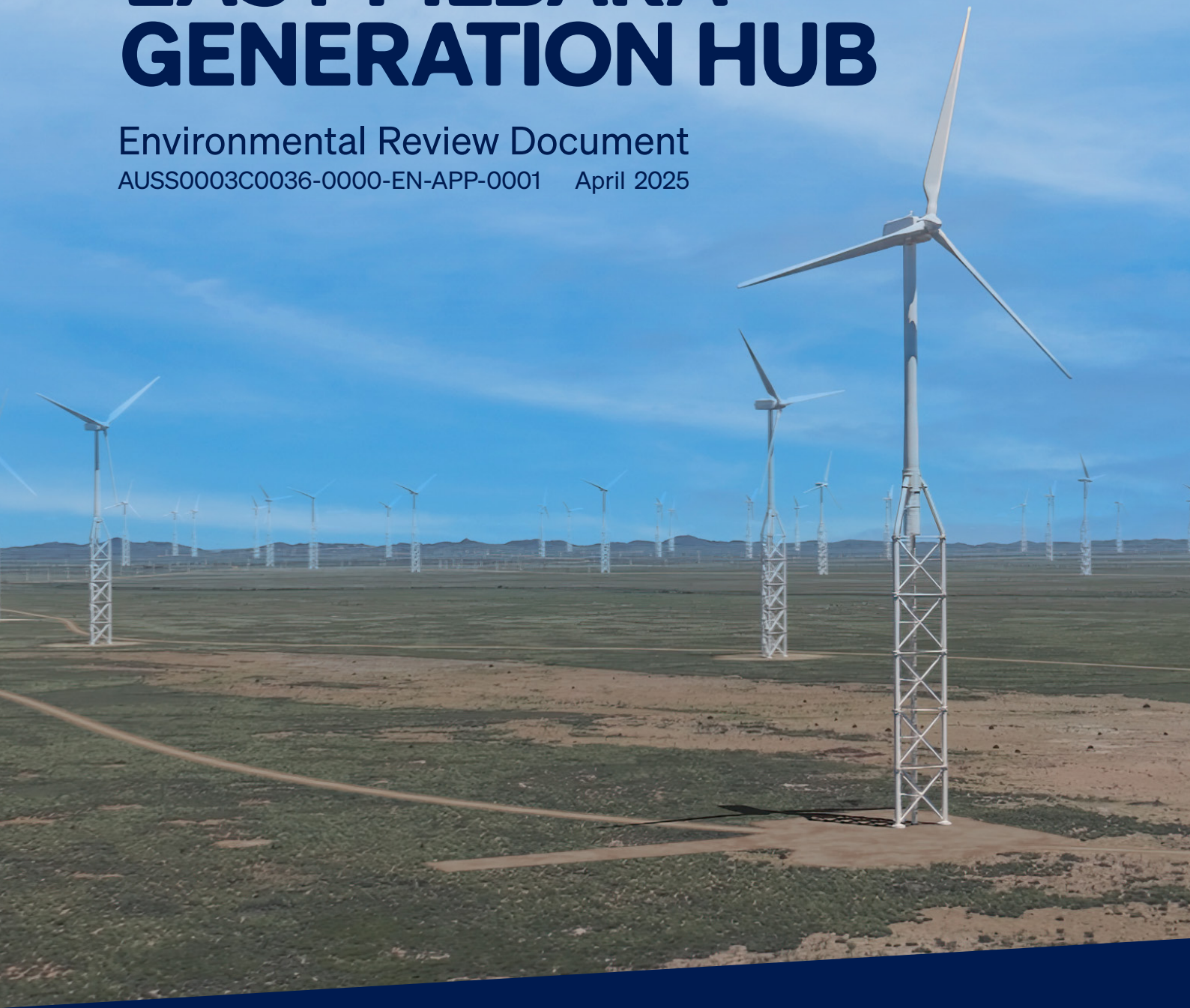




EAST PILBARA GENERATION HUB

Environmental Review Document
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Report

Environmental Review Document

East Pilbara Generation Hub

29 April 2025

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Rev 0.1



East Pilbara Generation Hub Environmental Review Document Assessment No. XXXX

Proponent

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Task	Name	Company	Signature	Date
Prepared by	Dominic Flynn	Jacobs Group (Australia)		20/12/2024
Reviewed by	Lisa Boulden / Melissa O'Toole	Jacobs Group (Australia)		20/12/2024
Approved by	Jarrold Pittson	Fortescue		29/04/2024



EXECUTIVE SUMMARY

Pilbara Energy (Generation) Pty Ltd (PEG), a wholly owned subsidiary of Fortescue Ltd (Fortescue), is proposing to develop a renewable energy hub, the East Pilbara Generation Hub (EPGH) (the Proposal), comprising of wind generation and a 220 kV transmission line connecting to Fortescue's Iron Bridge Project, in the Pilbara region of Western Australia (WA).

The Proposal includes the installation of up to 200 wind turbines and five substations, with a total capacity of up to 2.1 GW. The proposed 220 kV transmission line will be built to enable energy transfer to Fortescue's mining operations from the wind farm. The Proposal involves disturbance of up to 2,318.80 ha of vegetation within a 98,772.61 ha Development Envelope (DE) (Figure 1-1).

Background and Context

The purpose of this Environmental Review Document (ERD) is to present an Environmental Impact Assessment (EIA) of the Proposal for consideration by the Environmental Protection Authority (EPA). This document includes a detailed impact assessment and description of proposed mitigation and management measures for the environmental factors identified in this report.

This document has been prepared in accordance with the EPA's '*Instructions on how to prepare an Environmental Review Document*' (EPA, 2021a) and is based on project and study information available at the time of writing.

Overview of the Proposal

The physical, construction and operational elements required under Section 38 of the EP Act are summarised in Table E-1-1 and Table E-1-2.

Table E-1-1: Proposal Summary

Item	Description
Proposal title	East Pilbara Generation Hub
Proponent name	Pilbara Energy (Generation) Pty Ltd
Short Description	<p>The Proposal is for the construction and operation of a renewable energy wind generation hub (EPGH), to power the Fortescue mining operations in the Pilbara region.</p> <p>The Proposal comprises the installation of wind turbines and a 220 kV transmission line connecting the hub to Fortescue's Iron Bridge Mine, substations, 220 kV transmission lines between the substations, 33 kV reticulation to collect power from wind turbines, a borefield, associated supporting infrastructure, and linear supporting infrastructure such as roads, pipelines and corridors for overhead electrical reticulation.</p> <p>The Proposal is located approximately 40 km southeast of Marble Bar and 90 km east of Fortescue's Iron Bridge Project in the Shire of East Pilbara and Nyamal Native Title determination area.</p>



Table E-1-2: Proposal Content Elements

Element	Location	Proposed Extent
Physical Elements		
Wind Farm element: <ul style="list-style-type: none"> • Wind turbines and hardstands • Overhead electrical reticulation and transmission lines (220 kV and 33 kV) • Substations and switchyards 	Figure 3-2	Development Envelope of 98,772.61 ha, including: Clearing of native vegetation up to 2,318.80 ha, including: <ul style="list-style-type: none"> • 1,290.68 ha of permanent clearing • 1,028.12 ha of temporary clearing.
Transmission line elements: <ul style="list-style-type: none"> • 220 kV transmission line • Transmission line power poles and associated hardstands • Transmission line service corridor 		
Supporting and ancillary infrastructure elements: <ul style="list-style-type: none"> • Access roads and service corridors • Accommodation camps (construction and permanent) • Wastewater treatment plant and reverse osmosis plant • Laydown areas • Concrete batching • Explosives storage, preparation facilities and hydrocarbon storage • Waste management and landfill • Borrow pits • Meteorological masts • Crushing and screening plant • Airstrip • Topsoil stockpiles • Communication towers • Site offices and workshops • Battery storage 		
Construction Elements		
Water Supply (borefield, associated water pipelines and turkey's nests)	TBC	Up to 700 ML/annum during construction period
Backup Power Supply <ul style="list-style-type: none"> • Diesel Generators • Battery Storage 	Figure 3-2	Up to 4 MW (instantaneous load requirement)
Operational Elements		
Wind Energy Generation	Figure 3-2	Individual wind turbines generating renewable electricity
Transmission and Energy Storage (220 kV transmission line, substations and associated battery energy storage systems (BESS))	Figure 3-2	Up to five substations including BESS



Element	Location	Proposed Extent
Water Supply (borefield, associated water pipelines and turkey's nests)	TBC	Up to 100 ML/annum during operational period
Backup Power Supply <ul style="list-style-type: none"> • Diesel Generators • Thermal Generators • BESS 	Figure 3-2	Up to 4 MW (instantaneous load requirement)

Proposal elements with greenhouse gas emissions

Construction Elements

Scope 1:	Scope 1 emissions for the construction and installation phase of the Proposal are estimated to be 71,038 tCO ₂ -e
Scope 2:	No Scope 2 emissions are anticipated from the Proposal in construction as all electrical power will be self-generated.
Scope 3:	Emissions during manufacturing and construction of facility and equipment are expected to be less than 1,000,000 tCO ₂ -e per annum.

Operational Elements

Scope 1:	No significant ongoing Scope 1 emissions.
Scope 2:	No Scope 2 emissions are anticipated from the Proposal in operations as all electrical power will be self-generated
Scope 3:	Scope 3 emissions during operations are expected to be approximately 39,931 tCO ₂ -e per annum.

Total Emissions (based on annual average Scope 1 and Scope 2)

Total Scope 1 emissions are expected to be approximately 228,752 tCO₂-e.

Rehabilitation

Topsoil to be stored in allocated storage areas and used to rehabilitate areas disturbed for temporary facilities following construction. At the completion of the Proposal, any infrastructure no longer required will be removed and disturbed areas rehabilitated consistent with the surrounding landscape. Topsoil from permanent clearing will be spread consistent with the surrounding landscape or stockpiled.

Commissioning

The commissioning of the wind farm will commence with the completion and subsequent energisation of the 220 kV transmission line connecting the wind farm via the main substation to the main power transmission network. Groups of wind turbines connected to the substations via the 33kV overhead lines will be commissioned as power from the grid becomes available.

Before any operational activity begins, comprehensive system testing will be conducted on all turbines, electrical infrastructure, and grid connections to ensure that all components meet safety, performance, and environmental standards. Performance testing, and noise emission testing will be completed after commissioning if required.

Decommissioning

At completion of the operational phase, the decommissioning of the wind farm will involve the removal of all wind turbines, towers, foundations (to a specified depth), transformers, cabling, and other above-ground infrastructure. Underground components, such as cables or foundations below a certain depth, may be left in place if deemed environmentally preferable, in line with regulatory guidelines. All removed materials will be handled responsibly, with recyclable components sent to appropriate facilities and non-recyclable waste disposed of according to local regulations.

Works will be planned to minimise environmental impact and restore the site to its pre-development condition as much as feasible.



Element	Location	Proposed Extent
Other elements which affect extent on the environment		
Proposal time	Maximum project life	25-30 years At the end of life, the site will either be repowered or decommissioned.
	Construction phase	Approximately 42 months.
	Operations phase	Operations across the proposed site will be achieved once commissioning of all stages is complete. Infrastructure to be maintained and then replaced at the end of asset life (approximately every 30 years).
	Decommissioning Phase	Approximately 24 months.



Summary of Potential Impacts, Proposed Mitigation and Outcomes

Table E-1-3: Summary of Potential Impacts, Proposed Mitigation and Outcomes

Flora and Vegetation	
EPA Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Policy and Guidance	<ul style="list-style-type: none"> • Technical Guidance – Flora and Vegetation Surveys for EIA (EPA, 2016a). • Environmental Factor Guideline – Flora and Vegetation (EPA, 2016b).
Potential Impacts	<ul style="list-style-type: none"> • Direct impacts: <ul style="list-style-type: none"> ○ Clearing up to 2,318.80 ha of native vegetation. ○ Clearing 249 individuals of one Priority flora species (<i>Heliotropium murinum</i>). ○ Clearing 3.41 ha of habitat for Threatened flora species (<i>Quoysa zonalis</i> – within 200 m of known records). • Indirect impacts: <ul style="list-style-type: none"> ○ Fragmentation of conservation significant flora species habitat. ○ Edge effects on three conservation significant flora species. ○ Impacts on groundwater dependent vegetation as a result of groundwater abstraction. ○ Introduction or spread of weed species. ○ Increase of dust deposition. ○ Increased risk of bushfire incidents. • Cumulative impacts: <ul style="list-style-type: none"> ○ Combined impacts to the remaining extent of pre-European vegetation associations associated with the Proposal and other developments in the surrounding area. ○ Combined clearing of <i>Heliotropium murinum</i> individuals reducing the extent of occurrence of the species or changing its conservation status at a regional or species level. ○ Combined impacts to groundwater dependent vegetation resulting from direct clearing of vegetation associated with the Proposal and other developments in the surrounding area.



Mitigation	<ul style="list-style-type: none"> ● Avoidance: <ul style="list-style-type: none"> ○ The design has avoided known locations of conservation significant flora where practicable. ○ Where significant flora or vegetation occurs close to the Indicative Disturbance Footprint (IDF), clearing areas will be demarcated prior to construction activities to protect the conservation significant flora species and vegetation from impacts such as accidental clearing or disturbance. ○ Areas to be cleared will be demarcated on the ground (either physically or using GPS enabled methods). ● Minimisation: <ul style="list-style-type: none"> ○ All clearing areas will be checked and confirmed post-clearing through inspection of aerial imagery of clearing areas and comparison to the IDF. ○ Comprehensive weed hygiene management through implementation of weed management measures. All works will be undertaken in accordance with Fortescue’s Weed Management Plan (Reference: 45-PL-EN-0033) as the standard operating procedure. ○ Groundwater abstraction will be managed to minimise drawdown and potential impacts on groundwater dependent vegetation This will be managed under the <i>Rights in Water and Irrigation Act 1914</i> (RIWI Act) 5C water abstraction licence. ○ Dust deposition will be managed through standard construction measures (e.g., water application) to minimise dust generation and avoid impacts on vegetation in line with standard dust management measures. ○ Implementation of fire risk management measures will be undertaken (see Section 7.7 for further detail). ● Rehabilitation: <ul style="list-style-type: none"> ○ Rehabilitation of a total of 1,028.12 ha of cleared vegetation which will be undertaken progressively after each phase of the construction activities to reduce impacts to floral and vegetation over time, including potential fragmentation.
Outcomes	<p>The proposed permanent clearing of ‘Good to Excellent’ quality vegetation is considered a significant residual impact.</p> <p>Other potential direct and indirect impacts to flora and vegetation associated with the Proposal will not be significant at the local or regional scale.</p> <p>The avoidance and minimisation of impacts, together with the offsetting of significant residual impacts will result in the biological diversity and ecological integrity of the study area being maintained. The Proposal is consistent with the EPA’s environmental objective for Flora and Vegetation. Details of the proposed offsets are summarised in Chapter 12 (Offsets).</p>
Terrestrial Fauna	
EPA Objective	<p>To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.</p>
Policy and Guidance	<ul style="list-style-type: none"> ● Technical Guidance – Terrestrial vertebrate fauna surveys for EIA (EPA, 2020). ● Environmental Factor Guideline – Terrestrial Fauna (EPA, 2016c). ● Technical Guidance – Sampling methods for Terrestrial Vertebrate Fauna (EPA, 2016d).



Potential Impacts	<ul style="list-style-type: none">• Direct impacts:<ul style="list-style-type: none">○ Clearing of fauna habitat within the DE, including habitat critical to the survival of Threatened species (Northern Quoll; Greater Bilby; Grey Falcon; Pilbara Leaf-nosed Bat; Pilbara Olive Python; and Ghost Bat) and Priority and Migratory species.○ Barrier effect to fauna movement.○ Fauna mortality through collision with vehicles during the construction and operational phase (including bird and bat collisions).• Indirect impacts:<ul style="list-style-type: none">○ Introduction of invasive species.○ Trophic cascade effect predator-prey dynamic and ecosystem function.○ Potential increase of artificial nesting or use of artificial features as habitat.○ Disruption to behaviour of nocturnal fauna due to artificial light during construction and operational activities.○ Pollution (dust, light, noise and vibration).○ Increased risk of bushfires associated with construction activities and operation of new electrical infrastructure.• Cumulative impacts:<ul style="list-style-type: none">○ Combined impacts from clearing on general fauna habitats associated with the Proposal and other developments in the surrounding area.○ Combined impacts from clearing of habitat critical for the survival of Threatened species associated with the Proposal and other developments in the surrounding area.○ Combined disturbance to Threatened species from construction and operational activities associated with the Proposal and other developments in the surrounding area.
Mitigation	<ul style="list-style-type: none">• Avoidance:<ul style="list-style-type: none">○ Prior to conducting ground disturbance activities, ensure known locations of environmentally sensitive areas (such as areas of critical habitat) to be retained and protected from disturbance are identified on the ground by appropriate signage, fencing or flagging.○ Clearing areas will be demarcated on Proposal drawings and physically on site prior to clearing activities.• Minimisation:<ul style="list-style-type: none">○ Clearing and ground disturbing activities limited to the defined clearing limits and boundaries described within the approval documentation.○ All site operatives and personnel attending the site will undergo an induction regarding threatened fauna and direct and indirect impacts.○ Strict speed limits will be enforced around the site in order to avoid fauna strikes during clearing and construction.○ The design of both power lines and poles will comply with recommendations developed by BirdLife International (BirdLife International, 2007a) to minimise potential for impacts to birds.



	<ul style="list-style-type: none"> ○ Comprehensive weed hygiene management through implementation of weed management measures. All works will be undertaken in accordance with Fortescue’s Weed Management Plan (Reference: 45-PL-EN-0033) as the standard operating procedure. ○ Implementation of fire risk management measures will be undertaken (see Section 7.7 for further detail). ○ All food waste will be removed from site at the end of each shift to minimise attraction of feral animals. ○ Lighting will be designed and managed in accordance with the National Light Pollution Guidelines for Wildlife (DCCEEW, 2023c). ○ Standard construction noise management measures will be implemented (see Section 8.7 for further detail). ○ Operational measures to reduce potential impacts associated with collision of the wind turbine (see Section 8.7 for further detail). ● Rehabilitation: <ul style="list-style-type: none"> ○ Rehabilitation of 1,030.35 ha of habitat after each phase of the construction activities will reduce impacts to fauna habitat over time, including potential fragmentation impacts.
Outcomes	<p>The Proposal will result in the clearing of 2,328.23 ha of fauna habitat, some of which will provide habitat for conservation significant fauna. Critical habitat will be lost Northern Quoll, Greater Bilby, Grey Falcon, PLNB, Pilbara Olive Python, Ghost Bat, and Peregrine Falcon.</p> <p>Other potential direct and indirect impacts to terrestrial fauna associated with the Proposal will not be significant at the local or regional scale. The avoidance and minimisation of impacts, together with the offsetting of significant residual impacts will result in the biological diversity and ecological integrity of the study area being maintained. The Proposal is consistent with the EPA’s environmental objective for Fauna. Details of the proposed offsets are summarised in Chapter 12 (Offsets).</p>
Social Surroundings	
EPA Objective	To protect social surroundings from significant harm.
Policy and Guidance	<ul style="list-style-type: none"> ● Statement of Environmental Principles, Factors and Objectives (EPA, 2021b). ● Environmental Factor Guideline – Social Surroundings (EPA, 2023a). ● Technical Guidance: EIA of Social Surroundings – Aboriginal Cultural Heritage (EPA, 2023b).
Potential Impacts	<p>Aboriginal Cultural Heritage and Cultural Values</p> <ul style="list-style-type: none"> ● Direct impacts: <ul style="list-style-type: none"> ○ Removal or damage to cultural material. ○ Unauthorised disturbance/access to Heritage Places ○ Loss of culturally significant flora. ○ Disturbance to creek lines or banks from proposed crossings or widening of existing tracks over creeks. ○ Loss of access to Country, including areas used for hunting.



	<ul style="list-style-type: none">• Indirect impacts:<ul style="list-style-type: none">○ Increased dust from construction and operation reducing aesthetics at culturally significant areas and the wider cultural landscape.○ Reduced aesthetics at culturally significant areas and wider cultural landscape (no longer use or visit the area to undertake traditional activities).○ Reduced use of the area for traditional activities due to noise from construction and operation of wind turbines.○ Noise and Vibration from operating wind turbines resulting in altered behaviour of culturally significant fauna species.○ Altered hydrological regime of rivers and creek lines impacting health of waterways and natural characteristics.• Cumulative impacts:<ul style="list-style-type: none">○ Combined impacts from other surrounding developments on Aboriginal Cultural Heritage values. <p>Non-Aboriginal Heritage</p> <ul style="list-style-type: none">• Potential direct impacts include damage or degradation of the North Pole Dome / Meentheena site from construction and operation of the Proposal. <p>Amenity</p> <ul style="list-style-type: none">• No significant residual impacts from the Proposal are expected for visual, noise, vibration or dust.
Mitigation	<p>Aboriginal Cultural Heritage and Cultural Values</p> <ul style="list-style-type: none">• Avoidance<ul style="list-style-type: none">○ Undertake heritage surveys and consultation to identify Heritage Places and areas of cultural significance.○ Undertake relevant impact assessments / studies to assess potential impacts as designs plan change (where applicable).○ All areas of cultural significance are recorded as Heritage Places or HRZs within Fortescue's GIS system.○ Footprint designed to avoid all Heritage Places and areas of cultural significance (where practicable).○ Fencing (and signage where required) of Heritage Places in proximity to ground disturbance works.○ Complete relevant dust assessments / modelling to identify potential impacts to dust sensitive sites in high-risk areas.○ Where identified, dust sensitive sites are recorded as such in Fortescue's GIS system.○ Access to culturally significant places is maintained, including the Shaw and Coongan Rivers (and associated tributaries) and the Cultural Precinct.○ Undertake TEK surveys to identify plant and animal species of traditional use, including areas of culturally significant plants or animals, prior to ground clearing works.○ Undertake relevant assessments to understand potential impacts from vibration of operating wind turbines on behaviour of culturally significant fauna species, in particular Greater Bilby.• Minimisation



- Relevant Heritage conditions applied to Land Use Certificates (LUCs) prior to undertaking works in the DE.
- Inspection of Heritage Places or HRZs within proximity to Fortescue activities during construction (as required).
- Undertake Heritage LUC Audits during construction phase and ground disturbing activities.
- All personnel mobilised to site to undertake general and site-specific inductions regarding Fortescue's heritage management procedures.
- Undertake blasting activities in accordance with Fortescue's Blasting Near Heritage Place Procedure (100-PR-HE-0003).
- Where required, seek heritage approvals under relevant heritage legislation in consultation with Nyamal.
- Implement general dust management protocols (as discussed in Section 9.7.3.3) to minimise dust generated from Fortescue activities.
- Ensure consultation with Nyamal regarding Decommissioning Plan (where required).
- Establish appropriate criteria / thresholds for managing areas of culturally significant plants or animals in high-risk areas, including Groundwater Dependent Vegetation (where existing management strategies or procedures may not apply).
- Clearing of land kept to a minimum to reduce loss of traditional flora species and culturally significant fauna habitat.
- Proposal designed to minimise impacts to culturally significant water sources including the Shaw and Coogan River, and creek crossings.
- Pole locations placed outside of high flow areas, where required to be installed within rivers, as far as possible.
- Standard construction site pollution prevention measures will be implemented throughout the construction phase.
- Rehabilitation
 - Rehabilitation of a total of 1,028.12 ha of cleared vegetation which will be undertaken progressively after each phase of the construction activities to reduce impacts to floral and vegetation over time

Non-Aboriginal Heritage

- The North Pole Dome / Meentheena site will be identified in Fortescue's GIS system and impacts from ground disturbance will be minimised during the design phase and overseen during the construction phase (to ensure all clearing is within approved areas).

