velocities are predicted along steep slopes of proposed pits and landforms.

5.4.3 Changes to groundwater quality

Groundwater quality may be impacted from mining operations through alteration of the landscape, construction of infrastructure, exposure of acidic materials, or from the release of contaminants (including hydrocarbons) from accidental spills.

Acid and metalliferous drainage

BHP assessed Ministers North as having a moderate Acid and Metalliferous Drainage (AMD) potential for the Strategic Proposal FCDS (BHP 2016a – Figure 41).

Changes to groundwater quality may occur where alterations to landforms and construction of infrastructure (including OSA) expose acidic and/or metalliferous material. The AMD risk assessment undertaken specifically for

the Derived Proposal identified that the Ministers North waste rock and ore generally contain very low sulfur (MWM 2024).

The proposed AWT pit shells for Ministers North contains minimal sulfur with approximately 97% of all samples with <0.1 wt%S and approximately 98% with total sulfur <0.2 wt%S (MWM 2024). A total of 1,023 samples have sulfur greater than 0.5 wt%S and 704 samples exceeding 1 wt%S, with the majority of high sulfur samples associated with the Mt McRae Shale and Whaleback Shales units. The total exposed area of the pit shells was assessed, with virtually the entire surface expected to be AMD Class 0 (>99.9%). Assessment of the mining model also identified more than 99% of the total waste rock volume is classified as AMD Class 0 (NAF) (MWM 2024).

The risk of generating adverse neutral metalliferous drainage (NMD) or saline drainage associated with neutralisation of oxidation products is unlikely (MWM 2024). Generally, the deposit contains very little sulfur and therefore the opportunity for NMD or saline drainage to form as a result of sulfide oxidation is negligible.

Therefore, there is a low risk of groundwater contamination from these sources, and it is not considered further.

Other contaminants

The following other contaminants have the potential to impact groundwater quality in the Ministers North aquifer.

- Nitrate: Nitrate is considered a potential contaminant of concern due to its use in blasting products, and the subsequent risk of mobilisation to groundwater and surface water.
- Hydrocarbons: during construction and operation the Derived Proposal has the potential to contaminate groundwater due to hazardous materials and waste.
- PFAS: may be introduced through the water supply (further discussed below).

PFAS

As Ministers North will not be dewatering, water supply for construction and operations will be provided from external sources including but not limited to Yandi, and CPHSW as detailed in Section 5.3.3.5.

Water quality from the external sources has been considered. A suite of analytes (including but not limited to, metals, nitrates and other physico-chemical parameters) are tested for under the RiWi Act 5C Licenses (and groundwater operation strategy (GWOS)) for Yandi and MAC/SF. These are tested on a regular basis and reported through the Annual Aquifer Review (AAR). Site specific water quality trigger values have been developed as part of the GWOS, and if trigger values are exceeded, management measures will be implemented in line with licence requirements.

In addition, the potential for migration of Per- and polyfluoroalkyl (PFAS) contaminants that could occur with the transport of water across sites has been considered. Baseline PFAS sampling across Yandi mine, Ministers North and Yandicoogina Gorge has identified PFAS at trace levels only (marginally at or above the lowest 99% ecological guidelines).

PFAS investigations have also been undertaken at Yandi mine since 2020, with a Targeted Site Investigation (TSI) completed at Yandi mine in January 2024. The investigations targeted known and potential sources, migration pathways and known receptors. Over 500 samples were collected from a combination of soil, sediment, surface water, production bores, monitoring bores, ponds/sumps and surface water.

The investigations identified:

- Trace concentrations of PFAS are present across the Development Envelope, consistent with “mixed-ambient” concentration ranges as presented for Victoria and Queensland in the PFAS National Environmental Management Plan (NEMP) 3.0 – (HEPA 2025).
- Perfluorooctanoic acid (PFOA) was not identified above any regulatory guideline, with Perfluorooctane Sulfonate (PFOS) and Perfluorohexanesulfonic acid (PFHxS) representing the primary compounds of concern.

- No exceedances of human health guidelines have been recorded in the Yandi Development Envelope.
- No exceedances of the ecological 95% Species Protection Limit (0.48 µg/L) were recorded.
- The highest groundwater concentration of PFAS recorded was 0.016 µg/L, located adjacent to workshop facilities which undertook maintenance of fire-fighting systems.
- No exceedances of any human health or environmental guidelines were recorded in surplus groundwater discharged from site, or within Marillana Creek.

Baseline sampling has also occurred at MAC/SF. A preliminary PFAS investigation was conducted by Cardno in 2022 in which 13 areas of potential concern (AoPC) were targeting for sampling (Cardno 2022). Two of the 13 AoPCs could not be accessed, and therefore were not sampled. For the remainder of the AoPCs that were sampled, minor detection of PFAS were found at all locations sampled.

Results were compared against the NEMP 2020 (HEPA 2020) and toxicant default guideline values for aquatic ecosystem protection (DCCEEW 2023) and the following criteria exceedances were reported:

- No exceedances of the ecological 95% species protection limit (0.48 µg/L) were recorded in surface soil leachate analytical results from all AoPCs (DCEEW 2023). One sample reported an exceedance above Health Drinking Water criteria at the MAC medical centre (emergency vehicle washdown area).
- No exceedances of the ecological 95% species protection limit (0.48 µg/L) were recorded, freshwater 99% exceedances were reported in sediment leachate analytical results at the following AoPCs:
  - Western, Central and Eastern Infiltration Ponds
  - Packsaddle Wastewater Treatment Plant (WWTP)
  - Heavy Vehicle Workshop Evaporation Ponds
  - Bioremediation Farm.
- No exceedances of the ecological 99% species protection limit (0.0091 µg/L) were recorded in groundwater monitoring and groundwater production bores within the Development Envelope
- No exceedances of the ecological 95% species protection limit (0.48 µg/L) - the highest concentration of PFOS was reported in surface water analytical results, from the Bioremediation Farm.

PFAS fire-fighting foams were phased out at Yandi and MAC/SF (source for CPHSW) in 2021 as part of BHP's WAIO PFAS Phase Out Program. Therefore, the potential risks for transport of PFAS from external sources to Ministers North are considered low.

5.5 Mitigation

The Strategic Proposal (BHP 2016a) provides examples and case studies of the land and biodiversity management measures that BHP may apply to mitigate the potential impacts to Inland Waters values. BHP has applied the mitigation hierarchy to avoid, minimise, rehabilitate and offset the potential impacts to Inland Waters values, no significant residual impacts will remain. These measures are discussed further below.

5.5.1 Avoid

Avoidance measures seek to prevent or change the potential environmental impacts of an action before they occur.

Surface Water Features

Four ephemeral surface water features (WMN1-4) were recorded in Gorge/Gully habitat (Astron 2025) from within the central part of the mining area, in proximity to two Ghost Bat caves. These caves and surface water features

have been encompassed within the proposed Ghost Bat MEZ. As such, these water features will be avoided. More broadly, BHP commits to not clearing any known/recorded waterholes within the Development Envelope as listed in Table 5-3 above.

Groundwater

Groundwater abstraction (mine dewatering and water supply) has been excluded from this Derived Proposal and as such any significant direct impacts to the groundwater regime are avoided. A separation distance of 5 m between groundwater table and the base of mine pit is proposed.

Water quality – PFAS

To avoid the risk of generating PFAS contamination at Ministers North and potential impacts to water quality, BHP commits not to use PFAS containing fire-fighting foams in the Development Envelope.

Yandicoogina Creek and Yandicoogina Gorge

Initial mine planning for the Derived Proposal included a mine pit and OSA on the eastern side of the rail, adjacent to the Yandicoogina Gorge. Subsequent mine planning has removed the eastern mine pit and OSA, with these areas now not forming part of the Derived Proposal. The removal of the eastern mine pit and OSA has minimised the potential direct and indirect impacts to Yandicoogina Creek and Yandicoogina Gorge (see Stantec 2024), including complete removal of the gorge from the Development Envelope.

5.5.2 Minimise

Minimisation measures seek to reduce the duration, intensity, extent and/or likelihood of environmental impacts of a proposal where avoidance measures are not practicable. .

Surface water regimes

BHP will design and construct infrastructure according to standard internal water management practices, to minimise potential impacts to hydrological regimes and surface and groundwater quality.

The following relevant water management design principles are applied for the Derived Proposal:

1. Large scale permanent infrastructure is protected against a 1% AEP event.
2. Permanent flood protection will consider climate change, be compatible with post closure strategies and shall replicate key hydrological features that retain ecohydrological function to the extent practical.
3. The effectiveness of critical infrastructure (such as diversions and culverts) shall be reviewed annually and outcomes recorded in BHP's internal records.

The internal procedure *Borrow Pit Management and Rehabilitation Procedure* requires a 50-m setback from significant watercourses for the development of borrow pits. Furthermore, all borrow pits will be rehabilitated and left in a free draining state such that surface water flows will not be impacted.

Surface water quality- Sediment

BHP propose to minimise impacts from erosion and sedimentation through strategic placement of OSA, use of sedimentation basins and annual inspection of critical drainage infrastructure.

As described in Section 5.4.2, one of the main sources of potential increased sediment is runoff from the OSA. The OSA has been designed to be internally draining, and so minimal sediment loading is anticipated from the OSA. It should be noted than any runoff from the Central OSA will go directly to the North Pit.

Due to the highly undulating terrain and the relatively minor contributing catchment areas, permanent diversion of flows around the final OSA and pits is not considered to be feasible. Diversion of localised drainage paths around

proposed pits or controlled inflow measures may be required in some locations where concentrated flow paths intercept pits and landforms.

During construction staging and the LoM, sediment basins will be implemented to retain sediment laden runoff to capture the 10% AEP 72 hour storm event and trap sediment laden rainfall and runoff to allow for the settling of sediments before runoff enters the environment, minimising the risk of sediment levels exceeding natural conditions. The natural background suspended sediment load in the receiving waters will be higher in a major rainfall event and overflows from a sedimentation pond would be diluted and dissipated quickly. Any water that is pumped from the pits will be discharged into sediment ponds before being released to the environment.

An assessment was undertaken by Stantec (2024) to determine indicative sediment basin locations and sizes to be considered in the layout of the mine. The assessment was based on existing topography, infrastructure locations and distance to creeks. Five sediment basins were proposed, one for each pit, the OSA and stockpiles. For the North pit, there are two potential locations proposed (Appendix 5).

The detailed design and execution of these sediment basins will fall under the mine's tactical surface water management and are designed and executed as part of the annual wet weather planning procedure. The final location may vary from those proposed by Stantec (2024).

As part of engineering design, infrastructure that crosses drainage lines will include culverts or bridges, to manage surface water flows. Increased erosion from infrastructure which increase flow velocities above natural conditions may be another potential source of sediment. Examples include culverts or spoon drains, however, it is BHP standard practice that infrastructure is appropriately armoured with rip rap (or other energy dissipation structures) to reduce flow velocities and erosion potential. Where required rock sizing (for riprap) is selected based on predicted flow velocities, section thickness and rock sizing recommendations from Main Roads WA Floodway Design Guide (Main Roads WA 2006). High velocities are also modelled along steep slopes of proposed pits and landforms (Stantec 2024). The construction of rock chutes, down-drains, or other measures may be required to prevent erosion of the pit wall and crest at concentrated inflow locations. Effectiveness of haul road drainage infrastructure and controls will be reviewed annually.

Water quality – AMD

As discussed in Section 5.4.3, the overall risk of AMD is low and unlikely to require any specific management. However, BHP will manage the risk of AMD during operations in line with the Ministers North MCP (Appendix 12).

Water quality- Hydrocarbons

Hydrocarbon contamination will be managed to avoid leaks and spills through the use of bunds, location of bunded areas outside floodplains or appropriately elevated to avoid the risk of inundation. Fuel storage and transfer will occur in designated bunded areas.

Site drainage will be designed to collect, minimise or eliminate surface runoff into areas where hydrocarbon contamination may occur. Hydrocarbon storage facilities will be appropriately constructed and bunded in accordance with Australian Standards (AS1940). Regular facility inspection, maintenance, spill management procedures and staff training are expected to mitigate the risk of contamination effectively. BHP has well established strategies for the management of wastes at its Pilbara operations to ensure that risk of contamination of soil or groundwater is minimised.

Water quality- Nitrates

Nitrates in groundwater in the mining environment are typically a result of the use of Ammonium Nitrate Fuel Oil (ANFO) blasting products. The use of alternative blasting products (Maxam Rioflex) is currently being trialled at BHP Newman Operations which potentially reduces the release of nitrates to the environment. The trial will be reviewed during operation of the Derived Proposal to determine if this is a suitable alternative.

Accidental release of hazardous materials

During construction and operation, the Derived Proposal has the potential to contaminate surface water due to spills of hazardous materials and waste. Wastewater at washdown bay/pads will be captured and treated through an oily water separator. Hydrocarbon waste will then be transported to the closest treatment facility and the treated water will be transferred to a lined pond before being used for haul road dust suppression. Sewerage wastewater will be transported to the closest treatment facility.

Water Supply

Consistent with the hub approach provided for under the Strategic Proposal (MS 1105) and consistent with the Policy *Use of mine dewatering surplus* (DWER, 2020), Ministers North will utilise water from other operations in which water is available, including but not limited to Yandi mine, and MAC/SF (via CPHSW Stage 1 – approximately 15 ML/day proposed from this scheme). By utilising this surplus water from other sources, for construction and operation of this Proposal, the need to abstract groundwater in situ as part of the Derived Proposal has been eliminated. The needs of other sites to dispose of this water via other methods is also reduced and as such impacts to Inland Waters minimised.

A suite of analytes (including but not limited to, metals, nitrates and other physico-chemical parameters) are tested for under the RiWi Act 5C Licenses (and groundwater operation strategy (GWOS)) for Yandi and MAC/SF. These are tested on a regular basis and reported through the Annual Aquifer Review (AAR). Site specific water quality trigger values have been developed as part of the GWOS, and if trigger values are exceeded, management measures will be implemented in line with licence requirements.

Other regulatory instruments

BHP has a number of operations in the Central Pilbara Hub that are regulated under other EP Act Part IV approvals and EP Act Part V approvals these are summarised in Table 5-8. The monitoring and management requirements of other activities provide an opportunity to monitor Yandicoogina Gorge and any potential changes to its hydrological regime and/or water quality and reduce regulatory duplication.

The Yandicoogina Gorge GDE Supplementation Trial is part of the operating licence for BHP Yandi Operations (L6168/1991/11) and includes monitoring of groundwater level monitoring in the Gorge. Water quality is monitored at the Yandi break tank to determine any changes to water quality from surplus mine dewater from Yandi Operations. Water quality is also measured within a number of bores within the Gorge to determine if there are any significant changes to water quality.

As part of the MAC/SF Significant Amendment submitted to the EPA the proposal includes a long-term option for supplementation of Yandicoogina Gorge. To manage the outcome of supplementation ongoing water quality monitoring will be required in Gorge to determine any potential changes to water quality.

Table 5-8: Other approvals relating to water management

Site/location	Legislation and approval	Control
Yandicoogina Gorge GDE Supplementation Scheme	EP Act Part V L6168/1991/11 (Yandi Operations)	Limit on rate of emissions (injection to aquifer) Specifies the location of point source emissions Groundwater level monitoring includes: • nine monitoring bores within Yandicoogina Gorge. Trigger levels set to control injection rates • 21 monitoring bores within the general vicinity Groundwater and Injection Water quality monitoring: • Sampled on a quarterly basis from the Yandi break tank to control water quality of injected water • Sampled in groundwater bores on a fortnightly basis when the supplementation trial is in operation • Parameters: pH, electrical conductivity (EC), total dissolved solids (TDS), total suspended solids (TSS), Na, K, Ca, Mg, Cl, Carbonate, Bicarbonate, Sulphate, Nitrate, Al, B, Fe, Cu, Zn, Ag, As, Cr, Cd Hg, Ni, Se, Mn, total recoverable hydrocarbons (TRH), PFOS, PFOA and PFAS compounds
Yandicoogina Gorge	*Under assessment* EP Act Part IV Mining Area C-Southern Flank Significant Amendment Conditioned Central Pilbara Water Management Plan v5 (BHP 2025)	Groundwater level monitoring includes: • Continuous monitoring using telemetry • Four monitoring bores within the Gorge aquifer, trigger and threshold nominated to control groundwater level rise from groundwater supplementation program • 20 monitoring bores within the regional (Ministers North) aquifer; trigger and thresholds nominated to control groundwater rise from supplementation program Surface water monitoring levels in permanent pool • Continuous pool water level

5.5.3 Rehabilitate

BHP will implement the Ministers North MCP (Appendix 12), to meet the MS1105 approval Condition 15 environmental objective that the Derived Proposal is decommissioned and the site of the Derived Proposal is rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.

The MCP addresses how pits and constructed landforms (principally the Central OSA) 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. This will include rehabilitation of the haul road, with creek crossings removed and reshaped to the surrounding landform ensuring flows are maintained at closure.

5.5.4 Other statutory decision-making processes

The EPA (2021d) document *Taking Decision Making Processes into account in EIA: Interim Guidance* identifies that the EPA may consider other statutory decision-making processes which can mitigate the potential impacts of a

proposal on the environment, having regard to the ability and processes of a Decision-making Authority (DMA), the conditions that may be applied, and the likely environmental outcomes.

Table 5-9 summarises whether another statutory decision-making process can mitigate the potential environmental impacts of the Derived Proposal on Inland Waters, considering the EPA's *Taking decision making processes into account in EIA: Interim Guidance* (EPA 2021d).

Table 5-9: Inland Waters - other statutory decision-making processes

Impact from Derived Proposal	Other Statutory Decision-making Process
Changes to surface water regimes	**Yes.** Beds and Banks Permit (RiWI Act)

5.6 Validation of impacts and environmental outcome

BHP has validated the impacts to Inland Waters from the Derived Proposal against the Strategic Proposal, assuming relevant mitigation measures identified in Section have been applied, to demonstrate that the environmental objective identified in MS1105 Condition 10, can be met.

Following mitigation, BHP considers that there will not be any significant residual impacts on Inland Waters values from the Derived Proposal.

Table 5-10 summarises the residual impacts and environmental outcomes for Inland Waters and demonstrates consistency with MS1105 condition objectives.

Table 5-10: Inland Waters - residual impacts, environmental outcomes and consistency with MS1105 condition objectives

Derived Proposal residual impact	Derived Proposal environmental outcome	Consistency with Strategic Proposal MS1105 condition objectives
Minor reduction in surface water catchment areas. BHP considers that there will not be any significant residual impact from the Derived Proposal to inland waters values.	Contributes to the cumulative changes to surface water regimes from mining infrastructure. Avoidance of permanent and ephemeral rock pools (water holes).	Condition Objectives: 10-1 The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected, including where relevant avoiding and minimising direct and indirect impacts of the proposal, on: (a) Fortescue Marsh; (b) hydrological regimes that support threatened and priority ecological communities; (c) proclaimed Public Drinking Water Source Areas; (d) permanent and ephemeral rock pools; (e) wetlands which are Ramsar listed, or listed in the Directory of Important Wetlands in Australia; (f) wild rivers; (g) wetland types which may be poorly represented; (h) natural springs; (i) ecosystems which support conservation significant flora/ vegetation and fauna species or communities, including migratory waterbirds, bats, groundwater dependent biota and subterranean fauna; and (j) ecosystems which support significant amenity, recreation and cultural values. It is noted from the environmental values identified in Condition 10-1, a number are not relevant to the Derived Proposal (e.g. no impacts to proclaimed Public Drinking Water Sources, Ramsar listed wetlands etc.). However, consideration of permanent and ephemeral rock pools and ecosystems which support conservation significant species have been a key focus of the Derived Proposal. Avoidance and mitigation for these values have been proposed. Subject to application of the implementation conditions of the MS1105 approval, the EPA's objective for the Environmental Factor of Inland Waters can be met.

5.7 Implementation conditions

BHP considers that the following conditions of MS1105 should apply to the Derived Proposal:

- Condition 6: Condition Environmental Management Plans
- Condition 15: Rehabilitation and Decommissioning.

BHP has assessed the existing implementation conditions of the MS1105 approval for the Strategic Proposal in relation to their application for the Derived Proposal. BHP has concluded that the above implementation conditions are appropriate, and that a Condition 10 Water Environmental Management Plan is not required

6 Flora and Vegetation Validation

6.1 EPA environmental factor and objective

The EPA (2023a) objective for the Environmental Factor of 'Flora and Vegetation' is:

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

This objective remains generally consistent with the objective considered for Flora and Vegetation within the assessment of the Strategic Proposal (EPA 2018a).

In assessment of the Strategic Proposal by BHP (2016a), the EPA's objective for Flora and Vegetation was *"To maintain representation, diversity, viability and ecological function at the species, population and community level"*, however, in the assessment by EPA (2018a), the EPA's objective for Flora and Vegetation was *"To protect flora and vegetation so that biological diversity and ecological integrity are maintained"*.

6.2 Relevant policy and guidance

BHP validated this environmental factor considering the following relevant EPA policies and guidance, as outlined in Table 6-1.

Table 6-1: Flora and Vegetation - policy and guidance

EPA policy and guidance	Consideration of EPA policy and guidance
Environmental Protection Act 1986 (WA)	• Legislation considered relevant to the protection of flora and vegetation values.
Statement of Environmental Principles, Factors, Objectives and Aims of EIA (EPA 2023a)	• Consideration of the EPA's environmental objective for the Environmental Factor of Flora and Vegetation.
Environmental Factor Guideline: Flora and Vegetation (EPA 2016a)	• Identified the flora and vegetation values, and their significance. • Identified activities that can impact on flora and vegetation values. • Applied the relevant considerations for potential environmental impacts.
Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b)	• Biological surveys have been completed in accordance with the guidance.
WA Environmental Offsets Policy (Government of WA 2011) *WA Environmental Offsets Guidelines* (Government of WA 2014)	• Applied avoidance and mitigation measures to the Derived Proposal. • Quantified the significant residual impact. • Considered cumulative impacts in the regional context in determining significant residual impact.

Since the EPA (2018a) assessment of the Strategic Proposal there has been no change to the EPA's guidance on the Environmental Factor of Flora and Vegetation. On 1 January 2019, the *Biodiversity Conservation Act 2016* (BC Act) and *Biodiversity Conservation Regulations 2018* (BC Regulations) replaced the *Wildlife Conservation Act 1950* (WC Act) and its associated regulations. There is no policy or guidance for the BC Act relevant to the validation of Flora and Vegetation for the Derived Proposal.

6.3 Receiving environment

6.3.1 Studies and surveys

In assessment of the Strategic Proposal, BHP (2016a) considered the following information sources for the assessment of the potential impacts to flora and vegetation values:

- Commonwealth Scientific and Industrial Research Organisation (CSIRO) (2013) *Using Community-level Modelling to map levels of Biodiversity Significance in the Pilbara Bioregion*
- Beard J S (1975) *Vegetation Survey of Western Australia: Pilbara.* Map and explanatory notes 1:1,000,000 series. University of Western Australia Press, Perth, Western Australia
- Onshore Environmental Consultants Pty Ltd (Onshore Environmental) (2014) *Consolidation of Regional Vegetation Mapping BHP Billiton Iron Ore Pilbara Tenure*
- BHP Iron Ore Pty Ltd (BHP) (2016b) *Pilbara Strategic Proposal: Flora and Vertebrate Fauna Screening Assessment*.

As per the requirements of MS1105 *Guidelines for submitting a derived proposal 1(a)*, targeted surveys have been undertaken for the Derived Proposal (see Table 6-2). Note only surveys undertaken since the Strategic Proposal have been summarised below (survey coverage for the Development Envelope dates back to 2006).

Table 6-2: Flora and Vegetation - supporting studies

Title	Survey date	Survey summary	Appendix
Spectrum Ecology Pty Ltd (2023) *Ministers North Targeted Significant Flora and Vegetation Assessment*.	30 May – 7 June 2023	Spectrum was commissioned to undertake a targeted flora and vegetation assessment at Ministers North. The survey was undertaken by six botanists over a 54 person-day period and comprised 22 relevés and 405 km of targeted traverses. No Threatened flora taxa were recorded during the field assessment. Five Priority flora taxa were recorded.	Appendix 6
Biologic Environmental Survey Pty Ltd (Biologic) (2023a) *Yandi E8 Targeted Flora Survey*	13-20 May 2022	Targeted searching was undertaken for flora of significance. Flora taxa that were confirmed or considered Very Likely, Likely or Possible to occur were preferentially targeted. Three Priority flora taxa were recorded.	Appendix 6
Biologic (2024a) *Central Pilbara Hub Targeted and Detailed Flora Survey*	Five separate trips: comprising two trips in March 2022, one trip in April-May 2022, one trip in June 2022	A total of 152 quadrats, 21 relevés, and 27 mapping notes were completed across 25,563 ha of the Study Area, as well as opportunistic sampling. A total of 516 confirmed vascular flora taxa, from 62 families and 190 genera were recorded in the Study Area, comprising 499 native and 17 introduced flora taxa. No DRF, taxa listed under the EPBC Act or TEC were recorded.	Appendix 6
GHD Pty Ltd (GHD) (2022) *Targeted Flora Surveys of Pipeline Corridors*	April-May 2021	Four Priority flora species were recorded: *Aristida lazaridis* (P2 (now P3)), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3), *Rostellularia adscendens var. latifolia* (P3) and *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P4).	Appendix 6

Title	Survey date	Survey summary	Appendix
Biologic (2020a) *Ministers North Miscellaneous Licence Area Amendment Surveys and Yandicoogina Creek Detailed Flora and Vegetation Assessment*	30 Mar – 1 Apr 2020	At Ministers North, vegetation was sampled with three quadrats and four relevés, supplemented with targeted searches. Overall, a total of 279 vascular flora taxa from 51 families and 141 genera were recorded from the Study Area during the current field survey, comprising 262 native and 17 introduced flora taxa. No DRF, taxa listed under the EPBC Act or TEC were recorded.	Appendix 6
Onshore Environmental Consultants Pty Ltd (Onshore Environmental) (2020) *Ministers North and Yandi Vegetation Association and Condition Mapping*	N/A	BHP commissioned Onshore Environment to complete a detailed review of all existing vegetation association and condition mapping across their Ministers North and Yandi tenements. The consolidated vegetation association mapping for the project area resulted in the delineation of 40 vegetation associations, classified under 21 broad floristic formations.	Appendix 6
Astron Environmental Services Pty Ltd (2018) *Area C West to Yandi Flora and Vegetation Assessment*	13 – 22 November 2018	Astron Environmental Services conducted an assessment of flora and vegetation values along five creeklines in the vicinity of the Area C, Yandi and South Flank mining operations, including Marillana Creek and Yandicoogina Creek. No Threatened taxa were recorded nor are expected to occur. One Priority flora taxa was recorded.	Appendix 6
Onshore Environmental (2018a) *Yandicoogina Creek Reconnaissance Vegetation Survey*	4 – 6 June 2018	Onshore Environmental were commissioned to undertake a reconnaissance vegetation survey of Yandicoogina Creek. Six vegetation associations supporting groundwater dependent vegetation were described and mapped. A total of five Priority listed flora were opportunistically recorded during the reconnaissance survey.	Appendix 6
Onshore Environmental (2018b) *Ministers North to Yandi Corridor Flora and Vegetation Survey*	9 – 13 October 2017, & 21 – 27 May 2018	A total of 256 plant taxa (including varieties and subspecies) from 45 families and 130 genera were recorded. No Threatened flora taxa were recorded. Three Priority flora taxa were recorded.	Appendix 6
Biologic (2017a) *Ministers North to Yandi Corridor Single Phase Level 2 Fauna and Detailed Flora/Vegetation Survey*[1]	9 – 13 October 2017	The flora and vegetation field survey involved systematic sampling using quadrats. Relevé vegetation descriptions were undertaken, and targeted searches were completed in habitats where it was anticipated that significant flora might occur. No DRF were recorded, three Priority flora taxa were recorded.	Appendix 6
Biota Environmental Sciences Pty Ltd (Biota) (2017) *Ministers North Detailed Flora and Vegetation Survey*	Two Phases: Sept 2016 & May – Jul 2017	During the Phase 1 survey, 22 quadrats and 14 relevés were surveyed. Fifteen quadrats and five of the relevés were resampled, and one additional relevé was conducted, during the second phase a total of ten vegetation associations were described from the study area. No DRF, taxa listed under the EPBC Act or TEC were recorded and none are considered likely to occur	Appendix 6

[1] This survey is not shown on Figure 6-1 because the Flora and Vegetation component of this study comprises the survey *Ministers North to Yandi Corridor Flora and Vegetation Survey* Onshore Environmental (2018b).

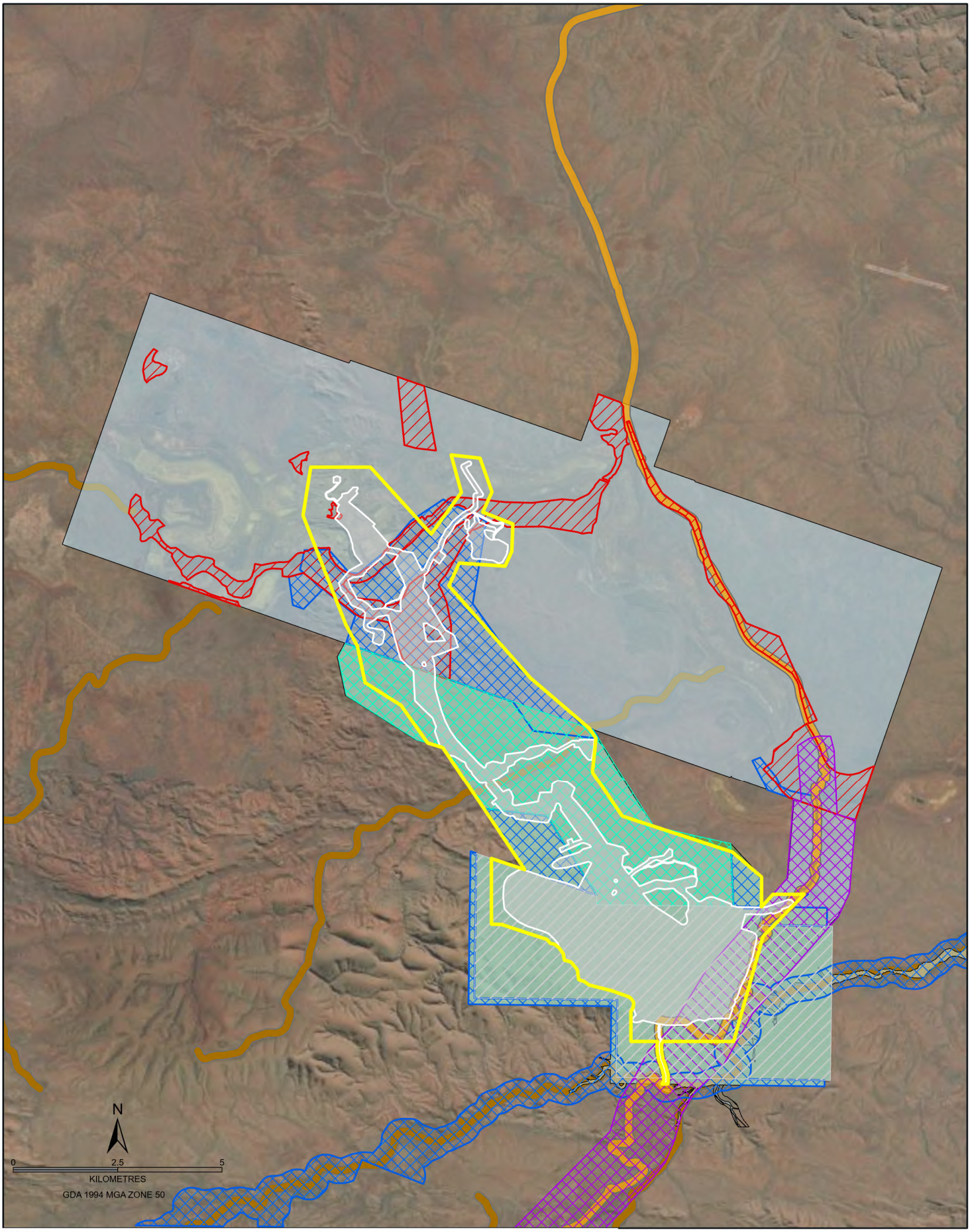
The location and extent of the biological surveys are identified by Figure 6-1.

6.3.2 Survey assumptions and limitations

In the assessment of the Strategic Proposal, BHP (2016a) identified that additional biological surveys would be necessary for future derived proposals in order to verify the potential impacts of the Strategic Proposal to flora and vegetation values. Several surveys have been undertaken within the Development Envelope since the assessment of the Strategic Proposal. This includes detailed vegetation mapping of the Development Envelope undertaken in 2020 (Onshore Environmental 2020). The mapping was based on the survey data from the most recent surveys undertaken for the area at the time and updated the 2014 consolidated vegetation mapping used for the assessment of vegetation for the Strategic Proposal (BHP 2016a - Section 8.1.3.1).

BHP has further updated its database to incorporate additional new survey information, and reviewed vegetation codes, to allow for the delineation of a wider suite of species. For locations in the Development Envelope where vegetation mapping from more recent surveys is available, it has been used in this Derived Proposal. Specifically, Biologic (2020a) conducted vegetation mapping for portions of the Development Envelope and targeted field surveys were undertaken by Spectrum Ecology (2023) which validated the local vegetation mapping and identified areas of significant vegetation in the majority of the Development Envelope (excluding the Yandi mine tenement). Notably, the key limitation from the Spectrum Ecology (2023) survey was that one small section of the survey area (382 ha, approximately 6.7% of the survey area) could not be accessed by foot due to distance from tracks and steep terrain. This section was noted as potentially providing suitable habitat for *Acacia bromilowiana* (P4) and *Sida* sp. Barlee Range (S. van Leeuwen 1642; P4). However, this area is excluded from the Development Envelope due to recent project modifications and as such does not represent a limitation for the assessment of the Derived Proposal.

Flora and vegetation survey coverage of the Development Envelope has been extensive, dating back to 2006. The survey effort and coverage are considered adequate and meets the requirements of the EPA's *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016b).



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Ministers North Targeted Significant Flora & Vegetation Assessment (Spectrum Ecology 2023)
- Central Pilbara Hub: Detailed and targeted flora and vegetation assessment (Biologic 2024a)
- Yandi E8 Targeted Flora Survey (Biologic 2023a)
- Targeted Flora Surveys of Pipeline Corridors (GHD 2022)
- Ministers North Miscellaneous Licence Area Amendment Surveys and Yandicoogina Creek Detailed Flora and Vegetation Assessment (Biologic 2020a)
- Ministers North and Yandi Vegetation Association and Condition Mapping (Onshore Environmental 2020)
- Area C West to Yandi Flora and Vegetation Assessment (Astron 2018)
- Yandicoogina Creek Reconnaissance Vegetation Survey (Onshore Environmental 2018a)
- Ministers North to Yandi Corridor Flora and Vegetation Survey (Onshore Environmental 2018b)
- Ministers North Detailed Flora and Vegetation Survey (Biota 2017)

BHP

PUBLIC

MINISTERS NORTH
FLORA AND VEGETATION SURVEYS

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:120,000	REQUESTOR:	PROJECTS	FIGURE:	6-1
DATE:	3/09/2025	PREPARED:	GEOMATICS	NO:	A1317-033 RevG
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6.3.3 Environmental values

6.3.3.1 *Regional biodiversity values and conservation reserves*

The CSIRO modelling (Figure 19 in BHP 2016a) identified areas of high biodiversity significance in the Pilbara bioregion. These areas are described in the PERSP (BHP 2016a - p93) and EPA Report 1619 (EPA 2018a). The majority of the Development Envelope has been predicted as having a low to medium modelled biodiversity significance (see Figure 6-2).

As discussed in Section 1.3, the Derived Proposal does not intersect any National Parks or conservation reserves, with the nearest National Park being located approximately 45 km.

6.3.3.2 *Threatened and Priority Ecological Communities*

As documented in the PERSP (BHP 2016a - Table 13), BHP identified two Threatened Ecological Communities (TECs) and eight Priority Ecological Communities (PECs) known from within the Strategic Proposal Boundary.

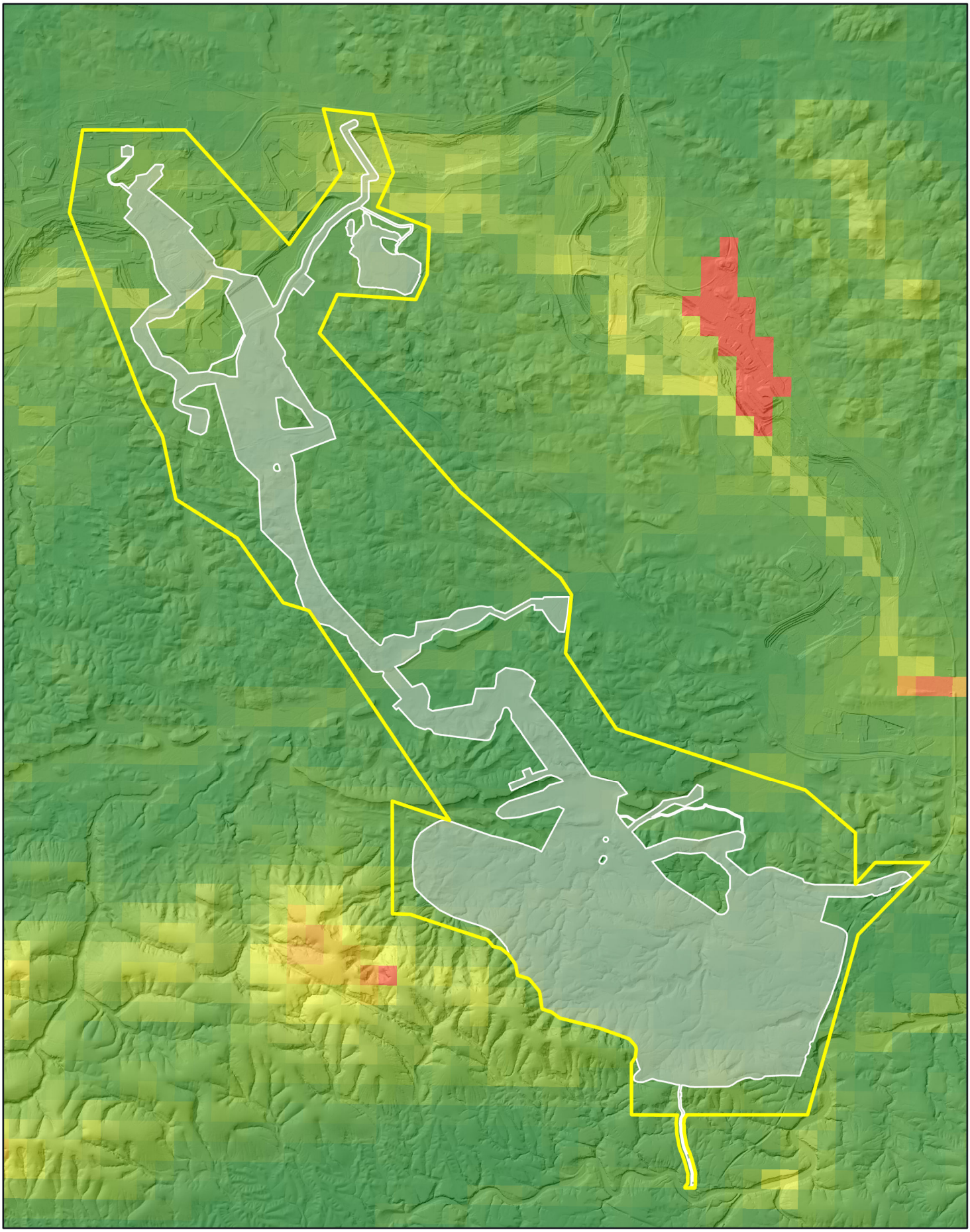
No formally recognised TECs or PECs have been recorded from within the Development Envelope.

In recent studies, during refined vegetation mapping of Yandicoogina Creek, Onshore Environmental (2020) and Biologic (2020a) described three groundwater dependent vegetation (GDV) associations that have been identified as having affinities with the DBCA Priority 2 ecological community '*Riparian flora and plant communities of springs and river pools with high water permanence of the Pilbara Region*' (Pilbara PEC).

Onshore Environmental (2020) mapped Vegetation Association MA EcrEvMa AcpAamAthe TydCyv, and reported that this together with the occurrence of semi-permanent and/or permanent water bodies characterised the area as similar to the PEC "*Riparian flora and plant communities of springs and river pools with high water permanence of the Pilbara Region".*

In addition, Biologic (2020a) identified occurrences within Yandicoogina Gorge of GDV vegetation associations MA Eco EuaTtSogl AtpGoroCule, MA EcoMa AtpCuleGoro TtEuaSopl and MA MaEco CyvTydFis TtEua. As a result of the presence of several permanent to semi-permanent pools, the GDV vegetation associations and key indicator understorey flora taxa including *Fimbristylis sieberiana* (DBCA P3) and *Imperata cylindrica,* Biologic (2020) noted that a 3.5 km section of Yandicoogina Creek had affinities to the *"Riparian flora and plant communities of springs and river pools with high water permanence of the Pilbara Region"* PEC.

The Pilbara PEC is currently known to occur sporadically throughout the Pilbara, with several occurrences in Karijini National Park. The presence of obligate phreatophytes, permanent to semi-permanent pools as well as several key indicator understorey species (i.e. *Imperata cylindrica* and *Fimbristylis sieberiana*) suggests that this 3.5 km section of Yandicoogina Creek may represent the Pilbara Pools PEC (Biologic 2020a). Whilst noting the above assessments, the occurrences of these vegetation associations with affinities to this PEC occur adjacent to but not within the Development Envelope for the Derived Proposal. The series of semi-permanent/permanent pools within Yandicoogina Gorge occur approx. 1-2 km east of the Development Envelope and as such will not be directly impacted by the Derived Proposal. Indirect impacts to the Yandicoogina Creek system are considered in Section 5.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)

Biodiversity Significance (all groups) excluding richness and condition

- High
- Low

N

0 1 2 3

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH

MODELLED AREAS OF BIODIVERSITY SIGNIFICANCE

WAIO PLANNING, TECHNICAL & ENVIRONMENT

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6.3.3.3 *Vegetation*

Regional Vegetation

The Derived Proposal is located in the Hamersley subregion of the Pilbara bioregion, as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) (Figure 6-3).

Of the 41 vegetation associations mapped by Beard (1975) and refined by Shepherd *et al.* (2002) that occur within the Strategic Proposal Boundary (Section 8.1.3.1 in BHP 2016a), two occur within the Development Envelope (Figure 6-4):

- Vegetation Association 18, described as *"low woodland; mulga (Acacia aneura)"*
- Vegetation Association 82, described as *"hummock grassland, low tree steppe; snappy gum over Triodia wiseana*".

The majority of the Development Envelope occurs within Vegetation Association 82 (Figure 6-4).

Vegetation Association 18 has a total mapped extent of greater than 19 million hectares (of which. 671,843 ha occurs in the Pilbara), with Vegetation Association 82 having a total mapped extent of greater than 2.5 million hectares, with each having over 99 % of their pre-European extent remaining (DBCA 2019b). As a result of their broad total mapped extent, Vegetation Association 18 and Vegetation Association 82 are not considered to be regionally significant.

Local vegetation

In assessment of the Strategic Proposal, consolidated local vegetation mapping across BHP tenure was undertaken by Onshore Environmental (2014). This vegetation mapping provides a greater level of detail than the Beard (1975) regional vegetation mapping.

Since the completion of the consolidated local vegetation mapping by Onshore Environmental (2014), the local vegetation mapping for the area of the Derived Proposal has been updated by Onshore Environmental (2020) and Biologic (2020a) to incorporate new survey information as it has become available. In addition, targeted field surveys by Spectrum Ecology (2023) validated the local vegetation mapping and identified areas of significant vegetation. The update to the database also involved a review of the vegetation codes, to allow for the delineation of a wider suite of flora taxa. The current vegetation codes, whilst aligning, are modified from those presented in the assessment of the Strategic Proposal (BHP 2016a).

Based upon the local vegetation mapping, the Development Envelope (5,557 ha) for the Derived Proposal comprises 4,402 ha (80 %) of native vegetation and 1,155 ha (20 %) of cleared/degraded land (of which 89 ha consist of rehabilitated land). The extent of cleared/degraded land within the Development Envelope and Indicative Footprint is predominantly associated with mineral exploration, mining operations and associated activities (e.g. rail transport) undertaken by BHP operations and other third-party mining companies.

A total of 35 Vegetation Associations have been mapped within the Development Envelope (see Table 6-3; Figure 6-5). The dominant Vegetation Associations within the Development Envelope are HC Tw AiAb InrSeao (approx. 35 % of the Development Envelope), HC TwTsTp Ellch Ah (approx. 17 % of the Development Envelope) and HC TwTsTp Ellch AhiAaa (approx. 13 % of the Development Envelope). The Vegetation Associations mapped within the Development Envelope are generally consistent with those discussed in the BHP (2016a) and the EPA (2018a) assessments for the Strategic Proposal.

Table 6-3: Local vegetation associations

Broad floristic formation	Vegetation code	Vegetation association description	Local Significance	Area within Development Envelope (ha)	% of Development Envelope[2]
Acacia Low Open Forest	SA Aa TpTwTb CcChf	Low Open Forest of *Acacia aptaneura* over Open Hummock Grassland of *Triodia pungens*, *Triodia wiseana* and *Triodia basedowii* over Open Tussock Grassland of **Cenchrus ciliaris* and *Chrysopogon fallax* on red brown sandy loam on sandy plains and undulating low hills	-	1.5	<0.1%
	SP AaApr TmTwTp TtChfAri	Low Open Forest of *Acacia aptaneura* and *Acacia pruinocarpa* over Open Hummock Grassland of *Triodia melvillei*, *Triodia wiseana* and *Triodia pungens* over Tussock Grassland of *Themeda triandra*, *Chrysopogon fallax* and *Aristida inaequiglumis* on red brown loam on stony plains	-	0.3	<0.1%
	MA AaAciApr CcTtChf EvEcr	Low Open Forest of *Acacia aptaneura*, *Acacia citrinoviridis* and *Acacia pruinocarpa* very Open Tussock Grassland of **Cenchrus ciliaris*, *Themeda triandra* and *Chrysopogon fallax* with Open Woodland of *Eucalyptus victrix* and *Eucalyptus camaldulensis subsp. refulgens* on brown loamy sand on major drainage lines with broad and deeply incised drainage channels.	Riparian Vegetation Potential GDV Ecosystem at risk (Major ephemeral watercourse)	0.1	<0.1%
Acacia Low Woodland	MA AciAcpAthe Tp EteEnl	Low Woodland of *Acacia citrinoviridis*, *Acacia coriacea subsp. pendens* and *Atalaya hemiglauca* with Open Hummock Grassland of *Triodia pungens* and Open Tussock Grassland of *Eriachne tenuiculmis* and *Enneapogon lindleyanus* on brown loam on raised levee banks of major drainage line	Riparian Vegetation Ecosystem at risk (Major ephemeral watercourse)	1.2	<0.1%
Acacia Open Scrub	MI AtpPlAm TpTs ChEll	Open Scrub of *Acacia tumida* var. *pilbarensis*, *Petalostylis labicheoides* and *Acacia monticola* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill (S.van Leeuwen 3835) with Low Open Woodland of *Corymbia hamerselyana* and *Eucalyptus leucophloia* subsp. *leucophloia* on red brown sandy loam on minor drainage lines	Riparian Vegetation	0.1	<0.1%
Acacia Shrubland	MI AbAdAma Tp TtPamuEua	Shrubland of *Acacia bivenosa*, *Acacia dictyophleba* and *Acacia maitlandii* over Open Hummock Grassland of *Triodia pungens* over Open Tussock Grassland of *Themeda triandra*, *Paraneurachne muelleri* and *Eulalia aurea* on brown sandy loam on minor drainage lines	Riparian Vegetation	1.4	<0.1%

Broad floristic formation	Vegetation code	Vegetation association description	Local Significance	Area within Development Envelope (ha)	% of Development Envelope[2]
Corymbia Low Woodland	GG CfEllFib AhDovmAsha CyaErmuThmb:	Low Woodland of *Corymbia ferriticola*, *Eucalyptus leucophloia* subsp. *leucophloia* and *Ficus brachypoda* over Open Shrubland of *Acacia hamersleyensis*, *Dodonaea viscosa* subsp. *mucronata* and *Astrotricha hamptonii* over Open Tussock Grassland of *Cymbopogon ambiguus*, *Eriachne mucronata* and *Themeda* sp. Mt Barricade on red brown loam along clifflines and gorge walls	-	24.5	0.4%
Eucalyptus Low Open Forest	MA EcrEvEx ApypAtpGoro TtEuaCyp	Low Open Forest of *Eucalyptus camaldulensis* subsp. *refulgens*, *Eucalyptus victrix* and *Eucalyptus xerothemica* over High Shrubland of *Acacia pyrifolia* var. *pyrifolia*, *Acacia tumida* var. *pilbarensis* and *Gossypium robinsonii* over Open Tussock Grassland of *Themeda triandra*, *Eulalia aurea* and *Cymbopogon procerus* on red brown clay loam on major drainage lines	Riparian Vegetation Potential GDV Ecosystem at risk (Major ephemeral watercourse)	23.8	0.4%
Eucalyptus Woodland	MA EcrEv AcpAtheEv TpTl	Woodland to Open Woodland of *Eucalyptus camaldulensis* and *Eucalyptus victrix* over Low Woodland of *Acacia coriacea* subsp. *pendens*, *Atalaya hemiglauca* and *Eucalyptus victrix* over Open Hummock Grassland of *Triodia pungens* and *Triodia longiceps* on brown sandy loam on levees and channel islands of major drainage lines	Riparian Vegetation Potential GDV Ecosystem at risk (Major ephemeral watercourse)	6.4	0.1%
	MA EcrEv AciApypMg CcEuaTt	Woodland of *Eucalyptus camaldulensis subsp. refulgens* and *Eucalyptus victrix* over High Open Shrubland of *Acacia citrinoviridis*, *Acacia pyrifolia var. pyrifolia* and *Melaleuca glomerata* over Tussock Grassland of **Cenchrus ciliaris, Eulalia aurea* and *Themeda triandra* on brown clay loam on banks of major drainage lines	Riparian Vegetation Potential GDV Ecosystem at risk (Major ephemeral watercourse)	<0.1	<0.1%
	MA EvAciEcr TercCocrApyp CcEuaTt	Woodland of *Eucalyptus victrix*, *Acacia citrinoviridis* and *Eucalyptus camaldulensis* subsp. *refulgens* over Low Open Shrubland of *Tephrosia rosea* var. *clementii*, *Corchorus crozophorifolius* and *Acacia pyrifolia* var. *pyrifolia* over Very Open Tussock Grassland of **Cenchrus ciliaris*, *Eulalia aurea* and *Themeda triandra* on brown loamy sand on channels of major drainage lines	Riparian Vegetation Potential GDV Ecosystem at risk (Major ephemeral watercourse)	43.3	0.8%

Broad floristic formation	Vegetation code	Vegetation association description	Local Significance	Area within Development Envelope (ha)	% of Development Envelope[2]
Mosaic (Eucalyptus High Open Forest and Eucalyptus Open Forest (to Woodland))	1/3	1: High Open Forest of *Melaleuca argentea*[8], *Eucalyptus camaldulensis var. obtusa* over High Shrubland of *Melaleuca glomerata*, *Acacia bivenosa*, *Acacia sericophylla* over Very Open Sedges of *Cyperus vaginatus* in alluvial gravelly soils along major drainage channels. 3: Open Forest (to Woodland) of *Eucalyptus camaldulensis var. obtusa*, *Eucalyptus victrix* over Open Scrub of *Acacia pyrifolia*, *Acacia tumida*, *Gossypium robinsonii* over Low Shrubland of *Corchorus crozophorifolius*, *Indigofera monophylla*, *Tephrosia rosea var. glabrior* Pedley ms[9] in dark red brown loam soils along major drainage lines.	Riparian Vegetation Potential GDV	1.8	<0.1%
Melaleuca High Open Forest	MA MaEcrEv MgAcpAtr Cyv	High Open Forest of *Melaleuca argentea*, *Eucalyptus camaldulensis* var. *refulgens* and *Eucalyptus victrix* over High Open Shrubland of *Melaleuca glomerata*, *Acacia coriacea* subsp. *pendens* and *Acacia trachycarpa* over Very Open Sedges of *Cyperus vaginatus* on alluvial gravelly soils on major drainage channels with seasonal pools	Riparian Vegetation Potential GDV Ecosystem at risk (Major ephemeral watercourse)	2.5	<0.1%
Themeda Open Tussock Grassland	ME TtAriCya ChEll AmPlAnl:	Open Tussock Grassland of *Themeda triandra*, *Aristida inaequiglumis* and *Cymbopogon ambiguus* with Low Open Woodland of *Corymbia hamerselyana* and *Eucalyptus leucophloia* ssp. *leucophloia* over Open Shrubland of *Acacia monticola*, *Petalostylis labicheoides* and *Androcalva luteiflora* on red brown alluvium on minor and medium drainage lines	Riparian Vegetation	0.4	<0.1%
Themeda Tussock Grassland	GG TtErmuThmb EllChCf AtpGoroPl	Tussock Grassland of *Themeda triandra*, *Eriachne mucronata* and *Themeda* sp. Mt Barricade with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* and *Corymbia ferriticola* over High Shrubland of *Acacia tumida* var. *pilbarensis*, *Gossypium robinsonii* and *Petalostylis labicheoides* on red brown sandy loam on narrowly incised rocky drainage lines	-	71.6	1.3%
	ME TtEuaEte ApypAtpPl EvCh	Tussock Grassland of *Themeda triandra*, *Eulalia aurea* and *Eriachne tenuiculmis* with High Shrubland of *Acacia pyrifolia* var. *pyrifolia*, *Acacia tumida* var. *pilbarensis* and *Petalostylis labicheoides* and Open Woodland of *Eucalyptus victrix* and *Corymbia hamersleyana* on red brown silty loam on medium drainage lines and flood plains	Riparian Vegetation	56.3	1.0%

[8] The tributaries within the Development Envelope where this mosaic vegetation occurs was originally mapped in 2011 as containing *Melaleuca argentea*. However, this is considered an error as more recent knowledge of the vegetation within the Development Envelope indicates it is unlikely this species occurs at those locations.

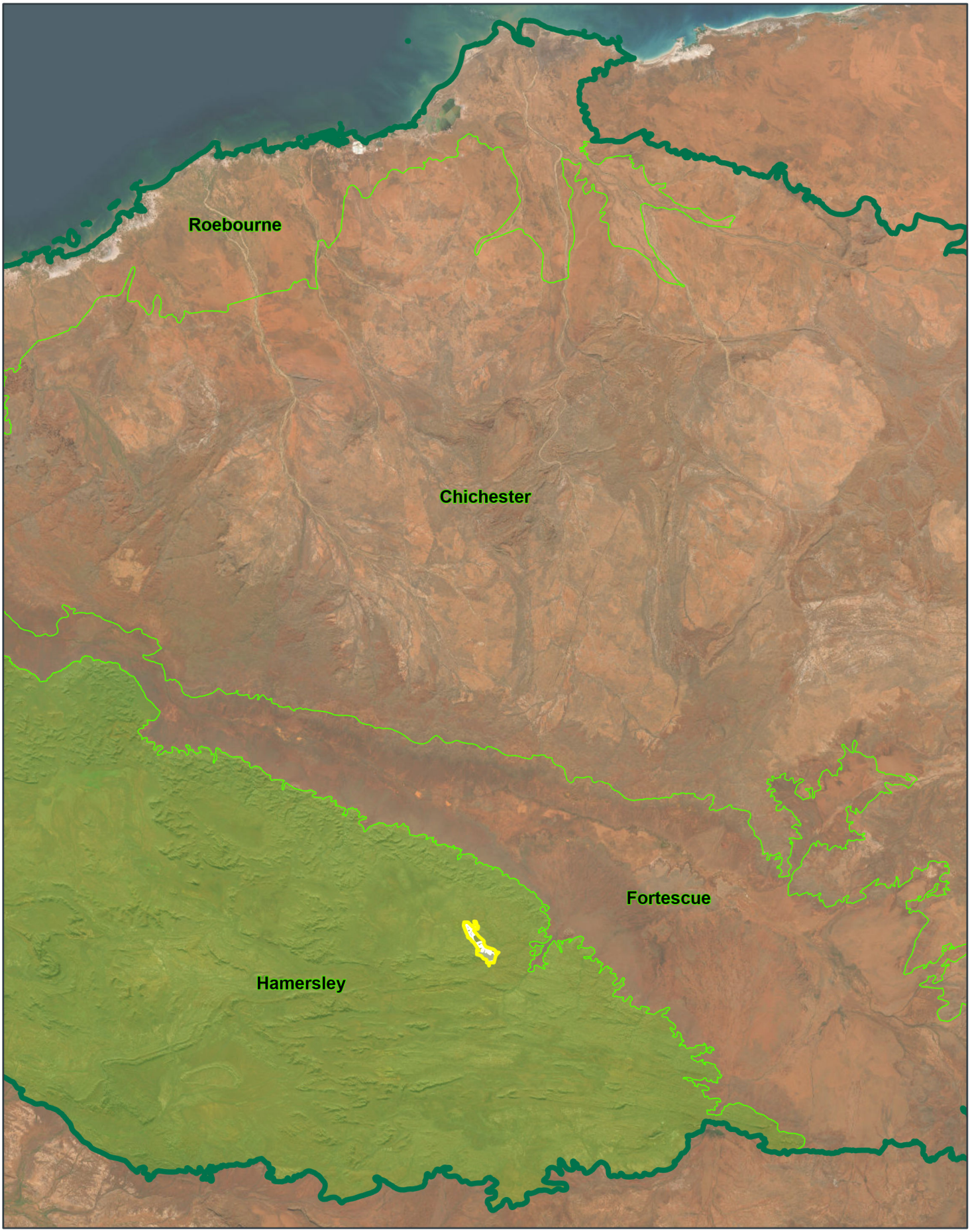
[9] More recently known as *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186).

Broad floristic formation	Vegetation code	Vegetation association description	Local Significance	Area within Development Envelope (ha)	% of Development Envelope[2]
Triodia Hummock Grassland	FS TsTpTw Ell AbApaAanc:	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia pungens* and *Triodia wiseana* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and Open Shrubland of *Acacia bivenosa*, *Acacia pachyachra* and *Acacia ancistrocarpa* on red brown loam on footslopes, low undulating hills and stony plains	-	66.2	1.2%
	FS Tw Ell	Hummock Grassland of *Triodia wiseana* with Scattered Low Trees of *Eucalyptus leucophloia* subsp. *leucophloia* on red silty clay on hill slopes and footslopes	-	22.3	0.4%
	FS Tv CddHc AancAiGrwh	Hummock Grassland of *Triodia vanleeuwenii* with Low Open Woodland of *Corymbia deserticola subsp. deserticola* and *Hakea chordophylla* over Open Shrubland of *Acacia ancistrocarpa, Acacia inaequilatera* and *Grevillea wickhamii subsp. hispidula* on footslopes and hillslopes	-	<0.1	<0.1%
	FS TvTpTw Ell AbApaAanc	Hummock Grassland of *Triodia vanleeuwenii, Triodia pungens* and *Triodia wiseana* with Low Open Woodland of *Eucalyptus leucophloia subsp. leucophloia* and Open Shrubland of *Acacia bivenosa, Acacia pachyacra* and *Acacia ancistrocarpa* on footslopes	-	1.9	<0.1%
	HC Tw AiAb InrSeao	Hummock Grassland of *Triodia wiseana* with High Open Shrubland of *Acacia inaequilatera* and *Acacia bivenosa* over Low Open Shrubland of *Indigofera rugosa* and *Senna artemisioides* subsp. *oligophylla* on red silty loam on dolerite hill crests	-	1938.9	34.9%
	HC TwTbrTp EllCh AmaGrwhAb	Hummock Grassland of *Triodia wiseana*, *Triodia brizoides* and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over High Open Shrubland of *Acacia maitlandii*, *Grevilllea wickhamii* subsp. *hispidula* and *Acacia bivenosa* on red brown sandy loam on hill crests and upper hill slopes	-	28.8	0.5%
	HC TwTsTp EllCh Ah	Hummock Grassland of *Triodia wiseana*, *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamerselyana* over Open Shrubland of *Acacia hamersleyensis* on red brown clay loam on hill crests and upper hill slopes	-	950.0	17.1%

Broad floristic formation	Vegetation code	Vegetation association description	Local Significance	Area within Development Envelope (ha)	% of Development Envelope[2]
	HC TwTvTp EllCh Ah	Hummock Grassland of *Triodia wiseana*, *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamerselyana* over Open Shrubland of *Acacia hamersleyensis* on red brown clay loam on hill crests and upper hill slopes	-	254.1	4.6%
	HS TsTwTp EllCh AhiAaa	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia wiseana* and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over Low Open Shrubland of *Acacia hilliana* and *Acacia adoxa* var. *adoxa* on red brown sandy loam on hill slopes	-	731.7	13.2%
	HS Tv(Tw) EllCdd AhiAaa	Hummock Grassland of *Triodia vanleeuwenii* (+/- *Triodia wiseana*) with Low Open Woodland of *Eucalyptus leucophloia subsp. leucophloia* and *Corymbia deserticola subsp. deserticola* over Low Open Shrubland of *Acacia hilliana* and *Acacia adoxa var. adoxa* on hillslopes	-	12.0	0.2%
	HS TvTwTp EllCh AhiAaa	Hummock Grassland of *Triodia vanleeuwenii, Triodia wiseana* and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia subsp. leucophloia* and *Corymbia hamersleyana* over Low Open Shrubland of *Acacia hilliana* and *Acacia adoxa var. adoxa* on hillslopes.	-	2.1	<0.1%
	HS TwTbrTs EllExCh PtcPtasAhi	Hummock Grassland of *Triodia wiseana*, *Triodia brizoides* and *Triodia* sp. Shovelanna Hill with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Eucalyptus xerothermica* and *Corymbia hamersleyana* over Low Open Shrubland of *Ptilotus calostachyus*, *Ptilotus astrolasius* and *Acacia hilliana* on brown loam on hill crests and upper hill slopes	-	8.9	0.2%
	HS TwTpTs Ell AprAaAanc	Hummock Grassland of *Triodia wiseana*, *Triodia pungens* and *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over Open Shrubland of *Acacia pruinocarpa*, *Acacia aptaneura* and *Acacia ancistrocarpa* on red brown loam on plains and low hills	-	12.5	0.2%
	ME TpTlo ExAciCh PlApypGoro	Hummock Grassland of *Triodia pungens* and *Triodia longiceps* with Low Woodland of *Eucalyptus xerothermica*, *Acacia citrinoviridis* and *Corymbia hamersleyana* over High Shrubland of *Petalostylis labicheoides*, *Acacia pyrifolia* var. *pyrifolia* and *Gossypium robinsonii* on red brown clay loam on medium drainage lines and surrounding floodplains	Riparian Vegetation	19.4	0.3%

Broad floristic formation	Vegetation code	Vegetation association description	Local Significance	Area within Development Envelope (ha)	% of Development Envelope[2]
	SP TbTp HlAancAi Ch	Hummock Grassland of *Triodia basedowii* and *Triodia pungens* with High Open Shrubland of *Hakea lorea* subsp. *lorea*, *Acacia ancistrocarpa* and *Acacia inaequilatera* and Scattered Low Trees of *Corymbia hamersleyana* on red brown loamy sand on stony plains	-	5.6	0.1%
	FP Tp ChHallEv TefcApy	Open Hummock Grassland of *Triodia pungens* with Low Open Woodland of *Corymbia hamersleyana, Hakea lorea* subsp. *lorea* and *Eucalyptus victrix* over Low Open Shrubland of *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186) and *Acacia pyrifolia* on brown sandy loam on floodplains and drainage lines	Riparian Vegetation	95.5	1.7%
Triodia Open Hummock Grassland	FS Ts EllCh Hc	Open hummock grassland of *Triodia vanleeuwenii* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on footslopes	-	<0.1	<0.1%
	HS TsTw Ell Ab	Open hummock grassland of *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835), *T. wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over open shrubland of *Acacia bivenosa* on dark reddish brown sandy clay loam on lower hill slopes.	-	<0.1	<0.1%
	HS Tw Ell Ab	Open hummock grassland of *Triodia wiseana* with scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* over scattered shrubs of *Acacia bivenosa* on dark reddish brown sandy clay loam on steep hill slopes.	-	<0.1	<0.1%
Eriachne Open Tussock Grassland	HC ErmuCyaTt CfEll Tw	Open Tussock Grassland of *Eriachne mucronata, Cymbopogon ambiguus* and *Themeda triandra* with Low Open Woodland of *Corymbia ferriticola* and *Eucalyptus leucophloia* subsp. *leucophloia* and Very Open Hummock Grassland of *Triodia wiseana* on brown sandy loam on clifflines	-	<0.1	<0.1%
- Cleared		-		1,155	20.8%
No survey data		-		16.5	0.3%
Total				**5,556.6[10]**	**100%**
Total (rounded up)				**5,557**	**100%**

[10] Individual vegetation association areas are rounded to the nearest 0.1 ha which results in some minor rounding errors when compared to the total area of the Development Envelope



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Pilbara IBRA Region (17,823,126 ha)
- Hamersley IBRA Subregion (5,634,727 ha)

N

0 20 40 60 80

KILOMETRES

GDA 1994 MGA ZONE 50

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IBRA BIOREGIONS AND SUBREGIONS

WAIO PLANNING, TECHNICAL & ENVIRONMENT

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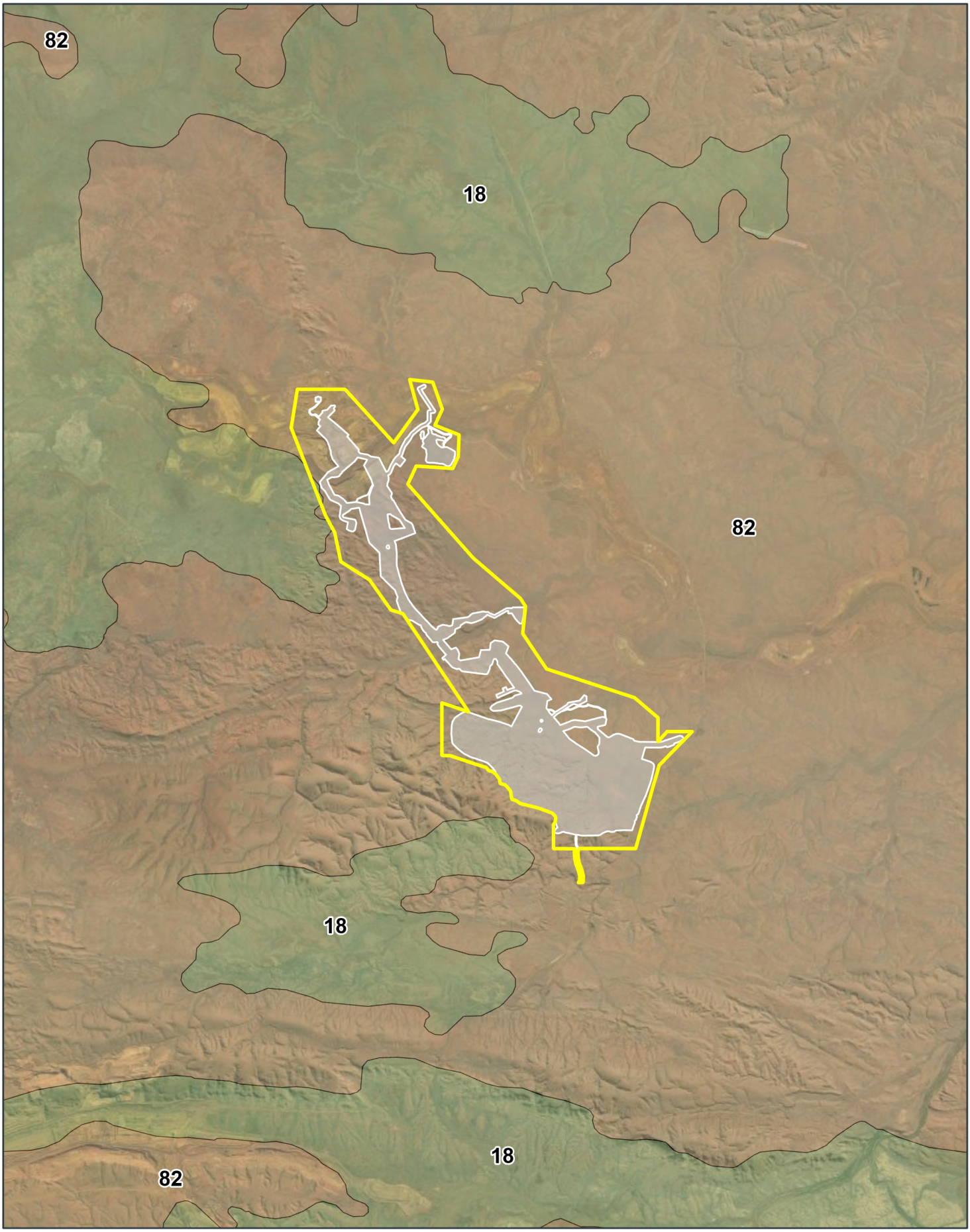

Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Beard Vegetation Association 18 (19,984,084 ha)
- Beard Vegetation Association 82 (2,565,571 ha)

N

0 1 2 3 4

KILOMETRES

GDA 1994 MGA ZONE 50

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BEARD VEGETATION ASSOCIATIONS

WAIO PLANNING, TECHNICAL & ENVIRONMENT

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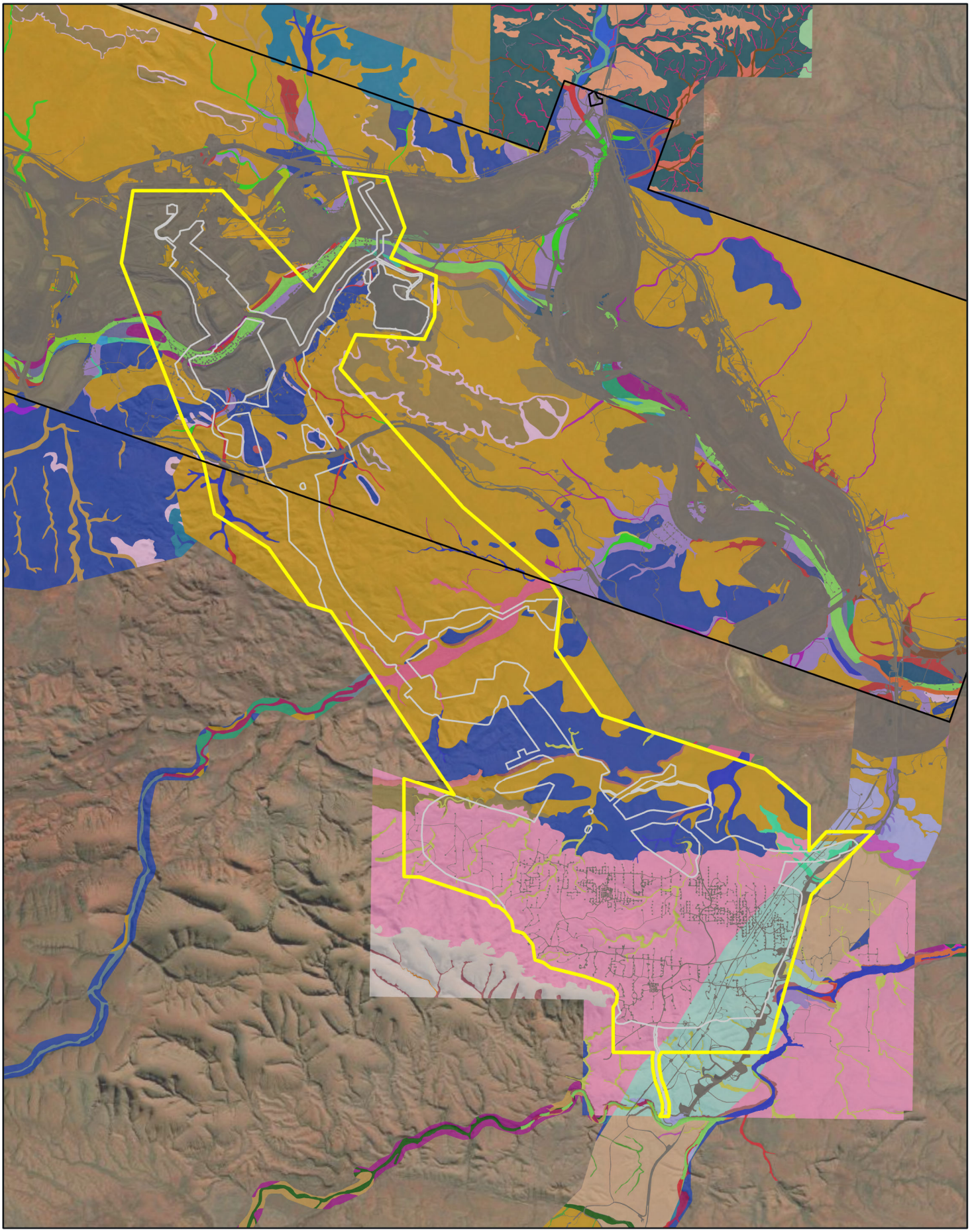

Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)

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0 1 2 3

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

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WAIO PLANNING, TECHNICAL & ENVIRONMENT

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Cleared

1/3 Mosaic

1c

1g

FP Tp ChHallEv TefcApy

FS Ts EllCh Hc

FS TsTpTw Ell AbApaAanc

FS Tv CddHc AancAiGrwh

FS TvTpTw Ell AbApaAanc

FS Tw Ell

GG CfEllFib AhDovmAsha CyaErmuThmb

GG TtErmuThmb EllChCf AtpGoroPl

HC ErmuCyaTt CfEll Tw

HC Tw AiAb InrSeao

HC TwTbrTp EllCh AmaGrwhAb

HC TwTsTp EllCh Ah

HC TwTvTp EllCh Ah

HS TsTw Ell Ab

HS TsTwTp EllCh AhiAaa

HS Tv(Tw) EllCdd AhiAaa

HS TvTwTp EllCh AhiAaa

HS Tw Ell Ab

HS TwTbrTs EllExCh PtcPtasAhi

HS TwTpTs Ell AprAaAanc

MA AaAciApr CcTtChf EvEcr

MA AciAcpAthe Tp EteEnl

MA EcrEv AciApypMg CcEuaTt

MA EcrEv AcpAtheEv TpTl

MA EcrEvEx ApypAtpGoro TtEuaCyp

MA EvAciEcr TercCocrApyp CcEuaTt

MA MaEcrEv MgAcpAtr Cyv

ME TpTlo ExAciCh PlApypGoro

ME TtAriCya ChEll AmPlAnl

ME TtEuaEte ApypAtpPl EvCh

MI AbAdAma Tp TtPamuEua

MI AtpPlAm TpTs ChEll

No Survey Data

SA Aa TpTwTb CcChf

SP AaApr TmTwTp TtChfAri

SP TbTp HlAancAi Ch

BHP

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VEGETATION ASSOCIATIONS LEGEND

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

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6.3.3.4 *Vegetation condition*

The majority of vegetation within the Development Envelope is in 'Excellent' condition (see Figure 6-6 and Table 6-4); consistent with the findings of the BHP (2016a) assessment of the Strategic Proposal. Areas of poorer vegetation condition were recorded in the areas of the Marillana Creek and the Yandicoogina Creek related to cattle grazing and introduced flora. Areas of poorer vegetation condition were also recorded surrounding BHP's Yandi.

Table 6-4: Vegetation condition within Development Envelope

Vegetation Condition	Area within Development Envelope (ha)	% of Development Envelope
Excellent	3,855.0	69.4%
Very Good	416.9	7.5%
Good	41.4	0.7%
Poor	55.5	1.0%
Degraded	0	0%
Completely Degraded[11]	12.5	0.2%
Cleared	1,155.0	20.8%
No data available	20.3	0.4%
Total	**5,556.6**	**100%**

Biota (2017) identified a fire from 2015 which affected a large part of the areas surveyed for the Derived Proposal. This area is understood to have largely recovered in the almost 10 years following this fire. Mapping of fire history by DBCA (2023) identifies a mosaic of mapped fires within the Development Envelope and surrounds which may have a temporary effect on the physical health of the vegetation (noting, however, that as fire is a natural part of the landscape ecology that fire alone may not result in a reduced vegetation condition assessment.

6.3.3.5 Riparian Vegetation

Riparian vegetation occurs within the Development Envelope along Marillana Creek and Yandicoogina Creek (including their tributaries), and around water features. A total of 14 riparian[12] vegetation associations comprising 252.2 ha (6%) have been mapped within the Development Envelope (refer to Table 6-3; Figure 6-7). A total of seven of the riparian vegetation associations in the Development Envelope represent DBCA "*ecosystems at risk*" as they are all associated with major ephemeral water courses in the Hamersley subregion and are under threat from grazing and introduced flora (Table 6-3).

Several of the riparian vegetation associations mapped within the Development Envelope are also considered to potentially be Groundwater Dependent Vegetation (GDV) and are discussed further below.

6.3.3.6 Groundwater Dependent Vegetation

Drainage lines within and in the region surrounding the Development Envelope have the potential to support GDV (i.e. vegetation that may be reliant on groundwater for part or all water requirements). GDV is typically characterised by the presence of flora species that rely on groundwater, known as phreatophytes.

[11] As per the vegetation condition scale in Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a), Completely Degraded includes existing cleared areas

[12] Riparian vegetation means the distinctive vegetation associated with a wetland or watercourse, as defined in DWER's A guide to the exemptions and regulations for clearing native vegetation (DWER 2019a).

Phreatophytes may be classified as either obligate (confined to habitats with permanent access to groundwater) or facultative phreatophytes (species that use groundwater opportunistically and/or can utilise groundwater to satisfy a portion of their ecological water requirements but that are not necessarily restricted to habitats with shallow groundwater) depending on occurrence in habitats with and without access to shallow groundwater (Eamus *et al.* 2016). Dominant facultative phreatophytic tree species of the riparian zone in the Pilbara are *Eucalyptus camaldulensis* and *Eucalyptus victrix* and the dominant obligate phreatophytic tree species is *Melaleuca argentea* (Onshore 2015).

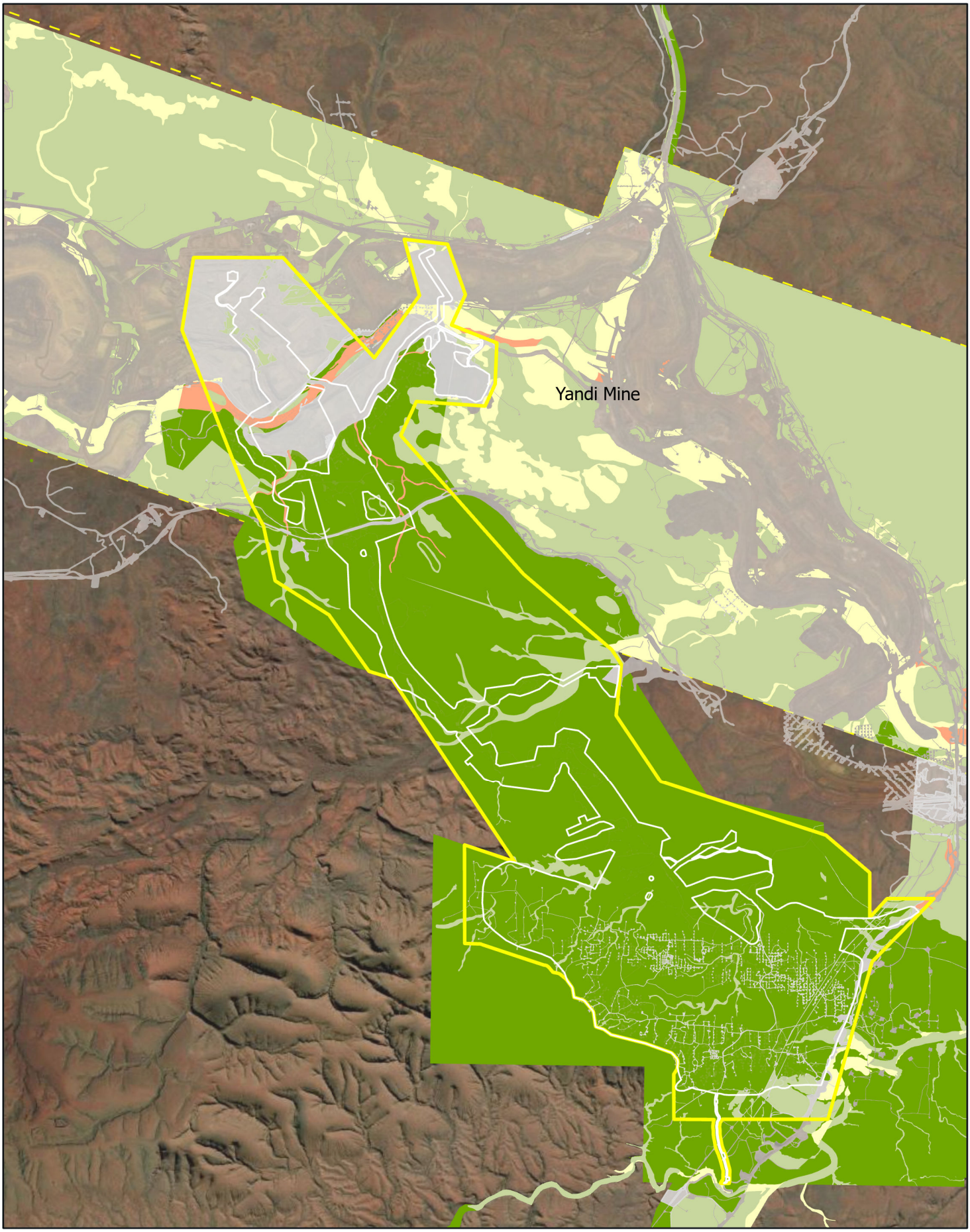
A total of seven of the 14 riparian vegetation types within the Development Envelope are considered to be potential GDV (Table 6-3). These were identified using the framework Biologic (2024a) utilised in their recent flora and vegetation survey for BHP's Central Pilbara Hub Project, which intersects the southern portion of the Development Envelope (including part of Yandicoogina Creek). The vegetation associations rated as 'High' or 'Moderate' are considered potential GDV (Biologic 2024a).

Spectrum Ecology (2023) identified the presence of vegetation associations assessed to be a groundwater-dependent vegetation, or potentially groundwater-dependent vegetation, as a result of containing *E. victrix* and/or *E. camaldulensis*.

6.3.3.7 Sheet-flow Dependent Vegetation

'Mulga' is the common name for the native flora taxon *Acacia aneura*, however, this common name can also be applied to closely related *Acacia* taxa that may co-occur such as *Acacia ayersiana*, *Acacia minyura* and *Acacia paraneura*. Mulga occurs across the Chichester, Fortescue and Hamersley subregions of the Pilbara IBRA Bioregion, and is acknowledged to be dependent on water sheet-flow. Of the two regional Vegetation Associations in the area of the Derived Proposal, it is noted that Vegetation Association 18 is described as *"low woodland; mulga (Acacia aneura)"*.

The recent biological surveys by Spectrum Ecology (2023) and Biologic (2020a) do not identify any vegetation associations within the Development Envelope as containing Mulga and do not suggest any mapped local Vegetation Associations as being sheet-flow dependent. More broadly, only scattered historic records of *A. aneura* coincide with the Derived Proposal, at the Yandi mine (two historic records intersect the proposed Indicative Footprint). The vegetation at the location of these records, Triodia Hummock Grassland (HC Tw AiAb InrSeao), is not considered to be sheet-flow dependent vegetation, and is widespread across the Derived Proposal.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)

Vegetation Condition

- Excellent
- Very Good
- Good
- Poor
- Completely Degraded/ Cleared

N

0 1 2 3

KILOMETRES

GDA 1994 MGA ZONE 50

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VEGETATION CONDITION

WAIO PLANNING, TECHNICAL & ENVIRONMENT

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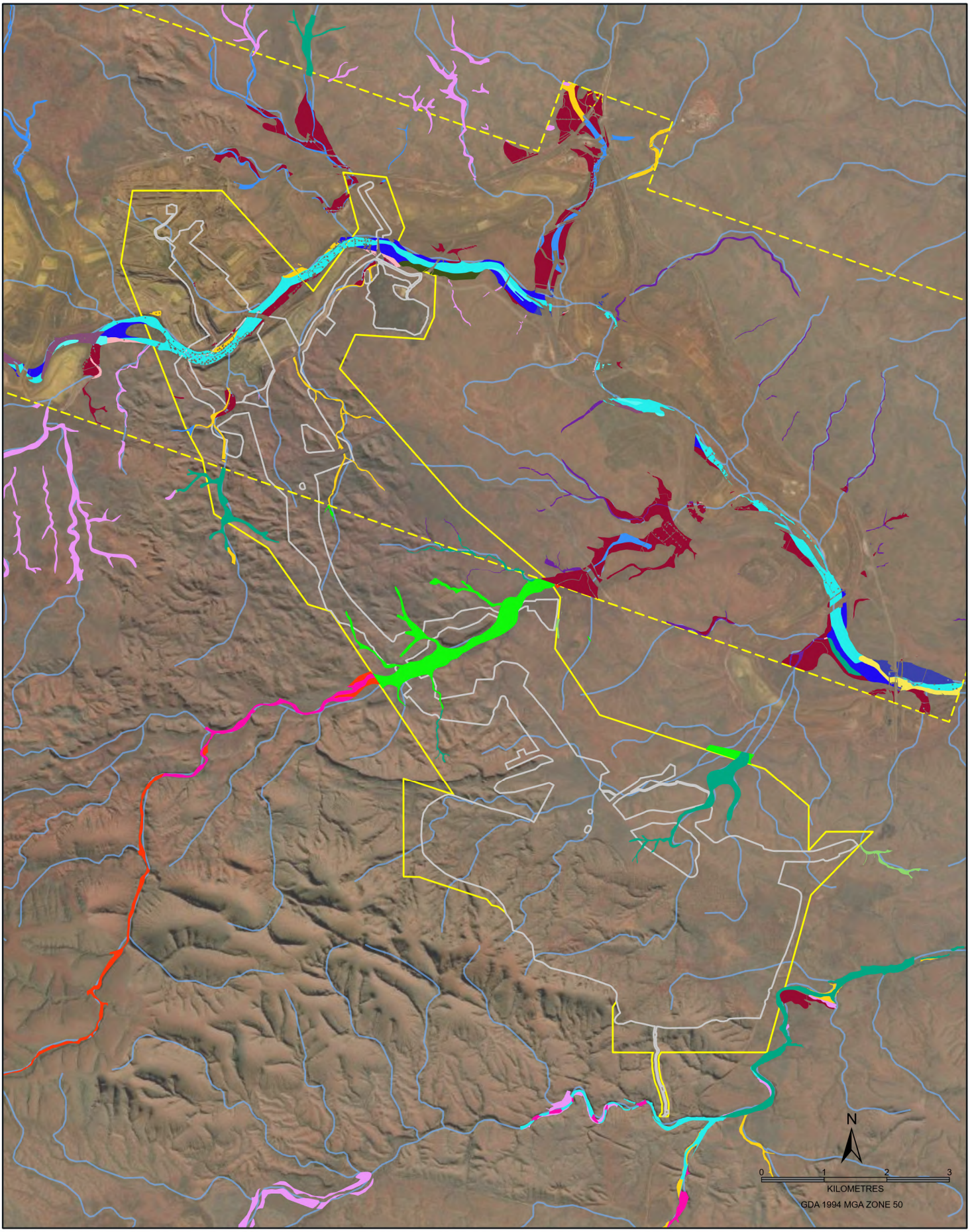

Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Yandi Development Envelope
- Watercourse

Riparian vegetation associations occuring within the Development Envelope

- 1/3 Mosaic (Potential GDV)
- FP Tp ChHallEv TefcApy
- MA AaAciApr CcTtChf EvEcr (Potential GDV)
- MA AciAcpAthe Tp EteEnl
- MA EcrEv AciApypMg CcEuaTt (Potential GDV)
- MA EcrEv AcpAtheEv TpTl (Potential GDV)
- MA EcrEvEx ApypAtpGoro TtEuaCyp (Potential GDV)
- MA EvAciEcr TercCocrApyp CcEuaTt (Potential GDV)
- MA MaEcrEv MgAcpAtr Cyv (Potential GDV)
- ME TpTlo ExAciCh PlApypGoro
- ME TtAriCya ChEll AmPlAnl
- ME TtEuaEte ApypAtpPl EvCh
- Ml AbAdAma Tp TtPamuEua
- Ml AtpPlAm TpTs ChEll

BHP

PUBLIC

MINISTERS NORTH
RIPARIAN VEGETATION

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	6-7
DATE:	10/09/2025	PREPARED:	GEOMATICS	NO:	A1317-047 RevG
		REVIEWED:			

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6.3.3.8 *Significant flora*

As documented in the PERSP (Appendix 4 in BHP 2016a), BHP identified two Threatened flora species and 126 Priority flora species known from within the Strategic Proposal Boundary (comprising 39 Priority 1 species, 19 Priority 2 species, 58 Priority 3 species and 10 Priority 4 species)[13].

