



Jimblebar Wind Power 2030 Targeted Vertebrate Fauna Survey

Report to BHP WAIO

7 January 2025

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Executive Summary

BHP Western Australian Iron Ore (BHP WAIIO) commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake a targeted vertebrate fauna survey of the Jimblebar Wind Power 2030 Project Area (herein the Study Area). The Study Area is located between approximately 6 kilometres (km) northwest and 30 km east of the Newman township and covers an area of approximately 8,575 hectares (ha).

A comprehensive desktop review and targeted field survey was conducted in April 2024 to determine the presence, or likely presence, of significant vertebrate fauna species within the Study Area, focussing on the following ten target species of Matters of National Environmental Significance (MNES):

- northern quoll (*Dasyurus hallucatus*) – Endangered
- greater bilby (*Macrotis lagotis*) – Vulnerable
- ghost bat (*Macroderma gigas*) – Vulnerable
- Pilbara leaf-nosed bat (*Rhynonictis aurantia* ‘Pilbara form’) – Vulnerable
- night parrot (*Pezoporus occidentalis*) – Endangered
- grey falcon (*Falco hypoleucos*) – Vulnerable
- princess parrot (*Polytelis alexandrae*) – Vulnerable
- southern whiteface (*Aphelocephala leucopsis*) – Vulnerable
- Pilbara olive python (*Liasis olivaceus* subsp. *barroni*) – Vulnerable
- great desert skink (*Liopholis kintorei*) – Vulnerable.

Twelve (12) broad fauna habitat types were recorded within the Study Area, comprising Stony Plain (1,669.52 ha, 19.47%), Hillcrest/ Hillslope (1,562.90 ha, 18.23%), Drainage Area/ Floodplain (1,102.45 ha, 12.86%), Mulga Woodland (433.95 ha, 5.06%), Sand Plain (385.33 ha, 4.49%), Gorge/ Gully (295.25 ha, 3.44%), Minor Drainage Line (171.23 ha, 2.00%), Undulating Low Hills (88.59 ha, 1.03%), Hardpan Plain (76.52 ha, 0.89%), Major Drainage Line (53.79 ha, 0.63%), Artificial Wetlands (6.48 ha, 0.08%) and Breakaway/ Cliff (6.39 ha, 0.07%). Cleared/ Disturbed (2,722.55 ha, 31.75%) areas made up the remaining extent within the Study Area. Five of these habitat types provide potential critical habitat for significant species; Drainage Area/ Floodplain, Gorge/ Gully, Major Drainage Line, Breakaway/ Cliff and Artificial Wetland.

Forty-four (44) potentially occurring significant species were assessed for likelihood of occurrence within the Study Area. Seven species have previously been recorded within the Study Area: brush-tailed mulgara (*Dasymercus blythi* – Priority 4 by the Department of Biodiversity Conservation and Attractions (DBCA)), northern quoll, ghost bat, western pebble-mound mouse (*Pseudomys chapmani* – Priority 4 DBCA), peregrine falcon (*Falco peregrinus* – Specially Protected under the *Biodiversity Conservation Act 2016*), Pilbara olive

python and Gane's blind snake (*Anilius ganeii* – Priority 1 DBCA). Four of these species were recorded during the current survey: brush-tailed mulgara, ghost bat, western pebble-mound mouse and Pilbara olive python.

Ghost bat was recorded on one occasion during the current survey via secondary evidence (1,000 scats) within a Category 3 roost (diurnal roost caves with occasional occupancy; cave CER-06). An additional three caves were recorded and assessed within the Study Area during the current survey and classified as Category 4 roosts (nocturnal roost caves with opportunistic usage). Eight other caves (two Category 3 and six Category 4 caves) are known to occur within the Study Area but were not assessed during the current survey; three of these caves are currently being monitored by another Biologic project (Biologic, 2024). Critical ghost bat foraging and/ or dispersal habitat within the Study Area is provided by Sand Plain, Stony Plain, Drainage Area/ Floodplain, Major Drainage Line, Minor Drainage Line, Mulga Woodland, Artificial Wetland, Hardpan Plain and Undulating Low Hills habitats, when proximal (<12 km) to a critical roost. Although no critical roosts were identified within the Study Area, there are four within 0.3–4.5 km north, east and west of the Study Area (CNIN-03, CWER-01, CWER-03 and CJIM-03) for which part of the 12 km critical foraging habitat buffer overlaps the Study Area. Supporting foraging and/ or dispersal habitat is provided by the same habitats outside of the 12 km buffer of the Category 2 roosts. Due to the presence of Category 3 roosts and critical and supporting foraging habitat within the Study Area, the individuals present in the Study Area forms part of the broader meta-population of ghost bats in the Pilbara and as such, aligns with the DoE (2013b) definition of an 'important population'.

Pilbara olive python was recorded during the current survey via one record of secondary evidence (slough). Twenty-nine (29) water features have been recorded in the Study Area, including three permanent/ persistent (all artificial) sources. The permanent/ persistent water features are considered critical habitat for the species; with the semi-persistent and ephemeral water features present considered supporting habitat. The Major Drainage Line, Gorge/ Gully, Artificial Wetland and Breakaway/ Cliff habitat types provide critical habitat, and Minor Drainage Line, Hillcrest/ Hillslope and Drainage Area/ Floodplain are considered supporting habitat where in the home range (88–450 ha) of critical habitat and where important microhabitats are present. Individuals that may be present within the Study Area would be considered part of an 'important population' (DoE, 2013a).

No Pilbara leaf-nosed bat or evidence of the species' occurrence was recorded within the Study Area during the current survey; however, it has previously been recorded on many occasions within 40 km of the Study Area. All 12 caves recorded in the Study Area are classified as non-critical Category 4 nocturnal refuges for the species. The nearest known provisional permanent diurnal (preliminary categorisation as Category 2) roost for this

species (CNIN-12) is located 1.4 km north of the Study Area. Given the proximity of a provisional critical Category 2 roost (CNIN-12) to the Study Area, all habitat types (i.e. not including Cleared/ Disturbed areas) within the 5 km buffer of this roost are considered critical habitat. All habitats outside of the 5 km buffer within the Study Area provide varying quality of supporting foraging habitat. The Pilbara population is regarded as a single interbreeding population and therefore, the entire population of Pilbara leaf-nosed bat is classified as an 'important population'. Although the Study Area is considered unlikely to represent a significant area for Pilbara leaf-nosed bats due to the absence of critical Category 1, 2 and 3 roosts, the species is considered highly likely to forage and/ or disperse within the Study Area due to the proximity of a provisional critical Category 2 roost.

Northern quoll was not recorded during the current survey but has been previously recorded once within the Study Area (unconfirmed record of a dead individual); however, there is a scarcity of records within the local vicinity and region. The Gorge/ Gully, Breakaway/ Cliff, and Major Drainage Line habitat types provide potential critical breeding/ denning, foraging and dispersal habitat. Potential supporting habitat for the northern quoll occurs in the Hillcrest/ Hillslope, Artificial Wetland and Minor Drainage Line habitat types, where proximal to potential critical habitat. The species occurrence within the Study Area is confirmed; however, it is unlikely a resident population occurs within the Study Area and may be limited to infrequent visitations by dispersing or foraging individuals only.

Whilst the target species southern whiteface and grey falcon were not recorded during the current survey and limited previous records occur within the vicinity of Study Area, potential critical and supporting habitat for these species does exist within the Study Area. Therefore, these species are considered possible to occur within suitable habitats of the Study Area.

There is a lack of records in the vicinity of the Study Area for the greater bilby, night parrot, princess parrot and great desert skink. In addition, there is no suitable habitat for the night parrot (lack of large, long-unburnt hummocks and chenopod shrubland) and marginally suitable habitat (small, fragmented patches of Sand Plain) for greater bilby within the Study Area, and the Study Area is outside the modelled and known distribution for the princess parrot and great desert skink. As such, these species are considered unlikely to occur.

Two non-MNES significant fauna species were recorded within the Study Area during the current survey (western pebble-mouse mound and brush-tailed mulgara) and two have previously been recorded within the Study Area but not during the current survey (peregrine falcon and Gane's blind snake). An additional 12 Migratory shorebird/ waterbird species are considered likely to occur within the Study Area and nine significant species (three DBCA Priority species, one Threatened bird species and five Migratory bird species) are considered possible to occur. The remaining eight significant species that were identified in the desktop assessment are considered unlikely or highly unlikely to occur.

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1 Introduction

1.1 Background

BHP Western Australian Iron Ore (BHP WAIO) commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake targeted vertebrate fauna survey of the Jimblebar Wind Power 2030 Project Area (herein the Study Area). The Study Area is located between approximately 6 kilometres (km) northwest and 30 km east of the Newman township and covers an area of approximately 8,575 hectares (ha) (Figure 1.1).

1.2 Survey Objectives

The overarching objective of this assessment was to determine the presence, or likely presence, of significant vertebrate fauna species within the Study Area, with a focus on Matters of National Environmental Significance (MNES; i.e. species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)), and species listed under the *Biodiversity Conservation Act 2016* (BC Act) and as Priority fauna species by the Department of Biodiversity, Conservation, and Attractions (DBCA) (Appendix A). The MNES species targeted for this survey were:

- northern quoll (*Dasyurus hallucatus*) – Endangered
- greater bilby (*Macrotis lagotis*) – Vulnerable
- ghost bat (*Macroderma gigas*) – Vulnerable
- Pilbara leaf-nosed bat (*Rhinochiropterus aurantia* 'Pilbara form') – Vulnerable
- night parrot (*Pezoporus occidentalis*) – Endangered/ Critically Endangered
- princess parrot (*Polytelis alexandrae*) – Vulnerable/ Priority 4
- southern whiteface (*Aphelocephala leucopsis*) – Vulnerable
- grey falcon (*Falco hypoleucos*) – Vulnerable
- Pilbara olive python (*Liasis olivaceus* subsp. *barroni*) – Vulnerable
- great desert skink (*Liopholis kintorei*) – Vulnerable.

1.3 Compliance

This assessment was carried out in accordance with the following guidelines and recommendations developed by the relevant state and federal regulatory bodies, relevant survey-specific license conditions and, where relevant, BHP WAIO procedures:

- Bat Call (2021a) A review of ghost bat ecology, threats and survey requirements
- Bat Call (2021b) A review of Pilbara leaf-nosed bat ecology, threats and survey requirements
- BHP (2023b) Biological survey spatial data requirements (SPR-IEN-EMS-015) Version 12.0
- BHP WAIO (2023) Vertebrate fauna surveys in Western Australia procedure (Document Number: SPR-IEN-EMS-012) Version: 12.0

- Department of Biodiversity, Conservation and Attractions [DBCA] (2017) Guidelines for surveys to detect the presence of bilbies, and assess the importance of habitat in Western Australia
- Department of Environment, Water, Heritage and the Arts [DEWHA] (2010a) Survey guidelines for Australia's threatened bats
- Department of Environment (2016) EPBC Act referral guideline for the endangered northern quoll (*Dasyurus hallucatus*)
- Department of Parks and Wildlife (2017) Interim guidelines for the preliminary surveys of night parrot (*Pezoporus occidentalis*) in Western Australia
- Department of Sustainability, Environment, Water, Population and Communities [DSEWPaC] (2011a) Survey guidelines for Australia's threatened mammals
- DEWHA (2010b) Survey guidelines for Australia's threatened birds
- DEWHA (2010c) Survey guidelines for Australia's threatened frogs
- DoE (2013a) Significant impact guidelines 1.1: Matters of National Environmental Significance
- DSEWPaC (2011b) Survey guidelines for Australia's threatened reptiles
- Environmental Protection Authority [EPA] (2020) Technical guidance: terrestrial vertebrate fauna surveys for environmental impact assessment
- EPA (2023) Statement of environmental principles, factors, objectives and aim of EIA
- EPA (2016) Environmental factor guideline: Terrestrial fauna
- TSSC (2008) Approved conservation advice for *Liasis olivaceus barroni* (Olive Python – Pilbara subspecies)
- TSSC (2020) Conservation advice: *Falco hypoleucos*, grey falcon
- TSSC (2016b) Conservation advice: *Macroderma gigas*, ghost bat
- TSSC (2016c) Conservation advice: *Rhinonicteris aurantia* (Pilbara form), Pilbara leaf-nosed bat.

2 Existing Environment

2.1 Climate

The Pilbara bioregion has a semi-desert to tropical climate, with rainfall occurring sporadically throughout the year, although mostly during summer (Thackway & Cresswell, 1995). Summer rainfall is usually the result of tropical low pressure systems and cyclonic activity in the region (Leighton, 2004). Winter rainfall is generally lighter and often associated with cold fronts moving north easterly across the state (Leighton, 2004). The average annual rainfall ranges from 200–350 mm, although there are significant fluctuations between years (BoM, 2024; McKenzie *et al.*, 2009). The Gascoyne bioregion has an arid climate with predominantly winter rainfall in the west and summer rainfall in the east (Thackway & Cresswell, 1995).

2.2 Biogeography

The Study Area is located within the Hamersley (PIL3) and Fortescue Plains (PIL2) subregions of the Pilbara bioregion and the Augustus (GAS3) subregion of the Gascoyne bioregion (Thackway & Cresswell, 1995) (Figure 1.1).

The Pilbara bioregion is characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges (Thackway & Cresswell, 1995). Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses (Bastin, 2008). The Hamersley subregion is characterised by mountainous areas of Proterozoic sedimentary ranges (ironstone ranges) and plateaux dissected by gullies and gorges (Kendrick, 2003b). Vegetation comprises mulga low woodland over bunch grasses on fine-textured soils dominant in valley floors, while skeletal soils of the ranges are dominated by snappy gum (*Eucalyptus leucophloia*) over *Triodia brizoides* (Kendrick, 2003b). Drainage is typically into the Fortescue River to the north, the Ashburton River to the south, or the Robe River to the west (Kendrick, 2003b). The Fortescue Plains subregion is characterised by extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east and deeply incised gorge systems in the western lower part of the drainage (Kendrick, 2003a). An extensive calcrete aquifer feeds numerous permanent springs in the centre Fortescue, supporting large permanent wetlands with extensive stands of river gum and cadjeput *Melaleuca* woodlands (Kendrick, 2003a).

The Gascoyne bioregion is characterised by low rugged ranges and broad flat valleys (Thackway & Cresswell, 1995). The vegetation is dominated by open mulga low woodlands (Thackway & Cresswell, 1995). The Augustus subregion is characterised by rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys (Desmond *et al.*, 2003). Vegetation is dominated by mulga woodland with *Triodia* occurring on shallow tony loams on rises, and mulga parkland on the shallow earthy loams over hardpan on the plans (Desmond *et al.*, 2003).

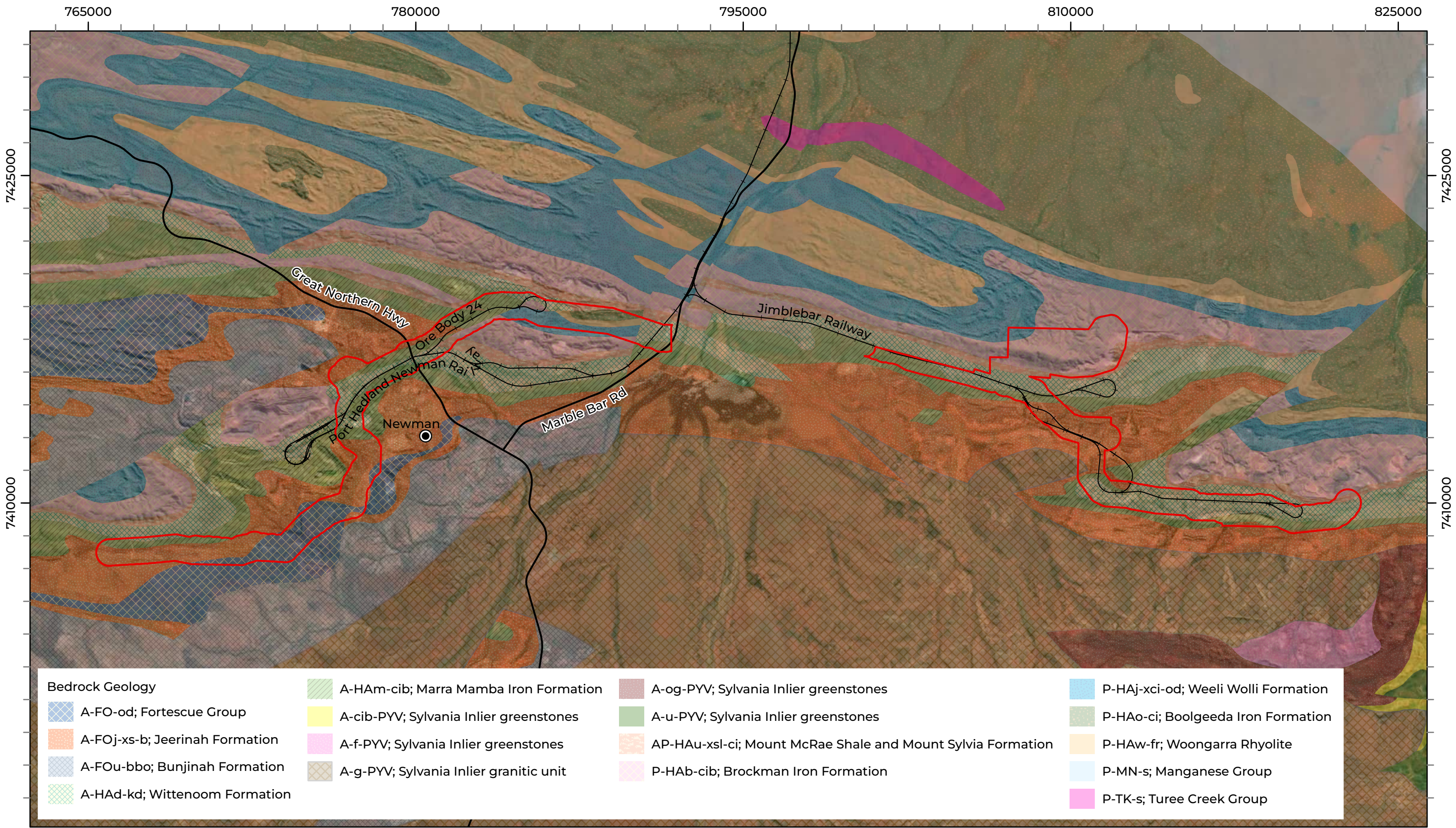
2.3 Geology

The Hamersley subregion contains Proterozoic sedimentary ranges and gorges of basalt, shale and dolerite. This subregion also contains calcrete deposits (Kendrick, 2003b). The Fortescue Plains subregion is dominated by alluvial plains and river frontage, with an extensive calcrete aquifer (Kendrick, 2003b). The Augustus subregion contains rugged low Proterozoic sedimentary and granite ranges and also includes the Narryera Complex and Bryah Basin of the Proterozoic Capricorn Orogen, as well as the Archaean Marymia and Sylvania Inliers (Desmond *et al.*, 2003).

The Study Area occurs across 10 regolith (1:500,000) geology units (Figure 2.1). The Marra Mamba Iron Formation is the bedrock geology most predisposed to forming deep caves in the Pilbara suitable for use by ghost bats and Pilbara leaf-nosed bats; however, the larger hills of Brockman Iron Formation also form suitable caves (Armstrong & Anstee, 2000; Cramer *et al.*, 2022). Both bedrock geologies are present within the Study Area.

2.4 Soils

The CSIRO (2009) Atlas of Australian Soils described and mapped the soils of Australia following Bettany *et al.* (1967). The Study Area occurs over five soil units, Fa13 (4,181.78 ha, 48.77%), BE6 (2,847.83 ha, 33.21%), Oc64 (1,424.25 ha, 16.61%), Mz25 (85.45 ha, 1.00%) and Fa14 (35.65 ha, 0.42%) (Figure 2.2). The dominant soil unit, Fa13, is characterised by ranges of banded jaspilite and chert along with shales, dolomites, and iron ore formations, some areas of ferruginous duricrust as well as occasional narrow winding valley plains and steeply dissected pediments. This unit is largely associated with the Hamersley and Ophthalmia Ranges.



LEGEND

- Study Area
- State Road
- Rail

Biologic

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 19/09/2024

Exmouth

Karratha

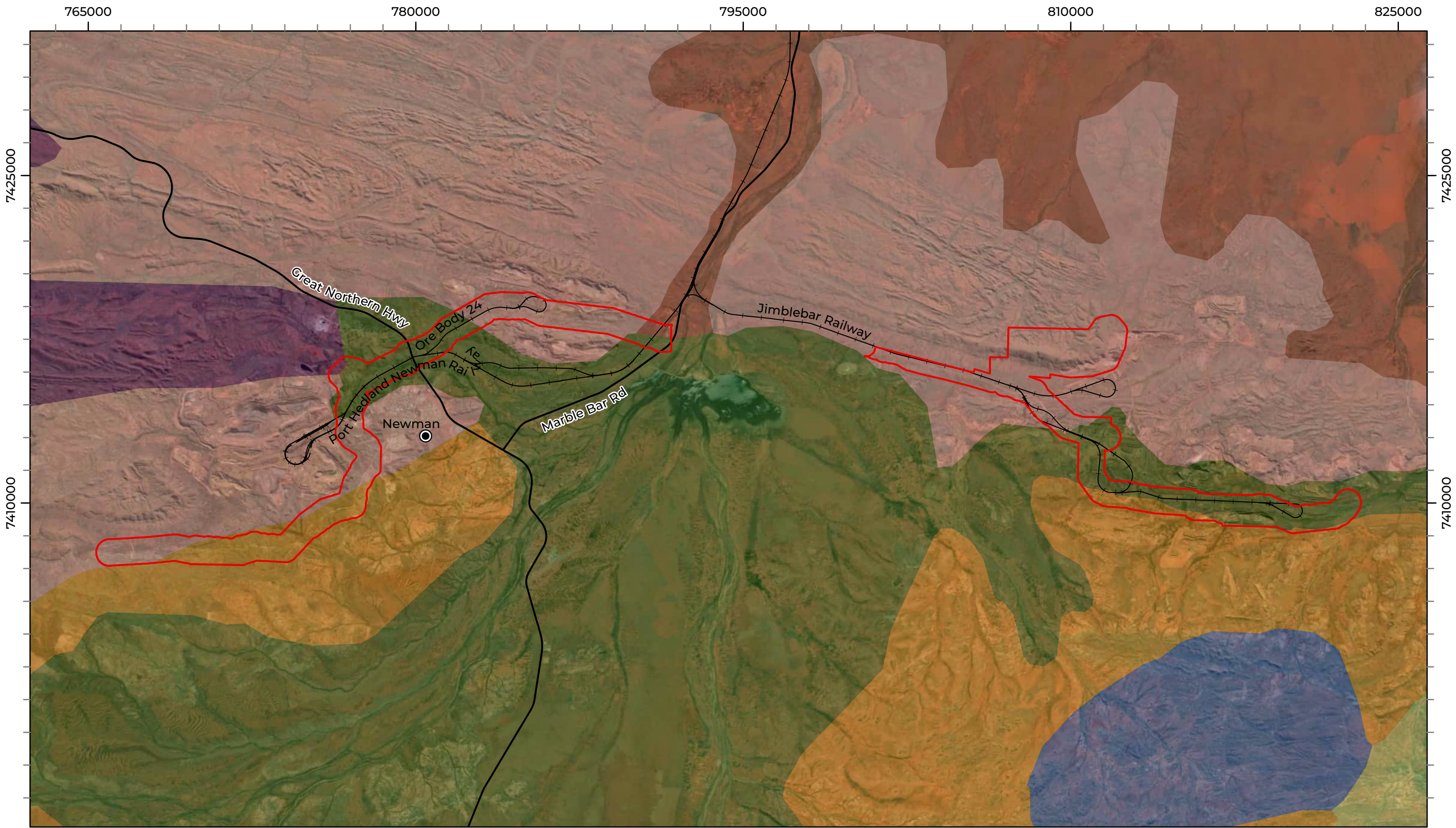
Port Hedland

Newman

BHP WAIO

Power 2030 Targeted
Vertebrate Fauna Survey

**Figure 2.1: Broad geology
of the Study Area**



LEGEND

Study Area	Soil Unit	Fa14
State Road	AA16	Mz25
Rail	BE6	Mz36
	Fa13	Oc64

Biologic

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 19/09/2024

Exmouth, Karratha, Port Hedland, Newman

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Figure 2.2: Soils of the Study Area

2.5 Land Systems

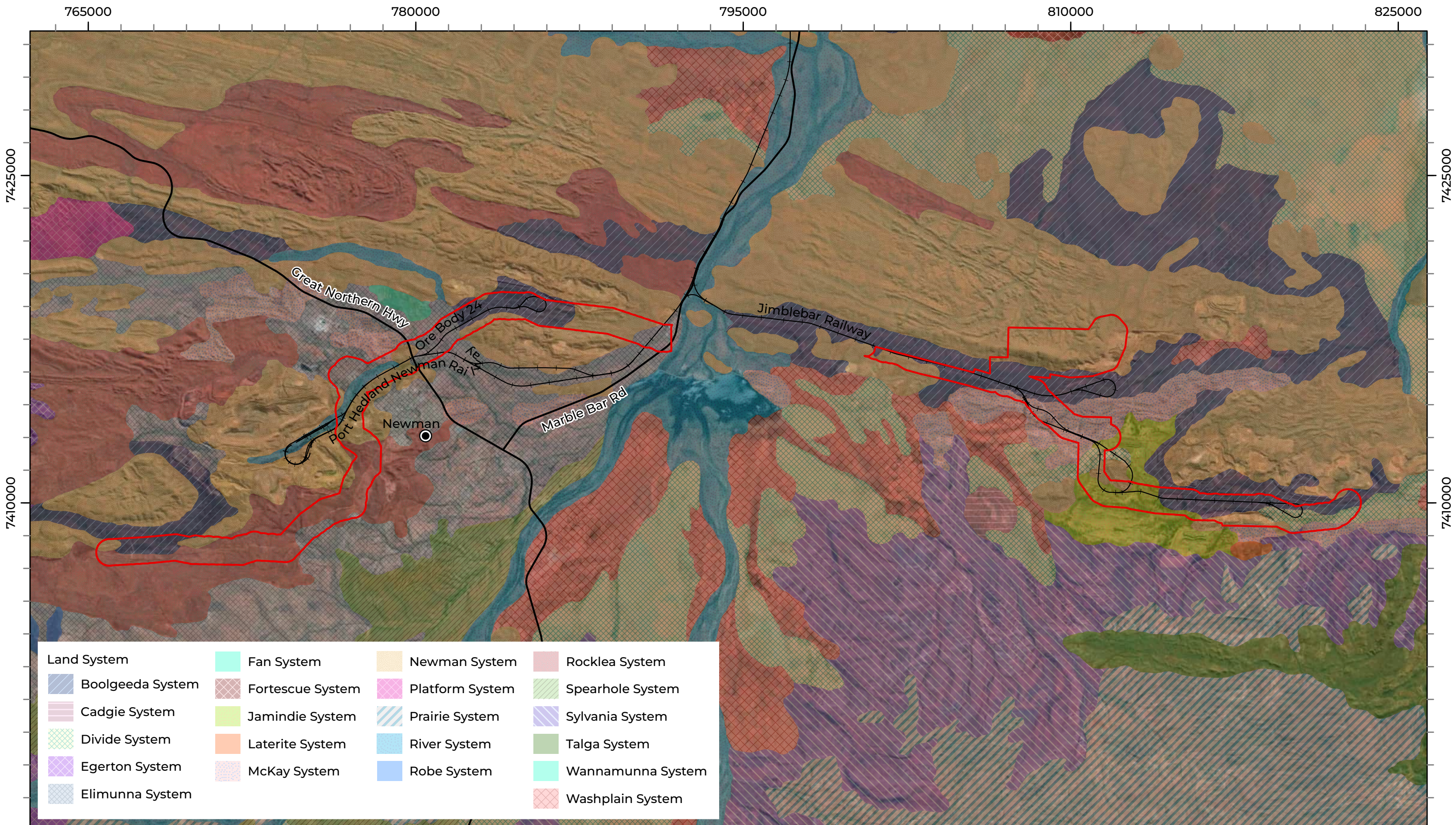
Payne *et al.* (1988) and van Vreeswyk *et al.* (2004) classified and mapped the land systems of the Pilbara bioregion according to similarities in landform, soil, vegetation, geology and geomorphology. Nine land systems occur within the Study Area, the dominant being the Newman land system, which covers approximately 30.56% (2,620.85 ha) of the Study Area (Figure 2.3; Table 2.1). The Newman land system is defined as “rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands” (van Vreeswyk *et al.*, 2004). The Newman land system contains the most significant habitats for many of the target MNES species. The rocky ridges and mountains associated with this land system can support important refugia and foraging habitats for Pilbara leaf-nosed bat, ghost bat, and northern quoll.

Table 2.1: Land systems of the Study Area

Land system	Land type	Description	Extent in Study Area	
			Ha	%
Newman (New)	Hills and ranges with spinifex grasslands	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands.	2,620.85	30.56
Boolgeeda (Bgd)	Stony plains with spinifex grasslands	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	2,108.10	24.58
Rocklea (Roc)	Hills and ranges with spinifex grasslands	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands.	1,415.34	16.51
Elimunna (Eli)	Stony plains with Acacia shrublands	Stony plains on basalt supporting sparse <i>Acacia</i> and <i>Cassia</i> shrublands and patchy tussock grasslands.	787.61	9.19
Mckay (Mck)	Hills and ranges with spinifex grasslands	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts.	627.42	7.32
Jamindie (Jam)	Wash plains on hardpan with groved mulga shrublands	Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey.	485.50	5.66
Divide (Div)	Sandplains with spinifex grasslands	Gently undulating sandplains with minor dunes, supporting hard spinifex hummock grasslands with numerous shrubs.	358.18	4.18
River (Riv)	Water course and drainage systems	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex.	164.98	1.92
Sylvania (Syl)	Stony plains and gritty surfaced plains	Gritty surfaced plains and low rises on granite supporting <i>Acacia-Eremophila-Cassia</i> shrublands.	6.97	0.08
Total			8,574.95	100.00

2.6 Surface Hydrology

The Study Area occurs over two hydrographic sub catchments: Ophthalmia Dam and an unnamed sub catchment (Figure 2.4). The Fortescue River and one of its main tributaries, Warrawanda Creek, lie in between the two sections of the Study Area and these discharge into Ophthalmia Dam (Figure 2.4). Part of one of the other main tributaries of the Fortescue River, Homestead Creek, passes through a section of the Study Area. Homestead Creek discharges into the Fortescue River downstream of Ophthalmia Dam. There are many ephemeral drainage lines within the Study Area that flow in direct response to rainfall, with streamflow mainly occurring during the summer months of December to March. Streamflow in the smaller flow channels is typically short in duration and ceases soon after the rainfall passes. In the larger river channels, which drain the larger catchments, runoff can persist for several weeks and possibly months following major rainfall events.



LEGEND

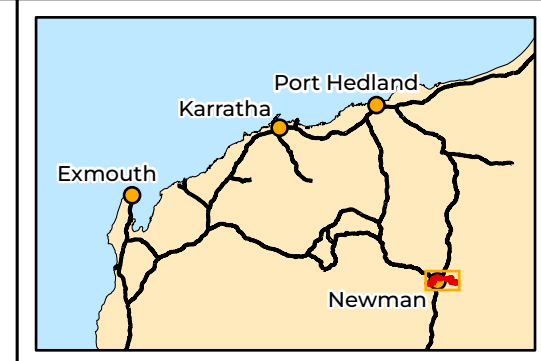
- Study Area
- State Road
- Rail

 **Biologic**

Scale 1:162,000

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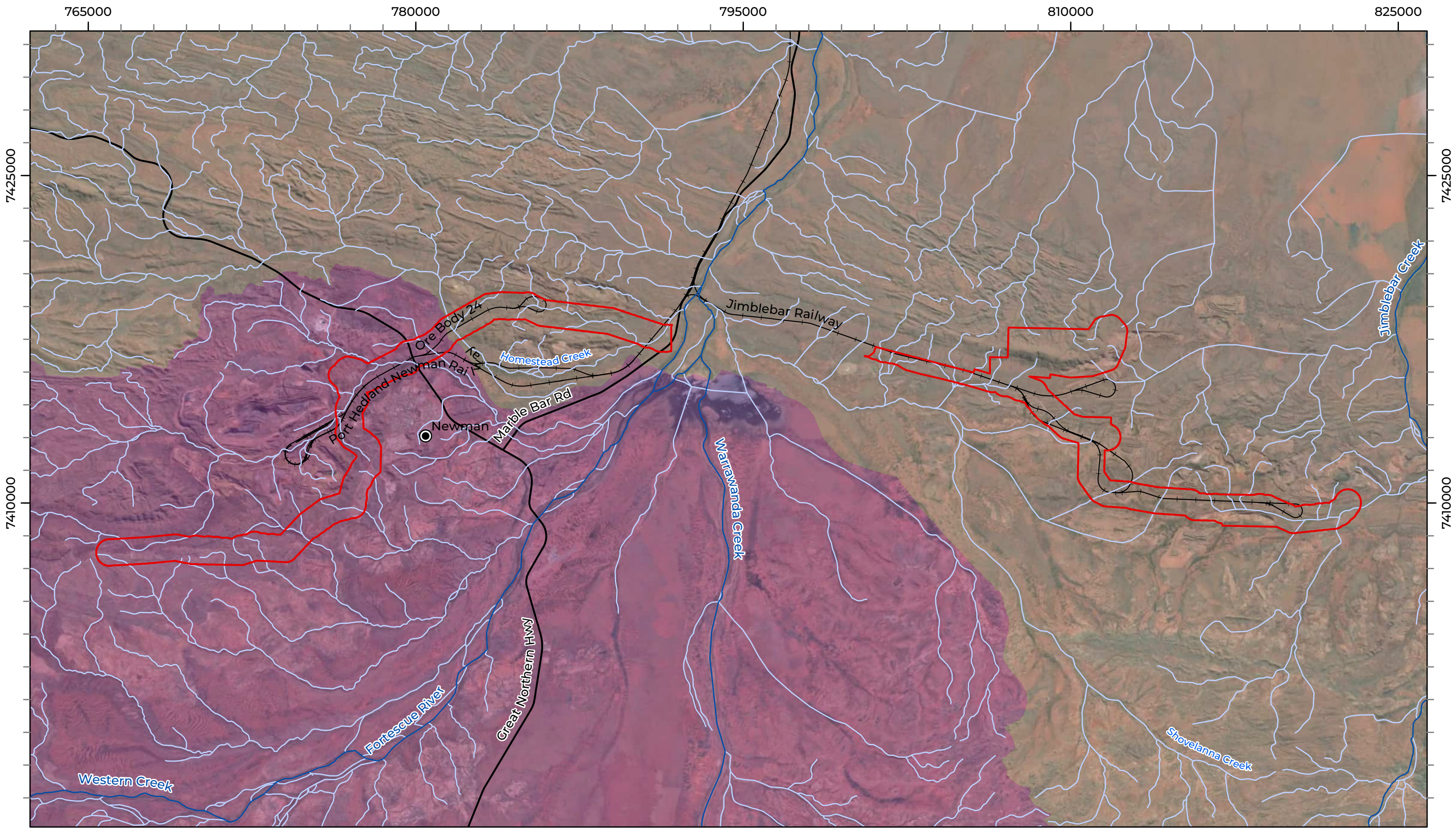
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Transverse Mercator Created: 19/09/2024



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Vertebrate Fauna Survey

**Figure 2.3: Land systems
of the Study Area**



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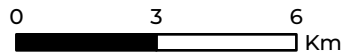
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|--|--|---|
|  Study Area |  Subcatchment |  Surface Hydrology |
|  State Road |  Ophthalmia Dam |  Minor |
|  Rail |  Unnamed |  Major |



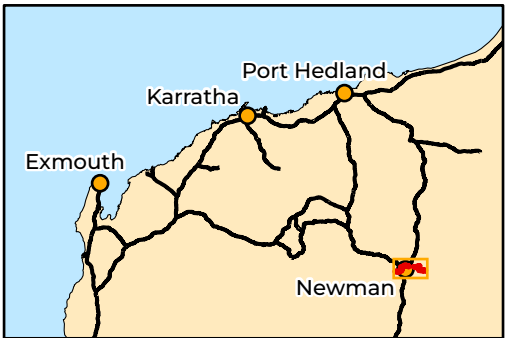
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Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 19/09/2024



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Vertebrate Fauna Survey

Figure 2.4: Surface
hydrology of the
Study Area

2.7 Pre-European Vegetation

Beard (1975) broadly (1:1,000,000) mapped the major structural vegetation types of Western Australia. Shepherd *et al.* (2002) reinterpreted and updated the vegetation association mapping to reflect the National Vegetation Information System (NVIS) standards (ESCAVI, 2003). This update also accounts for extensive clearing since Beard (1975) mapping.

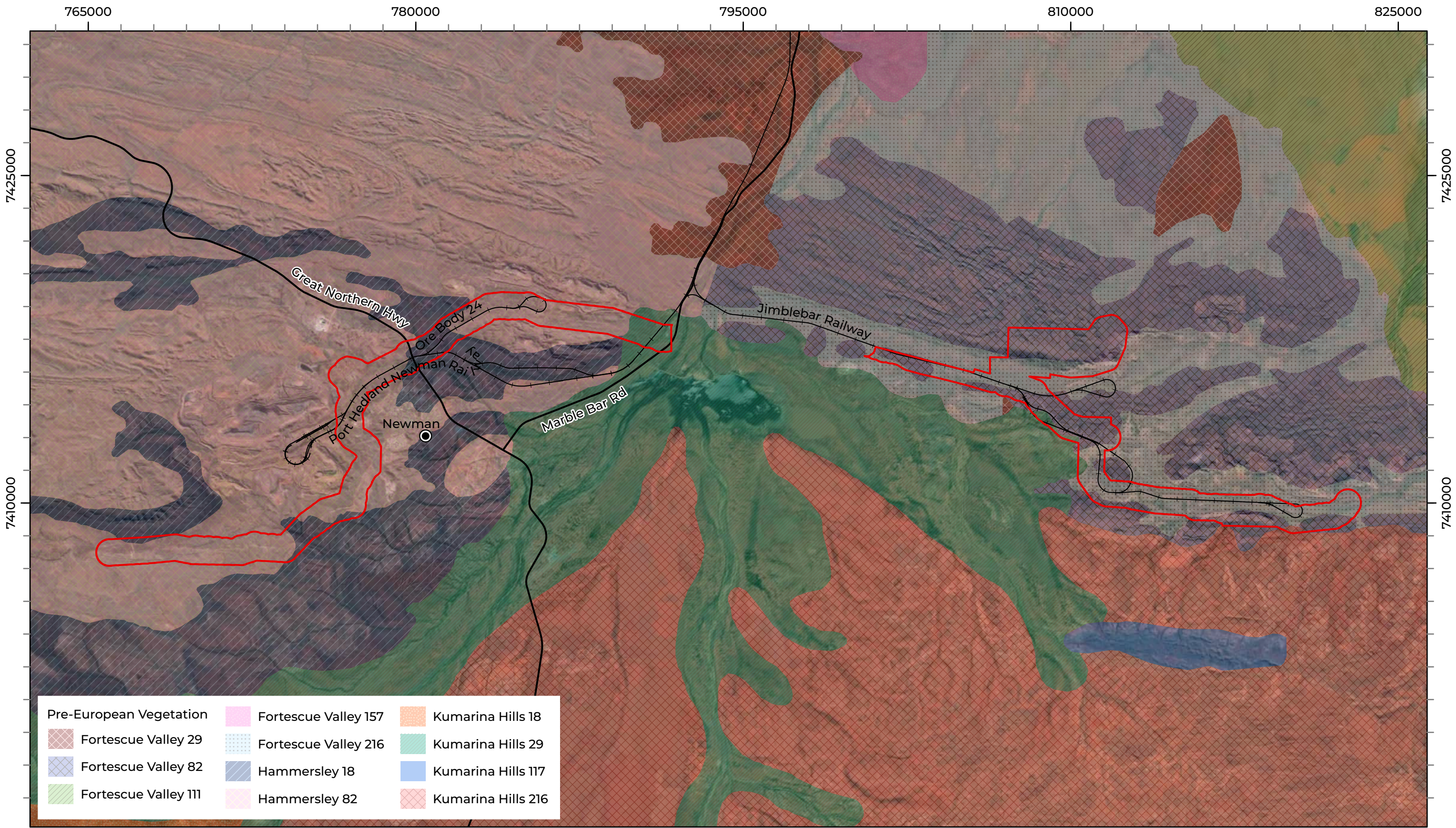
Seven vegetation associations occur within the Study Area (Figure 2.5; Table 2.2). The dominant vegetation association is HAMMERSLEY-82 which covers approximately 40.65% (3,485.30 ha) of the Study Area and comprises hummock grasslands and low snappy gum (*Eucalyptus leucophloia*) trees.

Table 2.2: Vegetation associations within the Study Area

Vegetation Association	Description	Extent in Study Area	
		Ha	%
HAMMERSLEY-82	Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i>	3,485.30	40.65
FORTESCUE VALLEY-216	Low woodland; mulga (<i>Acacia aneura</i>)	2,099.77	24.49
FORTESCUE VALLEY-82	Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i>	2,015.37	23.50
HAMMERSLEY-18	Low woodland; mulga (<i>Acacia aneura</i>)	603.57	7.04
KUMARINA HILLS_29	Low woodland; mulga (<i>Acacia aneura</i>)	345.35	4.03
KUMARINA HILLS_216	Low woodland; mulga (<i>Acacia aneura</i>)	24.91	0.29
FORTESCUE VALLEY_29	Low woodland; mulga (<i>Acacia aneura</i>)	0.67	0.01
Total		8,574.95	100.00

2.8 Land Use and Tenure

The dominant land uses in the Hamersley subregion include grazing, native pastures, conservation, urban areas, and mining (Kendrick, 2003b), as well as recreation and tourism. The Fortescue Plains subregion primary land uses are grazing, native pastures, UCL and Crown reserves, conservation, and mining (Kendrick, 2003b). The dominant land uses in the Augustus subregion are native pasture grazing with lesser areas of native pastures and conservation (Desmond *et al.*, 2003). Several mines and their associated infrastructure in proximity to the Study Area include Mt Whaleback, Orebody 35, Orebody 24, Orebody 25, Orebody 18 and Jimblebar (Figure 1.1). Railway infrastructure associated with these mines run through sections of the Study Area.



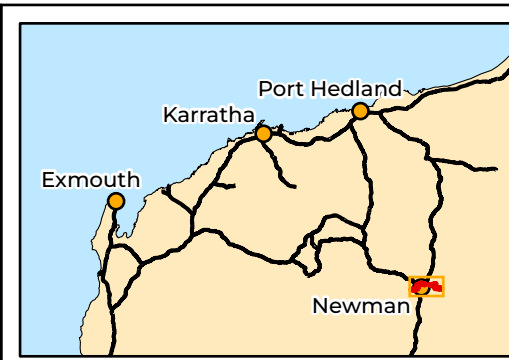
- LEGEND
- Study Area
 - State Road
 - Rail

 **Biologic**

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 19/09/2024



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**Figure 2.5: Pre-European
vegetation associations
of the Study Area**

3 Desktop Assessment

3.1 Methods

A desktop assessment comprising database searches and a literature review was undertaken to determine current distribution and records of the ten target MNES species and other significant vertebrate fauna species potentially occurring within the Study Area (Table 3.1 and Table 3.2).

Six fauna databases were searched (Table 3.1), three contain information on all vertebrate species previously recorded (ALA, 2024; BirdLife Australia, 2024; DBCA, 2024c), two identify species of significance previously recorded (BHP, 2023a; DBCA, 2024b), and one identifies species of significance known or likely to occur within the region based on modelled distribution (DCCEEW, 2024).

Twenty-nine (29) reports were reviewed as part of the literature review (six detailed surveys, 15 targeted surveys, six basic surveys, one desktop and one monitoring report) (Table 3.2; Figure 3.1; Appendix B). Fifteen (15) of these overlapped with a portion of the Study Area, and ten assessments were undertaken within 5 km of it (Table 3.2; Figure 3.1).

