BHP Pilbara Strategic Assessment

Validation Notice

Newman Hub Western Ridge

20 September 2023

Updated 30 September 2024

Document Version

Validation Notice

Rev	Description of Amendment	Organisation	Date issued	Date Validation Notice Effective From	Date of Validation Notice Expiry
Rev 0	Draft for public consultation	BHP Iron Ore Pty Ltd	20 July 2023	N/A	N/A
Rev 1	Final Validation Notice	BHP Iron Ore Pty Ltd	20 September 2024	19 October 2023	N/A
Rev 1a	Amended monitoring frequency of CWER-04 and CWER-20. Added monitoring of CWER-16.	BHP Iron Ore Pty ltd	30 September 2024	19 October 2023	N/A

Glossary and Abbreviations

Term	Meaning
Activity or activities	The activity includes Newman mining expansions at Western Ridge and associated infrastructure (Section 2).
Activity Area	The area which the activity (or activities) will be undertaken within and excludes existing Newman hub operations as described in Section 1.4.
APOP	Pilbara Strategic Assessment Assurance Plan and Offsets Plan, Revision 2.3. Published April 2023. Supersedes BHP (2018a and 2018b) versions.
Approval	The approval of the taking of an action or class of actions granted by the Minister on 19 June 2017 in accordance with the Program given under section 146B of the EPBC Act.
Approval Holder	Any person or persons named in an Approval as an Approval Holder who may take action in accordance with the Program.
Assurance Plan	The plan that provides further detail on the process described in the Program, including management of Program Matters, stakeholder management, reporting and auditing requirements and governance arrangements, as approved by the Minister on 15 May 2023.
BC Act	*Biodiversity Conservation Act 2016* (WA).
BHP	BHP Iron Ore Pty Ltd.
Commence, commenced or commencement	Any preparatory works required to undertake a Notifiable Action including clearing, the erection of any onsite temporary structure and the use of heavy duty equipment for the purpose of breaking the ground.
COS	Coarse ore stockpile
DAWE	Department of Agriculture, Water and the Environment.
DBCA	Department of Biodiversity, Conservation and Attractions (formerly DPaW).
DCCEEW	Department of Climate Change, Energy, the Environment and Water (formerly DAWE).
Department, the	The Australian Government Department responsible for the administration of the EPBC Act or successors.
Direct disturbance	The clearing of native vegetation and/or moving of earth as a result of activities undertaken within the Strategic Assessment Area in accordance with the Program.
DMIRS	Department of Mines, Industry Regulation and Safety.
DotE	Department of the Environment.
DPaW	Department of Park and Wildlife (now DBCA).
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities.
DWER	Department of Water and Environmental Regulation.
EPA	Environmental Protection Authority.

Term	Meaning
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth).
Full Conceptual Development Scenario	The conceptual direct disturbance footprint for the development of all current BHP mining tenures within the Strategic Assessment Area. Applied in the Impact Assessment Report.
Impact or impacts	As defined in section 527E of the EPBC Act.
Impact Assessment Report or IAR	BHP Billiton Iron Ore Strategic Assessment: Impact Assessment Report (BHP 2016).
Implementation Framework	Comprises this Assurance Plan and the Offsets Plan, which are designed to support the implementation of the Program.
Important population	A population that is necessary for a species' long-term survival and recover (N.B. variations of this definition may exist for the Program Matters -See Section 4.2.1).
Indicative Footprint	The area where the clearing of native vegetation and/or moving of earth as a result of activities is planned to occur.
LPP	Local Participation Plan.
Minister	Minister responsible for administering the EPBC Act (being, at the date of this Validation Notice, the Minister for the Environment).
MNES	Matters of National Environmental Significance.
MS	Ministerial Statement.
New Listings	Any new listed threatened species or existing species that have been included in a higher endangerment category identified in accordance with Section 4.1.2 of the Program.
New Matters	Other matters protected by a controlling provision of Part 3 of the EPBC Act (other than listed threatened species) that may be identified in accordance with Section 4.1.2 of the Program.
NJV hub	Newman Joint Venture Hub.
Notifiable Action	An activity that is considered likely to have a relevant impact on a Program Matter based on an assessment of the proposed Activity against the thresholds defined for Program Matters in the Assurance Plan and Offset Plan. In relation to the voluntary part of the Program, this includes an activity that is considered likely to have a relevant impact on a New Listing or a New Matter.
Notifiable Action completion	The point at which a Notifiable Action has been implemented in full, such as the time identified in a Validation Notice or at an earlier point as agreed between BHP and the Department.
NVCP	Native Vegetation Clearing Permit.
Offsets Plan	The plan that provides further detail on the processes that will be implemented to identify and deliver offsets associated with a Notifiable Action, as approved by the Minister on 15 May 2023.
OHP	Ore Handling Plant.
OSA	Overburden Storage Area.

Term	Meaning
Other controlling provisions	Any controlling provision under the EPBC Act that is not already considered in accordance with the Program, this Assurance Plan and/or the Offsets Plan.
Practicable	Reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge.
PEOF	Pilbara Environmental Offset Fund.
Program	The BHP Billiton Iron Ore Pilbara Strategic Assessment Program endorsed by the Minister on 11 May 2017. Whilst the Agreement refers to a Plan, it was agreed with the Department that the term Program is a better reflection of the systems and processes to be delivered by BHP.
Program Matters	The listed threatened species Pilbara Leaf-Nosed Bat (*Rhinonicteris aurantius*), Northern Quoll (*Dasyurus hallucatus*), Greater Bilby (*Macrotis lagotis*) Ghost Bat (*Macroderma gigas*), Pilbara Olive Python (*Liasis olivaceus barroni*), Night Parrot (*Pezoporus occidentalis*) and Grey Falcon (*Falco hypoleucos*)
Protected Matters	Matters protected by a provision of Part 3 of the EPBC Act.
PMO	Program Matter Outcome.
Strategic Assessment Area or SAA	The geographical extent of the assessment and boundaries within which the Program must be implemented, as depicted in Appendix 1.
Study Area	The geographical extent of a survey's boundaries.
TSSC	Threatened Species Scientific Community.
Validation Notice	This Validation Notice under Part C of the endorsed Program.
WA	Western Australia.

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1 Introduction

1.1 Background

BHP Iron Ore Pty Ltd (BHP) currently operates iron ore mines and associated rail and port infrastructure within the Pilbara region of Western Australia (WA). Current mining operations include:

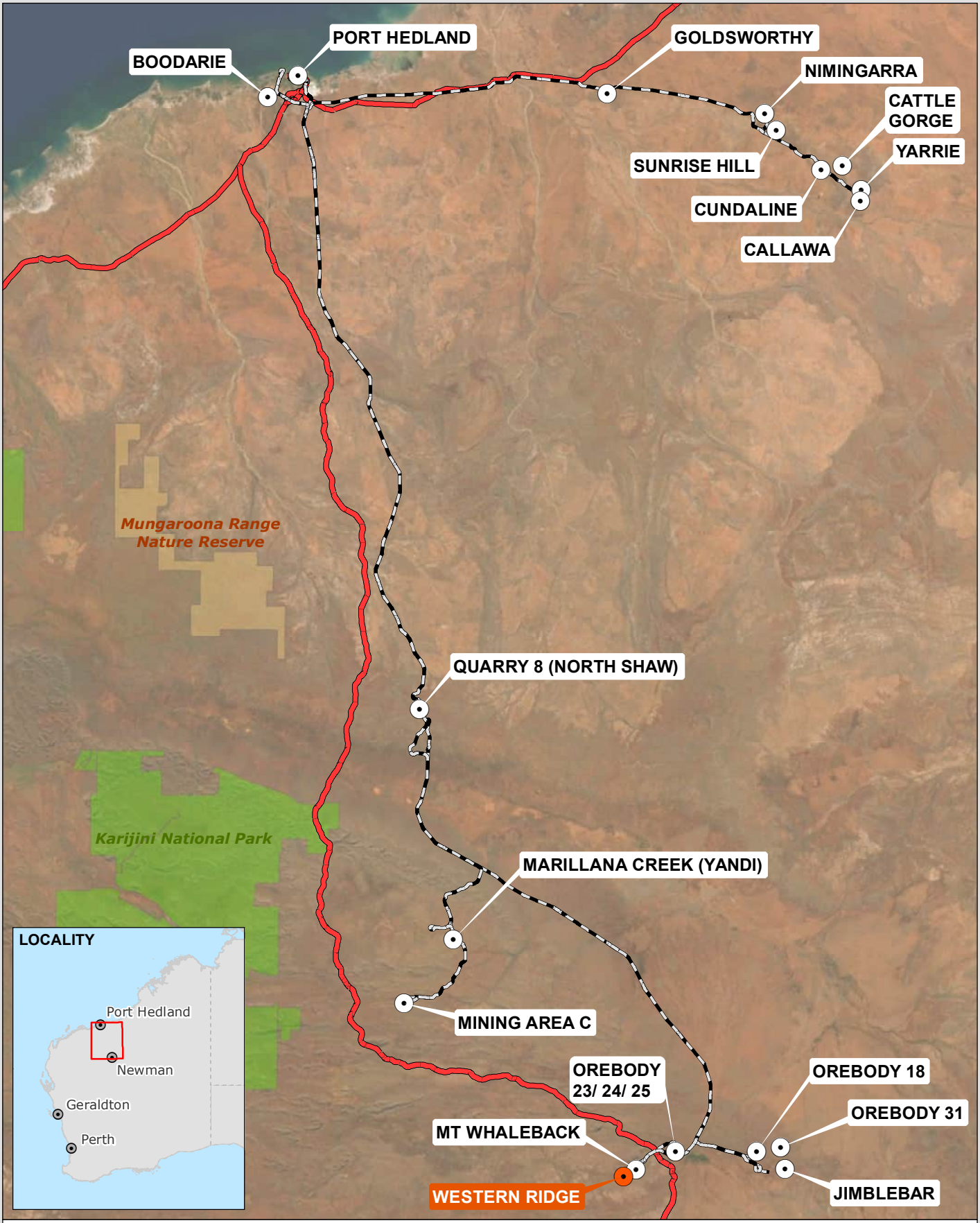
- Newman Joint Venture hub (NJV) – located approximately 2 km west of Newman township and consists of Mount Whaleback, and Orebodies 29, 30 and 35
- Mining Area C – Northern and Southern Flanks - located approximately 100 km northwest of Newman township
- Wheelarra Hill (Jimblebar) Mine, Orebody 18 and Orebody 31 (Jimblebar hub) - located approximately 35 km east of Newman township
- Eastern Ridge hub - located approximately 5 km east of Newman township and consists of Orebodies 23, 24, 25 and 32
- Yandi Mine - located approximately 100 km north northwest of Newman township.

Ore from the above mining operations is transported by rail to Port Hedland via the BHP Newman to Port Hedland Mainline (and associated spur lines). Ore is then shipped overseas via Port Hedland at the BHP facilities at Nelson Point and Finucane Island.

BHP proposes to mine an additional four iron ore deposits as part of the Newman Hub Western Ridge Proposal (the Activity) (BHP 2022a). This Validation Notice has been prepared to document the validation process for the Western Ridge Proposal required under the *BHP Billiton Iron Ore Pilbara Strategic Assessment Program* (the Program) (BHP 2017).

1.2 Framework

The Program (BHP 2017) was endorsed by the Australian Government Minister for the Environment and Energy on 11 May 2017 and an Approval Decision (the Approval) for taking actions in accordance with the Program was issued on 19 June 2017. The Approval applies to the development of new iron ore mines and associated infrastructure and the expansion of existing iron ore mines and associated infrastructure within a defined Strategic Assessment Area (SAA) (Appendix 1).



BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE VALIDATION NOTICE
Regional location

N

0 15 30 45 60
Kilometres

Date:	19/01/2022	Project No: A979/167B	Figure: 1-1
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- BHP operations
- Western Ridge
- BHP rail
- Great Northern Highway
- National park
- Nature reserve

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Key commitments of the endorsed Program and conditions of approval include preparation and approval of an Assurance Plan (BHP 2018a) and Offsets Plan (BHP 2018b) and undertaking a validation process including preparation of a Validation Notice for each Notifiable Action undertaken in accordance with the Program.

The original versions of the Assurance Plan (BHP 2018a) and Offset Plan (BHP 2018b) have been revised and collated into one document, 'the Assurance Plan and Offsets Plan' (APOP) (BHP 2023) which was endorsed on 15 May 2023. For this reason, this Validation Notice has been drafted in accordance with the APOP, which sets out the current processes and requirements for compliance with the Program.

The APOP defines the environmental objectives, procedures and governance arrangements to ensure that all future activities within the scope of the Program are undertaken in accordance with the endorsed Program and achieve the Program's objectives. The APOP includes Program Matter Outcomes (PMO) which are measurable outcomes that BHP must meet to achieve the objectives developed for each Program Matter. Notifiable Action triggers are set out within the APOP to prompt the requirement for a Validation Notice.

The APOP also ensures that appropriate offset pathways are applied to address significant residual impact(s) of actions, in accordance with the Program, pursuant to which this Validation Notice is being issued.

In accordance with Part C of the Program, BHP has undertaken a validation process for the Activity, to ensure that the PMOs are met across the SAA.

A Validation Notice is required for the Activity, for the following reasons:

- The Activity is within the scope of the Program; and
- The Activity meets one or more of the Notifiable Action triggers identified in the APOP.

1.3 Program, Assurance Plan and Offsets Plan Requirements

The endorsed Program and APOP specify the requirements and content of the Validation Notice. A summary of where the specified requirements and contents are addressed in this Validation Notice are provided in Table 1.1.

Table 1-1: Content of Validation Notice

	Strategic Assessment Program Offset Plan Requirements	Sections which address these Requirements
1	Decision whether a Validation Notice is required for the Activity	1.7
2	BHP authorisation and date the Validation Notice will take effect	Foreword
3	Program Matters and triggers relevant to the Validation Notice	4
4	Project description including activity location and timeframes for the duration of activities	2 and 1.6
5	Map illustrating the boundary of the action and area of direct disturbance	1.5
6	Stakeholder engagement and public consultation	3
7	Review of baseline and contemporary data with a description of the direct and indirect impacts	4.2
8	Estimates of disturbance and residual impacts	1.5 and 4
9	Application of the mitigation hierarchy	4, 5 and 6
10	Demonstration that the Program Matters Outcomes can be met through application of the mitigation hierarchy including details of offsets proposed	4, 5 and 6
11	Outline the objective/s of the offset project/s, consistent with the scope of actions to offset impacts stated in the Program and Offsets Plan	5
12	Outline how the offset project/s will support the long-term persistence and viability of the relevant Program Matters	5
13	Commitment to measurable offset project milestones	5

1.4 Activity

The Activity is located approximately 2 km southwest of the Newman township, in the Pilbara region of Western Australia and includes:

- mine pit excavation above and below the water table
- dewatering for below water table mining
- overburden storage areas (also known as waste dumps)
- haul and access roads
- primary crusher
- overland conveyor.

The nearest pits are located 7 km from Newman (Figure 1-2). BHP has prepared this Validation Notice for the disturbance required to implement the Activity. The Activity includes the infrastructure and processes identified in further detail in Section 2.

Decommissioning and closure will include the removal of infrastructure no longer required, earthworks to re-profile disturbed areas to create landforms that are consistent with the surrounding landscape within the constraints imposed by the physical nature of the materials, ripping of compacted surfaces, selective application of topsoil or alternative growth media, placement of woody material or constructing rocky features where potential exists and revegetation with local provenance seed. These activities will occur in areas already disturbed for implementation of the Activity and will remain outside of defined exclusion zones and buffers which apply to Program Matters and therefore are not predicted to result in significant residual impacts to Program Matters.

1.5 Activity Area

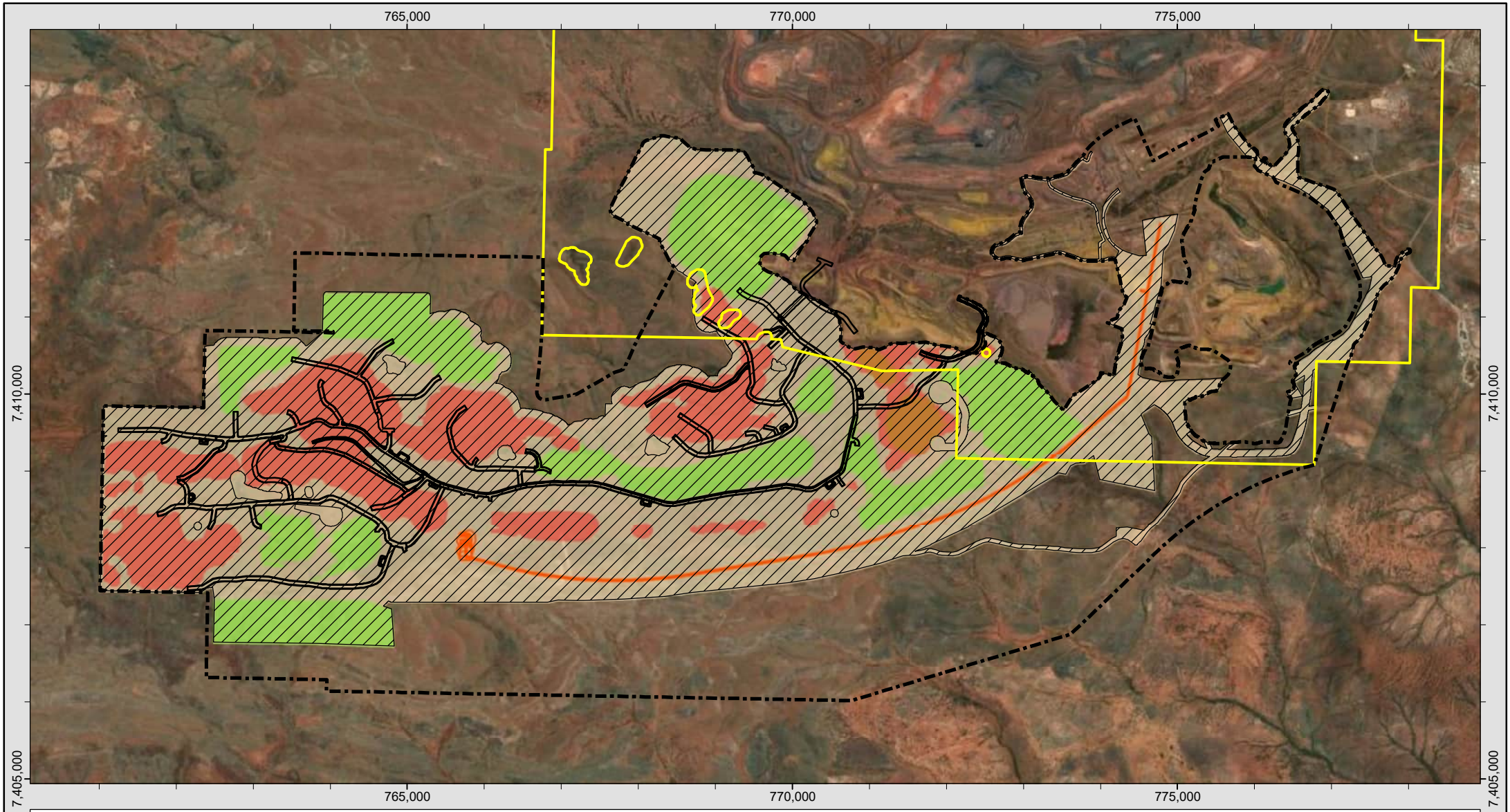
The Activity Area is the area where the Activity will be undertaken and encompasses an area of 7,234 ha. The Indicative Footprint required for the Activity covers an area of 4,603 ha.

The Activity is adjacent to the Mt Whaleback mine and Orebody 29/30/35 mine. Clearing for both mines is approved under the Mt Whaleback Strategic Native Vegetation Clearing Permit (NVCP) 5617 and below water table mining at Orebody 29/30/35 is authorised under MS963. NVCP 5617 overlaps the northern portion of the Activity Area and a total of 322 ha have already been cleared within the Indicative Footprint of the Activity Area, subject to NVCP 5617. This area is excluded from the extent requiring clearing for the Activity, such that the total area required to be cleared for the Activity is 4,281 ha.

Existing operations subject to NVCP 5617 do not form part of this Activity. This is depicted in Figure 1-2 below.

A further NVCP 5926 also covers the majority of the Activity Area and authorises clearing for mineral exploration, hydrogeological investigations, geotechnical investigations and associated works. This NVCP was first approved on 1 May 2014 and clearing has been undertaken in the Activity Area since that time for the authorised purposes. Areas previously cleared under NVCP 5926 are included in the extent considered as part of this Validation Notice.

The Activity Area includes the Western Creek Diversion Activity Area, documented in a Decision Report in 2020.



BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE VALIDATION NOTICE
Activity Area and Indicative Footprint

N

1 0.5 0 1
Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	12/09/2023	Project No: A979/168C	Figure: 1-2
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- Activity Area
- Haul road
- Indicative Footprint
- Native Vegetation Clearing Permit (5617)
- Pits
- Primary crusher and conveyor alignment
- Unmitigated Indicative Footprint
- Waste dumps

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1.6 Timeframes

This Validation Notice takes effect 20 business days from the date of authorisation (see Document Version page). If the notifiable action has not substantially commenced within a period of five years from that authorisation, BHP or a subsequent Approval Holder must not implement the action until either:

- the Department authorises commencement of the action by BHP or the Approval Holder; or
- BHP issues a new Validation Notice for the action in accordance with this Program. This process extends the commencement timeframe for another five years.

The Activity, including construction, operation and closure, is forecast to be completed within approximately 50 years from the date of this notice or date of authorisation.

1.7 Decision for a Validation Notice

A Validation Notice is required for actions that are Notifiable, in accordance with Notifiable Action Triggers set out in the APOP (BHP 2023) and reproduced in Table 1-2. The Activity is a Notifiable Action as it fulfils the triggers of the APOP for the Northern Quoll (*Dasyurus hallucatus*), Pilbara Leaf-Nosed Bat (*Rhinonicterus aurantia*), Ghost Bat (*Macroderma gigas*) and Pilbara Olive Python (*Liasis olivaceus barroni*). The Validation Notice will demonstrate how the implementation and operation of the Activity will meet each of the PMOs for these Program Matters by undertaking an impact assessment, applying the mitigation hierarchy and assessing residual impacts.

As the Activity does not fulfil the Notifiable Action Triggers for the Greater Bilby (*Macrotis lagotis*), Night Parrot (*Pezoporus occidentalis*) and Grey Falcon (*Falco hypoleucos*), these species are not applicable to this Activity. As such, Sections 4.7, 4.8 and 4.9 outline the findings in relation to these species to support this decision of a Notifiable Action Trigger not being met.

Amendments to the Threatened Species List effective under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) on 15 February 2018 included the delisting of the Hamersley Lepidium (*Lepidium catapycnon)*. Under Section 4.1.1 of the Program, BHP is not required to continue to manage any species under the Program Matters that has become delisted. On this basis, no validation of impacts to *Lepidium catapycnon* has been undertaken for the Activity.

Section 6 of the APOP notes that BHP will produce a report recording its decision on whether a proposed Activity is considered notifiable. This section meets the requirements of Section 6.

Table 1-2 Notifiable Action Triggers for the Activity

Program Matter	Notifiable Action trigger	Activity area Program Matter data[1]	Applicable trigger?
Northern Quoll (*Dasyurus hallucatus*)	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Northern Quoll critical habitat and or supporting habitat **AND** Presence or sign/s of Northern Quoll colony or residing individuals	Northern Quoll critical habitats (i.e. potential denning habitats) are present within the Activity Area and within 500m of the Activity Area and include Gorge/Gully and Breakaway/Cliff (Biologic 2020a, 2020b, 2021). The Hillcrest/Hillslope and Minor Drainage Line habitats present within and adjacent to the Activity Area are supporting habitats that may be used for foraging or dispersal. There are no records of a Northern Quoll colony or residing individuals within the Activity Area (Biologic 2020a).	No
	Within the Activity Area there is: Presence of Northern Quoll critical habitat and or supporting habitat **AND** Presence or sign of Northern Quoll transient, infrequent or dispersing individual/s	Critical and supporting habitat – see above. Evidence (one historical scat) of Northern Quoll has been recorded in the Activity Area. No further evidence of the species has been recorded in the Activity Area from targeted survey effort and therefore, the one historical scat is not considered representative of residing individuals, but more likely a dispersing individual (Biologic 2020a). No direct observations or camera trap records have been made from the Activity Area. This species has not been recorded adjacent to (i.e. < 1 km) the Activity Area.	Yes

[1] Critical Habitat and Supporting Habitats for the seven Program Matters are defined in Table 12.1 of the APOOP (BHP 2023) and are based on relevant published conservation guidance.

Program Matter	Notifiable Action trigger	Activity area Program Matter data[1]	Applicable trigger?
Ghost Bat *(Macroderma gigas)*	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Ghost Bat critical habitat and or supporting habitat **AND** Presence or sign/s of Ghost Bat colony or residing individuals	Ghost Bat critical roosting habitats including Gorge/Gully and Breakaway/Cliff, are present within the Activity Area and within 500m of the Activity Area (Biologic 2020a, 2020b, 2021). A total of 16 caves suitable for Ghost Bat usage have been identified within the Activity Area, with evidence of usage recorded in six caves (Biologic 2021). There are two critical Category 2 roosts present as defined by Bat Call WA (2021a). In addition, thee supporting Category 3 roosts and 11 Category 4 roosts present within the Activity Area. Critical Ghost Bat foraging habitat is also present within the Activity Area such as Drainage Area/Floodplain Minor Drainage Line, Stony Plain and Mulga Woodland (Biologic 2020a, 2020b, 2021, 2022). Ghost Bat individuals have been recorded within the Activity Area from direct observation, echolocation calls and scats in caves (Biologic 2020a, 2020b, 2021). There is also evidence of pregnant or lactating females. This is considered evidence of a residing population.	Yes
	Within the Activity Area there is: Presence of Ghost Bat critical habitat and or supporting habitat **AND** Presence or sign of Ghost Bat transient, infrequent or dispersing individual/s	As above	Yes

Program Matter	Notifiable Action trigger	Activity area Program Matter data[1]	Applicable trigger?
Pilbara Olive Python *(Liasis olivaceus barroni)*	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Pilbara Olive Python critical habitat and or supporting habitat **AND** Presence or sign/s of Pilbara Olive Python population or residing individuals	Pilbara Olive Python critical breeding habitat including Gorge/Gully and Breakaway/Cliff habitat types are present within the Activity Area and within 500m of the Activity Area. Ephemeral surface water features also support the species (Biologic 2020a). Supporting habitats are also present within the Activity Area and include Minor Drainage Line habitat and Hillcrest/Hillslope habitat. Pilbara Olive Python has been recorded in the Activity Area and within 500m of the Activity Area from direct observation of live individuals and indirect evidence including scats (Biologic 2020a, 2021). This evidence suggests that a colony or residing individuals are present within the Activity Area.	Yes
	Within the Activity Area there is: Presence of Pilbara Olive Python critical habitat and or supporting habitat **AND** Presence or sign of Pilbara Olive Python transient, infrequent or dispersing individual/s.	As above	Yes
Pilbara Leaf-Nosed Bat *(Rhinonicteris aurantia)*	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Pilbara Leaf-nosed Bat critical habitat and or supporting habitat	No critical habitat as defined in the APOP is present within the Activity Area or within 500m of the Activity Area (Biologic 2020a, 2020b, 2021)	No

Program Matter	Notifiable Action trigger	Activity area Program Matter data[1]	Applicable trigger?
	AND Presence or sign/s of Pilbara Leaf-nosed Bat colony or residing individuals	Supporting habitats including Drainage Area/Floodplain, Gorge/Gully, Breakaway/Cliff, Minor Drainage and Hillcrest/Hillslope Line are present within the Activity Area and within 500m of the Activity Area. No evidence of a Pilbara Leaf-nosed Bat colony or residing individuals are known from the Activity Area or within 500m of the Activity Area.	
	Within the Activity Area there is: Presence of Pilbara Leaf-nosed Bat critical habitat and or supporting habitat **AND** Presence or sign of Pilbara Leaf-nosed Bat transient, infrequent or dispersing individual/s.	Critical and or supporting habitat – see above. One call recording was made within the Activity Area (Biologic 2020b). This record likely represents a transient foraging individual; however, the source roost is unknown. No further direct or indirect evidence of the species has been recorded in the Activity Area despite targeted survey effort.	Yes
Greater Bilby (*Macrotis lagotis*)	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Greater Bilby critical habitat and or supporting habitat **AND** Presence or sign/s of Greater Bilby residing individuals	A total of four contemporary surveys have been conducted over the Western Ridge area, none of which have recorded Greater Bilby. The most recent targeted fauna survey conducted in 2020 did not identify any signs, tracks, scats, diggings, burrows or live individuals. Biologic concluded that Greater bilby is unlikely to occur due to lack of habitat suitability (Biologic 2020). Sandplain, Mulga Woodland and Drainage Area/Floodplain habitats, those traditionally used by the Greater Bilby, are present within the Activity Area. However, these habitats are considered unlikely to	Not applicable as there are no records of Greater Bilby within the Activity Area or within a 500m buffer of the Activity Area.

Program Matter	Notifiable Action trigger	Activity area Program Matter data[1]	Applicable trigger?
		support the species based on local substrate characteristics and close proximity to existing mining (Biologic 2020a, 2020b). While these habitats don't meet the definition of critical habitat provided in the APOP, they are considered potential supporting habitats. However, these habitats are unlikely to be used by the species, given the fragmented, degraded condition. There are no records of Greater Bilby in the Activity Area or within 500m of the Activity Area from survey effort to date (Biologic 2020a, 2020b). The nearest record of the species is located approximately 62 km north of the Activity Area.	
	Within the Activity Area there is: Presence of Greater Bilby critical habitat and or supporting habitat **AND** Presence or sign of Greater Bilby transient, infrequent or dispersing individual/s	As above	As above
Night Parrot	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Night Parrot critical habitat and or supporting habitat **AND** Presence or sign/s of Night Parrot population/s or residing individuals	A total of four contemporary surveys have been conducted over the Western Ridge area, none of which have recorded Night Parrot. The most recent targeted fauna survey conducted in 2020 (Biologic 2020) included a targeted survey for Night Parrot, with review of results by Night Parrot expert Nigel Jackett. The study found no evidence of Night Parrot.	Not applicable as there are no records of Night Parrot within the Activity Area or within a 500m buffer of the Activity Area

Program Matter	Notifiable Action trigger	Activity area Program Matter data[1]	Applicable trigger?
		There are no critical habitats present within the Activity Area or within 500m of the activity Area that nesting and foraging with dense roosting habitat (Biologic 2020a). Supporting habitats are present within the Activity Area including Drainage Area/Floodplain, Stony Plain and Minor Drainage Line (Biologic 2020a). There have been no records or sign of resident Night Parrot within the Activity Area or within 500m of the Activity Area (Biologic 2020a, 2020b).	
	Within the Activity Area there is: Presence of Night Parrot critical habitat and or supporting habitat **AND** Presence or sign/s of Night Parrot transient, infrequent or dispersing individual/s.	As above	As above
Grey Falcon	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Grey Falcon critical habitat and or supporting habitat **AND** Presence or sign/s of Grey Falcon colony or residing individuals	A total of four contemporary surveys have been conducted over the Western Ridge area, none of which have recorded Grey Falcon. No critical habitats which include tall trees along watercourses, are present within the Activity Area or within 500m of the Activity Area (Biologic 2020a, 2020b). While some Major Drainage Line habitat is present within the Activity Area, the extent present is highly fragmented and degraded due to being in close proximity to existing mining operations at Mt	Not applicable as there are no records of Grey Falcon within the Activity Area or within a 500m buffer of the Activity Area

Program Matter	Notifiable Action trigger	Activity area Program Matter data[1]	Applicable trigger?
		Whaleback. It is therefore considered unlikely to support Grey Falcon. No records of Grey Falcon have been made within the Activity Area or within 500m of the Activity Area (Biologic 2020a, 2020b).	
	Within the Activity Area there is: Presence of Grey Falcon critical habitat and or supporting habitat **AND** Presence or sign of Grey Falcon transient, infrequent or dispersing individual/s.	As above	As above

2 Project Disturbance and Description

2.1 Proposed disturbance

Total disturbance of up to 4,281 ha will be required for the Activity, excluding 322 ha which has already been cleared under the Whaleback Strategic NVCP 5617, from the SAA allocation upper disturbance limit of 110,000 ha (limit as outlined within Section 2.4 of the Program and Condition 7 of Annexure 2 of the Approval).

The 4,281 ha includes areas already cleared under the Western Ridge NVCP 5926 for the purposes of mineral and hydrogeological exploration, creek diversion, geotechnical investigations and associated works. The creek diversion required clearing of 15 ha which was deducted from the SAA upper disturbance limit for the Western Creek Diversion Decision Report, documented in 2020, therefore the total disturbance deducted for the purposes of this Validation Notice is 4,266 ha.

The disturbance allocated to the SAA upper disturbance limit to date including this Validation Notice is detailed in Table 2-1 below.

Table 2-1: SEA Program Disturbance Allocation

Project Name	Decision Made	Date Decision Documented	Proposed disturbance (ha)	Overall cumulative program disturbance remaining (ha)
MAC/South Flank	Validation Notice	May 2018	16,000	94,000
Jimblebar OSA1 Stage 1	Not a Notifiable Action	Aug 2018	95	93,905
Western Creek Diversion	Not a Notifiable Action	Feb 2020	15	93,890
MAC Surplus Water	Not a Notifiable Action	Apr 2020	0	93,890
Jimblebar Optimisation Project	Validation Notice	Jun 2020	2,000	91,890
OB30 Creek Diversion	SEA Exclusion	April 2021	40 ha of disturbance removed from SAA	NA
OB31 Stage 1 clearing	Not a Notifiable Action	December 2022	5	93,885
Mooka Rail Siding	Validation Notice	April 2023	23	93,862
Revised Jimblebar Optimisation Project	Validation Notice	May 2023	1,042 (in addition to 2,000 ha as provided under previous Validation Notice)	90,820
Western Ridge	Validation Notice	July 2023	4,266	86,554

2.2 Western Ridge Project

The Activity will include the following (Figure 1-2):

- above and below water table mining of the four iron ore deposits namely, Eastern Syncline, Bill's Hill, Silver Knight and Mount Helen
- overburden storage areas, ore stockpiles and topsoil stockpiles
- haul and access roads, with some roads to be upgraded and/or sealed
- borrow and laydown areas
- overland conveyor with radial and fixed stackers
- ore sampling station
- 30 Mtpa crusher
- creek diversions and water management installations to support groundwater dewatering and discharge of surplus water, including water pipelines and associated infrastructure
- non-process infrastructure including office, mobile equipment maintenance, breakdown facility, crib room, water and sewerage services and ablutions
- power supply and communication towers.

Mining will be undertaken as typical open pit operation.

2.2.1 Processing infrastructure

The ore from Eastern Syncline and Bill's Hill deposits will be transported via road to one of Mt Whaleback's existing primary crushing and ore handling plants (OHP) facilities, namely OHP2, OHP5 and OHP3. Ore from Mount Helen and Silver Knight will be crushed in a new primary crusher and transported via overland conveyor back to the existing Mt Whaleback coarse ore stockpile (COS) for processing through OHP4, prior to being transported via rail to port.

2.2.2 Mine dewatering, water supply and surplus water management

The Activity will involve conventional open pit iron ore mining activities above and below water table and will require mine dewatering to enable below water table mining. A total of up to 13 GL/a may be dewatered from all four deposits. During operations, the water abstracted will be preferentially used to supplement the water requirements for the activity. However, the dewatering volume is anticipated to be, on average, greater than the operational demand and surplus water will be produced. Surplus water not utilised for the Activity will be discharged to Ophthalmia Dam via a surplus water pipeline.

2.2.3 Closure and Decommissioning

A Mine Closure Plan (BHP 2022b) has been developed in consultation with the DMIRS. This document outlines the proposed decommissioning, rehabilitation and closure strategy for the Activity. Recognising the importance of mine planning in facilitating the completion criteria for rehabilitation has been critical in planning and implementing successful rehabilitation practices. Embedding closure and rehabilitation planning in the Life of Asset and 5 Year Planning process for the business has resulted in rehabilitation being included as part of the mining process rather than being considered an add on or separate from mining. This allows identification of areas available for rehabilitation so that plans for executing final landform earthworks and rehabilitation within the subsequent five year timeframe are integrated with mine plans. To allow appropriate landform design, planners now use waste characterisation information and with site input, model design options to identify the most appropriate rehabilitation plan for any given situation.

3 Stakeholder Engagement

BHP's commitment to community engagement is articulated in BHP's *Communications, Community and External Engagement Our Requirements* (BHP 2022), which states:

> '*Working openly with the communities in which we operate and with governments contributes to economic and social development and enhancement of BHP's reputation and social licence to operate."*

To support this commitment, BHP has comprehensive company standards and dedicated resources to ensure its activities are underpinned by continuous community engagement and feedback.

3.1 Stakeholder Consultation

BHP is required to maintain a register of interested parties for the purpose of stakeholder consultation. Interested parties listed on this register have been identified through the formal Strategic Assessment public consultation period or have self-identified after the consultation period. Members of the community and groups are able to self-identify through local stakeholder engagement activities such as Community Consultative Groups in Port Hedland and Newman, and regular meetings with Traditional Owner groups, or through www.bhp.com/contact. The BHP community team will advise on any enquiries or requests to be included in stakeholder engagement activities relating to the Strategic Assessment.

Key regulatory authorities, including the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and target stakeholders were consulted during the development of the draft Validation Notice. Consultation outlined the SAA, proposed submission, including a description of proposed activities of the Notifiable Action, the potential impacts on the Program Matters and the proposed management approach. The stakeholders consulted and level of stakeholder engagement undertaken depended on the location, complexity, size and risk of the particular activity, and the level of stakeholder interest. Table 3-1 summarises the relevant consultation undertaken by BHP regarding the Activity and various aspects of this Validation Notice.

3.2 Public Consultation

BHP has made the draft Validation Notice publicly available on its website for a minimum period of 28 days. The public consultation period commenced on the 24 July 2023. Registered stakeholders were notified by email outlining when the public consultation timing commenced and how to make a submission.

A summary of the engagement undertaken for the Validation Notice, including the public consultation period, is included in Table 3-1.

Table 3-1: Stakeholder Engagement

Stakeholder	Date	Topics/issues discussed	BHP response and outcome
DCCEEW (previously DAWE)	11 May 2021	Correspondence: • Five-yearly Review and Plan Amendments	BHP and DWER have exchanged formal correspondence reaching an agreement on the timing of submission of the five-yearly review and amended Assurance and Offset Plans.
	6 July 2021	Meeting: • Western Ridge project overview and Validation Notice, including: ○ Key MNES findings and preliminary assessment of impacts. ○ Key management establishes mining exclusions zones around Ghost Bat caves. ○ The size of these zones has been established to minimise fragmentation and isolation of key habitat features for the Ghost Bat. • Stakeholder Consultation process • Use of artificial caves as part of mitigation rather than offsets, where applicable	BHP to provide information and overview of proposed monitoring to be undertaken. BHP to provide clarification on methods for consultation used and how we address comments.
	17 August 2021	Meeting: • Proposed Ghost Bat monitoring at Western Ridge including ○ monitoring of caves at Western Ridge, Jimblebar and regional reference caves to align with Mining Area C monitoring programme to collect quality baseline data ○ proposed methods to include collection of scats and analysis (deposition data, genetics, hormone analysis), cameras & ultrasonic recorders and possibly short-term GPS tracking of bat movements	BHP shares quality control of data with its consultants. Periodic deep-dives are undertaken of the data to maintain an error free database. BHP has contingency options depending on the impact to the cave. These include expansion of buffers, changes to blasting requirements, changes to activities in buffers zones, rehabilitation measures and construction of artificial caves.

Stakeholder	Date	Topics/issues discussed	BHP response and outcome
		○ Quarterly visitation for caves with Ghost Bat recorded • Proposed Pilbara Olive Python monitoring, including: ○ Establishing monitoring and reference sites ○ Determining suitable methodology which may include targeted searches, genetic analysis, mark-recapture, motion-activated cameras, eDNA sampling and PIT tagging DCCEEW queried who is responsible for quality control of the data. DCCEEW queried what contingency measures exist for possible impacts to caves.	
DWER – EPA Services	10 June 2021	Pre-referral meeting to introduce the Western Ridge Proposal, key components and activities, avoidance and mitigation measures, potential significant residual impacts and offsets. MNES relevant to the Proposal were discussed.	BHP to review Development Envelope and consider EPA Services advice on relevant mitigation.
DWER - EPA Services	26 October 2022	BHP presented the Western Ridge Proposal including proposal overview, predicted impacts, proposed management and social surroundings engagement undertaken with Traditional Owners.	BHP expressed intent to refer the Western Ridge Proposal in January 2023.
DBCA	15 July 2021	Meeting: Overview of the Western Ridge Proposal, including key values, potential impacts, proposed monitoring programs and collaboration with key experts. Matters of National Significance relevant to the Proposal were discussed.	None applicable.
KNAC Implementation Committee	20-21 October 2022	Meeting: BHP presented the Western Ridge Proposal and draft Social Cultural Heritage Management Plan (SCHMP). BHP sought endorsement of the SCHMP to submit to the WA EPA with the referral documents under Part IV of the *Environmental Protection Act 1986.*	Implementation Committee members endorsed the SCHMP. BHP provided the draft Western Ridge Validation Notice to KNAC for comment and received written comments on 16 December 2022. BHP provided written response to these comments in January 2023 and

Stakeholder	Date	Topics/issues discussed	BHP response and outcome
			subsequently referred the Western Ridge Proposal to the EPA in January 2023.
Nyiyaparli Traditional Owners, through KNAC	19 February 2021	Introduction and overview of the Western Ridge Proposal, including matters relating to heritage, environment, biodiversity and water management, including impact on habitat, and topics including closure, tailings and future engagements. MNES relevant to the Proposal and proposed monitoring and management were discussed.	BHP offered this information session as an introduction for the Proposal and proposed future engagements on country to address social surroundings.
	18-19 May 2021	Overview of Western Ridge Proposal, key environmental values, potential impacts, avoidance measures including protection of habitat for conservation significant fauna, management of surplus water, water quality at Ophthalmia Dam and further engagement.	BHP to provide biodiversity spatial data to Nyiyaparli. BHP and Nyiyaparli to continue engagement to understand Traditional Owner values and to work together to manage and/or avoid impacts to these values
	28-29 July 2021	Visit on country to Western Ridge to discuss water values and potential changes to hydrological regimes including dewatering, discharge of surplus water and creek diversions.	BHP to consider other potential beneficial uses of surplus water. BHP to work with Nyiyaparli to provide ongoing access to country.
	20-23 September 2021	Recap of Western Ridge Proposal including key components, predicted impacts and completion of ethnobotanical survey on country to identify traditional bush tucker and bush medicine values.	BHP and Nyiyaparli to undertake a survey of traditional hunting values at next social surroundings engagement in 2022.
	18-22 July 2022	Overview of project, predicted impacts, management including on country site visit and focused discussions on water, ethnozoological values and closure.	BHP and KNAC agreed to further engagement in September 2022 to consolidate understanding of values, interests and feedback on the Proposal. BHP agreed to revise the Development Envelope to exclude temporary surface water features which support Pilbara Olive Python.
	5-9 September 2022	Overview of project, predicted impacts and management including on country site visits to proposed pits, waste dumps, and key infrastructure. Discussions on water and heritage management.	BHP and KNAC to further co-develop the SCHMP.

Stakeholder	Date	Topics/issues discussed	BHP response and outcome
Prairie Downs Pastoral Station	20 May 2021	Discussed the progression of BHP activities towards Prairie Downs including the Western Ridge Proposal overview and timelines, survey and exploration requirements.	None applicable.
Shire of East Pilbara	10 February 2021	Overview of Western Ridge Proposal including scope, timeline, approvals and engagement, and identification of issues, opportunities and deliverables	BHP to continue to provide updates to the Shire.

4 Validation Process

4.1 Guidance

The most recent Commonwealth guidance considered in the preparation of this Validation Notice include:

- DCCEEW (2023). Recovery Plan for the Greater Bilby (Macrotis lagotis)
- DotE (2016) EPBC Act referral guideline for the endangered northern quoll
- DotE (2015). Threat abatement plan for predation by feral cats
- DotE (2013) Matters of National Environmental Significance Significant Impact Guidelines 1.1 EPBC Act
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010) Survey guidelines for Australia's threatened bats
- DEWHA (2008a). Threat abatement plan for predation by the European red fox
- DEWHA (2008b). Approved Conservation Advice for Liasis olivaceus barroni (Olive Python - Pilbara subspecies)
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011a) Survey guidelines for Australia's threatened mammals
- DSEWPaC (2011b) Survey guidelines for Australia's threatened reptiles
- DSEWPaC (2011c). Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads
- Threatened Species Scientific Committee (TSSC) (2020). Conservation Advice Falco hypoleucos Grey Falcon
- TSSC (2016a). Conservation Advice Macrotis lagotis greater bilby
- TSSC (2016b). Conservation Advice Pezoporus occidentalis night parrot
- TSSC (2016c). Conservation Advice Macroderma gigas ghost bat
- TSSC (2016d). Conservation Advice Rhinonicteris aurantia (Pilbara form) (Pilbara Leaf-nosed Bat)
- TSSC (2005e). Commonwealth Listing Advice on Northern Quoll (Dasyurus hallucatus).