No Threatened flora were recorded within the Development Envelope and none were considered likely to occur (Spectrum Ecology 2023).

Biological surveys undertaken for the Derived Proposal identified eight Priority flora in the Development Envelope, as listed by the DBCA, as follows:

- *Aristida lazaridis* (P3[14])
- *Ipomoea racemigera* (P3)
- *Eremophila naaykensii* (P3)[15]
- *Fimbristylis sieberiana* (P3)
- *Gymnanthera cunninghamii* (P3)
- *Rostellularia adscendens* var. *latifolia* (P3)
- *Acacia bromilowiana* (P4)
- *Sida* sp. Barlee Range (P4).

The recorded locations of Priority flora are shown in Figure 6-8[16].

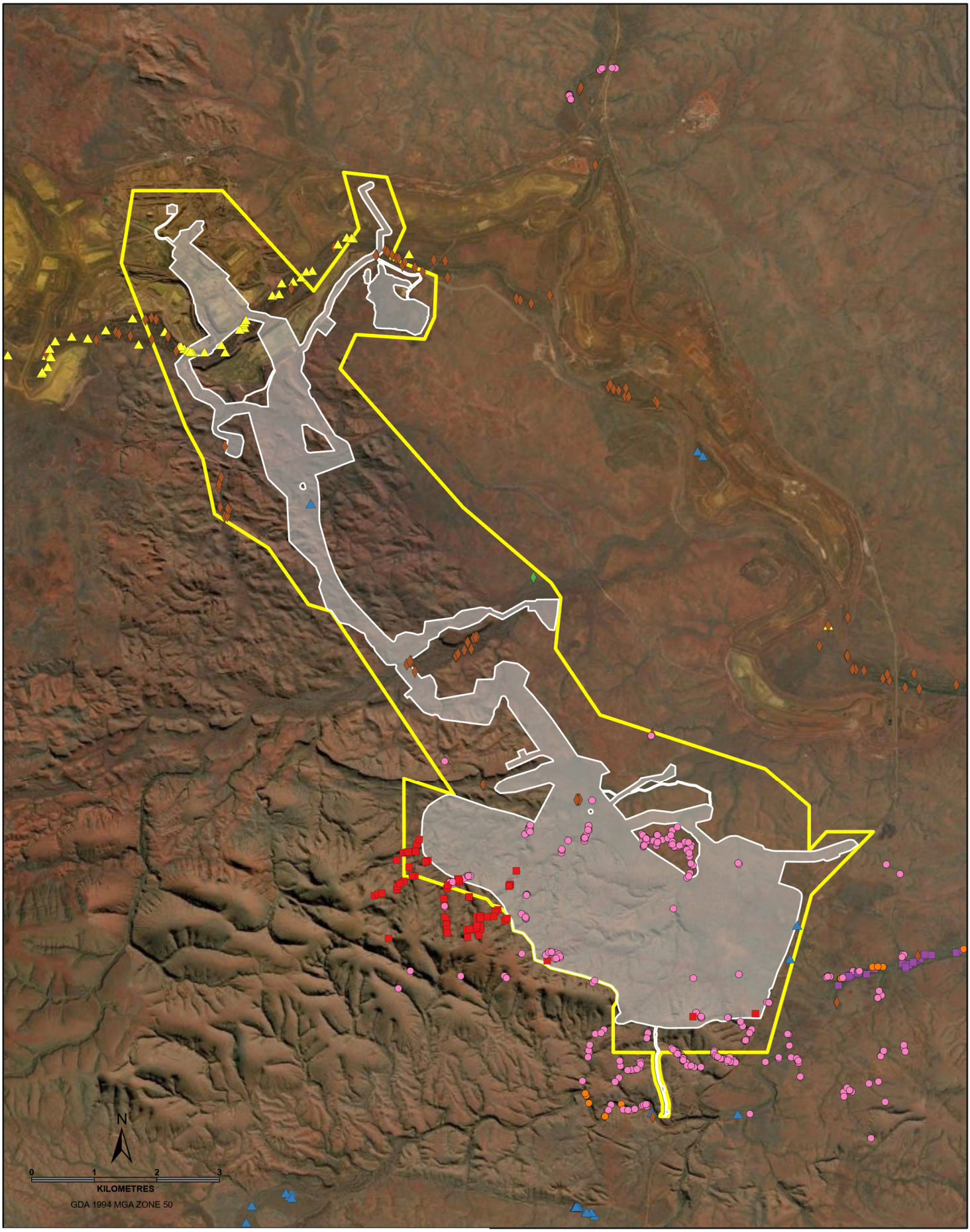
In addition to the above, the recent biological surveys noted a number of other Priority flora had a low to medium likelihood of occurrence, however, these species were not recorded within the Development Envelope (Appendix 15).

[13] The conservation status of several flora species has been amended since the Strategic Approval. BHP has considered the most recent conservation status when determining significance of impacts.

[14] *Aristida lazaridis* and *Ipomoea racemigera* were considered P2 at the time of the Spectrum (2023) survey, however, both species have recently changed to P3

[15] Note: *Eremophila naaykensii* (DBCA-P3) was reported in earlier biological surveys as *Eremophila* sp. Hamersley Range (DBCA-P3). All previous records of *Eremophila* sp. Hamersley Range (DBCA-P3) are identified on Figure 5-7 as *Eremophila naaykensii* (DBCA-P3).

[16] To note, the flora taxon Goodenia nuda - previously identified by biological surveys as Priority flora (DBCA P4) - has since been removed from DBCA's Priority flora list and is not discussed further.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)

DBCA Classified 'Priority' Flora Taxa

- *Aristida lazaridis* (P3)
- *Ipomoea racemigera* (P3)
- *Eremophila naaykensii* (P3)
- *Fimbristylis sieberiana* (P3)
- *Gymnanthera cunninghamii* (P3)
- *Rostellularia adscendens var. latifolia* (P3)
- *Sida sp. Barlee Range (S. van Leeuwen 1642)* (P4)
- *Acacia bromilowiana* (P4)

BHP

PUBLIC

MINISTERS NORTH
PRIORITY FLORA

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	6-8
DATE:	29/08/2025	PREPARED:	GEOMATICS	NO:	A1317-030 RevE
		REVIEWED:			

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6.3.3.9 Ethnobotanical flora

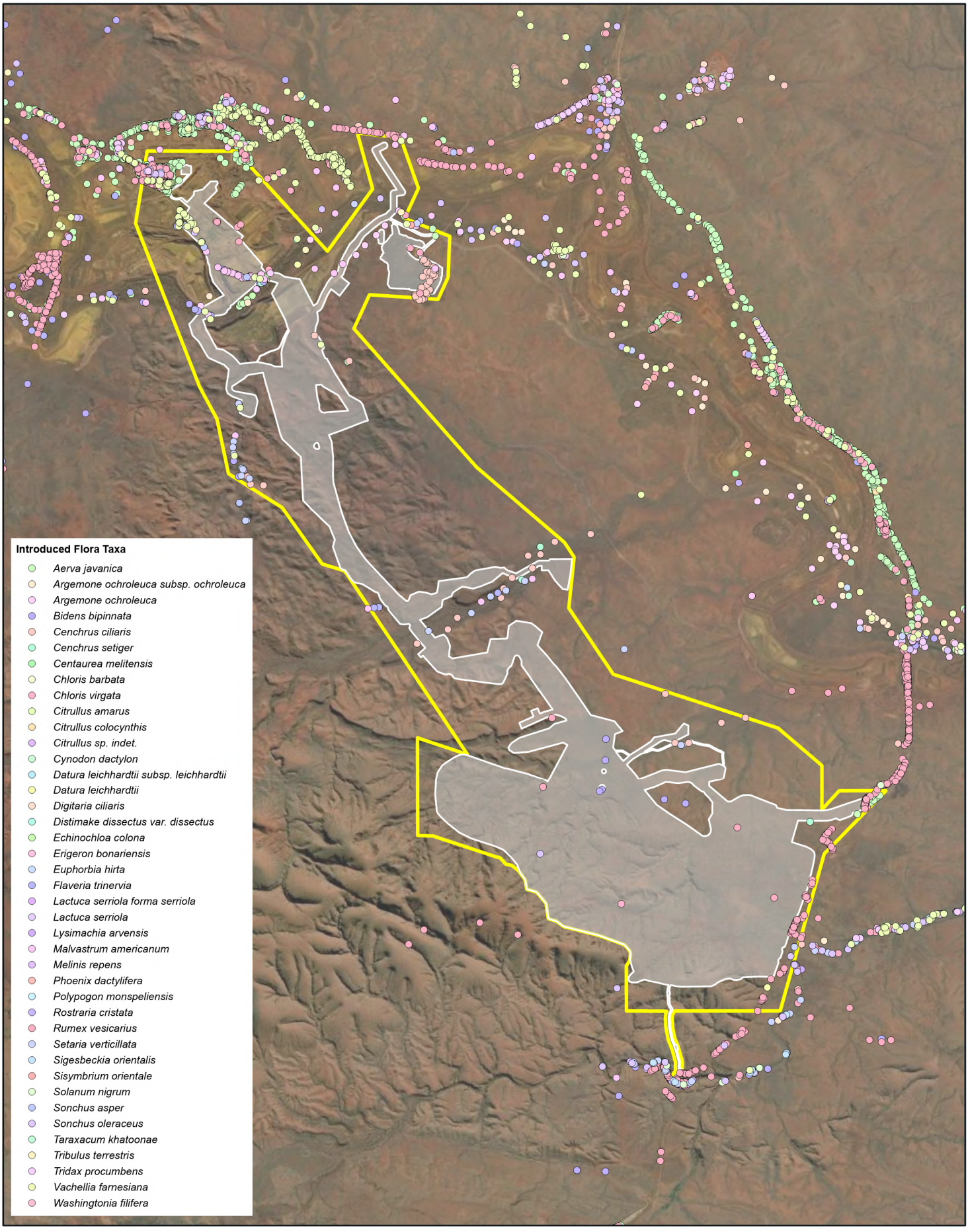
Native flora taxa of cultural significance have been considered under Section 11 Social Surroundings Validation.

6.3.3.10 *Introduced flora (weeds)*

As documented in the assessment of the Strategic Proposal by BHP (2016a), it was noted that the Pilbara region contains a relatively small number of introduced flora (weeds) when compared to other regions, however, the number of introduced flora present appears to be increasing as a result of pastoral activities, mining operations and tourism.

A total of 41 introduced flora were recorded in the Development Envelope and surrounds, as identified by Figure 6-9. The majority of introduced flora taxa records were located outside of the Development Envelope and associated with the Yandicoogina Creek and the Marillana Creek (including their tributaries), within/adjacent to BHP's Yandi and associated rail, and within/adjacent to third-party mining operations.

None of the introduced flora recorded are listed as a 'Declared Pest' under the State *Biosecurity and Agriculture Management Act 2007* (WA) (DPIRD 2016) or listed as a 'Weed of National Significance' (DAFF 2016).



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)

N

0 1 2 3

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
INTRODUCED FLORA

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	6-9
DATE:	29/08/2025	PREPARED:	GEOMATICS	NO:	A1317-031 RevF
		REVIEWED:			

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6.4 Potential environmental impacts

In the PERSP (Table 15 in BHP 2016a), BHP identified and described potential impacts from the Strategic Proposal on Flora and Vegetation. Table 6-5 identifies whether the Strategic Proposal potential impacts are relevant to the Derived Proposal.

Table 6-5: Flora and Vegetation - relevant impacts identified in the Strategic Proposal

Strategic Proposal Potential impact	Strategic Proposal impact relevant to Ministers North Derived Proposal	Potential impacts from Ministers North Derived Proposal
Removal of vegetation (direct)	Yes	Clearing of native vegetation (up to 1,848 ha) will be required in the Development Envelope (Section 6.4.1).
Altered water regimes (indirect)	Yes (surface water regimes) No (groundwater regimes) There is no abstraction of groundwater for the Derived Proposal	Mine infrastructure for the Derived Proposal may alter surface water flows to vegetation reliant on the surface water flows. The Derived Proposal does not include groundwater abstraction. Accordingly, impacts to vegetation reliant on groundwater will not occur as a result of groundwater drawdown (attributable to the Derived Proposal).
Fire (indirect)	No The Derived Proposal is not expected to alter the fire regime of the local area when managed in accordance with standard prevention and management measures for fire	N/A
Weeds (indirect)	Yes	The Derived Proposal has the potential to introduce weeds into the Ministers North area due to movement between the adjoining operation of Yandi. In addition, the haul road creates a risk of weed introduction into waterways subject to creek crossings.

6.4.1 Removal of vegetation (direct)

The Derived Proposal will result in the clearing of 1,848 ha of native vegetation within an Indicative Footprint of 2,360.2 ha. The Derived Proposal will also utilise a total of 512.2 ha of existing cleared/disturbed land.

6.4.1.1 *Vegetation*

Two vegetation associations (as described by Beard) are located within the Development Envelope (Section 6.3.3.3; Figure 6-4). Table 6-6 identifies the area of each association within the Development Envelope and Indicative Footprint. The potential impact of clearing for the Derived Proposal to each Vegetation Association (as a percentage of the current extent) is less than 0.1 %.

Table 6-6: Potential impacts to Beard vegetation associations

Beard (1975) Vegetation Association	Pre-European Extent[17] (ha)	Current Extent (ha)	Current Extent (%)	Development Envelope (ha)	Indicative Footprint (ha)	Remaining Extent (%)
18	19,892,306	19,843,148[1]	> 99.7 %	10.2	0	> 99.7 %
82	2,565,901	2,553,206[1]	> 99.4 %	5,546.4	2,360.2	> 99.3 %

1) Vegetation Association 18: 671,843 ha occurs within the Pilbara Region. Vegetation 82: 2,550,888 occurs within the Pilbara Region

Of the 35 local vegetation associations that occur within the Development Envelope, 21 vegetation associations occur in the Indicative Footprint (see Table 6-7). The dominant vegetation associations recorded within the Indicative Footprint are HC TwTsTp EllCh Ah, HC Tw AiAb InrSeao and HS TsTwTp EllCh AhiAaa; each comprising approximately 34.8 %, 20.3 % and 11.5 % of the Indicative Footprint, respectively. It is also important to note, utilising cleared areas has been a focus of the Derived Proposal, with cleared areas accounting for approximately 21.7% of the Indicative Footprint.

Of the 21 vegetation associations occurring in the Indicative Footprint, 12 will require clearing of <1% of their regional mapped extent in the BHP database to support the Derived Proposal. A further five vegetation associations will require clearing of 5% or less of their regional mapped extent. The remaining four vegetation associations will require clearing of >10% of their regional mapped extent in the BHP database; HS TsTw Ell Ab (12%), HC TwTsTp EllCh Ah (14%), FS Tw Ell (14%) and FP Tp ChHallEv TefcApy (15%). All but one of these are categorised as common Triodia Hummock Grassland vegetation associations with no local significance. FP Tp ChHallEv TefcApy is also classified as Triodia Hummock Grassland, though it does have some local significance as it represents riparian vegetation based on its species composition (notably *Eucalyptus victrix*) and its presence along drainage lines. It is not, however, classified as either an 'ecosystem at risk' or potential GDV.

Of the 14 riparian vegetation associations that occur within the Development Envelope, seven occur in the Indicative Footprint (Table 6-7), comprising approximately 33.7 ha which will be cleared for the Derived Proposal (1.8 % of the remaining vegetation in the Indicative Footprint). The majority of the seven impacted riparian vegetation associations will have <1% of their regional mapped extent in the BHP database cleared for the Derived Proposal. MA EcrEv AcpAtheEv TpTl will require clearing of <2% of its regional extent, and FP Tp ChHallEv TefcApy will require clearing of 15%. As described above, the significance of FP Tp ChHallEv TefcApy is limited to it representing riparian vegetation along some drainage lines at a local scale.

Four of the seven riparian vegetation associations in the Indicative Footprint are also classified as potentially representing GDV and represent DBCA "ecosystems at risk" as they are associated with major ephemeral water courses in the Hamersley subregion and are under threat from grazing and introduced flora. These vegetation associations comprise a total of 9.9 ha of the vegetation required to be cleared for the Derived Proposal. The vegetation associations MA EcrEv AcpAtheEv TpTl and MA MaEcrEv MgAcpAtr Cyv will each be subject to less than 1 ha of clearing. The other two vegetation associations; MA EvAciEcr TercCocrApyp CcEuaTt and MA EcrEvEx ApypAtpGoro TtEuaCyp will be subject to 3.3 ha and 5.4 ha of clearing respectively (Table 6-7). Regionally, these associations will require either <1% or <2% of their mapped extents cleared.

[17] Data Source: DBCA (2019b) 2018 Statewide Vegetation Statistics. All values have been rounded to the nearest 1 ha / 0.1 %.

Table 6-7: Potential Impacts to local vegetation associations

Vegetation Association Code	Local significance			Area within Development Envelope (ha)	% of Development Envelope[2]	Area within the Indicative footprint (ha)	% of Indicative Footprint
	Riparian vegetation	Potential GDV	Ecosystem at Risk				
SA Aa TpTwTb CcChf				1.5	<0.1%	0.4	<0.1%
SP AaApr TmTwTp TtChfAri				0.3	<0.1%	0	0%
MA AaAciApr CcTtChf EvEcr	✓	✓	✓	0.1	<0.1%	0	0%
MA AciAcpAthe Tp EteEnl	✓		✓	1.2	<0.1%	0	0%
MI AtpPlAm TpTs ChEll	✓			0.1	<0.1%	0	0%
MI AbAdAma Tp TtPamuEua	✓			1.4	<0.1%	0	0%
GG CfEllFib AhDovmAsha CyaErmuThmb:				24.5	0.4%	3.9	0.2%
MA EcrEvEx ApypAtpGoro TtEuaCyp	✓	✓	✓	23.8	0.4%	5.4	0.2%
MA EcrEv AcpAtheEv TpTl	✓	✓	✓	6.4	0.1%	0.9	<0.1%
MA EcrEv AciApypMg CcEuaTt	✓	✓	✓	<0.1	<0.1%	0	0%
MA EvAciEcr TercCocrApyp CcEuaTt	✓	✓	✓	43.3	0.8%	3.3	0.1%
Mosaic 1/3	✓	✓	✓	1.8	<0.1%	0	0%
MA MaEcrEv MgAcpAtr Cyv	✓	✓	✓	2.5	<0.1%	0.3	<0.1%
ME TtAriCya ChEll AmPlAnl:	✓			0.4	<0.1%	0	0%
GG TtErmuThmb EllChCf AtpGoroPl				71.6	1.3%	54.4	2.3%
ME TtEuaEte ApypAtpPl EvCh	✓			56.3	1.0%	5.1	0.2%
FS TsTpTw Ell AbApaAanc:				66.2	1.2%	7.0	0.3%
FS Tw Ell				22.3	0.4%	6.2	0.3%
FS Tv CddHc AancAiGrwh				<0.1	<0.1%	0	0%
FS TvTpTw Ell AbApaAanc				1.9	<0.1%	0	0%
HC Tw AiAb InrSeao				1938.9	34.9%	479.9	20.3%
HC TwTbrTp EllCh AmaGrwhAb				28.8	0.5%	3.4	0.1%
HC TwTsTp EllCh Ah				950.0	17.1%	821.2	34.8%
HC TwTvTp EllCh Ah				254.1	4.6%	153.4	6.5%

Vegetation Association Code	Local significance			Area within Development Envelope (ha)	% of Development Envelope[2]	Area within the Indicative footprint (ha)	% of Indicative Footprint
	Riparian vegetation	Potential GDV	Ecosystem at Risk				
HS TsTwTp EllCh AhiAaa				731.7	13.2%	270.9	11.5%
HS Tv(Tw) EllCdd AhiAaa				12.0	0.2%	0	0%
HS TvTwTp EllCh AhiAaa				2.1	<0.1%	<0.1	<0.1%
HS TwTbrTs EllExCh PtcPtasAhi				8.9	0.2%	0	0%
HS TwTpTs Ell AprAaAanc				12.5	0.2%	1.6	<0.1%
ME TpTlo ExAciCh PlApypGoro	✓			19.4	0.3%	3.2	0.1%
SP TbTp HlAancAi Ch				5.6	0.1%	<0.1	<0.1%
FP Tp ChHallEv TefcApy	✓			95.5	1.7%	15.5	0.7%
FS Ts EllCh Hc				<0.1	<0.1%	0	0%
HS TsTw Ell Ab				<0.1	<0.1%	<0.1	<0.1%
HS Tw Ell Ab				<0.1	<0.1%	0	0%
HC ErmuCyaTt CfEll Tw				<0.1	<0.1%	0	0%
Cleared				1,155	20.8%	512.2	21.7%
No survey data				16.5	0.3%	11.8	0.5%
Total				**5,556.6[18]**	**100%**	**2360.1**	**100%**
Total (rounded)				**5,557**	**100%**	**2,360**	**100%**

[18] Individual vegetation association areas are rounded to the nearest 0.1 ha which results in some minor rounding errors when compared to the total area of the Development Envelope

6.4.1.2 *Vegetation condition*

Of the 1,848 ha of native vegetation to be cleared, a total of 1,826.8 ha (greater than 99 %) has been assessed to be in a 'Good' to 'Excellent' condition (see Table 6-8).

Table 6-8: Potential impacts to vegetation condition

Vegetation Condition	Area within Indicative Footprint (ha)	% of Indicative Footprint
Excellent	1,724.2	73.1%
Very Good	100.8	4.3%
Good	1.8	0.1%
Poor	8	0.3%
Degraded	0	0%
Completely Degraded[19]	11.8	0.5%
Cleared	512.2	21.7%
No data available	1.2	0.1%
Total	**2,360.2**	**100%**

6.4.1.3 Significant Flora Taxa

Threatened Flora

No Threatened flora are recorded within the Development Envelope, accordingly, land clearing for the Derived Proposal will not result in any impact to Threatened flora.

Priority Flora

Of the eight Priority flora taxa recorded within the Development Envelope, five Priority flora are located within the Indicative Footprint:

- *Aristida lazaridis* (P3)
- *Ipomoea racemigera* (P3)
- *Rostellularia adscendens* var. *latifolia* (P3)
- *Acacia bromilowiana* (P4)
- *Sida* sp. Barlee Range (P4).

Table 6-9 identifies the Priority flora taxa identified by the biological surveys, the regional distribution and abundance, and the calculated impact of the Derived Proposal.

Whilst individuals will be removed, all of the Priority flora taxa recorded have broad regional distributions with multiple recorded locations and all impacts are less than 10% of known individuals. The Derived Proposal is also not anticipated to result in fragmentation of the retained recorded locations that could affect their long-term survival. The

[19] As per the vegetation condition scale in Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a), Completely Degraded includes existing cleared areas

two taxa with the highest potential impacts, based on reported regional records, are *A. bromilowiana* and *Sida* sp. Barlee Range. All other Priority flora taxa impacts are anticipated to be less than 1% of known records.

Acacia bromilowiana

Spectrum (2023) reported a total of 980 individuals of *A. bromilowiana* were recorded from within the most recent targeted survey (560 individuals comprised of 544 mature and 16 juveniles from the current survey and 420 from previous surveys), from 138 locations (66 from the current survey, 70 from previous surveys). The majority of these records sit outside of the Development Envelope, with 411 individuals known from within the Development Envelope.

Acacia bromilowiana was recorded high in the landscape on northerly facing hill crests, steep slopes, steep rocky gorges, or summits on ironstone skeletal soils with *Eucalyptus* spp. and *Triodia* spp. The species has a broad distribution (>300 km) and occurs within Karijini National Park. This species is known more broadly, including at the Brockman Syncline Proposal (EPA 2024e). The EPA assessed, this species had 4,551 regional records, of which 452 were potentially to be impacted by the Brockman Syncline Proposal. It should be noted; the 452 individuals were assessed as an upper clearing limit and only 16 individuals were within the conceptual footprint.

As part of the Derived Proposal, a total of 144 individuals are anticipated to be impacted. When considering publicly available information on regional records (including removal of up to 452 individuals at Brockman Syncline), the total impact to this species attributable to the Derived Proposal is approximately 3.5% of known records. This impact is likely an over-estimate, noting only a portion of those records at Brockman Syncline will likely be impacted and the species is poorly known. When considering the species broad distribution and occurrence more broadly in Karijini National Park, the impact of 3.5% as a result of the Derived Proposal is not anticipated to be significant.

Sida sp. Barlee Range

During the assessment for the Strategic Proposal, this species was known only from 130 records across the Pilbara. Spectrum (2023) reported a total of 2,716 individuals of *Sida* sp. Barlee Range were recorded from the most recent targeted survey (1,421 from the current survey and 1,295 from previous surveys) from 449 locations (239 from current survey and 207 from previous surveys). A large portion of these individuals were recorded outside of the Development Envelope, with 1,789 individuals known from within the Development Envelope.

This species was recorded in deep rocky gorges, rocky slopes and gullies on skeletal soils. The species has a broad distribution (>300 km) and occurs within a number of conservation estates, including the Barlee Range Nature Reserve and Karijini National Park. This species is known more broadly, including at the Brockman Syncline Proposal (EPA 2024e). The EPA assessed, this species had 12,212 regional records, of which 2,054 were potentially to be impacted by the Brockman Syncline Proposal. It should be noted; the 2,054 individuals were assessed as an upper clearing limit and only 421 individuals were within the conceptual footprint.

As part of the Derived Proposal, a total of 1,137 individuals are anticipated to be impacted. When considering the publicly available information on regional records (including removal of up to 2,054 individuals at Brockman Syncline), the total impact to this species attributable to the Derived Proposal is approximately 9.8% of known records. This impact is likely an over-estimate, noting only a portion of those records at Brockman Syncline will likely be impacted and the species is poorly known (highlighted by the increases known records since the Strategic Proposal e.g. 130 records to > 12,000). When considering the species broad distribution and occurrence more broadly in conservation estates, the impact as a result of the Derived Proposal (less than 10%) is not anticipated to be significant.

Table 6-9: Potential impacts to significant flora

Species (Conservation Status)	**Regional Records**[20] (No. individuals) (populations and records)	**Records in Development Envelope**	**% of known records in Development Envelope**	**Records in Indicative Footprint**	**% of known records in Indicative Footprint**
Aristida lazaridis (P3)	14,232 (93 populations)[21]	26	0.2%	3	<0.1%
Ipomoea racemigera (P3)	3,290 (77 populations)	69	2.1%	20	0.6%
Eremophila naaykensii (P3)	13,077 (31 populations)	1	< 0.1%	0	0%
Fimbristylis sieberiana (P3)	14,127 (22 populations)	0	0%	0	0%
Gymnanthera cunninghamii (P3)	273 (32 populations)	0	0%	0	0%
Rostellularia adscendens var. *latifolia* (P3)	7,807 (138 populations)	1,105	14.2%	40	0.5%
Acacia bromilowiana (P4)	4,165[22] (34 populations)	411	9.9%	144	3.5%
Sida sp. Barlee Range (P4)	11,579[23] (98 populations)	1,789	15.5%	1,137	9.8%

[20] Regional records sourced from internal BHP Datasets unless otherwise reported

[21] Source from internal BHP Datasets: noting other sources indicate higher regional records (e.g. > 23,000 individuals Source: EPA (2024d))

[22] Source EPA 2024e: Regional records of 4,551 (minus 452 individuals approved for impact), plus 66 recorded from current Derived Proposal targeted survey (Spectrum 2023)

[23] Source EPA 2024e: Regional records of 12,212 individuals from Brockman Syncline Proposal (minus 2,054 approved for impact), plus 1,421 from the current Derived Proposal targeted survey (Spectrum 2023)

6.4.2 Altered water regimes (indirect)

The Derived Proposal involves mining above the groundwater level only, as a result, the Derived Proposal will not result in changes to the groundwater that could affect potential groundwater-dependent vegetation.

Potential changes to surface water regimes as a result of the Derived Proposal (section 5.4.1) may have a potential to indirectly impact the flora and vegetation values that have adapted to, and/or are reliant upon, the natural surface water regimes. It is unlikely that riparian vegetation will be significantly impacted by the construction of creek crossings, based on the approach to construction. As part of standard engineering design, creek crossings will include culverts or bridges, to manage surface water flows.

The Derived Proposal will intercept surface water flows by infrastructure (such as roads, pits), resulting in localised, temporary surface water accumulation upslope (ponding/pooling), as well as a reduction in surface water flow to areas downslope (Stantec 2024) (Section 5). Water accumulation upstream of infrastructure may result in a reduction in vegetation condition from saturation of root zones, causing negative impacts to vegetation health and/or changes in composition to occur during waterlogging and/or after the ponded water recedes. Reduced flows downstream of infrastructure can result in negative impacts to vegetation health and change in composition from reduced water availability. However, the temporary and localised nature of the predicted surface water accumulation indicates it is unlikely vegetation will be significantly impacted by this occurrence.

Vegetation is at risk of changes to surface water quality from sediment runoff from the OSA as high velocities are predicted along the slopes of the modified landforms. Standard management practices proposed will minimise potential impacts to vegetation from a reduction in surface water quality due to sediment runoff. For example, culverts and spoon drains are installed with rip rap (or other energy dissipation structures) to reduce flow velocities and erosion potential (scour mitigation). The construction of rock chutes, down-drains, or other measures may be required to prevent erosion of the pit wall and crest at concentrated inflow locations.

As discussed in Section 5.4.1 changes to the Yandicoogina Gorge catchment are minimal, and as such potential indirect impacts to the vegetation associations in the gorge are not considered significant. Changes are likely in the Mungadoo Tributary catchment where the cumulative flow volumes are predicted to reduce by more than half compared to baseline conditions. These changes are due to the pits and OSA consisting of 30% of the local catchment area. Mungadoo Tributary catchment is highly disturbed downstream due to existing operations (e.g. BHP and Rio Tinto) with the Tributary currently diverted around the Rio Tinto pit towards Marillana Creek.

The riparian vegetation immediately north-east of the proposed pits where the Mungadoo Tributary catchment will be affected is potentially at risk from reduced surface water flows due to its location. However, the vegetation type present (ME TtEuaEte ApypAtpPl EvCh) is not considered to be surface water dependent or sensitive to surface water changes as it does not contain shallow rooting species that represent plant taxa susceptible to changes to surface water flow (i.e. Mulga and/or *Acacia citrinoviridis*) (Table 6-3). Therefore, significant impacts to this vegetation association are considered unlikely. In addition, as discussed in Section 6.3.3.7, no vegetation associations containing Mulga or sheet flow dependent vegetation is present in the Development Envelope (Spectrum Ecology 2023, Biologic 2020a).

The potential for impact to flora and vegetation values as a result of changes in surface water flows are not anticipated to be environmentally significant based on the recorded species and proposed management measures. .

6.4.3 Weeds (indirect)

As discussed in Section 6.3.3.10, more than 40 introduced flora were recorded in biological surveys for the area of the Derived Proposal and surrounds. The majority of introduced flora taxa records were located outside of the Development Envelope and associated with the Yandicoogina Creek and the Marillana Creek (including their tributaries), within/adjacent to BHP's Yandi and associated rail, and within/adjacent to third-party mining operations.

As such, there is the potential to introduce weeds into the Development Envelope from surrounding areas. Increasing vehicular and people access combined with disturbance such as clearing for roads and other infrastructure, has the potential to introduce and/or spread weed species. Construction and operation of the haul road, further creates a risk of weed introduction into waterways, particularly in those areas subject to creek crossings.

The introduction of weed species has the potential to impact on the vegetation condition and structure of native vegetation present.

Despite the risk, it is noted that none of the introduced flora recorded in areas surrounding the Derived Proposal, are listed as a 'Declared Pest' under the State *Biosecurity and Agriculture Management Act 2007* (WA) (DPIRD 2016) or listed as a 'Weed of National Significance' (DAFF 2016).

6.5 Mitigation

The PERSP provides examples and case studies of the Land and Biodiversity management measures that BHP may apply to mitigate the potential impacts on Flora and Vegetation (BHP 2016a - Section 8.1.1.3 and Section 8.1.3.3). The proposed mitigation (including standard management practices) for the Derived Proposal is discussed below, including how BHP has applied the mitigation hierarchy.

6.5.1 Avoid

As noted in EPA Report 1619 (EPA 2018a), undertaking site-specific surveys that feed into the planning process is the main method that BHP proposes to use to avoid Flora and Vegetation impacts.

A *Sida* sp. Barlee Range Mining Exclusion Zone (MEZ), has been proposed protecting 272 individuals (Figure 6-10). In addition, and as discussed in Section 7.5.1, a Ghost Bat MEZ has also been proposed as part of the Derived Proposal. Through the protection of the Ghost Bat roosts and connecting habitat, 177 individuals of *Sida* sp. Barlee Range are also subsequently avoided and protected within the Ghost Bat MEZ (see Figure 6-10). This equates to a total of 449 individuals avoided and protected through the implementation of exclusion zones.

In addition to the above exclusion zones, as part of the avoidance applied for this Derived Proposal, the Khargoonha heritage area has been a key area for avoidance (as discussed in Section 11.5). The Khargoonha heritage area provides a layer of protection for habitat and species within this area. Priority flora individuals have been recorded within this area and subsequently avoided including *Sida* sp. Barlee Range (24 individuals) and *A. bromilowiana* (363 individuals).

Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Ghost Bat Exclusion Zone
- *Sida* sp. Barlee Range Exclusion Zone
- *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P4)

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Sida sp. Barlee Range EXCLUSION ZONE

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:6,000	REQUESTOR:	PROJECTS	FIGURE:	6-10
DATE:	28/08/2025	PREPARED:	GEOMATICS	NO:	A1317-061 RevB
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6.5.2 Minimise

Consistent with MS1105 *Guidelines for submitting a derived proposal* (1(b)), the results from the targeted surveys were used to design the proposed mine and haul route to:

- minimise clearing of native vegetation by locating it in degraded and disturbed areas, where practicable
- minimise disturbance to Priority flora, where practicable and
- minimise disturbance to riparian vegetation, where practicable.

Use of existing infrastructure and cleared areas

As identified within the BHP (2016a) and EPA (2018a) assessments, the Strategic Proposal provides for a 'Hub' approach whereby infrastructure at existing mining operations (the 'hub') is shared with proposed new satellite mining operations. The purpose of the hub approach is to minimise the extent of new land disturbance that would otherwise be required (in comparison to a base-case where each new mining operation was required to construct and operate wholly separate, independent infrastructure).

The use of infrastructure at Yandi will result in a reduction in the extent of land disturbance required for the Derived Proposal (compared to a base case of constructing and operating separate, independent infrastructure) (see Figure 6-11). In order to connect the Derived Proposal to BHP's Yandi, crossing over Marillana Creek will be necessary. In planning for the Derived Proposal, BHP considered options for both a new (additional) purpose-built crossing over Marillana Creek, or alternatively, to seek to modify an existing crossing location over Marillana Creek.

Having regard to the recorded environmental and cultural values of Marillana Creek, BHP has selected the option to modify an existing crossing location over Marillana Creek for the Derived Proposal. The selected crossing over Marillana Creek will require widening to enable dual-lane ore transport in support of the Derived Proposal.

Widening of the existing crossing (in comparison to construction of a new crossing) will minimise the extent of new disturbance required, in particular to riparian vegetation (as the disturbed area for the existing crossing can be utilised), as well as avoid a new location of disturbance along Marillana Creek.

Altered Water Regimes

As discussed in Section 6.4.2, the potential for impact to flora and vegetation values as a result of changes in surface water flows are not anticipated to be environmentally significant.

With regard to minimising impacts from altered surface water regimes, the potential impact of the Derived Proposal to surface water and watercourses is discussed in detail within Section 5. Consistent with BHP practices for its Pilbara iron ore mine operations, surface water for the area of the Derived Proposal can be appropriately managed through standard engineering design and infrastructure including culverts, earthen bunds and swale drains.

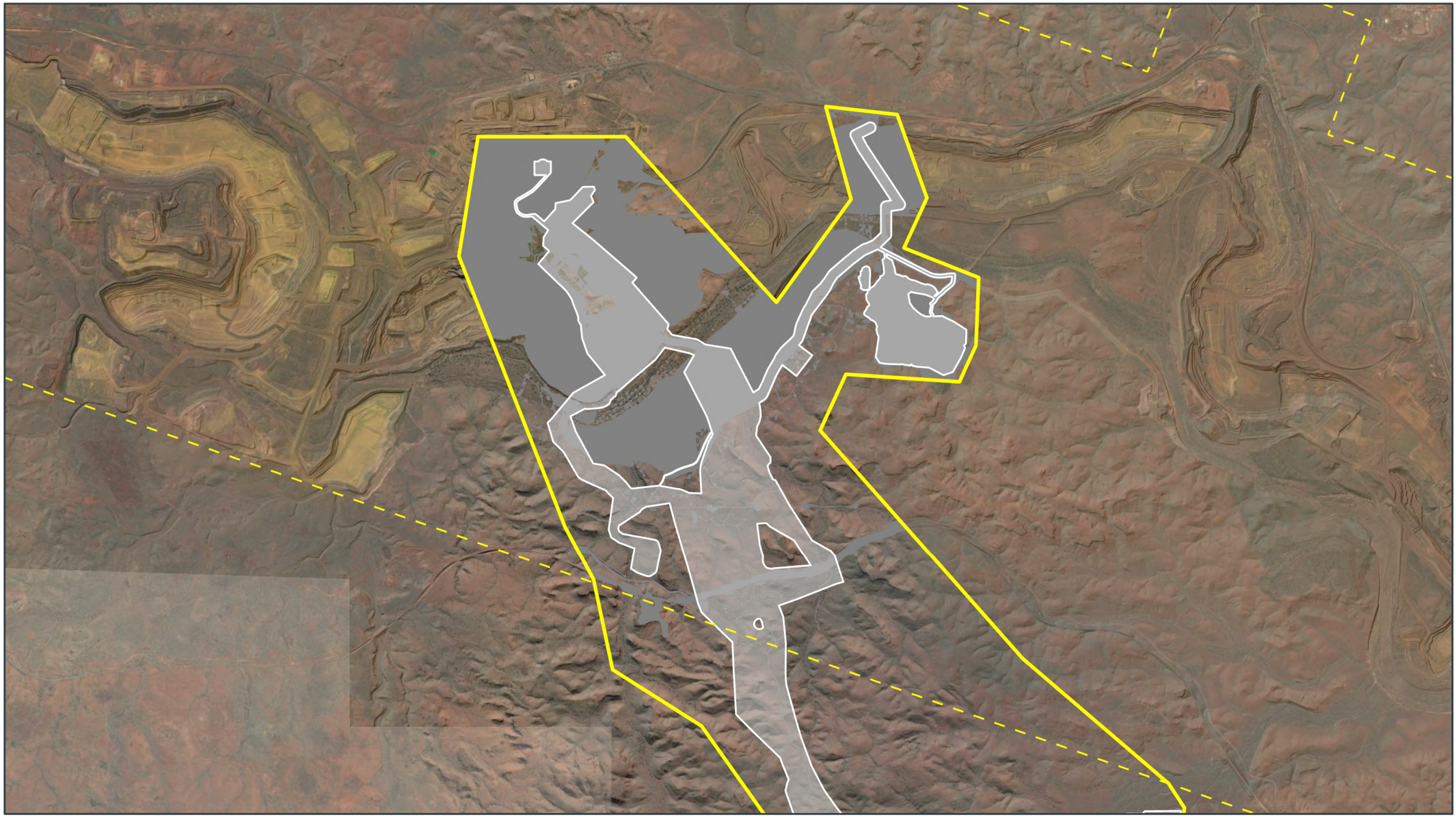
Weeds

Although weeds have the potential to be introduced as a result of the Derived Proposal, the Derived Proposal is not expected to significantly alter the existing introduced flora diversity or abundance when managed in accordance with standard hygiene management measures.

BHP will implement the BHP Environmental Weed Management in Western Australia procedure, within the Development Envelope and as applicable. The BHP Environmental Weed Management in Western Australia procedure defines the process to manage the risk of environmental weeds and incorporates management measures including, but not limited to:

- Weed mapping conducted annually
- All vehicles or equipment shall be inspected, cleaned as required and weed hygiene certified, prior to entering or leaving site

- All vehicles or equipment shall be inspected, cleaned as required and weed hygiene certified, prior to leaving a weed infested area
- Where practicable, keep to sealed roads
- Ensure clothing, particularly footwear is free from mud and vegetation before stepping into vehicles
- Maintain roads, tracks and buffer zones (firebreaks) to ensure they are free of weeds
- The site HSE team will determine the scope of the weed management program for the year, taking into account potential constraints (e.g. budgetary, weather, or other).



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Clearing (1155 ha)
- Yand Mine Tenement Boundary

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MINIMISING LAND DISTURBANCE THROUGH USE OF YANDI HUB

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:50,000	REQUESTOR:	PROJECTS	FIGURE:	6-11
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6.5.3 Rehabilitate

All areas of new land disturbance by the Derived Proposal will be rehabilitated with native vegetation, with the exception of the final pit voids (noting the consolidated rock structure of open pit surfaces do not allow for rehabilitation works, as well as safety considerations).

In order to optimise closure and rehabilitation outcomes for both the Yandi and Minister's North mines, material from the rehabilitated Yandi OSA C1 will be utilised as fill material for the Derived Proposal haul road. This will minimise the extent of landforms at closure, given the current closure strategy for OSA C1 is to remain a landform. Upon closure, the haul road route will be rehabilitated, including removal of culverts and all other infrastructure associated with the haul road, with the aim of returning land to pre-disturbance drainage and topography where practicable[24].

BHP will investigate development of strategies to collect seed from a range of Priority flora to determine suitability for propagation and rehabilitation utilising these species.

BHP will implement the Ministers North MCP (Appendix 12) to meet the MS1105 Condition 15 environmental objective that the Derived Proposal is decommissioned and the site of the proposal rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.

BHP has also prepared a Rehabilitation Report (Appendix 4) to outline BHP's progress towards rehabilitation for the Pilbara mining operations. The Rehabilitation Report is submitted in accordance with the Guidelines contained within the MS1105 approval for the Strategic Proposal, specifically detailing:

- the types of ecosystems and total area of rehabilitation that the proponent will be required to rehabilitate across their iron ore tenure including the derived proposal
- an analysis of the history of rehabilitation that the proponent has undertaken in the Pilbara and the demonstrated success of this rehabilitation
- the likely success of future rehabilitation activities in establishing self-sustaining areas of rehabilitation, taking into account:
    - relevant contemporary scientific evidence
    - the types of area to be rehabilitated and
    - the scale of rehabilitation activities.

This report builds upon BHP's FY2021 Rehabilitation Report. The scientifically based criteria and quantitative targets presented in the FY2021 Rehabilitation Report have continued to be applied to systematically, consistently and transparently to assess rehabilitation progress and success across BHP's WAIO operations.

BHP considers that the approach for this report will enable consistency with previous and future versions of this report to demonstrate success and progression of broadscale rehabilitation over time, whilst providing flexibility to continue to improve the standard of rehabilitation across BHP WAIO sites. The rehabilitation success methodology of the previous report has remained consistent, however improvements to the methodology are in development by BHP WAIO Rehabilitation. BHP will continue to use a scientifically verifiable approach for measuring rehabilitation success; however, the rehabilitation success methodology will be updated for future reports.

6.5.4 Offset

BHP has sought to minimise the potential impact of the Derived Proposal to flora and vegetation values as far as practicable.

In accordance with Condition 16 of the MS1105 approval, BHP will offset the clearing of native vegetation in 'Good' to 'Excellent' condition through a financial contribution to the Pilbara Environmental Offsets Fund (PEOF). Of the

[24] Road cuttings would remain in place, with the remainder reprofiled and contoured to natural topography where practicable.

total 1,848 ha of native vegetation that may be cleared during implementation of the Derived Proposal, a total of 1,826.8 ha (> 99 %) has been assessed as being in a 'Good' to 'Excellent' condition.

Riparian vegetation (considered as native vegetation with other important environmental values) will also be impacted as part of the Derived Proposal and warrant offsets. Riparian vegetation occurs within the Development Envelope in the form of vegetation present along major and minor watercourses, and around permanent and semi-permanent pools. Seven riparian vegetation associations occur in the Indicative Footprint, comprising approximately 33.7 ha which will be cleared for the Derived Proposal.

Further information this environmental offset (including offset calculations) is outlined within Section 13 *Environmental Offsets*.

6.5.5 Other statutory decision-making processes

In consideration of the Environmental Factor of Flora and Vegetation, and consideration of the EPA (2021d) guidance, BHP considers there are no other State or Commonwealth statutory decision-making process relevant that could mitigate or control the potential environmental impacts of the Derived Proposal to flora and vegetation values.

6.6 Validation of impacts and environmental outcome

BHP has validated the impacts to Flora and Vegetation from the Derived Proposal against the Strategic Proposal, assuming relevant mitigation measures identified in Section 6.5 have been applied, to demonstrate that the environmental objective identified in MS1105 Condition 7, can be met.

Following mitigation, BHP considers that there will be significant impacts on Flora and Vegetation from the Derived Proposal (as discussed in Section 6.5.4) and offsets will be provided to counterbalance this impact.

Table 6-10 summarises the residual impacts and environmental outcomes for Flora and Vegetation and demonstrates consistency with MS1105 condition objectives.

Table 6-10: Flora and Vegetation - residual impacts, environmental outcomes and consistency with MS1105 condition objectives

Derived Proposal residual impact	Derived Proposal environmental outcome	Consistency with Strategic Proposal MS1105 condition objectives
Clearing of up to 1,848 ha of native vegetation; including: • up to 1,826.8 ha in Good to Excellent condition • up to 33.7 ha of riparian vegetation • impacts to DBCA Priority flora taxa.	Contributes to the cumulative clearing of Good to Excellent native vegetation in the Pilbara bioregion. No change to status of Priority flora, with all impacts predicted to be less than 10% of known individuals.	Condition Objective: 7-1 The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) protect flora and vegetation so that biological diversity and ecological integrity are maintained, and in particular: (a) maintain the local and regional populations of flora taxa declared as threatened flora under the relevant legislation. (b) avoid and minimise direct and indirect impacts on flora taxa that is specially protected under the relevant legislation. (c) avoid and minimise direct and indirect impacts on flora taxa listed as Priority flora. (d) avoid and minimise direct and indirect impacts on the occurrences of threatened and priority ecological communities, and their habitat Through the application of the mitigation hierarchy, impacts to Flora and Vegetation have been minimised. No Threatened flora or ecological communities will be impacted as a result of the Derived Proposal. No change to the status of Priority flora, with all impacts predicted to be less than 10% of known individuals. As such, no Flora and Vegetation Environmental Management Plan is proposed. The significant residual impact of the proposed clearing can be counterbalanced by offsets, so that the environmental outcome is consistent with the above objectives.

6.7 Implementation conditions

BHP's view is that the following conditions relating to Flora and Vegetation set out in the Strategic Proposal MS1105 should apply to the Proposal:

- Condition 4 Compliance Reporting
- Condition 15 Rehabilitation and Decommissioning (MCP)
- Condition 16 Offsets.

BHP has assessed the existing implementation conditions of the MS1105 approval for the Strategic Proposal in relation to their application for the Derived Proposal. BHP has concluded that the above implementation conditions are appropriate to be applied to the Derived Proposal, and that a Condition 7 Flora and Vegetation Environmental Management Plan is not required.

7 Terrestrial Fauna Validation

7.1 EPA environmental factor and objective

The EPA (2023a) objective for the Environmental Factor of 'Terrestrial Fauna' is:

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

This objective remains consistent with the objective considered for Terrestrial Fauna within the assessment of the Strategic Proposal (EPA 2018a).

In assessment of the Strategic Proposal by BHP (2016a), the EPA's objective for Terrestrial Fauna was *"To maintain representation, diversity, viability and ecological function at the species, population and assemblage level"*. Whereas, in assessment of the Strategic Proposal by EPA (2018a), the EPA's objective for Terrestrial Fauna was *"To protect terrestrial fauna so that biological diversity and ecological integrity are maintained"*. Whilst the drafting of the EPA's objective has since changed as outlined now within EPA (2023a), the overarching intent of the environmental objective has remained consistent.

7.2 Relevant policy and guidance

BHP has validated this environmental factor considering the policies and guidance outlined in Table 7-1.

Since the assessment of the Strategic Proposal (BHP 2016a; EPA 2018a), the EPA has revised its technical guidance on terrestrial vertebrate fauna surveys (EPA 2020a). Terrestrial vertebrate fauna surveys undertaken prior to this revised guidance have been undertaken in accordance with the former technical guidance (EPA 2016c), with the terrestrial vertebrate fauna surveys undertaken following release of this revised guidance undertaken in accordance with the revised technical guidance.

On 1 January 2019, the BC Act and BC Regulations replaced the WC Act and its associated regulations. There is no policy or guidance for the BC Act relevant to the validation of Terrestrial Fauna for the Derived Proposal.

Table 7-1: Terrestrial Fauna - policy and guidance

Policy or Guidance	Consideration of Policy or Guidance
Statement of Environmental Principles, Factors, Objectives and Aims of EIA (EPA 2023a)	• Consideration of the EPA's environmental objective for the environmental factor of Terrestrial Fauna
Environmental Factor Guideline: Terrestrial Fauna (EPA 2016f)	• Identified the terrestrial fauna values, and their significance • Identified activities that can impact on terrestrial fauna values • Applied the relevant considerations for potential environmental impacts
Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020a) *Technical Guidance: Terrestrial Fauna Surveys* (EPA 2016c) *Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna* (EPA 2016d) *Technical Guidance: Sampling of Short Range Endemic Invertebrate Fauna* (EPA 2016e)	• Surveys were undertaken in accordance with the relevant guidance

Policy or Guidance	Consideration of Policy or Guidance
Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (DCCEEW 2013)	• Consideration of significant impacts to terrestrial fauna of listed conservation significance
WA Environmental Offsets Policy (Government of WA 2011) *WA Environmental Offsets Guidelines* (Government of WA 2014) *EPBC Act Environmental Offsets Policy* (DCCEEW 2012) *Pilbara Environmental Offsets Fund* (Government of (WA) 2024b)	• Applied avoidance and mitigation measures to the Derived Proposal • Quantified the significant residual impact • Considered cumulative impacts in the regional context in determining significant residual impact

7.3 Receiving environment

7.3.1 Studies and surveys

In assessment of the Strategic Proposal, BHP (2016a) considered the following information sources for the assessment of the potential impacts to terrestrial fauna values:

- CSIRO (2013) *Using Community-level Modelling to map levels of Biodiversity Significance in the Pilbara Bioregion*.
- Biologic (2014) *Consolidation of Regional Fauna Habitat Mapping: BHP Billiton Iron Ore Pilbara Tenure*.
- Biologic (2015a) *Strategic Environmental Assessment: Short-range Endemic Invertebrate Review and Risk Assessment*.
- BHP (2016b) *Pilbara Strategic Proposal: Flora and Vertebrate Fauna Screening Assessment*.

As per the requirements of MS1105 *Guidelines for submitting a derived proposal 1(a)*, targeted surveys have been undertaken for the Derived Proposal (see Table 7-2). Note only surveys undertaken since the Strategic Proposal have been summarised below (survey coverage for Ministers North dates back to 2006).

The location and extent of the biological surveys are identified by Figure 7-1 and Figure 7-2.

Table 7-2: Terrestrial Fauna - supporting studies

Title	Survey date	Survey summary	Appendix
Vertebrate Fauna			
Astron Environmental Services Pty Ltd (Astron) (2025) Consolidated Ministers North Targeted Significant Vertebrate Fauna Surveys	13 - 22 April 2023 and 7- 18 June 2024	One-hundred and eleven vertebrate fauna were recorded within the Survey Area, comprising one amphibian, 25 reptile, 64 bird, and 21 mammal (including three introduced) species. Three MNES species, Northern Quoll (*Dasyurus hallucatus*), Ghost Bat (*Macroderma gigas*), and Pilbara Olive Python (*Liasis olivaceus*), were recorded during the current surveys. Only the Ghost Bat records occur within the Development Envelope of the Derived Proposal.	Appendix 7
Astron (2023a) Yandi 45C Targeted Significant Vertebrate Fauna Survey.	22 Sept – 2 Oct 2022	There were 91 vertebrate fauna species recorded within the survey area, comprising of seven reptiles, 66 birds, and 18 mammals (including four introduced species). The fauna species assemblage recorded during the survey was considered typical for the Pilbara region.	Appendix 7
Biologic (2023b) Central Pilbara Hub: Targeted Matters of National Environmental Significance Vertebrate Fauna Survey	4 – 13 April 2022 (relevant dates to the Derived Proposal)	Due to the size of the Study Area (approximately 60,000 ha[25]), the field survey was undertaken over five separate field trips. Calls of Pilbara leaf-nosed bats were recorded at four locations during the survey (note these do not intersect the Derived Proposal area). Ghost Bat calls were recorded on 33 nights at four locations (note these do not intersect the Derived Proposal area). No evidence of other MNES were recorded.	Appendix 7
Biologic (2023d) Targeted Pilbara Olive Python Survey: South Flank and Mining Area C	7 – 14 March 2023	The survey consisted of a single season targeted Pilbara Olive Python survey within and surrounding MAC/SF. Additional environmental DNA (eDNA) sampling undertaken at ten water features within the Study Area and Regional Study Area. Pilbara Olive Python were recorded on three occasions within Gorge / Gully habitat, from one visual observation and two eDNA detections. These records do not coincide with the Derived Proposal Development Envelope.	Appendix 7
GHD Pty Ltd (GHD) (2021b) Ministers North Fauna Survey Level 2 Survey	19 Mar – 27 Mar 2020	The field survey identified 122 species of vertebrate fauna. This number comprises 55 birds, 44 reptiles, 19 mammals and four amphibians. Four significant fauna species were recorded during the field survey: Ghost Bat, Western Pebble-mound Mouse (*Pseudomys chapmani*), Pilbara Olive Python, Pilbara Flat-headed Blind Snake (*Anilios ganei*).	Appendix 7

[25] Only a small portion of this survey intersects with the project – Mining Area C to Yandi Rail Corridor assessment area

Title	Survey date	Survey summary	Appendix
GHD (2021a) Ministers North Fauna Survey Level 1 Survey	9 Sept – 20 Sept 2019	The fauna survey identified 67 species of vertebrate fauna. This number comprises 40 birds, 19 mammals and eight reptiles. Two conservation significant fauna species were recorded during the field survey: Ghost Bat; Western Pebble-mound Mouse.	Appendix 7
Biologic (2018a) Ministers North to Yandi Corridor Two Phase Targeted Fauna Survey	Phase 1: 9 – 13 Oct 2017 Phase 2: 15 – 23 June 2018	The surveys consisted of habitat assessments, targeted transect searches; motion cameras; ultrasonic bat recordings, acoustic bird recordings, Northern Quoll trapping sites and opportunistic recording of fauna species. Two species of conservation significance were recorded during the current survey: the Western Pebble Mound Mouse and the Peregrine Falcon (*Falco peregrinus*).	Appendix 7
Biologic (2017b) Ministers North Level 2 Vertebrate Fauna Survey	15 – 26 October 2016 and 3 – 13 April 2017	The survey recorded 116 vertebrate fauna species, comprising 17 mammal species, 54 bird species, 43 reptile species, and 2 amphibians. Two conservation significant species were recorded: the Western Pebble-mound Mouse (Priority) and Rainbow Bee-eater (no longer conservation significant). No species listed as Threatened were recorded.	Appendix 7
Short-range Endemic Fauna			
Bennelongia Pty Ltd (Bennelongia) (2024a) Ministers North Short-Range Endemic (SRE) Desktop and Field Survey	13-21 April 2023	The field survey resulted in the collection of 182 specimens (including higher order identifications) belonging to 39 species from SRE groups. This includes 12 centipedes, nine pseudoscorpions, five spiders (four mygalomorph spiders and one selenopid spider), five isopods, four scorpions, three millipedes, and one snail. The survey collected one Confirmed SRE species, and seven Potential SREs at Ministers North. The single Confirmed SRE species is the Mouse Spider *Missulena faulderi*. This species has also been collected outside the Study Area.	Appendix 7
Bennelongia (2024b) Yandi Operations Short-Range Endemic Fauna Survey Report.	Two Season: 14-19 October 2022 and 30 March-4 April 2023	The field survey collected 903 individuals attributable to at least 58 species belonging to SRE Groups. Of these, 25 were arachnids, including mygalomorph spiders, pseudoscorpions, and scorpions; 15 were centipedes, predominantly scolopendrids; seven were molluscs; seven were isopod crustaceans; and the remaining four species were millipedes. Two species were Confirmed SREs (the mygalomorph *Missulena faulderi* and the millipede *Antichiropus pendiculus*).	Appendix 7
Biologic (2021) Ministers North and Yandicoogina Creek Short Range Endemic Invertebrate Fauna Survey	Two Season: 9 – 13 Sept 2019 and 3 – 10 April 2020	A total of 123 invertebrates were collected from the two survey areas, of which 109 were considered to represent groups known to contain SRE species. These groups were Araneae (one taxon), Pseudoscorpiones (eight taxa), Scorpiones (three taxa), Chilopoda (one taxon), Diplopoda (one taxon), Isopoda (six taxa), and Gastropoda (four taxa). No Confirmed SRE were collected.	Appendix 7

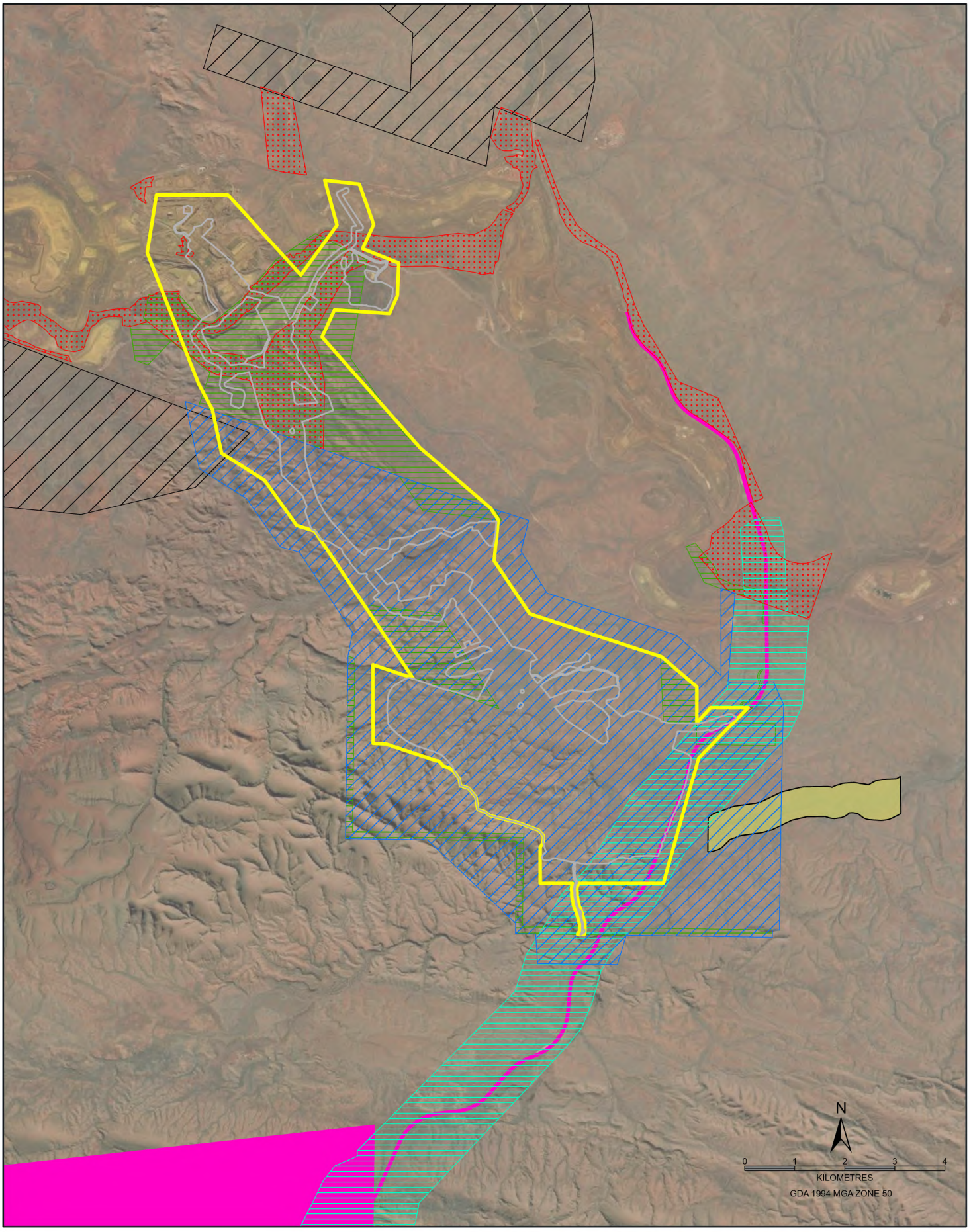
Title	Survey date	Survey summary	Appendix
Biologic (2018b) Ministers North to Yandi Corridor SRE Invertebrate Fauna Survey	Two Season: 9 – 13 Oct 2017 and 14 – 24 June 2018	A total of 21 invertebrate taxa representing five target groups known to contain SRE; namely selenopid spiders, pseudoscorpions, scorpions, millipedes and isopods. Six of these taxa have been regarded as widespread, nine considered 'Data Deficient' with the remaining six regarded as Potential SRE.	Appendix 7
Aquatic Fauna			
Biologic (2024b) Ministers North Yandicoogina Creek Aquatic Ecosystem Survey Dry 2022 and Wet 2023	September 2022 (dry season) March 2023 (wet season)	The fourth round of sampling for the two-season aquatic ecosystem survey along Yandicoogina Creek. Ecosystem sampling methods included habitat assessments and sampling of water quality, wetland flora (submerged and emergent macrophytes), zooplankton, hyporheos, macroinvertebrates and fish.	Appendix 7
Biologic (2023c) Ministers North Aquatic Ecosystem Survey: Dry 2021 – Wet 2022	October 2021 (dry season) April 2022 (wet season)	The third round of sampling for the two-season aquatic ecosystem survey along Yandicoogina Creek. Ecosystem sampling methods included habitat assessments and sampling of water quality, wetland flora (submerged and emergent macrophytes), zooplankton, hyporheos, macroinvertebrates and fish.	Appendix 7
Biologic (2022) Ministers North: Yandicoogina Creek Aquatic Ecosystem Surveys Dry 2020 and Wet 2021	October 2020 (dry season) April 2021 (wet season)	The third round of sampling for the two-season aquatic ecosystem survey of the pools at Yandicoogina Creek. Sampling methods included habitat assessments and sampling of water quality, wetland flora (submerged and emergent macrophytes), zooplankton, hyporheos, macroinvertebrates and fish.	Appendix 7
Biologic (2020b) Ministers North: Yandicoogina Creek Aquatic Ecosystem Surveys	October 2019 (dry season) April 2020 (wet season)	Aquatic ecosystem surveys were undertaken at eight sites. A diverse range of aquatic fauna was recorded, including 250 invertebrate taxa and three freshwater fish species.	Appendix 7
Wetland Research and Management (WRM) (2018) Yandi: Marillana Creek Aquatic Fauna Survey - Wet & Dry 2017 Sampling Final Report	May 2017 (wet season) Sept 2017 (dry season)	A diverse invertebrate fauna (microinvertebrates, hyporheos fauna and macroinvertebrates) was recorded during both the 2014 and 2017 surveys. The majority of invertebrate species recorded are common and widespread throughout the Pilbara. Three common, widespread freshwater fish species were recorded.	Appendix 7

7.3.2 Survey assumptions and limitations

The biological surveys include 'desktop' literature reviews and field-based 'detailed' and 'targeted' survey methodologies. The biological surveys were undertaken by suitably qualified and experienced environmental professionals in the survey and identification of vertebrate and invertebrate terrestrial fauna for the bioregion. Each of the biological surveys conform to the relevant survey guidance requirements that were applicable to the type of survey completed. The more recent biological surveys have also been undertaken in accordance with the BHP (2020a) *Vertebrate Fauna Surveys in Western Australia: Procedure* and the BHP (2022) *Short-range Endemic Invertebrate Fauna Assessment Methods: Technical Process Instruction* which were developed to ensure consistency with the survey approach.

For the most recent targeted significant vertebrate fauna survey, Astron (2025), reported only minor limitations for the factors of “completeness” and “remoteness and/or access”. The limitation was due to access to a portion of Gorge/Gully habitat through the south-west corner being relatively inaccessible, however, it should be noted that the area that was relatively inaccessible, falls outside of the final Development Envelope and as such does not represent a limitation for the Derived Proposal. All target habitats considered suitable for MNES species within the Development Envelope have been adequately surveyed. Astron (2025) noted for all other factors (e.g. timing, disturbances, intensity, resources, and availability of contextual information), there were no limitations.

The breadth of and results of the multiple biological surveys, as discussed in Table 7-2, provide a high level of confidence as to the understanding of the terrestrial fauna values present, and upon which the potential environmental impacts of the Derived Proposal can be appropriately assessed.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)

Contemporary Vertebrate Fauna Biological Surveys

- Consolidated Ministers North Targeted Significant Vertebrate Fauna Surveys (Astron 2025)
- Yandi 45C Targeted Significant Vertebrate Fauna Survey (Astron 2023a)
- Targeted Vertebrate Fauna Survey: Pilbara olive python South Flank and Mining Area C (Biologic 2023d)
- Central Pilbara Hub Targeted Matters of National Environmental Significance Vertebrate Fauna Survey (Biologic 2023b)
- Ministers North Fauna Survey Level 1 (GHD 2021a)
- Ministers North Level 2 Fauna Survey (GHD 2021b)
- Historical Vertebrate Fauna Biological Surveys

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VERTEBRATE FAUNA BIOLOGICAL SURVEYS

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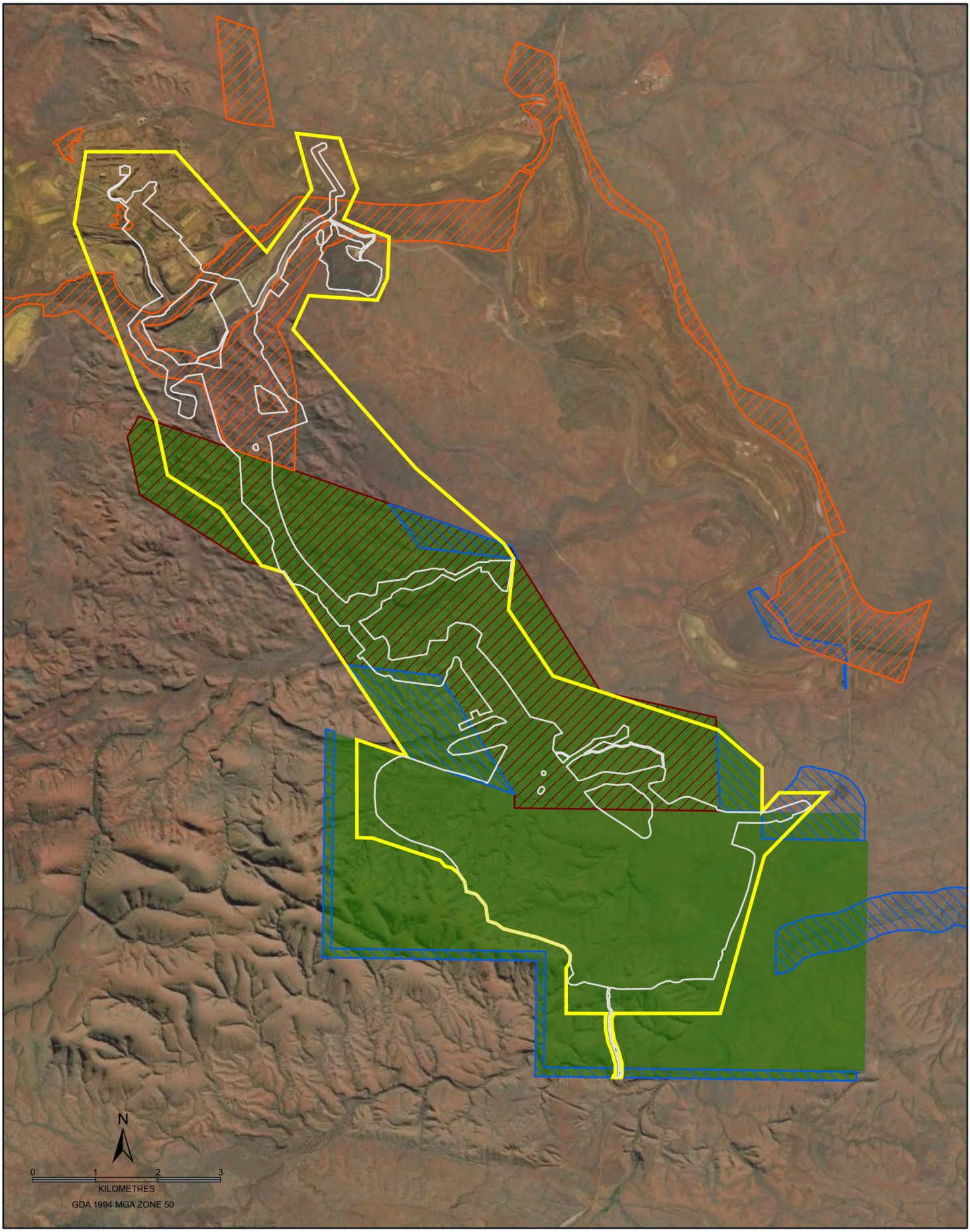

Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Ministers North Short-Range Endemic (SRE) Desktop and Field Survey (Bennelongia 2024a)
- Yandi Operations Short-Range Endemic Fauna Survey Report (Bennelongia 2024b)
- Ministers North and Yandicoogina Creek Short Range Endemic Invertebrate Fauna Survey (Biologic 2021)
- Ministers North to Yandi Corridor Short Range Endemic Invertebrate Fauna Survey (Biologic 2018b)

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INVERTEBRATE FAUNA BIOLOGICAL SURVEYS

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7.3.3 Environmental values

7.3.3.1 *Threatened and Priority Ecological Communities*

No listed TECs or PECs were recorded within the Development Envelope or in close proximity (nearest TEC approximately 16 km from the Derived Proposal) (Spectrum Ecology 2023). As discussed in Section 6.3.3.2, a 3.5-km section of Yandicoogina Creek has been identified to have affinities with a PEC (Biologic 2020a), however, this occurs approximately 1-2 km east of the Development Envelope.

Accordingly, land clearing for the Derived Proposal will not result in direct impact to terrestrial fauna values of any TEC or PEC and as such are not discussed further.

7.3.3.2 *Fauna habitat*

Biological surveys identified 13 broad fauna habitat types within the Development Envelope (Figure 7-3; Table 7-3), comprising:

- Hillcrest / Hillslope
- Undulating Low Hills
- Gorge / Gully
- Breakaway / Cliff
- Boulders / Rockpiles[26].
- Drainage Area / Floodplain
- Minor Drainage Line
- Medium Drainage Line
- Major Drainage Line
- Mulga Woodland
- Sand Plain
- Sandy/Stony Plain
- Wetland

In addition, there are 'Cleared / Disturbed' and 'Rehabilitated Area'; and these areas largely coincide with the existing operations at Yandi and generally representing limited fauna habitat value (Astron 2025, GHD 2021a, 2021b).

The fauna habitat types are generally consistent with the habitat types described for the Strategic Proposal, however, noting that the naming conventions and the mapping scales differ. The fauna habitat type of Breakaway / Cliff has been mapped as a new, separate fauna habitat type not previously recorded for the Strategic Proposal. Whilst noting this, the assessment of the Strategic Proposal (BHP 2016a) identified both breakaways and cliffs as habitat features that were present, albeit not as a separate fauna habitat type.

[26] The fauna habitat type of "Boulders / Rockpiles" identified by Astron Environmental (2025) is named as "Basalt Outcrops" in GHD (2021a).

Table 7-3: Fauna habitat within Development Envelope

Habitat Type	Description	Values for Significant Vertebrate Fauna	Value for SRE Invertebrate Fauna	Area within Development Envelope (ha)	% of Development Envelope
Hillcrest / Hillslope	Broad Habitat Description: Characterised by large open rocky areas with open grasslands, predominantly *Triodia* hummock grasslands with emergent *Eucalyptus* trees and mixed shrubs. Microhabitats: Overhangs, tree hollows, crevices, old *Triodia* and leaf litter.	This habitat was widespread across the survey area. Hillcrest/ Hillslope habitat provides both critical (within 12 km of a Category 2 roost cave[27]) and supporting foraging habitat for Ghost Bat and supporting habitat for Northern Quoll due to its foraging value.	Despite the perceived uniformity of this habitat and relative lack of microhabitat diversity, the only Confirmed SRE, was collected from this habitat type (outside of the Development Envelope) as well as six Potential and 10 Uncertain SRE species.	3,495.8	62.9 %
Undulating Low Hills	Undulating low hills, footslope, hillslope, hillcrest/upper hillslope, ironstone outcrops, with Scattered eucalypts over open Acacia shrubland over Triodia hummock grassland over gravelly silty or sandy clay loam. This habitat is widespread and common throughout the Pilbara region and exhibits low vegetation complexity and low diversity of microhabitats.	May provide supporting habitat for the Grey Falcon but is otherwise low value as it has low vegetation complexity and low diversity of microhabitats.	Undulating Low Hills tend to be sandy or rocky. This habitat is generally uniform with rock size and sand content being the major variable. This habitat tends to have a lack of microhabitat diversity. Twenty-eight SRE species were collected from sites within the Undulating Low Hills habitat.	58.2	1.0%
Gorge / Gully	Broad Habitat Description: Semi-enclosed rock formations in association with rocky hills, drainage lines and breakaways. *Eucalyptus*/*Corymbia* trees over mixed shrubs, *Triodia* spp. and tussock grassland. Microhabitats: Caves, overhangs, crevices, rock pile, leaf litter, thick undergrowth, old *Triodia*, pools, tree hollows and logs.	A number of potential Ghost Bat roost caves were recorded in this habitat type, including two Category 3 roost caves. Seven small surface water features were recorded in this habitat type. This habitat type provides critical habitat for a number of species including Ghost Bat, Northern Quoll and Pilbara Olive Python.	Like drainage lines, gorges and gullies can contain water long after rainfall has occurred and are protected from extreme weather in a similar way to south facing slopes. Trees may grow in the detritals to provide bark, litter and logs. Gullies tend to contain a complex set of microhabitats. SRE species are often found in gullies due to the protection they provide from extreme weather.	152.1	2.7 %
Drainage Area / Floodplain	Broad Habitat Description: Flat plains in association with drainage lines, gorges and breakaways. Often mixed shrubland with emergent *Corymbia* sp. over *Triodia* spp. on stony soils with occasional sandy soils. Microhabitats: Logs, tree hollows, thick undergrowth, soft soil (burrows), old *Triodia*, leaf litter, rock pile and termite mounds.	Drainage Area / Floodplain habitat consisted of two valleys running east-west through the central and northern part of the Development Envelope, in which the northern valley is intersected by a tributary of Marillana Creek. This habitat type represents supporting habitat for the Northern	Drainage Area / Floodplain is characterised by mostly flat, extensive, open areas that may feature pockets of shrubland or open woodland. Similar to drainage lines, slope and aspect are less relevant to SRE suitability but rather the density and	243.8	4.4 %

[27] The closest Category 2 (for Ghost Bat) cave (CMIN-03) occurs approximately 2 km south of the Derived Proposal.

Habitat Type	Description	Values for Significant Vertebrate Fauna	Value for SRE Invertebrate Fauna	Area within Development Envelope (ha)	% of Development Envelope
		Quoll, and critical habitat for the Ghost Bat (foraging habitat within 12km buffer of Category 2 roost cave).	structure of vegetation influences complexity of detrital microhabitats, and amount of shelter available. Limited detrital microhabitats can be present, are generally thought unlikely to support SRE species due to high exposure, low complexity, and low isolation		
Minor Drainage Line	Broad Habitat Description: Minor drainage channel often with thick *Acacia* growth along banks. Microhabitats: Logs, tree hollows, thick undergrowth, soft soil (burrows), leaf litter, old *Triodia* and overhangs.	Minor Drainage line habitat typically consisted of small drainage channels with low eucalypt woodland growing on the fringes. Minor Drainage Line habitat provides critical foraging habitat for Ghost Bat (within 12 km buffer of Category 2 roost cave), while supporting habitat is provided to Northern Quoll, Ghost Bat (outside of the 12 km buffer), and Pilbara Olive Python for foraging and dispersal values.	Minor Drainage Lines tend to have sandy or silty beds with scattered rocks and gravel. Seventeen of the species collected during the most recent targeted survey (Bennelongia 2024a) were found at least once within the Minor Drainage Line habitat.	142.0	2.6 %
Medium Drainage Line	Typically consists of small drainage channels with eucalypt woodlands growing in the riparian zone. A moderate diversity of microhabitats occurs with some seasonal presence of pools, tree hollows and woody debris (logs and leaf litter). Buffel grass is often present in the ground story vegetation, reducing floral diversity.	Provides critical foraging habitat for Ghost Bat where it occurs within 12 km of critical roosting habitat. Otherwise, provides supporting habitat for Northern Quoll, Pilbara Olive Python, Ghost bat and Pilbara Leaf-nosed Bat.	Drainage lines tend to support microhabitats suitable for SRE species owing to water being retained after rainfall events. While discrete from the surrounding landscape, these habitats often connect, and share characteristics, with both Major Drainage Lines and/or Minor Drainage Lines and, therefore, it is common for species collected in Medium Drainage Lines to extend their distributions into the related habitat types.	1.4	<0.1%
Major Drainage Line	Broad Habitat Description: Large drainage channel over 10 m in width in association with gorges, floodplains, rocky hills. Presence of tall *Melaleuca* and *Eucalyptus* trees over mixed shrubs and tussock and *Triodia* spp. grasses.	Major Drainage line habitat within the Derived Proposal consisted of two major drainage channels in association with rocky habitats. During the recent survey (Astron 2025), three surface water features were identified within this habitat type.	Drainage lines tend to support microhabitats suitable for SRE species owing to water being retained after rainfall events. Animals collected in this habitat were most commonly located in	131.6	2.4 %

Habitat Type	Description	Values for Significant Vertebrate Fauna	Value for SRE Invertebrate Fauna	Area within Development Envelope (ha)	% of Development Envelope
	Microhabitats: Logs, tree hollows, crevices, rock pile, thick undergrowth, old *Triodia*, soft soil (burrows), leaf litter and pools.	This habitat provides critical habitat for Pilbara Olive Python, Northern Quoll and Ghost Bat (within 12 km of Category 2 roost cave).	leaf litter, under bark on trees or burrowing in soil.		
Breakaway / Cliff	Broad Habitat Description: Exposed rock formations often associated with Hillcrest/Hillslope, Gully/Gorges, Drainage lines or Floodplains. Microhabitats: Overhangs, crevices, caves and rock pile.	This habitat type is generally unsuitable for a wide range of fauna species due to limited soft soil, leaf litter, and dense vegetation (Astron 2025). However, it provides potential denning, roosting, foraging and sheltering, and subsequently represents potential critical habitat for Northern Quoll and Pilbara Olive Python, and supporting habitat for Ghost Bat in the absence of critical roost caves.	Captured as a subset of the Gorge/Gully habitat type by Bennelongia (2024a). Cliffs and Breakaways are a common feature of Gorges and Gullies as are rocky slopes that retain both moisture and detritals washed from higher surfaces.	82.6	1.5 %
Boulders / Rockpiles	Broad Habitat Description: Basalt outcrops in association with Minor Drainage Lines and rocky hills with *Eucalyptus*/*Corymbia* trees over mixed shrubs, *Triodia* spp. and tussock grassland. Microhabitats: Rock pile, crevices, tree hollows and old *Triodia*.	The boulder piles in the Derived Proposal area were shallow and not extensive enough to provide significant (critical) denning habitat. Nevertheless, the habitat type provides supporting habitat for fauna species that utilise crevices in rocky substrates, such as the Northern Quoll and Pilbara Olive Python.	Boulders / Rockpiles habitat often comprise smaller, more discontinuous outcrops and boulder piles occurring on plains or open hill slopes. Inherently more isolated and generally less sheltered than Ridges/ breakaways. These areas rarely feature dense vegetation and present limited complex habitats. As such, these habitat zones are generally considered moderate-low SRE suitability.	29.5	0.5 %
Mulga Woodland Habitat	Mulga Woodland habitat comprises stands of mulga (*Acacia aneura* and other *Acacia* spp.) over clay or stony substrates. Differs from other plains by having a monoculture of mulga compared to a diversity of other Acacia species	This habitat type may provide critical foraging habitat for Ghost Bat where it occurs within <12 km of Category 2 roost caves (and supporting habitat when outside of the 12 km buffer).	Leaf litter from Acacia provides suitable microhabitat for invertebrates in this habitat type.	1.3	<0.1 %
Sand Plain Habitat	Characterised by relatively deep sandy soils supporting dense spinifex grasslands and sparse shrubs.	This habitat type does not provide critical or supporting habitat for significant fauna identified in proximity to the Derived Proposal.	These kinds of habitats can be important for burrowing species as they often occur on patches of deeper clay-loam soils, and for detritivore species that rely on dense leaf litter; however, they are often widespread and continuous. SRE groups that may be found in	<0.1	<0.1 %

Habitat Type	Description	Values for Significant Vertebrate Fauna	Value for SRE Invertebrate Fauna	Area within Development Envelope (ha)	% of Development Envelope
			this habitat include mygalomorph spiders, pseudoscorpions, scorpions and terrestrial isopods.		
Sandy / Stony Plain	This habitat is characterised by large hummock *Triodia* grasses or stands of *Acacia* or other shrubs over clay or stony substrates. Common throughout the Pilbara region and provides habitat for a wide spectrum of fauna species. Contains logs, tree hollows, thick undergrowth, leaf litter, soft soil (burrows), and old Triodia.	Provides critical foraging habitat for Ghost Bat where it occurs within 12 km of critical roosting habitat. Otherwise, provides supporting habitat for Northern Quoll, Ghost bat and Grey Falcon.	These areas are mostly flat, extensive, open plains that may feature pockets of shrubland or open woodland and limited detrital microhabitats. They are unlikely to support SRE species due to high exposure, low complexity, and low isolation.	4.8	0.1%
Wetland	Differs from surface water features as they are generally a larger water body that supports their own distinct ecosystem and aquatic fauna assemblages. Due to their rarity in the Pilbara region, these habitats generally have elevated significance.	Provides critical foraging habitat for Pilbara Olive Python and supporting habitat for Northern Quoll. Critical foraging habitat for Ghost Bat (when within 12 km of critical roosting habitat).	Wetland habitats are similar to drainage lines in terms of suitability for SREs. The major difference is that wetland habitats tend to be isolated within the broader landscape; accordingly, moisture dependent SREs may not have distribution corridors away from wetlands	4.1	<0.1%
Cleared / Disturbed (including Rehabilitated Areas)		N/A	N/A	1,155 89 ha currently rehabilitated	20.8 %
No survey data[28]		-	-	54.3	1%
Total		**-**	**-**	**5,556.6**	
Total (rounded)				**5,557**	

Source: Astron 2025, 2023a

[28] Coincides with overlapping third party operations and clearing

7.3.3.3 *Habitat features*

Within the fauna habitat types, the biological surveys recorded a number of specific fauna habitat features including caves and surface water features. These habitat features may provide high value habitat for a number of significant terrestrial and aquatic fauna. The habitat features recorded within the Development Envelope include ten caves and nine ephemeral or semi-permanent waterholes (see Figure 7-3).

Caves

Of the ten caves within the Development Envelope, two caves met the criteria for a Category 3 Ghost Bat roost, six caves met the criteria for a Category 4 Ghost Bat roost (categories as per Bat Call WA (2021)), with the remaining two caves assessed as being unsuitable for use by Ghost Bat. No caves assessed for Derived Proposal meet the criteria for a Category 1 or Category 2 roost (Table 7-4; Astron 2025).

One cave (CMN-02) displayed geological characteristics potentially suitable to support a non-permanent maternal roost (Category 2); however, the lack of occupancy evident over the breeding and pupping seasons indicates that CMN-02 is a diurnal roost with occasional occupancy (Category 3) (Astron 2025).

There are Category 2 Ghost Bat caves within 12 km of the Development Envelope which influence the status of critical and supporting habitat (Bat Call WA 2021). These include CMIN-03 (alongside existing rail between Ministers North and MAC) (see Section 13 Offsets and Figure 13-2), and two Category 2 roosts at MAC/SF (AC5 and AC9). Cave CMIN-03 is the closest Category 2 cave, occurring approximately 2 km south of the Derived Proposal.

A further 10 caves occur within 1 km of the Development Envelope, all of which are either Category 4 or considered unsuitable for Ghost Bat use (Table 7-4; Figure 7-3). The remaining caves shown on Figure 7-3 are over 1 km from the Development Envelope and are not considered further.