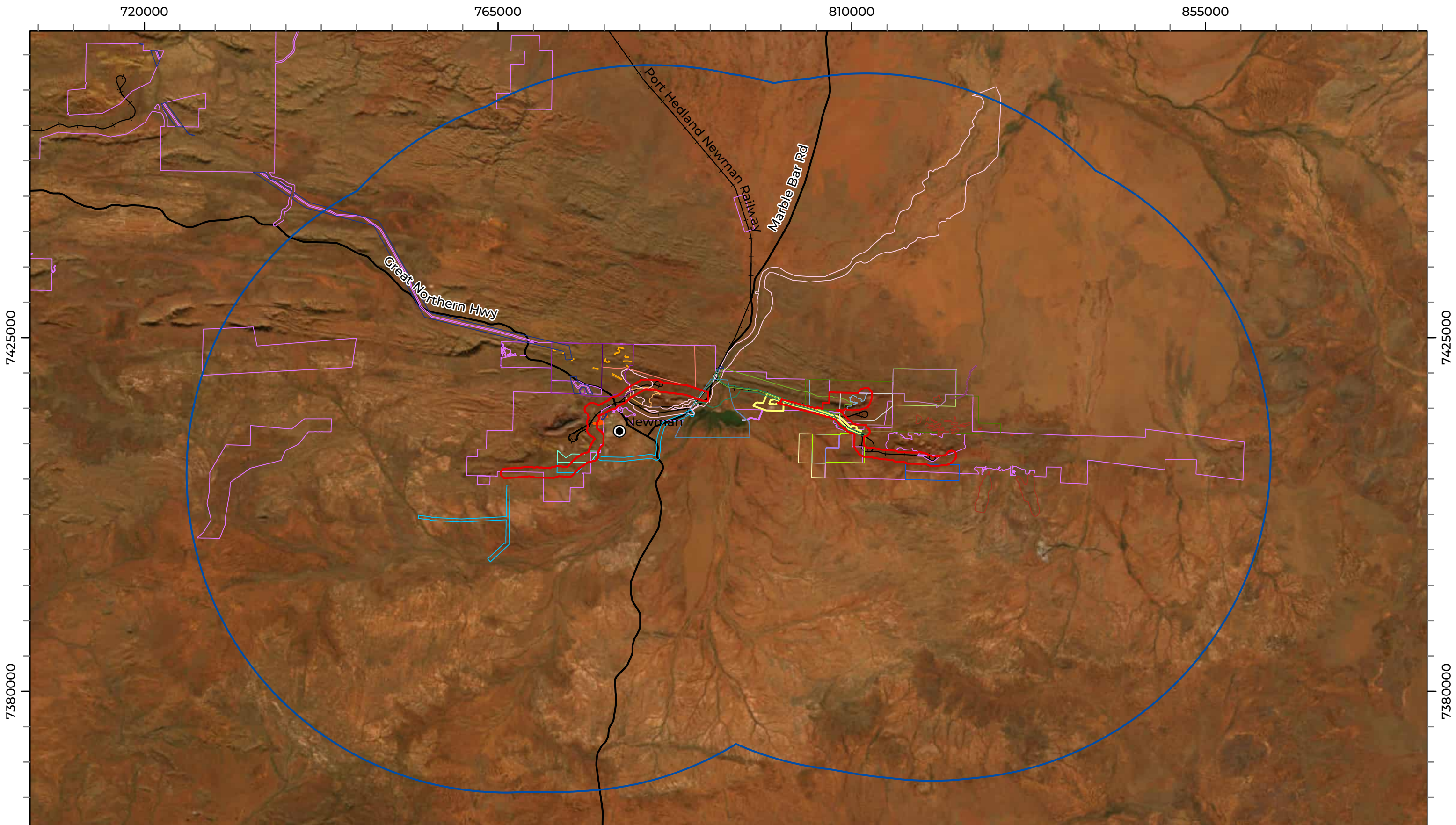
Table 3.1: Databases searched

Database	Data Access/ Receival Date	Search Area
ALA (2024) Atlas of Living Australia	February 2024	40 km
BHP (2023a) Fauna Records Database		
BirdLife Australia (2024) Birddata		
DBCA (2024b) Threatened and Priority Fauna Database		
DBCA (2024c) NatureMap		
DCCEEW (2024) Protected Matters Search Tool		

Table 3.2: Literature reviewed

Report	Survey Type	Distance from Study Area
Astron (2024a) East Caramulla targeted bilby fauna assessment	Targeted	20 km E
Astron (2024b) Newman water treatment plant area targeted significant fauna survey	Targeted	Intersects Study Area
Biologic (2013) Orebody 24 targeted vertebrate fauna survey	Targeted	Adjacent to Study Area
Biologic (2014a) Dynasty Tenement desktop review of vertebrate fauna and habitats	Detailed	Intersects Study Area
Biologic (2014b) Orebody 19 Level 2 vertebrate fauna survey	Targeted	Intersects Study Area
Biologic (2014c) Orebody 25 targeted vertebrate fauna survey	Detailed	3 km SE
Biologic (2014d) Orebody 31 vertebrate fauna survey	Desktop	1 km S
Biologic (2016a) Cathedral Gorge Level 1 and targeted vertebrate fauna survey	Targeted	2 km NW
Biologic (2016b) Dynasty Level 1 vertebrate fauna survey	Basic	1 km S
Biologic (2016c) Dynasty Level 2 vertebrate fauna survey	Detailed	1 km S
Biologic (2018b) Dynasty vertebrate fauna monitoring 2018	Monitoring	1 km S
Biologic (2019) Shearer's West targeted vertebrate and short-range endemic invertebrate fauna assessment	Targeted	Intersects Study Area
Biologic (2020b) Jimblebar greenhouse gas abatement study Basic vertebrate fauna survey	Basic	Intersects Study Area
Biologic (2022c) Western Ridge pipelines vertebrate fauna survey	Targeted	Intersects Study Area
Biologic (2022b) Western Ridge Paddy Bore Area vertebrate fauna assessment memorandum	Targeted	Intersects Study Area
Biologic (2022a) North Jimblebar: targeted northern quoll assessment	Targeted	Intersects Study Area
Biologic (2023a) OB32 West, OB28 and OB33: targeted fauna survey	Targeted	Intersects Study Area
Biologic (2023b) Warrawandu targeted significant vertebrate fauna survey	Targeted	Intersects Study Area
Biota (2022) Orebody 32 surplus water targeted MNES vertebrate fauna survey	Targeted	Intersects Study Area
Ecologia (2004) Eastern Ophthalmia range expansion biological survey	Detailed	12 km E
ENV (2007) Orebody 18 fauna assessment phase II	Detailed	24 km E
ENV (2011) Orebody 31 fauna assessment	Basic	32 km E

Report	Survey Type	Distance from Study Area
GHD (2021b) Jimblebar targeted ghost bat survey	Targeted	Intersects Study Area
GHD (2022) OB32 West, OB28 and OB33 targeted vertebrate fauna surveys	Targeted	Intersects Study Area
MWH (2015) Ophthalmia Dam avian fauna survey	Targeted	5 km E
Onshore (2015a) OB31 Jimblebar access track VCP Level 1 flora & vegetation survey and vertebrate fauna assessment	Basic	Intersects Study Area
Onshore (2015b) Tenement E52/2238 Level 1 flora and vegetation and Level 1 vertebrate fauna survey	Basic	Intersects Study Area
Onshore (2017) Reconnaissance flora and vegetation survey and fauna assessment Newman to Mining Area C powerline corridor	Basic	<1 km
Outback Ecology (2009) Jimblebar linear development terrestrial vertebrate fauna assessment	Detailed	3 km E



LEGEND

- Study Area
- Desktop Assessment Area
- State Road
- Rail

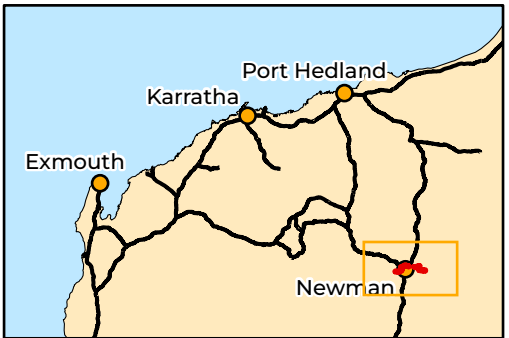


Biologic

Scale 1:450,000

0 5 10 15 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 25/10/2024



Exmouth

Karratha

Port Hedland

Newman

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**Figure 3.1: Previous
surveys from the
desktop assessment**

Literature Source

-  Astron Environmental Services (2024). Newman Water Tank Area Targeted Significant Fauna Survey. Unpublished report for BHP Western Australian Iron Ore.
-  Biologic Environmental Survey (2013). Ore Body 24 Targeted Vertebrate Fauna Survey
-  Biologic Environmental Survey (2014). Orebody 19 Level 2 Vertebrate Fauna Survey
-  Biologic Environmental Survey (2014). Orebody 31 Vertebrate Fauna Survey
-  Biologic Environmental Survey (2014). Orebody 25 Targeted Vertebrate Fauna Survey
-  Biologic Environmental Survey (2014). Dynasty Tenement Desktop Review of Vertebrate Fauna and Habitats
-  Biologic Environmental Survey (2015). Orebody 31 to Ophthalmia Dam Pipeline Level 1 Flora, Vegetation and Vertebrate Fauna Survey
-  Biologic Environmental Survey (2016). Dynasty Level 2 Vertebrate Fauna Survey
-  Biologic Environmental Survey (2016). Dynasty Level 1 Vertebrate Fauna Survey
-  Biologic Environmental Survey (2016). Cathedral Gorge Level 1 and Targeted Vertebrate Fauna Survey
-  Biologic Environmental Survey (2018). Consolidated Fauna Habitat Mapping 2017
-  Biologic Environmental Survey (2018). Dynasty Vertebrate Fauna Monitoring 2018
-  Biologic Environmental Survey (2019). Shearer's West Targeted Vertebrate and Short-range Endemic Invertebrate Fauna Assessment
-  Biologic Environmental Survey (2020). Jimblebar Greenhouse Gas Abatement Level 1 Terrestrial Vertebrate Fauna Survey. Unpublished report prepared for BHP Iron Ore.
-  Biologic Environmental Survey (2022). Western Ridge Pipeline Targeted Fauna. Unpublished report prepared for BHP Iron Ore.
-  Biologic Environmental Survey (2022). Western Ridge Paddy Bore Area Vertebrate Fauna Assessment Memorandum. Unpublished report prepared for BHP WAIO.
-  Biologic Environmental Survey (2022). North Jimblebar Targeted Northern Quoll Assessment. Unpublished report prepared for BHP WAIO
-  Biologic Environmental Survey (2023). OB28, OB32, OB33 Targeted Fauna Survey. Unpublished report prepared for BHP WAIO.
-  Biologic Environmental Survey (2023). Warrawandu Targeted Vertebrate Fauna Survey. Unpublished report prepared for BHP WAIO
-  Biota (2022). Orebody 32 Surplus Water Targeted MNES Vertebrate Fauna Survey. Unpublished report for BHP WAIO.
-  ENV (2007). Orebody 18 Fauna Assessment Phase II
-  ENV (2011). Orebody 31 Fauna Assessment
-  Ecologia (2004). Eastern Ophthalmia Range Expansion Biological Survey
-  GHD Pty Ltd (2021). Jimblebar targeted ghost bat survey. Unpublished report for BHP Iron Ore
-  GHD Pty Ltd (2022). OB32 West, OB33 and OB29 Targeted Vertebrate Fauna Survey. Report prepared for BHP Western Australia Iron Ore.
-  MWH (2015). Ophthalmia Dam Avian Fauna Survey
-  Onshore (2015). OB31 Jimblebar Access Track VCP Level 1 Flora & Vegetation Survey and Vertebrate Fauna Assessment
-  Onshore (2015). Tenement E52/2238 Level 1 Flora & Vegetation and Vertebrate Fauna Survey
-  Onshore (2017). Reconnaissance Flora and Vegetation Survey and Fauna Assessment Newman to Mining Area C
-  Outback Ecology (2009). Jimblebar Linear Development Terrestrial Vertebrate Fauna Assessment



3.2 Results

The desktop assessment identified 382 vertebrate fauna species (48 mammals, 207 birds, 118 reptiles and nine amphibians) which have previously been recorded and/ or have the potential to occur within the Study Area (Appendix B).

Forty-four (44) are classified as significant species, including the ten target MNES species (Figure 3.2a and b; Figure 3.3a and b; Appendix B). The following seven species have previously been recorded within the Study Area prior to the current survey:

- northern quoll – Vulnerable (EPBC Act and BC Act): one record
- ghost bat – Vulnerable (EPBC Act and BC Act): seven records
- brush-tailed mulgara (*Dasycercus blythi*) – Priority 4 (DBCA): eight records
- western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4 (DBCA): 22 records
- peregrine falcon (*Falco peregrinus*) – Specially Protected (BC Act): two records
- Pilbara olive python – Vulnerable (EPBC Act and BC Act): one record
- Gane's blind-snake (*Anilius ganei*) – Priority 1 (DBCA): three records.

A further 25 significant species have previously been recorded within 5 km of the Study Area:

- long-tailed dunnart (*Antechinomys longicaudatus*) – Priority 4 (DBCA)
- Pilbara leaf-nosed bat – Vulnerable (EPBC Act and BC Act)
- southern whiteface – Vulnerable (EPBC Act and BC Act)
- garganey (*Anas querquedula*) – Migratory (EPBC Act and BC Act)
- fork-tailed swift (*Apus pacificus*) – Migratory (EPBC Act and BC Act)
- little ringed plover (*Charadrius dubius*) – Migratory (EPBC Act and BC Act)
- oriental plover (*Charadrius veredus*) – Migratory (EPBC Act and BC Act)
- grey falcon – Vulnerable (EPBC Act and BC Act)
- barn swallow (*Hirundo rustica*) – Migratory (EPBC Act and BC Act)
- gull-billed tern (*Gelochelidon nilotica*) – Migratory (EPBC Act and BC Act)
- Caspian tern (*Sterna caspia*) – Migratory (EPBC Act and BC Act)
- common sandpiper (*Actitis hypoleucos*) – Migratory (EPBC Act and BC Act)
- sharp-tailed sandpiper (*Calidris acuminata*) – Migratory (EPBC Act and BC Act)
- curlew sandpiper (*Calidris ferruginea*) – Critically Endangered/ Migratory (EPBC Act and BC Act)
- pectoral sandpiper (*Calidris melanotos*) – Migratory (EPBC Act and BC Act)
- red-necked stint (*Calidris ruficollis*) – Migratory (EPBC Act and BC Act)
- long-toed stint (*Calidris subminuta*) – Migratory (EPBC Act and BC Act)
- black-tailed godwit (*Limosa limosa*) – Migratory (EPBC Act and BC Act)
- ruff (*Calidris pugnax*) – Migratory (EPBC Act and BC Act)
- wood sandpiper (*Tringa glareola*) – Migratory (EPBC Act and BC Act)
- common greenshank (*Tringa nebularia*) – Migratory (EPBC Act and BC Act)

- marsh sandpiper (*Tringa stagnatilis*) – Migratory (EPBC Act and BC Act)
- common redshank (*Tringa tetanus*) – Migratory (EPBC Act and BC Act)
- glossy ibis (*Plegadis falcinellus*) – Migratory (EPBC Act and BC Act)
- spotted ctenotus (*Ctenotus uber johnstonei*) – Priority 2 (DBCA).

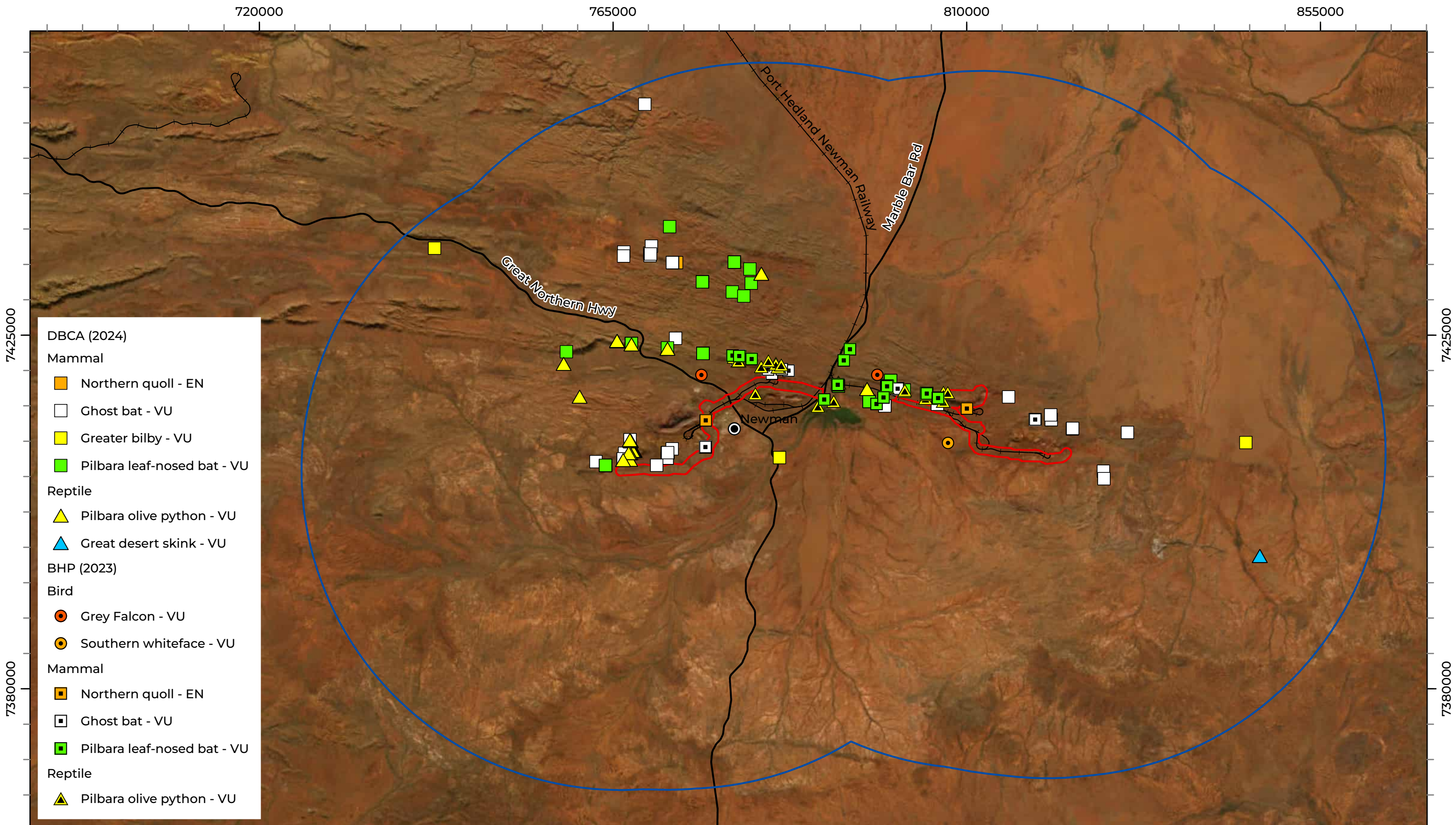
Due to the size of the desktop assessment search area, and likelihood of encompassing habitats which may not occur within the Study Area, results of the desktop review are likely to include species which may not occur within the Study Area (e.g. marine bird species). Additionally, many species tend to be patchily distributed even where appropriate habitats are present, and many species of birds can occur as regular migrants, occasional visitors or vagrants. For the purposes of this desktop assessment, extinct species, marine bird species (i.e. petrels and albatross) and/or species that cannot physically occur within the Study Area (i.e. marine species) have been excluded from the database search results and are not discussed further herein.

Table 3.3: Species of significance identified in the desktop assessment

Species		Conservation Status				Recorded within Study Area
Scientific Name	Common Name	EPBC Act	BC Act	DBCA	IUCN	
MAMMALS						
DASYURIDAE						
<i>Antechinomys longicaudatus</i>	Long-tailed dunnart			P4		
<i>Dasycercus blythi</i>	Brush-tailed mulgara			P4		•
<i>Dasyurus hallucatus</i>	Northern quoll	EN	EN		EN	•
MACROPODIDAE						
<i>Lagorchestes conspicillatus</i> subsp. <i>leichardti</i>	Spectacled hare-wallaby			P4		
<i>Petrogale lateralis</i> subsp. <i>lateralis</i>	Black-flanked rock-wallaby	EN	EN		EN	
MEGADERMATIDAE						
<i>Macroderma gigas</i>	Ghost bat	VU	VU		VU	•
MURIDAE						
<i>Leggadina lakedownensis</i>	Northern short-tailed mouse			P4		
<i>Pseudomys chapmani</i>	Western pebble-mound mouse			P4		•
NOTORYCTIDAE						
<i>Notoryctes caurinus</i>	Northern marsupial mole			P4		
RHINONYCTERIDAE						

Species		Conservation Status				Recorded within Study Area
Scientific Name	Common Name	EPBC Act	BC Act	DBCA	IUCN	
<i>Rhinonictes aurantia</i>	Pilbara leaf-nosed bat	VU	VU			
THYLACOMYIDAE						
<i>Macrotis lagotis</i>	Greater bilby	VU	VU		VU	
BIRDS						
ACANTHIZIDAE						
<i>Aphelocephala leucopsis</i>	Southern whiteface	VU				
ANATIDAE						
<i>Anas querquedula</i>	Garganey	MI	MI			
APODIDAE						
<i>Apus pacificus</i>	Fork-tailed swift	MI	MI			
CHARADRIIDAE						
<i>Charadrius dubius</i>	Little ringed plover	MI	MI			
<i>Charadrius leschenaultii</i>	Greater sand plover	MI / VU	VU			
<i>Charadrius veredus</i>	Oriental plover	MI	MI			
FALCONIDAE						
<i>Falco hypoleucos</i>	Grey falcon	VU	VU		VU	
<i>Falco peregrinus</i>	Peregrine falcon		OS			.
HIRUNDINIDAE						
<i>Hirundo rustica</i>	Barn swallow	MI	MI			
LARIDAE						
<i>Gelochelidon nilotica</i>	Gull-billed tern	MI	MI			
<i>Sterna caspia</i>	Caspian tern	MI	MI			
MOTACILLIDAE						
<i>Motacilla cinerea</i>	Grey wagtail	MI	MI			
<i>Motacilla flava</i>	Yellow wagtail	MI	MI			
PSITTACIDAE						
<i>Pezoporus occidentalis</i>	Night parrot	EN	CR		CR	
<i>Polytelis alexandrae</i>	Princess parrot	VU		P4	NT	
ROSTRATULIDAE						
<i>Rostratula australis</i>	Australian painted snipe	EN	EN		EN	
SCOLOPACIDAE						
<i>Actitis hypoleucos</i>	Common sandpiper	MI	MI			
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	MI	MI		VU	
<i>Calidris ferruginea</i>	Curlew sandpiper	CR/MI	CR/MI		NT	
<i>Calidris melanotos</i>	Pectoral sandpiper	MI	MI			

Species		Conservation Status				Recorded within Study Area
Scientific Name	Common Name	EPBC Act	BC Act	DBCA	IUCN	
<i>Calidris ruficollis</i>	Red-necked stint	MI	MI			
<i>Calidris subminuta</i>	Long-toed stint	MI	MI			
<i>Limosa limosa</i>	Black-tailed godwit	MI	MI			
<i>Calidris pugnax</i>	Ruff	MI	MI			
<i>Tringa glareola</i>	Wood sandpiper	MI	MI			
<i>Tringa nebularia</i>	Common greenshank	MI	MI			
<i>Tringa stagnatilis</i>	Marsh sandpiper	MI	MI			
<i>Tringa totanus</i>	Common redshank	MI	MI			
THRESKIORNITHIDAE						
<i>Plegadis falcinellus</i>	Glossy ibis	MI	MI			
REPTILES						
PYTHONIDAE						
<i>Liasis olivaceus</i> subsp. <i>barroni</i>	Pilbara olive python	VU	VU			•
SCINCIDAE						
<i>Ctenotus uber</i> subsp. <i>johnstonei</i>	Spotted ctenotus			P2		
<i>Liopholis kintorei</i>	Great desert skink	VU	VU		VU	
TYPHLOPIDAE						
<i>Anilius ganeii</i>	Gane's blind snake			P1		•



LEGEND

- Study Area
- Desktop Assessment Area
- State Road
- Rail

Scale 1:450,000

0 5 10 15 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 19/09/2024

Exmouth

Karratha

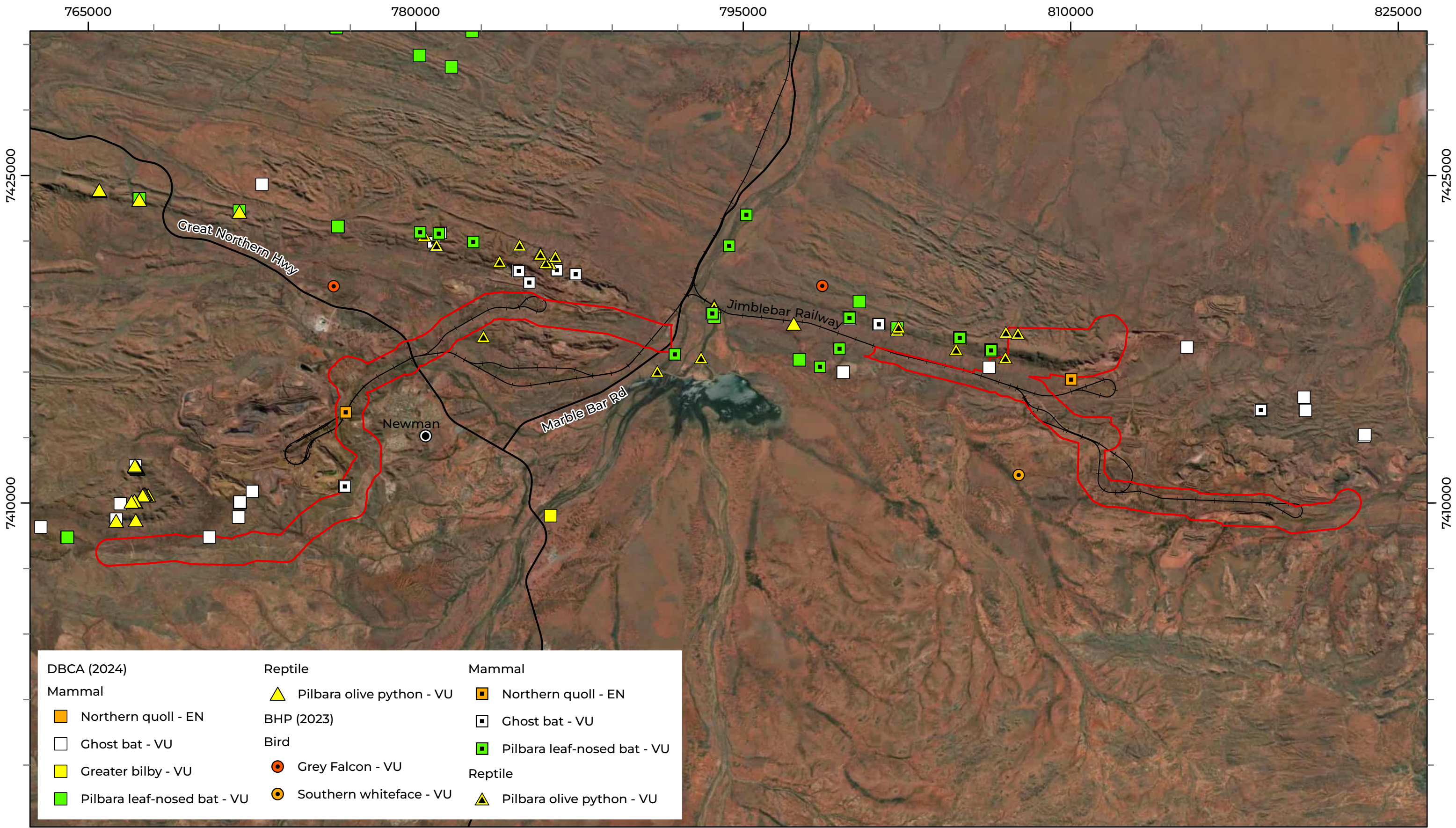
Port Hedland

Newman

BHP WAIO

Power 2030 Targeted Vertebrate Fauna Survey

Figure 3.2a: Targeted MNES fauna records from the desktop assessment



LEGEND

- Study Area
- Desktop Assessment Area
- State Road
- Rail

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 19/09/2024

Exmouth

Karratha

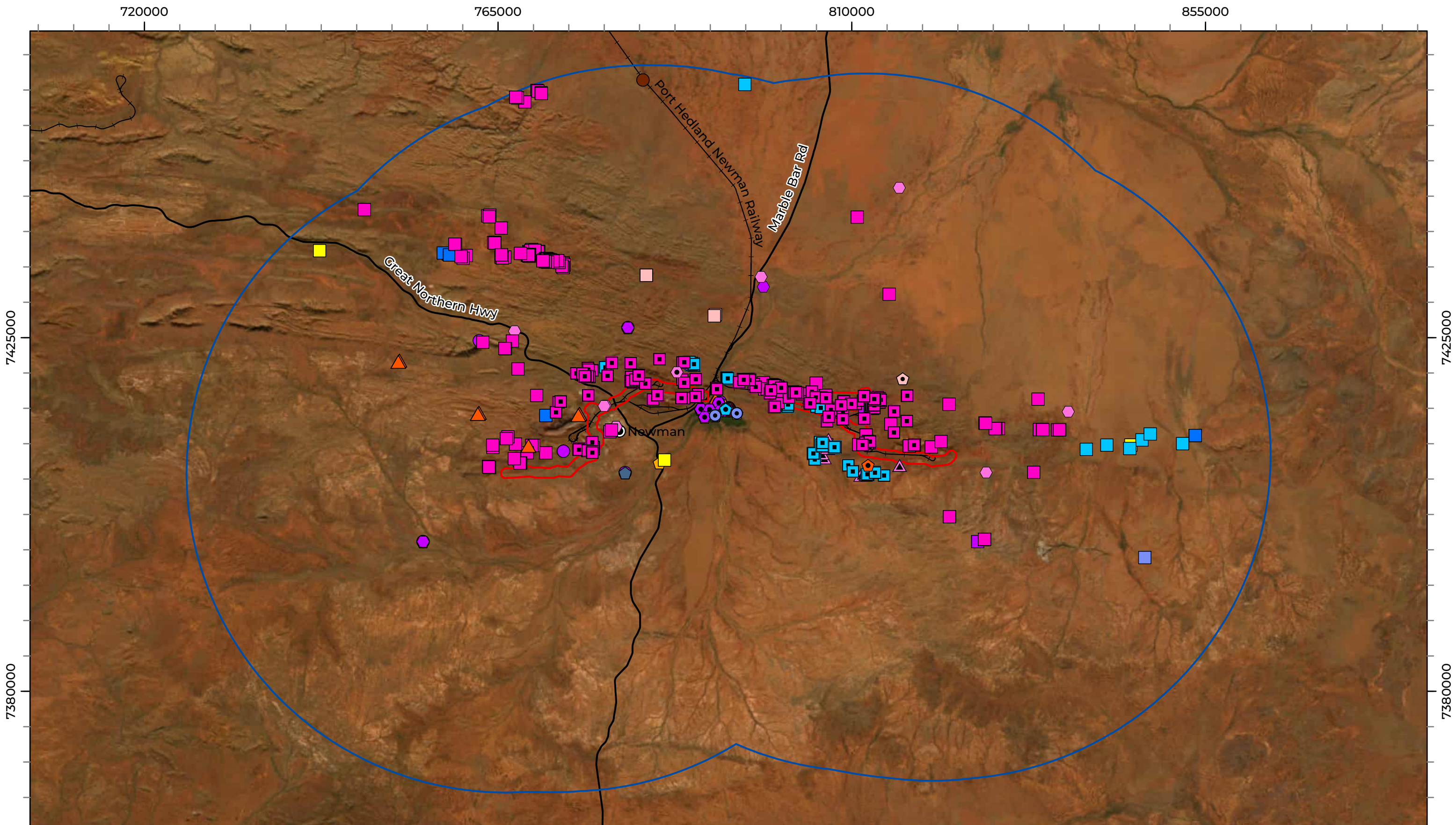
Port Hedland

Newman

BHP WAIO

Power 2030 Targeted Vertebrate Fauna Survey

Figure 3.2b: Targeted MNES fauna records from the desktop assessment in the Study Area



- LEGEND
- Study Area
 - Desktop Assessment Area
 - State Road
 - Rail



Biologic



Scale 1:450,000

0

5

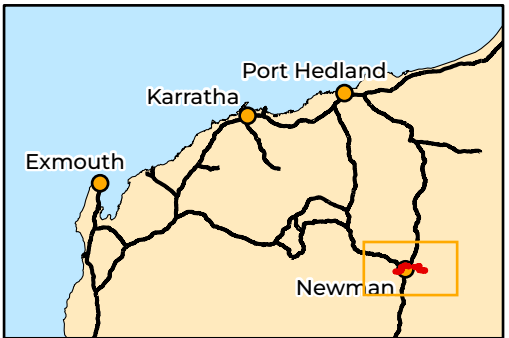
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15

Km

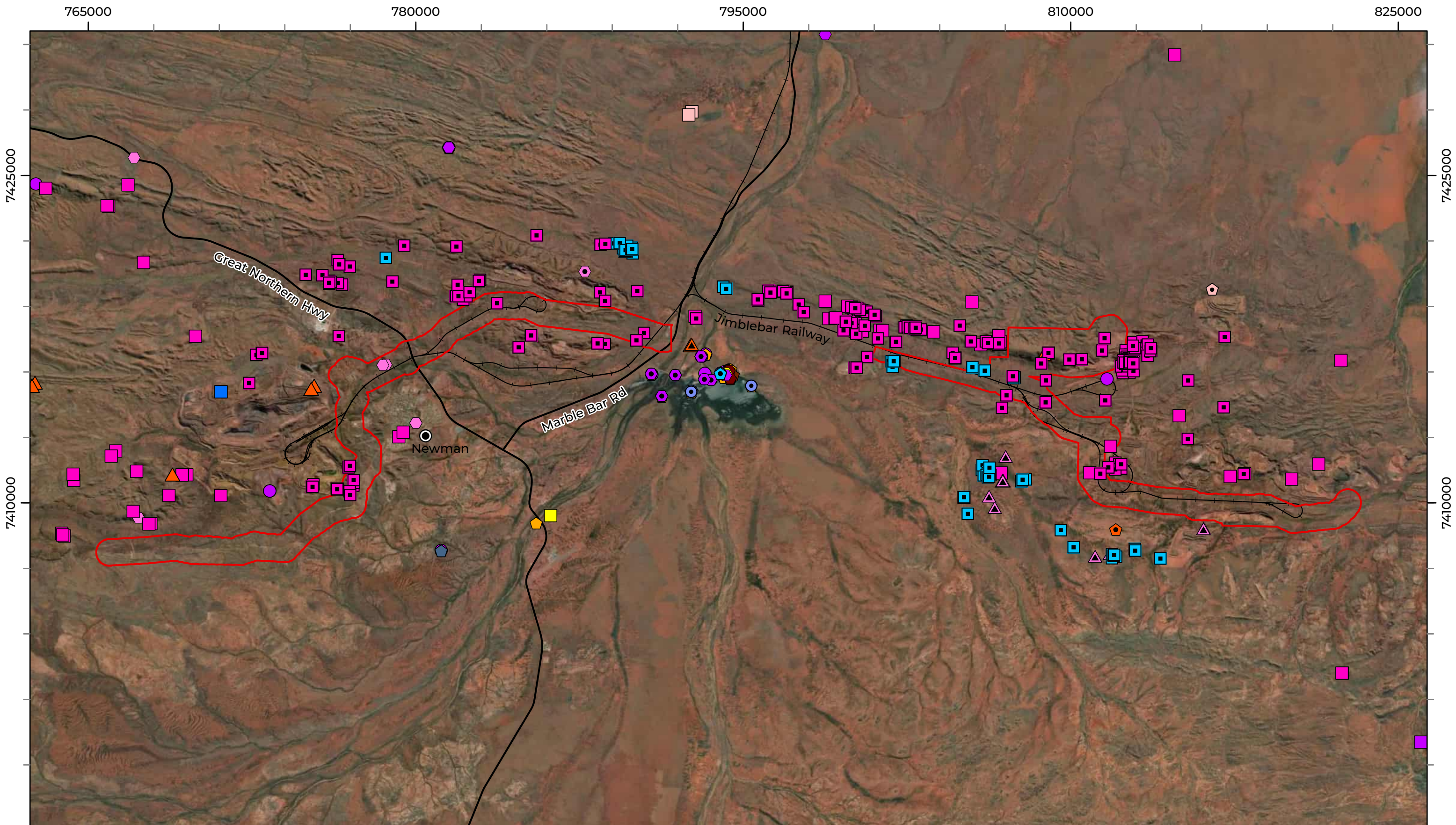
Coordinate System: GDA 1994 MGA Zone 50
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BHP WAIO
**Power 2030 Targeted
Vertebrate Fauna Survey**

Figure 3.3a: Other significant
fauna records from the
desktop assessment



- LEGEND
- Study Area
 - Desktop Assessment Area
 - State Road
 - Rail



Biologic



Scale 1:162,000

0

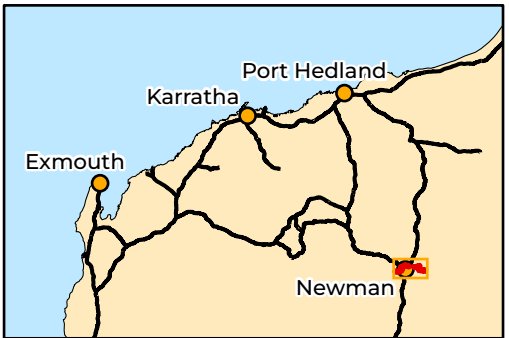
3

6

Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator

Created: 02/10/2024



BHP WAIO
**Power 2030 Targeted
Vertebrate Fauna Survey**

Figure 3.3b: Other
significant fauna records
from the desktop assessment
in the Study Area

DBCA (2024)

Bird

- Curlew sandpiper - CR
- Princess parrot - P4
- Caspian tern - MI
- Common greenshank - MI
- Common redshank - MI
- Common sandpiper - MI
- ◡ Fork-tailed swift - MI
- ◡ Glossy ibis - MI
- ◡ Gull-billed tern - MI
- ◡ Long-toed stint - MI
- ◡ Marsh sandpiper - MI
- ◡ Oriental plover - MI
- ◡ Pectoral sandpiper - MI
- ◡ Red-necked stint - MI
- ◡ Sharp-tailed sandpiper - MI
- ◡ Wood sandpiper - MI
- ◡ Peregrine falcon - OS

Mammal

- ◡ Black-flanked rock-wallaby - EN
- ◡ Greater bilby - VU
- ◡ Brush-tailed mulgara - P4
- ◡ Long-tailed dunnart - P4
- ◡ Northern marsupial mole - P4
- ◡ Spectacled hare-wallaby (mainland) - P4
- ◡ Western pebble-mound mouse - P4

Reptile

- ▲ Gane's blind snake - P1
- ▲ Spotted ctenotus - P2

BHP (2023)

Bird

- ◡ Curlew sandpiper - CR
- Barn swallow - MI
- Black-tailed godwit - MI
- Common greenshank - MI
- Common sandpiper - MI
- ◡ Fork-tailed swift - MI
- ◡ Garganey - MI
- ◡ Glossy ibis - MI
- ◡ Little ringed plover - MI
- ◡ Long-toed stint - MI
- ◡ Marsh sandpiper - MI
- ◡ Pectoral sandpiper - MI
- ◡ Ruff - MI
- ◡ Sharp-tailed sandpiper - MI
- ◡ Wood sandpiper - MI
- ◡ Peregrine falcon - OS

Mammal

- ◡ Brush-tailed mulgara - P4
- ◡ Western pebble-mound mouse - P4

Reptile

- ▲ Gane's blind snake - P1
- ▲ Spotted ctenotus - P2



4 Survey Methods

4.1 Survey Timing and Weather

One single-season targeted field survey was undertaken concurrently with the NEBO/OB25 West targeted field survey (Biologic, *in prep.-b*) from 15–24 April 2024 (Table 4.1). This meant there was some overlap with sampling sites due to the overlap in Study Areas. Observed weather conditions prior to and during the survey is shown in Table 4.1 and Figure 4.1. Current and long-term climatic data is available from the Bureau of Meteorology (BoM) weather station at Newman Aero (Station 007176), located approximately 9 km south-west of the Study Area (BoM, 2024). In the six months prior to the field survey (April 2024), minimum and maximum temperatures recorded at Newman Aero were higher than long-term averages for most months, except for March 2024 (Figure 4.1). Temperatures during the survey were slightly lower than the long-term minimum and maximum averages, recording 0.5°C below and 0.8°C below, respectively.

Overall, rainfall was higher than the long-term average for the six months prior to the survey with a total of 297.4 mm compared to the long-term average (LTA) of 235.1 mm. This was largely due to substantially higher than average rainfall in the months of January 2024 (188.6 mm compared with LTA 70.2 mm) and March 2024 (102 mm compared with LTA 43.5 mm) (Figure 4.1). All other months in this period received lower than average rainfall. April 2024 recorded 0.4 mm total rainfall, although no rain was recorded during the survey (Table 4.1). This is well below the long-term average of 21.6 mm for April.

Table 4.1: Climatic conditions at Newman Aero (BoM, 2024) during the survey

Date	Min. temp (°C)	Max. temp (°C)	Rainfall (mm)
15/04/2024	18.8	34.9	0
16/04/2024	18.4	34.2	0
17/04/2024	22.2	33.2	0
18/04/2024	20	30.3	0
19/04/2024	17	29.1	0
20/04/2024	14.7	27.4	0
21/04/2024	9.8	29.3	0
22/04/2024	11.2	29.4	0
23/04/2024	11	30.2	0
24/04/2024	17.1	28.3	0

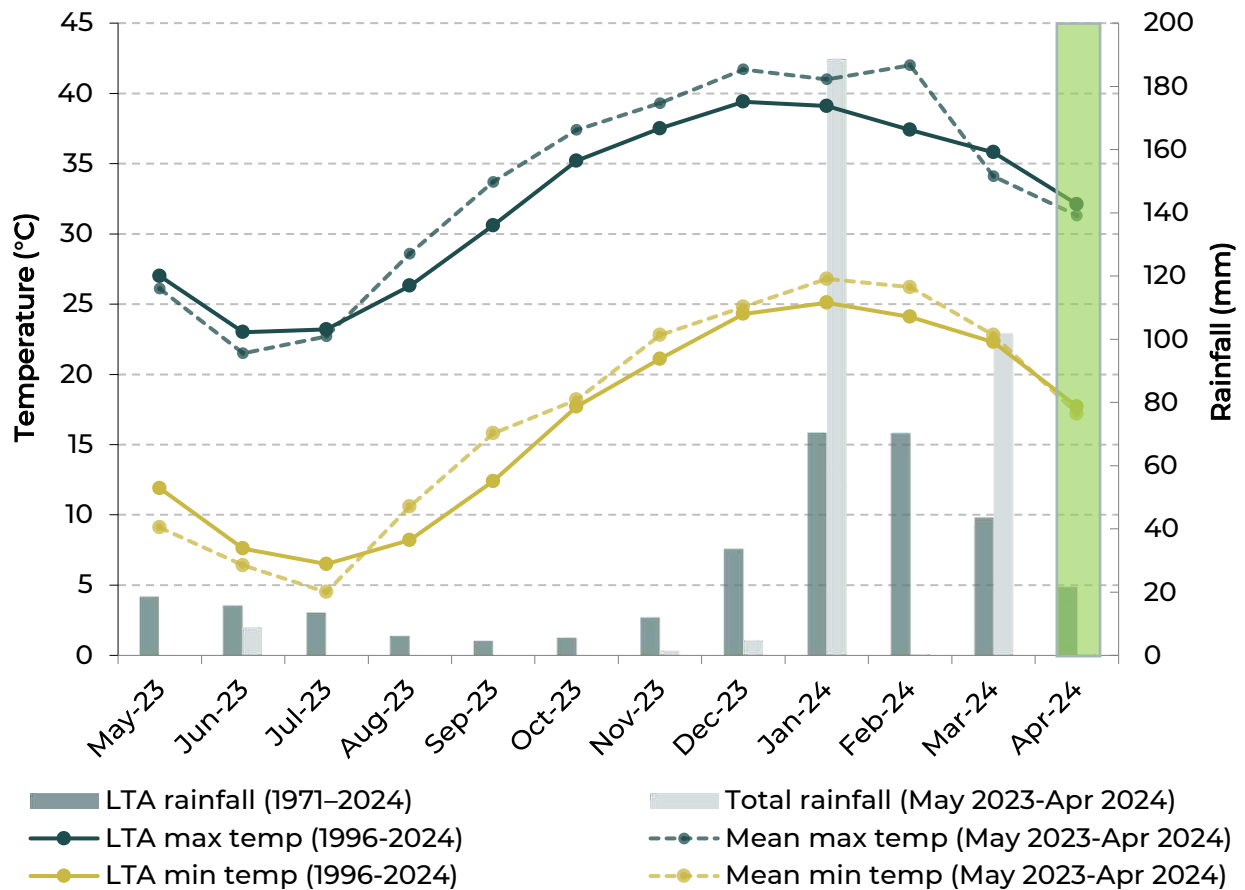


Figure 4.1: Current and long-term climatic data for Newman Airport (BoM, 2024) with approximate survey timing shown in green shaded box

4.2 Personnel and Licences

The field surveys were completed by zoologists with extensive experience undertaking vertebrate fauna surveys in the Pilbara region (Table 4.2). The survey was conducted under the following licences and permits; Department of Primary Industries and Regional Development (DPIRD) *Animal Welfare Act 2002* Licence to use animals for scientific purposes (Licence No. U244/2022-2024); DBCA Regulation 27 “Fauna Taking (Biological Assessment) Licence”, issued to Chris Knuckey (Licence No. BA27000980); DBCA “Authorisation to Take or Disturbed Threatened Species” issued to Chris Knuckey (Authorisation No. TFA 2324-0159); and Murdoch University Animal Ethics Committee permit RW3354/21.

Table 4.2: Survey personnel and experience

Name	Qualification	Experience
Aidan Williams (Senior Zoologist)	BSc Conservation Biology and Botany	7 years Zoology 9 years Field Survey 9 years EIA (consulting)
Jari Cornelis (Senior Zoologist)	MSc Philosophy BSc Zoology and Ecology	7 years Zoology 7 years Field Survey 6 years EIA (consulting)
Anders Zimny (Senior Zoologist)	BSc Biological Science	14 years Zoology 14 years Field Survey 6 years EIA (consulting)
Sammy Alatas (Zoologist)	BSc Conservation and Wildlife Biology (in progress)	1 year Zoology 3 years Field Survey 2 years EIA (consulting)

4.3 Habitat Assessments and Mapping

A total of 115 habitat assessments were undertaken in representative habitats across the Study Area (Figure 4.2a and b; Appendix C). The aim of these were to define and delineate broad fauna habitats present and their suitability to species of significance. Habitat assessments were undertaken at all sampling locations and opportunistically where changes or variation in habitats occurred. The assessment were conducted using methodology and terminology prescribed by BHP WAIO (2023). The characteristics recorded during the habitat assessments included:

- site information: location and photo
- habitat: broad habitat type, landform, aspect, slope, soil type and availability, rocky outcropping presence and type
- ground cover: rock size, vegetation litter and woody debris
- vegetation: broad vegetation type, structure and dominant species
- microhabitat: rocky cracks/ crevices, burrowing suitability, hollow presence and abundance, water presence
- condition: time since fire, disturbance, and overall habitat condition.

Fauna habitats were mapped at a scale of approximately 1:10,000 using data collected from the habitat assessments, previously completed fauna habitat and vegetation mapping within and adjacent to the Study Area, disturbance and rehabilitation mapping (provided by BHP WAIO), and high-resolution aerial imagery, vegetation, topographical, geology and soil mapping as relevant.

4.3.1 Cave Assessments

Cave searching survey effort focussed on areas of habitat (i.e. Gorge/ Gully) most suitable for cave formation. Information recorded during each cave assessment was consistent with those attributes required by BHP (2023b), and included:

- entrance location and photograph
- entrance shape, dimensions, position in the landscape, aspect and level of sun exposure
- internal structure and dimensions including depth, floor slope, number and size of chambers
- presence of water either within the cave or near its entrance
- presence or signs of bat use (such as remains, scats or feeding signs).

Each cave was categorised based on data from the cave assessments, including the presence of any target bat species via primary or secondary evidence (i.e. calls, scats and individual remains). Cave assessments followed BHP WAIO guidance and data documents SPR-IEN-EMS-012 (BHP WAIO, 2023) and SPR-IEN-EMS-015 (BHP, 2023b), and cave utilisation/ roost type classifications followed those described by Bat Call (2021b); TSSC (2016c) for Pilbara leaf-nosed bats and Bat Call (2021a) for ghost bats. A total of four cave assessments were undertaken at four caves (CER-06, CER-11, CWBK-02 and CBWK-03) across three sites (VPWR-020, VPWR-038 and VPWR-040) during the current survey.

4.3.2 Water Feature Assessments

Water feature assessments were conducted for any water features that were found within the Study Area. The assessments were aimed to define and characterise the water features and identify their likelihood of supporting significant fauna species (i.e. critical habitat for Pilbara olive python or water sources for Pilbara leaf-nosed bat). Water feature assessments were conducted and attributes assessed using attribute terminology prescribed by BHP WAIO (2023). The characteristics recorded during the habitat assessments were:

- site information, photo and location
- dimensions: length, width, depth
- water presence: above the surface, in the intermediate zone
- vegetation: obligate phreatophytes, emergent macrophytes.

Naturally occurring water features were assessed, and their persistence classified into three categories, comprising:

- permanent/ persistent – fed by ground water and/or surface drainage, persisting year-round
- semi-persistent – fed by rainfall/ surface drainage following rainfall, persisting for long periods (i.e. several months, 3-9 months) after rainfall

- ephemeral – fed by rainfall/ surface drainage following rainfall, persisting for short periods (i.e. weeks or less than three months) after rainfall.

The assessment of persistence was made at time of survey and is not based on long-term data, as such there is uncertainty in the categorisation of some water features as semi-persistent or ephemeral. Artificial water features were also recorded when present.

4.4 Targeted Searching and Sampling

Targeted searches were undertaken within areas considered to provide suitable habitat for significant fauna species. Sampling methods undertaken during the survey were specific to each targeted species and comprised (Figure 4.2a and b):

- targeted searches and/or transects (including cave searches) for all significant fauna species recognised from the desktop assessment, including northern quoll, western pebble-mound mouse, brush-tailed mulgara, Pilbara leaf-nosed bat, ghost bat, grey falcon, southern whiteface and Pilbara olive python
- camera trap transects for northern quoll
- plot searches for greater bilby
- ultrasonic recorders targeting Pilbara leaf-nosed bat and ghost bat
- acoustic recorders targeting night parrot and other significant birds (e.g. southern whiteface)
- bird census surveys for significant birds (e.g. southern whiteface)

Detailed information on species-specific methods is provided in Section 6.

4.5 Opportunistic Fauna Records

Opportunistic fauna observations from direct observation or secondary evidence (e.g. burrows, tracks, diggings, sloughs, remains and scats) were documented for all significant fauna species, rare species, other significant species or other fauna of interest.

4.6 Likelihood of Significant Species Occurrence

Significant fauna species identified by the desktop assessment were reassessed post-survey for their likelihood of occurring within the Study Area using a decision matrix which considers current survey records/ observations, the presence and suitability of habitat within the Study Area and the proximity of previous records (Table 4.3). Based on this decision matrix, each species was assigned to one of six categories of likelihood: Confirmed, Highly Likely, Likely, Possible, Unlikely, or Highly Unlikely.

The decision matrix is intended to be an indicative guide only, and the way in which it is interpreted may vary between species, depending on a given species' habitat preferences and ability to disperse, as well as the reliability and availability of contextual information. For example, considering species which have been previously recorded close to the Study Area, a

species with a limited dispersal capability will have a reduced likelihood of occurring in the Study Area compared with a species with greater dispersal capability. It is also recognised that a lack of records in the vicinity of a Study Area may indicate limited sampling effort rather than species' absence, and that previous records may include historic or presumed erroneous information which may misrepresent a species' current distribution. Where the determination of a species' likelihood of occurrence within the Study Area deviates from the decision matrix, detailed justification for any variation is presented.

Table 4.3: Species likelihood of occurrence decision matrix

		Habitat Suitability of Study Area			
		Breeding habitat present	Foraging and dispersal habitat present	Marginally suitable habitat present	No suitable habitat present
Species Records ¹	Recorded in Study Area	Confirmed	Confirmed	Confirmed	Confirmed
	Recorded within 10 km of Study Area	Highly Likely	Likely	Possible	Possible
	Recorded within 10-50 km of Study Area	Likely	Possible	Possible	Unlikely
	Recorded within 50-100 km of Study Area	Possible	Possible	Unlikely	Unlikely
	Recorded >100 km of Study Area	Possible	Unlikely	Unlikely	Highly Unlikely
	Species considered locally/regionally extinct	Unlikely	Unlikely	Highly Unlikely	Highly Unlikely

¹ Only records within the previous 50 years are considered.