The most recent Western Australian guidance considered included:

- EPA (2020) *Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment.*

Other guidance considered included:

- Bat Call WA (2021a). *A review of ghost bat ecology, threats and survey requirements*. DWER.
- Bat Call WA (2021b). *A review of Pilbara leaf-nosed bat ecology, threats and survey requirements*. DWER.
- Southgate *et al.* (2018). *Verifying bilby presence and the systematic sampling of wild populations using sign-based protocols – with notes on aerial and ground-based techniques and asserting absence*. Australian Mammalogy.
- DBCA (2017). *Guidelines for surveys to detect the presence of bilbies and assess the importance of habitat in Western Australia*. DBCA.

4.1.1 Important Population

For the purpose of this Validation Notice, and following EPBC Act guidance (DotE 2013), an important population for all Program Matters, with exception of Northern Quoll, is defined as:

'a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- *key source populations either for breeding or dispersal;*
- *populations that are necessary for maintaining genetic diversity; and/or*
- *populations that are near the limit of the species range.*'

An important population for the long-term survival of the Northern Quoll is specifically defined by DotE (2016) as including:

- *'high density quoll populations, which occur in refuge-rich habitat critical to the survival of the species, including where cane toads are present;*
- *occurring in habitat that is free of cane toads and unlikely to support cane toads upon arrival i.e. granite habitats in WA, populations surrounded by desert and without permanent water; and*
- *subject to ongoing conservation or research actions i.e. populations being monitored by government agencies or universities or subject to reintroductions or translocation.'*

4.1.2 Critical Habitat

Critical habitat is defined by DotE (2013) as '*Habitat critical to the survival of a species or ecological community*' and refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Critical Habitat and Supporting Habitat for the seven Program Matters are defined in Table 12.1 of the APOP (BHP 2023) and are based on relevant published conservation guidance.

4.2 Surveys and Studies

The Contemporary and historical surveys which form the baseline data for the Activity Area are considered adequate for validating impacts to Program Matters in line with the requirements of Section 7.1 (Contemporary Information and Data) of the Program.

4.2.1 Contemporary surveys

Surveys undertaken within the last five years encompassing parts of or all of the Activity Area are presented in Table 4-1 with survey boundaries illustrated in Figure 4-1. Appendix 2 provides these survey reports.

Contemporary surveys include detailed and targeted on-ground surveys in addition to desktop assessments. Surveys were undertaken in a manner consistent with the requirements of the Commonwealth and Western Australia guidance for surveys listed in Section 3 and fulfil the requirement of Section 7.1 of the Program for contemporary targeted on-ground surveys.

Table 4-1 Terrestrial Fauna – recent studies and surveys

Title	Survey date	Survey type	Survey summary
Western Ridge Ghost Bat Cave and Habitat Categorisation (Biologic 2022c) (Appendix 2A)	N/A	Memorandum summarising the significance of Ghost Bat roosts and habitats recorded in the Western Ridge area	The memorandum was prepared to consider additional information published on Ghost Bats since the baseline fauna assessments were completed (namely, Bat Call WA 2021). The additional information has refined the understanding of the Ghost Bat and its supporting habitats. The memorandum presents the Western Ridge Ghost Bat habitat against the revised roosting cave, and critical and supporting habitat categories.
Western Ridge Pipelines Vertebrate Fauna Survey (Biologic 2022d) (Appendix 2B)	Mar 2021 Mar 2022	Basic and targeted fauna survey of an eastern portion of the Western Ridge area and potential future pipeline corridors to support Newman operations	A two-phase basic and targeted fauna survey undertaken in March 2021 and March 2022, aimed to identify the occurrence of terrestrial vertebrate fauna species and their supporting habitats within the area surveyed, with a focus on fauna species of conservation significance. Targeted survey methods included targeted searches, spotlighting, camera traps, acoustic bird call recordings, bat echolocation recordings, bilby plots and habitat assessments. Six broad fauna habitat types were recorded and mapped. A total of 100 species, comprising 12 mammals (nine native and three introduced), 75 birds, 11 reptiles and two amphibians were recorded during the survey. The Pilbara Olive Python was detected at one water feature via environmental DNA sampling and the Western Pebble-mound Mouse was recorded from secondary evidence (mounds).
Western Ridge Paddy Bore Area Vertebrate Fauna Survey Memo (Biologic 2022) (Appendix 2C)			
Western Ridge Matters of National Environmental Significance Fauna Study (Biologic 2021b) (Appendix 2D)	Aug-Nov 2020	Targeted survey for Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat and Pilbara Olive Python in the Western Ridge area	Species-specific targeted surveying for Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat and Pilbara Olive Python. The survey was conducted over four separate field surveys between August and November 2020. Survey methods were focused on obtaining population information of each of the target species using a variety of techniques relevant to each species. During this survey, no evidence of Northern Quoll or Pilbara Leaf-nosed Bat was recorded within the Study Area. Evidence of the Ghost Bat was recorded from a

Title	Survey date	Survey type	Survey summary
			single cave, and the Pilbara Olive Python was recorded on 14 occasions during this survey.
Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2020a) (Appendix 2E)	Mar 2020	Targeted conservation significant vertebrate fauna survey of the Western Ridge area	A single-season targeted vertebrate fauna survey, with a focus on MNES species, was undertaken in March 2020. The methodology was specific to recording the presence of the targeted species and identifying their habitats (foraging, denning, roosting etc.). The survey recorded seven habitat types and numerous habitat features, in the form of caves and water features. Three of the targeted species (Northern Quoll, Ghost Bat and Pilbara Olive Python) were recorded. The Pilbara Leaf-nosed Bat has previously been recorded within 50 m of the area and was deemed highly likely to exist within the survey area despite not being recorded during this survey. The Greater Bilby and Night Parrot were deemed unlikely to occur in the Study Area.
Coombanbunna Well Level 2 Vertebrate Fauna Survey (Biologic 2020b) (Appendix 2F)	Nov-Dec 2019 Feb-Mar 2020	Two-season detailed vertebrate fauna survey of the Coombanbunna Well exploration tenements	A two-season detailed vertebrate fauna survey (including targeted surveying) conducted between November and December 2019, and between February and March 2020 of the Coombanbunna Well exploration tenements (covering the southern portion of the Western Ridge area). Five broad fauna habitat types were recorded and mapped. No important habitat features (caves or water features) were recorded. Of the 38 species of conservation significance identified in the desktop assessment, two were recorded, Pilbara Leaf-nosed Bat and Western Pebble-mound Mouse.
Western Ridge E52/3448 Desktop Flora and Fauna Assessment (Onshore Environmental 2018) (Appendix 2G)	N/A	Desktop assessment for flora, vegetation and terrestrial fauna (vertebrate and SRE invertebrate fauna) of the Western Ridge exploration tenement	A desktop flora, vegetation and terrestrial fauna assessment of the Western Ridge exploration tenement. The terrestrial fauna desktop assessment identified 32 conservation significant vertebrate fauna species potentially occurring within the vicinity of the exploration tenement. Four of these taxa were determined to be 'likely' to occur based on available habitat and distance to the nearest known record. Six vertebrate fauna habitats were mapped within the exploration tenement on the basis of land units, vegetation mapping and extrapolation from neighbouring mapping. None of the fauna habitats mapped were considered to be significant.

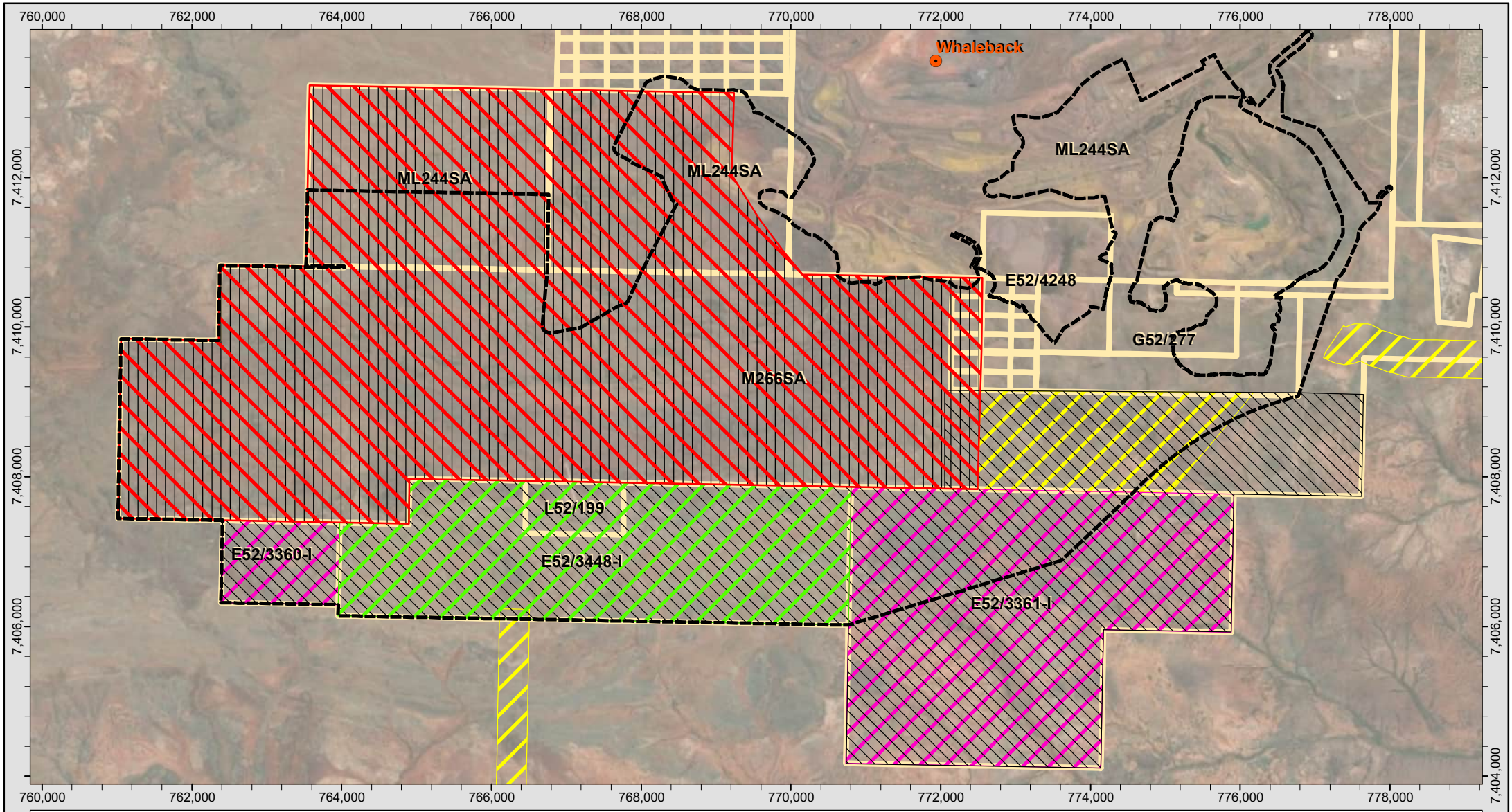
Title	Survey date	Survey type	Survey summary
Western Ridge Southern Tenements Vertebrate Fauna Desktop Assessment (Biologic 2016a) (Appendix 2H)	N/A	Desktop assessment for vertebrate fauna of the Western Ridge exploration tenements	A vertebrate fauna desktop assessment covering the Western Ridge southern tenements. The desktop assessment identified 33 species of conservation significance, of which it was determined that four were likely to occur and four species may occur in the southern tenements. No conservation significant fauna have previously been recorded. Based on preliminary habitat assessments undertaken during a site visit, aerial imagery, Land System data and vegetation mapping, three major fauna habitats were identified within the southern tenements.

The targeted vertebrate survey (Biologic 2020a) specifically targeted Greater Bilby, Northern Quoll, Ghost Bat, Pilbara Leaf-nosed Bat and Pilbara Olive Python and included habitat assessments at 52 locations, targeted searches at 32 sites comprising 61 person hours, 200 Northern Quoll camera trap nights, assessments of every identified cave, scat collections from caves where present, 26 bat echocolation call recording nights across 17 locations, 14 person hours of nocturnal searches for Pilbara Olive Python and 52 eDNA samples for Pilbara Olive Python from eight surface water features.

The Coombanbunna Well survey (Biologic 2020b) included six systematic trapping sites each open for seven consecutive nights, with each site comprising ten pit traps, two funnel traps, 20 medium Elliott traps and two cage traps. A total of 44 bat call recording nights, 18 camera trap nights, 13 hours of nocturnal spotlighting, five hours of targeted Greater Bilby sampling and opportunistic recording.

The Matters of National Environmental Significance Fauna Study (Biologic 2021) included 110 habitat assessment sites, 24 hours of targeted searches for Northern Quoll, 1840 camera trap nights for Northern Quoll, 89 bat echocolation call recording nights (comprising 48 within the activity area and 41 regional locations outside of the activity area), Ghost Bat scat collection visits at eight caves, 28 person hours of diurnal searches and 25 person hours of nocturnal searches for Pilbara Olive Python and collection of eDNA samples for Pilbara Olive Python from seven surface water features.

A memorandum summarising the significance of Ghost Bat roosts and habitats recorded in the Western Ridge area has been prepared by Biologic (2022). The memorandum was prepared to consider additional information published on Ghost Bats since the baseline fauna assessments were completed (namely, Bat Call (2021a) and consultation with DCCEW. In addition to the abovementioned surveys, a regional study to consolidate fauna habitat mapping within BHP's Pilbara tenements was undertaken to support the assessment of terrestrial fauna within the Pilbara: Consolidated Fauna Habitat Mapping (Biologic 2014).



BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE
Vertebrate fauna surveys

N

1 0.5 0 1
Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date: 12/09/2023	Project No: A979/191C	Figure: 4-1
Prepared: SPATIAL DATA	Checked: ENV APPROVALS	

LEGEND

- Activity Area
- BHP tenure
- BHP operations
- Coombanbunna Well Level 2 Vertebrate Fauna Survey (Biologic 2020)
- Western Ridge E52/3448 Desktop Flora and Fauna Assessment (Onshore Environmental 2018)
- Western Ridge Southern Tenements Vertebrate Fauna Desktop Assessment (Biologic 2016)
- Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2020)
- Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2021)
- Western Ridge Pipeline Vertebrate Fauna Survey (Biologic 2022)

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_191_E_WesternRidge_VN_VertFaunaSurveys_RevC.mxd

Relevant Program Matters

This section provides information relating to Program Matters for which the Notifiable Action Triggers are applicable. Relevant Program Matters include Northern Quoll, Ghost Bat, Pilbara Olive Python and Pilbara Leaf-nosed Bat.

4.3 Northern Quoll

4.3.1 General Species Information

The Northern Quoll is listed under the EPBC Act as 'Endangered'. It is the smallest and most arboreal of the four Australian quoll species (van Dyck and Strahan 2008) and has undergone a dramatic range contraction since European settlement, including a 75% reduction in distribution during the 20th century. In the Pilbara, Northern Quoll distribution is bounded in the north, east and south by the Great Sandy Desert, Gibson Desert and Little Sandy Desert (DotE 2014a). The potential invasion of the Pilbara by the Cane Toad is regarded as the most significant future threat to the persistence of the Northern Quoll in the Pilbara (Cramer *et al.* 2016a).

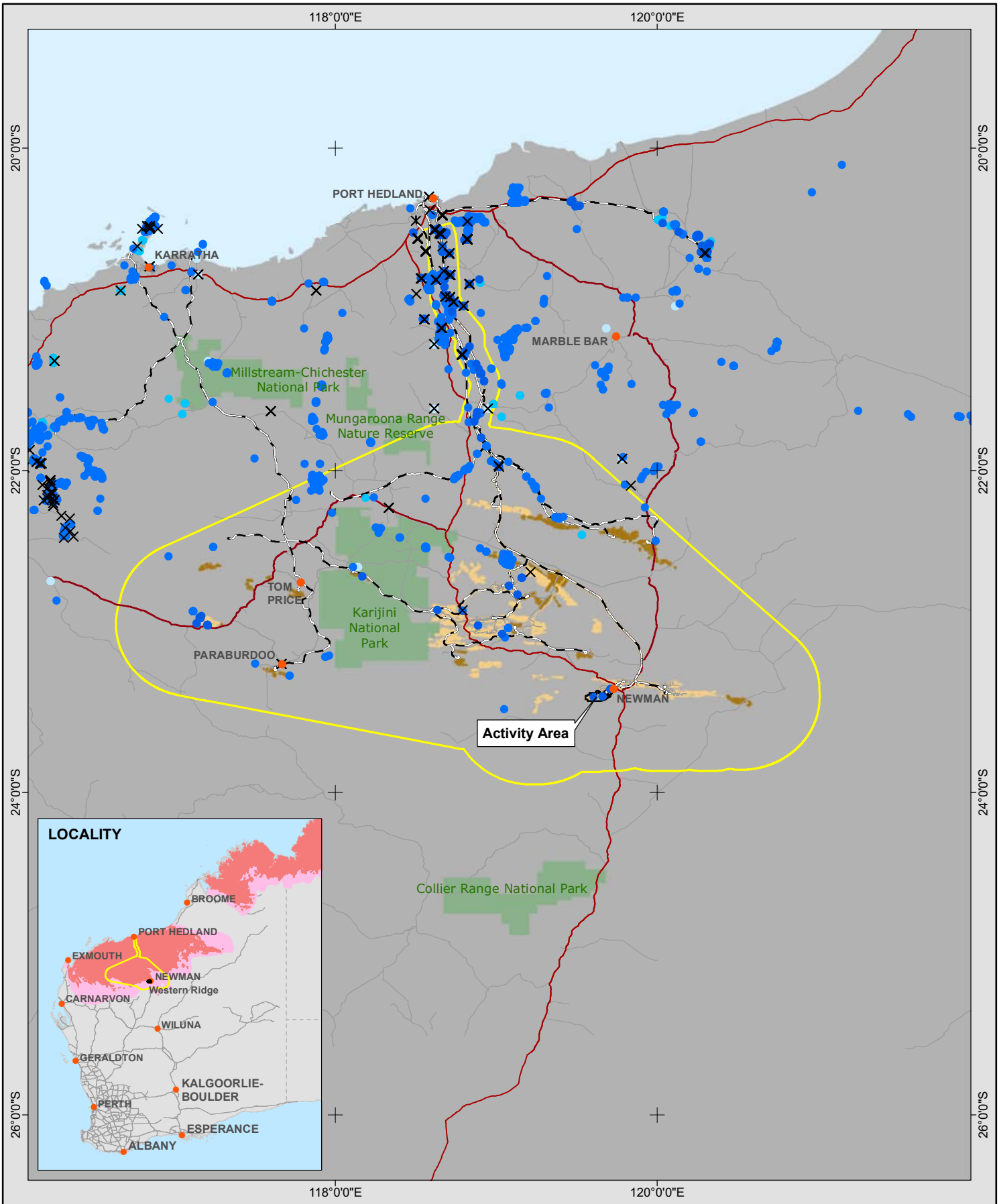
Northern Quolls mostly favour rocky habitats (e.g. escarpments, mesas, gorges, breakaways and boulder fields), major drainage lines and treed creek lines as denning or shelter habitat, and foraging occurs in the vegetated areas surrounding their dens (DotE 2016). Higher densities of Northern Quoll are usually found in rocky habitats as they offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite and Griffiths 1994, Oakwood 2002). Figure 4.2 illustrates the regional records and distribution of Northern Quoll.

The ecology of Northern Quolls is complex as they use habitats in a variety of ways for denning and foraging, and an individual can use multiple den sites. Northern Quolls will den during the day and leave den sites to forage during the night. They are generally considered to be solitary, with females having mutually exclusive denning areas, but can have overlapping foraging areas. Populations fluctuate annually, which is likely to be related to the abundance, dispersion and renewability of food (Oakwood 2002). Both sexes usually change dens every night, with females each using up to 55 dens (Oakwood 2008).

4.3.2 Regional Habitat and Baseline Modelling Data

The Impact Assessment Report (Eco Logical 2015) presented the modelled habitat preference for the Northern Quoll using 518 species records from publicly available and BHP data. The model indicated that preferred habitat (H4) was strongly associated with rugged hills, ranges and outcrops in the north and northeast of the Pilbara bioregion, as opposed to areas in the central and southern areas of the Pilbara bioregion. It was acknowledged, however, that the model may have potentially under predicted in the higher elevation ranges in the southern part of the Strategic Assessment Area (Eco Logical 2014a).

The cumulative impact assessment model predicts a potential impact of 504 ha to H4 for the Northern Quoll as a result of the Full Conceptual Development Scenario (Table 4.2). No preferred habitat (H4) exists in the Activity Area and only a minimal extent of the second most preferred habitat (H3) is present. Figure 4.3 shows the Northern Quoll modelled habitat and regional records within the Activity Area for this Notice.



BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE VALIDATION NOTICE

Northern Quoll regional records and distribution

N

100 50 0 100

Kilometres

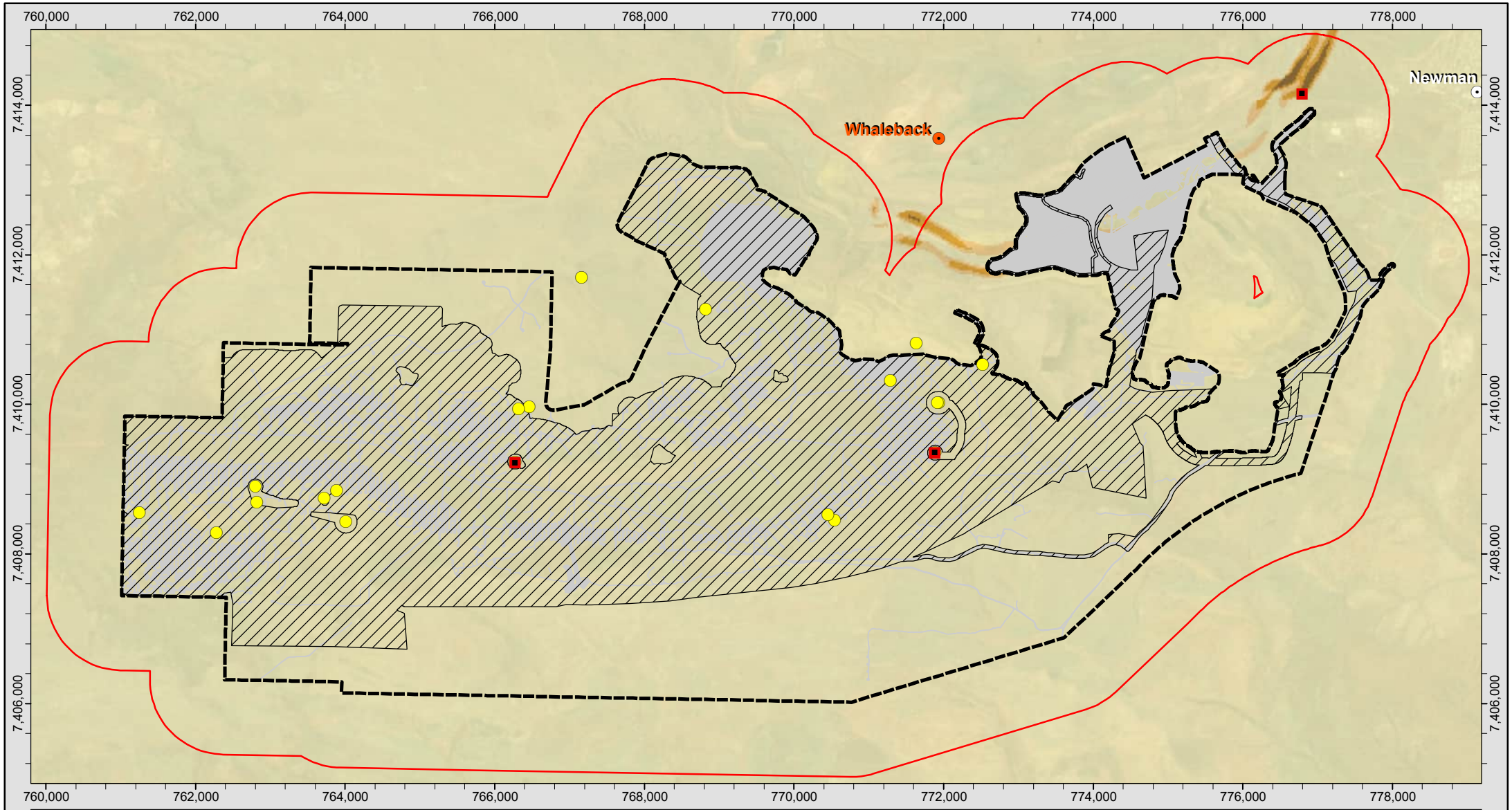
Coordinate System: GCS GDA 1994, Datum: GDA 1994, Units: Degree

Date:	1/03/2022	Project No: A979/179B	Figure: 4-2
Prepared:	M. English	Checked: A. Edgar	

LEGEND

Northern Quoll records
- Records After 2005
- Records between 1980 - 2004
- Records Prior 1979
- Records Missing Date
- Activity Area
- BHP LOA Mine Plan disturbance footprint
- Major Road
- Minor/Regional Road
- Rail Centreline
- Strategic Assessment Area
- Town
- Third Party disturbance footprint
- Species or species habitat likely to occur
- Species or species habitat may occur

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_179_E_WesternRidge_VN_SEASpecies_NQ_RevB.mxd



BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE VALIDATION NOTICE

Northern Quoll modelled habitat and regional records

N

1 0.5 0 1

Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	1/03/2022	Project No: A979/182C	Figure: 4-3
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- 1km radius of Activity Area
- Activity Area
- BHP operations
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- Northern Quoll (*Dasyurus hallucatus*) (EN)
- Cave

Northern Quoll potential habitat modelling

- H1 (Lowest potential)
- H2
- H3
- H4 (Highest potential)

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Table 4-2: Northern Quoll modelled habitats within the SAA

Habitat Description	Modelled Habitat Area Pilbara bioregion (ha)	Modelled Habitat in Strategic Assessment Area (ha)	Modelled Habitat within the Full Development Scenario (ha)	Modelled within ActivityAarea^ (ha)	Modelled within the IF (ha)
H4	1,552,321	64,228	504	0	0
H3	4,497,928	221,103	3,104	3	1
H2	3,822,101	678,966	3,104	32	3
H1	7,920,267	4,993,780	273	7,382	4,287

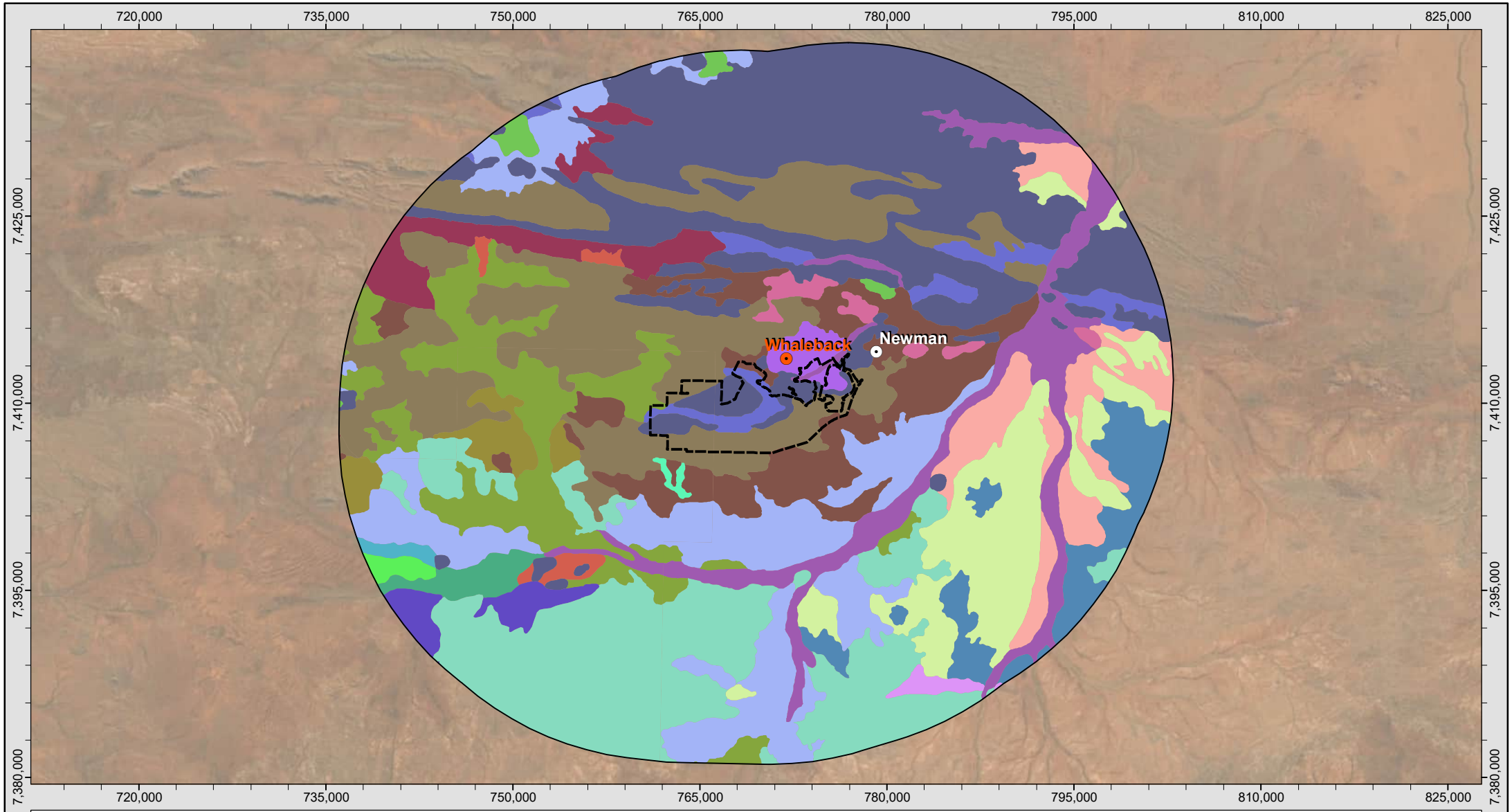
The land systems of the Pilbara region documented by van Vreeswyk *et al* (2004) that are found within 25 km of the Activity Area are detailed in Table 4.3 and Figure 4.4. Of these land systems, six provide a significant quantity (> 100,000 ha) of preferred Northern Quoll foraging and breeding habitat (Gorge/Gully and Breakaway/Cliff habitats) through Hills/Ridges/Breakaways adjacent to the Activity Area.

Table 4-3: Pilbara land systems within 25 km of the Activity Area

Land System	Description	Habitats	Area (ha)
River	Active flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands.	Major/Minor Drainage Lines Drainage Area/Floodplain	15,779
Nooingin	Hardpan plains with very large groves supporting mulga shrublands.	Stony Plain Drainage Area/Floodplain	915
Robe	Low limonite mesas and buttes supporting soft spinifex (and occasionally hard spinifex) grasslands.	Hills/Ridges/Breakaways	347
Warri	Low calcrete platforms and plains supporting mulga and cassia shrublands.	Drainage Area/Floodplain Major/Minor Drainage Lines	2,490
Turee	Stony alluvial plains with gilgaied and non-gilgaied surfaces supporting tussock grasslands and grassy shrublands.	Stony Plain Drainage Area/Floodplain Major/Minor Drainage Lines	694
Charley	Dolerite hills and ridges and restricted plains supporting mulga and *cassia* shrublands or spinifex grasslands.	Hills/Ridges/Breakaways Drainage Area/Floodplain Major/Minor Drainage Lines	940
Divide	Sandplains and occasional dunes supporting shrubby hard spinifex grasslands.	Sandplains/Sand Dunes	19,768
Jamindie	Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey.	Drainage Area/Floodplain Stony Plain Mulga Woodland	3,198

Land System	Description	Habitats	Area (ha)
Nirran	Undulating stony plains and hills supporting hard spinifex grasslands and mulga shrublands with soft spinifex	Stony Plain Mulga Woodland	4,234
Platform	Dissected slopes and raised plains supporting hard spinifex grasslands.	Major/Minor Drainage Lines Stony Plain	7,678
Prairie	Gently undulating stony plains and granite hills supporting *acacia-eremophila-cassia* shrublands and minor soft spinifex grasslands.	Stony Plain	41,150
McKay	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands.	Hills/Ridges/Breakaways	2,180
Egerton	Dissected hardpan plains supporting mulga shrublands and hard spinifex hummock grasslands.	Major/Minor Drainage Lines Stony Plain Mulga Woodland	21,169
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	Stony Plain Mulga Woodland	5,578
Elimunna	Stony plains on basalt supporting sparse acacia and cassia shrublands and patchy tussock grasslands.	Stony Plain	19,661
Newman	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands.	Hills/Ridges/Breakaways	61,075
Spearhole	Gently undulating gravelly hardpan plains and dissected slopes supporting groved mulga shrublands and hard spinifex.	Drainage Area/Floodplain Stony Plain Mulga Woodlands	30,514
Slyvania	Gritty surfaced plains and low rises on granite supporting *acacia-eremophila-cassia* shrublands.	Stony Plain	9,717
Table	Low calcrete plateaux, mesas and lower plains supporting mulga and cassia shrublands and minor spinifex grasslands.	Hills/Ridges/Breakaways Major/Minor Drainage Lines Drainage Area/Floodplain Mulga Woodlands	1,438
Wannamunna	Hardpan plains and internal drainage tracts supporting mulga shrublands and woodlands (and occasionally eucalypt woodlands).	Major/Minor Drainage Lines Drainage Area/ Floodplain Stony Plain Mulga Woodlands	1,341
Washplain	Hardpan plains supporting groved mulga shrublands.	Stony Plain Mulga Woodland	11,724

Land System	Description	Habitats	Area (ha)
Rocklea	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands.	Hills/Ridges/Breakaways	46,283
Disturbed	Disturbed area, mining activity etc	N/A	2,081



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WESTERN RIDGE VALIDATION NOTICE
Regional land systems

N

10 5 0 10
Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	21/02/2022	Project No: A979/208B	Figure: 4-4
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- 25km radius of the Activity Area
- Activity Area
- BHP operations
- Boolgeeda
- Charley
- Disturbed Land
- Divide
- Egerton
- Elimunna
- Jamindie
- McKay
- Newman
- Nirran
- Nooingnin
- Platform
- Prairie
- River
- Robe
- Rocklea
- Spearhole
- Sylvania
- Table
- Turee
- Wannamunna
- Warri
- Washplain

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4.3.3 Local Habitat

Survey areas and methods used to detect the Northern Quoll in the Activity Area are shown in Figure 4.5 with mapped habitat and records shown in Figure 4.6. The Activity Area falls within the current distribution of the Northern Quoll, whereby the species or species habitat may occur.

Gorge/Gully and Breakaway/Cliff habitats are considered critical denning and foraging habitats for Northern Quoll (DotE 2016). Although up to 187 ha of these habitats are present in the Activity Area, they only represent supporting habitat to Northern Quoll as no breeding evidence has been recorded or recent sign of individuals (Biologic 2020a, 2021) (Table 4.4). A total of 147 ha of critical habitat is present within the Indicative Footprint and will be impacted.

While up to 25.7 ha of Major Drainage Line is present within the Activity Area, of which 4.8 ha is within the Indicative Footprint, this habitat type extent is adjacent to the existing Mt Whaleback rail loop and is degraded and fragmented and therefore not considered critical or supporting habitat.

A total of 4,427 ha of Hillcrest/Hillslope and Stony Plain habitats are present in the Activity Area and represent supporting foraging habitat for the species (Biologic 2020a, 2021). Of this extent, up to 2,632 ha is within the Indicative Footprint and will be impacted by the Activity. While approximately 38.7 ha of Sand Plain habitat is present within the Activity Area, of which 31.7 ha is in the Indicative Footprint, this habitat type extent is not considered likely to support the species as it is fragmented and degraded due to being in proximity to existing activity at Mt Whaleback.

Table 4-4: Northern Quoll survey habitat assessment

Habitat Description	Within Activity Area (ha)	Within Indicative Footprint (ha)
Critical habitat		
Gorge/Gully	140.0	Up to 108
Breakaway/Cliff	47.0	Up to 39
Total	**187**	**147**
Supporting habitat		
Hillcrest/Hillslope	1,533.1	1,162.7
Stony Plain	2,894.3	1,469.3
Total	**4427.4**	**2,632**

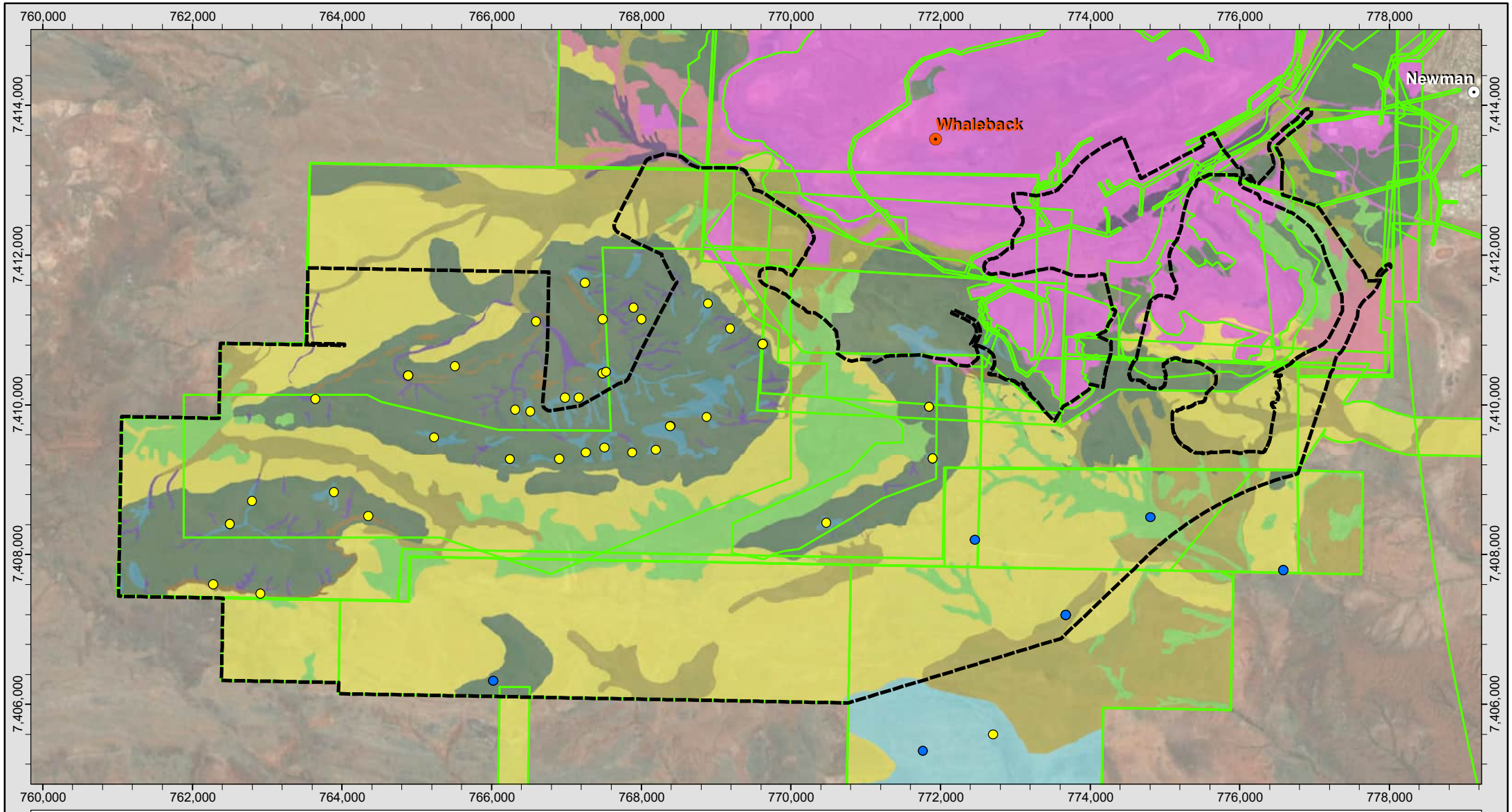
4.3.4 Northern Quoll Records

One confirmed record of Northern Quoll (scat) and two unconfirmed records (scats) have been recorded within the Activity Area within Gorge/Gully habitat (Figure 4.6) (Biologic 2020a). One scat, estimated to be over a year old was confirmed to belong to the Northern Quoll, while the other two scats were estimated to be over three years old and analysis could not confirm they belonged to Northern Quoll (Biologic 2020a). It is considered that the one confirmed record likely represents a dispersing individual and is not representative of present occurrence of Northern Quoll. Targeted sampling and camera transects within the Activity Area have not recorded any evidence of Northern Quoll (Biologic 2020a, 2020b, 2021).

The most recent record of Northern Quoll, a fresh scat, was recorded in 2021 at BHP's Orebody 18 mine in a rehabilitated waste dump, located approximately 40 km east of the Activity Area. A 2007 record of a roadkill juvenile individual was reported from the main access bridge into Whaleback, located approximately 1.2 km northeast of the

Activity Area (Onshore & Biologic, 2009a). This roadkill record from Whaleback represents the south-eastern limit of the species occurrence in the Pilbara region (DBCA 2020a).

Given the lack of recent records within or adjacent to the Activity Area, and lack of suitable habitat to support the species, it is considered unlikely that the Northern Quoll occurs within the Activity Area. The Activity Area does not support an important population for the long-term survival of the Northern Quoll as defined by DotE (2016.).



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WESTERN RIDGE VALIDATION NOTICE
Northern Quoll survey areas and methods

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	21/02/2022	Project No: A979/249B	Figure: 4-5
Prepared:	M. English	Checked: A. Edgar	

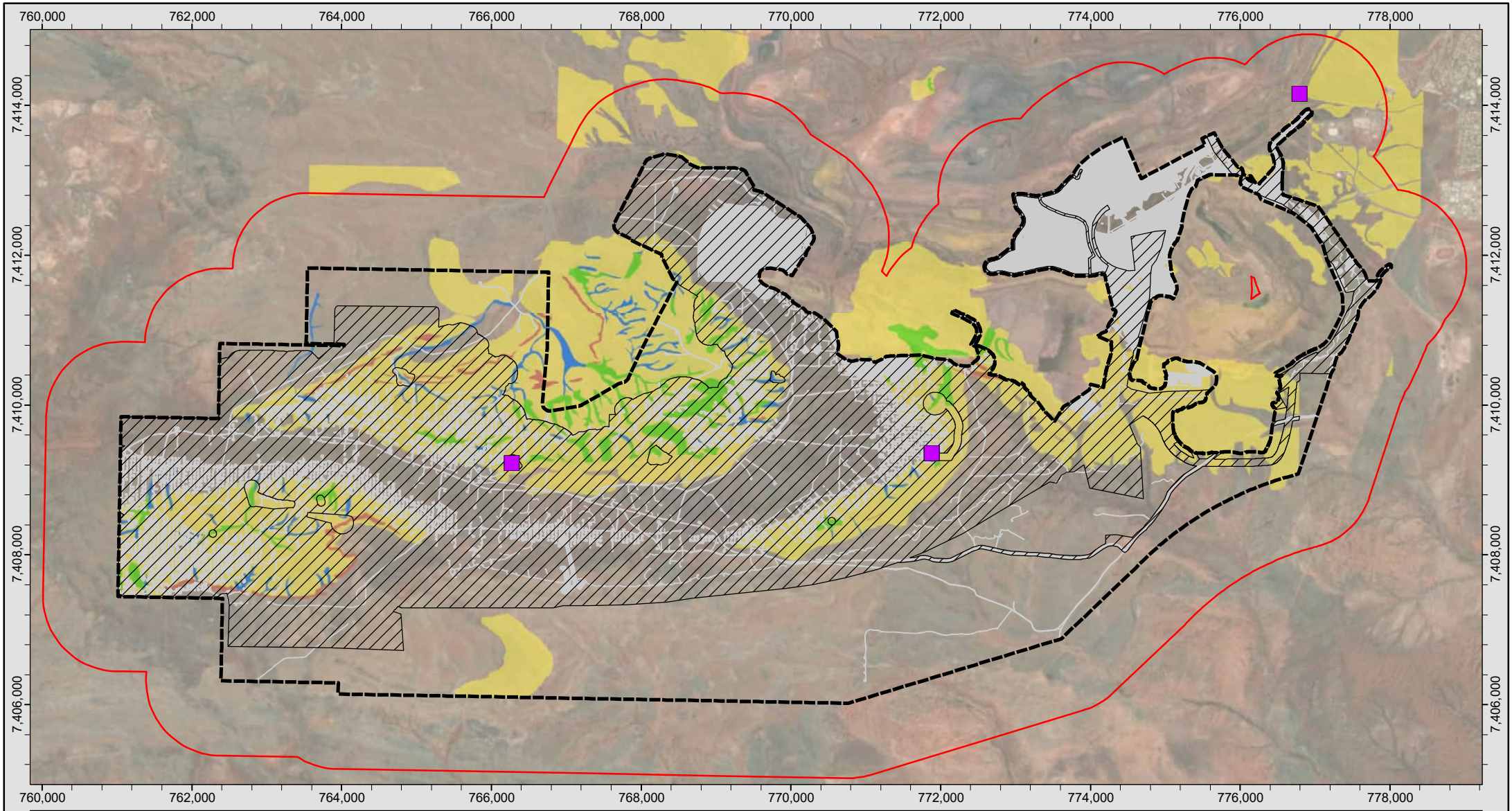
LEGEND

- Activity Area
- BHP operations
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

Northern Quoll Sample Site

- 2019
- 2020
- Northern Quoll Survey Coverage

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_249_E_WesternRidge_VN_NQ_SurveyCoverage_RevB.mxd



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Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE VALIDATION NOTICE
Northern Quoll mapped habitats and records

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	19/01/2022	Project No: A979/170C	Figure: 4-6
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- 1km radius of the Activity Area
- Activity Area
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- Northern Quoll (*Dasyurus hallucatus*) (EN)
- Breakaway/ Cliff
- Gorge/ Gully
- Hillcrest/ Hillslope
- Minor Drainage Line

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_170_E_WesternRidge_VN_NQ_HabitatRecords_RevC.mxd

4.3.5 Impact Assessment

The potential direct and indirect impacts to Northern Quoll from the Activity are outlined below. Loss of critical habitat is considered a significant residual impact that requires offsetting (Section 5).