Table 7-4: Ghost Bat roost categories and use

Cave ID	Roost Category	Characteristics	Evidence of Use
Caves within the Development Envelope			
CMIN-01	Category 4	Dimensions not available	No
CMN-02 (MNA)	Category 3	Wide open entrance. Four internal chambers (Main chamber 2.5 m high x 7 m wide x 25 m deep, first right chamber 1.8 m high x 2 m wide x 18 m deep, second right chamber 2 m high x 2 m wide x 6+ m deep, End chamber 5+ m high x 6 m wide x 6 m deep with a continued cavity 5+ m deep x 0.3 m high)	Yes - Ghost Bats previously recorded, Ghost Bat scat recorded (50 -100), bat smell, raised humidity, microbats present
CMN-05	Category 4	Wide open entrance. One internal chamber; 0.5 m high x 6 m wide x 8 m deep	No
CMN-07	Category 4	Wide open entrance. One internal chamber; 4 m high x 3 m wide x 8 m deep	No
CMN-09	Category 4	Wide open entrance. Three internal chambers. Raised humidity.	No
CMNY-01	Category 4	Wide entrance (4 m x 2 m), one internal chamber; 2 m high x 4 m deep	No
CMNY-03	Unsuitable	5m wide entrance. One internal chamber; 1.5 m high x 2 m deep.	No
CMNY-04	Unsuitable	Wide overhang (12 m wide entrance), one internal chamber; 4 m high x 3 m deep.	No
CMNY-05	Category 3	Narrow entrance. One internal chamber; 1.9 m high x 5 m wide x 12 m deep. Raised humidity.	Yes - Ghost Bat scats present (50-100), bat smell, microbats present.
CMNY-06	Category 4	Wide open entrance. One internal chamber; 1.5 m high x 7 m wide x 10 m deep.	No
Caves within 1 km of the Development Envelope			
CMIN-02	Category 4	South-east facing overhang, no evidence of use to date	No

Cave ID	Roost Category	Characteristics	Evidence of Use
CMIN-05 (CAV-01)	Unsuitable[29]	Mid-slope sheltered cavern with round/oval entrance. Entrance dimensions 3 m x 3 m, single chamber.	This cave had foraging evidence within the cave and was deemed suitable for foraging but not for roosting (GHD 2021a).
CMN-03	Category 4	Wide open entrance. One internal chamber; 1 m high x 1.5 m wide x 12 m deep.	No
CMN-04	Category 4	Wide open entrance. One internal chamber 0.7 m high x 5 m wide x 5 m deep	No
CMN-06	Category 4	Wide open entrance. One internal chamber; 3.5 m high x 6 m wide x 9 m deep	No
CMN-10	Unsuitable*	Narrow entrance. One internal chamber; 1 m high x 1 m wide	No
CMN-11	Unsuitable*	Wide open entrance. One internal chamber; 1 m high x 2 m wide x 10 m deep.	No
CMN-12	Unsuitable*	Wide open entrance. One internal chamber; 2 m high x 5 m wide x 20 m deep	No
CMNY-02	Category 4	Upper-slope, exposed overhang. Entrance dimensions 3.5 m x 1.5 m.	No
CYAN-01 (CAV-02)	Category 4[30]	Mid-slope, semi exposed overhang with horizontal entrance. Entrance dimensions 2 m x 0.6 m, single chamber.	No
Category 2 Caves within 12 km of the Development Envelope			
CMIN-03 / ACY 1	Category 2	Rail Corridor – cave contained large tunnel in the roof	Yes - Scats (2011), no recent evidence
AC5	Category 2	Mining Area C – cave entrance 6.5 m x 4.1 m, with multiple chambers. Crack present at back of cave, which would be accessible for Ghost Bats.	Yes – Scats present. Hormone analysis of scats with progesterone levels indicating pregnancy (2017)
AC9	Category 2	Mining Area C - relatively small, constricted entrance; deep caves". Entrance approximately 2 m high x 2 m wide. One large, complex internal chamber; approximately 10-15 m deep.	Yes – Hormone analysis of scats with progesterone levels indicating pregnancy (2014 and 2017)

* Caves considered unsuitable for usage by Ghost Bats due to a restricted entrance or the dimensions of the cave. No evidence of usage has been recorded.

Surface water features

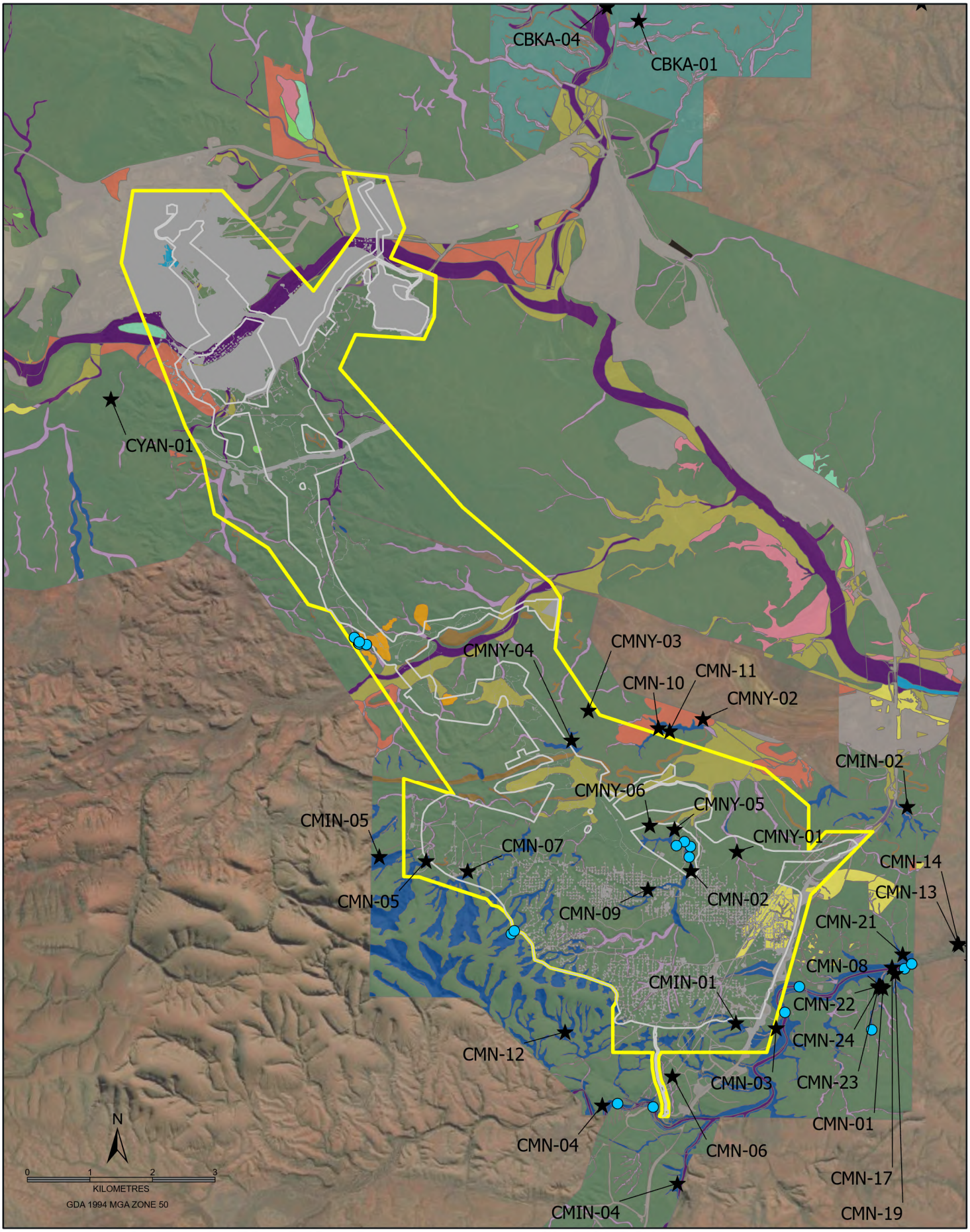
As described in Section 5.3.3, a total of 18 surface water pools have been recorded within, or in proximity to, the Development Envelope (Table 5-3 and Figure 5-3 in Section 5.3.3). This includes permanent pools, ephemeral pools, semi-permanent rock pools, river pools and small seeps. The observed number of distinct pools within the Development Envelope has varied in reporting over biodiversity and water monitoring surveys due to seasonal and temporal fluctuations of the hydrology of the pools. Most of the water pools recorded are associated with Yandicoogina Creek, Marillana Creek or one of their tributaries. The water pools occur in Major Drainage Line and/or Gorge/Gully habitat and provide critical foraging and dispersal habitat for species such as the Pilbara Olive Python.

There are nine ephemeral or semi-permanent water pools within the Development Envelope (Figure 7-3). None of the surface water pools within the Development Envelope are permanent water features. Four of the waterholes within the Development Envelope occur within the proposed Ghost Bat MEZ (Figure 7-3).

In the broader area, a number of water features, including semi-permanent and permanent water pools, occur within Yandicoogina Creek and Marillana Creek, including their tributaries (see Section 5.3.3).

[29] This cave had foraging evidence within the cave and was deemed suitable for foraging but not for roosting (GHD 2021a).

[30] Cave could not be closely assessed due to the entrance size however deemed to be a potential day roost (GHD 2021a).



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Surface Water Features
- Bat Cave Sites

Habitat Type

- Basalt Outcrops
- Boulders/ Rockpiles
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Ironstone Outcrops
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Sandy/ Stony Plain
- Stony Plain
- Undulating Low Hills
- Wetland

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SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	7-3
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		REVIEWED:			

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7.3.3.4 *Significant Fauna*

Threatened Fauna

The assessment of the Strategic Proposal (BHP 2016a, 2016b) documented 12 known Threatened fauna from within, or having a potential to occur within, the area of the Strategic Proposal. See Appendix 15 for an analysis of the likelihood of Threatened fauna to occur in the Development Envelope.

Biological surveys undertaken for the Development Envelope identified one Threatened fauna species:

- Ghost Bat (*Macroderma gigas*) listed as Vulnerable under the BC Act and EPBC Act.

Two additional Threatened fauna have been recorded in close proximity (within 150 m) to the Development Envelope:

- Northern Quoll (*Dasyurus hallucatus*) listed as Endangered under the BC Act and EPBC Act
- Pilbara Olive Python (*Liasis olivaceus barroni*) listed as Vulnerable under the BC Act and EPBC Act.

Ghost Bat

The Ghost Bat is found in a wide range of habitats but relies on day roosts in temperature stable caves with chambers or cavities that trap humidity (Bat Call WA 2021 as cited in Astron 2025). Ghost Bats typically occur in rocky landscapes along gorge and gully formations. They prefer an “apartment block” of roost sites concentrated within close range and where water is accessible (Bat Call WA 2021 as cited in Astron 2025).

Ghost Bat presence has been recorded at two caves (CMN-02 and CMNY-05) within the Development Envelope. Biologic assessed the area in 2017 and recorded cave CMN-02 (Biologic 2017c). While it was described as having the desired features for a potential maternal roost, no Ghost Bats or scats were observed. Prior to the survey by Astron (2025), a heritage team observed six individual Ghost Bats roosting in the cave in late March/early April 2023 and all Ghost Bats were accidentally flushed from the cave (pers. comm. Ralph Mongoo from Astron 2025).

During the most recent fauna survey (Astron 2025), the cave was investigated on two separate occasions and no Ghost Bats were observed, however, approximately 50 to 100 Ghost Bat scats were recorded. A bat detector was deployed at the entrance of the cave for three nights and did not detect Ghost Bat presence and scats from the cave were considered not to be recent. An additional long-term bat detector and scat sheet were placed within the cave between September 2023 and June 2024, and no evidence of Ghost Bat was detected over this time via either sampling method. Moreover, no additional scat was identified during revisitation of the cave (Astron 2025).

Approximately 50 to 100 Ghost Bat scats were recently recorded in cave CMNY-05 (previously recorded as a potential feeding roost). The structure provided roosting opportunities for Ghost Bats with one chamber at a height of 1.9 m which provided moderate humidity, although some light exposure was evident. It was conservatively classified as a Category 3 roost during the survey due to suitability and evidence of usage but may change (i.e. reduce) following additional monitoring.

Northern Quoll

The Northern Quoll is common in a range of habitats within its distribution, including rocky habitats and watercourses. Recent biological surveys identified nine records of Northern Quoll at four locations approximately 30 m to 800 m outside of the Development Envelope, comprising multiple records at camera traps positioned at three locations, and an additional location where a scat was recorded (Astron 2025; Figure 7-4). The records occur within an approximately 1,500 m linear distance (east to west) and were associated with Yandicoogina Creek (and or its tributaries). As reported by Astron (2025), photographic review of the spot patterning of the recorded Northern Quoll from the camera traps indicates that all records are likely to be of the same individual Northern Quoll and it was transitory in behaviour.

No evidence of Northern Quoll has been recorded within the Development Envelope, despite extensive sampling (undertaken over a period of more than 15 years [since 2006]) and the presence of potentially suitable fauna habitat types. This suggests that a sustained population is not present within the Development Envelope; however, suitable habitats within the Development Envelope may still be utilised for the dispersal of the Northern Quoll.

Pilbara Olive Python

The Pilbara Olive Python is restricted to ranges within the Pilbara and occurs in rocky outcrops, escarpments, and gorges, often in close proximity to permanent or seasonal water sources (including man-made). There are no Pilbara Olive Python records from within the Development Envelope despite extensive survey effort. The nearest record consists of a single scat of Pilbara Olive Python within Gorge / Gully habitat associated with the Yandicoogina Creek approximately 130 m outside of the Development Envelope (within the same Gorge / Gully habitat as the Northern Quoll records discussed above (see Figure 7-4; Astron 2025)). The scat was assessed as being approximately six months to one year old. A further historic record at Yandi from 2014 outside of the Development Envelope, with a further five records within 5 km of the Development Envelope (Figure 7-4).

Complementary eDNA (environmental DNA) sampling of surface water pools within the Development Envelope also did not record evidence of Pilbara Olive Python (Astron 2025). Water samples from surface water pools were collected from three locations in areas of potentially suitable habitat, with the extracted water samples analysed for DNA fragments of Pilbara Olive Python to determine any occurrence of this taxon at the sampled locations. The analysis of the collected samples yielded no records of DNA fragments for Pilbara Olive Python, indicating no recent[31] occurrence of the species at the sampled locations. However, the scat record indicates that Yandicoogina Creek is an important feature for foraging and dispersal opportunities for this species within the area.

Priority Fauna

The assessment of the Strategic Proposal (BHP 2016a, 2016b) documented 11 known DBCA-classified Priority fauna from within, or having a potential to occur within, the area of the Strategic Proposal. Biological surveys recorded one Priority fauna taxa within the Development Envelope:

- Western Pebble-mound Mouse (*Pseudomys chapmani*) listed as Priority 1 by DBCA

As outlined within the assessment of the Strategic Proposal (BHP 2016a), there are more than 3,500 records of Western Pebble-mound Mouse from the Pilbara region, of which the majority (greater than 80 %) were recorded from within the area of the Strategic Proposal (with this proportion reflecting the volume and intensity of biological survey work undertaken on behalf of BHP during the prior decade).

Biological surveys identified Western Pebble-mound Mouse to be locally common, with 113 records within the Development Envelope, largely associated with the widespread Hillcrest/Hillslope habitat type. These records consist of three individuals from pitfall trapping and 110 mounds. The status of these mounds at the time of surveying corresponded to 55 “active” mounds, 47 “inactive” mounds, and eight “recently inactive” mounds. It should be noted that use changes over time and as such, the activity status of the mounds was only current at the time of survey. Therefore, the number of mounds that are currently active or inactive, likely varies from the records discussed above.

Specially Protected Species

The assessment of the Strategic Proposal (BHP 2016a, 2016b) documented one known Specially Protected Species from within, or having a potential to occur within, the area of the Strategic Proposal, being:

- Peregrine Falcon (*Falco peregrinus*).

The Peregrine Falcon occurs in most habitat types, apart from treeless and waterless desert and dense forests, and is widespread but uncommon throughout Australia. Biological surveys undertaken for the Derived Proposal and

[31] BHP acknowledge eDNA relies on longevity of the DNA within the water column which is influenced by water temperature, sunlight, turbidity and other environmental factors. Tests indicate eDNA for Pilbara Olive Python may only be present for a short number of days and as such, does not exclude the potential presence of the species outside of this period.

surrounds have identified a single record of Peregrine Falcon from within the Development Envelope; being of an individual perched on a tree above a gorge (Biologic 2018a). The Derived Proposal area contains suitable nesting, foraging, and perching habitat within the Major Drainage Line, Breakaway/ Cliff, and Gorge/ Gully habitats, however, no further evidence of Peregrine Falcon has been observed.

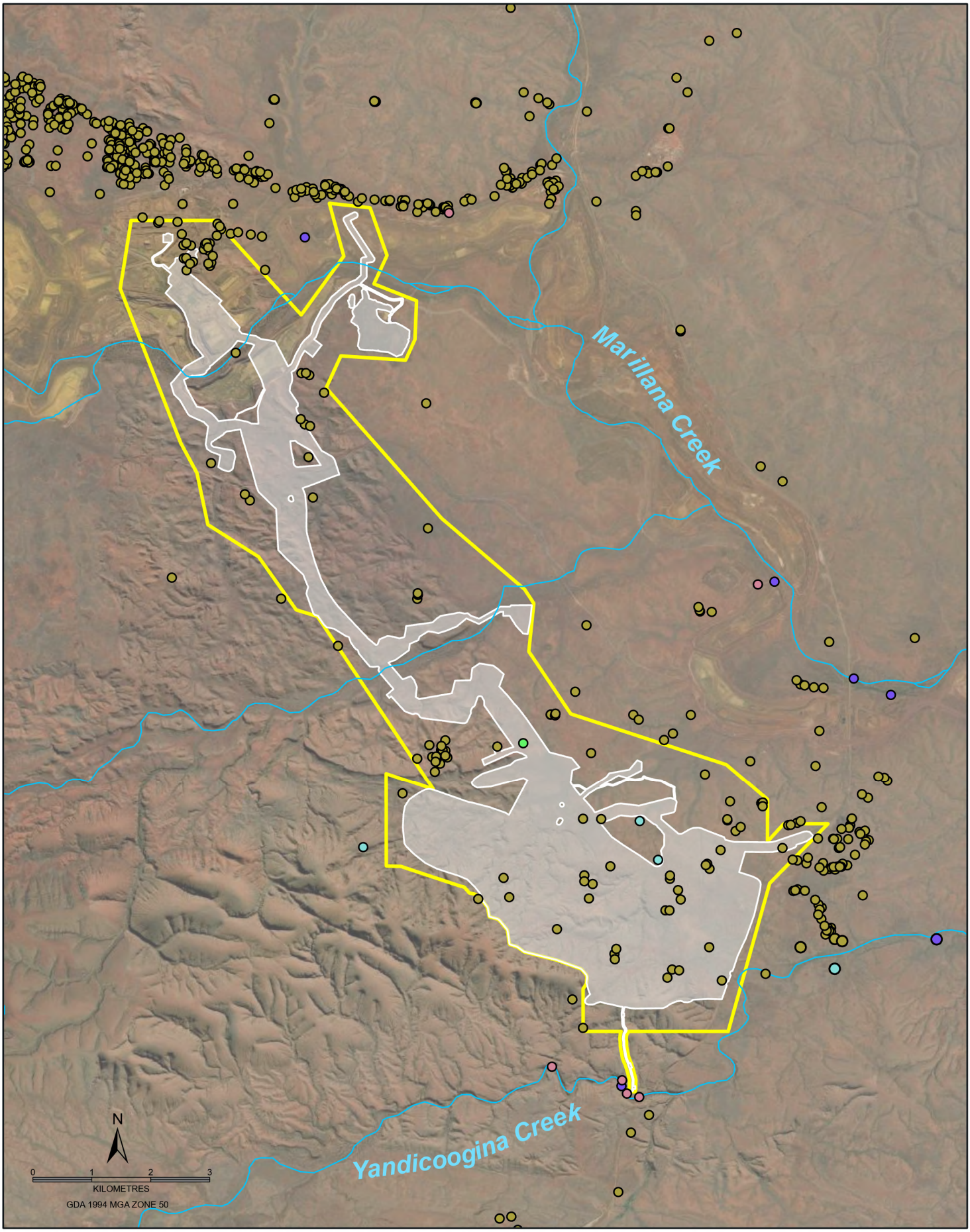
Migratory Species

The assessment of the Strategic Proposal (BHP 2016a, 2016b) documented more than 20 known Migratory Species from within, or having a potential to occur within, the area of the Strategic Proposal.

Biological Surveys for the Derived Proposal have not recorded any Migratory Species within the Development Envelope.

Astron (2025) notes that previous biological surveys have recorded four Migratory Species in the vicinity of the Derived Proposal (but not within), these being the Osprey (*Pandion haliaetus*), Common Sandpiper (*Actitis hypoleucos*), Common Greenshank (*Tringa nebularia*) and Forktailed Swift (*Apus pacificus*).

Of these Migratory Species, only the Fork-tailed Swift was considered by Astron (2025) to have a 'Moderate' likelihood of occurrence within the Development Envelope; with the other Migratory Species considered to have a 'Low' likelihood of occurrence due to limited (or an absence of) suitable habitat.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Watercourse

BC Act and DBCA Priority Listed Vertebrate Taxa

- *Dasyurus hallucatus* (Endangered)
- *Liasis olivaceus subsp. barroni* (Vulnerable)
- *Macroderma gigas* (Vulnerable)
- *Falco peregrinus* (Other Specially Protected Fauna)
- *Pseudomys chapmani* (P4)

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WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:85,000	REQUESTOR:	PROJECTS	FIGURE:	7-4
DATE:	9/09/2025	PREPARED:	GEOMATICS	NO:	A1317-038 RevE
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Short-range Endemic Fauna

The assessment of the Strategic Proposal (BHP 2016a) documented 60 Short-range Endemic (SRE) fauna or potential SRE invertebrate fauna in BHP tenure within the area of the Strategic Proposal, from a total of 144 SRE or potential SRE invertebrate fauna known from the Pilbara bioregion.

As a result of surveys for the Derived Proposal, total of 54 potential/uncertain SRE taxa (22 potential SRE and 32 uncertain/data deficient SRE) have been recorded within the Development Envelope. Of these, 37 occur within the Indicative Footprint (Table 7-5, Figure 7-5).

No “Confirmed” SRE species are known from within the Development Envelope[32]. One taxon, Conothele `MYG279` was originally designated as a Confirmed SRE in historic surveys but subsequent collections resulted in it having a known linear range of approximately 350 km making it unlikely to be a true SRE[33]. This species has still been considered but in the context of a “Potential” SRE (see Table 7-5).

None of the invertebrate fauna taxa recorded within the Development Envelope are listed under the EPBC Act or BC Act.

[32] Recent field assessments (Bennelongia 2024a, 2024b) recorded two confirmed SRE taxa known from in proximity to the Derived Proposal, being the Mouse Spider (*Missulena faulderi*), and the Centipede *Antichiropus pendiculus* (P1). As these species are located outside of the Development Envelope, these are not considered further.

[33] Confirmed SRE species are typically defined as having a range of less than 10,000 km^2 i.e. ~ 100 km linear

Table 7-5: Short-range endemic fauna records

Taxa	Survey	Known Range	Habitat recorded	Within Development Envelope	Restricted to Development Envelope	Within Indicative Footprint	Restricted to Indicative Footprint
Potential SRE							
Scorpion							
Lychas 'BSCO088'	Bennelongia (2024a, 2024b)	Known distribution over 20 km, including records at Yandi.	Minor Drainage Line, Undulating Low Hills, Cleared/Disturbed	Y	N	N	N
Urodacus `BSCO045`	Bennelongia (2024a, 2024b)	Known from multiple locations including Yandi and Western Ridge. Linear range of 107 km.	Major Drainage Line, Minor Drainage Line, Undulating Low Hills	Y	N	Y	N
Pseudoscorpion							
Austrohorus sp. `PSE121`	Biologic (2021)	Linear range of 3.56 km. Also collected outside the Development Envelope in multiple habitat types.	Hillcrest/Hillslope, Minor Drainage Line, Gorge/Gully	Y	N	N	N
Austrohorus `BPS524`	Bennelongia (2024a)	Linear range of 4.45 km. Collected from multiple sites within the same habitat type. True distribution remains unknown.	Undulating Low Hills	Y	Y	Y	Y
Cheliferidae sp. `BPS504`	Bennelongia (2024b)	Known from 11 individuals. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	Major Drainage Line	Y	Y	N	N
Indolpium sp. `PSE123`	Biologic (2021)	Linear range of 7.31 km. Also collected outside the Development Envelope in multiple habitat types.	Breakaway/Cliff, Gorge/Gully, Hillcrest/Hillslope	Y	N	N	N
Olpiidae gen. 7/4`BPS525`	Bennelongia (2024a)	Linear range of 7.7 km. Collected from multiple sites across multiple habitat types. True distribution remains unknown.	Undulating Low Hills, Major Drainage Line, Minor Drainage Line	Y	Y	Y	N

Taxa	Survey	Known Range	Habitat recorded	Within Development Envelope	Restricted to Development Envelope	Within Indicative Footprint	Restricted to Indicative Footprint
Oratemnus `BPS502`	Bennelongia (2024b)	Only known records from Yandi mining area (records associated with Marillana Creek). Known from four individuals. Distribution remains unknown.	Major Drainage Line	Y	Y	N	N
Mygalomorph Spiders							
Conothele `MYG279'	Bennelongia (2024b)	Conothele `MYG279` was originally designated a Confirmed SRE but subsequent collections resulted in it having a known linear range of approximately 350 km making it unlikely to be a true SRE.	Hillcrest/ Hillslope, Gorge/Gully, Stony Plain	Y	N	N	N
Araneomorph Spider							
Karaops ARA001-DNA	Biologic (2015b)	Recorded widespread across the survey areas, known from multiple habitats. Total range remains unknown.	Ridge-outcrop, Drainage Area, Gully	Y	N	Y	N
Isopod							
Acanthodillo `BIS523`	Bennelongia (2024b)	New species. Known from two individuals. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	Waterhole	Y	Y	Y	Y
Acanthodillo `BIS524	Bennelongia (2024b)	New species. Known from one individual. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	Stony Plain	Y	Y	N	N
*Buddelundi*a sp. `49`	Biologic (2016, 2018b, 2020)	Species is small and difficult to determine from other small species, however, has a tentative linear range of approximately 80 km.	Hillcrest/Hillslope, Gorge/Gully, Minor Drainage Line	Y	N	Y	N
Buddelundia sp. `10MA`	Biologic (2018b)	Known distribution 60 km recorded across multiple habitat types.	Breakway/Cliff, Gorge/gully, Hillcrest/Hillslopes, Minor Drainage Line	Y	N	Y	N
Buddelundia `BIS374`	Bennelongia (2024a, 2024b)	Linear range approx. 100 km. Known from 68 recorded individuals, across multiple sites and habitat types. Lower likelihood of being an SRE.	Undulating Low Hills, Hillslopes	Y	N	Y	N

Taxa	Survey	Known Range	Habitat recorded	Within Development Envelope	Restricted to Development Envelope	Within Indicative Footprint	Restricted to Indicative Footprint
Buddelundia `BIS520`	Bennelongia (2024a, 2024b)	Linear range of approximately 21 km. Known from 193 recorded individuals across multiple sites / habitat types.	Undulating Low Hills, Hillslopes, Gully, Major Drainage Line, Medium Drainage Line, Minor Drainage Line	Y	N	Y	N
Buddelundia `BIS521`	Bennelongia (2024b)	New species. Known from three individuals across two sites. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	Hillcrest/ Hillslope, Stony Plain	Y	N	N	N
Buddelundia `BIS536	Bennelongia (2024a, 2024b)	Linear range of approximately 18 km. Recorded at both Ministers North and Yandi across a range of habitats.	Undulating Low Hills, Hillcrest/ Hillslope, Gorge/gully, Minor Drainage Line	Y	N	Y	N
Buddelundia `BIS539`	Bennelongia (2024a)	Singleton record, distribution remains unknown.	Gorge/Gully	Y	Y	N	N
Laevophiloscia `BIS522`	Bennelongia (2024a, 2024b)	Linear range approx. 16 km. Known from 26 individual records. Recorded at both Ministers North and Yandi	Undulating Low Hills, Medium Drainage Line, Drainage Area / Floodplain	Y	N	Y	N
Millipede							
Antichiropus sp. indet.	Bennelongia (2024a, 2024b)	May represent *Antichiropus pendiculus* but not sufficiently diagnostic to identify.	Gorge/Gully, Hillcrest/Hillslope	Y	N	Y	N

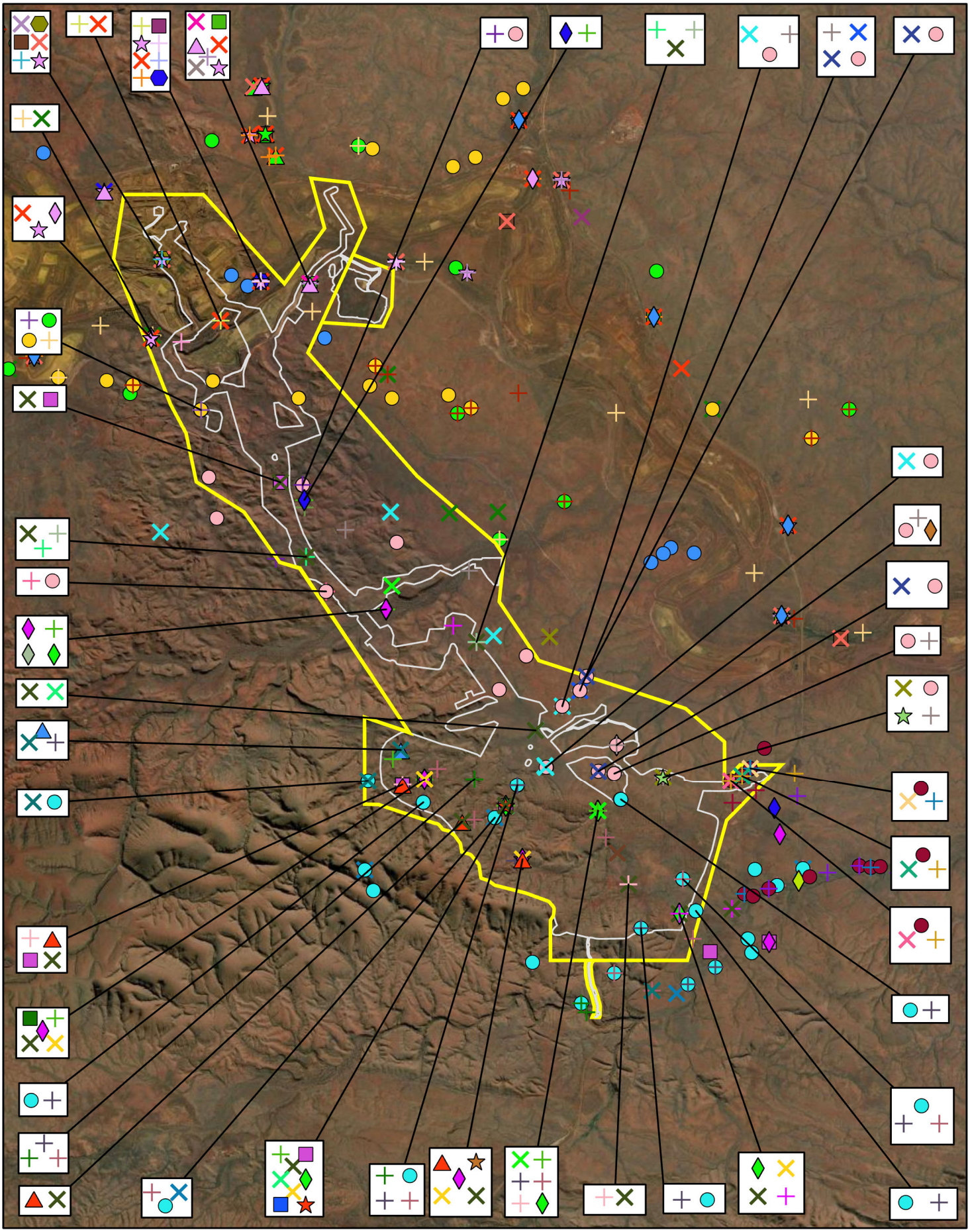
Taxa	Survey	Known Range	Habitat recorded	Within Development Envelope	Restricted to Development Envelope	Within Indicative Footprint	Restricted to Indicative Footprint
Uncertain SREs / Data Deficient							
Scorpion							
Lychas 'BSCO056'	Bennelongia (2024a, 2024b)	Linear distribution of 97 km, known across a range of habitats, unlikely to be an SRE.	Major Drainage Line, Minor Drainage Line, Drainage Area/ / Floodplain, Undulating Low Hills	Y	N	Y	N
Lychas sp. indet.	Biologic (2018b)	Single juvenile record. Higher order identification. Due to the lack of taxonomic resolution, this taxon is regarded as Data deficient and range known.	Hillcrest/Hillslope	Y	N	Y	N
Urodacus sp. indet.	Biologic (2021), Benelongia (2024a)	Single records from each survey (Biologic 2021 and Bennelongia 2024a). The distribution has not been determined, nor taxa resolved. Records may represent same taxon as 11 specimens (four locations) of *Urodacus* `BSCO045'.	-	Y	N	N	N
Pseudoscorpion							
Austrohorus sp. indet.	Biologic (2021)	>100 records, unresolved taxa, may represent one of many other *Austrohorus* sp. but remains unresolved.	Minor Drainage line, Gorge/Gully	Y	N	Y	N
Beierolpium 8/3 `BPS527`	Bennelongia (2024a)	Linear range of 7.2 km. Known across multiple habitat types. Members of this genus are typically not SRE taxa.	Undulating Low Hills, Major Drainage Line, Minor Drainage Line	Y	N	Y	N
Beierolpium 8/4 `BPS522`	Bennelongia (2024a)	Linear range of 3.4 km. New species currently known only from Ministers North, however, members of this genus tend not to be SRE	Undulating Low Hills, Hillslopes	Y	Y	Y	Y
Beierolpium sp. `8/4`	Biologic (2018b)	This taxon is known from throughout the Pilbara and is therefore regarded as Widespread (unlikely to be an SRE).	Major Drainage Line	Y	N	Y	N

Taxa	Survey	Known Range	Habitat recorded	Within Development Envelope	Restricted to Development Envelope	Within Indicative Footprint	Restricted to Indicative Footprint
Beierolpium sp. indet.	Bennelongia (2024b)	Higher order identification only, distribution unknown.	Gorge/gully	Y	N	Y	N
Euryolpium sp. indet.	Biologic (2018b)	There is limited taxonomic knowledge of this genus in the Pilbara. This taxon is regarded as Data Deficient (range unknown).	Boulders / Rockpiles	Y	N	N	N
Indolpium `BPS528`	Bennelongia (2024a)	Linear range of 3.2 km, currently only known from Ministers North.	Undulating Low Hills	Y	Y	Y	Y
Indolpium sp. indet.	Biologic (2018b) Bennelongia (2024b)	Known from over 300 records, unresolved taxa, uncertain if these records represent other recorded *Indolpium* sp.	Major Drainage Line, Hillcrest/ Hillslope, Stony Plain, Minor Drainage Line	Y	N	Y	N
Olpiidae gen. 7/4 `BPS525`	Bennelongia (2024a)	Linear range of 7.7 km. Currently known only from Ministers North, however, recorded at multiple sites across multiple habitat types.	Undulating Low Hills, Major Drainage Line, Minor Drainage Line	Y	Y	Y	N
Olpiidae sp. indet.	Biologic (2016, 2020) Bennelongia (2024b)	Unresolved taxa, higher order identification only due to juvenile specimens. Range unknown.	Minor Drainage Line, Drainage Area/ Floodplain, Gorge/ Gully, Major Drainage Line, Hardpan Plain	Y	N	Y	N
Oratemnus sp. indet.	Bennelongia (2024b)	Known from over 150 known records, unresolved taxa. Uncertain if these records represent other recorded Oratemnus sp.	Waterhole, Major Drainage Line	Y	N	Y	N
Synsphyronus `paradoxus complex`	Bennelongia (2024b)	New species. Sampled from multiple sites, so the probability of being an SRE is relatively low, but its distribution remains unknown.	Major Drainage Line, Gorge/ Gully	Y	N	N	N

Taxa	Survey	Known Range	Habitat recorded	Within Development Envelope	Restricted to Development Envelope	Within Indicative Footprint	Restricted to Indicative Footprint
Synsphyronus `PSE014`	Biologic (2021)	Also known from 13 km and 35 km south west and south-south west of the Development Envelope.	Gorge/Gully, Hillcrest/Hillslope, Drainage line	Y	N	N	N
Synsphyronus sp. indet.	Bennelongia (2024b)	Unresolved taxa, higher order identification only due to juvenile specimens. Range unknown.	Major Drainage Line	Y	N	N	N
Mygalomorph spider							
Aurecocrypta MYG316	Bennelongia (2024a, 2024b)	Linear range of 110 km, known from multiple locations across multiple habitat types.	Hillcrest/Hillslope, Undulating Low Hills, Gully, Minor Drainage Line, Drainage Area/Floodplain	Y	N	Y	N
Barychelidae sp. indet.	Biologic (2016)	Higher order identification, range remains unknown however records are not restricted to the Derived Proposal area.	Drainage Line	Y	N	Y	N
Araneomorph Spider							
Karaops sp. indet.	Biologic (2016, 2018b, 2021)	May be aligned with one of four separate *Karops* sp. taxa previously recorded within 20 km radius. Biologic (2021) unresolved if these specimens represent the same *Karaops* sp. indet. identified in Biologic (2018b). Biologic (2018b) unresolved if these specimens represent the same *Karaops* sp. indet. identified in Biologic (2016).	Gorge/Gully, Breakway/Cliff, Basalt outcrops, Hillcrest/Hillslope, Minor Drainage Line	Y	N	Y	N
Isopods							
Buddelundia sp. indet.	Biologic (2016, 2018b, 2020) Bennelongia (2024)	Recorded across multiple surveys but unresolved, so may represent separate taxa across surveys. Range remains unknown however records are not restricted to the Derived Proposal area.	Drainage line, Breakaway, Rocky outcrop, Gorge/gully	Y	N	Y	N
Buddelundiinae sp. indet.	Biologic (2020)	May overlap with other species (e.g. Buddelundia `sp. 10MA`, B. `sp. 48`, or B. `sp. 49`) however, remains unresolved. Range unknown.		Y	N	N	N

Taxa	Survey	Known Range	Habitat recorded	Within Development Envelope	Restricted to Development Envelope	Within Indicative Footprint	Restricted to Indicative Footprint
Philosciidae sp. indet.	Biologic (2016, 2018b)	Philosciids are rarely collected in the Pilbara and information on the taxonomy and distribution is lacking; however, they are currently all considered Potential SRE species in the Pilbara.	Gorge/Gully	Y	N	Y	N
Land Snail							
Austrosuccinea sp. indet.	Bennelongia (2024b)	Specimen too damaged to identify.	Major Drainage Line	Y	Y	N	N
cf. *Pupisoma* sp. indet.	Bennelongia (2024b)	Specimens too small for molecular analysis.	Drainage Area/Floodplain, waterhole	Y	N	Y	N
Centipedes							
Geophilidae sp. indet.	Bennelongia (2024a, 2024b)	Higher order identification due to specimen being in poor condition. Difficult to ascertain distribution, however records are not restricted to the Development Envelope.	Minor Drainage Line	Y	N	Y	N
Mecistocephalidae sp. indet.	Bennelongia (2024a, 2024b)	Higher order identification, so difficult to ascertain distribution, however, may represent either Mecistocephalus `BGE075`, or Mecistocephalus `BGE076`	Drainage Area/ Floodplain, Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line, Waterhole	Y	N	N	N
Scutigeridae sp. indet.	Bennelongia (2024a, 2024b)	Higher order identification. Difficult to ascertain distribution.	Undulating Low Hills, Gully, Minor Drainage Line	Y	N	Y	N
Xenolpium sp. indet.	Biologic (2014)	Higher order identification. Difficult to ascertain distribution, however records are not restricted to the Development Envelope.	Drainage line, ridge/breakway, rocky outcrop, gorge/gully	Y	N	Y	N

Taxa	Survey	Known Range	Habitat recorded	Within Development Envelope	Restricted to Development Envelope	Within Indicative Footprint	Restricted to Indicative Footprint
Millipedes							
Phryssonotus sp. indet.	Bennelongia (2024a)	Higher order identification. Difficult to ascertain distribution. Other recorded taxa of this genus include *Phryssonotus novaehollandiae* which represents a widespread species (not SRE).	Undulating low hills	Y	Y	Y	Y
Polyxenidae sp. indet.	Biologic (2018b)	Higher order identification. Difficult to ascertain distribution, however, record not within the Development Envelope.	Hillcrest/Hillslope	N	N	N	N
Unixenus sp. indet.	Bennelongia (2024b)	Multiple records, however, no SRE's are known from this family.	Drainage Area/ Floodplain, Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line, Stony Plain, Waterhole	Y	N	Y	N



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Invertebrate Taxa - refer to associated figure

N

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KILOMETRES

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SRE INVERTEBRATE FAUNA

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:90,000	REQUESTOR:	PROJECTS		7-5
DATE:	11/09/2025	PREPARED:	GEOMATICS	NO:	A1317-026 RevG
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INVERTEBRATE FAUNA (LEGEND)

WAIO PLANNING, TECHNICAL & ENVIRONMENT

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7.3.3.5 *Aquatic Fauna*

Aquatic fauna sampling has not been undertaken within the Development Envelope due to the ephemeral nature of the creeks, however, sampling has undertaken within Marillana Creek and east of the Development Envelope at Yandicoogina Creek (Biologic 2024b, 2023c, 2022 and 2020b; WRM 2018).

Marillana Creek

Aquatic ecosystem surveys were undertaken within the portion of Marillana Creek that extends throughout Yandi (WRM 2018). During recent and historical surveys, over 488 native aquatic invertebrate taxa (across zooplankton, hyporheic, rehydrate and macroinvertebrate lists), and three freshwater fish species (Western Rainbowfish, Pilbara Tandan and Spangled Perch) were recorded within Marillana Creek (Biologic 2024c).

The majority of taxa recorded were associated with the pools at Flat Rocks or the Yandi mine discharge point and are considered common species, with broad distributions (including the freshwater fish species); however, at least eight invertebrate species are of conservation interest as they are either new species, are potentially restricted to Marillana and/or Yandicoogina Creek, or are listed on the ICUN Redlist (note this doesn't include species potentially restricted to the Flat Rocks pools). This includes IUCN Redlist listed dragonflies/damselflies; *Eurysticta coolawanyah* (listed as Vulnerable), *Ictinogomphus dobsoni* (listed as Near Threatened) and *Hemicordulia koomina* (listed as Vulnerable (Dow, R 2019)).

In addition, at least five stygal/potential SREs are of interest as they are considered to have potentially restricted ranges including the amphipods *Paramelitdae* sp. B, *Paramelitdae* sp. D and *Chydaekata* sp., the isopod *Pygolabis weeliwolli*, and the ostracod *Gomphodella alexanderi* (WRM 2018). All recorded stygal SREs and epigean species have distributions which extend outside the Development Envelope (WRM 2018). None of the invertebrate or vertebrate aquatic fauna recorded from Marillana Creek are listed under the EPBC Act or BC Act or listed as Priority fauna by DBCA.

Yandicoogina Creek and Yandicoogina Gorge

Yandicoogina Creek contains a series of permanent and semi-permanent pools that are likely supported by groundwater at (or close to) surface (refer to Section 5.3.3.7). The pools occur approximately 2 km east of the Derived Proposal (see Table 5-3 in Section 5.3.3), outside the area of direct impact but potentially within the range of indirect impacts.

A diverse range of aquatic fauna has been recorded within the pools of Yandicoogina Creek including 250 invertebrate taxa and three freshwater fish species (Western Rainbowfish, Pilbara Tandan and Spangled Perch; (Biologic 2024b)). The majority of species recorded are widespread or known from other creeks and catchments; however, at least 11 aquatic invertebrate species are of conservation interest as they are either new species, are potentially restricted or are listed on the ICUN Redlist (Table 7-6). None of the invertebrate or vertebrate aquatic fauna recorded from Yandicoogina Creek are listed under the EPBC Act or BC Act or listed as Priority fauna by DBCA.

Of the taxa recorded during historical and recent surveys, 16% were identified as taxa directly dependent on groundwater (stygobites), highlighting the groundwater connection within Yandicoogina Creek (Biologic 2024b).

Table 7-6: Significant aquatic fauna recorded at Yandicoogina Creek

Type	Species	Yandicoogina Creek Sampling Site	Significance
Stygal ostracods	*Gomphodella* `sp. Biologic-OSTR077	YC7H (hyporheos)	A potential new species of ostracod currently not known from elsewhere.
Stygal copepods	cf. Australocamptus `sp. Biologic-HARP064`	YC3 (hyporheos)	Potential SRE and new species.

Type	Species	Yandicoogina Creek Sampling Site	Significance
	cf. Australocamptus sp.	YC2 (hyporheos)	Potential SRE. Species level identification not possible due to life stage.
	Kinnecaris `sp. Biologic-HARP037`	YC8H (hyporheos)	Potential SRE. Current known linear range 25 km.
Syncarids	Bathynellidae sp. BES7547	YC9H (hyporheos)	A potentially new species of syncarid. Currently not known from elsewhere.
	Atopobathynella `sp. Biologic-PBAT042`	YC1	A potential new species of syncarid. Is considered a Potential SRE (Data Deficient) that is currently not known from elsewhere.
	Bathynellidae `sp. Biologic-BATH019`	YC1 (hyporheos)	A potential new species of syncarid. Is considered a Potential SRE (Data Deficient) that is currently not known from elsewhere.
Isopoda	*Pygolabis* `sp. Biologic-ISOP035`	YC1 and YC3 (hyporheos)	Potential SRE. Currently known only from Yandicoogina Creek.
Dragonflies and damselflies	*Ictinogomphus dobsoni*	YC4 (surface waters)	Near Threatened IUCN Red List.
	Hemicordulia koomina	YC4 (surface waters)	Vulnerable IUCN Red List.
	Austroagrion pindrina	YC3 (surface waters)	Vulnerable IUCN Red List.

Sources: Biologic 2024b, 2023c, 2022

7.3.3.6 *Other fauna*

The biological surveys for the Derived Proposal and surrounds also identified a variety of other native fauna taxa that are not of listed conservation significance. Whilst not of listed conservation significance, these other native fauna taxa contribute towards biological diversity.

Of note, the biological surveys for the Derived Proposal identified the presence of one vertebrate fauna that may be considered locally significant:

- Chocolate Wattled Bat (*Chalinolobus morio*).

The Chocolate Wattled Bat occurs in the southern part of Western Australia but has a restricted distribution (Churchill 2008 cited in Biologic 2017b). Weeli Wolli Spring and Marillana Creek represent the only two locations in the Pilbara where this species has been previously recorded and are the most northern localities for this species. Given its geographic separation from the main population in Western Australia, the Pilbara population may be genetically distinct.

Biological surveys for the Derived Proposal and surrounds recorded multiple locations of Chocolate Wattled Bat*;* occurring both within and beyond the Development Envelope. Chocolate Wattled Bat was recorded within the Gorge / Gully and Major Drainage Line fauna habitat types. The records for Chocolate Wattled Bat were from calls consistent with foraging individuals (Biologic 2017b), with the majority of records associated with the Yandicoogina Creek located to the east of the Derived Proposal, with a single record occurring within the Development Envelope (in association with the CMIN-02 Ghost Bat cave discussed above).

The assessment of the Strategic Proposal (BHP 2016a) did not consider the potential for impacts to Chocolate Wattled Bat. The approach to consider of the potential impact of the Derived Proposal to Chocolate Wattled Bat is consistent with the assessment outcomes for the Strategic Proposal, for which EPA (2018a) noted that fauna taxa occurring at a local scale will require consideration at the Derived Proposal stage (in addition to the significant fauna identified above).

7.4 Potential environmental impacts

In the PERSP (BHP 2016a), BHP identified and described potential impacts from the Strategic Proposal on Terrestrial Fauna. Table 7-7 identifies whether the Strategic Proposal potential impacts are relevant to the Derived Proposal.

Table 7-7: Terrestrial Fauna - relevant impacts identified in the Strategic Proposal

Strategic Proposal Potential impact	Strategic Proposal impact relevant to Ministers North Derived Proposal	Potential impacts from Ministers North Derived Proposal
Removal of vegetation and fauna habitats (direct)	Yes.	Development of the Derived Proposal will require the clearing of up to 1,848 ha of fauna habitat (native vegetation).
Surface water and groundwater alteration (indirect)	Yes (surface water only).	Mine infrastructure for the Derived Proposal may alter surface water flows to fauna habitat (native vegetation) that is reliant on surface water flows. The Derived Proposal does not include groundwater abstraction, and accordingly, impacts to fauna habitat (native vegetation) that is reliant on groundwater will not occur.
Permanent modification of landforms (indirect)	No. The Derived Proposal is not expected to impact fauna habitat from the modification or removal of natural landforms, or from the creation of artificial landforms, beyond the potential impact considered for the 'Removal of vegetation and fauna habitats' – see above.	N/A
Contamination of soils and water (indirect)	Yes.	The Derived Proposal has the potential both during construction and operations for contamination events to occur impacting on terrestrial and aquatic fauna habitat through contamination of soils and/or water.
Introduced species (indirect)	Yes.	Habitat clearing can enhance the ability of feral predators to move through the landscape and prey on native fauna. Operations may also attract introduced species (e.g. attracted to domestic waste, artificial water sources etc.).
Dust deposition (indirect)	Yes.	The Derived Proposal will generate air emissions of particulate dust during construction and mining operations. Dust deposition resulting from air emissions of particulate dust may have a potential to impact fauna habitat and fauna taxa in proximity to the Derived Proposal.
Interactions with mining-related infrastructure (indirect)	Yes.	The Derived Proposal will generate noise, light and vibration during construction and mining operations. Additionally, potential exists for fauna taxa to interact with mining areas and infrastructure (e.g. cleared land, vehicles).
Fire (indirect)	No. The Derived Proposal is not expected to alter the fire regime of the local area when managed in accordance with standard prevention and management measures for fire.	N/A

The potential impacts are discussed in relation to the Indicative Footprint, which represents the planned area of direct disturbance within the Development Envelope. Where relevant, the extent of the terrestrial fauna values within the broader Development Envelope and surrounds are also discussed in respect of the potential for indirect impacts.

7.4.1 Removal of fauna habitat (direct)

The clearing of up to 1,848 ha of fauna habitat by the Derived Proposal will result in the direct loss of terrestrial fauna values. Impacts to each fauna habitat type are identified in Table 7-8. Impacts at a regional level are low (no impacts above 1% BHP regional mapping, with the exception of Boulders/Rockpiles).

The various habitats provide critical and supporting habitat for a range of significant fauna, particularly the Ghost Bat, Northern Quoll and Pilbara Olive Python.

Ghost Bat critical habitat is typically represented by Category 1, Category 2 and Category 3 (in associated with Category 1 or 2 – e.g. apartment block) caves (none to be impacted by the Derived Proposal), as well as rocky outcrops (such as Gorge/Gully, Breakaway Cliff habitats). In addition, foraging habitat (e.g. sand plain, stony plain, Mulga woodland, drainage area/floodplain) within 12 km of the above caves are considered critical habitat.

Northern Quoll critical habitat is typically represented by denning and foraging habitat within the home range of low rocky hills - mesas, gorges, escarpments, ranges, breakaways, and boulder fields, or major drainage lines and tree-lined creeks. Supporting habitat is typically represented by Hill Crest/Hill Slope, Stony Plain and Sand Plain habitat types.

Pilbara Olive Python critical habitat is represented by rocky outcrops in proximity to deep gorges, gullies, and waterholes. Supporting habitat is typically connected to and associated with the critical habitat and represented by drainage lines and water courses (e.g. Major Drainage Line and Minor Drainage Line habitat types).

Consideration of critical and supporting habitat for these species have been summarised in Table 7-9. Offsets in relation to these habitat impacts are discussed in further detail in Section 13 Offsets.

Habitat features

A total of three caves occur within the Indicative Footprint and as such, will be impacted by the Derived Proposal (see Table 7-10). These three caves are consistent with Category 4 roosts for the Ghost Bat. In addition, a further four caves (three Category 4, and one Unsuitable) occur in close proximity to the Indicative Footprint (Table 7-10). Given the nature of the footprint being indicative, there remains a potential that these caves are also impacted by the Derived Proposal. As such the Derived Proposal has the potential to impact on six Category 4 roosts and one Unsuitable cave. The only two caves categorised as Category 3 have been excluded from the Indicative Footprint and protected via a MEZ (see Section 7.5).

All water features (pools) within the Development Envelope are ephemeral or semi-permanent. Despite this, they likely provide potential critical/supporting habitat for species such as Pilbara Olive Python and provide an important water source for fauna. BHP commit to avoiding all known/currently recorded water pools within the Development Envelope (see Table 5-3 in Section 5.3.3.2) and none are located within the Indicative Footprint. As such, there will be no significant direct impact to surface water pools as a result of the Derived Proposal.

A number of Western Pebble-mound Mouse records occur within the Development Envelope, with 36 records associated with the Indicative Footprint itself. Of these records, one was from an individual in pitfall trapping, with the remaining 35 records representing mounds. These mounds will be removed as part of the Derived Proposal. Of these, 22 were deemed “active” at the time of survey, with 12 classified as “inactive mounds” at the time of survey and the remaining one mound classified as “recently inactive”. As use changes over time, the number of mounds that are currently active or inactive, likely varies from the records discussed above. Nevertheless, this species’ habitat is considered widespread and common, and the species is also known to occur in four of the Pilbara conservation reserves. As such, clearing of habitat and 35 mounds is not anticipated to be significant.

Table 7-8: Impact to fauna habitats

Habitat Type	Extent within Indicative Footprint (ha)	Extent of habitat mapped within region (ha)[34]	% of impact to regional mapping extent
Hillcrest / Hillslope	1,518.0	225,085	0.7%
Undulating Low Hills	12.2	12,779	0.1%
Gorge / Gully	86.0	11,582	0.7%
Drainage Area / Floodplain	111.9	64,734	0.2%
Minor Drainage Line	48.9	11,521	0.4%
Medium Drainage Line	<0.1	1,443	<0.1%
Major Drainage Line	15.9	26,151	<0.1%
Breakaway / Cliff	13.6	3,341	0.4%
Boulders / Rockpiles	13.9	102	13.6%
Mulga Woodland Habitat	0.2	72,637	<0.1%
Sand Plain Habitat	0	93,895	0%
Sandy / Stony Plain	0	15,665	0%
Wetland	0.6	56	1%
Total fauna habitat	1,821	-	-
Cleared / Disturbed (including Rehabilitated Areas)	512.2 87.9 ha currently rehabilitated	-	-
No survey data[35]	26.8	-	-
Total area	2,360.2	-	-
Total area (rounded up)	2,360	-	-

[34] Sourced from BHP consolidated mapping database

[35] Coincides with overlapping third party operations and clearing

Table 7-9: Clearing of critical and supporting habitat

Significant residual impact	Critical and/or supporting habitats	Extent of impact (ha)
Clearing of critical habitat Ghost Bat	Gorge/Gully Breakaway/Cliff All foraging (supporting) habitat within 12km of CMIN-03 cave	256.8
Clearing of supporting habitat for Ghost Bat	Sand Plain Stony Plain Mulga Woodland Drainage Area/Floodplain Major Drainage Line Minor Drainage Line	19.7
Clearing of critical habitat for Pilbara Olive Python	Gorge/Gully Breakaway/Cliff	99.6
Clearing of supporting habitat for Pilbara Olive Python	Major Drainage Lines Minor Drainage Lines Boulders/Rockpiles	78.7
Clearing of critical habitat for Northern Quoll	Gorge/Gully Breakaway/Cliff Major Drainage Line Eucalypt Woodland	115.5
Clearing of supporting habitat for Northern Quoll	Hillcrest / Hillslope Stony Plain Sand Plain	1,518

Table 7-10: Ghost Bat roost impacts

Cave ID	Roost Category	Within Development Envelope	Within Indicative footprint
CMN-02	Category 3	Y	N (Protected within MEZ)
CMN-05	Category 4	Y	N (within 50-100 m of Indicative Footprint: potential impact)
CMNY-05	Category 3	Y	N (Protected within MEZ)
CMNY-06	Category 4	Y	N (within 50-100 m of Indicative Footprint: potential impact)
CMN-07	Category 4	Y	Y (to be impacted)
CMN-09	Category 4	Y	Y (to be impacted)
CMIN-01	Category 4	Y	N (within 50-100 m of Indicative Footprint: potential impact)
CMNY-01	Category 4	Y	Y (to be impacted)
CMNY-03	Unsuitable	Y	N
CMNY-04	Unsuitable	Y	N (within 50-100 m of Indicative Footprint: potential impact)

Short-range endemic fauna

As discussed in Section 7.3.3, no Confirmed SREs occur within the Development Envelope. The majority of clearing proposed by the Derived Proposal, occurs in widespread habitat types (e.g. Hillcrest/Hillslope), as opposed to those rich with microhabitats suitable for SRE taxa. Nevertheless, it is acknowledged that even in widespread habitats, microhabitats occur such as under rocks and leaf litter at the base of trees and shrubs. This highlights the importance of the isolated trees and shrubs for harbouring SRE taxa.

Of the potential SRE fauna identified within the Development Envelope; four taxa are currently only known from the Indicative Footprint:

- *Acanthodillo* `BIS523`
- *Austrohorus* `BPS524`
- *Beierolpium* 8/4 `BPS522'
- *Indolpium* `BPS528'.

Acanthodillo `BIS523` was identified as a new species, known from two individuals. The phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown. *Acanthodillo* `BIS523` was collected from a site near a waterhole nearby existing infrastructure at Yandi operations (Bennelongia 2024b). It is noted the area it was recorded was already relatively disturbed. It is therefore thought that its distribution extends into surrounding habitat and any impact to this species as a result of the Derived Proposal is likely non-significant.

Austrohorus `BPS524, *Beierolpium* 8/4 `BPS522 and *Indolpium* `BPS528` were all recorded from multiple locations within the Indicative Footprint, with linear ranges of between 3.4 and 4.45 km. These species were recorded within widespread habitat types (e.g. Undulating Low Hills and Hilllcrest/Hillslope), with habitat extending outside of the Development Envelope. *Austrohorus* `BPS524 is from a genus which typically includes widespread cosmopolitan

species, and *Beierolpium* 8/4 `BPS522 is from a genus that tends not to be SRE fauna. Given this, all species are expected to have wider distributions and not be at significant risk from the Derived Proposal.

In addition, there is one higher order taxa that is currently only known from one site within the Indicative Footprint: *Phryssonotu*s sp. indet.. It is possible that this record represents *Phryssonotus novaehollandiae,* which is a widespread species and not an SRE (Bennelongia 2024a). In addition, this record occurs in widespread habitat (Undulating Low Hills) which extends outside of the Indicative Footprint and Development Envelope. As such, this species is likely to have a wider distribution and not be at significant risk from the Derived Proposal.

7.4.2 Surface water alteration (indirect)

In assessment of the Strategic Proposal (BHP 2016a), the potential impacts to surface water were considered in the context of watercourse realignment to access ore deposits, excess water (from groundwater abstraction) being discharged into watercourses, and the development of water sources that may be accessed by fauna (both temporary operational water storage dams and permanent in-pit post-mining surface water). The assessment of the Strategic Proposal identified that the potential impacts to surface water would be avoided/minimised where practicable, with mitigation to be implemented through management and monitoring (including performance criteria where appropriate) to ensure that fauna habitat values are maintained.

The Derived Proposal may have a potential to affect terrestrial and/or aquatic fauna habitats from altered surface water regimes through:

- Installation of mine infrastructure including mine pits, the haul road (including creek crossings), OSA and stockpiles which have the potential to alter the condition of terrestrial and/or aquatic fauna habitat (i.e. native vegetation or surface water pool levels or quality) from:
  - a reduction of downstream surface water volumes
  - increased erosion or sedimentation contaminating waterways.
- Development of operational water storage dams (e.g. turkey's nests) that both native fauna and introduced fauna may seek to access.

The potential impact of the Derived Proposal to surface water and watercourses is discussed in further detail within Section 5.4. Impacts to terrestrial vertebrate and SRE invertebrate fauna, and aquatic fauna are described below.

Installation of mine infrastructure including creek crossings

The excavation of pits, construction of infrastructure, and creek crossings all have the potential to alter surface water regimes from changes to water quality, quantity, flow rates, and/or physical or biological attributes. This can subsequently result in degraded or modified fauna habitats including habitats for both terrestrial vertebrate and SRE invertebrate fauna and aquatic fauna. Terrestrial fauna habitats at risk of degradation from altered surface water regimes mainly include vegetation associated with Major, Medium or Minor Drainage Lines (including riparian vegetation) whereas surface water pools, which may provide habitat for both terrestrial and aquatic fauna, are at risk of changes to water quality or water levels.

Modelling of surface water flows (Stantec 2024) has identified that the interception of surface water flows by infrastructure (such as roads and mine pits) will result in surface water accumulation upslope (ponding/pooling), as well as a reduction in surface water flow to areas downslope (see Section 5.4).

Water accumulation upstream of infrastructure has the potential to degrade terrestrial vertebrate and SRE invertebrate fauna habitat by reducing the condition or composition of vegetation (described in Section 6.4.2). However, water accumulation upslope is expected to be highly localised and temporary and as such, is considered unlikely to affect the condition of any vegetation (and the associated fauna habitats) in the long-term.

Reduced flows downstream of infrastructure can result in negative impacts to terrestrial vertebrate and SRE invertebrate fauna habitat by altering vegetation health and change in composition from reduced water availability.

However, as described in Section 6.4.2, there are no vegetation types (or associated fauna habitats) that are surface water dependant or sensitive to surface water changes, and no Mulga or sheet flow dependant vegetation present within the Development Envelope. Reduced water flows downstream of infrastructure are therefore unlikely to significantly impact terrestrial vertebrate or SRE invertebrate fauna habitats.

As discussed in Section 5.4.1, a reduction in surface water flows extending to the Yandicoogina Gorge catchment are minimal, and as such potential indirect impacts to the vegetation associations and associated vertebrate and SRE invertebrate fauna habitats in the gorge are unlikely to be significant.

A reduction in surface water flows also has the potential to impact surface water features. Surface water features WMN1-WMN4 are located within a MEZ where they will not be directly impacted by mining operations. However, the reduction in catchment (described in Section 5.4.1) will impact on flow volumes that intersect these pools. Whilst these pools may provide important habitat for significant fauna including the Pilbara Olive Python, Northern Quoll and Ghost Bat, they are unlikely to provide significant habitat for aquatic fauna given their ephemeral nature. The pools are all relatively shallow with depths of 0.5 m or less (Astron 2025). It is predicted that the waterway supporting these pools will be reduced during operations and closure. This may result in a small reduction in water levels in these pools; however, the reduced flow depth is expected to continue to be able to fill the pools during rainfall events and maintain the ephemeral nature of the pools in these locations (Section 5.4.1).

Pools within Yandicoogina Creek and Gorge (WMN-7, WMN-2 and YC1-YC4) will be impacted by a 1% reduction in catchment size. The pools provide critical and supporting habitat for significant vertebrate fauna and support a diverse and unique aquatic fauna assemblage. Whilst the pools are likely to also provide suitable habitat for SRE invertebrates, no Confirmed SREs have been recorded to date. As described in Section 5.4.1, the loss in catchment at Yandicoogina Creek and Gorge is equivalent to rainfall reduction of less than 4 mm in a location that has historical rainfall varying between 85 mm and 975 mm. This reduction is considered minor and unlikely to significant impact any of the aquatic fauna values within Yandicoogina Creek or Gorge.

Consistent with BHP practices for its Pilbara iron ore mine operations, surface water for the area of the Derived Proposal can be appropriately managed through standard engineering design and infrastructure including culverts, earthen bunds and swale drains. The purpose of the engineering design and infrastructure will be to allow for surface water flows to not be impeded (where practicable) to ensure an environmental outcome of local surface water flows being maintained, as well as a mining outcome for infrastructure to remain operational (e.g. not inundated by water).

As discussed in Section 5, sediment basins are also proposed to minimise impacts to waterways from sedimentation. Sediment basins are proposed (indicative locations) in proximity to the north pit and the Ghost Bat MEZ which in turn minimise indirect risk to the four water features protected within the MEZ.

Development of operational water storage dams

The Derived Proposal includes the installation of multiple temporary turkey's nests during construction (particularly along the haul road route), and the installation of a long-term turkey's nest located at the NPI during operations (noting this will be decommissioned at closure). As turkey's nests are a water source, there is the potential for both native and introduced fauna to seek to access. All turkey's nests will be fenced to restrict fauna access and the permanent turkey's nest at the NPI will have fauna egress points to ensure fauna entrapment risk is minimised.

7.4.3 Contamination of soils and water (indirect)

During construction and operation, the Derived Proposal has the potential to contaminate soils and water due to spills of hazardous materials and waste. Further, the Derived Proposal has the potential to impact surface water quality sediment laden runoff from the OSA or stormwater collected within mine pits increasing turbidity, or from sediment loading to downstream drainage lines as a result of ground disturbance. A reduction in water quality has the potential to result in a degradation of native vegetation or surface water pools, and the associated terrestrial and aquatic fauna habitats.

The potential impact of the Derived Proposal in relation to contamination of waterways (groundwater and surface water) is discussed in further detail within Section 5.4.2 and Section 5.4.3. Overall, given the proposed management and mitigation described in Section 5.5, impacts to surface or groundwater quality is not anticipated to be significant.

7.4.4 Introduced fauna (indirect)

Surveys for the Derived Proposal have recorded multiple introduced fauna species including, European cattle (**Bos taurus*) and feral cats (**Felis catus*) (Biologic 2017b, Biologic 2018a, GHD 2021b, Astron 2025). Areas of poorer vegetation condition (and subsequently fauna habitat) were recorded in the areas of the Marillana Creek and the Yandicoogina Creek related in part to cattle grazing. It should be noted cattle are managed under pastoral lease.

Habitat clearing can enhance the ability of feral predators to move through the landscape and prey on native fauna. Construction and operation of mining activities can also introduce and attract feral predators. Introduced fauna species may affect native fauna through direct predation, competition for food and shelter, habitat destruction and the spread of diseases.

7.4.5 Dust deposition (indirect)

The assessment of the Strategic Proposal (BHP 2016a) identified that particulate air emissions would be monitored and managed through measures including ore and waste moisture management, exposed surface management (i.e. dust suppression), ambient air monitoring and the progressive rehabilitation of cleared areas. The focus of the Strategic Assessment in relation to particulate air emissions was the potential for effects to nearby human receptors (e.g. Newman Townsite) rather than to biological receptors.

Fauna are typically not considered as a dust receptor given their ability to move away from emission sources. Whilst noting this, Bat Call WA (2021) identifies particulate air emissions may be relevant to the Ghost Bat, as high dust levels may have a potential to irritate eyes and reduce visual acuity.

There is also a perception that dust deposition on the surfaces of native vegetation can affect plant health and survivorship (and in turn impact on fauna habitat). As discussed in Section 9, air quality modelling was undertaken for the Derived Proposal. ETA (2024) modelled the potential risk of dust deposition from the Derived Proposal to vegetation (using 7 g/m^2/month as an indicative criterion for potential effects on vegetation). Modelled monthly dust deposition at the various receptors, as a result of the Derived Proposal in isolation, is predicted to be below this criterion (0.01 to 0.29 g/m^2/month). It is therefore not expected that dust emissions from the Derived Proposal will represent a significant indirect risk to fauna.

Consistent with the assessment of the Strategic Proposal (BHP 2016a), particulate air emissions from the Derived Proposal are proposed to be managed and monitored through BHP's normal business practices and targeted management measures, including ore and waste moisture management, exposed surface management (i.e. dust suppression), ambient air monitoring and the progressive rehabilitation of cleared areas. The implementation of both BHP's normal business practices and the targeted management measures can be expected to ensure that particulate air emissions from the Derived Proposal do not result in a significant impact to fauna or fauna habitat (native vegetation).

7.4.6 Interactions with mining-related infrastructure and activities (indirect)

The assessment of the Strategic Proposal (BHP 2016a) acknowledged that elevated noise, vibration and light can impact on fauna, typically in the form of changes to behaviour resulting in avoidance of, or attraction to, the mining areas. Noise, vibration and light associated with continuous mining operations may cause fauna to move away from their adjacent fauna habitat areas. Conversely, lighting may also attract some fauna (e.g. flying invertebrates like moths, which in turn, may also attract feeding nocturnal fauna).

The Derived Proposal may have a potential to affect fauna habitats adjacent to the mining operations through:

- Vibration and noise from activities such as blasting, excavation, loading and haulage

- Continuous lighting from mining operations
- Physical interaction with vehicles and/or mining infrastructure.

For the Derived Proposal, it can be expected that impacts will be greatest in closest proximity to the mining operations, with the impact potential decreasing with an increasing distance from the mining operations. Accordingly, the potential impacts to fauna are anticipated to be localised (i.e. within a few hundred metres), with any impacted fauna moving into adjoining areas of fauna habitat away from vibration and noise.

Injury or mortality of fauna can result from collisions with vehicles and machinery during construction and operation of the Proposal, especially with species that are attracted to cleared areas for basking or foraging activities, or at night when nocturnal fauna actively forage. The use of barbed wire fencing may result injury or mortality from fauna becoming entangled, particularly for Ghost Bats which are low flying.

Overall, impacts associated with interactions with vehicles, machinery or mining infrastructure are likely to be minor, limited to individuals, and unlikely to impact any species at regional or species level, particularly given that most significant species (if present) occur at low densities within the Development Envelope.

7.5 Mitigation

7.5.1 Avoid

7.5.1.1 *Ghost Bat caves*

Two identified Category 3 Ghost Bat roosts, occur in close proximity to the north pit. As part of the avoidance step in the mitigation hierarchy, BHP has applied a MEZ (see Figure 7-6 and Table 7-11) to protect both roosts and connecting habitat (including protecting 7 ha of Gorge/Gully habitat) to ensure direct impacts to these caves are avoided.

Table 7-11: Ghost Bat roost management

Cave ID	Ghost Bat Roost Category (Category 1-4)	Mining Exclusion Zone (MEZ) (Yes / No)	Blast Management Measures (Yes / No)
CMN-02	Category 3	**Yes** 100 m exclusion around roost for any new disturbance. MEZ extended to include Gorge/Gully (7 ha) fauna habitat connecting to roost CMNY-05.	**Yes** 500 m blast management area around roost. Mine pit blasting vibration limits as per Terrestrial Fauna EMP.
CMNY-05	Category 3	**Yes** 100 m exclusion around roost for any new disturbance. MEZ extended to include Gorge/Gully fauna habitat connecting to roost CMN-02.	**No** **Not applicable** - roost is located > 500 m from mine pits.

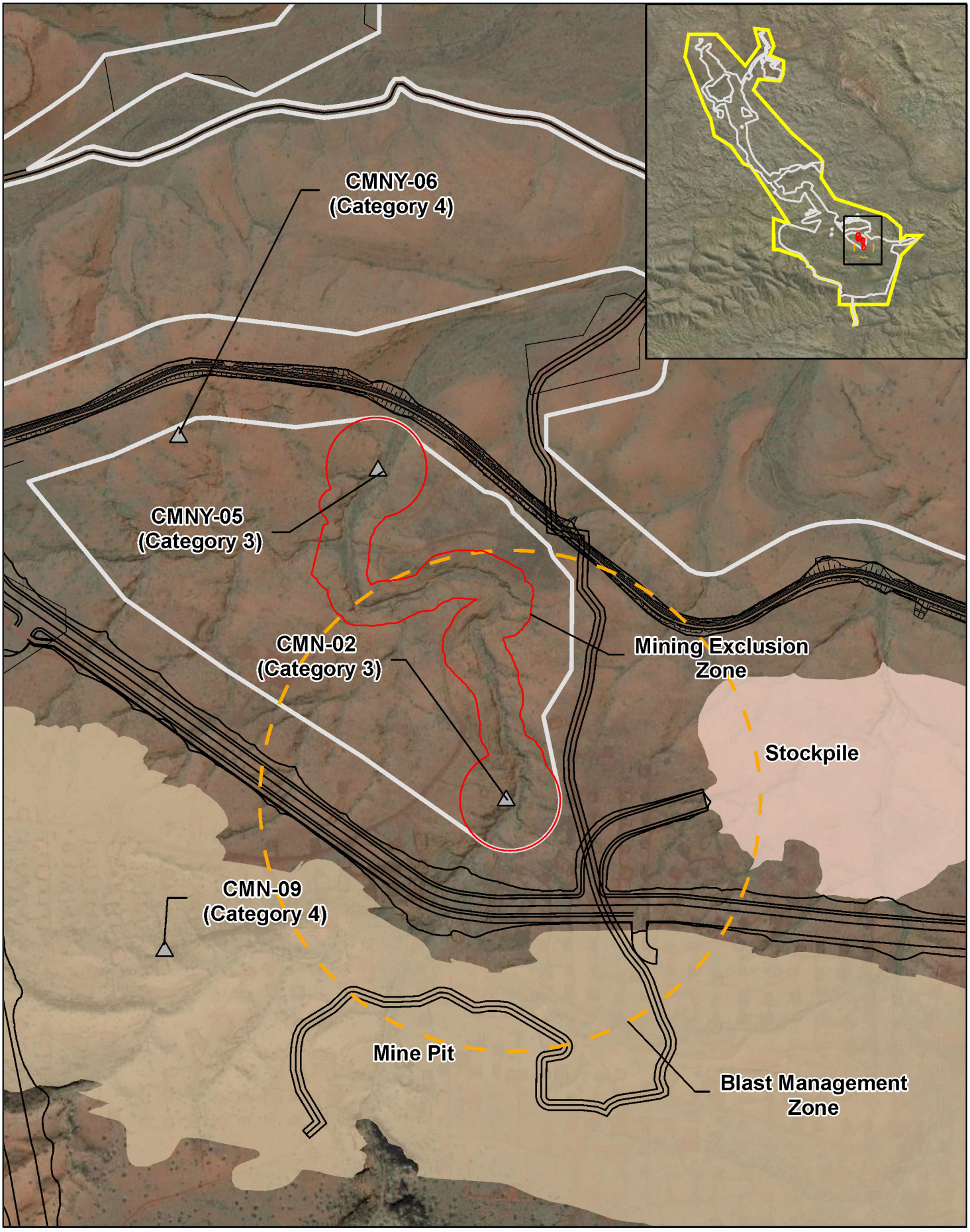
7.5.1.2 *Water features*

Four ephemeral waterholes were recorded in Gorge/Gully habitat in proximity to two Category 3 Ghost Bat caves. These waterholes have been encompassed within the proposed Ghost Bat MEZ. As such, these water features will be avoided. More broadly, BHP commits to not clearing any of the currently known/recorded waterholes (temporary/permanent) within the Development Envelope (see Table 5-3 in Section 5.3.3.2).

7.5.1.3 *Western Pebble-mound Mouse*

BHP commits to avoiding 29 Western Pebble-mound Mouse mounds within the Development Envelope, through the implementation of Western Pebble-mound Mouse exclusion zones (Figure 7-7). Of these, 25 were deemed “active” at the time of survey.

BHP’s internal permitting process will include consideration of Western Pebble-mound Mouse locations. Where practical, BHP will avoid impact to active Western Pebble-mound Mouse mounds in addition to those identified in the exclusion zones.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Roost (cave) for Ghost Bat *Macroderma gigas* (EPBC-V, BC-V)
- Mining Exclusion Zone - 100m Radius and Gorge/Gully Fauna Habitat
- Blast Management Zone - 500m Radius
- Conceptual Infrastructure Layout
- Mine Pit
- Stockpile

N

0 0.1 0.2 0.3

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
MANAGEMENT OF CATEGORY 3
GHOST BAT CAVES

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

SCALE @A4:	1:10,000	REQUESTOR:	PROJECTS	FIGURE:	7-6
DATE:	31/07/2025	PREPARED:	GEOMATICS	NO:	A1317-014 RevF
		REVIEWED:			

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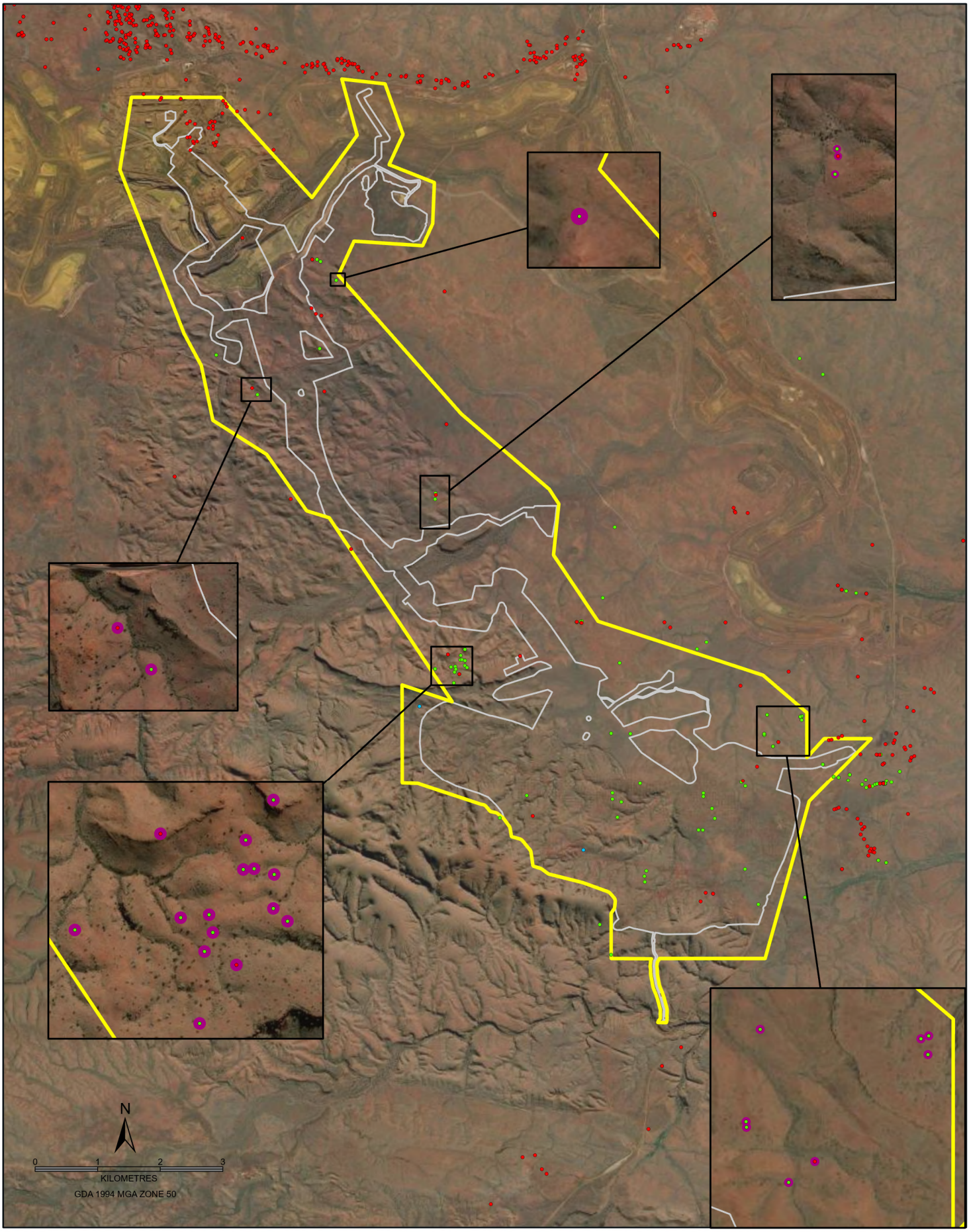

Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Western Pebble-mound Mouse 10m Avoidance Area

Western Pebble-mound Mouse Records

- Individual (alive)
- Mound (active)
- Mound (inactive / recently inactive)

BHP

PUBLIC

MINISTERS NORTH
WESTERN PEBBLE-MOUND MOUSE RECORDS

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	7-7
DATE:	1/09/2025	PREPARED:	GEOMATICS	NO:	A1317-058_RevD
		REVIEWED:			

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7.5.2 Minimise

Consistent with MS1105 *Guidelines for submitting a derived proposal* (1(b)), the results from the targeted surveys (Section 6.3.1) were used to design the proposed mine and infrastructure to minimise disturbance to terrestrial fauna values occurring within the Development Envelope.

Initial mining planning included a mine road (for ore haulage) to the north of the mine pits which passed between two Category 3 roosts for the Ghost Bat. The location of the mine road was optimal for mine planning, noting the absence of sufficient area for the mine road between the mine pit and the southern Category 3 roost (without resulting in the mine road being immediately adjacent to the roost itself). Whilst this mine road would not remove the Category 3 roosts, the mine road traversing between the roosts would fragment the landscape between the two roosts, and impact habitat the species may be reliant on (e.g. through the removal of the surface water features and habitat). This was considered to be an unacceptable outcome due to the risk of indirect disturbance to Ghost Bat individuals. In order to minimise the potential for impact to Ghost Bat, BHP has amended both its mine layout and mine scheduling in regard to this mine road so that it does not travel between the two caves (see Figure 7-8). The separation distance between the mine road and the southern Category 3 roost was increased to approximately 150 m.

This change substantially minimises the risk of disturbing Ghost Bats occupying the Category 3 roosts. Additionally, the realignment avoids surface water features potentially utilised by Ghost Bats as a water source.

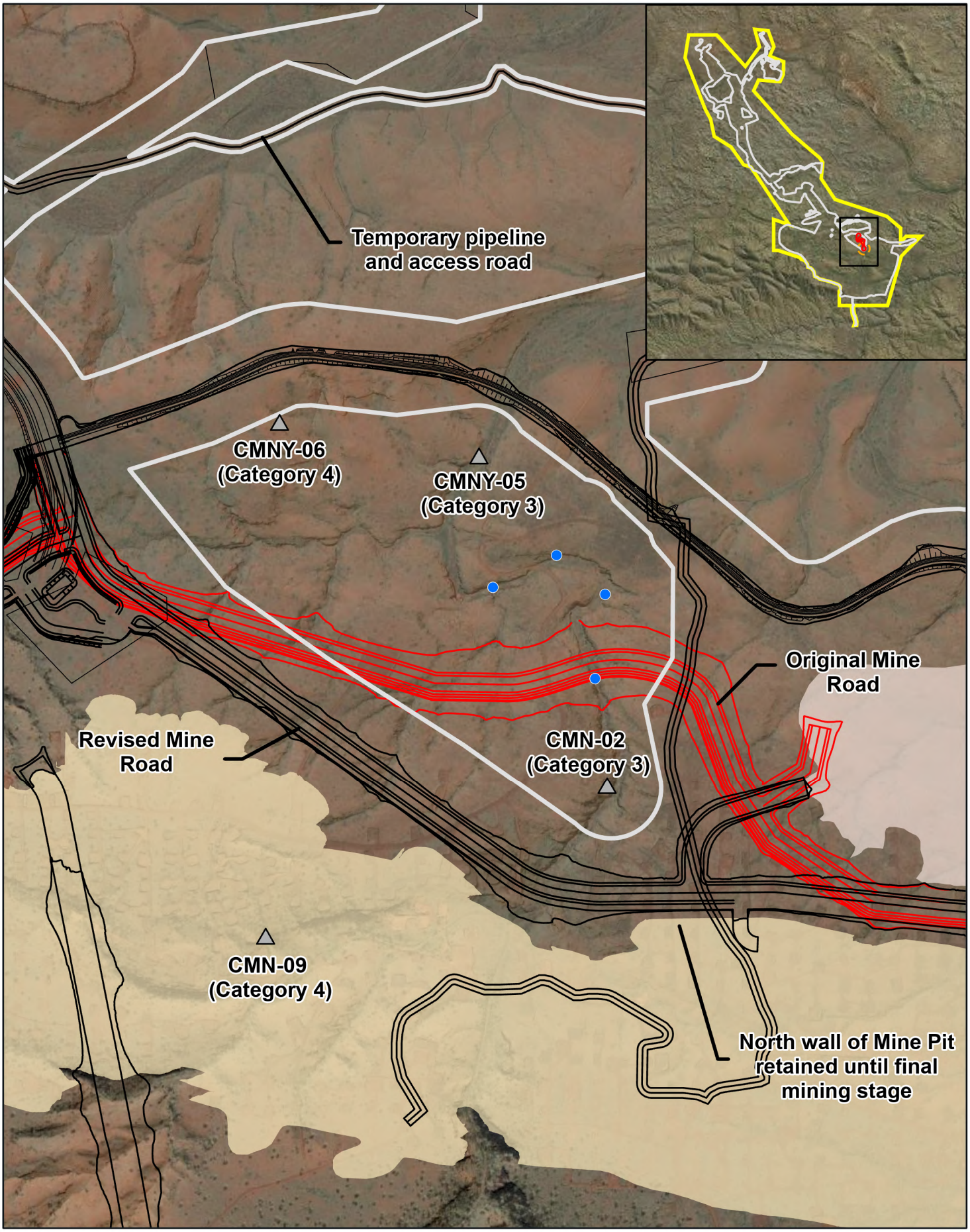
As discussed in Section 7.4.1, three Category 4 Ghost Bat roosts (CMN-07, CMN-09, CMNY-01) will be cleared, with an additional four (CMN-05, CMNY-06, CMIN-01, CMNY-04 (unsuitable)) with the potential to be impacted. While it is considered unlikely that Ghost Bat will be present in the caves at the time of impact (as these caves are potentially used as nocturnal or feeding roosts only), the caves will be inspected prior to disturbance to avoid impacting individual bats. If present, bats will be displaced from the cave and the cave entrance sheeted (if required) to ensure bats cannot re-enter the cave. If the cave entrance cannot be sheeted, deterrents (e.g. light, noise) will be used.

The MEZ and mine blasting will be managed in accordance with the Terrestrial Fauna Environmental Management Plan (Appendix 10). This plan also includes additional mitigation measures (to those measures described above) to manage terrestrial fauna more broadly. These measures include:

- site personnel to complete a site induction which includes information on the conservation significant fauna
- limiting vehicle speeds on unsealed roads to minimise the risk of collision with conservation significant fauna
- fencing turkey's nests to restrict fauna access and maintaining fauna egress points, where necessary (i.e. long-term turkey's nests), to minimise fauna entrapment risks
- minimising risk of injury or mortality to Ghost Bats from entanglement in barbed wire fencing by avoiding the use of barbed wire fencing within the Development Envelope as far as practicable, except where required by legislation. In addition, BHP will install bat reflectors where barbed wire fencing is required.

As discussed in Section 5, sediment basins are proposed (indicative locations) in proximity to the north pit and the Ghost Bat MEZ, which in turn minimise indirect risk to the four water features protected within the MEZ. The Derived Proposal has also included a number of commitments which aim to mitigate potential risks to water quality (and in turn, indirectly mitigates risks to aquatic fauna) and this is discussed in more detail in Section 5.

During mine design and planning phases, opportunities to minimise potential light-related impacts on fauna, will be considered. This may include evaluating lighting needs, placement, intensity, directionality and spectral characteristics in proximity to various fauna habitat types, and in consideration of other factors such as health and safety and regulatory requirements.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Conceptual Infrastructure Layout
- Mine Pit
- Stockpile
- Conceptual Infrastructure Layout - Original Mine Road (not proposed)
- Roost (cave) for Ghost Bat *Macroderma gigas* (EPBC-V, BC-V)
- Surface Water Feature (temporary, non-permanent)

N

0 0.1 0.2 0.3

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH

REALIGNMENT OF MINE ROAD FOR GHOST BAT

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:10,000	REQUESTOR:	PROJECTS	FIGURE:	7-8
DATE:	31/07/2025	PREPARED:	GEOMATICS	NO:	A1317-015 RevG
		REVIEWED:			

Document Path: Y:\Jobs\A1001_A1500\A1317\3Project\A1317_015_E_MNERD_RoadRealignmentforGhostBat_RevA.aprx

7.5.3 Rehabilitate

All areas of new land disturbance by the Derived Proposal will be rehabilitated with native vegetation (fauna habitat), with the exception of the final pit voids. The haul road route will be rehabilitated, including removal of culverts and all other infrastructure associated with the haul road, with the aim of returning land to pre-disturbance drainage and topography where practicable[36].

