

Application to Amend CPS 7009/3: Rail Strategic NVCP

Native Vegetation Clearing (Purpose) Permit
Amendment Application Supporting Document

July 2024



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1 INTRODUCTION

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

- Newman Operations consisting of:
 - The Mount Whaleback hub (including Orebodies 29, 30 and 35) located approximately two kilometres (km) west of Newman Township; and
 - The Eastern Ridge hub (Consisting of Orebodies 23, 24, 25 25 West and 32) located approximately 5 km east of Newman Township;
- Mining Area C / South Flank located approximately 90 km north west of Newman Township;
- Orebodies 18 and Wheelarra Hill (Jimblebar) Mine located approximately 35 km east of Newman Township; and
- Yandi Mine located approximately 100 km north west of Newman Township.

Ore from the NJV hub, MAC /South Flank, Newman Operations, Wheelarra Hill (Jimblebar) and Yandi mining operations is transported to Port Hedland via the BHP Newman to Port Hedland Mainline and associated spur lines (Newman Mainline) (**Figure 1-1**). Ore is then shipped out through Port Hedland at the BHP facilities at Nelson Point and Finucane Island.

BHP currently holds Native Vegetation Clearing Permit CPS 7009/3 over the Newman Mainline. This permit approves the clearing of 2,928 hectares (ha) of native vegetation within the total Amendment Application Area of 14,391.24 ha. The clearing period of this permit is due to expire on 30 November 2025. BHP is seeking to amend the permit by:

1. Remove Condition 12(b) as *Heliotropium muticum* is no longer listed as a Priority flora species.
2. Extending the clearing period to 30 November 2030; and
3. Extending the permit expiry to 30 November 2037.

Proposed changes 1 and 2 will allow sufficient time for BHP to undertake new flora and fauna surveys over the Newman Mainline (given the size of the area required to be surveyed).

This supporting document contains an assessment of the potential impacts from the clearing proposed within the Amendment Application Area. The following information is provided in this document to support this NVCP amendment:

- a description of the works to be carried out;
- other associated approvals required;
- information on flora and fauna;
- an assessment against the ten clearing principles; and
- Environmental and indigenous heritage management strategies.

1.1 LOCATION

The Newman Mainline (**Figure 1-1**) runs from Newman north to Port Hedland. It also includes the:

- Yandi spur line which runs from the 281 Chainage¹ to the Yandi Mining Operations; and
- MAC to Yandi spur line which runs from the Yandi Mining Operations to the MAC Operations.

1.2 PROPONENT

This application has been submitted by BHP Iron Ore Pty Ltd on behalf of the owners being the BHP Minerals Pty Ltd, BHP Iron Ore (Jimblebar) Pty Ltd, Goldsworthy Joint Venture (GJV), Mt Newman Joint Venture (NJV), Pilbara Pastoral Company Pty Ltd, and the Yandi Joint Venture (YJV).

The NJV and their interests are:

- | | |
|---|-----|
| • BHP Minerals Pty Ltd | 85% |
| • Itochu Minerals and Energy of Australia Pty Ltd | 5% |
| • Mitsui – Itochu Iron Pty Ltd | 10% |

¹ 1 chainage is equal to 1 km. Chainage zero is located at Port Hedland.

The GJV and their interests are:

- BHP Minerals Pty Ltd 85%
- Itochu Minerals and Energy Australia Pty Ltd 8%
- Mitsui Iron Ore Corporation Pty Ltd 7%

The YJV and their interests are:

- BHP Minerals Pty Ltd 85%
- Itochu Minerals and Energy Australia Pty Ltd 8%
- Mitsui Iron Ore Corporation Pty Ltd 7%

The key contact for this proposal is:

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1.3 TENURE

CPS 7009/3 is located on the following tenure:

- Mining Lease 47/283;
- Mining Lease 47/284;
- Mining Lease 47/289;
- Mining Lease 47/290;
- Mining Lease 47/291;
- Miscellaneous Licence 45/129;
- Miscellaneous Licence 45/130;
- Miscellaneous Licence 45/131;
- Miscellaneous Licence 45/132;
- Miscellaneous Licence 45/133;
- Miscellaneous Licence 45/134;
- Miscellaneous Licence 45/135;
- Miscellaneous Licence 45/136;
- Miscellaneous Licence 45/147;
- Miscellaneous Licence 45/190;
- Miscellaneous Licence 45/194;
- Miscellaneous Licence 47/92;
- Miscellaneous Licence 47/95;
- Iron Ore (Mount Newman) Agreement Act 1964, Mineral Lease 244SA (AML 70/244);
- Iron Ore (Marillana Creek) Agreement Act 1991, Mining Lease 270SA (AM 70/270);
- Iron Ore (Mount Newman) Agreement Act 1964, Special Lease for Mining Operations Lease 3116/6038, Document I123402L, Lot 135 on Deposited Plan 48926, F 963074 EL;
- Lease 3116/3690, Document I123403L, Lot 6254 on Deposited Plan 035659;
- Lease 3116/6301, Document I123595L, Lot 48 on Deposited Plan 048928, F 963074 EL;
- Lease 3116/6300, Document I123596L, Lot 143 on Deposited Plan 048927, F 963074 EL;
- Lease 3116/6298, Document I123599L, Lot 141 on Deposited Plan 048923, F 963074 EL;
- Lease 3116/6400, Document I123701L, Lots 86, 87 on Deposited Plan 213620;
- Lease 3116/6329, Document I123720L, Lot 49 on Deposited Plan 048931, F 963074 EL;
- Lease 3116/6068, Document I150309L, Lot 136 on Deposited Plan 048924;
- Lease 3116/6297, Document 150310L, Lot 140 on Deposited Plan 048922, F 963074 EL;
- Lease 3116/4028, N105667L, Lot 92 on Deposited Plan 60351, Lot 93 on Deposited Plan 60352, Lot 94 on Deposited Plan 60707, Lot 95 on Deposited Plan 60708, Lot 96 on Deposited Plan 60709, Lot 24 on Deposited Plan 60348, Lot 25 on Deposited Plan 60349, Lot 26 on Deposited Plan 60350;

- Lease 3116/3687, Document I154279L, Lot 65 on Deposited Plan 048920, Lot 19 on Deposited Plan 048921;
- Lease 3116/6299, Document I163678L, Lot 142 on Deposited Plan 048925, F 963074 EL;
- Lease 3116/3684, N88235L, Lot 351 on Deposited Plan 74327;
- Iron Ore (Marillana Creek) Agreement Act 1991 pursuant to Land Administration Act 1997, K843924L, Lots 145 on Deposited Plan 243202, 146 on Deposited Plan 243202 and 243203, 147 on Deposited Plan 243202, 149 on 243203, 150 on Deposited Plan 243203, 155 on Deposited Plan 220067, 156 on Deposited Plan 194001, 220 on Deposited Plan 243202;
- K843925L, Lot 148 on Deposited Plan 93544;
- Iron Ore (Mount Goldsworthy) Agreement Act 1964, Special Lease for Mining Operations, Lease 3116/5999, Document I126342L, Lot 125 on Deposited Plan 219861, M653978L pursuant to Land Administration Act 1997, Lots 321, 322, 323,324, 325 on Deposited Plan 74344.

1.4 LOCAL GOVERNMENT JURISDICTION

CPS 7009/3 is located within the Shire of Ashburton, Shire of East Pilbara and the Town of Port Hedland.

1.5 PROJECT DESCRIPTION

The general purpose of CPS 7009/3 is “Clearing for the purposes of railway construction, maintenance and associated activities”.

The expected typical activities considered to be included under this general purpose include, but are not be limited to the construction and maintenance of:

- railways;
- accommodation camps;
- support infrastructure including pipelines, power lines, fibre optic cables and other service infrastructure;
- rail welding yards;
- workshops and repair yards
- laydown areas;
- general port infrastructure;
- roads and access tracks
- borrow pits; and
- all associated activities.

1.6 PROJECT CHARACTERISTICS AND COMMITMENTS

BHP commits to undertake activities under the CPS 7009/3 in accordance with the details set out in **Table 1**.

Table 1: Project Characteristics and Commitments

Permit Characteristics	
Authorising Agency	DEMIRS
Permit Title:	Rail Strategic NVCP
Permit Number	CPS 7009/4
Area to be cleared:	2,928 hectares.
Amendment Application Area:	14,391.24 hectares.
Purpose of the permit:	Clearing for the purpose of Clearing for the purposes of railway construction, maintenance and associated activities.
Tenure:	See Section 1.3
Clearing Duration:	Until 30 November 2030.
Permit Duration:	Until 30 November 2037.
Proposed Annual Reporting Date:	01 October for the previous Financial Year.
Proposed Final Reporting Date:	30 November 2037

Application Boundary	Map Reference: <ul style="list-style-type: none"> • Figures 1-1 to 1-6: RAIL_011NVCP_001_RevA_0 • Figures 2-1 to 2-53: RAIL_011NVCP_002_RevA_0 • Figures 3-1 to 3-53: RAIL_011NVCP_003_RevA_0 • Figures 4-1 to 4-53: RAIL_011NVCP_004_RevA_0 • Figures 5-1 to 5-53: RAIL_011NVCP_005_RevA_0 • Figures 6-1 to 6-53: RAIL_011NVCP_006_RevA_0 BHP Shapefile D2 Reference: https://waio-dctm.bhp.com/D2/?docbase=bhpbio_od_prod&locateld=0b03c41a84859c4f&application=ManagedDocuments
Application Commitments	Section
Known locations of Priority flora will be avoided with a 10m buffer, where practicable	3.4.1 6.1
No more than 324 individual plants of identified <i>Tephrosia rosea</i> var. Port Hedland are cleared as per Condition 12(b) of CPS 7009/3.	3.4.1
Any disturbance within the Fortescue Marsh (Marsh Land System) (Figure 1-1) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.	3.4.2 6.4
Any disturbance within Vegetation Association SF TdcTibMf Ep (Figure 1-1) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.	3.4.2 6.4
Any disturbance within the Fortescue Marsh ESA (Figure 1-1) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3	3.4.2 6.4 6.6
It is BHP's intent that while some areas will be revegetated, they will not be termed rehabilitated until closure of the rail line. The success of the rehabilitation programme will be assessed at this stage.	3.4.2
Control of established weed populations will be carried out according to BHP's standard <i>Weed Control and Management Procedures and Condition 10 of CPS 7009/3</i> .	3.4.3 6.7.4
During the Grey Falcon's breeding season (April – June) no work will be undertaken on the communications tower where this species is known to breed (Figure 5-25), without prior consultation with DBCA.	3.4.5 6.2
Active <i>Mulgara</i> burrows will be avoided using a 10 m buffer, where practicable.	3.4.5 6.2
Active Greater Bilby burrows will be avoided using a 10 m buffer, where practicable.	3.4.5 6.2
Potential impacts to significant fauna species will be reduced by minimising disturbance to Major Drainage Line fauna habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.	3.4.5 3.6 6.2 6.6
Potential impacts to significant fauna species will be reduced by minimising disturbance to Gorge / Gully fauna habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.	3.4.5 6.2
Management of the Northern Quoll will be undertaken in accordance with the WAIO Northern Quoll Regional Management Plan Rev 3 (BHP Iron Ore, 2022).	3.4.5 6.2
Active mounds of the Western Pebble-mound Mouse will be avoided using a 10 m buffer, where practicable.	3.4.5 6.2
Groundwater along the mainline is managed in accordance with the existing groundwater licences and the Groundwater Water Licence (GWL) Operating Strategy for Rail.	3.5
Any areas cleared that are no longer required will be re-vegetated, where practicable.	6.7

1.7 NVCP RECORDS

BHP reports on each NVCP in accordance with the permit reporting conditions. For a majority of NVCPs this is incorporated into BHP Iron Ore's Annual Environmental Report (AER) which is submitted to government prior to the 01 October each year.

Clearing commenced in 2016 with a total of 166.1 ha cleared to the end of FY24. 9.52 ha have been rehabilitated with the remaining cleared areas still required.

Clearing has been minimised by restricting activities to the minimal required for safety and equipment access. Populations of significant flora have been avoided using the BHP Project Environmental and Heritage Review (PEAHR) procedure. This internal BHP procedure authorises ground disturbing activities. No environmental offsets are required for this NVCP.

2 ASSOCIATED APPROVALS

Any other relevant statutory approvals will be sought as required.

3 EXISTING ENVIRONMENT

3.1 CLIMATE

The Amendment Application Area runs from Newman to Port Hedland within the Pilbara region of WA. Rainfall is low and variable, with most rain falling between December and March, associated with tropical cyclones (Commonwealth of Australia, 2009).

Newman Aero meteorological site (007176) is the closest Bureau of Meteorology (BoM) station to the Amendment Application Area. Average annual rainfall at Newman Aero is 318.0 mm (BOM, 2024a). This is mainly derived from tropical storms and cyclones during summer, producing sporadic, heavy rains over the area. Mean monthly rainfall varies from 4.6 mm in September to 71.6 mm in February (BoM, 2024a). Daily rainfall is highly variable; the highest maximum daily rainfall ranges from 34.8 mm in October, to 305.6 mm in February (BoM, 2024a). The mean maximum temperature in summer months (October to March) is 35.2°C to 39.4°C, and mean maximum temperature in winter (April to September) is between 23.0°C and 32.1°C (BoM, 2024a).

Port Hedland Airport (meteorological site 004032) is the closest Bureau of Meteorology (BoM) station to the Amendment Application Area. Average annual rainfall at Port Hedland Airport is 314.1 mm with a dry season (mean monthly rainfall <5 mm) between August and November and a wet season (mean monthly rainfall between 54.2 mm and 88.3 mm) between January and March (BoM, 2024a). The highest and lowest annual rainfall recorded for Port Hedland was 713.2 mm (recorded in 2013) and 44.5 mm (recorded in 1944), respectively (BoM, 2024a). The highest ever recorded daily rainfall for Port Hedland was recorded on 27 January 1967 with 387.1 mm (BoM, 2024a) which is 68.6 mm over the current mean annual rainfall for Port Hedland. The mean maximum temperatures in summer months (October to April) is 35.1°C to 36.8°C, and mean maximum temperatures in winter (May to September) are between 27.4°C and 32.5°C at Port Hedland Airport (BoM, 2024a).

Wittenoom meteorological site (005026) is the closest station to the Amendment Application Area that records daily evaporation. Wittenoom is located approximately 120 km northwest of the Amendment Application Area. Mean daily evaporation at Wittenoom throughout the year is 8.6 mm/day (BoM, 2024b), which equates to 3.1 metres per year. Evaporation greatly exceeds rainfall in the region throughout the year and on a month-by-month basis (BoM, 2024b).

3.2 BIOREGION, LANDFORMS AND LAND SYSTEMS

The Amendment Application Area is located in the Pilbara (Chichester, Fortescue, Hamersley and Roebourne subregions) and Gascoyne (Augustus subregion) biogeographic regions.

The Chichester subregion is described as:

“the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. The climate is Semi-desert-tropical and receives 300mm of rainfall annually. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule, Sherlock)” (Kendrick, 2001a).

The Fortescue subregion is described as:

“Alluvial plains and river frontage. Extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains in the east. Deeply incised gorge systems in the western (lower) part of the drainage. River gum woodlands fringe the drainage lines. Northern limit of Mulga (*Acacia aneura*). An extensive calcrete aquifer (originating within a palaeo-drainage valley) feeds numerous permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of river gum and cadjeput *Melaleuca* woodlands. Climatic conditions are semi desert tropical, with average rainfall of 300 mm, falling mainly in summer cyclonic events. Drainage occurs to the north-west” (Kendrick and McKenzie, 2001).

The Hamersley subregion is described as:

“the Southern section of the Pilbara Craton. Mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges (basalt, shale and dolerite). Mulga low woodland over bunch grasses on fine textured soils in valley floors, and *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils of the ranges. The climate is Semi-desert tropical, average 300mm rainfall, usually in summer cyclonic or thunderstorm events. Winter rain is not uncommon. Drainage into either the Fortescue (to the north), the Ashburton to the south, or the Robe to the west” (Kendrick, 2001b).

The Roebourne subregion is described as:

“Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia stellaticeps* or *A. pyrifolia* and *A. inaequilatera*. Uplands are dominated by *Triodia* hummock grasslands. Ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, *Sporobolus* and mangal occur on marine alluvial flats and river deltas. Resistant linear ranges of basalts occur across the coastal plains, with minor exposures of granite. Islands are either Quaternary sand accumulations, or composed of basalt or limestone, or combinations of any of these three. Climate is arid (semi-desert) tropical with highly variable rainfall, falling mainly in summer. Cyclonic activity is significant, with several systems affecting the coast and hinterland annually” (Kendrick and Stanley, 2001).

The Augustus subregion is described as:

“Rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys. Also includes the Narryera Complex and Bryah Basin of the Proterozoic Capricorn Orogen (on northern margin of the Yilgarn Craton), as well as the Archaean Marymia and Sylvania Inliers. Although the Gascoyne River System provides the main drainage of this subregion, it is also the headwaters of the Ashburton and Fortescue Rivers. There are extensive areas of alluvial valley-fill deposits. Mulga woodland with *Triodia* occur on shallow stony loams on rises, while the shallow earthy loams over hardpan on the plains are covered by Mulga parkland. A desert climate with bimodal rainfall” (Desmond, et al., 2001).

The Amendment Application Area is located in the following 28 land systems, as mapped by van Vreeswyk et al. (2004).

- Adrian: “Level stony plains and low silcrete hills, shallow acidic soils, relief up to 40 m.”
- Boolaloo: “Granite hills, domes, tor fields and gritty surfaced sandy plains, relief up to 50 m.”
- Boolgeeda: “Stony lower slopes, level stony plains and narrow sub-parallel drainage floors, relief up to 20 m. A common system in shallow valleys below hill systems such as Newman and Rocklea.”
- Calcrete: “Calcrete platforms, plains and narrow drainage tracts, shallow alkaline loamy soils.”
- Capricorn: “Prominent strike ridges and ranges (relief up to 180 m) of sandstone and other sedimentary rocks with steep slopes and skeletal soils.”
- Christmas: “Level alluvial plains and distributary fans with abundant mantles of ironstone pebbles and cobbles and patches with gilgai microrelief.”
- Cowra: “Level plains on non-saline and weakly saline alluvium, abundant surface mantles of ironstone gravel and pebbles, fringing the Marsh land system in central parts of the survey area.”
- Divide: “Level to gently undulating sandplains and occasional small dunes.”
- Elimunna: “Level to gently undulating stony plains, gilgai plains and drainage tracts derived from basalt, relief up to 15 m.”
- Fan: “Level to very gently inclined alluvial plains with loamy soils over hardpan, minor sandy banks and plains with clay soils, vegetation in prominent bands (groves) on alluvial plains, relief less than 10 m.”
- Fortescue: “Flood plains, alluvial plains and river channels, non-saline clay and duplex soils.”
- Granitic: “Hill tracts of granitic rocks with pockets of shallow gritty surfaced acidic soils, relief up to 100 m.”
- Jamindie: “Level to gently undulating hardpan wash plains with mantles of ironstone grit and pebbles, minor stony plains, low rises and occasional low ridges with relief up to 30 m.”
- Littoral: “Bare coastal mudflats subject to occasional tidal inundation, minor samphire flats, sandy plains and islands, mangrove outer margins, coastal dunes and beaches.”
- Macroy: “Level to gently undulating stony and gritty surfaced plains with occasional granite tor fields and domes and closely to moderately spaced dendritic tributary drainage floors, relief up to 25 m. The fourth largest land system (7.2% of the survey area) widespread in the north and centre.”
- Mallina: “Sandy surfaced alluvial plains with occasional claypans, minor stony plains and sandplains.”
- Marillana: “Level gravelly plains with drainage foci and broad, unchanneled drainage tracts.”

- Marsh: "Lake beds and flood plains on saline alluvium. The system only occurs along the Fortescue River in the south-east central part of the survey area and is the most prominent alluvial valley fill in Western Australia."
- McKay: "Hills, ridges, plateaux remnants and minor breakaways of sedimentary and meta sedimentary rocks, relief up to 100 m."
- Newman: "Rugged high mountains, ridges and plateaux with near vertical escarpments of jaspilite, chert and shale, the second largest system in the survey area and prominent in southern parts (e.g. Ophthalmia Range, Hamersley Range), relief up to 450 m."
- Platform: "Narrow, raised plains and highly dissected slopes on partly consolidated colluvium below the footslopes of hill systems such as Newman, relief mostly up to about 30 m but occasionally considerably greater."
- River: "Narrow floodplains and major channels."
- Robe: "Conspicuous chains of limonite mesas and buttes with steep breakaway faces, source of iron ore as pisolitic limonite, relief up to 50 m."
- Rocklea: "Narrow, raised plains and highly dissected slopes on partly consolidated colluvium below the footslopes of hill systems such as Newman, relief mostly up to about 30 m but occasionally considerably greater."
- Uaroo: "Broad, level sandy surfaced plains, minor pebbly plains and tracts receiving sheet flow, relief mostly less than 10 m."
- Urandy: "Alluvial plains with or without stony mantles and river channels."
- Washplain: "Level wash plains and tracts receiving more concentrated through flow with prominent grove patterns of vegetation, loamy and clayey soils of variable depth over hardpan, relief less than 10 m."
- Wona: "Level to gently undulating upland basaltic plains with gilgai microrelief and clay soils, relief up to 30 m."

3.3 GEOLOGY AND SOILS

Soils of the Pilbara region have been defined and mapped at a scale of 1:2,000,000 by Bettenay et al. (1967). The following 17 soil units occur within the Amendment Application Area, based on mapping by Bettenay et al. (1967):

- AB19: "Extensive sandy plains: chief soils are red earthy sands (Uc5.21) with extensive areas of red earths (Gn2.12) and with some hard red soils (Dr) along creek lines. Similar to unit AB21 but without sandstone residuals."
- AB20: "Isolated sand plains and dune fields: chief soils are red earthy sands (Uc5.21) with loose red sands (Uc1.23) on the dunes."
- B27: "Low terrace associated with main stream channels: chief soils are loose sands (Uc1.22) with some (Um5.11) soils on patches of calcrete (kunkar)."
- BE6: "Extensive flat and gently sloping plains, which sometimes have a surface cover of gravels and on which redbrown hardpan frequently outcrops: chief soils are shallow earthy loams (Um5.3), with associated (Gn) soils of units My5O and Mz23 of Sheet 6. As mapped, there are inclusions of units Oc47 and BB9."
- Fa13: "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. The soils are frequently stony and shallow and there are extensive areas without soil cover: chief soils are shallow stony earthy loams (Um5.51) along with some (Uc5.11) soils on the steeper slopes. Associated are (Dr2.33 and Dr2.32) soils on the limited areas of dissected pediments, while (Um5.52) and (Uf6.71) soils occur on the valley plains."
- Gf1: "Steep ranges on basic lavas along with dolomites, tuff, banded iron formations, and dolerite dykes, with some narrow valley plains and high-level gently undulating areas of limited extent. The soils are generally shallow and stony and there are large areas without soil cover: chief soils are brown loams (Um6.23) along with significant areas of earthy loam (Um5.51) soils. (Dr2.33) soils occur on lower slopes with (Uf6.71) and (Ug5.37) soils on valley floors."
- Ja1: "Extensive valley plains largely associated with the Fortescue River: chief soils are earthy clays (Uf6.71) along with some (Ug5.38), (Um5.5), and (Dr2.33) soils. Small areas of calcrete (kunkar) with (Um5.11) soils occur also."

- Lh1: "Coastal plains mainly beyond marine flooding influence: main soils are pedal calcareous earths (Gc2.22) with some associated highly calcareous earths (Gc1.12). On the seaward side are firstly samphire flats (Gc1.1) and then bare saline mud (Uf). Calcareous dunes (Uc1.11) commonly occur on the seaward edge of the plains."
- MM19: "High-level gently undulating plain flanked by areas of basaltic ranges of unit Gfl: chief soils are cracking clays (Ug5.37). Areas of (Uf6.71) and (Dr2.33) soils occur also."
- My55: "Gently sloping outwash plains generally flanking the northern face of the Hamersley Range; coarse surface gravels are extensive: chief soils are neutral red earths (Gn2.12) with some (Gn2.11) and (Dr2.33) soils."
- Mz25: Plains associated with the Fortescue valley; there is a surface cover of stony gravels close to the ranges and hills: chief soils are acid red earths (Gn2.11) with some neutral red earths (Gn2.12); red-brown hardpan is absent. Associated are areas of calcareous earths (Gc) and loams (Um1) on kunkar, and some hard red (Dr) soils around creek lines."
- Oc62: "Very gently undulating pediplain with low granite outcrops and tors; occasional basic dykes occur as low elongate ridges: chief soils are hard alkaline red soils (Dr2.33) and (Dr2.43) having coarse-textured A horizons up to 18 in. thick. Associated are occasional patches of calcrete (kunkar) with (Um5.11) soils as well as some (Gn2.12) soils."
- Oc63: "'Pediplains on granite; more dissected than unit Oc62 and usually occurring as a zone flanking the main stream courses: chief soils are hard alkaline red soils (Dr2.33) and (Dr2.43). There are more areas of (Um5.11) soils on calcrete (kunkar) than in unit Oc62 and some (Uc5.11) and (Uc1.22) soils occur along creeks."
- Oc64: "Low stony hills and dissected pediments on granite with occasional basic dykes: chief soils are hard, alkaline red soils (Dr2.33) having shallow stony A horizons. Associated are shallow stony (Uc5.11) soils on steep slopes; (Uc1.22) soils along creek lines; and (Um5.11) soils on patches of calcrete (kunkar)."
- Oc68: "Dissected stony pediments with some steep stony hills: chief soils are hard alkaline red soils (Dr2.33) but quite large areas of hard neutral red soils (Dr2.32) occur too. There are also significant areas of (Um5.5) soils."
- Oc70: "Dissected pediments and low stony hills associated with cherts, jaspilites, and iron ore formations; much coarse surface gravel: chief soils are hard alkaline red soils (Dr2 33) along with some (Dr2.32) and (Um5.52) soils."
- Oc71: "Outwash plains with much coarse surface gravel: chief soils are hard alkaline red soils (Dr2.33) but (Uf6.71), (Ug5.38), and (Gn2.12) soils also occur. There are areas of (Gc) soils in proximity to unit Lb12."

3.4 FLORA, VEGETATION AND FAUNA

The most recent vegetation, flora and fauna survey conducted across the Amendment Application Area are:

- *East Ophthalmia & Ninga Detailed Flora & Vegetation Survey* (Spectrum Ecology & Spatial, 2022) (**Appendix 1**)
- *BHP Western Australian Iron Ore Windfence Flora and Fauna Assessment Level 1 Fauna and Reconnaissance Flora Survey* (GHD, 2020a) (**Appendix 2**).
- *Consolidation of Regional Vegetation Mapping BHP Billiton Iron Ore Pilbara Tenure* (Onshore Environmental, 2014a) (**Appendix 3**);
- *Port Hedland Regional Flora and Vegetation Assessment* (ENV, 2011a) (**Appendix 4**);
- *Mainline Rail Expansion Level 2 Flora and Vegetation Survey* (Onshore Environmental, 2014b) (**Appendix 5**);
- *Rapid Growth Project 5: Jimblebar Junction to Yandi Junction Railway Reserve Flora and Vegetation Assessment* (ENV, 2008a) (**Appendix 6**);
- *Rapid Growth Project 5: Quarry 6 Flora and Vegetation Assessment* (ENV, 2008b) (**Appendix 7**);
- *Ninga Flora and Vegetation Assessment* (Astron, 2013);
- *East Ophthalmia and Ninga Detailed Vertebrate Fauna Survey* (Biologic, 2022a) (**Appendix 8**)
- *BHP Fortescue Valley Targeted Bilby Survey* (GHD, 2020b) (**Appendix 9**)

- *Jimblebar targeted ghost bat survey* (GHD, 2020c) (**Appendix 10**)
- *Consolidation of Regional Fauna Habitat Mapping BHP Billiton Iron Ore Pilbara Tenure* (Biologic, 2017) (**Appendix 11**);
- *Port Hedland Regional Fauna Assessment* (ENV, 2011b) (**Appendix 12**);
- *Mainline Rail Expansion Vertebrate Fauna Survey* (Biologic, 2013) (**Appendix 13**);
- *Rapid Growth Project 5 Targeted Northern Quoll Survey Quarry 1,2, 4 and East Turner River* (Ecologia, 2008);
- *Rapid Growth Project 5: Jimblebar Junction to Yandi Junction Railway Reserve and Repeaters 6, 7 and 8 Fauna Assessment* (ENV, 2008c) (**Appendix 14**);
- *Rapid Growth Project 5: Quarry 6 Fauna Assessment* (ENV, 2008d) (**Appendix 15**);
- *Ophthalmia Dam Avian Fauna Survey* (MWH, 2015) (**Appendix 16**); and
- *Ninga Level 1 Vertebrate Fauna Assessment* (Eco Logical, 2013).