Habitat Loss

The key potential impact to the Northern Quoll arising from implementation of the Activity is loss of habitat. Up to 147 ha of critical habitat (which may be used for foraging) will be disturbed within the Activity Area. In addition, approximately 2,632 ha of supporting habitat will be disturbed within the Activity Area. Fragmentation of Northern Quoll habitat will occur at a local level due to construction of pits and OSAs; however, given the lack of evidence of a residing population or colony, fragmentation is not predicted to impact any individuals.

Habitat modification

Hot work activities on site and the introduction and increased vehicle movements could increase the risk of fire and spread of weeds, respectively. Fire and weed encroachment have the potential to degrade Northern Quoll critical and supporting habitat within the Activity Area and within 500m of the Activity Area (DotE 2023a). In addition, fire activity can remove ground cover and make native fauna more vulnerable to predation. With standard BHP fire management and weed control practices, the potential for increased risk of fire and habitat degradation due to weeds, are considered low.

Vegetation clearing and vehicle movements may result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation and causing habitat degradation. Degradation of habitat value due to dust emissions is considered unlikely with the implementation of dust monitoring and management, throughout construction and operation of the Activity.

Alterations to landforms and construction of infrastructure can lead to altered surface water drainage patterns which in turn may cause flooding and erosion in some areas and, rain-shadow effects in other areas. With the implementation of surface water management measures, changes to surface water drainage will be minimized and are not predicted to result in residual impacts to habitats.

An assessment of potential acid and metalliferous drainage risk was undertaken in 2020 based on the volume of waste rock and pit wall exposure. Greater than 98% of the total waste rock volume is classified as AMD Class 0 (inert waste or non-acid forming (NAF)). The remaining waste rock is classified as reactive or potentially acid forming (PAF), of which 0.4% is classified as AMD Class 1, which is likely to contain fresh sulphides and poses the highest risk to water quality. The risk of generating AMD at Western Ridge is considered to be low at Bill's Hill, low to moderate at Silver Knight, low to high at Eastern Syncline (only high for pit wall exposure) and high at Mt Helen (BHP 2023).

BHP will manage the risk of AMD during operations in accordance with the MCP (BHP 2023). Management approaches in the MCP relating to AMD include:

- undertake additional geochemical characterisation, including assessment of AMD waste material
- conduct studies to inform the detailed design of the cover (encapsulation) for pit wall exposure of AMD Class 1 waste within the Mt Helen pit
- refine groundwater models once dewatering starts and additional monitoring data becomes available
- review options for optimising pit designs to reduce AMD waste volumes mined and AMD pit wall exposures
- design surface water diversions and/or other flood protection for closure conditions to prevent permanent creek capture and changes to the pit water balance where AMD Class 1 material is located
- place and encapsulate AMD material according to relevant BHP AMD management standards, including the backfill / cover of AMD 1 pit wall exposure to above the level of AMD 1 exposure.

- Retain creek diversions post closure and upgrade for extreme rainfall events
- Backfill below water table pits to 5m above the pre-development water table if required, to mitigate potential impacts to receptors.

The potential for AMD is not predicted to result in any impact to Program Matters or the quality of habitats they utilise.

Feral Predators and Cane Toads

Feral predators may compete with the Northern Quoll for food or may prey on it. The Activity may attract feral predators to the area, with the storage of food and waste disposal on site. Evidence of cats was recorded during the 2020 Coombanbunna fauna survey (Biologic 2020b). With implementation of standard BHP waste management and feral cat management practices, and given there is only the one confirmed historical record of Northern Quoll in the Activity Area, the impact of feral cats on the Northern Quoll is considered low. BHP is also currently investigation options to implement ongoing feral cat monitoring at Western Ridge and at other BHP operations, to enhance detection and control measures. This information will be updated in the final Validation Notice if available at the time of publication.

The Northern Quoll is vulnerable to lethal toxic ingestion of cane toad toxin, and this is considered the main threat to Northern Quoll populations outside of the Pilbara (Oakwood 2004; Hill and Ward 2010). The future predicted spread of the cane toad into the Pilbara bioregion may have comparable negative impacts to the Northern Quoll as observed in other areas of northern Australia. Some models predict that the cane toad's distribution will spread to include the Pilbara via the narrow coastal strip but that this spread will be dependent on the presence of artificial water bodies (Tingley *et al*. 2013). As there is only one confirmed historical record of the species in the Activity Area, the potential impact of Cane Toads on the Northern Quoll is considered low.

Vehicle Collisions

Vehicle and machinery movements have the potential to result in fauna strike, causing injury or mortality to fauna individuals. Northern Quoll are vulnerable to vehicle strike due to being a ground dwelling species and the risk of interaction with vehicles is greatest where roads occur in proximity to suitable habitat for the species.

Haul roads and access roads will be required to support the Activity. As there is only one confirmed historical record of the species in the Activity Area, with no evidence of recent activity, the risk of mortality due to vehicle collision is considered low.

4.3.6 Mitigation Hierarchy

Avoid

BHP has modified and reduced the original Indicative Footprint by incorporating mining exclusion zones for Ghost Bats, buffers around Ghost Bat caves and a Short-range endemic fauna avoidance zone (see Figures 4.10, 4.11 and 4.16). This has also resulted in the avoidance of approximately 15 ha of critical habitat (Gorge/Gully and Breakaway/Cliff). BHP also revised the Activity Area to exclude an area to the north of the Development Envelope which includes Gorge/Gully and Breakaway/Cliff habitat.

Direct impacts to suitable Northern Quoll denning habitat will also be avoided where practicable through planning and implementing land disturbance approval processes prior to land disturbance.

Mitigate

While BHP adopts an Indicative Footprint, to allow for optimisation of design, upper limits have been applied to clearing of high value habitats including Gorge/Gully and Breakaway/Cliff. Therefore, any minor modifications to design will not result in increased impacts to these habitats. The following limits will apply:

- clearing of up to 108 ha Gorge/Gully
- clearing of up to 39 ha Breakaway/Cliff.

Potential impacts to Northern Quoll habitat from fire are to be minimised through standard BHP hot work management procedures, assigning designated smoking areas and managing fuel loads through weed control programs.

In the event the presence of Cane Toads is detected on site, additional management measures will be applied following the guidance of DBCA.

4.3.7 Residual Impact

Significant residual impacts for the Northern Quoll include the direct disturbance of the following habitats:

- 147 ha of critical habitats (Gorge/Gully and Breakaway/Cliff) which have the potential to support denning and foraging.
- 2,632 ha of supporting habitats (Hillcrest/Hillslope and Stony Plain) which have potential to support foraging.

Offsets will be provided for these significant residual impacts (Section 5).

4.3.8 Review of Program Matter Outcomes

Following the impact assessment (Section 4.3.5) and application of the mitigation hierarchy (Section 4.3.6) a review of the Activity against the PMOs was undertaken. Table 4.5 presents a review and identifies which PMOs are relevant for the Activity and considers further management.

Table 4-5: Review of Program Matter Outcomes (Northern Quoll)

Program Matter Outcome	Notifiable Action Trigger	Assessment
Minimise loss of critical and supporting habitats of the Northern Quoll as a result of Program Activities within the SAA	Within the Activity Area there is: Presence of Northern Quoll critical habitat and or supporting habitat **AND** Presence or sign of Northern Quoll transient, infrequent or dispersing individual/s	The loss of up to 147 ha of critical habitat and 2,632 ha of supporting habitat represents a significant residual impact and requires offsetting (see Section 5). The Activity is not predicted to result in any loss of population, given that there are no recent records within the Activity Area.

4.3.9 Monitor

Although there is limited historic evidence of Northern Quoll in the Activity Area, this record most likely represents a dispersing individual rather than regular or continual use of the area by a population. Therefore, monitoring is not considered to be required.

4.3.10 Summary

BHP considers the Activity will meet the PMO to minimise loss of critical and supporting habitats given that habitat loss has been avoided as far as practicable through changes to the design, upper limits have been placed on clearing of critical habitat to minimise loss of habitat; and the loss of both critical and supporting habitats will be offset (see Section 5).

4.4 Ghost Bat

4.4.1 General Species Information

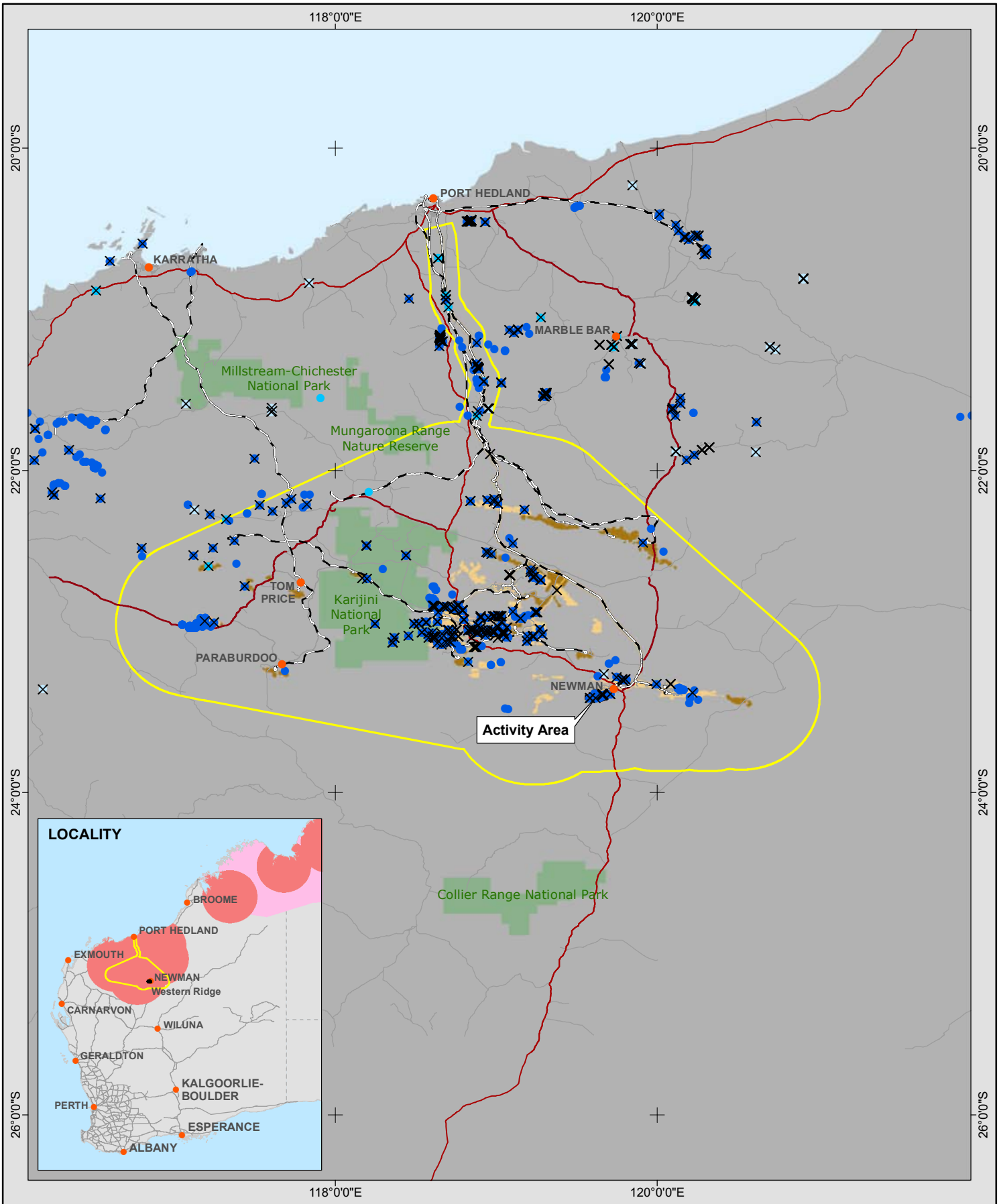
The Ghost Bat is listed under the EPBC Act as 'Vulnerable'. It is the largest microbat in Australia and the second largest in the world (TSSC 2016a). In the Pilbara region, the species occurs in all four sub-regions, and was recorded in 21 of the 24 areas surveyed by the DPaW during the Pilbara Biological Survey (2002-2007; see McKenzie and Bullen 2009). The Pilbara Ghost Bat population is currently estimated to be approximately 1,850 (350 across the Hamersley Range and 1,500 across the eastern Pilbara) (Bat Call WA 2021a). The largest colonies of Ghost Bats in the Pilbara occur outside the SAA where they mostly roost in abandoned mines. Colonies within the SAA are much smaller, and available data suggest that they likely depend on a number of roosts within their range (Biologic 2021). Figure 4.7 illustrates the regional records of Ghost Bat.

In the Pilbara region, the species roosts in deep, complex caves beneath bluffs of low rounded hills, often composed of Marra Mamba Iron Formation or banded iron formation, granite rock piles and abandoned mines (Armstrong and Anstee 2000). Ghost Bats may move between caves both seasonally and in response to weather changes (van Dyck and Strahan 2008). Highly suitable foraging habitats for the Ghost Bat in the Pilbara include Drainage Area/Floodplain, Gorge/Gully, Major Drainage Line and Mulga Woodland, followed by Stony Plain as a less suitable habitat (Biologic 2020c; unpublished data).

Recent Ghost Bat tracking studies (Augusteyn *et al.* 2018 and Bullen 2021) show that both male and female Ghost Bats, forage over large areas up to 12 km from their diurnal roost and up to 17 km from a roost during foraging bouts (Bullen *et al* 2023).

4.4.2 Regional Habitat

During the Strategic Environmental Assessment, the Ghost Bat was listed as a 'Vulnerable' species under the EPBC Act on 5 May 2016 and was therefore included as a Program Matter for the Impact Assessment Report. As this species was a late inclusion in the Impact Assessment Report, a regional model was not developed; however, BHP conducted an impact assessment based on species records in order to determine cumulative impacts of the Program on the Ghost Bat.



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WESTERN RIDGE VALIDATION NOTICE

Ghost Bat regional records and distribution

N

100 50 0 100

Kilometres

Coordinate System: GCS GDA 1994, Datum: GDA 1994, Units: Degree

Date:	1/03/2022	Project No: A979/177B	Figure: 4-7
Prepared:	M. English	Checked: A. Edgar	

LEGEND

Ghost Bat records

- Records After 2005
- Records Between 1980 - 2004
- Records Prior 1979
- Records Missing Date
- Activity Area
- BHP LOA Mine Plan disturbance footprint
- Major Road
- Minor/Regional Road
- Rail Centreline
- Strategic Assessment Area
- Town
- Third Party disturbance footprint
- Species or species habitat likely to occur
- Species or species habitat may occur

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The land systems of the Pilbara region documented by van Vreeswyk *et al* (2004) that are found within 25 km of the Activity Area are detailed in Table 4.3 and Figure 4.4. Of these land systems, six land systems provide a significant quantity (> 100,000 ha) of preferred Ghost Bat foraging and roosting habitat (Gorge/Gully and Breakaway/Cliff habitats) through Hills/Ridges/Breakaways adjacent to the Activity Area.

4.4.3 Local Habitat

Cave search areas and habitat assessment areas for the Ghost Bat are shown in Figure 4.8. Critical roosting and supporting habitat is present within the Activity Area or within 500m of the Activity boundary and is discussed below.

Breeding/roosting Habitat

Gorge/Gully and Breakaway/Cliff habitats are critical roosting habitat for the Ghost Bat, of which 140 ha and 47 ha, respectively, are located within the Activity Area (Table 4.6, Figure 4.9). The Gorge/Gully and Breakaway/Cliff habitat are considered critical breeding and roosting habitat to the species within the Activity Area as they support caves in which Ghost Bat roost and/or are prone to forming important habitat features such as overhangs and caves (Biologic 2020a, 2020b, TSCC 2016a and Bat Call WA 2021a). Up to 108 ha of Gorge/Gully and 39 ha of Breakaway/Cliff are present within the Indicative Footprint and will be impacted by the Activity.

Seventeen cave structures have been mapped within the Activity Area (Figure 4.9, 4.10 and 4.11). The caves are located within the Gorge/Gully and Breakaway/Cliff habitat types, generally close to the Hillcrest/Hillslope habitat type. Sixteen of these caves are considered suitable for Ghost Bat usage. The caves identified in the Activity Area are summarised in Table 4.7 and discussed in more detail below. Appendix 3 provides a summary of the features typically characteristic of the various roost types.

Critical roosting habitat

Two Category 2 roosts are present within the Activity Area. These represent critical roosting habitat for the Ghost Bat. Both of these roosts will be avoided within Mining Exclusion Zones.

One cave Category 2 roost (CWER-01), located in a breakaway in the western portion of the Activity Area, is a maternity roost for Ghost Bat (Biologic 2020a). Monitoring of this cave shows continued use with individuals sighted and large numbers of scats collected (Biologic 2020a). Elevated levels of progesterone were recorded from scats collected from monitoring undertaken in 2016 and 2019, indicating the cave is used by pregnant and/or lactating females, as such, confirming the classification as a maternity roost (Biologic 2020a).

A second Category 2 cave (CWER-03) located in a gorge south of the existing Orebody 35 mine, is a potential maternity roost and a confirmed diurnal roost by Biologic (2020a). Monitoring of this cave has recorded individuals on multiple occasions and scats (approximately 100) collected during each monitoring round, few of which have had elevated progesterone levels (Biologic 2020a, 2021). Based on the usage of the cave it is confirmed as a diurnal roost for Ghost Bat and based on the structure of this cave it is considered to have the potential to provide a maternity roost (Biologic 2020a). The number of scats recorded is considered low compared to the thousands usually recorded in a confirmed maternity roost, hence the classification as only a potential maternity roost.

Supporting roosting habitat

Three Category 3 roosts and five Category 4 roosts (Table 4-8 and Figure 4-9) are present within the Activity Area and these all represent supporting habitat for the Ghost Bat due to evidence of use, structural characteristics and location in relation to Category 2 roosts. The three Category 3 roosts are positioned more than 500m from the nearest Category 2 roost and therefore, they are considered supporting habitat rather than critical habitat. Up to five Category 4 roosts will be impacted by the Activity.

Indirect evidence of use (scats) has been recorded at four other caves within the Activity Area, including two Category 3 roosts (CWER-10, CWER-16) and three Category 4 roosts (CWER-02 and CWER-14). These caves are either

feeding roosts or potential feeding/nocturnal roosts. The Category 3 roosts are supporting habitat as they are not near to Category 2 roosts.

Elevated progesterone levels have recently been recorded in scats collected from CWER-16 (Category 3) indicating that pregnant bats have visited this roost. However, the number of scats deposited in CWER-16 was low (approximately 50 scats) and uncharacteristic of a maternity cave, such as when compared to the thousands of scats recorded at CWER-01 during previous surveys in 2018 (Biologic 2021) (see Appendix 3 for roost definitions). Furthermore, the number and locality of scats observed (i.e. at the entrance of the cave) suggests CWER-16 was being utilised for nocturnal roosting only by those individuals (Biologic 2021). This cave also lacks the structural characteristics required to support breeding.

None of the remaining cave structures recorded within the Activity Area have evidence of use by Ghost Bats and all are classified as supporting habitat as they are Category 4 roosts (potential feeding or nocturnal roosts), with the exception of one cave (CWER-17) classified as a potential diurnal roost (as per Biologic 2020a, 2021), also known as a Category 3 roost (as per Bat Call WA 2021a) (Table 4.7 and Figure 4.9).

There are four additional Category 4 roosts which are supporting habitat located directly north and outside of the Activity Area (within 500m of Activity boundary) (Figure 4.9). Three of these have evidence of usage by Ghost Bats in the form of a small number of old scats (Biologic 2020a).

Table 4-6: Caves recorded and evidence of Ghost Bat usage

Cave ID	Roost Category (Bat Call 2021)	Roost classification (Biologic 2020a)	Evidence of use by Ghost Bats (Biologic 2020a)
CWER-01	Category 2	Confirmed Maternity Roost	Yes - individuals observed; old and recent scats
CWER-02	Category 4	Feeding or Nocturnal Roost	Yes - old and recent scats
CWER-03	Category 2	Potential Maternity / Confirmed Diurnal Roost	Yes - individuals observed; acoustics calls; old and recent scats
CWER-04	Category 4	Potential Feeding or Nocturnal Roost	No
CWER-05	Category 4	Potential Feeding or Nocturnal Roost	No
CWER-07	Category 4	Potential Feeding or Nocturnal Roost	No
CWER-08	Category 4	Potential Feeding or Nocturnal Roost	No
CWER-09	Category 4	Potential Feeding or Nocturnal Roost	No
CWER-10	Category 3	Potential Diurnal / Feeding or Nocturnal Roost	Yes - old scats
CWER-11	Category 4	Potential Feeding or Nocturnal Roost	No
CWER-12	Category 4	Potential Feeding or Nocturnal Roost	No
CWER-13	Category 4	Potential Feeding or Nocturnal Roost	No
CWER-14	Category 4	Feeding or Nocturnal Roost	Yes - old scats
CWER-16	Category 3	Potential Diurnal / Feeding or Nocturnal Roost	Yes - recent scats
CWER-17	Category 3	Potential Diurnal Roost	No
CWER-19	Nil[1]	NA	No

Cave ID	Roost Category (Bat Call 2021)	Roost classification (Biologic 2020a)	Evidence of use by Ghost Bats (Biologic 2020a)
CWER-20	Category 4	Potential Feeding or Nocturnal Roost	No

[1] Further investigation of cave CWER-19 has shown it to be unsuitable as a Ghost Bat Roost.

Table 4-7: Ghost Bat Habitat Assessment

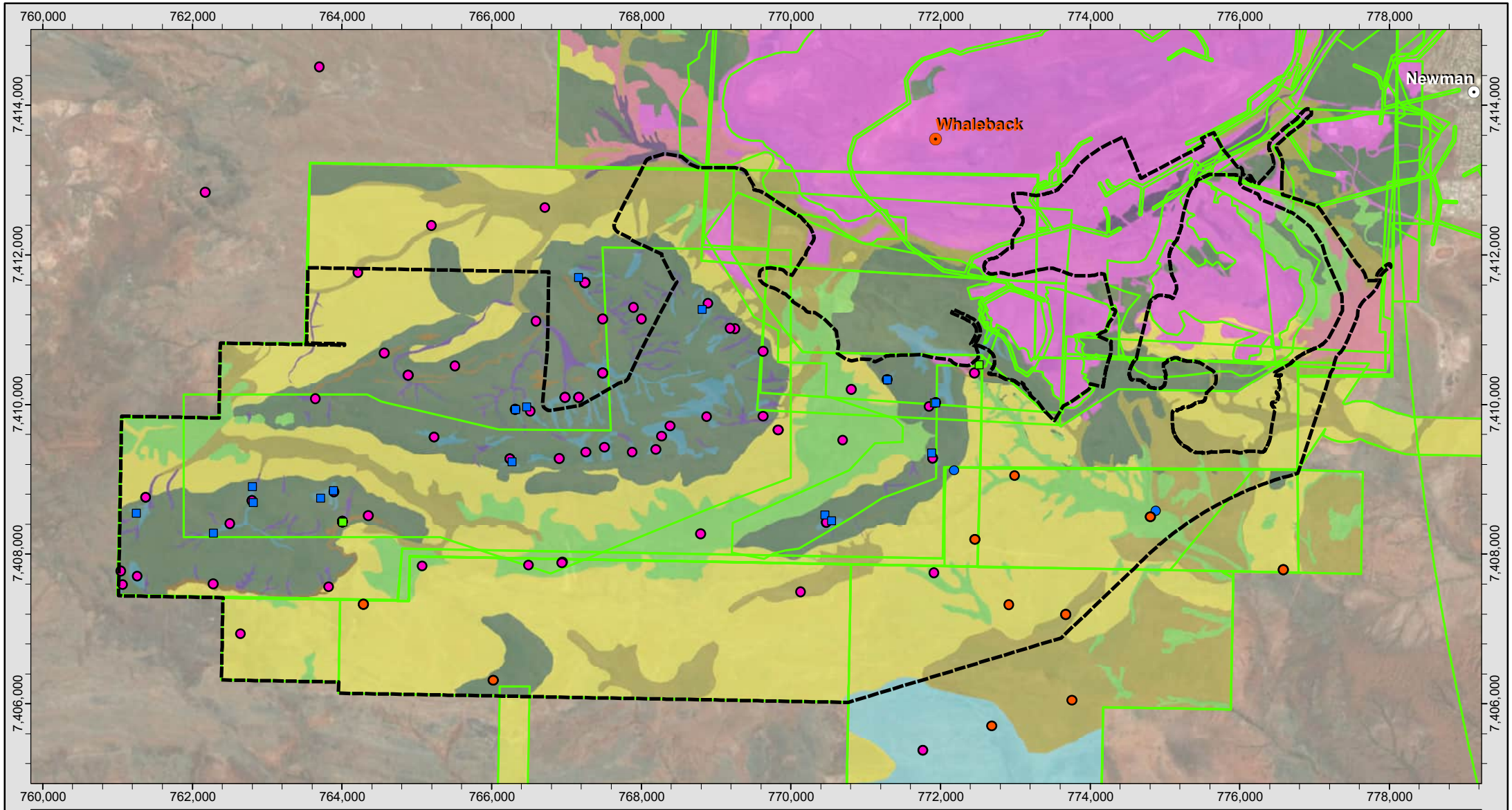
Habitat Description	Within Activity Area (ha)	Within Indicative Footprint (ha)
Critical habitat		
Gorge/Gully	140.2	Up to 108
Breakaway/Cliff	46.8	Up to 39
Critical foraging habitat		
Drainage Area/Floodplain	670.6	379.4
Mulga Woodland	776.7	647.8
Minor Drainage Line	74.9	56.0
Stony Plain	2,894.3	1,469.3
Total	**4,416.5**	**2,552.5**

Foraging Habitat

Unpublished satellite tracking data suggest Ghost Bats preferentially forage in areas of sparse, mature woodland over patchy and/ or clumped *Triodia* hummock grasslands. Ghost Bats are believed to use vantage points presented by tall, isolated trees on the edge of these woodlands and grasslands, as well as along watercourses to search for prey (Bat Call 2021, Biologic 2022).

Due to the evidence of Ghost Bat use of caves in the Activity Area, Ghost Bats are expected to forage over suitable habitat within the Activity Area. Habitats located within 12 km of Category 1, Category 2 or Category 3 roosts (if adjacent to Category 2 roosts) are considered critical foraging habitat for Ghost Bat (Bat Call WA 2021a). Critical foraging habitat present in the Activity Area has been identified as Drainage Area/Floodplain, Mulga Woodland, Stony Plain and Minor Drainage Line (Biologic 2022) (Table 4.6).

While the Major Drainage habitat type can also be considered supporting habitat, or critical foraging habitat where it occurs within 12 km of critical roosts; however, the extent of this habitat type within the Activity Area is highly fragmented and disturbed due to it being adjacent to and within the existing Mt Whaleback mining operations rail loop and is therefore considered unlikely to support Ghost Bat foraging. In addition, Sand Plain habitat can be considered supporting habitat, or critical foraging habitat where it occurs within 12 km of critical roosts; however, the extent available is fragmented, degraded and lacks woodland which is required to support foraging. On that basis, the Major Drainage and Sand Plain habitat types within the Activity Area are not considered to be either critical or supporting foraging habitat.



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WESTERN RIDGE VALIDATION NOTICE
Ghost Bat survey areas and methods

N
1 0.5 0 1
Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	21/02/2022	Project No: A979/248B	Figure: 4-8
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- Activity Area
- BHP operations
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

Targeted Bat Cave Site
- 2019
- 2020

Bat Sample Site
- 2014
- 2017
- 2018
- 2019
- 2020
- Ghost Bat Survey Coverage

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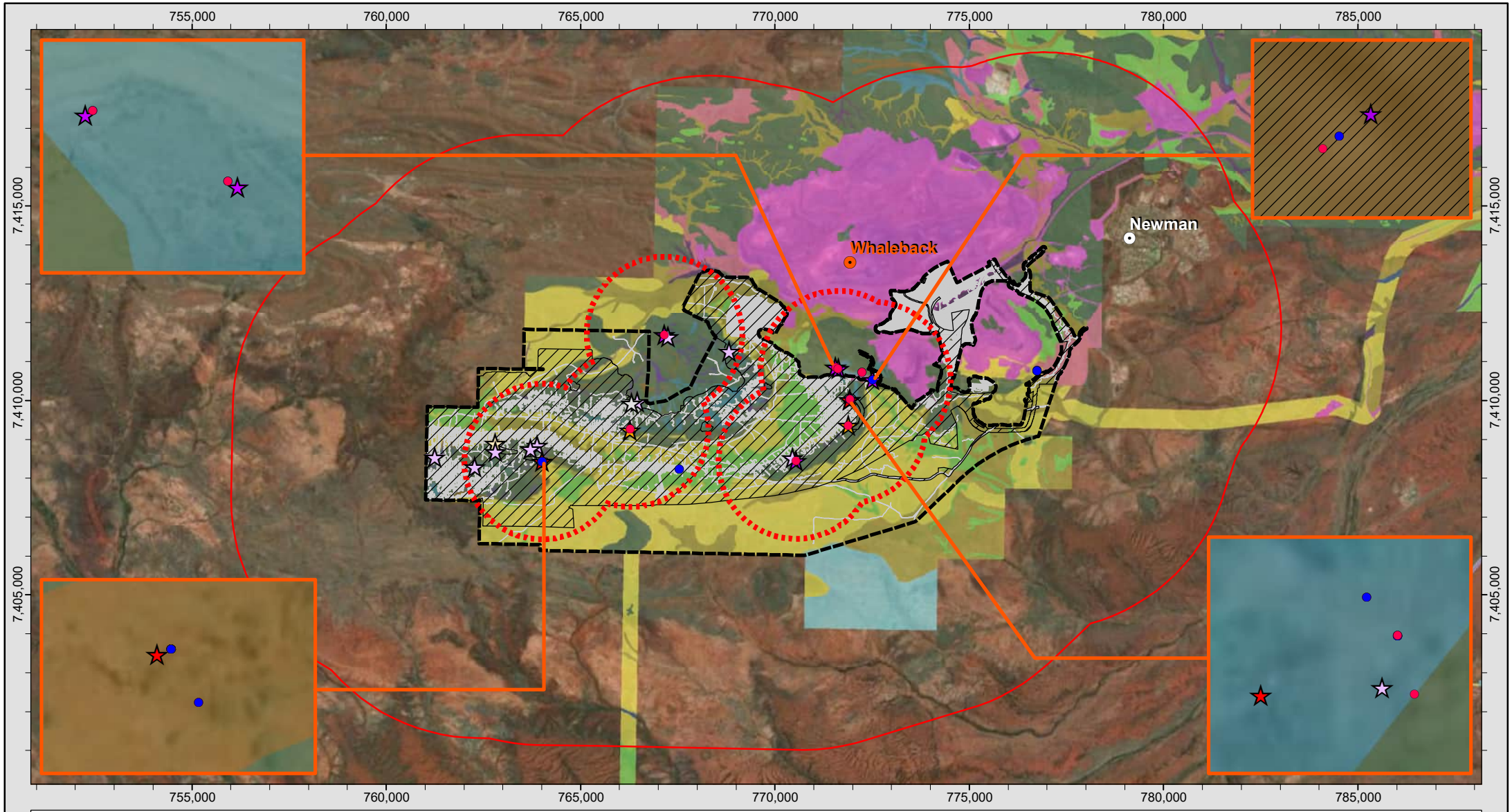

BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE VALIDATION NOTICE

Ghost Bat roosts, mapped habitat and records

N

2 1 0 2

Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	14/11/2022	Project No: A979/169D	Figure: 4-9
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- BHP operations
- Sighting
- Scat
- Other
- Category 2
- Category 3
- Category 3 (no evidence of Ghost Bats)
- Category 4
- Category 4 (no evidence of Ghost Bats)
- Nil (no evidence of Ghost Bats)
- 5km radius of the Activity Area
- Caves with evidance of Ghost Bats (2km buffer)
- Activity Area
- Indicative Footprint
- Indicative Cleared Area as at FY2021
- Breakaway/ Cliff
- Claypan
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

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4.4.4 Ghost Bat Records

Bat search and acoustic recorder locations from recent survey effort are shown in Figure 4.8. The Activity Area is located at the southern extent of the species current distribution, whereby the species or species habitat may occur in the Pilbara region (Biologic 2021). Thirty-eight records of Ghost Bat exist within the Activity Area from eight locations (Figure 4.9). Two of the locations were acoustic recordings and believed to belong to transient individuals; the remaining six locations are associated with cave locations.

Outside the Activity Area, the nearest record of the species is located approximately 50m north (2012), with few other records within a 50 km radius (DBCA 2020a). There are no contemporary records (< 20 years) of the species south of the Activity Area (DBCA 2020a), indicating the species occurrence may represent the south-eastern extent of the species occurrence in the Pilbara region.

The number of records of Ghost Bat in the Activity Area and presence of two Category 2 roosts (including a confirmed and potential maternity cave with breeding individuals) suggest there is an important population, as per the DotE (2013) definition, of Ghost Bat present (Biologic 2020a).

4.4.5 Impact Assessment

The potential direct and indirect impacts to Ghost Bats from the Activity are outlined below. The loss of critical roosts and critical foraging habitat is considered a significant residual impact that requires offsetting (Section 5).

Habitat Loss

The two critical Category 2 roosts within the Activity Area will be retained within Mining Exclusion Zones. The three supporting Category 3 roosts and five Category 4 roosts within the Activity Area will have avoidance measures applied to ensure they are retained. A further Category 4 roost will not have avoidance measures applied but is outside of the Indicative Footprint and will be retained.

Five Category 4 roosts which are supporting habitat, (CWER-02, CWER-05, CWER-08, CWER 12 and CWER-13) are located within the Indicative Footprint, of which two (CWER-02 and CWER-12) are located in the boundaries of the proposed pit or OSA and will be directly impacted (Figure 4.9). The remaining three caves are located within the Indicative Footprint, but outside of proposed pits and OSAs and therefore have the potential to also be impacted. All of these caves are shallow and structurally simple and are not considered suitable for diurnal usage by Ghost Bat. Therefore, the loss of these caves and potential impact to the Ghost Bat is considered to be low. All but one of these caves have had no evidence of usage by Ghost Bats (scats were recorded in CWER-02) (Table 4.7). As these caves are used by Ghost Bats as nocturnal or feeding roosts only, and are not suitable for diurnal roosting, it is considered unlikely that Ghost Bat individuals will be present in these caves during the day when the caves will be impacted by the proposed clearing/ earthworks. All other caves in the Activity Area are located outside of the Indicative Footprint and will not be directly impacted by the Activity.

To ensure the retention and protection of the caves outside of the Indicative Footprint, Mining Exclusion Zones (MEZs) and buffers have been applied during the design phase of the Proposal. Each MEZ provides protection to one or more caves and connecting habitats by excluding direct disturbance. The MEZ are discussed in more detail in Section 4.4.6.

Impacts to critical and supporting roosts are summarised in Table 4.8.

Table 4-8: Potential impacts to roosts recorded within the Activity Area

Cave ID[1]	Roost classification (Bat Call WA 2021a)	Proposed avoidance and management	Avoid or impact
Critical habitat			
CWER-01	Category 2 (confirmed maternity)	Retained within South-western MEZ. 100 m buffer applied for any disturbance and 150 m mining exclusion buffer applied[2]. Blast management measures within 300 m of the roost.[3]	Direct and indirect impacts avoided
CWER-03	Category 2 (potential maternity)	Retained within Eastern MEZ. 150 m mining exclusion buffer applied. Blast management measures within 300 m of the roost.	Direct and indirect impacts avoided
Supporting habitat			
CWER-04	Category 4	Retained within Eastern MEZ. 50 m buffer applied for mining.	Direct and indirect impacts avoided
CWER-05	Category 4	No direct avoidance measures. Within Indicative Footprint but outside of pit and OSA boundaries. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. No evidence of use. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Potential for direct and indirect impacts
CWER-07	Category 4	Greater than 50 m buffer applied for mining.	Direct impacts avoided. Potential for indirect impacts
CWER-08	Category 4	No direct avoidance measures. Within Indicative Footprint but outside of pit and OSA boundaries. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. No evidence of use. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Potential for direct and indirect impacts
CWER-09	Category 4	Retained within North-western MEZ. 50 m buffer applied for mining.	Direct impacts avoided. Potential for indirect impacts
CWER-10	Category 3	Retained within Eastern MEZ. 100 m buffer applied for mining. Blast management measures within 300 m of the roost.	Direct and indirect impacts avoided
CWER-11	Category 4	50 m buffer applied.	Direct impacts avoided. Potential for indirect impacts

Cave ID[1]	Roost classification (Bat Call WA 2021a)	Proposed avoidance and management	Avoid or impact
Critical habitat			
CWER-12	Category 4	No direct avoidance measures. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. No evidence of use. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Will be directly impacted
CWER-13	Category 4	No direct avoidance measures. Within Indicative Footprint but outside of pit and OSA boundaries. This cave is shallow and structurally simple. It is not considered suitable for diurnal usage – considered to provide potential feeding or nocturnal roost only. No evidence of use. The cave will be inspected prior to disturbance, any bats present will be displaced and the cave entrance sheeted, if required. Impact to cave will occur during daylight hours when bats are unlikely to be present.	Potential for direct and indirect impacts
CWER-14	Category 4	50 m buffer applied.	Direct impacts avoided. Potential for indirect impacts
CWER-16	Category 3	100 m buffer applied for mining. Blast management measures applied within 300 m of the roost.	Direct and indirect impacts avoided
CWER-17	Category 3	Retained within North-western MEZ. 100 m buffer applied for mining. Blast management measures within 300 m of the roost.	Direct and indirect impacts avoided
CWER-20	Category 4	No avoidance measures as cave is located outside of Indicative Footprint.	Direct impacts avoided. Potential for indirect impacts

[1] CWER-19 has been excluded from this table as recent investigation has shown it is not suitable for Ghost Bat usage.

[2] No direct mining activities (i.e. pits) will occur within 150 m of this cave. A 100 m buffer also applies specifically to CWER-01 for all other disturbance (i.e. roads), as due to topography an access road may need to be located within the 150 m buffer, but will remain 100 m from the cave.

[3] Blasting/mining can occur up to the boundary of the mining exclusion buffer, but within the 300 m blast management buffer, vibration limits apply (mm/s particle velocity).

The Activity will result in the direct loss of up to 147 ha of critical roosting habitat and 2,552.5 ha of critical foraging habitat, of which, 19 ha is degraded or completely degraded vegetation condition. Clearing of vegetation has the potential to fragment habitats (see Figure 4.10 and Figure 4.11); however, suitable foraging habitats including Hillcrest/Hillslope habitats adjacent to the potential and confirmed maternity roosts will be retained within the mining exclusion zones. In addition, Ghost Bats are highly mobile and able to fly over and around infrastructure and the species is known to continue occupancy of caves in close proximity to mining including at Process Minerals International's Poondano Iron Ore Project (Process Minerals 2013) and at BHP Goldsworthy operations (Gleeson and Gleeson 2012).

In addition, the inclusion of supporting habitats within MEZ and retention of substantial supporting foraging habitats outside of the Indicative Footprint will ensure suitable habitats remain within the usual foraging range.

Habitat modification

Fire has the potential to degrade Ghost Bat foraging habitat and reduce prey available to Ghost Bats, which in turn may cause population declines (Duncan *et al*. 1999). Hot work activities on site and the introduction and increased vehicle movements may increase the risk of fire and spread of weeds, respectively, which may degrade potential foraging habitat within the activity area. With standard BHP fire management, the potential for increased risk of fire and impacts to Ghost Bat habitat are considered low.

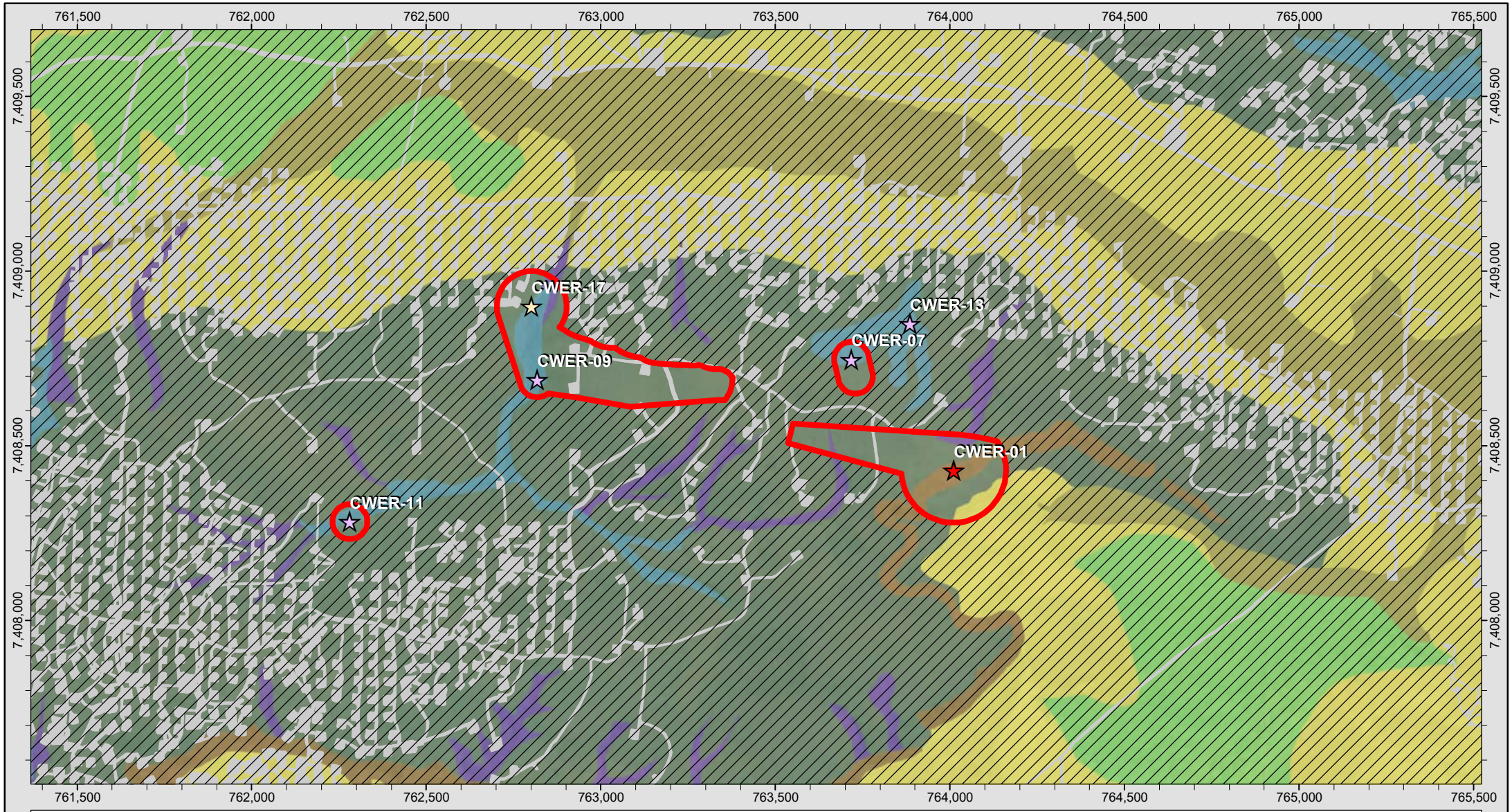
Vegetation clearing and vehicle movements may result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation and causing habitat degradation. Degradation of habitat value due to dust emissions is considered unlikely with the implementation of dust monitoring and management, throughout construction and operation of the Activity.