BHP will implement the Ministers North MCP (Appendix 12) to meet the environmental objective for the Derived Proposal to be decommissioned and the site rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.

BHP has prepared a Rehabilitation Report (Appendix 4) to outline BHP's progress towards rehabilitation for the Pilbara mining operations. The Rehabilitation Report is submitted in accordance with the Guidelines contained within the MS1105 approval for the Strategic Proposal.

7.5.4 Offset

BHP has sought to minimise the potential impact of the Derived Proposal on terrestrial fauna values as far as practicable (consistent with the Mitigation Hierarchy steps of avoidance, minimisation and rehabilitation). However, the loss of critical and supporting habitats for species known to occur in proximity to the Development Envelope likely represents a significant residual impact. BHP will provide offsets to counterbalance this impact.

Further information this environmental offset (including offset calculations) is outlined within Section 13.

7.5.5 Other statutory decision-making processes

The EPA (2021d) document *Taking Decision Making Processes into account in EIA: Interim Guidance* identifies that the EPA may consider other statutory decision-making processes which can mitigate the potential impacts of a proposal on the environment, having regard to the ability and processes of a DMA, the conditions that may be applied, and the likely environmental outcomes.

In consideration of the Environmental Factor of Terrestrial Fauna and the EPA (2021d) guidance, BHP considers the following State and Commonwealth statutory decision-making process are relevant to mitigate and control the potential environmental impacts of the Derived Proposal on terrestrial fauna values:

- *Environment Protection and Biodiversity Conservation Act 1999* (Cth)
- *Biodiversity Conservation Act 2016* (WA).

BHP's mining operations in the central Pilbara are subject to a 'Strategic Assessment' under the Commonwealth EPBC Act. The Approval Decision covers activities within the area of the Strategic Assessment, with the relevant 'Program Matters'. In accordance with the *Pilbara Strategic Assessment Assurance Plan and Offsets Plan* and the *Pilbara Strategic Assessment Program*, BHP administers a validation process to determine whether an activity (action) will have an impact on Program Matters, based upon agreed 'Notifiable Action Trigger' criteria. BHP has assessed the Derived Proposal in accordance with the *Pilbara Strategic Assessment Assurance Plan and Offsets Plan* and the *Pilbara Strategic Assessment Program*. BHP has determined the Ministers North proposed action to be a Notifiable Action with a requirement to prepare and submit a Validation Notice. Accordingly, BHP proposes to prepare a Validation Notice with submission to DCCEEW prior to implementation.

Section 40 of the BC Act (WA) identifies that the taking of, or disturbance to, listed Threatened fauna requires a Licence to be granted by the Minister for Environment (or typically, as delegated by the Minister to DBCA). BHP will consider requirements under the BC Act (WA) prior to implementation.

[36] Road cuttings would remain in place, with the remainder reprofiled and contoured to natural topography where practicable.

7.6 Validation of impacts and environmental outcome

BHP has validated the impacts to Terrestrial Fauna from the Derived Proposal against the Strategic Proposal, assuming relevant mitigation measures identified in Section 7.5 have been applied, to demonstrate that the environmental objective identified in MS1105 Condition 8, can be met.

Following mitigation, BHP considers that there will be significant impacts on Terrestrial Fauna from the Derived Proposal (as discussed above).

Table 7-12 summarises the residual impacts and environmental outcomes for Terrestrial Fauna and demonstrates consistency with MS1105 condition objectives.

Table 7-12: Terrestrial Fauna - environmental outcomes and proposed regulation and monitoring

Derived Proposal residual impact	Derived Proposal environmental outcome	Consistency with Strategic Proposal MS1105 condition objectives
Clearing of up to 1,848 ha of fauna habitat; including: • Critical habitat and supporting habitat for Ghost Bat, Pilbara Olive Python and Northern Quoll.	Contributes to the cumulative clearing of fauna habitat in the Pilbara bioregion. Ghost Bat MEZ resulting in protection of: - Two Category 3 Ghost Bat roosts - Four waterholes - 7 ha of Gorge/Gully habitat All currently recorded waterholes within the Development Envelope will be avoided. Avoidance of Western Pebble-mound Mouse mounds within the Development Envelope through implementing exclusion zones.	Condition Objectives: 8-1 The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) protect terrestrial fauna so that biological diversity and ecological integrity are maintained, and in particular: (a) maintain the local and regional populations of terrestrial fauna taxa that are listed as threatened or specially protected under the relevant legislation; (b) avoid and minimise direct and indirect impacts on the habitat of terrestrial fauna that is specially protected under the relevant legislation; (c) avoid and minimise direct and indirect impacts on terrestrial fauna listed as priority fauna, and its habitat; and (d) avoid and minimise direct and indirect impacts on conservation significant short-range endemic fauna. Through the application of the mitigation hierarchy, impacts to terrestrial fauna including Threatened and Priority fauna have been minimised such that the local and regional populations are maintained. Clearing of habitat suitable for SREs does occur, however, no conservation significant species of SRE were recorded, and species were recorded in habitat types that extend outside of the Indicative Footprint and Development Envelope. As such no significant residual impact to SRE fauna is anticipated. The significant residual impact to critical and supporting habitat for conservation significant fauna are counterbalanced through the provision of offsets which ensures the above objectives can be met. Subject to application of the implementation conditions of the MS1105 approval (including offsets), the EPA's objective for the Environmental Factor of Terrestrial Fauna can be met.

7.7 Implementation conditions

BHP considers that the following conditions relating to the Environmental Factor of Terrestrial Fauna as set out in the MS1105 approval for the Strategic Proposal should apply to the Derived Proposal:

- Condition 6: Condition Environmental Management Plans
- Condition 8: Terrestrial Fauna Environmental Management Plan
- Condition 15: Rehabilitation and Decommissioning
- Condition 16: Offsets.

BHP has assessed the existing implementation conditions of the MS1105 approval for the Strategic Proposal in relation to their application for the Derived Proposal. BHP has concluded that the above implementation conditions are appropriate to be applied to the Derived Proposal.

8 Subterranean Fauna Validation

8.1 EPA environmental factor and objective

The EPA (2023a) objective for the Environmental Factor of 'Subterranean Fauna' is:

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

This objective is generally consistent with the objective considered for Subterranean Fauna within the assessment of the Strategic Proposal (EPA 2018a).

8.2 Relevant policy and guidance

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

Table 8-1: Subterranean Fauna - policy and guidance

EPA, other State and Commonwealth policy and guidance	Consideration of EPA policy and guidance
Environmental Factor Guideline - Subterranean Fauna (EPA 2016h)	• Identified the subterranean fauna values, and their significance • Identified activities that can impact on subterranean fauna values • Considered the links with other environmental factors (Inland Waters) • Applied the relevant considerations for potential environmental impacts
Technical Guidance - Subterranean Fauna Surveys for Environmental Impact Assessment (EPA 2021e) *Technical Guidance - Sampling Methods for Subterranean Fauna* (EPA 2016g)	• Surveys were undertaken in accordance with the relevant guidance

8.3 Receiving environment

8.3.1 Studies and surveys

In assessment of the Strategic Proposal, BHP (2016a) considered the following information sources for the assessment of the potential impacts to subterranean fauna values:

- Bennelongia (2015) *Strategic Environmental Assessment: Description of Regional Subterranean Fauna*.

As per the requirements of MS1105 *Guidelines for submitting a derived proposal 1(a)*, targeted surveys have been undertaken for the Derived Proposal (see Table 8-2). The location and extent of the biological surveys are identified by Figure 8-1.

Table 8-2: Subterranean Fauna - supporting studies

Title	Survey date/phases	Survey summary	Appendix
Biologic (2025) *Ministers North Troglofauna Habitat Model and Impact Assessment*	N/A	Troglofauna habitat assessment (based on 2D information and 3D habitat modelling) and impact assessment of 19 potentially restricted troglofauna taxa, to determine the suitability, extent, and connectivity of suitable troglofauna habitats and troglofauna distributions within and extending beyond the proposed pits.	Appendix 8
Bennelongia (2024c) *Ministers North Subterranean Fauna Survey*	Three Phase: Apr – May 2023 July – Aug 2023 Nov 2023 – Feb 2024	A relatively depauperate stygofauna community of 117 specimens representing six species were recorded. In contrast, a rich assemblage of troglofauna species comprising 1551 troglofauna specimens belonged to at least 47 species, of which 19 represent new, undescribed species, were recorded.	Appendix 8
Bennelongia (2021) *Ministers North targeted troglofauna survey*	One Phase: November 2020 – February 2021	Targeted troglofauna survey to determine distributions of two potentially restricted troglofauna species: *Palpigradi* sp. B24 and *Hanseniella* sp. B43-DNA. Methods included scraping and setting traps. Fourteen species of troglofauna were collected. Neither of the targeted species was collected.	Appendix 8
Bennelongia (2018) Ministers North Subterranean Fauna Survey	Two Phases: Oct – Dec 2017 Mar – May 2018	A study consolidating subterranean fauna survey results dating back to 2009 and including additional baseline sampling for both stygofauna and troglofauna in 2017-2018. In total, 47 specimens belonging to seven species of stygofauna and 386 specimens belonging to 39 species of troglofauna were collected from Ministers North and its immediate surrounds, including historic and recent surveys.	Appendix 8
Subterranean Ecology (2010) Pilbara Regional Subterranean Fauna Survey Area C North Mining Area - Ministers North	Two Phases: Feb to May 2009 Feb to Apr 2010	Stygofauna were not detected in any of the sampled drill holes during this survey, whereas 24 species of troglofauna were collected, including 16 species only known from the Ministers North area.	Appendix 8
Bennelongia (2025) *Yandi Targeted Subterranean Fauna Survey Report*	One Phase: March to May 2024	Targeted sampling survey targeting two species of stygofauna (*Elaphoidella* `BHA342`, and *Parastenocaris* `BHA343) and five species of troglofauna (*Hanseniella* sp. indet., *Hesperanillus* `BCO247`, *Cryptops* `BSCOL091`, and Haplodesmidae `BDI080` and Trigoniulidae `BDI079`). The targeted survey and subsequent molecular work resulted in the additional collection and/or reclassification of three of the target species.	Appendix 8

Title	Survey date/phases	Survey summary	Appendix
Bennelongia (2024d) *Yandi Operations Subterranean Fauna Survey Report*	Three Phase: 9 – 11 May 2022 13 – 15 Sep 2022 7 – 9 March 2023	During the survey, 1,171 specimens belonging to at least 35 species of stygofauna were collected and 94 specimens belonging to 34 species of troglofauna were collected.	Appendix 8

8.3.1.1 Methods and sampling effort

Methods used in all of the subterranean fauna studies, including those dating back to 2009, include troglofauna litter traps and scraping, and stygofauna net hauls. Troglofauna traps were set for a minimum of eight weeks during all the surveys.

Sampling effort within the Development Envelope and wider region has been extensive and dates back to 2009 (Subterranean Ecology 2010; Bennelongia 2018). Sampling effort is summarised in Table 8-3 and shown on Figure 8-2 and Figure 8-3. For troglofauna, 265 drill holes have been sampled inside and 121 drillholes sampled outside the direct impact areas (i.e. the proposed mine pits; Table 8-3; Figure 8-2). For stygofauna, 131 samples from 75 drillholes have been collected across the Development Envelope (Table 8-3; Figure 8-3).

Recent subterranean fauna survey work included the collection of 75 stygofauna samples and 285 troglofauna samples over three rounds of survey within the Development Envelope, in accordance with the EPA guidance (Bennelongia 2024c, d). Overall, the consolidated sampling effort for subterranean fauna is considered sufficient and in line with EPA guidance requirements (EPA 2016h, 2016g, 2021e).

Table 8-3: Subterranean fauna - summary of subterranean fauna sampling effort at Ministers North

Area	Stygofauna sampling effort		Troglofauna sampling effort		
	Number of sample sites	Number of samples	Number of sample sites	Number of scrapes	Number of traps
Ministers North Development Envelope	75	131	386	537	766
Within mine pits (troglofauna only)	-	-	265	371	559
Outside mine pits (troglofauna only)	-	-	121	121	207
Regional sites within 5 km of Development Envelope	72	468	37	37	50

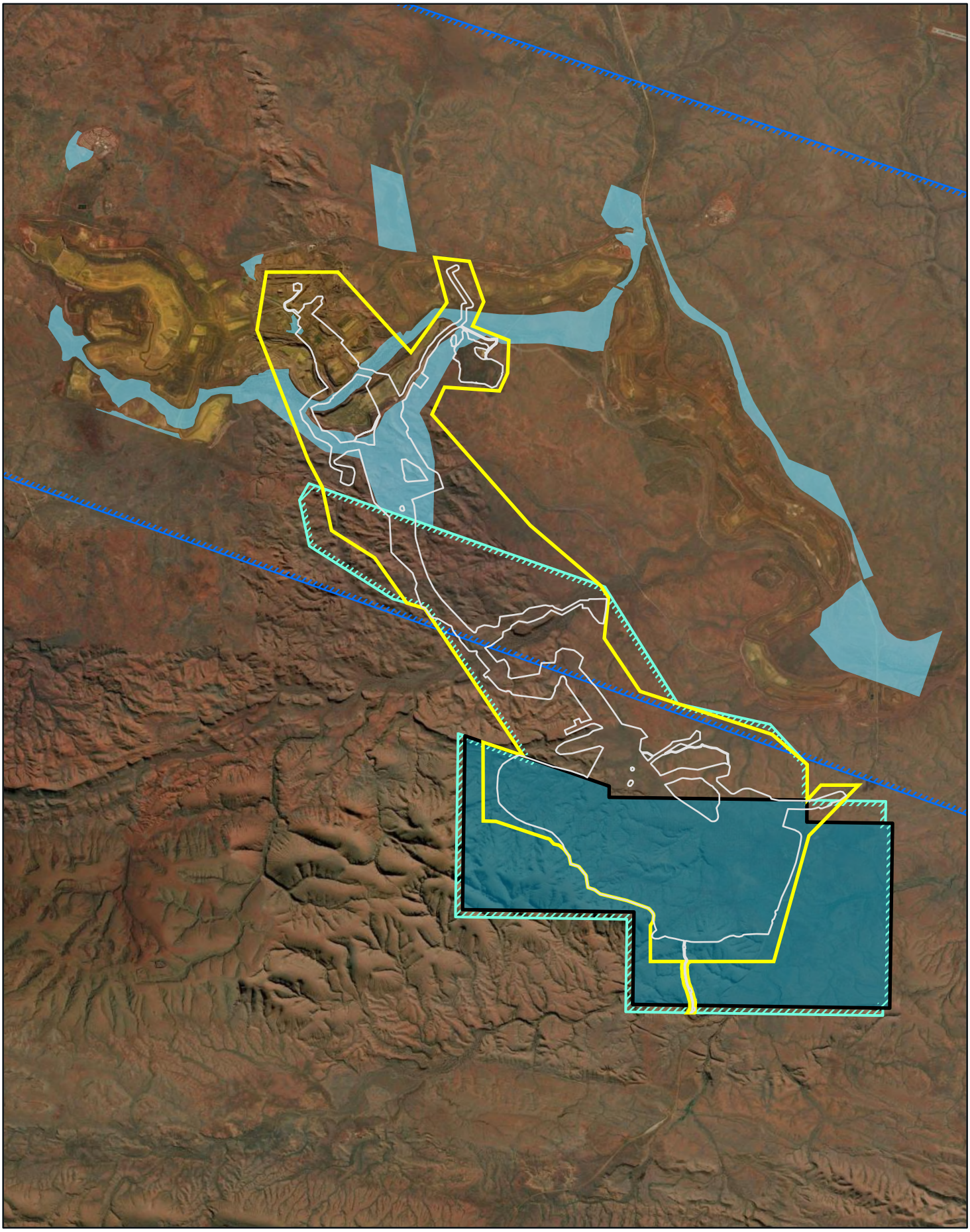
Sources: Bennelongia (2018, 2021, 2024c, 2024d, 2025) and Subterranean Ecology (2010)

8.3.1.2 *Survey assumptions and limitations*

No specific survey limitations were reported during any of the surveys listed in Table 8-2. However, as with most subterranean fauna surveys, paucity in taxonomic knowledge and artefacts of sampling were limiting factors in all studies due to the following:

- Most species are not formally described
- Data on wider distributions for many species is incomplete, largely due to the low abundance that these species are recorded at
- Relationships between mapped habitat and distribution of individual species is often uncertain due to a lack of information about species' habitat preferences and relatively broad geological information.

To reduce limitations associated with lack of taxonomic knowledge, all the studies included a combination of morphological identification and molecular analysis. The combined surveys included 12 phases of survey undertaken during both dry and wet seasons and were undertaken in accordance with EPA guidance relevant at the time of survey (EPA 2021e).



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Bennelongia (2018) Ministers North Subterranean Fauna Survey
- Bennelongia (2021) Ministers North targeted troglofauna survey
- Bennelongia (2024c) Ministers North Subterranean Fauna Survey
- Bennelongia (2024d) Yandi Operations Subterranean Fauna Survey Report
- Bennelongia (2025) Yandi Targeted Subterranean Fauna Survey Report

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BHP

PUBLIC

MINISTERS NORTH
KEY SUBTERRANEAN FAUNA SURVEYS

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:100,000	REQUESTOR:	PROJECTS	FIGURE:	8-1
DATE:	20/08/2025	PREPARED:	GEOMATICS	NO:	A1317-034 RevB
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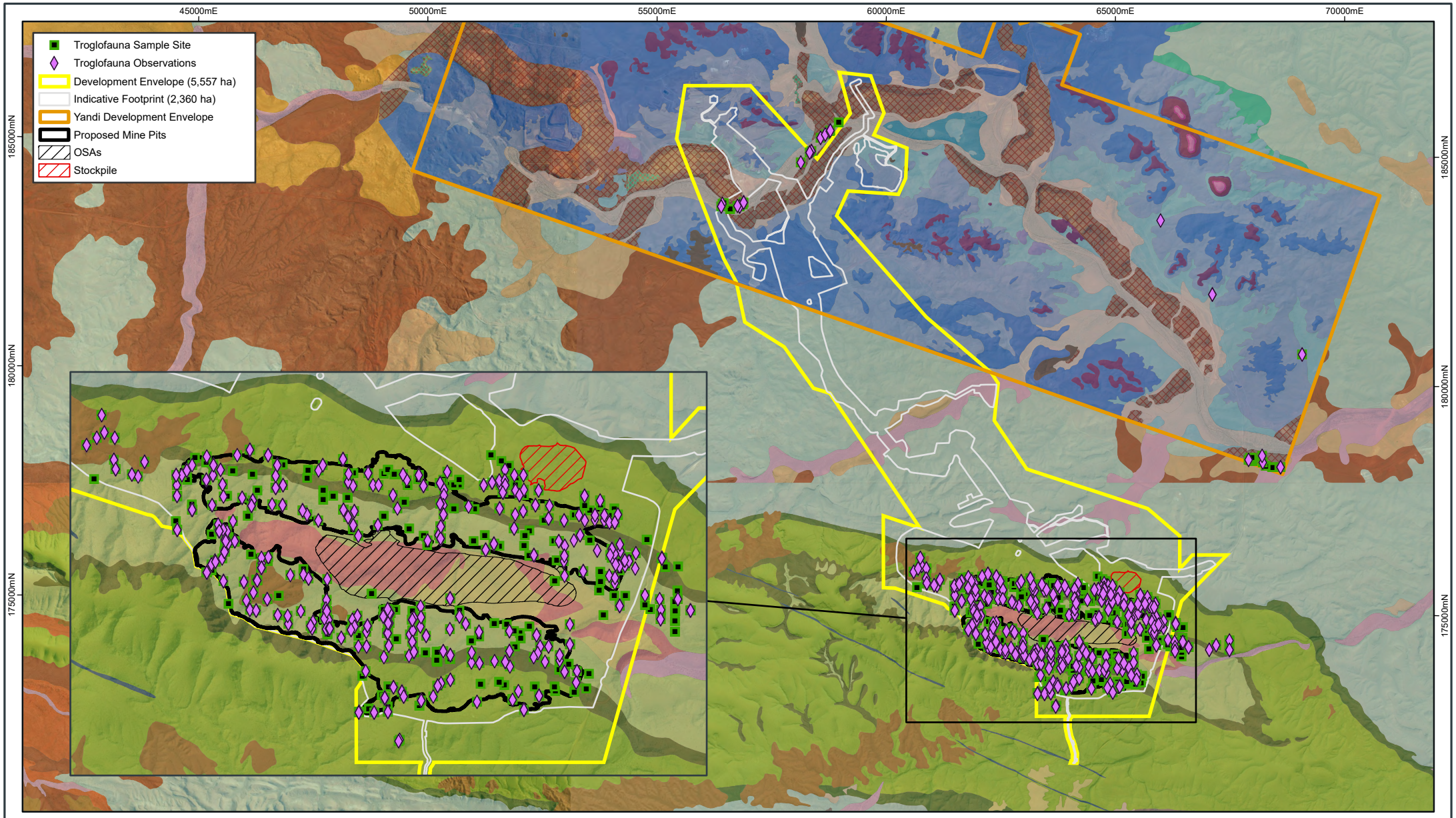

- AHdb - Wittenoom - Bee Gorge Member
- AHr - Mt McRae Shale
- AHs - Mt Sylvia Formation
- CID - Robe - Oolitic channel iron deposit
- Cza - Alluvium (consolidated)
- Czc - Colluvium & alluvium
- Czcb - Colluvium & alluvium (chert & BIF clasts)
- Czk - Calcrete-sheet carbonate; found along major drainage lines
- Czp - Pisolitic limonite deposits developed along river channels
- Czpi - Consolidated ferruginous pisolites
- PHbd - Brockman - Dales Gorge (BIF & Shale)
- PHbj - Brockman - Joffre (BIF with chert & shale)
- PHbw - Brockman - Mt Whaleback Shale
- PHby - Brockman - Yandicoogina Shale
- PHj - Weeli Wolli - BIF
- PLHt - Medium- to coarse-grained metadolerite sills intruded into Hamersley Group
- Pd - Dolerite dykes
- Phja- Dolerite 1
- Phjb - Shaly BIF 1
- Phjc - Dolerite 2
- Phjd - Shaly BIF 2
- Phje - Cherty BIF Band
- Phjg - BIF Marker 1
- Phjh - Dolerite 3
- Phji - BIF Marker 2
- Phjj - Dolerite 4
- Qa - Alluvium (drainage channels)
- Qc - Talus & colluvium
- Td - Duricrust - Limonitic mesa capping
- To - Oakover - Fluvial calcareous sediments
- Tp - Robe Pisolite - Goethite pisolite with fossil wood fragments

N

0 1 2 3
KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
TROGLOFAUNA SAMPLING EFFORT AND POSITIVE RECORDS

WAIO PLANNING, TECHNICAL AND ENVIRONMENT

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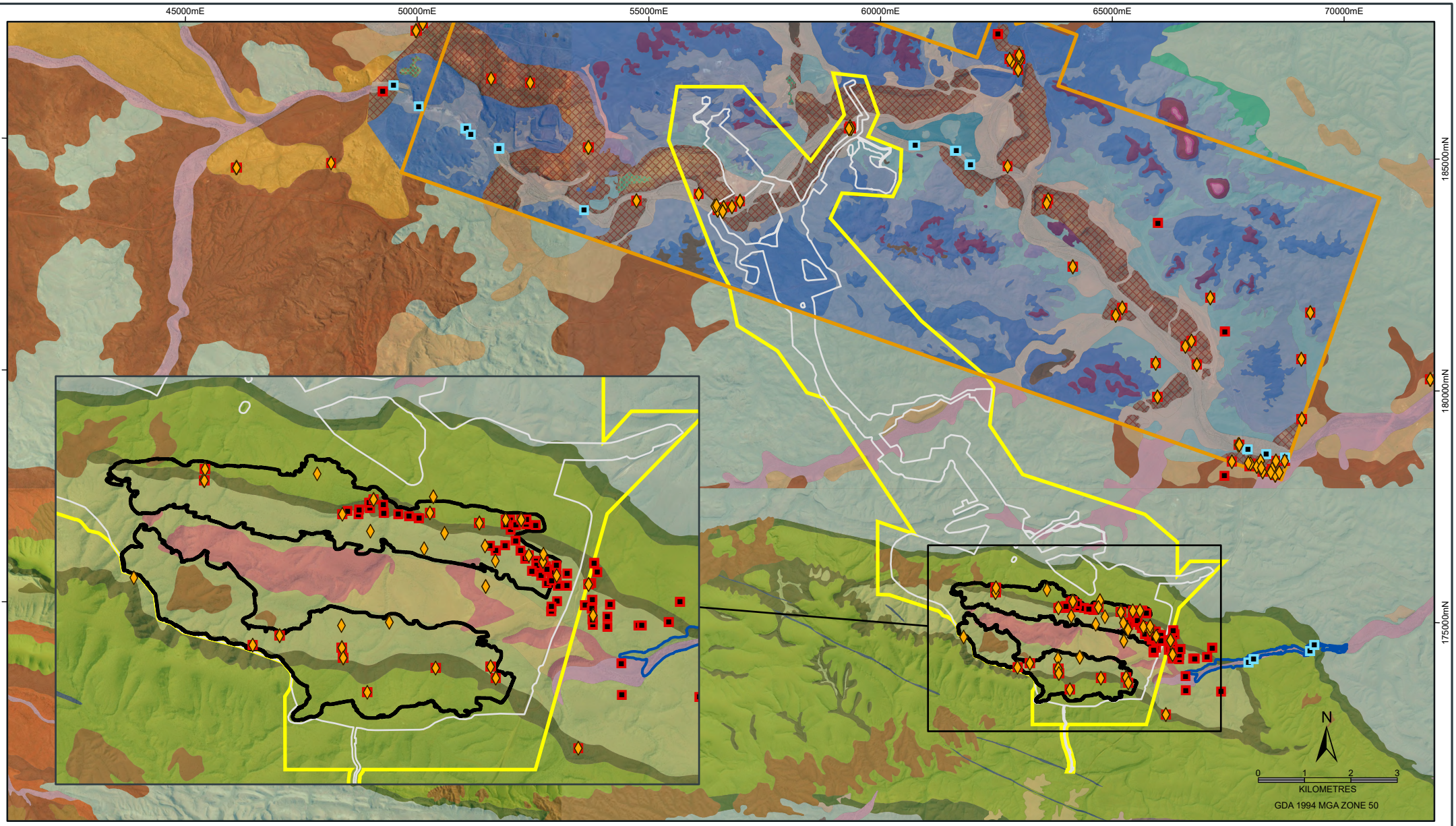

- Stygofauna Observations
- Stygofauna Sample Site
- Freshwater Aquatic Fauna Sample Sites
- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Yandi Development Envelope
- Proposed Mine Pits
- Yandicoogina Gorge

Geology

- AHdb - Wittenoom - Bee Gorge Member
- AHr - Mt McRae Shale
- AHs - Mt Sylvia Formation
- CID - Robe - Oolitic channel iron deposit
- Cza - Alluvium (consolidated)
- Czc - Colluvium & alluvium
- Czcb - Colluvium & alluvium (chert & BIF clasts)
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- Czp - Pisolitic limonite deposits developed along river channels
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- PHby - Brockman - Yandicoogina Shale
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- Pd - Dolerite dykes
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- Phjc - Dolerite 2
- Phjd - Shaly BIF 2
- Phje - Cherty BIF Band
- Phjg - BIF Marker 1
- Phjh - Dolerite 3
- Phji - BIF Marker 2
- Phjj - Dolerite 4
- Qa - Alluvium (drainage channels)
- Qc - Talus & colluvium
- Td - Duricrust - Limonitic mesa capping
- To - Oakover - Fluvial calcareous sediments
- Tp - Robe Pisolite - Goethite pisolite with fossil wood fragments

BHP

PUBLIC

MINISTERS NORTH
STYGOFAUNA SAMPLING EFFORT AND POSITIVE RECORDS

WAIO PLANNING, TECHNICAL AND ENVIRONMENT

SCALE @ A3:	1:110,000	REQUESTOR:	ENVIRONMENT	FIGURE:	8-3
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8.3.2 Environmental values

8.3.2.1 Troglofauna Habitat

Within the Strategic Proposal, rich troglofauna communities were identified as occurring in mineralised geologies on the flanks of valleys, as well as in the adjacent footslopes where mineralised geologies may be overlain by colluvium and the surrounding ridges and plateaux where hardcap is often well developed. Almost all Strategic Proposal tenure overlaps with areas that are predicted to be of high prospectivity for troglofauna; the exceptions are Jimblebar, Caramulla, Ophthalmia/Prairie Downs and Roy Hill (BHP 2016a Section 8.1.5.1). The mapping highlights the Hamersley Range as being likely to contain the richest troglofauna communities in the Pilbara.

Ministers North Overview

Based on mapping using contours to identify valley flanks and mesas, areas likely to be prospective for troglofauna within the Strategic Proposal Boundary and wider Pilbara region were determined. From this mapping, the Strategic Proposal assessment identified portions of the Development Envelope as being of 'High Prospectivity' for troglofauna (BHP 2016a Figure 35b). Depth to groundwater across much of the area is greater than 60 m.

The Derived Proposal lies north of a small ridge in the Hamersley Range, and is associated with the Wirriba Anticline, which is a convex sub-surface geological fold (Figure 8-4). The oldest geology in the fold is the Mt Sylvia Formation (at depth) and the youngest is the Weeli Wolli Formation, which is exposed in the northern part of the tenement. Most of the Ministers North deposit is associated with the Brockman Iron Formation, consisting of an alternating sequence of Banded Iron Formation (BIF), shale and chert. The BIF is subdivided into four members, the Dales Gorge Member, the Joffre Member, the Mt Whaleback Shale Member and the Yandicoogina Shale Member. The Ministers North orebody is primarily located within the mineralised Dales Gorge Member of the Brockman Iron Formation.

The tenement area is structurally simple with no significant faults, aside from the Keystone Fault modelled in the eastern portion of the Derived Proposal area. Dolerite dykes have been observed in the far west and southwest of the Derived Proposal area.

In the Brockman Iron Formation in the Development Envelope, weathering of exposed rock has led to the creation of a layer of hardcap about 20 m thick across the whole deposit. This layer contains numerous cavities, some of which are filled with clay material, but most are empty and provide suitable troglofauna habitats.

Ministers North Habitat Modelling

A subterranean fauna habitat assessment (based on two-dimensional [2D] information and three dimensional [3D] modelling) was recently undertaken to gain an understanding of the suitability, extent, and connectivity of troglofauna habitats within and surrounding the proposed mine pits (Biologic 2025).

Troglofauna habitat modelling was based on the Ministers North geological model compiled from drill hole logging, geophysics data, structural information, weathering profiles, and hydrogeological data, plus publicly available spatial data and geological mapping. The 3D habitat model refined the Ministers North geological model to show the 3D extent, suitability, and connectivity of troglofauna habitats at scales relevant to 19 target troglofauna species (described in further detail in Section 8.4.1.2). Geological members and sub-units were categorised for potential habitat suitability[37] for subterranean fauna (i.e. High, Medium, Low, Uncertain; Table 8-4; Figure 8-5).

Based on the habitat modelling, the Ministers North tenement hosts extensive Medium and High suitability habitats for troglofauna within the Dales Gorge and Joffre Members of the Brockman Iron Formation, and within superficial

[37] High potential habitat – Observed cavities; obvious and well-defined, interconnected voids, vugs, and microcavities; open fractures, particularly those affected by water penetration. Evident signs of secondary weathering and hydrated weathering of rock.

Medium potential habitat – Partially weathered rock, calcareous detritals, or pisolite with less well-developed cavities; smaller, less obvious fractures, voids, and vugs; singular or poorly developed voids and fractures; gravels and gravelly detritals; cavity fill; fault contacts.

Low potential habitat – Fresh rock lacking cavities, fractures, vugs, or minor evidence of weathering; fresh rock with fractures derived during drilling (no signs of weathering or water penetration); fresh clay, silt, and fine textured detritals; fresh or crumbly shale and black shale.

Uncertain – Intervals that cannot be confidently placed in previous categories due to data limitations.

deposits of detritals and scree (Table 8-4; Figure 8-5). These troglofauna habitats are interlayered and complex and are well-connected throughout the Study Area (Figure 8-5). Regional geological interpretations identified one significant fault, the Keystone fault, occurring in the Study Area. The fault is sub-vertical and shows a vertical displacement rather than horizontal displacement and trends northeast through the Study Area, displacing the geological sequence downward on the southern side of the fault relative to its northern side. The fault does not appear to form a barrier to groundwater flow and would not prevent troglofauna dispersal between proposed pit areas and habitat remaining intact outside the proposed pit areas.

Overall, the 3D habitat model predicts that suitable geological habitats extend beyond the current drilling, particularly to the east and west of the proposed pits with no barriers to dispersal. The habitat modelling is described in more detail for each target troglofauna species in Section 8.4.1.2.

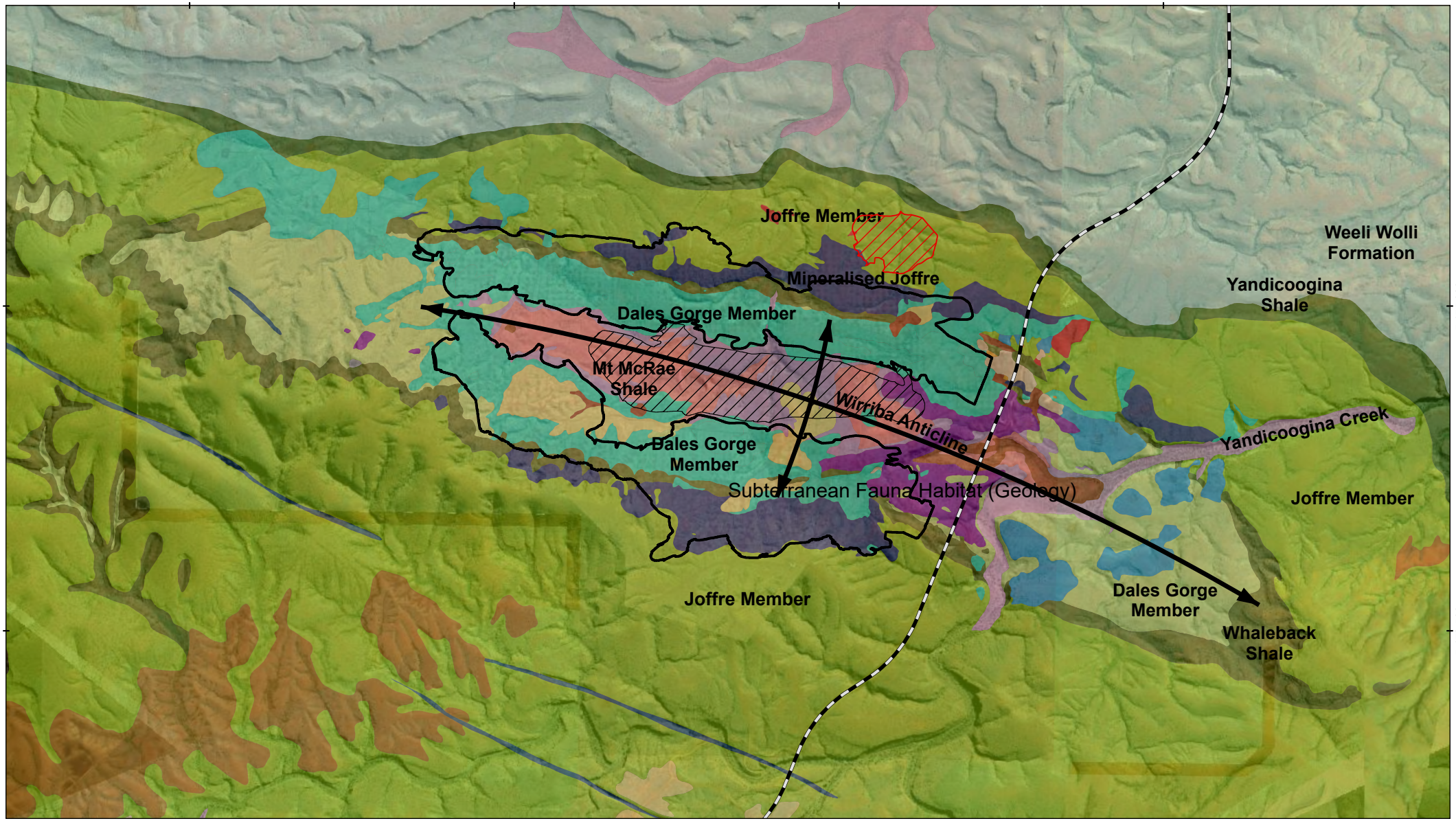
Table 8-4: Subterranean Fauna - habitat suitability of stratigraphic units

Stratigraphic unit	Map Code/s	Description	Habitat potential	Subterranean fauna habitat suitability assessment
DETRITALS & CID				
Quaternary Detritals	SZ	Surface Scree	High	Habitat suitability of these deposits is typically highly variable based on texture (clay, silt, sand, gravel). 90% of the assessed drillhole (DH) metres at Ministers North were Medium or High Suitability.
Tertiary Detritals	TD3	Tertiary detritals 3 (includes former AZ, BZ, CZ, FZ, GZ, HMZ, LLZ, LZ)	High	Void spaces expected to occur frequently throughout these Tertiary detritals (e.g. secondary weathering, vugs, fractures, porosity). Typically forms highly suitable subterranean fauna habitat. 92% of the assessed DH metres at Ministers North were Medium or High Suitability.
	TD2	Tertiary detritals 2 (CID Equivalent)	Medium	Void spaces expected to occur frequently throughout these Tertiary detritals (e.g. secondary weathering, vugs, fractures, porosity). Typically forms highly suitable subterranean fauna habitat. 77% of the assessed DH metres at Ministers North were Medium or High Suitability.
Geology				
Weeli Wolli Iron Formation	HJ	Weeli Wolli Iron Formation – Undifferentiated	Medium	Poorly sampled regionally. Habitat suitability varies widely at Ministers North depending on degree of weathering and fracturing. 54% of the assessed DH metres at Ministers North were Medium Suitability.
Brockman Iron Formation	Y	Yandicoogina Shale Member - Undifferentiated	Low	Insufficient void spaces, mostly shale, chert and fine textured material. 65% of the assessed DH metres at Ministers North were Low Suitability.
	J6	Joffre Member (PHbj), J6 - BIF rich	Medium	Habitat suitability varies depending on degree of weathering and fracturing. 67% of the assessed DH metres at Ministers North were Medium or High Suitability.
	J5	Joffre Member, J5 - Shaly	Low	Habitat suitability is generally low due to insufficient void spaces in the shales. 66% of the assessed DH metres at Ministers North were Low Suitability.
	J4	Joffre Member, J4 - BIF-rich	Medium	Habitat suitability varies depending on degree of weathering and fracturing. 76% of the assessed DH metres at Ministers North were Medium or High Suitability.
	J3	Joffre Member, J3 - Shaly	Low	Habitat suitability is generally low due to insufficient void spaces in the shales. 54% of the assessed DH metres at Ministers North were Low Suitability.

Stratigraphic unit	Map Code/s	Description	Habitat potential	Subterranean fauna habitat suitability assessment
	J2	Joffre Member, J2 - BIF-rich	Medium	Habitat suitability varies depending on degree of weathering and fracturing. 77% of the assessed DH metres at Ministers North were Medium or High Suitability.
	J1	Joffre Member, J1 – Shaly	Low	Habitat suitability is generally low due to insufficient void spaces in the shales. 71% of the assessed DH metres at Ministers North were Low Suitability.
	W	Whaleback Shale – Undifferentiated	Low	Insufficient void spaces within chert, shales, clay and fine textured material. 90% of the assessed DH metres at Ministers North were Low Suitability.
	D4	Dales Gorge Member, D4 - BIF-rich	Medium- High	Void spaces expected to occur frequently (e.g. frequent well-developed vugs, fractures, BIF-enriched zone). Potential areas where less vuggy. 84% of the assessed DH metres at Ministers North were Medium or High Suitability.
	D3	Dales Gorge Member, D3 – shaly	Low	Habitat suitability of this unit at Ministers North is mostly low due to insufficient void spaces in the shales. 72% of the assessed DH metres at Ministers North were Low Suitability.
	D2	Dales Gorge Member, D2 - BIF-rich	Medium- High	Void spaces expected to occur frequently (e.g. frequent well-developed vugs, fractures, BIF-enriched zone). Potential areas where less vuggy. 85% of the assessed DH metres at Ministers North were Medium or High Suitability.
	D1	Includes Colonial Chert Member (AHrc) unit of the Dales Gorge Member	Medium	Habitat suitability varies widely at Ministers North depending on degree of weathering and fracturing. 67% of the assessed DH metres at Ministers North were Medium or High Suitability.
Mount McRae Shale	RU	Upper unit	Low	Mainly clays and fine textured material, mostly insufficient void spaces. 74% of the assessed DH metres at Ministers North were Low Suitability.
	RN	Nodule Zone	Low	Mainly clays and fine textured material, mostly insufficient void spaces. 68% of the assessed DH metres at Ministers North were Low Suitability.
	RC	Chert	Low	Mainly clays and fine textured material, mostly insufficient void spaces. 95% of the assessed DH metres at Ministers North were Low Suitability.
	RL	Lower unit	Low	Mainly pyritic/black shales, impervious, occurs in fresh rock with mostly insufficient void spaces. 85% of the assessed DH metres at Ministers North were Low Suitability.

Stratigraphic unit	Map Code/s	Description	Habitat potential	Subterranean fauna habitat suitability assessment
Mount Sylvia Formation	TRB	Undifferentiated Turbidites	Low	Occurs in fresh rock without void spaces. 95% of the assessed DH metres at Ministers North were Low Suitability.
	S	Mount Sylvia Formation (AHs)	Low	Occurs in fresh rock without void spaces. 100% of the assessed DH metres at Ministers North were Low Suitability.
Wittenoom Formation	O	Undifferentiated Wittenoom	Uncertain	Habitat suitability varies widely depending on degree of weathering. No drilling data available for assessment

Source: Biologic 2025



- Stockpile
- OSAs
- Proposed Mine Pits
- BHP rail

Geology

- AHr - Mt McRae Shale
- CID - Robe - Oolitic channel iron deposit
- Czb - Silcrete (indurated)
- Czc - Colluvium & alluvium
- Czcb - Colluvium & alluvium (chert & BIF clasts)
- Czcg - Indurated colluvium (Canga)
- Czk - Calcrete
- Czl - Ferricrete (laterite)
- Czpi - Consolidated ferruginous pisolites
- H2/PHbd - Martite goethitic supergene ore (ochereous)
- H2/PHbj - Martite goethitic supergene ore (ochereous)
- PHbd - Brockman - Dales Gorge (BIF & Shale)
- PHbd/D1 - Brockman - Dales Gorge (D1 subdivided)
- PHbj - Brockman - Joffre (BIF with chert & shale)
- PHbw - Brockman - Mt Whaleback Shale
- PHby - Brockman - Yandicoogina Shale
- PHj - Weeli Wolli - BIF
- Pd - Dolerite dykes
- Qa - Alluvium (drainage channels)
- Qc - Talus & colluvium

N

0 200 400 600 800

Metres

GDA 1994 MGA ZONE 50

BHP

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MINISTERS NORTH

Subterranean Fauna Habitat (Geology)

WAIO PLANNING, TECHNICAL AND ENVIRONMENT

SCALE @ A4:	1:40,000	REQUESTED:	Environment	FIGURE:	8-4
DATE:	25/08/2025	PREPARED:	Geomatics		

A1317-059 RevA

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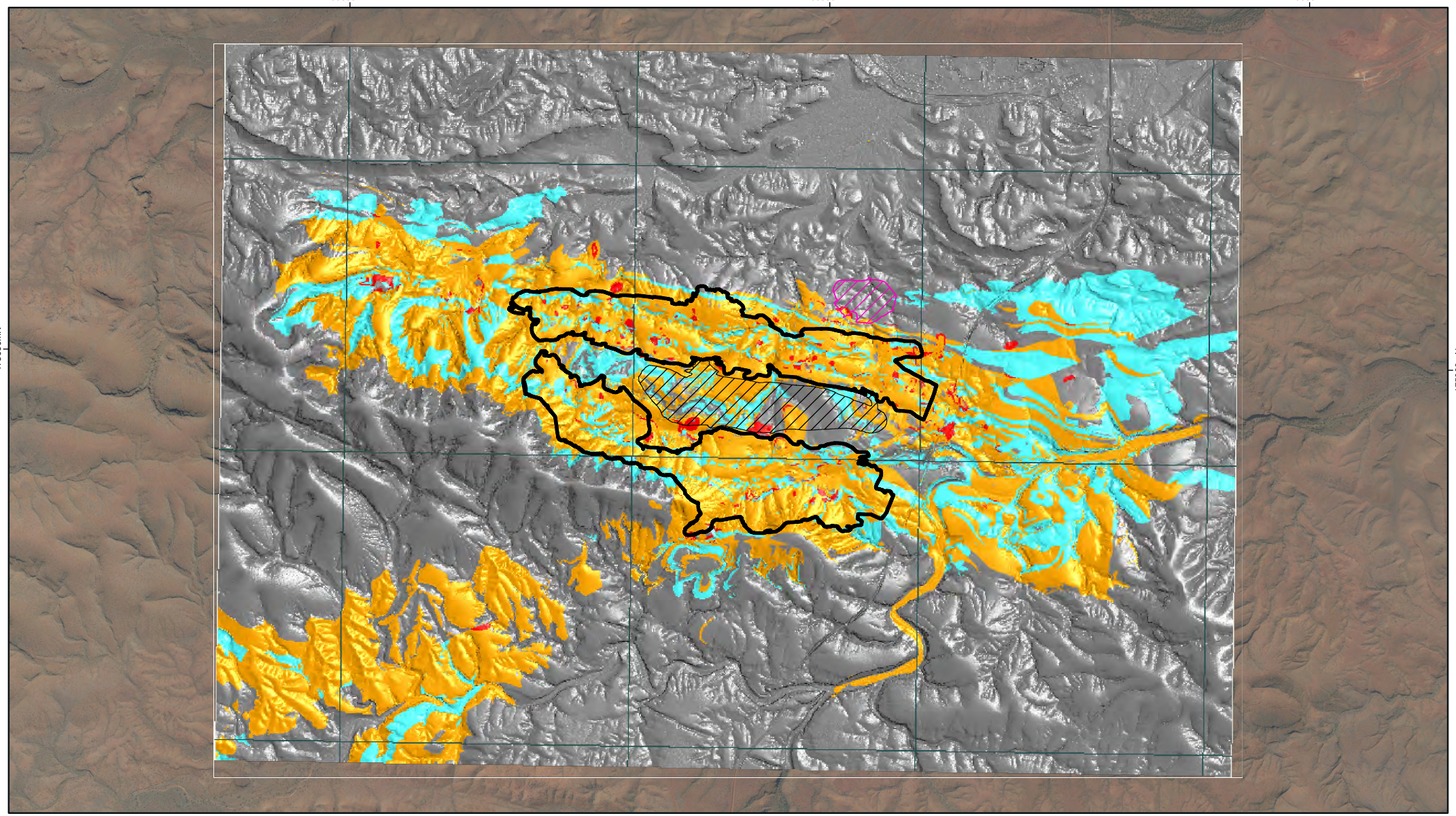

Proposed Mine Pits
OSAs
Stockpile

Troglofauna Habitat Suitability

High Suitability
Moderate Suitability
Low Suitability

N

0 0.5 1 1.5
KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
HIGH, MEDIUM AND LOW SUITABILITY TROGLOFAUNA HABITAT

WAIO PLANNING, TECHNICAL AND ENVIRONMENT

SCALE @ A3:	1:53,578	REQUESTOR:	ENVIRONMENT	FIGURE:	8-5
DATE:	26/08/2025	PREPARED:	GEOMATICS	NO:	A1317-060 RevA
		REVIEWED:			

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8.3.2.2 Troglofauna Taxa

Understanding of troglofauna values in the Development Envelope have been developed across a number of surveys dating back to 2009 (Subterranean Ecology 2010; Bennelongia 2018, 2021, 2024c, 2024d and 2025).

The troglofauna assemblage at Ministers North is considered relatively rich with recent and historical surveys having recorded a total of 79 troglofauna species within the Development Envelope (Bennelongia 2024c). Of these, 52 troglofauna species are currently only known from the Development Envelope (Table 8-5; Figure 8-6; Bennelongia 2024c); however, this is considered likely to be an artefact of sampling rather than a true indication of the distribution of many of these taxa (Bennelongia 2024c). The remaining troglofauna species are either widespread species or are known from outside the Development Envelope and are not considered further. None of the troglofauna taxa, nor the communities recorded in the Development Envelope, are listed or recognised as conservation priorities under state or federal legislation (Bennelongia 2024c, 2024d). Details of all 79 troglofauna species recorded is provided in Bennelongia (2024c) in Appendix 8.

Following the recent subterranean fauna survey, additional DNA sequencing analysis was undertaken (Biologic 2025). BHP provided sequence data generated from the Bennelongia (2024c) survey, which could be compared against Biologic's sequence libraries (using BLAST - Basic Local Alignment Search Tool) to potentially extend the known distribution of Operational Taxonomic Units (OTUs). In total, 122 sequences were provided from 27 species/OTUs. Eighteen of the 27 taxa matched taxa in Biologic's sequence databases, or GenBank. *Phaconeura* Biologic HEMI002 was the only taxon considered to be restricted to the pit that also had sequence data in Biologic's database and matched sequences in the analyses, extending its linear range to 78.7 km (Biologic 2025).

Of the 52 troglofauna taxa known only from Ministers North, 19 taxa are currently only known from the proposed mine pits (Table 8-5; Figure 8-7).

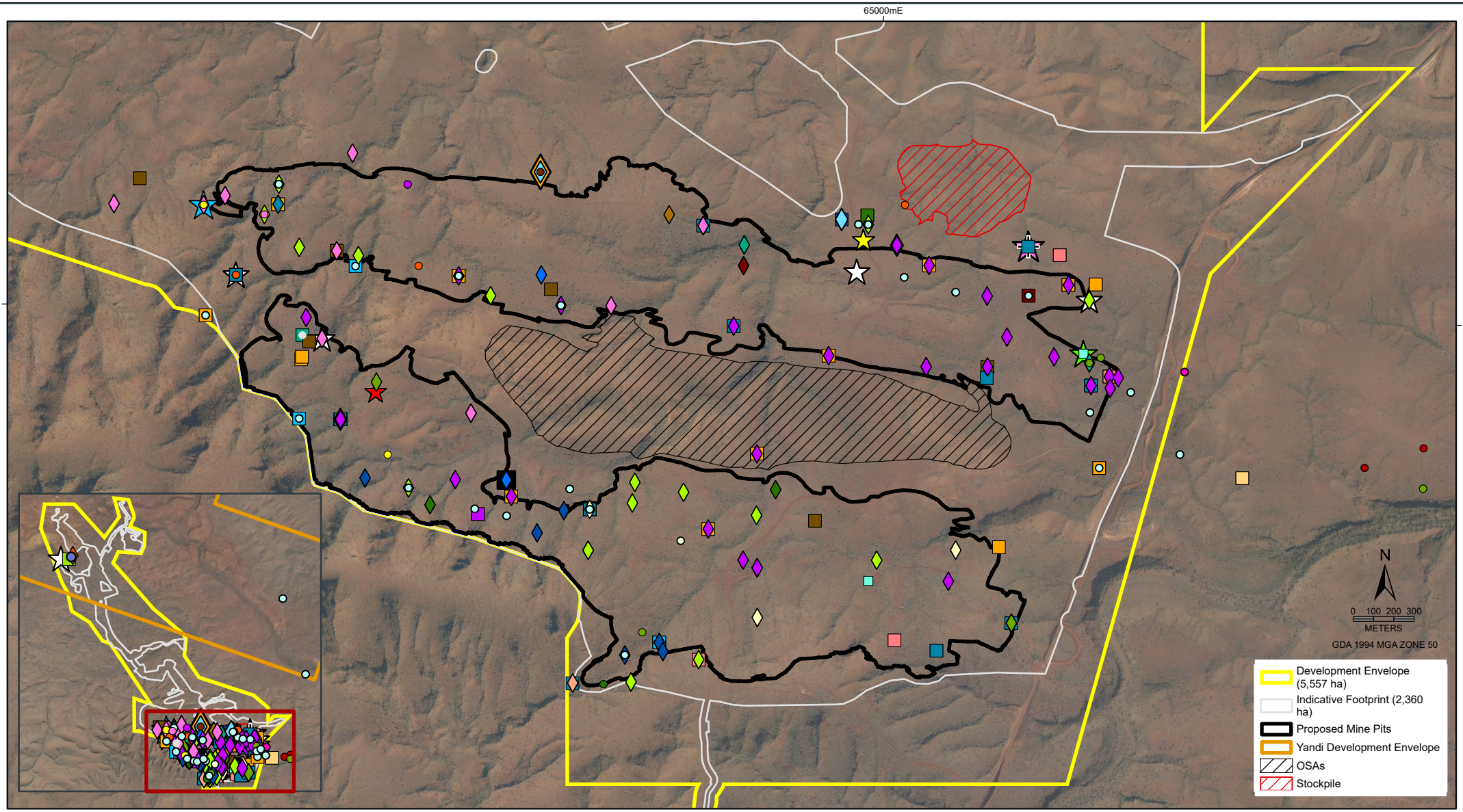
Table 8-5: Subterranean Fauna -troglofauna taxa known only from Ministers North

Higher order	Lowest identification	No. of specimens	Linear range (km)	Collected in the current survey	New species	Direct impact area (proposed pit/s)	Indirect impact area (OSA or stockpile)	Outside impact areas
Arachnida								
Opiliones								
Assamiidae	*Dampetrus* sp. B05 (nr isolatus)	4	3 km	X		X		X
Palpigradi	Palpigradi `BPAL054`	1	Singleton	X	X	X		
	Palpigradi sp. B23	1	Singleton					X
	Palpigradi sp. B24	1	Singleton					X
Pseudoscorpiones								
Chthoniidae	*Lagynochthonius sp.* B20 (= sp. S04)	32	4.3 km	X		X		X
	Tyrannochthonius `BPS499`	1	Singleton	X	X			X
Hyidae	*Indohya* `BPS560`	2	3.3 km	X	X	X		
Schizomida								
Hubbardiidae	*Draculoides* `BSC039`	4	Unknown					X
	Draculoides `BSC036` (SCH030 complex)	6	16.5 km	X				X
	Draculoides `BSC042-DNA`	12	3 km	X				
	Draculoides `SCH002`	52	5 km	X	X	X	X	
	Draculoides `SCH065`	14	11.1 km	X	X	X		X
Araneae								
	nr *Encoptarthria* `BAR142`	1	Singleton	X	X	X		
Gnaphosidae	Gnaphosidae sp. S03	2	1 km					X
Linyphiidae	Linyphiidae sp. S01	1	Singleton					X
	Linyphiidae `BAR148`	12	2 km	X	X	X		
Oonopidae	Oonopidae sp. B19-DNA	1	Singleton					X
	Pelicinus `BAR133`	18	4.3 km	X		X		X
	Prethopalpus sp. B32	2	1.5 km			X		
	Prethopalpus `BAR145`	3	2.5 km	X	X			X
	Prethopalpus `BAR146`	2	Single bore	X	X			X

Higher order	Lowest identification	No. of specimens	Linear range (km)	Collected in the current survey	New species	Direct impact area (proposed pit/s)	Indirect impact area (OSA or stockpile)	Outside impact areas
Symphytognathidae	*Anapistula* sp. S01	2	Single bore			X		
	Anapistula `BAR147`	4	Single bore	X	X	X		
Crustacea								
Malacostraca								
Isopoda								
Armadillidae	*Troglarmadillo* sp. B64 (= sp. S14)	26	4.5 km	X		X	X	X
	Troglarmadillo sp. B65	2	Single bore					X
Myriapoda								
Chilopoda								
Scolopendridae	Chilopoda sp. B01 (Scolopendridae/Cryptopidae)	1	Singleton					X
.....Cryptopidae	Cryptopidae `sp. MN`	1	Singleton			X		
	Cryptops `BSCO L111`	1	Singleton					X
Diplopoda								
Spirobolida	Trigoniulidae sp. B06	2	Single bore					
Pauropoda	*Pauropoda* sp. S04	2	3.5 km			X		
Tetramerocerata								
Pauropodidae	Pauropodidae `BPU078`	1	Singleton					X
	Pauropodidae `BPU118`	1	Singleton	X	X	X		
	Pauropodidae `BPU119`	1	Singleton	X	X	X		
	Pauropodidae `BPU114‘	3	Single bore					X
Symphyla								
Cephalostigmata								
Scutigerellidae	*Hanseniella* `BSYM129`	1	Singleton	X	X	X		
	Hanseniella sp. B42-DNA	9	3 km	X				X
	Hanseniella sp. B43-DNA	2	1.8 km	X		X		
	Symphylella `BSY M121‘	1	Singleton					X
Entognatha								

Higher order	Lowest identification	No. of specimens	Linear range (km)	Collected in the current survey	New species	Direct impact area (proposed pit/s)	Indirect impact area (OSA or stockpile)	Outside impact areas
Diplura								
Projapygidae	Projapygidae `BDP239`	1	Singleton	X	X			X
Insecta								
Zygentoma								
Nicoletiidae	*Trinemura* sp. B32	1	Singleton					X
	Trinemura `BZY112`	7	2 km	X	X			
Hemiptera								
Reduviidae	Reduviidae `sp. MN'	1	Singleton			X		
Meenoplidae	*Phaconeura* sp.	1	Singleton					X
Coleoptera	Coleoptera `BCO236`	1	Singleton	X	X	X		
Carabidae								
	Typhlozuphium sp. B04	4	2.5 km	X		X		X
	Zuphiinae sp. S01 s.l.	1	Singleton			X		
Curculionidae								
	Cryptorhynchinae sp. B10	38	5 km	X		X		X
	Curculionidae Genus 1 `BCO228`	2	2 km	X	X	X		
	Curculionidae Genus 1 sp. B15 (B02=S02 clade)	9	5.2 km	X				X
Endomychidae	*Holoparamecus* `BCO255`	11	1.7 km	X	X	X		
Staphylinidae	Pselaphinae sp. S04	3	Single bore			X		
Zopheridae	?Colydiinae `BCO256`	1	Singleton					X

adapted from Bennelongia 2024c and Biologic 2025
widespread species excluded



Troglofauna Species

- ?Colydiinae `BCO256`
- Anapistula 'BAR147`
- *Anapistula* sp. S01
- Chilopoda sp. B01 (Scolopendridae/ Cryptopidae)
- Cryptopidae indet. MN
- Cryptops `BSCO L111`
- Cryptorhynchinae sp. B10
- Coleoptera `BCO236`
- Curculionidae Genus 1 `BCO228`
- Curculionidae Genus 1 sp. B15 (B02=S02 clade)
- *Dampetrus* sp. B05 (nr isolatus)
- *Draculoides* `BSC036` (SCH030 complex)
- *Draculoides* `BSC039`
- *Draculoides* `BSC042-DNA`
- *Draculoides* `SCH002`
- *Draculoides* `SCH065`
- Gnaphosidae sp. S03
- *Hanseniella* `BSYM129`
- *Hanseniella* sp. B42-DNA
- *Hanseniella* sp. B43-DNA
- *Holoparamecus* `BCO255`
- *Indohya* `BPS560`
- *Lagynochthonius* sp. B20 (= sp. S04)
- Linyphiidae `BAR148`
- Linyphiidae sp. S01
- Oonopidae sp. B19-DNA
- Palpigradi `BPAL054`
- Palpigradi sp. B23
- Palpigradi sp. B24
- Pauropoda sp. S04
- Pauropodidae `BPU114`
- Pauropodidae `BPU078`
- Pauropodidae `BPU118`
- Pauropodidae `BPU119`
- *Pelicinus* `BAR133`
- *Phaconeura* sp.
- *Prethopalpus* `BAR145`
- *Prethopalpus* sp. B32
- Pselaphinae sp. S04
- *Prethopalpus* `BAR146`
- Projapygidae `BDP239`
- Reduviidae sp. Indet. MN
- *Symphylella* `BSY M121`
- *Trinemura* `BZY112`
- *Trinemura* sp. B32
- *Troglarmadillo* sp. B64 (= sp. S14)
- *Troglarmadillo* sp. B65
- Trigoniulidae sp. B06
- *Typhlozuphium* sp. B04
- *Tyrannochthonius* `BPS499`
- Zuphiinae sp. S01 s.l.
- nr *Encoptarthria* `BAR142`

BHP

PUBLIC

MINISTERS NORTH
TROGLOFAUNA TAXA KNOWN ONLY FROM MINISTERS NORTH

WAIO PLANNING, TECHNICAL AND ENVIRONMENT

SCALE @ A3:	1:25,460	REQUESTOR:	ENVIRONMENT	FIGURE:	8-6
DATE:	11/09/2025	PREPARED:	GEOMATICS	NO:	A1317-050 RevA
		REVIEWED:			

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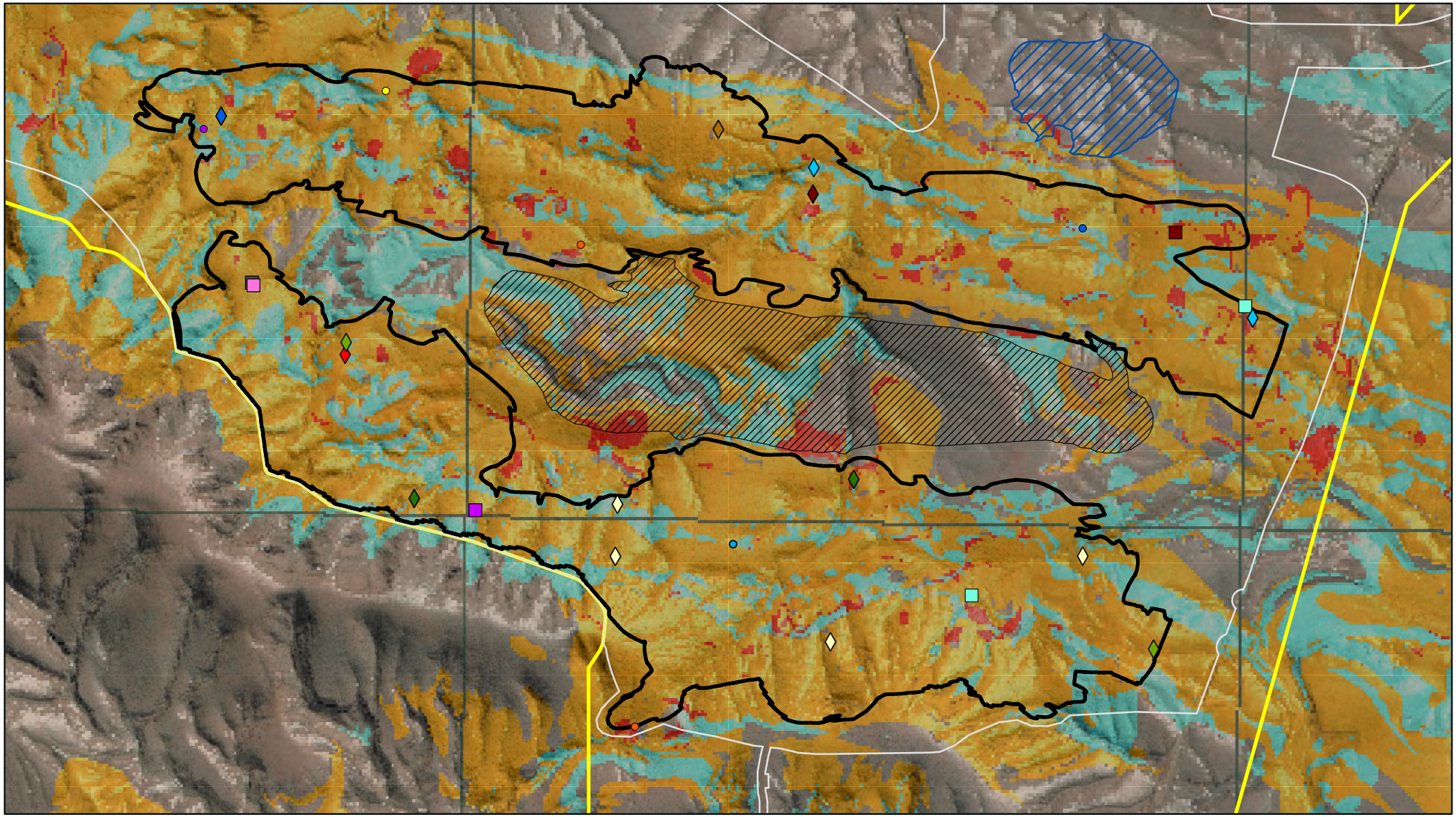

LEGEND

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Proposed Mine Pits
- Stockpile
- OSAs

Troglofauna Habitat Suitability

- High Suitability
- Moderate Suitability
- Low Suitability

Troglofauna Species

- *Anapistula* 'BAR147`
- *Anapistula* sp. S01
- Cryptopidae indet. MN
- Coleoptera `BCO236`
- Curculionidae Genus 1 `BCO228`
- *Hanseniella* `BSYM129`
- *Hanseniella* sp. B43-DNA
- *Holoparamecus* `BCO255`
- Indohya `BPS560`
- Linyphiidae `BAR148`
- Palpigradi `BPAL054`
- Pauropoda sp. S04
- Pauropodidae `BPU118`
- Pauropodidae `BPU119`
- *Prethopalpus* sp. B32
- Pselaphinae sp. S04
- Reduviidae sp. Indet. MN
- Zuphiinae sp. S01 s.l.
- nr *Encoptarthria* `BAR142`

N

0 200 400 600

METERS

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH

TROGLOFAUNA KNOWN ONLY FROM THE MINE PITS AND/OR OSA'S

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:20,000	REQUESTOR:	PROJECTS	FIGURE:	8-7
DATE:	3/09/2025	PREPARED:	GEOMATICS	NO:	A1317_044A

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8.3.2.3 Stygofauna Habitat

The assessment for the Strategic Proposal identified that stygofauna richness within the Strategic Proposal Boundary is highest in aquifers within the Quaternary and Tertiary valley-fill deposits in palaeovalleys and modern river channels. These aquifers have numerous voids and spaces that provide prospective stygofauna habitat and most have shallow water tables (BHP 2016a Section 8.1.5.1). This prospective habitat occurs across a substantial part of the Pilbara, both within and outside of the Strategic Proposal Boundary. Results of the Bennelongia (2015) survey indicate that low numbers of stygofauna occur where depth to groundwater is greater than 30 mbgl (BHP 2016a Section 8.1.5.1). To be conservative, areas likely to be prospective for stygofauna within the Strategic Proposal Boundary were determined based on mapping of areas where the depth to groundwater was less than 40 m.

Ministers North Development Envelope

The Strategic Proposal assessment identified the Development Envelope as typically being of 'Low Prospectivity' for stygofauna (BHP 2016a Figure 34). The dominant regional aquifer system of Ministers North occurs in the bedrock Dales Gorge Formation. The water table across the Derived Proposal area is flat, and typically deep (depth to the water table of approximately 40 to 153 mbgl), with the deepest levels occurring below the tops of ridges.

Groundwater is present within and surrounding the orebody such that it constitutes a fractured rock aquifer. An anticline hinged in the Mt McRae Shale dividing the orebody has resulted in a preferential flow path forming along-strike of the orebodies controlled by the lower permeability units (i.e. McRae Shale, unmineralized Joffre and Weeli Wolli formations) that sit adjacent to the Dales Gorge members. The Keystone Fault is a prominent regional structural feature that is steeply dipping and propagates NE-SW and has displaced the stratigraphy up to 60 m along the fault plane.

In the northern section of the Development Envelope, the fractured/weathered CID of the Marillana Formation and alluvial/ colluvial detritals associated with Marillana Creek and surrounding floodplains provide suitable subterranean fauna habitat (Bennelongia 2024d). The CID paleochannel orebody, is heterogeneous, and contains zones of higher permeability associated with secondary porosity features such as cavities and zones of lower permeability within the Lower CID and Basal Clay/Conglomerate. Groundwater hosted within the CID forms the primary stygofauna habitat, while the fractured/weathered parts of the Weeli Wolli Formation may also provide deeper habitat in some areas within the palaeochannel (Bennelongia 2024d). Following historic mining and dewatering, the alluvial detritals are unlikely to occur below the water table and so would only provide temporary stygofauna habitat following sporadic flood events.

Groundwater in the Development Envelope is fresh and, therefore, appropriate for the occurrence of stygofauna. However, the depth to the water table across most of the Development Envelope is not typically suitable for stygofauna communities (depth > 60 mbgl across most of the deposit). Historical studies have reflected this with limited records of stygofauna recorded in the area.

Yandicoogina Gorge

Groundwater is shallower to the east of the proposed mine pits (outside of the Indicative Footprint) where it is associated with Yandicoogina Creek/Gorge. Sampling of the hyporheic zone of Yandicoogina Creek has demonstrated a high level of connection between ground- and surface- waters (Biologic 2024b). Nevertheless, the Derived Proposal is for above water table mining only and no drawdown impacts are included as part of this Derived Proposal. Therefore, stygofauna are discussed further only in the context of the broader understanding of the biodiversity of the Derived Proposal area and potential for indirect impacts.

8.3.2.4 Stygofauna Taxa

Understanding of stygofauna values in the Derived Proposal area has been developed across a number of surveys dating back to 2009 (Subterranean Ecology 2010; Bennelongia 2018; Bennelongia 2024c). A desktop review identified a relatively depauperate stygofauna community, with only eight species of stygofauna known from the study area. This has been supported by the most recent three season field survey (Bennelongia 2024a).

The field survey collected 117 specimens of stygofauna taxa representing six species (Bennelongia 2024c). Annelids were the most abundant group (78 specimens), followed by nematodes (34 specimens) and crustaceans (three specimens). Crustacea was the most diverse group with three species (one amphipod, one copepod, and one ostracod). Stygofauna specimens were predominantly collected in the eastern part of Ministers North where groundwater is shallower (seven of 11 locations where stygofauna were found) (see Figure 8-8).

The stygofauna species collected during recent and historical surveys include:

- Enchytraeidae 'E06' - 58 specimens recorded from four sites. Considered widespread based on DNA sequencing (Biologic 2025).
- Enchytraeidae 'OB3' – 19 specimens recorded from two locations. Considered widespread based on DNA sequencing (Biologic 2025).
- Enchytraeidae `3 bundle` s.l. (short sclero). One specimen collected from MN1378RE, and one from MN0945R. Although these specimens were classified as higher order, they possibly belong to either Enchytraeidae 'E06' or Enchytraeidae 'OB3' species.
- *Diacyclops* `BCY059` (*humphreysi* s.l.). One specimen collected from MN0737R. This species has also been collected at Yandi mine.
- *Meridiescandona marillanae*. One specimen collected from HMN0037. This species has also been collected at Yandi mine as well as Yandicoogina Gorge and is known from Weeli Wolli Creek, Marillana Creek, Upper Fortescue.
- Paramelitidae sp. One specimen without its rear end was collected from MN0737R. Could not be identified beyond family level because of missing body parts but many paramelitid amphipods are common in the area.
- Nematoda spp. Thirty-three specimens collected from MN1428R and one specimen collected from MN1178R.
- Candonopsis `BOS1831` - five specimens (new species) collected from one site outside the proposed mining areas.
- Tubificinae sp. B09 - known from two specimens recorded in historical surveys, east of the existing rail which is outside the proposed mining areas.

The community of stygofauna collected during the field survey was similar to the community of species found in the desktop search. Species of nematodes, worms of the family Enchytraeidae, the copepod *Diacyclops* `BCY059` (*humphreysi* s.l.), species of the ostracod genus *Meridiescandona,* and species of the family of amphipods Paramelitidae were registered in both desktop search and field survey. The animals identifiable to species level have ranges extending outside the impact area of Ministers North mine area, including records at Yandi mine and more broadly.

When considering all species identified from current and historic surveys, there are no restricted species of stygofauna within the mining area; however, there are two species currently only known from the Development Envelope including Tubificinae sp. B09 and *Candonopsis* `BOS1831 (Bennelongia 2018, 2024c; Figure 8-8).

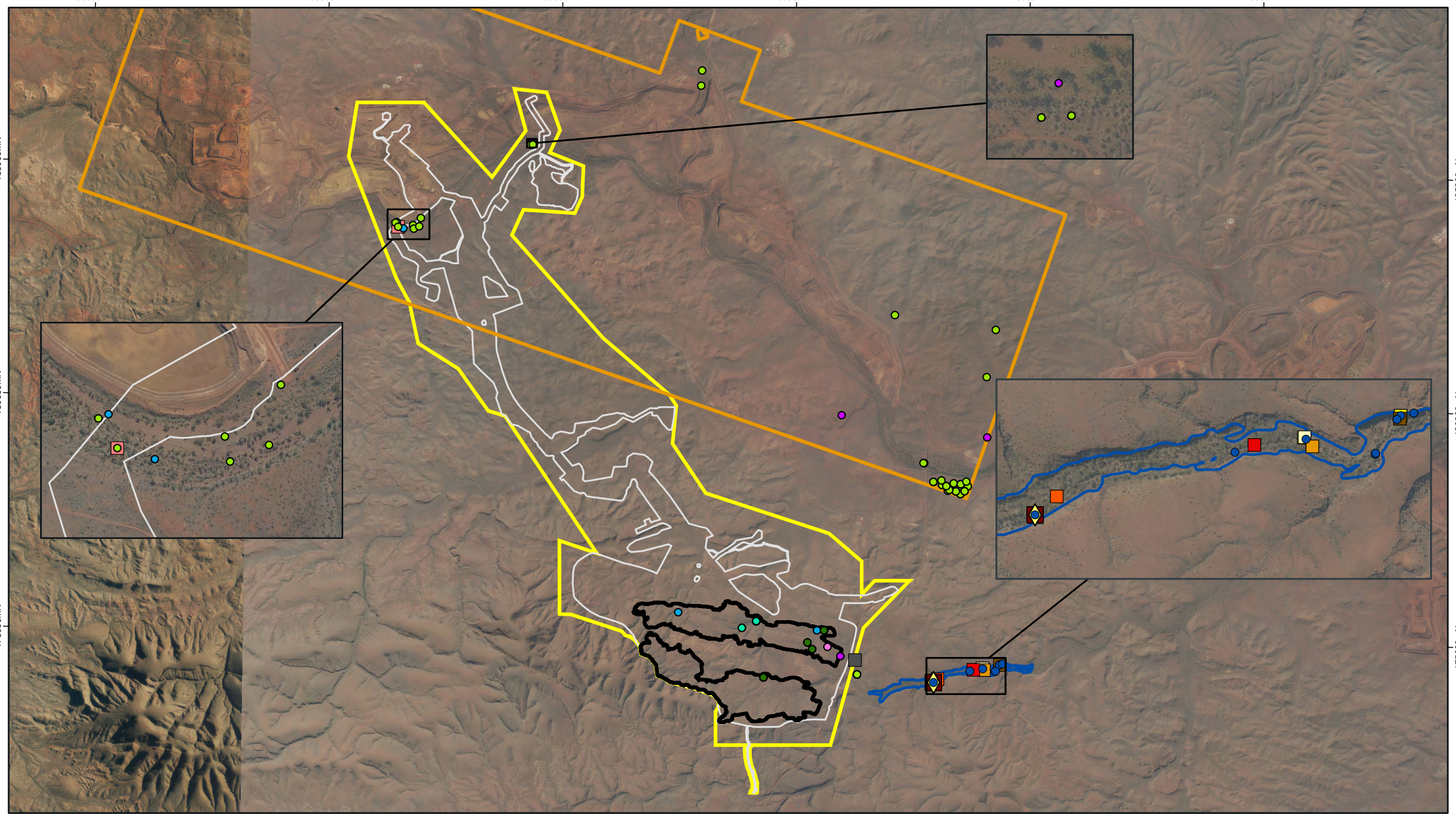
Yandicoogina Gorge

In contrast, sampling of the hyporheic zone at Yandicoogina Gorge, east of the Development Envelope, has yielded over 30 stygal species with the Gorge reported to support a relatively high percentage of stygobitic taxa (19%) compared to other hyporheic zones in the Pilbara (i.e. 5%). At least eight stygofauna species are unique to the Gorge including (see Table 7-6 in Section 7.3.3.5; Biologic 2024b):

- *Gomphodella* `sp. Biologic-OSTR077
- cf. *Australocamptus* `sp. Biologic-HARP064`

- cf. *Australocamptus* sp.
- *Kinnecaris* `sp. Biologic-HARP037
- *Atopobathynella* `sp. Biologic-PBAT042'
- Bathynellidae sp. BES7547
- Bathynellidae `sp. Biologic-BATH019`
- *Pygolabis* `sp. Biologic-ISOP035`.

These taxa are provided for overall context given that indirect impacts could potentially occur; however, they are not discussed at length as they will not be directly impacted by the Derived Proposal.



Development Envelope (5,557 ha)
Indicative Footprint (2,360 ha)
Yandi Development Envelope
Proposed Mine Pits
Yandicoogina Gorge

Un-restricted species

- *Diacyclops* `BCY059` (humphreysi s.l.)
- Enchytraeidae 'E06'
- Enchytraeidae 'OB3'
- Enchytraeidae `3 bundle` s.l. (short sclero).
- *Meridiescandona marillanae*
- Nematoda spp.
- Paramelitidae sp.

Potentially restricted species

- *Atopobathynella* `sp. Biologic-PBAT042`
- Bathynellidae sp. BES7547
- Bathynellidae sp. `Biologic-BATH019`
- *Candonopsis* `BOS1831`
- cf. *Australocamptus* sp.
- cf. *Australocamptus* `sp. Biologic-HARP064`
- Gomphodella `sp. Biologic-OSTR077'
- *Kinnecaris* `sp. Biologic-HARP037
- *Pygolabis* `sp. Biologic-ISOP035`
- Tubificinae sp. B09

N

0 1 2 3
KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
STYGOFAUNA TAXA

WAIO PLANNING, TECHNICAL AND ENVIRONMENT

SCALE @ A3:	1:110,000	REQUESTOR:	ENVIRONMENT	FIGURE:	8-8
DATE:	11/09/2025	PREPARED:	GEOMATICS	NO:	A1317-035 RevB
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8.4 Potential environmental impacts

In the PERSP (BHP 2016a - Table 15), BHP identified and described potential impacts from the Strategic Proposal on Subterranean Fauna. Table 8-6 identifies whether the Strategic Proposal potential impacts are relevant to the Derived Proposal.

Table 8-6: Subterranean Fauna - relevant impacts identified in the Strategic Proposal

Strategic Proposal Potential impact	Strategic Proposal impact relevant to Ministers North Derived Proposal	Potential impacts from Ministers North Derived Proposal
Mining operations (direct)	Yes	Removal of troglofauna habitat and individuals from excavation of the mine pits.
Groundwater alteration (direct)	No. The Derived Proposal does not propose the abstraction of groundwater. Mining is AWT only.	N/A
Vibration from blasting (indirect)	Yes	Vibrations from the Derived Proposal are considered low risk. Whilst unlikely to cause significant impacts beyond the pit areas which have been assessed for direct impacts, indirect impacts have been considered.
Presence of modified landforms (impact)	Yes	The construction of artificial landforms (e.g. OSA and stockpiles) is considered low risk, however, the potential impacts have been assessed for troglofauna.
Contamination of soils and water (impact).	Yes	Changes to subterranean fauna habitat from potential contamination of soils and groundwater quality where the groundwater table is shallow.

The potential impacts are discussed in relation to the Indicative Footprint, which represents the planned area of direct disturbance within the Development Envelope. Where relevant, the extent of the subterranean fauna values within the broader Development Envelope (and areas outside) are also identified.

Given that no dewatering will occur as part of this Derived Proposal, there are no direct impacts to stygofauna associated with changes to groundwater regimes. In addition, no pit lakes will form at closure given mining is above the water table. As such, direct impacts to stygofauna are not discussed further.

8.4.1 Mining operations (direct)

8.4.1.1 Removal of troglofauna habitat

The Derived Proposal will result in direct impacts to troglofauna through the removal of habitat from the excavation of mine pits (see Figure 8-4 and Figure 8-5).

3D modelling showed that suitable habitats for troglofauna occur extensively throughout the Study Area, hosted within several members and units of the Brockman Iron Formation and superficial deposits of Tertiary detritals and scree (Figure 3.9, Figure 3.10, Figure 3.11 in Biologic 2025; Appendix 8). Suitable troglofauna habitats were modelled beneath the proposed mining at the periphery of each pit, where most of the target troglofauna taxa were recorded.

The Derived Proposal is predicted to result in a localised reduction of troglofauna habitat, but a wider extent of well-connected, suitable habitat will remain intact outside of the proposed pits. There are no structural barriers that could affect potential troglofauna dispersal between impacted and non-impacted habitats and extensive and thick troglofauna habitats have been modelled on either side of the anticline at the location of the proposed pits (Figure 3.9 in Biologic 2025; Appendix 8). Here, the BIF-rich units of the Dales Gorge Member (D4, D2, and D1) provide

extensive suitable habitats for troglofauna within and underneath the pit shell. These habitats extend beyond the area of the proposed pits in an east-west direction (Figure 3.10 and Figure 3.11 in Biologic 2025; Appendix 8) and continue towards the north and south. Further medium suitability AWT habitats occur within the BIF-rich units of the Joffre Member (J2, J4 and J6) located further away from the centre of the anticline (Figure 3.9 in Biologic 2025; Appendix 8).

Overall, given the extent and connectivity of high and medium suitability troglofauna habitats remaining beneath the pit and extending into areas beyond those to be impacted (Figure 8-5), removal of troglofauna habitat as a result of the Derived Proposal is unlikely to be significant. The impacts of habitat removal to each individual troglofauna species potentially restricted to the proposed mine pit/s is discussed below.

8.4.1.2 Troglofauna Taxa

Of the 52 troglofauna taxa known only from Ministers North, 19 taxa are currently only known from the proposed mine pits (see Figure 8-7). These 19 taxa are the focus of this impact assessment as the remaining species do not occur within the proposed pits and will not be directly impacted by the Derived Proposal. The predicted impacts of the Derived Proposal on troglofauna are defined as follows:

- **Low impact:** habitat modelling shows following mining thick and well-connected suitable habitats will remain intact beneath the proposed mining at the known locations of these taxa.
- **Medium impact:** habitat modelling shows that the proposed mining will remove the local extent of suitable habitat AWT at the known record location(s). In each of these cases however, there is a wider context of well connected, suitable habitats remaining intact AWT following mining.

Based on these definitions, as well as considering ecological and taxonomic factors for each taxa, the Derived Proposal is predicted to have a low impact on 11 of the 19 troglofauna taxa and a medium impact to the remaining eight troglofauna species (Biologic 2025).

Whilst the Derived Proposal will remove some suitable troglofauna habitat, an extensive interconnected network of suitable habitat is predicted to remain intact beneath and surrounding the pit following the proposed mining. The direct reduction of suitable habitat within the proposed pits is not expected to result in the loss of any troglofauna species following the implementation of the Proposal given the extent and connectivity of suitable habitat remaining intact post-mining for each species, although it will result in the localised reduction in habitat for some medium impact species. In all cases, considering taxonomic and ecological factors of each taxa in question, the recorded occurrence of these species within the pit is likely to be an artefact of sampling rather than the species being restricted to the 3D impact area (Biologic 2025).

Overall, impacts to troglofauna as a result of the Derived Proposal are unlikely to be significant given the extent of suitable, connected habitat and given that the seemingly restricted ranges of all 19 troglofauna species is likely to be an artefact of sampling rather than a true indication of species distributions (Biologic 2025). Species specific impacts are described below with further details provided in Biologic (2025) in Appendix 8.

Low impact

The Derived Proposal is predicted to have a low impact on 11 of the 19 troglofauna taxa as suitable habitat will remain intact beneath the proposed pit at the locations of each of these 11 taxa post-mining. Post-mining habitat remaining at these locations is thick and well-connected to a wider extent of non-impacted suitable habitat outside the proposed pits (Biologic 2025). The species at low risk of impact are:

- *Anapistula* `sp. BAR147`
- *Anapistul*a `sp. S01`
- Linyphiidae `sp. BAR148`
- *Prethopalpus* `sp. B32`

- *Palpigrad*i `sp. BPAL054`
- *Indohya* `sp. BPS560`
- Curculionidae Genus 1 `sp. BCO228`
- *Holoparamecus* `sp. BCO255`
- Reduviidae `sp. MN`
- *Pauropoda* `sp. S04`
- *Hanseniella* `sp. B43`.

The above species are all considered low risk as a result of the Derived Proposal for reasons including substantial suitable habitat remaining post-mining, the proximity of species records to the edge of the pits, and no apparent barriers for dispersal. Specific considerations for each species is provided in Biologic (2025) in Appendix 8.

Medium impact

For eight of the 19 troglofauna species currently only known from the proposed mine pits, the Derived Proposal is predicted to have a medium impact as the proposed mining will remove the local extent of suitable habitat AWT at each species known location. However, well connected, suitable habitats will remain intact surrounding the mine pits, following mining and it is considered unlikely that any of these taxa would be highly restricted at small spatial scales to the 3D impact area only (Biologic 2025). At the local scale, the interconnected network of suitable habitat AWT is predicted to continue to support the troglofauna assemblage of Ministers North following the proposed mining (Biologic 2025). As such, potential impacts to these species are considered unlikely to be significant.

Each troglofauna species at risk of medium impact is described below with further details provided in Biologic (2025; Appendix 8).

nr. *Encoptarthria* `sp. BAR142`

The gnaphosid spider nr. *Encoptarthria* `sp. BAR142`was collected from a single site within the proposed northern pit where it was recorded in two stratigraphic units: J2 (Brockman Iron Formation, Joffre Member – BIF-rich) and J1 (Brockman Iron Formation, Joffre Member – Shaly) (Plate 1). 3D modelling shows that a small patch of habitat within the J1/J2 units will remain near the record location underneath the pit shell following proposed mining (Plate 1). That patch of habitat is approximately 10 m thick near the species location but extends considerably to the east beyond the area of the proposed pit, where it becomes approximately 50 m thick. The impacts of the Derived Proposal to nr. *Encoptarthria* `sp. BAR142` have been classified as medium, because only a thin patch of suitable AWT habitat will remain intact underneath the pit in the vicinity of the known record location of the species; however, it should be noted that the suitable habitat the species was recorded from extends widely to the east beyond the pit and where it becomes thick. In addition, of the Gnaphosidae OTU's with a known linear range in Biologic's database, the average linear range is 17 km (min 5 km – max 34 km). 3D modelling showed no potential habitat barriers between impacted and non-impacted habitats and given the ranges of other known Gnaphosidae OUT's and the extent of suitable habitat, it is highly likely that this species occurs in areas outside those to be impacted. As such, impacts to this species are unlikely to be significant.