Amenity

- Despite no significant residual impacts, the following mitigation measures are proposed:
 - Vibration impacts from the operation of turbines will be managed under Fortescue's '*Blasting Near Heritage Places Procedure*' (100-PR-HE-0003).
 - Dust deposition will be managed through standard construction measures during construction, including use of dust suppression, water sprays, completing relevant dust assessments / modelling to identify potential impacts to dust sensitive sites in high-risk areas, limiting the number and height of stockpiles and vehicles confined to designated routes with speed limits strictly enforced.



Outcomes	<p>The predicted environmental outcome for the Proposal is:</p> <ul style="list-style-type: none"> No direct or indirect impacts to the environment which significantly impact Nyamal's or other stakeholders social surrounding values, as a result of implementation of the Proposal. <p>No significant residual impacts to social surroundings have been identified and the EPA's objective for the Social Surroundings factor 'to protect social surroundings from significant harm' can be met.</p>
Other Factors	
Inland Waters	
EPA Objective	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.
Policy and Guidance	<ul style="list-style-type: none"> Environmental Factor Guideline: Inland Waters (EPA, 2018). Water Quality Protection Note no.25. Land use compatibility tables for public drinking water source areas (DoW 2016). Water Quality Protection Note no.65. Toxic and hazardous substances (DoW 2015). Water Quality Protection Note no.84. Rehabilitation of disturbed land in public drinking water source areas (DoW 2009).
Outcomes	<p>No significant impacts are anticipated as a result of construction or operation of the Proposal with regard to Inland Waters. The turbines have been designed to be positioned to avoid major watercourses and outside of the 1% Annual Exceedance Probability (AEP) floodplain area. The transmission line poles may be required to be located within the 1 % AEP floodplain of the Coongan and Shaw Rivers as the floodplain extent is larger than the practical maximum 600 m span that our design allowed for. However, the assessment showed that the impacts are minor and mitigation measures have been recommended to further minimise impacts.</p> <p>Potential impacts to all inland water elements are covered through regulation by other Decision Making Authorities with regard to permitting and licensing requirements (i.e. 26D and 5C licenses and Permits to Interfere with Bed and Banks under the RIWI Act). As discussed in Section 10.1.5.2, implementation of the GWOS conditioned under Section 5C of the RIWI Act will ensure any potential adverse impacts to identified receptors (Other Groundwater Users; Groundwater Dependent Ecosystems; and Subterranean Fauna) will be appropriately managed such that no significant impacts as a result of groundwater abstraction will occur. Water abstraction will be limited to rates/volumes that result in acceptable and manageable impact, with alternate supply to supplement abstraction from the DE where required.</p>
Subterranean Fauna	
EPA Objective	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.
Policy and Guidance	<ul style="list-style-type: none"> Technical Guidance – Subterranean fauna surveys for EIA (EPA, 2021c). Environmental Factor Guideline – Subterranean Fauna (EPA, 2016e).
Outcomes	As impacts to groundwater drawdown will be appropriately managed through the RIWI Act licencing process, and following implementation of the recommended mitigation measures, significant residual impacts to subterranean fauna are not anticipated. It is considered the EPA objective



	'to protect subterranean fauna so that biological diversity and ecological integrity are maintained' can be achieved without any additional control measures.
Terrestrial Environmental Quality	
EPA Objective	To maintain the quality of land and soils so that environmental values are protected.
Policy and Guidance	<ul style="list-style-type: none">• Statement of Environmental Principles, Factors and Objectives (EPA, 2021b).• Environmental Factor Guideline – Terrestrial Environmental Quality (EPA, 2016f).• Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes. (DER, 2015a).• Treatment and Management of Soil and Water in Acid Sulfate Soil Landscapes (DER, 2015b).
Outcomes	With the implementation of standard mitigation measures listed in Section 10.3.5, no significant residual impacts to terrestrial environmental quality have been identified and the EPA's objective for the terrestrial environmental quality factor 'to maintain the quality of land and soils so that environmental values are protected' can be met.



ABBREVIATIONS

Abbreviation	Definition
ABC	American Bird Conservancy
ABN	Australian Business Number
ABS	Australian Bureau of Statistics
ACHIS	Aboriginal Cultural Heritage Inquiry System
AEP	Annual Exceedance Probability
AH Act	<i>Aboriginal Heritage Act 1972</i>
AHD	Australian Height Datum
ALA	Atlas Living of Australia
ANZG	Australian and New Zealand guidelines
APLIC	Avian Power Line Interaction Committee
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
BAC	Barlbinbinya Aboriginal Corporation
BAM Act	<i>Biosecurity Agriculture and Management Act 2007</i>
BBAMP	Bird and Bat Adaptive Management Plan
BBSUS	Bird and bat site utilisation surveys
BC Act	<i>Biodiversity Conservation Act 2016</i>
BESS	Battery energy storage systems
BIF	Banded-iron formations
BoM	Bureau of Meteorology
CALM Act	<i>Conservation and Land Management Act 1984</i>
CAMBA	China–Australia Migratory Bird Agreement
CCWA	Conservation Council of WA
CEMP	Construction Environmental Management Plan
CEO	Chief Executive Officer
CISS	Centre for Invasive Species Solutions
CO ₂ -eq	CO ₂ Equivalent
COI	Cytochrome C oxidase subunit I
CPI	Consumer Price Index
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth
DAWE	Department of Agriculture, Water and the Environment
dBA	Decibel
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy the Environment and Water



Abbreviation	Definition
DE	Development Envelope
Development Envelope	The maximum area within which the footprint for the Proposal will be located
DEMIRS	Department of Energy Mines, Industry Regulation and Safety
DER	Department of Environmental Regulation
DEWHA	Department of Water Heritage and the Arts
DoE	Department of Environment
DoH	Department of Health
DOW	Department of Water
DP	Declared Pest
DPAW	Department of Parks and Wildlife
DPC	Department of Premier and Cabinet
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
DWER	Department of Water and Environmental Regulation
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986</i>
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPGH	East Pilbara Generation Hub
ERD	Environmental Review Document
ESA	Environmentally Sensitive Areas
ETA	Environmental Technologies and Analytics
FIFO	Fly-in Fly-out
FVC	Focused Vision Consulting
GDV	Groundwater Dependent Vegetation
GIS	Geographic Information System
GH	Generation Hub
GHG	Greenhouse Gas
GL	Gigalitres
GoWA	Government of Western Australia
GPS	Global Positioning System
GW	Giga watt
GWOS	Groundwater Operating Strategy



Abbreviation	Definition
ha	Hectare
HBI	Harry Butler Institute
HRZs	Heritage Restriction Zones
HSC	Heritage Sub-Committee
IBRA	Interim Biogeographic Regionalisation for Australia
ID	Identification
IDF	Indicative Disturbance Footprint – The indicative location where ground disturbance for the physical elements of the Proposal will occur. The extent of this footprint is used to determine impacts. The spatial location of this footprint may vary as the design is refined.
IRR	Impact Reconciliation Reports
ISCA	Infrastructure Sustainability Council of Australia
IUCN	International Union for Conservation of Nature
JAMBA	Japan–Australia Migratory Bird Agreement
km	kilometres
kV	Kilovolt
LCT	Landscape Character Types
LGA	Local Government Authority
LCOE	lowest levelized cost of energy
LCU	Landscape Character Unit
LIDAR	Light Detection and Ranging – Remote sensing method
LGA	Local Government Area
LUC	Land Use Certificates
m	metres
Main Road	Main Roads Western Australia
mbgl	Metres below ground level
ML	Mega Litres
mm	Millimetre
MNES	Matter of National Environmental Significance
MW	Mega Watt
NAC	Nyamal Aboriginal Corporation
NRS	National Reserve System
NSW	New South Wales
NT	Northern Territory
OS	Other Specially Protected
P	Priority
PAD	Potential Archaeological Deposit
PASS	Potential acid sulfate soil



Abbreviation	Definition
PBC	Prescribed Body Corporate
PDC	Pilbara Development Commission
PEC	Priority Ecological Community
PEG	Pilbara Energy (Generation) Pty Ltd
PEOF	Pilbara Environmental Offset Fund
PKEF	Preliminary Key Environmental Factor
PLNB	Pilbara Leaf-nosed Bat
PMST	Protected Matters Search Tool
PV	Photovoltaic
PVC	A synthetic resin made from the polymerization of vinyl chloride
QLD	Queensland
RCP	Representative Concentration Pathway
RIWI Act	Rights in Water and Irrigation Act 1914
ROKAMBA	Republic of Korea –Australia Migratory Bird Agreement
RSA	Rotor Swept Area
SKM	Sinclair Knight Merz
SODAR	sonic detection and ranging - Remote Sensing technique
SPRAT	Species Profile and Threats Database
SRE	Short Range Endemic
SWL	Static water levels
T	Threatened
TBC	To Be Confirmed
TEC	Threatened Ecological Community
TEK	Traditional Ecological Knowledge
TL	Transmission Line
TO	Traditional Owner
TPLF	Threatened and Priority Flora Database
TSSC	Threatened Species Scientific Committee
UNFCCC	United Nations Framework Convention on Climate Change
UV	Ultraviolet
VA	Vegetation Associations
VC	Vegetation Condition
VIA	Visual Impact Assessment
VLE	Visual Landscape Evaluation
VMO	Visual management objective
VU	Vulnerable
WA	Western Australia



Abbreviation	Definition
WAPC	Western Australian Planning Commission
WAOL	Western Australian Organism List
WoNs	Weeds of National Significance



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1 INTRODUCTION

Pilbara Energy (Generation) Pty Ltd (PEG), a wholly owned subsidiary of Fortescue Ltd (Fortescue), is proposing to develop the East Pilbara Generation Hub (the Proposal), comprising a wind farm, supporting infrastructure and a 220 kV transmission line for power supply, at a location approximately 40 km southeast of Marble Bar and 90 km east of Fortescue's Iron Bridge Project in the Pilbara region of Western Australia (WA) (Figure 1-1).

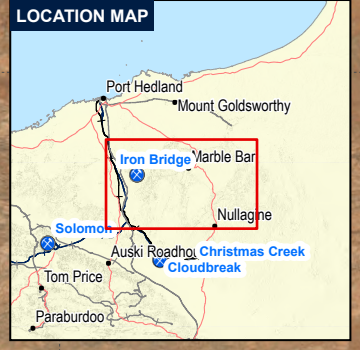
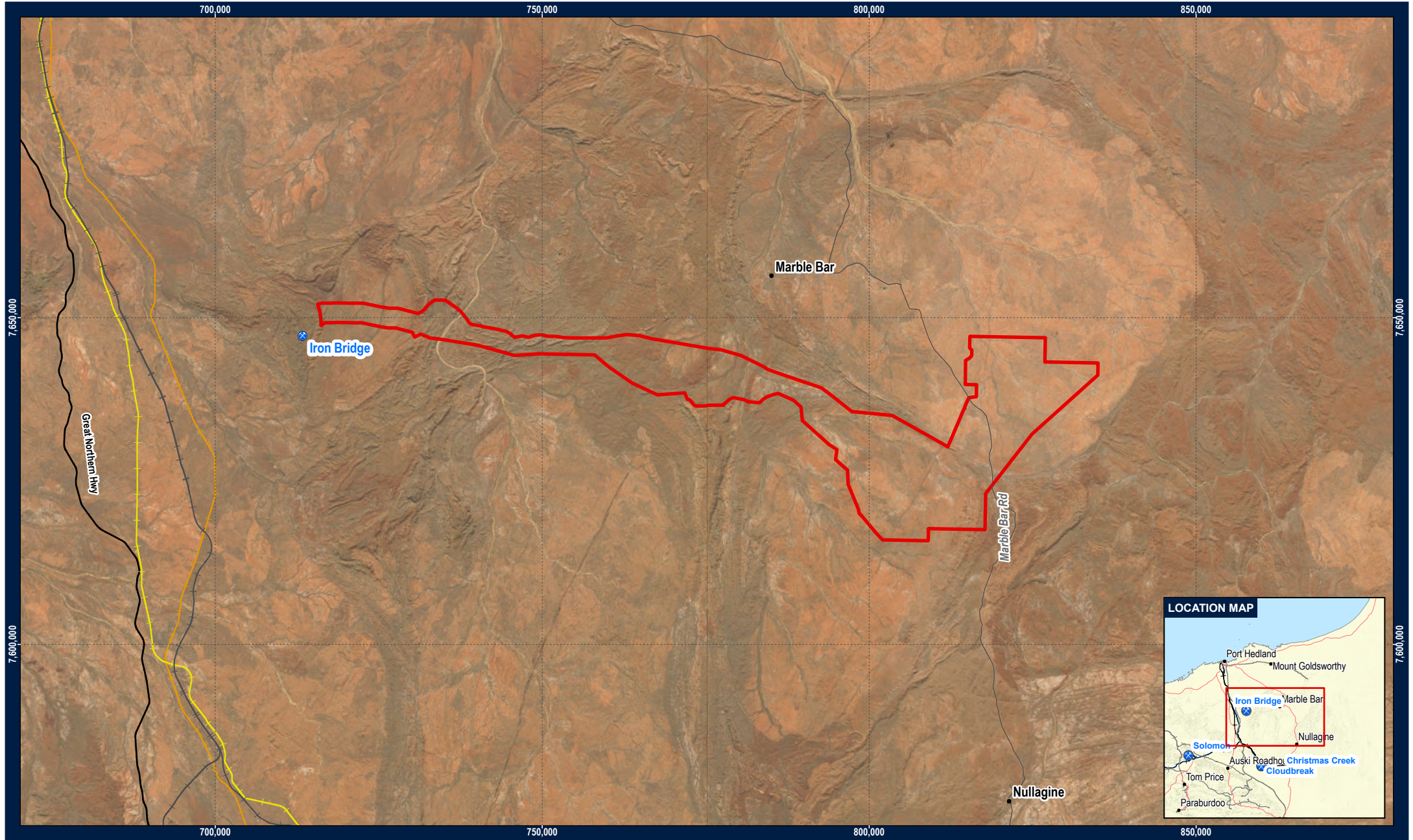
The Proposal will involve the installation of up to 200 wind turbines and five substations, with a target installed capacity of 2.1 GW, which could increase depending on the efficiency of the turbine equipment throughout the life of the Proposal. The proposed 220 kV transmission line will be built to enable energy transfer to Fortescue's mining operations from the wind farm. Fortescue has identified a 2 km wide transmission corridor to Iron Bridge to allow for deviations for any identified environmental, heritage and/or social sensitive receptors. The Proposal includes a Development Envelope (DE) of 98,772.61 ha within which an Indicative Disturbance Footprint (IDF) of 2,331.36 ha (including existing cleared areas) is anticipated.

The Proposal will also include temporary infrastructure such as fuel storage, construction laydown areas and site offices, and permanent supporting infrastructure such as water infrastructure (i.e., turkey's nests, abstraction bores and pipelines), accommodation camps, operations support offices, communications towers, and a series of access roads and corridors for overhead electrical reticulation.

The spacing and proposed design layout of the proposed wind turbines has been informed by an assessment of existing topography, and the collection of ongoing wind and climate data by Fortescue, specific to the Proposal site. Site data has been used to undertake energy modelling for the wind farm, with wind turbines positioned to optimise efficiency and power output.

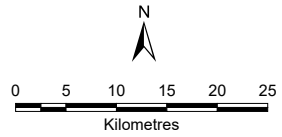


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- Legend**
- Towns
 - ⊗ FMG Mines
 - FMG Rail Alignments
 - BHPB Rail
 - Roy Hill Rail
 - Highway
 - Road
 - Development Envelope

Data Sources:
 Aerial, ESRI
 Towns, GA
 All other data, Fortescue, 2024



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostello
 Approved By:
 Scale: 1:750,000
 Coordinate System: GDA2020 MGA Zone 50
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**Figure 1-1
 Proposal Location**





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1.1 Purpose and Scope

The purpose of this Environmental Review Document (ERD) is to present an Environmental Impact Assessment (EIA) of the Proposal for public review and consideration by the Environmental Protection Authority (EPA). This ERD has been prepared in accordance with the EPA's *'Instructions on how to prepare an Environmental Review Document'* (EPA, 2021a) and is based on project and study information available at the time of writing.

1.2 Proponent

Pilbara Energy (Generation) Pty Ltd (PEG) is the Proponent of the East Pilbara Generation Hub (EPGH) Proposal.

Table 1-1: Proponent Details

Proponent	
Australian Business Number (ABN)	Pilbara Energy (Generation) Pty Ltd (PEG) 31 631 303 305
Registered Address	Level 2, 87 Adelaide Terrace, East Perth, WA 6004
Proponent Contact	
Name	Matthew Dowling
Position	Manager Environment, Primary Approvals
Email	primaryenvironmentapprovals@fortescue.com
Proponent Representative	
Name	Jarrold Pittson
Position	Group Manager Environment and Closure
Email	primaryenvironmentapprovals@fortescue.com



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2 LEGISLATIVE CONTEXT

2.1 Environmental Impact Assessment Process

2.1.1 *Environmental Protection Act 1986 (EP Act)*

The *Environmental Protection Act 1986 (EP Act)* is the key legislative tool for environmental protection in WA. The EP Act provides for the prevention, control and abatement of pollution and environmental harm; and for the conservation, preservation, protection, enhancement and management of the environment. The Proposal has been referred under Part IV of the EP Act (environmental impact assessment), which is administered by the EPA and the WA Minister of Environment.

This document has been prepared in accordance with the EIA (Part IV Divisions 1 and 2) Procedures Manual 2020 (EPA, 2021e) and the Instruction: How to Prepare an Environmental Review Document (EPA, 2021a) to provide sufficient information for the EPA to assess this Proposed Amendment at Referral Stage.

This ERD is a supporting document describing the specific studies and investigations conducted by Fortescue in relation to the key environmental factors and has been prepared to a standard consistent with that of similar Environmental Reviews for mining developments in WA.

2.1.2 *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

If a Proposal is likely to have a significant impact on a Matter of National Environmental Significance (MNES) it requires approval from the Commonwealth under the *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. The Proposal will be referred to the Commonwealth under the EPBC Act due to potential impact on MNES.

2.2 Other Approvals and Regulation

2.2.1 Other Approvals Required

The Proposal will be required to comply with the requirements of relevant State legislation and regulations (Table 2-1).



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Table 2-1: Other Approvals and Regulations

Decision making authority	Legislation	Type of Approval	Proposed Activity	Can process mitigate impacts on environment?
WA Government	<i>Local Government Act 1995</i>	Building licences	Construction and operation of accommodation camp and other buildings	Not specifically related to environmental impacts
Department of Water and Environmental Regulation (DWER)	<i>Environmental Protection Act 1986 (Part V)</i>	Works Approvals and Operating Licences	Construction and operation of prescribed activities and premises. The Proposal includes the construction and operation of a new landfill, concrete batching plant, waste water treatment plant, chemical storage, power generation and other supporting infrastructure etc which will require approval from DWER through a works approval/licence application under Part V of the EP Act.	Licensing process to prevent, control, abate, and mitigate pollution or environmental harm. Set limits and focuses on management controls to minimise impacts on the environment from emissions associated with the proposed prescribed activities and categories under Part V of the EP Act.
	<i>Rights in Water and Irrigation Act 1914</i>	5C and 26D Licence.	Groundwater abstraction for dewatering during construction and abstraction of construction water	Sets limits on the location and quantity of water abstraction to ensure impacts to groundwater levels and quality are minimised.
	<i>Rights in Water and Irrigation Act 1914</i> <i>Rights in Water and Irrigation Regulations 2000</i>	Bed and Banks Permit	Construction of watercourse crossings and/or floodway which will disturb the banks of rivers and multiple creeks	Sets conditions with respect to the disturbance of waterway beds and banks (including vegetation clearing).
Department of Planning, Lands, and Heritage (DPLH)	<i>Aboriginal Cultural Heritage Act 1972</i>	s18 Ministerial Consent	Disturbance of Aboriginal heritage sites	Prior to submitting a section 18 notice, consultation with Nyamal is required on: <ul style="list-style-type: none"> • The location, importance and significance of any Aboriginal heritage, • Strategies for the protection and management of any Aboriginal heritage, and



Decision making authority	Legislation	Type of Approval	Proposed Activity	Can process mitigate impacts on environment?
				<ul style="list-style-type: none"> Comments on the section 18 application, including any objection, support and/or any suggested conditions and mitigation strategies. <p>This consultation process is required by the Minister and Committee and will minimise and/or avoid harm to or disturbance of Aboriginal sites.</p>
Department of Biodiversity Conservation and Attractions (DBCA)	<i>Biodiversity Conservation Act 2016</i>	s40 Ministerial Authorisation	Clearing or disturbance of threatened flora or fauna species	Authorisation process for removal or disturbance of threatened flora or fauna species.
Department of Health DWER	<i>Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974</i> <i>Environmental Protection Act 1986</i>	Health approvals EP Act Part V Registration	Operation of wastewater treatment facilities at construction camps	Sets conditions with respect to the construction and operation of wastewater treatment facilities to maintain human health standards and minimise impacts to the environment.