Alterations to landforms and construction of infrastructure can lead to altered surface water drainage patterns which in turn may cause flooding and erosion in some areas and, rain-shadow effects in other areas. With implementation surface water management measures, changes to surface water drainage will be minimised.

Potential AMD risk is identified in Section 4.3.5.

Light

Artificial light has the potential to indirectly impact Ghost Bats by altering nocturnal foraging behaviours and/or potentially restricting the use of roosts. The potential indirect impacts to Ghost Bats associated with artificial light associated with active mine pits are considered to be minor given the implementation of buffers which will exclude disturbance in proximity to caves. Where practicable, light installations will be directed into active operational areas and away from caves, in order to minimise potential impact of light spill on caves. The entrance for the category 2 roost CWER-01 opens in a south-easterly direction, away from a proposed haul road, so is unlikely to experience indirect impacts of artificial lighting from haul trucks operating at night and road lighting.



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WESTERN RIDGE VALIDATION NOTICE

Ghost Bat North Western and South Western Mining Exclusion Zone and cave buffers

N

0.5 0.25 0 0.5

Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	27/09/2022	Project No: A979/189B	Figure: 4-10
Prepared:	M. English	Checked: N. McAlinden	

LEGEND

- Activity Area
- Ghost Bat exclusion zone
- Indicative Cleared Area as at FY2021
- Indicative Footprint
- Category 2
- Category 3 (no evidence of Ghost Bats)
- Category 4 (no evidence of Ghost Bats)
- Breakaway/ Cliff
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hillcrest/ Hillslope
- Minor Drainage Line
- Mulga Woodland
- Stony Plain

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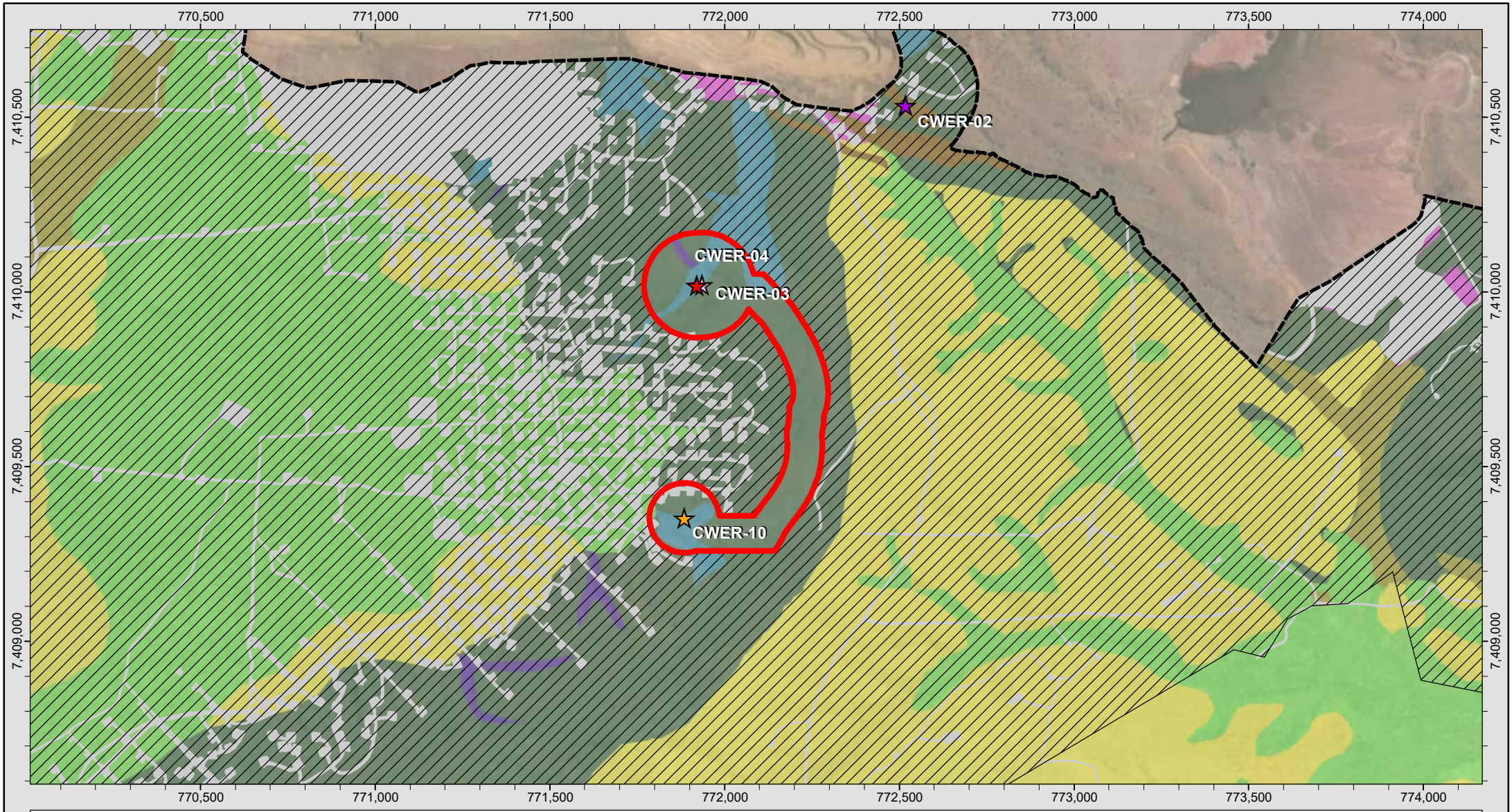

BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE VALIDATION NOTICE

Ghost Bat Eastern Mining Exclusion Zone and cave buffers

N

0.5 0.25 0 0.5

Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	28/09/2022	Project No: A979/188B	Figure: 4-11
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- Activity Area
- Ghost Bat exclusion zone
- Indicative Footprint
- Indicative Cleared Area as at FY2021
- Category 2
- Category 3
- Category 4
- Category 4 (no evidence of Ghost Bats)
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hillcrest/ Hillslope
- Minor Drainage Line
- Mulga Woodland
- Stony Plain

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Feral animals and Cane Toads

The Activity may attract feral predators to the area, with the establishment of water sources, storage of food and waste disposal on site. Evidence of cats was recorded during the 2020 Coombanbunna fauna survey to the south of the activity area (Biologic 2020b). Declines in Ghost Bat numbers could be attributable to competition for prey with foxes and feral cats (Duncan *et al.* 1999). With standard BHP feral cat management practices, the impact of feral cats on Ghost bat prey is considered low. BHP is also currently investigation options to implement ongoing feral cat monitoring at Western Ridge and at other BHP operations, to enhance detection and control measures. This information will be updated in the final Validation Notice if available at the time of publication.

The future predicted spread of the cane toad into the Pilbara bioregion, and potentially Western Ridge, may have negative impacts to the Ghost Bat population. Genetic studies have shown that Ghost Bats are unable to tolerate bufotoxins (Shine *et al*. 2016). The decline in Ghost Bat numbers in parts of Queensland has been attributed to the consumption of Cane Toads (Bullen pers. comm. 2015). Cane Toads may be introduced to areas via vehicles or equipment (DPaW 2015). It is considered unlikely that such introduction at Western Ridge will occur as travel to and from high-risk areas such as the Kimberley are not foreseen. Potential impacts from Cane Toads are therefore considered low.

Noise and Vibration

Noise and vibration are potential indirect impacts to the Ghost Bat. Noise generated from haul trucks, loaders/excavators, service trucks and light vehicles has the potential to cause roost abandonment (Bat Call WA 2021a, Bullen Crease 2014). Potential air blast noise and ground borne vibration levels from blasting near bat caves at Western Ridge has been investigated by Talis Consultants (2021). A haul road is proposed to the north and west of the Category 2 roost CWER-01 and will be situated 150m away. The cave entrance for CWER-01 opens in a south-easterly direction, away from the haul road. This cave orientation suggests Ghost Bats present are unlikely to experience indirect impacts from vibration or noise from moving haul trucks at levels high enough to cause roost abandonment as the landform at the rear of the cave would likely absorb vibrations before they entered the cave, thereby reducing levels experienced inside the cave and also cause the noise pressure wave to pass over the cave (Talis Consultants 2021).

Blasting during mining has the potential to cause flushing of bats from caves (i.e. individuals evacuating a cave) and physical damage to caves (Bullen and Crease 2014). In order to avoid and minimise the potential for indirect impacts to caves, BHP will implement buffers and blast vibration limits, within 300 m of high value caves, i.e. confirmed or potential maternity roosts or day roosts. This is consistent with the management approach adopted across mining operations in the Pilbara, for the protection of Ghost Bat. Rio Tinto (Biologic 2017) and Process Minerals International (Process Minerals International 2013) have recorded persistence of Ghost Bats in caves within 50m from active mining. With implementation of MEZ and blast vibration limits, it is predicted that the potential impact of noise and vibration on Ghost Bats is low. Monitoring of Ghost Bat will occur throughout life of the Activity and will help detect any changes in usage of roosts.

Infrastructure

Ghost Bats are known to become entangled in barbed wire due to their low elevation flying pattern (Armstrong and Anstee 2000). The use of barbed wire fencing within the Development Envelope will be avoided as far as practicable, except where required by legislation. In these instances, reflectors will be installed on barbed wire fencing to deter bat interaction. On this basis, the risk of this impact to Ghost Bats is considered to be low.

Human Disturbance

The Ghost Bat is understood to be easily disturbed and entering caves or minor disturbances on the perimeter of caves, including approaching vehicles or people, can cause the flushing or abandonment of caves by Ghost Bats and in extreme cases, the loss of pups (Churchill 2008, Armstrong 2010, Bullen and Crease 2014, Woinarski *et al*., 2014 and TSSC 2016a). Monitoring of caves may require access by humans to lay scat sheets or retrieve monitoring

equipment and has the potential to flush Ghost Bats from caves. With the proposed monitoring to remain outside of the breeding period for Ghost Bat, and caves to be only visited at intervals of three to four months, the impact to Ghost Bats is considered low.

4.4.6 Mitigation Hierarchy

Avoid

The Indicative Footprint has been modified to avoid direct impacts to significant habitat and caves for Ghost Bats, specifically by establishing three mining exclusion zones to protect Category 2 caves CWER-01 and CWER-03 and nearby caves CWER-04, CWER-09, CWER-10 and CWER-17, in addition to implementing a 100 m buffer around the Category 3 roost CWER-16 and implementing 50 m buffers around the Category 4 roosts CWER-07, CWER-11 and CWER-14 (Table 4.8 and Table 4.9, Figure 4.10 and Figure 4.11). Prior to the application of avoidance mitigation, 15 of the 17 cave structures mapped within the Activity Area occurred within the Indicative Footprint. The implementation of a number of exclusion zones and buffers has reduced the number of caves to be directly impacted or potentially directly impacted to five (Table 4.8).

The establishment of mining exclusion zones and buffers has protected 46 ha of Ghost Bat habitat from clearing (approximately 10 ha roosting/foraging habitat and 36 ha of foraging habitat i.e. Drainage Area Floodplain, Minor Drainage Line, Stony Plain and Mulga Woodland) (Table 4.9, Figure 4.10 and Figure 4.11). The SRE Avoidance Zones (see Figure 4.16) protect a further 1 ha of roosting habitat and 18 ha of foraging habitat for the Ghost Bat.

Table 4-9: Habitat retained in mining exclusion zones, avoidance zones or within individual cave buffers

Habitat Type	Eastern MEZ (ha)	NW MEZ (ha)	SW MEZ (ha)	CWER-07	CWER-11 (ha)	CWER-14 (ha)	CWER-16 (ha)	SRE avoidance zone (ha)	Total area (ha)
Breakaway/ Cliff	-	-	1.6	-	-	-	-	0.7	**2.3**
Gorge/ Gully	3.3	1.9	-	0.5	0.4	0.7	1.4	5.0	**13.0**
Drainage Area/ Floodplain	-	-	-	-	-	-	-	-	**-**
Hillcrest/ Hillslope	16.0	9.3	6.6	0.8	0.4	0.1	1.8	11.3	**46.4**
Mulga Woodland	0.1	-	-	-	-	-	-	-	**0.1**
Minor Drainage Line	0.2	0.3	0.3	-	-	-	-	1.9	**2.7**
Total	**19.6**	**11.4**	**8.5**	**1.3**	**0.8**	**0.8**	**3.1**	**19.0**	**64.5**

Direct impacts to suitable Ghost Bat habitat will also be avoided where practicable through planning and implementing land disturbance approval processes prior to land disturbance.

As detailed in Section 4.4.5 the Activity will impact on up to five Category 4 roosts, one of which has evidence of use (scats). While it is considered unlikely that Ghost Bat will be present in the caves at the time of impact (as these caves are used as nocturnal or feeding roosts only), the caves will be inspected prior to disturbance to avoid any potential impact to individuals. If present, bats will be displaced from the cave and the cave entrance will be 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 use of barbed wire fencing within and surrounding the Activity Area will be avoided as far as practicable, except where required by legislation, to avoid mortality or harm to bats from flying into them.

Mitigate

While BHP adopts an Indicative Footprint, to allow for optimisation of design, upper limits have been applied to clearing for high value habitats including Gorge/Gully, Breakaway/Cliff and caves. Therefore, any minor modifications to design will not result in increased impacts to these habitats. The following clearing limits will apply:

- up to 108 ha Gorge/Gully
- up to 39 ha Breakaway/Cliff
- up to five Category 4 roosts including CWER-02 and CWER-12 both located in the proposed pit or OSA; and potentially the three roosts CWER-05, CWER-08 and CWER-13.

In addition, BHP commits to no disturbance to the Category 4 roosts (CWER-02, CWER-12, CWER-05, CWER-08 and CWER-13) without prior inspection to verify absence of Ghost Bats from the roost or in the case of presence, the displacement of Ghost Bats from the roost.

Potential noise and vibration impacts will be minimised through the implementation of blast management measures including vibration limits, within 300 m of high value caves, including all those at which pregnant bats have been recorded, i.e. the Category 2 roosts CWER-01 and CWER-03, and the Category 3 roost CWER-16 (Table 4.8). The proximity of the proposed pits, where most indirect impacts come from, to the known significant Ghost Bat roosts (CWER-01 and CWER-03) has been increased to a distance of at least 150 m.

Potential impacts from light spill will be minimised by directing lighting away from cave openings and towards mine activities. Temporary mobile lighting will be installed in active mine pits and active operational areas.

Possible impacts to Ghost Bat foraging areas from fire are to be minimised through hot work management procedures, assigning designated smoking areas and managing fuel loads through weed control programs.

In the event that Cane Toads are detected on site, additional management measures will be applied following the guidance of DBCA.

Increased competition for Ghost Bat prey by feral cats is to be minimised on site through standard feral cat management practices which include reporting opportunistic sightings of feral cats, cage trapping and subsequent euthanasia of feral cats by qualified and licensed pest control technicians in accordance with the AW Act. Implementing correct waste management (e.g. contained waste bins, abiding by Landfill Regulations) will also minimise potential food sources for cats.

Disturbance of (human visitation at) roosting sites will be minimised through restricting access for monitoring to the months outside of the breeding/pupping season (September through to January).

4.4.7 Residual Impact

Significant residual impacts for the Ghost Bat include:

- direct disturbance of up to 147 ha of critical roosting/foraging habitat (Gorge/Gully, Breakaway/Cliff)
- direct disturbance of 2,552.5 ha of critical foraging habitats (Mulga Woodland, Minor Drainage Line, Stony Plain and Drainage Area/Floodplain)
- direct loss of supporting habitat including two Category 4 (non-critical habitat) roosts (CWER-02 and CWER-12) and potentially an additional three Category 4 roosts (CWER-05, CWER-08 and CWER-13).

Offsets will be provided for these significant residual impacts (Section 5).

4.4.8 Review of Program Matter Outcomes

Following the impact assessment (Section 4.4.5) and application of the mitigation hierarchy (Section 4.4.6) a review of the activity against the PMOs was undertaken. Table 4.10 identifies which PMOs are relevant for the Activity and considers further management.

Table 4-10: Review of Program Matter Outcomes (Ghost Bat)

Program Matter Outcome	Applicable Notifiable Action trigger	Assessment
Minimise loss of critical and supporting habitats of the Ghost Bat as a result of Program activities within the SAA AND No loss (or maintain) Ghost Bat colony(s) as a result of Program activities	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Ghost Bat critical habitat and or supporting habitat **AND** Presence or sign/s of Ghost Bat colony or residing individuals	The loss of up to 147 ha of critical habitat and 2,553 ha of supporting habitat represents a significant residual impact and requires offsetting (Section 5). Up to five Category 4 roosts will be impacted; however, this not predicted to result in loss of the Ghost bat colony. Retention of critical Category 2 roosts and supporting and Category 3 roosts within MEZ and buffers is predicted to maintain the colony. Therefore, no loss of the Ghost Bat populations will result from the Activity. Monitoring of Ghost Bat population will be ongoing to ensure the population persists.
Minimise loss of critical and supporting habitats of the Ghost Bat as a result of Program activities within the SAA	Within the Activity Area there is: Presence of Ghost Bat critical habitat and or supporting habitat **AND** Presence or sign of Ghost Bat transient, infrequent or dispersing individual/s	As above

4.4.9 Monitor

Limited baseline Ghost Bat monitoring data was collected between 2016 to 2019 from two caves within the Activity Area, CWER-01 (confirmed maternity roost / Category 2 roost) and CWER-03 (potential maternity/confirmed day roost / Category 2 roost), (Appendix 1). BHP has implemented the Western Ridge Terrestrial Fauna Management Plan which includes monitoring of Ghost Bat at Western Ridge. Monitoring will also be undertaken at relevant sites at Jimblebar, approximately 42 km east of Western Ridge.

Monitoring for Ghost Bat will utilise analysis of scat deposition to infer the usage of caves. The sheet monitoring method allows for a scat deposition rate to be estimated which can be linked to the usage of the cave and therefore importance, i.e. regularly vs. occasionally used. Genetic analysis of scats can provide information on the number of unique individuals using caves, genetic diversity, structure and spatial use of the caves across the local area. Provision of this data is likely to enable BHP to demonstrate in the future if a viable population exists within the activity area.

The proposed monitoring methods are detailed in Table 4.11, with the monitoring to be implemented detailed in Table 4.12.

Table 4-11: Ghost Bat Monitoring Methods

Method	Monitoring parameters
Motion camera footage	Presence (sighting of individuals) Number of individuals
Bat call detection (ultrasonic recordings)	Number of calls
Sheet method[2]	Presence of scats Scat deposition rate/usage Habitat characteristics Local meteorological data
Scat genetic analysis	Number of individuals (based on genotypes) Cave use (multiple or one cave)
Scat hormone analysis	Presence of lactating females
Cave microclimate recording	Temperature Humidity

[2] Entrance into caves will only be permitted for those deemed safe to do so following geotechnical assessment of the cave.

Table 4-12: Ghost Bat Monitoring

Program Matter Objective	To support the long-term persistence and viability of the Ghost Bat within the SAA.		
Notifiable Action Triggers	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Ghost Bat critical habitat and or supporting habitat **AND** Presence or sign/s of Ghost Bat colony or residing individuals		
	Within the Activity Area there is: Presence of Ghost Bat critical habitat and or supporting habitat **AND** Presence or sign of Ghost Bat transient, infrequent or dispersing individual/s		
Program Matter Outcome	Minimise loss of critical and supporting habitats of the Ghost Bat as a result of Program Activities within the SAA **AND** No loss (or maintain) Ghost Bat colony(s) as a result of program activities		
Monitoring Target	**Monitoring and Frequency**	**Corrective and contingency actions**	**Reporting**
Presence or evidence of presence of Ghost Bat at one or more Ghost Bat caves over one year of monitoring within the Activity Area	Quarterly monitoring at retained caves CWER01, CWER-03, CWER-10 and CWER-17 providing safe access is confirmed. Techniques may include but are not limited to scat monitoring (deposition rate, genetic analyses hormone analyses), ultrasonic recording, motion cameras, microclimate recording Annual monitoring at CWER-04, CWER-07, CWER-09, CWER-14 providing safe access is confirmed. Techniques may include but are not limited to scat collection and microclimate monitoring. Monitoring every two years at CWER-20, based on limited evidence of use.	Response actions to monitoring targets not being met may include, but are not limited to: • investigate potential cause of monitoring targets not being met; • consult with experts • compare changes to results from other Ghost Bat monitoring programs;	SEA AER

	Figures 4.10 and 4.11 show cave locations.	• increase the frequency of the monitoring; and • expand the monitoring program to other sites.	

4.4.10 Summary

BHP considers the Activity will meet the PMO to minimise loss of critical and supporting habitats of the Ghost Bat as a result of Program Activities within the SAA, and no loss (or maintain) Ghost Bat colony as a result of program activities, given that upper limits have been applied to clearing of high value habitats and no Category 2 or Category 3 roosts will be impacted. In addition, offsets will be provided for the loss of critical and supporting habitats (Section 5). As a result, the PMO will be achieved.

4.5 Pilbara Olive Python

4.5.1 General Species Information

The Pilbara Olive Python is listed under the EPBC Act as 'Vulnerable'. It is restricted to ranges within the Pilbara bioregion, although an isolated population is thought to occur south on Mount Augustus in the Gascoyne region (Bush and Maryan 2011), and additional records exist in the north-eastern Carnarvon region. Within the Pilbara bioregion, the species has been recorded from the Hamersley Range, Dampier Archipelago, Pannawonica, Millstream, Tom Price, Burrup Peninsula, and 70 km east of Port Hedland (Pearson 2006). The species is also known from riparian areas along the Fortescue River (Doughty *et al.* 2011).

The Pilbara Olive Python commonly inhabits rocky areas in proximity to water such as gorges, rivers, pools and surrounding hills, but can be found in a range of habitats. In the Hamersley region, this species is most often encountered in the vicinity of permanent water features in rocky ranges or among riverine vegetation (Biologic 2020c).

Pilbara Olive Pythons are known to occupy a distinct home range ranging from 85 ha to 450 ha and to move around frequently within their home range (Pearson 2006). Figure 4.12 illustrates the regional records of Pilbara Olive Python.

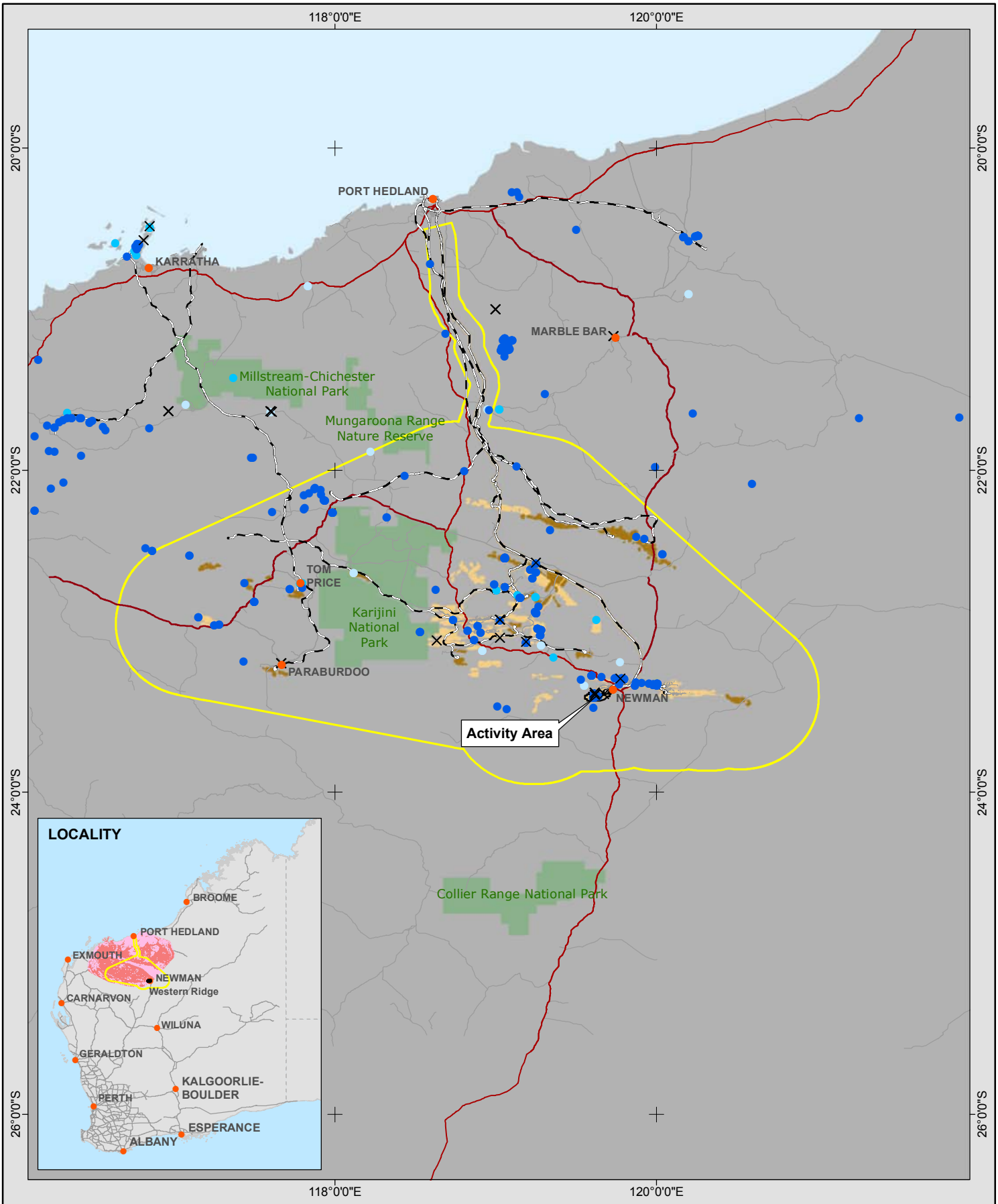
4.5.2 Regional Habitat and Habitat Modelling Data

In the Impact Assessment Report, Eco Logical (2015) modelled the habitat preference for the Pilbara Olive Python using 309 species records from publicly available and BHP data. The model indicated that preferred habitat (H4) was most heavily concentrated in the ranges of the southern and central areas of the Pilbara bioregion; however, preferred habitat was also predicted in association with river plains in the north and the ranges and outcrops of the eastern part of the Pilbara bioregion.

The cumulative impact assessment model predicted a potential decrease of 1,344 ha to H4 for the Pilbara Olive Python as a result of the Full Conceptual Development Scenario. This area of potential impact from the Program represents less than 1% of the area modelled as H4 within the Pilbara bioregion.

The baseline modelling data concluded that the cumulative impact to this species was considered to be moderate. Figure 4.13 and Table 4.13 shows the Pilbara Olive Python modelled habitat and regional records within the activity area. Up to 623 ha of the preferred habitat (H4) exists in the Activity Area.

The land systems of the Pilbara region documented by van Vreeswyk *et al* (2004) that are found within 25 km of the activity area are detailed in Table 4.3 and Figure 4.4. Of these land systems, six land systems provide a significant quantity (> 100,000 ha) of preferred Pilbara Olive Python foraging and breeding habitat (Gorge/Gully and Breakaway/Cliff habitats) through Hills/Ridges/Breakaways adjacent to the Activity Area.



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WESTERN RIDGE VALIDATION NOTICE

Pilbara Olive Python regional records and distribution

N

100 50 0 100

Kilometres

Coordinate System: GCS GDA 1994, Datum: GDA 1994, Units: Degree

Date:	1/03/2022	Project No: A979/178A	Figure: 4-12
Prepared:	M. English	Checked: A. Edgar	

LEGEND

Pilbara Olive Python records

- Records After 2005
- Records Between 1980 - 2004
- Records Prior 1979
- Records Missing Date
- Activity Area
- BHP LOA Mine Plan disturbance footprint
- Major Road
- Minor/Regional Road
- Rail Centreline
- Strategic Assessment Area
- Town
- Third Party disturbance footprint
- Species or species habitat likely to occur
- Species or species habitat may occur

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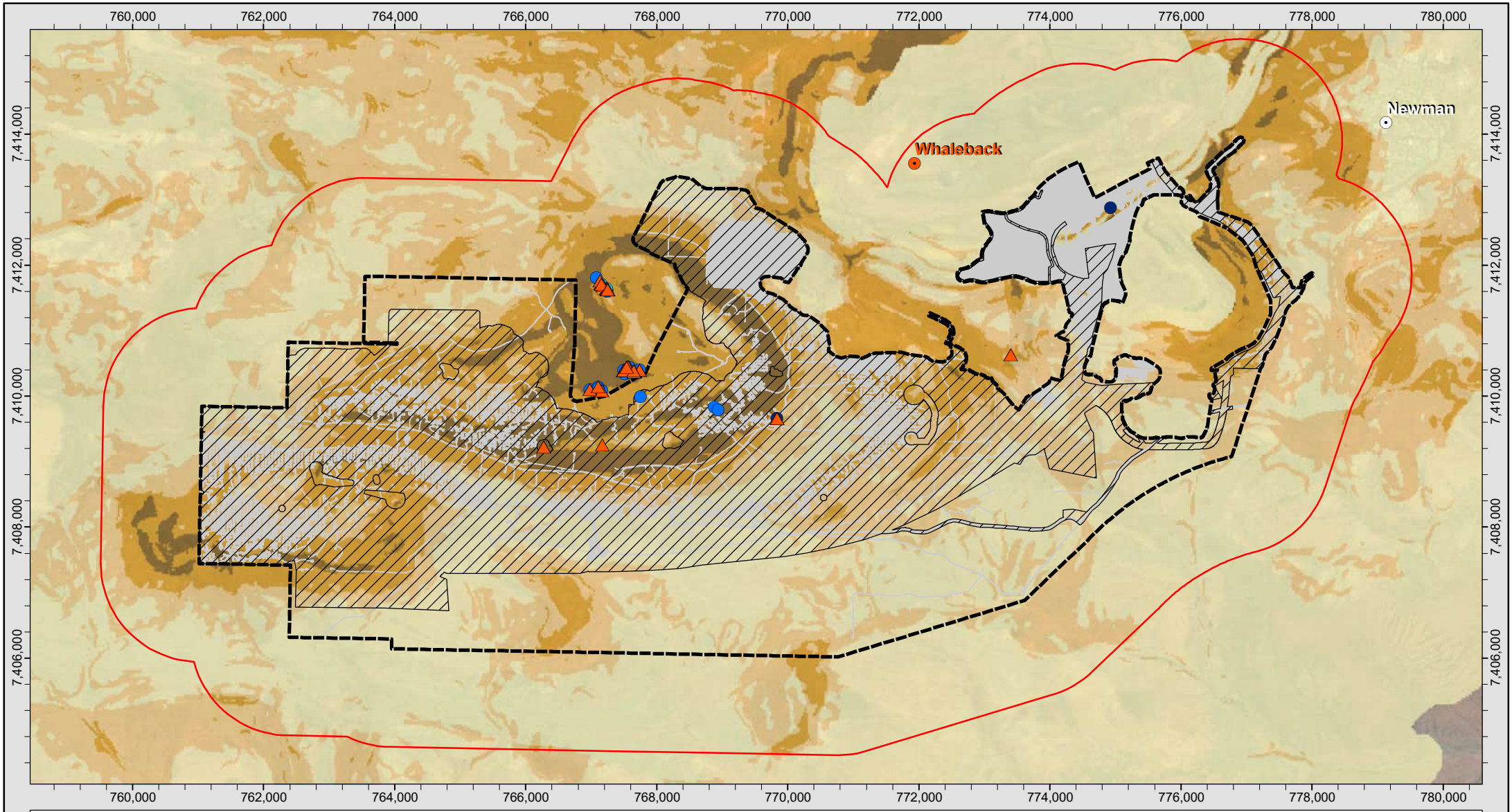

BHP

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WESTERN RIDGE VALIDATION NOTICE

Pilbara Olive Python modelled habitat and regional records

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	1/03/2022	Project No: A979/183C	Figure: 4-13
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- 1.5km radius of the Activity Area
- Activity Area
- BHP operations
- Indicative Footprint
- Indicative Cleared Area as at FY2021
- Pilbara Olive Python (*Liasis olivaceus* subsp. *barroni*) (VU)

Water feature

- Artificial surface water feature
- Temporary surface water feature
- Semi-permanent to permanent surface water feature
- H1 (Lowest potential)
- H2
- H3
- H4 (Highest potential)

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_183_E_WesternRidge_VN_Modelled_POP_RevC.mxd

Table 4-13: Pilbara Olive Python modelled habitats within the SAA

Habitat description	Modelled habitat Area Pilbara bioregion (ha)	Modelled habitat in Strategic Assessment Area (ha)	Modelled habitat within the Full Development Scenario (ha)	Modelled habitat within the activity area^ (ha)	Modelled within the IF (ha)
H4	1,126,500	473,336	1,344	623	547
H3	2,948,403	1,060,548	23,897	1,765	1,424
H2	3,100,368	1,161,035	35,155	2,301	1,550
H1	10,609,870	3,263,373	60,394	2,544	1,081

4.5.3 Local Habitat

Gorge/Gully and Breakaway/Cliff habitat types and water holes they support are considered critical habitat for the Pilbara Olive Python as they support denning, breeding and hunting for the species. Two of the three records of Pilbara Olive Python in the Activity Area are associated with Gorge/Gully habitat. A total of 187 ha of Gorge/Gully and Breakaway/Cliff habitat types are present in the Activity Area, of which up to 147 ha occurs within the Indicative Footprint and will be impacted by the Activity (Table 4.14). Note that Major Drainage Line Habitat has not been included here as critical habitat, given the extent available within the Activity Area is highly fragmented and degraded as a result of being in close proximity to historical mining operations.

Three ephemeral natural surface water features have been identified in the Activity Area during baseline and targeted surveys (WWER-10, WWER-18 and WWER-19), all of which are located in the Indicative Footprint (Figure 4.15). These water features are likely foraging habitats for Pilbara Olive Python. Two artificial water features (WWER-12 and WWER-20) associated with the adjacent Mt Whaleback mining operations (i.e. turkeys nest) are located within the Activity Area. A further nine temporary surface water features, previously within the Activity Area, have been excluded by modifying the Activity Area, following consultation with Traditional Owners. This will ensure the avoidance of direct and indirect impacts to these temporary surface water features.

Located more than 500m outside of the Activity Area is an area known as Nankunya (otherwise referred to as Afghan Springs) (Figure 4.15). The springs consist of a number of surface water pools and seeps, supported by a combination of surface water runoff, infiltration of surface water to a local, perched fractured rock aquifer and subsequent discharge of water from that perched aquifer at topographic low points (BHP 2021b). These pools are considered to be semi-permanent to permanent.

Minor Drainage Line habitat, where it occurs in proximity to the above critical habitats, is considered supporting habitat (Biologic 2020c). There is a total of 74.9 ha of this supporting habitat within the Activity Area, of which 56 ha occurs within the Indicative Footprint (Table 4.14).

Table 4-14: Pilbara Olive Python survey habitat assessment

Habitat Description	Within Activity Area (ha)	Within Indicative Footprint (ha)
Critical habitat		
Gorge/Gully	140.2	Up to 108
Breakaway/Cliff	46.8	Up to 39
Total	**187**	**147**

Habitat Description	Within Activity Area (ha)	Within Indicative Footprint (ha)
Supporting habitat		
Minor Drainage Line	74.9	56.0
Total	**74.9**	**56**

4.5.4 Pilbara Olive Python Records

The Activity Area is located at the south-eastern extent of the species current distribution, whereby the species or species habitat may occur. A total of three records of the Pilbara Olive Python, including one direct observation in an artificial water feature and two indirect records (i.e. scats,) located within Gorge/Gully habitat, have been documented from within the Activity Area (Figure 4.15). This indicates that residing individuals or a population is present within the Activity Area.

Immediately north of the activity area and at Nankunya (Afghan Springs) there have been numerous records of Pilbara Olive Python in surface water features (Figure 4.15). A juvenile was recorded immediately north of the Activity Area suggesting that breeding is occurring in that area.

The number of records of Pilbara Olive Python and the record of a juvenile (suggestive of breeding activity) suggest there is an important population within and/or adjacent to the Activity Area, as per the DotE (2013) definition (Biologic 2020a). Furthermore, the population is located at the south-eastern extent of the species current distribution.

4.5.5 Impact Assessment

The potential direct and indirect impacts to Pilbara Olive Python from the Activity are outlined below. The loss of critical and supporting habitat is a significant residual impact which requires offsetting (Section 5).

Habitat Loss

The Activity will result in the direct loss of up to 147 ha of critical habitat suitable for denning, breeding and foraging habitat (Gorge/Gully and Breakaway/Cliff).

Up to 56 ha of supporting habitat (Minor Drainage Lines) will occur as a result of the Activity. It should be noted that individuals are not expected to utilise the entire extent of this supporting habitat, with foraging and dispersal thought to be limited to habitat in close proximity to the critical habitat (Gorge/Gully and Breakaway/Cliff habitats and associated temporary surface water features located north of the Development Envelope).

Three temporary natural water features (WWER-10, WWER-18 and WWER-19), which are considered critical habitat, and one artificial water feature (WWER-12) which may be used as foraging habitat are located in the Indicative Footprint.

Clearing for the Activity has the potential to fragment habitat; however, suitable critical habitat which coincides with multiple records in the northern central section of the Development Envelope has been avoided. This area connects to critical habitat that extends outside of the Activity Area, which will enable ongoing dispersal of individuals. Therefore, the potential impact to the species of fragmentation is considered low.

Habitat Modification

Hot work activities on site and the introduction and increased vehicle movements could increase the risk of fire and spread of weeds, respectively. Fire and weed encroachment have the potential to degrade Pilbara Olive Python supporting habitat within and adjacent to the Activity Area. With standard BHP fire management and weed control practices, the potential for increased risk of fire and habitat degradation due to weeds, are considered low.

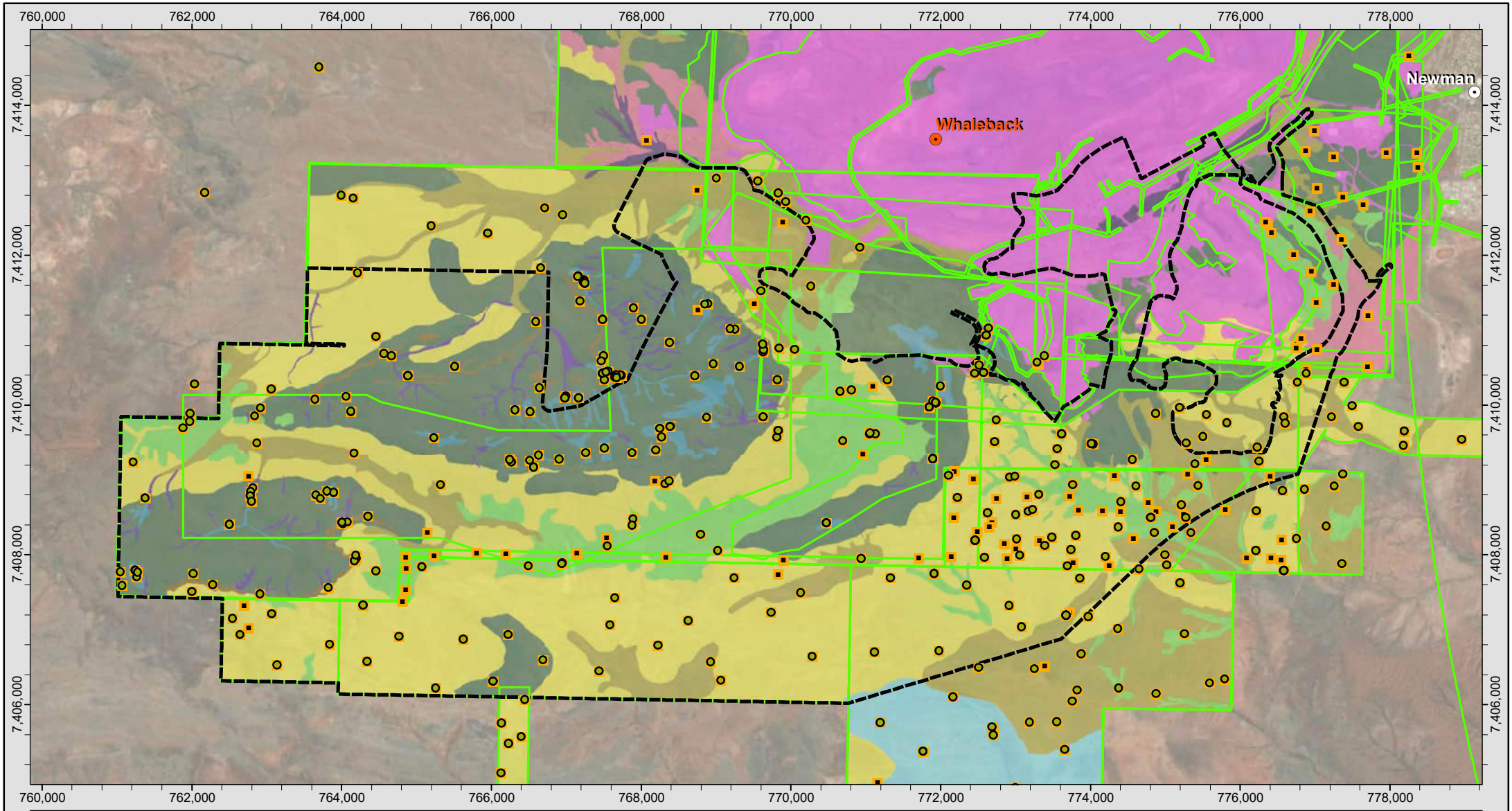
Alterations to landforms and construction of infrastructure can lead to altered surface water drainage patterns which in turn may cause flooding and erosion in some areas and, rain-shadow effects in other areas. Implementation of surface water management measures will minimize any changes to surface water drainage.

Vegetation clearing and vehicle movements may result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation and causing habitat degradation. Degradation of habitat value due to dust emissions is considered unlikely due to the implementation of dust monitoring and management measures within the Activity Area.

Potential AMD risk is identified in Section 4.3.5.

Feral Predators and Cane Toads

Feral predators such as feral cats (*Felis catus*) and foxes (*Vulpes vulpes*), may prey on the Pilbara Olive Python (TSSC 2008) and/or compete with the Pilbara Olive Python for food (quolls and rock-wallabies) (Pearson 2006). The Activity may attract feral predators to the area, with the establishment of water sources. Evidence of cats was recorded during the 2020 Coombanbunna fauna survey (Biologic 2020b) which is located to the south of the Activity Area. With standard BHP feral cat management practices, the impact of feral cats on the Pilbara Olive Python is considered low. BHP is also currently investigation options to implement ongoing feral cat monitoring at Western Ridge and at other BHP operations, to enhance detection and control measures. This information will be updated in the final Validation Notice if available at the time of publication.