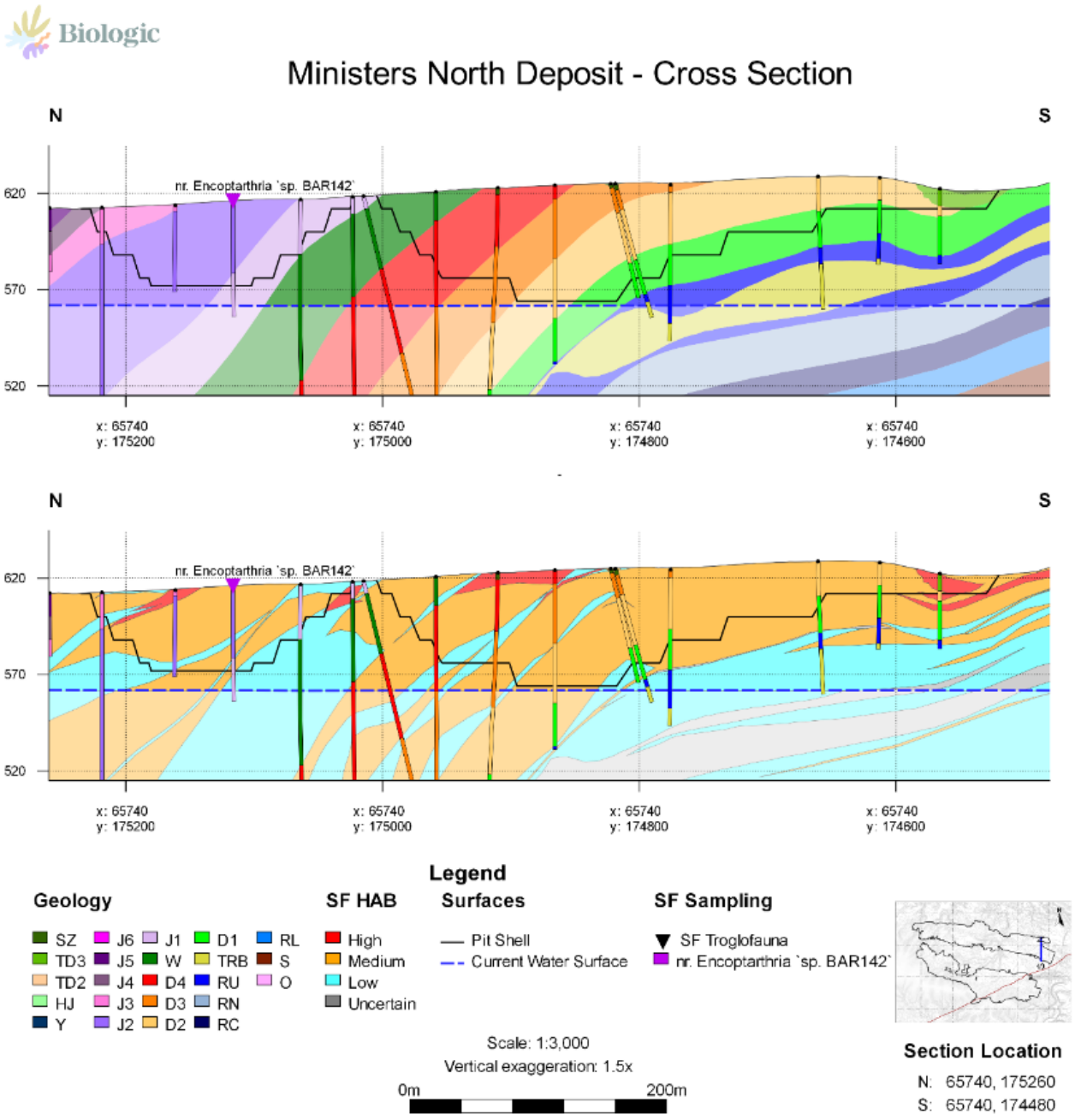


Plate 1: Cross-section showing potential AWT habitats for nr. *Encoptarthria* `sp. BAR142` at Ministers North

Coleoptera `sp. BCO236`

The beetle Coleoptera `sp. BCO236` was collected from a single site approximately 160 m from the edge of the proposed northern pit (Plate 2). Troglofaunal beetles tend to range over several kilometres to tens of kilometres in the Pilbara region, and it is unlikely that this taxon would be uniquely restricted to the proposed impact area (Biologic 2025). In addition, whilst this species is treated as troglofauna, there is a possibility it could represent soil fauna; however, as it lacks genetic sequencing this cannot be determined.

The species was recorded from a drillhole that intercepts two stratigraphic units (both of which represent low suitability habitat for troglofauna at Ministers North): J1 (Brockman Iron Formation, Joffre Member – Shaly) and W (Brockman Iron Formation, Whaleback Shale). The 3D model shows that the medium suitability habitat within the J1 unit where the species was recorded will be removed following implementation of the Derived Proposal (Plate 2). However, the

J1 unit extends widely underneath the pit shell to the north, potentially providing further suitable AWT habitats beyond the impact area. Further medium suitability habitats occur beyond the pit shell to the north within Joffre Member units J2, J3, and J4. These habitats are directly connected to the impacted habitat within the pit shell where the species was recorded. The impacts to Coleoptera `sp. BCO236` have been classified as medium because no suitable habitat will remain directly underneath the known record location following mining (Biologic 2025). However, it should be noted that a wider context of extensive suitable habitat has been shown to occur beyond the proposed pit. In addition, given this species belongs to a family of beetles that are generally widespread, and as it was recorded in low suitability habitats, it is likely to have a wider distribution than currently known. Impacts to this species are therefore unlikely to be significant.

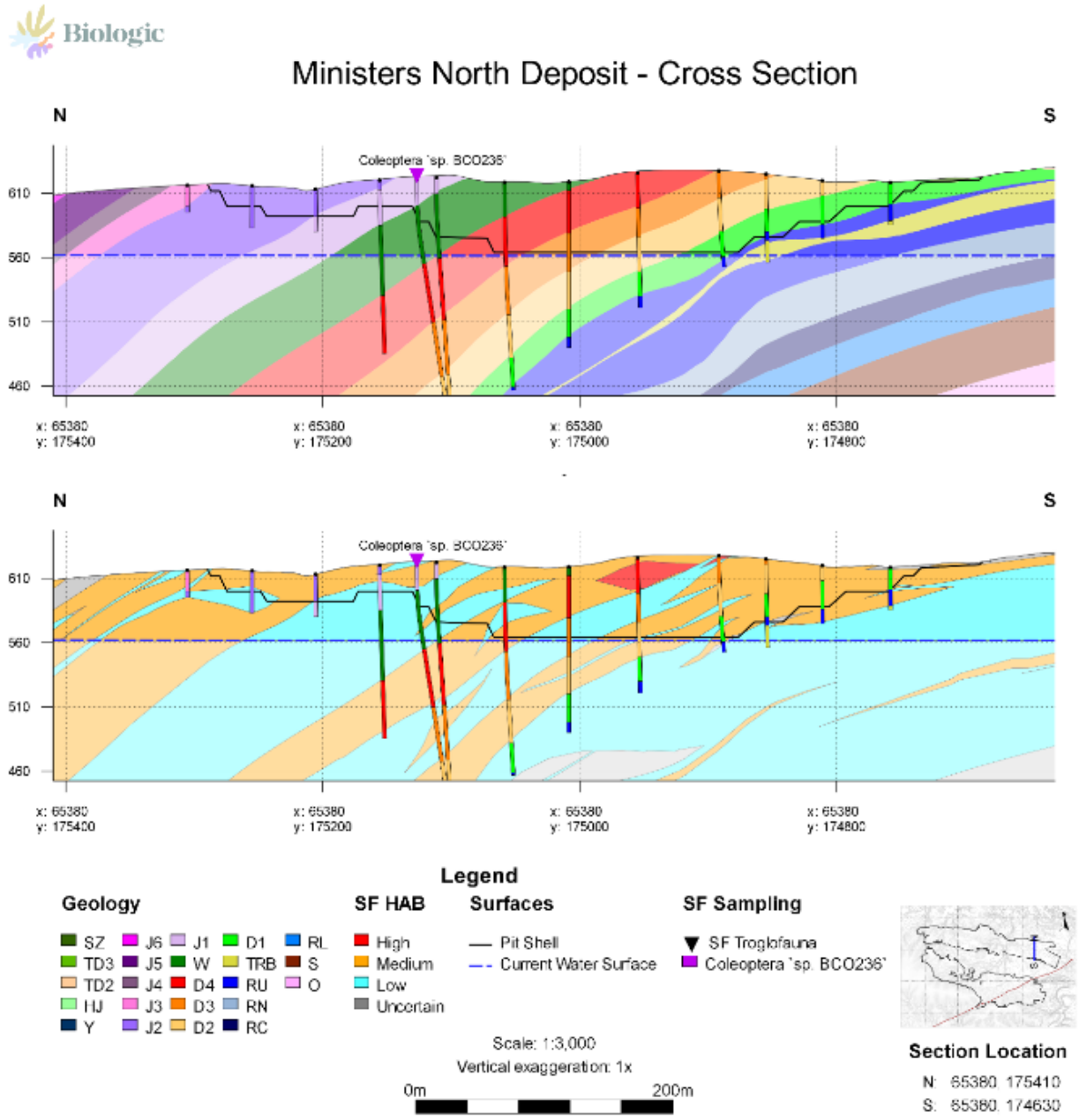


Plate 2: Cross-section showing potential AWT habitats for Coleoptera `sp. BCO236` at Ministers North

Pselaphinae `sp. S04`

A staphylinid beetle, Pselaphinae `sp. S04`, was collected from a single site approximately 95 m from the western edge of the proposed southern pit (Plate 3). The taxon was collected in 2009 and hasn't been sequenced; hence, could not be compared to available sequences from Biologic's DNA sequence database to potentially detect a wider regional match. Of the five Staphylinidae OTU sequences in Biologic's DNA sequence database at the time of writing, three were singleton records whereas the other two had linear ranges of 2 km and 77 km, respectively (Biologic 2025).

The species was recorded in a drillhole which intercepts three stratigraphic units: D2 - Brockman Iron Formation, Dales Gorge Member – BIF-rich, D1 – Brockman Iron Formation, Dales Gorge Member and RU – Mount McRae Shale, Upper Unit. The 3D model shows that the medium suitability habitat within the D2 and D1 units where the species was most likely recorded will be removed following implementation of the proposed mining (Plate 3). A relatively thin layer of habitat (D1) will remain underneath the pit shell which extends to the north beyond the area of the proposed pit. Collectively the D1 and D2 units provide a thick band of medium suitability habitat extending well beyond the pit to the south.

There is high confidence in the modelling that further medium suitability habitats occur beyond the pit shell to the south within all four Dales Gorge Member units (D1, D2, D3, and D4). These habitats are directly connected to the impacted habitat within the pit shell where the species was recorded. Combined with the dispersal characteristics and wider ranges of other members of this taxonomic group, it is reasonably unlikely that this taxon would be uniquely restricted to the impact area (Biologic 2025). Based on this and the extent of medium suitability habitats remaining outside the proposed pits, impacts to this species are unlikely to be significant.

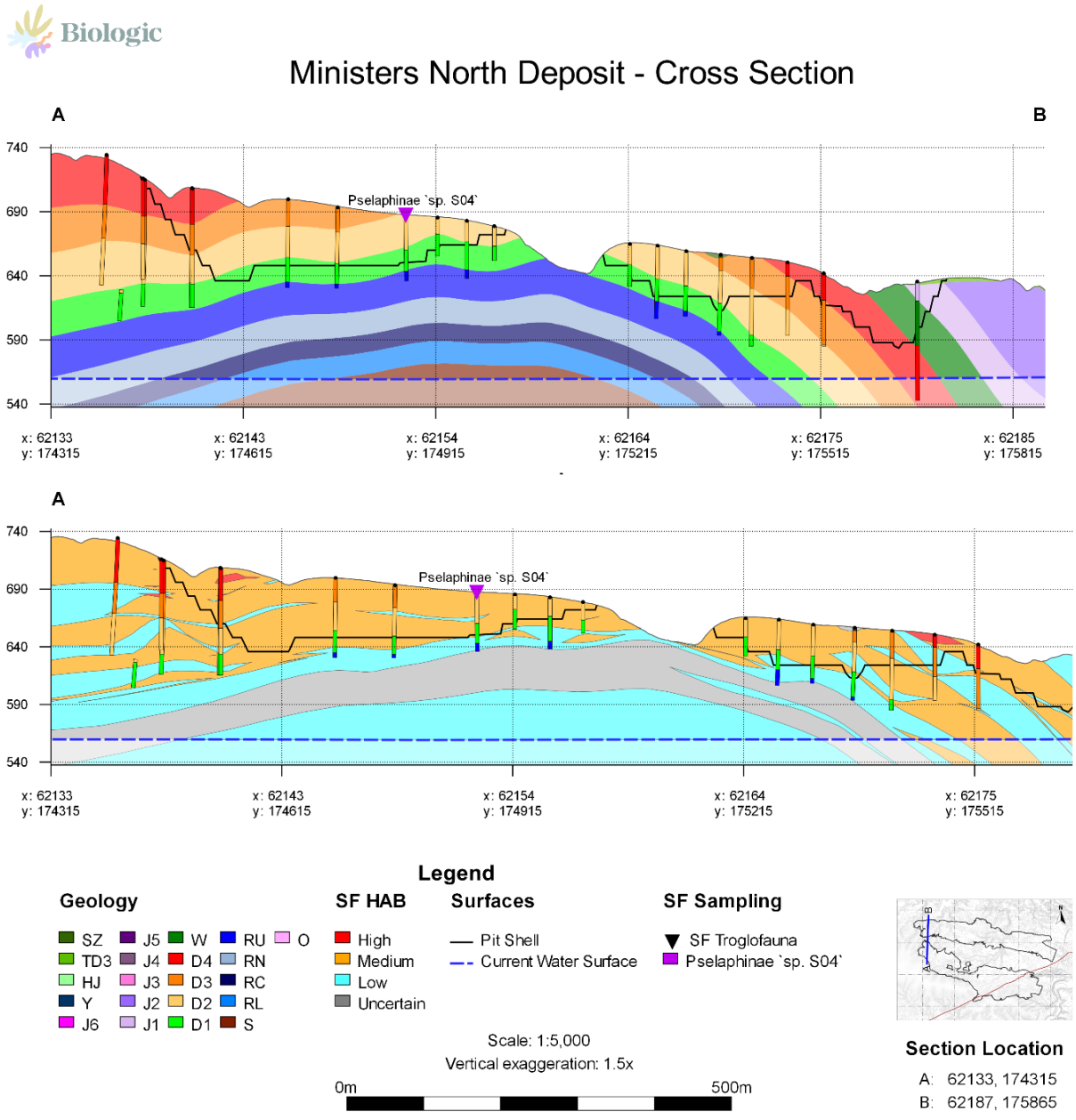


Plate 3: Cross-section showing potential AWT habitats for Pselaphinae `sp. S04` at Ministers North

Zuphiinae `sp. S01 s.l.`

The Carabid ground beetle Zuphiinae `sp. S01 s.l.`, was collected from a single site approximately 95 m from the western edge of the proposed southern pit (Plate 4). The taxon was collected in 2009 and hasn't been recorded since. Bennelongia (2018) suggest it is likely that Zuphiinae `sp. S01 s.l.` represents *Typhlozuphium* `sp. B04` which is known from four sites (2.5 km linear range) within the Study Area; however, both taxa have been treated as separate species herein. Troglofaunal Zuphiini are not as frequently collected as other Coleoptera groups but can be relatively widespread in the Pilbara region (Biologic unpublished data). Of the four Zuphiini OTUs in Biologic's DNA sequence database at the time of writing, one was a singleton whereas the other three had linear ranges of 2.5 km, 3.6 km, and 23 km, respectively (Biologic 2025).

3D modelling showed that the drill hole where this species was detected intercepts three stratigraphic units the D2 - Brockman Iron Formation, Dales Gorge Member – BIF-rich, D1 – Brockman Iron Formation, Dales Gorge Member and RU – Mount McRae Shale, Upper Unit. Thick bands of medium suitability habitats within the Dales Gorge

Member subunits D1, D2, D3 and D4 near the species location extend widely beyond the pit area to the south (Plate 4). Medium suitability habitat within the D2 and D1 units, where the species was most likely recorded, will be removed following implementation of the proposed mining (Plate 4). A relatively thin layer of habitat (D1) will remain underneath the pit shell and extends to the north beyond the area of the proposed pit, however, that portion of the D1 unit has mostly been classified as low suitability habitat in the 3D model (Plate 4). Despite this, there is high confidence in the modelling that further medium suitability habitats occur beyond the pit shell to the south within all four Dales Gorge Member units (D1, D2, D3, and D4) (Plate 4). This habitat is directly connected to the locations within the pit shell where the species was recorded (Plate 4). In combination with the typically wide linear ranges of troglofaunal Zuphiini it is considered unlikely that this taxon would be restricted to the impact area (Biologic 2025) and impacts to this species are therefore considered unlikely to be significant.

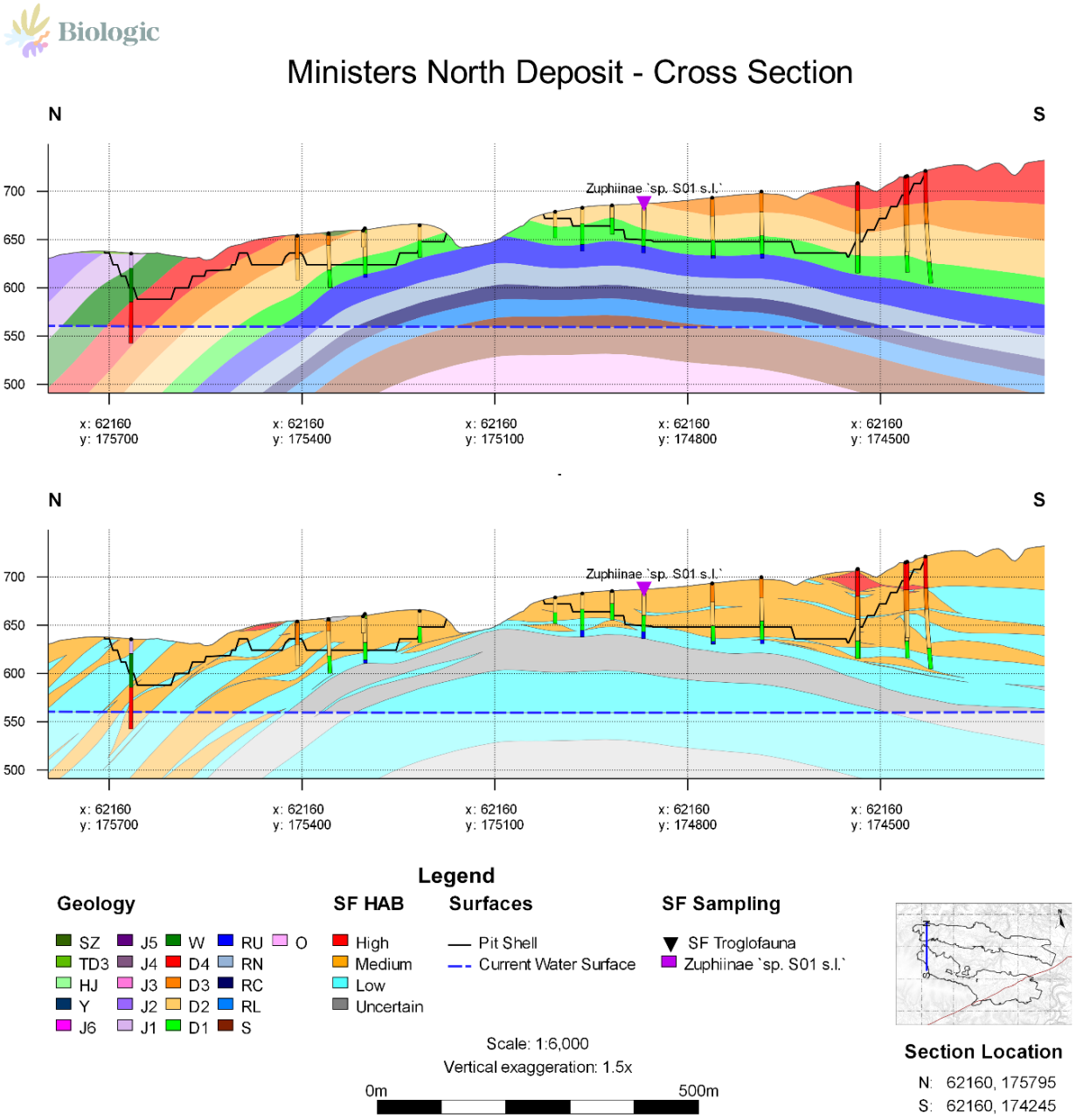


Plate 4: Cross-section showing potential AWT habitats for Zuphiinae `sp. S01 s.l.` at Ministers North

Pauropodidae `sp. BPU118`

Pauropodidae `sp. BPU118`was collected from a single site approximately 160 m from the edge of the proposed northern pit (Plate 5). The 3D model shows that the medium suitability habitat within the D4 unit where the species was recorded will be removed underneath the record location following implementation of the proposed mining (Plate 5). However, the D4 unit extends beyond the proposed pit to the north without habitat barriers, providing relatively thin (up to 15 m thick) but extensive (more than 1 km long) medium suitability AWT habitats in an east-west direction underneath the proposed pit (Plate 5; Biologic 2025). Further extensive and directly connected suitable AWT habitats have been modelled to the south of the proposed pit within the D1 unit of the Dales Gorge Member (Plate 5).

It is also noted that this species may not represent obligate troglofauna; however, as the specimen collected could not be genetically sequenced, taxonomy is based on morphology alone and its ecological status remains uncertain. Overall, given the extent of medium suitability habitats remaining beyond the pits, impacts to this species are unlikely to be significant.

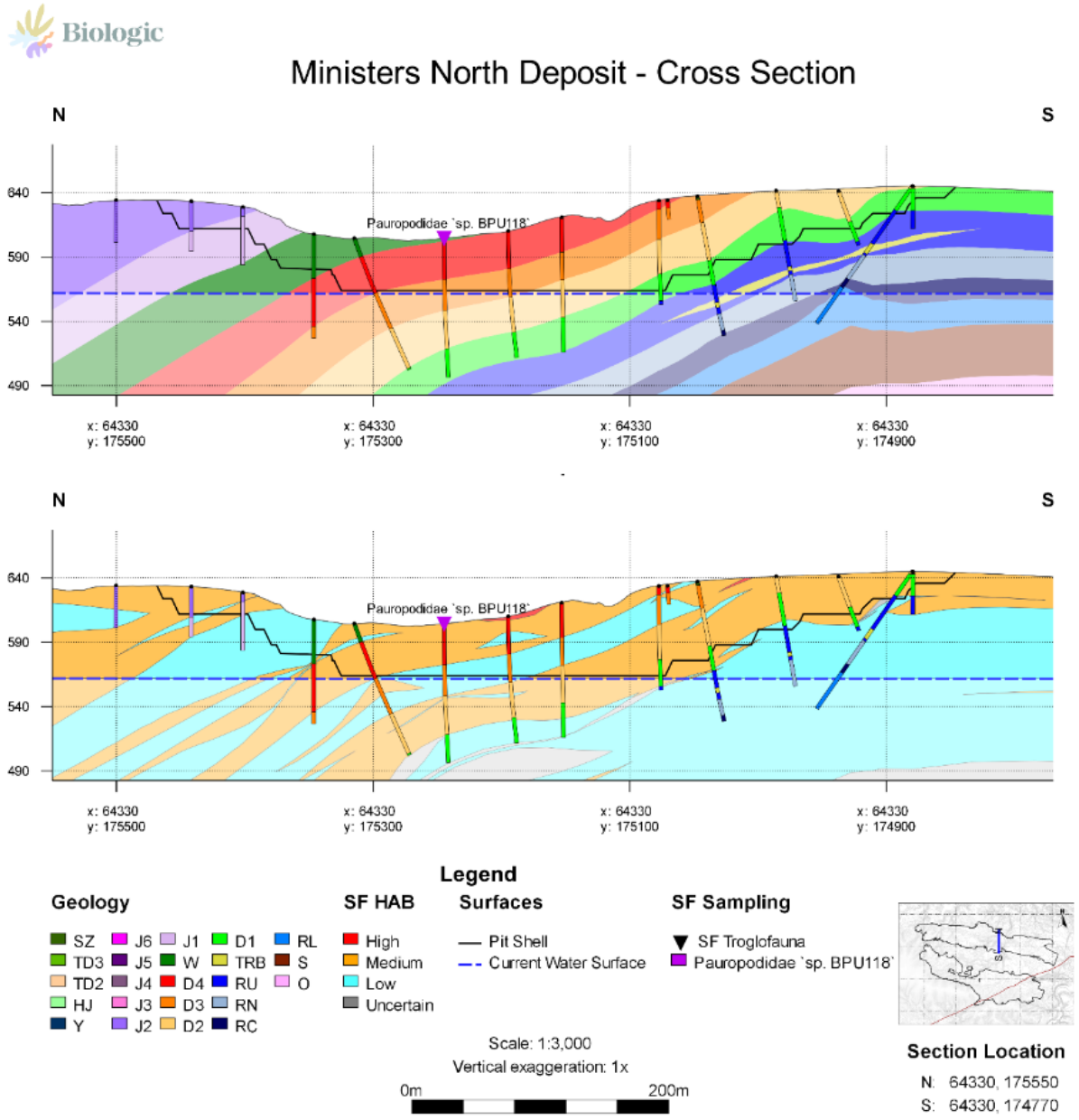


Plate 5: Cross-section showing potential AWT habitats for Pauropodidae `sp. BPU118` at Ministers North

Pauropodidae `sp. BPU119`

Pauropodidae `sp. BPU119` was collected from a single site approximately 90 m from the edge of the proposed southern pit (Plate 6). The 3D model shows that the medium suitability habitat within the D4 unit, where the species was recorded, will be removed underneath the record location by the proposed mining (Plate 6). However, that unit directly extends beyond the proposed pit to the south without habitat barriers, providing extensive medium suitability AWT habitat beyond the area of the proposed pit (Plate 6; Biologic 2025). Further extensive suitable AWT habitat within the D2 unit have been modelled at greater depth underneath the current record location and extending beyond the pit to the south (Plate 6).

As noted with P. 'sp. BPU118', this species may not represent obligate troglofauna; however, as the specimen collected could not be genetically sequenced, taxonomy is based on morphology alone and its ecological status remains uncertain. Overall, given the extent and connectivity of medium suitability habitats (including the D4 unit) remaining beyond the pits, impacts to this species are unlikely to be significant.

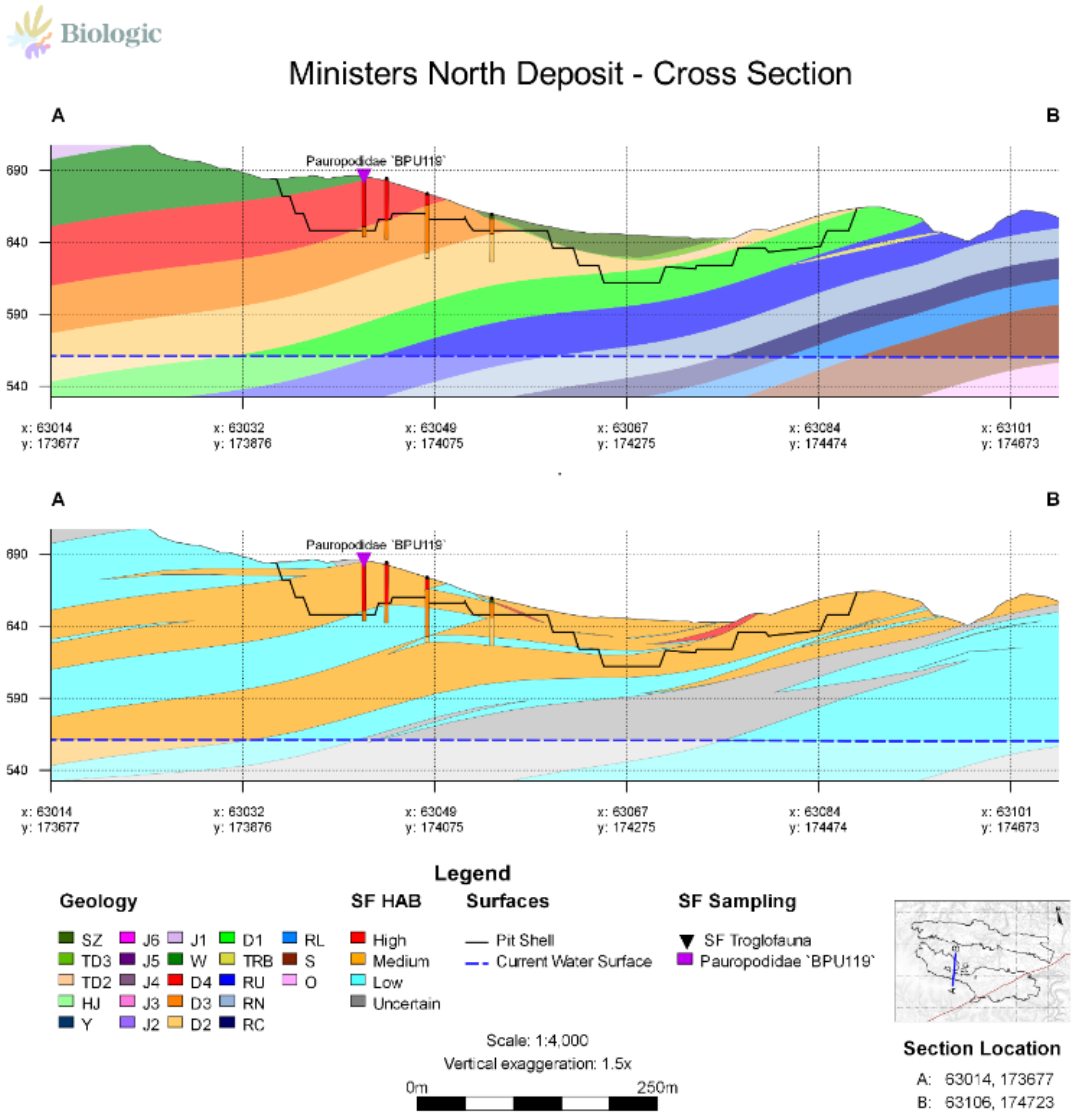


Plate 6: Cross-section showing potential AWT habitats for Pauropodidae `sp. BPU119` at Ministers North

Cryptopidae `sp. MN`

The centipede Cryptopidae `sp. MN` was collected from near the centre (approximately 360 m from the edge) of the proposed southern pit (Plate 7). The taxon was collected by Subterranean Ecology (2010), genetically sequenced by Helix Molecular Solutions, and has not been recollected. 3D habitat modelling predicts that suitable habitat within the D3 and D1 units will remain intact AWT below the proposed pit shell at the species location, extending widely underneath the pit in an east-west direction (up to 55 m thick) and also beyond the impact area. The impacts of the Proposal to Cryptopidae `sp. MN` have been classified as medium, because the species has been collected from the middle of the proposed pit. However, 3D modelling predicts that thick medium suitability habitats will remain intact at this location following implementation of proposed mining and well-connected AWT habitats extend widely underneath the pit shell in an east-west direction, and beyond the pit to the north (Biologic 2025). As such, impacts to this species are unlikely to be significant.

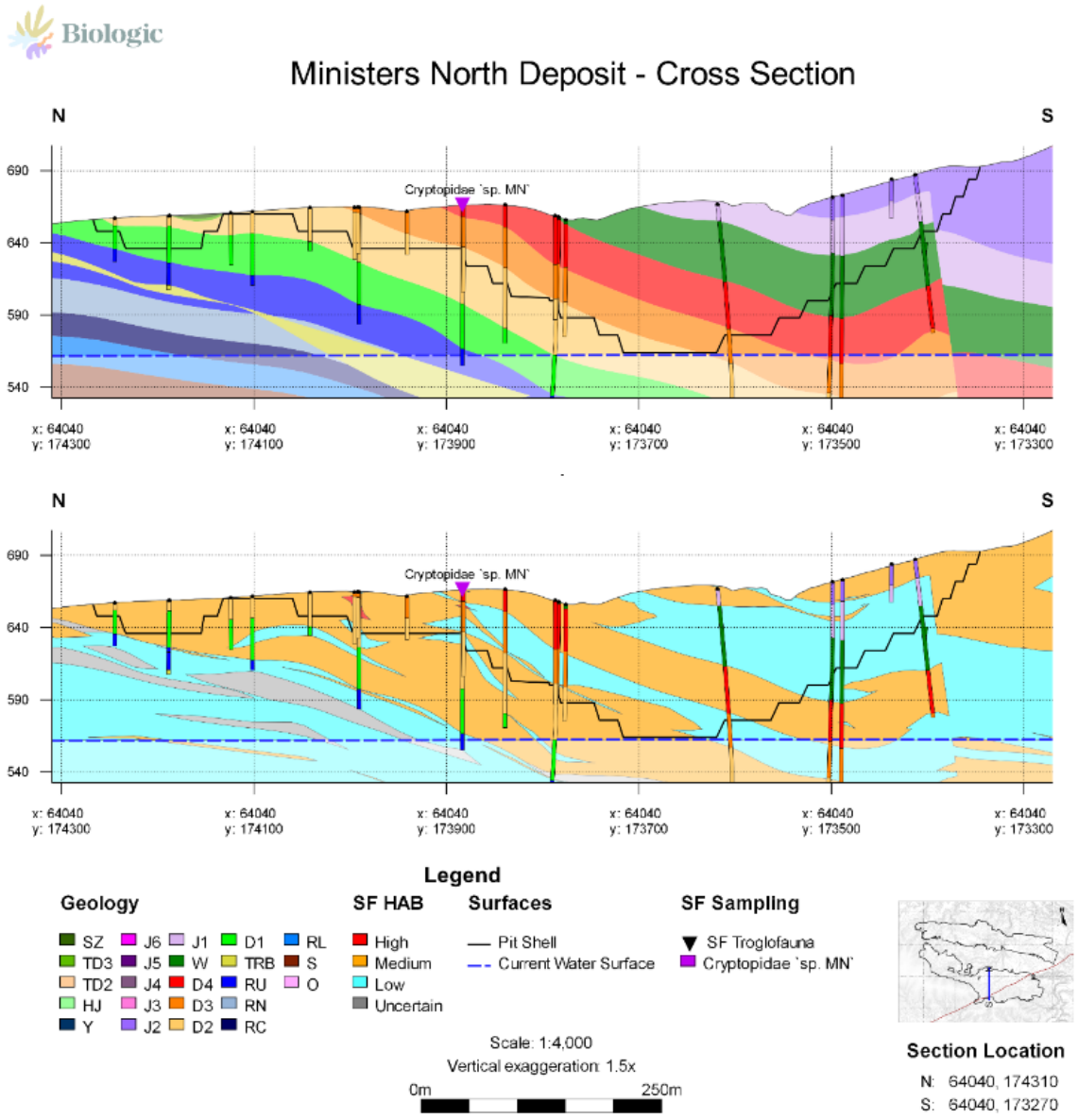


Plate 7: Cross-section showing potential AWT habitats for Cryptopidae `sp. MN` at Ministers North

Hanseniella `sp. BSYM129`

Hanseniella `sp. BSYM129` was recorded from a single site, approximately 110 m from the edge of the proposed northern pit (Plate 8). The 3D model shows that the medium suitability habitat within the D4 unit, where the species was recorded, will be removed following implementation of the proposed mining (Plate 8). However, that unit directly extends beyond the proposed pit to the north without habitat barriers, providing extensive medium suitable AWT habitat beyond the proposed pit (Plate 8). Further extensive suitable AWT habitat within the D2 unit have been modelled at greater depth underneath the current record location and extending beyond the pit to the north (Plate 8). The impacts of the Derived Proposal to *Hanseniella* `sp. BSYM129` have been classified as medium, because the 3D modelling predicts that no suitable habitat will remain directly underneath record location within the unit the species was recorded from (D4) following implementation of proposed mining; however, the D4 unit extends to the north, providing directly connected AWT habitat beyond the impact area and further suitable AWT habitat (within D2) occurs at greater depth underneath the record location, extending northwards beyond the pit shell (Biologic 2025). As such, impacts to this species are unlikely to be significant.

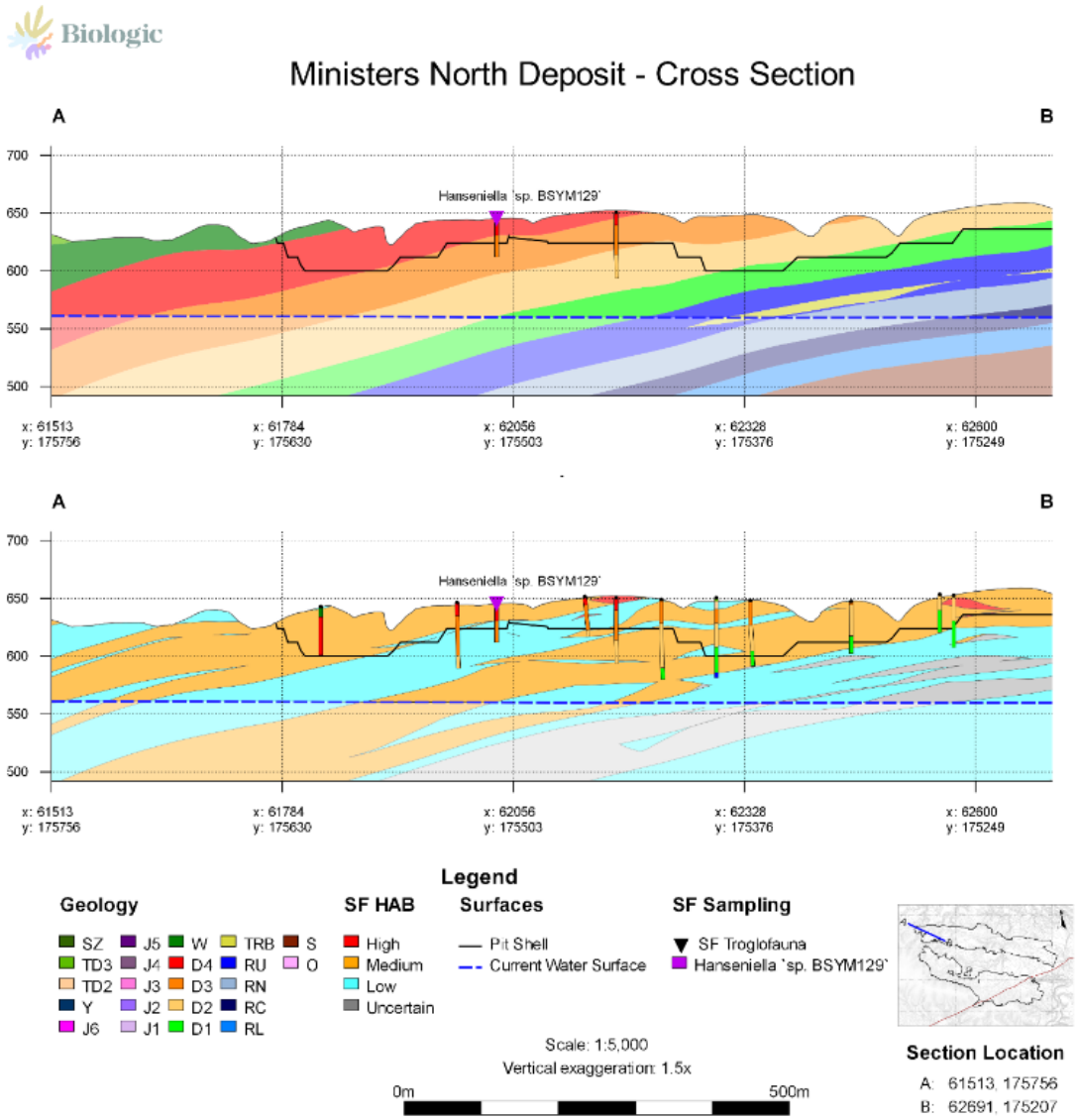


Plate 8: Cross-section showing potential AWT habitats for *Hanseniella* `sp. BSYM129` at Ministers North

8.4.2 Vibration from blasting (indirect)

In addition to the direct impacts from mine pits, subterranean fauna have the potential to be indirectly impacted through degradation of the subterranean environment associated with vibration/blasting. The PERSP (BHP 2016a) describes risks associated with blasting activities and vibration as being low risk but difficult to assess. Impacts on both stygofauna and troglofauna may occur through the physical effect of explosions. Blasting may also have indirect detrimental effects through altering underground structure (usually rock fragmentation and collapse of voids) and transient increases in groundwater turbidity.

The effects of blasting are often referred to in literature but are poorly quantified and have not been related to ecological impacts. Investigations at other mines in the Pilbara suggest that vibration and blasting have minimal effect on the integrity of geological structures (and therefore troglofauna habitat) even as close as 5 m away from the pit face (Rio Tinto 2018). Risks are likely to be localised to the immediate vicinity of the pit walls, with effects dissipating rapidly with distance from the pit. Overall, impacts associated with vibration from blasting are considered minor and unlikely to be significant.

8.4.3 Presence of modified landforms (indirect)

In addition to the direct impacts from mine pits, troglofauna have the potential to be indirectly impacted through degradation of the subterranean environment associated with vegetation clearing and placement of artificial landforms, including the OSA and stockpiles.

Modified landforms may cause localised reduction in rainfall recharge and associated inflow of dissolved organic matter and nutrients because water runs off these landforms rather than infiltrating through them and into the underlying ground. The effects of reduced carbon and nutrient input are likely to be expressed over many years and are likely to be greater for troglofauna than stygofauna (because lateral movement of groundwater should bring in carbon and nutrients). The extent of impacts on troglofauna will largely depend on the importance of chemoautotrophy (obtaining energy from electrons in their environment) in driving the subterranean system compared with infiltration-transported surface energy and nutrients. These modified landforms are unlikely to cause species extinctions, although population densities of species may decrease under them; however, troglofauna are expected to continue to utilise habitat in or below the proposed OSA and stockpiles as has been observed from recent troglofauna sampling at other mining operations (e.g. Rio Tinto's Mesa A and Mesa J; Rio Tinto 2018).

Six troglofauna species are known from the current OSA or stockpile footprint including two potentially restricted species (Table 8-5 in Section 8.3.2.2; Figure 8-7) and four widespread species (Bennelongia 2024c). All six species have distributions which extend beyond the boundaries of the OSA and are known from areas outside the direct and indirect impact areas. As such, impacts to troglofauna as a result of OSA or stockpiles are expected to be low and unlikely to be significant.

The impacts of the OSA and modified landforms to stygofauna was also considered, however, given the depauperate community, and depth to groundwater beneath the OSA and stockpiles (i.e. over 40 mbgl), the risk to stygofauna from these landforms is low.

8.4.4 Contamination of soils and water (indirect)

There is the potential for indirect impacts to occur via contamination of soils and/or groundwater, which has the potential to degrade subterranean fauna habitat (both above and below water table). Risks to above water table habitat from soil or water contamination are considered to be low, will be managed through BHP's standard practices, and are not considered further. However, impacts to below water table habitat (i.e. groundwater) could occur from changes to groundwater quality as a result of mining operations through alteration of the landscape, construction of infrastructure, exposure of acidic materials, or from the release of contaminants (including hydrocarbons) from accidental spills.

Depth to groundwater across most of the Development Envelope is relatively deep (i.e. over 40 mbgl) and as such, risk to stygofauna associated with groundwater contamination throughout most of the Development Envelope is minimal. However, the risk increases where the mine pits occur, given, they extend closer to the groundwater table and a minimum 5 m separation distance will occur during operations, as well as areas to the east, including Yandicoogina Gorge, where depth to groundwater is shallower. Yandicoogina Gorge supports a high percentage of stygofauna values including potentially restricted stygofauna species. As described in Section 5.4.3, groundwater contamination off-tenure at Yandicoogina Gorge has the potential to occur; however, is expected to be low risk. Despite the low risk, as a precautionary measure BHP has proposed monitoring at the source and local reinjection areas for the Yandicoogina Gorge supplementation trial which has subsequently been conditioned under L6168/1991/11. This will ensure that there are no changes to water quality that could significantly impact stygofauna values within the gorge.

There also is the possibility that subterranean habitats become contaminated from the exposure of PAF material, and/or handling of hazardous materials or wastes, however, as discussed in Inland Waters (Section 5) and the MCP (Appendix 12), risks associated with these are considered low. Site drainage will be designed to collect, minimise or eliminate surface runoff into areas where hydrocarbon contamination may occur. Hydrocarbon storage facilities will be appropriately constructed and bunded in accordance with Australian Standards. Regular facility inspection, maintenance, spill management procedures and staff training are expected to mitigate the risk of contamination effectively. BHP has well established strategies for the management of wastes at its Pilbara operations to ensure that risk of contamination of soil or groundwater is minimised. Additional areas where bunding and/or minor surface flow diversions may be required include the proposed batch plant, explosives storage area and top soil storage areas to minimise any residual risk of contamination.

Section 5 discusses the risk to groundwater from contamination in more detail, including potential risk from AMD, PFAS contamination due to water supply from other sites, hydrocarbons pills and other risks, along with relevant mitigation (see Section 5.4.3 and Section 5.5).

8.5 Mitigation

The BHP (2016a) assessment for the Strategic Proposal provides examples and case studies of the land and biodiversity management measures that BHP may apply to mitigate the potential impacts to subterranean fauna values.

Whilst BHP considers that there are no significant environmental impacts to subterranean values that would require targeted management measures, BHP's application of the Mitigation Hierarchy to avoid, minimise, rehabilitate and offset the potential impacts to subterranean values is discussed below.

8.5.1 Avoid

The Derived Proposal represents AWT mining only, meaning no dewatering will occur as part of this Proposal. As such direct impacts to stygofauna taxa, attributable to the Derived Proposal, will be avoided.

No specific avoidance measures for troglofauna values are proposed for the Derived Proposal, given that modelling demonstrates that an extensive interconnected network of suitable troglofauna habitat is predicted to remain intact within and surrounding the pits based on the proposed mine plan (Biologic 2025).

8.5.2 Minimise

Consistent with MS1105 *Guidelines for submitting a derived proposal* (1(b)), the results from the targeted surveys were used to inform the design of the proposed mine and infrastructure to minimise disturbance to subterranean fauna values within the Development Envelope where practicable.

8.5.2.1 Troglofauna

Initial mine planning for the Derived Proposal included a mine pit and OSA on the eastern side of the rail, adjacent to the Yandicoogina Gorge. Subsequent mine planning has removed these eastern mine pits and OSA, with these areas no longer forming part of the Derived Proposal. The removal of the eastern mine pit and OSA has minimised the potential direct and indirect impacts to troglofauna.

Initial mine planning also included a Western OSA which would remain at closure. Through optimisation, this has been removed and the footprint instead used for a temporary stockpile. As such, the extent of modified landforms at closure has been reduced, minimising risk to subterranean fauna beneath these landforms.

Hydrocarbon storage and spill management procedures are expected to effectively mitigate the risk of hydrocarbon or chemical contamination of subterranean fauna habitat. During the BHP (2016a) assessment for the Strategic Proposal, it was noted that contamination of soils was deemed low risk to subterranean fauna and management actions not applicable. Nevertheless, BHP has well established strategies for the management of wastes at its Pilbara operations to ensure that risk of contamination of soil or groundwater is minimised. Hydrocarbons will be handled, stored and disposed of in accordance with legal requirements.

Subterranean fauna risks associated with blasting activities and vibration are difficult to measure and assess but are generally considered minor. During the BHP (2016a) assessment for the Strategic Proposal, it was noted that vibration from blasting was deemed low risk to subterranean fauna and management actions not applicable.

Overall, any potential indirect impacts associated with vegetation clearing, placement of infrastructure, blasting and vibration and contamination for the Derived Proposal are likely to be highly localised, temporary and minor and therefore, do not require targeted management measures for troglofauna.

8.5.2.2 Stygofauna

As the Derived Proposal is AWT only, no specific management is proposed for stygofauna.

The potential impacts and risks of the Derived Proposal to groundwater are discussed in detail within Section 5 *Inland Waters*. There are no additional mitigation measures proposed to manage groundwater impacts and risks, and associated potential stygofauna impacts and risks, beyond those described in Section 5. Further details on the management of risks to groundwater quality is provided in Section 5.5.

8.5.3 Rehabilitate

BHP will implement the Ministers North MCP (Appendix 12) to meet the MS1105 approval Condition 15 environmental objective that the proposal is decommissioned, and the site of the proposal rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner. The MCP does not include specific measures relating to subterranean fauna, but the objectives of stable and non-polluting, indirectly link to subterranean fauna values.

8.5.4 Offset

Following the application of the Mitigation Hierarchy (avoid, minimise and rehabilitate), BHP considers that there will not be any significant residual impact from the Derived Proposal to subterranean fauna values. Accordingly, environmental offsets for the Derived Proposal in relation to subterranean fauna are not proposed.

8.5.5 Other statutory decision-making processes

The EPA (2021d) document *Taking Decision Making Processes into account in EIA: Interim Guidance* identifies that the EPA may consider other statutory decision-making processes which can mitigate the potential impacts of a proposal on the environment, having regard to the ability and processes of a DMA, the conditions that may be applied, and the likely environmental outcomes.

In consideration of the Environmental Factor of Subterranean Fauna and the EPA (2021d) guidance, BHP considers there are no other State statutory decision-making process relevant that could mitigate or control the potential environmental impacts of the Derived Proposal on subterranean fauna values.

8.6 Validation of impacts and environmental outcome

BHP has validated the impacts to Subterranean Fauna from the Derived Proposal against the Strategic Proposal, assuming relevant mitigation measures identified in Section 8.5 and Section 5.5 have been applied, to demonstrate that the environmental objective identified in MS1105 Condition 9, can be met.

Following mitigation, BHP considers that there will not be any significant residual impacts on Subterranean Fauna values from the Proposal. Table 8-7 summarises the residual impacts and environmental outcomes for Subterranean Fauna and demonstrates consistency with MS1105 condition objectives.

Table 8-7: Subterranean Fauna - residual impacts, environmental outcomes and consistency with MS1105 condition objectives

Derived Proposal residual impact after application of mitigation measures	Derived Proposal environmental outcome	Consistency with Strategic Proposal MS1105 condition objectives
Removal of subterranean fauna habitat	Protection of local stygofauna values by avoiding below water table mining and groundwater abstraction. Contributes to the cumulative clearing of troglofauna habitat in the Pilbara bioregion. Modelling demonstrates that an extensive interconnected network of suitable AWT habitat for troglofauna will remain intact based on the proposed mine plan.	9-1 The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) protect subterranean fauna so that biological diversity and ecological integrity are maintained, and in particular: (a) maintain the local population of subterranean fauna taxa which are known to have a restricted distribution; (b) maintain the local and regional populations of subterranean fauna that is specially protected under the relevant legislation; (c) avoid and minimise direct and indirect impacts on the habitat of subterranean fauna that is specially protected under the relevant legislation; and (d) avoid and minimise direct and indirect impacts on the occurrences of threatened and priority ecological communities, and their habitat, which are recognised as having conservation significant subterranean fauna values, including, but not limited to; (i) Ethel Gorge aquifer stygobiont community Threatened Ecological Community. The above environmental objectives can be met due to the following: • No below water table mining or groundwater abstraction and so no impacts to stygofauna values • No troglofauna taxon is expected to be lost as a direct impact from the implementation of the Derived Proposal given that all species are considered to have wider distributions than currently known • Habitat modelling demonstrates that an extensive interconnected network of suitable AWT troglofauna habitat will remain intact based on the proposed mine plan • The remaining interconnected network of suitable AWT habitat is predicted to continue to provide habitat for the troglofauna assemblage present within the Development Envelope following the proposed mining • Significant residual impacts to troglofauna are unlikely to be significant based on the above. Subject to application of the implementation conditions of the MS1105 approval, the EPA's objective for the Environmental Factor of Subterranean Fauna can be met

8.7 Implementation conditions

BHP considers that the following conditions relating to the Environmental Factor of Subterranean Fauna as set out in the MS1105 approval for the Strategic Proposal should apply to the Derived Proposal:

- Condition 4: Compliance Reporting
- Condition 15: Rehabilitation and Decommissioning.

BHP has assessed the existing implementation conditions of the MS1105 approval for the Strategic Proposal in relation to their application for the Derived Proposal. BHP has concluded that the above implementation conditions are appropriate to be applied to the Derived Proposal, and that a Condition 9 Subterranean Fauna Environmental Management Plan is not required.

9 Air Quality Validation

9.1 EPA environmental factor and objective

The EPA (2023a) objective for the Environmental Factor of 'Air Quality' is:

> *"To maintain air quality and minimise emissions so that environmental values are protected."*

During the preparation of the PERSP and EPA Report 1619, Air Quality was assessed in accordance with the former 'Air Quality and Atmospheric Gases' factor. The EPA split this factor into two separate factors in April 2020 (Air Quality and Greenhouse Gas Emissions).

The 'Atmospheric Gasses' component of the former Environmental Factor of 'Air Quality and Atmospheric Gases' is now considered separately under the current Environmental Factor of 'Greenhouse Gas Emissions'. The Environmental Factor of Greenhouse Gas Emissions is assessed in Section 10 *Greenhouse Gas Emissions*.

9.2 Relevant policy and guidance

BHP has validated this environmental factor considering the policies and guidance outlined in Table 9-1.

Table 9-1: Air Quality - policy and guidance

Policy or Guidance	Consideration of Policy or Guidance
Environmental Protection Act 1986 (WA)	• Legislation considered relevant to the protection of air quality values
Statement of Environmental Principles, Factors, Objectives and Aims of EIA (EPA 2023a)	• Consideration of the EPA's environmental objective for the environmental factor of Air Quality
Environmental Factor Guideline - Air Quality (EPA 2020b)	• Considered the links with other Environmental Factors • Considered the values of air quality, and their significance • Undertook investigations and studies consistent with the information required for environmental assessment
National Environment Protection (Ambient Air Quality) Measure (NEPC 2021) *Environmental Protection (Kwinana) (Atmospheric Wastes) Policy Approval Order 1999* (WA) *Port Hedland Air Quality and Noise Management Plan* (DJTSI 2010) *Port Hedland Dust Management Taskforce Report to Government* (DJTSI 2016) *Guideline: Air Emissions* (DWER 2019) *(Draft)* *Guideline: Dust Emissions* (DWER 2021a) *(Draft)*	Air quality estimates have been assessed against relevant air quality policies, guidelines and standards

9.3 Receiving environment

9.3.1 Studies and surveys

In assessment of the Strategic Proposal, BHP (2016a) considered the following information sources for the assessment of the potential impacts to air quality values:

- Pacific Environment Operations Pty Ltd (2015) *Pilbara Strategic Environmental Assessment - Cumulative Air Quality Assessment*.

The air quality values of the area of the Derived Proposal and surrounds have been subject to further studies, as described within the following report:

- Environmental Technologies & Analytics Pty Ltd (ETA) (2024) *Ministers North - Dust Modelling* (Appendix 9).

9.3.2 Survey assumptions and limitations

Ore mining and processing for the Derived Proposal is planned at a production rate of nominally 20 Mtpa (based on BHP's current mine planning), however, if increased ore supply to support BHP's broader Pilbara mining operations is required the production rate for the Derived Proposal may be increased up to 25 Mtpa in some years. With this in mind, the air quality modelling undertaken by ETA (2024) has utilised the 25 Mtpa conceptual plan. The modelling represents the highest potential mining year (greatest total annual movement of ore and waste) and therefore the results are conservative.

A number of receptors used in the ETA (2024) model were identified on the basis of Aboriginal cultural heritage. ETA (2024) notes that to date there are no published air quality ambient guidelines that would guide evaluation of Aboriginal cultural heritage values. In the absence of any documented criteria, the ambient air quality assessment criteria intended to protect human amenity and nuisance values, are assumed to be protective of Aboriginal cultural heritage values, and are used in this assessment as a "proxy" value. A modelling result that is higher than the assessment criteria should not be interpreted as a predicted impact or loss of the value but is an indication that results may need further consideration for the sensitive receptor location.

To determine the potential contribution of existing or background concentrations reference was made to the BHP Strategic Proposal, noting that this does not include any indication of potential background dust deposition rates. Therefore, dust deposition rates have been considered only in relation to the Derived Proposal in isolation.

9.3.3 Environmental values

EPA (2018a) noted in its assessment of the Strategic Proposal that the Pilbara is a naturally dusty environment as a result of the semi-arid landscape, with environmental monitoring demonstrating natural exceedances of air quality standards at various times. The EPA (2018a) concluded that impacts from particulate air emissions of dust are not considered to threaten the environmental values of the Pilbara region, as the environment is naturally subjected to high dust levels and effective management measures can be implemented to avoid and reduce impacts.

Consistent with the Strategic Proposal, the Derived Proposal occurs within the semi-arid landscape of the Pilbara. The environment is naturally subjected to high dust levels, with emissions naturally exceeding air quality standards at various times.

Key receptors in the vicinity of the Derived Proposal in relation to air quality include (ETA 2024):

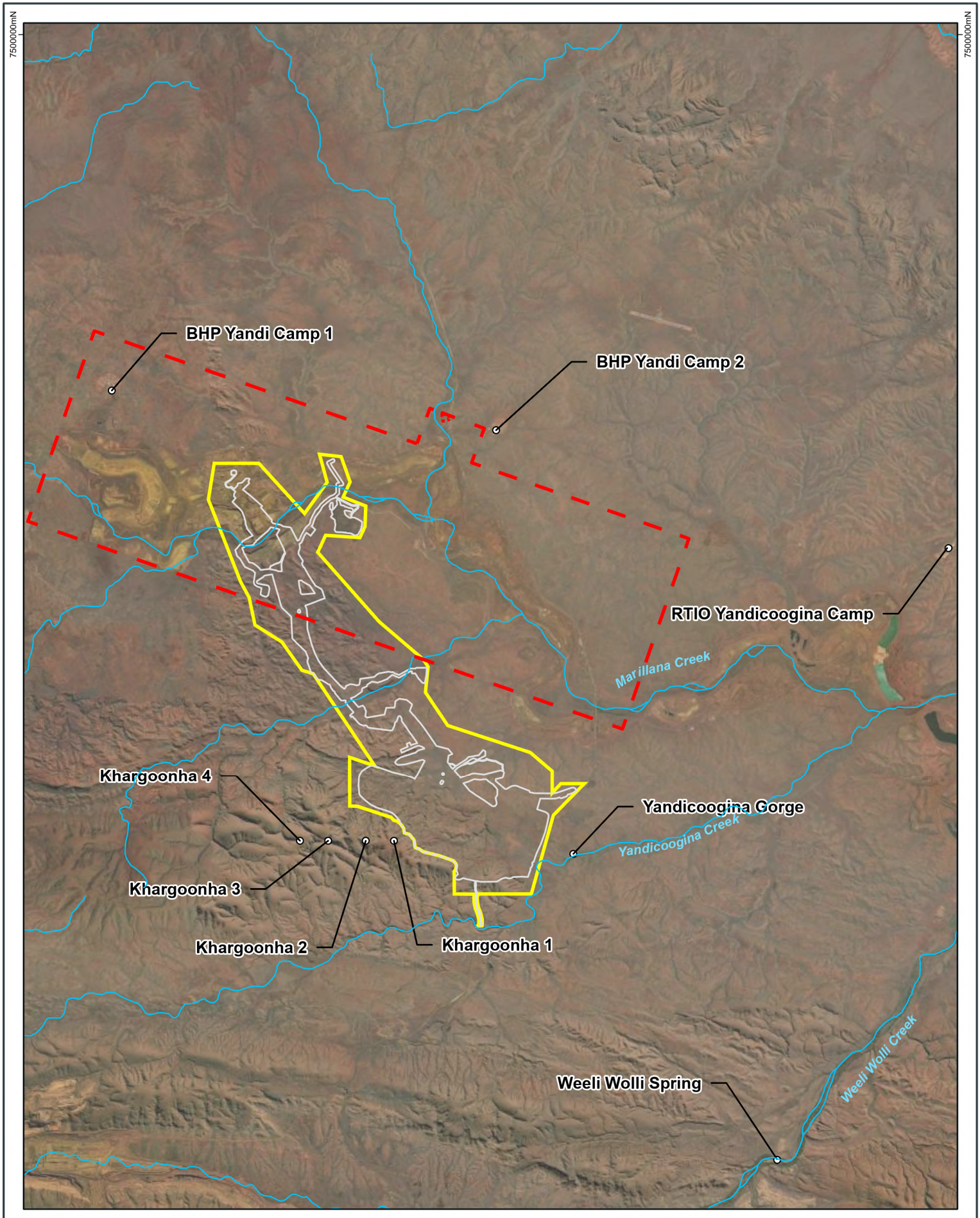
- Weeli Wolli Spring[38]
- Yandicoogina Gorge

[38] Receptor for particulate air emissions considered previously considered in the assessment of the Strategic Proposal (as outlined within BHP 2016a).

- Khargoonha Cultural Heritage Area (four receptors provided for within the heritage area at increasing distance from the Derived Proposal)
- BHP Yandi Camp 1
- BHP Yandi Camp 2[39]
- Rio Tinto Yandi Mining Operations Camp.

All receptors are within a nominal 15 km radius of the Derived Proposal (Figure 9-1). The Weeli Wolli Spring and the Yandicoogina Gorge are natural areas that may have short-term visitation for recreational purposes by a limited number of individuals. The Khargoonha Cultural Heritage Area is a location of identified Aboriginal cultural heritage that may similarly have short-term visitation by a limited number of individuals. The BHP Yandi Camp 1 and the Rio Tinto Yandi Mining Operations Camp represent locations of long-term visitation by a large number of mining personnel.

[39] BHP Yandi Camp 2 is no longer in operation (demolished and rehabilitated) however was included as a receptor for consistency with historic dust modelling.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Yandi MS Boundary
- Watercourse
- Air Quility Model Receptor

N

0 1.5 3 4.5 6

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
AIR QUALITY EMISSIONS MODELLING RECEPTOR LOCATIONS

WAIO- PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:155,000	REQUESTOR:	PROJECTS	FIGURE:	9-1
DATE:	5/09/2025	PREPARED:	GEOMATICS	NO:	A1317-032 RevD
		REVIEWED:			

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9.4 Potential environmental impacts

In the PERSP (BHP 2016a), BHP identified and described potential impacts from the Strategic Proposal on Air Quality. Table 9-2 identifies whether the Strategic Proposal potential impacts are relevant to the Derived Proposal.

Table 9-2: Air Quality - relevant impacts identified in the Strategic Proposal

Strategic Proposal Potential impact	Strategic Proposal impact relevant to Ministers North Derived Proposal	Potential impacts from Ministers North Derived Proposal
Pre-clearing works and construction of infrastructure (direct)	Yes	Pre-clearing works and construction of infrastructure can generate particulate air emissions which may potentially impact receptors.
Mining activities during operations (direct)	Yes	Mining operations can generate particulate air emissions through activities such as blasting, mining, materials loading/unloading and transport, which may potentially impact receptors and/or impact visual amenity.

9.4.1 Mining operations resulting in particulate air emissions

9.4.1.1 Particulate air emission sources

The key sources of particulate air emissions from the Derived Proposal include:

- earthworks involving land clearing and works on existing cleared/disturbed land
- wind erosion over cleared/disturbed land surfaces.
- mining operations including blasting, excavation, and the loading and transport of ore and waste rock materials.

The clearing of native vegetation and use of existing cleared/disturbed land will result in particulate air emissions. Particulate air emissions from land clearing and associated machinery movements can be high, however, are expected to be short in duration.

Once the land areas for the Derived Proposal have been cleared/disturbed, these areas become exposed and have the potential for further particulate air emissions as a result of wind-blown erosion until the surface soils form a stable crust, or the area is rehabilitated with native vegetation.

Mining operations will also generate dust from drilling, blasting, excavation, loading and transport of ore and waste rock.

9.4.1.2 Particulate air emission estimates

An air dispersion modelling assessment was undertaken to determine the potential impact of particulate air emissions associated with the Derived Proposal in isolation and cumulatively, including background air quality. Dust deposition rates and concentrations of total suspended particulates (TSP) and particulates as PM_{10} and $PM_{2.5}$ were predicted at identified sensitive receptors (i.e., mining camps, environmental sites and cultural heritage areas) for comparison to applicable air quality assessment criteria.

Emissions modelling results for the Derived Proposal undertaken by ETA (2024) are summarised in Table 9-3. Estimated particulate air emissions of TSP, PM_{10} and $PM_{2.5}$ from all sources are indicated. Data for Year 4 (2030) has been presented to identify the modelled period of peak emissions. Annual average emissions across the life of the Derived Proposal will be lower than the values presented in Table 9-3. The modelling applies standard emission controls for most emission sources; consistent with the approach identified for the assessment of the Strategic Proposal.

Of the emission sources, the mining operations account for approximately 50 % of total particulate air emissions, with approximately 40 % of particulate emissions coming from a combination of ore transport and ore processing. Wind erosion over cleared land accounts for the remaining approximately 10 % of particulate air emissions.

Table 9-3: Estimated particulate air emissions of TSP, PM_{10} and $PM_{2.5}$

Emission Source		Emission		
		TSP (3) (kg/y) [%]	**PM_{10}** (4) (kg/y) [%]	**$PM_{2.5}$** (kg/y) [%]
Mining	Drilling	32,264 [1 %]	32,209 [2 %]	4,831 [2 %]
	Blasting	66,826 [2 %]	66,024 [3 %]	9,904 [3 %]
	Loading (in-Pit)	606,713 [14 %]	553,322 [27 %]	82,998 [27 %]
	Unloading Waste	328,690 [7 %]	117,781 [6 %]	17,667 [6 %]
	Unloading Ore	38,487 [1 %]	13,791 [1 %]	2,069 [1 %]
	Loading Ore	176,033 [4 %]	84,496 [4 %]	12,674 [4 %]
	Bulldozers	339,844 [8 %]	82,734 [4 %]	12,410 [4 %]
Transport (Road Haulage)		1,724,904 [39 %]	509,124 [25 %]	76,369 [25 %]
Ore Processing (Yandi OHP)		736,175 [17 %]	320,776 [16 %]	48,117 [16 %]
Wind Erosion (all operations combined)		363,762 [8 %]	252,739 [12 %]	37,911 [12 %]
Total		4,413,698 [100%]	2,032,996 [100%]	304,950 [100%]

(1) Data for Year 4 (2030) is presented as the period of peak emissions based upon BHP's current scheduling for the Derived Proposal. Scheduling for the Derived Proposal may be subject to change due to various factors, which may include BHP's operational requirements.

(2) All values rounded to the nearest 1 kg / 1 %.

(3) Note: TSP emissions include the mass of both PM_{10} and $PM_{2.5}$ emissions.

(4) Note: PM_{10} emissions include the mass of $PM_{2.5}$ emissions.

9.4.2 Mining operations affecting air quality

9.4.2.1 Air quality assessment criteria

Criteria applicable for the assessment of particulate air emissions on air quality is presented in Table 9-4. The assessment criteria include consideration of TSP and PM_{10} consistent with the assessment of the Strategic Proposal, as well as the consideration of $PM_{2.5}$.

9.4.2.2 Air quality emissions modelling

Emissions modelling for the Derived Proposal undertaken by ETA (2024) considers TSP, PM_{10}, $PM_{2.5}$ and dust deposition in the context of the existing 'baseline' (background) levels, and 'cumulative' emissions from the Derived Proposal together with other emission sources (e.g. including BHP's Yandi).

The emissions modelling predicted the concentrations of TSP, PM_{10}, $PM_{2.5}$ and dust deposition at nine receptor locations, as presented in Figure 9-1. The results of the emissions modelling have been assessed in comparison to the emissions assessment criteria, as outlined by Table 9-4.

Table 9-4: Particulate air emissions assessment criteria

Emission	Air Quality Assessment Criteria		
	Concentration	Averaging Period	Criteria Reference
TSP	90 µg/m^3	24 hours	DWER (2019)
PM_{10}	50-70 µg/m^3	24 hours	DWER (2019, 2021), NEPC (2021), DJTSI (2010, 2016)
	25 µg/m^3	Annual	
$PM_{2.5}$	25 µg/m^3	24 hours	DWER (2019, 2021), NEPC (2021)
	8 µg/m^3	Annual	
Dust Deposition	2 g/m^2	30-days	DWER (2021) referencing NZ MfE (2016)
	4 g/m^2	30-days	DWER (2021) referencing NSW EPA (2017)

Note: NEPC (2021) identifies a 'goal' for $PM_{2.5}$ to be reduced to 20 µg/m^3 24-hour average and 7 µg/m^3 annual average from 2025, however the 'standard' as per the assessment criteria (above) remains unchanged.

The broad outcomes of the air quality modelling identify:

- The receptors of Yandicoogina Gorge, Khargoonha 1 and Yandi Camp 1 had modelled exceedances of air quality assessment criteria for TSP and/or PM_{10}.
- The receptors of Weeli Wolli Spring, Khargoonha 2, Khargoonha 3, Khargoonha 4, Yandi Camp 2 and the Rio Tinto Yandi Camp were not predicted to exceed any air quality assessment criteria.

The exceedances noted above, are inclusive of background concentrations. The Derived Proposal in isolation, will not result in exceedances, with the only exception being TSP at Yandicoogina Gorge. Further discussion on the outcomes of the air quality modelling is provided below.

Total Suspended Particulates

For TSP, the emissions modelling predicts that the Derived Proposal in isolation, would only exceed the air quality assessment criteria for TSP (90 µg/m^3) at the receptor of Yandicoogina Gorge (exceedances of 3 days annually, up to 103 µg/m^3). No exceedances are predicted at the remaining receptors.

Table 9-5 summarises the predicted TPS concentrations at the sensitive receptors for the Derived Proposal in isolation.

Table 9-5: Modelled TSP concentrations (Isolation)

Receptor	Maximum predicted TSP Concentration (µg/m^3)	Annual Average (µg/m^3)	Days exceeding criteria (90 µg/m^3)
Yandi Camp 1	73	8.1	0
Yandi Camp 2	29	4.2	0
Rio Yandi Camp	11	1.1	0
Weeli Wolli Spring	7	0.6	0
Yandicoogina Gorge	103	12.4	3
Khargoonha 1	64	8.6	0
Khargoonha 2	46	5.2	0
Khargoonha 3	37	3.3	0
Khargoonha 4	33	2.6	0

When considering background emissions, the modelling predicts that the Derived Proposal (cumulative), would exceed the air quality assessment criteria for TSP (90 µg/m^3) at the receptors of:

- Yandicoogina Gorge - exceedance on 14 days annually, up to 136 µg/m^3.
- Khargoonha 1 - exceedance on 2 days annually, up to 97 µg/m^3.
- Yandi Camp 1 - exceedance on 2 days annually, up to 106 µg/m^3.

Table 9-6 summarises the predicted TSP concentrations at the sensitive receptors for the Derived Proposal inclusive of background (cumulative).

Table 9-6: Modelled TSP concentrations (Cumulative – inclusive of background)

Receptor	Maximum predicted TSP Concentration (µg/m^3)	Annual Average (µg/m^3)	Days exceeding criteria (90 µg/m^3)
Yandi Camp 1	106	41.1	2
Yandi Camp 2	62	37.3	0
Rio Yandi Camp	45	34.2	0
Weeli Wolli Spring	40	33.7	0
Yandicoogina Gorge	136	45.4	14
Khargoonha 1	97	41.6	2
Khargoonha 2	79	38.2	0
Khargoonha 3	70	36.3	0
Khargoonha 4	66	35.6	0

The exceedance of the TSP criteria at these receptor locations is not unexpected; noting the position of the Yandicoogina Gorge, Khargoonha 1 and Yandi Camp 1 in proximity to key emission sources associated with the Derived Proposal (in particular, the Derived Proposal mine pits and the existing Yandi operations).

In relation to the Yandicoogina Gorge, the maximum modelled TSP result of up to 136 µg/m^3 (including background) exceeds the air quality assessment criteria by 46 µg/m^3; being approximately 50 % above the 90 µg/m^3 criteria limit.

The modelled 14 days above the TSP air quality assessment criteria represents less than 5 % of annual days. The estimated daily background TSP concentration contributes approximately 25 % of the maximum 24-hr TSP concentration predicted at Yandicoogina Gorge for the cumulative scenario. The number of modelled days above the TSP air quality assessment criteria reduces from 14 annual days to 3 annual days when the background TSP emissions are excluded.

In relation to the Khargoonha 1, the maximum modelled TSP result of up to 97 µg/m^3 (including background) exceeds the air quality assessment criteria by 7 µg/m^3; being approximately 10 % above the 90 µg/m^3 criteria limit. The modelled 2 days above the TSP air quality assessment criteria represents less than 1 % of annual days. The estimated daily background TSP concentration contributes approximately 25 % of the maximum 24-hr TSP concentration predicted. The number of modelled days above the TSP criteria reduces from 2 annual days to 0 days (nil exceedance) when the background TSP emissions are excluded. The modelled results identify exceedance of the TSP criteria occurs only at Khargoonha 1, with no exceedance of the TSP criteria occurring at the more distant Khargoonha 2 or Khargoonha 3 or Khargoonha 4 receptor locations; indicating that any potential impact of TSP emissions to the Khargoonha Cultural Heritage Area will be limited to area at the closest edge to the Derived Proposal mining operations.

In relation to the Yandi Camp 1, the maximum modelled TSP result of up to 106 µg/m^3 (including background) exceeds the air quality assessment criteria by 16 µg/m^3; being approximately 20 % above the 90 µg/m^3 criteria limit. The modelled 2 days above the TSP air quality assessment criteria represents less than 1 % of annual days. The estimated daily background TSP concentration contributes approximately 25 % of the maximum 24-hr TSP concentration predicted at Yandi Camp 1. The number of modelled days above the TSP criteria reduces from 2 annual days to 0 days (nil exceedance) when the background TSP emissions are excluded.

The modelled exceedances at the receptor sites of Yandicoogina Gorge and Khargoonha 1 should be viewed in the context of these receptors being heritage/recreation locations containing ecological values, however, human visitation to these receptor locations is occasional / short-term. The modelled exceedances at the receptor sites of Yandi Camp 1 should be viewed in the context of this receptor being for medium-term human occupation, an active mining operation and highly disturbed (i.e. limited ecological value).

PM_{10}

The annual average PM_{10} concentration is not predicted to exceed the NEPM criteria of 25 µg/m^3 (annual average) at any discrete receptor (including background). The Derived Proposal in isolation, is also not predicted to exceed the 24-hour criteria (50 µg/m^3) at any receptor (see Table 9-7).

When considering the Derived Proposal, cumulatively with background emissions, the modelling predicts exceedance of the 24-hour air quality assessment criteria for PM_{10} (50 µg/m^3 in 24 hours) at the receptors of:

- Yandicoogina Gorge - exceedance on 11 days annually, up to 68 µg/m^3.
- Khargoonha 1 - exceedance on 2 days annually, up to 50 µg/m^3.

Table 9-8 summarises the predicted concentrations of PM_{10} at the sensitive receptors for the Derived Proposal inclusive of background (cumulative).

Table 9-7: Modelled PM_{10} concentrations (Isolation)

Receptor	Maximum predicted PM_{10} Concentration (µg/m³)	Annual Average (µg/m³)	Days exceeding criteria (50 µg/m³)
Yandi Camp 1	29	3.3	0
Yandi Camp 2	12	1.8	0
Rio Yandi Camp	6	0.5	0
Weeli Wolli Spring	3	0.3	0
Yandicoogina Gorge	50	5.8	0
Khargoonha 1	32	4.5	0
Khargoonha 2	23	2.7	0
Khargoonha 3	19	1.6	0
Khargoonha 4	16	1.3	0

Table 9-8: Modelled PM_{10} concentrations (Cumulative – inclusive of background)

Receptor	Maximum predicted PM_{10} Concentration (µg/m³)	Annual Average (µg/m³)	Days exceeding criteria (50 µg/m³)
Yandi Camp 1	47	21.5	0
Yandi Camp 2	30	20	0
Rio Yandi Camp	24	18.7	0
Weeli Wolli Spring	22	18.5	0
Yandicoogina Gorge	68	24	11
Khargoonha 1	50	22.5	2
Khargoonha 2	41	20.7	0
Khargoonha 3	37	19.6	0
Khargoonha 4	34	19.3	0

In relation to the Yandicoogina Gorge, the maximum modelled PM_{10} result of up to 68 µg/m³ (including background) exceeds the air quality assessment criteria by 18 µg/m³; being approximately 35 % above the 50 µg/m³ criteria limit. The modelled 11 days above the PM_{10} air quality assessment criteria represents less than 5 % of annual days. The modelling identifies that background PM_{10} concentrations are a notable contributor to total PM_{10} emissions; accounting for approximately 35 % of total PM_{10} emissions. The number of modelled days above the PM_{10} criteria reduces from 11 annual days to no exceedances when the background PM_{10} emissions are excluded.

In relation to the Khargoonha 1, the maximum modelled PM_{10} result of up to 50 µg/m³ (including background) meets the 50 µg/m³ criteria limit. The modelled 2 days at the PM_{10} criteria limit represents less than 1 % of annual days. The modelling identifies that background PM_{10} concentrations are a notable contributor to total PM_{10} emissions; accounting for approximately 35 % of total PM_{10} emissions. The number of modelled days above the PM_{10} criteria reduces from 2 annual days to no exceedances when the background PM_{10} emissions are excluded. The modelled results identify the PM_{10} criteria limit is met only at Khargoonha 1, with no exceedance of the PM_{10} criteria occurring at the more distant Khargoonha 2 or Khargoonha 3 or Khargoonha 4 receptor locations; indicating that any potential

impact of PM_{10} emissions to the Khargoonha Cultural Heritage Area will be limited to area at the closest edge to the Derived Proposal mining operations.

The comparison of the PM_{10} modelling results above make comparison to the 50 µg/m^3 criteria limit for PM_{10} as outlined within DWER (2019, 2021) and NEPC (2021). If the DJTSI (2010, 2016) criteria limit of 70 µg/m^3 for PM_{10} is used in comparison of the modelling results then neither of the receptor locations Yandicoogina Gorge (68 µg/m^3 maximum) nor Khargoonha 1 (50 µg/m^3 maximum) would exceed this criteria on any annual day.

$PM_{2.5}$

For $PM_{2.5}$, the emissions modelling indicates no exceedances of the air quality assessment criteria (Annual and 24-hour average) is anticipated to occur at any receptor (summarised in Table 9-9 (Derived Proposal in isolation) and Table 9-10 (cumulative – inclusive of background)).

Accordingly, further consideration of the air quality assessment criteria for particulate air emissions of $PM_{2.5}$ is not necessary.

Table 9-9: Modelled $PM_{2.5}$ concentrations (Isolation)

Receptor	Maximum predicted $PM_{2.5}$ Concentration (µg/m^3)	Annual Average (µg/m^3)	Days exceeding criteria (25 µg/m^3)
Yandi Camp 1	4.4	0.5	0
Yandi Camp 2	1.8	0.3	0
Rio Yandi Camp	0.8	0.1	0
Weeli Wolli Spring	0.5	0	0
Yandicoogina Gorge	7.4	0.9	0
Khargoonha 1	5	1	0
Khargoonha 2	3.4	0.4	0
Khargoonha 3	2.8	0.2	0
Khargoonha 4	2.5	0.2	0

Table 9-10: Modelled $PM_{2.5}$ concentrations (Cumulative – inclusive of background)

Receptor	Maximum predicted $PM_{2.5}$ Concentration ($\mu g/m^3$)	Annual Average ($\mu g/m^3$)	Days exceeding criteria (25 $\mu g/m^3$)
Yandi Camp 1	7.1	3.2	0
Yandi Camp 2	4.5	3	0
Rio Yandi Camp	3.6	2.8	0
Weeli Wolli Spring	3.2	2.8	0
Yandicoogina Gorge	10.2	3.6	0
Khargoonha 1	7	3	0
Khargoonha 2	4	4	0
Khargoonha 3	4	4	0
Khargoonha 4	3	3	0

Dust deposition

In addition to air quality assessment criteria, ETA (2024) considered the potential risk of dust deposition to vegetation. Based on research undertaken within Australia, ETA (2024) used 7 g/m^2/month as an indicative criterion for potential effects on vegetation. As shown in Table 9-11, modelling for the Ministers North Derived Proposal in isolation predicts dust deposition at levels well below (0.01 to 0.29 g/m^2/month) this proposed value.

Table 9-11: Monthly dust deposition from Ministers North activities

Receptor	Monthly Deposition (g/m^2)
Yandi Camp 1	0.08
Yandi Camp 2	0.05
Rio Yandi Camp	0.02
Weeli Wolli Spring	0.01
Yandicoogina Gorge	0.29
Khargoonha 1	0.21
Khargoonha 2	0.12
Khargoonha 3	0.07
Khargoonha 4	0.05

Strategic Proposal Validation

In assessment of the Strategic Proposal, BHP (2016a) modelled the particulate air emissions for TSP and PM_{10} based on the Full Conceptual Development Scenario (FCDS), 30% Conceptual Development Scenario (30CDS) and for each mining operation, as summarised by Table 9-12. Whilst particulate air emissions for $PM_{2.5}$ were not separately assessed for the Strategic Proposal, particulate air emissions of $PM_{2.5}$ were included as a fraction of PM_{10}.

Table 9-12: Modelled particulate air emissions for the Strategic Proposal

Proposal	Mining Rate Ore + Waste (Mtpa)	TSP (tpa)			PM_{10} (tpa)		
		No Control	Standard Control	Leading Control	No Control	Standard Control	Leading Control
Strategic Proposal							
FCDS	1,980	953,049	516,447	164,221	333,324	180,576	57,420
30CDS	1,080	519,840	281,700	89,580	181,764	98,496	31,320
Assigned each mining operation	90	43,320	23,475	7,465	15,147	8,208	2,610
Derived Proposal							
Ministers North	48.5	-	4,414	-	-	2,033	-

Source: BHP (2016), ETA (2024).

Based on the maximum proposed ore production rate of 25 Mtpa, the total materials movement (ore and waste rock combined) has modelled peak at approximately 48.5 Mtpa (Year 4, 2030); being notably lower (and within the limits of) the 90 Mtpa total mining rate considered for each mining operation in assessment of particulate air emissions in the assessment of the Strategic Proposal.

9.5 Mitigation

The BHP (2016a) assessment for the Strategic Proposal provides examples and case studies of the management measures that BHP may apply to mitigate the potential impacts to air quality values. Whilst BHP considers that there are no significant environmental impacts to air quality values that would require targeted management measures, BHP's application of the Mitigation Hierarchy to avoid, minimise, rehabilitate and offset the potential impacts to air quality values is discussed below.

In addition, BHP has also considered other statutory decision-making processes which may assist to mitigate or manage the potential impacts of the Derived Proposal to air quality values.

9.5.1 Avoid

As mining operations are an inherently dust-generating activity, potential impacts to air quality from particulate air emissions generated by mining operations are unable to be avoided. Accordingly, the focus of BHP has been to minimise particulate air emissions generated by mining operations.

9.5.2 Minimise

BHP will undertake development and operation of the Derived Proposal consistent with accepted mining practices and commits to minimise particulate air emissions through a combination of 'standard' and 'leading' controls. Standard controls represent accepted actions to minimise particulate air emissions generally applied to mining operations. Leading controls represent additional actions which exceed the requirements of the standard controls. BHP (2016a) identifies that compared to mining operations with no control, the application of standard controls is estimated to reduce particulate air emissions by greater than 45 %, with the application of leading controls estimated to reduce particulate air emissions by greater than 80 %.

BHP has prepared an Air Quality Environmental Management Plan for the Derived Proposal (Appendix 11). The Air Quality EMP includes a range of controls to minimise particulate air emissions, including:

- minimising the extent of exposed land areas through limiting native vegetation clearing (i.e. progressive clearing as areas are required for mining development).
- dampening of exposed land areas with water to minimise dust lift, including the haul road and mine access roads
- where appropriate, dust suppression chemicals may be added to the water used
- limiting of vehicle speeds on unsealed roads (including provision for further reduction in speed during windy conditions).

The above actions are considered reasonable and practicable measures by which to minimise particulate air emissions and are generally consistent with the actions implemented across BHP's existing Pilbara mining operations outlined with the BHP (2024b) WAIO Dust Monitoring and Management Plan.

The BHP (2024b) WAIO Dust Monitoring and Management Plan identifies BHP's current air quality monitoring network which currently exists at Yandi. This existing monitoring network includes the monitoring of PM_{10} at the Yandi Camp 1 receptor location to ensure the ongoing protection of health for mine personnel. Also included in BHP's existing monitoring network is the Yandi weather station which collects meteorological data (wind speed, wind direction, temperature, rainfall) to inform dust emission risk assessment and approvals. The meteorological data collected from BHP's existing monitoring network will assist to inform the ongoing dust emission risk assessment and management for the Derived Proposal.

9.5.3 Rehabilitate

BHP has prepared a MCP for the Derived Proposal (Appendix 12), which includes progressive and post-mining rehabilitation of cleared land areas with native vegetation. Rehabilitation will reduce the extent of exposed cleared land, and accordingly, will reduce the potential for particulate air emissions.

Progressive and post-mining rehabilitation of cleared land areas is a reasonable and practicable approach by which to minimise particulate air emissions and is consistent with the actions implemented across BHP's existing Pilbara mining operations. Rehabilitation, once established, is anticipated to result in a substantial reduction in particulate air emissions at source.

9.5.4 Offset

Following the application of first three steps of the Mitigation Hierarchy (avoid, minimise and rehabilitate), BHP considers that there will not be any significant residual impact from the Derived Proposal to air quality. Accordingly, environmental offsets for the Derived Proposal in relation to air quality are not proposed.

9.5.5 Other statutory decision-making processes

The EPA (2021d) document *Taking Decision Making Processes into account in EIA: Interim Guidance* identifies that the EPA may consider other statutory decision-making processes which can mitigate the potential impacts of a proposal on the environment, having regard to the ability and processes of a DMA, the conditions that may be applied, and the likely environmental outcomes.

In consideration of the Environmental Factor of Air Quality and the EPA (2021d) guidance, BHP considers the following State statutory decision-making process are relevant to mitigate and control the potential environmental impacts of the Derived Proposal on air quality values:

- *Environmental Protection Act 1986* (WA) - Part V.

Consideration of the above other statutory decision-making processes is provided below.

A Works Approval and Licence under the EP Act will be required to authorise the mobile crushing and screening. It can be anticipated that as a result of the application for mobile crushing and screening the DWER will assess the potential risks and impacts of particulate air emissions to the environment, and following, determine if environmental limits and/or management practices are necessary to be applied through the conditions of approval.

Processing of ore at Yandi OHP is a currently authorised activity through the Licence L6168. The application by BHP for the amendment of the Licence L6168 to incorporate changes required for Ministers North, will outline BHP's proposed changes to the Yandi OHP including the infrastructure to be installed to control particulate air emissions (e.g. dust suppression water sprays, physical containment via covers and hoods and curtains, and dust extraction via fans and baghouses).

9.6 Validation of impacts and environmental outcome

BHP has validated the impacts to Air Quality from the Derived Proposal against the Strategic Proposal, assuming relevant mitigation measures identified in Section 9.5 have been applied, to demonstrate that the environmental objective identified in MS1105 Condition 9, can be met.

Table 9-13 summarises the residual impacts and environmental outcomes for Air Quality and demonstrates consistency with MS1105 condition objectives.

Table 9-13: Air Quality - environmental outcomes and proposed regulation and monitoring

Derived Proposal residual impact	Derived Proposal environmental outcome	Consistency with Strategic Proposal environmental outcome/s, and EPA and MS1105 condition objectives
Localised generation of particulate air emissions resulting in a reduction in local air quality	Contributes to the localised (and cumulative) generation of particulate air emissions resulting in a reduction in local air quality.	Condition Objectives: 11-1 The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) maintain air quality and minimise emissions so that environmental values are protected, and in particular: (a) meet recognised air quality standards and criteria, including: (i) National Environment Protection (Ambient Air Quality) Measure for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, particles as PM10 and PM2.5; or (ii) other guidelines on a proposal specific basis as determined by the CEO. Air dispersion modelling predicts exceedances of air quality assessment criteria for TSP and PM_{10} at Yandicoogina Gorge, Khargoonha 1 and Yandi Camp 1. The exceedances are inclusive of background concentrations. The results of the air dispersion modelling assessment are considered conservative as the modelling is based on the highest potential production year, representing the greatest total annual movement of ore and waste. The identified exceedances may occur in the highest production years, but not in all years. Modelling results that are higher than the air quality assessment criteria have be interpreted as an indication that the results require further consideration for the sensitive receptor, and not as a predicted impact or loss of value. To this end, BHP has prepared an Air Quality Environmental Management Plan for the Derived Proposal. The Air Quality EMP includes a range of controls to minimise particulate air emissions. Subject to application of the implementation conditions of the MS1105 approval, BHP considers that the EPA's objective for the Environmental Factor of Air Quality can be met.