3 PROPOSAL

3.1 Justification

The proposed installed capacity has been determined to be sufficient to ensure a robust and dependable power supply for Fortescue's mining operations. Effective oversight of both the generation and transmission networks will be critical in harmonising renewable energy production with operational demand and ensuring overall power system stability.

Investing in wind farms and other renewable energy sources is a strategic move that significantly contributes to Fortescue's ambition of reducing carbon emissions and advancing towards its 2030 'real-zero' carbon goal. This objective is centred on the complete elimination of Scope 1 and 2 emissions by phasing out fossil fuels from our Australian iron ore operations.

In FY23, Fortescue's operations, including Australian iron ore and marine vessels, emitted a total of 2.55 million tonnes CO₂-eq. This included 2.2 million tonnes CO₂-eq from Scope 1 sources primarily from diesel-heavy mobile equipment, haul trucks, and stationary power and 0.35 million tonnes CO₂-eq from Scope 2 sources, which are associated with power purchases. Addressing these emissions through the proposed renewable energy initiatives is not only a crucial step towards meeting our sustainability targets but also demonstrates Fortescue's commitment to minimizing its environmental footprint and leading the industry in climate action.

This approach is essential for meeting the targets set out in the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement and the 2021 Glasgow Climate Pact. The proposed Proposal also aligns with the Commonwealth and State Governments' commitments to reduce greenhouse gas emissions and reach renewable energy targets.

3.1.1 Benefits of the Proposal

One of the benefits of the Proposal includes a reduction in emissions and progress toward decarbonisation. By replacing diesel and gas-fired stationary power with renewable sources, the Proposal is projected to cut emissions by at least 1.5 million tonnes CO₂-e annually. This represents a significant step toward Fortescue's goal of achieving 'real-zero' carbon emissions by 2030.

The Proposal will also reduce fossil fuel dependency, the proposed 2.1 GW of renewable energy capacity, transmitted via the proposed Transmission Line, will provide a power source for Fortescue's operations. This will reduce dependency on fossil fuels and ensure a consistent energy supply critical for continuous mining operations.

Another benefit includes that investing in renewable energy can lead to significant long-term cost savings by reducing reliance on expensive and volatile fossil fuels.

Further, transitioning to renewable energy can enhance operational efficiency by modernising the power infrastructure and integrating advanced technologies, which can improve overall performance and reduce maintenance needs.

The Proposal will also result in a positive environmental impact, reducing the reliance on fossil fuels which lowers environmental pollution and mitigates climate change impacts, contributing to broader ecological benefits and helping to preserve natural resources.



Lastly, through our 'real zero' carbon goal, Fortescue is setting a precedent and leading the mining industry by demonstrating a commitment to sustainability and potentially influencing other companies to adopt similar practices.

3.1.2 Options and Alternatives Considered

Renewable energy projects are critical for the decarbonisation of mining operations, and therefore alternatives for this Proposal were restricted to location options and the type of renewable project. The footprint of the Proposal was reduced by the selection of a wind renewable project instead of solar PV infill and batteries, as wind allows for 24-hour generation and has a smaller footprint and therefore results in less clearing.

The location of a Proposal such as this is constrained by the following factors:

- Wind speeds must be high and consistent.
- Low vegetation cover is preferred.
- A remote location with a large area.
- Proximity to existing operations and grid.
- Road access suitable for construction and ongoing maintenance is required.

3.1.2.1 Alternative Power Generation Project

Fortescue has previously considered alternative power supply sources. The greenhouse gas emissions associated with these alternatives are at odds with the Paris Agreement, which aims to limit global warming to well below 2°C above pre-industrial levels. The alternatives were also inconsistent with the EPA's Greenhouse Gas Guidance (EPA, 2023c). Alternative power options to the East Pilbara Generation Hub include:

- Extension of Fortescue River Gas Pipeline to provide gas-fired power generation specifically to Fortescue's Chichester Hub and Iron Bridge operations.
- Utilisation of existing third-party power generation infrastructure.

In addition, use of alternative renewable sources was considered in the form of solar PV infill in and around mining operations, however as discussed, this option was constrained by footprint and operating hours.

3.1.2.2 No Development Option

The 'No Development Option' would mean continuing with the existing power sources for Fortescue's mining operations in the region. Without advancing the Proposal, the anticipated benefits of switching to renewable energy would be lost, leading to increased carbon emissions and exacerbating global and local climate change through mining operations.

Our Pilbara Energy Connect Proposal represents a crucial step in addressing this issue and furthering our decarbonisation goals by expanding the main power transmission infrastructure to create an integrated transmission network that will allow renewable electricity generated at any of Fortescue's sites to be shared across our operations.



Under a 'no development' scenario, the development of the critical North Star project, and other mines connected to the network such as Iron Bridge, Christmas Creek and Cloudbreak, would rely on the current power sources, specifically on-site diesel and/or gas power stations, for the entire lifespan of the mines. This reliance would significantly impede Fortescue's efforts to achieve carbon neutrality across its operations by 2030, as outlined in the Paris Agreement to limit global warming to well below 2°C compared to pre-industrial levels.

3.1.2.3 Proposal Site Selection

An analysis of publicly available wind data in the Pilbara was cross referenced with terrain profiles to identify areas which have the potential to support an economically viable wind farm. These potential areas were then further filtered by distance to Fortescue's existing infrastructure, tenure status, cyclone regions and identified social, heritage and environmental considerations. As a result, four potential site options were selected for further analysis. Due to commercial sensitivities, further detail cannot be provided.

Remote sensing devices (LIDAR and SODAR) were placed on each site to measure wind speed. A further site comparison process was conducted in March 2023 to identify which of the wind sites under consideration offered the lowest levelized cost of energy (LCOE) and to consider the schedule associated with each location. To achieve this, concept designs were produced for each site, the respective costs estimated, and the generation profiles calculated. These evaluations were used as inputs to a demand response model to determine the maximum renewable penetration for a set of given scenarios based on a predicted operational load.

The Proposal location was chosen as the preferred area for reasons including:

- It maintains a favourable wind resource to assist in achieving Fortescue's decarbonisation targets. Fortescue installed a 150 m Meteorological Mast (Met Mast) onsite April 2023 and this unit, combined with a ground monitoring unit onsite, has verified the Site is acceptable for wind power generation of the magnitude required.
- Relative proximity to Fortescue's existing mining operations, compared to other options.
- Lower cyclone risk compared to other locations as it is further from the coast.
- The underlying land is of lower value, due to native vegetation impacted by grazing.
- Relatively flat terrain compared to other options.
- Favourable transport and logistic options.

The Proposal will be developed to maximise power generation through innovative selection of wind turbine equipment, focusing on turbines that are designed to be the most efficient at the wind speeds measured on site, whilst also designed to minimise wake losses and systematic losses.

3.2 Proposal Description

3.2.1 Summary and Key Elements

The Proposal is for the construction and operation of a renewable energy wind generation hub, to power the Fortescue mining operations in the Pilbara region. The key elements of the proposal are summarised in Table 3-1.



Table 3-1: Key Elements of the Proposal

Key Elements	Proposed Extent
Renewable Infrastructure	Clearing of native vegetation up to 2,318.80 ha, including: <ul style="list-style-type: none"> • 1,290.68 ha of permanent clearing. • 1,028.12 ha of temporary clearing.
Supporting Electrical Infrastructure	
Supporting Infrastructure	
Water Infrastructure	Construction water demand is ~700 ML/annum. Operational water demand is ~100 ML/annum (includes potable water use for the accommodation facilities and maintenance activities).
Operation & Maintenance	The operation phase of the Proposal is expected to commence in 2028 and will operate 24 hours per day.
Decommissioning & Rehabilitation	Has an expected life of 42 years (with asset life extension, can operate indefinitely).

Reference is made throughout this document to two areas within the DE associated with the project infrastructure. These are the “Generation Hub area’ (covering the wind turbines, a small section of the transmission line area and supporting infrastructure) and the ‘Transmission line area’ (covering the majority of the transmission line corridor) as shown on Figure 3-1.

3.2.2 Renewable Energy Infrastructure

The Proposal will involve the installation and operation of wind turbines to generate wind-generated power.

Construction for each turbine will require access for cranes in order to hoist the turbine blades, nacelles, and towers. To safely erect the turbines, additional temporary construction clearing will be required around the turbines. It is anticipated that up to 2 ha will be required to facilitate construction of each turbine. The turbines to be installed will be up to 290 m in height (to the tip of blade).



Plate 3-1: Nabralift Tower Construction



Plate 3-2: Nabralift Tower

Depending on the geotechnical characteristics of each turbine location, different foundation types will be utilised. These may include:

- A Nabrawind Self Erecting Tower (Nabralift) design may be utilised for the wind turbines. Nabralift contains a three-column framed structure installed under the uppermost part of the tubular tower (an indicative Nabralift Tower is shown in Plate 3-1 and Plate 3-2). This option requires significantly less concrete than a traditional monopole.
- Mass gravity foundations requiring approximately 25 m diameter foundations that are approximately 4 m deep. These foundations are expected to have the largest volume of concrete required, consisting of approximately 1,100 m³ of concrete and requiring reinforcement and an anchor cage.
- Rock anchor foundations which require significantly less concrete. However, they require drilling to depths of up to 35 m. Approximately 25 bore holes with a diameter of 200 mm may be required for each of these foundations.
- Piled foundations will also require significantly less concrete than mass gravity foundations. However, they also require drilling to depths of up to 35 m. Approximately 12 bore holes, with a diameter of 800 mm may be required for each of these foundations.

Earthing grids for each turbine will be installed in parallel to the foundation. Excess excavated material will be appropriately stored and used as fill where suitable or spread locally to tie into the existing landscape.

During operations, turbines will have a permanent footprint of up to approximately 1 ha. Turbines will be arranged in rows that are spaced and orientated to maximise power generation. An indicative footprint has been provided in Figure 3-1.



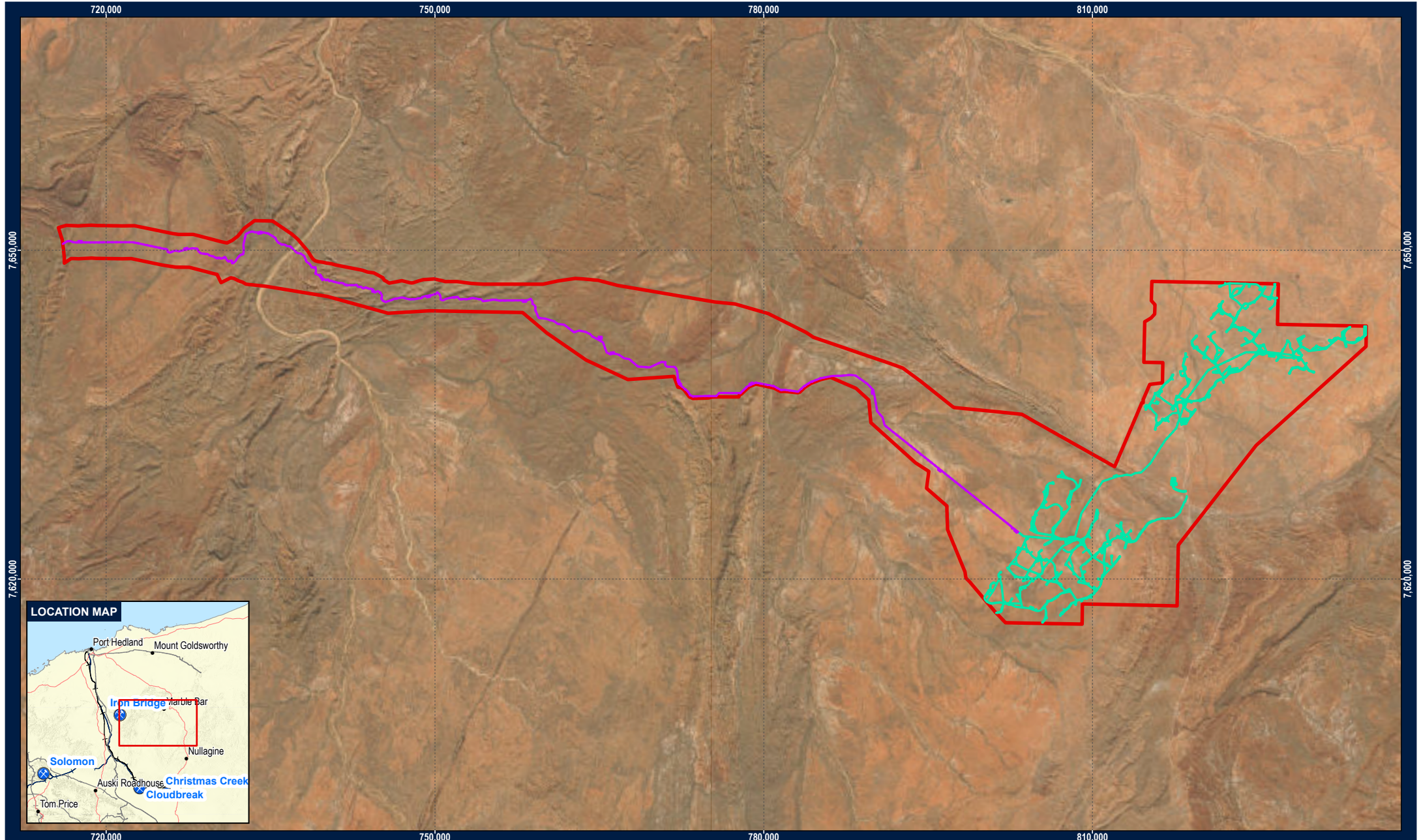
The final wind farm design will be completed following studies of environmental and heritage constraints. It is anticipated that there will be sufficient flexibility within the wind farm design to enable micro-siting to avoid environmental or heritage constraints.

Each turbine will have associated infrastructure to support the safe transmission of energy from the turbine via transmission lines and substations to Iron Bridge, where the Proposal will connect into the Pilbara Transmission network, which connects all of Fortescue's mine sites. Onsite energy storage will be located near substations along the network. Each turbine will have an unsealed access road (Plate 3-3) which will allow for construction and ongoing maintenance of equipment.



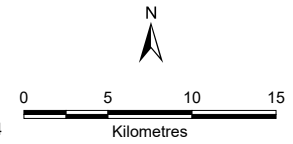
Plate 3-3: Access roads to the Generation Hub area

The total expected disturbance associated with the development of the wind turbines and supporting infrastructure is 2,331.36 ha (including 2,318.80 ha of native vegetation clearance and 12.56 ha of existing cleared areas). Following completion of construction, temporary cleared areas will be rehabilitated and a permanent Indicative Disturbance Footprint (IDF) of 1,299.54 ha (1,290.68 ha of native vegetation and 8.86 ha existing cleared areas) is expected.



- Legend**
- ▭ Development Envelope
 - Indicative Disturbance Footprint**
 - ▭ Generation Hub
 - ▭ Transmission Line

Data Sources:
 Aerial, ESRI
 All other data, Fortescue, 2024



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 Drawn By: S. Bowyer
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Figure 3-1
Indicative Disturbance Footprint





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3.2.3 Supporting Electrical Infrastructure

Supporting electrical infrastructure for the Proposal will include infrastructure for distribution and control, energy storage, and transmission.

3.2.3.1 Distribution and Control

All wind turbines will be connected via 33 kV reticulation systems to collector substations, so that electrical power generated by the wind turbines can be collected. The 33 kV reticulation consists mainly of overhead lines with short sections of underground cables at each end of the lines and at road crossings.

The typical height of the 33 kV electrical reticulation that Fortescue currently employs across operations incorporates steel poles up to 30 m high with an average span length of 200 m (between the poles). An approximate 6 m wide access track may be cleared for the construction and maintenance of the overhead line.

Each pole will require a 20 x 20 m pad. The 33 kV overhead lines also require a blade up cleared, 20 m-wide easement corridors with the centre of the overhead line aligned with the centre line of the corridor.

3.2.3.2 Transmission and Energy Storage

The wind farm will be connected to Fortescue's power network via several 220/33 kV substations located at the wind farm, and a 220 kV transmission line (PEC-6) to the North Star 220 kV Substation located at the Iron Bridge Mine, approximately 110 km to the west. All 220/33 kV collector substations at the wind farms are proposed to be interconnected in a ring configuration.

The Proposal is anticipated to use a similar methodology as previous 220 kV transmission lines constructed by Fortescue, which have typically used steel monopoles of approximately 50m high, with span length of approximately 400m. Access tracks were required to be cleared for the construction and maintenance of these lines at an average of 8 m width. Each pole will require a 25 x 25 m pad.

Up to five substations will be required with a 100 x 100 m pad for each. An additional temporarily cleared area of approximately 50 x 100 m is required for construction of each pad, which will be rehabilitated once construction is completed.

All substations are proposed to be equipped with gas-insulated 220 kV switchgear, which allows the substation footprint to be smaller compared to air-insulated technology. The internal transmission line corridors will include an access track for maintenance and will be located to maintain clearance from other infrastructure, to minimise interruption of the prevailing wind.

Battery energy storage systems (BESS) are proposed to be located at substation locations for the storage of energy to help balance load requirements throughout the transmission network.

3.2.4 Water Infrastructure

The Proposal will require a borefield, associated water pipelines and turkey's nests for construction and operational activities. The borefield will incorporate multiple bores, casings, and pumping systems. Up to thirty production bores will be required for water supply for the Proposal (during both construction and operation as discussed below). The production bores will target the underlying fractured rock aquifer and possibly the alluvial aquifer, where



required. Bores will be constructed with either PVC or steel casing and screened across the most productive zone.

The production bores will supply the Proposal's construction, operational (i.e., road and corridor maintenance) and potable water (with the use of water treatment) requirements. Water demand will be greatest during construction largely associated with construction of the wind turbine concrete foundations, concrete foundations for buildings, and construction of access tracks for the wind turbines and transmission lines, while operational requirements will be significantly less and will vary throughout the life of the Proposal dependent on the operational / maintenance activities.

Construction water demand is expected to be approximately 700 ML/annum. Operational water demand is approximately 100 ML/annum which includes potable water use for the accommodation facilities and maintenance activities associated with the Proposal infrastructure. Accommodation facilities are discussed further in Section 3.2.5.2.

Transfer and storage of water across the DE will consist of water pipelines and turkey's nests for construction and operation.

3.2.5 Supporting Infrastructure

Further to the above, additional infrastructure and support facilities will be required for the Proposal (Figure 3-2) as identified in Paragraphs 3.2.5.1 to 3.2.5.12.

3.2.5.1 Access and Internal Roads

The main access to the Proposal is via Marble Bar Road, which will enable transport of turbines and other infrastructure to the Proposal from port facilities at Port Hedland. The main internal tracks providing access from Marble Bar Road into the Proposal will allow for Proposal traffic and delivery of major components.

An internal network of site access tracks will connect the infrastructure for construction and operational activities. Internal access tracks will generally be unsealed. Access tracks within the DE have been designed to avoid areas subject to flooding where practical. However, where crossings are required, surface water infrastructure (floodways and culverts) will be used to ensure flow volume and velocity is not unreasonably impeded.

Approximately 250 km of internal access tracks will be required and will connect to the public road network (Marble Bar Road) at a suitable location. The layout of the access roads will minimise the overall track length required to provide access to all turbines, while also balancing cut to fill quantities.

Typically access tracks during operations will be unsealed, up to 20 m wide, suitable for two-way traffic including allowances for batters, shoulders and drains. During operation, this width will be reduced to 6-10 m wide with the remainder rehabilitated.

3.2.5.2 Accommodation

The Proposal will require an accommodation village for construction and operations. During construction, the camp will have capacity for up to 1,000 personnel, which will reduce to an operational workforce capacity of up to 100 personnel. Areas cleared for the construction village will be utilised for the operations village. Where areas are not required for operations, they will be rehabilitated once construction activities are complete.



Wastewater will be processed through a wastewater treatment plant. The plant will produce effluent suitable for land irrigation and discharged through a spray field or reused for dust suppression purposes.

The Proposal will utilise existing infrastructure and coexist with existing users of that infrastructure wherever possible; however, due to the size of the Proposal's workforce, a dedicated airstrip may be required to transport personnel to and from the site, although the location of this has not yet been determined.

3.2.5.3 Hydrocarbon and Chemical Storage

Fuel storage and refuelling areas will be required for servicing construction vehicles, and maintenance vehicles during operations. Fuel for light vehicles and mobile plant, as well as aviation fuel to support the airstrip, will be stored on site.

All fuel will be stored in bunded facilities in a manner that complies with relevant environmental, health and safety regulations. Consideration will be given to alternative fuel sources for on-site vehicles over time in line with Fortescue's decarbonisation strategy and commitments.

3.2.5.4 Waste Management

Waste management for the Proposal will seek to minimise the generation of waste and the disposal of waste to landfill, which may include making use of regional recycling facilities. An on-site landfill facility will be required for disposal of solid waste that cannot be otherwise appropriately managed.

As discussed in Section 3.2.5.2, a wastewater treatment plant will also be constructed to treat wastewater associated with the accommodation camp.

3.2.5.5 Communications

Communication towers supporting radio, telephone and internet will be installed to support operational requirements. In-ground fibre optic cabling will also be installed.

3.2.5.6 Weather Monitoring

Several meteorological monitoring masts of up to 200 m in height may also be constructed within the Development Envelope to support ongoing operations.

3.2.5.7 Temporary Infrastructure

During construction, various temporary works will be required for the Proposal. At completion of the construction works, all construction facilities that are no longer required for operational purposes will be removed and the areas rehabilitated.

3.2.5.8 Laydown Areas

Laydown areas will be required to store and stage wind turbine modules and electrical infrastructure modules as part of the installation and assembly process. These areas will be sited with consideration of environmental and heritage values during detailed construction planning. Some laydown areas utilised during construction will become permanent offices and associated ablutions during operation of the Proposal. Laydown areas will be rehabilitated once no longer required.



3.2.5.9 Borrow Pits

The Proposal will require suitable fill material (aggregate and rock) for construction of roads, pads, hardstand and laydowns. Sourcing of aggregate and rock will be informed by the results of geotechnical investigations and in agreement with key stakeholders including Nyamal traditional custodians. It is proposed that aggregate and rock be processed through an on-site mobile crushing and screening plant.