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Spatial Data - Studies Planning & Access
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WESTERN RIDGE VALIDATION NOTICE
Pilbara Olive Python survey areas and methods

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date: 29/03/2022	Project No: A979/250B	Figure:	4-14
Prepared: M. English	Checked: A. Edgar		

LEGEND

- Activity Area
- BHP operations
- Vertebrate Fauna Sample Sites
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain
- Pilbara Olive Python Survey Coverage

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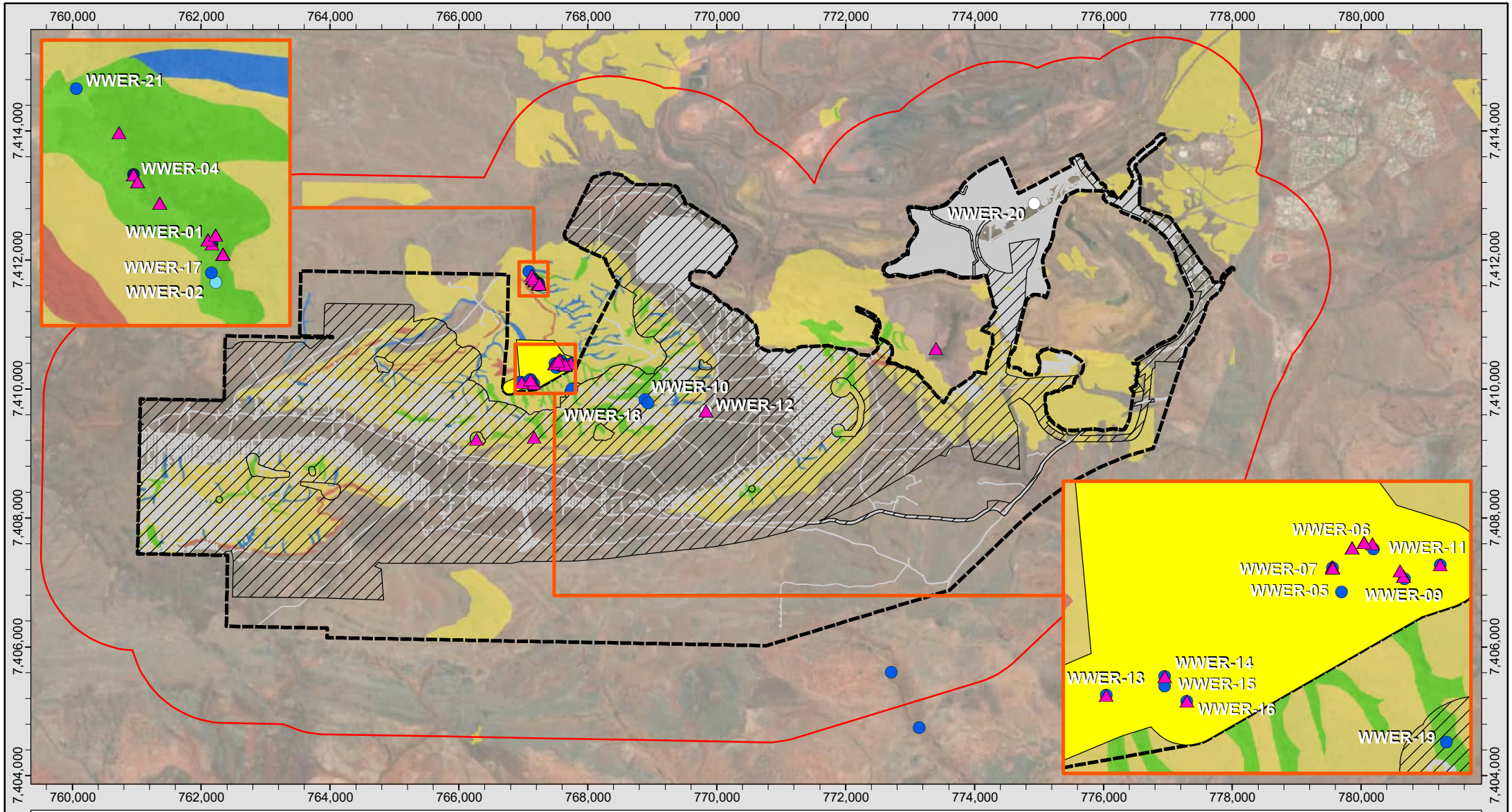

BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

WESTERN RIDGE VALIDATION NOTICE
Pilbara Olive Python mapped habitat and recordss

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	9/03/2022	Project No: A979/171C	Figure: 4-15
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- 1.5km radius of the Activity Area
- Activity Area
- Indicative Footprint
- Indicative Cleared Area as at FY2021
- Pilbara Olive Python Avoidance Zone
- Pilbara Olive Python (*Liasis olivaceus* subsp. *barroni*) (VU)

Water feature

- Artificial
- Permanent Seep
- Temporary Seep
- Temporary Surface Pool
- Breakaway/ Cliff
- Gorge/ Gully
- Hillcrest/ Hillslope
- Minor Drainage Line

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_171_E_WesternRidge_VN_POP_HabitatRecords_RevC.mxd

The future predicted spread of the cane toad into the water holes of the Pilbara bioregion, and potentially Western Ridge, may have negative impacts to the Pilbara Olive Python. Pilbara Olive Python are understood to be vulnerable to the toxins produced by Cane Toads. Cane Toads may be introduced to areas via vehicles or equipment (DPaW 2015). It is considered unlikely that such introduction at Western Ridge will occur as travel to and from high-risk areas such as the Kimberley is not foreseen. Potential impacts from Cane Toads are therefore considered low.

Groundwater Changes

The depth to groundwater in the Activity Area ranges from approximately 40 mbgl to 100 mbgl and no groundwater dependent vegetation is present within the Activity Area. All temporary surface water features within the Activity Area occur as a result of significant rainfall events, and hold water for a short duration, as water dissipates over time due to evaporation. No groundwater dependent pools are present within the Activity Area. On this basis, groundwater drawdown for the Activity is not predicted to result in impacts to Pilbara Olive Python habitat.

Surface Water Changes

There is the potential for ephemeral creek diversions to result in degradation to fauna habitats. The Activity will include the implementation of creek diversions of the ephemeral Southern Creek which flows in an easterly direction through the Activity Area to maintain surface water flows downstream. As there have been no records or evidence of Pilbara Olive Python from Southern Creek, and it has not been identified as critical habitat for the species, the proposed creek diversion is considered unlikely to impact the Pilbara Olive Python.

The location of the temporary surface water features north of the Activity Area known to be used by Pilbara Olive Python, are located in catchments of tributaries to Whaleback Creek. The local catchments contributing to these temporary surface water features are outside the impact areas and will not be directly or indirectly impacted by any potential changes in surface water flows. On this basis, the potential impacts to Pilbara Olive Python as a result of altered hydrological regimes are expected to be negligible.

Vehicle Collisions

Vehicle and machinery movements have the potential to result in fauna strike, causing injury or mortality. Pilbara Olive Python are vulnerable to vehicle strike due to being a ground dwelling species and the risk of interaction with vehicles is greatest where roads occur in proximity to suitable habitat for the species (DotE 2014b).

Haul roads and access roads will be required to support the Activity. As the majority of locations of recorded Pilbara Olive Python are confined to Gorge/Gully habitat in the northern portion of the Activity Area outside of the Indicative Footprint or outside of the Activity Area, the risk of mortality due to vehicle collision is considered low.

4.5.6 Mitigation Hierarchy

Avoid

The Development Envelope was modified during the Proposal design phase to avoid disturbance to Pilbara Olive Python habitat. In recognition of the number of records of Pilbara Olive Python from the north of the Activity Area, and the importance of water features to the species, nine temporary surface water features were excluded from the Development Envelope (Figure 4.16). The occurrence of these temporary surface water features coincides with records of the Pilbara Olive Python, including evidence of breeding by this species. This modification to the Development Envelope, will avoid 13 records of the species and will avoid direct impacts to 16.3 ha of critical habitat (Gorge/Gully and Breakaway/Cliffs) and supporting habitat (Minor Drainage Line) for the Pilbara Olive Python.

The Ghost Bat mining exclusion zones and buffers (see Figures 4.10 and 4.11) and SRE avoidance zone (Figure 4.16) protect a further 15 ha of critical breeding/denning/foraging habitat for the Pilbara Olive Python.

Direct impacts to Pilbara Olive Python critical habitat will also be avoided where practicable through planning and implementing land disturbance approval processes prior to land disturbance.

Mitigate

While BHP adopts an Indicative Footprint, to allow for optimisation of design, upper limits have been applied to clearing for high value habitats including Gorge/Gully and Breakaway/Cliff. Therefore, any minor modifications to design will not result in increased impacts to these habitats. The following clearing limits will apply:

- up to 108 ha Gorge/Gully
- up to 39 ha Breakaway/Cliff.

As noted in EPA Report 1619 (EPA 2018a), the Strategic Proposal allows for a 'hub' approach with the sharing of infrastructure between mines to reduce the disturbance footprint required for each future proposal. Existing processing infrastructure at the Mt Whaleback mine will be utilised to minimise the amount of clearing required for infrastructure to support the Activity.

Predation on Pilbara Olive Python or increased competition for prey by feral cats is to be minimised on site through standard feral cat management practices which include reporting opportunistic sightings of feral cats, cage trapping and subsequent euthanasia of feral cats by qualified and licensed pest control technicians in accordance with the AW Act. Implementing correct waste management (e.g. contained waste bins, abiding by Landfill Regulations) will also minimise potential food sources for cats.

In the event the presence of Cane Toads is detected on site, additional management measures will be applied following the guidance of DBCA.

4.5.7 Residual Impact

Significant residual impacts for the Pilbara Olive Python include the direct disturbance of:

- up to 147 ha of critical breeding/foraging habitat (Gorge/Gully, Breakaway/Cliff)
- three temporary natural water features (WWER-10, WWER-18 and WWER-19) which provide critical habitat
- 56 ha of supporting habitats (Minor Drainage Lines) which support foraging and dispersal.

Offsets will be provided for these significant residual impacts (Section 5).

4.5.8 Review of Program Matter Outcomes

Following the impact assessment (Section 4.5.5) and application of the mitigation hierarchy (Section 4.5.6) a review of the Activity against the PMOs was undertaken. Table 4.15 identifies which PMOs are relevant for the Activity and considers further management.

Table 4-15: Review of Program Matter Outcomes for Pilbara Olive Python

Program Matter Outcome	Applicable Triggers	Assessment
Minimise loss of critical and supporting habitats of the Pilbara Olive Python as a result of Program Activities within the SAA AND No loss (or maintain) of Pilbara Olive Python population(s) as a result of Program activities.	Within the activity area and or within a 500m buffer of the activity boundary, there is: Presence of Pilbara Olive Python critical habitat and or supporting habitat **AND** Presence or sign/s of a Pilbara Olive Python or residing individuals	The loss of up to 147 ha of critical habitat and 56 ha of supporting habitat represents a significant residual impact and requires offsetting (see Section 5). No loss of population will occur as a result of the Activity given the retention of critical and supporting habitats and retained Gorge/Gully and Breakaway/Cliff and temporary natural water features will be monitored for presence of Pilbara Olive Python to

Program Matter Outcome	Applicable Triggers	Assessment
		demonstrate the Program Matter Outcome is being achieved.
Minimise loss of critical and supporting habitats of the Pilbara Olive Python as a result of Program Activities within the SAA	Within the activity area there is: Presence of Pilbara Olive Python critical and or supporting habitat **AND** Presence or sign of Pilbara Olive Python transient, infrequent or dispersing individual/s	As above

4.5.9 Monitor

Monitoring for Pilbara Olive Pythons in the Activity Area will be undertaken to ensure the Program Activities are not impacting this species and the Program Matter Outcomes are being achieved.

Given the cryptic nature of the species, it is possible that monitoring may yield low numbers and as a result, there may be insufficient data to interpret any trends in population numbers. On this basis, monitoring will focus on demonstrating continued presence of Pilbara Olive Python.

Survey techniques for Pilbara Olive Python are limited due to the cryptic nature of this species and its ability to remain hidden in deep crevices for extended periods. Monitoring will focus on targeted searches for individuals and collection of data from recorded individuals as recommended by the Survey Guidelines for Threatened Reptiles (DSEWPaC 2011b). eDNA will also be used to sample water features for usage by Pilbara Olive Python. The proposed monitoring methods which may be implemented are detailed in Table 4.16, with the monitoring program likely to be implemented presented in Table 4.17.

Table 4-16: Proposed Monitoring Methods for Pilbara Olive Python

Method	Monitoring parameters
Targeted searches of water holes and gorges and gullies, nocturnal transects and road spotting	Presence and counts of individuals/scats Individual data/biometric data (e.g. life stage, snout-vent length, weight, sex (if possible), condition) Genetic samples - scales/sloughs/scats Location Area of occupancy Habitat characteristics Local meteorological data
Opportunistic records by consultants or the workforce	As above
eDNA sampling at water features	eDNA Water depth Water quality

Table 4-17: Pilbara Olive Python Monitoring Program

Program Matter Objective	To support the long-term persistence and viability of the Pilbara Olive Python within the Strategic Assessment Area.		
Notifiable Trigger	Within the Activity Area and or within a 500m buffer of the Activity boundary, there is: Presence of Pilbara Olive Python critical habitat and or supporting habitat **AND** Presence or sign/s of Pilbara Olive Python population or residing individuals		
	Within the Activity Area there is: Presence of Pilbara Olive Python critical habitat and or supporting habitat **AND** Presence or sign of Pilbara Olive Python transient, infrequent or dispersing individual/s.		
Program Matter Outcome	Minimise loss of critical and supporting habitats of the Pilbara Olive Python as a result of Program Activities within the SAA **AND** No loss (or maintain) of Pilbara Olive Python population(s) as a result of Program activities.		
Monitoring Target	**Monitoring and frequency**	**Corrective and contingency response**	**Reporting**
Presence or evidence of presence of Pilbara Olive Python over one year of monitoring within the Activity Area and in critical habitat within 500m of the Activity Area	Annual monitoring in the wet season of retained Gorge/Gully habitat within the Activity Area and/or temporary surface water features located within the Activity Area and Nankunya (outside of activity area). Exact sites are to be confirmed. Methods may include but are not limited to targeted searches, genetic analyses of scats/sloughs/tissue and eDNA markers in water features.	Response actions to monitoring targets not being met may include, but are not limited to: • investigate potential cause of monitoring targets not being met • consult with Python experts • increase the frequency of the monitoring • expand the monitoring program to other sites.	SEA AER

4.5.10 Summary

BHP considers the Activity will meet the PMO for Pilbara Olive Python. Application of the mitigation hierarchy has minimised loss of critical and supporting habitats of the Pilbara Olive Python and there will be no loss of population as a result of the Activity, by applying upper limits to clearing of critical habitat and by offsetting loss of both critical and supporting habitats (Section 5). In addition, temporary surface water features located within 500m of the Activity Area where Pilbara Olive Python has been recorded will be avoided by the Activity.

4.6 Pilbara Leaf-Nosed Bat

4.6.1 General Species Information

The Pilbara Leaf-Nosed Bat is listed as 'Vulnerable' under the EPBC Act and occurs over an approximate area of 120 million hectares (Eco Logical 2014b) and is restricted to the Pilbara bioregion of Western Australia. The Pilbara population is regarded as representing a single interbreeding population comprising multiple colonies (TSSC 2016b). Individual colonies vary in size from 10 individuals to 20,000 individuals, although the latter is exceptional (Armstrong 2001; Ecologia Environment 2005, 2006). The total number of Pilbara Leaf-Nosed Bats is currently unknown (TSSC 2106b).

The most updated conservation advice (Bat Call WA 2021b) indicates there are 48 confirmed permanent day roosts (including maternity roosts) with 38 of these in banded iron formations in the Hamersley Ranges and eastern Pilbara, and six in disused underground gold and copper mines of the eastern Pilbara. Figure 4.16 illustrates the regional records and distribution of Pilbara Leaf-Nosed Bat. Area of occupancy (AOO) in the Pilbara region has been calculated by Woinarski *et al.* (2014) as under 10 km^2.

Pilbara Leaf-nosed Bats roost in undisturbed caves, deep fissures or abandoned mine shafts with a stable warm and humid microclimate because of their poor ability to maintain heat and water balance (Kulzer *et al.* 1970; Churchill *et al*. 1988; Jolly 1988; Churchill 1991; Baudinette *et al.* 2000; Armstrong 2001). Caves and abandoned mines with seeps of water, moist wall surfaces and or flooded lower levels are usually of ideal humidity (Bat Call WA 2021b). The species forages within and in the vicinity of roost caves and more broadly along waterbodies with suitable fringing vegetation supporting prey species (TSSC 2016b). Pilbara Leaf-nosed Bats are predicted to travel up to 20 km from roost caves during nightly foraging (Cramer *et al.* 2016b); however, seasonal variation is known to occur, with foraging occurring up to 20 km in the dry season and up to 50 km during the wet season (Bullen 2013).

4.6.2 Regional Habitat and Baseline Modelling Data

In the Impact Assessment Report, Eco Logical (2015) modelled the habitat preference for the Pilbara Leaf-Nosed Bat using 137 species records from publicly available and BHP data. The model indicated that preferred habitat (H4) occurs in the central east of the Pilbara bioregion.

The cumulative impact assessment model predicted a potential decrease of 6,275 ha to H4 for the Pilbara Leaf-Nosed Bat as a result of the Full Conceptual Development Scenario (Table 4.18). This area of potential impact from the Program represents less than 1% of the area modelled as H4 within the Pilbara bioregion. BHP recognises that although the modelled potential impact is considered relatively minor at a regional scale, the Pilbara Leaf-Nosed Bat has specific habitat requirements that may not have been captured at a regional scale, and thus management at a local scale is important. Whilst no preferred habitat (H4) exists in the Activity Area, over 900 ha of the second most preferred habitat exists (Table 4.18, Figure 4.17).

In addition to the regional modelling approach, BHP also conducted an impact assessment based on Pilbara Leaf-Nosed Bat species records. The records data were obtained from the DBCA and Western Australian Museum in December 2015 and January 2016 respectively. Based on the species records data, 7.7% of the known records within the SAA were predicted to be cumulatively impacted by iron ore mining in the Pilbara. The data show that the

potential impact is from both BHP and reasonably foreseeable third party mines. Based on surveys to date, there have been no significant roosts for this species identified in BHP tenure; therefore, this species was considered to be at low risk from the Full Conceptual Development Scenario.

The land systems of the Pilbara region documented by van Vreeswyk *et al* (2004) that are found within 25 km of the Activity Area are detailed in Table 4.3 and Figure 4.4. Of these land systems, six land systems provide a significant quantity (> 100,000 ha) of preferred Pilbara Leaf-nosed Bat Python foraging and roosting habitat (Gorge/Gully and Breakaway/Cliff habitats) through Hills/Ridges/Breakaways adjacent to the Activity Area.

Table 4-18: Pilbara Leaf-nosed Bat modelled habitats within the SAA

Habitat Description	Modelled Habitat Area Pilbara bioregion (ha)	Modelled Habitat in Strategic Assessment Area (ha)	Modelled Habitat within the Full Development Scenario (ha)	Modelled within Activity Area^ (ha)	Modelled within the IF (ha)
H4	1,623,283	437,819	6,275	0	0
H3	4,233,754	1,956,461	59,048	986	926
H2	6,569,572	1,388,978	15,271	2,200	1,875
H1	5,372,377	2,174,864	80,595	4,048	1,801

4.6.3 Local Habitat

The survey areas and survey methods used for detecting Pilbara Leaf-nosed Bat activity are presented in Figure 4.18. The Activity Area is located at the southern extent of the species current distribution, whereby the species or species habitat may occur (DotEE 2019c).

No critical habitats for Pilbara Leaf-Nosed Bat have been recorded within the Activity Area or within 500m of the Activity Area (Biologic 2020b). Of the 17 caves identified in the Activity Area, none are considered likely to support Pilbara Leaf-nosed Bat. All caves were classified as supporting habitat as they are potential nocturnal refuges only, due to lack of the unique microclimate required by the species (Biologic 2020c).

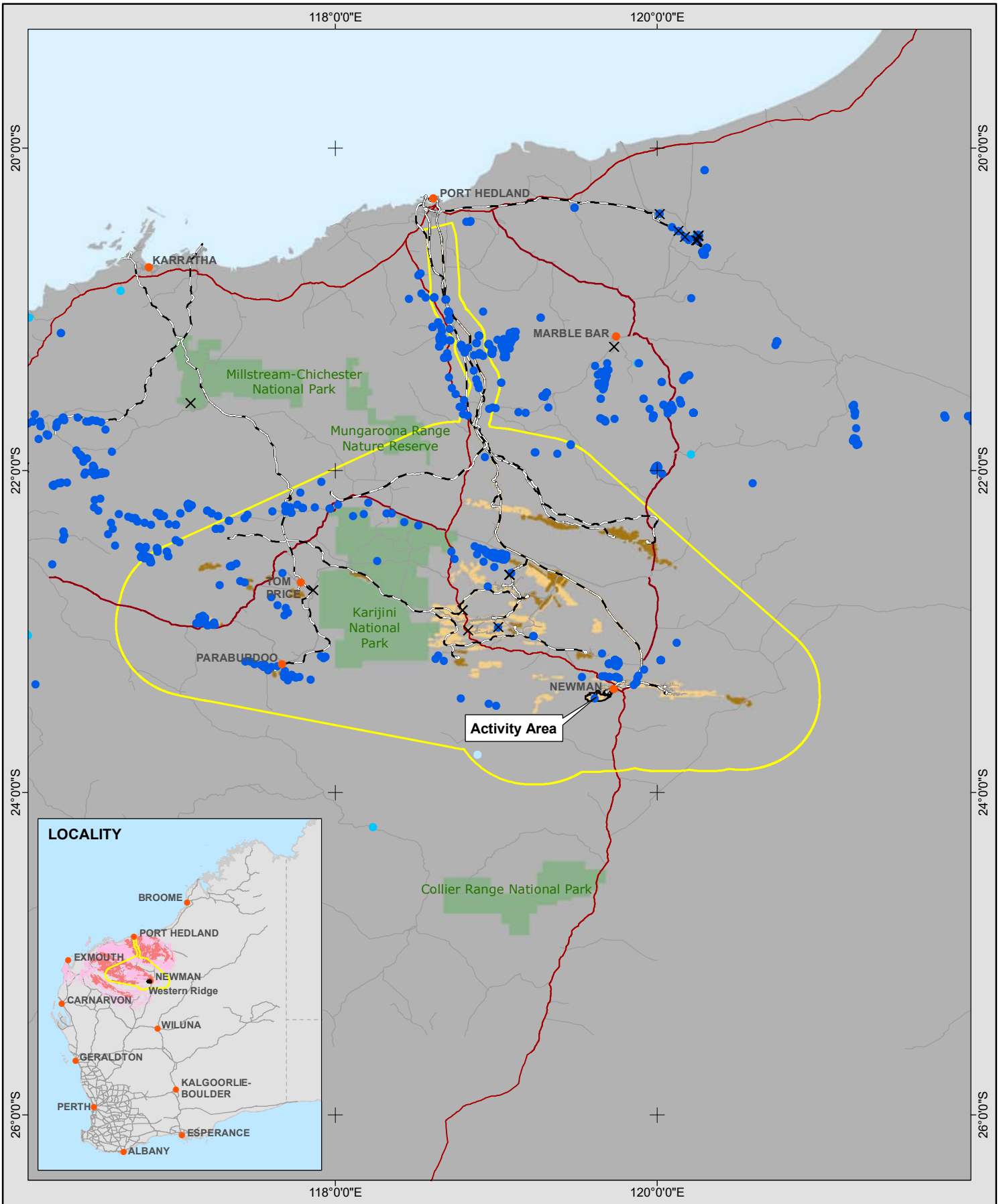
A total of 2,466 ha of supporting habitats are present within the Activity Area and these include habitats which support foraging including Drainage Area/Floodplain, Minor Drainage Line, Gorge/Gully, Breakaway/Cliff and Hillcrest/Hillslope habitats. These are presented in Table 4.19 and shown in Figure 4.19. Of this extent, 1,745 ha is within the Indicative Footprint and will be impacted by the Activity.

Although Major Drainage Line habitat (Priority 4) is present in the Activity Area, it is surrounded by disturbed areas, is highly fragmented and adjacent to a rail loop so is not considered a supporting habitat for Pilbara Leaf-nosed Bat at Western Ridge.

In addition to the supporting habitats listed in Table 4.19, three natural temporary surface water features and two artificial water features occur within the Activity Area and may be used by foraging by the Pilbara Leaf-nosed Bat. Pilbara leaf-nosed Bat are understood to rely on permanent surface water being available in proximity to roosts. No permanent surface water features are present in the Activity Area; however permanent to semi-permanent surface water is available to the north and outside of the Activity Area at Nankunya.

Table 4-19: Pilbara Leaf-Nosed Bat survey habitat assessment

Habitat Description	Within Activity Area (ha)	Within Indicative Footprint (ha)
Supporting Habitat		
Gorge/Gully	140.2	Up to 108
Breakaway/Cliff	46.8	Up to 39
Hillcrest/Hillslope	1,533.1	1,162.7
Minor drainage line	74.9	56.0
Drainage area/Floodplain	670.6	379.4
Temporary surface water features	3	3
Total	**2,465.6**	**1,745.1**



BHP

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WESTERN RIDGE VALIDATION NOTICE

Pilbara Leaf-nosed Bat regional records and distribution

N

100 50 0 100

Kilometres

Coordinate System: GCS GDA 1994, Datum: GDA 1994, Units: Degree

Date:	1/03/2022	Project No: A979/180B	Figure: 4-16
Prepared:	M. English	Checked: A. Edgar	

LEGEND

Pilbara Leaf-nosed Bat records

- Records After 2005
- Records between 1980 - 2004
- Records Prior 1979
- Records Missing Date
- Activity Area
- BHP LOA Mine Plan disturbance footprint
- Major Road
- Minor/Regional Road
- Rail Centreline
- Strategic Assessment Area
- Town
- Third Party disturbance footprint
- Species or species habitat likely to occur
- Species or species habitat may occur

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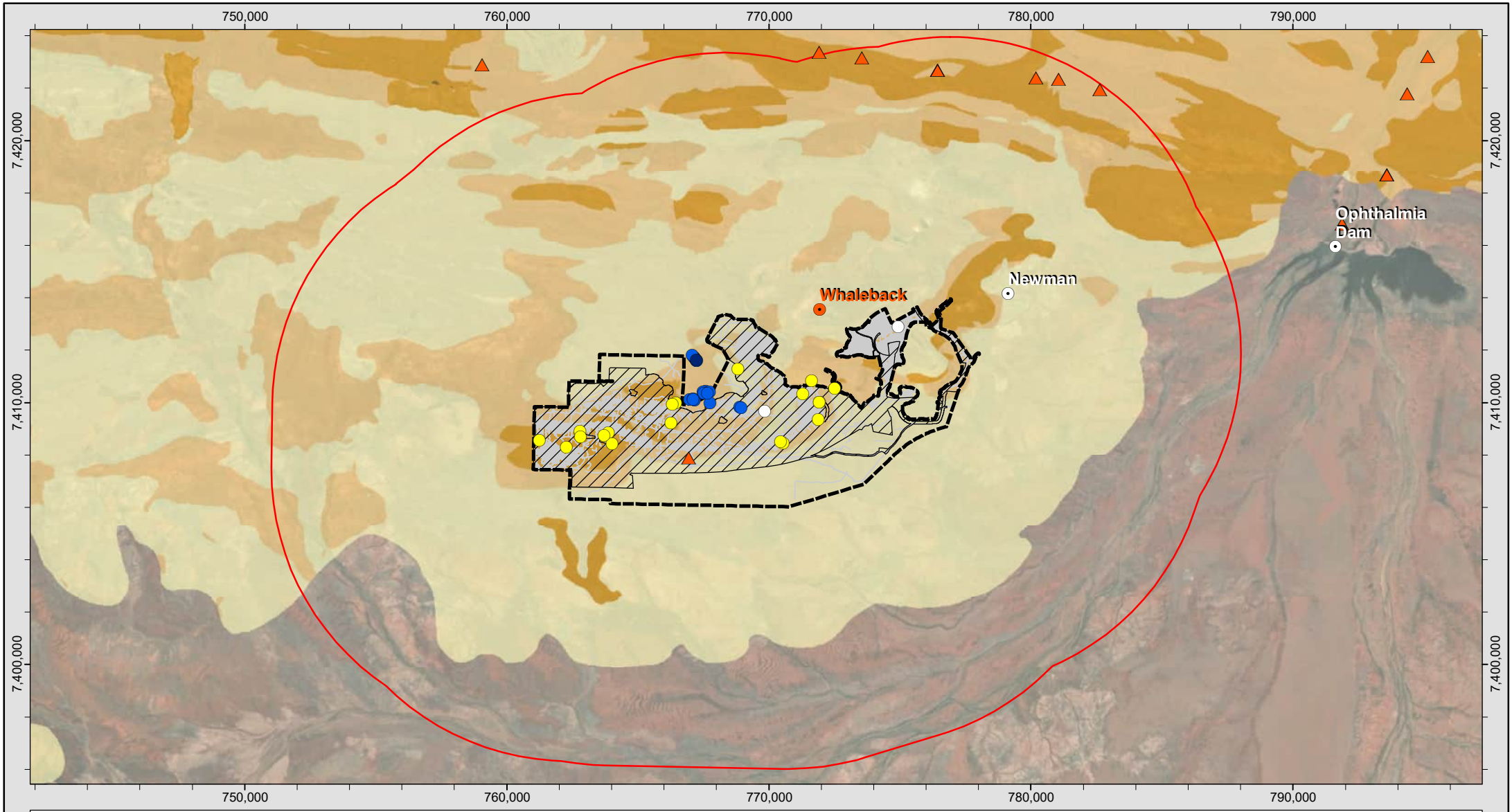

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Spatial Data - Studies Planning & Access
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WESTERN RIDGE VALIDATION NOTICE

Pilbara Leaf-nosed Bat modelled habitat and regional records

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5 2.5 0 5

Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	1/03/2022	Project No: A979/181C	Figure: 4-17
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- 10km radius of the Activity Area
- Activity Area
- BHP operations
- Indicative Footprint
- Indicative Cleared Area as at FY2021
- Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) (VU)
- Cave

Water feature

- Artificial
- Permanent Seep
- Temporary Seep
- Temporary Surface Pool

Pilbara Leaf-nosed Bat potential habitat modelling

- H1 (Lowest potential)
- H2
- H3
- H4 (Highest potential)

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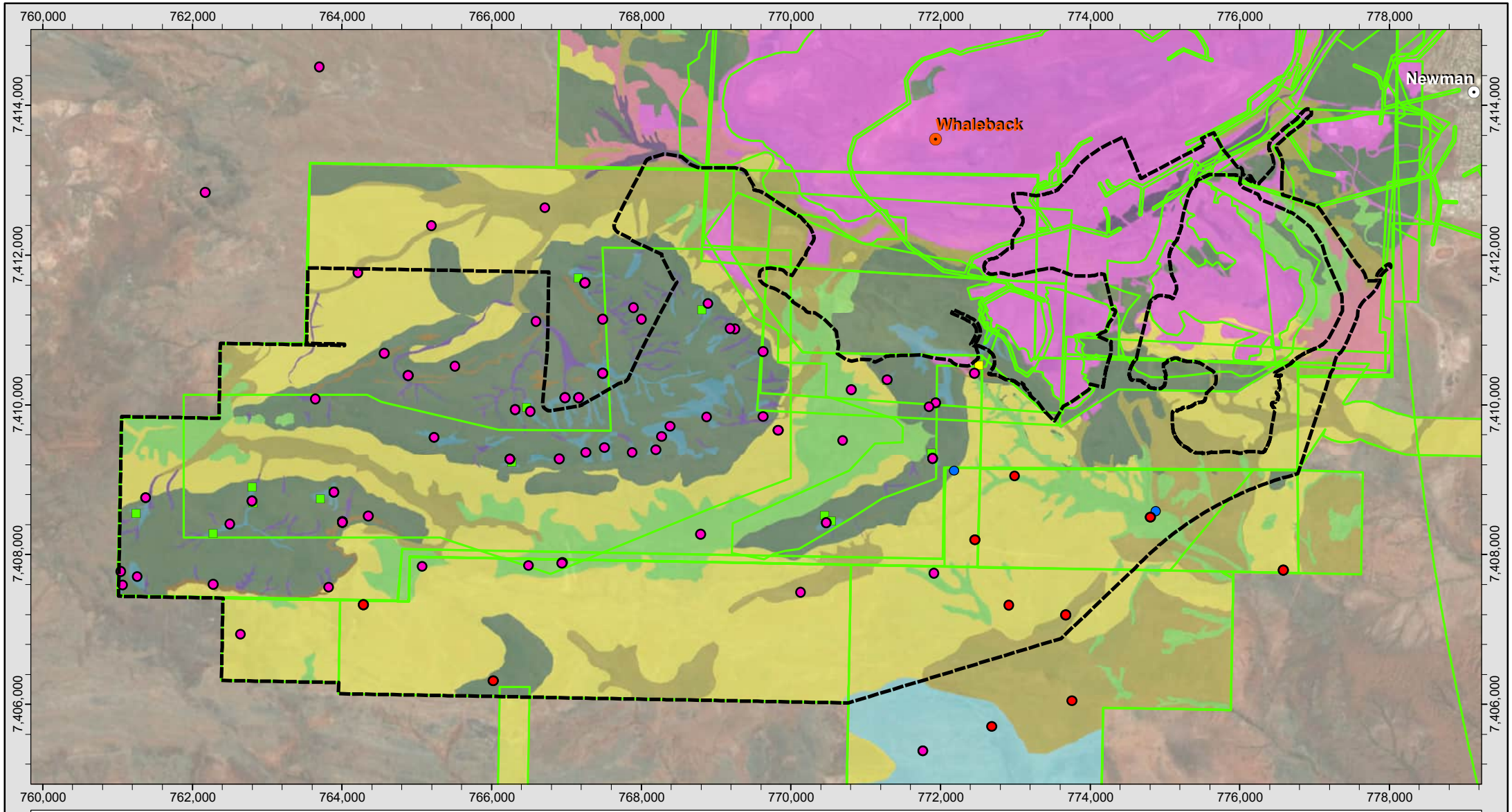

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Spatial Data - Studies Planning & Access
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WESTERN RIDGE VALIDATION NOTICE
Pilbara Leaf-nosed Bat survey areas and methods

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	21/02/2022	Project No: A979/251B	Figure: 4-18
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- Activity Area
- BHP operations
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

Targeted Bat Cave Site
- 2019
- 2020

Bat Sample Site
- 2014
- 2017
- 2018
- 2019
- 2020
- Pilbara Leaf-nosed Bat Survey Coverage

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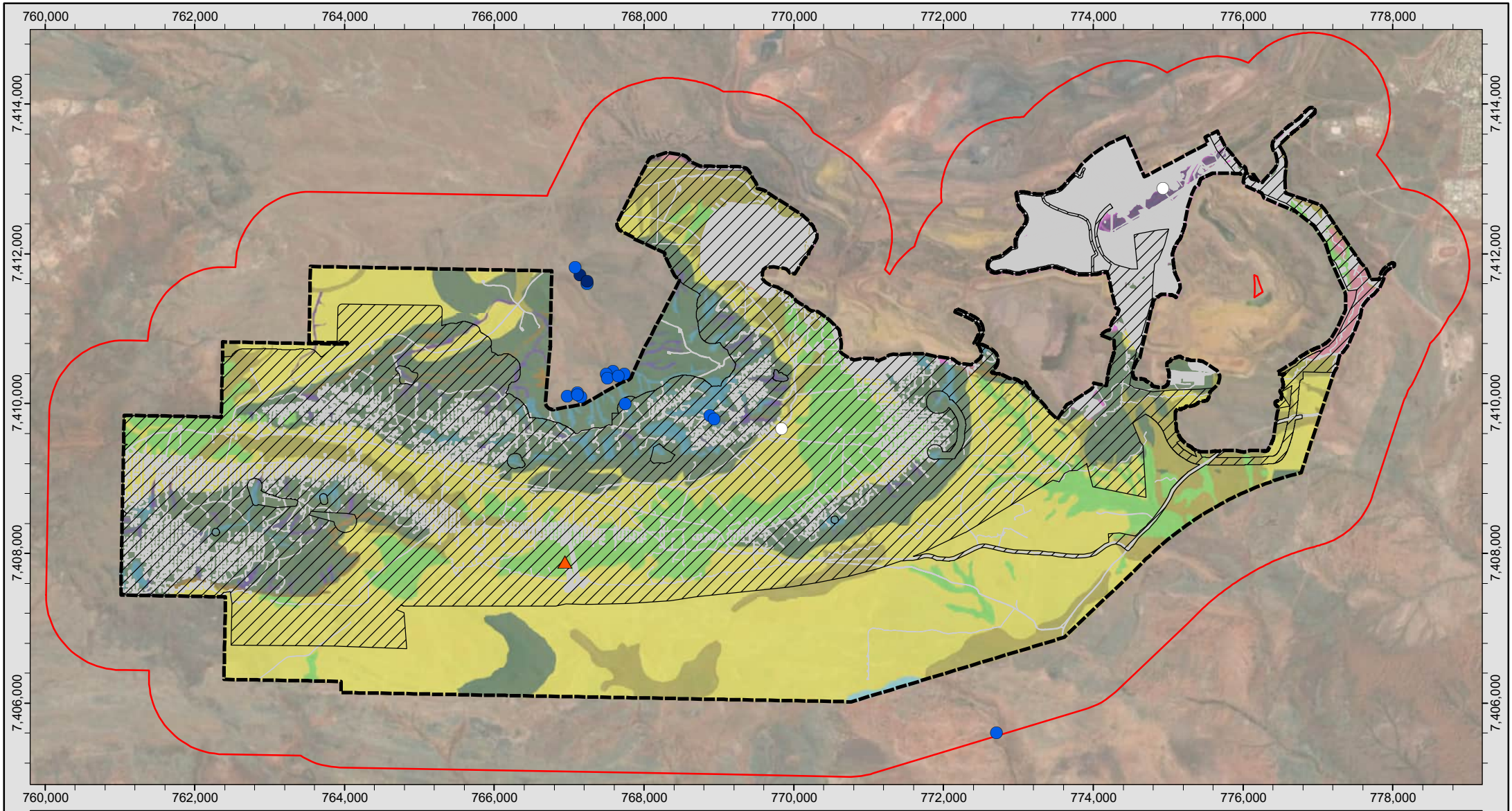

BHP

Spatial Data - Studies Planning & Access
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WESTERN RIDGE VALIDATION NOTICE
Pilbara Leaf-nosed Bat mapped habitat and records

N
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Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date: 1/03/2022	Project No: A979/172C	Figure:	4-19
Prepared: M. English	Checked: A. Edgar		

LEGEND

- Activity Area
- Indicative Footprint
- Indicative Cleared Area as at FY2021
- Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) (VU)

Water feature
- Artificial
- Permanent Seep
- Temporary Seep
- Temporary Surface Pool
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

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4.6.4 Pilbara Leaf-Nosed Bat Records

Bat search and acoustic recorder locations are shown in Figure 4.18. A single ultrasonic call recording of this species was recorded from Mulga Woodland habitat within the central portion of the Activity Area (Biologic 2020a) (Figure 4.19). Based on the late timing of the call (9:03pm), the record is likely to represent an isolated foraging/dispersing individual. The lack of further records, despite additional targeted survey effort (Biologic 2021), confirms that the species is highly unlikely to permanently reside (i.e. roost) in the Activity Area and may only occur to intermittently forage and disperse.

The nearest records of the species are located at Cathedral Gorge, approximately 11 km north of the Activity Area in 2015 (Biologic 2016). The remaining records occur between 20–26 km north of the Activity Area, primarily along Kalgan Creek and the Ophthalmia Range, from 2013–2017 (DBCA 2020b).

The absence of critical habitat roost sites and only one record of the species within the Activity Area (and no records within 500m of the Activity Area) suggest there is no important population as per the DotE (2013) definition, of Pilbara Leaf-nosed Bat present.

4.6.5 Impact Assessment

The potential direct and indirect impacts to Pilbara Leaf-Nosed Bat from the Activity are outlined below. The loss of supporting habitat is a significant residual impact which requires offsetting (Section 5).

Habitat Loss

The key impact to the Pilbara Leaf-Nosed Bat is the loss of supporting habitat associated with mining activities. There are no critical roosts located in the Activity Area and only one record exists of an isolated foraging/dispersing individual suggesting the area is not an important foraging ground for Pilbara Leaf-nosed Bat. Approximately 1,745.1 ha of supporting habitat will be cleared in the Activity Area (Table 4.19). These habitats are contiguous with surrounding areas outside of the Activity Area and are considered to be common in this part of the Pilbara.

Three temporary natural water features (WWER-10, WWER-18 and WWER-19) and one artificial water feature (WWER-12) which may be used as foraging habitat are located in the Indicative Footprint. BHP considers that the Activity will not have a significant impact on this species at a local or regional scale through habitat loss owing to the paucity of records in the area for this species and lack of critical habitat within the Activity Area.

Clearing of habitat may also result in fragmentation; however, given that there is no evidence of individuals or a population residing in the Activity Area or within 500m of the Activity Area, this potential for fragmentation to impact the species is considered very low.

Habitat Modification

Hot work activities on site and the introduction and increased vehicle movements could increase the risk of fire and spread of weeds, respectively. Fire and weed encroachment have the potential to degrade Pilbara Leaf-Nosed Bat supporting habitat within and adjacent to the Activity Area. With standard BHP fire management and weed control practices, the potential for increased risk of fire and habitat degradation due to weeds, are considered low.

Alterations to landforms and construction of infrastructure can lead to altered surface water drainage patterns which in turn may cause flooding and erosion in some areas and, rain-shadow effects in other areas. Implementation of surface water management measures will minimize any changes to surface water drainage.

Vegetation clearing and vehicle movements may result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation and causing habitat degradation. Degradation of habitat value due to dust emissions is considered unlikely due to the implementation of dust monitoring and management measures within the Activity Area.

Potential AMD risk is identified in Section 4.3.5.

Groundwater Changes

The depth to groundwater in the Activity Area ranges from approximately 40 mbgl to 100 mbgl and there is no groundwater dependent vegetation within the Activity Area. All temporary surface water features within the Activity Area occur as a result of significant rainfall events, and hold water for a short duration, as water dissipates over time due to evaporation. No groundwater dependent pools are present within the Activity Area. Permanent to semi-permanent surface water is available at Nankunya, north of and greater than 500m outside of the Activity Area. These water features are supported by a perched aquifer, which is not connected to the orebody aquifers that will be dewatered and will therefore not be impacted by the Activity. Furthermore, no critical roosts, which can be affected by groundwater changes through humidity changes, are present. On this basis, the Activity is not predicted to result in indirect impacts to Pilbara Leaf-nosed Bat from groundwater drawdown.

Surface Water Changes

The Activity will include the implementation of ephemeral creek diversions to maintain surface water flows downstream. The location of the temporary surface water features which may be used by Pilbara Leaf-nosed Bat for foraging, are predominantly located within a Whaleback Creek tributary, and these features will be retained. This includes nine temporary surface water features. On this basis, the potential impacts to Pilbara Leaf-nosed Bat as a result of altered hydrological regimes are expected to be negligible.

Vehicle Strikes

As Pilbara Leaf-nosed Bats tend to fly relatively low and display a curiosity for light sources, they are susceptible to vehicle strike (Armstrong 2001). Given the lack of records in the Activity Area (only one call), the risk of impact to the species by vehicle strike is considered very low.

4.6.6 Mitigation Hierarchy

Avoid

BHP has modified and reduced the original Indicative Footprint by incorporating mining exclusion zones and buffers around Ghost Bat caves and a Short-range endemic fauna avoidance zone (see Figures 4.10, 4.11 and 4.16). This has also resulted in an avoidance of clearing of supporting habitat for the Pilbara Leaf-nosed Bat through enabling:

- the protection of approximately 39 ha of Gorge/Gully, Breakaway/Cliff, Hillcrest/Hillslope, Minor Drainage Line, and Drainage Area/Floodplain (foraging/dispersal habitat) from clearing
- the protection of nine temporary surface water features to the north which may be utilised as foraging habitat by Pilbara Leaf-nosed Bat.

Direct impacts to suitable Pilbara Leaf-nosed Bat foraging habitat will also be avoided where practicable through planning and implementing land disturbance approval processes prior to land disturbance.

Mitigate

The key potential direct impact to the Pilbara Leaf-nosed Bat from the Activity is loss of supporting foraging habitat. The management measures proposed to minimise this impact include utilising existing infrastructure, facilities and cleared areas, and maximising the disposal of waste rock within mine pits, where practicable. Existing processing infrastructure at the adjacent Mt Whaleback mine will be utilised, to minimise the amount of clearing (and removal of potential habitat) required for infrastructure to support the activity. Where clearing is unavoidable, mine and linear infrastructure will be located, where practicable, to minimise impacts to significant fauna and habitat features recorded from surveys.

4.6.7 Residual Impact

Significant residual impacts for the Pilbara Leaf-nosed Bat include direct disturbance of:

- 1,745.1 ha of supporting foraging habitats (Drainage Area/Floodplain, Minor Drainage Line, Gorge/Gully, Breakaway/Cliff, Hillcrest/Hillslope)
- three supporting temporary natural surface water features (WWER-10, WWER-18 and WWER-19).

Offsets will be provided for these significant residual impacts (Section 5).

4.6.8 Review of Program Matter Outcomes

Following the impact assessment (Section 4.6.5) and application of the mitigation hierarchy (Section 4.6.6) a review of the Activity against the PMOs was undertaken. Table 4.20 identifies which PMOs are relevant for the Activity.