The Amendment Application Area is within the Interim Biogeographic Regionalisation for Australia (IBRA) Pilbara and Gascoyne Bioregions. According to the Government of Western Australia (2013), these bioregions are more than 99% vegetated (**Table 2**).

The vegetation within the Amendment Application Area is classified into the following 13 vegetation associations, as mapped by Beard (1975):

- 18 Low woodland; mulga (*Acacia aneura*).
- 29 Sparse low woodland; mulga, discontinuous in scattered groups.
- 82 Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*.
- 93 Hummock grasslands, shrub steppe; kanji over soft spinifex.
- 111 Hummock grasslands, shrub steppe; *Eucalyptus gamophylla* over hard spinifex.
- 157 Hummock grasslands, grass steppe; hard spinifex *Triodia wiseana*.
- 173 Hummock grasslands, shrub steppe; kanji over soft spinifex & *T. wiseana* on basalt.
- 175 Short bunch grassland – savannah/grass plain (Pilbara).
- 562 Mosaic: Low woodland; mulga in valleys / Hummock grasslands, open low tree-steppe; snappy gum over *T. wiseana*.
- 589 Mosaic: Short bunch grassland – savannah /grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex soft spinifex.
- 619 Medium woodland; river gum (*Eucalyptus camaldulensis*)
- 647 Hummock grasslands, dwarf-shrub steppe; *Acacia translucens* over soft spinifex.
- 676 Succulent steppe; samphire.

There is more than 95% of the pre-European vegetation remaining of these vegetation associations within Western Australia (**Table 2**). The Amendment Application Area is not part of any significant remnant vegetation in the wider regional area.

Table 2: Extent of pre-European and current vegetation in the Pilbara bioregion and vegetation associations represented in the Amendment Application Area (Government of Western Australia, 2013)

Vegetation*		Pre-European Extent (ha)	Current Extent (ha)	Remaining (%)	Pre-European % in IUCN Class I-IV Reserves
Pilbara IBRA Bioregion		17,808,657	17,733,583	99.58	6.34
Gascoyne IBRA Bioregion		18,075,219	18,067,441	99.96	1.93
Vegetation association 18	WA	19,890,665	19,843,409	99.76	2.13
	Pilbara IBRA	676,556	672,424	99.39	16.78
	Gascoyne IBRA	3,273,579	3,271,339	99.93	2.49
Vegetation association 29	WA	7,903,991	7,900,200	99.95	0.29
	Pilbara IBRA	1,133,219	1,132,939	99.98	1.91
	Gascoyne IBRA	3,802,459	3,799,635	99.93	0.03

Vegetation*		Pre-European Extent (ha)	Current Extent (ha)	Remaining (%)	Pre-European % in IUCN Class I-IV Reserves
Vegetation association 82	WA	2,565,901	2,553,217	99.51	10.25
	Pilbara IBRA	2,563,583	2,550,899	99.51	10.26
	Gascoyne IBRA	2,318	2,318	100.00	0.00
Vegetation association 93	WA	3,044,293	3,040,639	99.88	0.44
	Pilbara IBRA	3,042,114	3,038,471	99.88	0.44
	Gascoyne IBRA	96	96	100.00	0.00
Vegetation association 111	WA	762,963	762,326	99.92	5.46
	Pilbara IBRA	550,287	550,232	99.99	1.29
	Gascoyne IBRA	212,465	211,883	99.73	16.28
Vegetation association 157	WA	502,647	499,302	99.33	17.95
	Pilbara IBRA	119,832	119,409	99.29	6.65
	Gascoyne IBRA	182,807	182,807	100.00	40.16
Vegetation association 173	WA	1,753,104	1,748,260	99.72	7.49
	Pilbara IBRA	1,752,520	1,747,677	99.72	7.49
	Gascoyne IBRA	N/A	N/A	N/A	N/A
Vegetation association 175	WA	525,953	524,484	99.72	4.22
	Pilbara IBRA	507,860	507,466	99.92	4.37
	Gascoyne IBRA	962	962	100.00	0.00
Vegetation association 562	WA	103,606	103,606	100.00	0.00
	Pilbara IBRA	103,606	103,606	100.00	0.00
	Gascoyne IBRA	N/A	N/A	N/A	N/A
Vegetation association 589	WA	806,985	802,646	99.46	1.60
	Pilbara IBRA	728,768	724,695	99.44	1.77
	Gascoyne IBRA	N/A	N/A	N/A	N/A
Vegetation association 619	WA	119,074	118,201	99.27	0.2
	Pilbara IBRA	118,920	118,116	99.32	0.2
	Gascoyne IBRA	N/A	N/A	N/A	N/A
Vegetation association 647	WA	195,860	191,710	97.88	0.00
	Pilbara IBRA	195,860	191,710	97.88	0.00
	Gascoyne IBRA	N/A	N/A	N/A	N/A
Vegetation association 676	WA	2,061,241	1,962,923	95.23	3.56
	Pilbara IBRA	92,363	92,303	99.93	0.00
	Gascoyne IBRA	713,577	713,566	99.99	0.00

3.4.1 Significant Flora

No Threatened flora listed under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) or gazetted as Threatened Flora species under the *Biodiversity Conservation Act, 2016* (BC Act) have been recorded within the Amendment Application Area.

Sixteen flora species listed as Priority Flora by the Department of Biodiversity, Conservation and Attractions (DBCAs) have been identified within the Amendment Application Area (**Figures 2-1 to 2-8, 2-10, 2-11, 2-25, 2-27, 2-28, 2-34 to 2-36, 2-44 to 2-45, 2-51 and 2-52**):

- *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (Priority 1);
- *Acacia bromilowiana* (Priority 4);
- *Aristida jerichoensis* var. *subspinulifera* (Priority 3);
- *Aristida lazaridis* (Priority 2);
- *Bulbostylis burbridgeae* (Priority 4);
- *Eremophila spongiorcarpa* (Priority 1);

- *Euploca mutica* (Priority 3);
- *Gomphrena pusilla* (Priority 2);
- *Gymnanthera cunninghamii* (Priority 3);
- *Hibiscus* aff. *campanulatus* (Priority 1);
- *Lepidium catapycnon* (Priority 4).
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3);
- *Rostellularia adscendens* var. *latifolia* (Priority 3);
- *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 4);
- *Tephrosia rosea* var. Port Hedland (A.S. George 1114) (Priority 1); and
- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (Priority 3).

Known locations of Priority flora will be avoided with a 10m buffer, where practicable.

No more than 324 individual plants of identified *Tephrosia rosea* var. Port Hedland are cleared as per Condition 12(b) of CPS 7009/3.

Heliotropium muticum (Condition 12(b) of CPS 7009/3) is no longer listed as a Priority flora species.

One other priority flora species has previously been recorded in the Amendment Application Area: *Bonamia oblongifolia* (Priority 1) (**Figure 2-4**). The location where this flora species was recorded has since been cleared by an external party to BHP.

An assessment of the potential impact of the proposed clearing on the species of conservation significant flora recorded or considered potentially occurring in the Amendment Application Area is provided in **Table 3**.

Table 3: Conservation Significant Flora Occurring within the Amendment Application Area

Conservation Significant Species	Description	Habitat Relevance	Potential Impact on Species
Priority 1 (DBCA)			
<p><i>Abutilon</i> sp. Pritzelianum (S. van Leeuwen 5095)</p>	<p><i>Abutilon</i> sp. Pritzelianum (S. van Leeuwen 5095) is a large diffuse perennial shrub growing to 3m. It has yellow or orange flowers and fruits between June and November (DPaW and Rio Tinto, 2015).</p>	<p><i>Abutilon</i> sp. Pritzelianum (S. van Leeuwen 5095) grows in red sand and clay often in open scrubby vegetation (Onshore Environmental, 2014b; DPaW and Rio Tinto, 2015). It has predominately been recorded from coastal and near coastal sand dunes, margins of estuaries and coastal plains (DPaW and Rio Tinto, 2015) from the Carnarvon, Murchison and Pilbara bioregions although there are a number of inland records (WAH, 2016). A majority of the Pilbara records occur around Port Hedland where it appears to occur on road verges (DPaW and Rio Tinto, 2015).</p> <p>This species has been recorded from:</p> <ul style="list-style-type: none"> one location within the Amendment Application Area (Figure 2-8); and 55 locations across the Carnarvon (7), Murchison (1) and Pilbara (47) bioregions. 	<p>Low</p> <p>The clearing of a single record of this species (if required) within the Application Area would not result in any significant impact upon species distribution as:</p> <ol style="list-style-type: none"> This species is widely distributed having been found at 55 locations across three bioregions in WA; Given it is known from locations at Port Hedland and within 500m of the BHP rail line up to the 225 chainage marker; and This species appears to respond well to disturbance.
<p><i>Eremophila spongiorcarpa</i></p>	<p><i>Eremophila spongiorcarpa</i> is a compact succulent leaved shrub growing up to 1m and producing white flowers from May to September. It grows on weakly saline alluvial plains on the margins of the Fortescue Marsh (Onshore, 2014b).</p>	<p><i>Eremophila spongiorcarpa</i> is endemic to the Pilbara and grows extensively on weakly saline alluvial red clay loams on plains on the margins of the Fortescue Marsh (DPaW and Rio Tinto, 2015; Onshore Environmental, 2014b).</p> <p>There is a dense population (256 records) of this species occurring within the Amendment Application Area on the edge of the Fortescue Marsh (Figures 2-27 and 2-28). This species is endemic to the Fortescue Marsh but occurs extensively across the entire marsh area. There are numerous records within 500m of the Amendment Application Area in this area, as well as other populations up to 20 km away within the Fortescue Marsh on both sides of the Newman Mainline (more than 180 of which are outside the Amendment Application Area).</p>	<p>Low</p> <p>There are multiple records of this species outside of the Amendment Application Area throughout the Fortescue Marsh and given the extensive distribution of this species across the marsh area, if required the clearing of the plants within the Amendment Application Area would not result in any significant impact upon species distribution.</p>
<p><i>Hibiscus</i> aff. <i>campanulatus</i></p>	<p><i>Hibiscus campanulatus</i> is a large perennial shrub growing 1.5 to 3 m tall, with whitish cream to light rusty brown, erect, stellate hairs densely covering all vegetative parts to a greater or lesser degree. Flowers are white to pale lilac in August.</p> <p>This species often grows in sheltered or rocky drainage lines associated with cliff-lines or rocky ridges typically in soils associated with the Canga detrital formations of the Pilbara region (DPaW and Rio Tinto, 2015).</p>	<p>There are eight potential records of this species within the Amendment Application Area (Figure 2-51) with a further 1,314 potential records in the surrounds. If confirmed this would be a significant range extension for this species.</p> <p>This record has not been confirmed and until a positive identification is determined the records will be treated as they are <i>Hibiscus campanulatus</i>.</p>	<p>Low</p> <p>There are multiple records of this potentially identified species outside of the Amendment Application Area, if required the clearing of the plants within the Amendment Application Area would not result in any significant impact upon species distribution.</p>

Conservation Significant Species	Description	Habitat Relevance	Potential Impact on Species
<p><i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114)</p>	<p><i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114) is an erect shrub reaching 1.7 m in height, flowers are red or purple and occur between August to September, (DPaW and Rio Tinto, 2015, Onshore, 2014b).</p>	<p><i>Tephrosia rosea</i> var. Port Hedland (A.S. George 1114) appears to be a coastal species that is endemic to the Pilbara where it has been found to the west, south and east of Port Hedland as well as on some offshore islands (DPaW and Rio Tinto, 2015).</p> <p>It occurs on red sands near creeks and on disturbed road sides and rail lines around Port Hedland (Onshore Environmental, 2014b). It has also been found on loams, <i>Triodia</i> hummock grasslands and <i>Acacia stellaticeps</i> woodlands (DPaW and Rio Tinto, 2015).</p> <p>This species has been recorded from:</p> <ul style="list-style-type: none"> • 325 locations within the Application Area (Figures 2-1 and 2-3 to 2-6), where it has generally been recorded in disturbed areas along tracks and the rail line; • 632 other locations across the coastal Northern Pilbara region ranging from west of Point Sampson to east of Port Hedland with two isolated inland records (one east of Yarrrie and one north of Mungaroon Range Nature Reserve). 	<p>Low</p> <p>The clearing of this species (if required) within the Amendment Application Area would not result in any significant impact upon species distribution as:</p> <ol style="list-style-type: none"> 1. This species is broadly distributed across the Chichester and Roebourne IBRA subregions, predominantly along coastal areas; 2. There are 967 other records of this species across the broader region; and 3. This species appears to respond well to disturbance. 4. No more than 324 individual plants of identified <i>Tephrosia rosea</i> var. Port Hedland will be cleared as per Condition 12(b) of CPS 7009/3.
<p>Priority 2 (DBCA)</p>			
<p><i>Aristida lazaridis</i></p>	<p><i>Aristida lazaridis</i> is a tufted perennial grass ranging in height from 0.4 m to 1.5 m occurring in areas of sand or loam in the Pilbara (Onshore 2013; Atlas of Living Australia, 2016).</p>	<p><i>Aristida lazaridis</i> occurs in the Pilbara region of Western Australia, in the Northern Territory and extensively throughout Queensland (ALA, 2016).</p> <p>This species has been recorded from:</p> <ul style="list-style-type: none"> • One location within the Amendment Application Area (Figures 2-35 and 2-36); • 287 other locations in the broader region including one record within Karijini National Park; and • numerous other locations outside of the Application Area across the Pilbara and the entire north of Australia. 	<p>Low</p> <p>The clearing of the single record of this species (if required) within the Amendment Application Area would not result in any significant impact upon species distribution as:</p> <ol style="list-style-type: none"> 1. One location within the Amendment Application Area; 2. 287 other locations in the broader region including one record within Karijini National Park; and 3. numerous other locations outside of the Application Area across the Pilbara and the entire north of Australia.
<p><i>Gomphrena pusilla</i></p>	<p><i>Gomphrena pusilla</i> is a slender branching annual herb to 0.2 m with white flowers from March to April/June (ENV, 2011a). It is typically found in fine beach sand behind the foredune, on limestone.</p>	<p>There is one record of this species within the Amendment Application Area at Nelson Point in Port Hedland (Figures 2-1 and 2-2). The Nelson Point record is a historical record and this species has not been identified at this site in subsequent surveys. There are also 11 records of <i>Gomphrena pusilla</i> from immediately adjacent to, up to 7 km from, the Amendment Application Area. This species is also known from the Kimberley area around Broome.</p>	<p>Low</p> <p>If required the clearing of this single plant would not result in any significant impact upon species distribution given there are multiple records outside of the Amendment Application Area.</p>

Conservation Significant Species	Description	Habitat Relevance	Potential Impact on Species
Priority 3 (DBCA)			
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	<i>Aristida jerichoensis</i> var. <i>subspinulifera</i> is a compactly tufted perennial, grass-like or herb which grows 0.30 to 0.80 m in height (Astron, 2013).	There have been two records of this species within the Amendment Application Area around the Newman Area (Figure 2-51). All records have been within or adjacent to Major or Minor Drainage Lines. This species is known from approximately 230 records within the Pilbara region, including numerous records around Newman extending west, and large populations of this species throughout the central Pilbara region directly east of Karijini National Park.	Low This species is broadly distributed across the Hamersley IBRA subregion. There are multiple records of this species outside of the Amendment Application Area and if required the clearing of these five records would not result in any significant impact upon species distribution.
<i>Euploca mutica</i>	<i>Euploca mutica</i> is an ascending to spreading perennial herb reaching 0.3 m in height. It grows on flat plains south of Port Hedland in brown loam and red silty sand (Onshore, 2014b).	<i>Euploca mutica</i> was recorded from 52 locations at Mooka within the Amendment Application Area (Figures 2-5 and 2-6). There are also numerous records within 2 km of the Amendment Application Area around Mooka. This species also occurs in three populations within 1 km of the Amendment Application Area. These can be found between Chainage 63 to 77, Chainage 94 to 104 and Chainage 165. This species has been recorded in sandplains and on sandy/loamy soils.	Low This species is broadly distributed across the Chichester and Roebourne IBRA subregions. There are multiple records of this species outside of the Amendment Application Area and if required the clearing of these plants would not result in any significant impact upon species distribution.
<i>Gymnanthera cunninghamii</i>	<i>Gymnanthera cunninghamii</i> is an erect shrub up to 2 m in height and producing cream, yellow or green flowers year round, grows in sandy soils along medium to large drainage lines (Onshore, 2014b).	There have been 13 records of this species within the Amendment Application Area. One at Nelson Point (Figures 2-1 and 2-2) and twelve at Ophthalmia Dam (Figure 2-51). The Nelson Point record is a historical record and this species has not been identified at this site in subsequent surveys. There are numerous records of this species adjacent to the Amendment Application Area between Port Hedland and Newman, as well as multiple records across the broader region.	Low This species is broadly distributed across the Pilbara IBRA region. There are multiple records of this species outside of the Amendment Application Area and if required the clearing of these six records would not result in any significant impact upon species distribution.
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) (Plate 13) is a perennial chenopod species growing to a height of 2 m in orange to red loam soils on flood plains (DPaW and Rio Tinto, 2015).	There is one record of this species within the Amendment Application Area, just north of Ophthalmia Dam (Figure 2-51). There are numerous records of this species adjacent to the southern portion of the Amendment Application Area. In the broader region this species is widely distributed associated with mulga on floodplains and is known from over 1,300 record in the Pilbara region extending from east of Newman to west Karijini National Park.	Low This species is broadly distributed across the Pilbara IBRA region. There are multiple records of this species outside of the Amendment Application Area and if required the clearing of this one record would not result in any significant impact upon species distribution.

Conservation Significant Species	Description	Habitat Relevance	Potential Impact on Species
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	<i>Rostellularia adscendens</i> var. <i>latifolia</i> is a low shrub to 0.3 m in height. It has blue-purple-violet flowers in April and May. It grows in ironstone soils with habitat ranging from creeks to rocky hills (WAH, 2016).	There are seven records of this species within the Amendment Application Area (Figures 2-34, 2-44 and 2-45) as well as numerous records adjacent to the Amendment Application Area. This species is known to occur widely in drainage lines throughout the southern and eastern Pilbara (more than 350 other records) in the broader region between Mining Area C and Yandi Mining Operations and surrounding Karijini National Park.	Low This species is broadly distributed across the Pilbara IBRA region. There are multiple records of this species outside of the Amendment Application Area and if required the clearing of these seven records would not result in any significant impact upon species distribution.
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431) is tussock perennial grass 0.9-1.8 m high, flowering August, grows on red clay on clay pans and grassy plains (WAH, 2016).	There are four records of this species within the Amendment Application Area (Figures 2-7, 2-25 and 2-52) as well as numerous records adjacent to the Amendment Application Area, predominately in the south. This species is extensively distributed within the south-east Pilbara and extending north-west to Karratha (more than 136 other records). It has previously been recorded from within the Coondewanna Flats PEC (Lake Robinson). There are numerous records of this species in the broader region between Mining Area C and Yandi Mining Operations and surrounding Karijini National Park.	Low This species is broadly distributed across the Pilbara IBRA region. There are multiple records of this species outside of the Amendment Application Area and if required the clearing of these two records would not result in any significant impact upon species distribution.
Priority 4 (DBCA)			
<i>Acacia bromilowiana</i>	<i>Acacia bromilowiana</i> is a tree / shrub typically growing to 6 m but can reach up to 12 m in favourable areas. It has dark grey fibrous bark with leafstalks that are covered in a grey/blue powdery wax coating. It has yellow/pink flowers between July and August (WAH, 2016).	<i>Acacia bromilowiana</i> occurs on red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone and basalt and is typically found on rocky hills, breakaways, scree slopes, gorges and creek beds of the Southern Pilbara (WAH, 2016). This species has been recorded from: <ul style="list-style-type: none"> • one location within the Amendment Application Area (Figure 2-35); • four locations within Karijini National Park; and • 58 other locations across the southern Pilbara. 	Low The clearing of a single record of this species (if required) within the Application Area would not result in any significant impact upon species distribution as: <ol style="list-style-type: none"> 1. There are four records of this species within Karijini National Park; and 2. This species has been recorded from 58 other locations across the broader southern Pilbara outside of the Application Area
<i>Bulbostylis burbridgeae</i>	<i>Bulbostylis burbridgeae</i> is a tufted, erect to spreading annual sedge reaching 0.25 m in height, spiklets are in a simple umbel or solitary and flowers occur in March or between June to August. It grows on granitic soils in crevices on granite outcrops or at the base of cliffs (Onshore, 2014b).	There have been four records of this species within the Amendment Application Area (Figure 2-10, 2-11 and 2-51). Two of the records have occurred on granite, one occurs within spinifex grassland and one on the edge of the rail formation at the Jimlebar Wye. Onshore (2014b) identified 65 locations and more than 1,248 plants within 1 km of the Newman Mainline. This species is known from over 100 records within the Pilbara region.	Low This species is broadly distributed across the Chichester and Roebourne IBRA subregions. There are multiple records of this species outside of the Amendment Application Area and if required the clearing of these four plants would not result in any significant impact upon species distribution.

Conservation Significant Species	Description	Habitat Relevance	Potential Impact on Species
<i>Lepidium catapycnon</i>	<i>Lepidium catapycnon</i> is an open, woody perennial, herb / shrub between 0.2-0.3 m high with distinctive zigzag stems with white flowers in October. It has been identified as a pioneer species that responds rapidly to disturbance, especially fire. The majority of known populations have been recorded in areas that were recently burnt (DPaW and Rio Tinto, 2015).	<p>This species has been recorded from one location within the Amendment Application Area (Figure 2-35) within Vegetation Association (HC Tw AiAb IrSao).</p> <p>This species is broadly distributed between the Pilbara towns of Newman, Nullagine and Wittenoorn. The total area of extent approximates 21,736 km² with eight confirmed populations occurring within Karijini National Park. It is regarded as being relatively common across the south-east Pilbara region.</p>	<p>Low</p> <p>This species is broadly distributed across the Pilbara with more than 1,000 plants known to occur within Karijini National Park.</p> <p>Given this species is a disturbance opportunist and known from numerous records within and surround Karijini National Park, the clearing of one record (if required) is unlikely to impact on this species distribution.</p>
<i>Sida</i> sp. Barlee Range (S. van Leeuwen 1642)	<i>Sida</i> sp. Barlee Range (S. van Leeuwen 1642) is a spreading shrub that grows to 0.5 m in height. Flowers are yellow and occur in August. It grows on skeletal red soil pockets on the steep sides of ranges (DPaW and Rio Tinto, 2015).	<p>There are six records of this species within the Amendment Application Area (Figure 2-34 to 2-36) as well as numerous records adjacent to the Amendment Application Area between the southern edge of the Fortescue Marsh and the Yandi Mining Operations.</p> <p>This species occurs extensively in gorges and steep rocky slopes throughout southern Pilbara and northern Gascoyne bioregions, with numerous records between the southern edge of the Fortescue Marsh, Mining Area C Mining Operations and from within Karijini National Park.</p>	<p>Low</p> <p>This species is broadly distributed across the Pilbara and Gascoyne IBRA regions. There are multiple records of this species outside of the Amendment Application Area and if required the clearing of this one record would not result in any significant impact upon species distribution.</p>

3.4.2 Vegetation Communities

Onshore (2014a) undertook a consolidation of vegetation association mapping across BHP’s tenure (**Appendix 3, Table 6**). This project developed standard broad floristic communities and vegetation associations for use across BHP sites. An additional two vegetation surveys (Spectrum Ecology & Spatial, 2022 [**Appendix 1, Table 9**] and GHD, 2020a [**Appendix 2, Table 4**]) have been undertaken since the Onshore (2014a). Where these new surveys overlap the Onshore (2014a) mapping the newer data has been used.

Three areas of the Amendment Application Area are not covered by the consolidation project or the more recent surveys:

1. Port Hedland to Chainage 14; Chainage 33 to Chainage 38: Covered by the *Port Hedland Regional Flora and Vegetation Assessment* (ENV, 2011a) (**Appendix 4, Table 5**);
2. Chainage 313 to Chainage 401: Covered by the *Rapid Growth Project 5: Jimblebar Junction to Yandi Junction Railway Reserve Flora and Vegetation Assessment* (ENV, 2008a) (**Appendix 6, Table 7**); and
3. Quarry 6: *Rapid Growth Project 5: Quarry 6 Flora and Vegetation Assessment* (ENV, 2008b) (**Appendix 7, Table 8**).

Spectrum Ecology & Spatial (2022) mapped a total of two broad floristic communities with two vegetation associations within the Amendment Application Area (**Table 4; Figures 3-1**).

Table 4: Vegetation associations of the Amendment Application Area: Finucane Island (GHD, 2020a)

Broad Floristic Community	Vegetation Association (GHD, 2020a)	
Saline Flat and Marsh (Low open forest of <i>Avicennia marina</i> (mangrove)).	VT01 - SF Am	Low open forest of <i>Avicennia marina</i> (mangrove) on dark grey clay with some sand patches on tidal saline flats influenced by tidal inundation. VT01 does have tidal inundation in very high tides, however, influenced by road and rail line infrastructure.
Embankment on track/rail line verge (<i>Acacia</i> shrubland).	VT02	Shrubland of <i>Acacia bivenosa</i> , <i>Acacia pyrifolia</i> and <i>Acacia colei</i> over * <i>Cenchrus ciliaris</i> (Buffel Grass), <i>Eragrostis falcata</i> and <i>Eragrostis eriopoda</i> open tussock grasses over mixed herbs on embankment soil/large boulders and gravel. Other associated species include <i>Cleome viscosa</i> * <i>Aerva javanica</i> , <i>Enchylaena tomentosa</i> , <i>Ipomoea pes-caprae</i> and <i>Bonamia media</i> .

ENV (2011a) mapped a total of six broad floristic communities with fourteen vegetation associations within the Amendment Application Area (**Table 5; Figures 3-1 to 3-6**).

Table 5: Vegetation associations of the Amendment Application Area: Port Hedland to Chainage 38 (ENV, 2011a)

Broad Floristic Community	Vegetation Association (ENV, 2011a)	
Drainage	Drainage A (DA)	A low open <i>Eucalyptus victrix</i> woodland over a high open <i>Acacia ampliceps</i> and <i>Acacia trachycarpa</i> shrubland over a low open <i>Acacia stellaticeps</i> , <i>Pluchea ferdinandi-muelleri</i> and <i>Corchorus incanus</i> subsp. <i>incanus</i> shrubland over a <i>Triodia epactia</i> hummock grassland over an <i>Aristida holathera</i> var. <i>latifolia</i> , <i>Eriachne obtuse</i> and * <i>Cenchrus ciliaris</i> tussock grassland.
	Major Drainage Line A (MDLA)	Scattered low <i>Eucalyptus victrix</i> trees over a high open <i>Melaleuca argentea</i> , <i>Acacia ampliceps</i> and <i>Acacia trachycarpa</i> shrubland over scattered <i>Adriana tomentosa</i> var. <i>tomentosa</i> and <i>Pluchea ferdinandi-muelleri</i> shrubs over open <i>Triodia epactia</i> hummock grassland.
	Major Drainage Line B (MDLB)	Low open <i>Eucalyptus victrix</i> woodland over an <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Acacia colei</i> var. <i>colei</i> shrubland over very open <i>Triodia epactia</i> hummock grassland.
Dune	Dune C (DC)	A low open <i>Acacia stellaticeps</i> , <i>Acacia bivenosa</i> and <i>Acacia ampliceps</i> shrubland over a <i>Spinifex longifolius</i> and * <i>Cenchrus ciliaris</i> open grassland over scattered <i>Gomphrena canescens</i> herbs.