3.2.5.10 Dangerous Goods and Storage

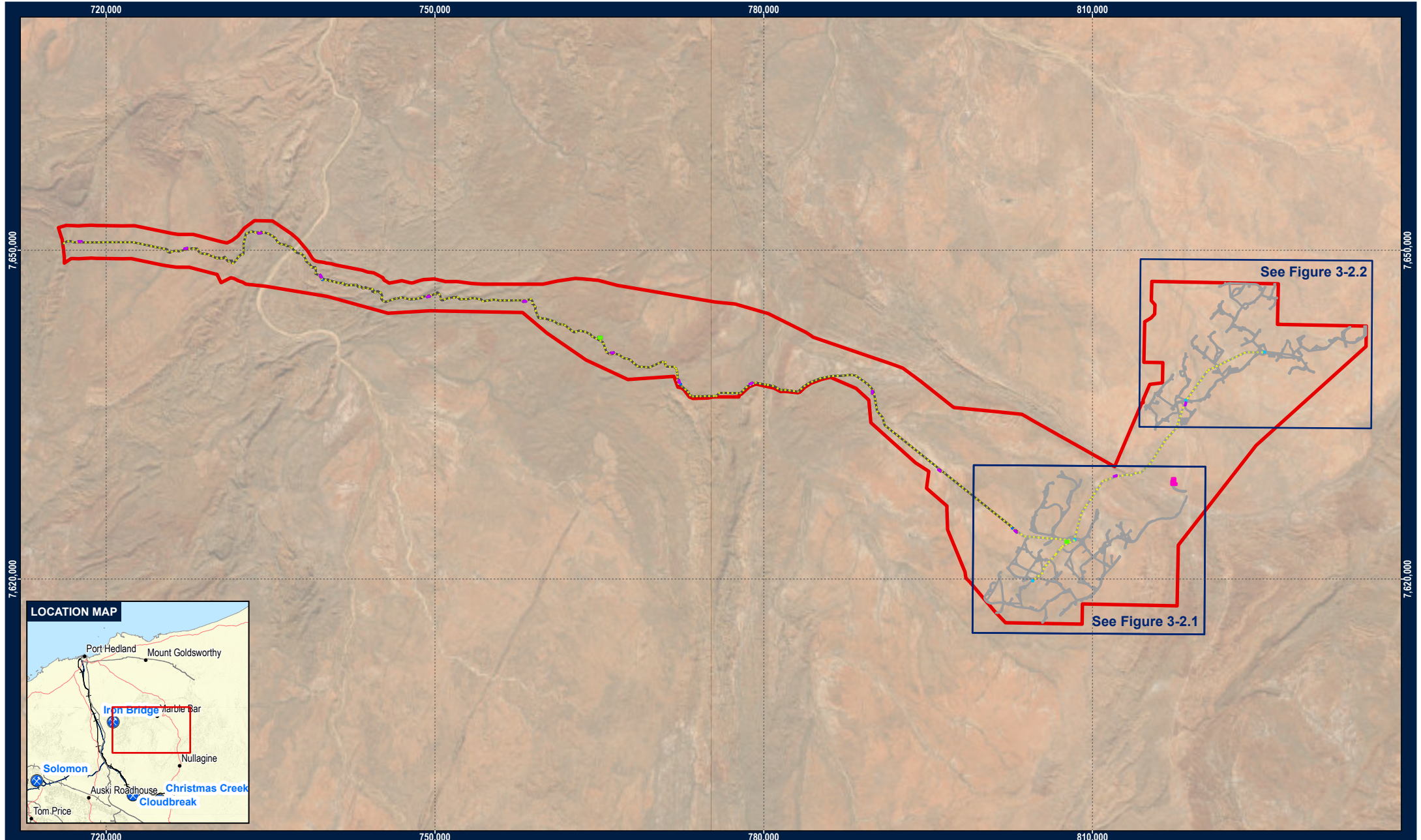
An ammonium nitrate facility is proposed to store explosive materials required for quarrying and excavation in hard rock during construction. Storage facilities will be located to meet required separation distances for safe storage of dangerous goods in line with the Safe Storage of Solid Ammonium Nitrate code of practice (DEMIRS, 2021).

3.2.5.11 Temporary Power Supply

The Proposal considers the need for power supply during construction of up to 4 MW of instantaneous load, which is likely to be provided by diesel electricity generation infrastructure. Fortescue will develop and apply approaches to continue to reduce emissions from its construction activities, utilising renewable energy where practicable.

3.2.5.12 Topsoil Stockpiles

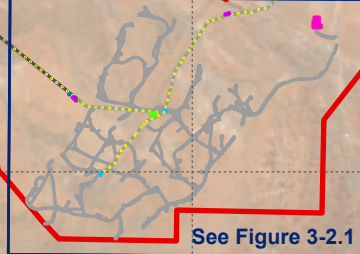
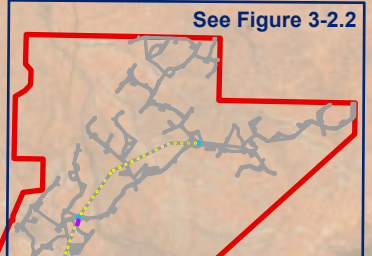
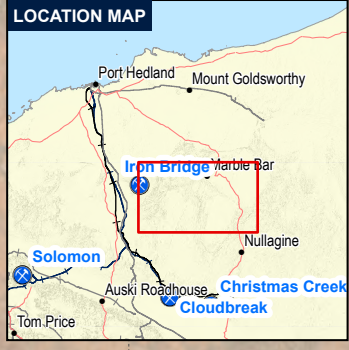
Clearing of vegetation and topsoil is required to construct and install the proposed infrastructure. Vegetation and topsoil will be stripped and stored separately in designated stockpiled areas and used to progressively rehabilitate temporarily disturbed areas following completion of construction activities.



720,000 750,000 780,000 810,000

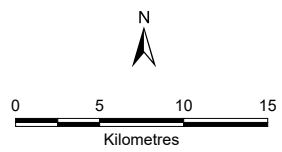
7,650,000 7,620,000

720,000 750,000 780,000 810,000



- Legend**
- ▭ Development Envelope
 - ▭ Laydown
 - Infrastructure**
 - ▭ Borrow Pit
 - ▭ Powerpole
 - ▭ Substation
 - ▭ Turkey Nest

- Indicative Disturbance Footprint**
- ▭ Generation Hub
 - ▭ Transmission Line



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All other data, Fortescue, 2024

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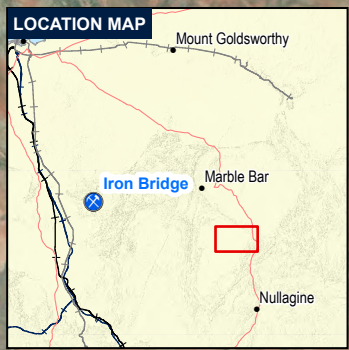
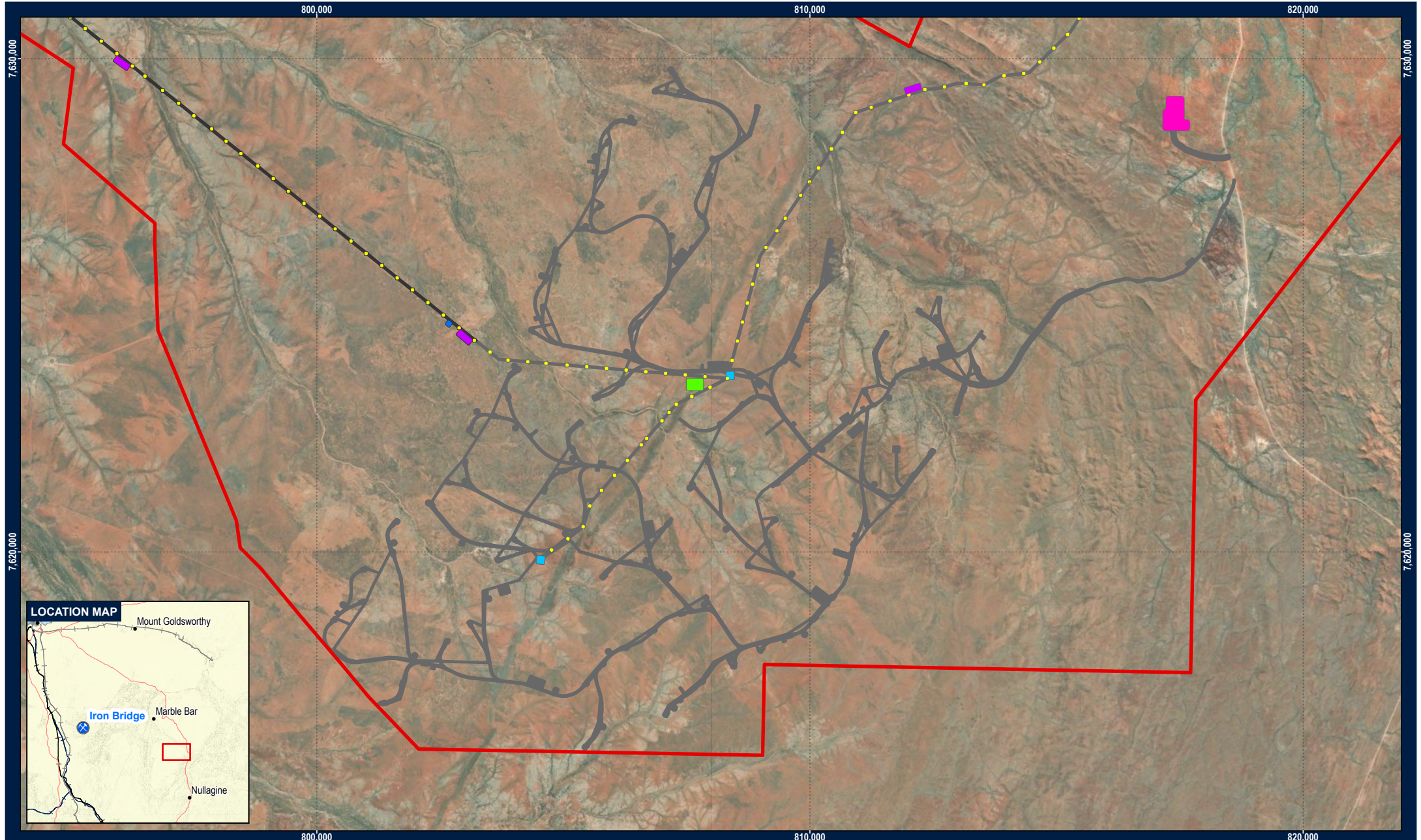
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Figure 3-2
Supporting Infrastructure of the Proposal





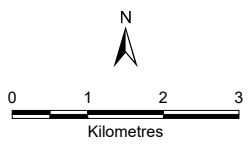
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Legend

Development Envelope	Infrastructure
Indicative Disturbance Footprint	Borrow Pit
Generation Hub	Camp
Transmission Line	Laydown
	Powerpole
	Substation
	Turkey Nest

Data Sources:
 Aerial, ESRI
 All other data, Fortescue, 2024



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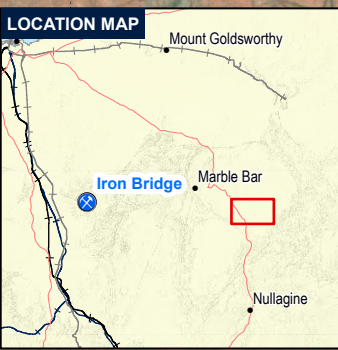
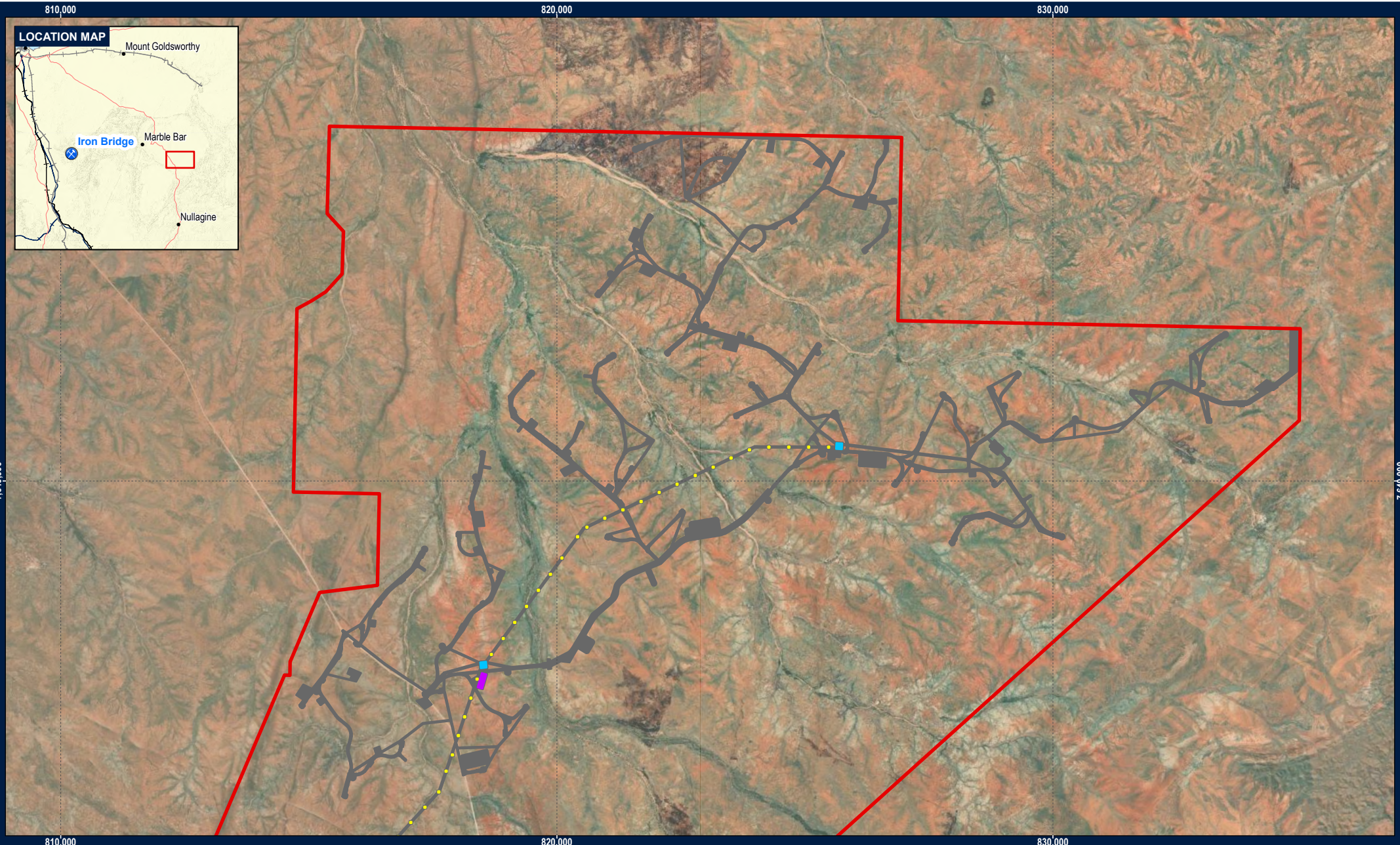
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Figure 3-2.1
Supporting Infrastructure of
the Proposal





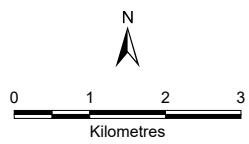
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- Legend**
- Development Envelope
 - Substation
 - Infrastructure**
 - Borrow Pit
 - Powerpole

- Indicative Disturbance Footprint**
- Generation Hub

Data Sources:
 Aerial, ESRI
 All other data, Fortescue, 2024



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Figure 3-2.2
Supporting Infrastructure of the Proposal





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3.2.6 Proposal Timelines

The Proposal is a critical component of Fortescue's decarbonisation commitments for achieving net-zero emissions from mining operations by 2030.

Construction works will commence following the receipt of all necessary approvals which has been estimated to be obtained late 2026. Construction activities are expected to take approximately 32 months. Generation and electrical transmission infrastructure will be progressively commissioned during construction.

It is anticipated that renewable energy generation and supporting electrical infrastructure will be maintained and then replaced at the end of the infrastructure's operational life. The proposed lifespan of the Proposal (approximately 25-30 years) is based on the tenure duration of miscellaneous licences under the *Mining Act 1978*. However, the operational lifespan of the Proposal is anticipated to be longer as the wind resources are expected to be available at the Site for the foreseeable future. Should an extension be required, appropriate approvals will be sought.

3.2.7 Operation and Maintenance

The operation phase of the Proposal is expected to commence in 2028 and will operate 24 hours per day. Operational personnel will consist of a local workforce with an accommodation village. Activities associated with the operational and maintenance phase include:

- Re-powering.
- Hazardous materials and waste handling.
- Operation of wind farm and supporting electrical infrastructure.
- Transfer of wind generation energy via substations and transmission lines to Fortescue Power Network.
- Groundwater abstraction and pumping.
- Treatment of groundwater.
- Raw and demineralised water storage in above ground tanks.
- Dangerous goods storage/chemical system.

3.2.8 Decommissioning and Rehabilitation

The Proposal is expected to have a life of 25-30 years and, with asset life extension, can operate indefinitely. It is intended to restore the environmental values of the Proposal area following the lifespan of the Proposal. Requirements for decommissioning will be established through consultation with relevant stakeholders. The result will be a decommissioning management plan, which will be developed in the years leading up to decommissioning the Proposal.

Progressive rehabilitation will be undertaken during the construction phase, including the rehabilitation of previously cleared areas following completion of construction activities within



specific locations of the wind farm. Rehabilitation will be undertaken once construction has been undertaken within separate construction areas, rather than after completion of the construction of the entire wind farm. Rehabilitation activities will include all temporary pads and tracks reprofiled back to the natural hillside/terrain, and any excavations backfilled and recontoured to achieve a gentle slope consistent with the surrounding natural landscape, to reduce erosion. Vegetation and topsoil removed during construction will be spread over cleared areas, and all potentially contaminated soil will be removed to an appropriately licensed facility, and rubbish will be removed from the site and disposed of appropriately. All compacted areas will be ripped / scarified to loosen compacted soil and promote vegetation growth. Monitoring of rehabilitated areas will be undertaken during wind farm operations to ensure vegetation becomes self-sustaining.

At such a time the Proposal is not required and has reached end of life, decommissioning activities will include:

- Agreements for Post-Development Land Use with relevant stakeholders.
- Removal of all infrastructure, vehicles and machinery.
- Removal from site and recycling, or appropriate disposal, of all infrastructure and waste.
- Decommissioning or repurposing of production bores.
- Rehabilitation / restoration of disturbed areas.

All decommissioning activities will be developed in consultation with relevant stakeholders for Post-Development Land Use.

3.3 Location and Regional Context

3.3.1 Physical Environment

3.3.1.1 Climate

The Pilbara is a semi-arid and arid region, which experiences approximately 300 mm of rainfall annually (McKenzie *et al.*, 2003). The weather station at Marble Bar (Site 004106) shows a long-term annual rainfall of 386 mm, with rain experienced predominately in January, February and March (BoM, 2024). Annual mean temperatures within the region range from 12.1°C in winter to 42.1°C in summer (BoM, 2024). Plate 3-4: outlines the monthly rainfall and temperature averages for the Marble Bar station (BoM, 2024).

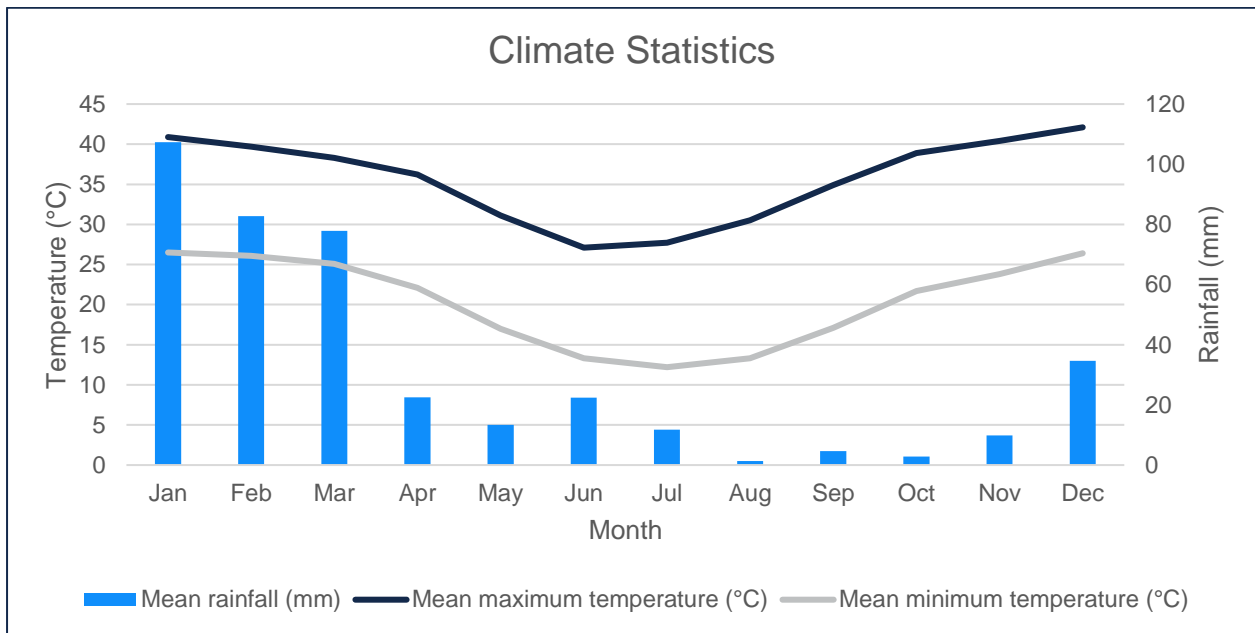


Plate 3-4: Marble Bar Climate Data (Site No. 004106) (BoM, 2024)

3.3.1.2 Geology, Soil and Land Systems

The Pilbara region is formed by a basement of Archaean granite and volcanics, overlain by massive deposits of Proterozoic sediments and volcanics (Semeniuk and Brocx, 2019). The DE comprises of 35 geographical units described in Table 3-2 and Figure 3-3 (DEMIRS, 2018).

There are 12 land systems within the DE (DPIRD, 2022), of which Macroy system covers more than 55% of the total DE (Table 3-3 and Figure 3-4).