Table 4-20: Review of Program Matter Outcomes (Pilbara Leaf-Nosed Bat)

Program Matter Outcome	Applicable Triggers	Assessment
Minimise loss of critical and supporting habitats of the Pilbara Leaf-nosed Bat as a result of Program Activities within the SAA .	Within the Activity Area there is: Presence of Pilbara Leaf nosed Bat critical habitat and or supporting habitat **AND** Presence or sign of Pilbara Leaf-nosed Bat transient,	The loss of 1,745.1 ha of supporting foraging habitat and three temporary surface water features within the Activity Area represents a significant residual impact and requires offsetting (see Section 5). As there is only one record of a transient foraging individual in the Activity Area and no evidence within 500m of the Activity Area, the Activity will not result in any loss of population.

Program Matter Outcome	Applicable Triggers	Assessment
	infrequent or dispersing individual/s	

4.6.9 Monitor

Although one Pilbara Leaf-nosed Bat call has been detected in the Activity Area, this record most likely represents an isolated foraging/dispersing individual rather than being representative of a population continually using the area which is further supported by the absence of any critical day roosts (Biologic 2020, Biologic 2021). Monitoring is therefore not considered required.

4.6.10 Summary

BHP considers the activity will meet the PMO to minimise loss of critical and supporting habitats, given no critical habitat is present in the Activity Area and offsets will be provided for the loss of supporting habitats.

Other species

The following sections provide information for Program Matters where the Notifiable Action Triggers are not applicable. These include Greater Bilby, Night Parrot and Grey Falcon.

4.7 Greater Bilby

The following sections provide background information to support the absence of Greater Bilby Notifiable Action Triggers. Impacts to the Greater Bilby are discussed to illustrate that the Program Matter Objective for this species will be met.

4.7.1 General Species Information

The Greater Bilby is listed under the EPBC Act as 'Vulnerable'. This mammal was common throughout most of its range until the early 1900s when there was a sudden and widespread collapse (Abbott 2001; Johnson 2008). This collapse and range contraction has been attributed to predation from cats and foxes, habitat destruction from introduced herbivores and changed fire regimes. Feral cats have been linked to the reduced success of reintroduced populations (Pavey 2006a).

The Greater Bilby is a highly mobile species with home ranges varying between 1 km^2 to 3 km^2 (Pavey 2006a). The movement patterns of the Greater Bilby are thought to be influenced by resource availability (Strahan 1995). The species may also persist in areas of low productivity (Southgate and Carthew 2006, Southgate *et al*. 2007 and Southgate *et al*. 2018).

The presence of the Greater Bilby is strongly associated with substrate type as it is generally restricted to areas that contain suitable burrowing habitat, such as sandy loam plains, alluvial creeks, dunes and sand ridges (TSSC 2016c). Within the Pilbara region the species is sparsely distributed, and often associated with level or undulating plains including watercourses and dune systems, composed of cracking clay, soil or sand that allows burrowing, with vegetation consisting of hummock grassland (spinifex), with low shrubland, usually *Acacia* dominated (Dziminski and Carpenter 2017). The Greater Bilby has also been recorded from mulga woodlands and stony plain habitats in the Abydos Plains region further north in the Pilbara. Food sources for the Greater Bilby include, but are not limited to, grass, sedge seeds, ants, fungi, termites, beetles, insect larva and spiders (Dziminski and Carpenter 2017, Southgate *et al.* 2018).

4.7.2 Local Habitat

The Activity Area falls within the current distribution of the Greater Bilby, whereby the species or species habitat may occur.

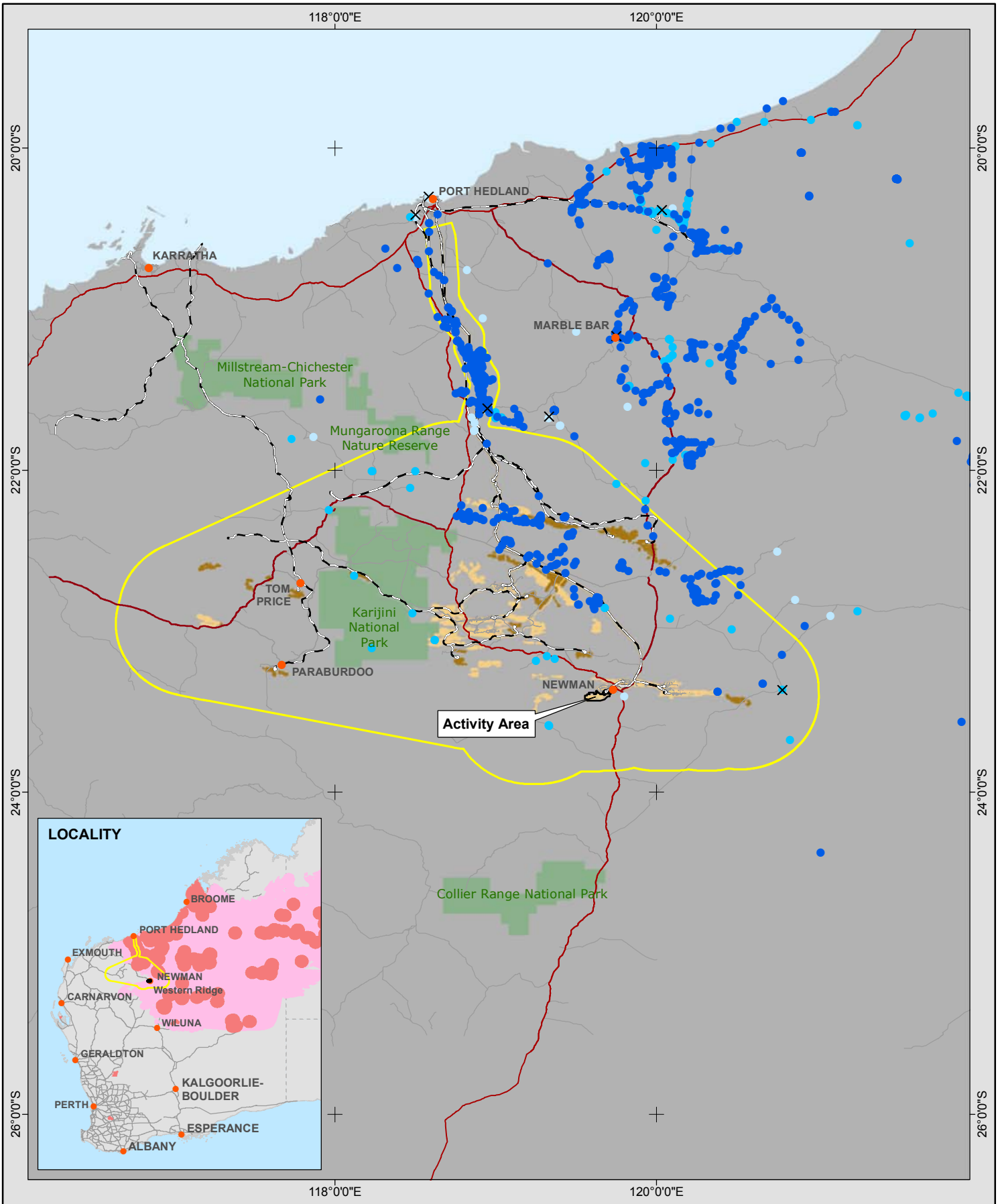
The areas surveyed for Greater Bilby are shown in Figure 4-21. While Sandplain habitat is considered critical habitat for Greater Bilby, the extent mapped in the Activity Area is fragmented and degraded as a result of being immediately adjacent to existing operations at Mt Whaleback. Coupled with the lack of records in the area, this habitat is considered supporting habitat and unlikely to support the species.

Drainage Area/Floodplain is also present within the Activity Area; however, habitat assessments undertaken by Biologic (2020a and 2020b) determined that the occurrence of Drainage Area/Floodplain habitat within the Activity Area contains heavy soils with low burrowing suitability for larger burrowing species such as the Greater Bilby. On this basis, this habitat type within the Activity Area is considered marginal habitat unlikely to support Greater Bilby and is not considered critical habitat (Table 4.22).

Mulga Woodland is present in the Activity Area and this is typically considered supporting habitat. However, as for Drainage Area/Floodplain, this extent contains heavy soils unsuitable for burrowing. Mulga Woodland is also therefore considered supporting habitat.

Table 4-21: Greater Bilby Habitat Assessment

Habitat Description	Within Activity Area (ha)	Within Indicative Footprint (ha)
Supporting Habitat		
Sand Plain	38.7	31.7
Stony Plain	2,894.3	1,469.3
Mulga Woodland	776.7	647.8
Drainage Area/Flood Plain	670.6	379.4
Total	**4,380.3**	**2,528.2**



BHP

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WESTERN RIDGE VALIDATION NOTICE

Greater Bilby regional records and distribution

N

100 50 0 100

Kilometres

Coordinate System: GCS GDA 1994, Datum: GDA 1994, Units: Degree

Date:	1/03/2022	Project No: A979/176A	Figure: 4-20
Prepared:	M. English	Checked: A. Edgar	

LEGEND

Greater Bilby records

- Records After 2005
- Records between 1980 - 2004
- Records Prior 1979
- Records Missing Date
- Activity Area
- BHP LOA Mine Plan disturbance footprint
- Major Road
- Minor/Regional Road
- Rail Centreline
- Strategic Assessment Area
- Town
- Third Party disturbance footprint
- Species or species habitat likely to occur
- Species or species habitat may occur

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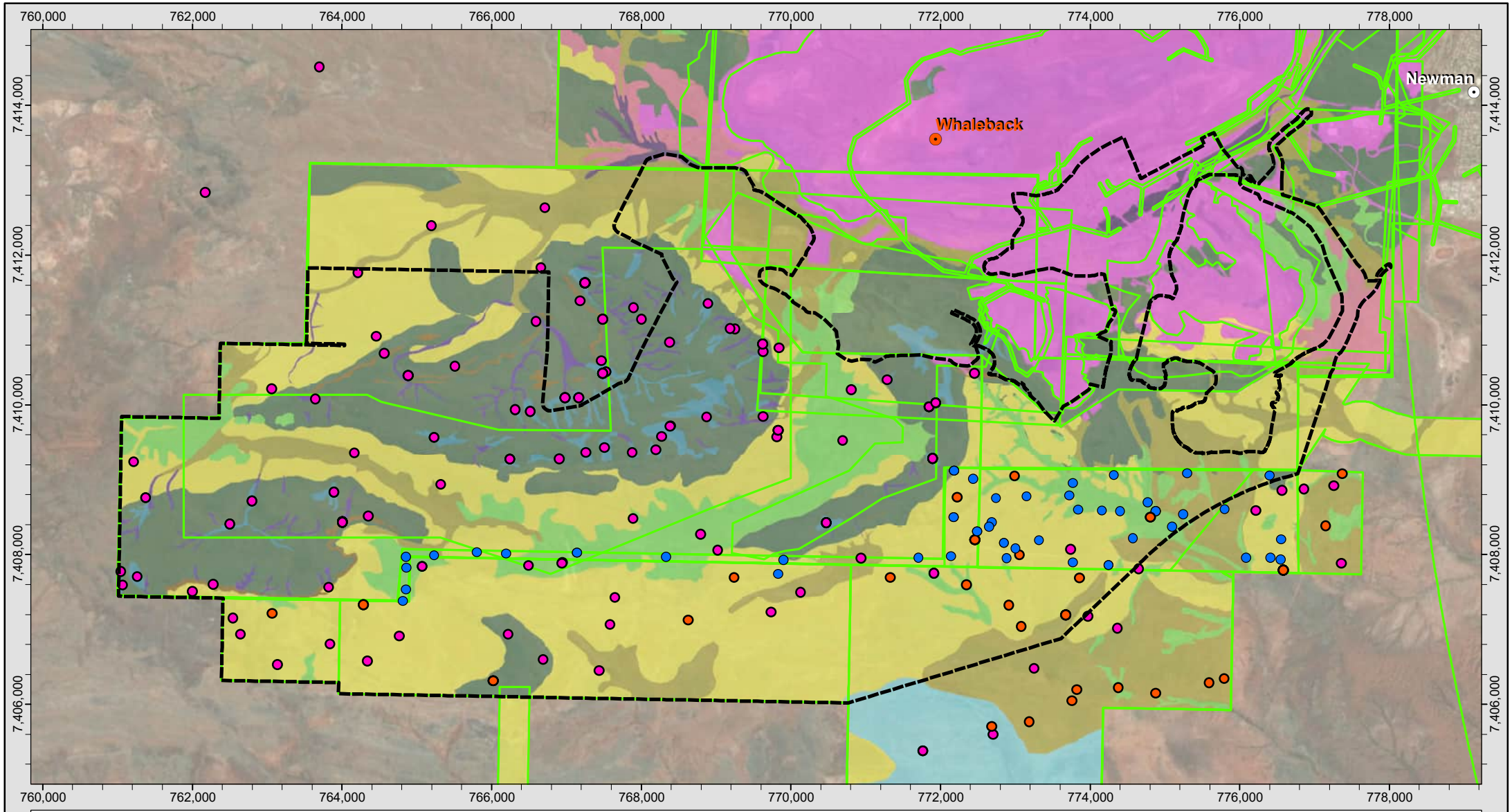

BHP

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WESTERN RIDGE VALIDATION NOTICE
Greater Bilby survey areas and methods

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Kilometres

Coordinate System: GDA 1994 MGA Zone 50Projection: Transverse Mercator, Datum: GDA 1994, Units: Meter

Date:	30/03/2022	Project No: A979/247B	Figure: 4-21
Prepared:	M. English	Checked: A. Edgar	

LEGEND

- Activity Area
- BHP operations
- Breakaway/ Cliff
- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

Sample Site

- 2014
- 2017
- 2018
- 2019
- 2020
- Greater Bilby Survey Coverage

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_247_E_WesternRidge_VN_GreaterBilby_SurveyCoverage_RevB.mxd

4.7.3 Greater Bilby Records

There is no evidence of any individuals or populations of Greater Bilby within the Activity Area or the immediate surrounds (Biologic 2020a, 2020b). Surveys to date, including a targeted survey by Biologic (2020a) utilising the 2 ha plot method recommended by DBCA (2017), have not recorded any Greater Bilby signs, tracks, scats, diggings or burrows within the Activity Area. The nearest contemporary records (< 20 years) are located approximately 62 km north (2013) and 74 km east (2018) (DBCA 2020a).

Given the lack of records, and lack of suitable habitat to support the species, it is considered unlikely that the Greater Bilby occurs within the Activity Area.

4.7.4 Impact Assessment

The potential direct and indirect impacts to Greater Bilby supporting habitat from the Activity are outlined below.

Habitat Loss

The Activity will result in the direct loss of approximately 1058.9 ha of marginal habitat including Sandplain, Drainage Area/Floodplain and Mulga Woodland. Given Biologic (2020a and 2020b) has assessed the Mulga Woodland and Drainage area/Floodplain habitats within the Activity Area as being unsuitable for supporting the Greater Bilby based on the substrate characteristics, this habitat loss does not represent a significant impact to the Greater Bilby.

Surface Water Changes

The Activity will include the implementation of ephemeral creek diversions to maintain surface water flows downstream. This change in surface water has the potential to impact on vegetation that is reliant on surface water such as Mulga Woodland, a habitat known to be used by Greater Bilby within the Pilbara. Vegetation mapping completed in the Activity Area has not identified any areas of vegetation considered to be reliant on sheet-flow. The vegetation occurring in association with the Elimunna land system (which is known to support sheet flow) did not have any distinctive banding or grooving of Mulga and was mostly dominated by scattered mulga trees/ tall shrubs on stony surface (Biologic 2020a, 2020b, 2021a). On this basis, the potential impacts to Mulga Woodland as a result of altered hydrological regimes are expected to be negligible.

Clearing has the potential to fragment habitat; however, given there are no records from within the Activity Area or 500m of the Activity Area, the potential for impact is considered very low.

Habitat modification

Fire and weed encroachment have the potential to degrade Greater Bilby foraging habitat which in turn may cause population declines (Bradley *et al.* 2015). Hot work activities on site and the introduction and increased vehicle movements may increase the risk of fire and spread of weeds, respectively, which may degrade Sand Plain, Stony Plain, Mulga Woodland and Drainage Area/Flood Plain habitats within the Activity Area. However, given the lack of records and unsuitable burrowing characteristics of habitats in the Activity Area, the impact of habitat modification to the Greater Bilby is considered to be very low.

Alterations to landforms and construction of infrastructure can lead to altered surface water drainage patterns which in turn may cause flooding and erosion in some areas and, rain-shadow effects in other areas. Implementation of surface water management measures will minimize any changes to surface water drainage.

Vegetation clearing and vehicle movements may result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation and causing habitat degradation. Degradation of habitat value due to dust emissions is considered unlikely due to the implementation of dust monitoring and management measures within the Activity Area.

Feral Predators

Feral predators such as feral cats (*Felis catus*) and foxes (*Vulpes vulpes*), may predate on the Greater Bilby (DotE 2014c, Woinarski *et a*l. 2014, Pavey 2006b). The Activity may attract feral predators to the area, with the establishment of water sources. Evidence of cats was recorded during the 2020 Coombanbunna fauna survey (Biologic 2020b) to the south of the Activity Area. Given the lack of records for Greater Bilby, the impact from feral predators is considered very low.

4.7.5 Summary

The Greater Bilby Notifiable Action Triggers are not applicable as there are no records of Greater Bilby within the Activity Area or within 500m of the Activity boundary. Direct and indirect impacts to Greater Bilby supporting habitat within the Activity Area or within 500m of the Activity Area are not considered significant.

4.8 Night Parrot

The following sections provide background information to support the absence of Night Parrot Notifiable Action Triggers. As there are no records, critical or supporting habitat within the Activity Area or within 500m of the Activity Area, impacts to the Night Parrot are not considered as the PMO is not at risk from the Activity.

4.8.1 General Species Information

The Night Parrot is listed as Endangered under the EPBC Act and Critically Endangered under the BC Act. The Night Parrot has long been considered one of Australia's most mysterious birds. The species was presumed extinct until 2013 when, after more than a century since the last widely accepted sighting of a live individual, a population was discovered in south-west Queensland. Since then, the species has been recorded from isolated populations in south-west Queensland and northern inland WA (TSSC 2016d).

There are two known records of the Night Parrot in the SAA from 1967 (DBCA) and 2005 (Birdlife). The 1967 record is located in the far south-western portion of the SAA. The 2005 record is from Minga Well in the northern portion of the SAA, approximately 2.5 km north of the Fortescue Marsh. These are unlikely to be the only records in the SAA, based on the reported increase in Night Parrot discoveries in Australia. Due to confidentiality issues the location of any other records within the SAA boundary are unable to be sourced from external databases.

The Night Parrot requires access to reliable food sources, shelter for breeding, protection from predators and the elements, and access to either free water or water-rich plant foods (Burbidge 2020). The spatial configuration requirements of Night Parrot habitat features have become increasingly evident through recent records of the species by Paruku Rangers and Birriliburu Rangers and others (Davis & Metcalfe 2008; Jackett *et al*. 2017; Murphy *et al.* 2017; Michelmore and Birch 2020 as cited in Burbidge 2020). The records have occurred at locations where productive feeding habitat (such as ephemeral grasslands, herb-fields or samphire, gilgais, run-on areas, flood plains, or salt lake systems), is interspersed or juxtaposed (at a scale of tens of square kilometres) with old-growth, dense hummock-forming spinifex for roosting/nesting that is broken up into fire-isolated patches by ironstone, rocky bars, salt lakes or samphire flats, within 50 km of free water (Burbidge 2020). The species also appears to rely on roosting/nesting in dense clumps of vegetation that are long-unburnt (TSSC 2016d).

4.8.2 Local Habitat

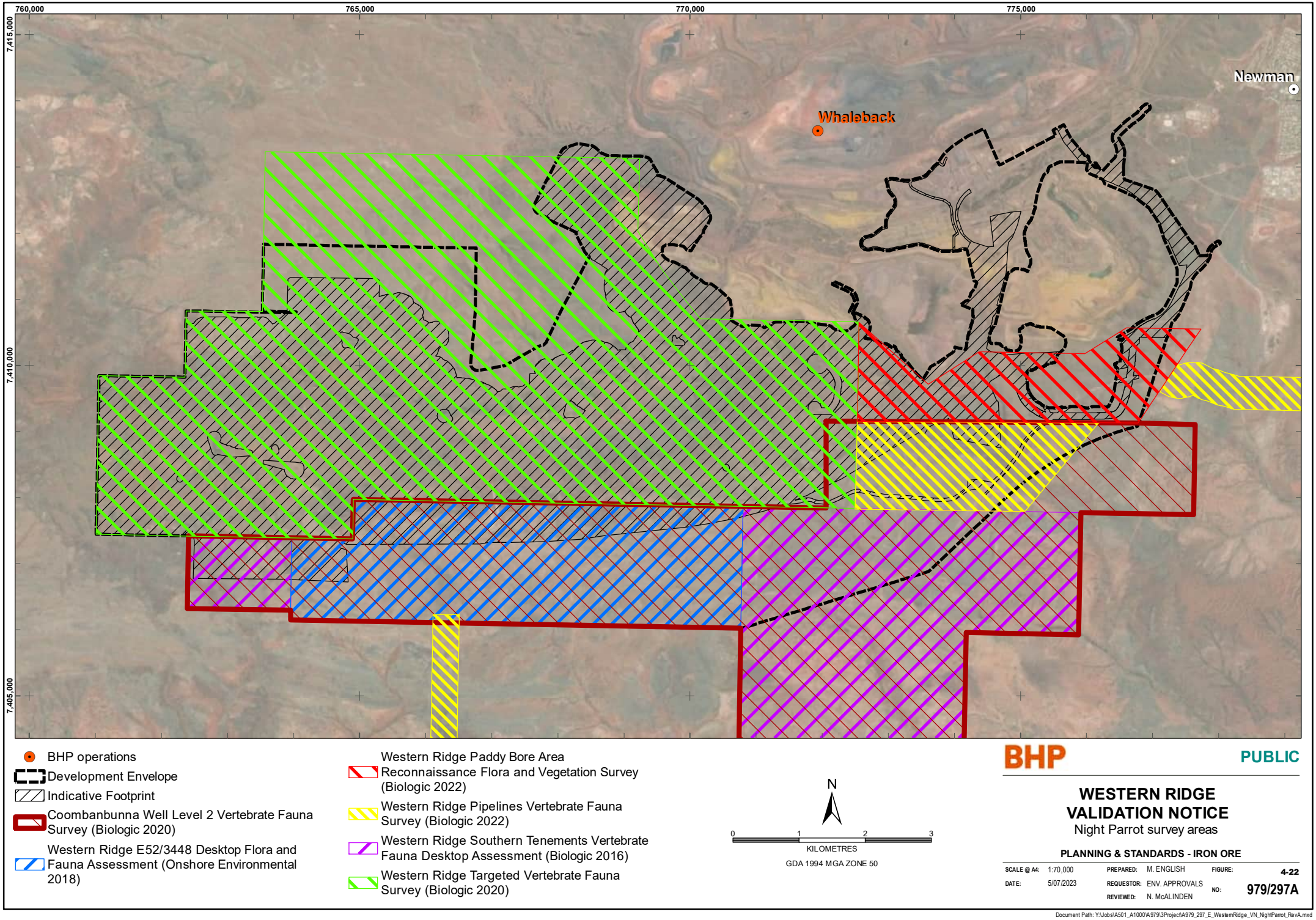
Survey coverage for the Night Parrot is shown in Figure 4.24.

There are no critical habitats present within the Activity Area. Although there are some instances of *Triodia* hummocks of a suitable size, these are sparsely distributed and there is an absence of high quality foraging habitats which are defined as low, treeless chenopod shrublands or herb lands with high abundance of annual grasses and herbs.

Approximately 3,564.9 ha of supporting habitat for Night Parrot is present in the Activity Area and includes Drainage Area/Floodplain and Stony Plain habitats (Table 4-22) (Biologic 2020a). Of this extent, 1,848.7 ha is within the Indicative Footprint and will be impacted.

Table 4-22 Night Parrot Habitat Assessment

Habitat Description	Within Activity Area (ha)	Within Indicative Footprint (ha)
Supporting habitat		
Drainage Area/Flood Plain	670.6	379.4
Stony Plain	2,894.3	1,469.3
Total	**3,564.9**	**1,848.7**


760,000
765,000
770,000
775,000
7,415,000
7,410,000
7,405,000
Newman
Whaleback
BHP operations
Development Envelope
Indicative Footprint
Coombanbunna Well Level 2 Vertebrate Fauna Survey (Biologic 2020)
Western Ridge E52/3448 Desktop Flora and Fauna Assessment (Onshore Environmental 2018)
Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey (Biologic 2022)
Western Ridge Pipelines Vertebrate Fauna Survey (Biologic 2022)
Western Ridge Southern Tenements Vertebrate Fauna Desktop Assessment (Biologic 2016)
Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2020)
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1
2
3
KILOMETRES
GDA 1994 MGA ZONE 50
BHP
PUBLIC
WESTERN RIDGE
VALIDATION NOTICE
Night Parrot survey areas
PLANNING & STANDARDS - IRON ORE
SCALE @ A4: 1:70,000
DATE: 5/07/2023
PREPARED: M. ENGLISH
REQUESTOR: ENV. APPROVALS
REVIEWED: N. McALINDEN
FIGURE: 4-22
NO: 979/297A
Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_297_E_WesternRidge_VN_NightParrot_RevA.mxd

4.8.3 Night Parrot Records

There are no records of Night Parrot from the Activity Area (Biologic 2020a, 2020b). Records of Night Parrot within the Pilbara region are scarce with the nearest record approximately 100 km from the Activity Area.

4.8.4 Impact Assessment

The potential direct and indirect impacts from the Activity are discussed below.

Habitat loss

The Activity will result in the direct loss of 1,848.7 ha of supporting habitat suitable for foraging and dispersal (Drainage Area/Flood Plain and Stony Plain).

Clearing for the Activity has the potential to fragment habitat; however, given the Night Parrot is understood to travel up to 40 km in a single night to forage (Biologic 2020a), and as there are no records within the Activity Area or within 500m, the potential impact is considered to be low,

Habitat modification

Numerous references indicate that the Night Parrot appears to rely on roosting/nesting in dense clumps of vegetation that are long-unburnt (TSSC 2016d). The Night Parrot is therefore considered susceptible to the effects of changes in fire regimes or human-induced fire events. Hot work activities on site and the introduction and increased vehicle movements may increase the risk of fire to Night Parrot supporting habitats within the Activity Area. Further habitat degradation is likely to have been caused through grazing cattle which have been observed in the Activity Area during surveys (Biologic 2020a). Given the lack of records in the Activity Area, the impact of habitat modification to the Night Parrot is considered to be very low. With standard BHP fire management and weed control practices, the potential for increased risk of fire and habitat degradation due to weeds, are considered low.

Alterations to landforms and construction of infrastructure can lead to altered surface water drainage patterns which in turn may cause flooding and erosion in some areas and, rain-shadow effects in other areas. Implementation of surface water management measures will minimize any changes to surface water drainage.

Vegetation clearing and vehicle movements may result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation and causing habitat degradation. Degradation of habitat value due to dust emissions is considered unlikely due to the implementation of dust monitoring and management measures within the Activity Area.

Feral predators

The Night Parrot is vulnerable to predation by feral cats (*Felis catus*) and foxes (*Vulpes vulpes*) (TSSC 2016d). Fauna surveys have recorded feral cats during the 2020 Coombanbunna fauna survey (Biologic 2020b) to the south of the Activity Area. Given the lack of Night Parrot records, the potential impact from feral predators is considered very low.

4.8.5 Summary

The Night Parrot Notifiable Action Triggers are not applicable as no records exist within the Activity Area or within 500m of the Activity boundary. Direct and indirect impacts to Night Parrot supporting habitat are not considered significant.

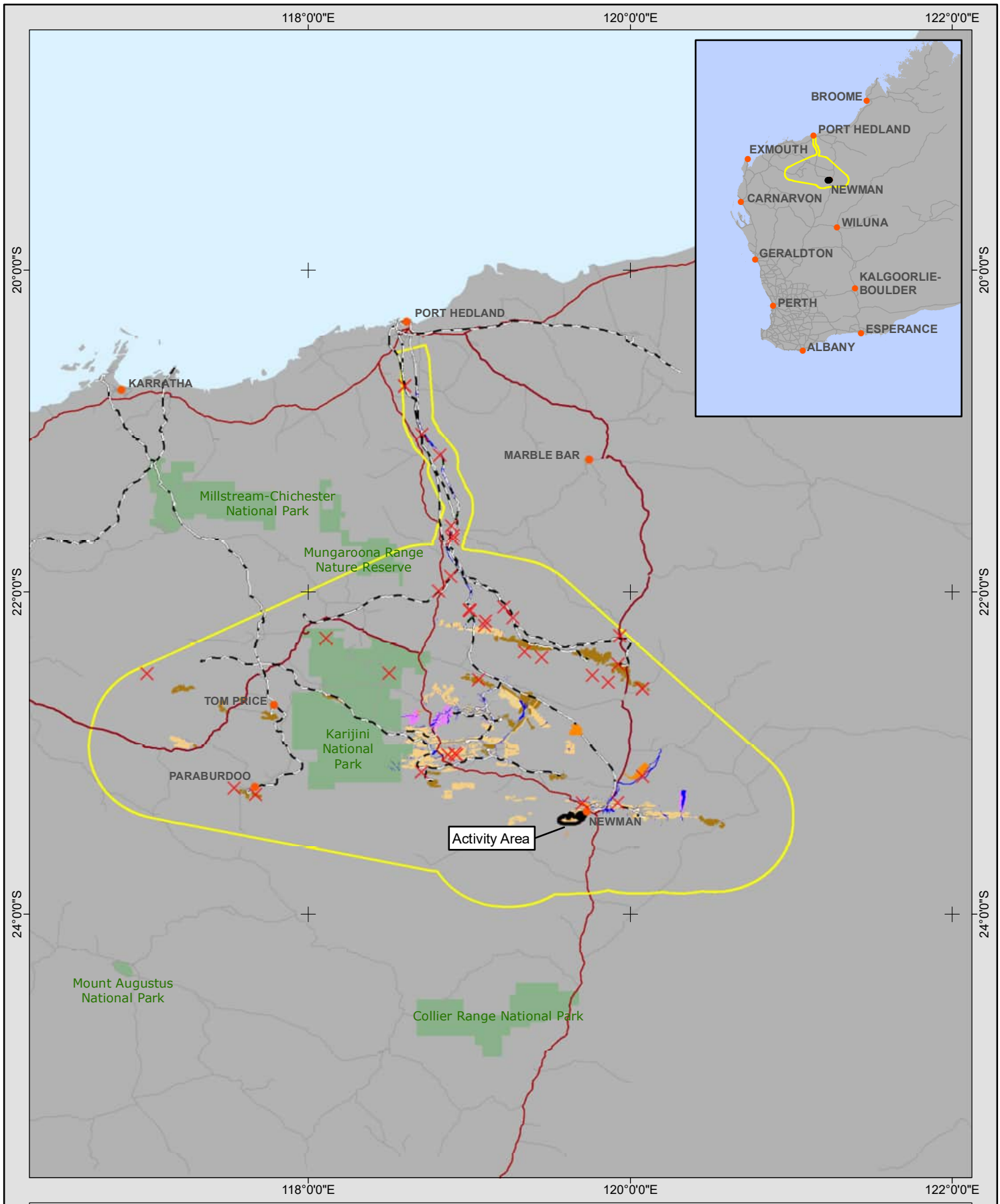
4.9 Grey Falcon

The following sections provide background information to support the absence of Grey Falcon Notifiable Action Triggers. Impacts to the Grey Falcon are discussed to illustrate that the PMO for this species will be met.

4.9.1 General Species Information

The Grey Falcon occurs at low densities in arid and semi-arid regions of Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Marchant and Higgins 1993 as cited in TSSC 2020). The species is typically confined to the arid and semi-arid zones where annual rainfall is less than 500 mm (Schoenjahn 2018 as cited in TSSC 2020). The species frequents timbered lowland plains, particularly Acacia shrublands that are crossed by tree-lined water courses (Garnett et al. 2011; Watson 2011; Schoenjahn 2013, 2018; Janse et al. 2015; Ley and Tynan 2016 as cited in TSSC 2020). The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland (Olsen and Olsen 1986; Schoenjahn 2018 as cited in TSSC 2020). Eggs are laid in the old nests of other birds, usually in the tallest trees along watercourses or in telecommunication towers (Marchant and Higgins 1993; Schoenjahn 2013, 2018; Falkenberg 2011 as cited in TSSC 2020) or other similar artificial structures. River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (E. coolabah) are favoured nesting trees.

Figure 4-23 depicts regional records of Grey Falcon.



BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE
PUBLIC

WESTERN RIDGE VALIDATION NOTICE

Grey Falcon regional records and distribution

Scale @ A4:	1:3,500,000	Prepared: SPATIAL DATA	Project No: A979/290A
Date:	22/06/2023	Checked:	Figure: 4-23
Revision:	REV A	Reviewed: ENVIRO. A&I	

- Falco hypoleucos (Grey Falcon)
- Town
- Activity Area
- Minor/Regional Road
- Major Road
- Rail Centreline

HabitatType

- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Waterhole
- Drainage Area/ Floodplain
- Strategic Assessment Area
- BHP LOA Mine Plan disturbance footprint
- Third Party disturbance footprint

Liability
BHPBIO does not warrant that this map is free from errors or omissions. BHPBIO shall not be in any way liable for loss, damage or injury to the user of this map or any other person or organisation consequent upon or incidental to the existence of errors or omissions on this map. This map has been compiled with data from numerous sources with different levels of reliability and is considered by the authors to be fit for its intended purpose at the time of publication. However, it should be noted that the information shown may be subject to change and ultimately, map users are required to determine the suitability of use for any particular purpose.

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0 25 50 75
Kilometres

Coordinate System: GCS GDA 1994
Datum: GDA 1994

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4.9.2 Local Habitat

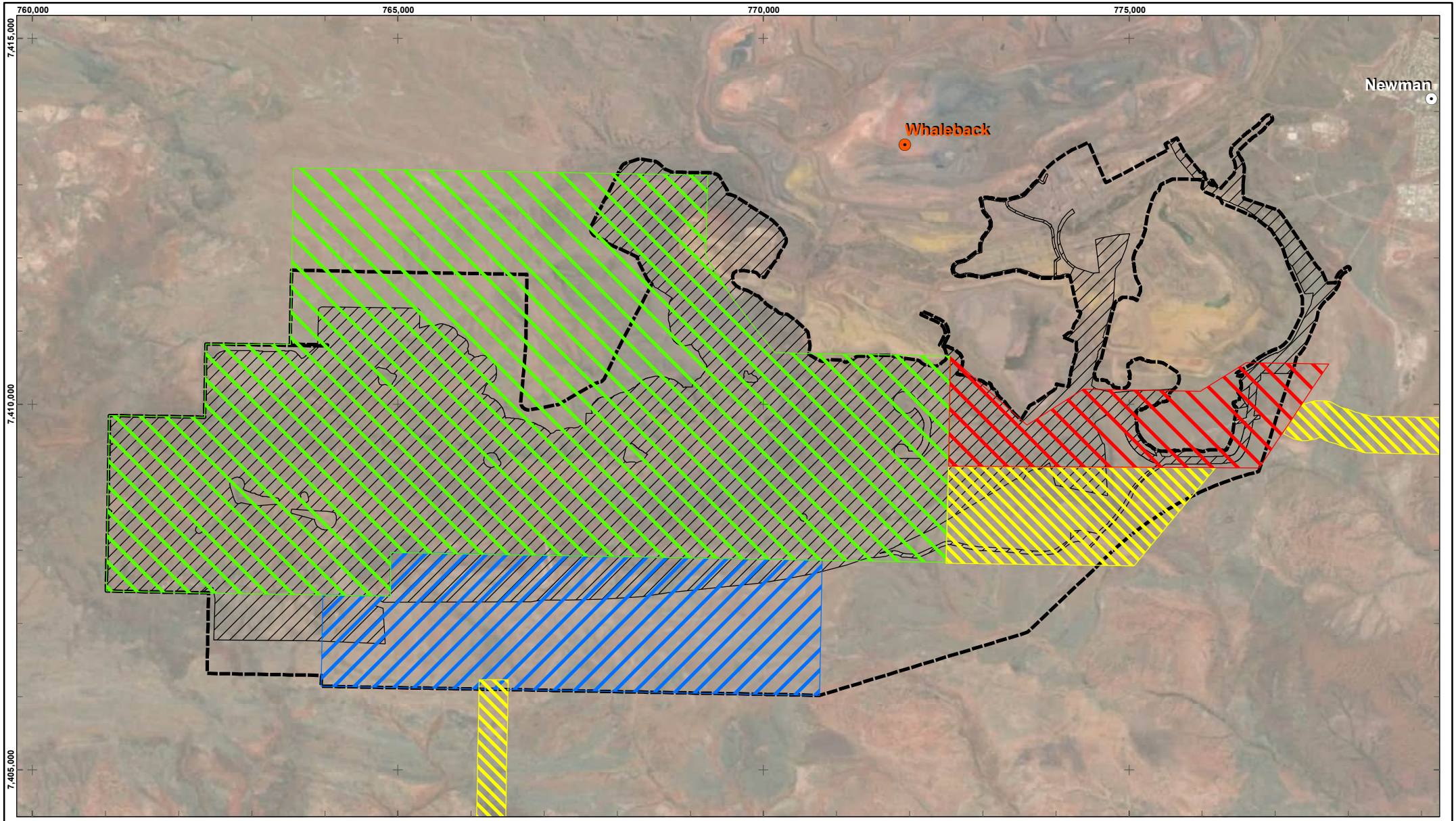
Grey Falcon survey coverage is depicted in Figure 4-24.

While Major Drainage Line is generally considered critical habitat for Grey Falcon, the extent of this habitat type within the Activity Area is fragmented and degraded as a result of being in close proximity to existing mine operations at Mt Whaleback and is therefore unlikely to support Grey Falcon. As a result, it is not considered a critical habitat in this assessment.

Supporting habitat is present within the Activity Area and includes Drainage Area/Floodplain, Mulga Woodland and Stony Plain (Biologic 2020a) (Table 4-23). As there have been no records of Grey Falcon within the Activity Area, it is unlikely that supporting habitats are used on a regular basis.

Table 4-23 Grey Falcon habitat assessment

Habitat Description	Within Activity Area (ha)	Within Indicative Footprint (ha)
Supporting habitat		
Drainage Area/Flood Plain	670.6	379.4
Stony Plain	2,894.3	1,469.3
Total	**3,564.9**	**1,848.7**



- BHP operations
- Development Envelope
- Indicative Footprint
- Western Ridge E52/3448 Desktop Flora and Fauna Assessment (Onshore Environmental 2018)
- Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey (Biologic 2022)
- Western Ridge Pipelines Vertebrate Fauna Survey (Biologic 2022)
- Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2020)

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KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

WESTERN RIDGE VALIDATION NOTICE

Grey Falcon survey areas

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:70,000	PREPARED:	M. ENGLISH	FIGURE:	4-24
DATE:	5/07/2023	REQUESTOR:	ENV. APPROVALS	NO:	979/298A
		REVIEWED:	N. McALINDEN		

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_298_E_WesternRidge_VN_GreyFalcon_RevA.mxd

4.9.3 Grey Falcon Records

There are no records of Grey Falcon from within the Activity Area or within 500m of the Activity boundary (Biologic 2020a, 2020b). The nearest record of Grey Falcon is approximately 10 km northwest of the Activity Area.

4.9.4 Impact Assessment

The potential direct and indirect impacts from the Activity are discussed below.

Habitat loss

Land clearing of the semi-arid zone and overgrazing of arid zone rangelands have been identified as possible threats to Grey Falcon. The Activity will result in the loss of approximately 1,848 ha of supporting habitat including Drainage Area/Floodplain and Stony Plain. Given the lack of records of Grey Falcon in the area, habitat loss associated with the Activity is not considered to be a significant impact.

Habitat Modification

Hot work activities on site and the introduction and increased vehicle movements could increase the risk of fire and spread of weeds, respectively. Fire and weed encroachment have the potential to degrade Grey Falcon supporting habitat within and adjacent to the Activity Area. With standard BHP fire management and weed control practices, the potential for increased risk of fire and habitat degradation due to weeds, are considered low.

Alterations to landforms and construction of infrastructure can lead to altered surface water drainage patterns which in turn may cause flooding and erosion in some areas and, rain-shadow effects in other areas. Implementation of surface water management measures will minimize any changes to surface water drainage.

Vegetation clearing and vehicle movements may result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation and causing habitat degradation. Degradation of habitat value due to dust emissions is considered unlikely due to the implementation of dust monitoring and management measures within the Activity Area.

Feral predators

Feral predators such as feral cats (*Felis catus*) and foxes (*Vulpes vulpes*), may predate on the Grey Falcon. Schoenjahn (2018) documented that Grey Falcons will roost on the bare open ground and evidence of Grey Falcon in the gut contents of cats. Chicks may also be vulnerable to cat predation at accessible nests. The Activity may attract feral predators to the area, with the establishment of water sources. Evidence of cats have been recorded in fauna surveys of the area (Biologic 2020a). With standard BHP feral cat management practices in place and the lack of Grey Falcon records in the Activity Area, the impact of feral cats on the Grey Falcon is considered very low.

4.9.5 Summary

The Grey Falcon Notifiable Action Triggers are not applicable as no records exist within the Activity Area or within 500m of the Activity boundary. Direct and indirect impacts to Grey Falcon are not considered significant.

5 Offset Proposal

5.1 Residual impacts

The Western Ridge Validation Notice has determined that the Activity will result in significant residual impacts to critical and/or supporting habitat for the Northern Quoll, Ghost Bat, Pilbara Olive Python and Pilbara Leaf-nosed Bat, as identified in Table 5-1 below.

5.2 Offset requirements

BHP developed the following objective for each of the Program Matters based on the Standards for Accreditation of Environmental Approvals under the EPBC Act and in consultation with the DCCEEW (Section 3.1.1 of the Program):

> *'To support the long-term persistence and viability of the Ghost Bat within the strategic assessment area*'.

Offsets for the significant residual impacts identified in Table 5-1, are required to achieve this PMO. Furthermore, the PMOs identified for each Program Matter (see Sections 4.3.8, 4.4.8, 4.5.8, 4.6.8), must also be achieved.

Table 5-1: Significant residual impacts for Western Ridge requiring offsetting under the SEA

Significant residual impact	Habitat types and extents (ha) to be offset	Total area to be offset (ha)	Habitat rating	Offset rate ($/ha)[1]	Estimated financial offset ($)[2]
Northern Quoll					
Clearing of habitat which supports denning and foraging	108 ha Gorge/Gully 39 ha Breakaway/Cliff	147 ha	Critical	3,306	485,982
Clearing of habitat which supports foraging	1,162.7 ha Hillcrest/Hillslope 1,469.3 ha Stony Plain	2,632 ha	Supporting	1,653	4,350,696
Ghost Bat					
Clearing of critical roosting/breeding habitat	108 ha Gorge/Gully 39 ha Breakaway/Cliff	147 ha	Critical	3,306	485,982
Clearing of critical foraging habitat	379.4 ha Drainage Area/Flood Plain 647.8 ha Mulga Woodland 1,469.3 ha Stony Plain 56 ha Minor Drainage Line	2,552.5 ha	Critical	3,306	8,438,565
Clearing of supporting habitat	Up to five Category 4 roosts	N/A	Supporting	Included in critical roosting/breeding habitat	N/A
Pilbara Olive Python					
Clearing of critical denning/breeding and hunting habitat	108 ha Gorge/Gully 39 ha Breakaway/Cliff	147 ha	Critical	3,306	485,982

Clearing of supporting hunting habitat	56 ha Minor Drainage Line	56 ha	Supporting	1,653	92,568
Pilbara Leaf-nosed Bat					
Clearing of supporting foraging habitats	108 ha Gorge/Gully 39 ha Breakaway/Cliff 1,162.7 ha Hillcrest/Hillslope 56 ha Minor drainage line 379.4 ha Drainage Area/Flood Plain	1,745.1 ha	Supporting	1,653	2,884,650.3
Total offset payment					**17,224,425**
Initial 10% pre-payment					**1,722,442.50**

1 This is the current offset payment rate applicable in 2023. This rate will be adjusted annually with the Perth Consumer Price Index (CPI).

2 Estimated offset rates based on 2023 rates. This will increase over time with application of Perth CPI.

5.3 Proposed Offset

Typical offset methods available in the Pilbara that BHP may use include financial, land management and research offsets. The DCCEEW have agreed that contributions to the Pilbara Environmental Offsets Fund (PEOF) will address clearing of critical and supporting habitat. The offset package includes two components:

Advance payment of 10% of the estimated total offset contribution to be paid into the PEOF within one month of the Validation Notice becoming effective.