4.7 Assessment of Significance

4.7.1 Fauna Habitats

For each MNES species, habitat was categorised as either providing critical (foraging, breeding or roosting) habitat or supporting (foraging, roosting or dispersal) habitat, as per the DoE (2013b) definitions and BHP WAIO (2023). For non-MNES species, these habitats were classified as important (foraging, breeding or roosting) habitat for the species or supporting (foraging, breeding, roosting or dispersal), for habitat types where the species may occur, but it is not necessary for such activities. The presence or absence of habitat features, suitable connecting habitat (e.g. movement corridors), the influence of other habitats (i.e. caves, water features) occurring within and adjacent to the Study Area and species records were also considered.

4.7.2 Significances of Species Occurrence

For the target MNES species, an assessment was made on the significance of their occurrence based on the most relevant and prescriptive guidance documents relative to each species.

For northern quoll the significance of occurrence was based on definitions of the DoE (2016), specifically whether the individuals present in the Study Area formed part of or contributed to “populations important for the long-term survival of the northern quoll”. These are populations that are (DoE, 2016):

- 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/or
- subject to ongoing conservation or research actions i.e. populations being monitored by government agencies or universities or subject to reintroductions or translocation.

For the Pilbara leaf-nosed bat and ghost bat, the entire Pilbara is suggested to represent an ‘important population’ (Bat Call, 2021a, 2021b; TSSC, 2016c). Thus, the significance of occurrence was based on the presence of critical roosting habitat.

For the night parrot, the significance of occurrence was based on definitions by the DoE (2013a), specifically the presence of a ‘population’. A ‘population of a species’ is defined under the EPBC Act as an occurrence of the species in a particular area, including, but are not limited to:

- a geographically distinct regional population, or collection of local populations, or
- a population, or collection of local populations, that occurs within a particular bioregion.

For the greater bilby, southern whiteface, grey falcon, princess parrot, Pilbara olive python and great desert skink (species listed as Vulnerable under the EPBC Act but with no specific criteria to assess significance of occurrence), the significance of occurrence was based on criteria defined by DoE (2013a), specifically whether their occurrence in the Study Area represented an ‘important population’. An ‘important population’ is 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 (DoE, 2013a):

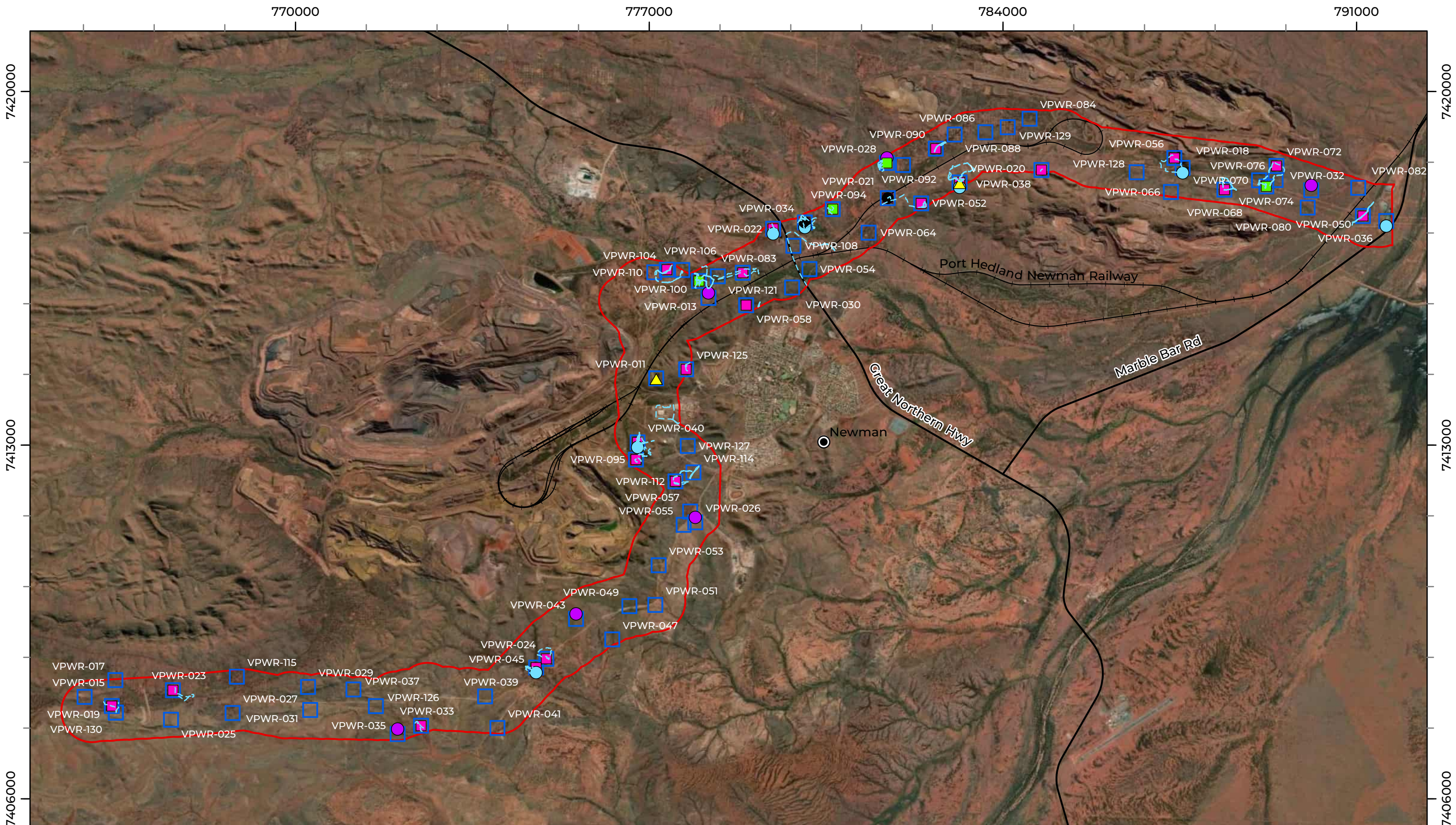
- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

4.8 Constraints and Limitations

The EPA (2020) outlines several potential limitations to vertebrate fauna surveys. These aspects are assessed and discussed in Table 4.4 below. No major limitations or constraints were identified during the survey.

Table 4.4: Survey constraints and limitations

Potential limitation or constraint	Constraint	Applicability to this survey
Sources/ availability of data and information (recent or historic) and availability of contextual information	No	A significant amount of survey work has been undertaken within the surrounding region (e.g. Jimblebar hub and Eastern Ridge hub) which provided context for the current surveys. At least 24 surveys have been undertaken intersecting or within 5 km of the Study Area.
Competency/ experience of the survey team	No	The field personnel involved in the survey and analyses are experienced in undertaking fauna surveys in the Pilbara, including with the significant species targeted during the survey.
Scope (faunal groups sampled and whether any constraints affect this)	No	The scope was a targeted fauna survey and was conducted within that framework (EPA, 2020). Sampling for target species was undertaken in accordance with relevant guidelines and recommendations (see Section 1.3).
Timing, weather, and season	No	The field survey occurred over appropriate or optimal periods for sampling the target species.
Disturbances (e.g. fire or flood)	No	No disturbances were observed during the survey period that may have impacted the outcomes of the survey.
Proportion of fauna identified	No	Most fauna observed during the field survey were identified to species level. Fauna recorded via camera traps and ultrasonic and acoustic recorders were identified by technical personnel with relevant expertise.
Adequacy of the survey intensity and proportion of the survey achieved	No	The sampling methods and survey intensity was high and focussed on the species of interest.
Remoteness or access issues	No	The majority of the Study Area was accessible either by vehicle or on foot. A helicopter was utilised for areas with remote access.
Problems with data and analysis, including sampling bias	No	No limitations with data collection and/or analysis were encountered during the field survey or during subsequent analysis.



LEGEND

Study Area

State Road

Rail

Sampling Type

Acoustic Recorder

Bilby Plot

Camera Trap

Habitat Assessment

Nocturnal Search

Targeted Search

Ultrasonic Recorder

Targeted Search



Biologic

Scale 1:70,000

0 1 2 Km

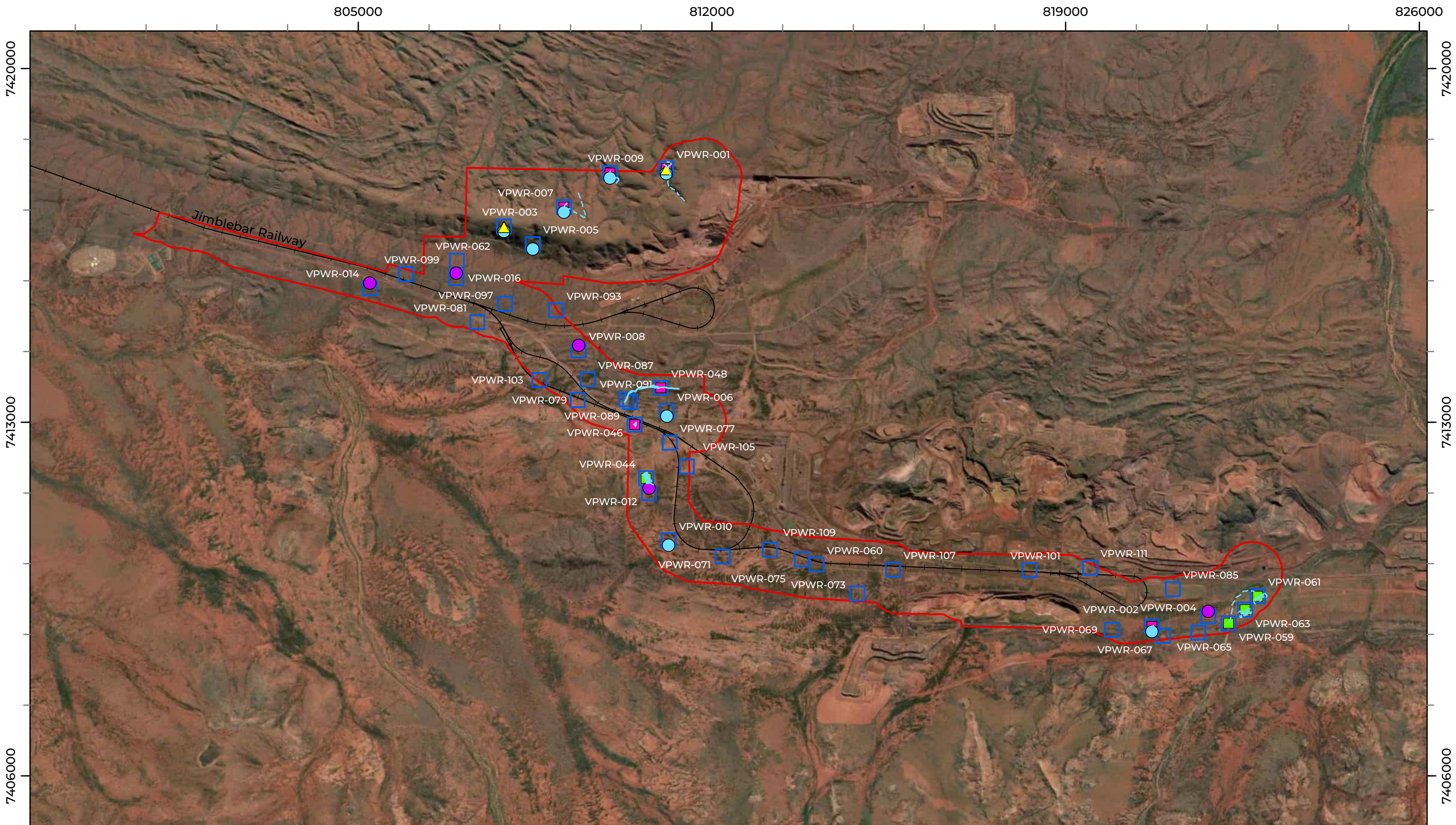
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Transverse Mercator

Created: 03/10/2024

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**Figure 4.2a: Fauna sampling
sites and traverses - West**



LEGEND

Study Area

Rail

Sampling Type

Acoustic Recorder

Bilby Plot

Camera Trap

Habitat Assessment

Targeted Search

Ultrasonic Recorder

Targeted Search



Biologic



Scale 1:70,000

0

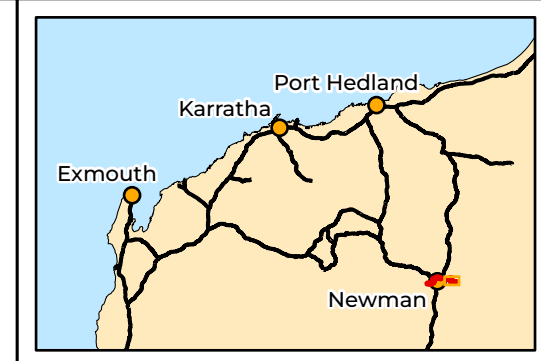
1

2

Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator

Created: 03/10/2024



BHP WAIO
**Power 2030 Targeted
Vertebrate Fauna Survey**

**Figure 4.2b: Fauna sampling
sites and traverses - East**

5 Fauna Habitats

5.1 Fauna Habitats of the Study Area

A total of 12 broad fauna habitat types were recorded and mapped across the Study Area, comprising, in decreasing extent (Table 5.1; Figure 5.1a and b):

- Stony Plain (1,669.52 ha, 19.47%);
- Hillcrest/ Hillslope (1,562.90 ha, 18.23%);
- Drainage Area/ Floodplain (1,102.45 ha, 12.86%);
- Mulga Woodland (433.95 ha, 5.06%);
- Sand Plain (385.33 ha, 4.49%);
- Gorge/ Gully (295.25 ha, 3.44%);
- Minor Drainage Line (171.23 ha, 2.00%);
- Undulating Low Hills (88.59 ha, 1.03%);
- Hardpan Plain (76.52 ha, 0.89%);
- Major Drainage Line (53.79 ha, 0.63%);
- Artificial Wetland (6.48 ha, 0.08%); and
- Breakaway/ Cliff (6.39 ha, 0.07%).

The remaining areas within the Study Area are Cleared/ Disturbed areas (2,722.55 ha, 31.75%). The condition of habitats within the Study Area ranged from 'very good' to 'poor'. The greatest disturbance was caused by tracks and cleared areas, because of active mining and infrastructure and exploration activity throughout parts of the Study Area, most often within Hillcrest/ Hillslope habitat. Descriptions of the distinguishing characteristics and the occurrence within the Study Area for each of habitat type is presented in Table 5.1. Data from on-site habitat assessments is presented in Appendix C.

A total of five habitats (Breakaway/ Cliff, Gorge/ Gully, Major Drainage Line, Drainage Area/ Floodplain and Artificial Wetland) within the Study Area provide critical habitat for various significant species (Table 5.1). Breakaway/ Cliff, Gorge/ Gully and Major Drainage Line provide potential critical breeding (Pilbara olive python), denning (northern quoll), foraging and dispersal habitat (Pilbara olive python and northern quoll), particularly in areas with caves and overhangs (i.e. Gorge/ Gully and Breakaway/ Cliff) and where pooling water remains for prolonged periods following rainfall events (i.e. Major Drainage Line) (Table 5.1). Major Drainage Line and Drainage Area/ Floodplain provides critical breeding/ nesting habitat for grey falcon and southern whiteface, respectively (Table 5.1). Artificial Wetland habitat provides critical breeding, foraging and dispersal habitat for Pilbara olive python. For ghost bat and Pilbara leaf-nosed bat critical foraging and/or dispersal habitat is provided by habitats (e.g. Sand Plain, Stony Plain, Drainage Area/ Floodplain, Major Drainage Line, Minor Drainage Line, Mulga Woodland, Gorge/ Gully (only Pilbara leaf-nosed bat), Hillcrest/ Hillslope

(only Pilbara leaf-nosed bat), Hardpan Plain, Undulating Low Hills and Artificial Wetland) that are within the 12 km buffer (CNIN-03, CWER-01, CWER-03 and CJIM-03) and 5 km buffer (CNIN-12) of critical roosts, respectively (Table 5.1).

The remaining habitats, Hillcrest/ Hillslope, Sand Plain, Stony Plain, Undulating Low Hills, Minor Drainage Line, Mulga Woodland and Hardpan Plain, provide various levels of supporting habitat for certain significant species. More detailed discussion on the habitats and their usage by the target significant species are discussed in Section 6.

Although critical and/or supporting habitat for numerous significant species was identified within the Study Area, the occurrence of suitable habitat does not necessarily indicate species presence. Many of the fauna habitats mapped that provide supporting habitat are broadly distributed and well represented across the Pilbara bioregion and surrounding regions, and therefore support fauna assemblages which are generally common and widespread.

Table 5.1: Broad fauna habitats within the Study Area

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Photo
Stony Plain 1,669.52 ha 19.47%	Comprises low-lying open plains and the rolling hills below upland areas, with very slight to no gradient. The substrate consists of gravel and pebbles, with vegetation dominated by <i>Triodia</i> and scattered Mulga, <i>Eucalyptus</i> and <i>Acacia</i> trees, with patches of various small to medium shrub species.	Stony Plain habitat occurs throughout a large portion of the Study Area, often occurring as the intervening area between other habitats. The southwest extension of the Study Area is predominantly Stony Plain with Mulga Woodland and Drainage Area/ Floodplain habitats co-occurring in small pockets. The large area of Stony Plain habitat in the Study Area to the southwest of Newman remains relatively undisturbed compared to the north and easternmost areas of the Study Area where the habitat is highly disturbed and/ or fragmented by roads, tracks and mining activities. Stony Plain is one of the most common and widespread habitat types within the Pilbara region. The vegetation and substrate which make up this habitat type are characteristic features of the region.	Critical habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Pilbara leaf-nosed bat – foraging and dispersal habitat where proximal (~5 km) to a critical roost (CNIN-12) Supporting habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to roosting habitat Pilbara leaf-nosed bat – foraging and dispersal southern whiteface – foraging and dispersal Important habitat for: western pebble-mound mouse - breeding, foraging and dispersal brush-tailed mulgara - foraging and dispersal	
Hillcrest/ Hillslope 1,562.90 ha 18.23%	Comprises a rocky substrate, often with exposed bedrock, on moderate to steep slopes leading into lower foot slopes. This habitat was characterised by steep slopes with a high proportion of coarse fragments dominated by ironstone. These can contain cracks and crevices. Instances of Gorge/ Gully is contained within this habitat. This habitat is usually dominated by open <i>Eucalyptus</i> woodlands, <i>Acacia</i> and <i>Grevillea</i> scrublands and <i>Triodia</i> low hummock grasslands.	Hillcrest/ Hillslope habitat occurs regularly throughout the Study Area. The southwestern most extension of the Study Area has limited extent of this habitat as it is mostly low-lying Drainage Area/ Floodplain and Mulga Woodland. Within the Study Area and greater Pilbara region, Hillcrest/ Hillslope habitat is common and widespread. The vegetation and substrate which make up this habitat type are characteristic features of the region.	Critical habitat for: Pilbara leaf-nosed bat – foraging and dispersal habitat where proximal (~5 km) to a critical roost (CNIN-12) Supporting habitat for: northern quoll – foraging and dispersal habitat where proximal to breeding habitat ghost bat – roosting habitat only, Category 4 caves (CER-11, CWBK-02 and CWBK-03) occur within this habitat in the Study Area. Pilbara leaf-nosed bat — foraging and dispersal Pilbara olive python — foraging and dispersal Important habitat for: western pebble-mound mouse - breeding, foraging and dispersal Gane's blind snake - breeding, foraging and dispersal	

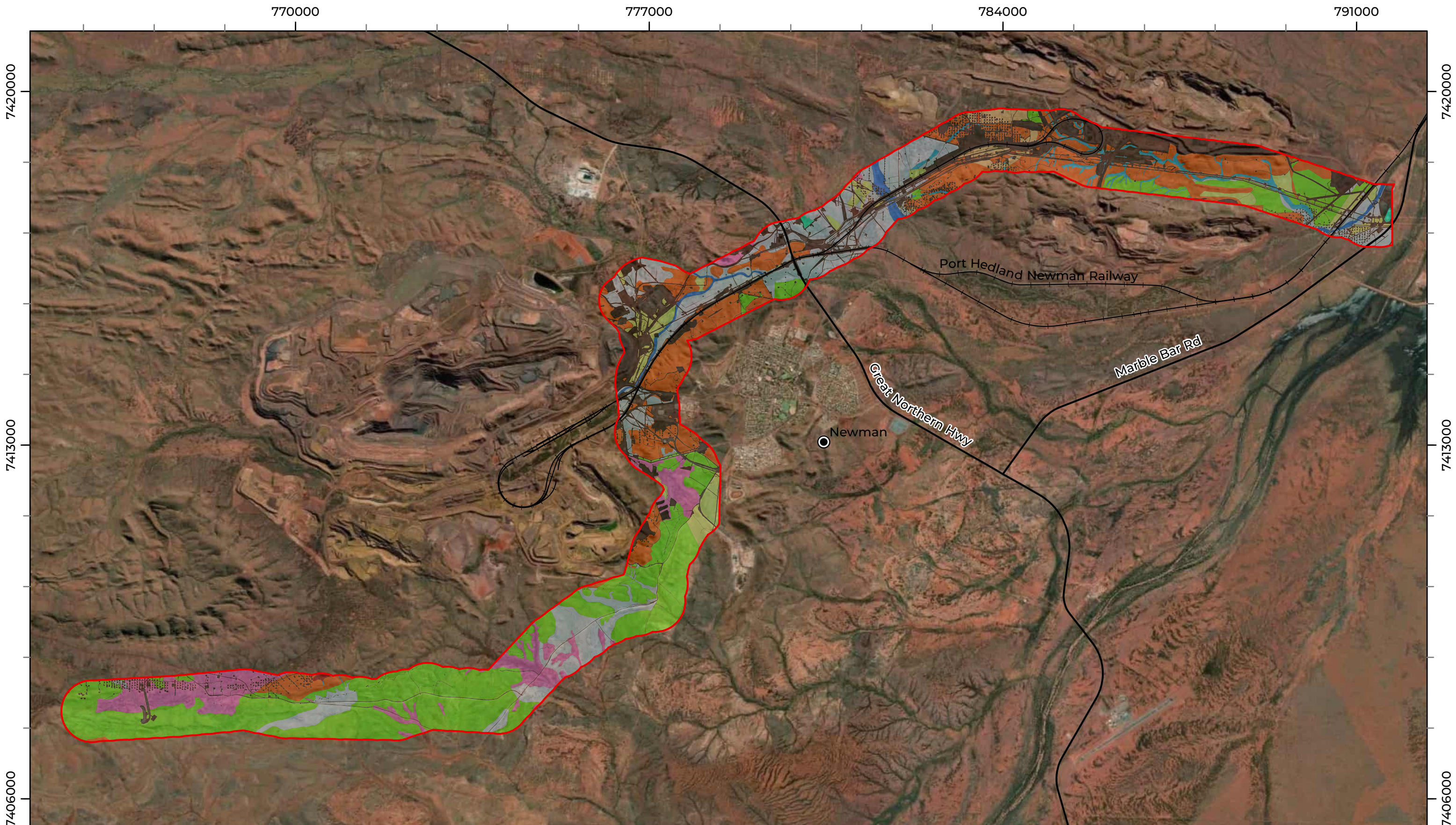
Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Photo
Drainage Area/ Floodplain 1,102.45 ha 12.86%	Lower lying plain often subjected to sheet flow following large rainfall events. Vegetation and substrates of this habitat was variable, often comprising scattered <i>Eucalyptus</i> over <i>Acacia</i> and/or <i>Grevillea</i> shrubs with an understory dominated by <i>Triodia</i> hummock grasses and/or mixed tussock grasses on alluvial substrates, often with heavy clays and gravel. Tussock grasses can be dominant within Drainage Area/ Floodplain habitat because of high rainfall events.	This habitat occurs commonly throughout the Study Area flanking Major Drainage Lines and in areas between drainage lines and areas of higher elevation such as Hillcrest/ Hillslope. Much of eastern extent of this habitat within the Study Area is disturbed and/ or fragmented by clearing for roads, rail and other mining activities. This fauna habitat is common throughout the Pilbara bioregion. Across the region its structure and condition are variable because of rainfall events and disturbance (i.e. fire and cattle grazing).	Critical habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Pilbara leaf-nosed bat – foraging and dispersal habitat where proximal (~5 km) to a critical roost (CNIN-12) southern whiteface – nesting/ breeding, foraging and dispersal Supporting habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to roosting habitat Pilbara leaf-nosed bat – foraging and dispersal grey falcon – foraging and dispersal habitat where proximal to breeding habitat Pilbara olive python — foraging and dispersal Important habitat for: brush-tailed mulgara – breeding, foraging, and dispersal	
Mulga Woodland 433.95 ha 5.06%	Comprises stands of mulga (<i>Acacia aneura</i>) over clay or stony substrates. Differs from other plains by having a monoculture of mulga compared to a diversity of other <i>Acacia</i> species.	Within the Study Area, Mulga Woodland habitat primarily occurs within low lying areas co-occurring with Drainage Area/ Floodplain and Stony Plain habitats. The greatest concentration of the habitat occurs in the southwest of the Study Area near Newman. There is little to no connectivity between small areas of habitat. This habitat is relatively common throughout the Pilbara region, usually occurring in areas of drainage or sheet flow.	Critical habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Supporting habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to roosting habitat Pilbara leaf-nosed bat - foraging and dispersal southern whiteface - foraging and dispersal	

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Photo
Sand Plain 385.33 ha 4.49%	Low-lying or elevated sandy areas with accumulated loose sandy substrates. Often supporting an open vegetation cover, dominated by <i>Acacia</i> shrubs over <i>Triodia</i> hummock grasses of various life stages.	Sandplain occurs in relatively small areas in isolated patches across the Study Area. The largest extent occurs in the northeast of the Study Area where the habitat occurs in two reasonably large patches either side of a hilly-ridgeline and rail line corridor. Sand Plain is common and widespread habitat throughout the Pilbara region.	Critical habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Pilbara leaf-nosed bat – foraging and dispersal habitat where proximal (~5 km) to a critical roost (CNIN-12) Supporting habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to roosting habitat Pilbara leaf-nosed bat – foraging and dispersal southern whiteface – nesting/ breeding, foraging and dispersal Important habitat for: brush-tailed mulgara - breeding, foraging and dispersal	
Gorge/ Gully 295.25 ha 3.44%	Characterised by rugged, steep-sided valleys incised into the surrounding landscape. Gorges are deeply incised with vertical cliff faces, while gullies are more open (but not as open or shallow as Minor Drainage Lines). Caves and rock pools are most often encountered in this habitat type. Vegetation can be dense and complex in areas of soil deposition or sparse and simple where erosion has occurred.	With the exception of a small isolated area in the southwestern portion of the Study Area, Gorge/ Gully habitat occurs exclusively in the northeast corner within Hillcrest/ Hillslope habitat. This habitat within the northeast corner of the Study Area is part of a linear range that extends to the west where many caves have been previously located. A reasonably common habitat in the Pilbara, usually associated with ranges; however, because this habitat type is narrow and linear, they only represent a small proportion of the total land area.	Critical habitat for: northern quoll – breeding, denning, foraging and dispersal Pilbara leaf-nosed bat – foraging and dispersal habitat where proximal (~5 km) to a critical roost (CNIN-12) Pilbara olive python – breeding, foraging and dispersal Supporting habitat for: ghost bat – dispersal; may contain critical roosting habitat (Category 1 and 2 caves, and Category 3 caves when found in an apartment block); the broad habitat itself is considered supporting roosting habitat Pilbara leaf-nosed bat – foraging and dispersal; may contain critical roosting habitat (Category 1-3 caves) but the broad habitat itself is not considered critical Important habitat for: peregrine falcon – marginal nesting, foraging Gane's blind snake - breeding, foraging and dispersal	

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Photo
Minor Drainage Line 171.23 ha 2.00%	Usually lacks a tall dense upper storey, but with a dense mid storey, including sparse <i>Eucalyptus</i> sp., and <i>Acacia</i> sp. over tussock grasses and <i>Triodia</i> hummock grasses.	Minor Drainage Line habitat occurs throughout the Study Area to the north and east of Newman, surrounding areas of higher elevation, particularly the Hillcrest/Hillslope habitat. It is widespread throughout the Pilbara bioregion, though its structure and condition are variable as a result of rainfall events and susceptible to degradation from cattle grazing.	Critical habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Pilbara leaf-nosed bat – foraging and dispersal habitat where proximal (~5 km) to a critical roost (CNIN-12) Supporting habitat for: northern quoll – foraging and dispersal habitat where proximal to breeding habitat ghost bat – foraging and dispersal where proximal (~12 km) to roosting habitat Pilbara leaf-nosed bat – foraging and dispersal grey falcon – foraging and dispersal habitat where proximal to breeding habitat southern whiteface – nesting/ breeding, foraging and dispersal Pilbara olive python – foraging and dispersal habitat where proximal to breeding habitat Important habitat for: peregrine falcon – foraging Gane’s blind snake - foraging and dispersal (when adjacent to rocky habitats)	
Undulating Low Hills 88.59 ha 1.03%	The Undulating Low Hills habitat comprises low hills and undulating stony plains of higher elevation than Stony Plain. The habitat supports hard spinifex with a mantle of gravel and larger rocks with occasional outcropping or minor breakaway. Vegetation is dominated by hard <i>Triodia</i> hummock grasslands with scattered <i>Eucalyptus</i> trees and <i>Acacia</i> , <i>Eremophila</i> and/or <i>Grevillea</i> shrubs.	Undulating Low Hills habitat occurs in a few small and highly disturbed areas within the Study Area, largely impacted by rail corridor and mine clearing activities. Undulating Low Hills habitat is a characteristic habitat type of the Pilbara region. Its occurrence throughout the region is widespread and common.	Critical habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Pilbara leaf-nosed bat – foraging and dispersal habitat where proximal (~5 km) to a critical roost (CNIN-12) Supporting habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to roosting habitat Pilbara leaf-nosed bat – foraging and dispersal Important habitat for: western pebble-mound mouse - breeding, foraging and dispersal	

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Photo
Hardpan Plain 76.52 ha 0.89%	Lower lying plain often sparsely vegetated with open or sparsely scattered Mulga over a sparse understory on heavy clay substrates with a stony or gravelly surface. Large areas often void of vegetation.	Hardpan Plain habitat occurs over a single low-lying area in the east of the Study Area. The habitat is divided by several rail and infrastructure corridors. This fauna habitat is common throughout parts of the Pilbara bioregion and the Gascoyne bioregion to the south. Structure and condition is variable as a result of rainfall events and disturbance (i.e. fire and cattle grazing).	Critical habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Supporting habitat for: Pilbara leaf-nosed bat – foraging and dispersal southern whiteface – foraging and dispersal Important habitat for: - peregrine falcon - foraging	
Major Drainage Line 53.79 ha 0.63%	Comprises scattered <i>Eucalyptus</i> and <i>Acacia</i> , or mulga woodland, with an understory dominated by tussock grasses. The structure and condition of vegetation often varies seasonally, particularly following rainfall events. Vegetation condition often subject to heavy cattle grazing. This habitat type is prone to pooling and ponding in areas.	Within the Study Area, Major Drainage Line habitat occurs in discrete linear areas within the northwest portion where major drainages linked to the Fortescue River occur. An additional Major Drainage Line habitat occurrence sits on the periphery of the eastern projection of the Study Area. This fauna habitat is widespread throughout the Pilbara bioregion, though its structure and condition are variable as a result of rainfall events and susceptible to degradation from cattle grazing.	Critical habitat for: northern quoll – denning, foraging and dispersal ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Pilbara olive python – breeding, foraging, dispersal grey falcon – breeding, foraging and dispersal Supporting habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to roosting habitat Pilbara leaf-nosed bat – foraging and dispersal southern whiteface – nesting/ breeding, foraging and dispersal Important habitat for: peregrine falcon - foraging Gane's blind snake - foraging and dispersal (when adjacent to rocky habitats)	

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Photo
Artificial Wetland 6.48 ha 0.08%	Artificial wetland with permanent/persistent water source all year round and dominated by <i>Typha domingensis</i> .	Artificial Wetland habitat is located in two locations within the Study Area, one on the eastern boundary and the second along the northern boundary of the western extension of the Study Area.	Critical habitat for: ghost bat – foraging and dispersal where proximal (~12 km) to a critical roost (CNIN-03, CWER-01, CWER-03 and CJIM-03) Pilbara olive python – breeding, foraging and dispersal Supporting habitat for: northern quoll – foraging and dispersal ghost bat – foraging and dispersal where proximal (~12 km) to roosting habitat Pilbara leaf-nosed bat – foraging and dispersal grey falcon – foraging and dispersal Important habitat for: - Migratory waterbird/ shorebird species – foraging and dispersal - peregrine falcon - foraging	
Breakaway/ Cliff 6.39 ha 0.07%	Comprises single sided rock faces within steep mid-upper slopes with bare rock outcrops or cliffs (not the entire slope).	Within the Survey Area Breakaway/ Cliff habitat occurs in one location in the eastern arm of the Study Area. The habitat is very limited with only three very small and isolated pockets mapped within Hillcrest/ Hillslope habitat. A reasonably common habitat in the Pilbara, usually associated with ranges; however, because this habitat type is narrow and linear, they only represent a small proportion of the total land area.	Critical habitat for: northern quoll – breeding, denning, foraging and dispersal Pilbara olive python – breeding, foraging and dispersal Supporting habitat for: ghost bat – dispersal; may contain critical roosting habitat (Category 1 and 2 caves, and Category 3 caves when found in an apartment block) but the broad habitat itself is not considered critical habitat Pilbara leaf-nosed bat – foraging and dispersal; may contain critical roosting habitat (Category 1-3 caves) but the broad habitat itself is not considered critical habitat Important habitat for: peregrine falcon – marginal nesting, foraging Gane's blind snake - breeding, foraging and dispersal	
Cleared/ Disturbed 2,722.55 ha 31.75%	Cleared/ Disturbed areas include areas where the natural vegetation and microhabitats have been disrupted, usually devoid of native vegetation. This includes tracks, laydown areas, camps, major roads/ highways and historic, large-scale clearing.	Within the Study Area Cleared/ Disturbed areas include discrete linear corridors, including roads, rail corridors and access tracks, as well as larger areas of clearing and disturbance related to active mining and infrastructure.	N/A	No photo



LEGEND

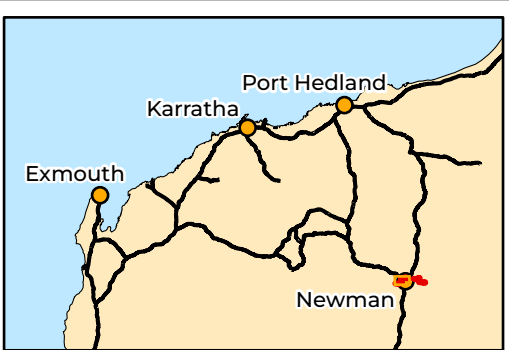
- | | | | | |
|------------|----------------------|---------------------------|---------------------|----------------------|
| Study Area | Fauna Habitat | Drainage Area/ Floodplain | Major Drainage Line | Mulga Woodland |
| State Road | Artificial Wetlands | Gorge/ Gully | Minor Drainage Line | Sand Plain |
| Rail | Breakaway/ Cliff | Hillcrest/ Hillslope | | Stony Plain |
| | Cleared/ Disturbed | | | Undulating Low Hills |

 **Biologic**

Scale 1:70,000

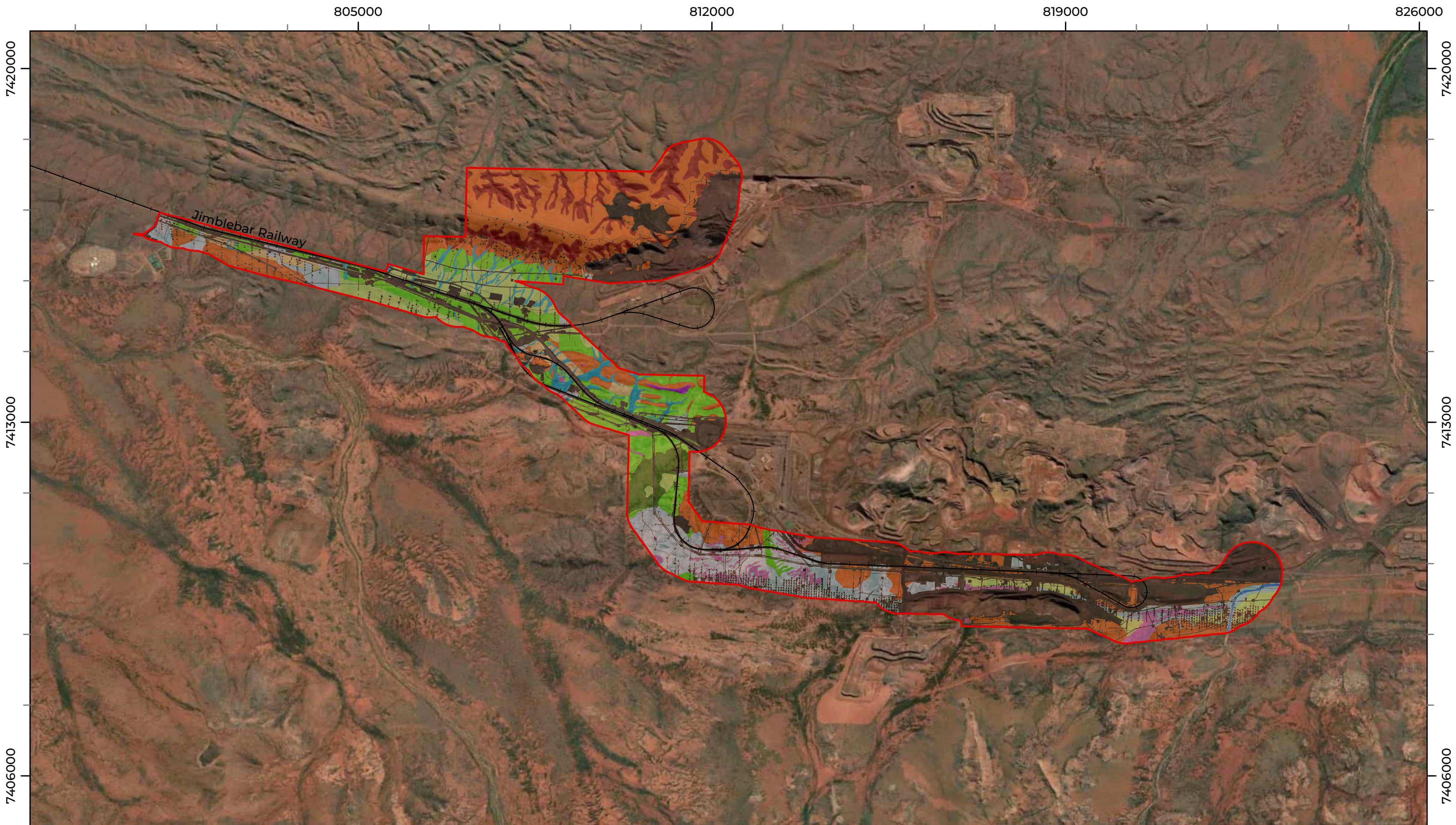
0 1 2 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 29/10/2024



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Vertebrate Fauna Survey**

**Figure 5.1a: Fauna habitats
in the Study Area - West**



LEGEND

Study Area

Rail

Fauna Habitat

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

Undulating Low Hills



Biologic



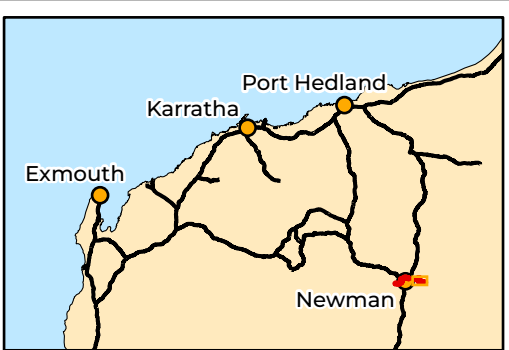
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012

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Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator

Created: 29/10/2024



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**Figure 5.1b: Fauna habitats
in the Study Area - East**

5.2 Habitat Features of the Study Area

5.2.1 Caves

Four caves were recorded and assessed within the Study Area during the survey (Figure 5.2; Table 5.2; Appendix D). Eight previously recorded caves also occur within the Study Area (Table 5.2). Three caves are recorded in Gorge/Gully habitat and the remaining nine caves in Hillcrest/Hillslope habitat within the Study Area. A further four additional caves were recorded and assessed during the 2024 BHP NEBO/ OB25 West targeted fauna survey; however, are just outside the current Study Area (Biologic, *in prep.-b*).

Of the four caves recorded and assessed within the Study Area during the current survey, one cave (CER-06) was classified as a Category 3 ghost bat roost (diurnal roost caves with occasional occupancy). While no ghost bats were observed or calls recorded at the time of the survey, the presence of recent scats (~1,000) and the dimensions (two chambers, depth approx. 18 m) and microclimate of the cave were indicative of being suitable for diurnal roosting of ghost bats. The classification of CER-06 could not be confirmed to be a Category 2 roost (diurnal roost caves with regular occupancy) due to a lack of evidence of usage from one visit; however, further evidence of regular usage and breeding from ghost bats is required to confirm it to be a Category 2 roost. The remaining three caves (CER-11, CWBK-02 and CWBK-03) had no evidence of use by ghost bats and were classified as Category 4 ghost bat roosts (nocturnal roost caves with opportunistic usage) (Table 5.2; Appendix D). All four caves were classified as Category 4 Pilbara leaf-nosed bat roosts (nocturnal refuge).

Of the eight previously identified caves, two caves were classified as Category 3 ghost bat roosts (CNIN-02 and CNIN-06) and the remaining six caves were classified as Category 4 ghost bat roosts (Table 5.2) (Biologic, 2023c; ENV, 2009). All eight previously identified caves were classified as Category 4 Pilbara leaf-nosed bat roosts. Multiple Category 2 and 3 caves have been previously recorded in Gorge/ Gully or Hillcrest/ Hillslope habitats in the vicinity of the Study Area within the Western Ridge (approximately 0.9 – 2.7 km north and west of the western portion of the Study Area), Cathedral Gorge (~3.3 – 11 km north and northwest of the western portion of the Study Area), Ninga (~0.3 – 1.9 km north and northwest of the eastern portion of the Study Area) and Jimblebar areas (~2.7 – 12 km north and east-south-east of the eastern portion of the Study Area) (Biologic, 2023c).

Table 5.2: Summary of known caves within the Study Area

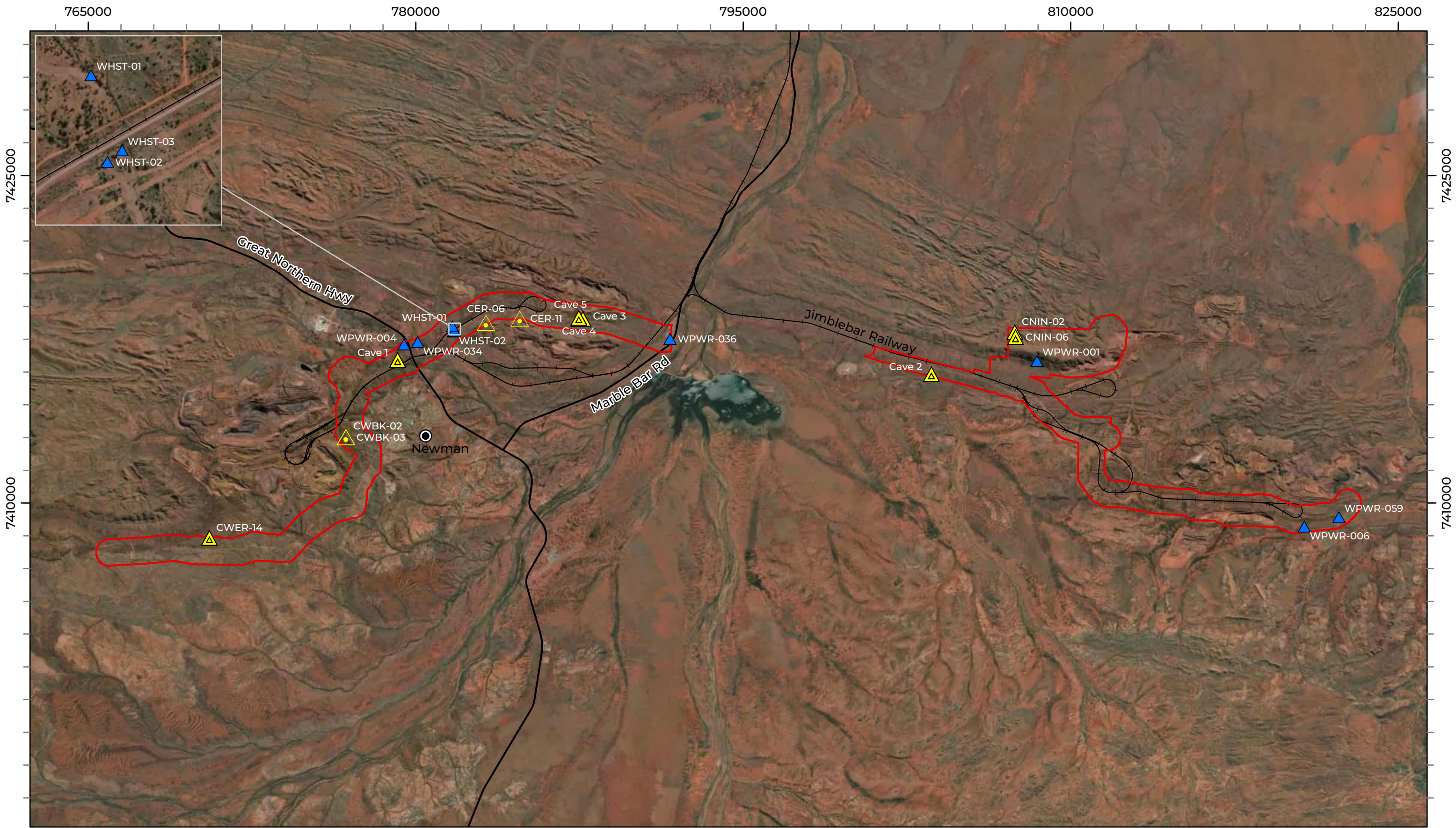
Current Cave ID	Previous Cave ID & Source	Coordinates		Habitat	Ghost Bat Significance	Pilbara Leaf-nosed Bat Significance
		Latitude	Longitude			
CER-06	-	-23.3208	119.7693	Breakaway/ Cliff	Category 3	Category 4
CER-11	-	-23.3188	119.7845	Hillcrest/ Hillslope	Category 4	Category 4
CWBK-02	CWBK-02 (Astron, 2024b)	-23.3691	119.7076	Hillcrest/ Hillslope	Category 4	Category 4
CWBK-03	CWBK-03 (Astron, 2024b)	-23.3692	119.7077	Hillcrest/ Hillslope	Category 4	Category 4
-	CWER-14 (Biologic, 2023c)	-23.4115	119.6474	Gorge/ Gully	Category 4	Category 4
-	CNIN-02 (Biologic, 2023b)	-23.3200	120.0061	Gorge/ Gully	Category 3	Category 4
-	CNIN-06 (Biologic, 2023c) (trOB19_1 (Biologic, 2014b))	-23.3220	120.0065	Gorge/ Gully	Category 3	Category 4
-	Cave 1 (ENV, 2009)	-23.3365	119.7302	Hillcrest/ Hillslope	Category 4	Category 4
-	Cave 2 (ENV, 2009)	-23.3380	119.9692	Hillcrest/ Hillslope	Category 4	Category 4
-	Cave 3 (ENV, 2009)	-23.3181	119.8128	Hillcrest/ Hillslope	Category 4	Category 4
-	Cave 4 (ENV, 2009)	-23.3182	119.8110	Hillcrest/ Hillslope	Category 4	Category 4
-	Cave 5 (ENV, 2009)	-23.3177	119.8109	Hillcrest/ Hillslope	Category 4	Category 4

5.2.2 Water Features

Twenty-nine (29) water features were historically recorded or recorded during the current survey in the Study Area. Of these, nine water features were recorded during the current survey (Figure 5.2; Appendix E). Three are classified as permanent/persistent or likely permanent/persistent, and are artificial water features (WPWR-006, WPWR-034 and WPWR-036) (Appendix E). An additional four are classified as semi-persistent and two as ephemeral (Appendix E). Water features recorded in the Study Area during the current survey were recorded in Major Drainage Line ($n = 4$), Gorge/ Gully habitat ($n = 1$), Artificial Wetland habitat ($n = 2$), Drainage Area/ Floodplain ($n = 1$) habitat and within disturbed areas within Mulga Woodland ($n = 1$) (Figure 5.2; Appendix E).