Broad Floristic Community	Vegetation Association (ENV, 2011a)	
Grassland	Grassland A (GA)	<i>Triodia secunda</i> and <i>Triodia epactia</i> hummock grassland.
Hill / Rocky Outcrop	Rock Outcrop (RO)	Scattered <i>Acacia coleii</i> var. <i>coleii</i> and <i>Acacia inaequilatera</i> shrubs over scattered herbs over scattered <i>Triodia</i> spp. hummock grasses.
Mangrove	Mangrove (M)	A high closed <i>Rhizophora stylosa</i> and <i>Avicennia marina</i> shrubland.
Sandplain	Sandplain A (SA)	Low <i>Acacia stellaticeps</i> shrublands over <i>Triodia epactia</i> and <i>Triodia secunda</i> hummock grasslands/ <i>Triodia epactia</i> and <i>Triodia secunda</i> hummock grasslands mosaic.
	Sandplain B (SB)	An open <i>Acacia coleii</i> var. <i>coleii</i> shrublands over low <i>Acacia stellaticeps</i> shrublands over <i>Triodia epactia</i> and <i>Triodia secunda</i> hummock grasslands/low <i>Acacia stellaticeps</i> shrublands over <i>Triodia epactia</i> and <i>Triodia secunda</i> hummock grasslands mosaic.
	Sandplain O (SO)	Scattered low <i>Eucalyptus victrix</i> and <i>Corymbia hamersleyana</i> trees over an open <i>Acacia ancistrocarpa</i> , <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Acacia inaequilatera</i> and <i>Acacia trudgeniana</i> shrubland over a low open <i>Acacia stellaticeps</i> shrubland over a <i>Triodia epactia</i> and <i>Triodia lanigera</i> hummock grassland.
	Sandplain P (SP)	Low open <i>Eucalyptus victrix</i> , <i>Corymbia hamersleyana</i> and <i>Corymbia flavescens</i> woodland over an open <i>Acacia coleii</i> var. <i>coleii</i> shrubland over a low open <i>Acacia stellaticeps</i> and <i>Pluchea tetranthera</i> shrubland over <i>Triodia epactia</i> hummock grassland.
	Sandplain Q (SQ)	Scattered low <i>Corymbia flavescens</i> trees over open <i>Acacia ancistrocarpa</i> and <i>Acacia bivenosa</i> shrubland over scattered low <i>Acacia stellaticeps</i> shrubs over a <i>Triodia epactia</i> and <i>Triodia lanigera</i> hummock grassland.
	Sandplain R (SR)	Low open <i>Corymbia candida</i> subsp. <i>lautifolia</i> and <i>Corymbia hamersleyana</i> over <i>Acacia coleii</i> var. <i>coleii</i> and <i>Acacia tumida</i> var. <i>pilbarensis</i> open shrubland over <i>Triodia epactia</i> and <i>Triodia lanigera</i> hummock grassland.

Onshore Environmental (2014a) mapped a total of 36 broad floristic communities with 102 vegetation associations within the Amendment Application Area (Table 6; Figures 3-4 to 3-41 and 3-51 to 3-53).

Table 6: Vegetation associations of the Amendment Application Area: Chainage 14 to 313 and Chainage 401 to Newman (Onshore Environmental, 2014a)

Broad Floristic Community	Vegetation Association (Onshore Environmental, 2014)	
* <i>Cenchrus</i> Closed Tussock Grassland	FP CcCs ChAa AtpAan	Closed Tussock Grassland of * <i>Cenchrus ciliaris</i> and * <i>Cenchrus setiger</i> with Low Open Woodland of <i>Corymbia hamersleyana</i> and <i>Acacia aptaneura</i> and Open Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Acacia ancistrocarpa</i> on red brown silty loam on floodplains.
* <i>Cenchrus</i> Open Tussock Grassland	GP CcCs AaApr AsyAa	Open Tussock Grassland of * <i>Cenchrus ciliaris</i> and * <i>Cenchrus setiger</i> with Low Open Woodland of <i>Acacia aptaneura</i> and <i>Acacia pruinocarpa</i> over High Open Shrubland of <i>Acacia synchronicia</i> and <i>Acacia aptaneura</i> on red sandy clay loam on gilgai plains.
* <i>Cenchrus</i> Tussock Grassland	MA CcCs EvAciAh	Tussock Grassland * <i>Cenchrus ciliaris</i> and * <i>Cenchrus setiger</i> with Low Woodland of <i>Eucalyptus victrix</i> , <i>Acacia citrinoviridis</i> and <i>Atalaya hemiglauca</i> on brown sandy loam on major drainage lines and adjacent flood plains.
	MA CcTtEa ChCa AbAtpAsc	Tussock Grassland of * <i>Cenchrus ciliaris</i> , <i>Themeda triandra</i> and <i>Eulalia aurea</i> with Low Open Woodland of <i>Corymbia hamersleyana</i> and <i>Corymbia aspera</i> over High Open Shrubland of <i>Acacia bivenosa</i> , <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> on brown loamy sand on levee banks of major drainage lines.
<i>Acacia</i> High Open Shrubland	GP Asy AsySaoEla CcCsCf	High Open Shrubland of <i>Acacia synchronicia</i> over Low Open Shrubland of <i>Acacia synchronicia</i> , <i>Senna artemisioides</i> subsp. <i>oligophylla</i> and <i>Eremophila lanceolata</i> over Very Open Tussock Grassland of * <i>Cenchrus ciliaris</i> , * <i>Cenchrus setiger</i> and <i>Chrysopogon fallax</i> on red light clay on gilgai plains.
	GR Atp Te TloAcoSau	High Open Shrubland of <i>Acacia tumida</i> subsp. <i>pilbarensis</i> over Very Open Hummock Grassland of <i>Triodia epactia</i> and Very Open Tussock Grassland of <i>Tripogon loliiformis</i> , <i>Aristida contorta</i> and <i>Sporobolus australasicus</i> (with Scattered Low Trees of <i>Terminalia canescens</i> and <i>Ficus brachypoda</i>) on skeletal brown sandy loam on granite plateaux / sheet outcrops.

Broad Floristic Community	Vegetation Association (Onshore Environmental, 2014)	
Acacia High Shrubland	FP AaAscAan Tp	High Shrubland of <i>Acacia aptaneura</i> , <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and <i>Acacia ancistrocarpa</i> over Very Open Hummock Grassland of <i>Triodia pungens</i> on red brown sandy loam on floodplains and drainage lines.
	MA AtpApyAse Ec TmbTtCpr	High Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> and <i>Acacia sericophylla</i> with Scattered Trees of <i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i> over Open Tussock Grassland of <i>Themeda</i> sp. Mt Barricade (M.E. Trudgen 2471), <i>Themeda triandra</i> and <i>Cymbopogon procerus</i> on brown loam and gravels on major drainage channels.
	ME AamAtrAcp CcEb Cv	High Shrubland of <i>Acacia ampliceps</i> , <i>Acacia trachycarpa</i> and <i>Acacia coriacea</i> subsp. <i>pendens</i> over Open Tussock Grassland of <i>Cenchrus ciliaris</i> and <i>Eriachne benthamii</i> with Very Open Sedges of <i>Cyperus vaginatus</i> on brown sand along medium drainage lines.
	MI AccAbAtp TtE AstPfmPt	High Shrubland of <i>Acacia colei</i> var. <i>colei</i> , <i>Acacia bivenosa</i> and <i>Acacia tumida</i> var. <i>pilbarensis</i> over Open Hummock Grassland of <i>Triodia lanigera</i> and <i>Triodia epactia</i> with Low Open Shrubland of <i>Acacia stellaticeps</i> , <i>Pluchea ferdinandi-muelleri</i> and <i>Pluchea tetranthera</i> on orange sand on minor drainage lines and floodplains.
Acacia Low Woodland	FP ApaAaApr AsyEffPo CcAinAco	Low Woodland of <i>Acacia paraneura</i> , <i>Acacia aptaneura</i> and <i>Acacia pruinocarpa</i> over Open Shrubland of <i>Acacia synchronicia</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> and <i>Ptilotus obovatus</i> over Open Tussock Grassland of <i>Cenchrus ciliaris</i> , <i>Aristida inaequiglumis</i> and <i>Aristida contorta</i> on red brown loam on floodplains.
Acacia Low Closed Woodland	FP Aa CfCc PlaEla	Low Closed Woodland of <i>Acacia aptaneura</i> over Very Open Tussock Grassland of <i>Chrysopogon fallax</i> and <i>Cenchrus ciliaris</i> with Scattered Shrubs of <i>Psydrax latifolia</i> and <i>Eremophila lanceolata</i> on red/brown clay loam on plains.
Acacia Low Open Forest	FP AciAa Cc Bb	Low Open Forest of <i>Acacia citrinoviridis</i> and <i>Acacia aptanera</i> over Tussock Grassland of <i>Cenchrus ciliaris</i> over Open Herbs of <i>Bidens bipinnata</i> on red brown loamy sand on floodplains.
	SP AaAanApr TeTs EffGbDpe	Low Open Forest of <i>Acacia aptaneura</i> , <i>Acacia aneura</i> x <i>ayersiana</i> and <i>Acacia pruinocarpa</i> over Hummock Grassland of <i>Triodia epactia</i> and <i>Triodia</i> sp. Shovelanna Hill with Open Shrubland of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Grevillea berryana</i> and <i>Dodonaea petiolaris</i> on red brown loamy sand on stony plains.
	SP AaApr TmTwTp TtCfAin	Low Open Forest of <i>Acacia aptaneura</i> and <i>Acacia pruinocarpa</i> over Open Hummock Grassland of <i>Triodia melvillei</i> , <i>Triodia wiseana</i> and <i>Triodia pungens</i> over Tussock Grassland of <i>Themeda triandra</i> , <i>Chrysopogon fallax</i> and <i>Aristida inaequiglumis</i> on red brown loam on plains.
	SP Ax SggSbSg ApeEobEx	Low Open Forest of <i>Acacia xiphophylla</i> over Low Scattered Shrubs of <i>Senna glutinosa</i> subsp. <i>glutinosa</i> , <i>Streptoglossa bubakii</i> and <i>Senna glaucifolia</i> over Scattered Tussock Grasses of <i>Astrelba pectinata</i> , <i>Eriachne obtuse</i> and <i>Eragrostis xerophila</i> on red brown medium clay on basalt plains.
	SP AxAa EffAteAsy CfAcoSau	Low Open Forest of <i>Acacia xiphophylla</i> and <i>Acacia aptaneura</i> over Open Shrubland of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia tetragonophylla</i> and <i>Acacia synchronicia</i> over Very Open Tussock Grassland of <i>Chrysopogon fallax</i> , <i>Aristida contorta</i> and <i>Sporobolus australasicus</i> on red brown sandy clay loam on stony plains.
Acacia Low Open Heath	HS AbAsy TseTaTb	Low Open Heath of <i>Acacia bivenosa</i> and <i>Acacia synchronicia</i> over Hummock Grassland of <i>Triodia secunda</i> , <i>Triodia angusta</i> and <i>Triodia basedowii</i> on brown sandy loam on stony lower slopes and plains.
	SA Ast Tsc AtpAccMI	Low Open Heath of <i>Acacia stellaticeps</i> over Hummock Grassland of <i>Triodia schinzii</i> with High Open Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Acacia colei</i> var. <i>colei</i> and <i>Melaleuca lasiandra</i> on red brown loamy sand on sandplains.
Acacia Low Open Woodland	FP AaAciApr AsyAscAb Tp	Low Open Woodland of <i>Acacia aptaneura</i> , <i>Acacia citrinoviridis</i> and <i>Acacia pruinocarpa</i> over Open Shrubland of <i>Acacia synchronicia</i> , <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and <i>Acacia bivenosa</i> over Very Open Hummock Grassland of <i>Triodia pungens</i> on red brown clay loam on floodplains and medium drainage lines.
	FP AaAprCh EfrAteDpe AinCfAco	Low Open Woodland of <i>Acacia aptaneura</i> , <i>Acacia pruinocarpa</i> and <i>Corymbia hamersleyana</i> with Open Shrubland of <i>Eremophila fraseri</i> , <i>Acacia tetragonophylla</i> and <i>Dodonaea petiolaris</i> over Tussock Grassland of <i>Aristida inaequiglumis</i> , <i>Chrysopogon fallax</i> and <i>Aristida contorta</i> on red sandy loam on floodplains.

Broad Floristic Community	Vegetation Association (Onshore Environmental, 2014)	
	FP Ax AsyRe MpMtScu	Low Open Woodland of <i>Acacia xiphophylla</i> over High Open Shrubland of <i>Acacia synchronicia</i> and <i>Rhagodia eremaea</i> over Low Open Shrubland of <i>Maireana pyramidata</i> , <i>Maireana triptera</i> and <i>Sclerolaena cuneata</i> on red brown sandy clay loam on floodplains.
Acacia Low Woodland	FP AaAprAca EffDpeSe AcoDamAin	Low Woodland of <i>Acacia aptanerua</i> , <i>Acacia pruinocarpa</i> and <i>Acacia catenulata</i> subsp. <i>occidentalis</i> over Open Shrubland of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Dodonaea petiolaris</i> and <i>Sida ectogama</i> over Open Tussock Grassland of <i>Aristida contorta</i> , <i>Digitaria ammophila</i> and <i>Aristida inaequiglumis</i> on red orange clay loam on floodplains.
Acacia Open Heath	MI AadAluDpa Tp EICh	Open Heath of <i>Acacia adsurgens</i> , <i>Androcalva luteiflora</i> and <i>Dodonaea pachyneura</i> over Open Hummock Grassland of <i>Triodia pungens</i> with Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Corymbia hamersleyana</i> on brown loamy sand on minor drainage lines.
Acacia Open Scrub	ME AtpAanAcc TeTI Ch	Open Scrub of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Acacia ancistrocarpa</i> and <i>Acacia colei</i> var. <i>colei</i> over Hummock Grassland of <i>Triodia epactia</i> and <i>Triodia lanigera</i> with Scattered Low Trees of <i>Corymbia hamersleyana</i> on brown sandy loam along minor and medium drainage lines.
	MI AtpGwApy TpTb CcCs	Open Scrub of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> and <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> over Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia basedowii</i> over Open Tussock Grassland of * <i>Cenchrus ciliaris</i> and * <i>Cenchrus setiger</i> on brown sandy loam on minor drainage lines and floodplains.
	MI AtpPIAmo TpTs ChEI	Open Scrub of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Petalostylis labicheoides</i> and <i>Acacia monticola</i> over Open Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia</i> sp. Shovelanna Hill (S.van Leeuwen 3835) with Low Open Woodland of <i>Corymbia hamersleyana</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> on red brown sandy loam on minor drainage lines.
Astrebla Tussock Grassland	SP ApeAinSau SfiCtrTbc Oa	Tussock Grassland of <i>Astrebla pectinata</i> , <i>Aristida inaequiglumis</i> and <i>Sporobolus australasicus</i> with Low Open Shrubland of <i>Sida fibulifera</i> , <i>Corchorus trilocularis</i> and <i>Tephrosia</i> sp. Bungaroo Creek (M.E. Trudgen 11601) and Open Herbs of <i>Operculina aequisejala</i> on brown medium clay on basalt plains.
Corymbia Low Open Woodland	MI CcAa CcCs Tb	Low Open Woodland of <i>Corymbia candida</i> subsp. <i>dipsodes</i> and <i>Acacia aptaneura</i> over Open Tussock Grassland of * <i>Cenchrus ciliaris</i> and * <i>Cenchrus setiger</i> and Very Open Hummock Grassland of <i>Triodia basedowii</i> on red brown loam on floodplains and minor drainage lines.
Corymbia Low Woodland	FP CcaCa AtpAcc Tp	Low Woodland of <i>Corymbia candida</i> and <i>Corymbia aspera</i> over Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Acacia colei</i> var. <i>colei</i> over Open Hummock Grassland of <i>Triodia pungens</i> on brown medium clay on floodplains.
Eriachne Open Tussock Grassland	MI EbEfCf Ca AtrAcc	Open Tussock Grassland of <i>Eriachne benthamii</i> , <i>Eriachne flaccida</i> and <i>Chrysopogon fallax</i> with Scattered Low Trees of <i>Corymbia aspera</i> over High Open Shrubland of <i>Acacia trachycarpa</i> and <i>Acacia colei</i> var. <i>colei</i> on brown loamy sand along minor drainage lines.
Eriachne Tussock Grassland	FP EbEa HI Acc	Tussock Grassland of <i>Eriachne benthamii</i> and <i>Eulalia aurea</i> with High Open Shrubland of <i>Hakea lorea</i> subsp. <i>lorea</i> over Open Shrubland of <i>Acacia colei</i> var. <i>colei</i> on brown medium clay on floodplains.
	ME EbEf Ev Te	Tussock Grassland of <i>Eriachne benthamii</i> and <i>Eriachne flaccida</i> with Low Woodland of <i>Eucalyptus victrix</i> over Hummock Grassland of <i>Triodia epactia</i> on brown grey silty loam on drainage depressions.
Eucalyptus Low Open Forest	MA EcEvEx ApyAtpGr TtEaCpr	Low Open Forest of <i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i> , <i>Eucalyptus victrix</i> and <i>Eucalyptus xerothermica</i> over High Shrubland of <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> , <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Gossypium robinsonii</i> over Open Tussock Grassland of <i>Themeda triandra</i> , <i>Eulalia aurea</i> and <i>Cymbopogon procerus</i> on red brown clay loam on major drainage lines.
Eucalyptus Low Woodland	ME EvAcp AtpAtrApy Tp	Low Woodland of <i>Eucalyptus victrix</i> and <i>Acacia coriacea</i> subsp. <i>pendens</i> over Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Acacia trachycarpa</i> and <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> over Open Hummock Grassland of <i>Triodia pungens</i> on brown loamy sand along minor and medium drainage lines.
	ME TtEaEte ApyAtpPI EvCh	Tussock Grassland of <i>Themeda triandra</i> , <i>Eulalia aurea</i> and <i>Eriachne tenuiculmis</i> with High Shrubland of <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> , <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Petalostylis labicheoides</i> and Open Woodland of <i>Eucalyptus victrix</i> and <i>Corymbia hamersleyana</i> on red brown silty loam on medium drainage lines and flood plains.

Broad Floristic Community	Vegetation Association (Onshore Environmental, 2014)	
<i>Eucalyptus</i> Woodland	MA EcEv AciApyMg CcEaTt	Woodland of <i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i> and <i>Eucalyptus victrix</i> over High Open Shrubland of <i>Acacia citrinoviridis</i> , <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> and <i>Melaleuca glomerata</i> over Tussock Grassland of * <i>Cenchrus ciliaris</i> , <i>Eulalia aurea</i> and <i>Themeda triandra</i> on brown clay loam on banks of major drainage lines.
	MA EvAciEc TrcCcrApy CcEaTt	Woodland of <i>Eucalyptus victrix</i> , <i>Acacia citrinoviridis</i> and <i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i> over Low Open Shrubland of <i>Tephrosia rosea</i> var. <i>clementii</i> , <i>Corchorus crozophorifolius</i> and <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> over Very Open Tussock Grassland of * <i>Cenchrus ciliaris</i> , <i>Eulalia aurea</i> and <i>Themeda triandra</i> on brown loamy sand on channels of major drainage lines.
<i>Eulalia</i> Open Tussock Grassland	MI EaTt AxAcP AanAtp	Open Tussock Grassland of <i>Eulalia aurea</i> and <i>Themeda triandra</i> with Low Open Woodland of <i>Acacia xiphophylla</i> and <i>Acacia coriacea</i> subsp. <i>pendens</i> and Open Shrubland of <i>Acacia ancistrocarpa</i> and <i>Acacia tumida</i> var. <i>pilbarensis</i> on red brown clay on minor drainage lines.
<i>Maireana</i> Low Open Shrubland	FP MtPoSc AxAsy AinCc	Low Open Shrubland of <i>Maireana triptera</i> , <i>Ptilotus obovatus</i> and <i>Sclerolaena cuneata</i> with Scattered Low Trees of <i>Acacia xiphophylla</i> and <i>Acacia synchronicia</i> and Scattered Tussock Grasses of <i>Aristida inaequiglumis</i> and * <i>Cenchrus ciliaris</i> on red sandy clay loam on wind scalded plains.
<i>Melaleuca</i> High Open Forest	MA MaEcEv MgAcpAtr Cv	High Open Forest of <i>Melaleuca argentea</i> , <i>Eucalyptus camaldulensis</i> var. <i>refulgens</i> and <i>Eucalyptus victrix</i> over High Open Shrubland of <i>Melaleuca glomerata</i> , <i>Acacia coriacea</i> subsp. <i>pendens</i> and <i>Acacia trachycarpa</i> over Very Open Sedges of <i>Cyperus vaginatus</i> on alluvial gravelly soils on major drainage channels with seasonal pools.
Mosaic: <i>Acacia</i> Low Open Woodland/ <i>Acacia</i> Low Woodland	FP Mosaic mulga snakewood	Mosaic: Low Woodland of <i>Acacia paraneura</i> , <i>Acacia aptaneura</i> and <i>Acacia pruinocarpa</i> over Open Shrubland of <i>Acacia synchronicia</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> and <i>Ptilotus obovatus</i> over Very Open Tussock Grassland of * <i>Cenchrus ciliaris</i> ; Low Open Woodland of <i>Acacia xiphophylla</i> over High Open Shrubland of <i>Acacia synchronicia</i> and <i>Rhagodia eremaea</i> over Low Open Shrubland of <i>Maireana pyramidata</i> , <i>Maireana triptera</i> and <i>Sclerolaena cuneata</i> on red loamy sand on plains.
Mosaic: <i>Triodia</i> Hummock Grassland / <i>Acacia</i> High Open Shrubland	HS Mosaic low granite hills	Mosaic: Hummock Grassland of <i>Triodia epactia</i> , <i>Triodia basebowii</i> and <i>Triodia wiseana</i> with High Shrubland of <i>Acacia orthocarpa</i> and <i>Acacia inaequilatera</i> in brown loamy sand on low undulating granite hills; High Open Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> with Scattered Low Trees of <i>Terminalia canescens</i> and <i>Ficus brachypoda</i> over Very Open Hummock Grassland of <i>Triodia epactia</i> over Very Open Tussock Grassland of <i>Tripogon loliiformis</i> , <i>Aristida contorta</i> and <i>Sporobolus australasicus</i> on skeletal brown sandy loam on granite plateau / sheet outcrops.
	SA Mosaic granitic plains	Mosaic: Hummock Grassland of <i>Triodia lanigera</i> with High Open Shrubland of <i>Acacia ancistrocarpa</i> over Low Open Shrubland of <i>Acacia stellaticeps</i> ; High Open Shrubland of <i>Acacia tumida</i> subsp. <i>pilbarensis</i> with Scattered Low Trees of <i>Terminalia canescens</i> and <i>Ficus brachypoda</i> over Very Open Hummock Grassland of <i>Triodia epactia</i> (and Very Open Tussock Grassland of <i>Tripogon loliiformis</i>) on orange loamy sand on undulating granitic plains with granitic outcrops.
	SP Mosaic granite / calcrete	Mosaic: Hummock Grassland of <i>Triodia longiceps</i> , <i>Triodia angusta</i> and <i>Triodia wiseana</i> with Low Open Shrubland of <i>Acacia bivenosa</i> , <i>Acacia stellaticeps</i> and <i>Pluchea ferdinandi-muelleri</i> on brown sandy clay loam on stony calcrete plains; High Open Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> with Very Open Hummock Grassland of <i>Triodia epactia</i> over Very Open Tussock Grassland of <i>Tripogon loliiformis</i> on skeletal brown sandy clay loam on granite plateau / sheet outcrops.
Mosaic: <i>Triodia</i> Hummock Grassland	SA Mosaic sand plains	Mosaic: Hummock Grassland of <i>Triodia secunda</i> and <i>Triodia epactia</i> with Low Open Shrubland of <i>Acacia stellaticeps</i> over Scattered Tussock Grasses of <i>Sporobolus australasicus</i> ; Hummock Grassland of <i>Triodia epactia</i> and <i>Triodia lanigera</i> with Scattered Low Trees of <i>Corymbia hamersleyana</i> over High Open Shrubland of <i>Acacia inaequilatera</i> , <i>Acacia ancistrocarpa</i> and <i>Acacia coleii</i> var. <i>coleii</i> on red orange sandy clay loam on plains.
Mosaic: <i>Triodia</i> Open Hummock Grassland/ <i>Triodia</i> Hummock Grassland	HS Mosaic hill crests and slopes	Mosaic: Open Hummock Grassland of <i>Triodia lanigera</i> , <i>Triodia basedowii</i> and <i>Triodia epactia</i> with Scattered Low Trees of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> over Low Open Shrubland of <i>Acacia atkinsiana</i> and <i>Acacia bivenosa</i> in brown sandy loam on hill crests and hill slopes; Hummock Grassland of <i>Triodia basedowii</i> and <i>Triodia pungens</i> with Low Woodland of <i>Acacia aptaneura</i> on brown sandy clay loam in drainage basins and on plains.