9.7 Implementation conditions

BHP considers that the following conditions relating to the Environmental Factor of Air Quality as set out in the MS1105 approval for the Strategic Proposal should apply to the Derived Proposal:

- Condition 6: Condition Environmental Management Plans
- Condition 11: Air Quality Environmental Management Plan
- Condition 15: Rehabilitation and Decommissioning.

BHP has assessed the existing implementation conditions of the MS1105 approval for the Strategic Proposal in relation to their application for the Derived Proposal. BHP has concluded that the above implementation conditions are appropriate to be applied to the Derived Proposal.

10 Greenhouse Gas Emissions Validation

10.1 EPA environmental factor and objective

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

> *To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.*

During the preparation of the PERSP and EPA Report 1619, Greenhouse Gas Emissions was assessed in accordance with the former 'Air Quality and Atmospheric Gases' factor. The EPA split this factor into two separate factors in April 2020 (Air Quality and Greenhouse Gas Emissions). Air Quality has been addressed separately in Section 9.

The Guideline has since been updated in in July 2022 and November 2024. The revised guideline included an update to the EPA's objective for Greenhouse Gas Emissions (reflected above).

10.2 Relevant policy and guidance

BHP validated this environmental factor considering the following relevant EPA guidance and other legislation and policy, as outlined in Table 10-1.

Table 10-1: Greenhouse Gas Emissions – policy and guidance

Policy or Guidance	Consideration of policy and guidance
Environmental Factor Guideline - Greenhouse Gas Emissions (EPA 2024b)	BHP has considered the guideline and has addressed the requirements as follows: • Credible estimates of the expected Scope 1, Scope 2 and Scope 3 emissions associated with the Derived Proposal, including breakdowns of GHG emissions by source, including land clearing emissions, grid-electricity, transport and domestic and international sources of Scope 3 emissions are presented in Section 10.4.1. • GHG emissions covered by the NGER Scheme, the indicative emissions baseline consistent with the requirements of the Safeguard Mechanism and the anticipated net emissions over the life of the Derived Proposal are provided in Section 10.5.2.1. • Adoption and consideration of best practice measures to avoid or reduce Scope 1, Scope 2 and Scope 3 emissions are summarised in Section 10.5. • Whether carbon offsets are proposed to be surrendered for more than 30% of the baseline applicable to the Derived Proposal and BHP's offset strategy are summarised in Section 10.5.3 • The application of the Safeguard Mechanism and sectoral measures to reduce grid-connected electricity emissions, and the international regulatory context covering Scope 3 emissions are summarised in Section 10.5.2
Greenhouse Gas Emissions Policy for Major Projects (Government of Western Australia 2024)	BHP has considered the Greenhouse Gas Emissions Policy for Major Projects and outlined alternative regulatory measures which require emission reductions associated with the Derived Proposal, including the Safeguard Mechanism to meet the EPA's objectives.
Western Australian Climate Policy (Government of Western Australia 2020)	BHP supports and is aligned with this policy to enable the business to transition to the goal of net zero emissions by 2050.

Policy or Guidance	Consideration of policy and guidance
National Greenhouse and Energy Reporting Act 2007 (NGER Act)	This document details requirements of the NGER Act and Safeguard Mechanism, and application to the Derived Proposal 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 Derived Proposal.

10.3 Receiving environment

10.3.1 Studies

The assessment of the Strategic Proposal, BHP (2016a) considered the following information sources for the assessment of the potential impacts of greenhouse gas emissions:

- Pacific Environment Operations Pty Ltd (2015) Pilbara Strategic Environmental Assessment - Cumulative Air Quality Assessment.

BHP (2016a) identified that additional surveys and studies would be necessary to verify the potential impacts of the Strategic Proposal to air quality. The EPA (2018a) also acknowledged that some areas covered by the Strategic Proposal required additional surveys and studies to be completed.

Consistent with the above approach, greenhouse gas emissions modelling for the Derived Proposal has been undertaken by BHP, by suitably qualified and experienced professionals in the modelling of greenhouse gas emissions for iron ore mining operations. The modelling applied the relevant greenhouse gas emissions assessment methodology and guidance requirements in reaching the emission modelling results.

The greenhouse gas emissions assessment for each of the Strategic Proposal and for the Derived Proposal, together, provide a high level of confidence as to the understanding of potential greenhouse gas emissions, and upon which the potential environmental impacts of greenhouse gas emissions from the Derived Proposal can be appropriately assessed.

10.3.2 Survey assumptions and limitations

10.3.2.1 *Strategic Proposal*

BHP quantified the potential GHG emissions for the Strategic Proposal for Scope 1 and Scope 2 GHG emission sources assessed through a Public Environmental Review (BHP 2016a – Section 8.4.3). The assessment estimated annual GHG emissions from existing operations at this time, and proposed development scenarios.

The total Scope 1 and Scope 2 GHG emissions for the Strategic Proposal were calculated using an average fuel use per tonne of material moved (TMM) for existing BHP Billiton Iron Ore operations at the time of assessment (Mining Area C, Yandi, Orebody 23 to 25, Orebody 18 and Mt Whaleback mine). Using this weighted average with the TMM associated with potential future development scenarios, GHG emissions were calculated for the three development scenarios, i.e. Existing Development Scenario, 30% Conceptual Development Scenario and Full Conceptual Development Scenario.

The total Scope 1 and Scope 2 GHG emissions from the Existing Development Scenario, 30% Conceptual Development Scenario and Full Conceptual Development Scenario were 0.9, 2.6 and 4.4 Mt CO2-e per annum respectively. Although annual Scope 1 and 2 GHG emissions were individually specified, Scope 3 GHG emissions were not estimated, which was standard practice at the time. A cumulative assessment of GHG emissions was not included in BHP's 2016 GHG emissions assessment for the Strategic Proposal.

At the time of assessment, the maximum annual GHG emissions represented 0.8% of Australia's and 5.8% of Western Australia's, when compared to respective FY2012 National and State GHG inventories, including Land use, Land Use Change and Forestry (LULUCF) GHG emissions (BHP 2016a).

10.3.2.2 *Derived Proposal*

BHP has undertaken an assessment of GHG emissions associated with the Derived Proposal) utilising established methodologies to estimate GHG emissions consistent with methods developed and applied by the DCCEEW in National and State climate change inventory reporting, specifically the NGER Scheme and the Full Carbon Accounting Model (FullCAM) for land clearing GHG emissions. BHP has included the outcomes of GHG modelling in this document including the summaries of the methodologies, inputs and assumptions used to estimate GHG emissions associated with the Derived Proposal. Other supporting information is referenced, where relevant. BHP considers that this information is provided in accordance with the EPA's Environmental Factor Guideline - Greenhouse Gas Emissions (EPA 2024b) to support the assessment of GHG emissions for the Derived Proposal.

GHG Emissions calculation methodology

As noted above, GHG emissions estimates for the Derived Proposal have been calculated in accordance with DCCEEW GHG emission factors and methods of the NGER Act and National Greenhouse Accounts, with the exception of land clearing GHG emissions for which the NGER Act does not include a calculation methodology. Consistent with the land-use change GHG emission estimation methods adopted by the Australian Government, BHPIO has derived land-use change GHG emissions using the FullCAM methodology, which is consistent with the National Inventory reporting used by DCCEEW to determine LULUCF GHG emissions in both National and State GHG emission inventory reporting and to support estimates for the generation of abatement and associated Australian Carbon Credit Units (ACCUs) for vegetation methods under the Emissions Reduction Fund (ERF).

Scope 1 GHG emissions

The steps to determine diesel demand from the operation of mining equipment to estimate Scope 1 GHG emissions associated with the Derived Proposal are summarised below to provide further detail on each step, including estimation of GHG emissions from land use change.

- heavy haulage and ancillary equipment: Diesel consumed by haul trucks and other mining equipment, is derived from estimated equipment hours and work required to support iron ore and waste movements, and original equipment manufacturer (OEM) fuel consumption rate estimates. These factors are routinely reviewed against business records and by subject matter experts (SMEs). Other consumers of diesel have been considered and compared to estimates used in BHPIO Business Plans in conjunction with project specific assumptions from relevant SMEs.
- land clearing: Estimating GHG emissions associated with land use (clearing of vegetation) aligned with the FullCAM methodology

GHG emissions for each year of the Derived Proposal mine operations were estimated for two cases, a 'baseline case' wherein no anthropogenic clearing was assumed, and a 'progressive clearing' case. GHG emissions attributed to land clearing are defined as the difference between the two cases. Sequestration from revegetation associated with mine rehabilitation is not included in estimates, ensuring GHG emissions estimates remain conservative.

Land clearing will be progressively undertaken through the life of the Derived Proposal, with a total of 1,848 ha of native vegetation estimated to be cleared to support the key proposal activities as described in Section 1.1.

The FullCAM database identifies Eucalyptus Open Woodland and Acacia Open Woodland as the dominant vegetation type associated with land clearing. Growth and other properties required by the FullCAM model are sourced from the FullCAM database. The cumulative estimated land-use change GHG emissions are 65,144 t CO_2-e, modelled between FY2027 to FY2051 (associated with 1,848 ha of additional clearing) which represents 4.23% of the Derived Proposal's total Scope 1 GHG emissions (Safeguard Mechanism covered emissions and land-use change GHG emissions from the Development Envelope i.e. Scope 1 mining activities).

Scope 1 GHG emissions (Grid-connected electricity and Iron ore rail transport)

In the context of BHP's Strategic Proposal Boundary, Derived Proposal GHG emissions associated with Yarnima Power Station and Rail transport operations are identified as Scope 1 GHG emissions, notwithstanding that they occur outside of the Development Envelope. BHP takes a regional approach to the management of GHG emissions, and as such these GHG emissions are classified as Scope 1.

Electricity GHG emissions are based of the recent average of BHPIO's NGER Act reported GHG emissions associated with the megawatt hours of electricity generation from Yarnima Power Station. The electricity GHG emissions have been calculated by apportioning estimated electricity demand associated with the Derived Proposal to the unit emissions per megawatt hour based on BHPIO's NGER Act reported GHG emissions.

Rail transport emissions are based on the recent average of BHPIO's NGER Act reported GHG emissions associated with iron ore transport activities. The average unit emissions per net tonne kilometre to transport iron ore from BHPIO's mines to Port Hedland has been calculated. The Derived Proposal's specific rail GHG emissions are determined through the apportionment of saleable production of iron ore and the average rail GHG emissions per net tonne kilometre.

Scope 3 GHG emissions (Domestic – Port Hedland ship loading)

Emissions associated with diesel and electricity use at BHPIO's Port Hedland operations supporting iron ore ship loading activities occur outside of the both the Development Envelope and the Strategic Proposal Boundary, and are considered as Scope 3 GHG emissions in the context of the Derived Proposal. This categorisation of GHG emissions is consistent with BHPIO's NGER, which excludes rail and port emissions from the Yandi NGER facility. Scope 3 GHG emissions for the Derived Proposal have been estimated by apportioning the NGER Act reported GHG emissions associated with BHPIO's Port Hedland activities required to support the forecasted production from the Derived Proposal.

Scope 3 emissions (International – Shipping and steelmaking)

GHG emissions have been estimated based on the most material Scope 3 GHG emission sources (the dominant sources being processing of sold products, and downstream shipping of sold products). Outlined below is the industry average GHG emission factors and key assumptions used in the calculations. These provide an estimate for material Scope 3 GHG emissions sources, but because they are not customer, shipper or geography-specific, may only approximate the activities taking place within our value chain. Estimates exclude less material sources of Scope 3 GHG emissions, such as upstream emissions associated with purchased goods and services. Therefore, the Derived Proposal's Scope 3 GHG emission estimates are directly aligned with downstream activities of the iron value chain.

GHG emissions associated with the downstream processing of BHPIO's iron ore products into steel has been estimated according to the same industry-average GHG emissions factors used at BHP Group level reporting of Scope 3 Category 10 "Processing of Sold Products" emissions in FY2024 (BHP 2024c). GHG emissions relating to steelmaking from processing raw materials associated with the Derived Proposal are estimated using global average emissions intensity factor (tonnes of CO_2 per tonne of crude steel) for the blast furnace to basic oxygen furnace (BF-BOF) process route sourced from the International Energy Agency (IEA). This GHG emissions intensity factor for crude steel is assumed to be attributable to iron ore only and not scrap steel.

The GHG emissions intensity factor is applied to an equivalent crude steel production volume assuming 100% of the Derived Proposal's iron ore product is processed using this route (BHP 2024c). The crude steel equivalent is calculated assuming the average annual rate of output for the orebodies that are relevant to the Derived Proposal and the average percentage iron (Fe) content across BHP's product portfolio in FY2022, converted to equivalent crude steel quantity assuming the global industry average iron content of crude steel (99.1% Fe) from the International Energy Agency Iron and Steel CCS Study (IEA GHG 2013). This estimate does not take into account site-specific production grades or fluctuations in production volumes anticipated from the Derived Proposal.

This estimate is a straight-line extrapolation of the potential indirect emissions associated with the downstream processing of our iron ore products, holding all assumptions constant from FY2022. Shipping emissions have been estimated assuming 100% of production from the Derived Proposal will be shipped over a distance reflecting a North Asia dispatch region using an industry average, and historical GHG emissions intensity factor per voyage. BHP assumes this GHG emissions intensity factor and distance travelled holds constant across the life of the Derived Proposal.

Scope 3 GHG emissions estimates do not contain any forward-looking views on potential emissions abatement measures that may occur in the value-chain that may impact future Scope 3 GHG emissions.

10.3.3 Environmental values

The Derived Proposal is located approximately 15 km south-east of BHP's Yandi. 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.

The Derived Proposal includes above water table open cut mining, crushing, stockpiling and transport of ore to Yandi for processing. The Derived Proposal will utilise existing infrastructure at Yandi, as much as practicable.

The Derived Proposal comprises a Development Envelope of 5,556 ha and an Indicative Footprint of up to 2,360 ha with clearing of up to 1,848 ha of native vegetation.

10.4 Potential environmental impacts

In the PERSP (BHP 2016a), BHP identified and described potential impacts from the Strategic Proposal on Greenhouse Gas Emissions. Table 10-2 identifies whether the Strategic Proposal potential impacts are relevant to the Derived Proposal.

Table 10-2: Greenhouse Gas Emissions - relevant impacts identified in the Strategic Proposal

Strategic Proposal Potential impact	Strategic Proposal impact relevant to Ministers North Derived Proposal	Potential impacts from Ministers North Derived Proposal
Greenhouse gas emissions (direct)	Yes	Greenhouse gas emissions from the Derived Proposal (Scope 1 and Scope 2 emissions of ≥ 100,000 tonnes CO2-e per year) will contribute to the total greenhouse gas emissions from Western Australia.

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 2024b) when considering the potential impacts relevant to the Derived Proposal.

BHP has provided information on GHG emissions for the Derived Proposal. Consistent with the guideline, BHP has estimated the expected Scope 1 GHG emissions covered by the Safeguard Mechanism for the Derived Proposal. Other sources of Scope 1 GHG emissions from the Derived Proposal summarised in Section 10.4.1.4 are not expected to exceed the EPA's Scope 1 information Option B threshold of 100,000 t CO_2-e GHG emissions in any year. Accordingly, the Option A Safeguard Mechanism confirmation for the Derived Proposal's assessment of GHG emissions approach has therefore been adopted.

The cumulative GHG emissions from the Derived Proposal will contribute to WA's GHG emissions. Consistent with BHP's NGER Act reporting, GHG emissions from iron ore operations are primarily associated with diesel combustion emissions and therefore tend to comprise of predominantly carbon dioxide (CO_2). Other greenhouse gases emitted

include methane (CH_4), nitrous oxide (N_2O) and sulphur hexafluoride (SF_6). Quantities of these other greenhouse gases are immaterial compared to carbon dioxide[40].

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 Greenhouse gas emissions

10.4.1.1 *Greenhouse gases and global warming potentials*

The types of GHG estimated from the Derived Proposal are summarised in Table 10-3 with their corresponding Global Warming Potentials (GWP). GHG emissions from these sources are required to be reported under the NGER Act and are included within the scope of the Derived Proposal. The Scope 1 GHG emissions inventory is based on NGER Act reportable activities occurring within the Development Envelope. Scope 1 GHG emissions associated with grid-connected electricity supply and Scope 1 GHG emissions associated with iron ore rail transport and ship loading activities are also subject to the reporting requirements of the NGER Act.

Table 10-3: GHG and GWP (Clean Energy Regulator 2025)

Greenhouse gas	GWP (FY2025-26 onwards)[41]
Carbon dioxide (CO_2)	1
Methane (CH_4)	28
Hydrofluorocarbons (HFCs)	116 – 12,400 (Dependent of HFC type)
Nitrous oxide (N_2O)	265
Perfluorocarbons (PFCs)	6,630 – 11,100 (Dependent of PFC type)
Sulphur hexafluoride (SF_6)	23,500
Nitrogen trifluoride (NF_3)	See comment below

As of compilation number 30 (*National Greenhouse and Energy Reporting Regulations 2008*) NF_3 is not a listed greenhouse gas in the NGER Scheme. NF_3 is used in a relatively small number of industrial processes. It is primarily produced in the manufacture of semiconductors and LCD (Liquid Crystal Display) panels, and certain types of solar panels and chemical lasers (World Resources Institute, 2013). There are no Scope 1 GHG emissions sources of NF_3 associated with the Derived Proposal.

SF_6 emissions have been considered and evaluated as immaterial[42]. Annual GHG emissions inventory reporting required by NGER Act of BHPIO's existing iron ore mining operations continue to validate this category of GHG emissions to be immaterial. BHPIO's NGER reporting continues to be independently assured to a reasonably assurance level.

10.4.1.2 *Greenhouse gas emissions sources*

Scope 1 GHG emissions (Direct emissions from the Development Envelope)

BHPIO has adopted the NGER Act framework as a basis of identifying and estimating all sources of Scope 1 GHG emissions generated for activities associated with the Proposal.

[40] Aggregation of CH_4, N_2O and SF_6 emissions from the Yandi Hub represented 0.49% or 535 t CO_2-e of the NGER Facility's Scope 1 GHG emissions in FY2024. Iron ore mining activities at Ministers North are intended to be aggregated by BHPIO into the Yandi Hub NGER facility.

[41] GWPs are consistent with the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). Use of AR5 GWP's is consistent with GHG emission estimation methods governed by the NGER Scheme for FY2025-26.

[42] Aggregation of CH_4, N_2O and SF_6 emissions from the Yandi Hub represented 0.49% or 535 t CO_2-e of the NGER Facility's Scope 1 GHG emissions in FY2024. Iron ore mining activities at Ministers North are intended to be aggregated by BHPIO into the Yandi Hub NGER facility.

Scope 1 GHG (direct emissions) from the Derived 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, including infrastructure changes, and civil construction works.
- diesel energy powering 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[43].
- fugitive emissions of sulphur hexafluoride used in electrical switchgear.

The largest source of Scope 1 GHG emissions is associated with diesel consumed by heavy haulage and ancillary equipment. Oils and greases will be consumed for haul truck and ancillary equipment use.

Scope 1 GHG emissions (grid-connected electricity generation and rail transport)

As discussed in section 10.3.2.2 above, in the context of BHP's Strategic Proposal Boundary, Derived Proposal GHG emissions which occur outside of the Development Envelope that are associated with Yarnima Power Station and Rail transport operations are identified as Scope 1 GHG emissions. Although these GHG emissions are from sources outside of the Development Envelope for the Derived Proposal, they occur within BHP's Strategic Proposal Boundary.

Electricity supply from Yarnima Power Station is primarily generated by a combination of pre-existing natural gas fired power generation plant and waste heat recovery.

Scope 1 GHG emissions associated with generation and transmission of electricity from Yarnima Power Station supporting the Derived Proposal, include:

- natural gas consumed for power generation
- diesel consumed for power generation, including backup and black-start operations
- fugitive emissions of sulphur hexafluoride used in electrical switchgear.

Iron ore is transported to Port Hedland via BHPIO's owned and operated rail operations for export by sea, activities associated with iron ore rail transport that occur outside of the Development Envelope, other than a small section of rail loop within the Development Envelope, and primarily within the Strategic Proposal Boundary, other than a small section of track from the northern boundary to BHPIO's Port Hedland Operations.

GHG emissions associated with the transport of iron ore via rail from mining hub to Port Hedland, include:

- diesel consumed by locomotives and rail maintenance activities
- diesel power generation, supporting remote camps.

Scope 3 GHG emissions sources (Domestic)

As discussed in Section 10.3.2.2 above, BHPIO's domestic sources of downstream emissions are associated with activities that occur outside of both the Development Envelope and the Strategic Proposal Boundary, including ship loading activities at Port Hedland. BHP has therefore considered iron ore ship loading activities as Scope 3 emissions to the Derived Proposal.

BHPIO's Port Hedland operations include GHG emissions from grid-connected electricity associated with unloading, stacking and reclaiming, and ship loading of iron ore.

[43] The NGER Act does not provide a calculation methodology for GHG emissions associated with land clearing. Estimates of land clearing emissions in this Derived Proposal have been derived from the Full Carbon Accounting Model (FullCAM), consistent with the framework used in National Inventory reporting used by Department of Climate Change, Energy, the Environment and Water (DCCEEW) to determine land use, land use change and forestry (LULUCF) emissions.

Scope 3 GHG emissions sources (International)

Scope 3 GHG emissions are also associated with the iron ore value chain including the shipping of iron ore to BHP's customers and the GHG 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 GHG emissions associated with the Derived 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 GHG emission factors or proxy input data or assumptions.

Excluded sources of emissions

In accordance with the NGER framework, several minor sources of Scope 1 GHG emissions have been excluded from emissions estimates from the Derived Proposal. These are summarised below.

The following sources of GHG emissions are not included in the scope of the Derived Proposal:

- GHG emissions of HFCs, PFCs, and wastewater effluent which are below NGER reporting thresholds[44]
- GHG emissions associated with landfill have been considered as per NGER reporting methods[44]
- decommissioning and closure phase emissions have been excluded from Scope 1 GHG emission estimates from the Derived Proposal, activities excluded include:
  - final landform, pit closure strategies and backfill designs will continue to be undertaken and optimised through progressive rehabilitation in the operational phase of the Derived Proposal. Disposal of 50% of waste rock into mine pits as in-pit backfill and ~50% ex-pit in the OSA is included in GHG emission estimates Derived Proposal
  - removal of site infrastructure and rehabilitation post last ore
  - FullCAM revegetation and GHG emission abatement are excluded from the Derived Proposal's LULUCF estimates.
- minor sources of Scope 3 GHG emissions, including diesel value chain emissions have been excluded on the basis that they are immaterial to total Scope 3 estimates. By way of comparison the total upstream Scope 3 GHG emissions associated with BHPIO's diesel consumption for the period equates to <0.01% of the GHG emissions associated with steelmaking and international shipping or iron ore.

10.4.1.3 *Historical GHG emissions reporting*

The Derived Proposal's iron ore mining activities are planned to be aggregated by BHPIO into the Yandi NGER facility in the future. The Yandi NGER facility, is subject to NGER Act energy and GHG emissions reporting, as such BHPIO is required to prepare and report GHG emissions consistent with methodologies and GHG emission factors associated with the NGER (Measurement) Determination 2008 every financial year, reporting GHG emissions to the Clean Energy Regulator (CER) by the 31 October, following the relevant reporting period.

NGER facilities which have Scope 1 GHG emissions which exceed 100,000 t CO_2-e will have their Scope 1 GHG emissions reported publicly for the individual NGER facility on the CER's website. Table 10-4 summarises the Scope 1 GHG emissions from the Yandi NGER facility reported through the NGER Act.

[44] Annual GHG emissions inventory reporting required by the NGER Act of BHPIO's existing iron ore mining operations continue to validate these categories of GHG are below reporting thresholds under the NGER scheme or not applicable to iron ore mining. BHPIO's NGER reporting has been and continues to be independently assured to a reasonable assurance level.

Table 10-4: Yandi recent NGER Act reported GHG emissions

Year	Scope 1 GHG emissions (t CO_2-e)	Scope 2 GHG emissions (t CO_2-e)[45]
FY2021	190,343	N/A
FY2022	149,694	N/A
FY2023	111,995	N/A
FY2024	107,160	N/A

10.4.1.4 *Scope 1 GHG emissions estimates*

BHP has estimated annual Scope 1 GHG emissions for the Derived Proposal. A summary of modelled GHG emissions for the Derived Proposal's GHG emissions which are and are not covered by the NGER Scheme and Safeguard Mechanism is provided in Table 10-5 and Table 10-6 and includes the following:

- Estimated peak annual GHG emissions
- Estimated total GHG emissions
- Estimated average annual GHG emissions.

The Derived Proposal's Scope 1 GHG emissions not covered by the NGER Scheme and Safeguard Mechanism are associated with land-use change and peak at 5,854 t CO_2-e in FY2029. NGER Scheme Scope 1 GHG emissions greater than 100,000 t CO_2-e are covered by the Safeguard Mechanism. Although Scope 1 GHG emissions associated with the Derived Proposal are predicted in some years to remain below 100,000 t CO_2-e, should these reported Scope 1 GHG emissions exceed 100,000 t CO_2-e in any year Safeguard Mechanism obligations would apply and be enforced by the CER.

Scope 1 GHG emissions which are not covered by the Safeguard Mechanism are not estimated to reasonably be likely to exceed 100,000 t CO_2-e in any year, supporting an Option A: Safeguard Mechanism confirmation assessment in accordance with the EPA's guidelines (EPA 2024b).

Table 10-5: Scope 1 GHG emissions estimates for the Derived Proposal (Mining activities – Development Envelope)[46]

Emissions estimate	Scope 1 GHG emissions covered by the NGER (t CO_2e)	Scope 1 GHG emissions Not covered by the NGER (t CO_2e)[1]	Scope 1 GHG emissions Total (t CO_2e)
Maximum annual emissions	120,383 (FY37)	5,854 (FY29)	123,524 (FY32)
Total emissions over life of Proposal	1,473,316	65,144	1,538,460
Average annual emissions	98,221	3,514	101,735

[1] Land clearing emissions are the only source of Scope 1 GHG emissions within the Development Envelope of the Proposal not covered by the NGER Scheme and Safeguard Mechanism.

[45] To avoid double-counting of Scope 1 and Scope 2 emissions, previous versions of the NGER Act required WAIO to report the Scope 1 emissions associated with electricity generation at Yarnima Power Station and in turn, electricity use at WAIO's mines was not reportable as Scope 2 emissions through NGER Act reporting obligations. From FY2025 updates to the NGER Act will allow for Yarnima's electricity supply to WAIO's individual mines to be reported as Scope 2, adjustments will be made by the CER to aggregated emissions reporting of BHPIO and BHP to avoid double-counting of Scope 1 and Scope 2 emissions from Yarnima Power Station.

[46] The threshold for coverage by the Safeguard Mechanism is 100,000 t CO_2-e of Scope 1 emissions measured by NGER facility. The Yandi NGER Facility boundary is consistent with the Derived Proposal's Development Envelope and has recently continued to be covered by the Safeguard Mechanism. Scope 1 emitting activities associated with the Derived Proposal's emissions forecast directly contribute to the total Scope 1 emissions reportable by the Yandi NGER facility. In any given year, where reported Scope 1 emissions from an NGER Facility exceed 100,000 t CO_2-e Safeguard Mechanism obligations will apply and be enforced by the CER.

Table 10-6: Scope 1 GHG emissions estimates attributable to the Ministers North Derived Proposal (mining, electricity supply and rail transport)[46, 47]

Emissions estimate	Scope 1 GHG emissions covered by the NGER (t CO_2e)	Scope 1 GHG emissions Not covered by the NGER (t CO_2e)[1]	Scope 1 GHG emissions Total (t CO_2e)
Maximum annual emissions	189,723 (FY37)	5,854 (FY29)	192,864 (FY32)
Total emissions over life of Proposal	2,312,062	65,144	2,377,206
Average annual emissions[2]	154,137	3,514	157,652

[1] Land clearing emissions are the only source of Scope 1 GHG emissions within the Development Envelope of the Proposal not covered by the NGER Scheme and Safeguard Mechanism. Scope 1 GHG emissions not covered by the Safeguard Mechanism are estimated to remain below the EPA's 100,000 t CO_2-e per annum threshold, supporting an Option A: Safeguard Mechanism confirmation assessment.

[2] Annual average emissions for the Derived Proposal are from FY2027 to FY2041 and excludes periods of low GHG emissions to better represent average operational GHG emissions. For example, land clearing emissions, not covered by NGER, are predicted to extend beyond the period of operational GHG emissions.

Table 10-7 provides a summary of the estimated annual Scope 1 GHG emissions covered by the NGER Scheme for activities within the Development Envelope for the Derived Proposal, including annual and lifetime Scope 1 GHG emissions. Included are annual estimates of emission sources contributing to Scope 1 GHG emissions from the Development Envelope including land-use change emissions. Although land-use change emissions are not covered by the NGER Scheme and Safeguard Mechanism, their inclusion in Scope 1 GHG emission source summaries illustrates they are estimated to remain below 100,000 t CO_2-e in any year.

Table 10-8 provides a summary of the estimated annual Scope 1 GHG emissions from electricity generation and iron ore rail transport, these activities are attributable to the Derived Proposal. The Scope 1 GHG emissions profile (including by source) of the Derived Proposal is illustrated in Figure 10-1.

[47] Yarnima Power Station and Rail are BHPIO's NGER facilities covered by the Safeguard Mechanism, the Derived Proposal's estimated proportional share of Scope 1 emissions supporting iron ore production is summarised, these NGER facilities currently exceed and are predicted to continue to exceed NGER Safeguard Mechanism coverage thresholds.

Table 10-7: Annual Scope 1 GHG emissions by source (Mining activities – Development Envelope)

Financial Year	Heavy haulage & ancillary (diesel) (t CO_2e)	Oils & greases (t CO_2e)	Land-use change (t CO_2e)[1]	Total (excluding land-use change)[2] (t CO_2e)
FY27	21,810	25	3,143	21,835
FY28	62,209	72	4,802	62,281
FY29	91,509	106	5,854	91,615
FY30	109,664	127	4,778	109,791
FY31	111,800	130	3,773	111,930
FY32	118,094	137	5,293	118,231
FY33	114,619	133	4,464	114,752
FY34	116,498	135	3,503	116,633
FY35	113,602	132	3,170	113,734
FY36	120,243	140	2,877	120,383
FY37	120,243	140	2,619	120,383
FY38	109,471	127	2,391	109,598
FY39	95,048	110	2,189	95,158
FY40	95,048	110	2,009	95,158
FY41	71,746	83	1,847	71,830
FY42	-	-	1,703	-
FY43	-	-	1,573	-
FY44	-	-	1,456	-
FY45	-	-	1,350	-
FY46	-	-	1,253	-
FY47	-	-	1,166	-
FY48	-	-	1,086	-
FY49	-	-	1,013	-
FY50	-	-	946	-
FY51	-	-	885	-
Total	**1,471,605**	**1,711**	**65,144**	**1,473,316**
Average[3]	**98,107**	**114**	**3,514**	**98,221**

[1] Land-use change emissions are not covered by the Safeguard Mechanism. FullCAM model emissions from land-use change continues beyond cessation of mining; estimates have been included to 2051. The declining total carbon pool is driven by predicted soil carbon loss in the absence of commensurate increase in above and below ground plant comments, presumably because vegetation is assumed within the model (FullCAM) to have reached full maturity. To what extent the total carbon pool actually declines at the project site over time is uncertain, however the FullCAM simulated result does suggest that the loss in future sequestration potential, if vegetation was not cleared at the project site, is not expected to be overly significant.

[2] Land-use change emissions are not covered by the NGER Scheme and Safeguard Mechanism and have been excluded from Scope 1 GHG emission totals in this table.

[3] Annual average GHG emissions for the Derived Proposal are from FY2027 to FY2041 and excludes periods of low emissions to better represent average operational GHG emissions.

Table 10-8: Annual Scope 1 GHG emissions by source attributable to the Derived Proposal (Electricity Supply and Rail Operations)

Financial Year	Total Scope 1 Electricity Supply Yarnima Power Station ($t CO_2e$)	Total Scope 1 Rail Operations ($t CO_2e$)
FY27	0	0
FY28	8,915	9,517
FY29	22,384	28,723
FY30	31,288	38,052
FY31	31,288	38,052
FY32	31,288	38,052
FY33	31,288	38,052
FY34	31,288	38,052
FY35	31,288	38,052
FY36	31,288	38,052
FY37	31,288	38,052
FY38	31,288	38,052
FY39	31,288	38,052
FY40	24,718	30,061
FY41	9,490	11,542
FY42	-	-
FY43	-	-
FY44	-	-
FY45	-	-
FY46	-	-
FY47	-	-
FY48	-	-
FY49	-	-
FY50	-	-
FY51	-	-
Total	**378,388**	**460,358**
Average[1]	**25,226**	**30,691**

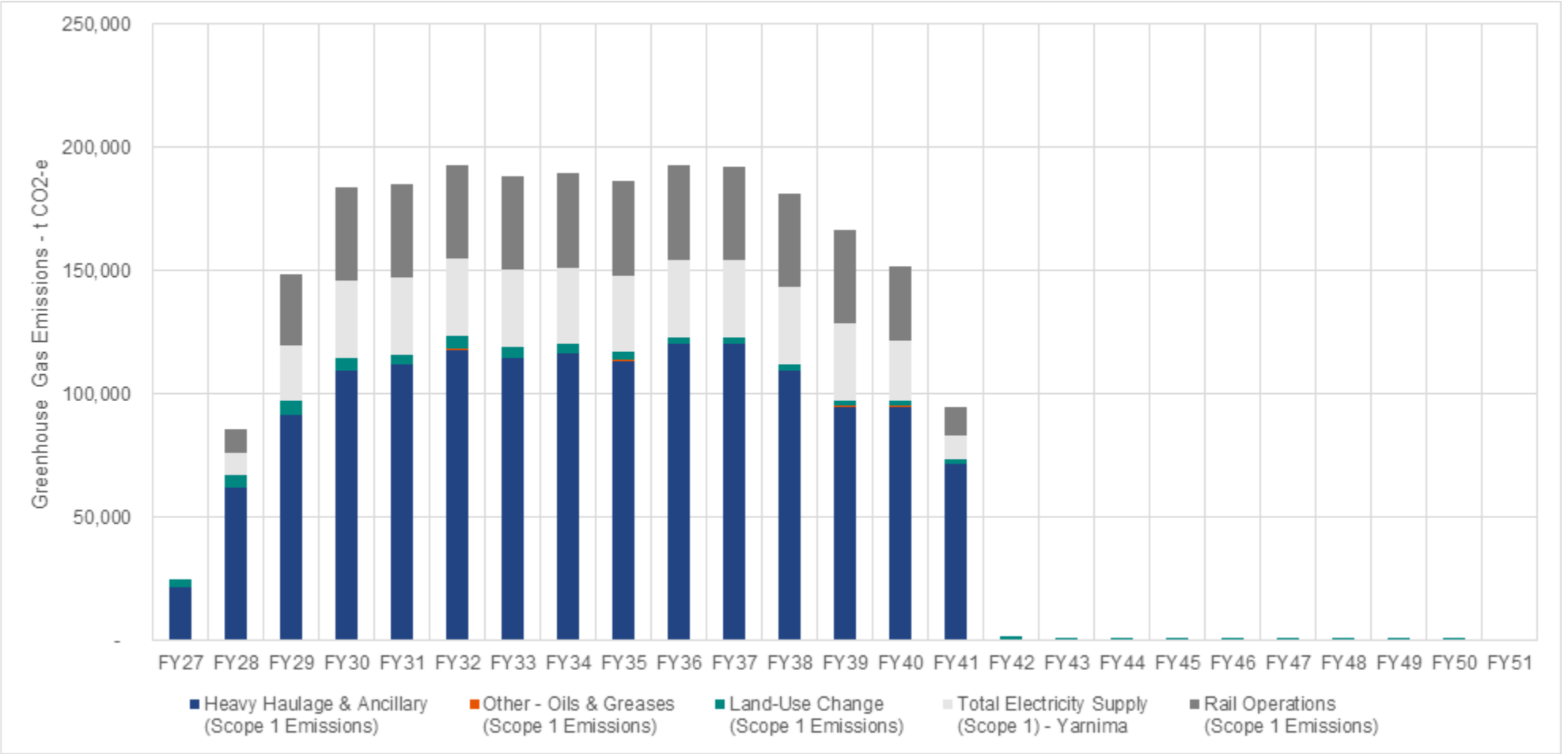


Figure 10-1: Ministers North Derived Proposal Scope 1 GHG emissions profile[48, 49]

[48] Land-use change emissions are not covered by the NGER Scheme or Safeguard Mechanism

[49] In the context of BHP's Strategic Approval boundary, 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 Strategic Approval boundary. BHP takes a regional approach to the management of GHG emissions, and as such these emissions are classified as Scope 1.

10.4.1.5 *Scope 2 GHG emissions estimates*

There are no Scope 2 GHG emissions associated with the Derived Proposal.

Grid-connected electricity supply to the Derived Proposal from outside of the Development Envelope is primarily generated by BHPIO at Yarnima Power Station. The GHG emissions resulting from electricity generation occurs within the Strategic Proposal Boundary, and as such GHG emissions are considered as a source of Scope 1 GHG emissions (electricity supply).

As a result, Scope 2 GHG emissions (electricity consumption) are not considered for the Derived Proposal.

10.4.1.6 *Scope 3 GHG emissions estimates*

A summary of estimated Scope 3 GHG emissions is provided in Table 10-9 and includes the following for the Derived Proposal:

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

Table 10-9: Derived Proposal Scope 3 GHG emissions summary

Emissions estimate	Steel-making (t CO_2-e)	Shipping (t CO_2-e)	BHPIO Port: Downstream (t CO_2-e)	Total (t CO_2-e)
Peak annual emissions	26,790,104	261,817	23,144	27,075,066
Total emissions over the life of the Proposal	324,114,292	3,167,535	280,007	327,561,834
Average annual emissions	21,607,619	211,169	18,667	21,837,456

The GHG emissions resulting from iron ore rail transportation occurs primarily within the Strategic Proposal Boundary (with the exception of a relatively small section of track north of the Strategic Proposal Boundary to BHPIO's Port Hedland operations). As such, GHG emissions associated with rail operations are considered as a source of Scope 1 emissions for the Derived Proposal.

10.4.2 GHG emissions intensity benchmarking

Table 10-10 summarises the estimated Scope 1 GHG emissions intensity for the Derived Proposal and other MS1105 derived proposals. For each derived proposal emissions intensity is averaged over the life of mine and presented on the basis of GHG emissions directly associated with mining activities, which is comparable to most other benchmarks. Emissions intensity is also presented for to include emissions from electricity and rail transport.

GHG emissions intensity has been calculated on the basis of Scope 1 GHG emissions associated with iron ore mining activities from within the Development Envelope, divided by the tonnes of iron ore produced of saleable quality, measured on a wet basis, consistent with the Safeguard Mechanism's iron ore production variable.

Table 10-10: Estimated Scope 1 GHG emissions intensity of the Ministers North Derived Proposal and the MS1105 Strategic Proposal

Derived Proposal	Mining Activities (t CO_2-e/ t iron ore)	Mining, Electricity Supply and Rail Downstream (t CO_2-e/ t iron ore)
Ministers North	0.0061	0.0010
Western Ridge	0.0073	0.0115
OB32 BWT	0.0038	0.0067
MS1105 Total[1]	0.0063	0.0100

[1] Weighted average emissions intensity of MS1105 Derived Proposals, based on estimated emissions at the time of respective referrals to the EPA

Industry benchmarks

The forecasted Scope 1 GHG emissions intensity for the Derived Proposal and of comparable iron ore proposals referred to the EPA and comparison to the Safeguard Mechanism's 'default' emissions intensity are set out in Table 10-11 and Figure 10-2.

The inherent variability of mining makes benchmarking GHG emissions difficult. The geology of the resource, grade of ore, strip-ratio, proportion of below water table resource, location of the ore body from infrastructure, topography and other factors influence the GHG emissions from mining activities. Additionally, the consistency of the inclusion of NGER Act reportable activities related to the operation of a mine (such as power generation, transport and processing) is also a significant determinant of emissions intensity and may vary materially between proposals.

The emissions intensity for Scope 1 GHG emissions associated with the Derived Proposal is estimated to be approximately 0.0061 t CO2-e/t iron ore (mining activities only), this remains in line with other proposals of comparable scope, as illustrated in Figure 10-2 and is approximately 28% higher than the Safeguard Mechanism's iron ore mining production variable default emissions intensity. The default Scope 1 GHG emissions intensity published in NGER for iron ore mining is 0.00476 t CO_2-e/t of iron ore (wet) and represents the Australian iron ore mining historical average FY2013 to FY2017 (note this excludes electricity generation and land-use change GHG emissions).

Factors which may contribute to the emissions intensity of the Derived Proposal being higher than some other benchmarks are related to the Derived Proposal being brownfields expansion. The orebody is also located 15 km from existing iron ore processing infrastructure at Yandi, meaning that increased energy and GHG emissions are required to transport iron ore to existing infrastructure. In general terms, resource extraction emissions intensity will be lower for greenfields iron ore developments at the commencement of mining a new resource. Relevant factors such as the depth of the orebody and distance from processing infrastructure will increase as the resource is extracted and mining locations move further and deeper, increasing emissions intensity as resource is extracted.

Table 10-11: Estimated Scope 1 GHG emissions intensity of recent comparable iron ore proposals

Proposal	EPA Assessment Number	Ministerial Statement number and date	Production Capacity (Mtpa)	GHG emissions intensity ($t CO_2$-e/ t)	Source
Jimblebar Hub – Mining Only	2223	1126 (17 March 2020)	85	0.00463	BHP Pilbara Regional GHGMP
West Pilbara Iron Ore Project – Mining only	2351	1203 (16 June 2023)	40	0.0054	EPA Report-West Pilbara Iron Ore Project, Stage 1 Mine Area (June 2023)
Mcphee Creek Iron Ore Project – Mining only	2285	1224 (14 June 2024)	14	0.0057	GHGMP McPhee Creek Iron Ore Project (22 April 2022)
Ministers North Derived Proposal – Mining only	1934	N/A	25	0.0061	N/A
BHP Strategic Proposal – Mining only	1934	1105 (11 July 2019)	105	0.0063	MS1105 GHGMPv1.1
Brockman Syncline – Mining only	2219	1246 (31 January 2025)	Not Defined	0.0069	GHGMP: Brockman Syncline Proposal (November 2024)
Greater Paraburdoo – Mining only	2189	1195 (5 August 2022)	30	0.0072	GHG MP: Greater Paraburdoo Iron Ore Hub Proposal (April 2022)
Roy Hill Revised Proposal – Mining only	1716	1189 19 May 2022	86* 65**	0.0076	GHGMP – Roy Hill Iron Ore Mine (July 2021)
West Angelas Revised Proposal – Mining only	2290	Not allocated (under assessment – EPA Assessment Number: 2290)	35	0.0080	GHGMP: West Angelas Revised Proposal
FMG Iron Bridge North Star Magnetite Extension – Mining only	2353	Not allocated (under assessment – EPA Assessment Number: 2353)	50	0.0106	GHGMP: North Star Magnetite Project (July 2022)

**Annual period to produce **Annual period for export*

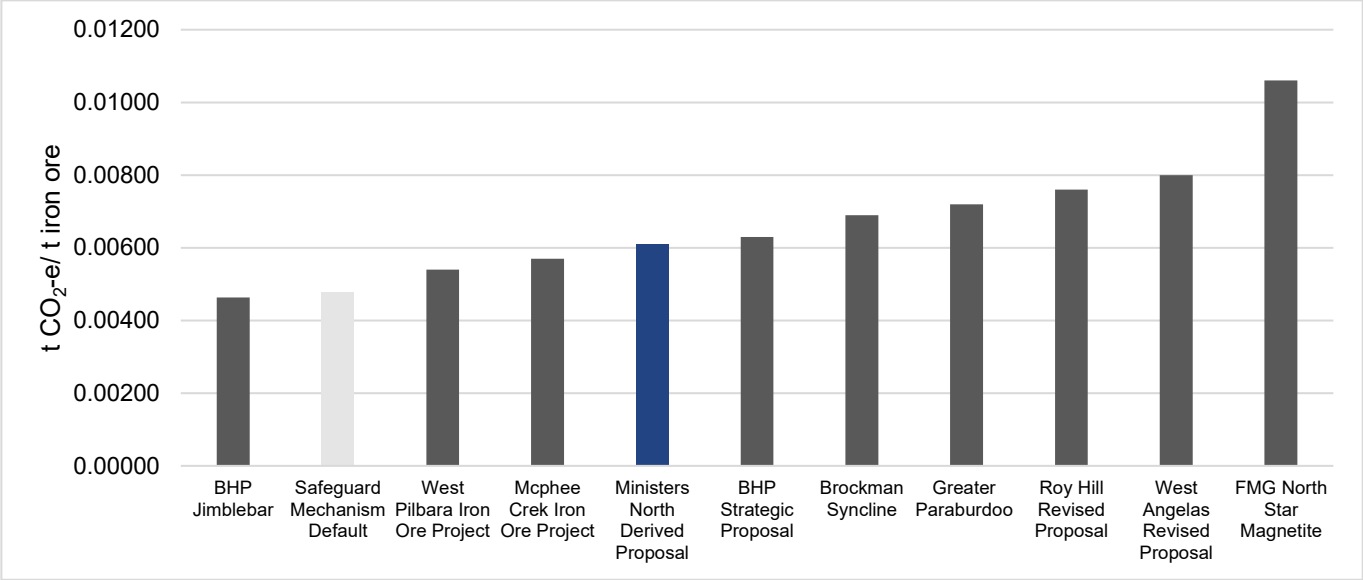


Figure 10-2: Scope 1 GHG emissions intensity benchmarks of iron ore mining

Contribution of State and National GHG Emissions

The estimated average annual emissions from the Derived Proposal have been compared to recent national and state GHG emission totals (Table 10-12 and Table 10-13).

Table 10-12: Contribution to total national and state annual GHG emissions

Emission Source	WA GHG Emissions[50] (%)	National GHG Emissions[50] (%)
Derived Proposal – Scope 1 GHG emissions (mining)	0.110%	0.022%
Derived Proposal – Scope 1 GHG emissions (mining, power supply and rail)	0.176%	0.035%

Table 10-13: National and state GHG inventories

Emission Source	2023 Western Australian Emissions (Mt CO_2-e)	2023 Australian Emissions (Mt CO_2-e)
Energy	81.44	397.98
Industrial processes and product use	5.42	32.99
Agriculture	10.05	82.39
Waste	(9.41)	(73.70)
Land use, land use change and forestry	1.88	13.79
Total	**89.37**	**453.45**

[50] Estimates based on 2023 National and Western Australian GHG emissions inventories reported by DCCEEW

10.5 Mitigation

The PERSP provides examples of the GHG emissions management measures that BHP may apply to derived proposals mitigate the potential impacts on Greenhouse Gas Emissions (BHP 2016a – Section 8.4.1.3 and Section 8.4.3.3). BHP manages its operational decarbonisation program on an enterprise wide basis, and in turn at the asset level (i.e. across its iron ore operations in the Pilbara region). This is consistent with the intent of the MS1105 and PERSP (BHP 2016a), which allows for coordination and consistency across BHP's iron ore operations in the Pilbara.

BHP applies the mitigation hierarchy of avoid, reduce, offset for GHG emissions from site level to global level. The key areas of focus in WAIO are the decarbonisation of purchased electricity, increasing the availability of renewable power to its Pilbara operations, and rail and fleet electrification. Through studies and a capital allocation process, BHP seeks to optimise the risk and reward proposition for operational decarbonisation projects and optimise decarbonisation at a portfolio level. BHP has developed an internal marginal abatement cost curve designed to support identification of the most efficient and effective decarbonisation projects.

GHG emissions abatement opportunities for the Derived Proposal have been assessed by BHPIO to determine whether they are reasonable and practicable against multiple criteria including safety, technical performance, operability, emissions reduction, availability, scale, and economic viability. In addition, BHPIO has assessed these abatement opportunities in the context that the Derived Proposal relates to a brownfields expansion which by its nature influences the scope of such opportunities.

There is potential for substantial changes in GHG policies, markets, technology, and regional energy infrastructure over the lifetime of BHPIO's operations in the Pilbara. This may provide future opportunities to accelerate adoption of GHG abatement measures or influence the reasonableness or practicability of GHG abatement measures.

Further information regarding BHP climate change strategy and commitments is available in the BHP Climate Transition Action Plan 2024 (BHP 2024d).

10.5.1 Avoid

The Derived Proposal is a brownfields development, which includes established mining fleet and mine infrastructure which will be used by the Derived Proposal. These factors influence the scope of practicable GHG emission avoidance opportunities at the commencement of the Derived Proposal.

BHP will mitigate Scope 1 GHG emissions associated with the Derived Proposal through various measures. These include optimising mine design, enhancing the efficiency of mining equipment, utilising low-emission intensity grid-connected electricity, and minimising land clearing by utilising existing infrastructure such as cleared tracks, roads, and mine processing facilities.

The Derived Proposal includes avoidance measures, considered in its design, these are estimated to decrease Scope 1 GHG emissions of the Derived Proposal by approximately 110,891 t CO_2-e which represent a 7.0% decrease in Scope 1 GHG emissions compared to an unmitigated emissions scenario from mining activities within the Development Envelope, and a 4.6% decrease in Scope 1 GHG emissions when including Scope 1 GHG emissions from electricity supply and iron ore rail transport supporting the Derived Proposal, which occur within the Strategic Proposal Boundary.

Figure 10-3 summarises the avoided Scope 1 GHG emission from sources within the Development Envelope excluding land-use change GHG emissions not covered by the Safeguard Mechanism. Modelled initiatives include:

- Position of W5 land bridge: The location of the W5 land bridge was optimised to reduce operating hours to the haul truck fleet, avoiding Scope 1 GHG emissions by an estimated 35,660 t CO_2-e over the Derived Proposal's lifespan.
- Haul truck payload uplift: Refurbishment of 793F haul trucks to be utilised at Ministers North include upgrades to the Gross Vehicle Mass of the rebuilt fleet are expected to increase payloads, reducing the

number of trips and fuel consumption. Over the lifespan of the Derived Proposal these are estimated to avoid 27,009 t CO_2-e of Scope 1 GHG emissions.

- FEL efficiency: The Derived Proposal will utilise CAT 995 front end loaders (FEL) with enhanced fuel efficiency, based on OEM data the FEL's are estimated to avoid 19,233 t CO_2-e of Scope 1 GHG emissions over the lifespan of the Derived Proposal when compared to baseline equipment.
- Ministers North fuel farm: The installation of an additional fuel farm at Ministers North to complement the existing fuel infrastructure at the Yandi Hub is estimated to improve diesel use efficiency, reducing transit distances for refuelling, avoiding 15,746 t CO_2-e of Scope 1 GHG emissions over the lifespan of the Derived Proposal.
- Haul road gradient optimisation: Reducing the haul road gradient from 10% to 6% in key sections is estimated to improve truck cycle times, reducing operating hours and reducing diesel consumption. Over the lifespan of the Derived Proposal 13,243 t CO_2-e of Scope 1 GHG emissions are estimated to be avoided.

Consideration of Overland Conveyor for Ore Transport

The initial design considered ore transport via an overland conveyor to Yandi mine site, in lieu of ore transport by a haul road. Ore transport by overland conveyor is an option utilised at multiple iron ore operations in the Pilbara region (including by BHP), with the benefits of an overland conveyor including reduced particulate air emissions and reduced GHG emissions (when compared to road haulage). However, conveyors are typically less flexible forms of linear infrastructure, and as such make it difficult to navigate between areas of sensitivities (e.g. environmental and cultural) which has been a dominant driver for the current haul road design.

Pre-feasibility assessment determined the preferred development scenario to be ore haulage by road due to lower capital cost of establishment, lower operational costs for maintenance, and readiness for integration with the existing operations at Yandi (which also utilises ore haulage by road). Accordingly, an overland conveyor has not been selected as the ore transport solution for the Derived Proposal.

Electrification of heavy mining equipment (Pilbara-wide Initiatives)

The most material source of Scope 1 GHG emissions associated with the Derived Proposal are from diesel consumption from existing mining equipment (heavy haulage & ancillary). Section 10.5.2.2 summarises BHPIO's plans to avoid and reduce these diesel GHG emissions through the adoption of battery-electric haul trucks and other electric equipment, including excavators and drills. Section 10.5.2.3 also provides summary of BHPIO's initiatives to decarbonise grid-connected electricity generation.

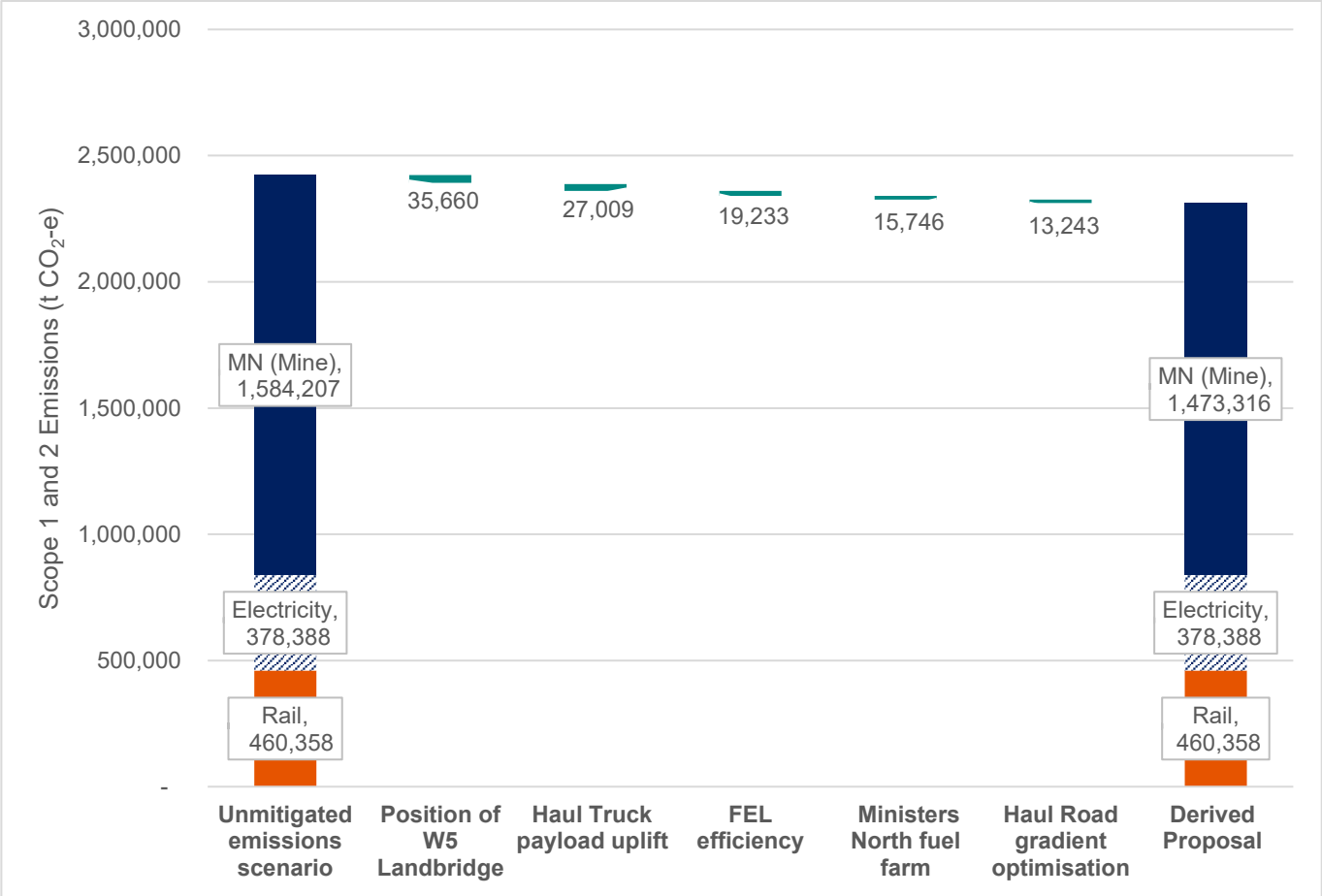


Figure 10-3: Derived Proposal GHG emissions comparison for operational scenarios

10.5.2 Reduce

BHP will reduce GHG emissions from activities supporting the Derived Proposal in accordance with the NGER Act and Safeguard Mechanism.

The activities associated with the Derived Proposal (mining, electricity generation and rail transport) are aligned with the activities covered by the NGER facilities listed in Table 10-16, which are subject to NGER Act energy and GHG emissions reporting. BHP is also required to report on both Scope 1 and Scope 2 GHG emissions annually by NGER facility.

BHP will also explore opportunities to reduce GHG emissions associated with the Derived Proposal through measures such as fleet electrification and the adoption of low carbon and renewable energy.

10.5.2.1 *Indicative Scope 1 GHG emissions reduction trajectory*

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 Derived Proposal and enable the objectives of the EPA to be met (EPA 2024b), as well as the WA Government's Greenhouse Gas (GHG) Emissions Policy for Major Projects (Government of Western Australia 2024a).

Figure 10-4 illustrates the Scope 1 GHG emissions baseline and the indicative GHG emissions trajectory for the Derived Proposal. BHPIO has estimated the indicative GHG emissions reduction trajectory for the Derived Proposal by applying the relevant Safeguard Mechanism decline rates to the Derived Proposal's baseline GHG emissions. Reductions in GHG emissions will be achieved through BHP's operational decarbonisation strategy, which prioritises structural abatement, including the use of low carbon and renewable power and fleet electrification which are discussed in Section 10.5.2.2 and Section 10.5.2.3.

The actual Safeguard Mechanism (production-adjusted) GHG emission baseline, which the indicative GHG emissions baseline represents, will vary based on a number of factors, including the transition from “Site-specific emission intensities” to “Default Emission Intensities”, planned consultation to revise FY2031 to FY2035 Safeguard Mechanism decline rates, and variance between forecast and recorded production, and Safeguard Mechanism coverage thresholds.

Production-adjusted baselines are determined by the CER annually and once GHG 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 GHG emissions limits remain relative to actual production, limiting issues of discrepancy between estimated production and GHG emissions, and those which occur in practice. As a result, BHPIO provides an estimate of the expected baseline or ‘indicative GHG emissions reduction trajectory’ as the CER will annually determine the Yandi’s NGER facility, Yarnima Power Station NGER facility and Rail NGER facility GHG emission baseline, which will operate as the net GHG emissions limits for that year.

Indicative emissions reduction trajectories are subject to a range of uncertainties, including:

- mine strategy and production may fluctuate in response to changes in the market or operational considerations, which may impact GHG emissions from mining associated with the Derived Proposal; and
- amendments to the Safeguard Mechanism, which may include changes to production variables, relevant production variable emissions intensities (default or industry best practice), revised annual decline rates and/or coverage thresholds. However, any amendments to the Safeguard Mechanism Rule would need to be consistent with the NGER Act objects, notably the ‘hard cap’ and overarching GHG emissions reduction requirements.

Table 10-14 and Figure 10-4 provides the Scope 1 GHG emissions baseline and indicative GHG emissions reduction trajectory (applying the Safeguard Mechanism decline rate to the Derived Proposal).

Table 10-14: Scope 1 GHG emissions and Safeguard Mechanism decline rates attributable to Ministers North Derived Proposal [51, 52, 53]

Fiscal Year	Baseline Ministers North mining activities – Yandi (t CO_2-e)	Baseline Ministers North Electricity Supply – Yarnima Power Station (t CO_2-e)	Baseline Ministers North Rail Iron Ore Transport – Rail (t CO_2-e)	Safeguard Mechanism decline rate (%)	Indicative Emissions Reduction – Yandi (Ministers North) (t CO_2-e)	Baseline Ministers North Electricity Supply – Yarnima Power Station (t CO_2-e)	Baseline Ministers North Rail Iron Ore Transport – Rail (t CO_2-e)	Indicative Emissions Reduction Trajectory – Ministers North (t CO_2-e)
2027	21,835	0	-	19.60	17,556	-	-	17,556
2028	62,281	8,915	9,517	24.50	47,022	6,731	7,185	60,938
2029	91,615	22,384	28,723	29.40	64,681	15,803	20,279	100,762
2030	109,791	31,288	38,052	34.30	72,133	20,556	25,000	117,689
2031	111,930	31,288	38,052	37.59	69,861	19,528	23,750	113,140
2032	118,231	31,288	38,052	40.87	69,910	18,501	22,500	110,911
2033	114,752	31,288	38,052	44.16	64,083	17,473	21,250	102,806
2034	116,633	31,288	38,052	47.44	61,302	16,445	20,000	97,747
2035	113,734	31,288	38,052	50.73	56,042	15,417	18,750	90,210
2036	120,383	31,288	38,052	54.01	55,364	14,389	17,500	87,254
2037	120,383	31,288	38,052	57.30	51,410	13,362	16,250	81,021
2038	109,598	31,288	38,052	60.58	43,204	12,334	15,000	70,537
2039	95,158	31,288	38,052	63.87	34,386	11,306	13,750	59,441
2040	95,158	24,718	30,061	67.15	31,260	8,120	9,875	49,254
2041	71,830	9,490	11,542	70.44	21,236	2,806	3,412	27,455
Total	**1,473,316**	**378,388**	**460,358**	N/A	**759,450**	**192,771**	**234,500**	**1,186,721**

[51] Safeguard Mechanism decline rate is sourced from the NGER (Safeguard Mechanism) Rule 2015. Decline rates are subject to change, with DCCEEW indicating that the decline rates for FY2031 to FY2050, subject of 2027 consultation.

[52] 'Indicative GHG emissions reductions are based on the Safeguard Mechanism Decline Rate and estimated GHG emissions associated with the Ministers North Derived Proposal. Actual reductions will vary based on factors, including 'Site-specific' and "Schedule 2 – Default Emission Intensities', and recorded production variable outputs.

[53] The threshold for coverage by the Safeguard Mechanism is 100,000 t CO2-e of Scope 1 emissions measured by NGER facility. In practice the indicative emissions baseline represented in Table 10-14and Figure 10-4 will be regulated by the CER against their respective NGER facility and individually assessed Safeguard Mechanism thresholds (Section 10.5.4.1).In any given year, where reported Scope 1 emissions from an NGER Facility exceed 100,000 t CO2-e Safeguard Mechanism obligations will apply and be enforced by the CER.

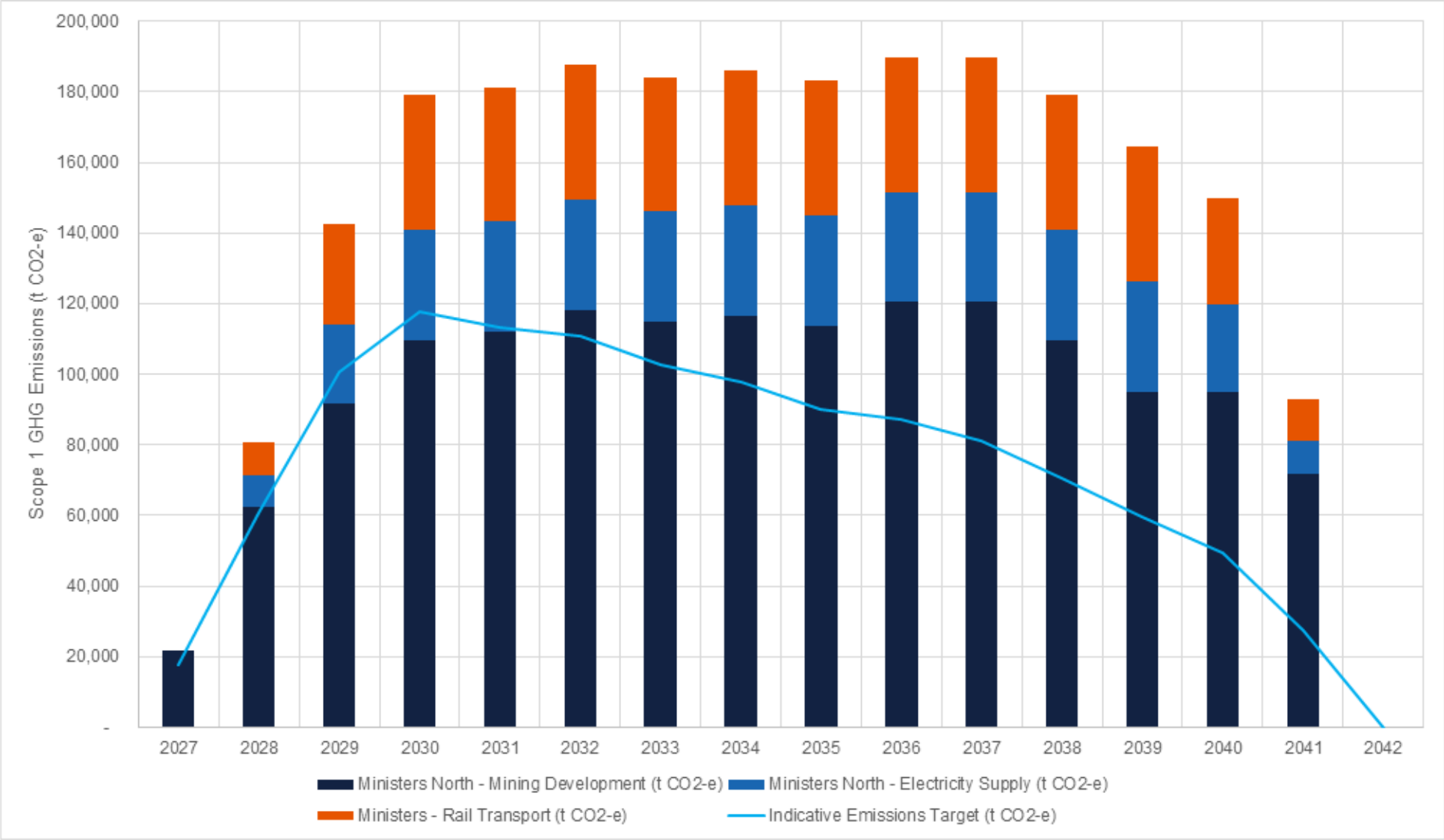


Figure 10-4: Ministers North Derived Proposal Scope 1 GHG emissions baseline and indicative GHG emissions reduction trajectory

10.5.2.2 *Reduction of Scope 1 GHG emissions through fleet electrification*

Displacing diesel as an energy source requires a transformation of mining operations through an integrated abatement program. Many of the technologies BHP will need to reduce operational GHG emissions to achieve net zero by 2050, will require a significant technological step change in safety, reliability, operability, commercial availability and economics.

Due to the low technology readiness level of the products, BHP's Original Equipment Manufacturers (OEMs) are adapting their products to ensure they are technically, commercially and operationally viable. This has resulted in a delay to BHP's previously projected timeframes and now expects to adopt diesel displacement technologies at scale in our operations post FY2030.

Safe and successful trials are an essential enabler of BHP's ability to confidently scale and deploy the technologies required to decarbonise its operations. BHP will continue to progress existing trials and pursue new opportunities where products have reached a suitable technology readiness. These delays will impact the previously projected timelines for deploying battery-electric heavy mobile equipment and locomotives at WAIO, including operational activities within the area of the Strategic Proposal. The delays to adoption of electrified fleet at scale similarly delay the associated electricity demand, which will also impact timing for BHP's interdependent low to zero GHG electricity investments. .

Iron ore mining operations

BHP has partnered with Caterpillar and Komatsu to develop battery electric trucks and will continue to work closely with OEM partners to advance diesel displacement technologies, including by investing in site-based trials. BHP is collaborating with Caterpillar through its Early Learner program for a CAT 793 battery-electric haul truck trial at BHPIO's Jimblebar mine, planned for commencement in FY2026 (BHP AR 2025). Subject to technology readiness and commercial viability, BHP expects to deploy electric haul trucks at selected BHP operations, displacing diesel GHG emissions via electrification.

Replacing diesel as a fuel source requires a new operational ecosystem, impacting mine planning, haulage networks, and reconsideration of safety and operational factors. In FY2022, BHP became a founding member of the Mining Taskforce at CharIN, a global association dedicated to promoting standards in the field of charging systems for electric vehicles. The Taskforce aims to achieve interoperability of charging systems to ensure that any truck charging interfaces across the industry will be standard, regardless of the manufacturer.

In addition to BHP's existing partnerships with Caterpillar and Komatsu, BHP has announced an exploration of opportunities with XCMG, Contemporary Amperex Technology Co. Limited and BYD for the supply of electric mining equipment and the latest in battery technology for mining equipment, locomotives, light vehicles and battery storage systems (BHP AR 2025).BHP has also partnered with Toyota Australia to trial a new light electric vehicle at a site in Western Australia and BHPIO intends to replace its diesel-powered light vehicles with electric light vehicles at its Pilbara iron ore operations in due course (BHP 2024e) to reduce the associated GHG emissions.

Trials of electric fleet at BHP will contribute to the industry decarbonisation initiatives described above.

Diesel GHG emissions from excavators are also a significant source of BHPIO's Scope 1 GHG emissions, and BHPIO's Yandi mine has been trialling the operation of an electric excavator since February 2024, with a view to determining how tethered electrical heavy mining equipment may be effectively integrated into BHPIO's existing and future mining operations.

Iron ore rail transport

Transportation of iron ore from the Derived Proposal to Port Hedland will be supported by BHPIO's rail operations. In January 2023, BHPIO signed partnership agreements with two locomotive manufacturers, Wabtec and Progress

Rail, to develop battery-electric locomotives. Prototypes have already been developed by these manufacturers (BHP 2023).

BHP expects delivery of two battery-electric locomotives from Wabtec and two locomotives from Progress Rail in FY 2026, followed by commissioning and the commencement of trials. Subject to technology readiness and commercial viability, deployment is expected to follow in subsequent years. Battery electric locomotives have the potential to reduce GHG emissions across BHPIO's operations by ~20% if fully implemented[54].

BHPIO's rail operations are covered by a facility-specific Safeguard Mechanism Scope 1 GHG emissions baseline and required to reduce Scope 1 GHG emissions under the NGER Act and Safeguard Mechanism.

10.5.2.3 *Reduction of Scope 1 GHG emissions through low carbon and renewable energy*

The Derived 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 29% less CO2 than the Australian average[55], achieved through waste-heat recovery.

It is estimated that approximately 900 MW of additional power will be required to support operations at WAIO if BHP displaces diesel with electricity (BHP 2022). BHP expects to source that additional power from renewable sources, subject to availability. Acknowledging the need for exponential growth in renewable power infrastructure in the Pilbara, BHP is engaging with the WA government's Pilbara Roundtable to develop interconnectivity with broader networks in the Pilbara (WA Government 2025). As the proportion of renewable power available to Pilbara networks (including BHP's networks) grows, the Scope 1 GHG emissions related to electricity generation for the Derived Proposal will be able to decrease accordingly.

Yarnima Power Station is covered by a facility-specific Safeguard Mechanism Scope 1 GHG emissions baseline. BHPIO is required to reduce GHG emissions associated with electricity generation at Yarnima Power Station through compliance with the Safeguard Mechanism on a trajectory aligned with a 34.3% decline rate by FY2030 and net zero by FY2050 on a production-adjusted basis. Additionally, Yarnima Power Station is subject to the Renewable Energy Target, which requires renewable energy certificates (RECs) to be surrendered for electricity consumed. The purchase and surrender of RECs financially supports renewable electricity generation across Australia, contributing to a reduction in Australia's Scope 1 GHG emissions from the electricity sector..

10.5.2.4 *Reduction of domestic Scope 3 GHG emissions*

GHG emissions associated with BHP's Port Hedland operations are primarily associated with grid-connected electricity generation supporting stacking, reclaiming and ship loading activities. APA's (formerly Alinta Energy Pty Ltd's) Port Hedland Power Station is the principal source of electricity supplied to BHP's Port Hedland operations.

In September 2022, BHP signed a Power Purchase Agreement with APA to purchase 100% of the energy produced by a solar farm that will be constructed near Port Hedland, and which became operational in 2024. This solar battery hybrid project includes a 45-Megawatt solar array and 36.7 Megawatt hours of battery energy storage system reducing BHPIO's Port Hedland purchased electricity GHG emissions (APA 2024).

BHP's Port Hedland electricity supply, which is supplied by APA's Port Hedland Power Station is currently subject to 5-yearly emission reductions on a linear trajectory to net-zero by 2050 as established in MS1236 which is held by APA. Additionally, electricity demand is subject to the Renewable Energy Target, which requires RECs to be surrendered for electricity consumed, which financially supports renewable electricity generation across Australia, contributing to a reduction in Australia's Scope 1 GHG emissions from the electricity sector.

[54] Based on BHPIO's FY2024 NGER Scope 1 and Scope 2 total reported emissions (location-based)

[55] Compared to the National average Scope 2 GHG emissions intensity (0.63 kg CO2-e/ kWh) sourced from DCCEEW's National Greenhouse Account Factors 2024

10.5.2.5 *Reduction of international Scope 3 GHG 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.

Measures to support decarbonisation of steel production

The most material contribution to Scope 3 GHG emissions associated with the Derived Proposal is expected to be the downstream processing of iron ore into steel by steelmakers. In FY2024, use of iron ore in steelmaking was 75% of BHP's total reported emissions inventory (Scope 1, 2 and 3 GHG emissions combined, across all commodities).

For the world to transition to a net zero economy and produce the steel needed to meet the demands of increasing urbanisation, population growth and energy transition infrastructure, widespread deployment of near zero emissions steelmaking technology is needed. Currently there are no near zero emissions technologies for iron ore-based steelmaking that are ready for widespread commercial adoption.

Although Scope 3 steelmaking GHG emissions are outside of BHPs operational control, BHP are taking measures to support the industry to decarbonise. BHP have set a medium-term goal to support industry to develop steel production technology capable of 30 per cent lower GHG emissions intensity relative to conventional blast furnace steelmaking, and a long-term goal of net-zero Scope 3 GHG emissions by CY2050. To deliver these goals, BHP have established the steelmaking decarbonisation program.

As of FY2024, BHP had committed US$140 million into steelmaking decarbonisation, with an additional US$75 million planned. BHP's steelmaking partnerships are with companies representing approximately 22% of reported global steel production. More information about BHP's partnerships and program activities can be found in BHP's Climate Transition Action Plan 2024.

Examples of recent activities under the program include:

- In FY2024, BHP successfully used hydrogen to convert WAIO iron ore fines into direct reduced iron, then electrically smelted the direct reduced iron to produce molten iron at laboratory scale
- In FY2023, BHP announced a pre-feasibility design study for a pilot-scale electric smelting furnace facility (ESF) with global engineering firm, Hatch. The study examined scale, configuration, and location of a potential pilot facility and was completed in FY2024.
- In FY2024, BHP formed a consortium with BlueScope and Rio Tinto to conduct a joint pre-feasibility study for a pilot ESF facility located in Australia. This arose from a shared ambition to collaborate and advance near zero emissions steelmaking in Australia. If the study is successful and further investment is approved by all partners, a pilot plant could be commissioned as early as CY2027.
- In FY2024, BHP commissioned industrial CCUS trial equipment at ArcelorMittal's Ghent steelworks in Belgium, in partnership with ArcelorMittal and Mitsubishi Heavy Industries, and commenced carbon capture trials, testing its efficiency and effectiveness on blast furnace gas streams.
- BHP are investing in nascent molten oxide electrolysis (Boston Metal) and low temperature electrolysis (Electra) technologies which have the potential to provide a scalable, near zero emissions ironmaking process with the flexibility to process a variety of iron ore types

Our strategy, actions and progress to support steelmaking GHG emission reductions are subject to existing Board and management governance and undergo regular periodic review. We also regularly monitor the merits of technologies under development and update our strategy and activities. All investments related to steelmaking GHG

emission reductions that are above a certain financial threshold are subject to existing capital management processes.

Measures to support decarbonisation of shipping

BHP is one of the world's largest dry bulk charterers and aims to use our chartering size and scale to increase the speed of the shipping industry's pace and progress towards decarbonisation. BHP seek to influence the supply chain and broader market through execution of many industry- and world-first initiatives along with creating demand for low and zero GHG emission fuels and energy efficient technologies in shipping.

Vessel propulsion is still primarily powered by the combustion of fuel oil. The long distances travelled, need for suitable port infrastructure, long life of vessels, safety concerns, and nascent alternative fuel options contribute to making international shipping a hard-to-abate sector. BHP play several important roles towards maritime decarbonisation, such as:

- Create demand for lower, low and zero GHG emissions fuels, such as biodiesel, LNG and low to zero GHG emissions ammonia, which assists to accelerate the adoption of fuels and technologies (once proven) and provide suppliers confidence to make investment decisions.
- Partner to bring energy saving technologies to maturity to reduce the use of bunker fuel.
- Advocate for industry regulations to increase the speed and scale of shipping decarbonisation.
- Use real-time data analytics to optimise vessel and route selection for voyage and vessel efficiency.

BHP collaborate with industry organisations (such as the Global Centre for Maritime Decarbonisation and Global Maritime Forum) and port authorities on decarbonisation frameworks and industry wide collaborations. BHP also joined the First Movers Coalition as a Founding Member in the shipping sector, committing that 10% of BHP's products shipped to our customers, on our time charter vessels, will be on vessels using zero emissions fuels by 2030, subject to the availability of technology, supply, safety standards, and the establishment of reasonable thresholds for price premiums.

International regulatory context

The majority of global steel production currently occurs in China (OECD 2023) and China and India are key geographical markets for BHP. Through its Nationally Determined Contribution (NDC) China has a target to reach peak CO_2-e emissions by 2030 and achieve carbon neutrality by 2060 (People's Republic of China 2022). China has also made additional commitments by 2030, such as reducing CO_2 emissions per unit of GDP by over 65% (on a 2005 base year), increasing non-fossil energy by 25%, and increasing total wind and solar capacity to 1.2 billion kilowatts (People's Republic of China 2021a).

These ambitions are supported by two documents that outline the strategic plan to achieve China's targets across the economy, the *Working Guidance for Carbon Dioxide Peaking* (People's Republic of China 2021a) and *Carbon Neutrality and Action Plan for Carbon Dioxide Peaking Before 2030* (People's Republic of China 2021b).

China's national Emissions Trading Scheme (ETS), which previously covered power generation and heat, has been expanded to include the steel sector, aluminium and cement sectors. In 2025, the Ministry of Ecology and Environment (MEE) of China issued the 'Work Plan for the National Carbon Emissions Trading Market Covering Steel, Cement and Aluminium Smelting Industries' (Ministry of Ecology and Environment of the People's Republic of China 2025a). The ETS will cover both energy related and process GHG emissions directly associated with production of steel.

The ETS is applying a phased implementation approach to regulating emissions from the steel sector. The initial focus of the ETS is to develop and enhance the accuracy of carbon emissions reporting from covered sectors. For the 2024 compliance year entities covered by the scheme will be allocated allowances equivalent to their verified emissions, ensuring a smooth transition into the market with no shortfall and supporting initial compliance readiness.

In 2025 to 2026 the allocation approach will shift to a model that is both output-based and intensity-regulated. While the specific parameters are yet to be released, they are expected to be sufficiently flexible to avoid material impacts on industry development, from FY2025 onward, declining intensity baselines will be introduced to drive continuous improvement in carbon efficiency, encouraging industry-wide reductions in emissions per unit of output (Ministry of Ecology and Environment of the People's Republic of China 2025b).

China Iron and Steel Association (CISA) also released its suggested Decarbonisation Pathway for the China Steel Industry:

- Ensure carbon peak before 2030 and develop technologies and resources capable of 15% GHG emission volume reduction by 2030 (2020 baseline)
- 40% and 85% carbon emission volume reduction by 2040 and 2050 respectively
- 95% carbon emission volume reduction by 2060 and achieve carbon neutral using carbon offset.

India submitted its updated NDCs to the UNFCCC in August 2022: to reduce GHG emissions intensity by 45% below 2005 levels by 2030, and to increase the share of non-fossil power capacity to 50% by 2030 and achieve net zero emissions by 2070 (Government of India 2022).

The iron and steel industry in India is covered under the Environment Protection Act and Environment Protection Rules & Regulations enacted & published by Ministry of Environment & Forest (MoEF&CC). Initiatives to reduce GHG emissions in the sector include (Government of India 2024):

- The National Steel Policy, launched in 2017 by the Ministry of Steel (MoS 2017). This policy includes targets to improve energy efficiency, which are adopted through the Government of India's Perform, Achieve, and Trade scheme
- The Steel Scrap Recycling Policy (MoS 2019) is aimed at increasing the utilisation of steel scrap
- Perform, Achieve and Trade (PAT) scheme, under National Mission for Enhanced Energy Efficiency, incentivizes steel industry to reduce energy consumption (MoS, 2022).
- Charter on Corporate Responsibility for Environment Protection (CREP). An initiative of the Indian government and major steel producers to improve environmental performance such as limiting pollution, water consumption, and energy consumption. A National Task Force has been established to implement the recommendations of CREP

There has been successful implementation of two United Nations Development Programme (UNDP) projects ("Energy efficiency in steel re-rolling mills" and "Up-scaling energy efficient production in small-scale steel industry in India"). In 2023, the Ministry of Steel initiated 14 Task Forces to develop a green steel roadmap. The associated roadmap, released in September 2024, provides a pathway to a reduction of 13.39% of steelmaking carbon intensity against a 2024-25 baseline. (MoS 2024).

India is rapidly advancing toward a structured and regulated carbon pricing ecosystem as part of its broader climate and sustainable development agenda. Against the backdrop of increasing global emphasis on carbon markets and emissions trading, India is now actively developing a rate-based Emissions Trading System (ETS) and associated voluntary carbon crediting mechanisms (Government of India 2025).

10.5.3 Offsets

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 Derived Proposal aligns to the Safeguard Mechanism. Although BHP prioritise structural abatement of the Derived Proposal, BHP acknowledges a role for the use of flexible compliance arrangements as provided under the Safeguard Mechanism.

This means that where structural abatement of GHG emissions is insufficient to meet the Derived Proposal GHG emissions reduction trajectory, BHP will ensure that these targets are met by either using banked Safeguard Mechanism Credits (SMC) 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 carbon 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.

In the context of BHP's operations in Western Australia, including the Derived Proposal, BHPs preference is to source offsets in line with the 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 Australia, in partnership with reputable project developers under ERF methodologies.

BHP's procurement of carbon credits, includes due diligence so that we 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 (ICROA 2024).
- **Adheres to a robust emissions reduction accounting methodology**, to provide assurance of the volume of GHG emissions reduced through a project.
- **Meets additionally 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 GHG 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 GHG 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 GHG emissions reduction from activities that occurred a long time ago.

Whether surrender of carbon offsets may exceed 30% of the Derived Proposal's expected baseline

BHPIO is committed to achieving net zero Scope 1 and 2 GHG emissions by 2050. BHP prioritises the 'structural abatement' to reduce GHG emissions at its operated assets to achieve our Scope 1 and 2 goals. The exact measures to be implemented to achieve net zero Scope 1 and 2 GHG emissions remains subject to uncertainty due to the long-

time horizon of BHPIO's operations in the Pilbara, changing policy and regulation and the rapid evolution of availability and feasibility of technological solutions.

The magnitude and timing of GHG emissions reduction will be subject to a range of factors, some of which are uncertain or otherwise outside the control of BHP, including:

- mine strategy and production may fluctuate in response to changes in the market or operational considerations, which may impact GHG emissions from the Derived Proposal due to changes to forecast mining activities, power demand and rail transport
- adoption, availability or effectiveness of decarbonisation technologies may change as new technologies emerge, or as complexities of implementation become clearer
- suitable sources of renewable energy may take longer to become available than forecasted, for example through delays in developing suitable regional energy infrastructure
- increased competition for decarbonisation expertise, services and technology may impact speed, effectiveness, or cost of implementation.

Acknowledging these uncertainties, there is potential that BHPIO's use of carbon offsets may exceed 30% of the Safeguard Mechanism baseline covering Yandi, Yarnima Power Station and Rail in any given year [56]. Under the Safeguard Mechanism:

- only Australian Carbon Credit Units and Safeguard Mechanism Credits may be used offset emissions, which ensures only credible offsets and credits are used;
- BHPIO is required to provide a statement to the CER setting out technological and regulatory barriers to decarbonisation in respect of facilities which surrender carbon offsets equal or greater than 30% of its annual baseline, as an accountability measure (DCCEEW 2024).

10.5.4 Other statutory decision-making processes

Table 10-15 summarises whether other statutory decision-making processes can mitigate the potential environmental impacts of the Derived Proposal on Greenhouse Gas Emissions.

Table 10-15: Greenhouse Gas Emissions – other statutory decision-making processes

Impact from Derived Proposal	Other Statutory Decision-making Process
Generation of GHG emissions	**NGER Act** • provides a framework for Nationally consistent reporting of Scope 1 and Scope 2 GHG emissions and where Scope 1 GHG emissions exceed defined thresholds, BHP will be required to undertake action to manage these GHG emissions **NGER Safeguard Mechanism** • imposes Scope 1 limits and annual reporting requirements on large GHG emitting facilities to keep net emissions below a defined baseline, consistent with Australia's GHG emission targets **Renewable Energy Target** • aims to reduce greenhouse gas emissions in the electricity sector and increase renewable electricity generation through creation of market incentive for the generation and use of renewable energy through obligation for electricity consumers to surrender renewable energy credits for a proportion of their electricity use

[56] The Derived Proposal's mining activities are expected to be included within BHPIO's Yandi NGER facility, grid-connected electricity generation within BHPIO's Yarnima Power Station NGER facility and iron ore rail transport within BHPIO's Rail NGER facility.

Impact from Derived Proposal	Other Statutory Decision-making Process
	Emissions Reduction Fund • allows for the purchase and surrender of offsets to counterbalance GHG emissions.

10.5.4.1 *NGER Act and Safeguard Mechanism coverage*

BHPIO is the responsible emitter in respect of a number of designated large facilities that are covered by the Safeguard Mechanism. The facilities described below are relevant to the Derived Proposal. Table 10-16 summarises the links between the NGER facility and the Safeguard Mechanism production variable and default emissions intensity, applicable to determine emission baselines through the Safeguard Mechanism.

Scope 1 emitting activities associated with iron ore mining activities within the Development Envelope of the Derived Proposal are expected to directly contribute to the total Scope 1 GHG emissions reportable by the Yandi NGER facility. The Scope 1 GHG emissions associated with grid-connected electricity generation and iron ore rail transport supporting the Derived Proposal are also expected to be covered by the Safeguard Mechanism. In any given year, where reported Scope 1 GHG emissions from an NGER Facility exceed 100,000 t CO_2-e Safeguard Mechanism obligations will apply and be enforced by the CER.