Table 3-2: Geological Units in the Development Envelope (DEMIRS, 2018)

Geological Units	Description	Area within the DE (ha)	Proportion within the DE (%)
Apex Basalt	Basalt, komatiitic basalt, serpentinized peridotite; local dolerite sills; minor felsic volcanoclastic rocks and chert; metamorphosed	1,556.60	1.6
Bishop Creek Monzogranite	Biotite monzogranite to granodiorite and syenogranite; fine to coarse grained; locally seriate and porphyritic; rare pegmatite dykes; weakly metamorphosed	341.14	0.3
Black Range Dolerite Suite	Dolerite dyke; local gabbro; weakly metamorphosed	497.15	0.5
Bookargemoona Tonalite	Metamorphosed biotite tonalite; foliated to gneissic; local xenoliths of amphibolite	45.41	0.0
Carbana Monzogranite	Biotite monzogranite; feldspar porphyritic; common mafic xenoliths; weakly metamorphosed	23,737.68	24.0
Charteris Basalt	Basalt and basaltic komatiite; minor dolerite sills, chert and felsic volcanic rocks; metamorphosed	1.84	0.0
Cleaverville Formation	Banded iron-formation, ferruginous chert, sandstone, siltstone and shale; minor grey-white chert and felsic volcanoclastic rock; metamorphosed	6.19	0.0



Geological Units	Description	Area within the DE (ha)	Proportion within the DE (%)
Corboy Formation	Siliciclastic sedimentary rocks; metamorphosed	465.20	0.5
Dalton Suite	Mafic and ultramafic intrusive rocks; metamorphosed	1,031.56	1.0
Duffer Formation	Felsic volcanic rock; local basalt, chert, and felsic schist; metamorphosed	1,379.96	1.4
Emu Pool Supersuite	Monzogranite and granodiorite; minor trondhjemite; metamorphosed	1,908.27	1.9
Euro Basalt	Basalt, komatiitic basalt, serpentinized peridotite; local dolerite and gabbro sills; minor felsic volcanoclastic rocks and chert; metamorphosed	8,351.27	8.5
Fig Tree Gneiss	Banded metatonalite and metagranodiorite gneiss; local metatondhjemite, metamonzogranite and metasyenogranite gneiss, and migmatite	2,772.42	2.8
Gorge Creek Group	Banded iron-formation and siliciclastic rocks	111.08	0.1
Hardey Formation	Sedimentary and felsic volcanic rocks; local intrusive rocks	3,684.65	3.7
Honeyeater Basalt	Massive and pillowed basalt and komatiitic basalt; locally vesicular; metamorphosed	867.20	0.9
Joorina Granodiorite	Biotite granodiorite; local tonalite and monzogranite; locally porphyritic; variably foliated; metamorphosed	9,584.07	9.7
Kangaroo Caves Formation	Felsic and mafic volcanic rocks, and siliciclastic sedimentary rocks; metamorphosed	1,292.71	1.3
Kennell Granodiorite	Biotite--hornblende granodiorite; local monzogranite and tonalite; foliated; local mafic xenoliths and schlieren; metamorphosed	12,686.92	12.8
Kunagunarrina Formation	Basaltic rocks with komatiitic basalt; minor komatiite, siliciclastic rocks and chert; metamorphosed	25.46	0.0
Kylena Formation	Massive, amygdaloidal, and vesicular basalt and basaltic andesite; local komatiitic basalt, dacite, and rhyolite	7,555.06	7.6
Lalla Rookh Sandstone	Sandstone with beds of conglomerate, and minor siltstone and shale; metamorphosed	7.82	0.0
Leilira Formation	Siliciclastic sedimentary rocks, minor felsic volcanic rocks, and chert; metamorphosed	46.49	0.0
Mondana Monzogranite	Massive leucocratic monzogranite; very fine to medium grained; quartz-rich, minor biotite; equigranular to sparsely feldspar-porphyritic; weakly metamorphosed	408.40	0.4
Mount Ada Basalt	Mafic volcanic rock; local ultramafic rock; metamorphosed	1,051.70	1.1
Mount Roe Basalt	Basaltic volcanic rock; local volcanoclastic and siliciclastic rocks	5,034.94	5.1
Nandingarra Granodiorite	Biotite--hornblende granodiorite to tonalite; equigranular; contains inclusions of Tambina Supersuite tonalite; metamorphosed	1,275.65	1.3



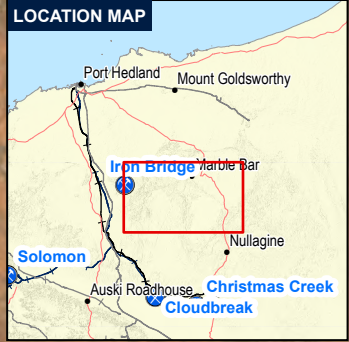
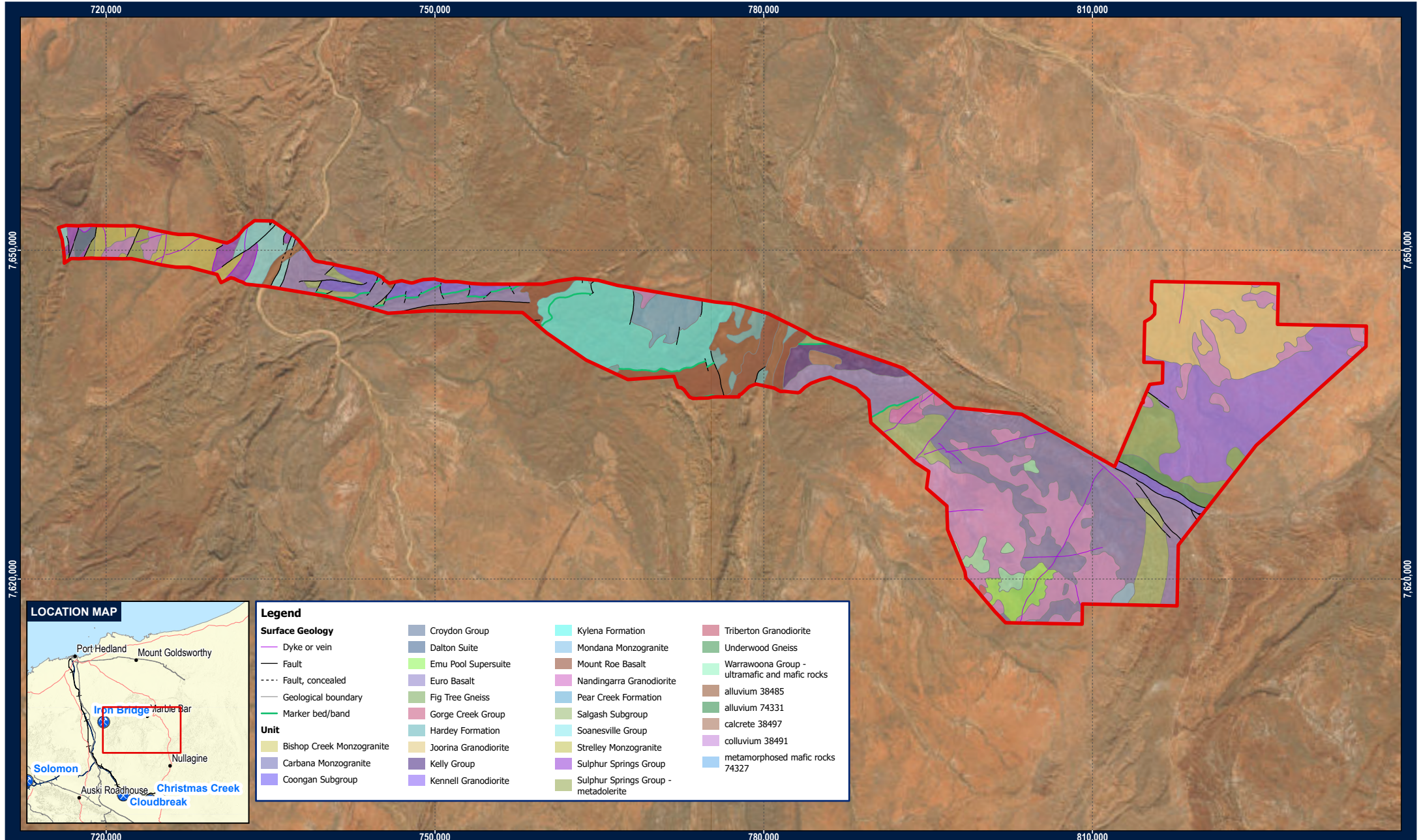
Geological Units	Description	Area within the DE (ha)	Proportion within the DE (%)
Paddy Market Formation	Banded iron-formation, chert, siliciclastic sedimentary rocks, and local felsic volcanic rocks; metamorphosed	346.04	0.4
Panorama Formation	Felsic volcanic rock; local sedimentary rock; metamorphosed	2,712.54	2.7
Pear Creek Formation	Conglomerate and other siliciclastic rocks interlayered with basalt; clasts range from boulders to pebbles; dominantly basaltic clasts; granitic, felsic volcanic, and chert clasts present locally	2,227.61	2.3
Strelley Monzogranite	Hornblende--biotite monzogranite and granophyric monzogranite; local diorite, dolerite, and gabbro; metamorphosed	3,299.12	3.3
Strelley Pool Formation	Silicified carbonate rocks, sandstone, conglomerate, chert, and dolomite; stromatolitic; metamorphosed	478.91	0.5
Underwood Gneiss	Granitic gneiss and migmatite; metatonalite, metagranodiorite, and metamonzogranite banding; strongly sheared	794.44	0.8
Warrawoona Group	Amphibolite derived from mafic intrusive or extrusive rock	1,294.90	1.3
Wyman Formation	Felsic volcanic and volcanoclastic rocks; local clastic sedimentary rocks, chert and basalt; metamorphosed	1,891.91	1.9

Table 3-3: Land Systems within and adjacent to the Development Envelope (Van Vreeswyk *et al.*, 2004)

Land System	Description	Area within the Proposal (ha)	Proportion within the Proposal (ha)
Black system	Linear ridges of dolerite or basalt supporting hard spinifex grasslands, with unvegetated boulder slopes and rock piles along summits	903.89	0.9
Boolgeeda system	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands	1,271.85	1.3
Calcrete system	Low calcrete platforms and plains supporting shrubby hard spinifex grasslands	464.28	0.5
Capricorn system	Rugged sandstone hills, ridges, stony footslopes and interflues supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs	4,898.73	5.0
Granitic system	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands	3,459.96	3.5
Macroy system	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands	54,351.93	55.0
Platform system	Dissected slopes and raised plains supporting shrubby hard spinifex grasslands	530.58	0.5
River system	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing	2,531.06	2.6

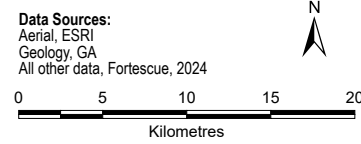


Land System	Description	Area within the Proposal (ha)	Proportion within the Proposal (ha)
	communities of eucalypts sometimes with tussock grasses or spinifex		
Rocklea system	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs	25,266.65	25.6
Satirist system	Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands	1,018.20	1.0
Talga system	Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands	3,979.68	4.0
Taylor system	Stony plains and isolated low hills of sedimentary rocks supporting hard and soft spinifex shrubby grasslands	95.20	0.1



Legend			
Surface Geology			
Dyke or vein	Croydon Group	Kylena Formation	Triberton Granodiorite
Fault	Dalton Suite	Mondana Monzogranite	Underwood Gneiss
Fault, concealed	Emu Pool Supersuite	Mount Roe Basalt	Warrawoona Group - ultramafic and mafic rocks
Geological boundary	Euro Basalt	Nandingarra Granodiorite	alluvium 38485
Marker bed/band	Fig Tree Gneiss	Pear Creek Formation	alluvium 74331
	Gorge Creek Group	Salgash Subgroup	calcrete 38497
	Hardey Formation	Soanesville Group	colluvium 38491
	Joorina Granodiorite	Strelley Monzogranite	metamorphosed mafic rocks 74327
Unit	Bishop Creek Monzogranite	Sulphur Springs Group	
	Carbarua Monzogranite	Sulphur Springs Group - metadolerite	
	Coongan Subgroup		
	Kelly Group		
	Kennell Granodiorite		

Legend
 Development Envelope



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostellio
 Approved By:
 Scale: 1:450,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066
 Document Name: 4519OP002_MP_EN_0066.004

Date: 17/01/2025
 Size: A4L
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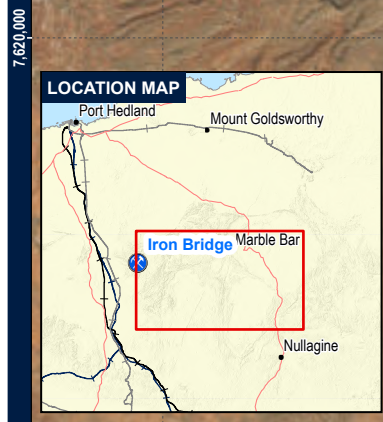
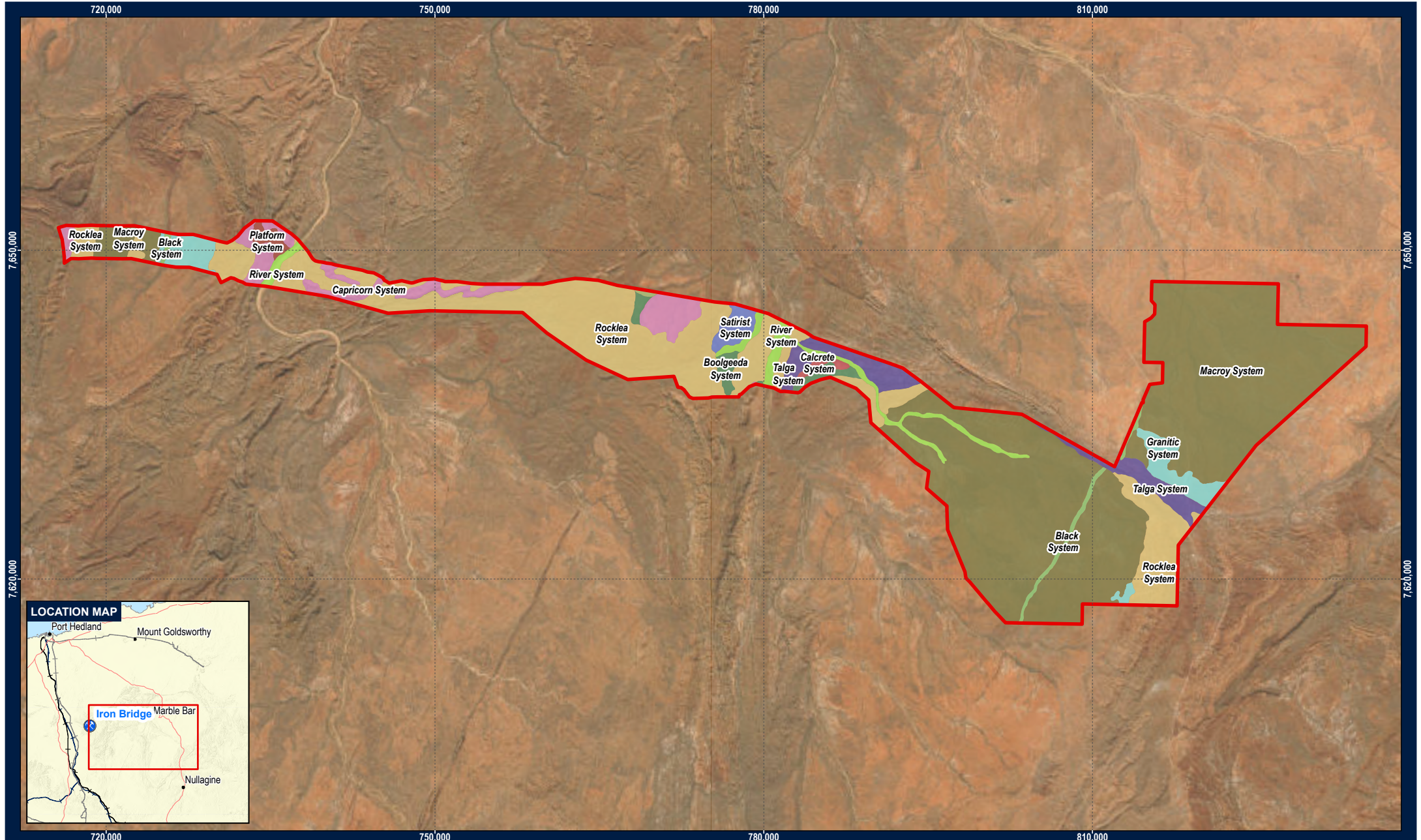
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Figure 3-3
Geological units within the Development Envelope



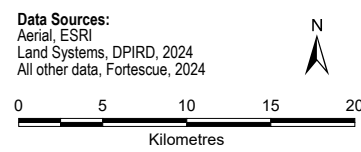


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Legend

Development Envelope	Capricorn System	Rocklea System
WA Land Systems	Granitic System	Satirist System
Black System	Macroy System	Talga System
Boolgeeda System	Platform System	Taylor System
Calcrete System	River System	



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Figure 3-4
Land Systems within the
Development Envelope





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3.3.1.3 Hydrology and Hydrogeology

The DE is located within the Pilbara Surface Water Area and Pilbara Groundwater Area proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act) (DWER, 2018a). The DE is not located within any Public Drinking Water Source Areas (DWER, 2018b). The Proposal occurs within the De Grey River Basin and overlaps three catchments: (1) Coongan River, (2) Shaw River and (3) Strelley River (DWER, 2018c). Inland Waters is discussed further in Chapter 10.

3.3.1.4 Environmentally Sensitive Areas

The Proposal does not intersect any mapped Environmentally Sensitive Areas (ESAs) (DWER, 2021a). With the nearest ESA approximately 110 km south of the Proposal and associated with the Fortescue Marsh.

3.3.1.5 Conservation Reserves

The Proposal does not intersect any legislated conservation lands or waters or lands of conservation interest (DBCA, 2017a). With the closest land of conservation interest (proposed for conservation) the ex-Meentheena Station. This station is approximately 3 km east of the Proposal at the closest point. The nearest conservation land is Mungaroona Range Nature Reserve approximately 75 km south-east of the Proposal.

3.3.1.6 Wetlands

The Proposal does not intersect nor is within 20 km of any Important Wetlands (DBCA, 2018) nor Ramsar Wetlands (DBCA, 2017b). The closest wetland, De Grey River, is located 60 km north of the DE.

3.3.1.7 Contaminated Sites and Acid Sulfate Soils

Acid Sulfate Soils (ASS) are naturally occurring soils and sediments which contain metal sulfides. When potential ASS is exposed to air, the iron sulphides within the soil react with oxygen and water, producing a variety of iron compounds and sulphuric acid (ANZG, 2018). The Atlas of Australian Acid Sulfate Soils (ASS) describes the national map of available ASS mapping on coastal states and territories and ASS qualification inferred from surrogate databases based on national and state soils, hydrography and landscape coverages for the remaining Australian territory. The vast majority of the DE (99.97%) is described as having a low or extremely low probability for occurrence of ASS. However, this classification has a confidence level 4, which means that this is a provisional classification inferred from surrogate data with no on-ground verification (Fitzpatrick *et al.*, 2011). The detailed classification is described in Table 3-4 and Figure 3-5.



Table 3-4: Acid Sulfate Soils within the Development Envelope

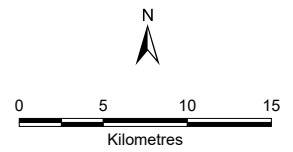
Classification	Area (ha)	Description
High Probability of occurrence - >70% chance of occurrence in mapping unit.		
Af(p4)	120.26	ASS, generally below 1 m from the surface. Generally, wetland forests (e.g. Melaleuca, Casuarina). Includes plains and levees.
An(p4)	522.43	ASS generally within upper 1 m in wet / riparian areas with Sodosols, Chromosols and Dermosols (Isbell, 1996).
Aq(p4)	1,742.79	ASS generally below 3 m from the surface. Generally forests. Includes plains and levees.
Low Probability of occurrence - 6-70% chance of occurrence in mapping unit.		
Bg(p4)	323.88	ASS, generally below 3 m from the surface. Generally forests. Includes plains and levees.
Bn(p4)	2,853.17	ASS generally within upper 1 m in wet / riparian areas with Sodosols, Chromosols and Dermosols (Isbell, 1996)
Extreme low probability of occurrence - 1-5% chance of occurrence in mapping unit with any occurrences in small, localised areas.		
Cn(p4)	10,723.63	ASS generally within upper 1 m in wet / riparian areas with Sodosols, Chromosols and Dermosols (Isbell, 1996)
Cq(p4)	82,457.10	ASS generally within upper 1 m in wet / riparian areas with Kandosols, Ferrosols, Tenosols, Rudosols and Podosols (Isbell, 1996)
Cu(--)	28.82	Insufficient information to classify map unit.

P - Potential acid sulfate soil (PASS) = sulfidic material; 4 - No necessary analytical data are available, and classifier has little knowledge or experience with ASS, hence classification is provisional.



- Legend**
- Development Envelope
 - Indicative Disturbance Footprint
 - Acid Sulphate Soil Risk Areas
 - High to moderate risk
 - Moderate to low risk

Data Sources:
 Aerial, ESRI
 ASS, DWER, 2024
 All other data, Fortescue, 2024



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 Revised By: scostello
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Figure 3-5
Acid Sulfate Soils within the Development Envelope





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3.3.2 Biological Environment

3.3.2.1 Bioregions

There are 89 recognised Interim Biogeographic Regionalisation for Australia (IBRA) regions that have been defined (DCCEEW, 2021).

The DE lies within the Pilbara Bioregion and the Chichester Subregion defined by the IBRA, Version 7 (DAWE, 2020). The Pilbara Bioregion is characterised as extensive coastal plains, mountain ranges, and active drainage in the Ashburton, Fortescue and De Grey River systems. The vegetation predominately consists of low mulga woodlands or snappy gum over tussock and hummock grasses (McKenzie *et al.*, 2003).

The Chichester subregion (PIL1), described by Kendrick and McKenzie (2001) as “undulating Archaean granite and basalt plains include significant areas of basaltic ranges”. The vegetation within this subregion consists of shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly known as *Triodia pungens*) hummock grasslands, with *Eucalyptus leucophloia* tree steppes on ranges. Land use within the area includes grazing, native pasture, conservation, urban and mining (Kendrick & McKenzie, 2001).