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<i>Pluchea</i> Low Shrubland	FP PfmPrCI Ta SauCpePd	Low Shrubland of <i>Pluchea ferdinandi-muelleri</i> , <i>Pluchea rubelliflora</i> and <i>Carrissa lanceolata</i> over Open Hummock Grassland of <i>Triodia angusta</i> and Very Open Tussock Grassland of <i>Sporobolus australasicus</i> , <i>Chloris pectinata</i> and <i>Panicum decompositum</i> on grey medium clay on crusting plains.
<i>Tecticornia</i> Low Open Heath	SF TdcTibMf Ep	Low Open Heath of <i>Tecticornia</i> sp. Dennys Crossing (K.A. Shepherd & J English KS552), <i>Tecticornia indica</i> subsp. <i>bidens</i> and <i>Muehlenbeckia florulenta</i> over Very Open Tussock Grassland of <i>Eragrostis pergracilis</i> on brown medium clay on saline flats and marsh.
<i>Themeda</i> Open Tussock Grassland	ME TtAinCa ChEI AmoPIAlu	Open Tussock Grassland of <i>Themeda triandra</i> , <i>Aristida inaequiglumis</i> and <i>Cymbopogon ambiguus</i> with Low Open Woodland of <i>Corymbia hamersleyana</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> over Open Shrubland of <i>Acacia monticola</i> , <i>Petalostylis labicheoides</i> and <i>Androcalva luteiflora</i> on red brown alluvium on minor and medium drainage lines.
<i>Themeda</i> Tussock Grassland	FP TtEaCc ChEx AdAaAmc	Tussock Grassland of <i>Themeda triandra</i> , <i>Eulalia aurea</i> and * <i>Cenchrus ciliaris</i> with Low Open Woodland of <i>Corymbia hamersleyana</i> and <i>Eucalyptus xerothermica</i> over High Open Shrubland of <i>Acacia dictyophleba</i> , <i>Acacia ancistrocarpa</i> and <i>Acacia macraneura</i> on brown silty clay loam on floodplains.
	GG TtEmuTmb EICHcfe AtpGrPI	Tussock Grassland of <i>Themeda triandra</i> , <i>Eriachne mucronata</i> and <i>Themeda</i> sp. Mt Barricade with Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> , <i>Corymbia hamersleyana</i> and <i>Corymbia ferriticola</i> over High Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Gossypium robinsonii</i> and <i>Petalostylis labicheoides</i> on red brown sandy loam in narrowly incised rocky drainage lines.
	ME TtCFEa ExEvCh PIAaApy	Tussock Grassland of <i>Themeda triandra</i> , <i>Chrysopogon fallax</i> and <i>Eulalia aurea</i> with Low Open Woodland of <i>Eucalyptus xerothermica</i> , <i>Eucalyptus victrix</i> and <i>Corymbia hamersleyana</i> and Shrubland of <i>Petalostylis labicheoides</i> , <i>Acacia pachyacra</i> and <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> on red sandy loam on medium drainage lines.
<i>Triodia</i> Closed Hummock Grassland	FP TITp AscAbMg	Closed Hummock Grassland of <i>Triodia longiceps</i> and <i>Triodia pungens</i> with Shrubland of <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> , <i>Acacia bivenosa</i> and <i>Melaleuca glomerata</i> on brown sandy clay loam on undulating floodplains.
	SA TbTI AsyAscElo Aa	Closed Hummock Grassland of <i>Triodia basedowii</i> and <i>Triodia longiceps</i> with High Shrubland of <i>Acacia synchronicia</i> , <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and <i>Eremophila longifolia</i> and Low Open Woodland of <i>Acacia aptaneura</i> on red brown clay loam on plains.
<i>Triodia</i> Hummock Grassland	CP TITe AbAstPfm	Hummock Grassland of <i>Triodia longiceps</i> and <i>Triodia epactia</i> with Low Open Shrubland of <i>Acacia bivenosa</i> , <i>Acacia stellaticeps</i> and <i>Pluchea ferdinandi-muelleri</i> on brown sandy clay loam on stony calcrete plains.
	CP TwTa Es AbPIApy	Hummock Grassland of <i>Triodia wiseana</i> and <i>Triodia angusta</i> with Open Mallee of <i>Eucalyptus socialis</i> subsp. <i>eucentrica</i> and Open Shrubland of <i>Acacia bivenosa</i> , <i>Petalostylis labicheoides</i> and <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> on light brown clay loam on calcrete plains and rises.
	FP Tb AaApr Eff	Hummock Grassland of <i>Triodia basedowii</i> with Low Open Woodland of <i>Acacia aptaneura</i> and <i>Acacia pruinocarpa</i> over Open Shrubland of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> on red sandy loam on floodplains.
	FP TbTp AaGb Go	Hummock Grassland of <i>Triodia basedowii</i> and <i>Triodia pungens</i> with Low Woodland of <i>Acacia aptaneura</i> and <i>Grevillea berryana</i> over Low Open Shrubland of <i>Gompholobium oreophilum</i> on brown sandy clay loam on drainage depressions.
	FP TsTI AbAsPfm	Hummock Grassland of <i>Triodia secunda</i> and <i>Triodia longiceps</i> with Low Open Shrubland of <i>Acacia bivenosa</i> , <i>Acacia stellaticeps</i> and <i>Pluchea ferdinandi-muelleri</i> on orange sandy clay loam on stony floodplains.
	FS Ts CdHc AanAiGw	Hummock Grassland of <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Open Woodland of <i>Corymbia deserticola</i> subsp. <i>deserticola</i> and <i>Hakea chordophylla</i> over Open Shrubland of <i>Acacia ancistrocarpa</i> , <i>Acacia inaequilatera</i> and <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> on red brown sandy loam on footslopes and stony plains.
	FS TsTpTw EI AbApaAan	Hummock Grassland of <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835), <i>Triodia pungens</i> and <i>Triodia wiseana</i> with Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and Open Shrubland of <i>Acacia bivenosa</i> , <i>Acacia pachyachra</i> and <i>Acacia ancistrocarpa</i> on red brown loam on footslopes and low undulating hills.

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HC Te AdCc Gw		Hummock Grassland of <i>Triodia epactia</i> with Open Shrubland of <i>Abutilon</i> sp. Dioicum and <i>Cajanus cinereus</i> and Scattered Tall Shrubs of <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> on brown silty loam on dolerite ridges.
HC Te AiAanAarr		Hummock Grassland of <i>Triodia epactia</i> with High Open Shrubland of <i>Acacia inaequilatera</i> and <i>Acacia ancistrocarpa</i> over Low Open Shrubland of <i>Acacia arrecta</i> on brown sandy loam on low undulating hills.
HC TeTI ArAiAb		Hummock Grassland of <i>Triodia epactia</i> and <i>Triodia lanigera</i> with Open Shrubland of <i>Acacia roborum</i> , <i>Acacia inaequilatera</i> and <i>Acacia bivenosa</i> on brown sandy loam on low dolerite/basalt hills.
HC Tw AiAb IrSao		Hummock Grassland of <i>Triodia wiseana</i> with High Open Shrubland of <i>Acacia inaequilatera</i> and <i>Acacia bivenosa</i> over Low Open Shrubland of <i>Indigofera rugosa</i> and <i>Senna artemisioides</i> subsp. <i>oligophylla</i> on red silty loam on dolerite hill crests
HC TwTbrTp EICH AmaGwAb		Hummock Grassland of <i>Triodia wiseana</i> , <i>Triodia brizoides</i> and <i>Triodia pungens</i> with Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Corymbia hamersleyana</i> over High Open Shrubland of <i>Acacia maitlandii</i> , <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> and <i>Acacia bivenosa</i> on red brown sandy loam on hill crests and upper hill slopes.
HS TbrTw EI AbPoSgg		Hummock Grassland of <i>Triodia brizoides</i> and <i>Triodia wiseana</i> with Scattered Low Trees of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> over Scattered Low Shrubs of <i>Acacia bivenosa</i> , <i>Ptilotus obovatus</i> and <i>Senna glutinosa</i> subsp. <i>glutinosa</i> on brown silty loam on scree slopes.
HS TbTeTw AtpGw AanAbAac		Hummock Grassland of <i>Triodia basedowii</i> , <i>Triodia epactia</i> and <i>Triodia wiseana</i> over High Open Shrubland of <i>Acacia tumida</i> subsp. <i>pilbarensis</i> and <i>Grevillea wickhamii</i> over Low Open Shrubland of <i>Acacia ancistrocarpa</i> , <i>Acacia bivenosa</i> and <i>Acacia acradenia</i> on red brown silty/sandy loam on undulating low hills and stony plains.
HS TeTbTw AorAi		Hummock Grassland of <i>Triodia epactia</i> , <i>Triodia basedowii</i> and <i>Triodia wiseana</i> with High Open Shrubland of <i>Acacia orthocarpa</i> and <i>Acacia inaequilatera</i> on brown loamy sand on low undulating granite hills.
HS TeTw Ch AiAan		Hummock Grassland of <i>Triodia epactia</i> and <i>Triodia wiseana</i> with Low Open Woodland of <i>Corymbia hamersleyana</i> over High Open Shrubland of <i>Acacia inaequilatera</i> and <i>Acacia ancistrocarpa</i> on red brown sandy loam on granite and quartz hill slopes and footslopes.
HS TITwTe AtpAerAcc AiAor		Hummock Grassland of <i>Triodia lanigera</i> , <i>Triodia wiseana</i> and <i>Triodia epactia</i> with High Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Acacia eriopoda</i> and <i>Acacia colei</i> var. <i>colei</i> in swales with High Open Shrubland of <i>Acacia inaequilatera</i> and <i>Acacia orthocarpa</i> on rises on red brown silty clay/sandy loam on undulating hills and swales.
HS Tp Ir Gp		Hummock Grassland of <i>Triodia pungens</i> with Low Shrubland of <i>Indigofera rugosa</i> and Scattered Low Trees of <i>Grevillea pyramidalis</i> on brown sandy loam on quartz and granite hill slopes.
HS TpTbTe Ch Ai		Hummock Grassland of <i>Triodia pungens</i> , <i>Triodia basedowii</i> and <i>Triodia epactia</i> with Scattered Low Trees of <i>Corymbia hamersleyana</i> over Scattered Tall Shrubs of <i>Acacia inaequilatera</i> on brown sandy clay loam on dolerite hill slopes.
HS TsTwTp EICH AhiAad		Hummock Grassland of <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835), <i>Triodia wiseana</i> and <i>Triodia pungens</i> with Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Corymbia hamersleyana</i> over Low Open Shrubland of <i>Acacia hilliana</i> and <i>Acacia adoxa</i> var. <i>adoxo</i> on red brown sandy loam on hill slopes.
HS Tw Cd AarAsiAb ArhAprAa		Hummock Grassland of <i>Triodia wiseana</i> with Low Open Woodland of <i>Corymbia deserticola</i> subsp. <i>deserticola</i> over Low Shrubland of <i>Acacia arrecta</i> , <i>Acacia sibirica</i> and <i>Acacia bivenosa</i> in red loamy sand on hill slopes with Low Open Woodland of <i>Acacia rhodophloia</i> , <i>Acacia pruinocarpa</i> and <i>Acacia aptaneura</i> on red sandy loam on rocky hill crests.
HS Tw EICHc AanAbAa		Hummock Grassland of <i>Triodia wiseana</i> with Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> , <i>Corymbia hamersleyana</i> and <i>Hakea chordophylla</i> and Open Shrubland of <i>Acacia ancistrocarpa</i> , <i>Acacia bivenosa</i> and <i>Acacia aptaneura</i> on red sandy loam on hill slopes.
HS TwTbrTs EIExCh PcaPasAhi		Hummock Grassland of <i>Triodia wiseana</i> , <i>Triodia brizoides</i> and <i>Triodia</i> sp. Shovelanna Hill with Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> , <i>Eucalyptus xerothermica</i> and <i>Corymbia hamersleyana</i> over Low Open Shrubland of <i>Ptilotus calostachyus</i> , <i>Ptilotus astrolasius</i> and <i>Acacia hilliana</i> on brown loam on eroded outcropping upper slopes and crests.

Broad Floristic Community	Vegetation Association (Onshore Environmental, 2014)	
	HS TwTpTs EI AprAaAan	Hummock Grassland of <i>Triodia wiseana</i> , <i>Triodia pungens</i> and <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Open Woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> over Open Shrubland of <i>Acacia pruinocarpa</i> , <i>Acacia aptaneura</i> and <i>Acacia ancistrocarpa</i> on red brown loam on plains and low hills.
	ME TpTb Ch AtpAcc	Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia basedowii</i> with Low Open Woodland of <i>Corymbia hamersleyana</i> over High Open Shrubland of <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Acacia colei</i> var. <i>colei</i> on red brown loamy sand on levee banks and floodplains.
	ME TpTI ExAciCh PIApyGr	Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia longiceps</i> with Low Woodland of <i>Eucalyptus xerothermica</i> , <i>Acacia citrinoviridis</i> and <i>Corymbia hamersleyana</i> over High Shrubland of <i>Petalostylis labicheoides</i> , <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> and <i>Gossypium robinsonii</i> on red brown clay loam on medium drainage lines and surrounding floodplains.
	MI TITe Ch AtrAanAac	Hummock Grassland of <i>Triodia longiceps</i> and <i>Triodia epactia</i> with Scattered Low Trees of <i>Corymbia hamersleyana</i> over High Shrubland of <i>Acacia trachycarpa</i> , <i>Acacia ancistrocarpa</i> and <i>Acacia acradenia</i> on brown loamy sand on minor drainage lines.
	SA Tb AaApr Aan	Hummock Grassland of <i>Triodia basedowii</i> with Scattered Tall Trees of <i>Acacia aptaneura</i> and <i>Acacia pruinocarpa</i> over High Open Shrubland of <i>Acacia ancistrocarpa</i> on red sand on sand plains.
	SA TeTI Ai Aco	Hummock Grassland of <i>Triodia epactia</i> and <i>Triodia lanigera</i> with Open Shrubland of <i>Acacia inaequilatera</i> over Open Tussock Grassland of <i>Aristida contorta</i> on red brown sandy clay loam on raised plains and quartz hills.
	SA TI AiAan Ast	Hummock Grassland of <i>Triodia lanigera</i> with High Open Shrubland of <i>Acacia inaequilatera</i> and <i>Acacia ancistrocarpa</i> over Low Open Shrubland of <i>Acacia stellaticeps</i> on red orange sandy loam on sandy plains.
	SA Tp Ev AccAst	Hummock Grassland of <i>Triodia pungens</i> with Low Woodland of <i>Eucalyptus victrix</i> over Low Shrubland of <i>Acacia colei</i> var. <i>colei</i> and <i>Acacia stellaticeps</i> on grey brown sandy loam on sandy plains.
	SD TscTb Ad CtCcuSc	Hummock Grassland of <i>Triodia schinzii</i> and <i>Triodia basedowii</i> with High Open Shrubland of <i>Acacia dictyophleba</i> over Low Open Shrubland of <i>Corchorus tectus</i> , <i>Crotalaria cunninghamii</i> and <i>Sida cardiophylla</i> on red sand on linear sand dunes.
	SP Tb AaApr AwAanAi	Hummock Grassland of <i>Triodia basedowii</i> with Low Open Woodland of <i>Acacia aptaneura</i> and <i>Acacia pruinocarpa</i> over Open Shrubland of <i>Acacia wanyu</i> , <i>Acacia ancistrocarpa</i> and <i>Acacia inaequilatera</i> on red brown silty loam on stony plains.
	SP TbTp HIAanAi Ch	Hummock Grassland of <i>Triodia basedowii</i> and <i>Triodia pungens</i> with High Open Shrubland of <i>Hakea lorea</i> subsp. <i>lorea</i> , <i>Acacia ancistrocarpa</i> and <i>Acacia inaequilatera</i> and Scattered Low Trees of <i>Corymbia hamersleyana</i> on red brown loamy sand on stony plains.
	SP TITe Ai AanAb	Hummock Grassland of <i>Triodia lanigera</i> and <i>Triodia epactia</i> with High Open Shrubland of <i>Acacia inaequilatera</i> over Low Open Shrubland of <i>Acacia ancistrocarpa</i> and <i>Acacia bivenosa</i> on orange loamy sand on sandy plains.
	SP TpTb AccAi AccAan	Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia basedowii</i> with High Open Shrubland of <i>Acacia colei</i> var. <i>colei</i> and <i>Acacia inaequilatera</i> over Shrubland of <i>Acacia colei</i> var. <i>colei</i> and <i>Acacia ancistrocarpa</i> on red brown sandy loam on stony plains.
	SP TpTb Eg PIAbAan	Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia basedowii</i> with Open Mallee of <i>Eucalyptus gamophylla</i> and Shrubland of <i>Petalostylis labicheoides</i> , <i>Acacia bivenosa</i> and <i>Acacia ancistrocarpa</i> on red brown loamy sand on stony plains and footslopes.
	SP Ts Ai	Hummock Grassland of <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) with High Open Shrubland of <i>Acacia inaequilatera</i> on red brown loamy sand on hill slopes and stony plains.
	SP TsTwTp EgEt AbApaApr	Hummock Grassland of <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835), <i>Triodia wiseana</i> and <i>Triodia pungens</i> with Very Open Mallee of <i>Eucalyptus gamophylla</i> and <i>Eucalyptus trivalva</i> over Open Shrubland of <i>Acacia bivenosa</i> , <i>Acacia pachyacra</i> and <i>Acacia pruinocarpa</i> on red brown sandy loam and clay loam on stony plains.

Broad Floristic Community	Vegetation Association (Onshore Environmental, 2014)	
<i>Triodia</i> Open Hummock Grassland	GR Te AdTmaCci PclCc	Open Hummock Grassland of <i>Triodia epactia</i> with Open Shrubland of <i>Abutilon</i> sp. Dioicum, <i>Triumfetta maconochieana</i> and <i>Cajanus cinereus</i> over Very Open Tussock Grassland of <i>Paspaidium clementii</i> and * <i>Cenchrus ciliaris</i> on skeletal brown loamy sand on granite rockpiles.
	HC TbTp EI AatAmmAma	Open Hummock Grassland of <i>Triodia basedowii</i> and <i>Triodia pungens</i> with Scattered Low Trees of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> over Open Shrubland of <i>Acacia atkinsiana</i> , <i>Acacia marramamba</i> and <i>Acacia maitlandii</i> on brown sandy loam on hill crests and hill slopes.
	HC TbTp EICh AmoApy	Open Hummock Grassland of <i>Triodia basedowii</i> and <i>Triodia pungens</i> with Low Open Woodland of <i>Eucalyptus leucophloia</i> and <i>Corymbia hamersleyana</i> over Open Shrubland of <i>Acacia monticola</i> and <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> on brown sandy loam on hill slopes and hill crests.
	MI TeTb Ch CciApy	Open Hummock Grassland of <i>Triodia epactia</i> and <i>Triodia basedowii</i> with Scattered Low Trees of <i>Corymbia hamersleyana</i> over Open Shrubland of <i>Cajanus cinereus</i> and <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> on red sandy loam on minor drainage lines.
	SA TI AanApa ApaAprCh	Open Hummock Grassland of <i>Triodia lanigera</i> with Open Shrubland of <i>Acacia ancistrocarpa</i> and <i>Acacia pachyacra</i> and Scattered Low Trees of <i>Acacia paraneura</i> , <i>Acacia pruinocarpa</i> and <i>Corymbia hamersleyana</i> on red sandy loam on stony plains.
	SA TI CzCh Ai IalmTbc	Open Hummock Grassland of <i>Triodia lanigera</i> with Low Open Woodland of <i>Corymbia zygophylla</i> and <i>Corymbia hamersleyana</i> over Open Shrubland of <i>Acacia inaequilatera</i> over Low Open Shrubland of <i>Isotropis atropurpurea</i> , <i>Indigofera monophylla</i> and <i>Tephrosia</i> sp. Bungaroo Creek (M.E. Trudgen 11601) on orange red loamy sand on sand plains.
	SP TpTm AaExAca ApaEffAad	Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia melvillei</i> with Low Open Woodland of <i>Acacia aptaneura</i> , <i>Eucalyptus xerothermica</i> and <i>Acacia catenulata</i> subsp. <i>occidentalis</i> and Open Shrubland of <i>Acacia pachyacra</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> and <i>Acacia adsurgens</i> on red brown clay loam or silty loam on stony plains and floodplains.
<i>Typha</i> Sedges	MA TdCv EcEv AciAcp	Sedges of <i>Typha domingensis</i> and <i>Cyperus vaginatus</i> with Open Woodland of <i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i> and <i>Eucalyptus victrix</i> over Low Open Woodland of <i>Acacia citrinoviridis</i> and <i>Acacia coriacea</i> subsp. <i>pendens</i> on brown clayey sand on permanent pools along major drainage lines.

ENV (2008a) mapped a total of 14 broad floristic communities with 14 vegetation associations within the Amendment Application Area (Table 7; Figures 3-41 to 3-51).

Table 7: Vegetation associations of the Amendment Application Area: Chainage 313 to 401 (ENV, 2008a)

Broad Floristic Community	Vegetation Association (ENV, 2008a)	
<i>Acacia aneura</i> open woodland	AaAnTp/*Cc	<i>Acacia aneura</i> (mixed subspecies) low open woodland over <i>Acacia ancistrocarpa</i> shrubland over <i>Triodia pungens</i> open hummock grassland over * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Acacia aneura</i> shrubland	AaAsCf/*Cc	<i>Acacia aneura</i> (mixed subspecies), <i>Acacia ancistrocarpa</i> , <i>Acacia pruinocarpa</i> and <i>Acacia synchronicia</i> shrubland over <i>Triodia pungens</i> very open hummock grassland over <i>Chrysopogon fallax</i> and * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Acacia citrinoviridis</i> woodland/shrubland - drain / riparian	AcAs*Cc	<i>Acacia citrinoviridis</i> and mixed <i>Acacia</i> species high shrubland over * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Acacia dictyophleba</i> shrubland	AdAnTp/*Cc	<i>Acacia dictyophleba</i> high open shrubland over mixed <i>Acacia</i> shrubland over <i>Triodia pungens</i> open hummock grassland over * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Acacia dictyophleba</i> and <i>Acacia ancistrocarpa</i> high shrubland – drain / riparian	AdTp	<i>Acacia dictyophleba</i> , <i>Acacia marramamba</i> and <i>Acacia ancistrocarpa</i> high shrubland over <i>Triodia pungens</i> very open hummock grassland over * <i>Cenchrus ciliaris</i> , <i>Chrysopogon fallax</i> tussock grassland.

Broad Floristic Community	Vegetation Association (ENV, 2008a)	
<i>Acacia pruinocarpa</i> low woodland	ApAsCf/*Cc	<i>Acacia pruinocarpa</i> low woodland over mixed <i>Acacia</i> shrubland over <i>Chrysopogon fallax</i> and * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Acacia pruinocarpa</i> shrubland over <i>Senna artemisioides</i> scrub	ApSaCf	<i>Acacia pruinocarpa</i> and mixed <i>Acacia</i> species shrubland over <i>Senna artemisioides</i> (mixed subspecies) low shrubland over <i>Chrysopogon fallax</i> and * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Acacia synchronicia</i> shrubland	AsTp*Cc	<i>Acacia synchronicia</i> and mixed <i>Acacia</i> species shrubland over <i>Triodia pungens</i> hummock grassland over * <i>Cenchrus ciliaris</i> and <i>Chrysopogon fallax</i> tussock grassland.
<i>Corymbia aspera</i> low open woodland	CaAn*Cc	<i>Corymbia aspera</i> low open woodland over mixed <i>Acacia</i> species shrubland over <i>Triodia pungens</i> open hummock grassland over * <i>Cenchrus ciliaris</i> open tussock grassland.
<i>Corymbia hamersleyana</i> woodland - plains	ChAp*Cc	<i>Corymbia hamersleyana</i> , <i>Corymbia semiclara</i> and <i>Corymbia</i> aff. <i>opaca</i> scattered low trees over mixed <i>Acacia</i> shrubland over <i>Triodia basedowii</i> and <i>Triodia pungens</i> very open hummock grassland over * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Eucalyptus gamophylla</i> low open mallee woodland	EgApTp	<i>Eucalyptus xerothermica</i> low open woodland over <i>Eucalyptus gamophylla</i> low open mallee woodland over mixed <i>Acacia</i> shrubland over <i>Triodia pungens</i> open hummock grassland over * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> low open woodland on hill slopes	EIAaTw/Tp	<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> low open woodland over <i>Acacia aneura</i> var. <i>aneura</i> , <i>Acacia bivenosa</i> , <i>Senna glutinosa</i> subsp. <i>glutinosa</i> shrubland over <i>Triodia wiseana</i> , <i>Triodia pungens</i> , <i>Triodia</i> sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland over * <i>Cenchrus ciliaris</i> open tussock grassland.
<i>Eucalyptus victrix</i> low woodland - drains / riparian	EvAc*Cc	<i>Eucalyptus victrix</i> low woodland over mixed <i>Acacia</i> species shrubland over <i>Triodia pungens</i> very open hummock grassland over * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Eucalyptus xerothermica</i> low open woodland - riparian	ExAa*Cc	<i>Eucalyptus xerothermica</i> low open woodland over mixed <i>Acacia citrinoviridis</i> and other <i>Acacia</i> species shrubland over <i>Triodia pungens</i> open hummock grassland over * <i>Cenchrus ciliaris</i> open tussock grassland.

ENV (2008b) mapped a total of 12 broad floristic communities with 12 vegetation associations within the Amendment Application Area (Table 8; Figure 3-44).

Table 8: Vegetation associations of the Amendment Application Area: Chainage 334 to 336 (ENV, 2008b)

Broad Floristic Community	Vegetation Association (ENV, 2008b)	
<i>Maireana triptera</i> low shrubland	AsMtTp	<i>Acacia synchronicia</i> scattered tall shrubs scattered over <i>Maireana triptera</i> and <i>Eremophila cuneifolia</i> low shrubland over <i>Triodia pungens</i> and * <i>Cenchrus ciliaris</i> scattered tussock grasses.
<i>Corymbia candida</i> subsp. <i>dipsodes</i> low open woodland – drainage line	CcGwTb	<i>Corymbia candida</i> subsp. <i>dipsodes</i> , <i>Corymbia hamersleyana</i> and <i>Eucalyptus gamophylla</i> low open woodland over <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> , <i>Acacia dictyophleba</i> and <i>Eremophila longifolia</i> open shrubland over <i>Keraudrenia velutina</i> subsp. <i>elliptica</i> over <i>Triodia basedowii</i> open hummock grassland.
Highly degraded * <i>Vachellia farnesiana</i> open shrubland	Ch*Vf*Cc	<i>Eucalyptus camaldulensis</i> var. <i>obtusa</i> and <i>Corymbia hamersleyana</i> low open woodland over <i>Acacia pruinocarpa</i> , <i>A. sclerosperma</i> subsp. <i>sclerosperma</i> and <i>A. synchronicia</i> high shrubland over <i>A. tetragonophylla</i> and * <i>Vachellia farnesiana</i> open shrubland over * <i>Cenchrus ciliaris</i> open tussock grassland.
Highly degraded – former quarry works	ChApTb	<i>Corymbia hamersleyana</i> scattered low trees over <i>Acacia pruinocarpa</i> scattered shrubs over <i>Triodia basedowii</i> very open hummock grassland over <i>Aristida inaequiglumis</i> , <i>A. contorta</i> and * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Acacia pruinocarpa</i> high shrubland	ChAp*Tp	<i>Corymbia hamersleyana</i> scattered low trees over <i>Acacia pruinocarpa</i> and mixed <i>Acacia</i> spp. high shrubland over <i>Triodia pungens</i> open hummock grassland.

Broad Floristic Community	Vegetation Association (ENV, 2008b)	
<i>Corymbia hamersleyana</i> open woodland	ChGwTb/Tw	<i>Corymbia hamersleyana</i> and <i>Eucalyptus gamophylla</i> low open woodland over <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> , <i>Acacia pyrifolia</i> and <i>A. pruinocarpa</i> high shrubland over <i>Keraudrenia velutina</i> subsp. <i>elliptica</i> low scattered shrubs over <i>Triodia basedowii</i> and <i>T. wiseana</i> open hummock grassland.
Former drainage line	EcAa*Cc	<i>Eucalyptus camaldulensis</i> var. <i>obtusata</i> , <i>Corymbia hamersleyana</i> low open woodland over <i>Acacia aneura</i> var. <i>pilbarana</i> scattered shrubs over * <i>Cenchrus ciliaris</i> and <i>Aristida inaequiglumis</i> very open tussock grassland.
Acacia ancistrocarpa shrubland-floodplain	EgAaTp	<i>Eucalyptus gamophylla</i> and <i>E. xerothermica</i> low open woodland over mixed <i>Acacia</i> spp. shrubland over <i>Triodia pungens</i> very open hummock grassland over * <i>Cenchrus ciliaris</i> tussock grassland.
<i>Eucalyptus xerothermica</i> and <i>Acacia aneura</i> var. <i>pilbarana</i> high shrubland	Ex/AaAsTp	<i>Eucalyptus xerothermica</i> and <i>Acacia aneura</i> var. <i>pilbarana</i> over <i>Acacia</i> spp., <i>Eremophila</i> spp. <i>Ptilotus obovatus</i> var. <i>obovatus</i> , <i>Psydrax latifolia</i> and <i>Anthobolus leptomerioides</i> open shrubland over <i>Maireana triptera</i> low open shrubland over <i>Triodia pungens</i> and * <i>Cenchrus ciliaris</i> hummock/tussock grassland.
<i>Acacia paraneura</i> low woodland	Ex/ApTp	<i>Acacia paraneura</i> low woodland over <i>A. sclerosperma</i> subsp. <i>sclerosperma</i> , <i>A. aneura</i> and <i>A. synchronicia</i> and <i>Eremophila</i> spp. shrubland over <i>Triodia pungens</i> hummock grassland over * <i>Cenchrus ciliaris</i> scattered grasses.
<i>Eucalyptus xerothermica</i> and <i>E. gamophylla</i> woodland	Ex/EgAsTp	<i>Eucalyptus xerothermica</i> and <i>E. gamophylla</i> low woodland over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and other mixed <i>Acacia</i> spp. open shrubland over <i>Triodia pungens</i> hummock grassland.
<i>Triodia angusta</i> hummock grassland	ExAsTa	<i>Eucalyptus xerothermica</i> scattered low trees over <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> and other <i>Acacia</i> spp. shrubland over <i>Triodia angusta</i> hummock grassland.