Table 10-16: Summary of Safeguard Mechanism coverage of BHPIO's relevant operations to the Derived Proposal

NGER Facility	Production Variable	Relevance to Derived Proposal
YAN01 Yandi/Marillana Creek Mine – MNG Facility	Iron ore default emissions intensity of 0.00476 t CO_2-e per tonne of iron ore applicable	Activities generating Scope 1 GHG emissions from iron ore mining associated with the Derived Proposal are planned to be aggregated into the Yandi NGER facility
Yarnima Power Station	Megawatt hours of electricity generation default emissions intensity of 0.539 t CO_2-e applicable	Source of Scope 1 GHG emissions, Yarnima is the primary source of off-site electricity supply to the Derived Proposal's Development Envelope
PRL03 Rail – IOR Facility	Net-tonne-kilometres of bulk freight on a dedicated line default emissions intensity of 5.29×10^{-6} t CO_2-e per net-tonne-kilometre applicable	Source of Scope 1 GHG emissions, rail transport of iron ore from the Derived Proposal's Development Envelope

YAN01 Yandi/Marillana Creek Mine – MNG Facility (Yandi)

Yandi is located approximately 178 km north-west of Newman in the Pilbara region of WA. The Yandi hub produces iron ore through open-pit iron ore mining methods. The Yandi NGER facility reports the energy and GHG emissions supporting the mining and production of iron ore to where it is loaded onto BHPIO's rail.

Iron ore mining activities at Ministers North are intended to be aggregated by BHPIO into the Yandi NGER facility.

Yarnima Power Station

Yarnima is a combined cycle gas turbine (CCGT) power station located in Newman in the Pilbara region of WA. The power station operates gas turbines equipped with heat recovery steam generators to capture waste heat. Waste

heat recovery generates additional power, reducing gas use for electricity generation and increasing the overall thermal efficiency and reducing carbon emissions intensity of the power station.

In the event of a gas supply interruption or shortfall, the power station is configured to allow normal operations to continue using diesel fuel. Yarnima supplies electricity to BHPIO's mines and the Newman township via BHPIO's inland electricity grid, including for the Derived Proposal.

PRL03 Rail – IOR Facility (Rail)

BHPIO's mining hubs are connected by more than 1,000 km of railway infrastructure in the Pilbara region of WA. This railway infrastructure is dedicated for BHPIO's sole use and rail transport activities are operated by BHPIO, which includes the transport of ore from the Derived Proposal. The NGER facility, PRL03 Rail – IOR Facility reports the energy and GHG emissions from activities which support the transport of iron ore from BHPIO's mining hubs, where it is loaded, to Port Hedland where iron ore is unloaded for export.

Legislative and policy settings for GHG emissions reductions

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

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

The activities associated within the Development Envelope of the Derived Proposal are aligned with the Yandi NGER facility boundary, electricity generation and iron ore rail transport supporting the Derived Proposal are also aligned with BHPIO's Yarnima Power Station and Rail NGER facilities, which are subject to the NGER Act energy and GHG emissions reporting requirements. BHP is also required to report on both Scope 1 and Scope 2 GHG emissions annually by NGER facility.

The NGER Act and Safeguard Mechanism apply to the majority of GHG emissions associated with the Derived Proposal and enable the objectives of the EPA to be met, as well as the WA Government's GHG Emissions Policy for Major Projects (Government of Western Australia 2024a).

10.6 Validation of impacts and environmental outcomes

BHP has validated the impacts from GHG emissions associated with the Derived Proposal against the Strategic Proposal assuming mitigation measures identified in Section 10.5 have been applied, to demonstrate that the environmental objective identified in MS1105 Condition 12, can be met.

10.6.1 Strategic Proposal environmental outcomes

Key environmental outcomes for Greenhouse Gas Emissions established through the assessment of the Strategic Proposal (BHP Billiton 2016 and EPA 2018a) that are relevant to the Derived Proposal are:

- the total emissions of GHG across the life of the Strategic Proposal are potentially significant; however, emissions of future proposals can be avoided and minimised through proposal design and best-practice technology for operations
- GHG emissions intensity is not expected to increase, as mining methods are consistent with those currently used for iron ore operations
- the impacts are manageable and would no longer be significant, through the application of measures to avoid, minimise and if necessary, offset GHG emissions over the life of the Strategic Proposal.

10.6.2 Greenhouse gas emissions

The source of estimated GHG emissions considered from the Derived Proposal includes mining activities, heavy haulage, ancillary equipment, oils and greases, and land clearing. These GHG emission sources are comparable to GHG emission sources described in EPA Report 1619 (EPA 2018a)

BHP quantified potential GHG emissions for the Strategic Proposal for CO_2, CH_4 and N_2O (BHP 2016a - Section 8.4.3.1). The other GHG emissions (SF_6, HFCs and PFCs) are reportable by BHP but the contribution to BHP's overall GHG emissions is negligible (<0.1%). BHP used information at its Mining Area C, Yandi, OB24/25, OB18 and Mt Whaleback operations to calculate GHG emissions for the development scenarios (BHP Billiton 2016 - Section 8.4.3.4) using 2009 data from BHP's NGER Act reportable Scope 1 and Scope 2 GHG emissions. GHG emissions associated with BHP's ship-loading operations at Port Hedland and material movement via rail, are excluded from these figures.

BHP considered Scope 1 and Scope 2 GHG emissions for the Strategic Proposal (BHP 2016a - Section 8.4.3.1). BHP predicted total GHG emissions of 4.4 Mt CO_2-e p.a. for the Full Conceptual Development Scenario (FCDS) (3.0 Mt CO_2-e p.a. Scope 1 GHG emissions and 1.4 Mt CO_2-e p.a. Scope 2 GHG emissions) compared to 0.9 Mt CO_2-e p.a. from existing operations at the time of assessment, which represents an incremental increase of 3.5 Mt CO_2-e p.a. from existing operations. (BHP 2016a - Table 75).

Table 10-17 summarises the annual average Scope 1 GHG emissions for the Ministers North Derived Proposal and previous derived proposals. Scope 1 GHG emissions estimates cover iron ore mining activities within the Development Envelope, including land-use change emissions, other sources of Scope 1 GHG emissions from electricity consumption and iron ore rail transport[57], apportioned to Derived Proposals within the Strategic Assessment Boundary are also summarised. The cumulative total of active Derived Proposals is approximately 0.44 Mt of CO2-e p.a., which represents ~12.4% of the incremental emissions associated with the FCDS.

Scope 1 GHG emission estimates for the Derived Proposal include consideration of measures to avoid GHG emissions (Section 10.5.1), they do not factor the Scope 1 GHG emission reductions required to comply with the Derived Proposal's Safeguard Mechanism indicative Scope 1 GHG emissions reduction trajectory, which is anticipated to further reduce Scope 1 GHG emissions from the Derived Proposal and is covered in Section 10.6.5 (this is also consistent with the Scope 1 GHG emissions of other derived proposals).

Table 10-17: MS1105 annual average Scope 1 GHG emissions (t CO_2-e)

Derived Proposal	Mining	LULUCF	Electricity Supply	Rail	Total (Mining, Electricity & Rail)
Ministers North	98,221	3,514	25,226	30,691	157,652
Western Ridge	135,939	2,838	44,101	36,265	219,143
OB32 BWT	33,706	230	10,139	15,726	59,801
MS1105 Total	**267,866**	**6,852**	**79,466**	**82,682**	**436,596**
MS1105 FCDS					3,500,000

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

In the EPA Report 1619 (EPA 2018a), the EPA noted that BHP had set a performance target of maintaining its GHG emissions for all of its assets (not just iron ore) below the company's 2006 GHG emission levels and was on track to meet its 2017 target. BHP met its 2017 target, with total GHG emissions of 16.3 Mt CO_2-e which is 21% below the adjusted FY06 baseline levels (BHP 2017b). In 2017, BHP set a five-year GHG emissions reduction target, 'to maintain our total operational GHG emissions in FY22 at or below FY17 levels while we continue to grow our business' (BHP 2018a). Also in 2017, BHP set the long-term goal of 'achieving net-zero operational GHG emissions in the latter half of this century, consistent with the Paris Agreement' (BHP 2018b). Through BHP's Climate Change Report 2020 (BHP 2020d), a medium-term target of reducing Scope 1 and Scope 2 GHG emissions by at least 30% from FY20 levels by 2030 was established, and BHP's long-term goal to achieve net-zero operational emissions updated from 'the latter half of this century' to 'by 2050'.

The validation demonstrates that the potential GHG emissions (amount of emissions) from the Derived Proposal are consistent with the Strategic Proposal outcomes, as the Derived Proposal has been designed to avoid and minimise emissions. The average annual GHG emissions of the Proposal to BHP's iron ore operations, represent approximately 3.5% of the estimated average annual emissions of the FCDS, which totals 4.4 Mt CO_2-e per annum.

The outcomes in the Strategic Assessment referring to the implementation of a GHG Management Plan was included at a time when there was no other legislative GHG emissions reduction mechanism. BHP considers that the outcomes can be met without an implementation of a GHG Management Plan as emissions are now being reduced under the Safeguard Mechanism. BHP's compliance with the Safeguard Mechanism provides a contemporary, robust, transparent, and enforceable requirements to deliver GHG emissions reductions commensurate to Australia's international obligations.

Aligned with recent amendments to the WA Greenhouse Gas Emissions Policy for Major Projects and the EPA's Greenhouse Gas Emissions Environmental Factor Guideline, BHP will manage its GHG emissions through compliance with the Safeguard Mechanism and is not proposing to develop a GHG Management Plan.

10.6.3 GHG emissions intensity

In the PERSP (BHP Billiton 2016), BHP noted that the Scope 1 and Scope 2 GHG intensity of its mining operations is comparable with similar developments (BHP Billiton 2016 - Section 8.4.3.4). The EPA noted in EPA Report 1619 that for future proposals identified in the Strategic Proposal, intensity is not expected to increase as future mining methods will be consistent with those currently used for operations. The EPA also noted that BHP improved GHG emissions intensity from 8.50 t CO_2-e/kt of ore in 2014 to 8.17 t CO2-e/kt in 2016 (EPA 2018a). At the time of the PERSP, the industry average GHG emissions intensity was 11.9 t CO_2-e/kt.

As discussed in Section 10.4.2, the estimated Scope 1 GHG emissions intensity for the Proposal is 6.1 t CO_2-e/kt of ore based on mining activities within the Development Envelope and 10.0 CO_2-e/kt of ore when including electricity supply and rail transport GHG emissions. While the Derived Proposal's GHG emissions intensity is 28% higher than the default emissions intensity for iron ore mining (4.76 t CO2-e/kt of iron ore), the GHG emissions intensity is lower than the industry average GHG emissions intensity identified in the PERSP (BHP 2016a). These emission intensities do not factor the Scope 1 GHG emissions reductions required to comply with the Derived Proposal's Safeguard Mechanism indicative Scope 1 GHG emissions reduction trajectory, compliance with the Safeguard Mechanism is anticipated to further reduce Scope 1 GHG emissions.

The validation demonstrates that the GHG emissions intensity from the Derived Proposal are consistent with the Strategic Proposal outcomes, as the Derived Proposal has been designed to avoid and minimise emissions. Resulting GHG emissions intensity is comparable to relevant benchmarks.

Table 10-18: MS1105 Scope 1 GHG Emissions Intensity (t CO_2-e/ kt iron ore)

Derived Proposal	Mining Activities	Mining, Electricity & Rail
Ministers North	6.1	10.0
Western Ridge	7.3	11.5
OB32 BWT	3.8	6.7
MS1105 Total – Weighted Average	**6.3**	**10.0**

10.6.4 Comparison of GHG emissions (residual) against State and National GHG emissions

In the PERSP (BHP 2016a), BHP considered Scope 1 and Scope 2 GHG emissions for the Strategic Proposal (BHP 2016a - Section 8.4.3.4). BHP predicted total GHG emissions from the FCDS had the potential to contribute to an increase in National GHG emissions of 0.8% and Western Australian GHG emissions of 5.8%, based on the FY2012 National and FY2012 State GHG inventories, including LULUCF GHG emissions. The existing contribution of BHP's operations to National and State GHG inventories assessed at the time was 0.2% and 1.2% respectively, including LULUCF emissions (i.e. a 0.6% and 4.6% increase from existing operations).

Table 10-19 summarises the comparison of the Derived Proposals activities and wider Strategic Assessment Boundary activities of electricity supply and iron ore rail transport to recent state and national GHG emission totals. Emissions used to determine the percentage comparison from the Derived Proposal are the annual average GHG emissions (Table 10-17), which have been compared to DCCEEW's 2023 Western Australian GHG emissions (89.37 Mt CO2-e) and 2023 National GHG emissions inventory (453.45 Mt CO2-e).

Table 10-19: MS1105 annual average Scope 1 emissions comparison to state and national emissions

Derived Proposal	Emission Sources	WA GHG Emissions (%)	National GHG Emissions (%)
Ministers North	Mining Activities Only (Development Envelope)	0.110%	0.022%
	Mining, Electricity Supply & Rail Transport Activities	0.176%	0.035%
MS1105 Cumulative Total (including Ministers North)	Mining Activities Only	0.265%	0.052%
	Mining, Electricity Supply & Rail Transport Activities	0.424%	0.084%

The estimated percentage contribution of the cumulative annual average Scope 1 GHG emissions from MS1105, including the Ministers North Derived Proposal, are less than the previously assessed contribution of incremental GHG emissions associated with the FCDS, which was 4.6% of WA's GHG emissions and 0.6% on national GHG emissions, including LULUCF.

The validation demonstrates that the potential GHG emissions (amount of emissions) from the Derived Proposal are consistent with the Strategic Proposal outcomes, as the Derived Proposal has been designed to avoid and minimise emissions.

10.6.5 Residual GHG emissions following the application of the Safeguard Mechanism

For the purposes of this assessment, the indicative Safeguard Mechanism decline rate expected to be applied to the Yandi, Yarnima Power Station and Rail NGER facilities has been used to calculate the residual Scope 1 GHG emissions which are shown in Table 10-20.

With mitigation, the Derived Proposal would result in estimated net Scope 1 GHG emissions up to:

- 759,450 t CO_2-e from the Derived Proposal's Development Envelope (Ministers North mining activities associated with the Yandi NGER Facility)
- 192,771 t CO_2-e from electricity supply to Derived Proposal (Yarnima Power Station NGER Facility)
- 234,500 t CO_2-e from iron ore rail transport supporting the Derived Proposal (Rail NGER Facility)

With mitigation, the lifetime Scope 1 GHG emissions for the Derived Proposal will reduce by:

- 713,866 t CO_2-e from mining activities (approximately 48.5% reduction of GHG emissions over the life of the Derived Proposal)
- 185,617 t CO_2-e from electricity supply activities (approximately 49.1% reduction of GHG emissions over the life of the Derived Proposal)
- 225,858 t CO_2-e from iron ore rail transport activities (approximately 49.1% reduction of GHG emissions over the life of the Derived Proposal)

Table 10-20: Residual Scope 1 GHG emissions using application of Safeguard Mechanism decline rate

Scope 1 emission sources	With Mitigation – estimated net Scope 1 GHG emissions	With Mitigation – estimated lifetime Scope 1 GHG emissions reduction	Percentage (%) reduction in emissions over the life of the Derived Proposal
Derived Proposal (mining, electricity supply & rail)	1,186,721	1,124,341	**48.7%**

BHP has validated that the GHG emissions from the Ministers North Derived Proposal as well as the cumulative GHG emissions other Derived Proposals from the Strategic Proposal are within the incremental GHG emissions previously assessed for the FCDS of the Strategic Proposal. The validation demonstrates that the GHG emissions, GHG emissions intensity and comparison of GHG emissions to state and national GHG emission totals from the Derived Proposal are consistent with the Strategic Proposal outcomes. These validations do not factor the Scope 1 reductions required to comply with the Derived Proposal's Safeguard Mechanism indicative Scope 1 GHG emissions reduction trajectory, which is anticipated to further reduce Scope 1 GHG emissions from the Derived Proposal.

BHP considers that the GHG emission outcomes can be met without an implementation of a GHG Management Plan as emissions are now being reduced under the Safeguard Mechanism. Aligned with recent amendments to the WA Greenhouse Gas Emissions Policy for Major Projects and the EPA's Greenhouse Gas Emissions Environmental Factor Guideline, BHP will manage its GHG emissions through compliance with the Safeguard Mechanism and is not proposing to develop a GHG Management Plan. Table 10-21 summarises the residual environmental impact, outcomes and consistency with MS1105 condition objectives for Greenhouse Gas Emissions.

Table 10-21: Greenhouse Gas emissions residual impacts, environmental outcomes and consistency with MS1105 condition objectives

Derived Proposal residual impact	Derived Proposal environmental outcome	Consistency with Strategic Proposal MS1105 objective
Generation of GHG emissions	• Mining and associated activities (including land use change): Scope 1 – 101,735 t CO_2-e annual emissions (average) for a total of 1,538,460 t CO_2-e over the operational life of the Derived Proposal • Electricity Demand: Scope 1 – 25,226 t CO_2-e annual emissions (average) for a total of 378,388 t CO_2-e over the operational life of the Derived Proposal • Rail transport: Scope 1 – 30,691 t CO_2-e annual GHG emissions (average) for a total of 460,358 t CO_2-e over the operational life of the Derived Proposal • Downstream emissions (including port, iron ore shipping and steel making: Scope 3 – 21,837,456 t CO_2-e annual GHG emissions (average) for a total of 328,020,884 t CO_2-e over the operational life of the Derived Proposal	Condition Objectives: 12-1 (1) avoid, where possible, and minimise greenhouse gas emissions as far as practicable. The Derived Proposal has considered avoidance and minimisation of greenhouse gas emissions where practicable. Design considerations included the position of W5 landbridge to reduce operating hours, haul truck payload uplift reducing the number of trips and fuel consumption, FEL efficiency, the Ministers North fuel farm to complement the existing fuel infrastructure at the Yandi Hub is estimated to improve diesel use efficiency, and haul road gradient optimisation. The Scope 1 emissions from the Derived Proposal are expected to decrease by 110,891 t CO_2-e through the implementation of these proposed avoidance BHP considers that the GHG emission outcomes can be met without an implementation of a GHG Management Plan as emissions are now being reduced under the Safeguard Mechanism. Aligned with recent amendments to the WA Greenhouse Gas Emissions Policy for Major Projects and the EPA's Greenhouse Gas Emissions Environmental Factor Guideline, BHP will manage its GHG emissions through compliance with the Safeguard Mechanism and is not proposing to develop a GHG Management Plan.

10.7 Implementation conditions

BHP considers that the application of conditions 12-2, 12-3 and 12-4 from MS1105 is not required for the factor of Greenhouse Gas Emissions. Outcomes can be assured through the following other statutory decision-making processes, to mitigate the potential impacts of the Derived Proposal on the environment:

- NGER Act and Safeguard Mechanism: to report GHG emissions against annually reducing thresholds, and manage GHG emissions if thresholds are exceeded by reducing net GHG emissions in accordance with the Safeguard Mechanism

11 Social Surroundings Validation

11.1 EPA environmental factor and objective

The EPA (2023a) objective for the Environmental Factor of 'Social Surroundings' is:

> *"To protect social surroundings from significant harm."*

The EPA (2023a) objective for Social Surroundings remains consistent with the objective as considered within the EPA (2018a) assessment of the Strategic Proposal.

11.2 Relevant policy and guidance

BHP has validated this environmental factor considering the policies and guidance outlined in Table 11-1.

Since the EPA (2018a) assessment of the Strategic Proposal, the EPA has revised its guidance to reflect changes in legislation (see additional discussion below).

Table 11-1: Social Surroundings - policy and guidance

Policy or Guidance	Consideration of Policy or Guidance
Environmental Factor Guideline - Social Surroundings (EPA 2023d) *Technical Guidance: Environmental Impact Assessment of Social Surroundings - Aboriginal Cultural Heritage* (EPA 2023f)	• Considered the links with other environmental factors • 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 practicable • Undertaken consultation with the Banjima representatives through BNTAC on the Derived Proposal.

In November 2023, the EPA published updated *Environmental Factor Guideline – Social Surroundings* (EPA 2023d) and supporting *Technical Guidance Environmental Impact Assessment of Social Surroundings – Aboriginal Cultural Heritage* (EPA 2023e). The guidance defines Social Surroundings and considerations for impact assessment. This guidance was updated to reflect the repeal of the ACH Act 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. BHP is committed to ongoing consultation with the Banjima People through BNTAC to fully 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 objective, legislative requirements, the Comprehensive Agreement and Traditional Owner expectations.

11.3 Traditional Owners, engagement and values

11.3.1 Banjima Native Title Determination Area

The Banjima People are the Traditional Owners of the land in which the Development Envelope occurs. The Development Envelope sits wholly within the external boundaries of the Banjima Native Title Determination Area (WCD 2014/001). BHP has an ongoing relationship with the Banjima 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 of heritage and cultural values within the determination area and the management of BHP's activities to minimise impact on cultural heritage and protect cultural heritage values from significant harm.

Representatives from both BHP and the Banjima Traditional Owners meet regularly through the established Heritage Advisory Council (HAC). This forum is an important part of the relationship between BHP and the Banjima Traditional Owners which enables sharing of information, feedback from recent engagements and identification and discussion of concerns and decision making in relation to matters including heritage and environment. BNTAC represents the Banjima Traditional Owners, and BHP maintains an ongoing relationship with BNTAC through regular communication and the pathways prescribed in the Comprehensive Agreement.

11.3.1.1 *Engagement with Banjima Traditional Owners*

BHP first introduced plans to develop the Ministers North Operation, including the open cut mining of iron ore and associated infrastructure requirements, to BNTAC and representatives of the Banjima People at the Banjima Heritage Advisory Council (HAC) in July 2021. Consultation with the Banjima HAC continued throughout 2022 and 2023 and included an on-country ethnographic consultation over the Development Envelope in October 2022.

BHP has consulted with Banjima Traditional Owners in relation to the current Derived Proposal through on country Social Surroundings engagements in May 2024, September 2024 and April 2025. The purpose of the on country engagements was for BHP to better understand the broader social, cultural and heritage values of their lands, to understand and respond to any concerns in relation to the potential impacts of the Derived Proposal, and to work together to identify priorities for avoidance and management.

BHP has prepared a Project Management Plan (PMP) (confidential) in consultation with Banjima Traditional Owners through BNTAC. The Ministers North PMP identifies and sets out the agreed management of Aboriginal Cultural Heritage and Social Surroundings values affected by, or in proximity to, the Ministers North Operation.

The Ministers North PMP documents the outcomes of consultation and was developed by BNTAC and BHP in April 2025, endorsed by the Banjima Heritage Advisory Council in May 2025, and finalised in June 2025. Finalised copies of the Ministers North PMP have been provided to BNTAC, BHP, and the Banjima Heritage Manager.

A summary of engagement undertaken to date is provided in Table 11-2.

Table 11-2: Social Surroundings - record of engagement with Traditional Owners

Date and Location	Description of Engagement	Summary	Banjima Feedback	BHP Response
15th July 2021 – Port Hedland	Banjima HAC	Introduction of Ministers North Mining Proposal. Proposal to co-develop a section 16 application to enable further investigation and research into locations of ACH within the Mining Area and better understand the cultural landscape.	Banjima consultants sought feedback on direction for next steps with proceeding with the section 16 application.	BHP to provide Banjima consultants access to previous heritage reports to assist in the development of the section 16 program.
28th February 2022 – Perth BHP Office	Banjima HAC	Further consultation over the Ministers North Mining Proposal and the plan to co-develop a section 16 application to enable further investigation and research into locations of ACH within the Mining Area, and better understand the cultural landscape	The development of a Section 16 submission for the Ministers North project area is provided to BNTAC in a scope of works so that it is Banjima led. Banjima heritage consultants can develop the Section 16 application.	BHP to provide the scope of works for development of Ministers North Section 16 application to BNTAC
20th April 2022 – Perth BHP office	Banjima HAC	Further consultation over the Ministers North Mining Proposal.	Banjima HAC passed a resolution that Banjima Technical Consultants would draft the Project Plan, including methodology, and BHP would submit the application.	BHP are to develop the supporting material, including the submission of Heritage Information Submission Forms to the DPLH.
20th September 2022	Banjima HAC	Confirmation that section 16 application had been submitted	Confirm scheduling for works.	BHP confirmed fieldwork to support investigations and research would be scheduled for 2023.
21st November 2022	Banjima HAC	Consultation over refined Ministers North Mine Plan design. Confirmation that a Section 16 permit had been granted by the Registrar. Consultation over potential management measures for Khargoonha	Discussions need to be holistic and include rehabilitation discussions, cumulative impact to Banjima country, and opportunities for Banjima People.	BHP to provide Section 16 permit to BNTAC and Banjima Heritage Manager. BHP to further review Ministers North mine plan and identify engineering and mitigation options to reduce cumulative impact.
21st March 2023	Banjima HAC	BHP presented revised Ministers North Mine Plan design. Consultation over potential management measures for Khargoonha.	Banjima HAC members indicated that this would need to be discussed with BNTAC offline and advice would need to be provided at later date.	BHP to seek feedback at future meetings.

Date and Location	Description of Engagement	Summary	Banjima Feedback	BHP Response
22nd to 23rd June 2023 – Perth BHP Office	Banjima HAC	BHP and ACHM provided an overview of the Section 16 excavation progression at Ministers North including carbon dating results. BHP presented revised Ministers North Mine Plan design which included option to adopt progressive backfill. Consultation over potential management measures for Khargoonha, including confirmation that Khargoonha would not be directly impacted by the Ministers North Mine Plan	Banjima HAC members were generally supportive of a progressive backfill solution, however no agreement was reached on a standoff distance. Banjima HAC members confirmed that visual and aesthetic impacts to Khargoonha and the surround landscape need to be considered.	BHP confirms that these carbon dating results and the final report from ACHM with recommendations will be used for development of the ACHMP for Ministers North. BHP confirmation that Khargoonha would not be directly impacted by the Ministers North Mine Plan. BHP to develop visualisation that illustrates mine sequence and progressive backfill at Ministers North.
26th September 2023 – Perth BHP Office	Banjima HAC	BHP presented a summary of heritage work to date around Khargoonha. This included archaeological surveys and an ethnographic consultation. BHP presented visualisation of progressive backfill at Ministers North.	Banjima HAC members indicated that this would need to be discussed further at future meetings.	BHP to seek feedback at future meetings.
20th to 24th May 2024 – Ministers North	On Country ethnobotanical survey at Ministers North	Engagement which also included a site visit to the Yandi nursery for rehabilitation overview. The ethnoecologists approach to the brief and methods with Banjima women were to document cultural species, record stories and narratives related to specific plants, stimulate interest in cultural plants and opportunity to learn more, introduce processes to record, identify and document cultural plants, affirm individuals to feel good or better about themselves, connect and strengthen relations between participants.	Banjima provided a number of recommendations to BHP, including but not limited to maintain and expand attention to cultural plants and animals, recognise that there are many cultural plant species with use values within the Ministers North and adjacent areas, and resolve labelling of plants and seeds with Banjima name/s.	BHP to continue to work with Banjima in relation to cultural plant inventories at the nursery. BHP will develop Banjima language posters and awareness on site in relation to heritage places, and flora and fauna

Date and Location	Description of Engagement	Summary	Banjima Feedback	BHP Response
21st to 23rd May 2024 – CPHSW Stage 1 and Ministers North	On Country social surroundings consultation occurred with Banjima.	Focus was on CPHSW Stage 1 (which will provide water to Ministers North) however a brief visit to the Ministers North area and project introduction was provided. BHP showed the Banjima representatives the locations of the northern and southern pits as well as the central OSA.	Noting Ministers North was only briefly introduced, Banjima requested a number of items be presented at the next Ministers North social surroundings consultation including but not limited to, the Surface Water Impact Assessment for Ministers North, potential impacts as a result of lost surface water flow to Yandicoogina Gorge, OSA height of Ministers North and proposed closure outcomes for the OSA, proposed pit depths and proposed closure outcomes for the pits, sediment management, provide heritage survey coverage and ensure mine footprint avoids heritage sites and closure objectives.	BHP to schedule future Social Surroundings engagement and prepare pre-read material encompassing more detailed information on the Proposal including impacts to surface water.
5th September 2024 – Perth BHP office	Banjima HAC	Consultation over mine plan and management measures for ACH identified as Harmed by the Mine Plan. BHP representatives provided an overview of factors considered when designing the Ministers North project to reduce impacts to environmental values, including but not limited to not pursuing mining pits to the east of the MAC-Yandi railway. BHP representatives sought to further discuss the stand-off zone that Banjima had previously requested be implemented around ethnographic site Khargoonha.	Banjima representatives confirmed that water management is of great importance to them. Banjima consultants sought further information on the proposed Ministers North waste management, rehabilitation and closure strategies. Banjima representatives and Banjima consultants informed BHP that the Khargoonga stand-off zone it should now be referred to the Agreement Modernisation (Amod) Process.	BHP representatives confirmed that there will be no pit lakes at closure as all Ministers North mining will be above water table. All parties agreed that closure including management of ex-pit waste storage, would be a good topic to discuss on ground during the Social Surroundings engagements.
23rd to 27th September 2024 – Ministers North and Yandi	On Country social surroundings consultation occurred with Banjima.	The Ministers North Proposal overview was presented, and a site visit was undertaken to view the Ministers North area from the communications tower south of the south pit. In addition, the Yandi nursery and spinifex trial plot was visited, along with aspects	Banima raised several concerns and clarification was requested on a number of items including but not limited to all elements of the Proposal that will interfere with water, such as locations and design specifications of land bridges, creek crossings; the location of the current haul road. Banjima did not support this option. It was recommended that	BHP to investigate feasibility of additional routes and will hold a technical workshop with Banjima consultants to discuss these further.

Date and Location	Description of Engagement	Summary	Banjima Feedback	BHP Response
		relating to Yandi operations (e.g. Marillana Creek diversion).	BHP should investigate a haul route option that roughly follows the already disturbed BHP MAC rail corridor north to BHP's E7 (and proposed E8) pit at Yandi.	
18th October 2024 – Perth BHP Office	Technical Workshop held with Banjima consultants to discuss haul road alternatives.	BHP shared the key variance and considerations for each alternative alignment and the influences of the preferred alignment (central Haul Rd route 1). Eastern haul route alignments are not palatable to BHP due to additional engineering complexities, material cost, safety and GHG implications (from increased haulage route and truck numbers).	Banjima advisors acknowledged the engineering, complexity, cycle time and costs issues associated with Eastern Alignments, however reinforced position the Eastern Alignments have a significantly lesser impact on country and the information presented by BHP does not change that position.	BHP to further investigate feasibility of additional routes.
30th October 2024	Banjima Closure Principles Workshop #1	BNTAC provided a presentation on preliminary Banjima closure objectives, principles and outcomes. BHP provided a presentation on BHP's approach to closure planning and post mining land use principles.	Key aspects included but were not limited to ideas for collaborative engagement on closure including quantification and communication of risks and liabilities, consideration of cumulative impacts and opportunities within the Banjima Native Title Determination area including prioritisation of repurposing of existing disturbed land for future development rather than disturbance of new land, communication of long-term planning for mining operations, maintaining surface water quality and no saline pit lakes, post-closure access and management of cultural materials and sites, ex-pit storage of overburden, management of waste and contaminated sites and return of environmental diversity, Mandu (bush meats) and medicine and bush tucker plants.	BHP committed to sharing the Life of Asset plan with Banjima and BNTAC in future engagements.
31st October-1st November 2024 – Perth BHP Office	Banjima HAC	Ministers North haul road alignment options and modifications made to the mine plan following the September Social Surroundings Consultation were presented.	The Banjima representatives and Banjima Technical Advisors confirmed that their preference was for the Ministers North haul road	BHP representatives confirmed that they understood that Banjima's preference is for the Ministers North haul road to be located within pre-existing disturbance and/or

Date and Location	Description of Engagement	Summary	Banjima Feedback	BHP Response
			to be designed within pre-existing disturbance and/or 'compromised landscapes'. Banjima recommended BHP investigate an additional route which largely follows existing disturbance along the Rio rail line.	'compromised landscapes' and that they would conduct further analysis on the newly identified option along Rio Tinto's rail line.
20th November 2024	Banjima Closure Principles Workshop #2	Second engagement with Banjima representatives, BNTAC and their consultants on closure principles and outcomes. This was a follow up meeting to the workshop on 20th October and included: sharing BHPs Life of Asset plan across Banjima country and a discussion on timing of the developments and how the mines will be developed, discussion on the ongoing routines to talk through closure principles, initial discussions on post mining land uses preferred by the Banjima people.	Key points raised which are relevant to the closure of Ministers North included but were not limited to: • BNTAC consultants presented their ideas for potential post-mining land uses associated with water and power. • The Banjima people expressed a strong view on the need for the restoration of natural and cultural values post mining, but did not express a strong position on other post mining land use outcomes. • Transition land uses should be targeted and support restoration towards post mining land use. These land uses could include recycling opportunities (tyres, belts scrap), and rehabilitation project work to support closure outcomes.	There was general agreement that the next engagement should be on site to review rehabilitation and discuss closure landforms.
29th January 2025 – Perth BHP Office	Technical Workshop held with Banjima consultants to discuss haul road alternatives	BHP presented a number of alternative routes including potential alignment in proximity to the Rio rail, along with overall Indicative Footprint and consideration of Khargoonha.	Banjima consultants acknowledged that the presented alternative alignments achieved avoidance of heritage sites and other environmental values. However, neither option presented addressed the initial feedback from Banjima in avoiding impact to the valley as a whole. Greater consideration for overall assessment including closure outcomes should be provided	BHP acknowledges there is currently not alignment on the proposed haul route. BHP will continue discussions with Banjima in relation to the proposed haul road. BHP will develop closure waste management solution (integration with Yandi mine pit lakes resolution) to put forward to Banjima at a future HAC meeting.

Date and Location	Description of Engagement	Summary	Banjima Feedback	BHP Response
			(including potential to utilise waste from Ministers North for backfilling at Yandi mine).	
18th March 2025 – Perth BHP Office	Agreement Modernisation (Amod) Meeting	Negotiation leading to in principle alignment on the development of a Ministers North Project Management Plan (PMP) (confidential).	In principle agreement reached on BHP's preferred Ministers North Haul Road alignment (Road 1) and 100 metre stand-off zone around Khargoonha.	-
7th to 9th April 2025 – On country	On Country social surroundings consultation occurred with Banjima.	An on-country Social Surroundings engagement at Ministers North was held with representatives of the Banjima People and BHP. Priority topics discussed included updates and refinements to the mine plan from earlier engagements (e.g. removal of Western OSA), updates on the consideration of multiple haul road alignments, consideration of Khargoonha standoff distance, updates on water management and closure outcomes.	Pending report	Pending report
5th to 6th May 2025 – Perth BHP Office	Banjima HAC	Ministers North PMP presented for Banjima HAC review and feedback following review by BNTAC and their Technical Consultants.	Banjima representatives and advisors raised a number of queries and suggestions regarding the Yandicoogina Gorge water monitoring TARP; the use of ANFO products used by drill and blast; opportunities for Banjima involvement in monitoring to build capacity; the closure management plan; and BHP's long-term commitment to not pursuing below water table mining at Ministers North.	BHP representatives confirmed that the PMP would be updated to include the feedback and suggestions and advised that the final Yandicoogina TARP and Ministers North closure plan will be included in the Ministers North Derived Proposal Request (ERD).
7th May 2025– Perth BHP Office	Technical Workshop	Technical review of haul road engineering design and opportunity assessment to identify whether simplification of the road alignment is possible.	No further opportunities for optimisation were identified.	Acknowledged no further opportunities to optimise design and will proceed on current design basis.

Date and Location	Description of Engagement	Summary	Banjima Feedback	BHP Response
26 May 2025 – Perth BHP Office	Banjima HAC	Final review of the Ministers North PMP.	Ministers North PMP endorsed by the Banjima Heritage Advisory Council via formal resolution.	Finalised copies of the Ministers North PMP to be provided to BNTAC, BHP, and the Banjima Heritage Manager.
4th August to 3rd September 2025	Draft ERD review and meeting to discuss feedback	Draft Ministers North Derived Proposal Environmental Review Documentation (ERD) provided to BNTAC for review and comment on the 4th August 2025. Comments were provided by BNTAC on 29th August 2025 and 3rd September 2025. The review was followed up with a meeting on 3rd September to provide initial feedback on the comments.	BNTAC comments related to the project scope, air quality (dust), water (sedimentation and erosion, separation distance between pit floor and groundwater table, and catchment reductions), fauna management (cave management buffers and vibration limits, lighting and vehicles), offsets (Pilbara Environmental Offsets Fund and lack of offsets on Banjima country) and closure (engagement with the Banjima People and general nature of the Mine Closure Plan).	A number of the points of feedback were addressed through clarifications. BHP has considered the comments from BNTAC and amended the ERD and EMPs, where relevant. Key amendments included additional detail and clarifying statements on concerns raised during Social Surroundings engagements, clarification on minimising impacts to surface water and groundwater (i.e. effectiveness of haul road drainage infrastructure and controls to be reviewed annually, review the use of alternative blasting products) and clearer management outcomes for fauna. BHP will provide BNTAC with written response to each comment and continue to engage through regular routines including but not limited to the Implementation Committee and/or Heritage or Environment sub-committee meetings (HAC), where relevant.

11.3.2 Surveys, values and interests

11.3.2.1 *Surveys*

BHP has undertaken numerous archaeological and ethnographic surveys over the Development Envelope, spanning multiple years from 1982 to 2025. The studies discussed below are confidential and so have not been appended to this ERD and the full citations are not provided in the reference list. These surveys have consisted of baseline surveys for exploration, as well as broader-area baseline surveys across tenure. These surveys were undertaken by a combination of Banjima Traditional Owners, BNTAC representatives, archaeological consultants and BHP.

Ethnographical and archaeological surveys have been undertaken across much of the proposed Development Envelope, including comprehensive surveys of all of the Indicative Footprint. These are summarised below:

- Early ethnographic survey conducted over the Ministers North project area 1982, 1999, and 2000
- Baseline (site avoidance) archaeological surveys were conducted over the Ministers North project area between 2011 and 2024
- Boundary for Khargoonha (Gaguna) provided to BHP through the Banjima Comprehensive Agreement process
- Detailed recording of heritage sites within the Ministers North mining area was completed in 2016
- In 2022 an ethnographic survey was completed by Banjima and their consultants over the Ministers North mining area (defined by the section 16 permit boundary)
- In 2022 a joint Ministers North Section 16 project plan was developed by BNTAC, Banjima's consultants, and BHP, a section 16 application was submitted, and permit received
- In 2023 test pit excavations were completed at thirteen (13) rockshelters identified located within the proposed Ministers North mining area
- In 2024 and 2025 an ethnographic survey was undertaken by Banjima and their consultants over the Ministers North Infrastructure Corridor.

A number of places within the Development Envelope were assessed by independent archaeologists and Banjima Traditional Owners. BHP has identified a number of potential heritage sites within the Indicative Footprint, including ethnographic sites, rock art sites, stone arrangements, scarred trees and rock shelters.

East of the proposed Development Envelope, BHP has mapped multiple pools identified as permanent and semi-permanent, all along Yandicoogina Creek (Yandicoogina Gorge). There will be no direct impacts to Yandicoogina Creek or its pools as a result of the Derived Proposal. Two painted art sites have been identified under overhangs within the Yandicoogina Creek area. The sites are outside the Indicative Footprint and will not be directly impacted through clearing. As discussed under Section 9 Air Quality, modelling has been undertaken to predict potential impacts on the Yandicoogina Gorge (and in turn the rock art sites) from dust deposition (ETA 2024).

In addition to the above ethnographical and archaeological surveys, an on-Country ethnobotanical survey was undertaken at Ministers North in 2024, which also included a site visit to the Yandi nursery for rehabilitation overview. The ethnoecologists approach to the brief and methods with Banjima women were to document cultural species, record stories and narratives related to specific plants, stimulate interest in cultural plants and opportunity to learn more, introduce processes to record, identify and document cultural plants, affirm individuals to feel good or better about themselves, connect and strengthen relations between participants.

11.3.2.2 *Social Environmental Values*

Water

To the Banjima People, “Water is life. Without water, the land dies. If the land dies, then there is nothing” (ACHM 2024a, 2024b). Not only is water the life blood of the land, but it is also the essential life force of the Banjima People themselves (Pers comms. Banjima person, 15 June 2023 at Marillana Creek, as cited in ACHM 2024a).

Consequently, the Fortescue River and all of its tributaries are of central importance to the Banjima People (ACHM 2024a). The significance of these waterways mostly lies in them being the pathway of the *warlu* (the water serpent creation ancestor). All underground, surface and ephemeral waterways are equally important to the free movement of the *warlu* through country. Anything that impedes the progress of the *warlu* through country is dangerous to the country and the Banjima People (ACHM 2024a).

For Banjima People, there are three different kinds of water that make their way into the Fortescue River from across Banjima country - salty water, red water from claypans and fresh water.

The Banjima People have a very keen sense of their cultural responsibility to maintain the Fortescue River system including its tributaries, so that the *warlu* can move freely throughout country, thereby ensuring lore and culture are maintained. They also have a responsibility to neighbouring groups, to ensure that no impacts are suffered in the area of the marsh and associated waterways that could have subsequent detrimental impacts on neighbouring groups downstream.

Khargoonha

The cultural heritage area named 'Khargoonha' occurs in proximity to the Derived Proposal (100 m south-west). Khargoonha is an elevated and isolated ridge landform adjoining the western side of the mining area for the Derived Proposal, measuring approximately 12 km in length (east to west) and 4 km in width (north to south), with a topographic elevation ranging from approximately 750 mAHD to 1080 mAHD (peak) rising above the surrounding plains (generally 600 mAHD to 650 mAHD). The Khargoonha landform is generally consistent with the numerous other elevated ridge landforms of the broader Hamersley Ranges (which extends over 250 km in length (east to west) and with a peak elevation of approximately 1,200 mAHD).

Khargoonha has been identified by the Banjima People to be of cultural heritage significance. Khargoonha is a mythological and ceremonial ethnographic site previously known to BHP as Gaguna (DPLH 30213). The location was first identified by BNTAC and made available to BHP during the development of the Banjima and BHP Comprehensive Agreement (2015) as a Heritage Rights Reserved Area. The boundary was later reaffirmed in 2022 by the Banjima People through an ethnographic Aboriginal heritage survey (ACHM 2022).

Animals

Desktop mapping indicates that the following species occur, or are likely to occur, within the Development Envelope surrounds:

- Euro (*Macropus robustus*)
- Goanna (*Varanus spp*.)
- Emu (*Dromaius novaehollandiae*)
- Bush turkey or Australian bustard (*Ardeotis australis*)
- Western pebble-mound mouse (*Pseudomys chapmani*)
- Pilbara Olive Python *(Liasis olivaceus barroni)*

Of note, the Western Pebble-mound Mouse and Pilbara Olive Python are also conservation significant fauna, discussed in greater detail in Section 7.

The Western Pebble-mound Mouse is known locally and is of interest to the Banjima People (raised through discussions at Social Surroundings engagements for Ministers North). Surveys undertaken by BHP within the Pilbara area suggest over 3,500 records for Western Pebble-mound Mouse are known from the Pilbara region. Biological surveys within the area have identified the Western Pebble-mound Mouse to be locally common. Within the Development Envelope, Western Pebble-mound Mouse was most abundant within the Hillcrest / Hillslope fauna habitat type.

The Pilbara Olive Python is also known locally and of interest to the Banjima People (raised through engagements and feedback). Despite being known locally, no Pilbara Olive Python records coincide with the Development Envelope despite extensive survey effort. However, records do occur in close proximity. For example, Astron (2025) recorded a single scat of Pilbara Olive Python within Gorge / Gully habitat associated with the Yandicoogina Creek south of the Derived Proposal (adjacent to the proposed fleet access track).

Ethnobotanical values

An ethnobotanical survey at Ministers North occurred from 20 May to 24 May 2024 to identify plant species of cultural significance across Ministers North (Walsh, 2024). At least 126 cultural or heritage plant species have been found (26 recorded in the May survey) or are likely to occur in the Ministers North area and vicinity (see Table 11-3). These species provide value for a range of purposes, including but not limited to, medicine for colds and toothaches, food, seed, fibre, tanning and dye, and timbers for tools.

Table 11-3: Banjima cultural plant inventory

Banjima Name	Common English name (scientific name)	Use
Pilarri	Nil (*Acacia adsurgens*)	Food: edible grubs
Yiringan	Salt Wattle (*Acacia ampliceps*)	Medicine: for cuts, sores, chicken pox, for sore eyes
-	Fish book wattle (*Acacia ancistrocarpa*)	Food: seeds
Wintamarra, Wirndamarra	Mulga (*Acacia aneura*)	Food: edible gall. Tools: timber for spear types, spear thrower, digging sticks. Shelter: bough shed.
-	- (*Acacia aneura var. intermedia*)	Food: seeds, gum
Wirndamarra	Weeping mulga (*Acacia aptaneura*)	Tools
Kunalya	Arid Wattle (*Acacia arida*)	Medicine: for sore eyes
Dam-bar-lee, Murruru	Two Nerved Wattle (*Acacia bivenosa*)	Food: grubs
Jarparri, Jarrawayi	Black mulga, River Jam, Pilbara Jam (*Acacia citrinoviridis*)	Food: edible grubs; shade; mattress
-	- (*Acacia colei*)	Food: seeds
Warntayin	Weeping wirewood, Dogwood (*Acacia coriacea subsp. pendens*)	Shade; tobacco ashes; insect repellant
-	- (*Acacia coweleana)*	Food: seeds
-	- (*Acacia dictyophleba*)	Food: fruit
Jartinpa	Mimosa bush, spiky wattle (*Acacia farnesiana*)	Medicine: warts
Boo-na-roo tree, Boo-nung-goo, Barlgarringu	Hamersley Bloodwood, Pilbara Bloodwood (*Acacia hamersleyensis*)	Food: gall, lerp. Honey; Medicine.
-	Flying saucer bush (*Acacia hilliana*)	Food: edible grubs
Partirri (LY), Garrany, Ba-deri, Bod-e-rae, Bard-deedee, Ngardgarlah LB)	Kanji, Camel Bush, Fire Wattle (*Acacia inaequilatera*)	Food: seeds green raw or cooked. Medicine: cooling the body; fly repellant, burnt bark paint. Other: nickname
Pulurru, Yalari	Gidgee (*Acacia pruinocarpa*)	Food: gum; tobacco ashes
Ganyji, Kanji	Ranji, Ranji Bush, Fire Wattle (*Acacia pyrifolia*)	Food: edible gum, edible seeds.
Mantaru	Minnie Ritchie (*Acacia rhodophloia*)	Tools: spears, digging sticks, dancing sticks. Fly repellant.

Banjima Name	Common English name (scientific name)	Use
Pakurta	Rattle tree, Limestone wattle (*Acacia sclerosperma*)	For tanning and dye.
Pirrkala	Desert dogwood (*Acacia sericophylla*)	Food: seeds. Tools.
Nburungan	- (*Acacia synchronicia*)	Food: edible grubs
-	- (*Acacia tenuissima*)	Food: seeds; Medicine
Kurarra	Dead finish (*Acacia tetragonophylla*)	Food: seeds
Parrkalyi	Sweet scented minni Ritchie (*Acacia trachycarpa*)	Food
Mugarli, Jun-Gin, Junjin	Pilbara Pindan Wattle, spear wattle (*Acacia tumida var. pilbarensis*)	Tools, artefacts: dancing sticks.
-	- (*Acacia tumida var. tumida*)	Food: seeds
Murruturru	Wanyu or Silver leaf mulga (*Acacia wanyu*)	Shelter. Seeds not eaten by people.
Pukarti, Marruwa	Snakewood, Marrawa (*Acacia xiphopylla*)	Food: edible grubs; edible gum. Tools: timber for fighting & singing boomerang. Firewood. Tobacco ashes
-	Mistletoe (*Amyema gibberula var. gibberula*)	Food: fruit
-	Mistletoe (*Amyema sanguinea var. pulcher*)	Food: fruit
-	Mistletoe (*Amyema sanguinea var. sanguinea*)	Food: fruit
-	Whitewood (*Atalaya hemiglauca*)	Fire
-	Tarvine (*Boerhavia coccinea*)	Hunting net
Ngangu	Kurrajong (*Brachychiton acuminatus*)	Water: roots hold water.
-	Sedge (*Bulbostylis barbata*)	Food: seeds
Kukatarri	Parakeelya (*Calandrinia sp.*)	Food: roots
-	- (*Callitris columellaris*)	Medicine; Tools; Firewood
Jilpukarri (LY), Gudja-wari, Jirrwirliny	Split jack, Nipan, Native Orange, Wild passionfruit (LY) (*Capparis lasiantha*)	Food: fruit. Medicine: for stomach complaints
Pajila (LY), Bajirla	Coastal Caper, Caper Bush, Wild Passionfruit (*Capparis spinosa subsp. nummularia*)	Food: fruit
Kajawarri	Wild Orange (*Capparis umbonata*)	Food: fruit
Kunti	Tickweed (*Cleome viscosa*)	Food: edible seeds

Banjima Name	Common English name (scientific name)	Use
-	Smooth Clerodendrum (*Clerodendrum floribundum var. angustifolium*)	Food: roots
-	Desert poplar (*Codonocarpus cotinifolius*)	Medicine: roots
Malykampa	Rough leaved ghost gum (*Corymbia aspera*)	Food
Punaangu, Boo-na-roo tree	Bloodwood (*Corymbia hamersleyana*)	Food: sugar bag; bush coconut (bush apple). Medicine: for cuts, sores, stomach complaints, heart complaints, sore ears. Shade
Thurlayilku	Snake Vine (*Cucumis argenteus* (*Mukia maderaspatana*))	Medicine: for sore eyes. Emu food
Jibburra, Ngabunthurr	Ulcardo Melon, Rock Melon *(Cucumis melo*)	Food, fruit. Hunting: turkey lure and trap
Marrayin	Scent Grass, Lemon Grass (*Cymbopogon ambiguus*)	Medicine: for colds, toothache wash
-	Native Pear (*Cynanchum floribundum*)	-
Ngarlgu	Wild Onion (*Cyperus bulbosus*)	Food: tuber
-	- (*Cyperus ixiocarpus*)	Food: seeds
Yaliri, Kanampa	Stiff leaf sedge (*Cyperus vaginatus*)	Tools: rope, string
Pirungu	Native hops (*Dodonaea pachyneura*)	Medicine: for colds, for cuts, sores, for the skin, fragrance.
-	Kalpari (*Dysphania kalpari*)	Food: seeds
-	Rats tail (*Dysphania rhadinostachya subsp. rhadinostachya*)	Food: seeds
Nyirlyi, Nyinarri	Ruby Saltbush, Barrier Saltbush (*Enchylaena tomentosa var. tomentosa*)	Food: fruit. Medicine: for stomach complaints
Miyiru	Mallee love grass (*Eragrostis dielsii*)	Other
Nhirti	Emu bush (*Eremophila cuneifolia*)	Medicine: for colds, for sore muscles, swelling, soap.
Jilan (LY), Jummy	Burra, Jilarnu (*Eremophila fraseri subsp. fraseri*)	Medicine: for cuts, sores, skin; insect repellent.
-	Emu bush (*Eremophila latrobei subsp. filiformis*)	Food: nectar
-	Emu bush (*Eremophila latrobei subsp. glabra*)	Food: nectar
-	Emu bush (*Eremophila latrobei subsp. latrobei*)	Food: nectar
Berrigan	Emu bush (*Eremophila longifolia*)	Medicine: smoke; Law: ash, smoke

Banjima Name	Common English name (scientific name)	Use
Marralba (LY), Wiranggura	Blunt-budded River Red Gum (*Eucalyptus camaldulensis subsp. obtusa*)	Food: grubs, edible gum. Medicine, leaves for sores.
Marralha	River red gum (*Eucalyptus camaldulensis subsp. refulgens*)	-
Kartapirangu (LY),Blackart, Gurrabi-unn, Malygan	Snappy Gum, Migum (*Eucalyptus leucophloia subsp. leucophloia*)	Food: lerp, sugar bag, honey. Medicine leaves; Tools, timber
Wirlu	Smooth-barked coolabah (*Eucalyptus victrix*)	Food: edible grubs, beehive. Medicine: for cuts, sores. Timber: bowl. Tobacco ashes
Yarun	Pilbara Box, Desert coolabah (*Eucalyptus xerothermica*)	Food: beehive. Careful of biting ants.
Winyarrangu, Wingga	Rock Fig, Desert Fig (*Ficus brachypoda*)	Food: fruit
Weenyarr	White fig, Albayi (*Ficus virens*)	Food: fruit
-	- (*Fimbristylis dichotoma*)	Food: seeds
-	Pink ball (*Gomphrena canescens*)	-
Wathawa	Wild cotton (*Gossypium robinsonii*)	Tools: dancing sticks. Fly repellant
-	Caustic bush (*Grevillea pyramidalis subsp. leucadendron*)	Food: nectar
Wiralu	Beefwood (*Grevillea striata*)	Tool: timber for shield. Marked trees.
-	- (*Hakea chordophylla)*	Food: nectar
Kartanpa, Garrayin	Corkwood tree (*Hakea lorea subsp. lorea*)	Food: edible nectar. Medicine: burnt bark, cooling body
Wira	- (*Hibiscus panderiformis*)	Fire: firestick
Jitha, Jidda, Gulyu	Bush potato, poison morning glory (*Ipomoea muelleri* (or *I. costata*))	Food: tuber
-	- (*Lepidium pedicellosum*)	Food: leaves
Yajerri	Native mustard (*Lepidium platypetalum*)	Medicine: for cuts, sores, for sore muscles, swelling, for cancer
Thulamarta	Saltbush (*Maireana leuhmannii*)	Other
Cuggla-leara	Bush Banana, Silky Pear, Green Vine, Karlkurla (*Marsdenia australis*)	Food: fruit
Mirli (LY), Thalgu, Tharlgu	Silver cadjeput, Silver-leaved Paperbark (*Melaleuca argentea*)	Water: holding water. Shelter: bark: ground sheet; Attire: shoes; Fire

Banjima Name	Common English name (scientific name)	Use
Mirli	Black tea-tree, river tea-tree, Mock olive (*Melaleuca bracteata*)	Tools: broom
Gurlibirn	Desert honey-myrtle, inland paperbark, white tea-tree (*Melaleuca glomerata*)	Tools: broom
Nharkarnun, Nharkarangu	- (*Melaleuca lasiandra*)	Utensils: tablecloth, broom. Mattress
Native tobacco	- (*Nicotiana benthamiana*)	Tobacco: leaves
Native tobacco	Native tobacco (*Nicotiana herantha*)	Tobacco
Native tobacco	- (*Nicotiana occidentalis subsp. obliqua*)	Tobacco: leaves
Mirntunji	Butterfly bush (*Petalostylis labicheoides* (*P. cassioides*))	Food: sugar.Tool: stems for practice spears
Kurnmi	Black powder puff toadstool (*Podaxis pistillaris*)	Ceremony. Other.
Patharra	Native Plum (*Psydrax latifolia*)	Food: fruit
Wanalja (LY)	Wild currant (*Psydrax suaveolens*)	Food: fruit
-	- (*Pterocaulon serrulatum*)	Medicine
Murlumurlu	Mulla mulla (*Ptilotus exaltus*)	Pillow stuffing
-	Mulla mulla purple (*Ptilotus nobilis subsp. nobilis*)	-
Djidda, Djitha, Marla	Bush carrot, Sweet Potato (*Rhynchosia minima*)	Food: tuber
-	Roly poly, Tumbleweed (*Salsola australis*)	Food: edible grubs
Gurrungali	Samolous (*Samolous sp*)	Other
Burdardu, Ngilunpa (LY)	Northern Sandalwood, Bush Plum (*Santalum lanceolatum*)	Food: fruit, seeds. Medicine
Putatu, Burdardu	Sandalwood (*Santalum spicatum*)	Medicine: kernal for cuts, sores, hair growth
Pipiju	Caustic bush (*Sarcostemma viminale* (now *Cynanchum*))	Medicine: for cuts, sores, breast milk stimulation.
-	Senna (*Senna artemisioides subsp. helmsii*)	Indicator: flowers for Emu egg time
-	Showy Senna, Cockroach Bush, Cockroach Cassia, Beetle Bush (*Senna notabilis*)	Food: edible grubs. Emu food
Pitankara	Swamp corkwood, White dragon tree (*Sesbania formosa*)	Tool: timber for bowl, shield
Thapulji	Life saver burr (*Sida platycalyx*)	Food: other

Banjima Name	Common English name (scientific name)	Use
-	- (*Solanum cleistogamum*)	Food: fruit
Jalhparrpa	Bush tomato (*Solanum diversiflorum*)	Food: fruit
Kulkaturra	Flannel bush (*Solanum lasiophyllum*)	Not food for people. Food for kangaroo
Minjawarri (LY), Minjarri (LY), Jami, Jummy Bush	Vicks Bush, Marsh Stemodia (*Stemodia grossa*)	Medicine: for colds, leaves for sores. Insect repellent. Snake venom for goanna
-	Mintbush (*Streptoglossa decurrens*)	Medicine
-	Nut bush (*Stylobasium spathulatum*)	Food: kernel
-	Desert pea (*Swaisonia formosa*)	Food: edible nectar
Thurlayiku	Snake vine (*Tinospora smilacina*)	Medicine: headache, broken bones; Fibre: carrying
Kujiwangkalarra	Laceflower (*Trachymene oleracea subsp. oleracea*)	Water: straw
Kartajiparra, Gawiwarnda	Cork hopbush, Fish Poison, Corky Bark Caltrop (*Tribulus suberosus*)	Medicine: for cuts, sores. Fish stun
Minha, Mina	Soft spinifex, sticky spinifex (*Triodia pungens*)	Tool: stem, resin adhesive. Mattress. Shelter: plants. Other: child placenta
Paru	Hill spinifex (*Triodia sp.*)	Food: seeds; fishing: net
Puwarji (LY), Marduwari	Bulrush (*Typha domingensis*)	Food: roots. Pillow: seed fluff
-	Pencil Yam (*Vigna lanceolata var. lanceolata*)	Food: roots
-	Bush bean (*Vincetoxicum lineare*)	Food: fruit

Adapted from Walsh 2024

11.3.3 Pastoral stations and other land users

A small portion of the Derived Proposal intersects with the Marillana Pastoral Station (sub-leased to Karlka Nyiyaparli Aboriginal Corporation (KNAC)). BHP has engaged with KNAC in relation to aspects of the Derived Proposal, specifically:

- KNAC providing consent to enable the grant of a s.91 licence for the haul road
- Notified of BHP's L47/1169 tenement application in September 2024
- Notified of BHP's L47/1228 application.

11.4 Potential impacts

In the PERSP (BHP 2016a), BHP identified and described potential impacts from the Strategic Proposal on Aboriginal heritage. Table 11-4 identifies whether the Strategic Proposal potential impacts are relevant to the Ministers North Derived Proposal.

Table 11-4: Social Surroundings – relevant impacts identified in the Strategic Proposal

Strategic Proposal potential impact	Strategic Proposal impact relevant to the Proposal	Potential impacts from the Ministers North Proposal
Activities or processes impacting heritage values (direct)	Yes	Mining operations may directly impact heritage values through physical presence, which may involve clearing vegetation, direct alteration of waterways or impact to landscape.
Activities or processes impacting heritage values (indirect)	Yes	Mining operations may indirectly impact heritage values through alteration of the landscape, changes to water values, indirect impacts to vegetation and fauna, and particulate air (dust) emissions.

In consideration of the EPA (2023d) document *Environmental Factor Guideline - Social Surroundings*, BHP considers the potential impacts requiring detailed assessment for the Derived Proposal to be:

- Activities or processes impacting heritage values - direct and indirect

Potential direct impacts to social surroundings values by mining operations may include disturbance of cultural heritage sites and values, and changes to land access, landscape and amenity. Potential indirect impacts to social surroundings values by mining operations may include degradation of cultural heritage through dust deposition. Key concerns raised during Social Surroundings engagements included impacts relating to:

- Permanent alteration of landscapes
- Changes to catchments, surface water regimes and risks to water quality
- Loss of access to country
- Loss of visual and general amenity (including dust)
- Permanent alteration to and loss of tangible and intangible cultural heritage values
- Potential impacts to Khargoonha and Yandicoogina Gorge
- Mine closure, including mine pit depths and rehabilitation.

Detailed assessment of the potential for the Derived Proposal to result in a significant impact to social surroundings values is provided below.

11.4.1 Activities or processes impacting social, cultural, heritage values (direct)

Implementation of the Derived Proposal will include an Indicative Footprint of up to 2,360.2 ha including clearing of up to 1,848 ha of native vegetation for the installation of infrastructure (including creek crossings), excavation of mine pits and establishment of an OSA and stockpiles. This has the potential to directly disturb Aboriginal cultural heritage and social surroundings values located within the Development Envelope.

Banjima and BHP have identified a number of locations of Aboriginal Cultural Heritage within the Development Envelope and have collaborated and agreed upon mitigation management measures. Aboriginal Cultural Heritage will be managed in accordance with the AH Act.

A PMP (confidential) has been prepared in consultation with the Banjima Traditional Owners to address the management of the impacted sites.

Clearing for the Derived Proposal may result in the removal of some habitat which supports native fauna of cultural value as identified in Section 11.3.2.2. Impacts and mitigation to terrestrial fauna are discussed in more detail in Section 7.

Clearing for the Derived Proposal will result in the removal of some bush tucker and bush medicine plants. At least 126 cultural or heritage plant species have been found (26 recorded in the May survey) or are likely to occur in the Ministers North area and vicinity as identified in Section 11.3.2.2. Impacts and mitigation to flora and vegetation more broadly are discussed in more detail in Section 6.

The Derived Proposal will not directly impact any known permanent pools. BHP has modified the Indicative Footprint to avoid direct impacts to several temporary waterholes in proximity to Ghost Bat caves (within the Ghost Bat MEZ), as well as modifying the Development Envelope to avoid any direct impacts to Yandicoogina Gorge. Further discussion on impacts (and proposed mitigation) for waterways are discussed in detail in Section 5.

11.4.2 Activities or processes impacting social, cultural, heritage values (indirect)

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

11.4.2.1 *Access and amenity*

Implementation of the Derived Proposal may alter Banjima 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. To ensure the safety and wellbeing of Traditional Owners when accessing areas in proximity to active mining and infrastructure, agreed access procedures have been established and such agreed measures include BHP escorts accompanying Banjima Traditional Owners while on site. This has the potential to alter the timing or frequency of access and/or alter the experience when on country.

Aboriginal cultural heritage values extend beyond discrete identified Aboriginal cultural 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, establishment of stockpiles, an OSA 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 Derived Proposal where practicable, however, permanent alteration of the landscape will occur because of the

Derived Proposal as a result of mine pits and the OSA[58]. Despite pit voids remaining, as the Derived Proposal is AWT only, no pit lakes will occur as part of the Derived Proposal.

11.4.2.2 *Water*

The excavation of mine pits and the construction of infrastructure (including borrow pits) have the potential to change surface water regimes by altering natural surface flows and reducing the availability of surface water downstream. A key impact attributable to the Derived Proposal is the loss of catchment areas draining to downstream receptors (discussed in further detail in Section 5).

A key concern raised by Banjima during consultation was the potential indirect impact to waterways in the form of water quality. Specifically concerns around sediment control for catchments draining to Yandicoogina Gorge and the risk related to nitrogen levels (e.g. related to risk of ANFO from blasting). This is also discussed in greater detail in Section 5.

Another key concern raised by Banjima during consultation was the potential for future below water table mining. As discussed in Section 1.1.6.1, mining of the Ministers North ore deposits below the groundwater table and associated dewatering, is excluded from this Derived Proposal and accessing below water table ore is not within BHP's life-of-asset plan for the Ministers North Operations.

11.4.2.3 *Noise and vibration*

Construction and operation of the Derived 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 and 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 Indicative Footprint.

11.4.2.4 *Dust air emissions*

The Derived Proposal has the potential to generate 'dust' as detailed in Section 9.

Dust emissions can impact Aboriginal cultural heritage and social surroundings values. Potential dust impacts to native vegetation, general amenity and aesthetics, and surface water quality are matters of concern to the Banjima Traditional Owners.

Air dispersion modelling (ETA, 2024) commissioned for the Derived Proposal predicts exceedances of air quality assessment criteria for TSP and particulates as PM_{10} at Yandicoogina Gorge and Khargoonha, being sites of cultural heritage significance. As discussed in Section 9, modelling results that are higher than the air quality assessment criteria have be interpreted as an indication that the results require further consideration for the sensitive receptor, and not as a predicted impact or loss of value.

11.5 Mitigation

The BHP (2016a) assessment for the Strategic Proposal provides examples and case studies of the management measures that BHP may apply to mitigate the potential impacts to social surroundings values. BHP's application of the Mitigation Hierarchy to avoid, minimise, rehabilitate and offset the potential impacts to social surroundings values is discussed below.

[58] As part of the mine waste strategy, BHP will continue to optimise backfill to minimise ex-pit OSA – the backfill strategy is a core principle for the mine plan, schedule and sequencing, to minimise surface disturbance and OSA where practicable. In addition, BHP will include consideration of using mine waste from Ministers North at Yandi to optimise regional closure outcomes (note this is not currently within the scope of the Derived Proposal).

In addition, BHP has also considered other statutory decision-making processes which may assist to mitigate or managed the potential impacts of the Derived Proposal.

11.5.1 Avoid

BHP modified the Development Envelope and Indicative Footprint, to avoid direct impacts to values and sites which are recognised as being of Aboriginal cultural heritage significance, were practicable. Where this has not been possible BHP have, and will, consult with Banjima and follow the AH Act process.

BHP has identified key areas, such as Yandicoogina Gorge, which have been excluded from the Development Envelope to ensure direct impacts are avoided. Initial mine planning for the Derived Proposal included a mine pit and overburden storage area on the eastern side of the rail, adjacent to the Yandicoogina Gorge. Given the values identified in relation to the gorge, subsequent mine planning has removed these eastern mine pits and OSA, which are not part of the Derived Proposal.

BHP has designed the Development Envelope and Indicative Footprint to avoid direct impact to Khargoonha. The Development Envelope and Indicative Footprint provide for a 100 m buffer from the defined boundary of the Khargoonha. As a result of this buffer, the extent of the mine pits has been reduced (with reduced ore tonnes to be extracted) and the location and shape of the OSA adjusted from the preferred (non-constrained) design.

11.5.2 Minimise

BHP has prepared a PMP (confidential) in consultation with Banjima Traditional Owners through BNTAC. The Ministers North PMP sets out how the construction and operation of the Ministers North operations will occur and be managed to avoid, minimise or mitigate the effect of the Ministers North operation on Aboriginal cultural heritage and social surroundings values. Furthermore, the PMP specifies the circumstances and conditions under which harm to Aboriginal Cultural Heritage and social environmental values is authorised, and how these impacts will be managed and mitigated.

The PMP specifically outlines measures in which BHP has minimised impacts, including but not limited to:

- Protection of cultural and environmental values of Yandicoogina Gorge through:
  - Sediment control from catchments draining to Yandicoogina Gorge
  - Water quality monitoring for nitrogen levels at Yandicoogina Gorge (e.g. related to risk of ANFO from blasting).
- Protection of Khargoonha from direct and indirect impacts (e.g. flyrock/vibration):
  - No new direct mining impacts (i.e mining pit pushbacks) permitted within 100 metres of Khargoonha
  - Activities associated with the rehabilitation of existing tracks and drill pads, mine closure, and mine rehabilitation within 100 metres of Khargoonha are permitted
  - Drill and Blast activities in proximity to Khargoonha to be conducted under Blast Management Plans to ensure that indirect impact to Khargoonha (i.e. fly rock) does not occur.
  - Access to Khargoonha to be retained for Banjima as per the Comprehensive Agreement.
- Protection of Western Pebble-mound Mouse:
  - BHP's internal permitting process will include consideration of Western Pebble-mound Mouse locations. Where practical, BHP will avoid impact to active Western Pebble-mound Mouse mounds.

This Ministers North PMP shall be reviewed in its entirety every 10 years or as the Parties otherwise agree. The review shall be undertaken by BHP and BNTAC through the Banjima HAC. BHP and BNTAC will work together to implement the management and mitigation measures identified in this Ministers North PMP.

BHP will report to and consult with BNTAC on a regular basis about proposed new operations and developments in the Ministers North PMP Boundary, BHP's management of harm to ACH or Social Surroundings values arising from its activities in the Ministers North PMP Boundary, and on the implementation of this Ministers North PMP. Each report will include timely updates on changes to ACH or SS value status and any breaches or suspected breaches of this Ministers North PMP.

This Ministers North PMP will also be reviewed regularly in the following scenarios:

- As new information becomes available in relation to ACH or SS values that is material or materially changes its significance
- When BHP amends the development boundary defined within the PMP or
- If advances in technology or mining processes result in new opportunities to improve or modify management strategies to manage impacts of BHP's activities on ACH or SS values.

BHP acknowledges the inherent interaction between Social Surroundings values and other factors. Table 11-5 provides a summary of other supporting management plans that are in addition to the PMP which will assist in minimising potential indirect impacts to social surroundings and Aboriginal cultural heritage values.

Table 11-5: Social Surroundings - summary of supporting management plans

Proposed Management Plan	Purpose
Terrestrial Fauna Environmental Management Plan (Appendix 10)	To ensure the implementation of the Derived Proposal meets the environmental objective (as defined under Condition 8 of MS 1105), "*protect terrestrial fauna so that biological diversity and ecological integrity are maintained*". The key focus of this plan is protection of Ghost Bat caves, however, measures relating to fauna more broadly are included.
Air Quality Environmental Management Plan (Appendix 11)	BHP will manage dust in accordance with an Air Quality Environmental Management Plan developed specifically for the Derived Proposal. The EMP will guide mitigation, monitoring, reporting, and adaptive management strategies to minimise dust.
Mine Closure Plan (Appendix 12)	To ensure that the proposed 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 Banjima Traditional Owners. In addition to mine closure commitments relevant to flora and vegetation, terrestrial fauna and Inland Waters, BHP commits to consulting with the Banjima representatives through BNTAC, to identify post-mining land uses.

BHP will work with Traditional Owners in relation to ethnobotanical values and this may include the use of ethnobotanical species in rehabilitation seed mixes and/or the propagation of ethnobotanical species for planting in rehabilitation areas.

BHP has made the following closure and rehabilitation commitments in consideration of feedback from Banjima:

- Implement a geomorphic design on the southern pit wall of South Pit (against Khargoonha) and in doing so will have regard to Banjima's Closure Principles[59] and BHP's Closure and Legacy Management Global Standard[60].
- Central OSA (if required at closure) to be blended with southern pit landform
- Progressive rehabilitation and partial pit backfill
- Surface water management will be designed, so no pit lake will form post closure. BHP will ensure final pit voids are a minimum of 5 m above the groundwater table (564 mAHD 2018 to 560m AHD 2025) to further prevent the formation of pit lakes
- Topsoil to be stockpiled pre-mining for use in rehabilitation, and to avoid a volume deficit at closure
- Haul road to be rehabilitated, including removal of culverts and all other infrastructure associated with the haul road, with the aim of returning land to pre-disturbance drainage and topography where possible[61].
- Undertake a climate change resilience assessment on proposed closure strategies
- Undertake an assessment of cumulative closure impacts/opportunities for Ministers North and BHPs Yandi operations[62]
- Opportunities for Banjima People involvement in rehabilitation monitoring will be explored by BHP with BNTAC.

BHP is also committed to ongoing engagement with Banjima Traditional Owners in relation to closure outcomes of the Derived Proposal, through ongoing consultation on the MCP.

BHP will implement the MCP (Appendix 12) to meet the MS1105 approval Condition 15 environmental objective that the proposal is decommissioned and the site of the proposal rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner.

11.5.4 Offset

Following the application of the Mitigation Hierarchy (avoid, minimise and rehabilitate), BHP considers that there will not be any significant residual impact from the Derived Proposal to Social Surroundings values. Accordingly, environmental offsets for the Derived Proposal in relation to Social Surroundings are not proposed.

11.5.5 Other statutory decision-making processes

The EPA (2021d) document *Taking Decision Making Processes into account in EIA: Interim Guidance* identifies that the EPA may consider other statutory decision-making processes which can mitigate the potential impacts of a proposal on the environment, having regard to the ability and processes of a DMA, the conditions that may be applied, and the likely environmental outcomes.

The recognition, preservation and management of activities that may impact Aboriginal cultural heritage is currently provided for under the *Aboriginal Heritage Act 1972* (AH Act). The AH Act establishes the Aboriginal Cultural Material Committee and provides for the registration of sites of heritage significance. Section 18 of the AH Act allows for the provision of Ministerial consent for certain activities, including disturbance to heritage sites.

[59] As received by BHP from BNTAC 21/03/2025

[60] As per published by BHP on 21/03/2025 [240000_ClosureGlobalStandard.pdf]

[61] Road cuttings would remain in place, with the remainder reprofiled and contoured to natural topography where practicable.

[62] Preliminary work will be undertaken by BHP in collaboration with Banjima with outcomes and action integrated into future Mine Closure Plans

In December 2021, the Western Australian Parliament passed the new *Aboriginal Cultural Heritage Bill 2021*. The *Aboriginal Cultural Heritage Act 2021* (ACH Act) replaced the old AH Act. Following additional stakeholder consultation, on 15 November 2023 the WA Government repealed the *Aboriginal Cultural Heritage Act 2021* (WA) (2021 Act) and restored the *Aboriginal Heritage Act 1972* (WA) (old 1972 Act) with some additions and amendments (new 1972 Act).

The amended AH Act includes the following improvements:

- Proponents and Native Title parties will have the same right of review for Section 18 decisions via the State Administrative Tribunal, with clear timeframes and an ability for the Premier to call-in a decision of 'State or regional significance', to act in the interests of all Western Australians.
- When a Section 18 consent has been granted by the Minister, the landowner will be required to notify the Minister of any new information about an Aboriginal site
- Section 18 Consents will transfer where there is a change in land ownership.
- A new statutory Aboriginal Cultural Heritage Committee, with majority Aboriginal representation and male and female Aboriginal co-Chairs, will make recommendations on Section 18 Notices to the Minister.

Table 11-6 describes the other statutory decision-making process that can assist to mitigate and manage greenhouse gas emissions from the Derived Proposal.

Table 11-6: Social Surroundings - other statutory decision-making processes

Impact from Derived Proposal	Other Statutory Decision-making Process
Activities or processes impacting heritage values (direct)	**Yes** *Aboriginal Heritage Act 1972* (WA) Approval under the AH Act is required prior to impact to registered heritage sites, BHP have prepared an Aboriginal and Cultural Heritage Management Plan to mitigate potential impact to heritage sites from the construction and operation of the Proposal, other than those that are exempt under s18 of the AH Act.
Activities or processes impacting heritage values (indirect)	**Yes** *Aboriginal Heritage Act 1972* (WA) The ACHMP required by the Act also allows for management of indirect impacts to less tangible cultural heritage values.

11.6 Validation of impacts and environmental outcome

BHP has validated the impacts to Social Surroundings from the Derived Proposal against the Strategic Proposal environmental outcomes, assuming mitigation measures identified in Section 11.5 have been applied, to demonstrate that the objective in MS1105 Condition 13 can be met.

Table 11-7 summarises the residual impacts, outcomes and demonstrates consistency with MS1105 condition objectives for Social Surroundings.

Table 11-7: Social Surroundings – outcomes, proposed regulation and monitoring

Derived Proposal residual impact	Derived Proposal outcome	Consistency with Strategic Proposal environmental outcome/s and consistency with EPA objective
Activities or processes impacting heritage values (direct and indirect). The Proposal will result in loss of up to 1,848 ha of native vegetation.	Heritage sites will be impacted, however, key sites such as Khargoonha have been avoided. BHP will engage with Banjima Traditional Owners, through BNTAC, throughout the life of operation, in relation to social, cultural and heritage values and interests.	Condition Objective: (1) manage the proposal to minimise the impacts on Aboriginal heritage and culture. BHP has prepared a Ministers North PMP in consultation with Banjima Traditional Owners through BNTAC, which supports the development and submission of the Environmental Review Document (Derived Proposal Request via MS1105). The PMP (confidential) sets out how the construction and operation of the Ministers North Operation, which will sustain BHP's Iron Ore Business at Yandi Hub, will occur and be managed to avoid, minimise or mitigate the effect of the Ministers North Operation on Aboriginal cultural heritage and social surroundings values. Furthermore, the PMP specifies the circumstances and conditions under which harm to Aboriginal Cultural Heritage and Social Environmental values are authorised, and how these impacts will be managed and mitigated. BHP will continue to engage with the Banjima Traditional Owners, through BNTAC, throughout the life of the Derived Proposal in relation to the management of cultural heritage and environmental values, mine closure and other matters connected to Social Surroundings. BHP considers with the implementation of the PMP (confidential), and the management actions outlined within this ERD, that Condition 13 Cultural Heritage Management Plan does not need to apply to the Derived Proposal.

11.7 Implementation conditions

BHP considers that the following conditions relating to the Environmental Factor of Social Surroundings as set out in the MS1105 approval for the Strategic Proposal should apply to the Derived Proposal:

- Condition 15: Rehabilitation and Decommissioning.

BHP has assessed the existing implementation conditions of the MS1105 approval for the Strategic Proposal in relation to their application for the Derived Proposal. BHP has concluded that the above implementation conditions are appropriate to be applied to the Derived Proposal.

BHP considers with the implementation of the PMP (confidential), and the management actions outlined for the Derived Proposal, that the Derived Proposal meets the intent of Condition 13 Cultural Heritage Management Plan, "*manage the proposal to minimise the impacts on Aboriginal heritage and culture*", and therefore, is of the view that this condition does not need to apply to the Derived Proposal. As such, BHP has not proposed a standalone Cultural Heritage Management Plan (outside of the confidential PMP).

In addition to the implementation conditions of the MS1105 approval for the Strategic Proposal, BHP considers that the following statutory decision-making processes are applicable to the mitigation and management of Social Surroundings values:

- *Aboriginal Heritage Act 1972* (WA): management of activities to avoid or minimise potential direct and indirect impacts to cultural heritage sites and values.

12 Other environmental factors or matters

BHP’s evaluation of 'other' Environmental Factors in relation to the Derived Proposal is summarised in Table 12-1. The assessment supports BHP’s view that these other Environmental Factors are not applicable for assessment as 'Key Environmental Factors' for the Derived Proposal, and accordingly, do not require further detailed assessment

Table 12-1: Other environmental factors

Derived Proposal Activities / Operations	Potential Impacts	Assessment
LAND		
Landforms EPA (2023a) objective: "*To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected"*		

Mine pits and Overburden Storage Area	Permanent modification of natural landforms from mining operations.	BHP has reviewed the potential impacts of the Derived Proposal on the Environmental Factor of 'Landforms', considering the assessment of the Strategic Proposal (BHP 2016a; EPA 2018a) and in consideration of the EPA (2018c) document *Environmental Factor Guideline - Landforms*.
		Strategic Proposal - Significance Considerations
		• The Environmental Factor of 'Landforms' was not considered by the EPA to be a 'Key Environmental Factor' for the Strategic Proposal, however, BHP assessed the potential impacts to landform values in the region, including the potential for cumulative impacts (EPA 2018a).
		• The area of the Strategic Proposal consists of a range of common landforms generally classified as hills and ranges and other elevated areas or plains. There will be no impacts by the Strategic Proposal to regionally significant landforms (e.g. Mount Robinson, The Governor and Mount Meharry) (BHP 2016a).
		• The primary impacts to landform values by the Strategic Proposal are associated with the modification or removal of local landforms (e.g. ridgelines, gullies and gorges) (BHP 2016a).
		• Although some direct impacts of the Strategic Proposal to some land systems are high, the impacted systems do not comprise unique landforms (and therefore do not represent a significant impact to unique landforms) (BHP 2016a).
		• The assessment of the Strategic Proposal provides examples of the measures that BHP may apply to mitigate the potential impacts to Landforms (BHP 2016a).
		• The key environmental outcomes for Landforms established through the assessment of the Strategic Proposal (BHP 2016a; EPA 2018a) were:
		  • Management of the direct impacts on landforms is principally through avoidance.
		  • Impacts to landforms and landscapes at the regional level were considered to be low.
		  • Whilst impacts on landforms would occur as part the Strategic Proposal, these impacts were not considered to threaten the variety or integrity of significant landforms in the Pilbara region.

		Derived Proposal - Significance Considerations • BHP acknowledges landforms are of significance to the Banjima Traditional Owners and this was reinforced during Social Surroundings engagements. • The key local landform of significance in proximity of the Derived Proposal is associated with Khargoonha, which is an elevated and isolated ridge landform adjoining the south-western side of the mining area for the Derived Proposal, measuring approximately 12 km in length (east to west) and 4 km in width (north to south), with a topographic elevation ranging from approximately 750 mAHD to 1080 mAHD (peak) rising above the surrounding plains (generally 600 mAHD to 650 mAHD). The boundary of Khargoonha aligns generally to the 750 mAHD land contour. • Yandicoogina Gorge may also be considered a local landform of significance in proximity of the Derived Proposal. Yandicoogina Gorge is the landform containing Yandicoogina Creek system, incised into the landscape with steeply angled walls on either side up to approximately 40 m in height (nominally 570 mAHD to 610 mAHD in the area east of the Derived Proposal). Yandicoogina Gorge extends for approximately 3 km length, of the approximately 30 km total length of Yandicoogina Creek. **Derived Proposal - Mitigation** • BHP has designed the Indicative Footprint for the Derived Proposal to avoid impact to Khargoonha. Mine planning for the Derived Proposal has established a buffer of 100 m from the boundary of Khargoonha. In-pit backfilling of the mine pits will be undertaken in a manner that will seek to integrate (i.e. 'blend-in') with shape and profile of the adjacent landforms, including Khargoonha. Accordingly, no impact to Khargoonha will occur as a result of implementation of the Derived Proposal. • BHP has designed the Indicative Footprint for the Derived Proposal to avoid impact to the Yandicoogina Gorge. Whilst initial mine planning for the Derived Proposal included mine pits and overburden storage areas on the eastern side of the Yandicoogina Gorge, subsequent mine planning has removed these eastern mine pits and overburden storage areas. Accordingly, no direct impact to the Yandicoogina Gorge will occur as a result of implementation of the Derived Proposal. • Changes to landforms through the excavation of mine pits and the construction of an Overburden Storage Area has been minimised through in-pit backfilling of the mine pits. • Land and landforms within the area of the Derived Proposal will be rehabilitated with native vegetation (progressively, and post-mining) to restore land values in accordance with the MCP (Appendix 12). **Derived Proposal - Environmental Outcomes** • Following the avoidance measures identified above (i.e. avoidance of Khargoonha and the Yandicoogina Gorge), the Derived Proposal is not anticipated to impact any landforms of either local or regional significance. The residual impact to local landforms from the Derived Proposal is consistent with the outcomes considered for the Strategic Proposal. Land and landforms within the area of the Derived Proposal will be rehabilitated with native vegetation to restore land values. Accordingly, the EPA's environmental outcome for the Environmental Factor of 'Landforms' can be met.

Derived Proposal Activities / Operations	Potential Impacts	Assessment
Terrestrial Environmental Quality EPA (2023a) objective: "*To maintain the quality of land and soils so that environmental values are protected"*		

Mine pits and Overburden Storage Area
Ground disturbance and earthworks
Surface water management
Mine closure
	Land contamination from Acid and Metalliferous Drainage (AMD) or Neutral Metalliferous Drainage (NMD)
	Erosion of Overburden Storage Area
		BHP has reviewed the potential impacts of the Derived Proposal on the Environmental Factor of 'Terrestrial Environmental Quality', considering the assessments of the Strategic Proposal (BHP 2016a; EPA 2018a) and in consideration of the EPA (2016j) document *Environmental Factor Guideline - Terrestrial Environmental Quality*.
		Strategic Proposal - Significance Considerations
		• The Environmental Factor of ' Terrestrial Environmental Quality' was not considered by EPA to be a 'Key Environmental Factor' for the Strategic Proposal (EPA 2018a).
		• The assessment of the Strategic Proposal (BHP 2016a) identified the following potential impacts relating to Terrestrial Environmental Quality:
		  • Generation of AMD through exposure of sulfide-bearing rocks to atmospheric oxygen during excavation and/or groundwater dewatering, which in turn, may impact upon soils, surface water, groundwater and local ecosystems.
		  • Erosion of landforms (primarily through surface water drainage) has a potential to destabilise landforms, which in turn, may result in unacceptable closure outcome for landforms or/or result in a decline in surface water quality (turbidity).
		  • Contamination of land from activities such as the storage and use of hydrocarbons and other chemicals.
		• Material characterisation indicates that materials associated with Brockman-type ore deposits and Marra Mamba-type ore deposits to be potentially susceptible to surface erosion, however, materials associated with Brockman-type ore deposits less susceptible compared to materials associated with Marra Mamba-type ore deposits occurring at other BHP mining locations (BHP 2016a; EPA 2018a).
		• The assessment of the Strategic Proposal (BHP 2016a) provides examples of the measures that BHP may apply to mitigate the potential impacts related to Terrestrial Environmental Quality, primarily as part of mine closure (rehabilitation and decommissioning).
		• The key environmental outcomes for Terrestrial Environmental Quality established through the assessment of the Strategic Proposal (BHP 2016a; EPA 2018a) were:
		  • AMD and erosion risks from BHP operations are well understood and manageable. Based upon BHP's experience in operations across the Pilbara region, BHP has established a suite of management measures that are proven to be effective in appropriately managing AMD and erosion risks.

Derived Proposal Activities / Operations	Potential Impacts	Assessment
		• Contamination of land from activities such as the storage and use of hydrocarbons and other chemicals is unlikely to result in a significant environmental impact and can be effectively managed through proper storage and handling in accordance with relevant legislation, standards and operational procedures. • Implementation of BHP's management measures for derived proposals, including management in accordance with a MCP, can be expected to prevent significant environmental impacts. **Derived Proposal - Significance Considerations** • Geochemical assessment of representative waste rock material samples from the Derived Proposal indicates a low AMD potential with > 99 % of total waste rock volume classified as NAF (Non-acid Forming) (Mine Waste Management (MWM) 2024). • The risk of generating NMD or saline drainage associated with neutralisation of oxidation products is unlikely. Generally, the deposit contains very little sulfur and therefore the opportunity for NMD or saline drainage to form as a result of sulfide oxidation is negligible (MWM 2024). **Derived Proposal - Mitigation** • BHP has prepared a MCP for the Derived Proposal which addresses: • The management (handling and disposal) of waste materials and in-pit backfilling to minimise the potential risk of AMD or NMD generation. • Construction and rehabilitation of the OSA to minimise the risk of erosion. • Operational risks for activities such as the storage and use of hydrocarbons and other chemicals can be effectively managed through proper storage and handling in accordance with relevant legislation, standards and BHP's standard operational procedures. Additional mitigation measures specific to the Derived Proposal are not considered to be necessary. **Derived Proposal - Environmental Outcomes** • Following the management measures identified above (i.e. management in accordance with a MCP, management of operational risks in accordance with legislation, standards and procedures), the Derived Proposal is not anticipated to result in a significant impact to terrestrial environmental quality values. The residual risk/impact to terrestrial environmental quality values from the Derived Proposal is consistent with the outcomes considered for the Strategic Proposal. Accordingly, the EPA's environmental outcome for the Environmental Factor of 'Terrestrial Environmental Quality' can be met.

13 Offsets

In assessment of the Strategic Proposal, the EPA (2018a) concluded the Strategic Proposal may result in a significant residual impact to the following environmental values:

- 'Threatened' or 'Priority' fauna taxa
- 'Threatened' or 'Priority' flora taxa
- 'Threatened' or 'Priority' ecological communities
- Habitat for 'Threatened' fauna taxa
- Areas of recognised high biodiversity value (e.g. Fortescue Marsh)
- Important habitat such as riparian vegetation.