3.3.2.2 Pre-European Vegetation

Pre-European vegetation mapping based on Beard (1975; 1990) describes six vegetation associations (VA) within the DE. The DE is mostly composed of VA 93 (67.10%), VA 587 (15.47%) and VA 171 (10.68%). The Pre-European Vegetation Associations within the DE and their current extent are discussed further in Chapter 7.

3.3.2.3 Threatened and Priority Ecological Communities

The DBCA database did not identify any EPBC Act or BC Act listed Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC) within the DE, or within 20 km of the DE. Additionally, Focused Vision Consulting (FVC) (2024) did not record any vegetation representative of a TEC or PEC.

3.3.2.4 Threatened and Priority Fauna

Threatened Flora

The Desktop survey identified one species, *Quoya zonalis*, listed under the EPBC Act as Endangered (as *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)) and listed as Endangered under the BC Act. There are 95 recorded locations of this species, all in the western area outside of the DE. FVC (2024) recorded 93 individuals within the DE during the field survey.

Priority Flora

The Desktop survey identified 44 Priority flora species listed by DBCA that have previously been recorded within 40 km of the DE, of which seven species occurred within the DE. FVC (2024) recorded seven Priority flora species, comprising 827 individuals from within the DE.

The Threatened and Priority Flora recorded during the survey are discussed further in Chapter 7 (Flora and Vegetation).



3.3.3 Social Context

3.3.3.1 Native Title

The Proposal is located within Nyamal People #1 and #10 native title determination areas and is relevant to the Nyamal People (Nyamal). The Nyamal People were granted native title in September 2019 over 28,479 km² of land in the northern portion of the DE (Federal Court file no: WAD20/2019) and in January 2024 over 9,238.25 km² of land in the southern portion of the DE (Federal Court file no: WAD20/2019, WAD23/20).

Nyamal Aboriginal Corporation (NAC) is the Prescribed Body Corporate (PBC) representing Nyamal. Consultation with Nyamal on the Proposal was facilitated through NAC and their delegated heritage service provider, Barlbinbinya Aboriginal Corporation (BAC). Consultation with Nyamal has been undertaken for the Proposal and is detailed in Section 9.4.2.1.

3.3.4 Land Use

The Proposal is located approximately 40 km south-east of Marble Bar and 90 km east of Fortescue's Iron Bridge site in the Pilbara region of WA (Figure 1-1). The Proposal is located in the Shire of East Pilbara. The main town sites within the Shire are Newman, Marble Bar and Nullagine, with a number of Aboriginal Communities: Goodabinya, Irrungadji, Jigalong, Kiwirrkurra, Kunawarritji, Parnurr, Punmu and Warralong.

The Shire is rich in mining and pastoral activities, providing a significant contribution to the State and National economies. There are 109 active iron ore mines with the East Pilbara producing half of the Pilbara's total iron ore production (Shire of East Pilbara, 2022) and generating \$57.6 billion in commodities in 2020 (Shire of East Pilbara, 2022).

The Proposal is sited within the Marble Bar locality. The closest conservation area, approximately 75 km from the Proposal, is Mungaroona Range Nature Reserve, which is important regionally due to its natural and cultural values (Parks & Wildlife Service, 2024). One WA state and territory reserve, Mentheena Station, is situated towards the eastern extent of the Development Envelope, which was declared in 1999 and is currently in the National Reserve System (NRS), with gazettal in progress. Mentheena Station was previously a cattle station but has been transformed into a retreat for war veterans (ABC Rural, 2014).

Dominant land uses in the region include grazing on native pastures, conservation reserves and mining leases (DAWE, 2020). The DE is situated on the Eginbah, Panorama and Corunna Downs pastoral leases.



4 STAKEHOLDER ENGAGEMENT

4.1 Key Stakeholders

Table 4-1: Key Stakeholders Identified for the Proposal

Stakeholder Category	Organisation	Primary Area of Interest
Government Agencies	Department of Planning, Lands and Heritage (DPLH)	Appropriate land use Endorsement in line with existing and future planning requirements
	Department of Biodiversity, Conservation and Attractions (DBCA)	Environmental impact assessment Environmental approvals
	Department of Water and Environmental Regulation (DWER) – EPA Services, Licensing, Regional Services.	Understanding of impacts to Preliminary Key Environmental Factors Environmental impact assessment Watercourse Water Protection
	Pilbara Development Commission (PDC)	Remit to manage drive and growth in the Pilbara region
	Department of Energy, Mines, Industry, and Safety (including Worksafe) (DEMIRS)	Environmental impact assessment
	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Understanding of impacts to MNES Environmental impact assessment Responsible for environmental approvals
	WA Treasury	Economic impacts of the Proposal (WA Treasury)
Native Title Holders	Nyamal People and Elders. Nyamal Aboriginal Corporation – native title body corporation representative of the Nyamal Native Title Determination Area.	Native Title rights and access to country Management of Aboriginal Cultural Heritage and Cultural Values Potential impacts and changes to land use Contract opportunities
Local Government	Shire of East Pilbara	Project development Project economic benefits during construction and operations phases.
Land Holders	Corunna Downs Pastoral Station Eginbah Pastoral Station Panorama Pastoral Station	Pastoral lease holder - impacts to pastoral activity
Community and Special Interest Groups	Association of Mining and Exploration Companies (WA)	Project development Project economic benefits during construction and operations phases. Decarbonisation of emissions intensive industry.
	Chamber of Minerals and Energy (WA)	Project Development Decarbonisation of emissions intensive industry. Project economic benefits during construction and operations phases.



Stakeholder Category	Organisation	Primary Area of Interest
	Beeliar Group	Potential impacts to environmental values, threatened species and communities. Environmental management.
	Conservation Council WA	Potential impacts to environmental values, threatened species and communities. Environmental management.
	Australian Conservation Fund	Potential impacts to environmental values and threatened species.
	Wildflower Society	Potential impacts to environmental values in particular listed plants and vegetation communities
	World Wildlife Fund (Australia)	Potential impacts to environmental values and threatened species
	Greening Australia	Potential impacts to environmental values and threatened species.
	Kimberley Pilbara Cattlemen's Association	Potential impacts to pastoral activities and viability of pastoral stations. Land use.
	Pilbara Mesquite Management Committee	Potential environmental impacts such as weed introduction and spread.
	Rangelands NRM	Potential impacts and changes to land use. Potential environmental impacts such as weed introduction and spread, fire management, feral species, threatened species habitat.
	Save the Bilby Fund	Potential impacts to environmental values in particular Bilby Habitat.
	The Wilderness Society of WA Inc	Potential impacts to environmental values and threatened species
	Birdlife WA	Potential impacts to environmental values in particular threatened birds including the Night Parrot and migratory birds that may utilise Fortescue Marsh.
	Australian Wildlife Conservancy	Potential impacts to environmental values and threatened species.
	Care for Hedland	Potential impacts to environmental values and threatened species.

4.2 Stakeholder Engagement Process

Stakeholder consultation for the Proposal has been undertaken since 2023 and will continue throughout the Proposal life. The stakeholder consultation undertaken to date is summarised in Table 4-2.



4.2.1 Stakeholder Consultation

Table 4-2: Stakeholder Consultation Undertaken for the Proposal

Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
Government Agencies and Regulators				
Department of Climate Change, Environment, Energy and Water (Cth) (DCCEEW)	6 June 2024	<p>In person meeting:</p> <p>DCCEEW:</p> <ul style="list-style-type: none"> • Kylie Calhoun (Branch Head, Nature Positive Regulation Division) • Candice Cooke (Director, Nature Positive Regulation Division) <p>Fortescue:</p> <ul style="list-style-type: none"> • Matthew Dowling – Manager Environment, Primary Approvals and Governance • Jarrod Pittson – General Manager Environment 	<p>Meeting to provide an update on the following projects:</p> <ul style="list-style-type: none"> • East Pilbara Generation Hub • Bonney Downs Wind • Nullagine Pilot Wind • NSJ West Solar (now Turner River Solar Hub) • Mindy South and Nyidinghu • Western Hub 	DCCEEW expressed support for the design principles for the proposed solar and wind projects.
	1 November 2025	<p>Remote Online Meeting:</p> <p>DCCEEW</p> <ul style="list-style-type: none"> • Candace Cooke (Director, Nature Positive Regulation Division) • Samantha Lucas • Stuart Panozzo 	<p>Fortescue provided an overview of the Proposed Action including project details and approval timeframes, environmental studies and MNES.</p>	DCCEEW was supportive of the approval's pathway.



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
		Fortescue <ul style="list-style-type: none"> • Matthew Dowling - Manager Environment, Primary Approvals and Governance Sofie Springer – Senior Primary Approvals		
Department of Biodiversity, Conservation and Attractions (DBCA)	25 Oct 2024	In person meeting: DBCA: <ul style="list-style-type: none"> • Harley Taylor – A/Principle for North team • Luke Porter – A/Senior in Pilbara region • Michelle Corbellini • Todd Gibson • Murray Baker – Green Energy Officer • Cho Lamb - Enviro officer for Pilbara region. Fortescue: <ul style="list-style-type: none"> • Matt Dowling Manager Environment, Primary Approvals and Governance • Sofie Springer – Senior Environment • Kren Fairweather – Senior Environment 	Meeting to provide an update on the following projects and preliminary EIA: <ul style="list-style-type: none"> • East Pilbara Generation Hub • NSJ West Solar (now Turner River Solar Hub) • Mindy South 	The outcomes of the meeting relevant to EPGH were: <ul style="list-style-type: none"> • DBCA supportive of the design principles for solar and wind projects. • Interested to hear more as the bird and bat monitoring program continues.



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
Department of Water and Environment Regulation – EPA Services (Green Energy Division)	30 October 2023	Meeting with Fortescue to discuss decarbonisation and detailed environment discussions. DWER: <ul style="list-style-type: none"> • Shaun Meredith • Tracey Hassell • Tania Ashworth • Carrie Sunderland Fortescue: <ul style="list-style-type: none"> • Jarrod Pittson – Group Manager Environment and Governance • Matt Dowling – Manager Environment, Primary Approvals and Governance 	Follow-up meeting from 12/10/23 to discuss possible environmental approval pathways.	GED requested further information regarding life cycle of green energy technologies and consideration of transport of infrastructure.
	16 January 2024	In person meeting: EPA / GED: <ul style="list-style-type: none"> • Tania Ashworth – Manager Solar and Wind • Samara Rogers – Senior Environmental • Koby Anderson Senior Environmental Fortescue:	Overview of environmental studies and preliminary key environmental factors (flora and vegetation, terrestrial fauna and social surroundings), sensitive receptors identified, surveys outcomes discussed and ongoing work. Preferred environmental approvals pathways discussed.	EPA / GED was supportive of the proposed project and approvals pathway.



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
		<ul style="list-style-type: none"> • Jarrod Pittson – Group Manager Environment and Governance • Lazaro Rogue-Albelo – Functional Lead Biodiversity & Science • Jacob Azzarello – Principal Environment • Rikki Hughes - Environmental Advisor 		
	23 April 2024	<p>In person meeting:</p> <ul style="list-style-type: none"> • Alicia Dudzinska – Manager Solar and Wind • Samara Rogers – Senior Environmental • Koby Anderson Senior Environmental <p>Fortescue:</p> <ul style="list-style-type: none"> • Matthew Dowling – Manager Environment, Primary Approvals and Governance • Parveen Bauer – Manager Environmental Mining Approvals <p>Jacob Azzarello – Principal Environment</p>	<p>Updates provided on decarbonisation project definition and timeframes and streamlining green energy approvals timeframes.</p>	<p>EPA / GED was generally supportive of the proposed projects and approvals pathway. Encouraged a pre-referral meeting to go through defined projects and potential impacts on preliminary environmental factors.</p>
	30 Oct 2024	<p>In person meeting EPA/GED</p>	<p>Meeting held at EPA premises to provide an overview on the Proposal:</p> <ul style="list-style-type: none"> • Proposal Content (scope), 	<p>Supportive of detailed Proposal submission and key factors presented.</p>



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
		<ul style="list-style-type: none"> Sam Rycken Helen Lafuente Tayla Hunter Fortescue <ul style="list-style-type: none"> Matt Dowling – Manager – Primary Approvals Jacob Azzarello – Principal Environment Sofie Springer – Senior Environmental Advisor 	<ul style="list-style-type: none"> Identified preliminary key environmental factors & other factors. Key information describing receiving environment. Approval and development timelines.	
Department Jobs, Tourism, Science and Innovation (JTSI)	12 October 2023	Meeting with JTSI, DWER and DMIRS JTSI: <ul style="list-style-type: none"> Lakshmi Jones – Project Support Officer Green Energy Major Projects David Alexander DWER: <ul style="list-style-type: none"> Shaun Meredith – Executive Director Green Energy Directorate DMIRS: <ul style="list-style-type: none"> Dan Endacott - General Manager Mining Environment Fortescue:	Presentation of key Decarbonisation Projects to the Green Energy Directorate (GED), Department of Energy, Mines, Industry and Safety (DEMIRS) and JTSI. Assessment pathways for the proposed decarbonisation projects were discussed outlining the preferred approach; key projects discussed included: <ul style="list-style-type: none"> EPGH seeking assessment on referral information. Main goals for the decarb projects include: <ul style="list-style-type: none"> Fortescue requires ~1 GW solar and ~1 GW of wind, planned to be built in tranches - 2023 - 2028 to achieve 2030 Business Decarbonisation target. 	Supportive of Fortescue Decarbonisation projects however indicated that sufficient information for projects will be required to facilitate streamlined approvals / assessments.



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
		<ul style="list-style-type: none"> Matthew Dowling – Manager Environment, Primary Approvals and Governance Jacob Azzarello – Principal Environment 	<ul style="list-style-type: none"> Support for efficient and accelerated approval pathways - interagency cooperation 	
Local Government				
Shire of East Pilbara	11 Nov 2024	Pre-referral notification letter sent via email. Matt Dowling to Steve Gould	Notification of the environmental assessment process for the Proposal and update on Fortescue’s plan to submit a referral under Part IV of the EP Act to the Western Australian EPA.	The letter was acknowledged during meeting with the SoEP on 27 November 2024. No queries raised.
	27 Nov 2024	<p>In person and online meeting:</p> <p>SoEP:</p> <ul style="list-style-type: none"> Steven Harding – CEO Etienne Vorster - Director of Infrastructure Services Steven Gould – Manager of Strategy and Partnerships <p>Fortescue:</p> <ul style="list-style-type: none"> Dominik Spodniewski – Study Manager Moira Nell - Senior Tenements Advisor Sofie Springer – Senior Environmental Advisor 	<p>Fortescue and Shire of East Pilbara monthly meeting. Fortescue provided updates on the following:</p> <ul style="list-style-type: none"> Decarbonisation projects updates including hillside access road modifications and EPGH wind farm. Mindy South Mine East Hamersley Rail Nyidinghu Mine 	<p>The outcomes of the meeting relevant to EPGH were:</p> <ul style="list-style-type: none"> SoEP supportive of engagement with Nyamal regarding the EPGH Project. No concerns raised regarding visual impacts from Marble Bar Road.



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
		<ul style="list-style-type: none"> • Ben Nicholson – Principal Communities • Adrian Marcello – Development Manager Green Power • Janelle Fell – Senior Tenements Specialist • Sophie Gaunt – Manager Decarbonisation Projects 		
Surrounding Land Owners				
Panorama Pastoral Station	11 Nov 2024	Pre-referral notification letter sent via email. Matt Dowling (Fortescue) to Brent Smoothy; Panorama Station Owner	Notification of the environmental assessment process for the Proposal and update on Fortescue’s plan to submit a referral under Part IV of the EP Act to the Western Australian EPA.	No response received
Eginbah Pastoral Station	11 Nov 2024	Pre-referral notification letter sent via email. Matt Dowling (Fortescue) to Cam Brooks; Eginbah Station Owner	Notification of the environmental assessment process for the Proposal and update on Fortescue’s plan to submit a referral under Part IV of the EP Act to the Western Australian EPA.	No response received
Corunna Downs (and Bonney Downs) Pastoralist	11 March 2025	In person meeting: Corunna Downs Pastoralist: <ul style="list-style-type: none"> • Erica Goyder (Owner / Director) • Mike Smith (Tenement Manager) 	Meeting to provide an update on to present project updates and environmental impacts for the East Pilbara Generation Hub (EPGH).	The outcomes of the meeting relevant to EPGH were: <ul style="list-style-type: none"> • Corunna Downs noted general concerns will all relevant social surroundings factors (visual, noise, dust and vibration). <ul style="list-style-type: none"> ○ Fortescue responded that it can assess these factors in areas of



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
		<ul style="list-style-type: none"> • Robert Edel (Consultant/Lawyer) <p>Fortescue:</p> <ul style="list-style-type: none"> • Damon Edwards (General Manager Tenure and Access) • Max Coyne (Manager Pastoral Access) • Leigh Dowie (Senior Manager Green Power Delivery) • Matthew Dowling (Manager Primary Environmental Approvals) 		<p>importance as nominated by Corunna Downs.</p> <ul style="list-style-type: none"> • Corunna Downs noted turbine locations are generally on ridges. Queried feasibility of road access to ridges and management of associated erosion. <ul style="list-style-type: none"> ○ Fortescue response: <ul style="list-style-type: none"> - Road access is planned to accommodate max gradient for cranes and is not considered a risk. - Surface runoff will be dealt with in corresponding studies and Corunna Downs is invited to comment on any areas of particular concern for Fortescue assessment. - Fortescue invited Corunna Downs to nominate areas of importance (as mentioned above) for further or more focussed social surrounds assessment. • Fortescue committed to send a letter or email inviting Corunna Downs to nominate areas of importance for further or more focussed social surrounds assessment.
Corunna Downs (and Bonney Downs) Pastoralist	14 March 2025	Email sent to Corunna Downs from Matthew Dowling (Manager Primary Environmental Approvals).	Email requesting Corunna Downs to provide nominated areas of importance for focussed social surroundings assessments.	No response.



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
Nyamal Traditional Owners				
Nyamal Aboriginal Corporation (NAC) Board	16 Feb 2023	Meeting	Introduction of Fortescue's social surroundings consultation process and requirement to engage Nyamal for consultation on the proposed East Pilbara Generation Hub Wind Farm (EPGH).	Nyamal Board supported the consultation process proposed and looked forward to the ongoing engagement.
	20 Feb 2024	Meeting	Fortescue provided an update to the NAC Board, and new interim CEO, on the proposed EPGH project and status of the social surrounds consultation conducted to date.	NAC Board is looking forward to hearing more about the project and continued engagement with Fortescue.
Nyamal Representatives	14-18 Aug 2023	Social Surrounds Consult	The first on-country social surrounds consultation with Nyamal for the proposed EPGH project. The consult provided opportunity to visit the project area and identify social, cultural, or heritage values in the area. The consult also provided Nyamal representatives an opportunity to raise any concerns regarding the proposed development.	<p>Nyamal commented that the northeast portion of the EPGH Hub area was a highly dense cultural landscape, and the project should focus on the southwest section to avoid the granite outcrops. Fortescue noted that heritage places can be avoided.</p> <p>Nyamal developed principles for creek crossings and provided these to Fortescue for consideration in layout design.</p> <p>It was acknowledged the consultation process is ongoing and actions will be addressed at upcoming trips.</p>
	16-19 Oct 2023	Social Surrounds Consult	The second on-country social surrounds consultation with Nyamal for the proposed EPGH project. The	Nyamal built on their principles for minimising impacts on water by providing Fortescue with feedback on proposed groundwater bores.



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
			<p>project continued conversations from Trip 1, providing further updates on studies completed to date.</p> <p>The consultation also focused on identifying key receptors or points of interest for inclusion in upcoming dust, noise, and visual impacts assessments, as well as seeking feedback from Nyamal on proposed creek crossings options.</p>	<p>Nyamal supported how creek crossing assessments were undertaken in the design process and requested this is applied to other locations within the project area.</p> <p>Nyamal provided suggested locations for inclusion in the Visual Impact Assessment (VIA) and concerns to address in the dust and noise impact assessments.</p>
	9-24 May 2024	Field Survey	<p>Traditional Ecological Knowledge (TEK) survey for the proposed EPGH & PTP6 project (2024_NJA_TEK_Trip1).</p> <p>Purpose of this trip was to identify plants and animals of traditional use or value to Nyamal, and document cultural associations with species or ecological systems of particular cultural significance.</p>	<p>The EPGH TEK Survey identified 49 flora species, and 45 fauna species of traditional use / cultural value were identified. One plant species (<i>Melaleuca argentea</i>) was identified as being of high cultural significance and is an indicator of subsurface water and healthy country.</p>
	25-31 May 2024	Social Surrounds Consult	<p>The third on-country social surrounds consultation with Nyamal for the proposed EPGH project. This trip introduced the proposed PTP6 alignments and provided an opportunity for Nyamal to fly over the two options. Field visits to proposed creek crossing options on Sandy Creek were also undertaken, as well as demonstrations on predicted noise levels from operational wind turbines. Fortescue</p>	<p>Nyamal confirmed the visual impacts / changes to the landscape and the predicted noise levels were acceptable and did not pose any impacts on cultural values. Nyamal provided preference for one proposed creek crossing and requested completion of heritage surveys before providing feedback on the second creek crossing proposed.</p>



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
			also used Virtual Reality imagery to present the outcomes of the VIA.	Nyamal provided no preference for the PTP6 alignments and would be better informed once completion of heritage surveys.
Nyamal Heritage Sub-Committee (HSC)	1 Feb – 2 March 2023	Meeting	Introduction of the proposed EPGH and PTP6 wind project and outcomes of heritage surveys for the area. Fortescue explained the need to install Meteorological Masts that measured the wind in the area and outlined management to avoid heritage places identified in the area.	Nyamal HSC had no objection to the installation of the Met Mast and requested Nyamal monitors to be present at ground clearing and installation. Fortescue agreed to this request.
	7 Jun 2023	Meeting	<p>Fortescue provided an update restriction accessing the EPGH project area impacting on the heritage survey schedule.</p> <p>Fortescue suggested that due to the high volume of sites being identified in the EPGH area, that the recording methodology is changed to site avoidance to reduce the time spent recording sites.</p> <p>A review of project maps was undertaken to assess the tracks requiring to be surveyed. Fortescue also discussed the scope for the proposed ethnographic survey.</p>	<p>Nyamal HSC supported the proposed change to recording methodology and confirmed only the tracks Fortescue will be using, where they are bringing machines through, should be surveyed (not all tracks).</p> <p>Nyamal proposed the ethnographic scope may need to split the area into the different family groups. Fortescue agreed to facilitate this and would liaise through BAC to organise the survey.</p>
	5-6 Sept 2023	Meeting	Nyamal HSC was updated on outcomes of the first social surrounds trip including key concerns raised.	No comment or concerns were raised by Nyamal HSC regarding the update.