Spectrum Ecology & Spatial (2022) mapped a total of three broad floristic communities with eight vegetation associations within the Amendment Application Area (Table 9; Figure 3-51).

Table 9: Vegetation associations of the Amendment Application Area: Chainage 399 to 405 (Spectrum Ecology & Spatial, 2022)

Broad Floristic Formation	Vegetation Association Description (Spectrum Ecology & Spatial, 2022)	
Acacia Open Shrubland	SS TeAsEse	Open hummock grassland of <i>Triodia epactia</i> and <i>Triodia angusta</i> with very open tussock grassland of * <i>Cenchrus ciliaris</i> under Open shrubland of <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> , <i>Stylobasium spathulatum</i> , and <i>Senna artemisioides</i> subsp. <i>oligophylla</i> . over and low open woodland of <i>Eucalyptus socialis</i> subsp. <i>eucentrica</i> or <i>Corymbia hamersleyana</i> on orange sandy stone plains.
	SA AinErer	High open shrubland of <i>Acacia incurvaneura</i> , (+/-) <i>Acacia catenulata</i> subsp. <i>occidentalis</i> , and <i>Acacia ayersiana</i> over scattered tussock grasses of <i>Eragrostis eriopoda</i> , <i>Eriachne helmsii</i> , and or <i>Digitaria brownii</i> on orange sandy clay plains.
	SA AaCocTb	Open shrubland of <i>Acacia aptaneura</i> with lower shrubland of <i>Grevillea striata</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> with low open woodland of <i>Corymbia candida</i> over very open hummock grassland of <i>Triodia basedowii</i> and very open tussock grassland of <i>Aristida pruinosa</i> , and * <i>Cenchrus ciliaris</i> on orange sandy clay plains.
Eucalyptus Open Woodland	MI EgAdTp	Low open woodland of <i>Eucalyptus gamophylla</i> over tall shrubland of <i>Acacia dictyophleba</i> , <i>Petalostylis labicheoides</i> and <i>Grevillea wickhamii</i> over hummock grassland of <i>Triodia pungens</i> on orange sandy clay in minor drainage line.
	MA EcoAciCyix	Low open woodland of <i>Eucalyptus camaldulensis</i> and <i>Eucalyptus victrix</i> over high open shrubland of <i>Acacia citrinoviridis</i> and (+/-) <i>Melaleuca glomerata</i> over very open sedgeland of <i>Cyperus ixiocarpus</i> and <i>Cyperus vaginatus</i> with very open tussock grassland of * <i>Cenchrus ciliaris</i> on orange sandy clay in major creek lines.

Broad Floristic Formation	Vegetation Association Description (Spectrum Ecology & Spatial, 2022)	
	ME EIIAcITt	Low open woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Eucalyptus victrix</i> over high open shrubland of <i>Acacia citrinoviridis</i> , <i>Acacia monticola</i> , and <i>Gossypium robinsonii</i> over very open tussock grassland of <i>Themeda triandra</i> , and * <i>Cenchrus ciliaris</i> tall sparse grassland with open hummock grassland of <i>Triodia pungens</i> on orange sandy clay in medium drainage line.
Triodia Hummock Grassland	HS TsAbEII	Hummock grassland of <i>Triodia vanleeuwenii</i> and <i>Triodia pungens</i> with very open tussock grassland of <i>Eriachne lanata</i> under open shrubland of <i>Acacia bivenosa</i> and or <i>Acacia hilliana</i> and woodland of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> on stony hillslopes.
	UH TsSeglCh	Hummock grassland of <i>Triodia vanleeuwenii</i> , and <i>Triodia pungens</i> with very open tussock grassland of <i>Paraneurachne muelleri</i> under open shrubland of <i>Senna glutinosa</i> subsp. x <i>luerissenii</i> , (+/-) <i>Acacia bivenosa</i> and <i>Grevillea wickhamii</i> subsp. <i>aprica</i> and woodland of <i>Corymbia deserticola</i> subsp. <i>deserticola</i> , <i>Corymbia hamersleyana</i> , and <i>Eucalyptus gamophylla</i> on orange sandy stone undulating low hills.

None of these vegetation associations detailed in **Tables 4 to 9** are representative of a Threatened Ecological Community (TEC).

The Amendment Application Area intersects the boundary of one TEC: the Ethyl Gorge aquifer stygobiont community (**Figures 2-51 to 2-53**). Clearing of vegetation is unlikely to impact this subterranean community. No other TECs are located in the Amendment Application Area.

One Priority Ecological Community (PEC), Fortescue Marsh (Marsh Land System), occurs within the Amendment Application Area (**Figures 2-27 and 2-28**). Any disturbance within the Fortescue Marsh (Marsh Land System) (**Figure 1-1**) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.

While not mapped as part of the Fortescue Marsh (Marsh Land System) PEC a small amount of vegetation association SF TdcTibMf Ep which is associated with the PEC has been identified in the Amendment Application Area (**Figure 1-1 and Figures 3-27 to 3-28**) (Onshore, 2014a). Any disturbance within Vegetation Association SF TdcTibMf Ep (**Figure 1-1**) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.

The Amendment Application Area also intersects the buffer of the following PEC:

- Brockman Iron cracking clay communities of the Hamersley Range (Priority 1) (**Figure 2-27**).

None of the vegetation associations within the Amendment Application Area are associated with this PECs.

One Environmentally Sensitive Area (ESA) occurs within the Amendment Application Area: Fortescue Marsh. Any disturbance within the Fortescue Marsh ESA (**Figure 1-1**) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.

Vegetation condition within the Amendment Application Area ranges from Completely Degraded to Excellent. Vegetation adjacent to the Amendment Application Area is in similar or better condition to the vegetation of the Amendment Application Area.

Constant rail maintenance requirements and upgrades combined with the narrow rail corridor makes it likely that areas of disturbance that have been revegetated will be disturbed in the future. It is BHP's intent that while some areas will be revegetated, they will not be termed rehabilitated until closure of the rail line. The success of the rehabilitation programme will be assessed at this stage.

3.4.3 Weeds

Forty four introduced flora species (weeds) have been recorded within the Amendment Application Area, three of which are listed as Declared Pests (**Table 10**).

Control of established weed populations will be carried out according to BHP's standard *Weed Control and Management Procedures* and Condition 10 of CPS 7009/3.

Table 10: Introduced Flora Recorded within the Amendment Application Area

Species	Common Name	DPAW Rating (DPAW, 2016)	Declared Pest ¹
* <i>Aerva javanica</i>	Kapok Bush	High and Rapid	No
* <i>Argemone ochroleuca</i>	Mexican Poppy	Unknown and Rapid	No
* <i>Bidens bipinnata</i>	Bipinnate Beggartick	Unknown and Rapid	No
* <i>Bidens pilosa</i>	Cobbler's Pegs	Unknown and Rapid	No
* <i>Brassica tournefortii</i>	Mediterranean Turnip	High and Rapid	No
* <i>Calotropis procera</i>	Sodam Apple	Not listed	Yes
* <i>Cenchrus ciliaris</i>	Buffel Grass	High and Rapid	No
* <i>Cenchrus echinatus</i>	Burrgrass	Medium and Rapid	No
* <i>Cenchrus setiger</i>	Birdwood Grass	High and Rapid	No
* <i>Chloris barbata</i>	Purpletop Chloris	High and Rapid	No
* <i>Chloris virgata</i>	Feathertop Rhodes Grass	High and Rapid	No
* <i>Citrullus amarus</i>	Pie Melon	Unknown and Moderate	No
* <i>Citrullus colocynthis</i>	Wild Watermelon	Unknown and Moderate	No
* <i>Coccinia grandis</i>	Scarlet Gourd	Not listed	Yes
* <i>Cynodon dactylon</i>	Couch	High and Rapid	No
* <i>Cynodon nlemfuensis</i> var. <i>nlemfuensis</i>	African Stargrass	Not listed	No
* <i>Datura leichhardtii</i>	Native Thornapple	Unknown and Unknown	No
* <i>Digitaria ciliaris</i>	Summer Grass	Not listed	No
* <i>Echinochloa colona</i>	Awnless Barnyard Grass	High and Rapid	No
* <i>Erigeron bonariensis</i>	Flaxleaf Fleabane	Not listed	No
* <i>Euphorbia hirta</i>	Asthma Plant	Low and Slow	No
* <i>Flaveria trinervia</i>	Speedy Weed	Not listed	No
* <i>Indigofera oblongifolia</i>		Not listed	No
* <i>Lactuca serriola</i>	Prickly Lettuce	Not listed	No
* <i>Leucaena leucocephala</i>	Leucaena	Not listed	No
* <i>Lysimachia arvensis</i>	Scarlet Pimpernel	Not listed	No
* <i>Malvastrum americanum</i>	Spiked Malvastrum	High and Rapid	No
* <i>Melinis repens</i>	Natal Grass	Not listed	No
* <i>Passiflora foetida</i>	Stinking Passion Flower	Not listed	No
* <i>Phoenix dactylifera</i>	Date Palm	High and Rapid	No
* <i>Rumex vesicarius</i>	Ruby Dock	High and Rapid	No
* <i>Setaria verticillata</i>	Whorled Pigeon Grass	High and Rapid	No
* <i>Sigesbeckia orientalis</i>	Indian Weed	Unknown and Rapid	No
* <i>Sisymbrium orientale</i>	Indian Hedge Mustard	Low and Unknown	No
* <i>Solanum nigrum</i>	Black Berry Nightshade	Low and Unknown	No
* <i>Sonchus asper</i>	Spiny Sowthistle	Not listed	No
* <i>Sonchus oleraceus</i>	Common Sowthistle	Low and Rapid	No
* <i>Stylosanthes hamata</i>	Verano Stylo	High and Moderate	No
* <i>Tamarix aphylla</i>	Athel Tree	High and Rapid	Yes
* <i>Trianthema portulacastrum</i>	Giant Pigweed	Not listed	No
* <i>Tribulus terrestris</i>	Caltrop	Unknown and Moderate	No
* <i>Tridax procumbens</i>	Tridax	Not listed	No
* <i>Vachellia farnesiana</i>	Mimosa Bush	High and Rapid	No
* <i>Washingtonia filifera</i>	Cotton Palm	High and Rapid	No

¹ Biosecurity and Agriculture Management Act, 2007 (BAM Act) s22

3.4.4 Fauna Habitats

Biologic (2017) undertook a consolidation of fauna habitat mapping across BHP's tenure (**Appendix 11**). This project developed standard fauna habitats for use across BHP's site. Three areas of the Amendment Application Area are not covered by the consolidation project:

1. Port Hedland (Finucane Island): Covered by the *BHP Western Australian Iron Ore Windfence Flora and Fauna Assessment Level 1 Fauna and Reconnaissance Flora Survey* (GHD, 2020a) (**Appendix 2**).
2. Port Hedland to Chainage 14; Chainage 33 to Chainage 38: Covered by the *Port Hedland Regional Fauna Assessment* (ENV, 2011b) (**Appendix 12**);
3. Chainage 313 to Chainage 401: Covered by the *Rapid Growth Project 5: Jimblebar Junction to Yandi Junction Railway Reserve and Repeaters 6, 7 and 8 Fauna Assessment* (ENV, 2008c) (**Appendix 14**);
4. Quarry 6: *Rapid Growth Project 5: Quarry 6 Fauna Assessment* (ENV, 2008d) (**Appendix 15**).
5. Chainage 402 to 407: *East Ophthalmia and Ninga Detailed Vertebrate Fauna Survey* (Biologic, 2022a) (**Appendix 8**).

GHD (2020a) mapped one fauna habitats within the Amendment Application Area (**Figure 4-1**):

1. **Mangroves:** *Avicennia marina* dominated woodland over sparse low shrubs. This habitat is located along the western edge of the survey area. It is periodically inundated during high tides and as such has very little understory species. The mangrove trees have a closed canopy over most of the area providing refuge for bats and birds for both hunting and nesting/roosting. The trees within the survey area did not appear to contain any hollows suitable for nesting or roosting. A complex root system provides microhabitats for small ground dwelling fauna as well as foraging habitat for shorebirds.

ENV (2011b) mapped a total of seven fauna habitats within the Amendment Application Area (**Figures 4-1 to 4-6**):

1. **Beach / Dunal:** The Beach/Dunal habitat type is the buffer zone that exists between the sea and land. The vegetation of this habitat type is characterised by scattered *Acacia bivenosa* shrubs over *Cenchrus ciliaris* (Buffel Grass) open tussock grassland. Given the large tides experienced in the Port Hedland region this habitat type is in continual change. Above the high tide mark limestone outcrops and sand dunes provide roost and nest locations for marine and shorebirds.
2. **Billabong:** single Billabong, known as Coolarin Pool, was located in the study area. At the time of the survey Coolarin Pool contained surface water and was an important source of water for local fauna including many waterbirds.
3. **Mangroves:** Like the Tidal Flats, Mangrove habitat type is dominated by the tides and is in a constant transition between marine and terrestrial habitats. It differs from the Tidal Flats by the fact that it is dominated by thick groves of Mangrove trees. The vegetation of this habitat type is characterised by high closed *Rhizophora stylosa* and *Avicennia marina* shrubland. The Mangrove trees create a range of microhabitats in the form of tree hollows and foliage for birds to forage, roost and nest in. The Mangroves supports a unique faunal assemblage of Mangrove specialists such as the Mangrove Golden Whistler (*Pachycephala melanura*) and Mangrove Grey Fantail (*Rhipidura phasiana*).
4. **Riverine:** The vegetation of this habitat type is characterised by low open *Eucalyptus victrix* woodland over a high open *Melaleuca – Acacia* shrubland over open *Triodia epactia* hummock grassland. A large diversity of microhabitats are present in this habitat and include tree hollows, logs, leaf litter, thick vegetation and soft soil suitable for digging and burrowing fauna. Isolated areas of surface water were still present during the survey providing an important water source for the local fauna and shorebirds including those classified as Migratory under the EPBC Act. This habitat type contains mature eucalypt trees that are larger than other trees in the surrounding plains. These trees that line the watercourses most likely function as wildlife corridors. In particular, birds, bats, large mammals (such as the *Euro Macropus robustus*) and wide-ranging reptiles (such as snakes and goannas) are likely to use these drainage lines as a corridor for dispersal.
5. **Rockpile:** Like the Low Hills these habitat features are isolated stony habitats in areas dominated by flat sandy terrain. As such they provide small pockets of habitat for rock dwelling reptile species such as *Gehyra punctata* and *Egernia depressa*.

6. **Sandplain:** The vegetation structure consists of a Low *Acacia* shrublands over *Triodia* hummock grasslands. A moderate diversity of microhabitats was present and includes shrubs, grass hummocks and leaf litter. In addition, the soils were suitable for digging and burrowing animals.
7. **Tidal Flats:** The Tidal Flats are dominated by the tides and is in constant transition between marine and terrestrial habitats. At high tide most of the habitat type is inundated with seawater, however some areas of mudflats remain dry until the highest tides. The vegetation of this habitat type is characterised by scattered *Avicennia marina* shrubs over a low open *Tecticornia* spp. shrubland.

Biologic (2017) mapped a total of 15 fauna habitats within the Amendment Application Area (**Figures 4-4 to 4-41, 4-43, 4-44, 4-48, 4-49 and 4-51 to 4-53**):

1. **Artificial Northern Quoll Habitat:** Artificial habitats are habitats that have being altered by human activity that are known to support Northern Quoll.
2. **Boulders:** This habitat occurs where the surrounding material has eroded, exposing boulders. Boulder piles provide excellent crevices and cracks for fauna to inhabit. Vegetation is sparse through these areas due to the lack of soil availability. They are almost always surrounded by sand plains.
3. **Crest / Slope:** These fauna habitats tend to be more open and structurally simple due to their recent depositional history than other fauna habitats, and are dominated by varying species of spinifex. A common feature of these habitats is a rocky substrate, often with exposed bedrock, and skeletal red soils. These are usually dominated by *Eucalyptus* woodlands, *Acacia* and *Grevillea* scrublands and *Triodia* spp. low hummock grasslands.
4. **Drainage Area:** Characterised by *Eucalyptus xerothermica* and *Corymbia hamersleyana* woodland over broad-leafed *Acacia* shrubland on sandy loam soils sometimes with exposed rocky areas. These can have high vegetation density, complexity and diversity, and because they tend to occur on accretional or depositional areas, and often have deeper and richer soils than other fauna habitats. Grasses tend to be dominated by tussock grasses rather than spinifex, or the weed Buffel Grass **Cenchrus ciliaris*.
5. **Drainage Line:** Drainage Lines are low lying, linear, gently sloping areas and tend not to support moderately dense *Eucalypt* forest (unlike Major Drainage Line). This habitat tends not to be associated with ridgelines and hills (unlike Minor Drainage Line).
6. **Fortescue Marsh Samphire:** Samphire is generally considered a hostile environment with extreme heat and salinity in waterlogged soils. The vegetation consists of members of the family Chenopodiaceae (genus *Tecticornia*).
7. **Gilgai:** Often associated with tussock grasses. Cracking clay soils, usually contain weak crabhole (gilgai) microrelief, and which are generally saline at depth. Surface mantles are absent or common to abundant as pebbles and cobbles of ironstone, basalt and other rocks.
8. **Gorge / Gully:** Gorges and gullies are rugged, steep-sided valleys incised into the surrounding landscape. Gorges tend to be deeply incised, with vertical cliff faces, while gullies are more open (but not as open 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.
9. **Granite Domes:** This habitat occurs where the surrounding material has eroded, exposing large domes. Exfoliating rock on the granite domes provide excellent crevices and cracks for fauna to inhabit. Vegetation is sparse through these areas due to the lack of soil availability. They are almost always surrounded by sand plains.
10. **Major Drainage Line:** Major Drainage Lines comprise mature River Red Gums, Coolibahs and stands of Silver Cadjeput over river pools. Open, sandy or gravelly riverbeds characterise this habitat type. In ungrazed areas, the vegetation adjacent to the main channel or channels is denser, taller and more diverse than adjacent terrain and can include reedbeds around pools.
11. **Minor Drainage Line:** Located within the minor gullies and depressions, generally through the Crest/Slope habitat. Consists primarily of *Acacia* low shrubland. The understorey generally lacks density and often consists solely of sparse tussock grassland, often including the weed Buffel Grass **Cenchrus ciliaris* where it has been introduced. The substrate can be sandy in places but generally consists of a skeletal loam gravel or stone.

12. **Mulga:** This habitat includes woodlands and other ecosystems in which Mulga (*Acacia aneura*) is dominant, either as the principal *Acacia* species or mixed with others. It consists of disintegrating groves on stony soils with spinifex. This habitat type is grouped with other habitat occurring on the plains; however it is noted that small groves of Mulga occur on ridgelines.
13. **Sand Plain:** Sand Plain habitat is characterised by relatively deep sandy soils supporting dense spinifex grasslands and sparse shrubs. This habitat transitions into patches of Mulga in places. This habitat often occurs as terraces along Major Drainage Lines.
14. **Sandy / Stony Plain:** These are predominantly stony plains with localised depositions of sand.
15. **Stony Plain:** These are erosional surfaces of gently undulating plains, ridges and associated footslopes. Mainly support hard spinifex (and occasionally soft spinifex) with a mantle of gravel and pebbles.

ENV (2008c) mapped a total of seven fauna habitats within the Amendment Application Area (**Figures 4-41 to 4-51**):

1. **Floodplain:** *Corymbia aspera* low open woodland over mixed *Acacia* species shrubland over *Triodia pungens* open hummock grassland over **Cenchrus ciliaris* open tussock grassland.
2. **Low Rise:** *Eucalyptus gamophylla* low open mallee woodland over mixed *Acacia* shrubland over *Triodia pungens* open hummock grassland over **Cenchrus ciliaris* tussock grassland.
3. **Major Drainage Line:** *Eucalyptus victrix*, *Acacia citrinoviridis* low woodland over mixed *Acacia* species shrubland over *Triodia pungens* very open hummock grassland over **Cenchrus ciliaris* tussock grassland.
4. **Minor Drainage Line:** *Acacia dictyophleba*, *Acacia ancistrocarpa*, *Acacia marramamba* high shrubland over *Triodia pungens* very open hummock grassland over **Cenchrus ciliaris* and *Chrysopogon fallax* tussock grassland.
5. **Plain:** *Corymbia hamersleyana*, *C. semiclara*, *C. opaca* scattered / *Acacia aneura* (mixed sub-species) low open woodland (or scattered trees) over *Acacia dictyophleba*, *A. ancistrocarpa*, *A. pruinocarpa*, *A. synchronicia* shrubland over *Triodia pungens*, *T. basedowii* hummock grassland over *Chrysopogon fallax* and **Cenchrus ciliaris* tussock grassland.
6. **Rocky Hills:** *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland over *Acacia aneura* var. *aneura*, *Acacia bivenosa*, *Senna glutinosa* subsp. *glutinosa* shrubland over *Triodia wiseana*, *Triodia pungens* and *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) hummock grassland over **Cenchrus ciliaris* open tussock grassland.
7. **Valley:** *Acacia synchronicia* and mixed *Acacia* species shrubland over *Triodia pungens* hummock grassland over **Cenchrus ciliaris* and *Chrysopogon fallax* tussock grassland.

ENV (2008d) mapped a total of four fauna habitats within the Amendment Application Area (**Figure 4-43 and 4-44**):

1. **Floodplain:** *Acacia synchronicia* scattered tall shrubs scattered over *Maireana triptera* and *Eremophila cuneifolia* low shrubland over *Triodia pungens* and **Cenchrus ciliaris* scattered tussock grasses.
2. **Low Rise:** *Corymbia hamersleyana* and *Eucalyptus gamophylla* low open woodland over *Grevillea wickhamii* subsp. *hispidula*, *Acacia pyrifolia* and *A. pruinocarpa* high shrubland over *Keraudrenia velutina* subsp. *elliptica* low scattered shrubs over *Triodia basedowii* and *T. wiseana* open hummock grassland.
3. **Minor Drainage Line (three types):**
 - Subtype 1:** *Acacia synchronicia* scattered tall shrubs over *Maireana triptera* and *Eremophila cuneifolia* low shrubland over *Triodia pungens* and **Cenchrus ciliaris* scattered tussock grasses.
 - Subtype 2:** *Corymbia candida* subsp. *dipsodes*, *Corymbia hamersleyana* and *Eucalyptus gamophylla* low open woodland over *Grevillea wickhamii* subsp. *hispidula*, *Acacia dictyophleba* and *Eremophila longifolia* open shrubland over *Keraudrenia velutina* subsp. *elliptica* over *Triodia basedowii* open hummock grassland.
 - Subtype 3:** *Eucalyptus camaldulensis* var. *obtusata*, *Corymbia hamersleyana* low open woodland over *Acacia aneura* var. *pilbarana* scattered shrubs over **Cenchrus ciliaris* and *Aristida inaequiglumis* very open tussock grassland.

4. **Plain:** *Eucalyptus xerothermica* / *E. gamophylla* / *E. xerothermica* / *Acacia paraneura* woodland over *A. sclerosperma* subsp. *sclerosperma*, *A. pruinocarpa*, *A. ancistrocarpa*, *A. synchronicia*, *Stylobasium spathulatum*, *Rhagodia eremaea*, *Ptilotus obovatus* var. *obovatus*, *Psyrax latifolia*, *Eremophila cuneifolia*, *Anthobolus leptomerioides* over *Sida cardiophylla*, *Maireana triptera*, *Corchorus parviflorus* and *Senna notabilis* low open shrubland over *Triodia pungens* and *T. angusta* hummock grassland over **Cenchrus ciliaris*, *Aristida inaequiglumis* and *Eragrostis eriopoda* tussock grassland.

Biologic (2022a) mapped a total of eight fauna habitats within the Amendment Application Area (Figure 4-51):

1. **Breakaway / Cliff:** Breakaway/ Cliffs are rugged, incised rocky hills and ranges. They tend to contain large rock fragments and more rock outcropping than other fauna habitats. Significant habitat features such as caves are sometimes encountered in this habitat type. Vegetation can be dense and complex in areas of soil deposition or sparse and simple where erosion has occurred.
2. **Drainage Area / Floodplain:** Lower lying plain often subjected to sheet flow following large rainfall events. Vegetation and substrates of this habitat was variable, often comprising scattered *Eucalyptus* over *Acacia* and/or *Grevillea* shrubs with an understorey dominated by *Triodia* hummock grasses and/or mixed tussock grasses on alluvial substrates, often comprising heavy clays and gravel.
Tussock grasses can be dominant within Drainage Area/ Floodplain habitat as a result of high rainfall events.
3. **Gorge / Gully:** Gorge/ Gully habitat was characterised by rugged, steep-sided valleys incised into the surrounding landscape. Gorges tend to be deeply incised, with vertical cliff faces, while gullies are more open (but not as open 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.
4. **Hillcrest / Hillslope:** The Hillcrest/ Hillslope habitat comprised a rocky substrate, often with exposed bedrock, on moderate to steep slopes leading into lower footslopes. 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 *Eucalyptus* woodlands, *Acacia* and *Grevillea* scrublands and *Triodia* low hummock grasslands.
5. **Major Drainage Line:** Major Drainage Line habitat is prone to flooding and is more likely to retain water when inundated. The structure and condition of vegetation often varies seasonally, particularly following rainfall events. This habitat supports an upper story of relatively tall *Eucalyptus*.
6. **Minor Drainage Line:** Minor Drainage Line habitat usually lacked a tall dense upper story but with a dense mid story, including sparse *Eucalyptus* sp. and *Acacia* sp. over tussock grasses and *Triodia* sp. hummock grasses. Does not include the minor drainage depressions that flow off high ground features. It is less likely to support surface water for long after rainfall.
7. **Stony Plain:** Stony Plain comprise 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 *Triodia*, although scattered trees also occur. Vegetation within this habitat varied in composition but was generally dominated by scattered Mulga and *Acacia* forming an over-storey, with patches of various small to medium shrub species, over low hummock grasslands of *Triodia*. Scattered *Corymbia* and *Eucalyptus* are usually present.
8. **Undulating Low Hills:** 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 *Triodia* hummock grasslands with scattered *Eucalyptus* trees and *Acacia*, *Eremophila* and/or *Grevillea* shrubs.

3.4.5 Significant Fauna

The surveys undertaken across the Amendment Application Area have resulted in 20 fauna species of conservation significance being recorded from within the Amendment Application Area (**Figures 5-1 to 5-53 [non-migratory species]** and **Figures 6-1 to 6-53 [migratory species]**):

EPBC Act listed fauna species recorded within the Amendment Application Area:

- Ghost Bat (*Macroderma gigas*) (Vulnerable EPBC Act and BC Act);
- Greater Bilby (*Macrotis lagotis*) (Vulnerable EPBC Act and BC Act);
- Grey Falcon (*Falco hypoleucos*) (Vulnerable EPBC Act and BC Act);
- Northern Quoll (*Dasyurus hallucatus*) (Endangered EPBC Act and BC Act);
- Pilbara Olive Python (*Liasis olivaceus* subsp. *barroni*) (Vulnerable EPBC Act and BC Act); and
- Pilbara Leaf-nosed Bat (*Rhinonictes aurantia*) (Vulnerable EPBC Act and BC Act).

EPBC Act Migratory listed fauna species recorded within the Amendment Application Area:

- Caspian Tern (*Sterna caspia*) (Migratory EPBC Act and BC Act);
- Common Greenshank (*Tringa nebularia*) (Migratory EPBC Act and BC Act);
- Common Sandpiper (*Actitis hypoleucos*) (Migratory EPBC Act and BC Act);
- Eastern Osprey (*Pandion haliaetus*) (Migratory EPBC Act; Schedule 5 BC Act);
- Fork-tailed Swift (*Apus pacificus*) (Migratory EPBC Act and BC Act);
- Little Curlew (*Numenius minutus*) (Migratory EPBC Act and BC Act);
- Oriental Plover (*Charadrius veredus*) (Migratory EPBC Act and BC Act);
- Oriental Pratincole (*Glareola maldivarum*) (Migratory EPBC Act and BC Act);
- Whimbrel (*Numenius phaeopus*) (Migratory EPBC Act and BC Act); and
- Wood Sandpiper (*Tringa glareola*) (Migratory EPBC Act and BC Act).