Consistent with the overarching approach for Strategic Proposal, the potential impacts to the above environmental values are assessed for this Derived Proposal. Where this Derived Proposal is likely to result in a significant environmental impact, environmental offsets will be applicable, as described below.

BHP predicts that there will be significant residual impacts to the following values, and as a result, offsets will be provided:

- Native vegetation in ‘Good’ to ‘Excellent’ Condition
- Riparian vegetation
- Critical and supporting habitat for the Ghost Bat
- Critical and supporting habitat for the Northern Quoll
- Critical and supporting habitat for the Pilbara Olive Python.

Figure 13-1 identifies the area upon which the environmental offset for the clearing of native vegetation in 'Good' to 'Excellent' condition and riparian vegetation have been calculated. Figure 13-2 to Figure 13-4 identifies the spatial area upon which the environmental offset for terrestrial fauna values has been calculated. In order to avoid duplication, the environmental offset for the clearing of native vegetation is applicable only to areas of native vegetation that are not otherwise offset for the clearing of fauna habitat (which a higher rate is applicable for the financial contributions).

BHP proposes to contribute to the PEOF, based on the PEOF 2024/25 financial year contribution rates (Table 13-1).

Table 13-1: Significant residual impacts and proposed offsets

Significant residual impact	Values	Extent of impact (ha)	Area to be offset (ha) [1]	Offset payment rate $/ha	Proposed offset $
Clearing of native vegetation in the Pilbara - Hamersley IBRA subregion	Native vegetation in Good to Excellent condition	1826.8	27.4	$986	$27,016.4
Clearing of riparian vegetation	Riparian Vegetation	33.7	0.3	$1,972	$591.6
Clearing of critical habitat Ghost Bat, Northern Quoll and Pilbara Olive Python	Gorge/Gully Breakaway/Cliff Major Drainage Line	269.2	269.2	$1,972	$530,862.4

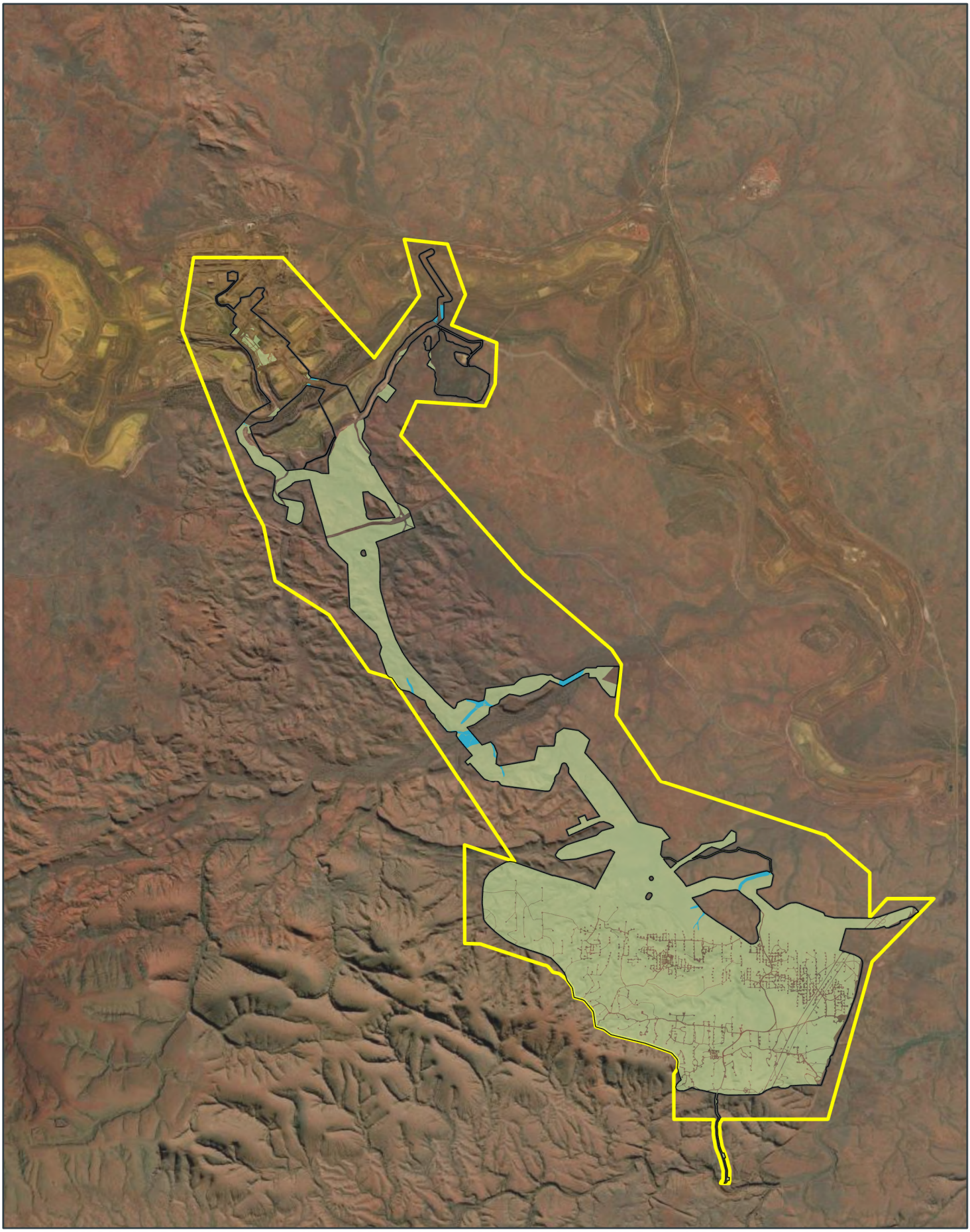
[1] The total extent to be offset has removed areas where good to excellent vegetation and riparian vegetation and/or critical and supporting fauna habitat to avoid duplication of offsets.

Significant residual impact	Values	Extent of impact (ha)	Area to be offset (ha) [1]	Offset payment rate $/ha	Proposed offset $
	All GB foraging habitat within 12km of CMIN-03 cave (Category 2 roost)				
Clearing of supporting habitat for Ghost Bat, Northern Quoll and Pilbara Olive Python	Hill Crest / Hill Slope Stony Plain Sand Plain Minor Drainage Line Drainage Area / floodplain Mulga Woodland Boulders / Rockpiles	1539.2	1539.2	$986	$1,517,651.2
Total					**$2,076,121.6**

BHP's mining operations in the central Pilbara are also subject to a 'Strategic Assessment' under the Commonwealth EPBC Act. BHP will prepare a Validation Notice with submission to DCCEEW prior to implementation. In line with the *Pilbara Strategic Assessment Assurance Plan and Offsets Plan* (APOP) (BHP 2023), offsets for the Commonwealth will be applied through financial contributions to the PEOF (including consideration of relevant rates under the Commonwealth approval).

In accordance with the APOP (BHP 2023), a 10% upfront payment for offsets must be completed within one month of the Validation Notice becoming effective. The remaining offsets are paid in line with the EPBC Impact Reconciliation Report (IRR) in which clearing is paid for as it progresses during operations (e.g. via data reconciliation and reporting). An EPBC Act IRR dataset for each financial year within the reporting period is developed. The EPBC Act IRR dataset will be used for calculating and reporting the total number of hectares with the Program Matter offset requirements within the reporting period and the cumulative totals.

The Impact Reconciliation Procedure required under the State Approval (Condition 16 Offsets - Appendix 13), allows for BHP to note where a payment has been made to satisfy a condition of an approval under the EPBC Act in relation to the proposal to avoid duplication of payments for offsets.



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Good to Excellent Vegetation Condition
- Good to Excellent Riparian Vegetation

N

0 1 2 3

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
ENVIRONMENTAL OFFSETS - VEGETATION CONDITION

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	13-1
DATE:	3/09/2025	PREPARED:	GEOMATICS	NO:	A1317-045 RevB
		REVIEWED:			

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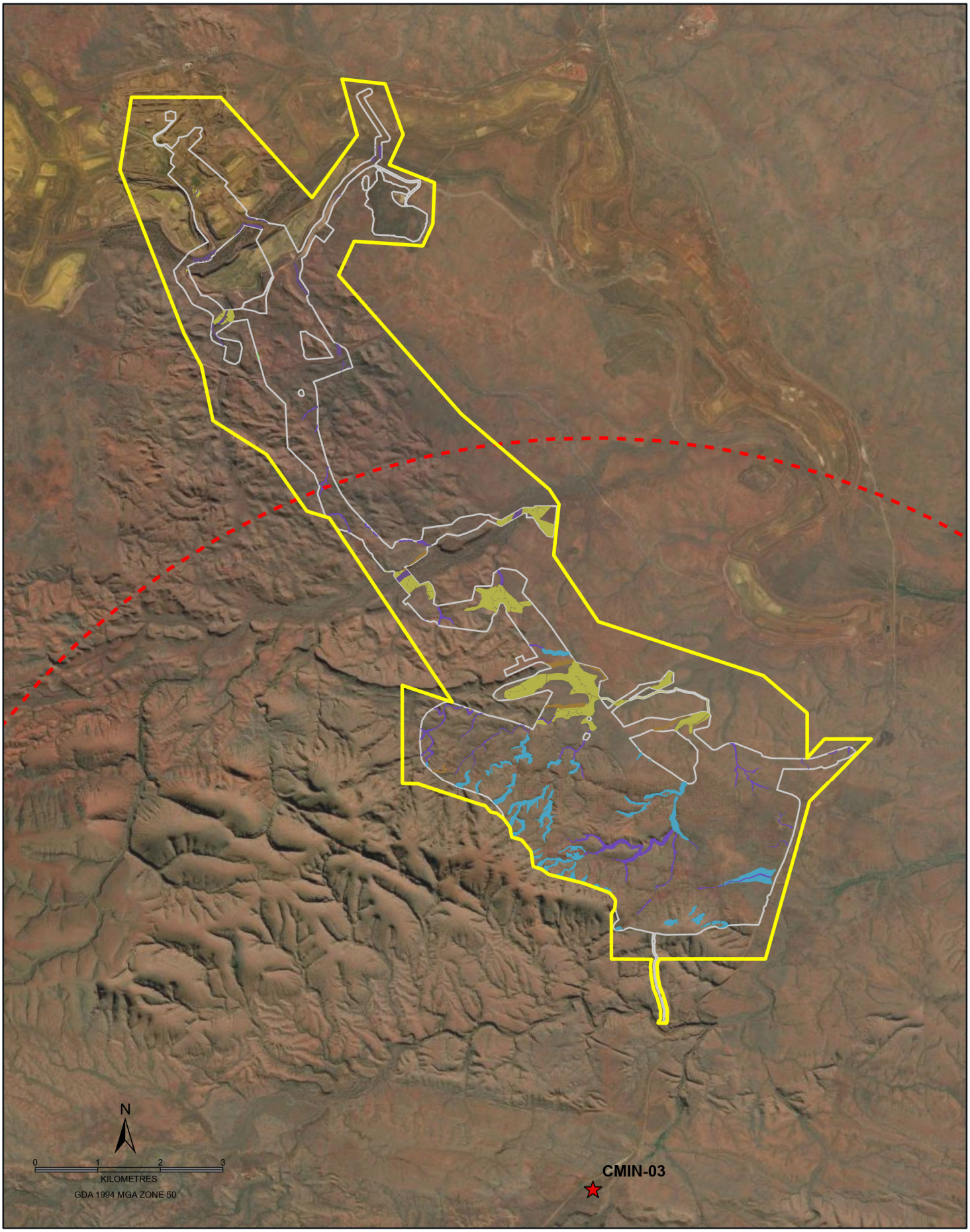


Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- 12km Foraging Range
- Category 2 Ghost Bat Cave

Critical Habitat (Inside 12km Foraging Range)

- Breakaway/ Cliff
- Drainage Area/ Floodplain
- Gorge/ Gully
- Major Drainage Line
- Minor Drainage Line

Supporting Habitat (Outside 12km Foraging Range)

- Drainage Area/ Floodplain
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland

BHP

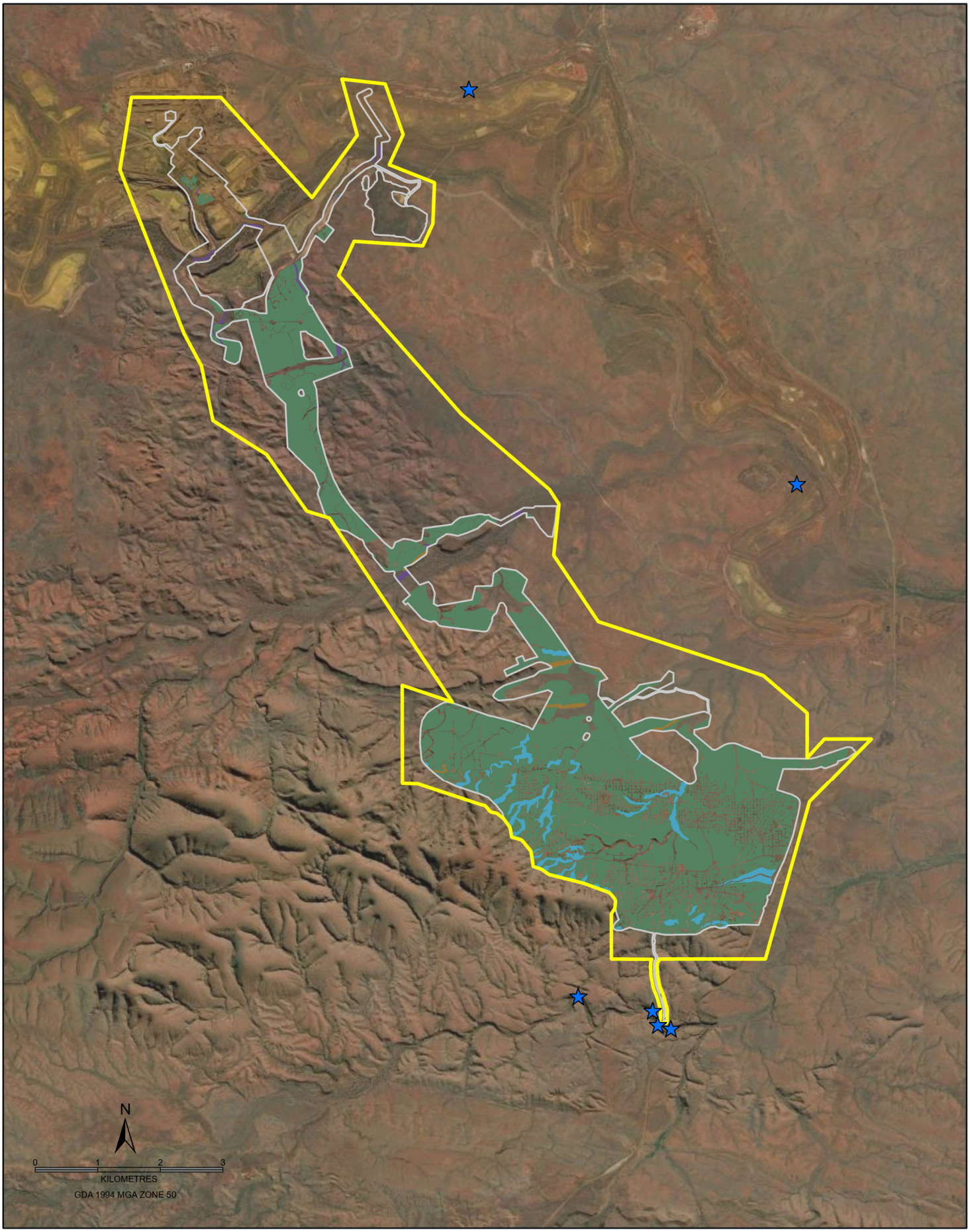
PUBLIC

MINISTERS NORTH
ENVIRONMENTAL OFFSETS - GHOST BATS

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	13-2
DATE:	15/07/2025	PREPARED:	GEOMATICS	NO:	A1317-046 RevB
		REVIEWED:			

Document Path: Y:\Jobs\A1001_A1500\A1317\3Project\A1317_046_E_MNERD_Offsets_GhostBatHabitat_RevA.aprx



Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Northern Quoll Records

Critical Habitat

- Gorge/ Gully
- Breakaway/ Cliff
- Major Drainage Line

Supporting Habitat

- Hillcrest/ Hillslope

BHP

PUBLIC

MINISTERS NORTH
ENVIRONMENTAL OFFSETS - NORTHERN QUOLL

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	13-3
DATE:	15/07/2025	PREPARED:	GEOMATICS	NO:	A1317-048 RevB
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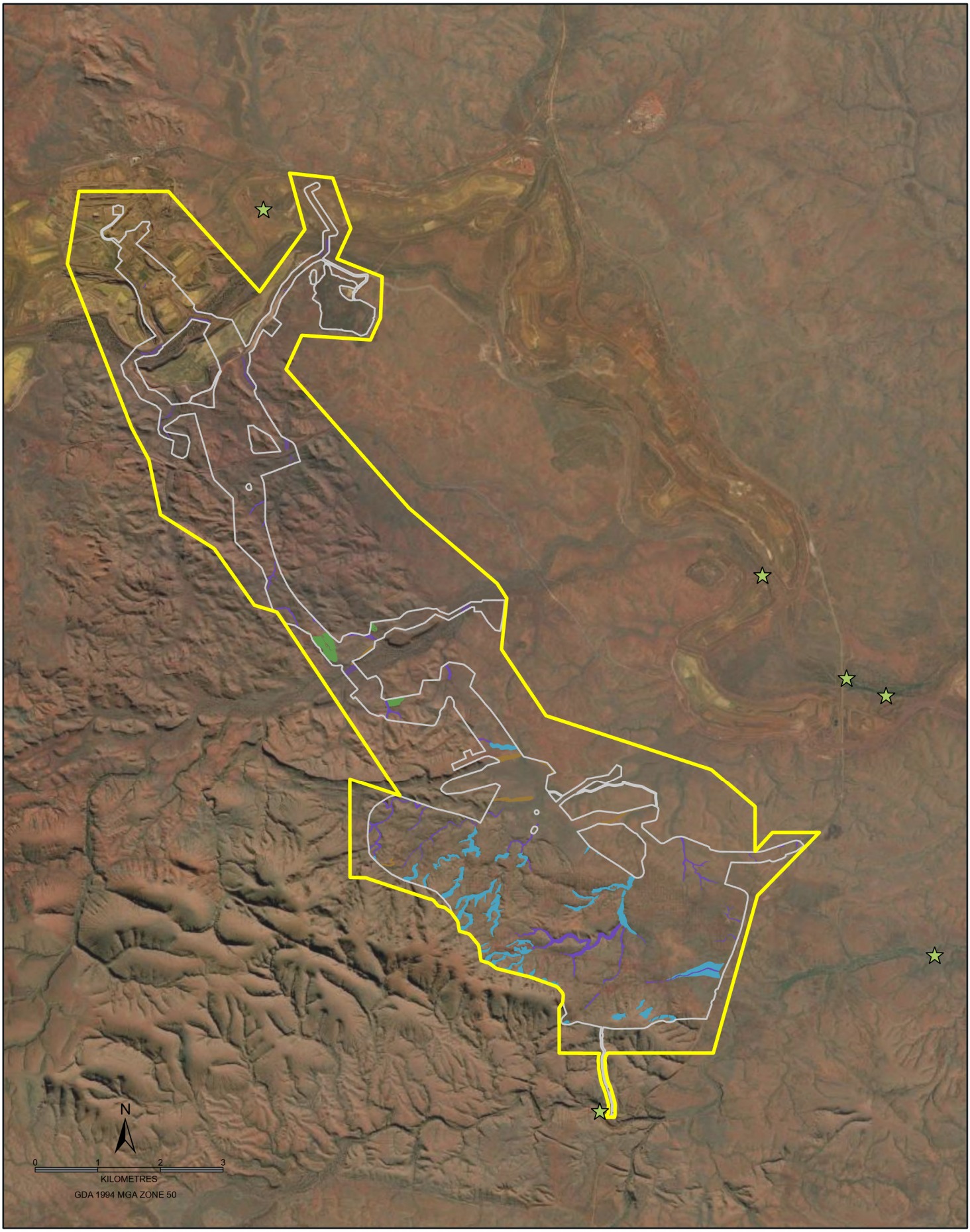


Legend

- Development Envelope (5,557 ha)
- Indicative Footprint (2,360 ha)
- Pilbara Olive Python Record

Critical Habitat

- Breakaway/ Cliff
- Gorge/ Gully

Supporting Habitat

- Boulders/ Rockpiles
- Major Drainage Line
- Minor Drainage Line

BHP

PUBLIC

MINISTERS NORTH
ENVIRONMENTAL OFFSETS - PILBARA OLIVE PYTHON

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @ A4:	1:80,000	REQUESTOR:	PROJECTS	FIGURE:	13-4
DATE:	9/09/2025	PREPARED:	GEOMATICS	NO:	A1317-049 RevC
		REVIEWED:			

Document Path: Y:\Jobs\A1001_A1500\A1317\3Project\A1317_049_E_MNERD_Offsets_POPHabitat_RevA.aprx

13.1 Impact reconciliation procedure

BHP considers that the following conditions as set out in the MS1105 approval for the Strategic Proposal should apply to the Derived Proposal:

- Condition 16: Offsets.

Condition 16 of the MS1105 approval requires that significant environmental impacts shall be offset through financial contributions to the PEOF.

Consistent with Condition 16 of the MS1105 approval, BHP has prepared the following procedure:

- Ministers North Impact Reconciliation Procedure (Appendix 13).

The purpose of the Impact Reconciliation Procedure is to identify the land disturbance (clearing) calculations to be used for calculating the financial contribution requirements for environmental offsets, the methodology to calculate the extent of land disturbance during each year, and the timing and content of submission of Impact Reconciliation Reports to be submitted to DWER.

The Impact Reconciliation Procedure has been prepared consistent with the EPA (2024c) document *Instructions on How to Prepare Environmental Protection Act 1986 Part IV Impact Reconciliation Procedures and Impact Reconciliation Reports* and outlines the requirement for environmental offsets for the Key Environmental Factors of 'Flora and Vegetation' and 'Terrestrial Fauna' as described above.

BHP has assessed the existing implementation Condition 16 of the MS1105 approval for the Strategic Proposal in relation to the application of environmental offsets. BHP has concluded that implementation Condition 16 remains appropriate to be applied to the Derived Proposal for the management and monitoring of environmental offsets.

14 Holistic impact assessment

BHP has validated the potential impacts of the Proposal for the relevant environmental factors and environmental values individually (Sections 5 to 11). BHP has also considered connections and interactions between the relevant environmental factors (Figure 14-1) to inform a holistic view of impacts to the whole environment.

An example of this holistic view can be seen with interactions between Social Surroundings, Inland Waters, and Flora and Vegetation. For example, to maintain Social Surroundings values for human connection and interaction with the environment, there is a need to consider the values of Inland Waters and Flora and Vegetation (i.e. a decline in these values would affect the environment, and therefore the human connection to that environment would also be affected).

BHP considers that when the relevant environmental factors are considered together, for the holistic validation, that the Proposal is still consistent with the Strategic Proposal environmental outcomes, the EPA's objectives and the relevant environmental objectives in Strategic Proposal MS1105.

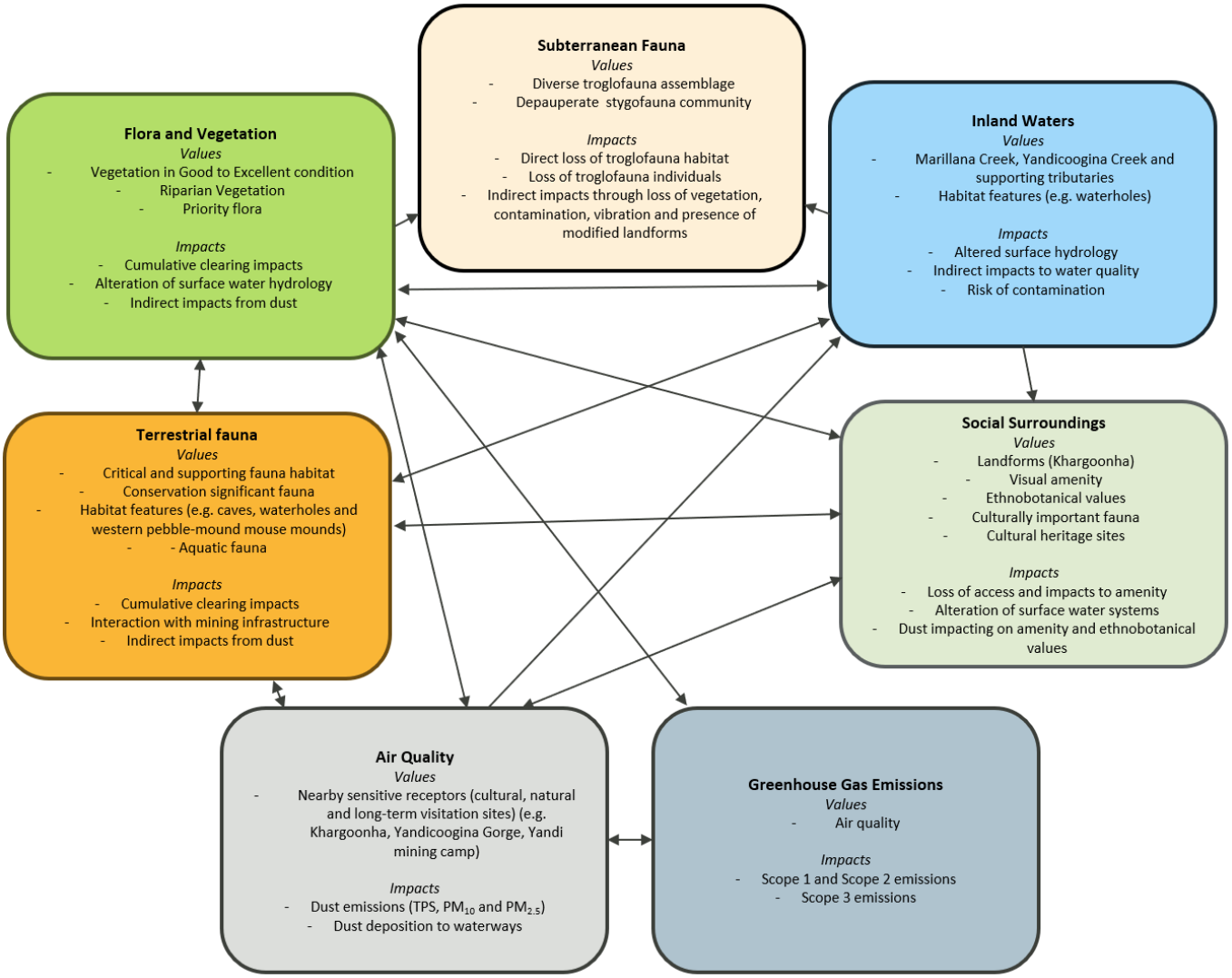


Figure 14-1: Holistic impact assessment

15 Cumulative environmental impact assessment

BHP undertook a cumulative environmental impact assessment for the Strategic Proposals. BHP considered the successive, incremental and interactive impacts on the environment of the Strategic Proposal with past, present and reasonably foreseeable future activities including third party activities. These are detailed in the PERSP (BHP 2016a - Section 7).

In assessing the Pilbara Expansion as a strategic proposal, the EPA considered the cumulative impacts of future proposals by the proponent, rather than assessing impacts on a case-by-case basis as individual iron ore mines are proposed (EPA 2018a). The following provides further cumulative impact assessment for this Derived Proposal.

To date, BHP has submitted and subsequently had approved, two derived proposals, totalling 4,505 ha of new land disturbance; equating to approximately 4.6 % of the total 98,500 ha disturbance approved for the Strategic Proposal. Implementation of the Ministers North Derived Proposal will result in an increase (1,848 ha) of the progressive extent of disturbance for the Strategic Proposal from 4,505 ha to 6,353 ha; however, this remains within the total 98,500 ha of disturbance authorised for the Strategic Proposal through MS1105. Table 15-1 and Figure 15-1 consider the cumulative impacts of the Derived Proposal with other approved derived proposals under MS1105.

Table 15-2 and Figure 15-2 considers the cumulative impacts of the Derived Proposal in the context of other nearby operations.

The validation demonstrates that the potential impacts of the Derived Proposal, when considered cumulatively with the impacts of other third-party mining or other non-mining land uses, remains consistent with the cumulative impacts as assessed for the Strategic Proposal.

Table 15-1 Cumulative impacts of Derived Proposals subject to MS1105

Environmental value	Approved disturbance from previous Derived Proposal		Extent to be disturbed from this Derived Proposal	Extent at the State/regional level	Cumulative impact to the environmental value
	Orebody 32 Below Water Table (EPA 2023c)	Western Ridge (EPA 2023b)	Ministers North (Derived Proposal)		
Vegetation					
Total clearing	224 ha	4,281 ha	1,848 ha	98,500 ha authorised via MS1105	Cumulative total of 6,535 ha within an authorised limit of 98,500 ha
Beard Vegetation Association 18	152.88 ha	1,411 ha	0 ha	671,843 ha[1]	No cumulative impact from the Derived Proposal
Beard Vegetation Association 82	59.97 ha	2,870 ha	2,360 ha	2,550,888 ha[1]	Cumulative total 5,290 ha (>99% remaining).
Good to Excellent condition veg	156 ha	3,863 ha	1,827 ha	-	Cumulative total of 5,846 ha of Good to Excellent veg

Environmental value	Approved disturbance from previous Derived Proposal		Extent to be disturbed from this Derived Proposal	Extent at the State/regional level	Cumulative impact to the environmental value
	Orebody 32 Below Water Table (EPA 2023c)	Western Ridge (EPA 2023b)	Ministers North (Derived Proposal)		
Riparian Vegetation	12 ha	4.8 ha	33.7 ha	-	Cumulative total of 50.5 ha of riparian vegetation
Priority flora					
Aristida lazaridis (P3)	No impact	No impact	3 individuals	14,232 (93 populations)[64]	Cumulative total of 3 individuals (<0.1% of regional records)
Ipomoea racemigera (P3)	No impact	No impact	20 individuals	3,290 (77 populations)	Cumulative total of 220 individuals (0.6% of regional records)
Eremophila naaykensii (P3)	No impact	97 records	No impact	13,077 (31 populations)	No cumulative impact from the Derived Proposal
Indigofera gilesii (P3)	No impact	43 records	No impact		No cumulative impact from the Derived Proposal
Rostellularia adscendens var. *latifolia* (P3)	No impact	No impact	40 individuals	7,807 (138 populations)	Cumulative total of 40 individuals (0.5% of regional records)
Acacia bromilowiana (P4)	No impact	No impact	144 individuals	4,165[65] (34 populations)	Cumulative total of 144 individuals (3.5% of regional records)
Sida sp. Barlee Range (P4)	No impact	No impact	1,137 individuals	11,579[66] (98 populations)	Cumulative total of 1,137 individuals (9.8% of regional records)
Fauna habitats					
Ghost Bat Caves	No impact	Five Category 4 caves impacted	Three Category 4 caves impacted. An additional four caves with potential to be impacted (three Category 4 caves and one unsuitable).	-	Eight Category 4 caves impacted. An additional four caves (three Category 4 caves and one unsuitable) with potential to be impacted
Western Pebble-mound Mouse mounds	No impact	72 mounds impacted	35 mounds impacted	3,536	Cumulative 107 mounds impacted (approx. 3% of regional mounds).

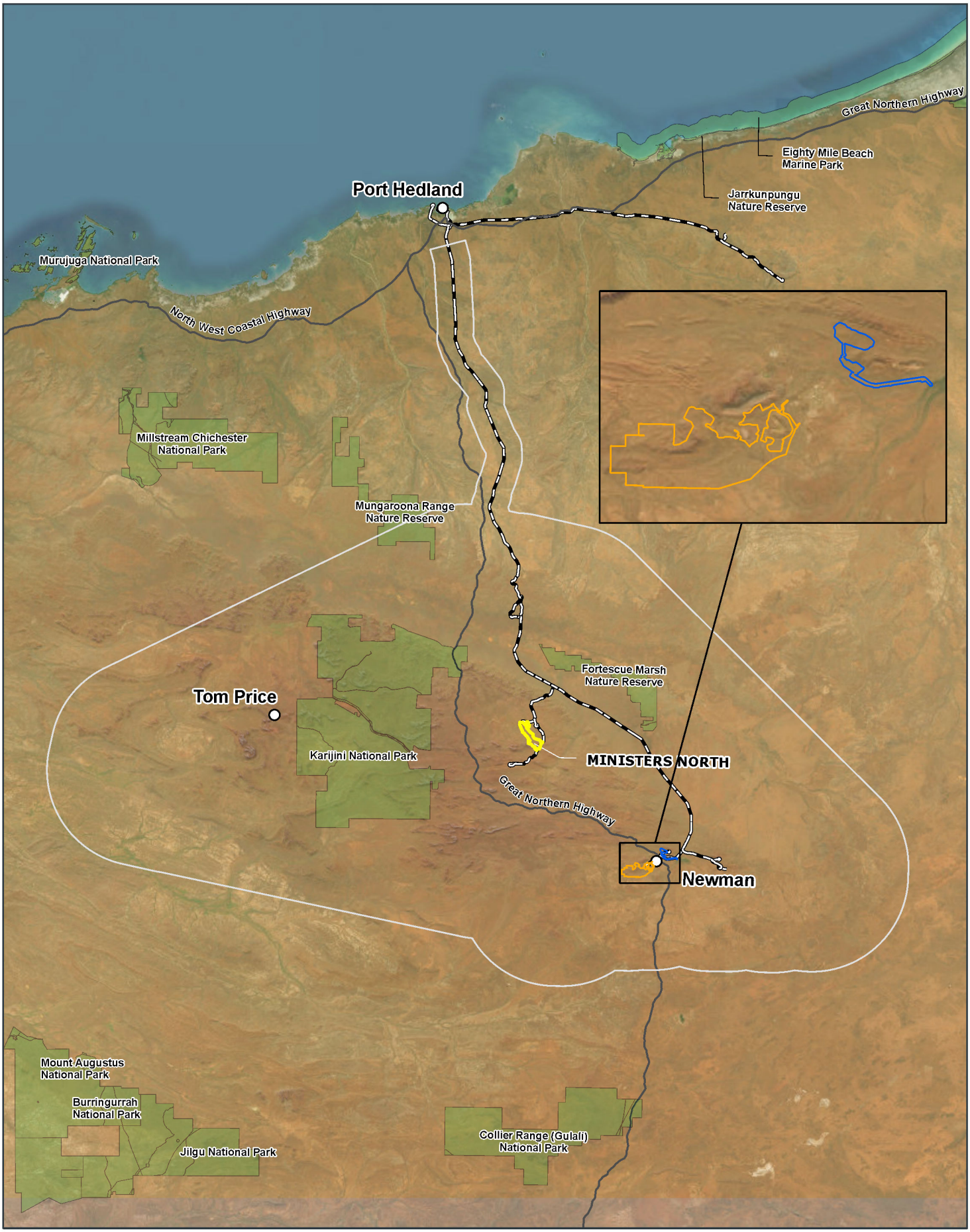
[64] Source from internal BHP Datasets: noting other sources indicate higher regional records (e.g. > 23,000 individuals Source: EPA (2024d))

[65] Source EPA 2024e: Regional records of 4,551 (minus 452 individuals approved for impact), plus 66 recorded from current Derived Proposal targeted survey (Spectrum 2023)

[66] Source EPA 2024e: Regional records of 12,212 individuals from Brockman Syncline Proposal (minus 2,054 approved for impact), plus 1,421 from the current Derived Proposal targeted survey (Spectrum 2023)

Environmental value	Approved disturbance from previous Derived Proposal		Extent to be disturbed from this Derived Proposal	Extent at the State/regional level	Cumulative impact to the environmental value
	Orebody 32 Below Water Table (EPA 2023c)	Western Ridge (EPA 2023b)	Ministers North (Derived Proposal)		
Waterbodies / surface water pools	No impact	Three temporary surface water pools impacted	No impact	-	No cumulative impact from the Derived Proposal
Critical habitat for Ghost Bat	No significant residual impact	2,534 ha	256.8 ha	-	Cumulative total of 2,790.8 ha
Supporting habitat for Ghost Bat	No significant residual impact	No significant residual impact	19.7 ha	-	Cumulative total of 19.7 ha
Critical habitat for Pilbara Olive Python	No significant residual impact	147 ha	99.6 ha	-	Cumulative total of 246.6 ha
Supporting habitat for Pilbara Oliive Python	No significant residual impact	No significant residual impact	78.7 ha	-	Cumulative total of 78.7 ha
Critical habitat for Northern Quoll	No significant residual impact	No significant residual impact	115.5 ha	-	Cumulative total of 115.5 ha
Supporting habitat for Northern Quoll	No significant residual impact	No significant residual impact	1,518 ha	-	Cumulative total of 1,518 ha

[1] Based on current DBCA data for the Pilbara bioregion (DBCA 2019b). The current extent of Associations 18 and 82 statewide are 19,843,148 ha and 2,553,206 ha respectively.



Legend

- Development Envelope (5,557 ha)
- Strategic Proposal Boundary
- Orebody 32 Below Water Table Derived Proposal
- Western Ridge Derived Proposal
- Conservation Area
- Townsite
- Major Roads
- Rail (BHP)

N

0 25 50 75 100

KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
CUMULATIVE IMPACTS OF DERIVED PROPOSALS

WAIO PLANNING, TECHNICAL & ENVIRONMENT

SCALE @A4:	1:2,600,000	REQUESTOR:	PROJECTS	FIGURE:	15-1
DATE:	24/07/2025	PREPARED:	GEOMATICS	NO:	A1317-055 RevA
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Table 15-2 Cumulative impacts by third parties within the vicinity of the Derived Proposal

Environmental value	Extent of loss from existing and reasonably foreseeable future projects[1]							Extent to be disturbed from this Derived Proposal	Current extent at the State/regional level[3]	Cumulative impact to the environmental value
	BHP MAC-South Flank	BHP MAC-South Flank Significant Amendment	RTIO Hope Downs 2	RTIO Yandicoogina – Revised Proposal[2]	BHP Yandi mine	BHP Yandi mine Significant Amendment	Polaris – Iron Valley BWT Proposal			
Vegetation										
Beard Vegetation Association 18	8,977 ha	595 ha	3,067 ha	0	693 ha	0	0	0 ha	671,843 ha[4]	No cumulative impact from the Derived Proposal
Beard Vegetation Association 82	12,750 ha	481 ha	1,792 ha	1,909 ha	3,987 ha	95 ha	149 ha	2,360 ha	2,550,888 ha[4]	23,523ha (>98% remaining)
Good to Excellent condition vegetation	19,696 ha	1,043 ha	4,205 ha	4,000 ha	508 ha	85 ha	988 ha	1,827 ha	-	32,352 ha
Riparian vegetation	Not stated	60 ha	54 ha	104 ha	Not stated	48 ha	Not stated	33.7 ha	-	300 ha
Priority flora										
Aristida lazaridis (P3)	2,774 individuals	476 individuals	395 individuals	No impact	Not stated	No impact	No impact	3 individuals	14,232 (93 populations)[5]	Cumulative total of 3,648 individuals (25% of regional individuals)
Ipomoea racemigera (P3)	No impact	No impact	No impact	No impact	Not stated	No impact	No impact	20 individuals	3,290 (77 populations)	Cumulative total of 20 individuals (0.6% of regional individuals)

Environmental value	Extent of loss from existing and reasonably foreseeable future projects[1]							Extent to be disturbed from this Derived Proposal	Current extent at the State/regional level[3]	Cumulative impact to the environmental value
	BHP MAC-South Flank	BHP MAC-South Flank Significant Amendment	RTIO Hope Downs 2	RTIO Yandicoogina – Revised Proposal[2]	BHP Yandi mine	BHP Yandi mine Significant Amendment	Polaris – Iron Valley BWT Proposal			
Rostellularia adscendens var. *latifolia* (P3)	297 individuals	43 individuals	No impact	No impact	Not stated	173 individuals	No impact	40 individuals	7,807 (138 populations)	Cumulative total of 553 individuals (7% of regional individuals)
Acacia bromilowiana (P4)	1 individual[6]	8 individuals	202 individuals	No impact	Not stated	No impact	No impact	144 individuals	4,099[7] (34 populations)	Cumulative total of 355 individuals (8.6% of regional individuals)
Sida sp. Barlee Range (P4)	47 individuals	80 individuals	No impact	No impact	Not stated	No impact	No impact	1,137 individuals	11,578[8] (98 populations)	Cumulative total of 1,264 individuals (11% of regional individuals)
Fauna habitats										
Ghost Bat Caves	5 High Value Caves and 12 low value caves (EPA Report 1610)	No impact	Two caves impacted – one Category 3 and one category 4	No impact	No impact	No impact	No impact	Three Category 4 caves impacted. An additional four caves with potential to be impacted (three Category 4	-	Cumulative four Category 4 caves and one Category 3 cave impacted. A further four caves with potential to be impacted

Environmental value	Extent of loss from existing and reasonably foreseeable future projects[1]							Extent to be disturbed from this Derived Proposal	Current extent at the State/regional level[3]	Cumulative impact to the environmental value
	BHP MAC-South Flank	BHP MAC-South Flank Significant Amendment	RTIO Hope Downs 2	RTIO Yandicoogina – Revised Proposal[2]	BHP Yandi mine	BHP Yandi mine Significant Amendment	Polaris – Iron Valley BWT Proposal			
								caves and one unsuitable).		
Western Pebble-mound mouse mounds	36 mounds	17 mounds	1 mound	11 mounds	Not stated	No impact	6 mounds	35 mounds	3,536	Cumulative 106 mounds impacted (approx. 3% of regional mounds).
Waterbodies/surface water pools	Not stated	No impact	No impact	No impact	Not stated	No impact	Not stated	No impact	-	No cumulative impact from the Derived Proposal
Critical habitat	9,307 ha for Pilbara Olive Python, Pilbara Leaf-nosed Bat and Northern Quoll (EPA Report 1610)	810 ha for Ghost Bat, Pilbara Olive Python, Pilbara leaf-nosed bat and Grey Falcon (BHP 2025e)	105 ha for Northern Quoll, Ghost Bat and Pilbara Olive Python (Hamersley HMS 2023)	Not stated	Not stated	72 ha for Pilbara Olive Python, Ghost Bat and Grey Falcon (BHP 2025d)	Not stated	269.2 ha for Ghost Bat, Northern Quoll and Pilbara Olive Python	-	Cumulative total 10,563.2 ha
Supporting habitat	6,635 ha of foraging habitat for Ghost Bat (EPA Report 1610)	1,045 ha Pilbara Olive Python, Northern Quoll,	2,659 ha for Northern Quoll, Ghost Bat and Pilbara Olive Python	Not stated	Not stated	72 ha for Northern Quoll, Pilbara Leaf-nosed Bat, Pilbara Olive Python and	Not stated	1,539.2 ha for Ghost Bat, Northern Quoll and Pilbara Olive Python	-	Cumulative total 11,950.2 ha

Environmental value	Extent of loss from existing and reasonably foreseeable future projects[1]							Extent to be disturbed from this Derived Proposal	Current extent at the State/regional level[3]	Cumulative impact to the environmental value
	BHP MAC-South Flank	BHP MAC-South Flank Significant Amendment	RTIO Hope Downs 2	RTIO Yandicoogina – Revised Proposal[2]	BHP Yandi mine	BHP Yandi mine Significant Amendment	Polaris – Iron Valley BWT Proposal			
		Pilbara Leaf-nosed Bat and Grey Falcon (BHP 2025e)	(Hamersley HMS 2023)			Grey Falcon (BHP 2025d)				

[1] Existing and reasonably foreseeable future projects within 40 km of the Proposal include Yandicoogina Revised Proposal (Rio Tinto 2015]), MAC/SF (BHP 2017b), Hope Downs 2 (Hamersley HMS 2023), BHP Yandi mine (existing) and Yandi mine E8 Proposal (BHP 2025d; currently under assessment by EPA), Mining Area C-South Flank Significant Amendment Central Pilbara Hub Surplus Water Proposal Stage 1 (BHP 2025e; currently under assessment by EPA) and Iron Valley Below Water Table Proposal (AECOM 2016). Data for original mining areas such as RTIO Yandicoogina and Hope Downs is not publicly available.

[2] Comprises values from the two recent expansions of the Yandicoogina Iron Ore Project (JSW and Oxbow and Pocket and Billiard South). The original Yandicoogina Iron Ore Project EIA documents are either unavailable or contain limited information given the age of the project.

[3] Regional records sourced from internal BHP Datasets unless otherwise reported

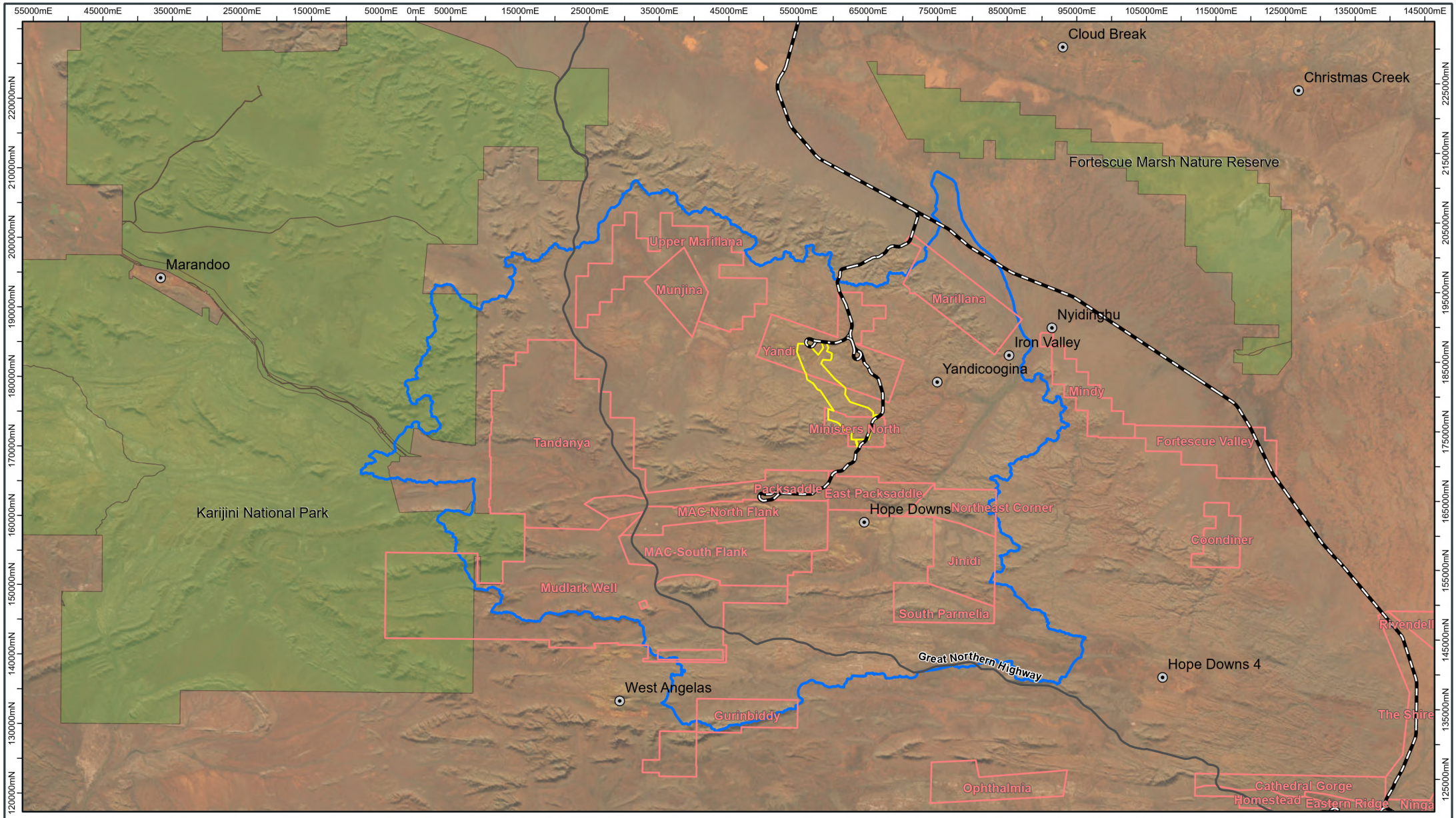
[4] Based on current DBCA data for the Pilbara bioregion (DBCA 2019b). The current extent of Associations 18 and 82 statewide are 19,843,148 ha and 2,553,206 ha respectively.

[5] Sourced from internal BHP Datasets: noting other sources indicate higher regional records (e.g. > 23,000 individuals Source: EPA (2024d))

[6] The MAC/SF PER states 1 population will be impacted with '1% cover'. The number of individuals has been estimated as one.

[7] Source EPA 2024e: Regional records of 4,551, minus 452 individuals approved for impact.

[8] Source EPA 2024e: Regional records of 12,212 individuals from Brockman Syncline Proposal (minus 2,054 approved for impact), plus 1,421 from the current Derived Proposal targeted survey (Spectrum 2023).



Legend

- Other Mining Operations
- Rail (BHP)
- Major Roads
- Development Envelope (5,557 ha)
- Conservation Area
- Projects
- WAIO Central Catchment

N

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KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

MINISTERS NORTH
CUMULATIVE IMPACTS WITH NEARBY OPERATIONS

WAIO PLANNING, TECHNICAL AND ENVIRONMENT

SCALE @ A3:	1:725,000	REQUESTOR:	ENVIRONMENT	FIGURE:	15-2
DATE:	8/09/2025	PREPARED:	GEOMATICS	NO:	A1317_056C
		REVIEWED:			

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Appendices

Appendix 1 Proposal Content Document

Appendix 2 Derived proposals clearing extent tracking

Declared Derived Proposal Title	Derived Proposal Number	Derived Proposal Declaration date	Derived proposal clearing extent (ha)	Cumulative clearing extent (ha)	Remaining clearing extent (ha) [Against authorised extent of 98,500 ha]
Orebody 32 Below Water Table	1	27 September 2023	224	224	98,276
Western Ridge	2	27 September 2023	4,281	4,505	93,995
Ministers North	3	To be confirmed	1,848	6,353	92,147

Appendix 3 Proposed content for Section 38E(6) and Section 45B notices

NOTICE OF SECTION 38E DECLARATION
THAT PROPOSAL IS A DERIVED PROPOSAL
(Section 38E(6) of the Environmental Protection Act 1986)

Schedule 1 - Description of Derived Proposal

Derived Proposal: Ministers North

Proponent: BHP Iron Ore Pty Ltd (ACN) 008 700 981

Proponent Address: 125 St Georges Tce PERTH WA 6000

Description of the Derived Proposal: As detailed in Tables 1 and 2 and Figures 1 and 2

Table 1: General proposal description

Proposal title	Ministers North (Derived Proposal)
Proponent name	BHP Iron Ore Pty Ltd
Short description	The Proposal is for iron ore mining operations at Ministers North, as a Derived Proposal considered as part of the BHP Pilbara Expansion Strategic Proposal under the Ministerial Statement 1105 approval (Figure 1) The Derived Proposal comprises a Development Envelope of 5,556.6 hectares (ha) and an Indicative Footprint of up to 2,360 ha with clearing of up to 1,848 ha of native vegetation. The location and extent of the Derived Proposal is identified by Figure 2. The Derived Proposal is located approximately 15 km south-east of BHP's existing Yandi Mining Operations (Yandi). The Derived Proposal includes the following main elements and activities: • Above water table mining in open mine pits. • Stockpiling of ore on a Run of Mine (RoM) pad prior to transport of ore to Yandi. • A Central Overburden Storage Area (OSA) and in-pit backfilling of the mine pits. • Infrastructure corridor connecting Ministers North to Yandi. • A new primary crusher at Yandi to accommodate the Brockman-type ore supply. • Mine access roads and tracks to connect various mining infrastructure. • Borrow pits, laydown areas, stockpiles (topsoil, subsoil, vegetation). • Surface water management infrastructure. • Water supply pipelines (including requirement for pump stations and turkey's nests). • Ground disturbance and earthworks. • Drilling and blasting. • Associated infrastructure to support the mine construction and operation, including, but not limited to, administration, workshops, warehouse/storage, vehicle parking, vehicle and equipment wash-down, fuel and explosives storage, power generation and transmission lines, services infrastructure, pipelines, wastewater treatment, and communications. • Rehabilitation and decommissioning activities.

Table 2: Authorised extent of proposal elements

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Mine and associated infrastructure for construction and operation	Figure 2	Indicative Footprint of up to 2,360 ha, including up to 1,848 ha of native vegetation clearing, within a 5,556.6 ha Development Envelope.
Operational elements		
Production capacity (crushed ore)	-	Up to 25 million tonnes per annum (Mtpa)
Overburden storage (ex-pit storage)	-	Up to 30 Mtpa, cumulative of 160 Mt.
Water supply	-	Water supply will be sourced from other users including BHP operations and third parties.
Max pit depth (at closure)	-	569mAHD (minimum 5m separation from groundwater table)
Proposal elements with greenhouse gas emissions		
Peak emissions		
Mining and associated activities (including land use change)	Scope 1 – 123,524 t CO_2-e annual emissions (maximum)	
Electricity demand[67]	Scope 1 – 31,288 t CO_2-e annual emissions (maximum)	
Rail transport	Scope 1 – 38,052 t CO_2-e annual emissions (maximum)	
Electricity demand[1]	Scope 2 – Nil	
Downstream emissions (including port, iron ore shipping and steel making)	Scope 3 – 27,075,066 t CO_2-e annual emission (maximum)	
Annual average emissions		
Mining and associated activities (including land use change)	Scope 1 – 101,735 t CO_2-e annual emissions (average) for a total of 1,538,460 t CO_2-e over the operational life of the Derived Proposal	
Electricity demand	Scope 1 – 25,226 t CO_2-e annual emissions (average) for a total of 378,388 t CO_2-e over the operational life of the Derived Proposal	
Rail transport	Scope 1 – 30,691 t CO_2-e annual GHG emissions (average) for a total of 460,358 t CO_2-e over the operational life of the Derived Proposal	
Downstream emissions (including port, iron ore shipping and steel making)	Scope 3 – 21,837,456 t CO_2-e annual GHG emissions (average) for a total of 327,561,834 t CO_2-e over the operational life of the Derived Proposal	
Rehabilitation		
Rehabilitation (as a component of mine closure) will be undertaken for all cleared land areas excluding the pit voids at closure (which are unable to be rehabilitated due to the consolidated rock substrate). Rehabilitation works will be completed progressively where practicable.		
Commissioning		
Commissioning will be undertaken in accordance with the requirements of approvals under the *Environmental Protection Act 1986.*		
Decommissioning		
Mine closure for the Derived Proposal will be implemented in accordance with a Mine Closure Plan (MCP). The overarching implementation objective of the MCP is to ensure the site is decommissioned and rehabilitated to be safe, stable and non-polluting and in an ecologically appropriate and sustainable manner to allow for a post-mining land use.		

Figure 1: Proposal location in relation to the Strategic Proposal

Figure 2: Proposal development envelope

[67] In the context of BHP's Strategic Assessment boundary, emissions which occur outside of the Development Envelope associated with Yarnima Power Station and Rail transport operations are identified as Scope 1 emissions

NOTICE OF TAKING EFFECT OF STRATEGIC PROPOSAL STATEMENT IN RELATION TO DERIVED PROPOSAL (Section 45B(2) of the *Environmental Protection Act 1986*)

Strategic Proposal: Pilbara Expansion Strategic Proposal

Strategic Proposal Statement No: Ministerial Statement 1105 published on 11 July 2019

Derived Proposal: Ministers North

Proponent: BHP Iron Ore Pty Ltd (ACN) 008 700 981

Having received written notice on XX MMM YYYY under section 38E(6)(b) of the Act that the Environmental Protection Authority has declared the above proposal a derived proposal, I hereby give notice pursuant to section 45B(2) of the Act, that:

1. The implementation agreement previously made in relation to the derived proposal has taken effect on XX MMM YYYY.

2. The following implementation conditions in Statement No. 1105 dated 11 July 2019 apply to this Derived Proposal subject to any changes made pursuant to section 45C or 46 of the *Environmental Protection Act 1986*:

    - 1 Derived Proposals
    - 2 Contact Details
    - 3 Time Limit for Substantial Commencement
    - 4 Compliance Reporting
    - 5 Public Availability of Data
    - 6 Condition Environmental Management Plans
    - 8 Terrestrial Fauna Environmental Management Plan
    - 11 Air Quality Management Plan
    - 15 Rehabilitation and decommissioning
    - 16 Offsets

Schedule 1 - Description of Derived Proposal

Content as for s38E Notice

Appendix 4 BHP Rehabilitation Report

Appendix 5 Inland Waters Study Reports

Appendix 6 Flora and Vegetation Study Reports

Appendix 7 Terrestrial Fauna Study Reports

Appendix 8 Subterranean Fauna Study Reports

Appendix 9 Air Quality Study Reports

Appendix 10 Terrestrial Fauna EMP

Appendix 11 Air Quality Environmental Management Plan

Appendix 12 Mine Closure Plan

Appendix 13 Impact Reconciliation Procedure

Appendix 14 IBSA data packages

BHP has provided biodiversity data and reports as part of the IBSA data package, prepared consistent with the EPA's *Instruction for the preparation of data packages for the Index of Biodiversity Surveys for Assessments* (IBSA) (EPA 2021c).

The biodiversity surveys identified in Sections 6.3.1, 7.3.1 and 8.3.1 and their corresponding IBSA portal submission status are presented in the table below.

Title	IBSA number
Flora and Vegetation	
Spectrum Ecology Pty Ltd (2023) *Ministers North Targeted Significant Flora and Vegetation Assessment*.	IBSA-2025-0095
Biologic Environmental Survey Pty Ltd (Biologic) (2023a) *Yandi E8 Targeted Flora Survey*	IBSA-2025-0041
Biologic (2024a) *Central Pilbara Hub Targeted and Detailed Flora Survey*	IBSA-2024-0443
GHD Pty Ltd (GHD) (2022) *Targeted Flora Surveys of Pipeline Corridors*	IBSA-2025-0387
Biologic (2020a) *Ministers North Miscellaneous Licence Area Amendment Surveys and Yandicoogina Creek Detailed Flora and Vegetation Assessment.*	IBSA-2025-0218
Onshore Environmental Consultants Pty Ltd (Onshore Environmental) (2020) *Ministers North and Yandi Vegetation Association and Condition Mapping*	Not required (is an internal amalgamation, data provided on other reports)
Astron Environmental Services Pty Ltd (2018) *Area C West to Yandi Flora and Vegetation Assessment.*	IBSASUB-20250909-EDC37B6D
Onshore Environmental (2018a) *Yandicoogina Creek Reconnaissance Vegetation Survey*.	IBSASUB-20250909-5A7EE7F1
Onshore Environmental (2018b) *Ministers North to Yandi Corridor Flora and Vegetation Survey*	IBSA-2020-0338
Biologic (2017a) *Ministers North to Yandi Corridor Single Phase Level 2 Fauna and Detailed Flora/Vegetation Survey*	IBSA-2020-0279
Biota Environmental Sciences Pty Ltd (Biota) (2017) *Ministers North Detailed Flora and Vegetation Survey*.	IBSA-2024-0314
Terrestrial Vertebrate Fauna	
Astron Environmental Services Pty Ltd (Astron) (2025) Consolidated Ministers North Targeted Significant Vertebrate Fauna Surveys	IBSA-2025-0297
Astron (2023a) Yandi 45C Targeted Significant Vertebrate Fauna Survey.	IBSA-2025-0038
Biologic (2023b) Central Pilbara Hub: Targeted Matters of National Environmental Significance Vertebrate Fauna Survey	IBSA-2024-0319
Biologic (2023d) Targeted Pilbara Olive Python Survey: South Flank and Mining Area C	IBSASUB-20250206-4B3B3C15
GHD Pty Ltd (GHD) (2021b) Ministers North Fauna Survey Level 2 Survey	IBSASUB-20250909-DEE2D26C
GHD (2021a) Ministers North Fauna Survey Level 1 Survey	IBSA-2025-0263
Biologic (2018a) Ministers North to Yandi Corridor Two Phase Targeted Fauna Survey	IBSA-2020-0337
Biologic (2017b) Ministers North Level 2 Vertebrate Fauna Survey	IBSA-2024-0315

Title	IBSA number
Short-range Endemic Fauna	
Bennelongia Pty Ltd (Bennelongia) (2024a) Ministers North Short-Range Endemic (SRE) Desktop and Field Survey	IBSA-2025-0046
Bennelongia (2024b) Yandi Operations Short-Range Endemic Fauna Survey Report.	IBSA-2025-0040
Biologic (2021) Ministers North and Yandicoogina Creek Short Range Endemic Invertebrate Fauna Survey	IBSASUB-20250909-0D3AE161
Biologic (2018b) Ministers North to Yandi Corridor SRE Invertebrate Fauna Survey	IBSA-2025-0409
Aquatic Fauna	
Biologic (2024b) Ministers North Yandicoogina Creek Aquatic Ecosystem Survey Dry 2022 and Wet 2023	IBSA-2025-0068
Biologic (2023c) Ministers North Aquatic Ecosystem Survey: Dry 2021 – Wet 2022	IBSA-2025-0073
Biologic (2022) Ministers North: Yandicoogina Creek Aquatic Ecosystem Surveys Dry 2020 and Wet 2021	IBSA-2025-0433
Biologic (2020b) Ministers North: Yandicoogina Creek Aquatic Ecosystem Surveys	Submission in progress: data requires additional processing
Wetland Research and Management (WRM) (2018) Yandi: Marillana Creek Aquatic Fauna Survey - Wet & Dry 2017 Sampling Final Report	IBSA-2025-0410
Subterranean Fauna	
Biologic (2025) *Ministers North Troglofauna Habitat Model and Impact Assessment*	Not required. Habitat model and impact assessment, no new biological sampling undertaken
Bennelongia (2024c) *Ministers North Subterranean Fauna Survey*	IBSA-2025-0217
Bennelongia (2021) *Ministers North targeted troglofauna survey*	IBSASUB-20250909-46B35781
Bennelongia (2018) *Ministers North Subterranean Fauna Survey*	IBSA-2025-0411
Subterranean Ecology (2010) Pilbara Regional Subterranean Fauna Survey Area C North Mining Area - Ministers North	IBSA-2025-0432
Bennelongia (2025) *Yandi Targeted Subterranean Fauna Survey Report*	IBSA-2025-0425
Bennelongia (2024d) *Yandi Operations Subterranean Fauna Survey Report*	IBSA-2025-0215

Appendix 15 Likelihood of occurrence tables

Table A16-1 Flora and Vegetation: Significant Flora Likelihood of occurrence

Species	Conservation Status	Description	Distribution	Identified within Strategic Proposal	Likelihood of occurrence[68]
Synostemon hamersleyensis	T[69]	Glabrous monoecious or dioecious subshrub from a perennating, woody rootstock with stems much branched. Up to 50 cm high.	Typically restricted to the south-east Pilbara within the Hamersley IBRA subregion.	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest Low likelihood of occurrence.
Calotis squamigera	P1	Procumbent annual, herb, to 0.21 m high, with yellow flowers in July.	Typically restricted to the south-east Pilbara, within the Fortescue and Hamersley IBRA subregions.	Yes	Medium - annuals can have lower detectability during surveys and suitable habitat exists.
Triodia sp. Karijini (S. van Leeuwen 4111)[70]	P2	Perennial hummock grass up to 1 m high. Soft leaf blades. Foliage non-resinous to weakly resinous; leaf sheath surfaces hairy or not	Restricted distribution, with known records around and within Karijini National Park. Occurs on or near outcropping ironstone, on summits or steep hillslopes of mountains.	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest Low likelihood of occurrence.
Hibiscus sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	Spindly upright shrub up to 3 m tall with purple flowers.	Scattered records across the Hamersley subregion. Typically occurring on gravelly, pebbly red-brown loam.	Yes	Medium - Suitable habitat exists, however survey effort sufficient to suggest 'Medium' likelihood of occurrence.
Aristida lazaridis	P3	Tufted perennial grass-like or herb to 1.5 m high with green/purple flowers in April.	*Aristida Lazaridis* has a recorded distribution of approximately 150 km from > 15 location records extending from the Karijini National Park (near the Karijini National Park Airstrip) to north-west of Newman (near Rio Tinto Hope Downs 4 Mine).	Yes	Recorded.
Ipomoea racemigera	P3	Creeping annual, herb or climber. Superficially, it closely resembles the unlisted taxon *Ipomoea plebeia*	A restricted taxon in Western Australia, with records mainly recorded from sandy soils along medium and major watercourses in the Pilbara region from Jimblebar Mine to Millstream Chichester National Park. However, it is a common taxon through northern-central and eastern central Australia	No	Recorded. Note – Spectrum (2023) classified this species as Medium likelihood, however, historic records occur across the Derived Proposal (at Yandi outside of the Survey area for Spectrum (2023))

[68] Occurrence criteria as per Spectrum (2023) – High: Species or vegetation community recorded within 10 km near the Survey Area, and suitable habitat does, or is likely, to occur; Medium - Species or vegetation community recorded outside the Survey Area but within 30 km and suitable habitat may occur; and Low - Species or vegetation community rarely or not recorded within 50 km of the Survey Area and suitable habitat is not likely to occur within the Survey Area

[69] Synostemon hamersleyensis I.Telford & Naaykens has been upgraded from P1 to being listed as a Threatened flora species since Spectrum (2023)

[70] Most recently known as *Triodia karijini* M.D.Barrett & S.J.Dillon and its status has changed from P1 to P2 since the Spectrum (2023) report.

Species	Conservation Status	Description	Distribution	Identified within Strategic Proposal	Likelihood of occurrence[68]
Cladium procerum	P2	Densely tufted perennial, grass-like or herb (sedge), 2 m high. Flowers in November.	Typically associated with perennial pools and swamps, across the Chichester, Fortescue and Hamersley subregions.	No	Low – no suitable habitat (perennial pools and swamps)
Eragrostis sp. Mt Robinson (S. van Leeuwen 4109)	P3	Tussock-forming perennial, grass-like or herb, to 0.3 m high. Flowers in September.	Largely restricted to upper slopes of Mt Robinson where it occurs with a suite of other significant flora. Occurs on red-brown skeletal soils, ironstone, on steep slopes, summits.	Yes	Medium - Suitable habitat exists, however survey effort sufficient to suggest 'Medium' likelihood of occurrence.
Eremophila sp. West Angelas (S. van Leeuwen 4068)	P3	Spindly shrub up to 3 m high	Largely restricted to the upper slopes of Mt Robinson but also occurs within a small range extending to the southwest and southeast towards Newman.	Yes	Low – no suitable habitat (Mulga Plains)
Fimbristylis sieberiana	P3	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge) to 0.6 m high with brow flowers in May to June.	*Fimbristylis sieberiana* has a recorded distribution of approximately 1,300 km from > 20 location records extending from west of the Chichester National Park (west) to the Purnululu National (east).	No	High. Recorded in proximity to the Derived Proposal in earlier surveys (scattered throughout Yandicoogina Creek).
Gymnanthera cunninghamii	P3	Shrub 1.6-2.3 m high, with pendulous, green, glossy leaves, milky sap in the stems, cream-yellow-green flowers in January to December.	*Gymnanthera cunninghamii* has a recorded distribution of approximately 850 km from > 30 location records extending from Exmouth (west) to near Eighty Mile Beach (east). A single location record also occurs in the Northern Territory	No	Recorded.
Rostellularia adscendens latifolia	P3	Compact herb 20-50 cm high, with a woody base, Inflorescence in a dense terminal spike a with pink/purple corolla.	*Rostellularia adscendens* var. *latifolia* has a recorded distribution of approximately 450 km from > 30 location records extending from the Hamersley Range (west) to north-east of Meentheena Station (east).	Yes	Recorded.
Eremophila naaykensii	P3	Shrub or small tree to 2.5 m height with grey to very pale grey slightly fissured bark, with yellowish, greenish, red or purple-tinged flowers.	*Eremophila naaykensii* has a recorded distribution of approximately 220 km from > 15 location records extending from Paraburdoo (west) to Newman (east). Recorded locations include the secure conservation tenure of the Karijini National Park.	Yes[71]	Recorded. Note – Spectrum (2023) classified this species as a High likelihood of occurrence, however, historic records occur across the Derived Proposal
Amaranthus centralis	P3	Erect, to 60 cm high. Stems angular, sometimes reddish, sparsely hairy with glandular or	Records across the Fortescue, Hamersley, Mann-Musgrave Block IBRA subregions. Occurs on red sand in ephemeral watercourses. Sandy to clayey	No	Medium - annuals can have lower detectability during surveys and suitable habitat exists.

[71] Assessed under the Strategic Assessment as *Eremophila* sp. Hamersley Range (K. Walker KW 136)

Species	Conservation Status	Description	Distribution	Identified within Strategic Proposal	Likelihood of occurrence[68]
		multicellular hairs or becoming glabrous; leaf axils spineless.	loam. Riverbanks. Edges of permanent pools in eucalypt lined channels.		
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	P3	Open, erect annual or biennial, herb, up to 0.2 m high with yellow flowers.	Regionally known from multiple localities between Paraburdoo and Mount Cooke. Recorded in both the Pilbara and Gascoyne IBRA Regions. It is habitat-specific, occurring on calcrete formations in close proximity to major drainage lines	Yes	Medium - annuals can have lower detectability during surveys and suitable habitat exists.
Aristida jerichoensis var. subspinulifera	P3	Compactly tufted perennial, grass-like or herb, 0.3-0.8 m high, with a muricate lemma groove.	Occurs in large numbers in NSW and QLD, with smaller populations in the NT, South Australia and WA. Typically found on flat terrain, red clay loam, low in the landscape and hardpan plains.	Yes	Low – No suitable habitat (hardpan plains)
Dampiera metallorum	P3	Rounded, multi-stemmed perennial, herb, up to 0.5 m high with blue flowers.	Restricted to the Hamersley Ranges within and east of Karijini National Park. Known from the slopes of Mt Robinson. Occurs on skeletal red-brown gravelly soil over banded ironstone. Steep slopes. Summits of hills.	Yes	Low – No suitable habitat (banded ironstone)
Rhagodia sp. Hamersley *(M. Trudgen 17794)*[72]	Previously P3- No longer listed (see footnote)	Erect shrub to 1.5 m.	Widely distributed taxon associated with mulga on floodplains. Records occur within Karijini National Park. Occurs on flat plains, floodplain, hillslope. Red sandy loam with surface cobbles.	Yes	Low – No suitable habitat (Mulga plains)
Acacia effusa	P3	Low, dense, spreading, somewhat viscid shrub, 0.3-1 m high, 'minni-ritchi' bark and yellow flowers	Records across the Hamersley IBRA subregion, including records in Karijini National Park. Occurs on gently inclined footslope. Brown sandy loam soil	No	Low - No suitable habitat (gentle foot slopes near floodplains)
Acacia subtiliformis	P3	Spindly, slender, erect shrub, up to 3.5 m high. The new growth is slightly viscid, resinous, and aromatic while the inflorescence occurs in heads to 6 mm diameter with red peduncles and yellow flowers.	Recorded extensively between Newman and Karijini National Park, a range of approximately 120 km east-west and 90 km north-south. Habitat specific occurring on rocky calcrete low hills and plains.	Yes	Low - No suitable habitat (rocky calcrete plateaux)
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	Prostrate herb with fleshy leaves, blue-mauve petals, and immature fruit brown.	Widespread across the Pilbara, occurring within the Chichester, Fortescue, Hamersley, and Roebourne IBRA Subregions. Occurs on cracking clays.	No	Medium - annuals can have lower detectability during surveys and suitable habitat exists.

[72] This species was removed from the Priority flora list on 04/03/2025 (DBCA)

Species	Conservation Status	Description	Distribution	Identified within Strategic Proposal	Likelihood of occurrence[68]
Euphorbia australis var. glabra	P3	Prostrate annual or perennial herb, up to 0.02-0.1 m high with red-pink flowers.	Records known across the Chichester, Fortescue, Hamersley IBRA subregions including records in Karijini National Park. Occurs on broad, flat plain calcrete platform and plains.	No	Medium - annuals can have lower detectability during surveys and suitable habitat exists.
Indigofera gilesii	P3	Shrub up to 1.5 m high with purple-pink flowers.	Widely distributed within the southeast Pilbara (west of Newman) and represented in three other bioregions extending east to the Northern Territory border and south to Wiluna	Yes	Medium - Suitable habitat exists, however survey effort sufficient to suggest 'Medium' likelihood of occurrence
Glycine falcata	P3	Mat forming perennial herb up to 0.2 m with blue/purple flowers	Previously recorded between Karratha and Newman in the Pilbara, and also from the Kimberley, but also is widespread and common across the NT and Queensland with an isolated population in NSW.	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence
Goodenia lyrata	P3	Prostrate herb, with lyrate leaves and yellow flowers.	The distribution extends east and south outside the Pilbara bioregion to the NT border. The Pilbara populations are relatively localised, but conservation is enhanced by plants occurring within the Coondewanna Flats PEC boundary.	Yes	Low - No suitable habitat (claypans)
Grevillea saxicola	P3	Tall shrub to 2.5 m.	Occurring east of Newman along the southern fringe of the Pilbara. Recorded from the eastern end of the Packsaddle Range, southern slopes of BHP Billiton Iron Ore's Jinidi tenements, and western fringe of Mt Robinson.	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence.
Isotropis parviflora	P3	Shrub, up to 0.1 m high with white/pink flowers.	This species is known from the northern fringe of the Hamersley Range, and records border Karijini National Park. It is considered likely that this species occurs within the Karijini National Park. Recorded outside of the Pilbara Region within the Great Sandy Desert and Tanami regions.	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence.
Pilbara trudgenii	P3	Gnarled, aromatic shrub, up to 1 m high	Restricted to the south-east Pilbara, with records from Mt Robinson. Records occur within Karijini National Park. Occurs on skeletal red stony soil over ironstone on hill summits, steep slopes, screes and cliff faces.	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence

Species	Conservation Status	Description	Distribution	Identified within Strategic Proposal	Likelihood of occurrence[68]
Solanum kentrocaule	P3	Shrub to 1.5 m high, extremely prickly with purple flowers	Occurs throughout the southern Pilbara and into the northern Gascoyne bioregions. A number of records occur within Karijini National Park. Prefers brown/rocky soil, in gorges and drainage lines.	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence
Stylidium weeliwolli	P3	Annual, herb, 0.1-0.25 m high with four red-shaped throat appendages and pink/red flowers	Recorded across the Gascoyne and Pilbara Regions, occurring within the Ashburton, Augustus, Chichester, Fortescue and Hamersley IBRA subregions. Prefers gritty sand soil, sandy clay, edge of watercourses.	No	Low – No suitable habitat (edge of permanent pools and gorges)
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	P3	Tussock grass.	Extensively distributed within the southeast Pilbara and extending northwest to Karratha. Occurs in flat terrain, low in landscape. Red loamy soil with some alluvial sand material and stones.	Yes	Low – No suitable habitat (cracking clay)
Triodia basitricha	P3	Curly leaf spinifex to 0.5 m.	Recorded across the Gascoyne and Pilbara Regions, occurring within the Ashburton, Chichester, Fortescue and Hamersley IBRA subregions. Occurs on hill slopes, crest of range, skeletal clay loam over ironstone.	No	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence
Triodia sp. Mt Ella (M.E. Trudgen 12739)	P3	Perennial, grass-like or herb, 0.4 m high	Recorded across the Gascoyne, Little Sandy Desert and Pilbara regions. Within the Pilbara region it is known from records near Karijini National Park and also the eastern end of the Ophthalmia Range. Prefers gullies, hill slopes and drainage lines	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence
Vittadinia sp. Coondewanna Flats (S. Vanleeuwen 4684)	P3	Tall daisy to 1 m, open canopy with cream/white flowers.	Recorded around and within Karijini National Park, and within and around the Coondewanna Flats. Prefers flat terrain, low in landscape. Red clay loam with some stone. Gilgai. Drainage lines.	Yes	Low – No suitable habitat (gilgai and cracking clay)
Acacia bromilowiana	P4	Gnarled tree or shrub 1.2-6 m tall, variably domed, and grey fissured bark; yellow/pink flowers in July to August.	*Acacia bromilowiana* has a recorded distribution of approximately 450 km from > 15 location records extending from the Hamersley Range (west) to north of Jigalong (east).	No	Recorded
Sida sp. Barlee Range (S. van Leeuwen 1642)	P4	Shrub 15-80 cm high, with grey-blue leaves with yellow flowers in August.	*Sida sp.* Barlee Range has a recorded distribution of approximately 400 km from > 30 location records extending from the Barlee Nature Reserve (west) to towards Newman (east).	Yes.	Recorded.

Species	Conservation Status	Description	Distribution	Identified within Strategic Proposal	Likelihood of occurrence[68]
Lepidium catapycnon	P4	Open, woody perennial, herb or shrub, 0.2-0.3 m high, stems zigzag. Flowers white	Broadly distributed between the Pilbara towns of Newman, Nullagine and Wittenoom. Known populations occur within Karijini National Park. Prefers skeletal soils, hillsides.	Yes	Medium – suitable habitat exists in the Derived Proposal
Eremophila magnifica subsp. magnifica	P4	Shrub up to 0.5-1.5 m high with blue flowers	This species is known from the Hamersley Ranges, with a number of populations occurring within Karijini National Park. It occurs on rocky slopes in open *Eucalyptus* and *Acacia* shrublands, often associated with Triodia hummock grassland.	Yes	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence
Ptilotus mollis	P4	Compact, perennial shrub, up to 0.5 m high, soft grey foliage with white/pink flowers	Known from the Little Sandy Desert and Pilbara IBRA Regions. Prefers moderately steep midslope, stony hills and screes.	No	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence
Rhynchosia bungarensis	P4	Compact, prostrate, or spreading shrub, to 0.5 m high.	Known from the Carnarvon, Gascoyne, Pilbara, Tanami IBRA Regions. Prefers gently inclined drainage depression. Brown silty loam soil.	No	Low - Suitable habitat exists, however survey effort sufficient to suggest 'Low' likelihood of occurrence

Table A16-2 Terrestrial Fauna - significant fauna likelihood of occurrence

Species	Conservation Code			Habitat preference (as per Astron 2025)	Identified within Strategic Proposal	Likelihood of occurrence
	EPBC	BC	DBCA			
Reptiles						
Great Desert Skink (*Liopholis kintorei*)	VU	VU	-	Most commonly found on red sandplains and sand ridges. Sparsely distributed across arid sand flats and clay-based or loamy soils vegetated with spinifex. Suitable habitat was limited within the Derived Proposal area	No.	Low (limited habitat availability, with all known records further east).
Pilbara Olive Python (*Liasis olivaceus barroni*)	VU	VU	-	Generally rocky habitats in close association to permanent and semi-permanent water sources. This includes gorges, rock pools, and riparian zones.	Yes.	High (Recorded in proximity to the Derived Proposal).
Pilbara Flat-headed Blind Snake / Gane's Blind Snake (*Anilios ganei*)	-	-	P1	Gane's Blind Snake lives underground, and accordingly, is rarely encountered in field surveys. Little information is available on this species, but it is believed to be associated with moist gorges and gullies. Suitable habitat is common throughout the Derived Proposal area.	Yes.	High (Recorded in proximity to the Derived Proposal).
Pilbara Barking Gecko (*Underwoodisaurus seorsus*)	-	-	P2	Confined in the Pilbara to the Hammersley Ranges from Tom Price to Newman. Occurs in rocky areas with spinifex and low tree cover.	Yes.	High (nearest record approximately 7.5 km south of the Derived Proposal. Suitable habitat occurs within the Survey Area).
Unpatterned Robust Slider (Robertson Range) (*Lerista macropisthopus remota*)	-	-	P2	Acacia shrublands and woodlands in the central interior. Shelters in loose soil under leaf litter at the base of shrubs. Preferred habitat is limited to Floodplains/Drainage Areas within the Derived Proposal area.	Yes.[73]	Low (all known records all records over 30 km south of the Derived Proposal).
Birds						
Curlew Sandpiper (*Calidris ferruginea*)	CR/MI	CR	-	Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast. Preferred habitat is limited within the Derived Proposal area.	Yes.	Low (limited suitable habitat, no nearby records).

[73] The BHP Strategic assessment considered this species, but noted, the only known records of *Lerista macropisthopus remota*, adjacent to BHP Billiton Iron Ore's Whaleback operations were incorrect. These were records of *Lerista neander*.

Species	Conservation Code			Habitat preference (as per Astron 2025)	Identified within Strategic Proposal	Likelihood of occurrence
	EPBC	BC	DBCA			
Night Parrot (*Pezoporus occidentalis*)	EN	CR	-	Arid and semi-arid areas characterised by dense, low vegetation. Habitat consists of *Triodia* grasslands in stony or sandy environments, of samphire and chenopod shrublands, on floodplains and claypans and margins of salt lakes, creeks, and other water sources. The habitat required for this species, being old growth hummock grassland and/or chenopod shrubland, does not occur within the Derived Proposal area.	Yes.	Low (The habitat required for this species does not occur within the Derived Proposal area).
Australian Painted Snipe (*Rostratula australis*)	EN	EN	-	Inhabits shallow terrestrial freshwater wetlands, lakes, swamps, and claypans. Also found in waterlogged grassland and saltmarsh. Preferred habitat is limited within the Derived Proposal Area.	Yes.	Low (preferred habitat is limited, and nearest records occur > 40 km from the Derived Proposal area).
Red Goshawk (*Erythrotriorchis radiatus*)	VU	VU	-	This species usually occurs in the tropics and subtropics of northern and eastern Australia however there are occasional records in the Pilbara, likely dispersing juveniles. This species may be an unlikely vagrant to the Derived Proposal area.	No.	Low (only occasional records in Pilbara, if present, would be an unlikely vagrant).
Grey Falcon (*Falco hypoleucos*)	VU	VU	-	Occurs in open habitats of semi-arid deserts, grassy inland plains, timbered watercourses, and pastoral lands. Moderate chance of occurring along major drainage lines with large trees and foraging within supporting habitats of drainage area/floodplain and minor drainage line habitats	Yes.	Moderate (nearest records approximately 24 km south-west, however, suitable habitat occurs within Derived Proposal area).
Southern Whiteface (*Aphelocephala leucopsis*)	VU	-	-	Inhabits a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. The species prefers Acacia woodlands, particularly those dominated by mulga and drought-resistant chenopod shrub species, including saltbush and bluebush.	No.	Moderate (Derived Proposal area is within the modelled 'known to occur' distribution)
Princess Parrot (*Polytelis alexandrae*)	VU	-	P4	The Princess Parrot inhabits sand dunes and sand flats in the arid zone of western and central Australia. Preferred habitat is limited, and this species distribution is on the western edge of its range.	Yes.	Low (nearest records >60 km from the Derived Proposal).
Peregrine Falcon (*Falco peregrinus*)	-	OS	-	Cosmopolitan, will hunt in any habitat, soaring at height or from a perch, often near cliffs. Nests on rocky ledges in tall, vertical cliff faces and tall trees associated with	Yes.	Recorded (a single record being of an individual perched on a tree above a gorge)

Species	Conservation Code			Habitat preference (as per Astron 2025)	Identified within Strategic Proposal	Likelihood of occurrence
	EPBC	BC	DBCA			
				drainage lines. High chance of occurring along major drainage lines with large trees.		
Letter-winged Kite (*Elanus scriptus*)	-	-	P4	The letter-winged kite is a bird of open country and grasslands in arid and semi-arid Australia, where there are tree-lined streams or water courses. Tree-lined drainage lines and drainage/floodplain areas provide suitable habitat within the Derived Proposal area.	Yes.	Low (if present would likely be a vagrant)
Mammals						
Northern Quoll (*Dasyurus hallucatus*)	EN	EN	-	Occurs in a variety of habitats but commonly found in rocky escarpments and open lowland savanna forest. Found in areas associated with rocky areas, but also along watercourses. Suitable habitat is common throughout the Derived Proposal area.	Yes.	High (Recorded in proximity to the Derived Proposal).
Black-flanked Rock-wallaby (*Petrogale lateralis lateralis*)	EN	EN	-	This species is patchily distributed across Western Australia. Populations are scattered and restricted to sites with suitable rocky habitat with caves and crevices. Suitable habitat is found within the Derived Proposal area.	Yes.	Low (Nearest record approximately 70 km from the Derived Proposal, and only spare records occur)
Greater Bilby, dalgyte (*Macrotis lagotis*)	VU	VU	-	The major habitats they now occupy in Western Australia include mulga scrub and hummock grasslands on sandplains, or along drainage or salt lake systems. This species requires sandy or loamy soils in which to burrow. The preferred habitat of sandplain is limited within the Derived Proposal area.	Yes.	Low (Nearest record approximately 35 km from the Derived Proposal with limited suitable habitat present).
Pilbara leaf-nosed Bat (*Rhinonicteris aurantia* (Pilbara form))	VU	VU	-	Roosts in deep, warm, humid caves or rock cracks, especially in proximity to water pools. Forages while flying low along watercourses and gorges and over *Triodia* grassland.	Yes	High (majority of nearby records clustered 22 km to 26 km north of the Derived Proposal area, however, suitable habitat exists within the area)
Ghost Bat (*Macroderma gigas*)	VU	VU	-	Occurring in rocky landscapes along gorge and gully formations and roosting within caves with warm, humid microclimates. They prefer an “apartment block” of roost sites concentrated within close range and where water is accessible. Ghost Bat evidence has been recorded within the Derived Proposal area.	Yes.	Recorded (records within two caves within the Development Envelopes)

Species	Conservation Code			Habitat preference (as per Astron 2025)	Identified within Strategic Proposal	Likelihood of occurrence
	EPBC	BC	DBCA			
Brush-tailed Mulgara (*Dasycercus blythi*)	-	-	P4	Common in a range of habitats, including tussock/hummock grasslands and sparse shrubs and low open woodlands on ridge tops, cliffs, scree slopes, hills, and valley floors. Suitable habitat is present (Drainage Area/Floodplain in particular).	Yes.	Moderate (limited historical records within the vicinity and species distribution is generally further east)
Long-tailed Dunnart (*Sminthopsis longicaudata*)	-	-	P4	Occurs in rocky areas and specifically, found in rocky scree and plateau areas with minimal vegetation or in Triodia grassland, shrubland and open woodland. A rare species that is patchily distributed. Its preferred habitat occurs within the Derived Proposal area although previous records are sparse.	Yes.	Low (despite suitable habitat being present, records are sparse with the nearest record being >70 km south-east)
Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)	-	-	P4	Occurs in Acacia shrubland and spinifex grassland and shelters in large spinifex hummocks.	Yes.	Low (Low numbers in mainland Pilbara and unlikely to occur within the Derived Proposal area)
Short-tailed Mouse (*Leggadina lakedownensis*)	-	-	P4	Open tussock and hummock grassland, Acacia shrubland and savanna woodland on alluvial clay/sandy soils and cracking clays. The Derived Proposal is situated at the southern boundary of the distribution and preferred habitat is limited.	Yes.	Low (nearest records >30 km from the Derived Proposal area, preferred habitat is limited).
Western pebble-mound Mouse (*Pseudomys chapmani*)	-	-	P4	Gentle rocky slopes, hills and spurs with small pebble surface cover and sparse vegetation. Multiple records occur both within and in close proximity to the Derived Proposal, with suitable habitat common in the area.	Yes.	Recorded (multiple records from within the Development Envelope, including active mounds and two individuals from pitfall trapping)