The remaining historical water features were not located during the current survey and are likely to be ephemeral or semi-persistent, noting that the classification is not confirmed for these historical water features. It is possible that following large rainfall events that additional semi-persistent and ephemeral water features occur within the Study Area, particularly within Gorge/ Gully, Major Drainage Line, and Minor Drainage Line habitats.

All water features known from within the Study Area are considered to provide supporting foraging habitat for the northern quoll, Pilbara leaf-nosed bat and Pilbara olive python. For northern quolls, they often represent areas of high productivity, and therefore may contain a relatively high abundance of feeding resources (Braithwaite & Griffiths, 1994; Oakwood, 2000), particularly when occurring within rocky habitats, and to a lesser degree, drainage lines. For Pilbara leaf-nosed bats permanent/ persistent water features can provide significant drinking and foraging sources, and are a key component to 'Gorges with Pools' being recognised as the priority foraging habitat for the species (TSSC, 2016c). Ephemeral and semi-persistent water features when available can provide supporting drinking and foraging sources for Pilbara leaf-nosed bats. For Pilbara olive pythons, these features can often act as primary foraging locations and for that reason the species is more often than not associated with such features, particularly within rocky habitats, but also, to a lesser extent within drainage line habitats (Pearson, 1993). This occurrence is likely to be seasonal and irregular, dependent on the permanency of the feature. Permanent water features are considered critical habitat for Pilbara olive python; however, as the permanent water features in the Study Area are artificial (WPWR-006, WPWR-034 and WPWR-036) and the prolonged existence is limited by mining activity, it's significance in the landscape will be periodical.



LEGEND

Study Area	Cave
State Road	Previously Recorded Cave
Rail	Water Feature

Biologic

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 03/10/2024

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**Figure 5.2: Fauna
habitat features recorded
in the Study Area**

6 Target Species

Forty-four (44) potentially occurring significant species were identified during the desktop assessment, of which seven have previously been recorded within the Study Area: northern quoll, ghost bat, brush-tailed mulgara, western pebble-mound mouse, peregrine falcon, Pilbara olive python and Gane's blind snake (Table 6.1). During the current survey, four significant fauna species were recorded, all of which had previously been recorded from the Study Area (ghost bat, brush-tailed mulgara, western pebble-mound mouse and Pilbara olive python) (Table 6.1).

One additional species is considered highly likely to occur within the Study Area (Pilbara leaf-nosed bat), 12 species are considered likely to occur (migratory waterbirds/ shorebirds: common sandpiper, sharp-tailed sandpiper, curlew sandpiper, pectoral sandpiper, red-necked stint, long-toed stint, black-tailed godwit, ruff, wood sandpiper, marsh sandpiper, common redshank and glossy ibis), and 11 as possible to occur (long-tailed dunnart, northern short-tailed mouse (*Leggadina lakedownensis*), southern whiteface, garganey, fork-tailed swift, little ringed plover, oriental plover, grey falcon, gull-billed tern, common greenshank, and spotted ctenotus (Table 6.1). The remaining 13 species are considered unlikely or highly unlikely to occur primarily due to the absence of any critical and/or supporting habitats likely to be used by the species (Table 6.1).

Table 6.1: Significant species likelihood of occurrence assessment

Species	Conservation Status			Preferred Broad Habitats	Within Current Known Distribution	Nearest Records to the Study Area	Potential Habitat within the Study Area												Likelihood of Occurrence	Occurrence	Comments	
	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/Gully	Major Drainage Line	Stony Plain	Drainage Area/ Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/ Hillslope	Breakaway/ Cliff	Hardpan Plain				Cleared/ Disturbed
MAMMALS																						
DASYURIDAE																						
long-tailed dunnart <i>(Antechinomys longicaudatus)</i>			P4	Typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Burbidge <i>et al.</i> , 2008). Once considered rare but now shown to be relatively common and widespread in rocky habitats (Burbidge <i>et al.</i> , 2008).	Yes	4.9 km WSW (1997) (DBCA, 2024d)														Possible	Resident	May occur as a resident in Breakaway/ Cliff and Hillcrest/ Hillslope habitats within the Study Area.
brush-tailed mulgara <i>(Dasyercus blythi)</i>			P4	Prefers spinifex <i>Triodia</i> spp. grasslands on sand plains and the swales between low dunes (Pavey <i>et al.</i> , 2012; Woolley, 2006). Mature spinifex hummocks appear to be important for protection from introduced predators (Körtner <i>et al.</i> , 2007).	Yes	Within (2013) (BHP WAIO, 2024)					•	•			•					Confirmed	Resident	Recorded once during the current survey (active burrow) and previously recorded on eight occasions within the Study Area. May occur as a resident in Sand Plain, Stony Plain and Drainage Area/ Floodplain habitats, particularly where suitable substrates permitting burrow excavation occur.
northern quoll <i>(Dasyurus hallucatus)</i>	EN	EN		The species tends to inhabit rocky habitats which offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994) (Oakwood, 2000). Other Microhabitat features important to the species include rock cover, proximity to permanent water and time-since last fire (Woinarski <i>et al.</i> , 2008).	Yes	Within (2007) (BHP WAIO, 2024)	S	C	C					S			S	C		Confirmed	Infrequent visitor, likely dispersing or foraging individuals only	Previously recorded on one occasion within the Study Area, but not recorded during current survey. Critical denning/ shelter habitat within Study Area includes Gorge/ Gully, Breakaway/ Cliff and Major Drainage Line habitats. Supporting foraging/dispersal habitat within Study Area includes Minor Drainage Line, Hillcrest/ Hillslope and Artificial Wetland habitats.

Species	Conservation Status			Preferred Broad Habitats	Within Current Known Distribution	Nearest Records to the Study Area	Potential Habitat within the Study Area													Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/Gully	Major Drainage Line	Stony Plain	Drainage Area/Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/Hillslope	Breakaway/Cliff	Hardpan Plain	Cleared/Disturbed			
MACROPODIDAE																						
spectacled hare-wallaby (<i>Lagorchestes conspicillatus leichardti</i>)			P4	Inhabits spinifex hummock grasslands and <i>Acacia</i> shrublands (van Dyck & Strahan, 2008; Woinarski <i>et al.</i> , 2014).	Yes	10.6 km SSE (undated) (DBCA, 2024d)														Highly Unlikely	N/A	Has declined drastically in the Pilbara and Great Sandy Desert and is now a rare species. Marginally suitable habitat occurs within the Study Area. However, there are a lack of contemporary records nearby with the closest record ‘undated’ so there is uncertainty as to when the record was made, but likely it is very old as it was a vouchered specimen.
black-flanked rock-wallaby (<i>Petrogale lateralis subsp. lateralis</i>)	EN	EN		Rocky habitats, including gorges and gullies or outcrops with sufficient shelter habitat. Often vegetated with <i>Acacia</i> thickets and open low eucalypt woodlands with an understory of grasses and low shrubs (Willers <i>et al.</i> , 2011).	No	9.5 km NNE (1975) (DBCA, 2024d)														Highly Unlikely	N/A	There is a lack of contemporary records nearby with the closest records being 49 years old. The Study Area is not within the species’ current distribution.
MEGADERMATIDAE																						
ghost bat (<i>Macroderma gigas</i>)	VU	VU		Ghost Bats roost in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned Mines (Armstrong & Anstee, 2000). These features often occur within habitats including gorge/gully, hill crest/ hill slope and low hills (Armstrong & Anstee, 2000). Forages broadly across habitats, particularly woodland and open woodland habitats, including eucalypt and Mulga woodlands (Biologic, 2020a; Richards <i>et al.</i> ,	Yes	Within (2015) (BHP WAIO, 2024; DBCA, 2024d)	C/S	S	C/S	C/S	C/S	C/S	C/S	C/S	C/S		S	C		Confirmed	Resident	Ghost bat was recorded from ~1,000 recent scats within cave CER-06 during the current survey. Previously recorded on seven occasions within the Study Area from two locations. No critical roosts were identified within the Study Area, however there are four Category 2 roosts within 0.3–4.5 km north, east and west of the Study Area (CNIN-03, CWER-01, CWER-03 and CJIM-03). Therefore critical foraging habitat is present within the

Species	Conservation Status			Preferred Broad Habitats	Within Current Known Distribution	Nearest Records to the Study Area	Potential Habitat within the Study Area												Likelihood of Occurrence	Occurrence	Comments	
	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/Gully	Major Drainage Line	Stony Plain	Drainage Area/Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/ Hillslope	Breakaway/ Cliff	Hardpan Plain				Cleared/ Disturbed
				2008; Tidemann <i>et al.</i> , 1985; TSSC, 2016b)																		Study Area in Sand Plain, Stony Plain, Drainage Area/ Floodplain, Major Drainage Line, Minor Drainage Line, Mulga Woodland, Artificial Wetland, Hardpan Plain and Undulating Low Hills habitats, within the 12 km critical foraging buffer of these critical roosts. Supporting (roosting) habitat is present in the form of 12 caves (three Category 3 and nine Category 4). Supporting foraging habitat within the Study Area includes Artificial Wetlands, Stony Plain, Sand Plain, Major Drainage Line, Minor Drainage Line, Drainage Area/ Floodplain, Mulga Woodland, and Undulating Low Hills when outside of the 12 km buffer of the Category 2 roosts. Supporting dispersal habitat includes Gorge/ Gully and Breakaway/ Cliff when proximal to roosting habitat.
MURIDAE																						
northern short-tailed mouse <i>(Leggadina lakedownensis)</i>			P4	The species occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, <i>Acacia</i> shrublands, tropical eucalypt and Melaleuca woodlands and stony ranges; however, the species is usually found	Yes	~68.9 km N (2004) (ALA, 2024)				•	•			•	•				•	Possible	Resident	Species is possible to occur in Drainage Area/ Floodplain, Sand Plain, Stony Plain, Mulga Woodland and Hardpan Plain habitat where sandy-clay soils are present; however, the Study Area does not contain cracking clays which is considered critical habitat for the species. Due to the species

Species	Conservation Status			Preferred Broad Habitats	Within Current Known Distribution	Nearest Records to the Study Area	Potential Habitat within the Study Area													Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/ Gully	Major Drainage Line	Stony Plain	Drainage Area/ Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/ Hillslope	Breakaway/ Cliff	Hardpan Plain	Cleared/ Disturbed			
				in seasonally inundated habitats on red or white sandy-clay soils (Moro & Kutt, 2008).																		boom and bust nature, it may occur sporadically in the Study Area during the boom periods, particularly following large rainfall events.
western pebble-mound mouse (<i>Pseudomys chapmani</i>)			P4	This species occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee, 1996; Start <i>et al.</i> , 2000).	Yes	Within (2015) (BHP WAIO, 2024)				•	•					•				Confirmed	Resident	Recorded during the current survey on one occasion (inactive mound) and previously recorded on numerous occasions within the Study Area. Species likely to occur as a resident within Stony Plain, Hillcrest/ Hillslope and Undulating Low Hills.
RHINONYCTERIDAE																						
Pilbara leaf-nosed bat (<i>Rhinonictoris aurantia</i> 'Pilbara form')	VU	VU		Species roosts within caves and abandoned Mines with high humidity (95%) and temperature (32°C) (Armstrong, 2001). Species forages in caves and along waterbodies with fringing vegetation (TSSC, 2016c).	Yes	0.2 km (2022) (BHP WAIO, 2024)	S HR=4	C/S HR=3	S HR=3	C/S HR=2	C/S HR=2	C/S HR=2	C/S HR=2	S HR=2	C/S HR=2	C/S HR=2	S HR=4	S HR=2		Highly Likely	Infrequent visitor (foraging/ dispersal)	Not recorded within the Study Area during current or previous surveys; however, has been previously recorded very close (~200 m) to the Study Area boundary. No suitable roosting habitat present within the Study Area, and no known critical roosts (Category 1–3) within the Study Area. Twelve caves recorded during the current survey are identified as nocturnal refuges (Category 4) for the species. A provisional critical Category 2 roost occurs within approximately 1.5 km of the Study Area (eastern portion), CNIN-12. All habitats within the 5 km buffer of the roost are considered critical foraging habitat for the species.

Species	Conservation Status			Preferred Broad Habitats	Within Current Known Distribution	Nearest Records to the Study Area	Potential Habitat within the Study Area													Likelihood of Occurrence	Occurrence	Comments												
	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/ Gully	Major Drainage Line	Stony Plain	Drainage Area/ Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/ Hillslope	Breakaway/ Cliff	Hardpan Plain	Cleared/ Disturbed															
																				Supporting foraging within the Study Area includes all habitats (except Cleared/ Disturbed).														
THYLACOMYIDAE																																		
greater bilby (<i>Macrotis lagotis</i>)	VU	VU		Variety of habitats including spinifex hummock grassland and <i>Acacia</i> shrubland, on soft soils (Burrows <i>et al.</i> , 2012). In the Pilbara often associated with major drainage line sandy terraces (How <i>et al.</i> , 1991).	Yes	8 km E (1979 – exact location unconfirmed/ uncertain) (DBCA, 2024d)																Unlikely	N/A	Not recorded during current or previous surveys within the Study Area. Records within the vicinity of the Study Area are sparse and/ or old/ unconfirmed records. Only marginally suitable habitat is present within the Study Area (Sand Plain).										
BIRDS																																		
ACANTHIZIDAE																																		
southern whiteface (<i>Aphelocephala leucopsis</i>)	VU			Occupies a wide range of open woodlands and shrublands with grass and/or shrub dominated understory (DCCEEW, 2023). Vegetation is often dominated by <i>Acacia</i> or <i>Eucalyptus/ Corymbia</i> species on ranges, foothills and lowlands, and plains (DCCEEW, 2023). Forages almost exclusively on the ground, favouring areas with low tree density and herbaceous understory litter cover (DCCEEW, 2023)	Yes	~2.6 km SW (2020) (BHP, 2023a)				S	S	C		S	S	S				S	Possible	Resident	May occur within Drainage Area/ Floodplain habitats where suitable vegetation cover and structure are present, which provide breeding, foraging and dispersal habitat. May also utilise supporting habitats Minor Drainage Line, Major Drainage Line, Stony Plain, Mulga Woodland, Hardpan Plain and Sand Plain if in association with critical habitat.											
ANATIDAE																																		
Garganey (<i>Anas querquedula</i>)	MI	MI		Garganey is a small teal. This duck is a rare visitor to Australia recorded from sewage ponds, lakes and sometimes inland waterbodies (Johnstone & Storr, 1998).	Yes	1.0 km S (2013) (BHP, 2023a)															Possible	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage, however, usually occurs along the coast so would be a rare visitor inland.											

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APODIDAE																						
fork-tailed swift <i>(Apus pacificus)</i>	MI	MI		Inhabits dry/open habitats, inclusive of riparian woodlands and tea-tree swamps, low scrub, heathland or saltmarsh, as well as treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (Johnstone & Storr, 1998). Aerial species, which forages high above the tree canopy and rarely lower (Johnstone & Storr, 1998).	Yes	6.4 km E (2022) (DBCA, 2024d)	•	•	•	•	•	•	•	•	•	•	•	•	Possible	Infrequent visitor (foraging/ migration only)	May occasionally occur within the airspace above the Study Area to forage in all habitats, unlikely to land or nest within Study Area.	

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	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/Gully	Major Drainage Line	Stony Plain	Drainage Area/Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/Hillslope	Breakaway/Cliff	Hardpan Plain				Cleared/Disturbed
CHARADRIIDAE																						
little ringed plover (<i>Charadrius dubius</i>)	MI	MI		Bare or sparsely vegetated sandy and pebbly shores of shallow standing freshwater pools, lakes or slow-flowing rivers. Also found in artificial habitats including gravel pits, sewage works, industrial wastelands and rubbish tips (BirdLife International, 2016b)	Yes	2.0 km SSE (2014) (BHP WAIO, 2024)	●													Possible	Infrequent visitor (foraging/migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
greater sand plover (<i>Charadrius leschenaultia</i>)	MI / VU	VU		Wide, sandy or shelly beaches, sandspits, sand clays, tidal mudflats, reefs, mangroves, saltmarsh, dunes and bare paddocks (Pizzey & Knight, 2007)	Yes	~22 km S (1982) (ALA, 2024)														Highly Unlikely	N/A	Suitable habitat not present in the Study Area
oriental plover (<i>Charadrius veredus</i>)	MI	MI		Variety of habitats, including coastal habitats, such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches as well as open inland environments such as, semi-arid or arid grasslands, where the grass is short and sparse (Johnstone & Storr, 2004).	Yes	3.9 km ESE (1981) (DBCA, 2024d)	●													Possible	Infrequent visitor (foraging/migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
FALCONIDAE																						
grey falcon (<i>Falco hypoleucos</i>)	VU	VU		Timbered lowlands, particularly Acacia shrubland and along inland drainage systems. Also frequent spinifex and tussock grassland (Burbidge <i>et al.</i> , 2010; Olsen & Olsen, 1986)	Yes	~3.3 km NW (2021) (BHP WAIO, 2024)	S		C		S		S							Possible	Infrequent visitor (foraging)	Species' occurrence is likely to be dependent on the proximity of nesting. Critical nesting habitat is considered Major Drainage Line within the Study Area; however, no direct or indirect observations were recorded during the current survey.

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																						May occasionally occur to forage within Drainage Area/ Floodplain, Artificial Wetland and Minor Drainage Line habitats. Frequency of occurrence likely to be occasional and dependent on proximity of nesting to the Study Area.
peregrine falcon (<i>Falco peregrinus</i>)		OS		Arid areas and is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr, 1998). It typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 m and 50 m high (Olsen <i>et al.</i> , 2004; Olsen & Olsen, 1989). In general it nests on cliffs, granite outcrops, quarries and in the wheatbelt, old Raven and Whistling Kite nests (Johnstone & Storr, 1998).	Yes	Within (2006) (BHP WAIO, 2024)	•		•							•	•			Confirmed	Infrequent visitor (foraging or dispersal)	Previously recorded on two occasions within the Study Area, but not recorded during current survey. May occur infrequently within the Study Area to forage, particularly within Hillcrest/ Hillslope, Artificial Wetland and Major Drainage Line habitats and, to a lesser extent, other habitats more broadly. Frequency of visitation may vary depending on proximity of nesting sites in the vicinity of the Study Area. Marginal suitable nesting habitat present in Breakaway/ Cliff habitat but are limited in extent. Tall eucalypts along the Major Drainage may also provide nesting opportunities.
HIRUNDINIDAE																						
barn swallow (<i>Hirundo rustica</i>)	MI	MI		Non-breeding summer visitor to the Pilbara and Kimberley. It favours areas near water (Johnstone <i>et al.</i> , 2013) (Menkhorst <i>et al.</i> , 2017).	Yes	2.2 km ESE (2014) (BHP WAIO, 2024)														Highly Unlikely	N/A	Suitable habitat not present in the Study Area

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	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/ Gully	Major Drainage Line	Stony Plain	Drainage Area/ Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/ Hillslope	Breakaway/ Cliff	Hardpan Plain	Cleared/ Disturbed			
LARIDAE																						
gull-billed tern (<i>Gelochelidon nilotica</i>)	MI	MI		Shallow sheltered seas close to land, estuaries, tidal creeks; and inundated samphire flats, flooded salt lakes, claypans and watercourses in the interior (Johnstone & Storr, 1998).	Yes	2.6 km ESE (1999) (DBCA, 2024d)	•													Possible	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
Caspian tern (<i>Sterna caspia</i>)	MI	MI		Mainly sheltered seas, estuaries and tidal creeks; occasionally near-coastal salt lakes (including saltwork ponds) and brackish pools in lower courses of rivers; rarely fresh water (Johnstone & Storr, 1998).	Yes	2.6 km ESE (2004) (DBCA, 2024d)														Unlikely	N/A	Suitable habitat not present in the Study Area.
MOTACILLIDAE																						
grey wagtail (<i>Motacilla cinerea</i>)	MI	MI		Higher altitudes near fast-running water (Simpson <i>et al.</i> , 2010).	Yes	~647 km NE (2019) (ALA, 2024)														Highly Unlikely	N/A	Suitable habitat not present in the Study Area
yellow wagtail (<i>Motacilla flava</i>)	MI	MI		An uncommon but regular visitor to the Pilbara region (Johnstone <i>et al.</i> , 2013). Occupies a range of damp or wet habitats with low vegetation although favors edges of fresh water, especially sewage ponds (Johnstone & Storr, 2004).	Yes	~346 km NW (2022) (ALA, 2024)														Highly Unlikely	N/A	Suitable habitat not present in the Study Area

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PSITTACIDAE																						
night parrot <i>(Pezoporus occidentalis)</i>	EN	CR		The Night Parrot prefers sandy/stony plain habitat with old-growth spinifex for roosting and nesting in conjunction with native grasses and herbs for foraging (DPaW, 2017).	Yes	~90 km N (~2005) (Biota, 2005)														Unlikely	N/A	No records in proximity to the Study Area and preferred habitat not present.
princess parrot <i>(Polytelis alexandrae)</i>	VU			The princess parrot inhabits low open eucalypt woodlands and savannah shrublands in arid deserts, usually where <i>Casuarina</i> and <i>Allocasuarina</i> species are present (Baxter & Henderson, 2000; Pavey <i>et al.</i> , 2014). The species also occurs and breeds in vegetated riverine and littoral areas, with breeding primarily occurring in marble gum hollows (DEWHA, 2008; Pavey <i>et al.</i> , 2014).	No	~38 km N (2012) (DBCA, 2024d)														Unlikely	N/A	Preferred habitat not present and outside modelled distribution for which species or species habitat is known, likely, or may occur.
ROSTRATULIDAE																						
Australian painted snipe <i>(Rostratula australis)</i>	EN	EN		Favours recently flooded areas in shallow lowland freshwater temporary or permanent wetlands. This includes swamps, marshes, reedbeds, overgrown rice fields, inundated grassland and saltmarsh, margins of pools, freshwater lakes, sewage pools, reservoirs and mudflats (BirdLife International, 2016a).	Yes	56.8 km N (2012) (ALA, 2024)														Unlikely	N/A	No records in close proximity to the Study Area (closest record >50 km) and preferred habitat only occurs in small patches.
SCOLOPACIDAE																						
common sandpiper <i>(Actitis hypoleucos)</i>	MI	MI		Estuaries and deltas of streams, as well as banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans (Geering <i>et al.</i> , 2007; Johnstone & Storr, 1998).	Yes	0.3 km SSE (2006) (DBCA, 2024d)	•													Likely	Infrequent visitor (foraging/migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.

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	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/Gully	Major Drainage Line	Stony Plain	Drainage Area/Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/ Hillslope	Breakaway/Cliff	Hardpan Plain	Cleared/ Disturbed				
sharp-tailed sandpiper (<i>Calidris acuminata</i>)	MI	MI		Coastal and inland areas saline and freshwater but prefers non-tidal fresh or brackish wetlands (Geering <i>et al.</i> , 2007). Favours flooded samphire flats and grasslands, mangrove creeks mudflats, beaches, river pools, saltwork ponds, sewage ponds and freshwater soaks (Johnstone <i>et al.</i> , 2013).	Yes	1.2 km ENE (1981) (DBCA, 2024d)	•														Likely	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
curlew sandpiper (<i>Calidris ferruginea</i>)	CR / MI	CR / MI		Inhabits intertidal mudflats in sheltered coastal areas (i.e. estuaries, bays, inlets and lagoons) (Geering <i>et al.</i> , 2007). This rare species generally roosts on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (Geering <i>et al.</i> , 2007).	Yes	2.0 km SSE (2014) (BHP WAIO, 2024)	•														Likely	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
pectoral sandpiper (<i>Calidris melanotos</i>)	MI	MI		Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (Johnstone <i>et al.</i> , 2013). It prefers wetlands with open fringing mudflats and low, emergent or fringing vegetation (Geering <i>et al.</i> , 2007).	Yes	1.2 km ENE (1981) (DBCA, 2024d)	•														Likely	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
red-necked stint (<i>Calidris ruficollis</i>)	MI	MI		Lives in permanent or ephemeral wetlands of varying salinity, and regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and	Yes	2.8 km ESE (2005) (DBCA, 2024d)	•														Likely	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.

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				flooded inland lakes. In Western Australia they prefer freshwater to marine environments(Johnstone & Storr, 1998)																		
long-toed stint (<i>Calidris subminuta</i>)	MI	MI		They prefer shallow freshwater or brackish wetlands but are also fond of muddy shorelines, growths of short grasses, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. Also frequents permanent wetlands and forages on wet mud or in shallow water, often among short grass, weeds and other vegetation on islets or around the edges of wetlands (Johnstone & Storr, 1998).	Yes	1.2 km ENE (1981) (DBCA, 2024d)	•													Likely	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
black-tailed godwit (<i>Limosa limosa</i>)	MI	MI		Found mainly in coastal habitats like estuaries, tidal mudflats, sandspits, shallow river margins, sewage ponds. Inland habitats include large shallow fresh or brackish waters (Pizzey & Knight, 2007). There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore- overflows. They also use lagoons in sewage farms and saltworks (Higgins & Davies, 1996).	Yes	2.0 km SE (2014) (BHP WAIO, 2024)	•													Likely	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
ruff (<i>Calidris pugnax</i>)	MI	MI		Mainly fresh, brackish and saline wetlands with exposed mudflats. Found near lakes, swamps, pools, lagoons, tidal rivers and floodlands. Sometimes observed in sheltered coastal areas, including	Yes	2.0 km SSE (2014) (BHP WAIO, 2024)	•													Likely	Infrequent visitor (foraging/ migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.

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				harbours and estuaries (DoEE, 2019b).																		
wood sandpiper <i>(Tringa glareola)</i>	MI	MI		Species occurs as a non-breeding summer migrant which occurs throughout the region. Occurs mainly in river pools, sewage ponds, flooded claypans, freshwater lagoons and bore overflows (Johnstone <i>et al.</i> , 2013). Freshwater wetlands and occasional brackish intertidal mudflats (Geering <i>et al.</i> , 2007).	Yes	1.0 km S (2014) (BHP WAIO, 2024)	•													Likely	Infrequent visitor (foraging/migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
common greenshank <i>(Tringa nebularia)</i>	MI	MI		Species occurs as a non-breeding summer Migrant which occurs throughout the region. Occurs mainly in tidal mudflats, mangrove creeks, flooded samphire flats, beaches, river pools, and saltwork and sewage ponds (Johnstone <i>et al.</i> , 2013).	Yes	1.7 km NW (2012) (DBCA, 2024d)	•													Possible	Infrequent visitor (foraging/migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.

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marsh sandpiper <i>(Tringa stagnatilis)</i>	MI	MI		Lives in permanent or ephemeral wetlands of varying salinity, and regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In Western Australia they prefer freshwater to marine environments (Johnstone & Storr, 1998).	Yes	2.4 km ESE (2014) (BHP WAIO, 2024)	•														Likely	Infrequent visitor (foraging/migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
common redshank <i>(Tringa totanus)</i>	MI	MI		It is found at sheltered coastal wetlands with bare open flats and banks of mud or sand. They are also found around salt lakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms (Johnstone & Storr, 1998).	Yes	1.7 km NW (2012) (DBCA, 2024d)	•														Likely	Infrequent visitor (foraging/migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
THRESKIORNITHIDAE																							
glossy ibis <i>(Plegadis falcinellus)</i>	MI	MI		Freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone <i>et al.</i> , 2013).	Yes	1.0 km S (2014) (BHP WAIO, 2024)	•														Likely	Infrequent visitor (foraging/migration only)	Species may infrequently occur during migration within the Artificial Wetland habitat to forage.
REPTILES																							
PYTHONIDAE																							
Pilbara olive python <i>(Liasis olivaceus</i> supsp. <i>barroni)</i>	VU	VU		Associated with drainage systems, including areas with localised drainage and watercourses (Pearson, 1993). In the inland Pilbara the species is most often encountered near permanent waterholes in rocky ranges or among riverine vegetation (Pearson, 1993).	Yes	Within (2013) (BHP WAIO, 2024)	C	C	C		S		S			S	C				Confirmed	Resident	Recorded on two occasions during the current survey (one ~1.5k m outside the Study Area) and has also previously been recorded within the Study Area on one occasion. Critical breeding/denning and foraging/dispersal habitat includes Gorge/ Gully, Breakaway/ Cliff, Major

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																						Drainage Line and Artificial Wetland habitats. Supporting foraging and dispersal habitat comprises, Drainage Area/ Floodplain, Minor Drainage Line and Hillcrest/ Hillslope habitats.
SCINCIDAE																						
spotted ctenotus (<i>Ctenotus uber</i> subsp. <i>johnstonei</i>)			P2	Within the Pilbara, the taxon is known from <i>Triodia</i> on hillslopes, <i>Acacia xiphophylla</i> over chenopods, and <i>Acacia xiphophylla</i> scattered tall shrubs to high open shrubland (Cogger, 2014).	Yes	0.31 km SSE (2013) (BHP WAIO, 2024)				•		•				•				Possible	Resident	May occur in Stony Plain, Undulating Low Hills and lower slopes of Hillcrest/ Hillslope habitats. Taxonomic status of the disjunct Pilbara population is unknown and may represent an undescribed taxon (P. Doughty, Western Australian Museum, <i>pers. comm.</i>).
great desert skink (<i>Liopholis kintorei</i>)	VU	VU		Sandplain vegetated by spinifex and scattered shrubs appears to be the habitat type most widely used by the species, and some adjacent dunefield swales (Pavey, 2006). In the Tanami Desert and parts of the Great Sandy Desert they also inhabit paleodrainage lines characterised by giant termite mounds and titree (<i>Melaleuca</i> spp.) shrubs.	No	~27 km ESE (2010) (DBCA, 2024d)														Highly Unlikely	N/A	The Study Area is outside the modelled distribution for which the species or species habitat is known, or likely to occur. The Sand Plain habitat present within the Study Area is not considered suitable to support the species due to the absence of large undisturbed areas of the habitat
TYPHLOPIDAE																						
Gane's blind snake (<i>Aniliios ganei</i>)			P1	Little is known of the species' ecology, but it is often associated with moist soils and leaf litter within gorges and gullies (Wilson & Swan, 2021) and potentially within a wide range of other stony habitats. The species has been recorded from	Yes	Within (2014 2006) (BHP WAIO, 2024; DBCA, 2024d)		•	•				•			•	•			Confirmed	Resident	Previously recorded on three occasions within the Study Area, but not recorded during current survey. Likely to occur as a resident within Hillcrest/ Hillslope, Breakaway Cliff, Gorge/ Gully, and Major and Minor Drainage Line

Species	Conservation Status			Preferred Broad Habitats	Within Current Known Distribution	Nearest Records to the Study Area	Potential Habitat within the Study Area												Likelihood of Occurrence	Occurrence	Comments	
	EPBC Act	BC Act	DBCA				Artificial Wetland	Gorge/ Gully	Major Drainage Line	Stony Plain	Drainage Area/ Floodplain	Undulating Low Hills	Minor Drainage Line	Mulga Woodland	Sand Plain	Hillcrest/ Hillslope	Breakaway/ Cliff	Hardpan Plain				Cleared/ Disturbed
				numerous habitats but is most likely to be present in rocky terrain and along drainage lines (DBCA, 2022).																		(when adjacent to rocky habitats) habitats, particularly where moist substrates are present for prolonged periods.

6.1 Northern Quoll (*Dasyurus hallucatus*) – Endangered EPBC Act & BC Act

6.1.1 Species Profile

The northern quoll was once widely distributed across northern Australia; however, it is now restricted to three isolated populations in the Pilbara, Kimberley and Northern Territory, and Queensland (DoE, 2016). As a result of facultative die-off, the abundance of the species is cyclical, and the annual reproduction is highly synchronised (Oakwood *et al.*, 2001). In the Pilbara, abundance is lowest toward the end of winter into early spring after the mating season, as a significant proportion of adult males die off and young have not yet begun to forage independently (Braithwaite & Griffiths, 1994; Oakwood, 2000). Population density is thought to be highest in the summer months, prior to the mating season and when juveniles have begun foraging independently (Oakwood, 2000). Schmitt *et al.* (1989) reported relatively small home ranges in rugged habitat in the Kimberley (2.3 ha for females and 1.8 ha for males), whereas in the western Pilbara, minimum activity areas (often used as an estimator of home range) are 75–443 ha for females and 5–1,109 ha for males (King, 1989).

The northern quoll is both arboreal and terrestrial, inhabiting ironstone and sandstone ridges, scree slopes, granite boulders and outcrops, drainage lines, riverine habitats (Braithwaite & Griffiths, 1994; Oakwood, 2002), dissected rocky escarpments, open forest of lowland savannah and woodland (Oakwood, 2002, 2008). They are opportunistic omnivores, consuming a wide range of invertebrates and small vertebrates also in addition to fruit, nectar, carrion and human refuse (Dunlop *et al.*, 2017). Rocky habitats tend to support higher densities, as they offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994; Oakwood, 2000). Other microhabitat features important to the species include rock cover, proximity to permanent water, and time-since last fire (Woinarski *et al.*, 2008). Dens occur in a wide range of habitat features, including rock overhangs, tree hollows, hollow logs, termite mounds, goanna burrows and human dwellings/infrastructure, where individuals usually den alone (Oakwood, 2002; Woinarski *et al.*, 2008). At present, northern quolls are relatively common in the northern Pilbara region (generally within 150 km of the coast) but are much less common in southern and south-eastern parts of the region (Cramer *et al.*, 2016b).

6.1.2 Previous Records

The Study Area falls within the south-eastern extent of the modelled distribution of the northern quoll. The desktop assessment identified nine records from within 40 km of the Study Area, including one record from 2007 within the Study Area at Mt Whaleback (BHP WAIO, 2024; DBCA, 2024d), however this record is unconfirmed and was reported to be of a dead (roadkill) individual. Another record of a scat found on a rehabilitated waste dump in 2021 is adjacent (approximately 94 metres (m) south) to the Study Area (BHP WAIO, 2024). Three records are from secondary signs (historical scats) at Western Ridge, approximately 1 km north of the Study Area in 2020, and four records are from Hope Downs 4, approximately

18 km north of the Study Area in 2021 and 2022 (DBCA, 2024d). Both records from the Whaleback mine site are possibly representative of individuals which had been transported to the area, and the Western Ridge records are believed to be representative of historical and/or intermittent population presence. This suggests that the species' occurrence within the Study Area is extremely rare. This may be due to the species occurring in very low densities within, or nearby the Study Area, or the record being from a transient individual. In addition, a recent study by Biologic (2022a) extensively surveyed the north Jimblebar area (which overlaps with the eastern portion of the Study Area) for northern quoll and no direct or indirect evidence of the species was recorded during the 52.5 person hours of targeted searches and over 5,000 camera trap nights during this survey.

6.1.3 Survey Methods

6.1.3.1 Targeted Searches

Targeted searches for direct or secondary evidence were undertaken in suitable habitat for northern quoll along 17 transects, equating to approximately 25.5 person hours (Appendix F; Figure 6.2). In addition, two person hours of nocturnal searching at one site (VPWR-021) were conducted along a Major Drainage Line habitat (Appendix F; Figure 6.2).

6.1.3.2 Camera Trap Transects

Four camera trap transects were deployed in suitable northern quoll breeding, foraging and dispersal habitat (e.g. Gorge/ Gully, Breakaway/ Cliff) (Table 6.2; Figure 6.2). Where possible, survey effort followed methods recommended by DoE (2016). Ten cameras were deployed across each transect with an approximate spread of one camera every 50–100 m (Table 6.2). Cameras were deployed for four consecutive nights, for a total of 160 camera trap sampling nights (Table 6.2).

Cameras were baited with universal bait mixture (oats, peanut butter and sardines) in a non-reward receptacle (perforated and capped PVC pipe).

Table 6.2: Camera transects sampled for northern quoll

Site	Habitat	Deployment	Retrieval	No. Cameras	Total Trap Nights
VPWR-001	Gorge/ Gully	16/04/2024	20/04/2024	10	40
VPWR-003	Gorge/ Gully	16/04/2024	20/04/2024	10	40
VPWR-011	Breakaway/ Cliff, Hillcrest/ Hillslope	17/04/2024	21/04/2024	10	40
VPWR-020	Breakaway/ Cliff, Hillcrest/ Hillslope	17/04/2024	21/04/2024	10	40
Total camera transects deployed					4
Total trap nights					160

6.1.4 Survey Results

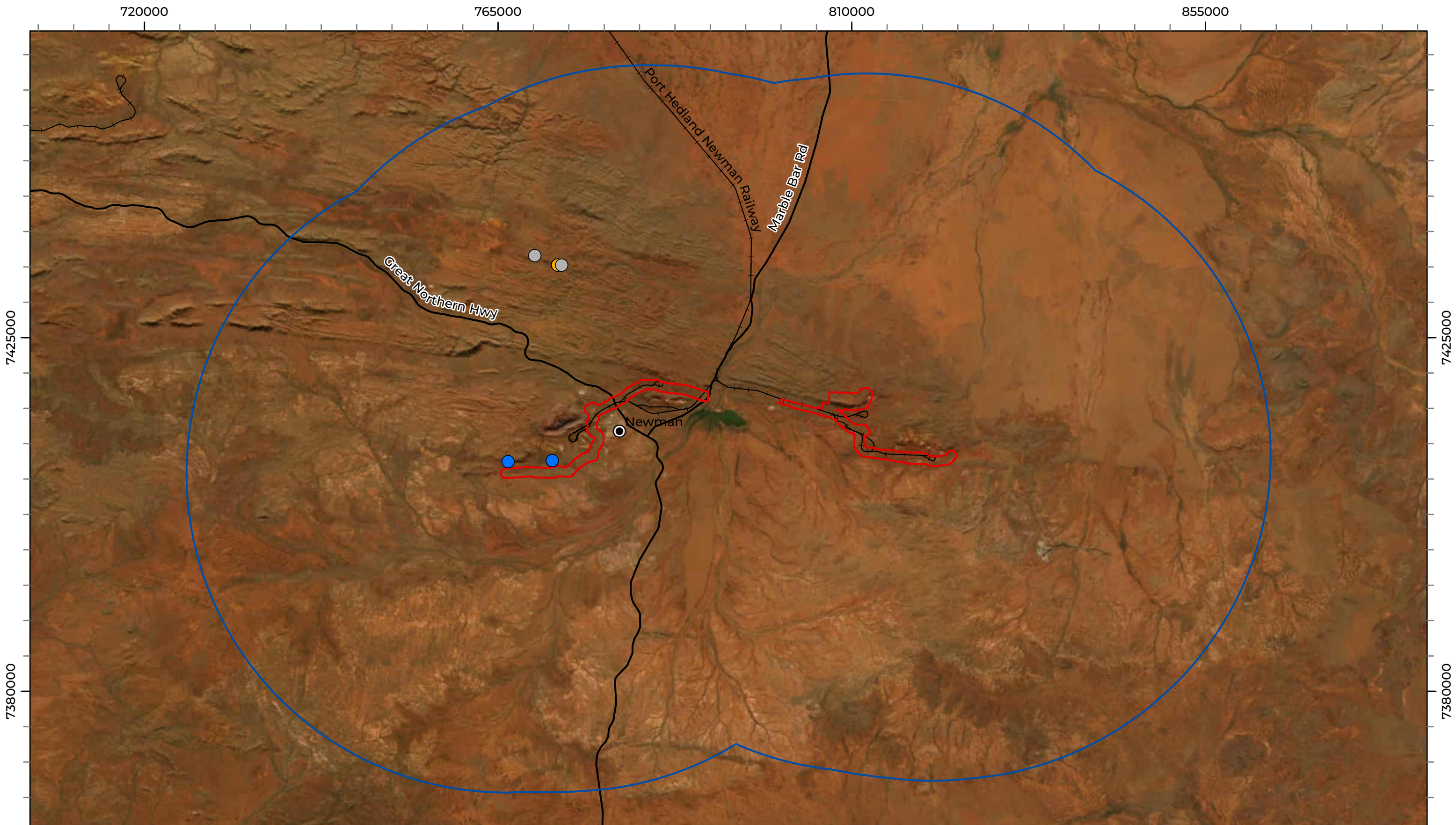
No evidence of northern quoll was recorded within the Study Area.

6.1.5 Discussion

One previous record of northern quoll from 2007 occurs within the Study Area in Cleared/ Disturbed habitat, however this record is unconfirmed and was reported to be of a dead (roadkill) individual. A further eight previous records fall within 20 km of the Study Area. Four records (secondary evidence) occur within 1 km of the Study Area in the Western Ridge Area ($n = 3$) and OB-18 Shovelanna Hill ($n = 1$). The four remaining previous records (including live individuals) were recorded at Hope Downs mine (18 to 20 km northwest of the Study Area). There is uncertainty regarding these previous records, particularly with regard to the species long-term occurrence and persistence in the broader area, and recent survey effort for the species has resulted in no records (Biologic, 2022a).

The Gorge/ Gully (295.25 ha, 3.44%), Breakaway/ Cliff (6.39 ha , 0.07%), and Major Drainage Line (53.79 ha , 0.63%) habitats within the Study Area represent potential critical habitat for northern quoll (BHP WAIO, 2023; DoE, 2016) (Figure 6.2). Potential supporting habitat for the northern quoll occurs in the Hillcrest/ Hillslope (1,562.90 ha, 18.23%), Artificial Wetland (6.48 ha, 0.08%), and Minor Drainage Line (171.23 ha, 2.00%) habitats, where proximal (<35 ha, BHP WAIO (2023)) to potential critical habitat (Gorge/ Gully, Breakaway/ Cliff, and Major Drainage Line). The extent of potential critical habitat within the Study Area is limited; however, the supporting habitats form part of larger continuations of the habitat beyond the extent of the Study Area and may therefore potentially act as foraging and dispersal corridors where connectivity to other areas of critical habitat is provided.

Despite the species being recorded once previously within the Study Area and a few close records to the Study Area, records of the species in the vicinity of the Study Area are sparse suggesting that the species' occurrence within the Study Area is extremely rare and it is unlikely a resident population occurs within the Study Area. The species is considered confirmed; however, may be limited to infrequent visitations by foraging and/ or dispersing individuals only.



LEGEND

Study Area	DBCA (2024)
Desktop Assessment Area	Individual (alive)
State Road	Secondary Evidence
Rail	Unknown

Scale 1:450,000

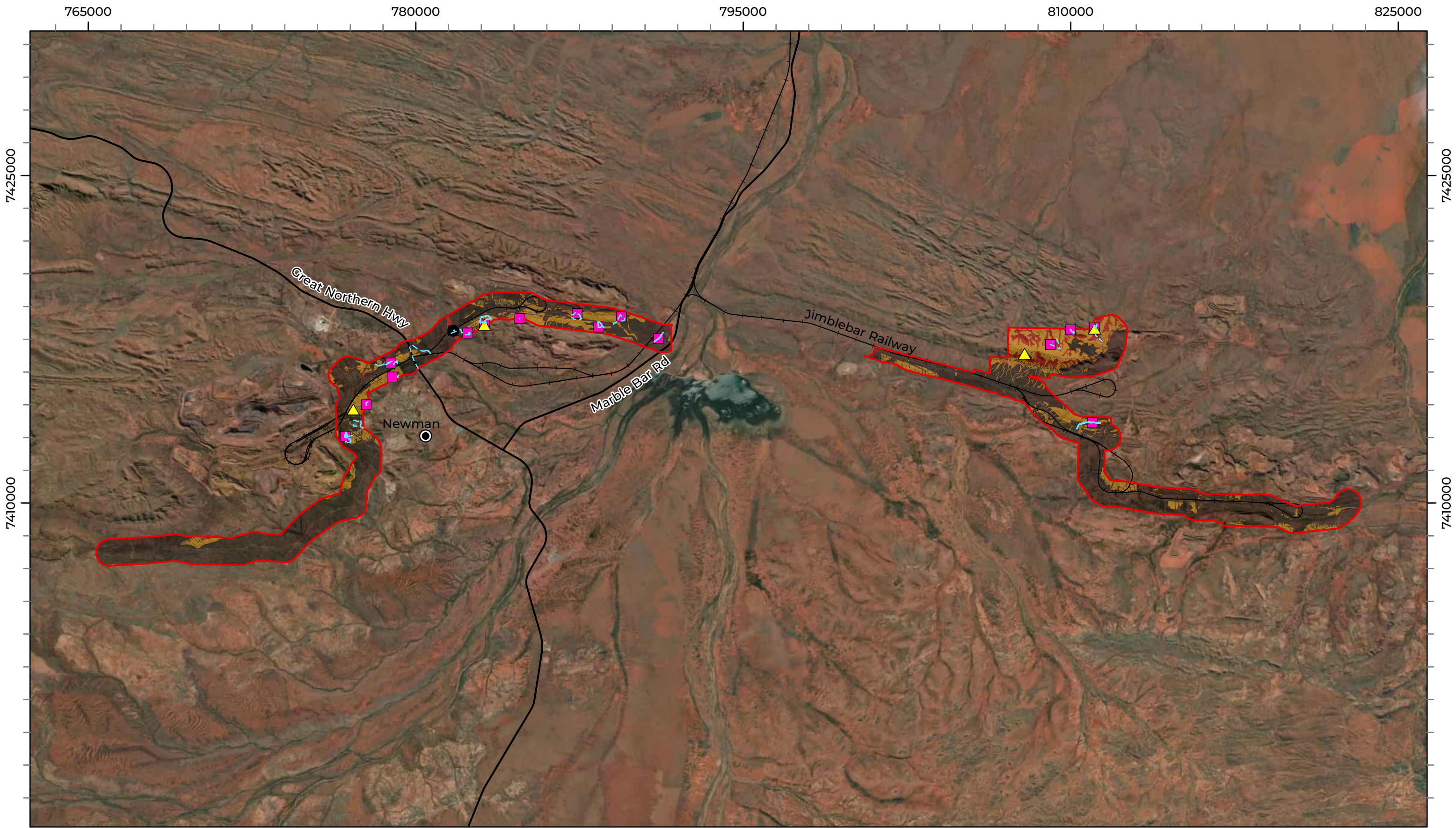
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Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 19/09/2024

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Figure 6.1: Previous northern quoll records in the Survey Area and region



LEGEND

Study Area	Sampling Type	Habitat
State Road	Camera Trap	Critical
Rail	Nocturnal Search	Supporting
	Targeted Search	Nil
	Targeted Search	

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 29/10/2024

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Power 2030 Targeted Vertebrate Fauna Survey

Figure 6.2: Northern quoll sampling and habitat in the Study Area

6.2 Greater Bilby (*Macrotis lagotis*) – Vulnerable EPBC Act & BC Act

6.2.1 Species Profile

The greater bilby is semi-fossorial and nocturnal, remaining in their burrows during the day and intermittently during the night for rest and refuge. Greater bilby populations naturally occur as scattered solitary individuals or small groups (Smythe & Philpott, 1968; Southgate, 1990a). They are regarded as having low site fidelity and high mobility (Southgate et al., 2007); males regularly move 3-5 km between burrows on consecutive days and have been recorded moving up to 15 km in a few weeks (Southgate & Possingham, 1995). This high mobility, together with low population density, ensures that the area of occupancy is often far less than the extent of occurrence. As greater bilbies are solitary in nature, lack territoriality and have large home ranges, it is likely that males adopt a roving strategy to find receptive females, consistent with an overlapping promiscuous mating system (Miller et al., 2010), and may move in response to foraging potential (Southgate, 1990a; Southgate et al., 2019).

Populations of greater bilby exist in the Pilbara bioregion (particularly within the Chichester subregion, along the Fortescue River and north-east to Goldsworthy and Shay Gap), in the Dampier bioregion (along 80 Mile Beach north to Beagle Bay) and in the Central Kimberley and Ord-Victoria Plains bioregions south of the Fitzroy and Margaret Rivers (Southgate, 1990a). The species' distribution within the Pilbara region is highly fragmented (Cramer et al., 2017).