DBCA Priority listed fauna species recorded within the Amendment Application Area:

- Brush-tailed Mulgara (*Dasyercus blythi*) (Priority 4 DBCA);
- Grey-tailed Tattler (*Tringa brevipes*) (Migratory EPBC Act; Priority 4 DBCA);
- Pilbara Flat-headed Blind-snake (*Anilius ganei*) (Priority 1 DBCA); and
- Western Pebble-mound Mouse (*Pseudomys chapmani*) (Priority 4 DBCA).

Based on the occurrence of the habitat types and conservation significant fauna species previously recorded in the vicinity, an additional 27 species are considered to potentially occur within the Amendment Application Area (i.e. those considered 'likely' or 'possible' to occur within the Amendment Application Area):

EPBC Act listed fauna species potentially occurring within the Amendment Application Area:

- Curlew Sandpiper (*Calidris ferruginea*) (Critically Endangered and Migratory EPBC Act; Critically Endangered BC Act);
- Eastern Curlew (*Numenius madagascariensis*) (Critically Endangered and Migratory EPBC Act and BC Act);
- Great Knot (*Calidris tenuirostris*) (Critically Endangered and Migratory EPBC Act; Critically Endangered BC Act); and
- Greater Sand Plover (*Charadrius leschenaultii* subsp. *leschenaultii*) (Vulnerable and Migratory EPBC Act; Vulnerable BC Act);
- Lesser Sand Plover (*Charadrius mongolus*) (Endangered / Migratory EPBC Act; Endangered BC Act); and
- Red Knot (*Calidris canutus*) (Endangered / Migratory EPBC Act; Endangered BC Act);

EPBC Act Migratory listed fauna species potentially occurring within the Amendment Application Area:

- Bar-tailed Godwit (*Limosa lapponica*) (Migratory EPBC Act and BC Act);
- Black-tailed Godwit (*Limosa limosa*) (Migratory EPBC Act and BC Act);
- Glossy Ibis (*Plegadis falcinellus*) (Migratory EPBC Act and BC Act);
- Grey Plover (*Pluvialis squatarola*) (Migratory EPBC Act and BC Act);
- Little Ringed Plover (*Charadrius dubius*) (Migratory EPBC Act and BC Act);
- Little Tern (*Sternula albifrons*) (Migratory EPBC Act and BC Act);
- Long-toed Stint (*Calidris subminuta*) (Migratory EPBC Act and BC Act);
- Mash Sandpiper (*Tringa stagnatilis*) (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);
- Ruddy Turnstone (*Arenaria interpres*) (Migratory EPBC Act and BC Act);
- Ruff (*Philomachus pugnax*) (Migratory EPBC Act and BC Act);
- Sanderling (*Calidris alba*) (Migratory EPBC Act and BC Act);
- Sharp-tailed Sandpiper (*Calidris acuminata*) (Migratory EPBC Act and BC Act); and
- Terek Sandpiper (*Tringa cinerea*) (Migratory EPBC Act and BC Act).

BC Act listed fauna species potentially occurring within the Amendment Application Area:

- Peregrine Falcon (*Falco peregrinus*) (Other Specially Protected Fauna BC Act).

DBCA Priority listed fauna species potentially occurring within the Amendment Application Area:

- Black-lined *Ctenotus* (*Ctenotus nigrilineatus*) (Priority 1 DBCA);
- Northern Coastal Free-tailed Bat (*Ozimops cobourgianus*) (Priority 1 DBCA);
- Pilbara Barking Gecko (*Underwoodisaurus seorsus*) (Priority 2 DBCA);
- Short-tailed Mouse (*Leggadina lakedownensis*) (Priority 4 DBCA); and
- Spotted *Ctenotus* (*Ctenotus uber* subsp. *johnstonei*) (Priority 2 DBCA).

An assessment of the potential impact of the proposed clearing on the species of conservation significant fauna recorded or considered potentially occurring in the Amendment Application Area is provided in **Table 11**.

In addition to the specific management measures detailed in **Table 11** potential impacts to significant fauna species will be reduced by minimising disturbance to Major Drainage Line and Gorge / Gully fauna habitats; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.

Table 11: Conservation Significant Fauna recorded and Potentially Occurring within the Amendment Application Area

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Birds					
Bar-tailed Godwit (<i>Limosa lapponica</i>)	Migratory EPBC Act Migratory BC Act	The Bar-tailed Godwit is a relatively common summer non-breeding migratory shorebird that occurs along most of the coast of Western Australia and typically inhabits inter-tidal mudflats (Geering et al. 2007).	The small area of Tidal Flats habitat within the Amendment Application Area provides suitable habitat for this species. The Bar-tailed Godwit has been recorded adjacent to the Amendment Application Area (ENV, 2011b).	Likely	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Black-tailed Godwit (<i>Limosa limosa</i>)	Migratory EPBC Act Migratory BC Act	The Black-tailed Godwit is an uncommon summer non-breeding migratory shorebird that occurs along most of the coast of Western Australia (Geering et al. 2007). It inhabits fresh and brackish wetlands as well as inter-tidal mudflats (Geering et al. 2007). This Migratory bird breeds off the coast of Mongolia and Siberia. It migrates to Australian waters in September to May (Pizzey and Knight 2007).	The small area of Tidal Flats habitat within the Amendment Application Area provides suitable habitat for this species. The Black-tailed Godwit has been recorded adjacent to the Amendment Application Area (ENV, 2011b).	Likely	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Caspian Tern (<i>Hydroprogne caspia</i>)	Migratory EPBC Act Migratory BC Act	The Caspian Tern is distributed along the coast of Western Australia. It is scarce or uncommon north of Broome and uncommon to moderately common further south (Johnstone and Storr, 1998). This species inhabits coastal areas as well as inland watercourses, saline and brackish lakes (Simpson and Day, 2004).	The small area of Beach/Dunal habitat present in the Amendment Application Area provides suitable habitat for this species. The Caspian Tern has been recorded in the Amendment Application Area (ENV, 2011b) and in the broader area (Biologic, 2013).	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Common Greenshank (<i>Tringa nebularia</i>)	Migratory EPBC Act Migratory BC Act	The Common Greenshank is a nonbreeding migratory shorebird common along most of the coast of Western Australia (Geering et al. 2007). It inhabits intertidal mudflats as well as fresh and saltwater wetlands of the coast or inland (Geering et al. 2007).	The small areas of Tidal Flats and Riverine habitats provide the mudflats and freshwater wetlands preferred by this species. The Common Greenshank has been recorded in the Amendment Application Area (ENV, 2011b) and in the broader area (Biologic, 2013; Biota 2013).	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Common Sandpiper (<i>Actitis hypoleucos</i>)	Migratory EPBC Act Migratory BC Act	<i>Actitis hypoleucos</i> is a nonbreeding migratory shorebird which utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (Geering et al. 2007).	The small areas of Tidal Flats and Riverine habitats provide the mudflats and freshwater wetlands preferred by this species. <i>Actitis hypoleucos</i> has been recorded within the Amendment Application Area at Ophthalmia Dam (MWH, 2015).	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Curlew Sandpiper (<i>Calidris ferruginea</i>)	Critically Endangered and Migratory EPBC Act Critically Endangered (BC Act)	The Curlew Sandpiper is a summer non-breeding migratory shorebird that occurs along most of the coast of Western Australia (Geering et al., 2007). It inhabits exposed tidal mudflats, and is less frequently found on inland freshwater wetlands (Geering et al., 2007). This Migratory bird breeds in Siberia and migrates to Australian waters in August to April (Pizzey and Knight, 2007). It is abundant to common around Perth and Mandurah. This species is found in coastal and inland mudflats and sometimes on salt works (Simpson and Day, 2004).	The small areas of Tidal Flats habitat provides suitable habitat for this species. The Curlew Sandpiper has been previously recorded adjacent to the Amendment Application Area (ENV, 2011b; MWH, 2015). The record adjacent to the Amendment Application Area at Ophthalmia Dam represents the only inland DBCA record for north-west WA (MWH, 2015).	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility, the minimal disturbance around Ophthalmia Dam and the presence of large areas of its preferred habitat in the surrounding areas of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Eastern Curlew (<i>Numenius madagascariensis</i>)	Critically Endangered and Migratory EPBC Act Critically Endangered (BC Act)	The Eastern Curlew is a large nonbreeding migratory shorebird, found commonly along the north coast of Western Australia, but rarely south of Shark Bay. It inhabits a range of coastal habitats, but primarily intertidal mudflats, particularly on exposed seagrass beds or mudflats feeding on burrowing crabs or shrimps (Geering et al. 2007).	The Beach/Dunal and Tidal Flats habitat provides suitable habitat for this species. There have been five records of the Eastern Curlew have been recorded adjacent to the Amendment Application Area at Port Hedland (ENV, 2011b). DBCA has a further five records of this species between Port Hedland and Onslow.	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Eastern Osprey (<i>Pandion haliaetus</i>)	Migratory EPBC Act Migratory BC Act	The breeding range of the Eastern Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in New South Wales (Barrett, Silcocks et al. 2003). In the Pilbara region, the Eastern Osprey inhabits coastal areas, islands and larger rivers inland (Johnstone and Storr, 1998). Inland range extensions in north-west WA have been noted and may be an area of dispersal for first-year birds (Marchant and Higgins, 1993).	The small areas of coastal and near-coastal habitats (beach, dunes, tidal flats, riverine and mangroves) within the Amendment Application Area provide suitable habitat for this species. This species has been recorded from BHP's Nelson Point Wetlands in Port Hedland (Bennelongia, 2011). It has also been recorded near in the broader region adjacent to the Yandi and Yarrie mining operations.	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Fork-tailed Swift (<i>Apus pacificus</i>)	Migratory EPBC Act Migratory BC Act	The Fork-tailed Swift breeds in north-east and east Asia, wintering in Australia and southern New Guinea (Johnstone and Storr, 1998). Fork-tailed Swifts are entirely aerial within the Pilbara and may forage sporadically over the Amendment Application Area in the summer months associated with thunderstorms and cyclonic systems (Johnstone and Storr, 1998).	The Fork-tailed Swift is largely an aerial species and has a broad distribution across much of Western Australia. It is viewed as a nomadic species and may fly over the Amendment Application Area.	Recorded	Negligible As this species is entirely aerial in Australia and not reliant on terrestrial habitats, the impact to this species is considered to be negligible.
Glossy Ibis (<i>Plegadis falcinellus</i>)	Migratory EPBC Act Migratory BC Act	The Glossy Ibis inhabits areas of freshwater wetlands, irrigated areas, and margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone and Storr, 2004). This species is a casual vagrant in dry and hilly areas and is mainly a non-breeding visitor to Western Australia (Johnstone and Storr, 1998).	This species may forage within the Amendment Application Area when surface water is present. It has been recorded adjacent to the Amendment Application Area at Ophthalmia Dam	Possible	Low This species is wide ranging, and is unlikely to breed within the Application Area. It is also unlikely to rely just on habitats within the Application Area, given that suitable habitat occurs in the Application Area surrounds.
Great Knot (<i>Calidris tenuirostris</i>)	Critically Endangered and Migratory EPBC Act Critically Endangered BC Act	The Great Knot is a summer non-breeding migratory shorebird that occurs along most of the coast of Western Australia. It inhabits larger inter-tidal mud and sand flats (Geering et al. 2007).	The small areas of Beach/Dunal and Tidal Flats habitat provides suitable habitat for this species. The Great Knot has been previously recorded adjacent to the Amendment Application Area around Port Hedland (ENV, 2011b).	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Greater Sand Plover (<i>Charadrius leschenaultii</i> subsp. <i>leschenaultii</i>)	Vulnerable and Migratory EPBC Act Vulnerable BC Act	The Greater Sand Plover is a summer non-breeding migratory shorebird that is common on the north and west coast of Western Australia. It inhabits exposed sand and mud flats (Geering et al. 2007).	The small areas of Beach/Dunal and Tidal Flats habitat provides suitable habitat for this species. The Great Knot has been previously recorded adjacent to the Amendment Application Area around Port Hedland (ENV, 2011b).	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Grey Falcon (<i>Falco hypoleucos</i>)	Vulnerable EPBC Act Vulnerable BC Act	This species appears to have a distribution centred on ephemeral or permanent drainage lines (Garnett and Crowley, 2000) with numerous records from the Fortescue Marsh region. Grey Falcons prefer sparsely-treed, open plains and drainage lines for hunting (Slater et al., 2009). They typically nest in the abandoned nest of a raptor or corvid (Slater et al. 2009) in trees or man-made structures, most notably repeater towers.	Much of the Amendment Application Area represents suitable hunting territory for the Grey Falcon, in particular close to the open, sparsely vegetated plains of the northern Amendment Application Area. Grey Falcons were observed closer to an area of cracking clays (Gilgai habitat) in the southern part of the Chichester Range (Biologic, 2013). This observation was of a breeding pair that has bred successfully at the communications tower for three consecutive years (Figure 5-25) (Biologic, 2013). Grey falcons have also been recorded adjacent to the Amendment Application Area near Ophthalmia Dam and in the broader region.	Recorded	Low The Grey Falcon is known to nest in a communications tower within the Amendment Application Area and could potentially nest in the taller trees of the Riverine and Major Drainage Line habitats of Amendment Application Area. During the Grey Falcon's breeding season (April – June) no work will be undertaken on the communications tower where this species is known to breed (Figure 5-25), without prior consultation with DBCA. Given that the habitat for this species occurs extensively throughout the Pilbara and its ability to egress from the area, the proposed activities are expected to have a low impact on the Grey Falcon.
Grey Plover (<i>Pluvialis squatarola</i>)	Migratory EPBC Act Migratory BC Act	The Grey Plover is a common summer migrant that inhabits coastal areas, preferring marine shores of estuaries or lagoons on broad open mudflats, sandy bars or beaches and rocky coasts as well as coastal salt lakes and swamps (Morcombe, 2000). They occasionally are found in drying freshwater lakes (Johnstone and Storr, 1998).	The small areas of Beach/Dunal, Tidal Flats and Riverine habitat particularly towards the Port Hedland harbour, provides suitable habitat for this species. The Grey Plover has been recorded in the adjacent to the Amendment Application Area at Port Hedland (ENV 2011b).	Likely	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Grey-tailed Tattler (<i>Tringa brevipes</i>)	Priority 4	The Grey-tailed Tattler is a non-breeding migratory shorebird, common on the north and west coasts of Western Australia, but rare on the south coast (Geering et al. 2007). It inhabits sheltered coasts with reef and rock platforms or with inter-tidal mudflats (Morcombe 2000).	The Beach/Dunal and Tidal Flats habitat provides suitable habitat for this species. The Grey-tailed Tattler has been recorded adjacent to the northern end of the Amendment Application Area (ENV, 2011b)	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Lesser Sand Plover (<i>Charadrius mongolus</i>)	Endangered / Migratory EPBC Act Endangered BC Act	The Lesser Sand Plover is a summer non-breeding migratory shorebird that occurs on the north and west coast of Western Australia, but rarely south of Shark Bay. It inhabits exposed sand and mud flats and often intermingles with flocks of the Greater Sand Plover (Geering et al. 2007).	The small area of Beach/Dunal and Tidal Flats habitat of the northern Amendment Application Area provides ideal habitat for this species. The Lesser Sand Plover has been previously recorded adjacent to the Amendment Application Area (ENV, 2011b)	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Little Curlew (<i>Numenius minutus</i>)	Migratory EPBC Act Migratory BC Act	The Little Curlew is a medium sized shorebird and is typically found on short, dry grasslands. Flocks are highly mobile moving unpredictably according to grassland conditions, often congregating in wetlands to drink when conditions are hot. This species breeds in north-east Siberia and migrates to the sub-coastal plains of northern Australia during summer (Geering et al. 2007).	The Sandplain habitat, particularly around the Riverine habitat of the northern Amendment Application Area, provides suitable habitat for this species (ENV, 2011b). The Little Curlew has been previously recorded adjacent to the Amendment Application Area (ENV, 2011b).	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Little Ringed Plover (<i>Charadrius dubius</i>)	Migratory EPBC Act Migratory BC Act	This is a summer non-breeding species which favours extensive sandbanks, muddy and sandy shores of rivers and lakes, residual flood waters, short grassy areas on dry ground around villages or near water, airfields and pastures. It less commonly inhabits coastal areas such as saltpans, estuaries, creeks or rainwater pools on dry salt-flats bordering mangroves.	The small area of Beach/Dunal and Tidal Flats habitat in the north of the Amendment Application Area and Ophthalmia Dam in the south of the Amendment Application Area provides suitable habitat for this species. The Little Ringed Plover has been previously recorded adjacent to the Amendment Application Area (MWH, 2015).	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Little Tern (<i>Sterna albibrons</i>)	Migratory EPBC Act Migratory BC Act	The Little Tern is distributed along the northern coast of Western Australia south to Broome. There are three sub populations that occur; two that breed in Australia and the third that migrates north to breed in Asia but spends the spring/summer in Australia (DSEWPaC 2011). This species inhabits coastal and estuarine areas, breeding on sandy beaches and sand spits (Simpson and Day 2004).	The small areas of Beach/Dunal and near coastal sections of the Riverine habitat of the Amendment Application Area provide suitable habitat for this species. The Little Tern has been previously recorded in the riverine habitat adjacent to the Amendment Application Area, just north of Wedgefield near Port Hedland.	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Long-toed Stint (<i>Calidris subminuta</i>)	Migratory EPBC Act Migratory BC Act	The Long-toed Stint is a moderately common summer non-breeding migrant that occurs along the coast and inland waterways of Western Australia. It inhabits mainly inland freshwater swamps, lagoons, claypans, sewerage ponds, salt lakes and estuaries (Johnstone and Storr, 1998). This Migratory bird breeds in Siberia to the North Pacific and migrates to Australian waters in August to April (Pizzey and Knight, 2007). This species prefers coastal and inland swamps for habitat (Simpson and Day, 2004).	This species may forage within the Amendment Application Area when surface water is present. It has been recorded adjacent to the Amendment Application Area at Ophthalmia Dam.	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and their preferred habitat is present in the surrounding region.
Marsh Sandpiper (<i>Tringa stagnatilis</i>)	Migratory EPBC Act Migratory BC Act	The Marsh Sandpiper inhabits fresh or brackish wetlands including rivers, sewage farms, drains, lagoons and swamps (Birds Australia, 2010).	This species may forage within the Amendment Application Area when surface water is present. It has been recorded adjacent to the Amendment Application Area at Ophthalmia Dam.	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and their preferred habitat is present in the surrounding region.
Oriental Plover (<i>Charadrius veredus</i>)	Migratory EPBC Act Migratory BC Act	The Oriental Plover occurs in the Kimberley and in the north-eastern interior at Lake Gregory and on the north-west coastal plains (Johnstone and Storr, 1998). It is found on sparsely vegetated plains including Samphire, Spinifex plains (particularly after fire), as well as beaches and tidal flats (Johnstone and Storr, 1998). This species often feeds on insects (Johnstone and Storr, 1998).	This species may forage within sparsely vegetated stony plains of the Amendment Application Area when surface water is present. It has been recorded within the Amendment Application Area at Mooka (Figure 6-6) (Biologic, 2011) and adjacent to the Amendment Application Area at Port Hedland (Bennelongia, 2011).	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Oriental Pratincole (<i>Glareola maldivarum</i>)	Migratory EPBC Act Migratory BC Act	The Oriental Pratincole occurs in the Kimberley and along the northern coast of Western Australia, and is a summer migrant. It occurs around tidal flats and floodwaters where it feeds aerially on flying insects and roosts on bare ground (Johnstone and Storr 1998).	The small area of Tidal Flat habitat of the Amendment Application Area provides suitable habitat for this species. The Oriental Pratincole has been recorded from the Amendment Application Area and there have been numerous recent records in the broader region (Biologic, 2013; ENV, 2011b).	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Pectoral Sandpiper (<i>Calidris melanotos</i>)	Migratory EPBC Act Migratory BC Act	The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies, 1996)	This species may forage within the Amendment Application Area when surface water is present, but is unlikely to be reliant upon the Amendment Application Area as more suitable habitat is found in the broader vicinity.	Possible	Low The species has not been recorded within the vicinity of the Amendment Application Area. More suitable habitat in better condition is available adjacent to the Amendment Application Area and in the broader region. Therefore this species is unlikely to be reliant on the habitat present within the Amendment Application Area.
Peregrine Falcon (<i>Falco peregrinus</i>)	Other Specially Protected Fauna BC Act	The Peregrine Falcon is uncommon but wide ranging across Australia. They occur mainly along coastal cliffs, rivers and ranges as well as wooded watercourses and lakes. The Peregrine Falcon nests primarily on cliffs, granite outcrops and quarries, and feed mostly on birds (Johnstone and Storr 1998).	This species has been recorded adjacent to the Amendment Application Area. This species may forage over the Amendment Application Area, however there is no suitable breeding habitat located within the boundary.	Possible	Low This species is highly mobile with large home ranges and therefore able to easily move away from disturbance. This species may forage within the Application Area, however, no suitable nesting habitats were recorded, so impacts on breeding activity to these species are negligible. In addition, there are large amounts of suitable foraging and nesting habitat for this species outside of the Application Area.
Red Knot (<i>Calidris canutus</i>)	Endangered / Migratory EPBC Act Endangered BC Act	The Red Knot is a summer nonbreeding migratory shorebird that occurs along most of the coast of Western Australia (Johnstone and Storr 1998). It inhabits larger intertidal mud and sand flats (Geering et al. 2007).	The small areas of Beach/Dunal and Tidal Flat habitat of the Amendment Application Area provides suitable habitat for this species. The Red Knot has been recorded in the Dune habitat to the east of Port Hedland vicinity (ENV, 2011b).	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Red-necked Stint (<i>Calidris ruficollis</i>)	Migratory EPBC Act Migratory BC Act	The Red-necked Stint is a summer non-breeding migratory shorebird that occurs along most of the coast of Western Australia (Geering <i>et al.</i> , 2007). It inhabits a wide range of fresh and saltwater habitats (Geering <i>et al.</i> , 2007). This Migratory bird breeds in Siberia and Alaska and migrates to Australian waters in August to April (Pizzey and Knight, 2007). This species requires marine waters for habitat such as coastal and inland shores (Simpson and Day, 2004).	The small areas of Beach/Dunal and Tidal Flat habitat in the northern section of the Amendment Application Area provides suitable habitat for this species. The Red-necked Stint has been previously recorded in the Tidal Flats and Dune habitat around Port Hedland (ENV, 2011b).	Likely	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Ruddy Turnstone (<i>Arenaria interpres</i>)	Migratory EPBC Act Migratory BC Act	The Ruddy Turnstone is a summer non-breeding migratory shorebird that occurs on the coast of the north-west and west coast from Beagle Bay to Shark Bay (Johnstone and Storr 1998). It occurs primarily on rocky coasts and rocky reefs, as well as tidal mudflats and beaches and pebbly shores of near-coastal salt lakes and salt-work ponds (Johnstone and Storr 1998).	The small areas of Beach/Dunal and Tidal Flats habitat in the northern section of the Amendment Application Area provides suitable habitat for this species. The Ruddy Turnstone has been previously recorded in the Tidal Flats and Dune habitat around Port Hedland (ENV, 2011b).	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Ruff (Philomachus pugnax)	Migratory EPBC Act Migratory BC Act	The Ruff is a summer nonbreeding migratory shorebird found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges. It forages on exposed mudflats, in shallow water and occasionally on dry mud. They have been observed foraging in dry waterside plants and in swampy areas next to aeration tanks in sewage farms. They prefer to roost amongst shorter vegetation (Higgins & Davies 1996).	This species may forage within the Amendment Application Area. It has been recorded adjacent to the Amendment Application Area at Ophthalmia Dam.	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and their preferred habitat is present in the surrounding region.
Sanderling (<i>Calidris alba</i>)	Migratory EPBC Act Migratory BC Act	The Sanderling is a small compact shorebird and is often found in small to large flocks, mostly on open beaches exposed to surf. This species has also been recorded within inter-tidal mudflats. This species distinctly dashes between waves when feeding and is known at high tide to roost among beach debris (Geering <i>et al.</i> 2007).	The small areas of Beach/Dunal and Tidal Flats habitat in the northern section of the Amendment Application Area provides suitable habitat for this species. There have been numerous records of the Sanderling in the vicinity of Port Hedland (ENV, 2011b).	Possible	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	Migratory EPBC Act Migratory BC Act	The Sharp-tailed Sandpiper is a summer non-breeding migratory shorebird that occurs along most of the coast of Western Australia except for the south coast, and in well-watered parts of the interior and casually in the arid east south of Lake Gregory (Johnstone and Storr 1998). The Sharp-tailed Sandpiper uses fresh and salt water wetlands as its preferred habitat. Eighty Mile Beach has peak numbers in August to September (Johnstone and Storr, 1998). It inhabits both coastal and inland areas but prefers non-tidal fresh or brackish wetlands (Geering <i>et al.</i> , 2007).	The coastal Riverine habitat of the Amendment Application Area provides the fresh water wetland habitat which is preferred by this species. There have been numerous recent records of the Sharp-tailed Sandpiper from the vicinity of the Amendment Application Area (ENV, 2011b).	Likely	Low The proposed activities are unlikely to have an impact on this species given its high mobility and large areas of its preferred habitat is present in the surrounding region in the same or better condition to that of the Amendment Application Area.
Terek Sandpiper (<i>Tringa cinerea</i>)	Migratory EPBC Act Migratory BC Act	The Terek Sandpiper is a summer nonbreeding migratory shorebird that occurs along the north coast of Western Australia, but rarely south of Shark Bay. It inhabits exposed seagrass beds in estuaries and bays or on inter-tidal mudflats fringed by mangroves (Geering <i>et al.</i> 2007).	The small areas of Tidal Flat habitat of the Amendment Application Area, particularly those situated close to the Mangroves, provide suitable habitat for this species. The Terek Sandpiper has been recorded in the vicinity of the Amendment Application Area (ENV, 2011b).	Likely	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.
Whimbrel (<i>Numenius phaeopus</i>)	Migratory EPBC Act Migratory BC Act	The Whimbrel is a large non-breeding migratory shorebird, found commonly along the north coast of Western Australia, but less commonly south of Shark Bay (Geering <i>et al.</i> 2007). This species typically inhabits mudflats of estuaries or lagoons (Morcombe 2000).	The small areas of Tidal Flat habitat of the Amendment Application Area provides suitable habitat for this species. The Whimbrel has been previously recorded in the adjacent to the Amendment Application Area at Port Hedland (ENV, 2011b).	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility and the presence of large areas of its preferred habitat in the surrounding areas of the northern section of the Amendment Application Area and in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Wood Sandpiper (<i>Tringa glareola</i>)	Migratory EPBC Act Migratory BC Act	The Wood Sandpiper is a summer non-breeding migratory shorebird that occurs along the coast and inland regions of Western Australia. It primarily inhabits shallow fresh waters such as lagoons, swamps, claypans, dams and sewerage ponds (Johnstone and Storr 1998; Geering et al., 2007).	The Wood Sandpiper may utilise the Amendment Application Area when temporary ponds are formed after heavy rains. This species has been recorded across the Amendment Application Area particularly in the Riverine habitat (ENV, 2011b). The Wood Sandpiper is considered a regular summer visitor to Ophthalmia Dam (MWH, 2015).	Recorded	Low The proposed activities are unlikely to have an impact on this species given its high mobility, the minimal disturbance around Ophthalmia Dam and large areas of its preferred habitat is present in the surrounding region in the same or better condition to that of the Amendment Application Area.
Mammals					
Brush-tailed Mulgara (<i>Dasyercus blythi</i>)	Priority 4 (DBCA)	Brush-tailed mulgaras occur in a range of vegetation types, however, the principal habitat is mature hummock grasslands of spinifex, especially <i>Triodia basedowii</i> and <i>T. pungens</i> (Masters <i>et al.</i> , 2008). Note: Woolley, <i>et. al.</i> (2013) noted that the Crest-tailed Mulgara (<i>Dasyercus cristicauda</i>) is unlikely to occur within the Pilbara and therefore all unspecified records have been treated as Brush-tailed Mulgara.	Sandplain habitats of the Amendment Application Area represent suitable habitat for this species. Sandplains are present within and adjacent to the Amendment Application Area. There are multiple records of the Brush-tailed Mulgara between Port Hedland and Newman both within (Figures 5-6 and 5-9) and adjacent to the Amendment Application (ENV, 2011; Biologic, 2013; Eco Logical, 2013).	Recorded	Low Given its highly disturbed nature a majority of the Amendment Application Area is not suitable for Mulgara. Habitat for this species is extensive outside of the Amendment Application Area. Active Mulgara burrows will be avoided using a 10 m buffer, where practicable.
Ghost Bat (<i>Macroderma gigas</i>)	Vulnerable EPBC Act Vulnerable BC Act	The Ghost Bat occurs in a wide variety of habitats, and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost. It is patchily distributed across Australia, and is sensitive to disturbance. Colonies range in size from 400-1000 individuals (van Dyck and Strahan, 2008). The Ghost Bat forages in areas of open woodland (Churchill, 2008).	There has been evidence of Ghost Bats within rail culverts within the Amendment Application Area (Figures 5-15, 5-16, 5-22 and 5-34), as well as multiple records adjacent to the Amendment Application Area (Biologic, 2013). There are no suitable caves within the Amendment Application Area however it is likely that Ghost Bats will forage over the Amendment Application Area.	Recorded	Low This species is known to forage over the habitats within the Amendment Application Area and surrounds. Impact on this species is considered to be low as there are no suitable caves within the Amendment Application Area. Clearing activities undertaken within the Amendment Application Area will not significantly impact on Ghost Bat foraging habitat given the linear, narrow corridor nature of the clearing proposed and that suitable foraging habitat extends beyond the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Greater Bilby (<i>Macrotis lagotis</i>)	Vulnerable EPBC Act Vulnerable BC Act	Three major vegetation types associated with the Greater Bilby are listed by Southgate (1990) including: open tussock grassland on uplands and hills, Mulga woodland/shrubland on ridges and rises, and hummock grassland in plains and alluvial areas. Other habitats used by the species include stony downs, cracking clays, desert sandplains and dune fields, spinifex grassland and <i>Acacia</i> species shrublands on red earths (Johnson, 2008).	Areas of sandplain and stony plain interspersed with Mulga woodland within the Amendment Application Area are considered potentially suitable habitats for the Greater Bilby. Such habitat is widespread in the Chichester sub region (Biologic, 2013). Evidence of Greater Bilby's has been recorded within the Sand Plain Habitat of the Amendment Application Area Figures 5-9, 5-18 and 5-44), particularly around the Turner River (Biologic, 2013).	Recorded	Low Given its highly disturbed nature a majority of the Amendment Application Area is not suitable for the Greater Bilby. Habitat for this species is extensive outside of the Amendment Application Area (Biologic, 2013). Active Greater Bilby burrows will be avoided using a 10 m buffer, where practicable.
Short-tailed Mouse (<i>Leggadina lakedownensis</i>)	Priority 4 (DBCA)	This species is endemic to northern Australia, where it occurs from Cape York in the east to the Pilbara, in Western Australia, although the distribution is discontinuous (Moro and Kutt 2008). It is a nocturnal species found in areas of open tussock and hummock grassland, acacia scrubland, and savannah woodland, on alluvial clay or sandy soils (Lee 1995).	Generally restricted to cracking clays (Gilgai habitat) in the region (Gibson and McKenzie 2009). The band of cracking clays in the Amendment Application Area extends tens of kilometres either side. This species has been recorded adjacent to the Amendment Application Area (Biologic, 2013).	Likely	Low Larger, more suitable and undisturbed, areas of basalt hills (associated with the Gilgai habitat) occur outside of the Amendment Application Area and therefore the proposed clearing is unlikely to impact this species.
Northern Coastal Free-tailed Bat (<i>Ozimops cobourgianus</i>)	Priority 1 (DBCA)	The Little Northern Freetail-bat inhabits mangrove communities, roosting in crevices and sprouts of the dead upper branches of the mangrove <i>Avicennia marina</i> (van Dyck and Strahan, 2008). The genus for this species is in the process of being renamed in a recent taxonomic review of molossid by Terry Reardon, which has shown the genus <i>Mormopterus</i> does not occur in Australia (Churchill, 2008).	The small areas of Mangrove and the surrounding Tidal Flat habitats within the Amendment Application Area provide suitable habitat for this species. The Little Northern Freetail-bat has been recorded adjacent to the northern end of the Amendment Application Area (ENV, 2011b).	Likely	Low While this species may forage over the Mangrove and the surrounding Tidal Flat habitats of the Amendment Application Area and its surrounds. Impact on this species is considered to be low as there are large areas of its preferred habitat is present in the surrounding region in the same or better condition to that of the Amendment Application Area.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Northern Quoll (<i>Dasyurus hallucatus</i>)	Endangered EPBC Act Endangered BC Act	Northern Quoll populations occur in six geographical centres around Australia, including: Drummond Range, central Queensland; the wet tropics of Northern Queensland; northern Cape York Peninsula; northern and western Top End, Northern Territory; north Kimberley and the Pilbara, Western Australia (Braithwaite and Griffiths, 1994). Northern Quoll denning habitat in the Pilbara is associated with rocky habitats or riverine habitats with mature Eucalypt trees with hollows (SEWPaC, 2011).	There have been extensive records of Northern Quolls within the Amendment Application Area and its surrounds between Mooka (Chainage 25) and Redmont Camp (Chainage 204) (Figures 5-5 to 5-10, 5-14 to 5-16, 5-19 to 5-20 and 5-23). Most records are associated either with Quarries 1, 2, 3 and 4 (denning habitat) and the Turner and East Turner Rivers (foraging). Northern Quolls have also been recorded in the broader region (Ecologia, 2008).	Recorded	Low While the habitats within the Amendment Application Area between Port Hedland and Redmont are utilised by the Northern Quoll (specifically the quarries and Major Drainage Line habitat) (ecologia, 2008), the proposed area for clearing is small in a regional context and is contiguous with habitats in the local and regional area (Biologic, 2017). Management of the Northern Quoll will be undertaken in accordance with the <i>WAIO Northern Quoll Regional Management Plan Rev 3</i> (BHP Iron Ore, 2022).
Pilbara Leaf-nosed Bat (<i>Rhinonictis aurantius</i>)	Vulnerable EPBC Act Vulnerable BC Act	The Pilbara Leaf-nosed Bat requires deep caves or disused mine shafts in which to roost (van Dyck and Strahan, 2008), at least in the dry season. These bats have been recorded in isolated populations in the Pilbara, and are present only where suitable roosting niches are available. They are generally sparsely distributed. The Pilbara Leaf-nosed Bat forages in areas of open woodland (Churchill, 2008).	While there have been multiple records of Pilbara Leaf-nosed Bat adjacent to the Amendment Application Area, however there is only one record of this species within the Amendment Application Area at Ophthalmia Dam (Figure 5-51). There are no suitable caves within the Amendment Application Area however it is likely that this species may forage over the Amendment Application Area.	Recorded	Low This species may forage over the habitats within the Amendment Application Area and surrounds. No suitable roosting habitat has been identified within the Amendment Application Area and therefore the Pilbara Leaf-nosed Bat would not be dependent on the habitats present within the Amendment Application Area.
Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>)	Priority 4 DBCA	The Western Pebble-mound Mouse is restricted to the Pilbara, where it is recognised as an endemic species. Abandoned mounds to the east of its current range indicate a decline in distribution (Menkhorst and Knight, 2004). Abandoned mounds in disturbed areas suggest that the species is under threat by grazing and mining activities. The construction of extensive pebble mounds, built from small stones, which typically cover areas from 0.5-9.0 square metres, is characteristic of this species. Mounds are restricted to suitable class stones, and are usually found on gentle slopes and spurs (van Dyck and Strahan, 2008).	There are extensive areas of suitable habitat (Hill Crest / Slope and Stony Plain habitats) for this species within and adjacent to the Amendment Application Area. There are 95 records of this species within and adjacent to the Amendment Application Area (Figures 5 6, 5-14, 5-16, 5-25, 5-35, 5-36 and 5-51).	Recorded	Low While the Hill Crest / Slope and Stony Plain habitats of the Amendment Application Area may be utilised by the Western Pebble-mound Mouse, the proposed area for clearing is small in a regional context and there are large areas of suitable habitat for this species adjacent to the Amendment Application Area. Active mounds of the Western Pebble-mound Mouse will be avoided using a 10 m buffer, where practicable.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Reptiles					
Black-lined Ctenotus (<i>Ctenotus nigrilineatus</i>)	Priority 1 DBCA	Black-lined Ctenotus shows a patchy distribution in spinifex at the base of granite outcrops around the Woodstock area in the Abydos Plain, Hamersley Range and Meethena, and is only known from a few records (Storr, Smith et al. 1999; Coffey Environments, 2011).	The preferred habitat (spinifex at the base of granite outcrops) is common in the Amendment Application Area and its surrounds, particularly within the Chichester subregion. There is one record of this species 200m west of the Amendment Application Area within the Granite Dome habitat.	Possible	Low Larger, more suitable, areas of basalt hills (associated with the Gilgai habitat) occur outside of the Amendment Application Area and therefore the proposed clearing is unlikely to impact this species.
Pilbara Barking Gecko (<i>Underwoodisaurus seorsus</i>)	Priority 2 DBCA	This is a rock-inhabiting, restricted-range species encountered at mid elevations in the Hamersley Ranges, widely separated from the closest populations of the related Barking gecko <i>U. milii</i> in the northern Goldfields and Shark Bay in Western Australia (Doughty and Oliver, 2011)	This species preferred habitat (Gorge / Gully) is only present in limited amounts within the Amendment Application Area. Disturbance within Gorge and Gully habitat will be minimised.	Possible	Low The proposed clearing activities are unlikely to impact on this species as the Gorge / Gully habitat types will be avoided. Suitable habitat for this species is present outside of the amendment application area, as this species has been recorded in adjacent areas.
Pilbara Flat-headed Blind Snake (<i>Anilios gane</i>)	Priority 1 (DBCA)	The Pilbara Flat-Headed Blind Snake is endemic to the Pilbara. This insectivorous species feeds on termites and their eggs, and larvae and pupae of ants (Wilson and Swan, 2008). This species is fossorial and is rarely encountered. There are few records of the species in the Pilbara, however, given the species preference for rocky stony soils, it could occur broadly across the region.	Little is known about this species habitat preferences and it may occur within habitats of the Amendment Application Area. This species is likely to occur in gorge and gully habitat, which only makes up a small portion of the Amendment Application Area. It has been recorded from one location within the Amendment Application Area (Figure 5-51).	Recorded	Low This species may utilise the habitat types within the Amendment Application Area however is unlikely to be reliant on the areas within the Amendment Application Area, particularly as its preferred habitat (gorge/gully) are mostly absent from the Amendment Application Area.
Pilbara Olive Python (<i>Liasis olivaceus barroni</i>)	Vulnerable (EPBC Act) Vulnerable BC Act	Pilbara Olive Pythons are widespread across the Pilbara, with many significant populations remaining (Pearson, 2003). The Pilbara Olive Python is found in a range of habitats, including drier areas of woodland, escarpments, rocky gorges, gullies and around watercourses (Wilson and Swan, 2010). This species is known to den/shelter in rocky crevices or tree hollows and are often associated with areas containing watercourses. The Pilbara Olive Python uses drainage line habitat to forage and disperse throughout the landscape.	This species may occur in the Gorge / Gully and Riverine / Major Drainage Line habitat of the Amendment Application Area. There are two records of the Pilbara Olive Python within the Amendment Application Area (Figures 5-37, 5-38 and 5-51).	Recorded	Low The Pilbara Olive Python is unlikely to be reliant on the habitat within the Amendment Application Area as there are large areas of key habitat for this species (Major Drainage Line and Gorge / Gully habitat) in better condition located adjacent to the Amendment Application Area and in the broader region.