A biannual payment for each hectare of clearing of critical and/or supporting habitat for Northern Quoll, Ghost Bat, Pilbara Olive Python and Pilbara Leaf-nosed Bat.

Financial contributions to the PEOF will achieve the Program Matter Objective and relevant Program Matter Outcome through investment in one or more conservation projects relevant to Northern Quoll, Ghost Bat, Pilbara Olive Python and Pilbara Leaf-nosed Bat, such as:

- Landscape-scale programs address threats like weeds, feral animals, and inappropriate fire across the landscape.
- Priority area programs build on the landscape-scale outcomes to further improve and protect vegetation and species habitat in identified priority areas.
- Site-specific projects protect and improve specific environmental matters such as Priority Ecological Communities or a particular habitat with unique attributes.

Reporting on financial contributions to the PEOF will be included in the Annual Environmental Report.

5.4 Offset calculation

5.4.1 Baseline conditions

During the assessment, fauna habitat survey data for each Program Matter is collected. A component of the biological survey information is the identification and mapping of critical and suitable habitats for each Program Matter. As the presence of four Program Matters (Northern Quoll, Ghost Bat, Pilbara Olive Python and Pilbara Leaf-nosed Bat) has triggered the need for this Validation Notice, the following baseline datasets will be provided to the PEOF to assist in determining the offset value to be applied:

- the Activity Area and Indicative Footprint
- existing disturbance areas (as of FY 2017)
- fauna habitat mapping and relevant Program Matter records.

5.4.2 Offset Value

The following methodology is used to calculate the direct impacts to the Program Matter values that require offsetting utilising the PEOF:

1) Land disturbance data is captured

   BHP captures and prepares a land disturbance dataset to demonstrate the impacts that have occurred within the reporting period, via the following steps:

   - throughout the financial year periodic aerial imagery of the Validation Notice Activity Area is captured via aerial survey
   - using the aerial imagery closest to the end and beginning of each financial year, the land disturbance within each reporting period is digitised
   - land disturbance data is then categorised and attributed with data according to the standards set out in the Instructions and associated templates

- the land disturbance data further digitised and captured at 1:1,000, meaning that 1 millimetre on the computer screen is equivalent to 1 metre on the ground[3]; this is consistent with the precision of all BHP datasets
- a land disturbance dataset is then available for reconciliation and validation processing.

2) Data reconciliation and validation

Reconciliation and validation of the land clearing dataset is undertaken to ensure that all land disturbance activities for the reporting period have been streamlined, categorised and attributed according to the IRP, Instructions requirements and from prior feedback from DWER.

3) Processing of datasets

BHP has developed a methodology which automates the process of comparing the land clearing dataset against the baseline dataset, for calculating the hectares of land disturbance for each area of environmental value (areas subject to offsets), and those with Offset Exclusions.

The automated methodology ensures the process of deriving the final product is consistent and repeatable, across other approvals and reporting periods.

4) Production of final Impact Reconciliation Report dataset

An EPBC Act Impact Reconciliation Report (EPBC Act IRR) dataset for each financial year within the reporting period is then 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, in the EPBC Act IRR.

This EPBC Act IRR dataset and aerial imagery, is submitted to the DWER with the IRR for review and assessment, and will be maintained on record for auditing purposes.

5.4.3 Offset rate

The relevant financial rates to be paid per hectare of critical and or supporting habitat as determined by the DCCEEW are as follows:

- A minimum of $3,306 per ha of critical habitat
- A minimum of $1,653 per ha of supporting habitat.

5.5 Proposed schedule

Key anticipated steps for BHP for the advanced and biannual payments to the PEOF are outlined in Table 5-2 and Table 5-3.

Table 5-2 Offsets reporting period

Reporting Period	Action	Timing
1 July to 30 June	Offsets implemented for each Notifiable Action	Annual capture with biannual payment

3 BHP captures baseline land disturbance at 1:1,000 (i.e. +/- 0.5m on the ground) hence any polygon slivers or gaps in the dataset under one square metre are ignored and are considered acceptable in the context of analysing datasets at vastly different scales.

Table 5-3 PEOF contributions schedule

Validation Process Stage	Action	Timing
Consultation on PEOF contributions	Provision of the Validation Notice inclusion of Impact Reconciliation Process and spatial data (Section 5.2 for Contributions to the PEOF)	4 September to 29 September
Authorisation	Validation Notice becomes effective	20 business days after publication of Final Validation Notice.
Implementation Advanced Payment	Advanced Payment (10% of the estimated total contribution)	Within one month of Validation Notice becoming effective
	BHP to report payment of Advanced Payment in the AER	1 October 2024
Implementation Period 1	First annual reporting period	1 July 2023 to 30 June 2024
	Aerial survey/ground truthing	30 June 2024
	EPBC Impact Reconciliation Report submitted to DWER	30 September 2024
	BHP to report payment of Offset Payment in the AER	1 October 2023
Implementation Period 2 and so forth until final offset contributions are completed	Second annual reporting period	1 July 2024 to 30 June 2025
	Aerial survey/ground truthing	30 June 2025
	EPBC Impact Reconciliation Report submitted to DWER	30 September 2025
	BHP to report payment of Offset Payment in the AER	1 October 2024

5.6 Offsets Reporting

5.6.1 Payment of financial contributions

EPBC Impact Reconciliation Reports (IRRs) will be submitted biannually to the DWER PEOF administration team and kept on record for auditing purposes. In the event this Validation Notice and Offset Proposal are amended and superseded by a new version, a part-year reconciliation will be undertaken for the superseded approval to coincide with the start of the first reporting period.

The following information will be submitted in the IRR:

- clearing undertaken for each financial year of the reporting period
- supporting information to validate clearing including the aerial imagery, digitised polygons and ground-truthing surveys (undertaken in accordance with the DWER and the DCCEEW guidance) used to determine clearing in each financial year

- information regarding exempt clearing, other approvals or reductions to contributions to the fund, where relevant
- where applicable, information regarding part-year reconciliations required due to a Validation Notice and SEA Offsets Proposal being superseded
- a forward estimate of clearing.

5.6.2 Implementation of PEOF Projects

BHP will provide a progress summary of the offsets implemented and achievement of outcomes from the funding provided to the PEOF in the AER. Annual reports, evaluations or other progress reports provided by the PEOF and its delivery agents to BHP will be retained for auditing purposes.

6 Commitments

6.1 Monitoring commitments

Monitoring commitments to ensure the PMOs for the Ghost Bat and Pilbara Olive Python are achieved, are presented in Sections 4.4.9 and 4.5.9, respectively and provided in Table 6-1 below.

Table 6-1 Proposed monitoring commitments

Monitoring Commitment	Action	Monitoring and frequency	Reporting
Ghost Bat			
Presence or evidence of presence of Ghost Bat at one or more Ghost Bat caves over one year of monitoring	Undertake Ghost Bat monitoring using techniques such as scat collection and analysis, motion camera footage and microclimate monitoring.	Quarterly monitoring at CWER-01, CWER-03, CWER-10 and CWER-17. Annual monitoring at CWER-04, CWER-07, CWER-09, CWER-14. Monitoring every two years at CWER-20.	SEA AER
Pilbara Olive Python			
Targeted searches of water holes and gorges and gullies, nocturnal transects and road spotting	Presence and counts of individuals/scats Individual data/biometric data (e.g. life stage, snout-vent length, weight, sex (if possible), condition) Genetic samples - scales/sloughs/scats Location Area of occupancy Habitat characteristics Local meteorological data	Annual monitoring in wet season	SEA AER
Opportunistic records by consultants or the workforce	As above	Ongoing	SEA AER
eDNA sampling at water features	eDNA Water depth Water quality	Annual monitoring in wet season	SEA AER

6.2 Clearing commitments

The clearing commitments which form part of this Validation Notice, inclusive of proposed clearing allowances for each habitat type, are presented in Table 6-2 below.

Table 6-2: Proposed clearing commitments

Clearing Commitment	Management Action	Monitoring and frequency	Reporting
No unauthorised clearing within the Ghost Bat MEZ or buffers and SRE Avoidance Zones within the Activity Area. Specifically: 1. No disturbance within the following Ghost Bat MEZ: • Southwestern MEZ (including Category 2 roost CWER-01). • Northwestern MEZ (including Category 4 roost CWER-09 and Category 3 roost CWER-17). • Eastern MEZ (including Category 2 roost CWER-03, Category 4 roost CWER-04 and Category 3 roost CWER-10). 2. No disturbance within other retained potential Ghost Bat roosts (Category 4 roosts CWER-07, CWER-11, CWER-14 and Category 3 roost CWER-16).	1. Spatial boundaries of all Ghost Bat MEZ or buffers to be uploaded into the GIS spatial system. 2. All MEZ, buffers and Avoidance Zones to be flagged on the ground to clearly identify boundaries. 3. Implement BHP's internal ground disturbance permit process prior to all ground disturbance within the activity area to ensure no disturbance within the above identified MEZ, buffers and Avoidance Zones.	Annual land disturbance reconciliation (hectares and spatial footprint) for within the activity area. Annual review of caves and habitat retained within the mining exclusion zones and buffers (i.e. CWER-07, CWER-11, CWER-14 and CWER-16) (Figures 4.10 and 4.11), and avoidance zones (Figure 4.16) in relation to land disturbance within the activity area.	SEA AER
Clearing does not exceed the following limits: 3. Total disturbance of 4,281 ha 4. The 2 Category 4 roosts (CWER-02 and CWER-12) and potentially the 3 Category 4 roosts (CWER-05, CWER-08, CWER-13) 5. 3 temporary natural water features (WWER-10, WWER-18) and WWER-19 6. 1 one artificial water feature (WWER-12) • Up to 108 ha Gorge/Gully	4. Implement BHP's internal ground disturbance permit process prior to all ground disturbance within the activity area to ensure clearing does not exceed areas specified in the Validation Notice.	Annual land disturbance reconciliation (hectares and spatial footprint) for within the Development Envelope. Annual review of habitat and habitat features disturbed in relation to limits specified in the Validation Notice.	SEA AER

Clearing Commitment	Management Action	Monitoring and frequency	Reporting
• Up to 39 ha of Breakaway/Cliff			
No disturbance to: 5. the Category 4 roosts (CWER-02, CWER-12, CWER-05, CWER-08 and CWER-13) without prior inspection to verify absence of Ghost Bats from the roost or in the case of presence, the displacement of Ghost Bats from the roost.	6. Inspection of the Category 4 roosts (CWER-02, CWER-05, CWER-08, CWER-12 and CWER-13) undertaken prior to disturbance. 7. If present, displace Ghost Bats from a roost during the inspection via physical presence in the cave or use of deterrents (i.e. noise or light). 8. Sheet the cave entrance/s to prevent Ghost Bats from re-entering where required and practical. 9. Complete roost pre-disturbance check list.	Inspection of caves to be completed prior to disturbance. Annual review of Ghost Bat roost pre-disturbance check list.	SEA AER

6.3 Management commitments

The management commitments which form part of this Validation Notice are presented in Table 6-3 below.

Table 6-3 Proposed management commitments

Management Commitment	Action	Monitoring and Frequency	Reporting
Implement feral cat management	Monitor presence of feral cats through records of opportunistic sightings. Report all cat sightings to the site-environmental specialist. Cage trapping for cats if feral cats are sighted.	All personnel on site to report any opportunistic sightings of feral cats to the Site Environmental Specialist Cage trapping to be undertaken following reports of any cat sightings on site.	SEA AER
Implement fire management	Abide by hot work management procedures Firebreaks are maintained Ensure designated smoking areas are available.	Continuous during construction phase	SEA AER
Restrict barbed wire usage	Avoid use of barbed wire fencing within and surrounding the Activity Area far as practicable, except where required by legislation	N/A	Site recording system (EMS) SEA AER
Restrict human access to high value Ghost Bat caves	Monitoring of caves is to occur outside of the Ghost Bat breeding season (September to January).	Annual review of Ghost Bat monitoring report	Site recording system (EMS) SEA AER

6.4 Offset commitments

The offset commitments which form part of this Validation Notice are presented in Table 6-4 below.

Table 6-4 Proposed offset commitments

Offset Commitment	Action	Monitoring and Frequency	Reporting
Payment of financial contribution to PEOF	Advanced payment of 10% of offset amount within one month of the Validation Notice becoming effective.	One of payment within one month of Validation Notice becoming effective.	SEA AER Provide DCCEEW with receipt of payment to PEOF
	Biannual payment for clearing of supporting habitat	Disturbance reported annually EPBC IRR provided biannually	
Provide PEOF funding progress summary	A progress summary of the offsets implemented and achievement of outcomes from the funding provided to the PEOF will be provided in the AER.	Annually	SEA AER

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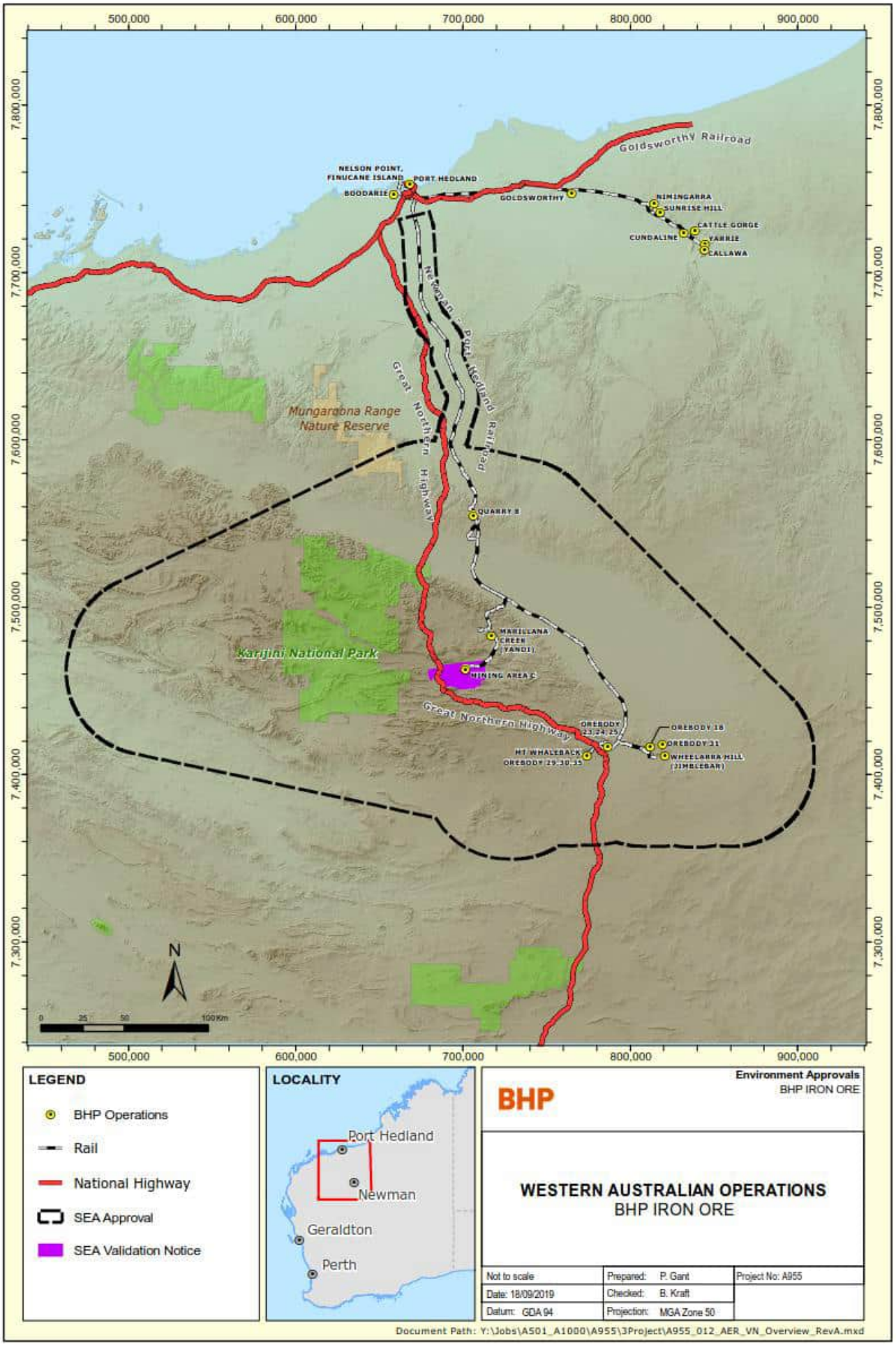
8 Appendices

Appendix 1: Strategic Environmental Assessment Approval Area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PORT HEDLAND
BOODARIE
GOLDSWORTHY
NIMINGARRA
SUNRISE HILL
CATTLE GORGE
CUNDALINE
YARRIE
CALLAWA
Newman - Port Hedland Railroad
Great Northern Highway
Mungaroona Range Nature Reserve
QUARRY 8
MARILLANA CREEK (YANDI)
MINING AREA C
Karijini National Park
Great Northern Highway
OREBODY 23,24,25
OREBODY 18
OREBODY 31
WHEELARRA HILL (JIMBLEBAR)
MT WHALEBACK OREBODY 29,30,35
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BHP Operations
Rail
National Highway
SEA Approval
SEA Validation Notice
LOCALITY
Port Hedland
Newman
Geraldton
Perth
BHP
Environment Approvals
BHP IRON ORE
WESTERN AUSTRALIAN OPERATIONS
BHP IRON ORE
Not to scale
Prepared: P. Gant
Project No: A955
Date: 18/09/2019
Checked: B. Kraft
Datum: GDA 94
Projection: MGA Zone 50
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Appendix 2: Terrestrial Fauna Survey Reports

Appendix 3: Ghost Bat Roost Categorisation Schemes

Appendix 3a: Ghost Bat roost categorisation according to Bat Call WA (2021a)

Roost Type	Roost Features
Category 1 maternity/diurnal roost sites with permanent ghost bat occupancy	Permanent colonies with large but fluctuating populations. Usually represented by underground mines in the Pilbara. There are no documented Category 1 caves in the Hamersley Ranges. Caves are deep and dark with one or more elevated roosting chambers Considered critical habitat
Category 2 maternity/diurnal roost caves with regular occupancy	Caves with regular but not continuous presence of Ghost Bats. Similar cave features to Category 1 caves but less complex with only a single inner chamber and located in less productive areas. These caves may form an 'apartment block' with other nearby caves. Considered critical habitat.
Category 3 diurnal roost caves with occasional occupancy	Caves or adits with less developed cave structure which are occupied occasionally or rarely by Ghost Bats or used as feeding sites. Reproducing females may visit these caves on occasion. Caves may enable the long distance movement of individuals across the landscape. Considered critical habitat only if located adjacent to a Category 2 cave as they may form an 'apartment block'.
Category 4 nocturnal roost caves with opportunistic usage	Shallow caves, shelters or deep overhangs used opportunistically by itinerant Ghost Bats. Not considered critical habitat.

Appendix 3b: Ghost Bat roost categorisation according to Biologic (2021)

Roost Type	Roost Features
Night Roost/ Feeding Roost	Only used at night habitually or for transitory visits. Typically shallow shelters that are well lit during the day. Often high in the strata and poorly insulated from the elements. Often contain guano scatters and middens
Potential Night Roost	Attributes as above but with no scats present
Day (Diurnal) Roost	Deeper and more complex than a Night Roost, typically these have one or more large chambers in the rear in the fully dark regions making them suitable for shelter during the day. They typically have a minimum roof height of 2-3m to protect form predators.

Roost Type	Roost Features
	Often these roosts are located at mid-level or lower in the strata and are well insulated overhead providing a stable temperature environment. Typically they contain multiple scat piles and middens of guano and food remains.
Potential Day Roosts:	Attributes as for Day Roost, but with no evidence of Ghost Bats present
Maternity Roost	Diurnal roosts which provide additional features, to support reproduction, namely, an interior chamber that is rising towards the rear thereby trapping more humid and warmer air allowing suitable conditions for pups and females. Typically heavy scat deposition is present. Pregnant females and pups are present in the breeding season.
Potential Maternity Roost	Same attributes as Maternity Roost, Ghost Bats (not confirmed pregnant females or pups) present in breeding season.

Appendix 4: Pilbara Leaf-nosed Critical Habitats (TSCC 2016b)

Appendix 4a: Pilbara Leaf-nosed Bat roost categorisation as per TSSC (2016b)

Category	Roost Description
1	**Permanent Diurnal Roosts** Maternity roosts occupied year-round with the seasonal proven presence of young. Critical habitat that is essential for the daily survival of the Pilbara Leaf-Nosed Bat.
2	**Permanent Diurnal Roosts** Maternal sites occupied year-round but without the proven presence of young. Critical habitat that is essential for both the daily and long-term survival of the Pilbara Leaf-Nosed Bat.
3	**Semi-permanent diurnal roosts** Occupied diurnally for part of the year, possibly during the breeding cycle and may facilitate long distance dispersal in the region. Critical habitat that is essential for both the daily and long-term survival of the Pilbara Leaf-Nosed Bat.
4	**Nocturnal refuge** Occupied or entered at night for resting, feeding or other purposes, with perching not a requirement. Excludes overhangs. Not considered critical habitat, but are important for persistence in a local area.

Appendix 4b: Pilbara Leaf-nosed Bat foraging habitat categorisation as per TSCC (2016b)

Priority	Habitat Description
1	**Gorges with pools** Watercourses through upland areas bounded by sheer rock walls for parts of their length, often containing pools that remain for weeks or months, sites of relatively large biomass production, sometimes containing caves.
2	**Gullies** Primary drainage with limited riparian development in upland rocky habitats, sometimes containing small pools that may last for weeks, with less biomass production than Priority 1 gorge habitat.
3	**Rocky outcrop** Areas of exposed rock at the top of rocky outcrop and mesa hills that contain caves and overhangs, and boulder piles in the granite terrains.
4	**Major watercourses** Riparian vegetation on flat land plus the main gravelly or sandy channel of the river bed, sometimes containing pools that persist for weeks or months, and generally supporting higher productivity of biomass than the surrounding habitats.
5	**Open grassland and woodland** Dominated by Triodia, on lowland plains, colluvial slopes and hilltops.

Appendix 6: Nankunya Monitoring Program

Appendix 5: Response to Comments

Section	Comment	BHP response
General	The validation notice indicates the following habitat within the Indicative Footprint for Western Ridge is highly fragmented, disturbed or degraded due to its proximity to existing activity at Mt Whaleback, is not considered to be habitat of any kind for program matters and is not included in residual impact or offset calculations for the Activity in this validation notice: • Northern Quoll: up to 4.8 ha major drainage line and 31.7 ha sand plain habitat (p.35) • Ghost Bat: assumed 4.8 ha (quantity not confirmed in draft validation notice) of major drainage line and assumed 31.7 ha (quantity not confirmed) of sandplain habitat (p.47) • Pilbara Olive Python: assumed 4.8 ha (quantity not confirmed draft validation notice) of major drainage line habitat (p.67) • Pilbara Leaf-nosed Bat: assumed 4.8 ha (quantity not confirmed draft validation notice) of major drainage line habitat (p76). Was the degradation caused by impact undertaken in accordance with Native Vegetation Clearing Permit 5617 or 5926? We recommend you update the validation notice to respond to the following questions regarding the causes of degradation if known: • When did this degradation (prior action) occur? • Who undertook the action? • Was this action referred and/or approved under parts 7-9 of the EPBC Act or subject of a validation notice or decision report under the endorsed program? • Do you believe this action was exempt from referral, assessment and approval under the EPBC Act, and if so, include reason for exemption (i.e. section 43A or 43B of the EPBC Act). If the action commenced prior to commencement of the EPBC Act, has the action been varied or extended since the date of approval? • Was this action assessed by BHP as not requiring referral under the EPBC Act based on a self-assessment of likely significant impact? Was this self-assessment supported by MNES habitat and fauna surveys prior to clearing? Without knowing the extent of degradation, or whether the existing degradation was taken as an approved (or exempt) action under the EPBC Act, we recommended – as a general principle - including impact as a result of the Activity described in this validation notice within the residual impact and offset calculations for the Activity. Rationale for including impact to degraded habitat in calculations for this Activity is the lost opportunity for these habitats to regenerate and provide suitable habitat for program	The extent of Major Drainage habitat identified is immediately south of Mt Whaleback mine (which was first opened in 1968) and north of Orebody 29, within the Newman Mainline. It is located within the boundaries of Mt Whaleback Strategic Native Vegetation Clearing Permit 5617. The Newman Mainline was constructed in 1967-1968 to haul iron ore from Mt Whaleback mine to Nelson Point at Port Hedland. Mining at Orebody 29, to the south of the rail loop commenced in 1974 with further development approved under State Agreement in 1988. The habitat extent has been intersected by access roads to enable movement between Mt Whaleback and Orebody 29, and has been impacted by surrounded mining operations. The extent of Sand Plain habitat to the east of Orebody 29 is intersected by access tracks These activities were undertaken by BHP before 2003, in accordance with the relevant Native Vegetation Clearing Permit. The activity was not referred under the EPBC Act as it was assessed as unlikely to result in significant residual impacts to any MNES.

	matters during the life of the Activity (or longer, depending on closure and rehabilitation plans).	
General	Include discussion and analysis of acid and metalliferous drainage risk and potential acid forming material from overburden storage above ground and in pit during operations (and closure if closure activities are included within scope of the Activity). Assessment and application of the mitigation hierarchy for this potential impact, and supporting studies, should be included in the draft validation notice, including if impact to program matters, their prey species, foraging or breeding habitat even if it is ruled out upon assessment.	The Validation Notice has been updated to include the following information. An Acid and Metalliferous Drainage (AMD) risk assessment was undertaken in 2020 based on the volume of waste rock and pit wall exposure. Greater than 98% of the total waste rock volume is classified as AMD Class 0 (inert waste or non-acid forming (NAF)). The remaining waste rock is classified as reactive or potentially acid forming (PAF), of which 0.4% is classified as AMD Class 1, which is likely to contain fresh sulphides and poses the highest risk to water quality. The risk of generating AMD at Western Ridge is considered to be low at Bill's Hill, low to moderate at Silver Knight, low to high at Eastern Syncline (only high for pit wall exposure) and high at Mt Helen (BHP 2023). BHP will manage the risk of AMD during operations in accordance with the MCP (BHP 2023). Management approaches in the MCP relating to AMD include: • undertake additional geochemical characterisation, including assessment of AMD waste material • conduct studies to inform the detailed design of the cover (encapsulation) for pit wall exposure of AMD Class 1 waste within the Mt Helen pit • refine groundwater models once dewatering starts and additional monitoring data becomes available • review options for optimising pit designs to reduce AMD waste volumes mined and AMD pit wall exposures • design surface water diversions and/or other flood protection for closure conditions to prevent permanent creek capture and changes to the pit water balance where AMD Class 1 material is located • place and encapsulate AMD material according to relevant BHP AMD management standards, including the backfill / cover of AMD 1 pit wall exposure to above the level of AMD 1 exposure. • Retain creek diversions post closure and upgrade for extreme rainfall events • Backfill below water table pits to 5m above the pre-development water table if required, to mitigate potential impacts to receptors.

Glossary and Abbbreviations	0.1 Consider removing acronyms DJTSI, DoEE, EP Act, PEAHR from the Glossary and Abbreviations table as they are not referenced in the Draft Validation Notice. 0.2 Replace the reference to 'significant residual impact' with 'residual impact' (p.3) as all impact remaining after avoidance and mitigation measures have been applied require offsetting (no test of significance is to be applied under the Program or during validation processes). This approach is consistent with calculation of residual impact for projects assessed under Part 8 of the EPBC Act.	01 The identified acronyms have been removed. 02 Comment noted. Reference to 'significant residual impact' is retained in accordance with the Program pursuant to which this Validation Notice is issued.
Introduction	1.1. In Table 1-1 (p.4), include the section reference for the map illustrating the boundary of the action and area of direct disturbance.	Addressed
	1.2 The Activity description (p.4) does not include any activities that might be included during the decommissioning or closure stage of the project. Although a mine closure plan is referenced in the validation notice (p.15), there is no analysis of potential impact to program matters from closure activities, or impact avoidance or mitigation measures that may result from closure or rehabilitation activities. We recommend BHP include a more thorough description of closure activities, impact analysis and application of the mitigation hierarchy and associated commitments either: a) within a subsequent draft of this validation notice (issued again for public comment), or b) in a separate or revised validation notice at a later date. This option would also require exclusion of closure and rehabilitation from the scope of the Activity described in this validation notice.	Additional text added to Section 1.4 to describe activities that will occur as part of decommissioning and closure. Closure activities will include removal of infrastructure no longer required, preparation of surfaces to enhance rehabilitation success and revegetation including placement of woody debris and rock features, where possible to provide potential fauna habitat. These activities are not predicted to result in residual impacts to Program Matters as these activities will occur in areas already disturbed for the Activity and will result in rehabilitation over time. On this basis, BHP considers that further public comment is not required in relation the additional content provided in the Validation Notice.
	1.2 Section 1.5 (p.5) states that: • 322 ha within the Indicative Footprint has already been cleared subject to the Mt Whaleback Strategic Native Vegetation Clearing Permit 5617 issued in accordance with Western Australian legislation (update Figure 1-2 to clearly show the location of the 322 ha or boundary of NVCP 5617 compared to the indicative footprint for this validation notice. This is currently not evident in Figure 1-2 (p.6)). • An unquantified number of hectares has already been cleared for mineral exploration, hydrogeological and geotechnical investigations subject to Native Vegetation Clearing Permit 5926 issued in accordance with Western Australian legislation on 1 May 2014. Satellite imagery indicates extensive tracts of clearing for exploration across much of the Indicative Footprint and surrounding areas.	Map updated to identify the boundary of NVCP 5617. The extent of clearing within the Indicative Footprint undertaken subject to the Western Ridge NVCP 5926 is included in the Indicative Footprint extent of 4,281 ha, defined in Section 2.1 of this Validation Notice. Additional text has been added to Section 2.1 to clarify this. Approximately 380 ha of clearing has been undertaken in accordance with this NVCP to date, from a disturbance limit of 400 ha. This clearing has been undertaken for the purposes of mineral exploration, hydrogeological investigations, creek diversion and geotechnical investigations. These actions were undertaken by BHP between 2014 and 2023, subject to NVCP 5926 (first issued in 2014). These actions were not referred or subject to a Validation Notice as they were not considered to result in significant residual impacts to Matters of National Environmental Significance. This was supported by surveys

	Approval granted by a State Minister in accordance with state legislation does not necessarily provide an exemption for activities requiring referral under Part 7 of the EPBC Act or consideration under a validation notice or decision report as part of the *BHP Billiton Iron Ore's Pilbara strategic assessment program* (the program). Respond to the following questions regarding the existing disturbance subject to NVCP 5617 and NVCP 5926 to the department by close of business 2 October 2023: • Quantify the amount of clearing already undertaken under NVCP 5926 within the Indicative Footprint for Western Ridge. Describe the action already undertaken within the Indicative Footprint include activities other than native vegetation clearing (e.g. exploration drilling/blasting). • When did this action occur? • Who undertook the action? • Was this action referred and/or approved under parts 7-9 of the EPBC Act or subject of a validation notice or decision report under the endorsed program? • Do you believe this action was exempt from referral, assessment and approval under the EPBC Act, and if so, include reason for exemption (i.e. section 43A or 43B of the EPBC Act). If the action commenced prior to commencement of the EPBC Act, has the action been varied or extended since the date of approval? • Was this action assessed by BHP as not requiring referral under the EPBC Act based on a self-assessment of likely significant impact? Was this self-assessment supported by MNES habitat and fauna surveys prior to clearing?	which concluded that there would be low potential for impact on species given the limited clearing to be undertaken and exclusion of high value habitats from the NVCP area.
	1.3 Figure 1.2 (p.6) refers to 'waste dumps'. In the list of what the Western Ridge Project will include (p.15) waste dumps are not listed. Are the 'waste dumps' the overburden storage areas, ore stockpiles and topsoil stockpiles listed on page 15? We recommended keeping terminology consistent in figures and text so it is clear to the reader what is being referred to in the Draft Validation Notice.	Text modified in Section 1.4 to state: overburden storage areas (also known as waste dumps).
	1.4 Not all actions/areas of disturbance listed in section 2.2 (p.15) are shown in Figure 1.2 (p.6) or described in enough detail to assist the reader to identify potential impacts to program matters (e.g. what is the power supply and where will it be located?).	Figure 1.2 identifies the key components including pits, overburden storage areas (also known as waste dumps), conveyor and crusher and haul roads. Other supporting infrastructure is subject to variation in the final design phase and clearing will not exceed

		4,281ha. Additional figures are provided at the end of this Appendix to depict the detailed indicative footprint and creek diversion.
	1.5 Table 1-2 (p.8) For each program matter where a notifiable action trigger is not met, include a summary of the purpose and scope of surveys referenced to support claims of no species presence. E.g. for Northern Quoll: Five surveys to identify evidence of Northern Quoll presence (including camera recordings, scats, tracks and desktop reviews) across the Activity Area between 2018 and 2022 have found no contemporary records or evidence of species presence. On-ground surveys were conducted in accordance with relevant survey guidelines.	Additional text added to summarise survey effort and results.
2 Project Description and impact quantifications	2.1 Table 2-1 (p.14): as per the department's comments on the draft Revised Jimblebar Optimisation Project Validation Notice, confirm the proposed disturbance of 2000 ha documented in the Jimblebar Optimisation Project Validation Notice (published May 2020) is correct.	The proposed disturbance of 2000 ha is correct. The Jimblebar Optimisation Project had a total Indicative Footprint of 2,693 ha, however clearing of 2,000 ha was required. Therefore, the Previous Validation Notice indicated an extent of 2,000 ha.
	2.2 Confirm the power supply type (p.15).	Power will be supplied from BHP's Yarnima Power Station. Yarnima is an existing natural gas fired power generation plant located outside of the Activity Area that supplies power to BHP's iron ore mining operations in the Pilbara region.
	2.3 For all future validation notices for projects that will involve hydrological changes, ensure that analysis of potential impacts extends to potential impacts to program matter habitat that may occur outside the activity area such as creek diversions resulting in increased water flows and dewatering of pits impacting aquifers extending beyond the activity area. Surveys for program matter habitat and occurrence may need to be extended beyond the activity area to support analysis of these potential impacts. Analysis of hydrological changes should include discussion and justification where BHP's analysis shows no impact will occur. All relevant hydrological surveys or assessments supporting this analysis should be provided as appendixes or attachments to the draft and final Validation Notice (p.15).	Noted.
	2.4 Closure and decommissioning (p.15): Is the mine closure plan publicly available? What targets, monitoring or reporting of outcomes which demonstrate how closure and rehabilitation efforts contribute to achievement of Program Matter Outcomes are included in the mine closure plan, if any?	The Western Ridge Mine Closure Plan was included in the Derived Proposal as an appendix to the referral submitted to the EPA and is available as a public document on the EPA website. The targets, monitoring or reporting of outcomes are proposed in the Completion Criteria as described in Section 8, Closure Outcomes and Completion Criteria, with a detailed table presented in Section 8.3. The Completion Criteria state the Closure objective and the verification procedure for items that will contribute to the Program Matters. Each aspect of the Completion Criteria is linked to the proposed Closure and Monitoring program as described in Section 10 and includes corrective actions, if required.

3 Stakeholder engagement	3.1. Refer to the interim First Nations engagement guidelines on our website for more information on the department's expectations of proponent for engaging with First Nations stakeholders throughout an environmental assessment process.	Noted.
	3.2 Public Consultation (p.16): unintentional error - the public consultation commencement date is stated as 30 June 2023. The Validation Notice is dated 19 July 2023 and was published on the BHP website for public comment on 24 July 2023.	Corrected.
4.2 Surveys and studies	4.2.1 Include rationale that the Western Ridge and Jimblebar 2021-2022 Ghost Bat Monitoring Program (Biologic 2023c) report from which data was incorporated into the Western Ridge Ghost Bat Cave and Habitat Categorisation (Biologic 2022) was not published online as an Appendix to the draft Western Ridge Validation Notice for comment during the public comment period.	Note that the Monitoring Program report was in preparation at the time of publication for public comment. The report is still in preparation and can be provided to DCCEEW when finalised.
	4.2.2 Good to see the published surveys are labelled as appendices, however the appendix numbers are duplicated in one instance and are not sequential. The appendix numbers are not ascribed to the surveys referenced in Table 4.1 Terrestrial Fauna – recent studies and surveys (pp.23-26) in the Draft Validation Notice.	Noted and amended.
	4.2.3 As noted at 4.9.2 – the Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey (Biologic 2022) has not been included as an Appendix to the Draft Validation Notice and is not in the referenced list. Please include a copy of this survey as an Appendix.	Amended.
	4.2.5 The surveys cited for the Grey Falcon may not be adequate- see comment at 4.9.2.	Surveys included detailed vertebrate fauna surveys to characterise the fauna assemblage present (with a focus on significant fauna species, listed under both the EPBC Act and WA *Biodiversity Conservation Act 2016* [BC Act], and Priority fauna by the Department of Biodiversity, Conservation and Attractions [DBCA]) and habitats within the area, and targeted fauna surveys for species known to utilise habitats present. All surveys undertaken within the Activity Area have considered significant vertebrate fauna species (i.e. those listed under the EPBC Act, BC Act and Priority fauna). While the Grey Falcon was first listed as Vulnerable under the EPBC Act in July 2020, the species

		was listed as Vulnerable under the BC Act at the time of all of the surveys. The report for the Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2020a), as mentioned in the comment at 4.9.2, was finalised in July 2020, with the field survey undertaken in March 2020. Therefore, the survey was completed prior to the listing of the species under the EPBC Act; however, the species was listed under the BC Act. While it is recognised the Biologic (2020a, 2021) surveys targeted species of MNES listed at the time, the surveys did record opportunistic observations of any other significant fauna recorded (refer to Section 3.4 of Appendix 2E and Section 3.5 of Appendix 2D). Therefore, while the surveys were focused on detecting MNES species, opportunistic effort for other significant fauna was inherent in the survey approach. Surveys undertaken in the Activity Area have not recorded the Grey Falcon. In addition, the Grey Falcon is reported as an elusive species, occurring at low densities across inland Australia and inhabiting timbered lowland plains, particularly acacia shrublands that are crossed by tree lined water courses (TSSC 2020). While the Activity Area includes acacia shrublands, it lacks the tree lined water courses that are preferred by the Grey Falcon.
	4.2.4 Hydrological reports (see comment at 2.3)	Noted
Northern Quoll	Northern Quoll 4.3.1 According to Figure 4.1 (p.27) the extent of the survey coverage area for the Northern Quoll does not appear to have surveyed a 500 m buffer to the west and south-west of the Activity Area boundary (other than a small section as part of the Western Ridge Pipeline Vertebrate Fauna Survey (Biologic 2022).	Biodiversity surveys for Northern Quoll were predominantly within BHP's tenure boundaries with the exception of the pipelines survey.
Ghost Bat	4.3.1 A 'short-range endemic fauna avoidance zone' (see Figures 4.10, 4.11 and 4.16)' is referred to as an avoidance measure (p.40). This is not identified by this term on the figures referenced. What does this refer to?	The Validation Notice depicts the avoidance zones applied to MNES as they are relevant to the Validation Notice; however, it only refers to the Short-range endemic (SRE) avoidance zone in text as this is not relevant to the Validation Notice. The SRE avoidance zone refers to areas that have been clipped out of the Activity Area to preserve habitat for SRE invertebrate fauna.

	4.4.1 Good to see that the Ghost Bat critical habitat being Category 2 caves CWER-01 and CWER-03 (a maternity roost and a potential maternity roost respectively) are being avoided particularly as they are described by in the Western Ridge Ghost Bat Cave and Habitat Categorisation (Biologic 2022) as the most significant Ghost Bat caves currently known in the Newman area. Also good to see that three Category 3 caves (CWER-10, CWER-16 and CWER-17) are included withing the Mining Exclusion Zones with 100 m buffers as they are supporting habitat for the Ghost Bat and as noted in the Western Ridge Ghost Bat Cave and Habitat Categorisation (Biologic 2022), 'may be of importance to the species in the local area as there is a general lack of such diurnal roosting caves within Study Area and surrounds', and also that a corridor has been included between CWER-03 and CWER-10. We also note that five Category 4 caves are being retained with 50 m buffers applied, although these may potentially be indirectly impacted.	Noted.
	4.4.2 Cave CWER-03 (p.44) is described as being 500 m from the Activity Area – is this correct?	Error corrected. CWER-03 is located 150m from the Activity Area.
	4.4.3 Figures 4-10 and 4-11 (pp.54 and 55): We recommend the dimensions of the Mining Exclusion Zones are also stated as text within the Draft Validation Notice, including distances from the MEZ boundary to the cave entrances.	Additional text added to section 4.4.6 to clarify establishment of MEZ to avoid Category 2 caves and nearby caves, application of buffers to Category 3 and Category 4 caves.
	4.4.4 Where is the proposed 100 m distance between the haul road and cave CWER-01 (p.56) measured from, for example from the cave entrance or from the perimeter of the furthermost chamber from the case entrance? Noting that CWER-01 has a deep chamber extending 35 m back where the Ghost Bats may roost during the day.	The haul road will be 150m to the north of, and behind the opening of the cave. That is, the cave opens away from the haul road. This has been corrected in the text.
	4.4.5 The Draft Validation Notice states (p.56) that potential air blast noise and ground borne vibration levels from blasting near Ghost Bat caves at Western Ridge has been investigated by Talis Consultants (2021). The reference list includes *Talis Consultants (2021). Western Ridge - Blasting Noise and Vibration Estimation for Bat Caves, letter prepared for BHP, March 2021, Western Australia*. Is this letter/information and the findings of the investigation publicly available? Was this investigation by Talis Consultants a geotechnical assessment? If not, has a geotechnical assessment been undertaken?	The letter provides predicted air blast noise and ground vibration levels at various distances to inform the quantified assessment of potential impacts on caves. The letter is not publicly available. A geotechnical assessment has been undertaken by BHP.