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
			<p>Fortescue provided an update on outcomes of heritage surveys conducted within the EPGH area to date and upcoming heritage scopes. Fortescue noted the addition of pastoral tracks to future heritage scopes as requested during social surrounds trip.</p>	
	5-6 Dec 2023	Meeting	<p>Update on the EPGH project and proposed works, including new Met Mast and groundwater bore program. Outcomes of social surrounds trip 2 were presented including Nyamal's principles regarding water. Fortescue updated Nyamal on changes to the EPA's requirement for SCHMPs and that these may no longer be conditioned. This provides an opportunity for Fortescue and Nyamal to develop management plans or other procedures that are more tailored to Nyamal's requirements.</p> <p>Fortescue presented on the proposed PTP6 alignments and requested initial input on potential areas of concern that may require additional on-ground investigations.</p>	<p>Nyamal agreed to scopes for the new proposed Met Mast to be included on the next heritage survey and requested Nyamal monitors to be invited for the proposed water bore drilling program when this occurs. HSC agreed Fortescue to scope of proposed bore locations to be included on the upcoming heritage surveys.</p> <p>HSC identified potential concern areas where the proposed PTP6 alignment intersects creek lines – these areas have a higher potential for cultural values to be present.</p>
	21-22 May 2024	Meeting	<p>Fortescue provided general overview of EPGH project progression and engineering plan update, heritage survey outcomes to date were presented.</p>	<p>No comment or concerns were raised by Nyamal HSC regarding the outcomes of the heritage surveys.</p> <p>Nyamal HSC would prefer Fortescue manage and facilitate any heritage surveys required for</p>



Stakeholder	Date	Engagement Type & List of Participants	Topics Raised / Discussed	Response / Outcome
			Fortescue outlined discussions with Main Roads on proposed Marble Bar Road upgrades that would be required to transport turbines blades to site.	road upgrades, rather than running these through Main Roads.
	17-18 Sept 2024	Meeting	Fortescue provided a project update on EPGH including revised wind farm layout, Met Mast installation, the groundwater bore drilling program, and creek crossings for PTP6. Nyamal HSC was also updated on the proposed road upgrades to transport the wind turbines to the project area should the project be constructed.	<p>Nyamal HSC noted that senior female elders need to make the decision about whether the powerline line itself could extend over [REDACTED]. [REDACTED] will avoid this site completely and deviate the powerline around the site as well.</p> <p>Nyamal noted they would prefer two poles located on either side of Coongan River rather than placement within the river itself. Fortescue noted that there is a minimum distance required between the poles and further assessments will identify the best placement to minimise impacts to surface water flow.</p>



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5 Objectives and Principles of the EP Act

The EP Act has five core principles of environmental protection, which align with the principles of Ecologically Sustainable Development outlined in section 3A of the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth). Table 5-1 describes how each of the five principles of the EP Act have been applied to the Proposal.

Table 5-1: Principles of Environmental Protection

Principle	Consideration of Principle
<p>1. The precautionary principle</p> <p>Where there are threats of serious irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</p> <p>In the application of the precautionary principle, decisions should be guided by:</p> <ul style="list-style-type: none"> careful evaluation to avoid, where practicable, serious or irreversible damage to the environment, and an assessment of the risk-weighted consequences of various options. 	<p>A comprehensive desktop survey and field studies were undertaken within the Development Envelope to assess the impact of the Proposal. Studies included:</p> <ul style="list-style-type: none"> Flora and Vegetation. Terrestrial fauna, including subterranean fauna. Bird and Bat Monitoring. Traditional Ecological Knowledge surveys. Heritage surveys. Noise and Vibration Assessment. Visual impact assessment. Dust assessment. Hydrological and hydrogeological assessment. Soil and landform assessment. <p>These scientific studies were used to identify the potential impacts of each Key Environmental Factor. Once identified, avoidance and mitigation measures were proposed to ensure these impacts are environmentally acceptable.</p>
<p>2. The principle of intergenerational equity</p> <p>The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.</p>	<p>The Proposal is for a renewable energy development that has the potential to significantly reduce the reliance on fossil fuel power for Fortescue's critical mineral operations, reducing greenhouse gas emissions and resulting in associated beneficial climate change impacts. The Proposal will allow Fortescue to cut down Scope 1 and Scope 2 emissions from its operations by at least 1.5 million TCO₂-e per year by replacing diesel and gas-fired stationery power generation with renewable sources. The proposal will also make a sustained contribution to WA's economy through provision of jobs and long-term clean energy.</p> <p>The Proposal will ensure the health, diversity and productivity of the environment is maintained by retaining as much habitat as possible and by minimising environmental impacts where practicable.</p> <p>The anticipated intergenerational benefits could be delivered ensuring no more than 1.4% of the vegetation within the DE is lost, including avoidance or effective mitigation of impacts on species of conservation significance.</p>
<p>3. The principle of the conservation of biological diversity and ecological integrity</p> <p>Conservation of biological diversity and ecological integration should be a fundamental consideration.</p>	<p>The Proposal meets the principle of conservation of biological diversity and ecological integrity by reducing the clearing of native vegetation within the DE, where practicable.</p> <p>Additionally, as discussed above the Proposal will reduce greenhouse gas emissions, contributing to the protection of biodiversity from the impacts of global warming.</p> <p>Lastly, Fortescue in partnership with the Harry Butler Institute, Murdoch University are developing a research programme to</p>



Principle	Consideration of Principle
	understand the potential impacts to avian and bat fauna from wind generation projects. Further detail on this programme is outlined in Section 8.3.
<p>4. Principles relating to improved valuation, pricing, and incentive mechanisms</p> <ul style="list-style-type: none"> • Environmental factors should be included in the valuation of assets and services. • The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. • The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste. • Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, which benefit and/or minimise costs to develop their own solutions and responses to environmental problems. 	<p>The proponent acknowledges the need for improved valuation, pricing and incentive mechanisms and has aimed to pursue these principles when appropriate. For example:</p> <ul style="list-style-type: none"> • Environmental factors were considered to determine the location of the IDF, including avoidance of high value areas (as discussed further in Chapters 7 to 9). • By its nature, the proposal will not generate intractable or large volume waste streams, with hydrocarbon and putrescible wastes management during construction and operations being the key considerations, which can be readily contained and managed through standard practices. • The cost of eventual decommissioning and rehabilitation has been incorporated into the financial modelling for the proposal.
<p>5. The principle of waste minimisation</p> <p>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</p>	<p>Waste management will be addressed during construction and operation activities to avoid and reduce waste, reuse and recycle where practicable, and treat and/or dispose in accordance with regulated requirements.</p>



6 ENVIRONMENTAL FACTORS

6.1 Identification of Environmental Factors

Table 6-1: WA EPA Environmental Factors (EPA, 2020a) and their Relevance to the Proposal

Theme	Factor	Objective	Relevance to the Proposal	Preliminary Key Environmental Factor
Sea	Benthic Communities and Habitats	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.	No credible pathway – DE is not located in or close to the marine environment.	No
	Coastal Processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.		
	Marine Environmental Quality	To maintain the quality of water, sediment and biota so that environmental values are protected.		
	Marine Fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained.		
Land	Flora and Vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	Credible pathway – the Proposal will involve the clearing of up to 2,318.80 ha of native vegetation.	Yes
	Landforms	To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.	No credible pathway – given the limited nature of any significant landforms within the IDF (related to Banded-iron formations), the fact the foundations for the wind turbines, transmission line structures, and supporting infrastructure will be relatively shallow (approximately 4m but up to 35m for some of the narrower bores), and the sporadic nature of any foundations, impacts to landforms are not considered to be a credible risk for the Proposal.	No
	Subterranean Fauna	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	Credible pathway – the Proposal will involve water extraction for construction and operation, however through preliminary assessment and analysis significant impacts are not	No



Theme	Factor	Objective	Relevance to the Proposal	Preliminary Key Environmental Factor
			considered likely and this factor has been covered in Chapter 10 (Other Factors).	
	Terrestrial Environmental Quality	To maintain the quality of land and soils so that environmental values are protected.	Credible pathway – Potential of disturbing Acid Sulfate Soils (ASS), land erosion and contamination of soil, however through preliminary assessment and analysis significant impacts are not considered likely and this factor has been covered in Chapter 10 (Other Factors).	No
	Terrestrial Fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	Credible pathway – the Proposal will involve the clearing of up to 2,328.23 ha of fauna habitat (excluding existing cleared areas).	Yes
Water	Inland Waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	Credible pathway – the Proposal will involve water extraction for construction and operation in addition to construction of watercourse crossings, however through preliminary assessment and analysis significant impacts are not considered likely and this factor has been covered in Chapter 10 (Other Factors).	No
Air	Air Quality	To maintain air quality and minimise emissions so that environmental values are protected.	No credible pathway – the Proposal is not anticipated to effect local or regional air quality and operationally will decarbonise existing energy supply. Remote location with limited sensitive receptors nearby.	No
	Greenhouse Gas (GHG) Emissions	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.	No credible pathway - Construction or operational activities not anticipated to exceed the threshold of 100,000 tonnes CO ₂ -e per year for scope 1 or 2 emission.	No
People	Social Surroundings	To protect social surroundings from significant harm.	Credible pathway – the Proposal will have a visual impact, will result in an increase in noise, dust and vibration and will impact plants, animals and waterways of significance to the Nyamal People.	Yes
	Human Health	To protect human health from significant harm.	No credible pathway – the Proposal is located in a remote location and appropriate mitigation controls will be in place for site operatives.	No



7 FLORA AND VEGETATION

7.1 EPA Objective

The WA EPA objective for the flora and vegetation environmental factor is ‘*To protect flora and vegetation so that biological diversity and ecological integrity are maintained*’ (EPA, 2021b).

The WA EPA defines flora as ‘*native vascular plants*’, and vegetation as ‘*groupings of different flora patterned across the landscape that occur in response to environmental conditions*’ (EPA, 2016b).

7.2 Policy and Guidance

The following EPA policies and guidelines have been considered during the preparation of this ERD and the supporting technical studies Proposal:

- Environmental Guidance for Planning and Development. Guidance Statement No. 33. Government of WA (GoWA) (EPA, 2008).
- Technical Guidance – Flora and Vegetation Surveys for EIA (EPA, 2016a).
- Environmental Factor Guideline – Flora and Vegetation (EPA, 2016b).
- Statement of Environmental Principles, Factors and Objectives (EPA, 2021b).
- Instructions – How to Prepare an Environmental Review Document (EPA 2021a).

The Environmental Factor Guideline has been considered during the identification of Flora and Vegetation values within the Development Envelope (DE), and the issues identified in the guideline have been considered in relation to potential impacts from the Proposal.

Flora and Vegetation surveys for the Proposal have been planned and executed in accordance with the EPA’s technical guidance for this factor. Any survey limitations relative to the technical guidance are noted in the Flora and Vegetation survey report (FVC, 2024).

Other policy and guidance considered during the preparation of this ERD and the supporting technical studies includes:

- *Biodiversity Conservation Act 2016* (BC Act).
- *Biosecurity Agriculture and Management Act 2007* (BAM Act).
- A guide to the assessment of applications to clear native vegetation under Part V Division 2 of the *Environmental Protection Act 1986* (DER, 2014).
- Department of Environment and Conservation (2007) ‘Conserving Threatened Ecological Communities.’ (Publicly available brochure prepared by the Department of Environment and Conservation in conjunction with National Heritage Trust: Perth, WA).



- Conservation advice for *Quoya zonalis* - Threatened Species Scientific Committee (2018). Conservation Advice *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4). Canberra: Department of the Environment and Energy.
- Commonwealth of Australia (2001) National Objectives and Targets for Biodiversity Conservation 2001-2005. (Canberra).
- State of WA (2005) Environmental Protection (Environmentally Sensitive Areas) Notice 2005. West. Aust. Gov. Gaz. 1163–1166.

7.3 Studies and Surveys

The following surveys and investigations in relation to flora and vegetation were undertaken:

- A desktop Flora and Vegetation assessment was undertaken for the Proposal by FVC (2024), which included database searches (Threatened and Priority Flora Database; WA Herbarium Database; Nature Map and PMST) and relevant existing survey reports. Previous surveys were sourced from the EPA Consultation Hub and other public available data or surveys provided directly by Fortescue. Twenty-six surveys undertaken between 2004 and 2021 were reviewed and summarised (Appendix A).
- A two-phase detailed Flora and Vegetation assessment and supplementary assessment (FVC, 2024). Phase 1 survey was completed between 5-13 April 2022 (Phase 1) and 3-5 and 14-19 October 2022 (Supplementary assessment); Phase 2 was conducted between 8-14 May 2023. Survey methods include helicopter, vehicle access, foot traverses, flora quadrats and relevés. A Targeted Significant Flora Survey was undertaken for a proportion of the Phase 1 and 2 field assessments. The searches were targeted based on previous records and likely habitat present using searching on foot, helicopter and traverses.
- Targeted searches for introduced flora, particularly Declared Pest (DP) Plants and Weeds of National Significance (WoNs) were carried out by CISS (2021) and incorporated within the FVC (2024) report.

The FVC (2024) report is provided in Appendix A.

7.3.1 Limitations

During Phases 1 to 3 of the surveys, some restricted access issues arose within the study area (refer to Figure 7, FVC (2024)). In 2022 and 2023, restricted access areas included Eginbah Station, and areas with heritage significance. The Panorama Station was also considered an area restricted for helicopter access.

Due to the access restriction, FVC (2024) extrapolated vegetation mapping using aerial imagery and land system mapping. The mapping reliability was considered moderate due to the size of the study area and the proportion of values identified and recorded; however, areas with restriction during phases 3 to 5, particularly areas not included in phase 1, are considered to have lower mapping reliability. In portions of Panorama Station, mapping was completed via extrapolation due to restricted access, although areas with land systems common to areas surveyed on the ground are considered likely to be similar. All land systems present within the study area are represented by one or more quadrats.



7.4 Receiving Environment

7.4.1 Regional Vegetation

The Proposal is located within the Chichester subregion (PIL1), which is described as being dominated by scrub steppe on Archaean granite and basalt plains and ranges. *Acacia inaequilatera* is the most typical shrub, growing over *Triodia wiseana*, a hummock grass, with *Eucalyptus leucophloia* tree steppes on ranges (George *et al.*, 2011).

7.4.2 Pre-European Vegetation

Pre-European vegetation mapping based on Beard (1975; 1990) describes six vegetation associations (VA) within the DE and their remaining extent (Table 7-1; Figure 7-1). The DE is mostly composed of VA 93 (67.11%), VA 587 (15.46%), and VA 171 (10.68%).



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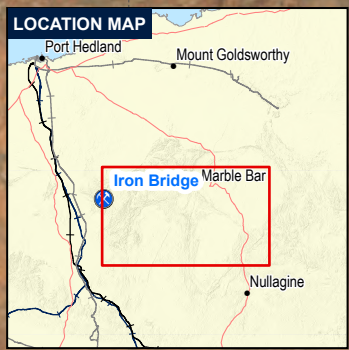
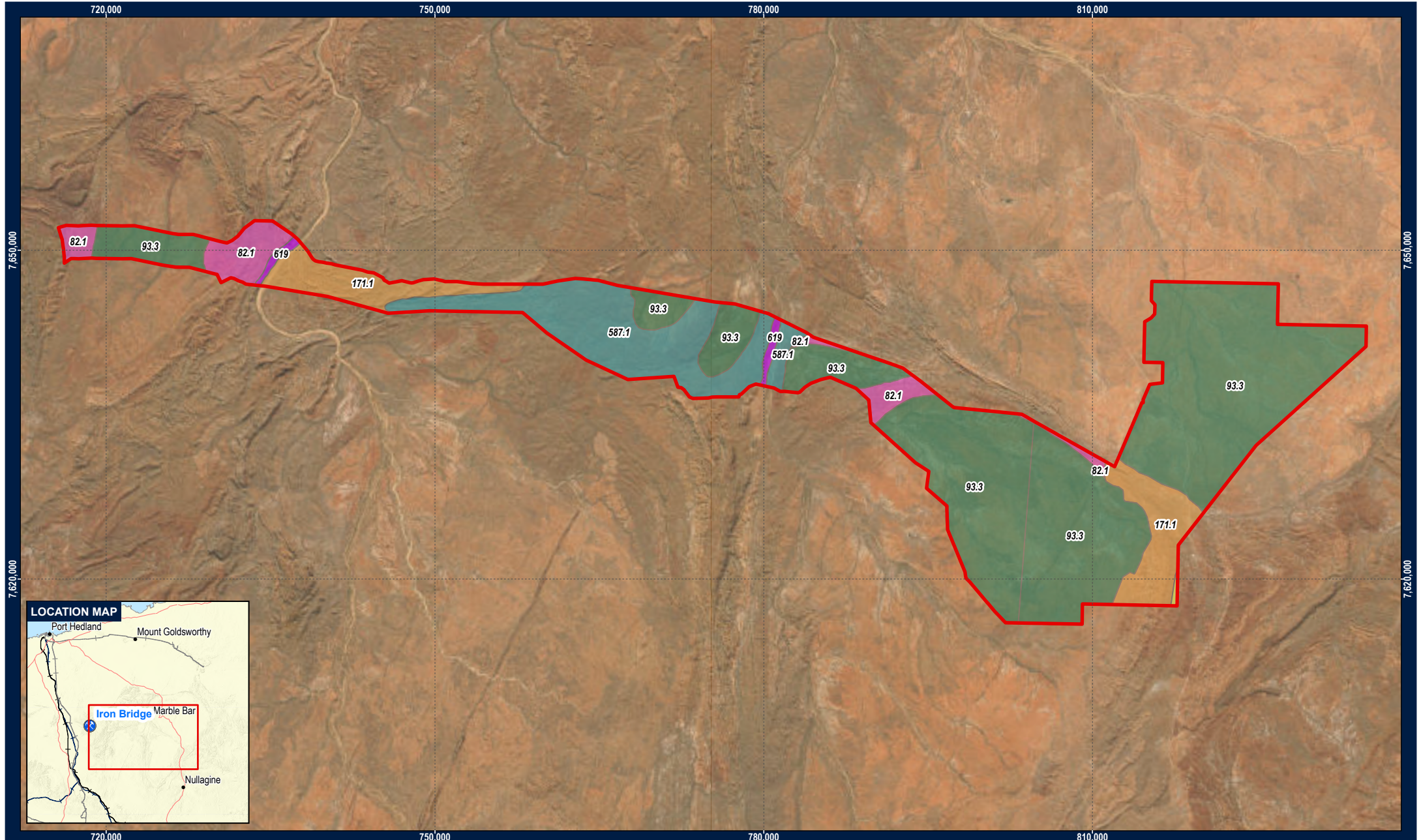
Table 7-1: Pre-European Vegetation associations within the Development Envelope (Source: Dataset - DPRID, 2019; Statistics - GoWA, 2019)

Vegetation Associations	Context	Pre-European extent (ha)	Extent Remaining (ha) ¹	Extent Remaining (%)	Current Extent in DBCA Managed Lands (%)	Area in DE (ha)	Proportion of DE (%)
82 Hummock grasslands, low tree steppe; <i>Corymbia dichromophloia</i> and <i>Eucalyptus leucophloia</i> over <i>Triodia wiseana</i> .	Western Australia	2,565,901.28	2,553,206.19	99.51	11.57	5,788.35	5.86
	Pilbara IBRA Region	2,563,583.23	2,550,888.14	99.50	11.58		
	Chichester IBRA Sub-Region	360,666.90	360,322.69	99.90	-		
	Shire of East Pilbara	927,709.76	919,072.17	99.07	0.50		
93 Hummock grasslands, shrub steppe; kanji (<i>Acacia inaequilatera</i>) over soft <i>spinifex</i> . <i>Triodia</i> spp., <i>Acacia</i> spp., <i>Grevillea</i> spp. <i>Eucalyptus</i> spp.	Western Australia	3,044,309.52	3,040,640.98	99.88	1.96	66,284.14	67.11
	Pilbara IBRA Region	3,042,114.27	3,038,471.67	99.88	1.96		
	Chichester IBRA Sub-Region	2,940,348.04	2,936,731.54	99.88	2.03		
	Shire of East Pilbara	1,709,522.24	1,706,780.57	99.84	15.98		
171 Hummock grasslands, low tree steppe; <i>Corymbia dichromophloia</i> , <i>Eucalyptus leucophloia</i> over soft <i>Spinifex</i> and <i>Triodia brizoides</i> .	Western Australia	331,951.73	330,643.09	99.61	10.92	10,545.40	10.68
	Pilbara IBRA Region	331,307.41	330,026.24	99.61	10.94		
	Chichester IBRA Sub-Region	31,742.84	31,195.06	99.61	10.94		
	Shire of East Pilbara	331,951.73	330,643.09	99.61	10.92		
173 Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low <i>Acacia</i> shrublands or hard <i>Spinifex</i> grasslands with scattered shrubs.	Western Australia	1,753,104.09	1,748,260.83	99.72	13.65	115.36	0.12
	Pilbara IBRA Region	1,752,520.89	1,747,677.63	99.72	13.66		
	Chichester IBRA Sub-Region	1,744,029.51	1,739,189.58	99.72	13.73		
	Shire of East Pilbara	1,085,704.89	1,081,937.46	99.65	9.93		

¹ Source: Government of Western Australia (GoWA). (2019). 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, <https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>.