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood	Potential Impact on Species
Spotted <i>Ctenotus</i> (<i>Ctenotus uber</i> subsp. <i>johnstonei</i>)	Priority 2 DBCA	Little is known of this species and its taxonomic status is uncertain. This species is only currently known from a few localities on the western plains surrounding the Fortescue Marshes and has been recorded from Mulga habitat (Biologic, 2013) and chenopod shrubland at a base of a sandstone hill (Wilson and Swan, 2008).	Little is known about this species habitat preferences and it may occur within habitats of the Amendment Application Area. This species is likely to occur in the vicinity of the Fortescue Marsh. It has been recorded from three locations adjacent to the Amendment Application Area.	Possible	Low There are no records of this species in the Amendment Application Area. The habitat of the Amendment Application Area is highly disturbed and therefore it is unlikely this species would rely on the habitat of the Application Area and there is more suitable habitat outside the Application Area.

3.5 GROUNDWATER

The Amendment Application Area is located in the Pilbara Groundwater Area, proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act) (DoW, 2009a). There are five main aquifers across the Amendment Application Area (**Table 12**).

Table 12: Aquifers of the Amendment Application Area (DoW, 2015a, 2015b, 2015c, 2015d and 2015e)

Aquifer	Groundwater Sub-Areas	Aquifer Description
Pilbara Alluvial	Ashburton	The main alluvial aquifers are developed along the Yule, Turner and De Grey Rivers. These are major aquifers which currently supply Port Hedland with potable water. The alluvium occupies the area close to the current river channels and is recharged directly from the rivers when they flow. The alluvium is up to about 60 metres thick in the De Grey valley. The salinity tends to be low along the river and increases outwards. The area of the alluvium aquifer also includes thinner and less permeable flood plain deposits on the coastal plain, and these are used principally for pastoral purposes. Bore yields are highest in the coarse alluvium along the river beds, but decrease with distance from the river. There is potential for further development along the Yule and De Grey Rivers (DoW, 2015a).
Pilbara Fractured Rock	Ashburton East Pilbara	The Pilbara fractured rock aquifer consists of Precambrian granite-greenstone terrain overlain by surficial sediments in the river valleys. The water table is generally within 5 to 10 metres of the surface in the granitic areas, but may be quite deep below the greenstone hills. The major aquifers within these rocks are quartz veins, and chert layers. Groundwater is mainly fresh, ranging up to brackish towards the coast. Bore yields vary depending on intersection of fractures. Marble Bar town water supply is drawn from bores in acid volcanic rocks. Nullagine's town water supply is drawn from both shallow alluvium (less than 12 m deep) and fractured sandstones. Water has also been produced by dewatering from the iron ore mines in the Goldsworthy-Shay Gap-Yarrie area. There are not considered to be any major regional groundwater resources in the Pilbara fractured rock. Development will be on a local basis principally for mining and town water supply. Pastoral bores intercept both the fractured rock and the overlying weathered zone (DoW, 2015b).
Hamersley Fractured Rock	Ashburton East Pilbara	The Precambrian rocks of the Hamersley Basin are principally volcanics, shales and iron formation. Groundwater is contained within fractures within these rocks. The groundwater level may be deep below the surface, and is generally fresh. The main use is for mining and mine dewatering from iron ore mines. Bores have also been drilled for road and railway construction. There will be increasing dewatering from the fractured rocks around iron ore mines as the pits become deeper (DoW, 2015c).
Hamersley Fortescue	Ashburton East Pilbara	The sediments in the Fortescue Valley include the Robe Pisolite, Millstream calcrete (Millstream Dolomite) and the alluvium extending farther eastward towards Roy Hill. These valley-fill sediments overlie the Roy Hill Shale, Marra Mamba Iron Formation and the Wittenoom Dolomite. They range up to 60 metres in thickness. There are also concealed deep palaeochannels consisting of gravels underlying the calcrete and pisolite. The water table comes to the surface in springs at Millstream, at Deep Reach Pool, Crystal Pool and at Palm Springs to the west. Groundwater salinity is variable, from fresh to marginal in the Millstream area, and hypersaline in the internally draining Marsh in the upper part of the valley near Roy Hill. The main groundwater resource is associated with the Millstream calcrete just upstream from Millstream and along the Fortescue River where the river provides direct recharge into the aquifer. Although there is a significant groundwater storage in the calcrete, the need to maintain water levels in the pools at Millstream restricts further development of groundwater. Groundwater from the alluvium is used for Wittenoom town water supply (DoW, 2015d).
Wittenoom – Wittenoom	Ashburton East Pilbara	The Wittenoom aquifer is distinguished as a separate aquifer system because the Wittenoom Dolomite is distinct from the other fractured rock aquifers in the Hamersley Basin, having karst development (solution cavities) and being overlain by a thick sequence of valley filled sediments consisting of pisolite, calcrete and alluvium. The Wittenoom Dolomite is the most important aquifer in the province and underlies the main valleys in the Hamersley Range; it is highly transmissive and high yielding where there is karst development. Water levels may be fairly deep. The groundwater is generally fresh. The aquifer has been developed for Tom Price and Marandoo water supply and has been investigated at other localities. There is likely to be significant development pressure on this aquifer for supply to iron ore operations (DoW, 2015e).

BHP currently holds seven 5C Licences under the RIWI Act for the abstraction of groundwater (**Table 13**). Groundwater along the mainline is managed in accordance with the existing groundwater licences and the *GWL Operating Strategy for Rail*.

Table 13: Current Groundwater Abstraction Licences of the Amendment Application Area

Groundwater Licence	Allocation (kL/yr)	Groundwater Sub-Area and Aquifer
158573(5)	1,029,500	Ashburton: Hamersley Fractured Rock
167110(8)	480,000	Ashburton: Pilbara Fractured Rock
167112(4)	939,500	Ashburton: Hamersley Fractured Rock
167113(6)	750,000	Ashburton: Hamersley Fortescue
167115(5)	936,000	East Pilbara: Hamersley Fractured Rock
167116(6)	1,310,000	East Pilbara: Pilbara Fractured Rock
170361(2)	141,000	East Pilbara: Pilbara Wittenoom

3.6 SURFACE WATER

The Amendment Application Area is situated in the Pilbara Surface Water Area, proclaimed under the RIWI Act (DoW, 2009b).

There are seven surface water catchments in the Amendment Application Area (Water and Rivers Commission, 2000):

1. **Coastal:** The Port Hedland Coast Drainage Basin is made up of six major rivers: Maitland, Harding, George, Sherlock, Yule and Turner Rivers. These are individually described in the following sections. However, the basin also a number of smaller rivers or creeks such as Beebingara, Petermarer, Tabba Tabba, Jones, Nickol, Peawah and Balla Balla. These creeks or rivers are predominantly flowing northwards within the Abydos Plain and have shrub steppe vegetation. The drainage basin covers an area of 35,190 km².
2. **South West Creek:** South and South West Creeks drain into Port Hedland Harbour, which then drain into the Indian Ocean. The catchments of South and South West Creeks are sufficiently flat (particularly in the northern part of each catchment) that during periods of flood or high tides and storm surge the flows from the two creeks combine into a single drainage system. During flood periods flows from the catchment of South Creek can cross over and flow into South West Creek and vice versa. The combined catchment area of South and South West Creeks is 557 km²
3. **Turner River:** The Turner River is similar to the Yule River with a highly braided alluvial mainstream. The drainage pattern is dendritic, with the major tributaries being Turner River - West and Chinaman Creek. There are a significant number of wells throughout the catchment. The Turner River bifurcates on the coastal plain. The Turner River is a much larger catchment than the combined catchments of South and South West Creeks, having a total catchment area of 3556 km²
4. **Yule River:** The Yule River is the largest and longest river in the Port Hedland Coast Drainage Basin. The headwaters of the Yule River are in the Abydos Plain, and bounded by the Mungaroon and Chichester Ranges. The vegetation in these headwater areas is typically kanji and spinifex. As the Yule flows northwards it becomes highly braided, with a wide alluvial riverbed. Some pools exist on the mainstream, however these are fewer in density than on other rivers in this basin. At the North West Coastal Highway the riverine vegetation becomes sclerophyll woodland. The major tributaries of the Yule are Beabea Creek, Coonarrie Creek and Cockeraga River. Downstream of Jelliabina Well, the Yule River bifurcates into Yule and Yule River West Branch.
5. **Shaw River:** The Shaw River is bounded in its headwaters by the Chichester and Gorge Ranges. A substantial number of wells and springs exist in the headwaters. The major tributaries of Shaw River, starting at the upstream end, are the Western Shaw, Garden Creek, Coolargorack Creek, Tambourah Creek, Cooglegong Creek, and Coolyia Creek. On the main Shaw River there is only one significant pool, Coordina Pool. The Shaw River main channel is braided, particularly in the downstream reaches, where the riverbed is up to 1.5 km wide. The drainage pattern for the Shaw River is considered to be distributary. The Shaw River joins with the De Grey River slightly upstream of the North West Coastal Highway.

6. **Fortescue River:** The middle section of the Fortescue River is between Gregory's Gorge and Goodiadarrie Crossing. This part of the catchment is flat and the river channel is poorly defined.
7. **Fortescue River Upper:** The remaining section incorporates all the catchment above Goodiadarrie Crossing. Physiographically it is extremely flat and the downstream portion of the river becomes what is called the "Marsh" area. It is considered that the river does not flow past Goodiadarrie Crossing, which is a raised area. The major tributaries contributing to the "Marsh" area are Weeli Wooli Creek, Yandicoogina Creek, and Mindy Mindy Creek as well as the Fortescue River itself. Upstream of the "Marsh" area there is a dendritic drainage pattern with three tributaries (Western Creek, Warrawanda Creek and Fortescue River) meeting just upstream of Newman.

Seven major named watercourses (Coonarrie Creek, Coondiner Creek, Fortescue River, Turner River East, Turner River, Warrawanda Creek and Yule River) and seven minor named creeks (Coorong Creek, Edgina Creek, Gillam Creek, Homestead Creek, Kalgan Creek, Shovelanna Creek and Two Camel Creek) intersect the Amendment Application Area.

Potential impacts to significant fauna species will be reduced by minimising disturbance to Major Drainage Line fauna habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.

4 ENVIRONMENTAL MANAGEMENT

The management of the environmental aspects of BHP's Iron Ore operations at the Amendment Application Area are managed under the company's AS/NZS ISO 14001:2004 certified Environmental Management System (EMS). The EMS describes the organisational structure, responsibilities, practices, processes and resources for implementing and maintaining environmental objectives at all BHP's Iron Ore sites.

Additionally, operational controls for environmental management for the Amendment Application Area are guided by BHP's Charter Values. The Charter Values outline a commitment to develop, implement and maintain management systems for sustainable development that drive continual improvement and set and achieve targets that promote efficient use of resources. In order to give effect to the Charter Values, a series of Our Requirement Documents have been developed.

BHP Iron Ore has also developed a Sustainable Development Policy for its operations. The Sustainable Development Policy outlines a commitment to setting objective and targets to achieve sustainable outcomes and to continually improve our performance.

To support these documents BHP Iron Ore has an internal Project Environmental and Aboriginal Heritage Review (PEAHR) Procedure. The Project Environmental Aboriginal Heritage Review Procedure is used to manage any potential environmental impacts of the proposal. The purpose of the procedure is to manage implementation of environmental, Aboriginal heritage, land tenure and legal commitments prior to and during land disturbance.

All personnel carrying out works associated with clearing activities are required to comply with BHP's Charter Values; Our Requirements; EMS, BHP Iron Ore's PEAHR Procedure; and relevant legislative and licensing requirements.

5 PROJECT COMPLIANCE WITH THE TEN CLEARING PRINCIPLES

BHP considers that the clearing within the Amendment Application Area will not result in any significant environmental or social impacts, and complies with the Ten Clearing Principles, as defined in Schedule 5 of the EP Act. **Section 6** provides an assessment of project compliance with the Ten Clearing Principles.

6 ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES

The information used to assess the project against the Ten Clearing Principles has been based on the findings of the biodiversity surveys listed in **Section 3.4**.

6.1 PRINCIPLE A

Native vegetation should not be cleared if it comprises a high level of biological diversity

This proposal is not likely to be at variance to this Principle.

Similar vegetation to the Amendment Application Area in the same or better condition is located outside the Amendment Application Area. These other areas of similar vegetation type are therefore expected to have a similar or better biological diversity and conservation value than that of the Amendment Application Area.

Sixteen flora species listed as Priority Flora by the DBCA have been identified within the Amendment Application Area (**Section 3.4.1; Figures 2-1 to 2-8, 2-10 to 2-11, 2-25, 2-27 to 2-28, 2-34 to 2-36, 2-44 to 2-45, 2-51 and 2-52**).

Known locations of Priority flora will be avoided with a 10m buffer, where practicable.

The proposed clearing is expected to have a low impact on the Priority Flora recorded within the Amendment Application Area (**Table 3**) and is unlikely to have any significant impact on the biodiversity of the region.

Table 14 provides an assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle A.

Table 14: Assessment against Principle A components

Principle	Criteria	Assessment	Outcome
<p>a) Native vegetation should not be cleared if it comprises a high level of biological diversity.</p>	<p>a1) Native vegetation should not be cleared if it is representative of an area of outstanding biodiversity in the Bioregion.</p>	<p>A large portion of the Amendment Application Area is already disturbed. The remaining native vegetation within the Amendment Application Area is represented in the same or better condition within the broader region and is not considered to be of outstanding biodiversity in the Bioregion.</p>	<p>Not at variance with clearing principle.</p>
	<p>a2) Native vegetation should not be cleared if it has higher diversity of indigenous aquatic or terrestrial plant or fauna species than native vegetation of that ecological community in good or better condition in the Bioregion.</p>	<p>A large portion of the Amendment Application Area is already disturbed. The remaining native vegetation within the Amendment Application Area is in the same or worse condition as other areas of similar vegetation type within the broader region.</p>	<p>Not at variance with clearing principle.</p>
	<p>a3) Native vegetation should not be cleared if it has higher diversity of indigenous aquatic or terrestrial plant or fauna species than the remaining vegetation of that ecological community in the local area.</p>	<p>Given the highly disturbed nature the native vegetation within the Amendment Application Area is not considered to have higher biodiversity and conservation value than that of the surrounding vegetation within the local area.</p>	<p>Not at variance with clearing principle.</p>
	<p>a4) Native vegetation should not be cleared if it has higher ecosystem diversity than other native vegetation of that local area.</p>	<p>The native vegetation within the Amendment Application Area is not considered to have a higher ecosystem diversity than other native vegetation of that local area.</p>	<p>Not at variance with clearing principle.</p>
	<p>a5) Native vegetation should not be cleared if it has higher genetic diversity than the remaining native vegetation of that ecological community.</p>	<p>The native vegetation within the Amendment Application Area is not considered to have a higher genetic diversity than the remaining native vegetation of that ecological community as the vegetation is contiguous with adjacent native vegetation and has no special features.</p>	<p>Not at variance with clearing principle.</p>
	<p>A6) Native vegetation should not be cleared if it is necessary for the continued <i>in situ</i> existence of significant habitat for priority flora species published by the DBCA.</p>	<p>Sixteen priority flora species were recorded in the Amendment Application Area, all of which are known from areas beyond the Amendment Application Area. Priority flora will be avoided using a 10 m buffer, where practicable.</p>	<p>Not at variance with clearing principle.</p>

6.2 PRINCIPLE B

Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia

This proposal is not likely to be at variance to this Principle.

The vegetation and habitat found within the Amendment Application Area are considered to be well represented in the Pilbara bioregion. Twenty fauna species of conservation significance have been recorded from within the Amendment Application Area (**Section 3.4.5; Figures 5-1 to 5-53 [non-migratory species] and Figures 6-1 to 6-53 [migratory species]**).