Greater bilbies occupy three major vegetation types - open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas (Southgate, 1990b). Laterite and rock feature substrates are an important part of their habitat as they support shrub species, such as *Acacia kempeana*, *A. hilliana* and *A. rhodophylla*, which have root-dwelling larvae prone that support a constant food source (Dziminski & Carpenter, 2017; Southgate et al., 2007). These habitats also contain spinifex hummocks, which are quite uniform and discrete, providing runways between hummocks and enabling easier movement and foraging (Southgate et al., 2007). Minimal ground cover is a common feature in greater bilby habitats, as it allows easy foraging (Dawson et al., 2018). Habitat within the Pilbara bioregion seems to consist mostly of spinifex sand plain associated with major drainage line sandy terraces. In general, the distribution of greater bilbies can be limited by the availability of suitable burrowing habitat, such as dunes where burrow excavation is easier (Moseby & O'Donnell, 2003), and are not found in predominantly rocky areas or mountains where they would be unable to dig suitable burrow systems or dig for food.

6.2.2 Previous Records

The desktop assessment identified 16 previous records of greater bilby within 40 km of the Study Area (Astron, 2024a; BHP WAI0, 2024; DBCA, 2024d) (Figure 6.3). Two of these records are historical from secondary signs (tracks and uncertain scats), a 1979 record approximately 8 km east of the Study Area (near Capricorn Roadhouse, exact record location unconfirmed/

uncertain) and a 1983 record approximately 36 km from the Study Area (DBCA, 2024d). The 2018 record of an old (unconfirmed) inactive burrow is from a site approximately 22 km east of the Study Area (Biologic, 2018a). The burrow has been reassessed in 2019, 2021 and 2023 on subsequent fauna surveys with no evidence of greater bilby recorded at the burrow (Astron, 2024a; DBCA, 2024d; GHD, 2019, 2021a). The most recent previous records are from the East Caramulla area in 2023, approximately 20 km east of the Study Area of old potential diggings and inactive (unconfirmed) burrows (Astron, 2024a). There are no previous records of the species within the Study Area.

6.2.3 Survey Methods

6.2.3.1 Greater Bilby Plots Searches

Eight survey plots (2-hectare plot search) and one targeted search transect (TPWR-083) equating to approximately 9.66 person hours were surveyed in Sand Plain, Drainage Area/ Floodplain, Major/ Minor Drainage Line and Hardpan Plain habitats where suitable sandy substrates were present (Table 6.3; Figure 6.4; Appendix F). The targeted searches focused on identifying signs of secondary evidence (burrows, diggings, tracks and scats) as described by Southgate *et al.* (2019).

Table 6.3: Sampling effort for greater bilby

Site	Habitat	Date	Number of person hours
VPWR-028	Drainage Area/ Floodplain	23/04/2024	0.5
VPWR-044	Hardpan Plain	20/04/2024	1
VPWR-059	Major Drainage Line	19/04/2024	1
VPWR-061	Sand Plain	19/04/2024	0.66
VPWR-063	Sand Plain	19/04/2024	0.5
VPWR-074	Sand Plain, Minor Drainage Line, Drainage Area/ Floodplain	23/04/2024	0.7
VPWR-094	Drainage Area/ Floodplain	23/04/2024	1
VPWR-100	Sand Plain, Major Drainage Line	24/04/2024	0.3
TPWR-083	Major Drainage Line	24/04/2024	4
Total number of person hours			9.66

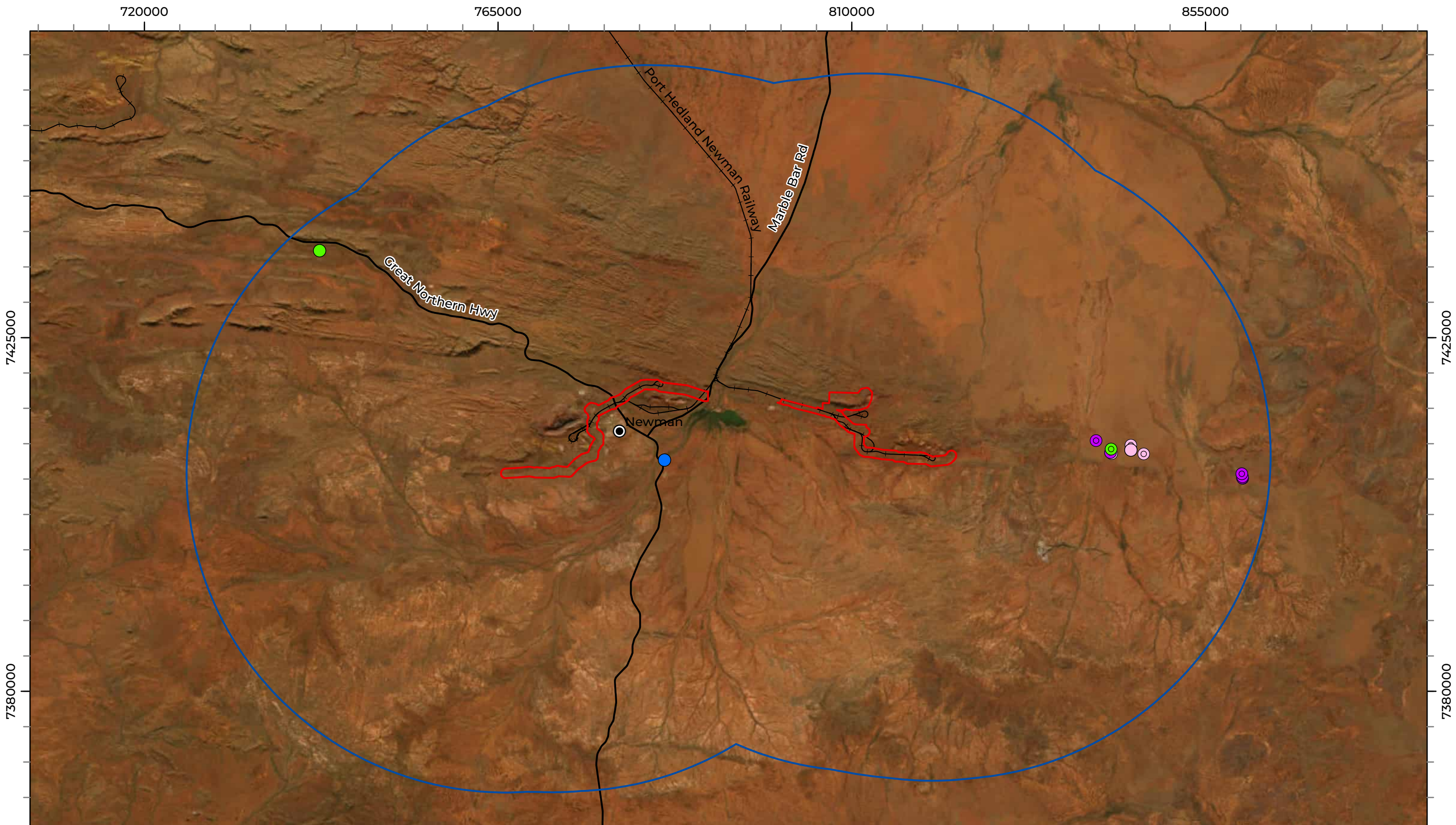
6.2.4 Survey Results

No evidence of greater bilby was recorded within the Study Area.

6.2.5 Discussion

No evidence of greater bilby was recorded during the current survey within the Study Area and there is a scarcity and uncertainty over the veracity of records within the vicinity of the Study Area and within the local region. While marginally suitable habitat in the form of Sand Plain (385.33ha, 4.49%) is present within the Study Area, the habitat is relatively small in size, impacted by tracks and mining activity, and isolated from other similar habitat outside of the Study Area, making it unlikely to support a population of the species (Figure 6.4). Based on

the limited number of nearby recent records and the uncertainty over the veracity of these records, and lack of critical and supporting habitats within the Study Area the greater bilby is considered unlikely to occur in the Study Area.



LEGEND

Study Area	DBCA (2024)	Astron (2024)
Desktop Assessment Area	Burrow (inactive)	Burrow (inactive)
State Road	Scat	Digging
Rail	Secondary Evidence	Scat

Biologic

Scale 1:450,000

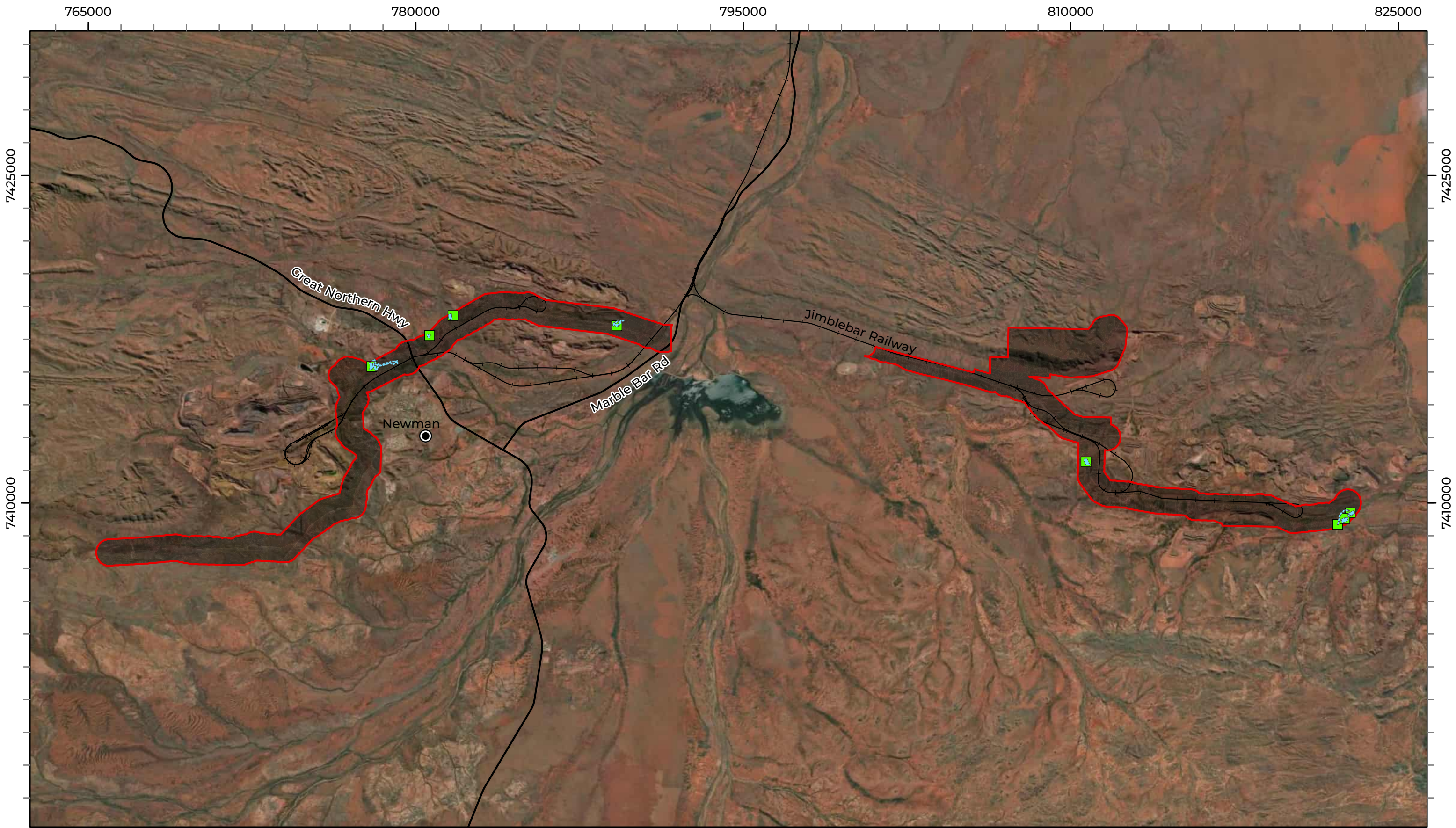
0 5 10 15 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 29/10/2024

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Figure 6.3: Previous greater bilby records in the Survey Area and region



LEGEND

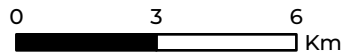
- | | | |
|--|---|---|
|  Study Area | Sampling Type | Habitat |
|  State Road |  Bilby Plot |  Nil |
|  Rail |  Targeted Search | |
| |  Targeted Search | |



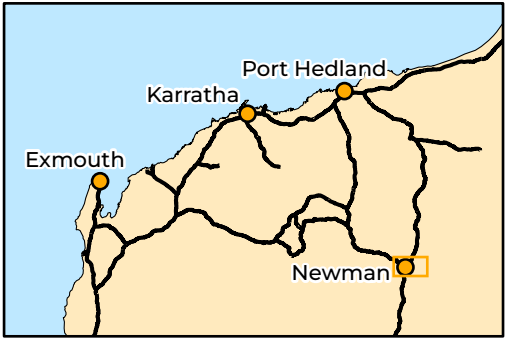
Biologic



Scale 1:162,000



Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 29/10/2024



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Figure 6.4: Greater bilby
sampling and habitat in
the Study Area

6.3 Ghost Bat (*Macroderma gigas*) – Vulnerable EPBC Act & BC Act

6.3.1 Species Profile

The ghost bat occurs in disjunct colonies across northern Australia (TSSC, 2016b). In the Pilbara region, the species occurs in all four subregions. The Pilbara population is estimated to comprise between 1,300 and 2,000 individuals (TSSC, 2016b). The largest population occurs within the Chichester subregion (estimated at approximately 1,500 individuals) where known populations are largely restricted to disused mines (TSSC, 2016b).

The distribution of ghost bats in the Pilbara is determined by the presence of suitable roosting sites. Natural roosts generally comprise deep, complex caves beneath bluffs or low rounded hills (Armstrong & Anstee, 2000). Centralised breeding sites in the Pilbara are largely restricted to abandoned mines in the Chichester Ranges; however, there are also a number of smaller maternity roosts in the Chichester and Hamersley Ranges (Armstrong & Anstee, 2000). Based on available data, breeding has been documented in natural caves at Mining Area C (including South Flank), Western Ridge (Biologic, 2023c, 2024), Mt Brockman and West Angeles in the Hamersley sub-region, and at Callawa and Tambrey Station in the Chichester subregion (Armstrong & Anstee, 2000). Ghost bats are known to move between a number of caves seasonally, or as dictated by weather conditions, and require a range of cave sites (Hutson *et al.*, 2001). Outside the breeding season, male bats are known to disperse widely, most likely during the wet season when conditions would allow bats to use caves that would otherwise not be suitable (Worthington-Wilmer *et al.*, 1994). Genetic studies indicate that females are likely to stay close to the maternity roosts (Worthington-Wilmer *et al.*, 1994).

The categories of cave significance for ghost bats followed the classifications defined by Bat Call (2021a):

- **Category 1** (maternity/ diurnal roost with permanent occupancy): Permanently occupied roost tending to have large fluctuating populations. Due to permanent presence maternity usage is assumed. Structurally, caves are often deep and dark with one or more elevated roosting chambers that provide a stable microhabitat. Critical for the ongoing presence of ghost bat in the area.
- **Category 2** (maternity/ diurnal roost with regular occupancy): Ghost bat presence regular, but not permanent/ continuous over long periods. Pregnant or pup-carrying individuals may be present. Similar to Category 1 caves, but often less complex, with only a single inner chamber and are often in less productive areas only used by the species periodically. Bats present for 25% to 75% but may be abandoned for weeks or months. Typically have several other caves, shelters and overhangs within a few hundred metres, which together make up an 'apartment block' grouping that supports the ongoing presence of the species. Critical for the ongoing presence of the species in the area.
- **Category 3** (diurnal roost with occasional occupancy): Diurnal roosts where the species roosts occasionally, or rarely. Structurally, less well-developed and often used as feeding

sites (as evidenced by middens with food scraps) or temporary refuges. Scats and/or small food middens present but may be no evidence of roosting bats or observations of roosting not consistent. May facilitate long-distance movements of individuals more broadly across the landscape. When adjacent to Category 2 roosts, Category 3 caves are considered part of an 'apartment block' and therefore critical habitat for the ongoing presence of the species in the area. Where occurring in isolation, Category 3 caves are not considered critical habitat essential for the long-term viability of a local population.

- **Category 4** (nocturnal roost with opportunistic usage): Roosts used in at least an opportunistic manner by itinerant individuals and may comprise single visitations to longer periods including periods of rest or feeding during foraging. Includes majority of shallow caves, shelters and deep overhangs in the Pilbara. Not considered critical habitat.

Foraging habitat for ghost bats is classified as occurring within a 12 km radius of these categorised caves (Bat Call, 2021a) or 1,200 ha of habitat surrounding each of these caves. The habitat includes:

- productive plain areas with thin mature woodland over patchy or clumped tussock or hummock grass (*Triodia* spp.) on sand or stony ground
- isolated trees and trees on the edge of thin thickets on the plains
- trees along the edges of watercourse woodlands
- gully or gorge system that opens onto a plain or riparian line.

Recent studies using VHF tracking and GPS/satellite tracking technologies show that ghost bats, both male and female, may forage over much larger areas (up to 17 km) from their diurnal roost, with an average radial distance of 8.5 km (Augusteyn *et al.*, 2018; Bat Call, 2021a; Biologic, 2020a; Bullen *et al.*, 2023). Ghost bats will utilise the majority of an available foraging area, spending on average 116 minutes at particular foraging sites (Bullen *et al.*, 2023). Ghost bats have a 'sit and inspect' foraging strategy; whereby they hang on a perch and visually inspect their surroundings for movement. Once their prey is detected it may be captured in the air, gleaned (i.e. taken from the surface of a substrate by a flying bat) from the ground or vegetation, or dropped on from a perch (Boles, 1999).

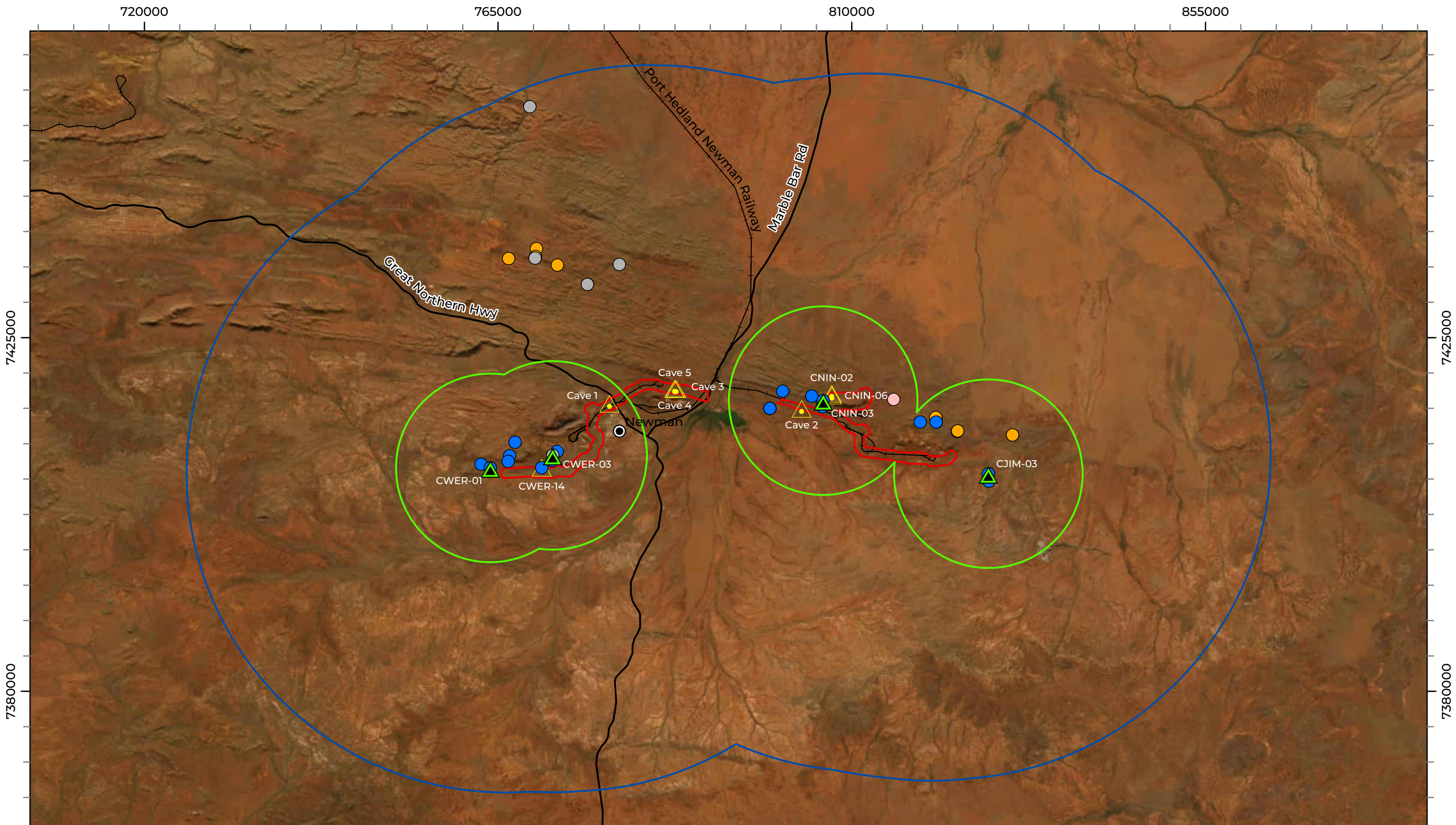
Ghost bats have been confirmed as foraging across a variety of habitat types, however generally thinly wooded areas of mulga, other *Acacia* or *Eucalypt* species or linear woodland features are preferred in areas with a moderate percentage of open ground (typically 30–70%) (Bullen *et al.*, 2023). Tracking studies at BHP WAIO's South Flank mine have observed a ghost bat exiting a cave and moving immediately towards broad drainage plains with Mulga Woodland and Major Drainage Line (Biologic, 2020a). Such areas are often highly productive and contain an abundance of foraging structures (Biologic, 2020a).

6.3.2 Previous Records

A total of 516 records of ghost bat occur within 40 km of the Study Area (Figure 6.5), with seven records occurring within the Study Area (BHP WAIO, 2024; DBCA, 2024d). The seven records

within the Study Area pertain to two locations – site VWER-28 from Western Ridge (Biologic, 2022c) and one site at Mt Whaleback (Onshore, 2013).

A large proportion of the previous records (466 records) were associated with monitoring (mostly echolocation calls) of the ghost bat population at important nearby roosts at Western Ridge and Jimblebar, approximately 0.9 – 2.7 km north and west of the western portion of the Study Area and 2.7 – 12 km north and east-south-east of the eastern portion of the Study Area, respectively (Biologic, 2023c). Further north, there are six records from Hope Downs 4 (DBCA, 2024d).



LEGEND

- | | | |
|-------------------------|--------------------------|--------------------|
| Study Area | Previously Recorded Cave | DBCA (2024) |
| Desktop Assessment Area | Category 2 Roost | Individual (alive) |
| State Road | Roost 12km Buffer | Secondary Evidence |
| Rail | | Specimen |
| | | Unknown |



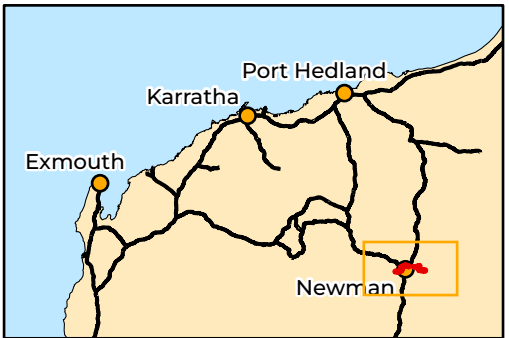
Biologic



Scale 1:450,000

0 5 10 15 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 08/11/2024



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Figure 6.5: Previous ghost bat records in the Study Area and region

6.3.3 Survey Methods

6.3.3.1 Targeted Searches

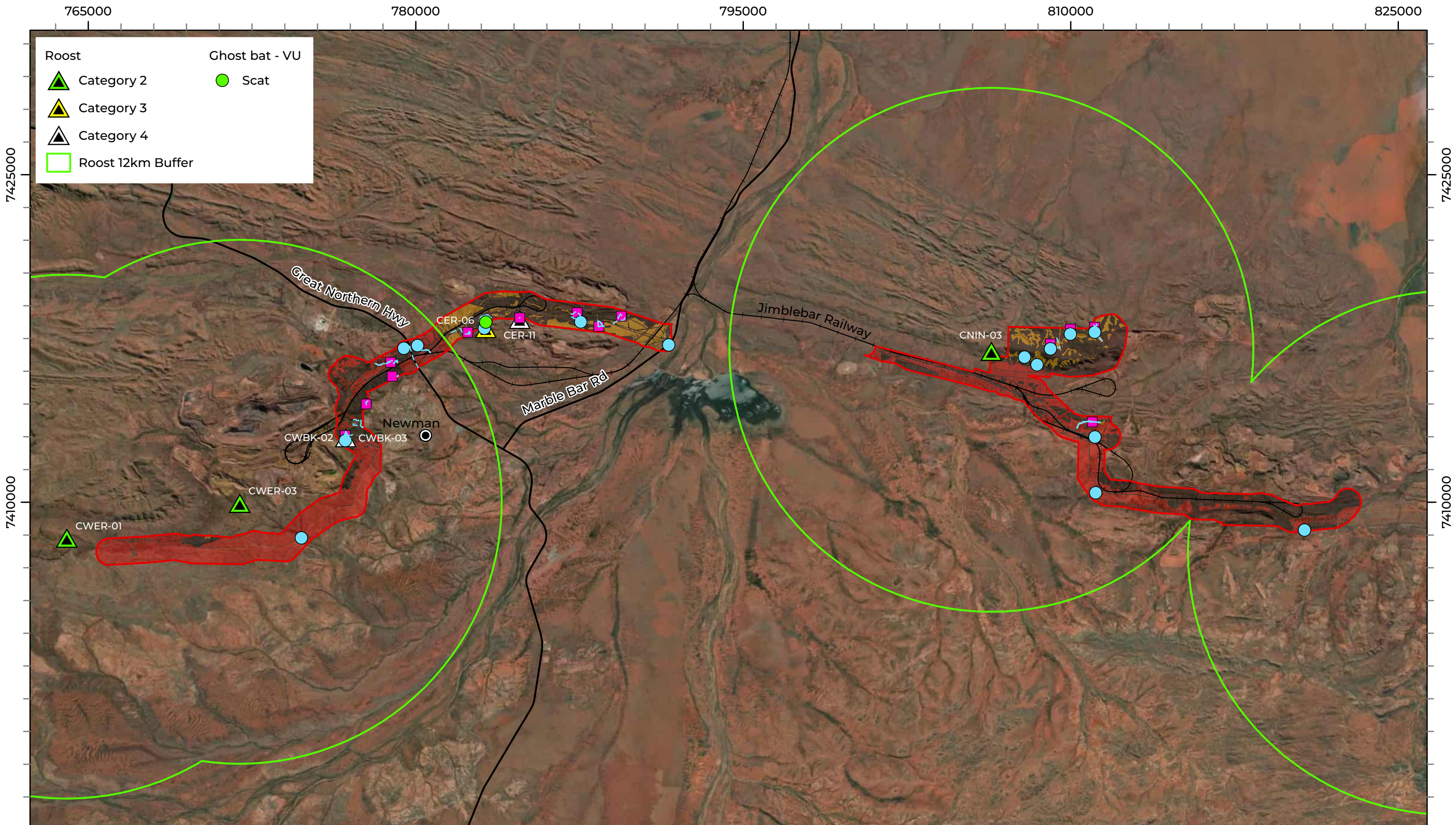
Targeted searches for significant bat species were undertaken at 15 locations across the Study Area in habitats with rocky outcropping (i.e. Gorge/ Gully, Breakaway/ Cliff and Hillcrest/ Hillslope). The searches were conducted on foot to determine the presence of caves likely to be used by ghost bats and/or Pilbara leaf-nosed bats (Appendix F; Figure 6.6). Where suitable caves or overhangs were located, detailed cave assessments were undertaken to search for evidence of occurrence and determine the cave classification as detailed in Bat Call (2021a). A total of four cave assessments were undertaken at four caves (CER-06, CER-11, CWBK-02 and CBWK-03) across three sites (VPWR-020, VPWR-038 and VPWR-040) during the current survey. Where a cave was not deemed safe for entry, efforts were made to assess the cave without entering. Approximately 23.5 person hours of search effort for significant bat species were undertaken during the surveys (Appendix F; Figure 6.6).

6.3.3.2 Ultrasonic Recorders

Overnight recordings of bat echolocation calls were undertaken with Song Meter ultrasonic bat recorder at 15 sites (Table 6.4; Figure 6.6). Recorders were placed in potential suitable habitat near water features, caves, and foraging/ dispersal corridors. Recorders were deployed for three or four consecutive nights at each site, resulting in a total of 51 recording nights (Table 6.4). All recordings were analysed by Robert Bullen of Bat Call WA for the presence of ghost bat and Pilbara leaf-nosed bat calls.

Table 6.4: Ultrasonic sampling for ghost bat and Pilbara leaf-nosed bat

Site	Habitat Feature	Habitat	Deployment	Retrieval	Sampling Nights
VPWR-001	-	Gorge/ Gully	16/04/2024	20/04/2024	4
VPWR-002	WPWR-006	Mulga Woodland	16/04/2024	19/04/2024	3
VPWR-003	-	Gorge/ Gully	16/04/2024	20/04/2024	4
VPWR-005	WPWR-001	Gorge/ Gully	16/04/2024	20/04/2024	4
VPWR-006	-	Minor Drainage Line	16/04/2024	19/04/2024	3
VPWR-007	-	Gorge/ Gully	20/04/2024	20/04/2024	4
VPWR-009	-	Gorge/ Gully	20/04/2024	20/04/2024	4
VPWR-010	-	Drainage Area/ Floodplain	16/04/2024	19/04/2024	3
VPWR-018	-	Minor Drainage Line	16/04/2024	23/04/2024	4
VPWR-020	CER-06	Breakaway/ Cliff	17/04/2024	21/04/2024	3
VPWR-022	WPWR-004	Drainage Area/ Floodplain	20/04/2024	23/04/2024	3
VPWR-034	WPWR-034	Artificial Wetland	19/04/2024	22/04/2024	3
VPWR-036	WPWR-036	Artificial Wetland	19/04/2024	22/04/2024	3
VPWR-040	-	Hillcrest/ Hillslope	19/04/2024	22/04/2024	3
VPWR-045	-	Mulga Woodland	19/04/2024	22/04/2024	3
Total ultrasonic recorders deployed					15
Total recording nights					51



LEGEND

Study Area	Sampling Type	Habitat
State Road	Targeted Search	Critical
Rail	Ultrasonic Recorder	Supporting
	Targeted Search	Nil

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 03/01/2025

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Power 2030 Targeted Vertebrate Fauna Survey

Figure 6.6: Ghost bat sampling, records and habitat in the Study Area

6.3.4 Survey Results

6.3.4.1 Targeted searches

Ghost bat was recorded on one occasion in the Study Area during the current survey (Figure 6.6; Appendix G). The species was recorded from secondary evidence (scats) observed at site VPWR-020 (within cave CER-06), with approximately 1,000 recent scats (estimated 1–6 months in age) observed (Plate 6.1).



Plate 6.1: Ghost bat scat pile observed in cave CER-06

Of the four caves recorded in the Study Area, cave CER-06 was categorised as a Category 3 ghost bat roost. The presence of recent scats (~1,000) and the dimensions (two chambers, depth approx. 18 m) and microclimate were indicative of being suitable for diurnal roosting of ghost bats. The classification of CER-06 could not be confirmed to be a Category 2 roost (diurnal roost caves with regular occupancy) due to a lack of evidence of usage from one visit. However, with continued monitoring further evidence of regular usage and breeding from ghost bats could suggest this cave to be a Category 2 roost. The remaining three caves were classified as Category 4 roosts (CER-11, CWBK-02 and CWBK-03) with the potential for night roosting (Figure 5.2; Figure 6.6; Appendix D).

6.3.4.2 Ultrasonic Recording

No calls from ghost bats were recorded by ultrasonic recorders during the current survey.

6.3.5 Discussion

Ghost bat was recorded on one occasion in the Study Area during the current survey via secondary evidence, comprising a large scat pile of approximately 1,000 recent (1–6 months old) scats at cave CER-06 (Figure 6.6). While bat detectors placed in areas targeting foraging or roosting habitats did not record calls over the survey period, it should be noted that ghost bat detectability via ultrasonic recorders, particularly of foraging individuals, is difficult due to their foraging behaviour (i.e. infrequent and highly variable calling during foraging) and the capabilities of ultrasonic recording devices (i.e. limited detection zones).

The most suitable areas of habitat (for potential caves/roosts) to support the species are in the northeast corner of the Study Area in the largely undisturbed expanse of Gorge/ Gully and Hillcrest/ Hillslope habitat, with other smaller areas located centrally and in the southwestern arm of the Study Area in similar habitats as well as Breakaway/ Cliff habitat. One suitable cave for ghost bat (CER-06) was recorded within Breakaway/ Cliff habitat and three caves were recorded within rocky elevated breakaway features within Hillcrest/ Hillslope habitat during the current survey (CER-11, CWBK-02 and CWBK-03) (Figure 5.2; Figure 6.6; Appendix D). Cave CER-06 was classified as a Category 3 roost with evidence of diurnal roosting, with all other caves classified as Category 4 roost caves (nocturnal roost caves with opportunistic usage). Eight other caves are known to occur within the Study Area in Gorge/ Gully (3.44%, 295.25 ha), and Hillcrest/ Hillslope (18.23%, 1,562.90 ha) habitats, comprising two Category 3 (diurnal roost caves with occasional occupancy) and six Category 4 caves (Figure 6.5) (Biologic, 2023c; ENV, 2009). There are several caves to the north, east and west of the Study Area within the Jimblebar/ Ninga, Cathedral Gorge and Western Ridge areas which are currently being monitored for ghost bat presence, with four Category 2 caves (maternity/ diurnal roost caves with regular occupancy for ghost bats) (CNIN-03, CWER-01, CWER-03 and CJIM-03) between 0.3–4.5 km of the Study Area (Biologic, 2023c).

No critical roosts were identified within the Study Area; however, four critical Category 2 roosts occur between 0.3–4.5 km north, east and west of the Study Area (CNIN-03, CWER-01, CWER-03 and CJIM-03) (Figure 6.5; Figure 6.6). Suitable foraging habitats for ghost bat that are within the 12 km buffer (usual foraging distance for the species (Bat Call, 2021a)) of these four Category 2 roosts are considered critical habitat (Stony Plain 1,528.51 ha, 17.83%; Drainage Area/ Floodplain 943.89 ha, 11.01%; Mulga Woodland 432.61 ha, 5.05%; Sand Plain 327.27 ha, 3.82%; Minor Drainage Line 102.93 ha, 1.20%; Hardpan Plain 76.52 ha, 0.89%; Undulating Low Hills 43.89 ha, 0.51%; Major Drainage Line 24.95 ha, 0.29%; and Artificial Wetland 3.70 ha, 0.04%) (based on definitions in BHP WAO (2023)) (Figure 6.6). Supporting foraging and dispersal habitat outside of the 12 km buffers of the four Category 2 roosts is provided by Drainage Area/ Floodplain (158.56 ha, 1.85%), Stony Plain (141.01 ha, 1.64%), Minor Drainage line (68.30 ha, 0.80%), Sand Plain (58.05 ha, 0.68%), Undulating Low Hills (44.69 ha, 0.52%), Major Drainage Line (28.85 ha, 0.34%), Artificial Wetland (2.79 ha, 0.03%) and Mulga Woodland

(0.02%, 1.34 ha) habitats within the Study Area. While Gorge/ Gully (295.25 ha, 3.44%) and Breakaway/ Cliff (6.39 ha, 0.07%) within the Study Area don't provide foraging habitat, these habitats can provide supporting dispersal habitat when proximal (<12 km) to roosting caves. Hillcrest/ Hillslope (1,562.90 ha, 18.23%) habitat within the Study Area is not considered supporting foraging habitat for the species as it is not highly productive and lacks the perching opportunities required for their foraging strategy. While no records of ghost bat were made via ultrasonic recorders, this does not indicate that the species is not foraging in these habitats. Unlike the majority of microbats, ghost bats are proficient in navigating and hunting visually without needing to constantly echolocate (Strahan, 2004). For this reason, it is not uncommon to not record ghost bats in areas where their presence is observed.

The presence of four Category 2 caves (CNIN-03 CWER-01, CWER-03 and CJIM-03) within approximately 0.3–4.5 km and eight Category 3 caves (CNIN-01, CNIN-02, CNIN-07, CNIN-09 – 13) within approximately less than 8 km of caves CNIN-02 and CNIN-06 within the Study Area suggests the species is foraging between these roosts. This also applies for CER-06 within the Study Area, where four Category 3 caves are recorded within 8 km (CCAT-01, CCAT-02, CCAT-06 and CCAT-13) of this cave. The suitability of these habitats is variable throughout the Study Area depending on habitat characteristics, including the abundance of foraging structures (tree perches) and vegetation structure and density present. Due to the presence of known roosting caves and confirmed records within the Study Area and surrounds, occurrence of suitable breeding and roosting habitat, and recent records of the species, it is likely to occur as a resident and utilise the above habitats within the Study Area regularly for foraging.

The occurrence of ghost bats within the Study Area is likely to form part of a broader ghost bat population with high genetic diversity across the Pilbara region (Ottewell *et al.*, 2017), in particular with the known populations at Jimblebar/ Ninga, Cathedral Gorge and Western Ridge. The individuals present in the Study Area would form part of the broader meta-population of ghost bats in the Pilbara and likely contribute to the high genetic diversity present in the region, potentially linking larger populations at South Flank/Mining Area C. As such, the population within the Study Area aligns with the DoE (2013b) definition of an 'important population'.

6.4 Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*) – Vulnerable EBPC Act & BC Act

6.4.1 Species Profile

The Pilbara leaf-nosed bat is recognised as a geographically isolated population of the orange leaf-nosed bat, which is distributed across northern Australia and separated from the Pilbara population by approximately 400 km of the Great Sandy Desert (Armstrong, 2001). The Pilbara leaf-nosed bat is regarded as a single interbreeding population comprising multiple colonies (TSSC, 2016c; Umbrello *et al.*, 2022). Currently, there are 48 permanent diurnal Category 1 and 2 roost sites (17 of known location and 31 yet to be found) assumed throughout the Pilbara region (Bat Call, 2021b).

Pilbara leaf-nosed bats typically roost in undisturbed caves, deep fissures or abandoned mine shafts (Armstrong, 2000, 2001). The species' limited ability to conserve heat and water (Baudinette *et al.*, 2000) means they require warm (28–32°C) and very humid (85–100%) roost sites to persist in arid and semi-arid climates (Armstrong, 2001; Churchill, 1991). Roost sites with such attributes are relatively uncommon in the Pilbara and the limiting factor of the species' distribution (Armstrong, 2001). During the dry season (June to November), individuals are believed to aggregate in roosts that provide a suitably warm, humid microclimate (Armstrong, 2000, 2001; Bullen & McKenzie, 2011). While in the wet season (December to May), when conditions are generally wetter and more humid, individuals typically disperse roosting in seasonally suitable features (Armstrong, 2000, 2001; Bullen & McKenzie, 2011). Bat Call (2021b) categorised underground refuges used by the species into four categories:

- **Permanent diurnal (Categories 1 and 2) roosts** – critical habitat that is essential for the daily and long-term survival of the Pilbara leaf-nosed bat. Category 1 are maternity roosts where seasonal presence of young is proven. Category 2 are occupied year-round but without the proven presence of young.
- **Semi-permanent diurnal (Category 3) roosts** – critical habitat that is essential for the long-term survival of the Pilbara leaf-nosed bat. Used diurnally during some part of the year, but not occupied year-round. May be used during the breeding cycle and may facilitate long distance dispersal in the region, particularly in autumn. Often associated with nearby Category 1 or 2 permanent roost as a 'satellite' roost, that together make up a colony.
- **Nocturnal refuge (Category 4)** – not considered critical but important for persistence in the local area. Are occupied or entered at night for resting, feeding or other purposes, with perching not a requirement. Includes most moderately deep caves and shallow abandoned mines.

Foraging sites surrounding known or suspected roosts can be critical to the survival of the species as the species forages within the vicinity of roost caves and more broadly along waterbodies with suitable fringing vegetation supporting prey species (TSSC, 2016c). The species is predicted to travel up to 20 km from roost caves during nightly foraging in the dry season (Cramer *et al.*, 2016a) and up to 50 km during the wet season (Bullen, 2013), with one individual being recorded travelling 170 km from the Ratty Spring Roost near Paraburdoo to the Gudai-Darri roost (Bullen & Reiffer, 2019).

6.4.2 Previous Records

The Study Area is located within the current distribution of the Pilbara leaf-nosed bat, whereby the species or species' habitat may occur (DoE, 2022b). Pilbara leaf-nosed bat has not previously been recorded in the Study Area. However, the database searches identified 475 records of the species occurring within 40 km of the Study Area (BHP WAIO, 2024; DBCA, 2024d) (Figure 6.7). This includes five recent records from 2021 and 2023, comprising evidence of foraging within Major Drainage Line, Drainage Area/ Floodplain and Mulga Woodland habitats (Biologic, 2023b; Biota, 2022). A permanent preliminary Category 2 roost (CNIN-12) has recently been identified in the Ninga area (Biologic, in prep.-a), approximately 1.4 km north from the Study Area (eastern portion) (Figure 6.7). It should be noted that the categorisation of CNIN-12 as a Category 2 permanent diurnal roost is based on a preliminary assessment and requires further monitoring to confirm the categorisation. In addition, there has also been recent roosting indicated at cave CNIN-09 (Biologic, 2024, in prep.-a), approximately 1.8 km northwest from the Study Area (eastern portion), and sporadic nocturnal visits recorded at caves CNIN-03 and CNIN-01, approximately 0.3 km and 1.4 km north from the Study Area (eastern portion) throughout 2022–2023. The nearest known provisional permanent diurnal roost is cave CNIN-12 (mentioned above), followed by Kalgan Creek Roost, approximately 15 km north of the Study Area (Category 2 roost); however, sampling within the intervening area is sparse and additional roost sites may occur closer to the Study Area.

6.4.3 Survey Methods

6.4.3.1 Targeted Searches

Targeted searches for significant bat species were undertaken at 15 locations across the Study Area in habitats with rocky outcropping (i.e. Gorge/ Gully, Breakaway/ Cliff and Hillcrest/ Hillslope), and potential foraging habitat (Major Drainage Line). The searches were conducted on foot to determine the presence of caves likely to be used by ghost bats and/or Pilbara leaf-nosed bats (Appendix F; Figure 6.8). Where suitable caves or overhangs were located, detailed cave assessments were undertaken to search for evidence of occurrence and determine the cave classification as detailed in Bat Call (2021a). A total of four cave assessments were undertaken at four caves (CER-06, CER-11, CWBK-02 and CBWK-03) across three sites (VPWR-020, VPWR-038 and VPWR-040) during the current survey. Where a cave was not deemed safe for entry, efforts were made to assess the cave without entering. Approximately 23.5 person hours of search effort was undertaken during the survey (Figure 6.8; Appendix F).

6.4.3.2 Ultrasonic Recorders

Overnight recordings of bat echolocation calls were undertaken with Song Meter ultrasonic bat recorder at 15 sites (Table 6.4; Figure 6.8). Recorders were placed in critical habitat near water features, caves, and foraging/ dispersal corridors. Recorders were deployed for three or four consecutive nights at each site, resulting in a total of 51 recording nights (Table 6.4; Figure 6.8). All recordings were analysed by Bat Call WA for the presence of ghost bat and Pilbara leaf-nosed bat calls.

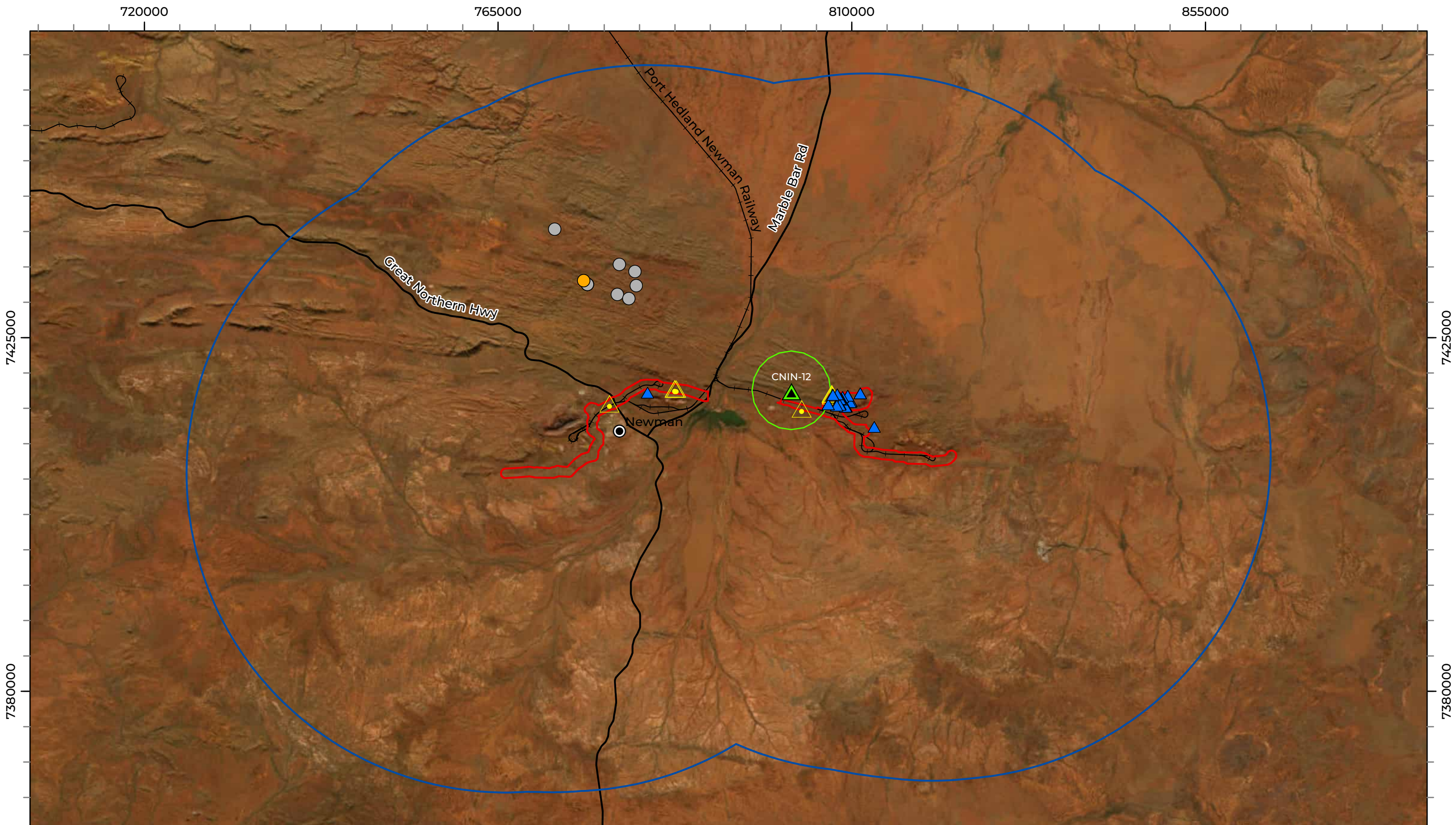
6.4.4 Survey Results

6.4.4.1 Targeted searches

Of the four caves occurring within the Study Area, all were classified as Category 4 (nocturnal refuge) (Figure 5.2; Figure 6.8; Appendix D).

6.4.4.2 Ultrasonic Recorders

No calls from Pilbara leaf-nosed bats were recorded by ultrasonic recorders during the current survey.