	4.4.6 The Draft Validation Notice states that the blasting/mining can occur up to the boundary of the mining exclusion buffer, but within the 300 m blast management buffer, vibration limits apply (mm/s particle velocity) (pp.52 and 56). What are these vibration limits? Has modelling occurred?	The vibration limits are currently under development and will be informed by limits applied elsewhere across BHP's WAIO operations and geotechnical information relevant to Western Ridge.
	4.4.7 Figure 4.9 (p.49): The extent of the survey coverage area does not appear to extend 500 m beyond the west and south-west Activity Area boundary. There is potential for Ghost Bat roosts and foraging habitat to occur in this unsurveyed area adjacent to the Activity Area. The western portion of the unsurveyed areas adjoins the indicative footprint and proposed ore pits, any potential Ghost Bat roosts within 500 m of the Activity Area boundary may be at risk of sustaining indirect impact from dust, noise, light and vibration. Provide explanation for lack of survey coverage in this area, and what efforts were taken to be able to survey (e.g. negotiated access with neighbouring tenement holders).	Survey effort predominantly aligns to BHP's tenement boundaries, with the exception of the Pipelines survey which included survey effort on third party tenure.
	4.4.8 Impact assessment (pp50-56) does not include an assessment of potential impacts to Ghost Bat foraging or roosting habitats as a result of hydrological changes. From attached hydrology studies, we can see ground water table in unlikely intersect with these roots. We note that creek diversions may increase or maintain seasonal flows to South Creek south of the Activity Area, but without habitat survey information for this area we cannot assess potential impact (e.g. on Ghost Bat foraging habitat). Topographic maps with roost locations would assist in understanding potential risks (e.g. flooding). We note that pit development and ore extraction adjacent to the roosts may impact on the current perched acquirer (comprising a saturated zone of rock within the upper subsurface along the ridges) including in rocks surrounding bat roosts. Without certainty as to the sources of humidity within these roosts, one potential source may be moisture seeping into roosts from the surrounding perched aquifer. As this potential impact was not considered in the draft validation notice, we strongly recommend reconsidering pit location/avoidance buffers around diurnal Ghost Bat roosts to be retained, to avoid loss of the upper perched aquifer adjacent to these roosts. Noting there is likely to be constant natural changes and fluctuations in the perched aquifer, we recommend monitoring the perched aquifer adjacent to these roosts with the aim of identifying any significant changes to the aquifer that may coincide with particular mining activity and potential abandonment of Ghost Bats from these roosts over the life of the project (refer comment at 6.1.6). Monitoring information (perched aquifer levels, internal roost humidity and Ghost Bat presence) should inform or trigger corrective action if any is available (e.g. increased avoidance boundaries around remaining roosts to be avoided). The validation notice should also specify offsetting measures in the event that	The groundwater at Western Ridge ranges from 40mbgl to over 100mbgl and is therefore too deep to support fauna habitat values. Dewatering is therefore not predicted to result in any changes to fauna habitat. Creek diversions will divert ephemeral creek flows around pits such that surface water flows continue downstream. The perched aquifer which supports Nankunya is located to the north of the Activity Area, more than 1km from the nearest pit. The perched aquifer is hydraulically disconnected from the orebodies to be dewatered and mined within the Activity Area. The Ghost Bat roosts within the Activity Area are well outside of the Nankunya catchment and are not reliant upon the perched aquifer for moisture. Therefore, groundwater abstraction for mining is not predicted to alter the groundwater levels in the perched aquifer at Nankunya.

	monitoring indicates impact to roosts has not been avoided and caves have become unviable as Ghost bat roosting habitat (i.e. time-bound trial of artificial roosts).	
	4.4.9 Figure 1.2 (p.6) indicates that the Mining Exclusion Zones will be surrounded by the indicative footprint. It also indicates that 'waste dumps' (assumed to be overburden storage areas, ore stockpiles and topsoil stockpiles listed on page 15) will be located to the east and south of CWER-03 and CWER-10 and to the south of CWER-01, CWER-09 and CWER-17. Is there a designated maximum height for these waste dumps? The development of these waste dumps may cause Ghost Bats to change their established flight routes from the cave entrance to access foraging habitat or they may be unwilling to fly across these areas. We note the impact assessment includes the statement (p.52) 'Ghost Bats are highly mobile and able to fly over and around infrastructure'. Is there a reference or evidence to support this information?	BHP has not defined final overburden storage area (OSA) height. The OSAs will be designed in-line with the agreed post closure land use, provisionally *"Natural environment for managed resource protection or relatively natural environment for pastoral grazing purposes",* and in accordance with Mines Closure Design Guidance Procedure 0128030 and Rehabilitation Standard 0001074. Within the MCP the creation of fauna habitat as part of the Western Ridge Closure strategy is discussed. Consideration of undisturbed habitat will be incorporated into the final OSA designs. Ghost Bats are known to fly long distances to forage and traverse topographies naturally ranging from areas with high elevation with steep gorges to low flat plains. Overburden storage areas are not considered to present obstacles to movement any greater than existing landforms in the area.
	4.4.11 As the overland conveyer is situated along the southern portion of the Activity Area and below Ghost Bat caves (Figure 1.2 p.6), has the need for deflectors been considered to mitigate potential Ghost Bat collision if they are flying at low elevation?	The overland conveyor is located approx. 1.6km from both Category 2 caves. The nearest cave to the overland conveyor is a Category 4 cave located approximately 480m from the conveyor. This cave has recorded old scats, with no recent activity detected. The conveyor will generate noise which may act as a deterrent. Collision of Ghost Bats with fences (especially those with barbed wire) is recognised as a direct threat in the species conservation advice (TSSC 2016). However, collision with other infrastructure is not listed as a threat. Bat deflectors are considered effective at deterring bat interaction with fences as they increase the visibility of the fence and deter bats from approaching or landing, due to either reflecting light and/or moving in the wind. The overland conveyor will be a solid structure and therefore is expected to be much more 'visible' to Ghost Bats, when compared to wire fences.
	4.4.12 Light (p53): The entrance for the Category 2 cave CWER-01 is identified as opening in a south-easterly direction, away from a proposed haul road, and it is concluded that it is unlikely to experience indirect impacts of artificial lighting from haul trucks operating at night and road lighting. Figure1-2 (p.6). Provide analysis of light impact for other Category 2 cave (CWER-03) which is also situated near a haul road (although further away than the haul road near CWER-01), what distance is this haul road from CWER-03, what direction does this cave entrance open and does it also face away from the haul road? Are there likely to be any other nighttime artificial light sources during operation of the project?	CWER-03 opens to the north; however, it has a cavern opening, which is beneath an overhang and is 1.5m high. The cave is deep (approximately 40m deep) with four chambers. Given the low opening height and cave depth, it is unlikely that light will penetrate into the chambers. Furthermore, the largest scat piles recorded within this cave have been at the rear of the cave in the deepest chamber (Biologic 2022).

	4.4.13 Cave CWER-19 has been classified as unsuitable as a Ghost Bat roost (p.46). The Western Ridge Ghost Bat Cave and Habitat Categorisation Memorandum (Biologic 2022c) states that this is due the cave's restricted entrance. The Memorandum also states that BHP have proposed a fifth category of caves, being caves considered unsuitable for use by Ghost Bats due to a restricted entrance or the dimensions of the cave and no evidence of Ghost Bat use has ever been recorded. What qualifies as a restricted entrance and what dimensions are deemed unsuitable?	BHP have proposed this fifth category for completeness, in recognition that there are other caves in the landscape; not only those suitable for Ghost Bats. While BHP have proposed this category, its use in the memorandum is solely based on the subject matter expertise and technical knowledge of the consultant, Biologic. CWER-19 has an entrance opening of approximately 0.6m in diameter and is a small cavity.
	4.4.14 Feral animals and cane toads (p.56): given the stated duration of this activity, including operation and closure, of 50 years – discuss how future changes in risk of cane toad incursion will be monitored and managed. What preventative measures could BHP adopt to reduce this risk?	Cane Toads require constant access to moisture to survive (DEWHA 2010). The Activity Area does not support permanent surface water features. The surface water features including creek and pools are ephemeral, only holding water for a short duration after significant rainfall events. The Activity will not result in increased presence of surface water which would enhance conditions for the species. If cane toads are observed, BHP will report this to DWER and implement relevant measures in consultation with DWER.
	4.4.15 Feral animals and cane toads (p.56): What are BHP's standard feral cat management practices (are these only one-time trapping of cats following sightings)? We note that BHP is also currently investigating options to implement ongoing feral cat monitoring at Western Ridge and at other BHP operations, to enhance detection and control measures. We recommend that this considers how far the monitoring will extend from the indicative footprint/Activity Area, how long would these practices remain in-place and include a pre-disturbance baseline. Feral predator/pest management, monitoring and reporting commitments should be included within the validation notice. Noting cats have already been sighted at part of the Activity Area during survey work, has trapping been initiated?	BHP records observations of feral animals and implements control measures in response to observations. As noted, BHP is investigating options to implement ongoing monitoring. This is still in the planning phase and trapping has not yet commenced.
	4.4.16 We recommend BHP undertake continuous monitoring and reporting on Ghost Bat usage of the category caves retained within the Activity Area (with particular attention on the significant caves CWER01 and CWER-03), and noise and vibration levels, at this site over the life of the Western Ridge Project – to confirm assumptions these activities do not eventuate in impact (see further comments on monitoring and suitable thresholds below at 6.1).	Quarterly monitoring is planned to occur at caves retained within mining exclusion zones. Maternity or potential maternity roosts will not be monitored during the breeding season, to avoid disturbance to individuals present. Other caves retained in buffers will be subject to annual monitoring, subject to safe access. The frequency of monitoring reflects the value of the cave and evidence of use to date. BHP are currently reviewing the monitoring frequency at each of the caves based on the results of the Western Ridge and Jimblebar Ghost Bat Monitoring Program and with direct input (and recommendation) from subject matter experts. The outcomes of this review may influence the ongoing frequency of monitoring; however, any changes will not affect the ability of the monitoring program to achieve the Monitoring Target for Ghost Bat. The application of blasting vibration limits, as part of the blast management measures to be implemented within 300 m of the category 2 and category 3 roosts, will provide year-round protection of Ghost Bats that may be present within these caves.

	4.4.17 Table 4-12 Ghost Bat Monitoring: Monitoring Targets to be updated to include presence of Ghost Bat at each Ghost bat roost committed to being retained (i.e. to demonstrate successful application of avoidance measures, noting that potential reasons for results showing temporary absence of Ghost Bats – such as movement between roosts in the region can be discussed when reporting results in the Annual Environmental Reports.	As above.
Pilbara Olive Python	4.5.1 It is good to see that the nine temporary water features to the north and immediately adjacent to the Activity Area (WWER-05, WWER-06, WWER-07, WWER-09 WWER-11, WWER-13, WWER-14, WWER-15, WWER-16) (p.71) have been avoided. This is important given surveys indicate residing individuals or a population is present within the Activity Area and the potential direct loss up to 147 ha of the 187 ha of Pilbara Olive Python critical habitat present in the Activity Area including three ephemeral natural surface water features (WWER-10, WWER-18 and WWER-19). We note the Western Ridge Matters of National Environmental Significance Fauna Study (Biologic 2021b) survey confirmed the presence of at least four individuals within the Study Area, within 12 months, comprising of one male, two females of breeding age and a female juvenile which is suggestive of breeding activity. Biologic considered this number to indicate high density but an 'underestimation of true species abundance within the Study Area due to the species' cryptic behaviour and difficulty of detection'.	Noted.
	4.5.2 Section 4.5.1 (p.66) states 'Located more than 500m outside of the Activity Area is an area known as Nankunya (otherwise referred to as Afghan Springs) (Figure 4.15). The springs consist of a number of surface water pools and seeps, supported by a combination of surface water runoff, infiltration of surface water to a local, perched fractured rock aquifer and subsequent discharge of water from that perched aquifer at topographic low points (BHP 2021b)'. This reference does not seem to be an appendix or in the reference list.	Updated reference list and Nankunya Monitoring Program attached.
	4.5.3 Confirm no excavation or disturbance will occur within the Nankunya (Afghan Spring) surface water catchment. Given the close proximity of pits, the potential for ore extraction to cut into and impact the perched fractured rock aquifer and subsequent discharge of water that is likely to contribute to the temporary surface water features (and potentially the permanent Nankunya pools), we recommend careful consideration and discussion of this potential impact within the validation notice, including any consideration of larger avoidance buffers or location of pits to avoid impact to Nankunya (Afghan Spring) surface water and Pilbara Olive Python habitat within this catchment. If certain that impact will be avoided, we recommend including this as a management commitment in the validation notice We also	The Activity Area has been modified to wholly exclude the Nankunya catchment. As a result, no excavation or disturbance will occur within Nankunya. The nearest pits are located more than 1km from the catchment. BHP considers that no further management commitment is necessary in relation to avoidance of the catchment. The Nankunya Monitoring Program involves quarterly monitoring of groundwater levels and quality of the perched aquifer and regional aquifers, in addition to surface water levels, quality, surface water flow, climate, vegetation cover and air quality, at Nankunya. The nature and frequency of monitoring is considered robust and appropriate to detect any changes. This program is already being implemented.

	recommend ongoing monitoring of the perched fractured rock aquifer adjacent to these surface water features to identify any significant changes or fluctuations in the aquifer (beyond normal variation) that may coincide with or lead to degradation or removal of these water features and/or vegetation in this area that is likely to support habitat for Pilbara Olive Python and prey species (see comment on monitoring at 6.2.1).	
	4.5.4 Reference to Biologic 2020c which is listed as Developments in knowledge of ghost bat home range and foraging areas, and its application at Mining Area C - South Flank in the reference list. Is this the correct reference? (pp.63 and 67).	Yes, this is the correct reference as this report provides developments in knowledge relating to Ghost Bat.
	4.5.5 Good to see that that survey techniques included RFID micro-chipping and sex identification was used for the captured individuals.	Noted.
	4.5.6 Vehicle collisions are included as a potential impact to the Pilbara Olive Python. The Draft Validation Notice states: 'As the majority of locations of recorded Pilbara Olive Python are confined to Gorge/Gully habitat in the northern portion of the Activity Area outside of the Indicative Footprint or outside of the Activity Area, the risk of mortality due to vehicle collision is considered low' (p.71). Given the Draft Validation Notice also states that records indicate 'residing individuals or a population is present within the Activity Area', it is recommended that mitigation measures be included for vehicle strikes such as the enforcement of speed limits particularly on any access roads, mine personnel education on avoiding vehicle strikes on the non-venomous Pilbara Olive Python (may be confused with the venomous brown snake), noting that autonomous haulage trucks may be used at Western Ridge that may detect/sense a Pilbara Olive Python and stop.	BHP implements speed limits in operational areas and induction materials for all site personnel will include information relating to environmental matters including all conservation significant species. Autonomous trucks operate within operational mine areas and are designed to detect other specially equipped vehicles. At this stage, autonomous truck technology does not enable detection of fauna.
	4.5.7 Feral animals and cane toads (p.68): refer comments at 4.4.14 and 4.4.15.	Responses as above.
Pilbara Leaf-nosed bat	4.6.1 Maximising the disposal of waste rock within mine pits, where practicable, is stated as a mitigation measure to minimise the impact of loss of Pilbara Leaf-nosed Bat foraging habitat withing the Activity Area (p.84). When is this likely to occur and how will it minimise the potential impact? Is it part of the rehabilitation and closure strategy for the Activity?	Disposal of waste rock in pits will occur as pits become available for backfill. This will reduce the areas required for overburden storage areas outside of pits and forms part of the closure strategy for the Activity.
	4.6.2 According to Figure 4.1 (p.27) the extent of the survey coverage area for the Pilbara Leaf-nosed Bat does not appear to have surveyed a 500 m buffer to the west and south-west of the Activity Area boundary ((other than a small section as part of the Western Ridge Pipeline Vertebrate Fauna Survey (Biologic 2022).	Biodiversity surveys were predominantly undertaken within BHP's tenure boundaries with the exception of the pipelines survey, due to access constraints.

Greater Bilby	4.7.1 We note the survey effort and results demonstrating no presence of Greater Bilby within the Activity Area, or 500m of the Activity Area boundary (noting survey coverage is difficult to interpret from Figure 4-22 (p.89).	That is correct. There are no records of Greater Bilby within the Activity Area. Biodiversity surveys were predominantly undertaken within BHP's tenure boundaries with the exception of the pipelines survey, due to access constraints.
Night Parrot	4.7.1 We note the survey effort and results demonstrating no presence of Night Parrot within the Activity Area, or 500m of the Activity Area boundary (noting some gaps in survey coverage at the NE and SW extend of the Activity Area, Figure 4-22 (p.93).	That is correct. There are no records of Night Parrot within the Activity Area. Biodiversity surveys were predominantly undertaken within BHP's tenure boundaries with the exception of the pipelines survey, due to access constraints.
Grey Falcon	4.9.1 Figure 4-24 (p.97) refers to Grey Falcon survey areas from four surveys: • Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2020) – only reference to the Grey Falcon is the species inclusion under Other Fauna of Conservation Significance in Table 3.9 (p.68) titled 'Species of conservation significance with the potential to occur in the Study Area'. Program Matters targeted in this survey were the Northen Quoll, Greater Bilby, Pilbara Leaf-nosed Bat, Ghost Bat, Night Parrot and the Pilbara Olive Python. • Western Ridge Pipelines Vertebrate Fauna Survey (Biologic 2022) – while no Grey Falcon was recorded during the survey it was listed as possibly occurring 'as an infrequent visitor and may forage in the Major Drainage Line and Medium Drainage Line habitats occurring within the Study Area'. No suitable nesting habitat was recorded within the Study Area. This survey area was small. • Western Ridge E52/3448 Desktop Flora and Fauna Assessment (Onshore Environmental 2018) – only reference to the Grey Falcon is a table stating that suitable habitat was present but that the species was unlikely to occur in the study area. The fourth survey: Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey (Biologic 2022), does not appear to be included as an Appendix to the Draft Validation Notice and is not in the reference list. Please include a copy of this survey as an Appendix	The Western Ridge Paddy's Bore Area Vertebrate Fauna survey is included in Appendix 2.
	4.9.2 The Draft Validation Notice states 'There are no records of Grey Falcon from within the Activity Area or within 500m of the Activity boundary (Biologic 2020a, 2020b)' (p.99). The evidence for concluding the absence of the Grey Falcon is limited. In Western Ridge Targeted Vertebrate Fauna Survey (Biologic 2020a) the Grey Falcon was not targeted in the desktop study or field survey but was identified as having potential to occur the study area. Coombanbunna Well Level 2 Vertebrate Fauna Survey (Biologic 2020a) only covered a small north-east portion of the Activity Area. Although this area includes supporting habitat for the Grey Falcon being stony plain, drainage area/floodplain, hardpan plain, mulga woodland and clay pan, the potential suitability of the habitat the species was not discussed and there is no reference to the species.	As above. The species was not specifically targeted, as at the time of undertaking those surveys, the species was not identified as a Program Matter in the endorsed Assurance Plan in place at the time. In addition, the targeted surveys at Western Ridge were undertaken in March 2020, prior to the Grey Falcon being listed as Vulnerable in July 2020. However, as noted in the response to comment 4.2.5, all surveys undertaken within the Activity Area have considered significant vertebrate fauna species (i.e. those listed under the EPBC Act, BC Act and Priority fauna). This includes the Grey Falcon as the species was listed under the BC Act at the time of undertaking the surveys. Furthermore, while the surveys were focused on targeting MNES species listed at the time, opportunistic observations of any other significant fauna were recorded. Therefore,

		while the surveys were focused on detecting MNES species, opportunistic effort for other significant fauna was inherent in the survey approach. In addition, the Grey Falcon occurs sparsely over its range and occupies a wide range of habitats, particularly acacia shrublands that are crossed by tree lined water courses (TSSC 2020). While the Activity Area includes acacia shrublands, it lacks the tree lined water courses that are preferred by the Grey Falcon.
	4.9.3 We note the Grey Falcon was only listed as a threatened species under the EPBC Act on 9 July 2020 and included as a Program Matter to the Assurance Plan and Offset Plan v.2 following Five Yearly Review finalised in December 2022. We also note that the survey reports listed above are dated July and October 2020, and 2018. The department recommends additional survey effort, targeting potential roosting trees or structures, to adequately conclude absence of Great Falcon within the Activity Area and support assessment of whether the program matter trigger has or has not been met by the Activity.	Please refer to responses to comments 4.2.5 and 4.9.2 Based on these responses, BHP considers the suite of surveys undertaken to be adequate to inform the potential presence of the species within the Activity Area. Furthermore, as noted in Section 4.9.2 of the Validation Notice, while Major Drainage Line is generally considered critical habitat for Grey Falcon as it represents potential nesting habitat, the extent of this habitat type within the Activity Area is fragmented and degraded as a result of being in close proximity to existing mine operations at Mt Whaleback. Therefore, it is unlikely to support Grey Falcon and, as a result, it is not considered a critical habitat in this assessment. It is recognised that supporting habitat is present within the Activity Area. However, as there have been no records of Grey Falcon within the Activity Area, despite numerous surveys being undertaken, it is unlikely that supporting habitats are used on a regular basis. This is aligned with the assessment in Western Ridge Pipelines Vertebrate Fauna Survey (Biologic 2022) and Western Ridge Paddy Bore Area Vertebrate Fauna Survey (Biologic 2022), in which the reports note the species is likely to be an infrequent visitor (foraging only). The potential presence of the species has been considered within Section 4.9.2 and the assessment of potential direct and indirect impacts in Section 4.9.4 undertaken in this context.
Offsets proposal	5.1 Table 5-1 residual impacts requiring offsetting (p.101): include a note in column 5 stating offset rate ($/ha) is the current rate (GST excl.), with Perth CPI to be applied annually to any subsequent payments. The heading (Total financial offset) in column 6 and row 14 should be minimum offset payment (as the total may increase over time due to annual application of CPI).	Text amended.
	5.3 Proposed offset: DCCEEW has not agreed that financial contributions alone will necessarily address, or offset, impacts to critical and supporting habitat for program matters i.e. funding must still result in real conservation benefits for the impacted species in a timely manner for it to be considered an offset. To ensure real conservation outcomes for Ghost bat populations in the Pilbara are achieved via proposed payments to the Fund, consider and respond to the following:	The PEOF proposes to achieve offsets through implementation of on ground projects to ensure no net loss. There may be a delay in achieving offsets, noting the timeline for project implementation. BHP will contribute 10% of the offset payment up front, in accordance with the endorsed APOP.

	• How does PEOF propose to achieve these offsets and what outcomes are expected?
	• What certainty does BHP have that offset outcomes can be achieved via the PEOF prior to or at the same time as impact to this habitat?
	• What corrective action will BHP implement if offsets have not been delivered within a reasonable time i.e. by the first annual reporting period and/or 12 months from payment into the Fund?
	• What alternative offsets were considered when applying the mitigation hierarchy to this Activity? E.g.:
	  ○ Protection and rehabilitation of degraded Major or Minor Drainage Line habitat.
	  ○ Feral cat baiting for the life of the Activity within or outside BHP's tenancy in the Pilbara region and areas known or likely for Ghost Bats to occur.
	  ○ Protection of known Ghost Bat roosts and foraging habitat away from iron ore deposits and areas suitable for future renewable energy or other infrastructure.
	
	Noting the occurrence of Pilbara Olive Python and important habitat at and around Nankunya and Whaleback creek to the north of the impact site, we strongly encourage BHP to undertake further consideration of potential offset sites (for protecting from future impacts) to ensure offsets can be implemented prior to or as close as practicable to time of impact. Note this validation notice (including offset commitments) can and should be varied after finalisation of this validation notice, e.g. if offsets to compensate for residual impact notified in this validation notice have not been delivered through the Pilbara Environmental Offset Fund within 12 months of commencing the Activity and alternative on-ground offsets are identified.
		BHP will seek annual reports on the performance of the PEOF and will engage with DWER in relation to potential corrective actions that could be implemented, if required. BHP is also committed to investigating the feasibility of implementing on ground offsets on its tenure.
		
		BHP has not considered alternative offsets to date, in addition to provision of financial offsets to the PEOF, which is an endorsed offset pathway identified in the current APOP.

	5.6 Summaries of offset outcomes included in Annual Environmental Reports are expected to be provided in enough detail for stakeholders to understand whether reasonable conservation outcomes are being achieved for the impacted species/program matter and the time between impact occurring and offset outcomes has been minimised as far as practicable.	Noted.
Monitoring commitments (triggered program matters only)	<u>Ghost bat</u> 6.1.1 The Ghost Bat Review (Bat Call WA 2021a) states that noise impacts should have a buffer of at least a few hundred metres to avoid the abandonment of the roost and noise levels should not exceed 70 dB(Z) at the roost entrances. Monitoring and reporting for noise impacts, including heavy vehicles and machinery on haul roads and blasting noise from ore pits, should include performance results against this threshold and discussion of corrective/preventative action implemented for any exceedance events. This is particularly pertinent given the two Category 2 caves (CWER-01 and CWER-02) are located 150m from mining activity and a haul road may be 100m from CWER-01.	BHP have considered the guidance and recommendations provided in Bat Call WA (2021). However, it is recognised they are general in nature and, as such, there may be variations at a local scale due to the influence of site specific conditions, including topographic features, geology, meteorological conditions and the orientation of the caves' entrance to the source of the disturbance. It is also noted the Bat Call WA (2021a) guidance acknowledges that the empirical data to fully assess the claim that ghost bat will habituate to the sound from drill and blast mining, as well as heavy machinery, when a

		buffer of several hundred metres from the entrance is observed is limited. Therefore, it is possible that smaller buffers may be adequate to limit interference from such activities. BHP acknowledges the Bat Call WA (2021a) states that current best practice is to limit sound pressure levels to below 70 dB(Z) at roost entrances, as based on Bullen and Crease (2014). On referring to the study by Bullen and Crease (2014), the findings reported that Ghost Bats inside the cave that received a maximum sound intensity of approximately 70 dB during drilling activities (which also represents the greatest sound pressure level measured at the caves observed during the study) were not disturbed. The report concludes the sound and vibration levels reported may provide an early benchmark for activities, such as infrastructure or road construction, where impact to Ghost Bat roosts is to be minimised. As context, the report also notes the 70 dB sound level is considered moderate to human hearing with the sound being generally equivalent to a room with a radio or television operating at normal volume. Therefore, based on the above context surrounding the single study of a drilling program and the limited scientific evidence base, BHP respectively argues that the 70 dB criteria should be considered highly conservative and does not represent a robust, well-tested threshold criterion. Blasting is a temporary, short term activity and therefore potential disturbance to Ghost Bats will be limited to discrete periods of short duration. Cumulative noise generated from the various mining activity sources, including heavy machinery, vehicles and/or equipment (e.g. haul trucks, conveyor, crusher), will likely exceed the 70 dB criteria proposed. It is not feasible or practicable to achieve moderate noise levels equivalent to 70 dB (e.g. radio or television on normal volume) in the context of a large-scale operational mine. This will be the case across all iron ore operations and sites. BHP have modified the Indicative Footprint to allow for the implementation of the three MEZ (refer to Section 6.5.1 of the Western Ridge Derived Proposal document) and sought to provide appropriate MEZ buffers within the constraints of the requirements of an operational mine, specifically the need to maintain access to ore to ensure viability of the Western Ridge project. BHP can confirm the haul road has been realigned such that it will be constructed more than 150 m north of CWER-01. This aligns with the proposed 150 m mining exclusion zone for CWER-01. BHP are in the process of updating the TFEMP to include the provision of appropriate, site-specific vibration limits for blasting and noise limits for mining activities, such as the operation of heavy machinery and/or equipment.

	6.1.2 Table 4-12 (p.61): We recommend the below additional monitoring, particularly of caves CWER01, CWER-03, CWER-04, CWER-10 and CWER-17, to inform better awareness and management of noise, vibration and light impacts from operation of fixed and/or moving machinery in proximity. • monitoring for noise impacts: management of machinery should aim to keep sound pressure levels to below 70 dB(Z) at the roost entrances. Monitoring (either continuous or during operations occurring within 750 m of this roost) and reporting should include performance results against this threshold and discussion of corrective/preventative action implemented for any exceedance events. • monitoring for vibration impacts: monitoring and management of potential vibration impacts should limit inground vibration to 10 mm/s at roost entrance (to provide for ongoing use of this cave over the life of the impact/during any blasting activity near-by) and must not exceed 25 mm/s to 75 mm/s to avoid structural impact and loss of this roosts' ability to provide diurnal roosting habitat for the Ghost bat. • monitoring for light: Refer to Appendix I: Bats, of the National Light Pollution Guidelines for Wildlife (DCCEEW 2023) for mitigation of light impacts, particularly within 500 m of the roost, and monitoring requirements (note - we recommend seeking additional advice from Pilbara Leaf-nosed Bat experts on the suitability of red/amber for other projects' potential impact to Pilbara Leaf-nosed Bats).	BHP suggest it is more appropriate to apply any additional monitoring to CWER-16, a Category 3 roost, instead of CWER-04, a Category 4 roost. *Monitoring for noise impacts* Please refer to response to the comment above regarding the proposed 70 dB criteria. BHP shall provide consideration to the inclusion of noise monitoring at the Category 2 roosts (CWER-01 and CWER-03) to collect data on noise levels received at the cave entrances. *Monitoring for vibration impacts* Further to the response to the comment above, BHP can commit to the following: • Where blasting is proposed within 300 m of the Category 2 roosts CWER-01 and CWER-03, monitoring will be undertaken to ensure in-ground vibration remains within defined limits at the cave entrance. • Where blasting is proposed within 300 m of the Category 3 roosts CWER-10, CWER-16 and CWER-17, monitoring will be undertaken to ensure in-ground vibration remains within defined limits at the cave entrance. The application of vibration limits, as part of the blast management measures to be implemented within 300 m of the Category 2 and Category 3 roosts, will provide year-round protection of Ghost Bats that may be present within these caves. *Monitoring for light* As discussed in Section 4.4.5 of the Western Ridge Project Validation Notice, the potential indirect impacts to Ghost Bats associated with artificial light associated with active mine pits are considered to be minor given the implementation of buffers which will exclude disturbance in proximity to caves. Considering this, and that the Category 2 and Category 3 roosts within the Western Ridge area are monitored quarterly (a frequency that is considered sufficient to detect potential impacts and to inform management), BHP is not proposing to undertake additional monitoring for light as the Category 2 and Category 3 roosts are considered sufficiently far from disturbance and sources of light. BHP will report outcomes of the Ghost Bat monitoring program in the AER. Light installations will be directed into active operational areas and away from caves, where practicable, in order to minimise potential impact of light spill on caves (Section 4.5.5 of the Validation Notice). Artificial light is unlikely to penetrate the Category 2 roosts such that it reaches the roosting chamber(s), given the characteristics of caves CWER-01 and CWER-03. Specifically, CWER-01 has a large overhang leading to two discreet chambers, with the deepest extending approximately 35 m (Biologic 2022). CWER-03 is

		an even deeper cave (approximately 40 m) with multiple chambers and Ghost Bat has mostly been recorded in the rear, discrete chamber (Biologic 2022). BHP notes DCCEEW's recommendation regarding consulting with Pilbara Leaf-nosed Bat experts on the suitability of red/amber. However, as discussed in Section 4.6.4 of the Validation Notice, the species has only been recorded once within the Activity Area, despite high intensity targeted survey effort. Further to the baseline studies, the Ghost Bat monitoring program, which commenced in the Western Ridge area in February 2022, has only recorded the species once (four calls) in May 2022 at CWER-01. The limited number of records of the Pilbara Leaf-nosed Bat supports the conclusion that the species is highly unlikely to permanently roost in area and may only occur intermittently to forage and disperse (Biologic 2021).
	6.1.3 Report results in Annual Environmental Reports from the proposed quarterly monitoring at caves CWER01, CWER-03, CWER-04, CWER-10 and CWER-17 and annual monitoring at CWER-07, CWER-09 and CWER 14 to demonstrate ongoing achievement of avoidance of impact.	Noted.
	6.1.4 Table 4-12 (p.61): What contingency measures - whether corrective actions or alternative management will be actioned for exceedance of noise/vibration limits?	If vibration limits are exceeded, BHP would cease blasting and review blast techniques to ensure that vibration limits remain with defined limits. Visual monitoring of caves pre- and post-blasting would also be undertaken to identify any visual sign of structural damage.
	6.1.5 Noting that limited baseline Ghost Bat monitoring data was collected between 2016 to 2019 from caves CWER-01 and CWER-03, will the proposed Western Ridge Terrestrial Fauna Management Plan which includes monitoring of Ghost Bat at Western Ridge include expanded and contemporary baseline monitoring prior to impact? When will monitoring commence? Will it be as soon as practicable, that is, during land clearance and construction phases of the project? Refer to the department's comments regarding monitoring and baselines provided for the draft Mooka rail upgrade validation notice. Baselines are particularly important here to determining whether avoidance measures have successfully ensured continuing viability and use of diurnal roosts at Western Ridge by Ghost bats.	Monitoring at Western Ridge has already commenced at caves retained in mining exclusion zones and buffers where safe access has been confirmed, prior to implementation of the Activity, to further establish baseline.
	6.1.6 We note that avoidance measures will be applied to ensure retention of the two Category 2 roosts, three Category 3 roosts and five Category 4 roosts within the Activity Area (p.50). Without certainty as to the sources of humidity within these roosts (particularly the Category 2 and 3 roosts providing diurnal roosting habitat), one potential source may be moisture seeping into roosts from the surrounding perched aquifer. Noting there is likely to be constant natural changes and fluctuations in this perched aquifer, we recommend monitoring the perched aquifer adjacent to these roosts with the aim of identifying any significant changes to the aquifer that may	Note this is a repeat of comment 4.4.8. The perched aquifer which supports Nankunya, is located to the north of the Activity Area, approximately more than 1km from the nearest pit. The perched aquifer is hydraulically disconnected from the orebodies to be dewatered and mined within the Activity Area. The Ghost Bat roosts within the Activity Area are well outside of the Nankunya catchment and are not reliant upon the perched aquifer for moisture. Therefore, groundwater abstraction

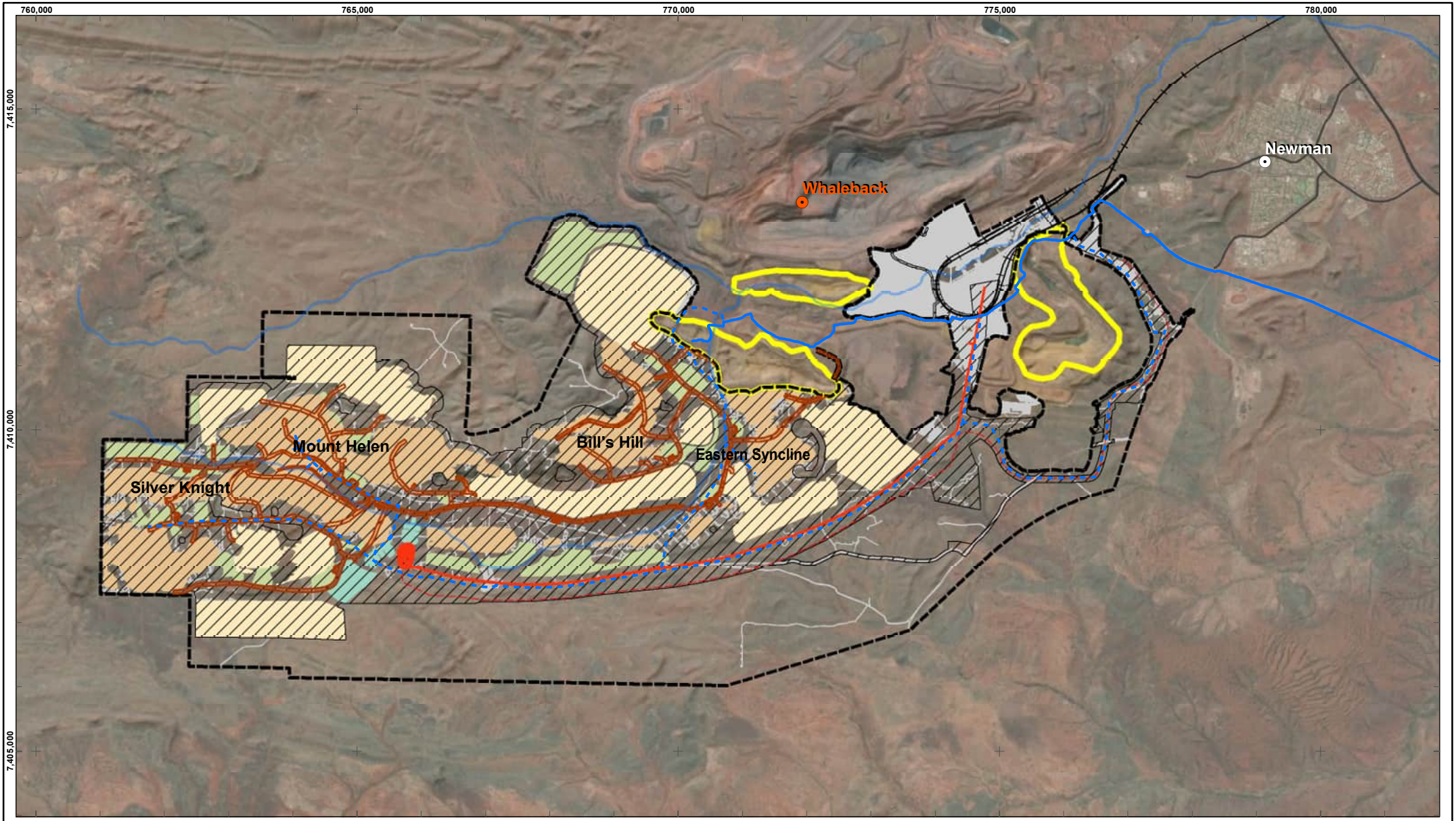
	coincide with particular mining activity and potential abandonment of Ghost Bats from these roosts over the life of the project. This monitoring should be in addition to humidity and temperature monitoring within the roosts if access is safe and possible without disturbing Ghost Bat roosting activity. We suggest monitoring continuing presence of the upper perched aquifer and it's level of control on cave humidity via nested piezometers (e.g. at depths of 8 m, 15 m and 30 m) around the bat caves, far enough away and timed so that the drilling won't disturb Ghost Bats, particularly during key reproductive months. Monitoring should commence well in advance of pit development to provide adequate baseline levels.	for mining is not predicted to alter the groundwater levels in the perched aquifer at Nankunya.
	6.1.3 Reliance on sightings to instigate feral cat trapping may not be adequate to ensuring feral cat numbers are appropriately managed at this site and reduce the risk to local Ghost bats exiting caves within the Activity Area. We encourage BHP to undertake regular feral cat monitoring, such as via motion cameras at key locations, to assist in early identification and ongoing control of feral cats in the area over the life of the impact.	As previously advised, BHP is investigating options to undertake ongoing feral cat monitoring to inform cat control.
	<u>Pilbara Olive Python</u> 6.2.1 Monitoring target, methods and frequency are partially appropriate. Corrective and contingency responses look appropriate also, however we recommend the following monitoring to provide a signal for corrective action or more information on potential causes if monitoring targets for the Pilbara Olive Python are not met. Given the close proximity of pits, the potential for ore extraction to impact the perched aquifer in the assumption that local area and potential the temporary surface water features and permanent Nankunya pools rely at least in part of the perched aquifer, we recommend ongoing monitoring of the perched aquifer adjacent to these surface water features to identify any significant changes or fluctuations in the aquifer (beyond normal variation) that may coincide with or lead to degradation or removal of these water features and/or vegetation in this area that is likely to support habitat for Pilbara Olive Python and prey species. We suggest monitoring via a north-south transect of 3 to 5, 20-30m deep piezometers installed across the ridge line immediately west of BH_PB2 to monitor the behaviour and persistence of the ridge aquifer as mining progresses. A further set of piezometers should be constructed between Nankunya (Afghan Springs) and the Bills Hill ridgeline to determine likely impact on spring behaviour.	As discussed in Section 4.6.5, the perched aquifer that supports Nankunya is hydraulically disconnected from the orebodies to be dewatered and mined for the Activity. Therefore, groundwater abstraction for mining is not predicted to result in any changes to Nankunya. The Nankunya Monitoring Program (provided in Appendix 6) provides detailed evidence regarding the disconnection between the local perched aquifer which supports Nankunya and the regional aquifer which may be affected by Western Ridge dewatering. It sets out BHP's commitment to monitor groundwater, surface water flows, surface water pools and vegetation at Nankunya and is implemented as a precautionary measure to detect any changes in values at Nankunya. This includes existing groundwater monitoring bores at Nankunya and regional monitoring bores between Western Ridge and Nankunya. As outlined in the Monitoring Program, additional monitoring and/or increased monitoring frequency will be undertaken if analysis indicates differences compared to the current hydrogeological conceptualisation (local Nankunya aquifer and/or regional/orebody aquifers).
Management commitments	6.3.1 update management commitments to respond to comments above for additional management commitments (feral cat abatement, light pollution, noise from haul trucks etc – and vibration if blasting and any additional measures to avoid or mitigate impacts to perched rock aquifers in the upper subsurface along ridgelines).	BHP considers that no additional management commitments are required.

Offset commitments	6.4.1 The offset commitment (Payment of financial contribution to PEOF) is not sufficient. Commitment needs to include achievement of conservation outcomes equal to or greater than the impact (e.g. habitat loss).	BHP proposes offsets for significant residual impacts in relation to notifiable actions in accordance with the Program and the endorsed APOP. BHP is also committed to investigating the feasibility of implementing on ground offsets on its tenure in future.
	6.4.2 Reporting needs to include evidence (payment receipt) provided to department of on-time payment into the Fund (minimum 10% within 1 month of validation notice becoming effective), and summary of offset outcomes in Annual Environment Report to the department and public.	Text amended.

Additional references

Department of Environment, Water, Heritage and the Arts (DEWHA) 2010, *The Cane Toad (Bufo Marinus)*, Commonwealth of Australia, Canberra.

Threatened Species Scientific Committee (TSSC) 2020, *Conservation Advice Falco hypoleucos (Grey Falcon*).



BHP operations
Development Envelope
Ministerial Statement (MS963)
Indicative Footprint
Indicative Cleared Area as at FY2021
Roads
Existing rail
Existing OB29/30/35 surplus water pipeline
Waterways

Proposed infrastructure
Proposed powerline
Proposed surplus water pipeline
Overland conveyor
Proposed mining disturbance
Haul road
OSA
Pit
ROM Pad
Topsoil storage

N

0 0.9 1.8 2.7 3.6 4.5
KILOMETRES

GDA 1994 MGA ZONE 50

BHP

PUBLIC

WESTERN RIDGE

Development Envelope and Indicative Footprint of the Proposal

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:80,000	PREPARED:	M. ENGLISH	FIGURE:	A 1
DATE:	21/11/2022	REQUESTOR:	ENV. APPROVALS	NO:	979/131D
		REVIEWED:	N. McALINDEN		

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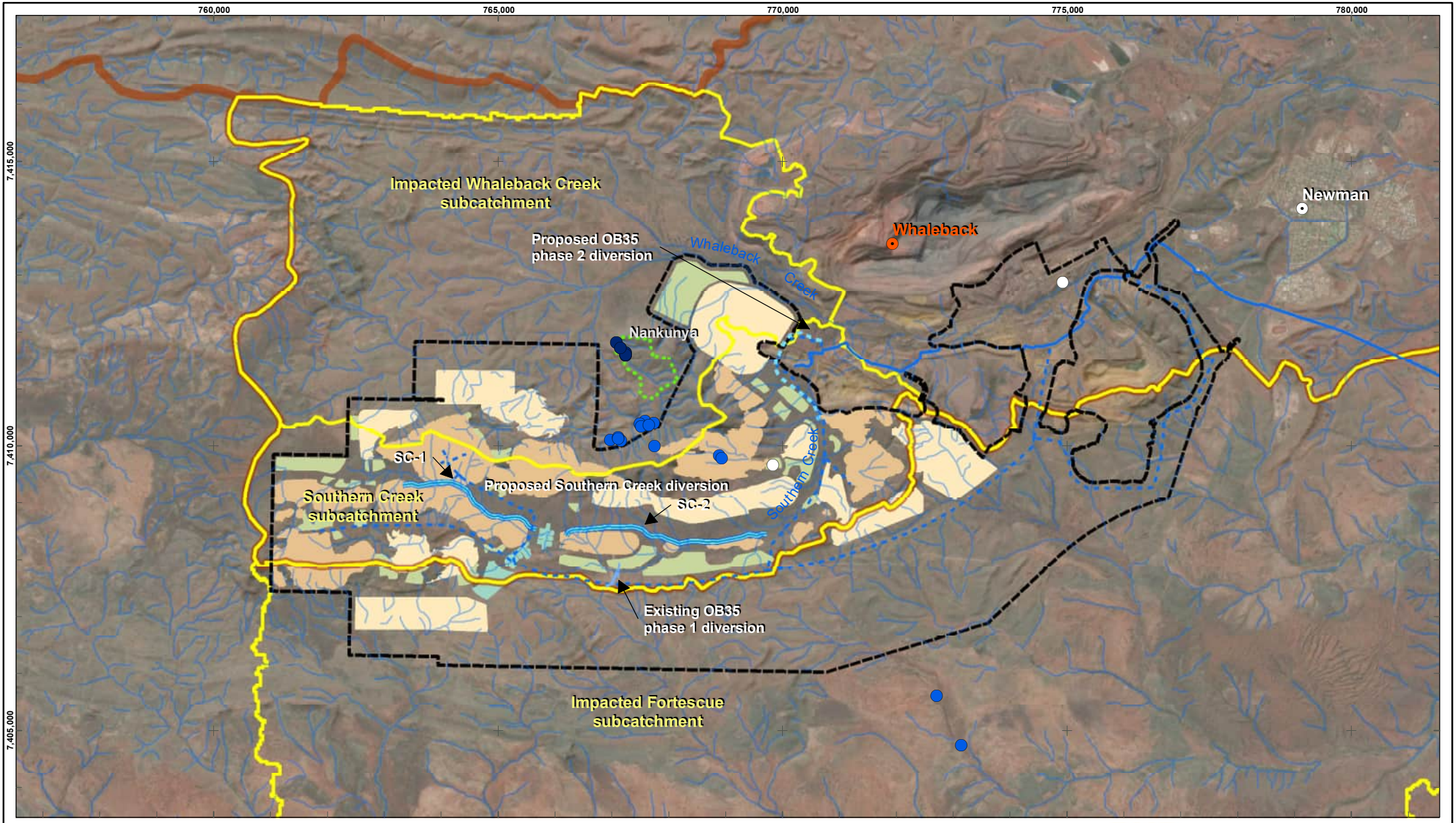

- BHP operations
- Development Envelope
- Waterways
- Existing OB29/30/35 surplus water pipeline
- Nankunya catchment
- Proposed Western Ridge surplus water pipeline
- Proposed Southern Creek diversion
- Regional subcatchments
- Local subcatchments

Surface water feature
- Artificial
- Semi-permanent to permanent
- Temporary

Proposed mining disturbance
- OSA
- Pit
- ROM Pad
- Topsoil storage

N

0 1 2 3 4 5
KILOMETRES

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WESTERN RIDGE

Local hydrology

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:90,000	PREPARED:	M. ENGLISH	FIGURE:	A 2
DATE:	12/10/2022	REQUESTOR:	ENV. APPROVALS	NO:	979/147
		REVIEWED:	N. McALINDEN		

Document Path: Y:\Jobs\A501_A1000\A979\3Project\A979_147_E_WesternRidge_DP_LocalHydrology_RevE.mxd