Based on the occurrence of the habitat types (**Figures 4-1 to 4-53**) and conservation significant fauna species previously recorded in the vicinity, an additional twenty seven species are considered to potentially occur within the Amendment Application Area (i.e. those considered 'likely' or 'possible' to occur within the Amendment Application Area) (**Section 3.4.5**).

As described in **Table 11**, clearing of the Amendment Application Area is expected to have a low impact on these species as a large portion of the Amendment Application Area is already disturbed, and similar habitat in better condition is located in the vicinity of the Amendment Application Area.

Table 15 provides an assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle B.

Table 15: Assessment against Principle B components

Principle	Criteria	Assessment	Outcome
<p>b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.</p>	<p>b1) Native vegetation should not be cleared if it is or is likely to be habitat for fauna that is declared Specially Protected under the BC Act.</p>	<p>Sixteen BC Act protected species have been recorded within the Amendment Application Area (Table 11) of which 10 were migratory species. Twenty two other BC Act listed species are considered 'possible' or 'likely' to occur within the Amendment Application Area, 21 of which are migratory species.</p> <p>Potential impacts to significant fauna species will be reduced by minimising disturbance to Major Drainage Line fauna habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.</p> <p>Potential impacts to significant fauna species will be reduced by minimising disturbance to Gorge / Gully and habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.</p> <p><i>Migratory Species</i></p> <p>The migratory species protected under the BC Act which have been recorded, or with the potential to occur, are unlikely to be significantly impacted by this proposal as they are highly mobile and large areas of their preferred habitat is present in the surrounding region in the same or better condition to that of the Amendment Application Area.</p> <p><i>Non-Migratory Species</i></p> <p>The Grey Falcon is known to nest in a communications tower within the Amendment Application Area and could potentially nest in the taller trees of the Riverine and Major Drainage Line fauna habitats of Amendment Application Area. This species is unlikely to be significantly impacted by this proposal as:</p> <ul style="list-style-type: none"> • Its preferred habitat occurs extensively throughout the Pilbara • The Grey Falcon is able to egress from the area • During the falcon's breeding season (April – June) no work will be undertaken on the communications tower where this species is known to breed (Figure 5-25), without prior consultation with DBCA. <p>Given its highly disturbed nature a majority of the Amendment Application Area is not suitable for the Greater Bilby. Habitat for this species is extensive outside of the Amendment Application Area. Active Greater Bilby burrows will be avoided with a 10 m buffer, where practicable.</p> <p>While the habitats within the Amendment Application Area between Port Hedland and Redmont are utilised by the Northern quoll (specifically the quarries and Major Drainage Line), the proposed area for clearing is small in a regional context and is contiguous with habitats in the local and regional area. Management of the Northern Quoll will be undertaken in accordance with the WAIO Northern Quoll Regional Management Plan Rev 3 (BHP Iron Ore, 2022).</p> <p>The Pilbara Olive Python is unlikely to be reliant on the habitat within the Amendment Application Area and disturbance to Major Drainage Line and Gorge Gully habitat types will be minimised.</p> <p>The Pilbara Leaf-nosed Bat and the Ghost Bat may forage over the habitats within the Amendment Application Area and surrounds. No suitable roosting habitat has been identified within the Amendment Application Area and therefore they would not be dependent on the habitats present within the Amendment Application Area and is unlikely to be impacted by this project.</p> <p>The impact to the BC Act protected species recorded within the Amendment Application Area and those considered 'possible' or 'likely' to occur will be low (Table 11).</p>	<p>Not likely to be at variance with clearing principle.</p>

Principle	Criteria	Assessment	Outcome
	<p>b2) Native vegetation should not be cleared if it is or is likely to be habitat for Priority Listed Fauna.</p>	<p>Four priority listed fauna species have been recorded within the Amendment Application Area, and a further five priority listed fauna species have the potential to occur (Table 11).</p> <p>The proposed activities are unlikely to have an impact on these DBCA priority listed species as:</p> <ul style="list-style-type: none"> • Suitable foraging habitat in the same or better condition is widespread in the Amendment Application Area surrounds; • Potential impacts to significant fauna species will be reduced by minimising disturbance to Major Drainage Line fauna habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline; • Potential impacts to significant fauna species will be reduced by minimising disturbance to Gorge / Gully and habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline; • Active Mulgara burrows will be avoided using a 10 m buffer, where practicable; and • Active mounds of the Western Pebble-mound Mouse will be avoided using a 10 m buffer, where practicable. <p>The impact to the DBCA priority listed fauna species recorded within the Amendment Application Area and those considered 'possible' or 'likely' to occur will be low (Table 11).</p>	<p>Not likely to be at variance with clearing principle.</p>
	<p>b3) Native vegetation should not be cleared if it is or is likely to be habitat for fauna that is otherwise significant.</p>	<p>The highly disturbed habitat found within the Amendment Application Area may be suitable for use by conservation significant fauna, however similar habitat in better condition is widespread in the Amendment Application Area surrounds.</p> <p>Potential impacts to significant fauna species will be reduced by minimising disturbance to Major Drainage Line and Gorge / Gully fauna habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.</p>	<p>Not at variance with clearing principle.</p>
	<p>b4) Native vegetation should not be cleared if it provides significant habitat for fauna species in the local area.</p>	<p>Habitat within the Amendment Application Area is not considered significant habitat for fauna species within the local area. Similar habitat to that proposed to be cleared is located to the area surrounding of the Amendment Application Area.</p>	<p>Not at variance with clearing principle.</p>
	<p>b5) Native vegetation should not be cleared if it maintains ecological functions and processes that protect significant habitat for fauna.</p>	<p>The clearing of native vegetation within the Amendment Application Area is not considered to alter ecological functions and processes that protect significant habitat for fauna.</p>	<p>Not at variance with clearing principle.</p>
	<p>b6) Native vegetation should not be cleared if it forms, or is part of, an ecological linkage that is necessary for the maintenance of fauna.</p>	<p>The Major Drainage Line habitat may be used as corridors by fauna. Potential impacts to significant fauna species will be reduced by minimising disturbance to Major Drainage Line fauna habitat; however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.</p> <p>No ecological linkages run through the Amendment Application Area that are considered necessary for the maintenance of fauna.</p>	<p>Not at variance with clearing principle.</p>

Principle	Criteria	Assessment	Outcome
	b7) Native vegetation should not be cleared if it provides significant habitat for fauna communities (assemblages) and meta-populations.	The Amendment Application Area is not considered to contain significant habitat for faunal assemblages that are not also present in other areas within the vicinity. The Amendment Application Area is not considered likely to contain geographically isolated fauna populations.	Not at variance with clearing principle.

6.3 PRINCIPLE C

Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora

This proposal is not likely to be at variance to this Principle.

No Threatened flora listed under the EPBC Act or gazetted as Threatened Flora species under the BC Act have been recorded within the Amendment Application Area.

Table 16 provides an assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle C.

Table 16: Assessment against Principle C components

Principle	Criteria	Assessment	Outcome
c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	c1) Native vegetation should not be cleared if it is necessary for the continued <i>in situ</i> existence of populations of Threatened Flora under the BC Act 2016.	No Threatened flora species were recorded in the Amendment Application Area.	Unlikely to be at variance with clearing principle.
	c2) Native vegetation should not be cleared if it is necessary for the continued <i>in situ</i> existence of other significant flora.	No species listed under the EPBC Act or other significant flora species were recorded in the Amendment Application Area.	Unlikely to be at variance with clearing principle.

6.4 PRINCIPLE D

Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community

This proposal is not likely to be at variance to this Principle.

The Amendment Application Area intersects the boundary of one TEC: the Ethyl Gorge aquifer stygobiont community (**Figures 2-51 to 2-53**). Clearing of vegetation is unlikely to impact this subterranean community. No other TECs are located in the Amendment Application Area.

One Priority Ecological Community, Fortescue Marsh (Marsh Land System), occurs within the Amendment Application Area (**Figures 2-27 and 2-28**). Any disturbance within the Fortescue Marsh (Marsh Land System) (**Figure 1-1**) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.

This PEC is associated with Vegetation Association SF TdcTibMf Ep (**Figure 1-1 and Figures 3-27 to 3-28**) (Onshore, 2014a). Any disturbance within Vegetation Association SF TdcTibMf Ep (**Figure 1-1**) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.

The Amendment Application Area also intersects the buffer of the following PEC:

- Brockman Iron cracking clay communities of the Hamersley Range (Priority 1) (**Figure 2-27**).

None of the vegetation associations within the Amendment Application Area are associated with this PECs.

One Environmentally Sensitive Area (ESA) occurs within the Amendment Application Area: Fortescue Marsh. Any disturbance within the Fortescue Marsh ESA (**Figure 1-1**) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.

Table 17 provides an assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle D.

Table 17: Assessment against Principle D components

Principle	Criteria	Assessment	Outcome
<p>d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.</p>	<p>d1) Native vegetation should not be cleared if threatened ecological communities listed under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> are present.</p>	<p>No EPBC Act TECs that are associated with native vegetation or terrestrial environments are present in the Amendment Application Area.</p>	<p>Not at variance with clearing principle.</p>
	<p>d2) Native vegetation should not be cleared if it is necessary for the maintenance of Threatened Ecological Communities listed under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>.</p>	<p>No EPBC Act TECs or associated native vegetation will be impacted by the proposed works.</p>	<p>Not at variance with clearing principle.</p>
	<p>d3) Native vegetation should not be cleared if other significant ecological communities are present.</p>	<p>No other significant ecological communities are known to occur or are likely to occur within the Amendment Application Area.</p>	<p>Not at variance with clearing principle.</p>
	<p>d4) Native vegetation should not be cleared if it is necessary for the maintenance of other significant ecological communities.</p>	<p>No DBCA listed TECs or associated native vegetation will be impacted by the proposed works.</p>	<p>Not at variance with clearing principle.</p>
	<p>d5) Native vegetation should not be cleared if it is necessary for the continued <i>in situ</i> existence of significant examples of priority threatened ecological communities published by the DBCA.</p>	<p>One DBCA listed PEC occurs within the Amendment Application Area: Fortescue Marsh (Marsh Land System). Any disturbance within the Fortescue Marsh (Marsh Land System) and/or Vegetation Association SF TdcTibMf Ep (Figure 1-1) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.</p>	<p>Not at variance with clearing principle.</p>

6.5 PRINCIPLE E

Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared

This proposal is not likely to be at variance to this Principle.

The habitat and vegetation within the Amendment Application Area is well represented in the Bioregion (**Table 2**). Given the highly disturbed nature of the habitat of the Amendment Application Area and its regional representation it is unlikely individual species would be restricted to a particular habitat and vegetation occurring in the Amendment Application Area.

Table 18 provides an assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle E.

Table 18: Assessment against Principle E components

Principle	Criteria	Assessment	Outcome
<p>e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.</p>	<p>e1) Native vegetation should not be cleared if the remaining native vegetation represents less than 30%, or the clearing would reduce the representation of remaining native vegetation to less than 30% in the Bioregion (or subregion where applicable).</p>	<p>Clearing native vegetation within the Amendment Application Area will not reduce the extent of native vegetation below 30% in the bioregion or subregion.</p>	<p>Not at variance with clearing principle.</p>
	<p>e2) Native vegetation should not be cleared if an ecological community represents less than 30% of its original extent or clearing would reduce the representation of any ecological community to less than 30% of its original extent in the Bioregion (or subregion where applicable).</p>	<p>Clearing native vegetation within the Amendment Application Area will not significantly reduce the known extent of the ecological community from pre-European extents. Current extents of this vegetation community in the bioregion are more than 95 % of pre-European extents.</p>	<p>Not at variance with clearing principle.</p>
	<p>e3) Native vegetation should not be cleared if clearing would reduce an ecological community to less than 1% of the Bioregion (or subregion where applicable).</p>	<p>Clearing native vegetation within the Amendment Application Area will not significantly reduce the known extent of the vegetation community in the bioregion.</p>	<p>Not at variance with clearing principle.</p>
	<p>e4) Native vegetation should not be cleared if the remaining native vegetation represents less than 30% or the clearing would reduce the representation of remaining native vegetation to less than 30% in the Local Area.</p>	<p>Clearing native vegetation within the Amendment Application Area will not reduce the representation of remaining native vegetation to less than 30% in the local area.</p>	<p>Not at variance with clearing principle.</p>
	<p>e5) Native vegetation should not be cleared if an ecological community represents less than 30% of its original extent or clearing will reduce the representation of any ecological community to less than 30% of its original extent in the Local Area.</p>	<p>Clearing native vegetation within the Amendment Application Area will not reduce the representation of any ecological community to less than 30% of its original extent in the local area.</p>	<p>Not at variance with clearing principle.</p>
	<p>e6) Native vegetation should not be cleared if clearing would reduce any ecological community to less than 1% of the Local Area.</p>	<p>Clearing native vegetation within the Amendment Application Area will not significantly reduce the known extent of the vegetation community in the local area.</p>	<p>Not at variance with clearing principle.</p>

6.6 PRINCIPLE F

Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland

This proposal is not likely to be at variance to this Principle.

The Fortescue Marsh ESA occurs within the Amendment Application Area. Any disturbance within the Fortescue Marsh ESA (**Figure 1-1**) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.

Seven major named watercourses (Coonarrie Creek, Coondiner Creek, Fortescue River, Turner River East, Turner River, Warrawanda Creek and Yule River) and seven minor named creeks (Coorong Creek, Edgina Creek, Gillam Creek, Homestead Creek, Kalgan Creek, Shovelanna Creek and Two Camel Creek) intersect the Amendment Application Area. Streamflow is ephemeral and associated with high rainfall events during December to April.

Potential impacts will be reduced by minimising disturbance to areas mapped as Major Drainage Line fauna habitat, however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.

An assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle F is provided in **Table 19**.

Table 19: Assessment against Principle F components

Principle	Criteria	Assessment	Outcome
<p>f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.</p>	<p>f1) Native vegetation should not be cleared if it is growing in a watercourse or wetland that has been identified as having significant environmental values.</p>	<p>The Fortescue Marsh ESA occurs within the Amendment Application Area. Any disturbance within the Fortescue Marsh ESA (Figure 1-1) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.</p> <p>The other watercourses of the Amendment Application Area have not been identified as having significant environmental value.</p>	<p>Unlikely to be at variance with clearing principle.</p>
	<p>f2) Native vegetation should not be cleared if it provides a buffer area for watercourses and wetlands identified in criteria (f1) and (f2).</p>	<p>The Fortescue Marsh ESA occurs within the Amendment Application Area. Any disturbance within the Fortescue Marsh ESA (Figure 1-1) will be minimised and be for ongoing rail maintenance and no borrow pits will be established as per Condition 5 of CPS 7009/3.</p> <p>No other native vegetation occurs within the Amendment Application Area that provides a buffer to watercourses or wetlands that have been identified as having significant environmental values.</p>	<p>Unlikely to be at variance with clearing principle.</p>
	<p>f3) Native vegetation should not be cleared if water tables are likely to change and adversely affect ecological communities that are wetland or groundwater dependent.</p>	<p>Due to the linear nature of the rail infrastructure clearing this project is not considered likely to adversely alter water tables, and as such will not impact on any ecological communities that are wetland or groundwater dependent.</p>	<p>Not at variance with clearing principle.</p>
	<p>f4) Native vegetation should not be cleared if it is growing in other watercourses or wetlands.</p>	<p>Seven major named watercourses and seven minor named creeks intersect the Amendment Application Area. Streamflow is ephemeral and associated with high rainfall events during December to April.</p> <p>Potential impacts will be reduced by minimising disturbance to areas mapped as Major Drainage Line fauna habitat, however some disturbance will need to be undertaken where necessary for the ongoing operation and maintenance of the Newman Mainline.</p>	<p>Unlikely to be at variance with clearing principle.</p>

6.7 PRINCIPLE G

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation

This proposal is not likely to be at variance to this Principle.

Land degradation may include impacts such as erosion, changes to pH, water logging, salinisation or spread of weeds. These potential impacts are assessed in the sections below. **Table 20** provides an assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle G.

Given the highly disturbed nature of the Amendment Application Area, the linear nature of the infrastructure, the proposed management strategies for weed species within the Amendment Application Area and the low susceptibility of the soils to erosion, it is considered that the project will not be at variance to Principle G.

6.7.1 Erosion

Due to the highly disturbed and linear nature of the Amendment Application Area, it is not anticipated that the removal of vegetation will contribute to increased amounts of wind or water erosion in the Amendment Application Area or adjacent areas. Any areas cleared that are no longer required will be re-vegetated, where practicable.

6.7.2 Changes to pH

The Amendment Application Area is not in an area at risk of acid sulphate soils and there are no recorded acid sulphate soils within the Amendment Application Area. It is not expected that the proposed clearing will result in changes to soil pH.

6.7.3 Water logging and salinisation

The plants of the Amendment Application Area would not have a significantly high uptake of groundwater and therefore there is not expected to be a significant reduction in groundwater uptake due to the proposed clearing. Due to the small amount of clearing no water logging or increased salinisation is expected to occur as a result of the proposed clearing.

6.7.4 Weeds

Forty four introduced flora species (weeds) were recorded within the Amendment Application Area (**Section 3.4.3**). Three of these weed species are Declared Pests under s22 of the *Biosecurity and Agriculture Management Act, 2007* (BAM Act): **Calotropis procera* (Sodam Apple), **Coccinia grandis* (Scarlet Gourd), and **Tamarix aphylla* (Athel Tree).

Control of established weed populations will be carried out according to BHP's standard Weed Control and Management Procedures and Condition 10 of CPS 7009/3.

Table 20: Assessment against Principle G components

Principle	Criteria	Assessment	Outcome
<p>g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.</p>	<p>g1) Native vegetation should not be cleared if wind or water erosion of soil is likely to be increased (on or off site).</p>	<p>Soil erosion is not anticipated to occur as any areas cleared that are no longer required will be re-vegetated, where practicable.</p>	<p>Not at variance with clearing principle.</p>
	<p>g2) Native vegetation on land with soils with high or low pH should not be cleared.</p>	<p>The Amendment Application Area is not considered to contain soils at risk of having acid sulphate soils present. No vegetation on soils with significantly low (or high) pH will be impacted by the proposed works.</p>	<p>Not at variance with clearing principle.</p>
	<p>g3) Native vegetation should not be cleared if water logging is likely to be increased (on or off site).</p>	<p>It is not expected that water logging would be increased by the clearing of native vegetation within the Amendment Application Area.</p>	<p>Not at variance with clearing principle.</p>
	<p>g4) Native vegetation should not be cleared if land salinisation is likely to be increased (on or off site).</p>	<p>Soil salinity is not considered to be increased in the Amendment Application Area (on or off site) by the clearing of native vegetation.</p>	<p>Not at variance with clearing principle.</p>

6.8 PRINCIPLE H

Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area

This proposal is not likely to be at variance to this Principle.

The Amendment Application Area is not within any conservation areas as listed by the DBCA or those protected under the EPBC Act. At its closest point Karijini National Park is approximately 25 km west of the Amendment Application Area

The Amendment Application Area is not considered to form an ecological linkage to this conservation area.

An assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle H is provided in **Table 21**.

Table 21: Assessment against Principle H components

Principle	Criteria	Assessment	Outcome
h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	h1) Native vegetation should not be cleared if it contributes significantly to the environmental values of a conservation area.	There are no conservation areas within the vicinity of the Amendment Application Area.	Not at variance with clearing principle.
	h2) Native vegetation should not be cleared if that vegetation provides a buffer to a conservation area.	There are no conservation areas within the vicinity of the Amendment Application Area.	Not at variance with clearing principle.
	h3) Native vegetation should not be cleared if the land contributes to an ecological linkage to a conservation area.	The nearest conservation area, Karijini National Park, is approximately 25 km away.	Not at variance with clearing principle.
	h4) Native vegetation should not be cleared if it provides habitats not well represented on conservation land.	There are no habitats within the Amendment Application Area that are not well represented on conservation land.	Not at variance with clearing principle.

6.9 PRINCIPLE I

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water

This proposal is not likely to be at variance to this Principle.

The Amendment Application Area is located in the Pilbara Groundwater Area, proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act) (DoW, 2009a). There are five main aquifers across the Amendment Application Area: Pilbara Alluvial, Pilbara Fractured Rock, Hamersley Fractured Rock, Hamersley Fortescue, and Wittenoom – Wittenoom (**Table 12**).

BHP currently holds seven 5C Licences under the RIWI Act, 1914 for the abstraction of groundwater (**Table 13**). Groundwater along the mainline is managed in accordance with the existing groundwater licences and the *GWL Operating Strategy for Rail*.

The Amendment Application Area is situated in the Pilbara Surface Water Area, proclaimed under the RIWI Act (DoW, 2009b). There are seven surface water catchments in the Amendment Application Area (Water and Rivers Commission, 2000): Coastal, South West Creek, Turner River, Yule River, Shaw River, Fortescue River and Fortescue River Upper.

Seven major named watercourses (Coonarrie Creek, Coondiner Creek, Fortescue River, Turner River East, Turner River, Warrawanda Creek and Yule River) and seven minor named creeks (Coorong Creek, Edgina Creek, Gillam Creek, Homestead Creek, Kalgan Creek, Shovelanna Creek and Two Camel Creek) intersect the Amendment Application Area.

Appropriate surface water management practices will be implemented to minimise erosion and minimise potential impacts on the quality of surface water.

Table 22 provides an assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle I.

Table 22: Assessment against Principle I components

Principle	Criteria	Assessment	Outcome
<p>i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.</p>	<p>i1) Native vegetation should not be cleared if clearing the vegetation will reduce the quality of surface or underground water in proclaimed, gazetted or declared areas or catchments.</p>	<p>The clearing of native vegetation is not considered likely to alter the quality of surface or ground water within the Amendment Application Area due to the small amount of clearing within the Amendment Application Area and lack of permanent waterbodies in the vicinity.</p>	<p>Not at variance with clearing principle.</p>
	<p>i2) Native vegetation should not be cleared if sedimentation, erosion, turbidity or eutrophication of water bodies on or off site is likely to be caused or increased.</p>	<p>Localised erosion will not impact any waterbodies as no permanent waterbodies are present within the vicinity of the Amendment Application Area.</p>	<p>Not at variance with clearing principle.</p>
	<p>i3) Native vegetation should not be cleared if water tables are likely to change significantly altering salinity or pH.</p>	<p>The clearing of native vegetation is not considered likely to alter the quality of surface or ground water within the Amendment Application Area.</p>	<p>Not at variance with clearing principle.</p>
	<p>i4) Native vegetation should not be cleared if the clearing is likely to alter the water regimes of groundwater-dependent ecosystems on or off site, causing degradation to the biological communities associated with these systems.</p>	<p>The clearing of native vegetation is not considered likely to alter the regimes of surface or groundwater dependent vegetation within the vicinity of the Amendment Application Area.</p>	<p>Not at variance with clearing principle.</p>

6.10 PRINCIPLE J

Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding

This proposal is not likely to be at variance to this Principle.

Massive surface water runoff and localised flooding occurs following intense rainfall events. However, the incidence or intensity of flooding is not likely to be significantly influenced by the relatively small amount of proposed vegetation clearing. It is highly improbable that surface runoff generated from the cleared area could create sufficient concentrated water volumes to cause even a localised flood event.

Table 23 provides an assessment of the proposed clearing activities within the Amendment Application Area against the components of clearing Principle J.

Table 23: Assessment against Principle J components

Principle	Criteria	Assessment	Outcome
j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	j1) Native vegetation should not be cleared if it is likely to lead to an incremental increase in peak flood height.	The clearing of native vegetation is not considered likely to cause any alteration to peak flood height.	Not at variance with clearing principle.
	j2) Native vegetation should not be cleared if it is likely to lead to an incremental increase in duration of flood peak.	The clearing of native vegetation is not considered likely to cause any impact on duration of flood peak.	Not at variance with clearing principle.

7 HERITAGE

The Land Access Unit is the internal group within BHP that manages Aboriginal heritage matters. The Land Access Unit is responsible for ensuring that BHP complies with the *Aboriginal Heritage Act, 1972*, and all other state and federal heritage legislation. All land disturbance activities are subject to ethnographic and archaeological surveys, prior to disturbance. BHP's PEHR process (**Section 4**), ensures that all heritage sites in the vicinity of the Amendment Application Area are identified and avoided where practicable.

The Proposal is situated within the following Native Title Claims: Banjima People (WC 2011/6), Kariyarra People (WC 1999/3), Kariyarra – Pipingarra (WC 2009/3), Kariyarra – Abydos (WC 2014/1), Njamal (WC 1999/8), Nyiyaparli People (WC 2005/6) and the Palyku (WC 1999/16).

Ethnographic and archaeological surveys of the Amendment Application Area have been conducted in consultation with the traditional owners. A number of heritage sites have been identified within the Amendment Application Area. The location of these sites has not been provided out of respect for the traditional owners.

In the event that any heritage sites cannot practicably be avoided, BHP would consult the relevant traditional owners and seek approval under the *Aboriginal Heritage Act, 1972* before the site is disturbed.

8 CONCLUSION

The proposed clearing within the Amendment Application Area is unlikely to be at variance to any of the Ten Clearing Principles. The proposal to clearing up to 2,928 ha for the construction and maintenance of the Newman Mainline and all associated activities, within a boundary of 14,391.24 ha is unlikely to have any significant negative impacts on biodiversity and environmental values in the area.

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Figures

Figure 1-1: NVCP CPS 7009/3 Renewal Newman Mainline – Regional Overview

Figures 2-1 to 2-53: NVCP CPS 7009/3 Renewal Newman Mainline – Significant Flora, TECs and PECs

Figures 3-1 to 3-53: NVCP CPS 7009/3 Renewal Newman Mainline – Broad Floristic Communities

Figures 4-1 to 4-53: NVCP CPS 7009/3 Renewal Newman Mainline – Fauna Habitat

Figures 5-1 to 5-53: NVCP CPS 7009/3 Renewal Newman Mainline – Non-Migratory Significant Fauna

Figures 6-1 to 6-53: Newman Mainline Strategic Rail NVCP – Migratory Significant Fauna

Appendices

Appendix 1: *East Ophthalmia & Ninga Detailed Flora & Vegetation Survey* (Spectrum Ecology & Spatial, 2022)

Appendix 2: *BHP Western Australian Iron Ore Windfence Flora and Fauna Assessment Level 1 Fauna and Reconnaissance Flora Survey* (GHD, 2020a)

Appendix 3: *Consolidation of Regional Vegetation Mapping BHP Billiton Iron Ore Pilbara Tenure (Onshore Environmental, 2014a)*

Appendix 4: *Port Hedland Regional Flora and Vegetation Assessment* (ENV, 2011a)

Appendix 5: *Mainline Rail Expansion Level 2 Flora and Vegetation Survey* (Onshore Environmental, 2014b)

Appendix 6: *Rapid Growth Project 5: Jimblebar Junction to Yandi Junction Railway Reserve Flora and Vegetation Assessment (ENV, 2008a)*

**Appendix 7: Rapid Growth Project 5: Quarry 6 Flora and Vegetation Assessment
(ENV, 2008b)**

Appendix 8: East Ophthalmia and Ninga Detailed Vertebrate Fauna Survey (Biologic, 2022a)

Appendix 9: BHP Fortescue Valley Targeted Bilby Survey (GHD, 2020b)

Appendix 10: Jimblebar targeted ghost bat survey (GHD, 2020c)

**Appendix 11: Consolidation of Regional Fauna Habitat Mapping BHP Billiton Iron Ore
Pilbara Tenure (Biologic, 2017)**

Appendix 12: Port Hedland Regional Fauna Assessment (ENV, 2011b)

Appendix 13: Mainline Rail Expansion Vertebrate Fauna Survey (Biologic, 2013)

**Appendix 14: Rapid Growth Project 5: Jimblebar Junction to Yandi Junction Railway
Reserve and Repeaters 6, 7 and 8 Fauna Assessment (ENV, 2008c)**

Appendix 16: Ophthalmia Dam Avian Fauna Survey (MWH, 2015)