LEGEND

- | | | |
|-------------------------|-------------------------------------|--------------------|
| Study Area | Category 2 Roost | DBCA (2024) |
| Desktop Assessment Area | Roost 5km Buffer | Individual (alive) |
| State Road | Previously Recorded Habitat Feature | Unknown |
| Rail | Cave | |
| | Water Feature | |

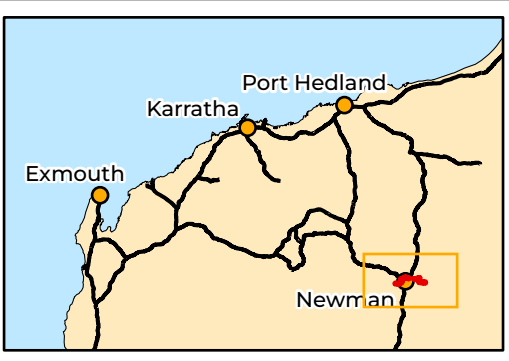
**Biologic**



Scale 1:450,000
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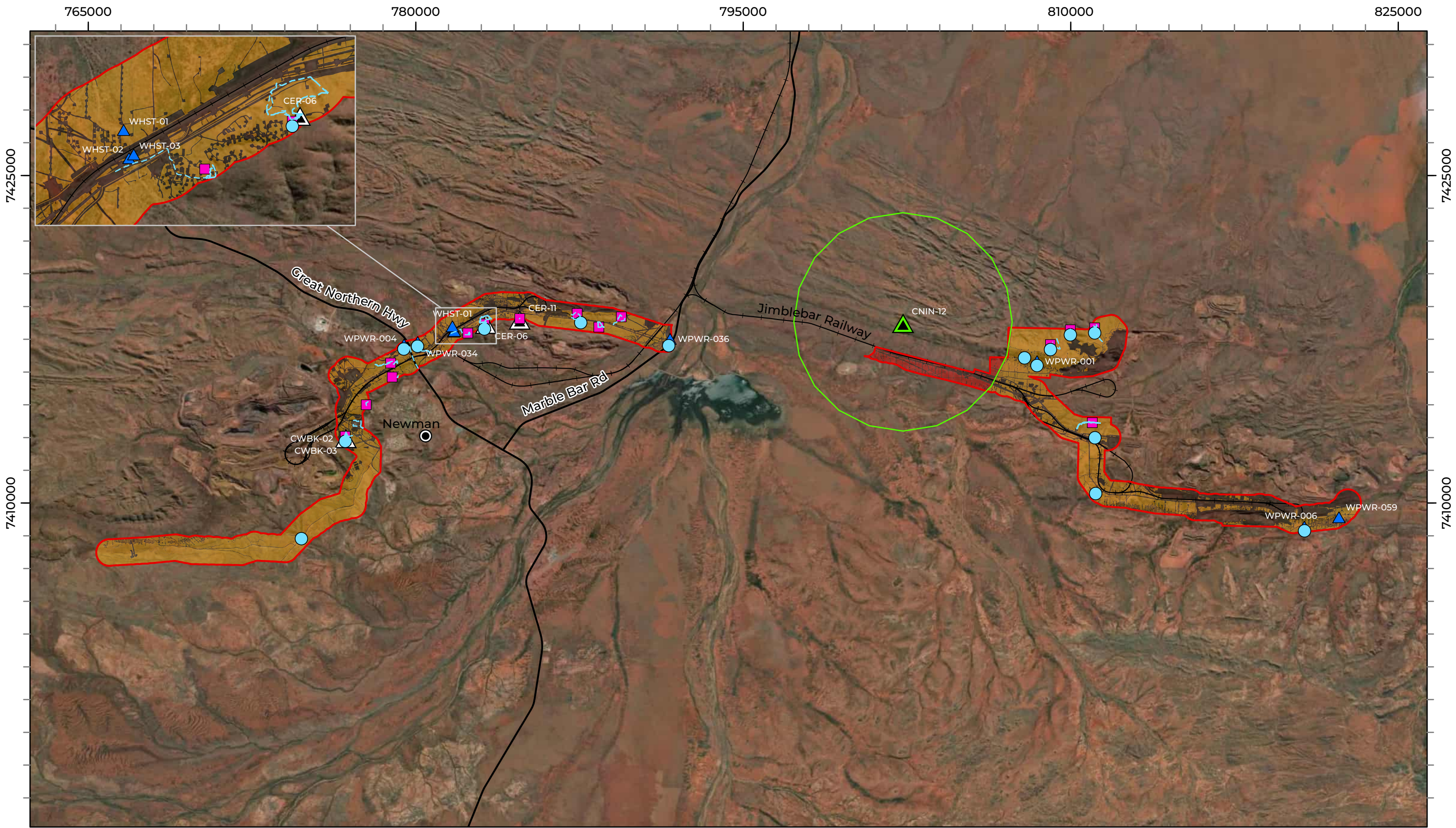
Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator

Created: 19/09/2024



BHP WAIO
**Power 2030 Targeted
Vertebrate Fauna Survey**

**Figure 6.7: Previous Pilbara
leaf-nosed bat records in
the Study Area and region**



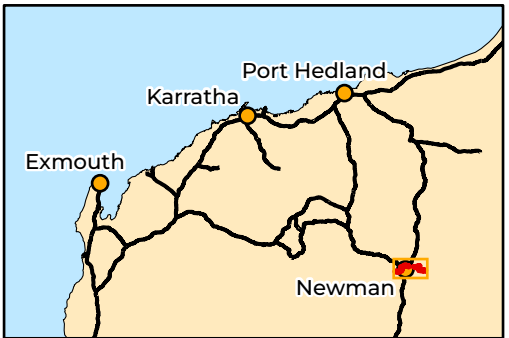
LEGEND

- | | | | |
|------------|----------------------|----------------|------------------|
| Study Area | Sampling Type | Habitat | Water Feature |
| State Road | Targeted Search | Critical | Roost |
| Rail | Ultrasonic Recorder | Supporting | Category 2 |
| | Targeted Search | Nil | Category 4 |
| | | | Roost 5km Buffer |



Biologic

Scale 1:162,000
0 3 6 Km
Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 03/01/2025



BHP WAIO
Power 2030 Targeted
Vertebrate Fauna Survey

Figure 6.8: Pilbara leaf-nosed bat sampling and habitat in the Study Area

6.4.5 Discussion

The nearest known provisional permanent diurnal roost (preliminary categorisation as Category 2) for this species is cave CNIN-12 (confirmed as a PLNB roost during the Eastern Pilbara threatened bat monitoring project in 2024 (Biologic, in prep.-a)), approximately 1.4 km north of the Study Area (eastern portion) (Figure 6.7). Pilbara leaf-nosed bats travel up to 20 km from roost caves during nightly foraging (Cramer *et al.*, 2016a), therefore foraging individuals from CNIN-12 roost are likely to forage within the Study Area.

Given the close proximity of a provisional critical Category 2 roost (CNIN-12) to the Study Area, all habitats (except Cleared/ Disturbed areas) that are within the 5 km buffer of this roost are considered critical habitat (Hillcrest/ Hillslope 86.92 ha, 1.01%; Sand Plain 66.98 ha, 0.78%; Drainage Area/ Floodplain 61.20 ha, 0.71%; Stony Plain 48.22 ha, 0.56%; Undulating Low Hills 19.53 ha, 0.23%; Minor Drainage Line 19.53 ha, 0.23%, and Gorge/ Gully 4.18 ha, 0.05%) (Figure 6.8). All habitats outside of the 5 km buffer are considered supporting foraging habitat, although the species is likely to frequently forage within the habitats <20 km from CNIN-12 (Bat Call, 2021b); as such, Breakaway/ Cliff and Artificial Wetland habitats are classified as a Habitat Rating 4 (very high) and Gorge/ Gully and Major Drainage Line habitats are classified as a Habitat Rating 3 (high), as defined by Bat Call (2021b). Presently, the Gorge/ Gully (291.06 ha, 3.39%), Breakaway/ Cliff (6.39 ha, 0.07%), Artificial Wetland (6.48 ha, 0.08%) and Major Drainage Line (53.79 ha, 0.63%) habitats within the Study Area provide supporting foraging and dispersal habitat for the species and tend to contain important habitat features such as nocturnal refuges and water features (Figure 6.8). Other supporting foraging and dispersal habitat for Pilbara leaf-nosed bat within the Study Area is provided by Hillcrest/ Hillslope (1,475.97 ha, 17.21%), Drainage Area/ Floodplain (1,041.26 ha, 12.14%), Stony Plain (1,621.29 ha, 18.91%), Sand Plain (318.34 ha, 3.71%), Undulating Low Hills (69.06 ha, 0.81%), Minor Drainage Line (160.45 ha, 1.87%), Mulga Woodland (433.95 ha, 5.06%) and Hardpan Plain (76.52 ha, 0.89%), and are classified as Habitat Rating 2 (moderate) (Bat Call, 2021b). The Study Area also contains water features likely to provide supporting foraging habitat (Figure 6.8).

The Pilbara population is regarded as a single interbreeding population (TSSC, 2016c; Umbrello *et al.*, 2022), and therefore, the entire population of Pilbara leaf-nosed bat present is classified as an 'important population'. The Study Area is considered unlikely to represent a significant area for Pilbara leaf-nosed bats based on the absence of Category 1, 2 and 3 roosts, as defined by (Bat Call, 2021b); however, due to the close proximity of a provisional permanent diurnal roost (preliminary categorisation as Category 2) CNIN-12, it is likely the Study Area would be used for foraging and dispersal. Therefore, the species is highly likely to occur within the Study Area.

6.5 Night Parrot (*Pezoporus occidentalis*) – Endangered EPBC Act & Critically Endangered BC Act

6.5.1 Species Profile

The night parrot is an elusive, nocturnal ground dwelling parrot that inhabits arid and semi-arid areas that contain a specific structure of dense, low vegetation (DPaW, 2017). Based on accepted records, the species' habitat consists of long-unburnt mature *Triodia* grasslands in stony or sandy environments (McGilp, 1931; North, 1898; Whitlock, 1924; Wilson, 1937), and samphire and chenopod shrublands, including genera such as *Atriplex*, *Bassia* and *Maireana*, on floodplains and claypans, as well as on the margins of salt lakes, creeks or other sources of water (McGilp, 1931; Wilson, 1937). The current guidelines for preliminary surveys of night parrot in Western Australia suggest the species requires old-growth spinifex (*Triodia*) (often more than 50 years' unburnt) for roosting and nesting (DBCA, 2024a).

Although little is known about foraging sites, habitats that comprise various grasses and herbs are thought to be suitable (DPaW, 2017; Murphy *et al.*, 2017). Foraging habitat is not necessarily within or adjacent to roosting habitat as the night parrot has been known to fly up to 40 km in a single night to forage (Murphy *et al.*, 2017). It is assumed that the species may fly cumulative distances of up to 100 km per night during productive seasons and considerably greater than 100 km per night during drought conditions (Night Parrot Recovery Team, 2017). *Triodia* is likely to provide a good seasonal food resource, particularly in times of mass flowering and seeding. *Sclerolaena* and other succulent chenopods also provide a source of food and moisture throughout the year, and are also likely to provide significant habitat (DPaW, 2017). Foraging habitat is likely to be more important when it occurs adjacent to or within approximately 10 km of suitable roosting habitat (DPaW, 2017).

The distribution of the night parrot is very poorly understood. The small number of confirmed/ verifiable records prevents the population size from being assessed with any accuracy; however, the population size is speculatively estimated to consist of approximately 50 breeding birds that occur in five subpopulations (Garnett & Crowley, 2000). The largest of these subpopulations is estimated, with low reliability, to consist of 20 breeding birds (Garnett & Crowley, 2000).

6.5.2 Previous Records

No previous surveys within or surrounding the Study Area have deployed acoustic recorders to target night parrot. The nearest record of the night parrot to the Study Area is approximately 100 km to the north, which was recorded from Cloudbreak mine in 2021 (FMG, 2021) (Table 6.5). This is the most recent documented record of the species in Western Australia and is the first to provide evidence of the night parrot persisting in suitable habitat areas adjacent to active mining operations, following the original record in the area of three

individuals sighted in 2005 (Davis & Metcalf, 2008) (Table 6.5). The 2005 record is from an artificial water source from a pastoral bore that was heavily degraded by cattle and lacking an understory; however, larger patches of old-growth *Triodia* grasslands were noted to occur in the vicinity near the Fortescue Marsh and chenopod shrublands occur within the marsh itself. Despite this 2005 observation, subsequent targeted survey for the species at the location and in the vicinity have failed to record the species again. Kanyirninpa Jukurrpa rangers recorded night parrot calls at two locations on Martu country in 2020 (Michelmores & Birch, 2020). The night parrot is especially cryptic and rare in occurrence and therefore difficult to record so the records to date may underestimate the occurrence of the species.

Table 6.5: Previous records of night parrot within Western Australia

Location	Date of Observation	Source	Distance from Study Area	Recorded Habitat Type/ Comments
Minga Well, south of Cloudbreak mine site	12/04/2005	Davis and Metcalf (2008)	~100 km N	Mulga woodland. No understorey Artificial water source from a pastoral bore. 3 individuals observed at dusk in a targeted survey
Adjacent to Cloudbreak Mine	~2021 (exact date not given)	(FMG, 2021)	~100 km N	Not noted but located near Fortescue Marsh Adjacent to mining operations
Moojarri Well	~2005 (exact date not noted)	Biota (2005)	~90 km N	Not noted Unconfirmed Biota record between Fortescue Marsh and FMG phase B Rail Corridor
Vacant crown land	15/07/1970	DBCA (2022)	Undisclosed location	Spinifex grassland (Spinifex and scattered gums) Crest/summit. Four individuals observed
Martu country (Great Sandy and Little Sandy Deserts)	~2020 (exact date not provided)	Michelmores and Birch (2020)	Undisclosed location	Salt Lake system Acoustic recording
Matuwa (Lorna Glen)	24/11/2009 05/12/2009	Hamilton et al. (2017)	~370 km south-east	Lake system-native and introduced grasses, samphire, sedges, chenopods. Thick <i>Eremophila</i> , Mulga and grasses One individual each night
East Murchison	March 2017	Night Parrot Recovery Team (2017), Jakkett et al. (2017)	Undisclosed location	Spinifex hummock grassland on sandy substrate, encompassed by mulga woodland and a breakaway, separated from the <i>Triodia</i> by an open plain of samphire Living individuals and an active nest

Location	Date of Observation	Source	Distance from Study Area	Recorded Habitat Type/ Comments
Telfer area, Great Sandy Desert	Oct–Nov 2020 April–May 2021 (exact date not given)	Biologic (2021)	~310 km NW	Spinifex hummock grassland on sandy loam substrate, with scattered <i>Acacia</i> shrubs and eucalypts. Acoustic recordings (two confirmed and one unconfirmed)

6.5.3 Survey Methods

6.5.3.1 Acoustic Recorders

Song Meter acoustic recorders were deployed at 11 sites within the Study Area (Table 6.6; Figure 6.9). No critical habitat aligning with habitat preferences of the species was recorded within the Study Area, therefore acoustic recorders were deployed in best available habitats; however, overall, these habitats were considered marginal and unlikely to provide critical nesting/ roosting or foraging habitat for the species. Units were placed within habitat considered most suitable for roosting and nesting as recommended by DPaW (2017). Song Meters were deployed for six consecutive nights each as per DPaW (2017) recommendations, for a total of 66 recording nights (Table 6.6). Acoustic recordings were analysed for night parrot calls by specialist Louis Masarei (Malu Fauna).

Table 6.6: Acoustic sampling for night parrot

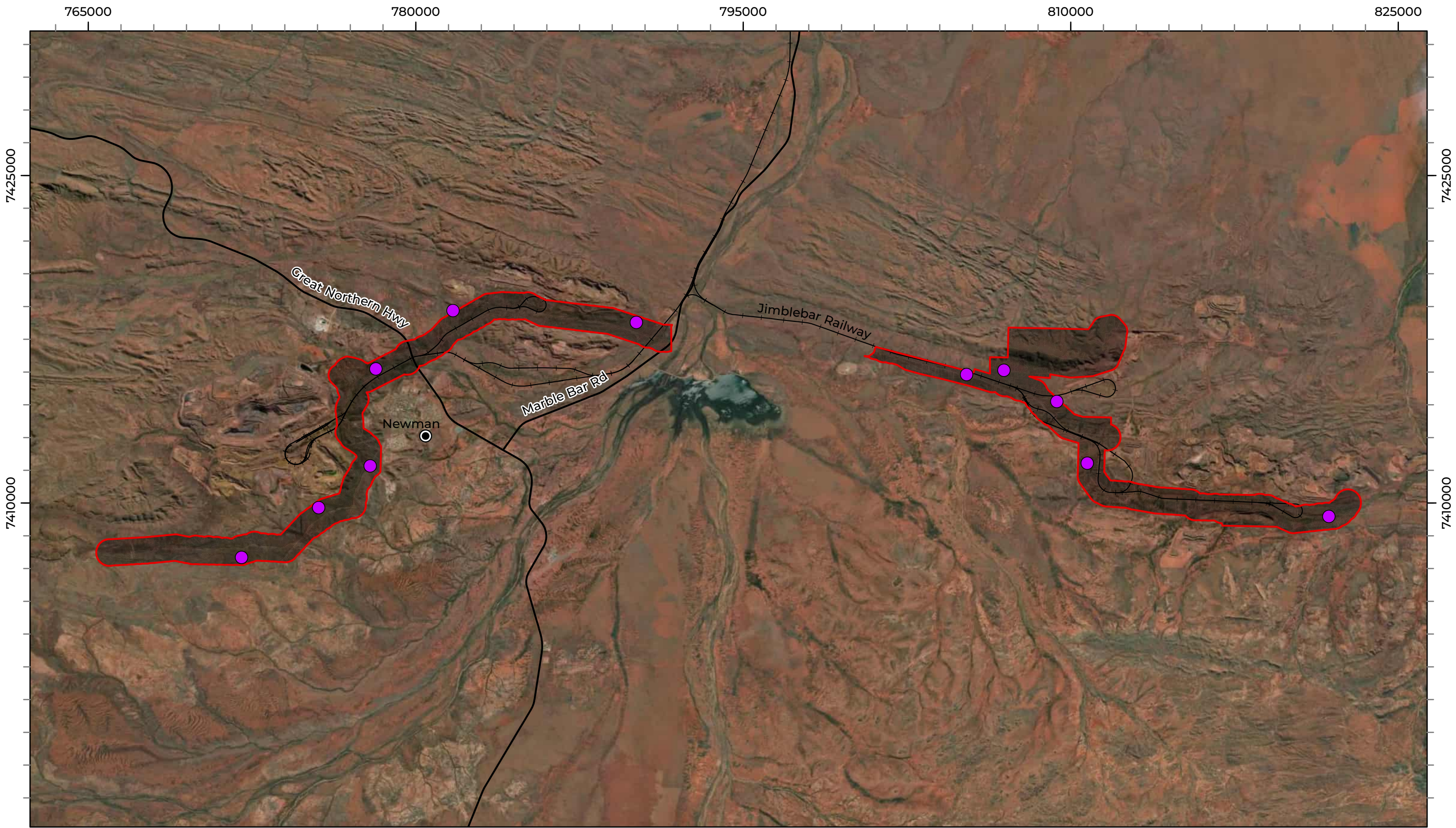
Site	Habitat	Deployment	Retrieval	Sampling Nights
VPWR-004	Drainage Area/ Floodplain	16/04/2024	22/04/2024	6
VPWR-008	Stony Plain	16/04/2024	22/04/2024	6
VPWR-012	Sand Plain	16/04/2024	22/04/2024	6
VPWR-013	Drainage Area/ Floodplain	17/04/2024	23/04/2024	6
VPWR-014	Sand Plain	16/04/2024	22/04/2024	6
VPWR-016	Sand Plain	16/04/2024	22/04/2024	6
VPWR-026	Sand Plain	17/04/2024	23/04/2024	6
VPWR-028	Drainage Area/ Floodplain	17/04/2024	23/04/2024	6
VPWR-032	Stony Plain	17/04/2024	23/04/2024	6
VPWR-035	Drainage Area/ Floodplain	17/04/2024	23/04/2024	6
VPWR-043	Drainage Area/ Floodplain	17/04/2024	23/04/2024	6
Total ultrasonic recorders deployed				11
Total number of recording nights				66

6.5.4 Survey Results

No evidence of night parrot was recorded at any of the acoustic recorder sampling sites.

6.5.5 Discussion

The distribution of the night parrot is very poorly understood in Western Australia; however, the Study Area occurs within the species' potential distribution, as currently mapped by DoEE (2018). No evidence of occurrence of night parrot was recorded within the Study Area during the current survey, including from targeted acoustic recorders deployed in areas of marginally suitable habitat. Habitat within the Study Area was considered suboptimal for the species, particularly due to most areas of *Triodia* grasslands lacking large, long-unburnt hummocks and the absence of any chenopod shrubland habitat within the Study Area. Although little is known about the species' habitat preferences and occurrence, particularly within the Pilbara region, the extent of which these habitats may still provide habitat for the species is unknown. It is possible that any night parrots occurring near the Cloudbreak mine could potentially use the Study Area as it is located 100 km north and within the known cumulative foraging distance (Night Parrot Recovery Team, 2017). However, based on the absence of any habitat considered to be of significance to the species, it is considered unlikely to occur within the Study Area either as a resident or infrequent visitor during foraging and or dispersal.



LEGEND

Study Area	Sampling Type	Habitat
State Road	Acoustic Recorder	Nil
Rail		

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 29/10/2024

BHP WAIO

Power 2030 Targeted Vertebrate Fauna Survey

Figure 6.9: Night parrot sampling and habitat in the Study Area

6.6 Southern Whiteface (*Aphelocephala leucopsis*) – Vulnerable EPBC Act

6.6.1 Species Profile

The southern whiteface is distributed across the majority of mainland Australia, inhabiting a variety of open woodlands and shrublands containing an understorey of grasses or shrubs, or both (Higgins & Peter, 2002). The distribution within the Pilbara is largely outside the “known” mapped distribution, with the Study Area mapped as the “species or species habitat may occur” (DCCEEW, 2023). Typically these woodlands are dominated by *Acacia* or *Eucalyptus* on ranges, foothills and lowlands and plains (Higgins & Peter, 2002). The species is considered to be sedentary; however, records suggest that individuals move to wetter areas outside their normal range during drought conditions (Higgins & Peter, 2002). Southern whiteface primarily forage on the ground, preferring areas with sparse tree cover and an herbaceous understorey litter cover, primarily feeding on insects, spiders, and seeds (DCCEEW, 2023; Higgins & Peter, 2002). The species commonly forages in small groups of two to eight individuals, however, may flock in larger foraging parties during the winter months with as many as 70 individuals previously recorded (Higgins & Peter, 2002).

Breeding takes place between July to October, however, exact timing in arid regions through the species’ range can be impacted by rainfall; individuals may breed outside of the known range following sufficient rainfall events, or not at all during periods of drought (Higgins & Peter, 2002). Nesting often occurs in a hollow or crevice, and less frequently in low bushes, where nests are made of a combination of grass, bark and roots forming a large, dome-like shape (Higgins & Peter, 2002). Southern whiteface are typically observed to nest in pairs, however little is known about the species’ social organisation (DCCEEW, 2023). Cooperative breeding has been recorded, with multiple instances of up to four adults participating in chick rearing (Higgins & Peter, 2002).

6.6.2 Previous Records

There is one previous record of three southern whiteface individuals approximately 2.6 km from the Study Area on a hardpan plain in 2020 (Figure 6.10) (Biologic, 2020b). The scarcity of southern whiteface records in the broader vicinity of the Study Area may be attributed to the occurrence of the Study Area in the northern peripheral of the species distribution, whereby the species may naturally occur at a lower abundance. Additionally, the species’ EPBC Act status has only recently been updated to Vulnerable, which could also be a contributing factor due to less/no specific consideration during previous surveys in the vicinity of the Study Area.

6.6.3 Survey Methods

6.6.3.1 Acoustic Recorders

Song Meter acoustic recorders were deployed at 11 sites within the Study Area in the best suitable habitat, including Drainage Area/ Floodplain, Stony Plain and Mulga Woodland (Table 6.6; Figure 6.11).

6.6.3.2 Avifauna Surveys

Bird census surveys were undertaken at two sites (VPWR-010 and VPWR-071) within Drainage Area/ Floodplain habitat totalling two person hours. In addition, avifauna sampling was undertaken whilst undertaking eight targeted searches in suitable habitat (i.e. Mulga Woodland, Drainage Area/ Floodplain and Stony Plain) within the Study Area (Figure 6.11; Appendix F). Sampling was undertaken during periods of likely activity, with a focus on recording either direct observation, calls and/or secondary evidence (e.g. nests and/or feathers).

6.6.4 Survey Results

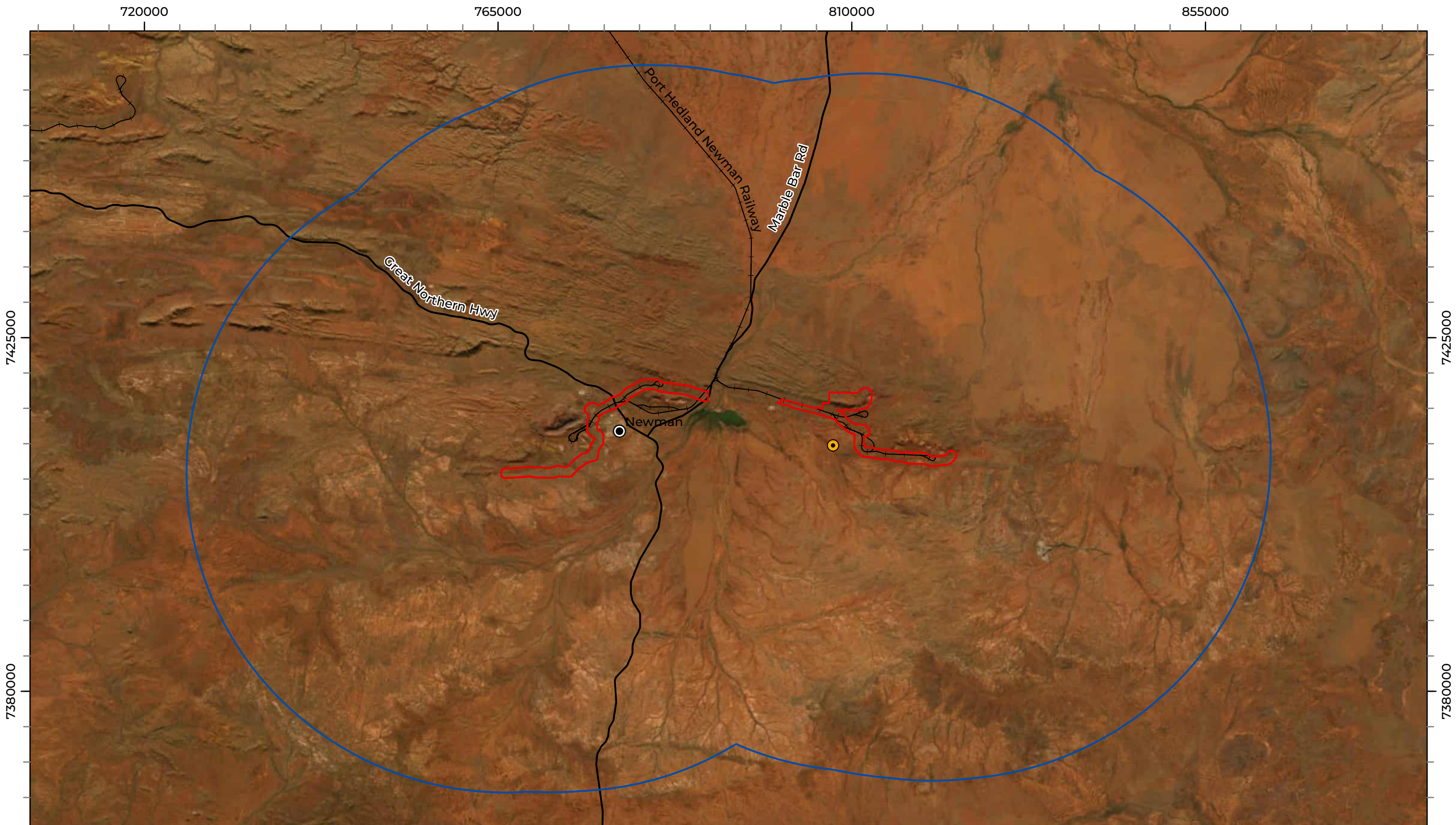
No southern whiteface or evidence of the species' occurrence was recorded during the current survey.

6.6.5 Discussion

The Study Area is outside the modelled distribution for which the species or species habitat is known or likely to occur; however, it is located within the modelled distribution for which the species or species habitat may occur (DCCEEW, 2023). Drainage Area/ Floodplain (12.86%, 1,102.45 ha) provides critical nesting/ breeding and foraging/ dispersal habitat for the species as this habitat contains more suitable vegetation characteristics for the species (i.e. open woodland/ shrubland with good understorey of grasses/ shrubs (dominated by *Acacia*), crevices for nesting) over the other habitats in the Study Area. Sand Plain (385.33 ha, 4.49% of the Study Area), Minor Drainage Line (171.23 ha, 2.00%) and Major Drainage Line (53.79 ha, 0.63%) habitats provide supporting habitat for nesting/ breeding and foraging and dispersal, while Stony Plain (1,669.52 ha, 19.47%), Hardpan Plain (76.52 ha, 0.89%) and Mulga Woodland (433.95 ha, 5.06%) habitats within the Study Area could provide suitable foraging and dispersal habitat for southern whiteface. Suitability of these habitats within the Study Area is variable, depending on particular habitat characteristics, including the presence of an understorey of grasses or shrubs, or both, with low tree densities and an herbaceous understorey litter cover (DCCEEW, 2023). The species may also forage and disperse more broadly across other habitats where suitable vegetation cover is present.

No southern whiteface records were made during the current survey and there is a scarcity of records in the broader vicinity. However, the species conservation status has only recently

been updated to Vulnerable under the EPBC Act, and as such may not have been previously subjected to the same targeted search effort in the region as other significant fauna during historic surveys (which predominantly targeted significant species or were basic surveys), and other records may be present. The Study Area occurs on the northern periphery of the species distribution (DCCEEW, 2023), and as such any records present may represent part of or contribute to an important population of the species, with the habitats within the Study Area potentially relied upon for individuals for persistence at a local and/or regional scale. However, there is a level of uncertainty due to the species distribution only extending into the southern edges of the Pilbara, with its core range in the Gascoyne and Murchison (DCCEEW, 2023). Given these factors and the presence of suitable habitats the species is considered possible to occur within the Study Area.



LEGEND

Study Area

Desktop Assessment Area

State Road

Rail

BHP (2023)

Individual (alive)

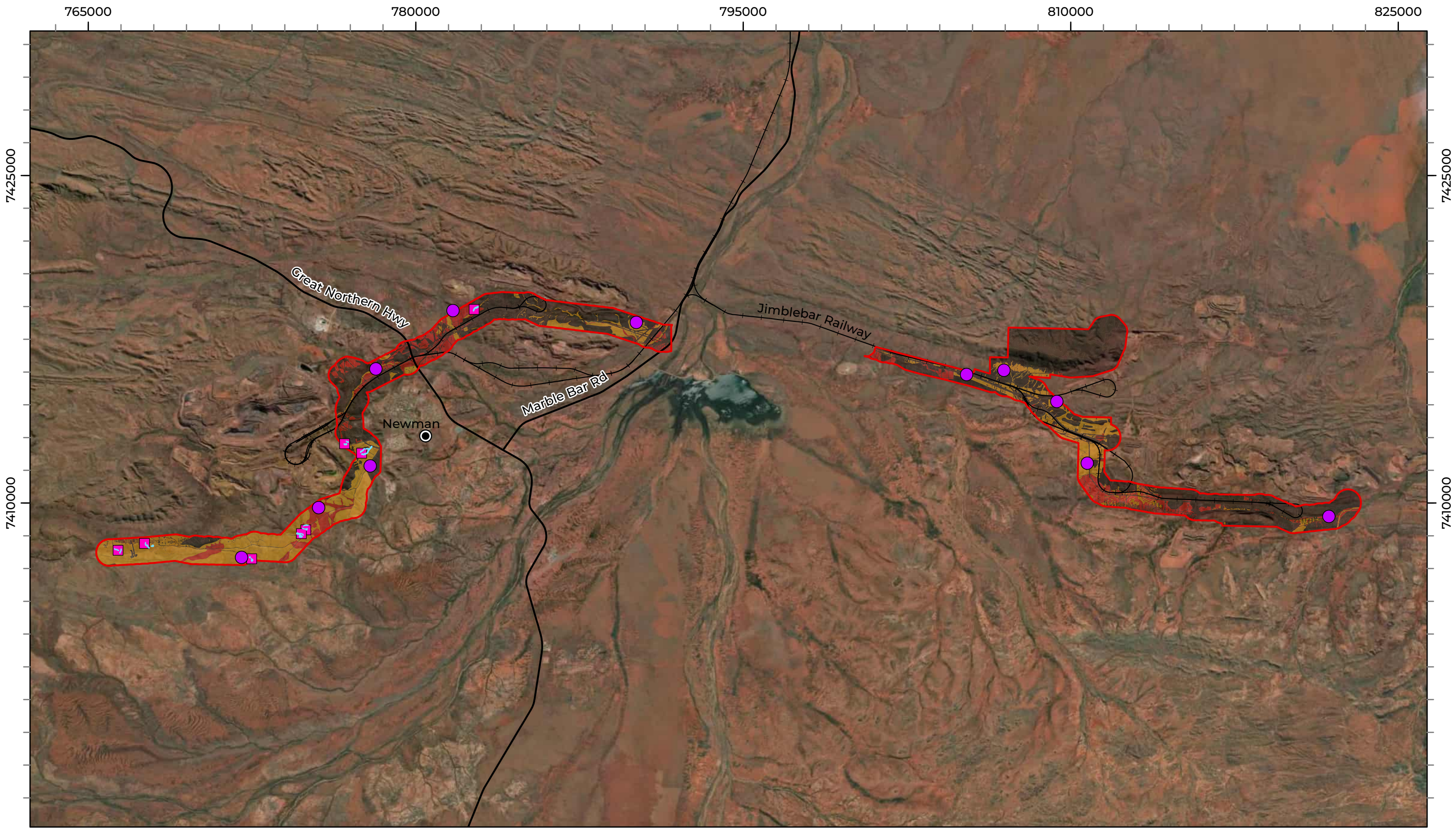
Scale 1:450,000

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 19/09/2024

BHP WAIO

Power 2030 Targeted
Vertebrate Fauna Survey

Figure 6.10: Previous
southern whiteface records
in the Study Area and region



LEGEND

Study Area	Sampling Type	Habitat
State Road	Acoustic Recorder	Critical
Rail	Targeted Search	Supporting
	Targeted Search	Nil

Biologic

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 29/10/2024

BHP WAIO

Power 2030 Targeted Vertebrate Fauna Survey

Figure 6.11: Southern whiteface sampling and habitat in the Study Area

6.7 Princess Parrot (*Polytelis alexandrae*) – Vulnerable EPBC Act and Priority 4 (DBCA)

6.7.1 Species Profile

The princess parrot inhabits low open eucalypt woodlands and savannah shrublands in arid deserts, usually where *Casuarina* and *Allocasuarina* species are present (Baxter & Henderson, 2000; Pavey *et al.*, 2014). The species also occurs and breeds in vegetated riverine and littoral areas, with breeding primarily occurring in marble gum hollows (DEWHA, 2008; Pavey *et al.*, 2014). Princess parrots have been observed feeding on grass, *Acacia* seed pods flowers (mulga, *Grevillea* spp., *Leptosema* spp., *Hakea* spp., *Eremophila* spp.), leaf stems, lerps, and other plant material (Pavey *et al.*, 2014).

6.7.2 Previous Records

There are no records of princess parrot in the immediate vicinity of the Study Area; the nearest record is approximately 38 km north of the Study Area from 2012 (DBCA, 2024d). The Study Area is outside the modelled distribution for which the species or species habitat is known, likely, or may occur (DoEE, 2019a); the core range of the princess parrot occurs in the arid interior in the Great Sandy Desert, Gibson Desert, or Great Victorian Desert (Pavey *et al.*, 2014).

6.7.3 Survey Methods

6.7.3.1 Acoustic Recorders

Song Meter acoustic recorders were deployed at 11 sites within the Study Area in marginally suitable habitat, including Stony Plain, Sand Plain and Drainage Area/ Floodplain (Table 6.6; Figure 6.11). No critical habitat aligning with habitat preferences of the species was recorded within the Study Area, therefore, acoustic recorders were deployed in best available habitats.

6.7.3.2 Avifauna Surveys

Avifauna sampling was undertaken whilst undertaking targeted searches throughout the Study Area; sampling was undertaken during periods of likely activity, with a focus on recording either direct observation and/or calls.

6.7.4 Survey Results

No records or evidence of princess parrot were recorded within the Study Area during the current survey.

6.7.5 Discussion

The Study Area is outside the modelled distribution for which the species or species habitat is known, likely, or may occur (DoEE, 2019a), with the core range for the species occurring in the arid interior in the Great Sandy Desert, Gibson Desert, or Great Victorian Desert (Pavey *et al.*, 2014). No princess parrot or evidence of the species' occurrence was recorded during the current survey, and there is a scarcity of records within the region. Princess parrot is a boom-bust species (Pavey *et al.*, 2014), and as such previous records of the species in the Pilbara may be attributed to population expansion during the time. Overall, the habitats present in the Study Area are unlikely to provide nesting/ roosting or foraging habitat to support the species outside these boom-bust periods. In consideration of the lack of previous records and location outside the known distribution, princess parrot is considered unlikely to occur.

6.8 Grey Falcon (*Falco hypoleucos*) – Vulnerable EPBC Act & BC Act

6.8.1 Species Profile

The grey falcon is widely distributed over the northern parts of Australia's arid and semi-arid zone (Mullin *et al.*, 2020). Climate characteristics appear to play a crucial role in this species' distribution (Schoenjahn *et al.*, 2019), perhaps because these birds rely on low levels of relative humidity for efficient evaporative cooling (Schoenjahn *et al.*, 2022). Recent studies suggest the grey falcon comprises a single, widely distributed interbreeding population (although there may be weak population structure between breeding grounds in the east and west of Australia) with around 1,415 females (Mullin *et al.*, 2020). The Pilbara is thought to potentially be a stronghold (Sutton, 2010). Grey falcons do not appear to be associated with particular vegetation types (Schoenjahn *et al.*, 2019); they often sit motionless in the canopies of trees or dead branches of eucalypts (Falkenberg, 2010). It tends to prefer sparsely-treed, open plains, and creek lines for hunting (Olsen & Olsen, 1986).

Breeding takes place between mid to late winter and the end of spring (Schoenjahn *et al.*, 2019). Breeding habitat comprises riparian vegetation as well as other productive 'oases' within arid environments, though not necessarily immediately adjacent to waterholes (Sutton, 2010). Nesting often occurs in the abandoned nest of a raptor or corvid in trees or tall infrastructure such as power line towers or communications towers (Olsen & Olsen, 1986; Schoenjahn *et al.*, 2019). Within the Pilbara, nests (made using disused stick nests of crows) have been observed in two riparian eucalypt species (*Eucalyptus coolabah* and *E. camaldulensis*; 23 km apart) on a dry river bed (Sutton, 2010). Ten years later, the area had a lot of scrubby regrowth and the grey falcons were absent (Sutton, 2010). Above-average rainfall in the first half of the year may encourage breeding if summer rainfall triggers growth of seed grasses which in turn increases abundance of granivorous birds which the species prey on (Sutton, 2010).

Grey falcons have an almost exclusive diet of birds, especially budgerigars (*Melopsittacus undulatus*), pigeons, doves and zebra finches (*Taeniopygia guttata*), but can under unusual circumstances include small non-avian species (Schoenjahn, 2013). Whether they scavenge carrion has been disputed, although they do have a tendency to consume their prey on the ground, sometimes by the side of roads and tracks (Schoenjahn, 2018).

Modelling by Runge *et al.* (2014) estimated the minimum range size as 882,558 km². Recent research has shown that it is a 'reluctant nomad'; only if conditions become a risk to their survival are they likely to move on and then they move no further than necessary (Schoenjahn, 2018). The grey falcon tends to stay and forego breeding rather than search for more favourable conditions (Schoenjahn, 2018). In general, it tends to keep physical activity levels low (Schoenjahn *et al.*, 2022).

6.8.2 Previous Records

Two records of grey falcon occur within 5 km of the Study Area, comprising a single individual observed flying over Hillcrest/ Hillslope and Breakaway/ Cliff habitat, 3.3 km north-northwest of the Study Area in 2021 (GHD, 2022), and another sub-adult individual observed 3.7 km northwest from the Study Area in 2013 (Eco Logical, 2013). A third record of grey falcon occurs approximately 20 km north of the Study Area comprising a single individual observed during a targeted search in 2021 (Biota, 2022). There are no previous records of grey falcon within the Study Area (Figure 6.12).

6.8.3 Survey Methods

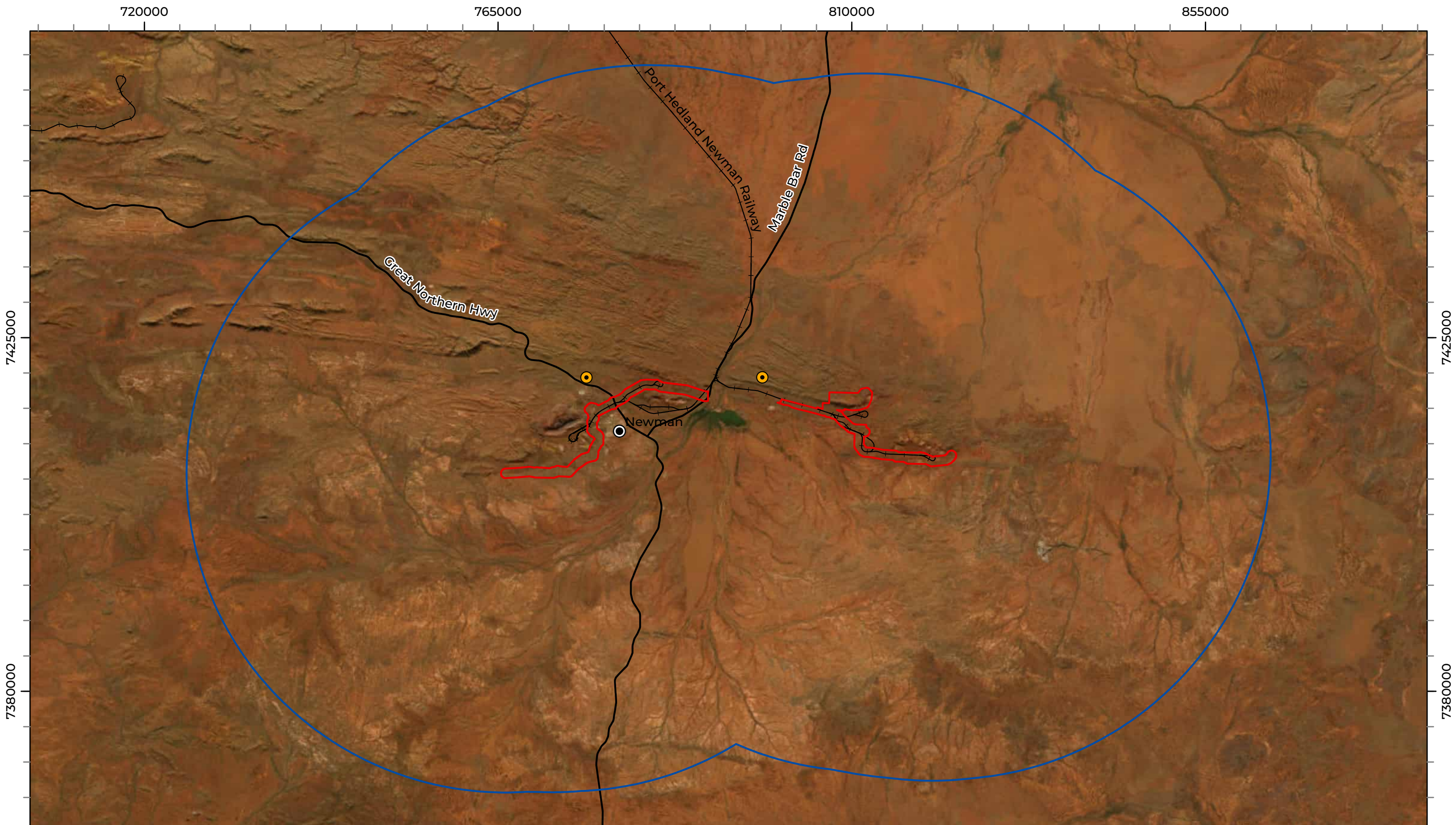
6.8.3.1 Avifauna Surveys

Avifauna sampling was undertaken during three targeted searches and general traversing for other significant species within the Study Area, focusing on suitable habitat (i.e. Major Drainage Line and adjacent habitats, Minor Drainage Line and Drainage Area/ Floodplain) (Figure 6.13; Appendix F). Sampling was undertaken during periods of likely activity, with a focus on recording either direct observation, calls and/or secondary evidence (e.g. nests and/or feathers).

Given that there was limited preferred habitat for the species, most of the targeted searches were undertaken alongside targeted searches for other species, including northern quoll, ghost bat, Pilbara leaf-nosed bat and Pilbara olive python.

6.8.4 Survey Results

Grey falcon was not observed during the current survey.



LEGEND

Study Area

Desktop Assessment Area

State Road

Rail

BHP (2023)

Individual (alive)

Biologic

Scale 1:450,000

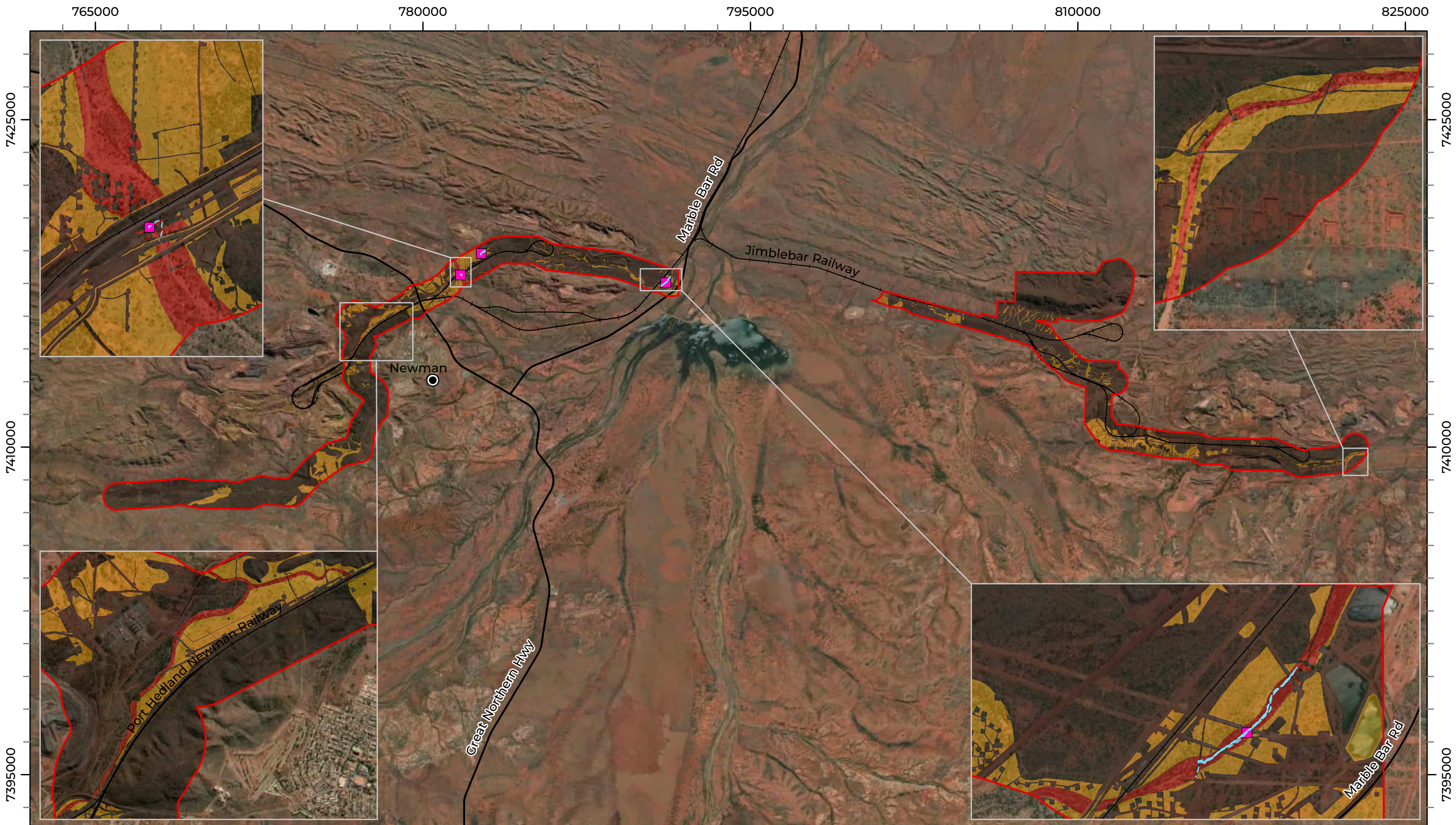
0 5 10 15 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 19/09/2024

BHP WAIO

Power 2030 Targeted
Vertebrate Fauna Survey

Figure 6.12: Previous grey
falcon records in the Study
Area and region



LEGEND

Study Area	Sampling Type	Habitat
State Road	Targeted Search	Critical
Rail	Targeted Search	Supporting
		Nil

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 29/10/2024

BHP WAIO

Power 2030 Targeted Vertebrate Fauna Survey

Figure 6.13: Grey falcon sampling and habitat in the Study Area

6.8.5 Discussion

The Study Area is located within the current distribution of the grey falcon, where the species or species' habitat is likely to occur (DoE, 2022a). The grey falcon is regarded as representing a single interbreeding population (Mullin *et al.*, 2020) and the Pilbara is thought to be a stronghold (Sutton, 2010). Thus, any grey falcon present in the Pilbara is therefore considered to be part of an 'important population'.

The Major Drainage Line habitat (53.79 ha, 0.63%) is considered potential critical habitat for grey falcon (Figure 6.13). The Drainage Area/ Floodplain (1,102.45 ha, 12.86%), Minor Drainage Line (171.23 ha, 2.00%) and Artificial Wetland (6.48 ha, 0.08%) habitats may provide supporting habitat for foraging and dispersal functions, and to a lesser extent, other habitats more broadly; however, the species' occurrence is likely to be dependent on the proximity of nesting (Figure 6.13). Nesting may occur in Major Drainage Line habitats where suitable tall trees are present or in other habitats where suitable tall infrastructure (i.e. powerline or transmission towers) occurs. Critical habitat within the Study Area is likely limited to the Major Drainage Line habitats that occur in four disjunct patches within the Study Area. The major creekline contains large *Eucalyptus camaldulensis* and *E. victrix* trees that may provide suitable nesting sites. If breeding was recorded within the Study Area, these areas would be considered important on a local and regional scale. Grey falcons are known to be "reluctant nomads", only moving on from their home range when conditions become a risk to their survival (Schoenjahn, 2018); as such, if any individuals are recorded, they are likely to rely on the habitats within the Study Area or local vicinity for long-term persistence. Based on the suitability of nesting and foraging habitats within the Study Area and the previous contemporary records, the grey falcon is considered possible to occur.

6.9 Pilbara Olive Python (*Liasis olivaceus* subsp. *barroni*) – Vulnerable EPBC Act & BC Act

6.9.1 Species Profile

The Pilbara olive python is Western Australia's largest snake, averaging 2.5 metres (m) in length, with records up to 4.5 m (Bush & Maryan, 2011; Cogger, 2014). It has a dull olive-brown upper surface and is pale cream below (Burbidge, 2004; Cogger, 2014). It is endemic to the Pilbara and northern parts of the Gascoyne bioregions, distributed from Burrup Peninsula, Ord Ranges and Meentheena, south to Nanutarra and Newman in the Pilbara, with an isolated population occurring at Mt Augustus in the Gascoyne region (Bush & Maryan, 2011; Storr *et al.*, 2002).

It is primarily nocturnal and tends to shelter amongst rocky habitats, in small caves or under vegetation during the day. During summer months they will emerge from daytime shelters soon after dark and continue to move until the early hours of the morning (DSEWPaC, 2011b).

In the winter months, it is primarily nocturnal, although adult pythons can sometimes be found basking in the morning sun (DSEWPaC, 2011b). The breeding season takes place in the cooler months, which extends from June to August, and males will travel up to 3 km in search of a mate (DSEWPaC, 2011b). It is a well-adapted opportunistic ambush predator and common prey items include rock-wallabies, small euros, fruit bats, waterbirds, doves/pigeons (Ellis, 2013; Ellis & Johnstone, 2016; Pearson, 2007; Pearson, 2003; TSSC, 2008).

It commonly inhabits areas such as gorges, rivers, pools and surrounding hills, but can be found in a range of habitats (Burbidge, 2004; DSEWPaC, 2011b). In the Hamersley region, it is most often encountered in the vicinity of permanent waterholes in rocky ranges or among riverine vegetation (DSEWPaC, 2011b; Pearson, 1993). It is likely to be attracted to these areas due to the productivity and abundance of suitably-sized prey (Pearson, 2003).

6.9.2 Previous Records

There are 61 records of the species within 40 km of the Study Area (BHP WAIO, 2024; DBCA, 2024d) (Figure 6.14). Of these, one record of an individual occurs within the Study Area from 2013 (BHP WAIO, 2024; Biologic, 2014b) and all except eight of the records are within 5 km of the Study Area (Figure 6.14) (BHP WAIO, 2024; DBCA, 2024d).

6.9.3 Survey Methods

6.9.3.1 Targeted Searches

Diurnal searches were conducted along 21 targeted search traverses, with efforts focused in habitats with particular features such as caves and overhangs (i.e. Gorge/ Gully and Breakaway/ Cliff) and where pooling water remains for prolonged periods following rainfall events (i.e. Major Drainage Line and Artificial Wetland) (Figure 6.15; Appendix F). In addition, six person hours of nocturnal searches at two sites were conducted along a Major Drainage Line and Artificial Wetland habitats (Figure 6.15; Appendix F). Searches focused on observing active individuals, particularly in or around water features, and from secondary evidence such as scats, sloughs or skeletal remains. A total of 33.75 person hours of targeted searches for Pilbara olive python were undertaken within the Study Area (Appendix F).

6.9.4 Survey Results

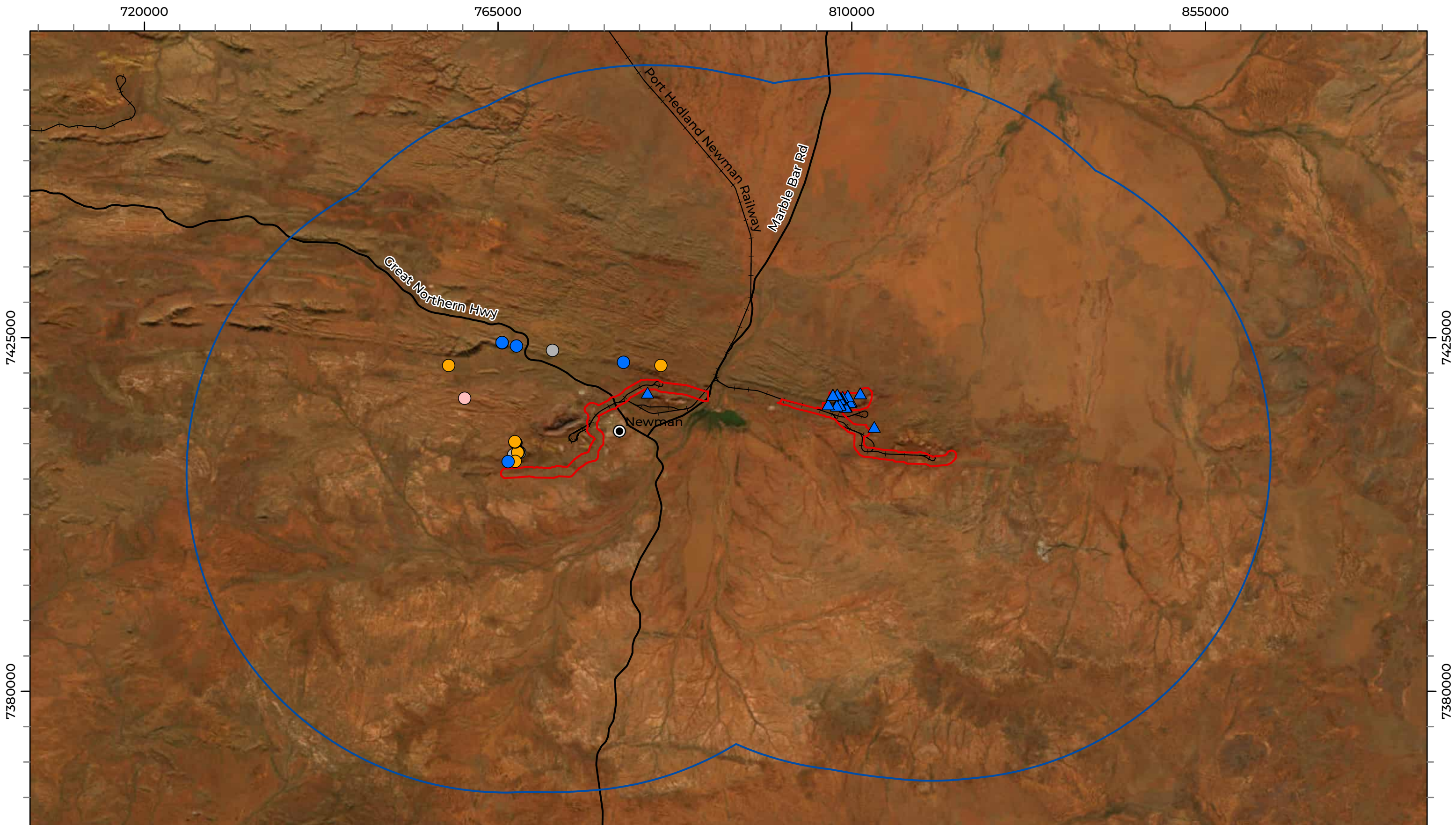
Evidence of Pilbara olive python was recorded from one location within the Study Area during the current survey, from a shed/slough during a targeted search (VPWR-020, corresponding to cave CER-06) (Figure 6.15). In addition, one dead individual was found opportunistically on the road approximately 1 km south of the Study Area (Figure 6.15).

6.9.5 Discussion

Nine water features were recorded in the Study Area during the current survey (Figure 5.2; Figure 6.15; Appendix E). Three artificial water features (WPWR-006, WPWR-034 and WPWR-036) are classified as permanent/persistent or likely permanent/persistent, four are classified as semi-persistent and two as ephemeral. Twenty-one water features have previously been recorded within the Study Area; with one of these also (WPWR-001, previous ID 10180_11_00761) recorded during the current survey. One natural water feature (WPWR-001) previously recorded by Biologic (2022a) is classified as ephemeral. The remainder were not located during the current survey, indicating they are all likely to represent ephemeral or semi-persistent water features. For Pilbara olive pythons, these water features often act as critical foraging locations in association with rocky habitats. These water features also occur to a lesser degree in Major Drainage Line and Minor Drainage Line habitat where suitable vegetation cover is present (Pearson, 1993). Permanent water features are considered critical habitat for Pilbara olive python, however, as the permanent water features in the Study Area are artificial and the prolonged existence is limited by mining activity, its significance in the landscape will be periodical. The semi-persistent and ephemeral pools in Major Drainage Line and Gorge/ Gully habitats are considered supporting habitat and may play a more critical role allowing connectivity between water sources seasonally.

Overall, the Gorge/ Gully (295.25 ha, 3.44%), Breakaway/ Cliff (6.39 ha, 0.07%), Major Drainage Line (53.79 ha, 0.63%) and Artificial Wetland (6.48 ha, 0.08%) habitats mapped within the Study Area provide critical habitat for the Pilbara olive python (Figure 6.15). Areas of Minor Drainage Line (171.23 ha, 2.00%) that do not contain permanent water features are classified as supporting habitat, particularly in areas where they connect between areas of critical habitat (i.e. Gorge/ Gully), but these areas may become of more value to the species seasonally when water is more abundant following rainfall events. In addition Hillcrest/ Hillslope (1,562.90 ha, 18.23%) and Drainage Area/ Floodplain (1,102.45 ha, 12.86%) is considered supporting habitat where in the home range (88 - 440 ha, BHP WAIO, 2023) of critical habitat and where important microhabitats are present (BHP WAIO, 2023).

The Pilbara olive python was recorded during the current survey and has been recorded previously within the Study Area so is confirmed to occur. Based on this and the Study Area containing both critical and supporting habitat, the population would be considered part of an 'important population' as defined by DoE (2013a).



LEGEND

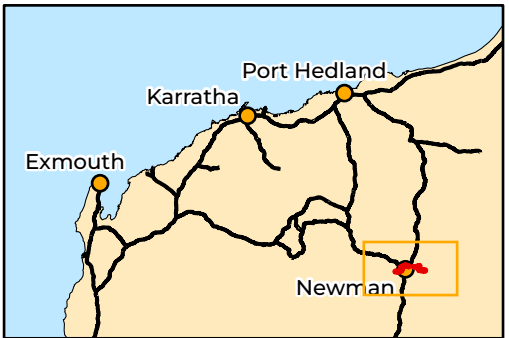
- | | |
|-----------------------------------|--------------------|
| Study Area | DBCA (2024) |
| Desktop Assessment Area | Individual (alive) |
| Previously Recorded Water Feature | Secondary Evidence |
| State Road | Specimen |
| Rail | Unknown |

**Biologic**



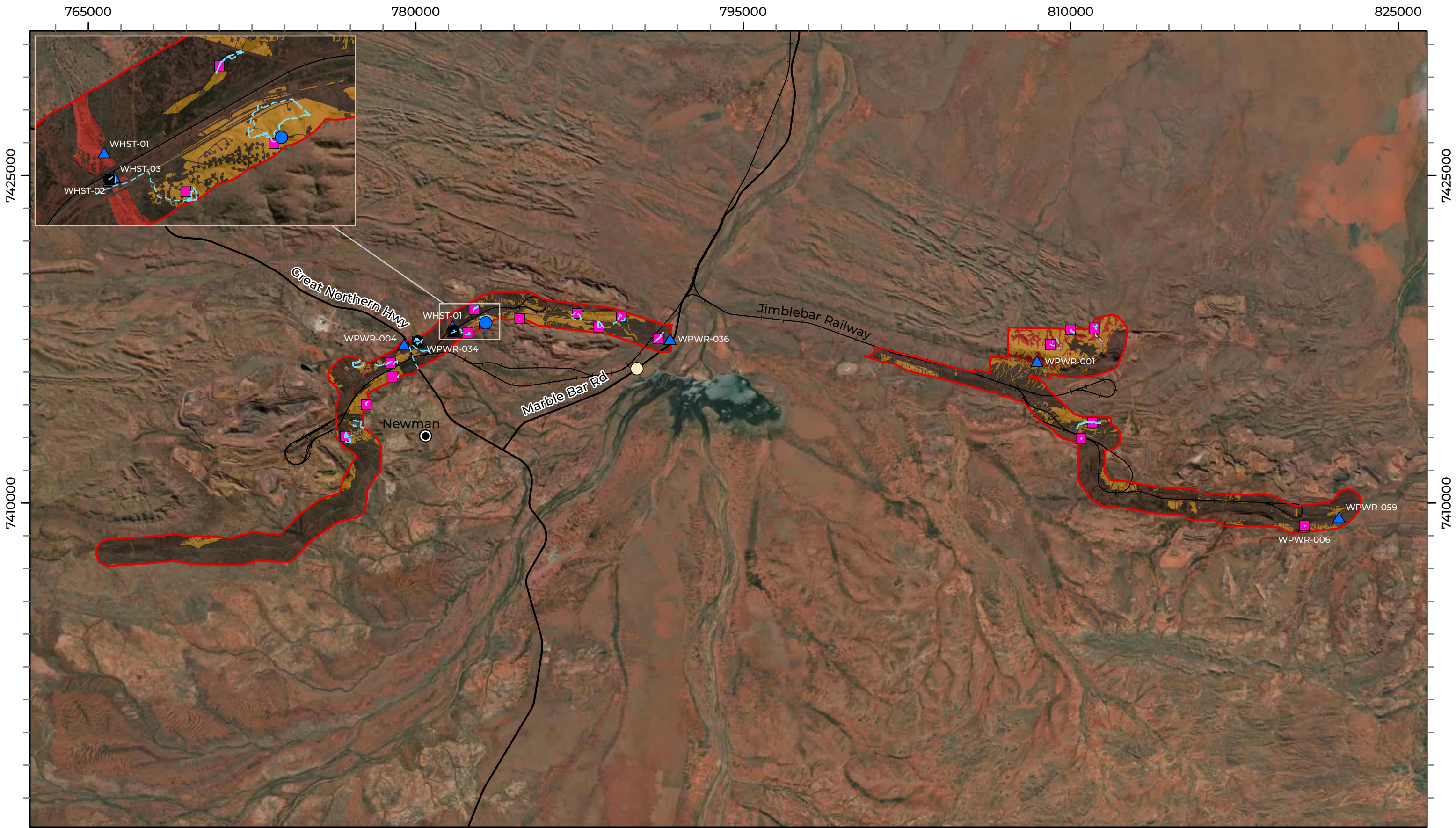
Scale 1:450,000
0 5 10 15 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 19/09/2024



BHP WAIO
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Figure 6.14: Previous Pilbara
olive python records in the
Study Area and region



LEGEND

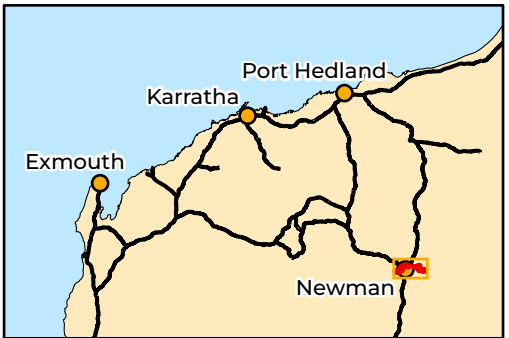
- | | | | |
|------------|----------------------|----------------|---------------------------|
| Study Area | Sampling Type | Habitat | Water Feature |
| State Road | Nocturnal Search | Critical | Pilbara olive python - VU |
| Rail | Targeted Search | Supporting | Individual (dead) |
| | Targeted Search | Nil | Secondary Evidence |

 **Biologic**

Scale 1:162,000

 0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 03/10/2024



BHP WAIO
Power 2030 Targeted
Vertebrate Fauna Survey

Figure 6.15: Pilbara olive python sampling, records and habitat in the Study Area

6.10 Great Desert Skink (*Liopholis kintorei*) – Vulnerable EPBC Act & BC Act

6.10.1 Species Profile

The great desert skink is endemic to the Australian arid zone in the western deserts region (TSSC, 2016a). Within Western Australia, the species appears to have undergone a range contraction, with surveys failing to detect the species in former strongholds in the Gibson Desert, north of Warburton and in the Great Victoria Desert (Pearson *et al.*, 2001).

Sandplain vegetated by spinifex and scattered shrubs appears to be the habitat type most widely used by the species, and some adjacent dunefield swales (Pavey, 2006). In the Tanami Desert and parts of the Great Sandy Desert they also inhabit paleodrainage lines characterised by giant termite mounds and titree (*Melaleuca* spp.) shrubs. The recently discovered population in northern South Australia is in an area of spinifex and woollybutt grass (*Eragrostis* sp.) with scattered mulga. Extensive areas of dunefields, rocky ranges and mulga woodlands occur through the western deserts and are considered unsuitable habitat (Pavey, 2006).

6.10.2 Previous Records

The Study Area is outside the modelled distribution for which the species or species habitat is known or likely to occur (DoEE, 2019a). There was one record of great desert skink approximately 27 km east of the Study Area from secondary signs in 2010 (DBCA, 2024d); however, the accuracy of this record could not be confirmed.

6.10.3 Survey Methods

Opportunistic sampling was undertaken during targeted searches for greater bilby throughout the Study Area in the best suitable habitat (i.e. Sand Plain). No high value habitat aligning with habitat preferences of the species was recorded within the Study Area; overall, the habitats present were considered marginal and unlikely to provide critical habitat for the species due to the lack of suitable large sandplain areas present.

6.10.4 Survey Results

No records or evidence of great desert skink were recorded within the Study Area during the current survey.

6.10.5 Discussion

The Study Area is outside the modelled distribution for which the species or species habitat is known or likely to occur (DoEE, 2019a), with the core range for the species occurring in the arid interior (Indigenous Desert Alliance, 2022). While marginally suitable habitat in the form of Sand Plain (380.43 ha, 4.44%) is present within the Study Area, the habitat is relatively small in size, impacted by tracks and mining activity, and isolated from other similar habitat

outside of the Study Area, making it unlikely to support a population of the species. No great desert skink or evidence of the species' occurrence was recorded during the current survey. Given the lack of records from the survey, a scarcity of records within the region and location of the Study Area outside the known distribution, great desert skink is considered highly unlikely to occur.

6.11 Other Fauna of Significance

In addition to the MNES species discussed above, other fauna species of significance were also searched for and recorded throughout the Study Area (Figure 6.16; Appendix G). Forty-three (43) non-target bird species were identified during the acoustic recordings (Appendix H).

Two other (non-MNES) significant species were recorded in the Study Area during the current survey, western pebble-mound mouse – Priority 4 (DBCA), and brush-tailed mulgara – Priority 4 (DBCA). One inactive pebble-mound was recorded from Hillcrest/ Hillslope habitat during the current survey (Figure 6.16; Appendix G). The western pebble-mound mouse has previously been recorded on more than 360 occasions within 40 km of the Study Area (BHP, 2023a; DBCA, 2023), 25 of which are from the Study Area, primarily within Hillcrest/ Hillslope and Stony Plain habitats. The species is confirmed to occur as a resident throughout the Study Area, primarily in Hillcrest/ Hillslope (1,562.90 ha, 18.23%), Stony Plain (1,669.52 ha, 19.47%) and Undulating Low Hills (88.59 ha, 1.03%) habitats. The species occurrence within the Study Area is unlikely to represent an important population and the species is not likely to be reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

One active brush-tailed mulgara burrow was recorded within Sand Plain habitat in the Study Area (Figure 6.16; Appendix G). This species has previously been recorded on eight occasions within the Study Area, primarily within Drainage Area/ Floodplain and Sand Plain habitats. The species may occur as a resident in small sections of the Study Area within the Drainage Area/ Floodplain (1,102.45 ha, 12.86%) and Sand Plain (385.33 ha, 4.49%) habitats. The species occurrence within the Study Area is unlikely to represent an important population and the species is not likely to be reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

Two other significant species have been recorded within the Study Area previously, peregrine falcon (OS BC Act) and Gane's blind snake (Priority 1 DBCA). Neither species were recorded during the current survey. The peregrine falcon has been previously recorded on two occasions within the Study Area in 2006 (BHP WAIO, 2024; DBCA, 2024d). In arid areas of its distribution, the peregrine falcon is often recorded along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr, 1998). It typically nests on

rocky ledges occurring on tall, vertical cliff faces between 25-50 m high; however, nesting may also occur in tall trees along drainage lines (Olsen & Olsen, 1989). The species is considered to occur as an infrequent visitor within the Study Area to forage within all broad fauna habitats occurring. The frequency of occurrence of the species within the Study Area is likely to be dependent on the proximity of nesting within or in the vicinity of the Study Area. Suitable nesting habitat for the species may occur within Gorge/ Gully (295.25 ha, 3.44%) and Breakaway/ Cliff (6.39 ha, 0.07%) habitat and instances of elevated breakaway within Hillcrest/ Hillslope (1,562.90 ha, 18.23%) habitat.

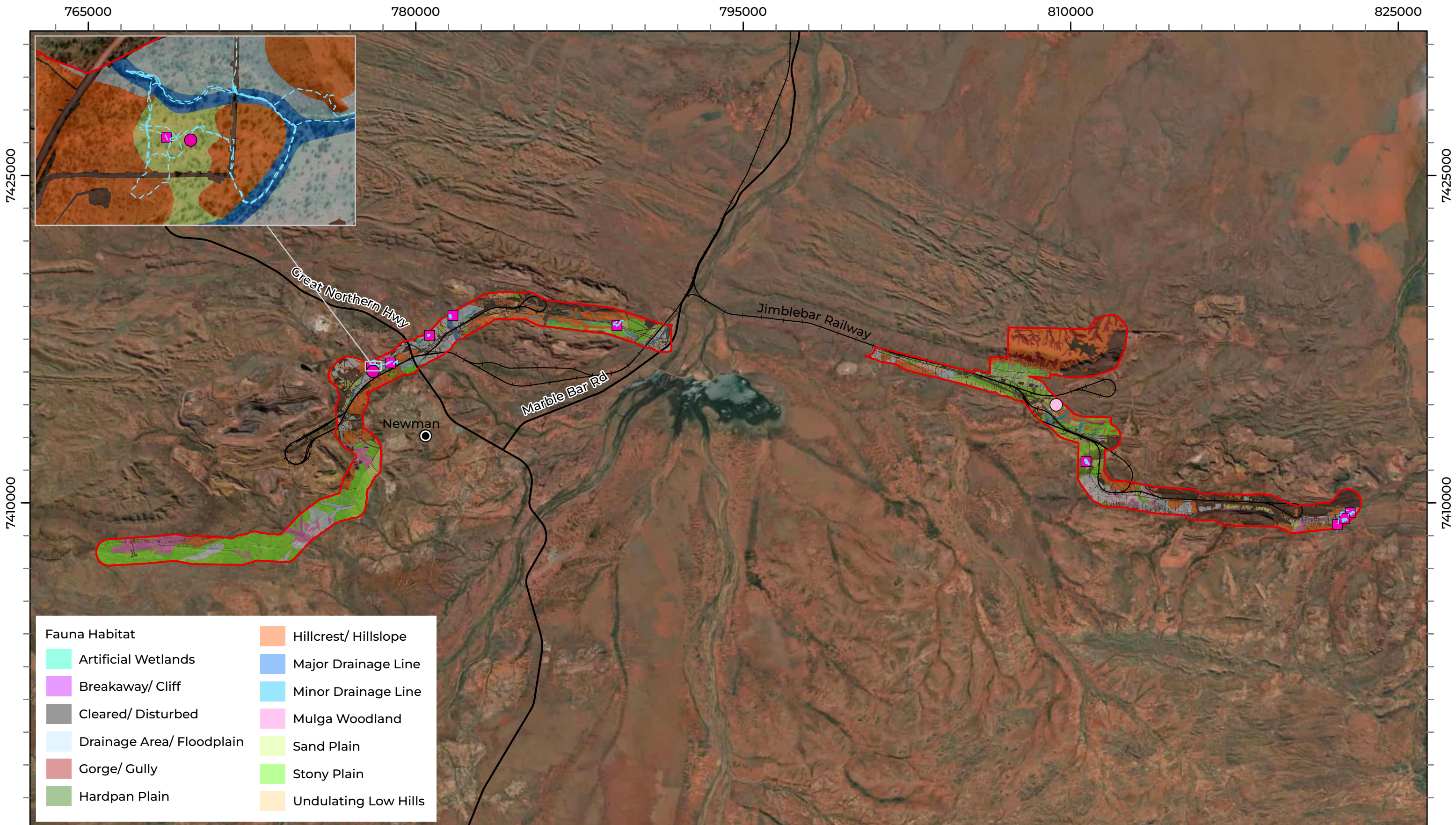
Gane's blind snake has been previously recorded on three occasions within the Study Area, with the most recent record of the species occurring in 2014 (BHP WAI0, 2024; DBCA, 2024d). Little is known about the species and its habitat preferences, however previous records have often been associated with moist gorges and gullies (Wilson & Swan, 2014). The species is considered to occur as a resident likely within Hillcrest/ Hillslope (1,562.90 ha, 18.23%), Gorge/ Gully (295.25 ha, 3.44%), Breakaway/ Cliff (6.39 ha, 0.07%), and Major and Minor Drainage Line (when adjacent to rocky habitats, 225.02 ha, 2.63%) habitats, particularly in areas where leaf litter accumulates, and moisture is retained in leaf litter and substrates.

Several other significant species were identified in the desktop assessment as recorded within the vicinity of the Study Area, of which 12 are considered likely to occur (all Migratory shorebirds/ waterbirds under EPBC Act and BC Act: common sandpiper, sharp-tailed sandpiper, curlew sandpiper (also listed as Critically Endangered under EPBC Act and BC Act), pectoral sandpiper, red-necked stint, long-toed stint, black-tailed godwit, ruff, wood sandpiper, marsh sandpiper, common redshank and glossy ibis), and nine as possible to occur (long-tailed dunnart – Priority 4 DBCA, northern short-tailed mouse – Priority 4 DBCA, and Migratory birds/ waterbirds under EPBC Act and BC Act: garganey, fork-tailed swift, little ringed plover, oriental plover, gull-billed tern, common greenshank, and spotted ctenotus – Priority 2 DBCA) (Table 6.1).

For the 17 migratory shorebird and waterbird species considered likely and possible to occur within the Study Area, the habitat preferences and likely utilisation in relation to the Study Area is similar and they are discussed together. These species are only likely to utilise the Artificial Wetland (6.48 ha, 0.08%) habitat within the Study Area where there are large areas of permanent/ persistent or likely permanent/ persistent water providing foraging habitat. Other habitats such as Drainage Area/ Floodplain and Major Drainage Line may be suitable for migratory shorebirds and waterbirds following heavy rainfall events when inundation of the area occurs and suitable foraging habitat is provided; however, are not considered important habitat for the species. The frequency of records of migratory shorebirds and waterbirds within the Study Area and surrounds is variable; however, this is also often representative of the highly variable nature of the occurrence of these species as far inland

as the Study Area, often because of cyclonic activity and high winds from the northwest. Occurrence of these species within the Study Area is likely to be dependent on the occurrence of other suitable habitat more broadly around Ophthalmia Dam. No migratory shorebird and waterbird species were recorded during the current survey.

Whilst the remaining species considered possible to occur (long-tailed dunnart, northern short-tailed mouse, fork-tailed swift and spotted ctenotus) were not recorded during the current survey they may occur within the Study Area, although habitats within are unlikely to be relied upon by any of these species for their long-term persistence at a local and/or regional scale (Table 6.1). The remaining eight (non-MNES) significant species that were identified in the desktop assessment are considered unlikely or highly unlikely to occur primarily due to the absence of any suitable habitats likely to be used by the species (Table 6.1).



LEGEND

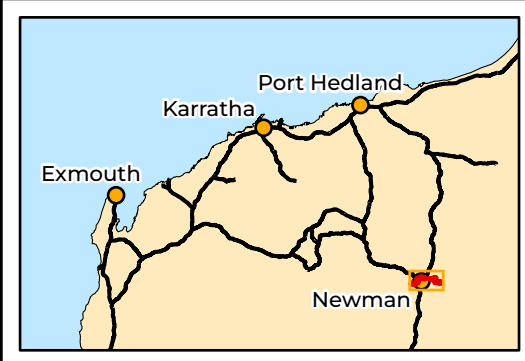
Study Area	Sampling Type	Brush-tailed mulgara - VU
State Road	Targeted Search	Burrow (active)
Rail	Targeted Search	Western pebble-mound mouse - VU
		Mound (inactive)

Biologic

Scale 1:162,000

0 3 6 Km

Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator Created: 29/10/2024



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Figure 6.16: Other significant
species sampling, records and
habitat in the Survey Area

7 Conclusion

7.1 Northern Quoll

Northern quoll was not recorded during the current survey, however, has been previously recorded once within the Study Area (unconfirmed record reported as a dead individual) and a further eight previous records fall within 20 km of the Study Area. There is uncertainty regarding these previous records, particularly with regard to the species long-term occurrence and persistence in the broader area, and recent survey effort for the species has resulted in no records (Biologic, 2022a). Potential critical breeding, foraging and dispersal habitat for the species is present within the Study Area in Gorge/ Gully (295.25 ha, 3.44%), Breakaway/ Cliff (6.39 ha, 0.07%), and Major Drainage Line (53.79 ha, 0.63%) habitats. Potential supporting habitat for the northern quoll occurs in the Hillcrest/ Hillslope (1,562.90 ha, 18.23%), Artificial Wetland (6.48 ha, 0.08%) and Minor Drainage Line (171.23 ha, 2.00%) habitats, where proximal (<35 ha, BHP WAIO (2023)) to potential critical habitat.

Overall, in consideration of the overall scarcity of records within and in the vicinity of the Study Area, the species' occurrence within the Study Area is considered to be extremely rare and it is unlikely a resident population occurs within the Study Area permanently. The species occurrence within the Study Area is confirmed (previous unconfirmed record); however, is likely limited to infrequent visitations by dispersing and/or foraging individuals.

7.2 Greater Bilby

No records or evidence of the greater bilby was recorded within the Study Area during the current survey; the most recent previous records (old diggings and unconfirmed inactive burrows) are approximately 20 km east of the Study Area at East Caramulla in 2023. While marginally suitable habitat in the form of Sand Plain (380.43 ha, 4.44%) is present within the Study Area, the habitat is relatively small in size and fragmented within the Study Area, and isolated from other similar habitat outside of the Study Area, making it unlikely to support a population of the species. Based on the limited number of nearby recent records and the uncertainty over the veracity of these records, and lack of critical and supporting habitats within the Study Area the greater bilby is considered unlikely to occur in the Study Area.

7.3 Ghost Bat

Ghost bat was recorded on one occasion via secondary evidence (approximately 1,000 scats) at cave CER-06 in the Study Area during the current survey. This cave was classified as a Category 3 roost (diurnal roost cave with occasional occupancy), with a further three additional caves recorded in the Study Area during the current survey identified as Category 4 (nocturnal roost caves with opportunistic usage) roosts for the species. Eight other caves

are known to occur within the Study Area, comprising two Category 3 and six Category 4 caves. In addition, several caves occur within the vicinity of the Study Area, comprising four Category 2 caves (maternity/ diurnal roost caves with regular occupancy for ghost bats) (CNIN-03, CWER-01, CWER-03 and CJIM-03) between 0.3–4.5 km of the Study Area.

The most suitable areas of habitat to support the species for roosting within the Study Area are Gorge/ Gully (3.44%, 295.25 ha), Breakaway/ Cliff (0.07%, 6.39 ha) and some instances of Hillcrest/ Hillslope (18.23%, 1,562.90 ha) (when caves are present in these habitats). All other habitats (Sand Plain, Stony Plain, Drainage Area/ Floodplain, Mulga Woodland, Major Drainage Line, Minor Drainage Line, Artificial Wetland, Hardpan Plain and Undulating Low Hills) provide critical foraging and dispersal habitat for the species when proximal (<12 km) to a critical ghost bat roost (i.e. Category 2 roosts CNIN-03, CWER-01, CWER-03 and CJIM-03). Supporting foraging and/ or dispersal habitat is provided by the same habitats outside of the 12 km buffer of the Category 2 roosts, with some habitats containing more important features (e.g. trees for perching) for foraging than others, including Drainage Area/ Floodplain, Stony Plain, Sand Plain, Mulga Woodland and Major Drainage Line.

Due to the presence of known roosting caves and confirmed records within the Study Area and surrounds, the presence of suitable breeding and roosting habitat and recent records of the species, it is likely to occur as a resident and utilise the above habitats within the Study Area for foraging. The individuals present within the Study Area contribute to a population aligning with the DoE (2013b) definition of 'important'.

7.4 Pilbara Leaf-nosed Bat

No records or evidence of the Pilbara leaf-nosed bat was recorded within the Study Area during the current survey; however, it has been recorded on many occasions within the vicinity of the Study Area. The nearest known provisional permanent diurnal (preliminary categorisation as Category 2) roost for this species is cave CNIN-12, approximately 1.4 km north of the Study Area.

Given the close proximity of CNIN-12 to the Study Area, all habitats (except Cleared/ Disturbed areas) that are within 5 km of this roost are considered critical habitat (Hillcrest/ Hillslope 86.92 ha, 1.01%; Sand Plain 66.98 ha, 0.78%; Drainage Area/ Floodplain 61.20 ha, 0.71%; Stony Plain 48.22 ha, 0.56%; Undulating Low Hills 19.53 ha, 0.23%; Minor Drainage Line 10.79 ha, 0.13%, and Gorge/ Gully 4.18 ha, 0.05%). All habitats outside of the 5 km buffer are considered supporting foraging habitat, and the species is likely to frequently forage within the habitats less than 20 km from CNIN-12. As such Breakaway/ Cliff and Artificial Wetland habitats are classified as a Habitat Rating 4 (very high), and Gorge/ Gully and Major Drainage Line habitats are classified as a Habitat Rating 3 (high) as defined by Bat Call (2021b). All other habitats within the Study Area provide varying degrees of supporting foraging habitat and were

classified as Habitat Rating 2 (moderate) for the species (Bat Call, 2021b). The Study Area also contains 29 water features likely to provide supporting foraging habitat for the species.

The results of this survey support previous studies which have showed that the Pilbara leaf-nosed bat is relatively scarce within the broader Newman region (summarised in Biologic (2020c)), due to the limited availability of roosting habitat. The Study Area is considered unlikely to represent a significant area for Pilbara leaf-nosed bats based on the absence of Category 1, 2 and 3 roosts; however, due to a provisional permanent diurnal roost (preliminary categorisation as Category 2) CNIN-12 within 1.4 km of the Study Area, the species is considered highly likely to occur within the Study Area for foraging and dispersal purposes.

7.5 Night Parrot

No evidence of night parrot was recorded within the Study Area during the current survey and the closest record is 100 km to the north, which was recorded from Cloudbreak mine in 2021 (FMG, 2021). The habitats within the Study Area were not considered suitable preferred habitat for the species to forage. Based on the absence of critical and/or supporting habitats present within the Study Area, the night parrot is considered unlikely to occur within the Study Area either as a resident or infrequent visitor during foraging and/or dispersal.

7.6 Southern Whiteface

No evidence of southern whiteface was recorded during the current survey and there is only one previous record within the vicinity of the Study Area. However, potential critical nesting/ breeding, foraging and dispersal habitat for the species exists within Drainage Area/ Floodplain (1,102.45 ha, 12.86%), and potential supporting nesting/ breeding, foraging and dispersal habitat for the species exists within Sand Plain (385.33 ha, 4.49%), Minor Drainage Line (171.23 ha, 2.00%), and Major Drainage Line (53.79 ha, 0.63%) habitats of the Study Area. Stony Plain (1,669.52 ha, 19.47%), Mulga Woodland (433.95 ha, 5.06%) and Hardpan Plain (76.52 ha, 0.89%) habitats provide supporting foraging and dispersal habitat for the species.

Due to recent update of the species' conservation status, the scarcity of records in the broader vicinity, and the Study Area occurring on the northern periphery of the species distribution (DCCEEW, 2023), any records present may represent part of an important population of the species. Given these factors and the presence of suitable habitats, the species is considered possible to occur within the Study Area.

7.7 Princess Parrot

The Study Area is outside the modelled distribution for which the species or species habitat is known, likely, or may occur. No princess parrot or evidence of the species' occurrence was recorded during the current survey, and the nearest record is approximately 2.6 km southwest (year 2012) of the Study Area. Overall, the habitats present in the Study Area are

unlikely to provide nesting/ roosting or foraging habitat to support the species outside boom-bust periods. Due to lack of suitable nesting/ roosting or foraging habitat, the lack of previous records and location outside the known distribution the princess parrot is considered unlikely to occur.

7.8 Grey Falcon

No grey falcons were recorded within the Study Area during the current survey, but two records of the species occur within 5 km of the Study Area (2021 and 2013) (Eco Logical, 2013; GHD, 2022). Potential critical habitat for nesting/ roosting, foraging and dispersal exists within the Major Drainage Line habitat (53.79 ha, 0.63%) of the Study Area. Potential supporting foraging and dispersal habitat occurs within the Drainage Area/ Floodplain (1,102.45 ha, 12.86%), Minor Drainage Line (171.23 ha, 2.00%) and Artificial Wetland (6.48 ha, 0.08%) habitats of the Study Area. The species' occurrence is likely to be dependent on the proximity of nesting. Nesting may occur in Major Drainage Line habitat where suitable tall trees are present, or where suitable tall infrastructure (i.e. powerline or transmission towers) occurs. No known nesting sites are present within or in the vicinity of the Study Area, therefore, the species is assessed as possible to occur, most likely as infrequent foraging and/ or dispersing individuals.

7.9 Pilbara Olive Python

Pilbara olive python was recorded once (skin/slough) within the Study Area during the current survey (from cave CER-06). There is one previous record of an individual within the Study Area from 2013 (BHP WAO, 2024; Biologic, 2014b). Nine water features were recorded within the Study Area during the current survey with three artificial water features classified as permanent/persistent or likely permanent/persistent. A further 20 water features have previously been recorded within the Study Area with one natural water feature (WPWR-001, previous ID 10398_11_00001) recorded during the current survey. The permanent/persistent water features are considered critical habitat for the species however, as the permanent water features in the Study Area are artificial and the prolonged existence is limited by mining activity, it's significance in the landscape will be periodical. The likely semi-persistent and ephemeral pools are considered supporting habitat for the species. Critical habitat for the species is present within the Study Area in Gorge/ Gully (295.25 ha, 3.44%), Breakaway/ Cliff (6.39 ha, 0.07%), Major Drainage Line (53.79 ha, 0.63%) and Artificial Wetland (6.48 ha, 0.08%) habitats. Supporting habitat for the species occurs within the Study Area in Minor Drainage Line (171.23 ha, 2.00%), Hillcrest/Hillslope (1,562.90 ha, 18.23%) and Drainage Area/ Floodplain (1,102.45 ha, 12.86%) particularly in areas connecting critical habitats.

Based on the records within and in the vicinity the Study Area, the presence of both critical and supporting habitat including water features, the individuals present would form part of an 'important population' as defined by DoE (2013a).

7.10 Great Desert Skink

No great desert skink or evidence of the species was recorded during the current survey, and there is a scarcity of records within the region. In addition, the Study Area is outside the modelled distribution for which the species or species habitat is known or likely to occur (Indigenous Desert Alliance, 2022). The Sand Plain habitat (385.33 ha, 4.49%) present in the Study Area is not considered suitable to support the species due to the absence of large undisturbed areas of the habitat. In consideration of this, the lack of previous records, and location outside the known distribution, great desert skink is considered highly unlikely to occur.

7.11 Other Fauna of Significance

Two other significant species were recorded in the Study Area during the current and previous surveys, western pebble-mound mouse (Priority 4 DBCA) and brush-tailed mulgara (Priority 4 DBCA). The western pebble-mound mouse is likely to occur as a resident throughout the Study Area, primarily in Hillcrest/ Hillslope (1,562.90 ha, 18.23%), Stony Plain (1,669.52 ha, 19.47%) and Undulating Low Hills (88.59 ha, 1.03%) habitats. The brush-tailed mulgara is likely to occur as a resident in small sections of the Study Area, in Drainage Area/ Floodplain (1,102.45 ha, 12.86%) and Sand Plain (385.33 ha, 4.49%,) habitats. Both species' occurrence within the Study Area is unlikely to represent an important population and the species is not likely to be reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

Two other significant species have previously been recorded within the Study Area: peregrine falcon on two occasions and Gane's blind snake on three occasions (BHP WAO, 2024; DBCA, 2024d). Neither species were recorded during the current survey. The peregrine falcon is considered to occur as an infrequent visitor within the Study Area to forage within all broad fauna habitats occurring, however the frequency of occurrence is likely to be dependent on the proximity of nesting within or in the vicinity of the Study Area. Suitable nesting habitat for the species may occur within Gorge/ Gully (295.25 ha, 3.44%) and Breakaway/ Cliff (6.39 ha, 0.07%) habitat and instances of elevated breakaway within Hillcrest/ Hillslope (1,562.90 ha, 18.23%) habitat. Gane's blind snake is considered to occur as a resident likely within Hillcrest/ Hillslope (1,562.90 ha, 18.23%), Gorge/ Gully (295.25 ha, 3.44%), Breakaway/ Cliff (6.39 ha, 0.07%), and Major and Minor Drainage Line (when adjacent to rocky habitats, 225.02 ha, 2.62%) habitats within the Study Area, particularly in areas where leaf litter accumulates, and moisture is retained in leaf litter and substrates.

Twelve other significant (Migratory under EPBC Act and BC Act) species are considered likely to occur within the Study Area: common sandpiper, sharp-tailed sandpiper, curlew sandpiper (also listed as Critically Endangered under EPBC Act and BC Act), pectoral sandpiper, red-necked stint, long-toed stint, black-tailed godwit, ruff, wood sandpiper, marsh sandpiper, common redshank and glossy ibis. A further nine other significant species are considered possible to occur within the Study Area: long-tailed dunnart (Priority 4 DBCA); northern short-tailed mouse (Priority 4 DBCA); spotted ctenotus (Priority 2 DBCA); garganey, fork-tailed swift, little ringed plover, oriental plover, gull-billed tern and common greenshank (Migratory under EPBC Act and BC Act).

All 17 migratory shorebird and waterbird species considered likely and possible to occur within the Study Area are only likely to utilise the Artificial Wetland (6.48 ha, 0.08%) habitat within the Study Area and their occurrence would be infrequent. Whilst the remaining species possible to occur (long-tailed dunnart, northern short-tailed mouse, fork-tailed swift and spotted ctenotus) were not recorded during the current survey, they may occur within the Study Area within suitable habitats; however, habitats within are unlikely to be relied upon by any of these species for their long-term persistence at a local and/or regional scale. The remaining eight significant species that were identified in the desktop assessment are considered unlikely or highly unlikely to occur primarily due to the absence of any critical and/or supporting habitats likely to be used by the species.

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Appendix A: Conservation Codes

Environment Protection and Biodiversity Conservation Act 1999

Category	Definition
Threatened Fauna Species	
Extinct (EX)	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild (EW)	Taxa known to survive only in captivity.
Critically Endangered (CE)	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (EN)	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable (VU)	Taxa facing a high risk of extinction in the wild in the medium-term future.
Migratory (MIG)	Consists of species listed under the following International Conventions: Japan-Australia Migratory Bird Agreement (JAMBA) China-Australia Migratory Bird Agreement (CAMBA) Convention on the Conservation of Migratory Species of Wild animals (Bonn Convention)

Biodiversity Conservation Act 2016

Category	Definition
Threatened Fauna Species	
Critically Endangered (Cr)	Rare or likely to become extinct, as <i>critically endangered</i> fauna.
Endangered (En)	Rare or likely to become extinct, as <i>endangered</i> fauna.
Vulnerable (Vu)	Rare or likely to become extinct, as <i>vulnerable</i> fauna.
Extinct (Ex)	Being fauna that is presumed to be extinct.
Migratory (Mi)	Birds that are subject to international agreements relating to the protection of migratory birds.
Conservation Dependent (CD)	Special conservation need being species dependent on ongoing conservation intervention. (Conservation Dependant)
Other Specially Protected Species (OS)	In need of special protection, otherwise than for the reasons pertaining to Schedule 1 through to Schedule 6 Fauna. (Other specially protected species)

Department of Biodiversity, Conservation and Attractions Priority Definitions

Category	Definition
Priority Fauna Species	
Priority 1 (P1)	Poorly-known Species Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2 (P2)	Poorly-known Species Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3 (P3)	Poorly-known Species Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4 (P4)	Rare, Near Threatened and other species in need of monitoring (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

International Union for Conservation of Nature

Category	Definition
Extinct (Ex)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a period appropriate to the taxon's life cycle and life form.
Extinct in the Wild (Ex)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a period appropriate to the taxon's life cycle and life form.
Critically Endangered (Cr)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (En)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (Vu)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases, great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period has elapsed since the last record of the taxon, threatened status may well be justified.

Appendix B: Significant Vertebrate Fauna Recorded in the Desktop Assessment

Species		Conservation Status				Database review						Literature review																														
Scientific Name	Common Name	EPBC Act	BC Act	DBCA	IUCN	NatureMap (40 km)	EPBC Protected Matters (40km)	DBCA Priority and Threatened Database (40km)	ALA (40km)	Birdlife (40km)	BHP (5km)	Biologic (2014b)	Biologic (2013).	Biologic (2014c).	Biologic (2014d)	Onshore (2015b)	Biologic (2016a)	Biologic (2016b).	Biologic (2016c)	Biologic (2019)	Biologic (2018b).	Biologic (2020b).	GHD (2021b).	Biologic (2022a).	GHD (2022).	Biologic (2022c).	Biologic (2023b).	Onshore (2017).	Biologic (2023a).	Biologic (2014a).	Biota (2022).	Astron (2024b).	Onshore (2015a).	Biologic (2022b).	Ecologia (2004).	ENV (2007).	Outback Ecology (2009)	ENV (2011).	MWH (2015).	Astron (2024a)		
MAMMALS																																										
DASYURIDAE																																										
<i>Antechinomys longicaudatus</i>	Long-tailed dunnart			P4		X		X	X																																	
<i>Dasycercus blythi</i>	Brush-tailed mulgara			P4		X		X			X		X		X			X	X		X				X																X	
<i>Dasyurus hallucatus</i>	Northern quoll	EN	EN		EN		Like ly	X			X																															
MACROPODIDAE																																										
<i>Lagorchestes conspicillatus</i> subsp. <i>leichardti</i>	Spectacled hare-wallaby			P4		X		X	X																												X					
<i>Petrogale lateralis</i> subsp. <i>lateralis</i>	Black-flanked rock-wallaby	EN	EN		VU	X		X	X																																	
MEGADERMATIDAE																																										
<i>Macroderma gigas</i>	Ghost bat	VU	VU		VU	X	X	X	X		X	X	X				X						X																			
MURIDAE																																										
<i>Leggadina lakedownensis</i>	Northern short-tailed mouse			P4																																						
<i>Pseudomys chapmani</i>	Western pebble-mound mouse			P4		X		X	X		X	X	X				X								X			X								X	X		X	X		
NOTORYCTIDAE																																										
<i>Notoryctes caurinus</i>	Northern marsupial mole			P4				X																																		
RHINONYCTERIDAE																																										
<i>Rhinonictes aurantia</i>	Pilbara leaf-nosed bat	VU	VU			X	X	X			X		X				X								X		X				X		X									
THYLACOMYIDAE																																										
<i>Macrotis lagotis</i>	Greater bilby	VU	VU		VU		Like ly	X																																		X
BIRDS																																										
ACANTHIZIDAE																																										
<i>Aphelocephala leucopsis</i>	Southern whiteface	VU				X	May		X														X																			
ANATIDAE																																										
<i>Anas querquedula</i>	Garganey	MI	MI								X																															
APODIDAE																																										
<i>Apus pacificus</i>	Fork-tailed swift	MI	MI				Like ly	X	X		X																				X		X		X			X				
CHARADRIIDAE																																										

Species		Conservation Status				Database review						Literature review																														
Scientific Name	Common Name	EPBC Act	BC Act	DBCA	IUCN	NatureMap (40 km)	EPBC Protected Matters (40km)	DBCA Priority and Threatened Database (40km)	ALA (40km)	Birdlife (40km)	BHP (5km)	Biologic (2014b)	Biologic (2013).	Biologic (2014c).	Biologic (2014d)	Onshore (2015b)	Biologic (2016a)	Biologic (2016b).	Biologic (2016c)	Biologic (2019)	Biologic (2018b).	Biologic (2020b).	GHD (2021b).	Biologic (2022a).	GHD (2022).	Biologic (2022c).	Biologic (2023b).	Onshore (2017).	Biologic (2023a).	Biologic (2014a).	Biota (2022).	Astron (2024b).	Onshore (2015a).	Biologic (2022b).	Ecologia (2004).	ENV (2007).	Outback Ecology (2009)	ENV (2011).	MWH (2015).	Astron (2024a)		
<i>Charadrius dubius</i>	Little ringed plover	MI	MI								X																												X			
<i>Charadrius leschenaultii</i>	Greater sand plover	MI/VU	VU						X	X																																
<i>Charadrius veredus</i>	Oriental plover	MI	MI				May	X	X																																	
FALCONIDA																																										
<i>Falco hypoleucos</i>	Grey falcon	VU	VU		VU		Like ly		X		X														X						X		X									
<i>Falco peregrinus</i>	Peregrine falcon		OS			X		X	X	X	X		X											X																		
HIRUNDINIDAE																																										
<i>Hirundo rustica</i>	Barn swallow	MI	MI				May				X																													X		
LARIDAE																																										
<i>Gelochelidon nilotica</i>	Gull-billed tern	MI	MI			X		X	X	X																																
<i>Sterna caspia</i>	Caspian tern	MI	MI			X		X	X	X																																
MOTACILLIDAE																																										
<i>Motacilla cinerea</i>	Grey wagtail	MI	MI				May																																			
<i>Motacilla flava</i>	Yellow wagtail	MI	MI				May																																			
PSITTACIDAE																																										
<i>Pezoporus occidentalis</i>	Night parrot	EN	CR		CR		Like ly																																			
<i>Polytelis alexandrae</i>	Princess parrot	VU		P4	NT		X	X	X																																	
ROSTRATULIDAE																																										
<i>Rostratula australis</i>	Australian painted snipe	EN	EN		EN		May																																			
SCOLOPACIDAE																																										
<i>Actitis hypoleucos</i>	Common sandpiper	MI	MI			X	X	X	X	X	X																									X			X			
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	MI	MI		VU	X	May	X	X	X	X																													X		
<i>Calidris ferruginea</i>	Curlew sandpiper	MI/CR	CR		NT	X	X	X	X	X	X																													X		
<i>Calidris melanotos</i>	Pectoral sandpiper	MI	MI			X	May	X	X		X																													X		
<i>Calidris ruficollis</i>	Red-necked stint	MI	MI		NT	X		X	X	X																																
<i>Calidris subminuta</i>	Long-toed stint	MI	MI			X		X	X	X	X																													X		
<i>Limosa limosa</i>	Black-tailed godwit	MI	MI		NT						X																													X		
<i>Calidris pugnax</i>	Ruff	MI	MI								X																													X		
<i>Tringa glareola</i>	Wood sandpiper	MI	MI			X		X	X	X	X																													X		

Species		Conservation Status				Database review						Literature review																															
Scientific Name	Common Name	EPBC Act	BC Act	DBCA	IUCN	NatureMap (40 km)	EPBC Protected Matters (40km)	DBCA Priority and Threatened Database (40km)	ALA (40km)	Birdlife (40km)	BHP (5km)	Biologic (2014b)	Biologic (2013).	Biologic (2014c).	Biologic (2014d)	Onshore (2015b)	Biologic (2016a)	Biologic (2016b).	Biologic (2016c)	Biologic (2019)	Biologic (2018b).	Biologic (2020b).	GHD (2021b).	Biologic (2022a).	GHD (2022).	Biologic (2022c).	Biologic (2023b).	Onshore (2017).	Biologic (2023a).	Biologic (2014a).	Biota (2022).	Astron (2024b).	Onshore (2015a).	Biologic (2022b).	Ecologia (2004).	ENV (2007).	Outback Ecology (2009)	ENV (2011).	MWH (2015).	Astron (2024a)			
<i>Tringa nebularia</i>	Common greenshank	MI	MI			X		X	X	X																														X			
<i>Tringa stagnatilis</i>	Marsh sandpiper	MI	MI			X		X	X	X	X																													X			
<i>Tringa totanus</i>	Common redshank	MI	MI			X		X																																			
THRESKIORNITHIDAE																																											
<i>Plegadis falcinellus</i>	Glossy ibis	MI	MI			X		X	X	X	X																													X			
REPTILES																																											
PYTHONIDAE (PREVIOUSLY BOIDAE)																																											
<i>Liasis olivaceus</i> subsp. <i>barroni</i>	Pilbara olive python	VU	VU			X	X	X	X		X	X	X	X			X									X																	
SCINCIDAE																																											
<i>Ctenotus uber</i> subsp. <i>johnstonei</i>	Spotted ctenotus			P2															X		X																						
<i>Liopholis kintorei</i>	Great desert skink	VU	VU		VU		May	X																																			
TYPHLOPIDAE																																											
<i>Anilius ganei</i>	Gane's blind snake			P1		X		X	X		X	X																									X	X					

Appendix C: Vertebrate Fauna Habitat Assessments

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-001	-23.3179	120.0418	16/04/2024	Gorge/ Gully	Gorge	North	Low	Clay Loam	Few Large Patches	Extensive Outcropping	BIF	Boulders (>61cm)	Many Large Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland, Tussock Grassland	Very High	Nil	0	Prone to Pooling	1	None Discernible	Old (6+ yr)	
VPWR-002	-23.3978	120.1376	16/04/2024	Cleared/ Disturbed	Sandy/ Stony Plain	Flat	Flat	Sandy Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Large Patches	Mulga Woodland	Low	High	0	Permanent	0.4	Cattle Grazing	Old (6+ yr)	
VPWR-003	-23.3288	120.0107	16/04/2024	Gorge/ Gully	Gully	South	Steep	Clay Loam	Scarce	Extensive Outcropping	BIF	Boulders (>61cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Very High	Nil	0	Prone to Pooling	1	None Discernible	Old (6+ yr)	
VPWR-004	-23.3957	120.1485	16/04/2024	Drainage Area/ Floodplain	Sandy/ Stony Plain	North	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Many Large Patches	Mulga Woodland, Scattered Shrubs, Spinifex Hummock Grassland	Low	Moderate	0	Prone to Flooding	0.6	Road/ Access Track	Old (6+ yr)	
VPWR-005	-23.3319	120.0163	16/04/2024	Gorge/ Gully	Gully	South	Steep	Clay Loam	Scarce	Extensive Outcropping	BIF	Boulders (>61cm)	Few Large Patches	Spinifex Hummock Grassland	Very High	Nil	0	Prone to Pooling	1	None Discernible	Old (6+ yr)	
VPWR-006	-23.3612	120.0429	16/04/2024	Mulga Woodland	Medium Drainage Line	South	Low	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Many Small Patches	Mulga Woodland	Nil	Low	0	Prone to Flooding	0.4	Weed Invasion	Old (6+ yr)	
VPWR-007	-23.3251	120.0222	20/04/2024	Gorge/ Gully	Gully	North	Moderate	Clay Loam	Few Small Patches	Extensive Outcropping	BIF	Boulders (>61cm)	Many Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Very High	Nil	3	Prone to Pooling	1	None Discernible	Old (6+ yr)	
VPWR-008	-23.3507	120.0256	16/04/2024	Stony Plain	Undulating Low Hills	South	Moderate	Silty Clay Loam	Scarce	Minor Outcropping	Sandstone	Pebbles (5-10cm)	Few Small Patches	Scattered Eucalypts, Spinifex Hummock Grassland	Low	Nil	0	None	0.6	Other	Old (6+ yr)	
VPWR-009	-23.3189	120.0309	16/04/2024	Gorge/ Gully	Gorge	North	Low	Clay Loam	Few Large Patches	Extensive Outcropping	BIF	Boulders (>61cm)	Few Large Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland, Tussock Grassland	Very High	Nil	5	Prone to Pooling	1	None Discernible	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-010	-23.3842	120.0438	16/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Low	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Large Patches	Mulga Woodland	Nil	Low	0	Prone to Flooding	0.6	Other	Old (6+ yr)	
VPWR-011	-23.3573	119.7107	17/04/2024	Breakaway/ Cliff	Breakaway	North/ West	Steep	Clay Loam	Evenly Spread	Extensive Outcropping	BIF	Boulders (>61cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Very High	Low	5	None	0.6	Other	Moderate (3 to 5 yr)	
VPWR-012	-23.3759	120.0398	16/04/2024	Sand Plain	Sand Plain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	None Discernible	Negligible	Few Large Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	High	0	Prone to Flooding	0.6	Other	Old (6+ yr)	
VPWR-013	-23.3428	119.7206	17/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Large Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	5	Prone to Flooding	0.6	Weed Invasion	Moderate (3 to 5 yr)	
VPWR-014	-23.3403	119.9850	16/04/2024	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	High	0	Prone to Flooding	0.4	Road/ Access Track	Old (6+ yr)	
VPWR-015	-23.4161	119.6013	17/04/2024	Hillcrest/ Hillslope	Undulating Low Hills	South	Moderate	Clay Loam	Scarce	Extensive Outcropping	BIF	Large Rocks (21-60cm)	Scarce	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Very High	Nil	3	None	0.6	Mining Exploration	Old (6+ yr)	
VPWR-016	-23.3382	120.0016	16/04/2024	Sand Plain	Sandy/ Stony Plain	South	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	Low	0	None	0.6	Mining Exploration	Old (6+ yr)	
VPWR-017	-23.4130	119.6072	17/04/2024	Hillcrest/ Hillslope	Hillslope	North	Moderate	Clay Loam	Evenly Spread	Extensive Outcropping	BIF	Large Rocks (21-60cm)	Many Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Very High	Nil	4	Prone to Flooding	0.4	Mining Exploration	Old (6+ yr)	
VPWR-018	-23.3179	119.8118	16/04/2024	Medium Drainage Line	Gully	South	Low	Clay Loam	Evenly Spread	Moderate Outcropping	BIF	Pebbles (5-10cm)	Many Small Patches	Scattered Eucalypts, Scattered Shrubs	Moderate	Low	0	Permanent	0.6	Weed Invasion	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-019	-23.4176	119.6066	17/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	1	Weed Invasion	Old (6+ yr)	
VPWR-020	-23.3213	119.7687	16/04/2024	Breakaway/ Cliff	Breakaway	West	Very Steep	Clay Loam	Scarce	Extensive Outcropping	BIF	Large Rocks (21-60cm)	Scarce	Scattered Eucalypts, Spinifex Hummock Grassland	High	Nil	0	None	0.8	Mining Exploration	Old (6+ yr)	
VPWR-021	-23.3244	119.7549	16/04/2024	Major Drainage Line	Major Drainage Line	East	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Tussock Grassland	Low	Moderate	0	Prone to Pooling	0.8	Road/ Access Track	Old (6+ yr)	
VPWR-022	-23.3302	119.7328	16/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	None Discernible	Scattered Shrubs	Nil	Nil	0	Prone to Pooling	0.6	Road/ Access Track	Old (6+ yr)	
VPWR-023	-23.4146	119.6184	17/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.6	Mining Exploration	Old (6+ yr)	
VPWR-024	-23.4078	119.6905	17/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs	Nil	Low	0	None	0.8	Road/ Access Track	Old (6+ yr)	
VPWR-025	-23.4199	119.6181	17/04/2024	Stony Plain	Hillslope	North	Low	Clay Loam	Evenly Spread	Limited Outcropping	BIF	Pebbles (5-10cm)	Scarce	Scattered Shrubs, Spinifex Hummock Grassland	Moderate	Low	0	None	0.8	None Discernible	Moderate (3 to 5 yr)	
VPWR-026	-23.3829	119.7188	17/04/2024	Sand Plain	Sand Plain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	Spinifex Hummock Grassland	Nil	Moderate	0	Prone to Flooding	0.6	Road/ Access Track	Moderate (3 to 5 yr)	
VPWR-027	-23.4185	119.6300	17/04/2024	Mulga Woodland	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.8	Road/ Access Track	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-028	-23.3181	119.7546	17/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Small Rocks (11-20cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Nil	Moderate	0	Prone to Flooding	0.8	Mining Exploration	Old (6+ yr)	
VPWR-029	-23.4136	119.6445	17/04/2024	Hillcrest/ Hillslope	Undulating Low Hills	North	Moderate	Clay Loam	Scarce	Moderate Outcropping	BIF	Small Rocks (11-20cm)	Many Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	High	Nil	0	None	0.2	Mining Exploration	Old (6+ yr)	
VPWR-030	-23.3407	119.7367	21/04/2024	Stony Plain	Undulating Low Hills	North/ East	Moderate	Clay Loam	Few Small Patches	Minor Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Moderate	Low	0	None		Road/ Access Track	Old (6+ yr)	
VPWR-031	-23.4177	119.6450	17/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Limited Outcropping	BIF	Pebbles (5-10cm)	Scarce	Scattered Shrubs, Spinifex Hummock Grassland	Low	Low	0	None	0.6	None Discernible	Moderate (3 to 5 yr)	
VPWR-032	-23.3215	119.8367	17/04/2024	Stony Plain	Ironstone Outcrops	Flat	Flat	Clay Loam	Evenly Spread	Minor Outcropping	BIF	Small Rocks (11-20cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	High	Nil	0	None	0.6	Mining Exploration	Old (6+ yr)	
VPWR-033	-23.4202	119.6665	17/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	Mulga Woodland, Scattered Shrubs, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.8	Road/ Access Track	Old (6+ yr)	
VPWR-034	-23.3290	119.7389	17/04/2024	Artificial Wetlands	Wetland	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	Typha	Nil	Nil	0	Permanent	0.6	Cattle Grazing	Old (6+ yr)	
VPWR-035	-23.4217	119.6620	17/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Limited Outcropping	BIF	Boulders (>61cm)	Many Large Patches	Mulga Woodland, Spinifex Hummock Grassland	Moderate	Moderate	0	Prone to Flooding	1	None Discernible	Old (6+ yr)	
VPWR-036	-23.3267	119.8513	19/04/2024	Artificial Wetlands	Wetland	Flat	Flat	Clay Loam	Many Large Patches	Negligible	None Discernible	Gravel (1-4cm)	Scarce	Acacia Shrubland, Reeds	Nil	Low	0	Permanent	0.6	Road/ Access Track	Moderate (3 to 5 yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-037	-23.4139	119.6533	17/04/2024	Undulating Low Hills	Undulating Low Hills	South/East	Moderate	Clay Loam	Evenly Spread	Limited Outcropping	BIF	Small Rocks (11-20cm)	Many Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Moderate	Nil	0	None	0.8	Mining Exploration	Old (6+ yr)	
VPWR-038	-23.3188	119.7845	18/04/2024	Hillcrest/Hillslope	Hillcrest/Upper Hillslope	North	Steep	Clay Loam	Scarce	Major Outcropping	BIF	Large Rocks (21-60cm)	Scarce	Scattered Eucalypts, Spinifex Hummock Grassland	High	Nil	0	None	0.6	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-039	-23.4147	119.6788	17/04/2024	Drainage Area/Floodplain	Undulating Low Hills	Flat	Flat	Clay Loam	Evenly Spread	Limited Outcropping	BIF	Small Rocks (11-20cm)	Many Large Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Nil	Nil	0	None	0.8	Mining Exploration	Old (6+ yr)	
VPWR-040	-23.3688	119.7074	19/04/2024	Hillcrest/Hillslope	Hillslope	South	Steep	Clay Loam	Few Small Patches	Major Outcropping	BIF	Gravel (1-4cm)	Scarce	Scattered Shrubs, Spinifex Hummock Grassland	Moderate	Nil	0	None	0.6	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-041	-23.4203	119.6813	17/04/2024	Drainage Area/Floodplain	Undulating Low Hills	Flat	Flat	Clay Loam	Evenly Spread	Limited Outcropping	BIF	Small Rocks (11-20cm)	Many Large Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	Moderate	0	None	1	Road/Access Track	Old (6+ yr)	
VPWR-043	-23.4006	119.6961	17/04/2024	Drainage Area/Floodplain	Undulating Low Hills	Flat	Flat	Clay Loam	Evenly Spread	Limited Outcropping	BIF	Large Rocks (21-60cm)	Many Small Patches	Mulga Woodland, Spinifex Hummock Grassland	Low	Moderate	0	Prone to Flooding	0.8	None Discernible	Old (6+ yr)	
VPWR-044	-23.3732	120.0392	20/04/2024	Hardpan Plain	Hardpan Plain	Flat	Flat	Loamy Sand	Evenly Spread	Minor Outcropping	Granite	Small Rocks (11-20cm)	Scarce	Scattered Shrubs	Nil	Moderate	0	Prone to Flooding	0.4	Other	Old (6+ yr)	
VPWR-045	-23.4094	119.6886	19/04/2024	Mulga Woodland	Drainage Area/Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Small Rocks (11-20cm)	Many Large Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Nil	0	None	1	Road/Access Track	Old (6+ yr)	
VPWR-046	-23.3637	120.0367	20/04/2024	Drainage Area/Floodplain	Claypan	Flat	Low	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Scarce	Scattered Shrubs	Nil	Nil	0	Prone to Pooling	0.6	Mining Exploration	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-047	-23.4041	119.7032	17/04/2024	Stony Plain	Undulating Low Hills	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	Shrubland, Spinifex Hummock Grassland	Nil	Moderate	0	None	1	Road/ Access Track	Old (6+ yr)	
VPWR-048	-23.3570	120.0416	20/04/2024	Hillcrest/ Hillslope	Breakaway	South	Moderate	Clay Loam	Few Small Patches	Moderate Outcropping	BIF	Pebbles (5-10cm)	Few Small Patches	Scattered Eucalypts, Spinifex Hummock Grassland	Low	Nil	0	None	0.6	Mining Exploration	Old (6+ yr)	
VPWR-049	-23.3981	119.7064	17/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Small Rocks (11-20cm)	Many Large Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Nil	0	None	1	Road/ Access Track	Old (6+ yr)	
VPWR-050	-23.3259	119.8468	20/04/2024	Major Drainage Line	Major Drainage Line	North	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	Eucalypt Woodland	Low	Low	0	Prone to Flooding	0.6	Mining Exploration	Old (6+ yr)	
VPWR-051	-23.3978	119.7114	17/04/2024	Stony Plain	Undulating Low Hills	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	Shrubland, Spinifex Hummock Grassland	Nil	Moderate	0	None	0.6	Road/ Access Track	Recent (0 to 2 yr)	
VPWR-052	-23.3252	119.7614	21/04/2024	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	West	Steep	Clay Loam	Scarce	Major Outcropping	BIF	Pebbles (5-10cm)	None Discernible	Spinifex Hummock Grassland	High	Nil	0	None	0.8	Mining Exploration	Old (6+ yr)	
VPWR-053	-23.3907	119.7119	17/04/2024	Stony Plain	Undulating Low Hills	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	Shrubland, Spinifex Hummock Grassland	Nil	Moderate	0	None	0.8	Road/ Access Track	Old (6+ yr)	
VPWR-054	-23.3373	119.7400	21/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Large Patches	Mulga Woodland	Nil	Low	0	Prone to Flooding	0.6	Weed Invasion	Old (6+ yr)	
VPWR-055	-23.3834	119.7166	17/04/2024	Stony Plain	Undulating Low Hills	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	Shrubland, Spinifex Hummock Grassland	Nil	Moderate	0	None	0.6	Road/ Access Track	Recent (0 to 2 yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-056	-23.3407	119.7368	21/04/2024	Stony Plain	Undulating Low Hills	North/East	Moderate	Clay Loam	Few Small Patches	Minor Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Tussock Grassland	Low	Low	0	Prone to Flooding	0.4	Weed Invasion	Old (6+ yr)	
VPWR-057	-23.3810	119.7178	17/04/2024	Mulga Woodland	Drainage Area/Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Small Rocks (11-20cm)	Many Large Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Nil	0	None	0.8	Road/Access Track	Old (6+ yr)	
VPWR-058	-23.3440	119.7279	21/04/2024	Hillcrest/Hillslope	Hillslope	North/East	Moderate	Clay Loam	Few Small Patches	Minor Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Moderate	Low	0	None	0.8	Road/Access Track	Old (6+ yr)	
VPWR-059	-23.3969	120.1524	19/04/2024	Major Drainage Line	Major Drainage Line	Flat	Flat	Sand	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	Eucalypt Woodland, Scattered Shrubs, Tussock Grassland	Nil	High	10	Prone to Flooding	0.8	Cattle Grazing	Old (6+ yr)	
VPWR-060	-23.3880	120.0725	22/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Low	Low	0	None	0.6	Mining Exploration	Old (6+ yr)	
VPWR-061	-23.3920	120.1579	19/04/2024	Sand Plain	Sand Plain	Flat	Flat	Clay Loam Sandy	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	High	0	Prone to Flooding	0.8	Cattle Grazing	Old (6+ yr)	
VPWR-062	-23.3351	120.0017	22/04/2024	Stony Plain	Stony Plain	South	Low	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	Scattered Shrubs	Nil	Low	0	None	0.4	Frequent Fire	Recent (0 to 2 yr)	
VPWR-063	-23.3944	120.1555	19/04/2024	Sand Plain	Sand Plain	Flat	Flat	Clay Loam Sandy	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	High	0	Prone to Flooding	0.4	Mining Exploration	Old (6+ yr)	
VPWR-064	-23.3306	119.7513	22/04/2024	Drainage Area/Floodplain	Calcrete Plain	Flat	Flat	Clay Loam	Scarce	Limited Outcropping	Sandstone	Pebbles (5-10cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Nil	Nil	0	None	0.6	Mining Exploration	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-065	-23.3987	120.1466	19/04/2024	Stony Plain	Undulating Low Hills	North	Low	Clay Loam	Evenly Spread	Minor Outcropping	BIF	Pebbles (5-10cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Low	Low	0	None	0.6	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-066	-23.3223	119.8096	23/04/2024	Stony Plain	Hillslope	South	Low	Clay Loam	Scarce	Limited Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Low	Moderate	0	None	0.4	Mining Exploration	Old (6+ yr)	
VPWR-067	-23.3994	120.1398	19/04/2024	Stony Plain	Undulating Low Hills	West	Low	Clay Loam	Evenly Spread	Minor Outcropping	BIF	Pebbles (5-10cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Low	Moderate	0	None	0.4	Mining Exploration	Old (6+ yr)	
VPWR-068	-23.3217	119.8199	23/04/2024	Hillcrest/Hillslope	Hillcrest/Upper Hillslope	North	Moderate	Clay Loam	Scarce	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Scarce	Scattered Shrubs, Spinifex Hummock Grassland	High	Nil	0	None		Mining Exploration	Old (6+ yr)	
VPWR-069	-23.3985	120.1299	19/04/2024	Stony Plain	Undulating Low Hills	West	Low	Clay Loam	Evenly Spread	Minor Outcropping	BIF	Pebbles (5-10cm)	Few Small Patches	Shrubland, Spinifex Hummock Grassland	Low	Low	0	None	0.6	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-070	-23.3199	119.8266	23/04/2024	Minor Drainage Line	Drainage Area/Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Few Large Patches	Shrubland, Spinifex Hummock Grassland	Low	Low	0	None	0.6	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-071	-23.3869	120.0543	19/04/2024	Drainage Area/Floodplain	Drainage Area/Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Small Patches	Mulga Woodland, Spinifex Hummock Grassland	Nil	Moderate	0	Prone to Flooding	0.6	Road/Access Track	Moderate (3 to 5 yr)	
VPWR-072	-23.3173	119.8299	23/04/2024	Hillcrest/Hillslope	Hillcrest/Upper Hillslope	South	Steep	Clay Loam	Scarce	Major Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Moderate	Nil	0	None	0.6	Mining Exploration	Old (6+ yr)	
VPWR-073	-23.3930	120.0805	19/04/2024	Mulga Woodland	Drainage Area/Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Small Patches	Scattered Shrubs, Tussock Grassland	Low	Low	0	Prone to Flooding	0.6	Mining Exploration	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-074	-23.3210	119.8280	23/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Flat	Sand	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	High	0	Prone to Flooding	0.6	Road/ Access Track, Mining Exploration	Old (6+ yr)	
VPWR-075	-23.3871	120.0696	19/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Small Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.6	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-076	-23.3198	119.8298	23/04/2024	Sand Plain	Sandy/ Stony Plain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.4	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-077	-23.3668	120.0436	19/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Nil	Moderate	0	None	0.6	Mining Exploration	Old (6+ yr)	
VPWR-079	-23.3595	120.0256	19/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Shrubland	Nil	Moderate	0	Prone to Flooding	0.8	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-080	-23.3246	119.8361	23/04/2024	Minor Drainage Line	Minor Drainage Line	South/ East	Flat	Medium Clay	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	Shrubland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.6	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-081	-23.3460	120.0059	19/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	Shrubland	Low	Nil	0	Prone to Flooding	0.6	Mining Exploration	Old (6+ yr)	
VPWR-082	-23.3209	119.8458	23/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Shrubland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.6	Mining Exploration	Old (6+ yr)	
VPWR-083	-23.3382	119.7271	24/04/2024	Major Drainage Line	Major Drainage Line	Flat	Flat	Clay Loam	Evenly Spread	Moderate Outcropping	BIF	Small Rocks (11-20cm)	Many Large Patches	Eucalypt Woodland, Shrubland, Tussock Grassland	Moderate	Moderate	10	Prone to Flooding	0.6	Weed Invasion	Recent (0 to 2 yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-084	-23.3097	119.7820	23/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Few Small Patches	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Shrubland, Spinifex Hummock Grassland	Nil	Low	0	None	0.4	Mining Exploration	Old (6+ yr)	
VPWR-085	-23.3910	120.1415	22/04/2024	Cleared/ Disturbed	Other	South	Moderate	Clay Loam	Evenly Spread	Negligible	None Discernible	Large Rocks (21-60cm)	None Discernible	Shrubland, Spinifex Hummock Grassland	Low	Low	0	None	0.2	Mining Exploration	Old (6+ yr)	
VPWR-086	-23.3123	119.7734	23/04/2024	Stony Plain	Hillslope	North	Moderate	Clay Loam	Scarce	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Weeds	Nil	Moderate	0	None	0.1	Rehab	Old (6+ yr)	
VPWR-087	-23.3558	120.0275	22/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Many Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Low	Nil	0	None	0.2	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-088	-23.3128	119.7675	23/04/2024	Minor Drainage Line	Minor Drainage Line	South	Flat	Clayey Sand	Evenly Spread	Limited Outcropping	BIF	Gravel (1-4cm)	Many Small Patches	Mulga Woodland, Shrubland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.8	Weed Invasion	Old (6+ yr)	
VPWR-089	-23.3597	120.0358	22/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Many Small Patches	Mulga Woodland, Scattered Shrubs	Low	Low	0	Prone to Flooding	0.2	Mining Exploration	Old (6+ yr)	
VPWR-090	-23.3154	119.7640	23/04/2024	Drainage Area/ Floodplain	Minor Drainage Line	Flat	Flat	Clay Loam	Few Small Patches	Negligible	None Discernible	Gravel (1-4cm)	Few Large Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Low	Low	0	Prone to Flooding	0.2	Weed Invasion	Old (6+ yr)	
VPWR-091	-23.3592	120.0350	22/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Many Small Patches	Mulga Woodland, Shrubland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.8	Weed Invasion	Old (6+ yr)	
VPWR-092	-23.3184	119.7577	23/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Scarce	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Low	Moderate	0	None	0.6	Mining Exploration	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-093	-23.3436	120.0211	22/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	Low	0	None	0.6	Road/ Access Track	Old (6+ yr)	
VPWR-094	-23.3265	119.7443	23/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Low	Moderate	0	Prone to Flooding	0.6	Mining Exploration	Old (6+ yr)	
VPWR-095	-23.3719	119.7071	21/04/2024	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Small Rocks (11-20cm)	Many Large Patches	Mulga Woodland, Shrubland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.8	Road/ Access Track	Old (6+ yr)	
VPWR-097	-23.3426	120.0112	22/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	Moderate	0	None	0.8	Mining Exploration	Old (6+ yr)	
VPWR-099	-23.3377	119.9919	22/04/2024	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Nil	Moderate	0	None	0.8	Mining Exploration	Old (6+ yr)	
VPWR-100	-23.3398	119.7187	24/04/2024	Sand Plain	Major Drainage Line	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Low	Moderate	0	Prone to Flooding	0.6	Mining Exploration	Old (6+ yr)	
VPWR-101	-23.3882	120.1137	22/04/2024	Cleared/ Disturbed	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	None Discernible	Scattered Shrubs, Spinifex Hummock Grassland	Nil	Moderate	0	None	0.8	Rehab	Old (6+ yr)	
VPWR-102	-23.3366	119.7174	24/04/2024	Stony Plain	Stony Plain	South	Low	Clay Loam	Few Small Patches	Limited Outcropping	Sandstone	Gravel (1-4cm)	Few Small Patches	None	Nil	Nil	0	None	0.1	Mine	Old (6+ yr)	
VPWR-103	-23.3561	120.0181	22/04/2024	Drainage Area/ Floodplain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Low	Nil	0	None	0.6	Mining Exploration	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-104	-23.3379	119.7124	24/04/2024	Hillcrest/Hillslope	Undulating Low Hills	East	Low	Clay Loam	Few Large Patches	Negligible	BIF	Pebbles (5-10cm)	Few Large Patches	Scattered Shrubs	Low	Low	0	Prone to Pooling	0.6	Mining Exploration	Old (6+ yr)	
VPWR-105	-23.3710	120.0470	22/04/2024	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam Sandy	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Scarce	Shrubland, Spinifex Hummock Grassland, Tussock Grassland	Low	Moderate	0	Prone to Flooding	0.6	Mining Exploration	Old (6+ yr)	
VPWR-106	-23.3379	119.7154	24/04/2024	Drainage Area/Floodplain	Drainage Area/Floodplain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Small Patches	Scattered Shrubs	Nil	Moderate	0	Prone to Flooding	0.6	Road/Access Track	Old (6+ yr)	
VPWR-107	-23.3886	120.0873	22/04/2024	Mulga Woodland	Drainage Area/Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Small Patches	Scattered Shrubs, Spinifex Hummock Grassland, Tussock Grassland	Nil	Low	0	Prone to Flooding	0.6	Cattle Grazing	Moderate (3 to 5 yr)	
VPWR-108	-23.3332	119.7368	24/04/2024	Hillcrest/Hillslope	Hillcrest/Upper Hillslope	West	Moderate	Clay Loam	Scarce	Moderate Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.6	Mining Exploration	Moderate (3 to 5 yr)	
VPWR-109	-23.3855	120.0634	22/04/2024	Mulga Woodland	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Moderate	Low	0	None	0.6	Road/Access Track	Old (6+ yr)	
VPWR-110	-23.3384	119.7100	24/04/2024	Mulga Woodland	Sandy/Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Few Large Patches	Mulga Woodland, Spinifex Hummock Grassland	Nil	Moderate	0	Prone to Flooding	0.6	Road/Access Track	Moderate (3 to 5 yr)	
VPWR-111	-23.3875	120.1254	22/04/2024	Cleared/Disturbed	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	None Discernible	Mulga Woodland, Scattered Shrubs	Low	Low	0	Prone to Flooding	0.4	Cattle Grazing	Moderate (3 to 5 yr)	
VPWR-112	-23.3757	119.7148	24/04/2024	Mulga Woodland	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Large Patches	Mulga Woodland	Low	Low	0	Prone to Flooding	0.4	Mining Exploration	Old (6+ yr)	

Site ID	Location		Date	Habitat type	Landform	Aspect	Slope	Soil		Outcropping		Ground Cover			Rocky Cracks / Crevices	Burrowing Suitability	Hollow count	Water presence	Habitat condition	Disturbances	Time since last fire (years)	Photo
	Latitude	Longitude						Type	Availability	Extent	Rock type	Rock Size	Veg. Litter	Dominant Veg. Type								
VPWR-114	-23.3740	119.7183	24/04/2024	Stony Plain	Hillslope	South/East	Moderate	Clay Loam	Scarce	Moderate Outcropping	Granite	Small Rocks (11-20cm)	Scarce	None	Nil	Nil	0	None	0.1	Mine	Old (6+ yr)	
VPWR-115	-23.4120	119.6307	23/04/2024	Mulga Woodland	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Moderate	Nil	0	None	0.6	Rubbish/ Litter	Old (6+ yr)	
VPWR-121	-23.3389	119.7223	24/04/2024	Hillcrest/Hillslope	Ironstone Outcrops	East	Moderate	Clay Loam	Scarce	Extensive Outcropping	BIF	Boulders (>61cm)	Few Small Patches	Mulga Woodland, Spinifex Hummock Grassland, Tussock Grassland	Nil	Moderate	0	Prone to Flooding	0.8	Road/ Access Track	Old (6+ yr)	
VPWR-125	-23.3556	119.7165	24/04/2024	Hillcrest/Hillslope	Breakaway	East	Moderate	Clay Loam	Few Small Patches	Extensive Outcropping	BIF	Boulders (>61cm)	Few Small Patches	Shrubland, Tussock Grassland	Very High	Nil	0	None	0.6	Weed Invasion	Old (6+ yr)	
VPWR-126	-23.4168	119.6577	17/04/2024	Drainage Area/ Floodplain	Undulating Low Hills	Flat	Flat	Clay Loam	Evenly Spread	Minor Outcropping	Granite	Gravel (1-4cm)	Many Large Patches	Shrubland, Spinifex Hummock Grassland	Moderate	Low	0	Prone to Flooding	0.8	Road/ Access Track	Old (6+ yr)	
VPWR-127	-23.3693	119.7171	24/04/2024	Hillcrest/Hillslope	Hillslope	East	Moderate	Clay Loam	Few Small Patches	Minor Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	Scattered Shrubs, Spinifex Hummock Grassland	Low	Nil	0	None	0.6	Road/ Access Track	Old (6+ yr)	
VPWR-128	-23.3189	119.8029	23/04/2024	Stony Plain	Hillslope	South	Low	Clay Loam	Scarce	Limited Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	Scattered Eucalypts, Scattered Shrubs, Spinifex Hummock Grassland	Low	Moderate	0	None	0.4	Mining Exploration	Old (6+ yr)	
VPWR-129	-23.3113	119.7778	23/04/2024	Mulga Woodland	Stony Plain	Flat	Flat	Clay Loam	Few Small Patches	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	Mulga Woodland	Low	Low	0	None	0.2	Mining Exploration	Old (6+ yr)	
VPWR-130	-23.4188	119.6074	17/04/2024	Stony Plain	Undulating Low Hills	South	Low	Clay Loam	Evenly Spread	Limited Outcropping	BIF	Small Rocks (11-20cm)	Scarce	Scattered Shrubs, Spinifex Hummock Grassland	Low	Low	0	None	0.8	None Discernable	Moderate (3 to 5 yr)	

Appendix D: Caves Recorded in the Study Area

Cave ID	Location		Habitat	Ghost bat significance	Pilbara leaf-nosed bat significance	Photo	Ghost bat evidence
	Latitude	Longitude					
CWBK-03	-23.3692	119.7077	Hillcrest/ Hillslope	Category 4	Category 4		None
CWBK-02	-23.3691	119.7076	Hillcrest/ Hillslope	Category 4	Category 4		None

Cave ID	Location		Habitat	Ghost bat significance	Pilbara leaf-nosed bat significance	Photo	Ghost bat evidence
	Latitude	Longitude					
CER-06	-23.3208	119.7693	Breakaway/ Cliff	Category 3	Category 4		~1,000 recent scats
CER-11	-23.3188	119.7845	Hillcrest/ Hillslope	Category 4	Category 4		None

Appendix E: Water Features Recorded in the Study Area

Water Feature ID	Sampling Site ID	Type	Location		Dimensions			Photo (current survey)
			Latitude	Longitude	Length (m)	Width (m)	Depth (m)	
WPWR-001 (previous ID 10180_11_00761)	VPWR-005	Ephemeral	-23.3318	120.0163	2	1	0.3	
WHST-02	VPWR-021	Semi-persistent	-23.3244	119.7549	15	10	0.5	
WHST-03	VPWR-021	Semi-persistent	-23.3241	119.7553	30	30	0.5	
WPWR-004	VPWR-022	Semi-persistent	-23.3301	119.7329	200	80	1	

Water Feature ID	Sampling Site ID	Type	Location		Dimensions			Photo (current survey)
			Latitude	Longitude	Length (m)	Width (m)	Depth (m)	
WHST-01	VPWR-021	Semi-persistent	-23.3222	119.7544	30	8	0.8	
WPWR-006	VPWR-002	Permanent/ Persistent (artificial)	-23.3978	120.1375	30	30	1	
WPWR-034	VPWR-034	Permanent/ Persistent (artificial)	-23.3290	119.7390	50	50	3	
WPWR-036	VPWR-036	Permanent/ Persistent (artificial)	-23.3257	119.8519	280	120	1	

Water Feature ID	Sampling Site ID	Type	Location		Dimensions			Photo (current survey)
			Latitude	Longitude	Length (m)	Width (m)	Depth (m)	
WPWR-059	VPWR-059	Ephemeral	-23.3936	120.1529	100	10	1	

Appendix F: Targeted Searches Undertaken

Transect ID	Sampling Site ID	Targeted Search Type	Date	Total person hours	Targeted Species	Habitat/s
TPWR-001	VPWR-021	Diurnal	16/04/2024	1	Northern quoll, grey falcon, Pilbara olive python	Major Drainage Line
TPWR-002	VPWR-020	Diurnal	17/04/2024	4	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python	Hillcrest/ Hillslope, Breakaway/ Cliff
TPWR-003	VPWR-001	Diurnal	16/04/2024	1	Ghost bat, northern quoll, Pilbara Leaf-nosed Bat, Pilbara olive python	Gorge/ Gully
TPWR-004	VPWR-002	Diurnal	17/04/2024	0.25	Pilbara olive python, migratory waterbirds	Cleared/ Disturbed (search done at water feature WPWR-006)
TPWR-007	VPWR-007	Diurnal	20/04/2024	2	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python	Gorge/ Gully
TPWR-009	VPWR-009	Diurnal	20/04/2024	1	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python	Gorge/ Gully
TPWR-019	VPWR-019	Diurnal	19/04/2024	1	Southern whiteface	Mulga Woodland
TPWR-022	VPWR-022	Diurnal	20/04/2024	1	Migratory waterbirds	Drainage Area/Floodplain
TPWR-023	VPWR-023	Diurnal	21/04/2024	1	Southern whiteface	Mulga Woodland
TPWR-024	VPWR-024	Diurnal	17/04/2024	0.8	Southern whiteface	Mulga Woodland, Drainage Area/ Floodplain
TPWR-033	VPWR-033	Diurnal	21/04/2024	0.5	Southern whiteface	Mulga Woodland
TPWR-034	VPWR-034	Diurnal	17/04/2024	1	Migratory waterbirds, Pilbara olive python	Artificial Wetland
TPWR-038	VPWR-038	Diurnal	18/04/2024	1	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, western pebble-mound mouse	Hillcrest/ Hillslope
TPWR-040	VPWR-040	Diurnal	22/04/2024	2	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, western pebble-mound mouse	Hillcrest/ Hillslope
TPWR-045	VPWR-045	Diurnal	21/04/2024	2	Southern whiteface	Mulga Woodland
TPWR-046	VPWR-046	Diurnal	20/04/2024	0.2	Pilbara olive python	Drainage Area/Floodplain
TPWR-048	VPWR-048	Diurnal	20/04/2024	2	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, western pebble-mound mouse	Hillcrest/ Hillslope, Breakaway/ Cliff, Minor Drainage Line
TPWR-050	VPWR-050	Diurnal	20/04/2024	1	Northern quoll, grey falcon, Pilbara olive python	Major Drainage Line
TPWR-052	VPWR-052	Diurnal	21/04/2024	0.2	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, western pebble-mound mouse	Hillcrest/ Hillslope
TPWR-056	VPWR-056	Diurnal	23/04/2024	1	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python	Hillcrest/ Hillslope, Minor Drainage Line

Transect ID	Sampling Site ID	Targeted Search Type	Date	Total person hours	Targeted Species	Habitat/s
TPWR-058	VPWR-058	Diurnal	21/04/2024	0.3	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, western pebble-mound mouse	Hillcrest/ Hillslope
TPWR-068	VPWR-068	Diurnal	23/04/2024	1	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, western pebble-mound mouse	Hillcrest/ Hillslope, Minor Drainage Line
TPWR-072	VPWR-072	Diurnal	23/04/2024	1.5	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, western pebble-mound mouse	Hillcrest/ Hillslope, Minor Drainage Line
TPWR-083	VPWR-083	Diurnal	24/04/2024	4	Greater bilby, brush-tailed mulgara, ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python	Major Drainage Line, Hillcrest/Hillslope, Drainage Area/ Floodplain
TPWR-090	VPWR-090	Diurnal	23/04/2024	0.8	Grey falcon, southern whiteface, Pilbara olive python	Drainage Area/ Floodplain
TPWR-095	VPWR-095	Diurnal	21/04/2024	0.4	Southern whiteface	Mulga Woodland
TPWR-104	VPWR-104	Diurnal	24/04/2024	1.5	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python, western pebble-mound mouse	Hillcrest/ Hillslope
TPWR-112	VPWR-112	Diurnal	24/04/2024	0.5	Southern whiteface	Mulga Woodland, Stony Plain
TPWR-125	VPWR-125	Diurnal	24/04/2024	1	Ghost bat, northern quoll, Pilbara leaf-nosed bat, Pilbara olive python	Hillcrest/ Hillslope
-	VPWR-021	Nocturnal	16/04/2024	2	Northern quoll, Pilbara olive python	Major Drainage Line
-	VPWR-034	Nocturnal	19/04/2024	4	Pilbara olive python	Artificial Wetlands

Appendix G: Significant Fauna Records

Scientific Name	Common name	Conservation Status				Sampling Site ID	Date	Record Type	Habitat	Comment
		EPBC Act	BC Act	DBCA	IUCN					
<i>Dasycercus blythi</i>	Brush-tailed mulgara			P4		VPWR-100	16/04/2024	Burrow (active)	Sand Plain	
<i>Macroderma gigas</i>	Ghost bat	VU	VU		VU	VPWR-020 (cave CER-06)	17/04/2024	Scat, ~1,000	Hillcrest/ Hillslope, Breakaway/ Cliff	
<i>Pseudomys chapmani</i>	Western pebble-mound mouse			P4		VPWR-008	17/04/2024	Mound (inactive)	Stony Plain	
<i>Liasis olivaceus subsp. barroni</i>	Pilbara olive python	VU	VU			Opportunistic/ OPP	20/04/2024	Individual (dead)	Cleared/ Disturbed	Dead on road, outside of Study Area
<i>Liasis olivaceus subsp. barroni</i>	Pilbara olive python	VU	VU			VPWR-020 (cave CER-06)	17/04/2024	Skin/ Slough	Hillcrest/ Hillslope, Breakaway/ Cliff	

Appendix H: Acoustic Analysis Report



28-05-2024

Dear Hannah,

Analysis of 72 nights of acoustic recording across 12 sites for BHP WAIO Power 2030 during April 2024 presented no detection of Night Parrot (*Pezoporus occidentalis*) calls.

Conditions were calm for the majority of the survey period with significant wind detected across the survey area during the 16th, 17th, 18th & 19th of April. Machinery Noise was detected at all sites and may have masked some concurrent calls within those specific frequencies, especially for non-target species. These interferences are considered minimal and the recording quality was considered adequate for detection of Night Parrot vocal signals.

There is a very low likelihood that long-term stable Night Parrot roosts exist within two hundred metres of each recording point. It is also highly unlikely that Night Parrots foraged within the same areas during the survey. These statements pertain only to the areas within two hundred metres of each recording point and not the entire survey area.

A total of 43 non-target species were recorded. These are shown for each site in Appendix 1.

Regards,

Louis Masarei

fauna.malu@gmail.com

Appendix 1: Species detected during acoustic analyses

Common Name	VNEB-002	VPWR-004	VPWR-008	VPWR-012	VPWR-013	VPWR-014	VPWR-016	VPWR-026	VPWR-028	VPWR-032	VPWR-035	VPWR-043
Spotted Nightjar <i>Eurostopodus argus</i>			○		○	○		○		○	○	○
Australian Owlet-nightjar <i>Aegotheles cristatus</i>	○			○	○							
Horsfield's Bronze Cuckoo <i>Chalcites basalis</i>											○	○
Pallid Cuckoo <i>Heteroscenes pallidus</i>	○				○	○						
Crested Pigeon <i>Ocyphaps lophotes</i>					○			○			○	○
Little Buttonquail <i>Turnix velox</i>						○						
Bush Stone-curlew <i>Burhinus grallarius</i>		○										
Brown Goshawk <i>Accipiter fasciatus</i>								○				
Whistling Kite <i>Haliastur sphenurus</i>					○					○		
Eastern Barn Owl <i>Tyto javanica</i>	○		○									
Southern Boobook <i>Ninox boobook</i>	○				○			○		○		○
Blue-winged Kookaburra <i>Dacelo leachii</i>	○									○		
Nankeen Kestrel <i>Falco cenchroides</i>		○										
Brown Falcon <i>Falco berigora</i>								○	○	○		○
Cockatiel <i>Nymphicus hollandicus</i>					○							
Galah <i>Eolophus roseicapilla</i>					○		○					
Little Corella <i>Cacatua sanguinea</i>					○			○				
Australian Ringneck <i>Barnardius zonarius</i>	○				○							
Budgerigar <i>Melopsittacus undulatus</i>					○						○	○
Purple-backed Fairywren <i>Malurus assimilis</i>	○	○			○				○	○	○	
White-winged Fairywren <i>Malurus leucopterus</i>					○					○		

Rufous-crowned Emu-wren <i>Stipiturus ruficeps</i>												o
Brown Honeyeater <i>Lichmera indistincta</i>	o	o				o		o	o	o		
Singing Honeyeater <i>Gavicalis virescens</i>	o		o	o	o	o	o	o	o	o	o	o
White-plumed Honeyeater <i>Ptilotula penicillate</i>	o	o					o		o			
Spiny-cheeked Honeyeater <i>Acanthagenys rufogularis</i>					o	o		o	o	o		o
Yellow-throated Miner <i>Manorina flavigula</i>					o	o						
Red-browed Pardalote <i>Pardalotus rubricatus</i>					o							
Striated Pardalote <i>Pardalotus striatus</i>					o							
Grey-crowned Babbler <i>Pomatostomus temporalis</i>					o							
Masked Woodswallow <i>Artamus personatus</i>											o	
Pied Butcherbird <i>Cracticus nigrogularis</i>	o				o				o			o
Black-faced Cuckooshrike <i>Coracina novaehollandiae</i>	o				o			o				
Crested Bellbird <i>Oreoica gutturalis</i>				o				o			o	o
Rufous Whistler <i>Pachycephala rufiventris</i>											o	
Willie Wagtail <i>Rhipidura leucophrys</i>	o										o	o
Magpie-lark <i>Grallina cyanoleuca</i>					o							
Torresian Crow <i>Corvus orru</i>					o			o	o		o	
Fairy Martin <i>Petrochelidon ariel</i>					o							
Spinifexbird <i>Poodytes carteri</i>			o					o	o	o	o	o
Rufous Songlark <i>Cincloramphus mathewsi</i>					o						o	
Painted Finch <i>Emblema pictum</i>			o		o		o					o
Zebra Finch <i>Taeniopygia castanotis</i>		o						o			o	o