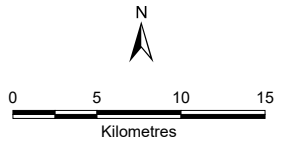
Vegetation Associations	Context	Pre-European extent (ha)	Extent Remaining (ha) ¹	Extent Remaining (%)	Current Extent in DBCA Managed Lands (%)	Area in DE (ha)	Proportion of DE (%)	
587	Mosaic: Hummock grasslands, open low tree-steppe; snappy gum over <i>Triodia wiseana</i> / Hummock grasslands, shrub-steppe; kanji over <i>Triodia pungens</i> .	Western Australia	580,728.60	580,696.99	99.99	21.24	15,273.41	15.46
		Pilbara IBRA Region	580,728.60	580,696.99	99.99	21.24		
		Chichester IBRA Sub-Region	570,997.04	570,965.44	99.99	21.48		
		Shire of East Pilbara	111,906.06	111,874.46	99.97	-		
619	Riverine; rivergum <i>E. camaldulensis</i> .	Western Australia	119,373.78	118,205.01	99.02	0.20	765.35	0.77
		Pilbara IBRA Region	118,920.31	118,116.78	99.32	0.20		
		Chichester IBRA Sub-Region	85,543.15	85,520.95	99.97	0.28		
		Shire of East Pilbara	52,765.30	52,763.69	100.00	-		
Total						98,772.02	100%	



Legend

Development Envelope	VA 171.1
Pre European Vegetation Associations	VA 173.1
VA 82.1	VA 587.1
VA 93.3	VA 619

Data Sources:
 Aerial, ESRI
 All other data, Fortescue, 2024



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 Drawn By: S. Bowyer
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Figure 7-1
Pre-European Vegetation
within the Development Envelope





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7.4.3 Vegetation Units

A two-phased detailed flora and vegetation assessment and supplementary assessments were completed (FVC, 2024). Phase 1 was completed between 5-13 April 2022 and a supplementary assessment (Phase 2) was completed between 3-5 and 14-19 October 2022. Phase 3 was conducted between 8-14 May 2023. Phases 4 and 5 were conducted between 24-30 May and 7-14 of August 2024. A total of 39 vegetation units (in addition to existing cleared areas) were mapped within the DE based on floristic analysis results, landform, geology, vegetation structure, species dominance and field observations. As mentioned in Section 7.3.1, to enable an impact assessment for the Proposal, the survey data collected by FVC (2024) has been extrapolated by a suitably qualified ecologist using satellite imagery. Table 7-3 and Figure 7-2 describes the vegetation unit, general vegetation condition, extent within DE and extrapolated data per vegetation unit.



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Table 7-2: Description of Vegetation Units within the Development Envelope

Landform	Vegetation Unit (VU)	Vegetation Unit Description	General vegetation condition
Drainage	AaTw2	<i>Acacia arida</i> Open Mid Shrubland over <i>Triodia wiseana</i> , <i>Triodia epactia</i> and <i>Triodia longiceps</i> Mid Hummock Grassland.	Excellent
	AhAtTa	<i>Atalaya hemiglauca</i> Low Isolated Trees over <i>Acacia trachycarpa</i> Tall Sparse Shrubland over <i>Triodia angusta</i> , <i>Triodia longiceps</i> and * <i>Cenchrus setiger</i> Low Open Hummock Grassland.	Degraded to Excellent
	AtTe	<i>Acacia trachycarpa</i> and <i>Acacia ampliceps</i> Tall Open Shrubland over <i>Triodia epactia</i> , <i>Triodia longiceps</i> and * <i>Cenchrus ciliaris</i> Tall Open Hummock Grassland.	Degraded to Excellent
	ChAcTw	<i>Corymbia hamersleyana</i> Low Isolated Trees over <i>Acacia coleii</i> Tall Sparse Shrubland over <i>Triodia wiseana</i> and <i>Chrysopogon fallax</i> Mid Hummock Grassland.	Very Good to Excellent
	ChAtTe	<i>Corymbia hamersleyana</i> Low Isolated Trees over <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Acacia adsurgens</i> and <i>Grevillea wickhamii</i> subsp <i>aprica</i> Tall Shrubland over <i>Triodia epactia</i> Open Mid Hummock Grassland.	Good to Excellent
	EcMa	<i>Eucalyptus camaldulensis</i> subsp <i>refulgens</i> and <i>Melaleuca argentea</i> Open Mid Woodland over <i>Melaleuca glomerata</i> and <i>Melaleuca linophylla</i> Tall Sparse Shrubland over * <i>Cenchrus setiger</i> and <i>Triodia longiceps</i> Open Mid Tussock Grassland.	Degraded to Excellent
	EcTI	<i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i> and <i>Melaleuca argentea</i> Open Mid Woodland over <i>Melaleuca glomerata</i> and <i>Melaleuca linophylla</i> Tall Sparse Shrubland over * <i>Cenchrus setiger</i> and <i>Triodia longiceps</i> Open Mid Tussock Grassland.	Good to Excellent
	EvAtEb	<i>Eucalyptus victrix</i> Open Mid Woodland over <i>Acacia tumida</i> var. <i>pilbarensis</i> and <i>Gossypium robinsonii</i> Open Mid Shrubland over <i>Eriachne benthamii</i> , <i>Triodia epactia</i> and <i>Chrysopogon fallax</i> Open Mid Tussock Grassland.	Very Good
	EvCi	<i>Eucalyptus victrix</i> Tall Mallee Woodland over <i>Cyperus ixiocarpus</i> Sparse Mid Sedgeland.	Excellent
	EvMITe	<i>Eucalyptus victrix</i> Mid Woodland over <i>Melaleuca linophylla</i> , <i>Melaleuca glomerata</i> and <i>Acacia</i> spp. Tall Open Shrubland over <i>Triodia epactia</i> , <i>Triodia longiceps</i> and * <i>Cenchrus ciliaris</i> Open Mid Hummock Grassland.	Good to Excellent
TcAtTe	<i>Terminalia circumalata</i> Low Open Woodland over <i>Acacia tumida</i> var. <i>pilbarensis</i> Tall Sparse Shrubland over <i>Triodia epactia</i> and <i>Eriachne mucronata</i> Low Open Hummock Grassland.	Good to Excellent	



Landform	Vegetation Unit (VU)	Vegetation Unit Description	General vegetation condition
Hills	AeAmTe	<i>Acacia eriopoda</i> and <i>Acacia orthocarpa</i> Tall Sparse Shrubland over <i>Acacia maitlandii</i> Sparse Mid Shrubland over <i>Triodia epactia</i> Low Open Hummock Grassland.	Very Good to Excellent
	AiCpTb	<i>Acacia inaequilatera</i> Tall Sparse Shrubland over <i>Corchorus parviflorus</i> Low Sparse Shrubland over <i>Triodia brizoides</i> Low Hummock Grassland.	Good to Excellent
	AiSgTb	<i>Acacia inaequilatera</i> Tall Isolated Shrubland over <i>Ptilotus auriculifolius</i> Low Sparse shrubland over <i>Triodia brizoides</i> , <i>Triodia epactia</i> , and <i>Triodia wiseana</i> Hummock Grassland.	Very Good to Excellent
	AiTe	<i>Acacia inaequilatera</i> and <i>Grevillea wickhamii</i> subsp. <i>aprica</i> Tall Sparse Shrubland over <i>Triodia epactia</i> and <i>Triodia brizoides</i> Mid Hummock Grassland.	Good to Excellent
	CcTe	<i>Corymbia candida</i> subsp. <i>candida</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> Low Open Woodland over <i>Triodia epactia</i> Low Hummock Grassland.	Excellent
	CspTb	<i>Corymbia</i> sp. Low Isolated Trees over <i>Acacia inaequilatera</i> and <i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i> Tall Isolated Shrubs over <i>Triodia wiseana</i> and <i>Triodia epactia</i> Low Open Hummock Grassland.	Excellent
	EIAte	<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> Low Isolated Trees over <i>Acacia tumida</i> var. <i>pilbarensis</i> Tall Sparse Shrubland over <i>Triodia epactia</i> and <i>Triodia brizoides</i> Mid Hummock Grassland.	Very Good to Excellent
	EIGwTw	<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Corymbia hamersleyana</i> Low Open Woodland over mixed <i>Acacia</i> spp. Sparse Mid Shrubland over <i>Triodia longiceps</i> and <i>Triodia brizoides</i> Open Mid Hummock Grassland.	Very Good-Excellent to Excellent
	EITITb	<i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Corymbia hamersleyana</i> Low Open Woodland over mixed <i>Acacia</i> spp. Sparse Mid Shrubland over <i>Triodia longiceps</i> and <i>Triodia brizoides</i> Open Mid Hummock Grassland.	Excellent
	Tw1	<i>Triodia wiseana</i> Low Hummock Grassland.	Very Good to Excellent
	Tw2	<i>Triodia wiseana</i> and <i>Triodia epactia</i> Mid Hummock Grassland.	Very Good to Excellent



Landform	Vegetation Unit (VU)	Vegetation Unit Description	General vegetation condition
Outcropping	AiCpTe1	<i>Acacia inaequilatera</i> , <i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i> and <i>Grevillea wickhamii</i> subsp. <i>aprica</i> Tall Sparse Shrubland over <i>Corchorus parviflorus</i> and <i>Rhynchosia minima</i> Low Sparse Shrubland over <i>Triodia epactia</i> Open Mid Hummock Grassland.	Excellent
	AtAHTe	<i>Acacia tumida</i> var. <i>pilbarensis</i> Tall Isolated Shrubs over <i>Acacia hilliana</i> Low Sparse Shrubland over <i>Triodia epactia</i> Open Mid Hummock Grassland.	Excellent
	ChTe	? <i>Corymbia hamersleyana</i> and <i>Brachychiton acuminatus</i> Low Isolated Trees over <i>Triodia epactia</i> , * <i>Cenchrus ciliaris</i> and <i>Cymbopogon ambiguus</i> Sparse Mid Hummock Grassland.	Very Good-Excellent to Excellent
	EiCpTb	<i>Eucalyptus ?leucophloia</i> subsp. <i>leucophloia</i> Low Isolated Trees over <i>Corchorus parviflorus</i> and <i>Tribulus suberosus</i> Sparse Mid Shrubland over <i>Triodia brizoides</i> and <i>Euphorbia careyi</i> Mid Hummock Grassland.	Very Good-Excellent to Excellent
	GwCpTe	<i>Grevillea wickhamii</i> subsp. <i>aprica</i> Isolated Mid Shrubs over <i>Corchorus parviflorus</i> Low Sparse Shrubland over <i>Triodia epactia</i> , <i>Cymbopogon ambiguus</i> and <i>Eriachne mucronata</i> Sparse Mid Hummock Grassland.	Good to Excellent
	GwTw	<i>Grevillea wickhamii</i> subsp. <i>aprica</i> , <i>Polycarpaea holtzei</i> and <i>Dampiera candicans</i> Sparse Mid Shrubland over <i>Triodia wiseana</i> and <i>Triodia epactia</i> Open Mid Hummock Grassland.	Excellent
	TcSpTI	<i>Terminalia circumalata</i> Low Isolated Trees over <i>Sida platycalyx</i> and <i>Ficus aculeata</i> var <i>indecora</i> Isolated Mid Shrubs over <i>Triodia longiceps</i> and <i>Digitaria brownii</i> Open Mid Hummock Grassland.	Very Good to Excellent
Plains	AaGWTe	<i>Acacia inaequilatera</i> Tall Isolated Shrubland over <i>Acacia acradenia</i> and <i>Grevillea wickhamii</i> Sparse Shrubland over <i>Triodia epactia</i> Open Mid Hummock Grassland.	Very Good to Excellent
	AbAITe	<i>Acacia bivenosa</i> Isolated Mid Shrubs over <i>Acacia levata</i> and <i>Acacia coleii</i> ?var <i>coleii</i> Low Isolated Shrubs over <i>Triodia epactia</i> Low Hummock Grassland.	Good to Very
	AiAaTe	<i>Acacia inaequilatera</i> and <i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i> Tall Sparse Shrubland over <i>Acacia ancistrocarpa</i> Isolated Mid Shrubs over <i>Triodia epactia</i> Mid Hummock Grassland.	Good to Excellent
	AiAaTw	<i>Acacia inaequilatera</i> and <i>Acacia acradenia</i> Tall Isolated Shrubland over <i>Triodia longiceps</i> and <i>Triodia wiseana</i> Low Hummock Grassland.	Good-Very Good



Landform	Vegetation Unit (VU)	Vegetation Unit Description	General vegetation condition
	AiCpTe2	<i>Acacia inaequilatera</i> , <i>Acacia ancistrocarpa</i> and <i>Grevillea pyramidalis</i> subsp. <i>leucadendron</i> Tall Sparse Shrubland over <i>Corchorus parviflorus</i> Low Isolated Shrubs over <i>Triodia epactia</i> Mid Hummock Grassland	Good to Excellent
	AiCpTw	<i>Acacia inaequilatera</i> Tall Sparse Shrubland over <i>Corchorus parviflorus</i> Low Sparse Shrubland over <i>Triodia wiseana</i> Low Hummock Grassland.	Good to Excellent
	AmTe	<i>Acacia maitlandii</i> and <i>Acacia adsurgens</i> Tall Sparse Shrubland over <i>Triodia epactia</i> and <i>wiseana</i> Mid Open Hummock Grassland.	Very Good to Excellent
	AsPftI	<i>Acacia stellaticeps</i> and <i>Acacia inaequilatera</i> Low Sparse Shrubland over <i>Pluchea ferdinandi-muelleri</i> Isolated Mid Shrubs over <i>Triodia longiceps</i> and <i>Triodia wiseana</i> Mid Hummock Grassland.	Good to Excellent
	ChTI	? <i>Corymbia hamersleyana</i> Low Isolated Trees over Mixed <i>Acacia</i> spp. Tall Sparse Shrubland over <i>Triodia longiceps</i> and <i>Triodia wiseana</i> Low Open Hummock Grassland.	Good to Excellent
	Ts	<i>Triodia secunda</i> , <i>Triodia angusta</i> and <i>Pluchea ferdinandi-muelleri</i> Mid Hummock Grassland.	Very Good
-	Cleared	-	Cleared



Table 7-3: Extent of Vegetation Units within the Development Envelope (FVC, 2024)

Landform	Vegetation Unit (VU)	Extent within DE			
		Transmission Line (TL) (ha)	Generation Hub (GH) (ha)	Total (ha)	Proportion of DE (VU/total area) (%)
Drainage	AaTw2	12.19	0.00	12.19	0.01%
	AhAtTa	113.82	1,160.9	1,274.72	1.29%
	AtTe	294.78	1,689.7	1,984.48	2.01%
	ChAcTw	222.55	0.00	222.55	0.23%
	ChAtTe	634.03	49.88	683.91	0.69%
	EcMa	1,610.17	1,065.92	2,676.09	2.71%
	EcTl	113.99	633.44	747.43	0.76%
	EvAtEb	0.00	203.1	203.1	0.21%
	EvCi	17.59	0.00	17.59	0.02%
	EvMlTe	1,370.7	174.75	1,545.45	1.56%
	TcAtTe	40.34	0.00	40.34	0.04%
Hills	AeAmTe	0.00	234.36	234.36	0.24%
	AiCpTb	7,443.86	360.48	7,804.34	7.90%
	AiSgTb	5,836.69	0.00	5,836.69	5.91%
	AiTe	4,777.63	2,137.83	6,915.46	7.00%
	CcTe	0.00	79.77	79.77	0.08%
	CspTb	0.00	23.97	23.97	0.02%
	EiAtTe	2,039.76	0.00	2,039.76	2.07%
	EiGwTw	390.89	0.00	390.89	0.40%



Landform	Vegetation Unit (VU)	Extent within DE			
		Transmission Line (TL) (ha)	Generation Hub (GH) (ha)	Total (ha)	Proportion of DE (VU/total area) (%)
	EITITb	670.88	1,056.67	1,727.55	1.75%
	Tw1	234.85	180.88	415.73	0.42%
	Tw2	5.73	113.34	119.07	0.12%
Outcropping	AiCpTe1	0.00	2186.2	2,186.20	2.21%
	AtAHTe	1,358.31	0.00	1,358.31	1.38%
	ChTe	31.55	4.79	36.34	0.04%
	EiCpTb	672.05	0.00	672.05	0.68%
	GwCpTe	0.00	2,259.04	2,259.04	2.29%
	GwTw	0.00	18.47	18.47	0.02%
	TcSpTl	20.18	2.93	23.11	0.02%
Plain	AaGWTe	1,570.8	0.00	1,570.80	1.59%
	AiAaTe	246.06	22,948.86	23,194.92	23.48%
	AiAaTw	630.37	0.00	630.37	0.64%
	AiCpTe2	791.56	10,167.41	10,958.97	11.10%
	AiCpTw	894.00	8,746.11	9,640.11	9.76%
	AmTe	1,657.24	0.00	1,657.24	1.68%
	AsPfTl	182.55	2,924.36	3,106.91	3.15%
	ChTl	4,726.8	1,272.62	5,999.42	6.07%
	Ts	7.62	0	7.62	0.01%

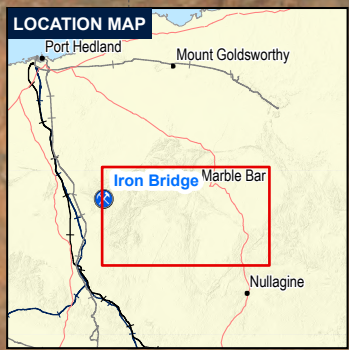
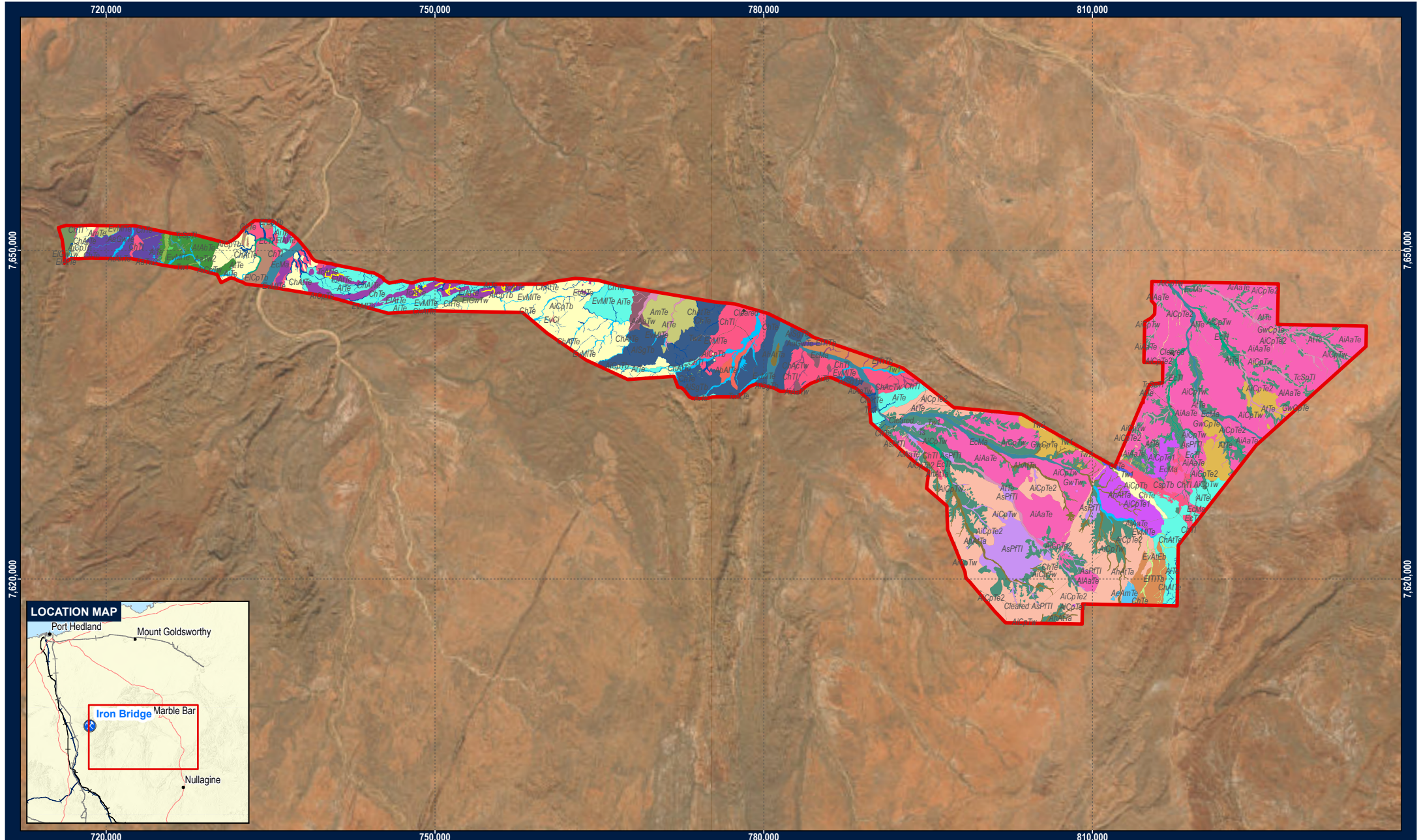


Landform	Vegetation Unit (VU)	Extent within DE			
		Transmission Line (TL) (ha)	Generation Hub (GH) (ha)	Total (ha)	Proportion of DE (VU/total area) (%)
-	Cleared	81.32	86.75	168.07	0.17%
Total		38,990.08	59,782.53	98,772.61	-

Note: Due to round issues attributed to the size of the DE and the diversity of details present in the region, the total area of the vegetation mapping (98,772.61) is slightly different from the total area of habitat mapping in the DE (98,772.60) reported in Chapter 8.

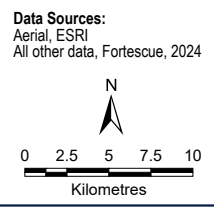


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Legend

Development Envelope	AeAmTe	AiCpTe2	AtAhTe	ChTI	EICpTb	GwCpTe	Tw2
Vegetation Unit	AhAtTa	AiCpTw	AtTe	Cleared	EIGwTw	GwTw	
AaGwTe	AiAaTe	AiSgTb	CcTe	CspTb	EITITb	TcAtTe	
AaTw2	AiAaTw	AiTe	ChActw	EcMa	EvAtEb	TcSpTI	
AbAIte	AiCpTb	AmTe	ChAtTe	EcTI	EvCI	Ts	
	AiCpTe1	AsPPTI	ChTe	EIAtTe	EvMITe	Tw1	



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostello
 Approved By:
 Scale: 1:450,000
 Coordinate System: GDA2020 MGA Zone 50
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Figure 7-2
Vegetation Units within the Development Envelope



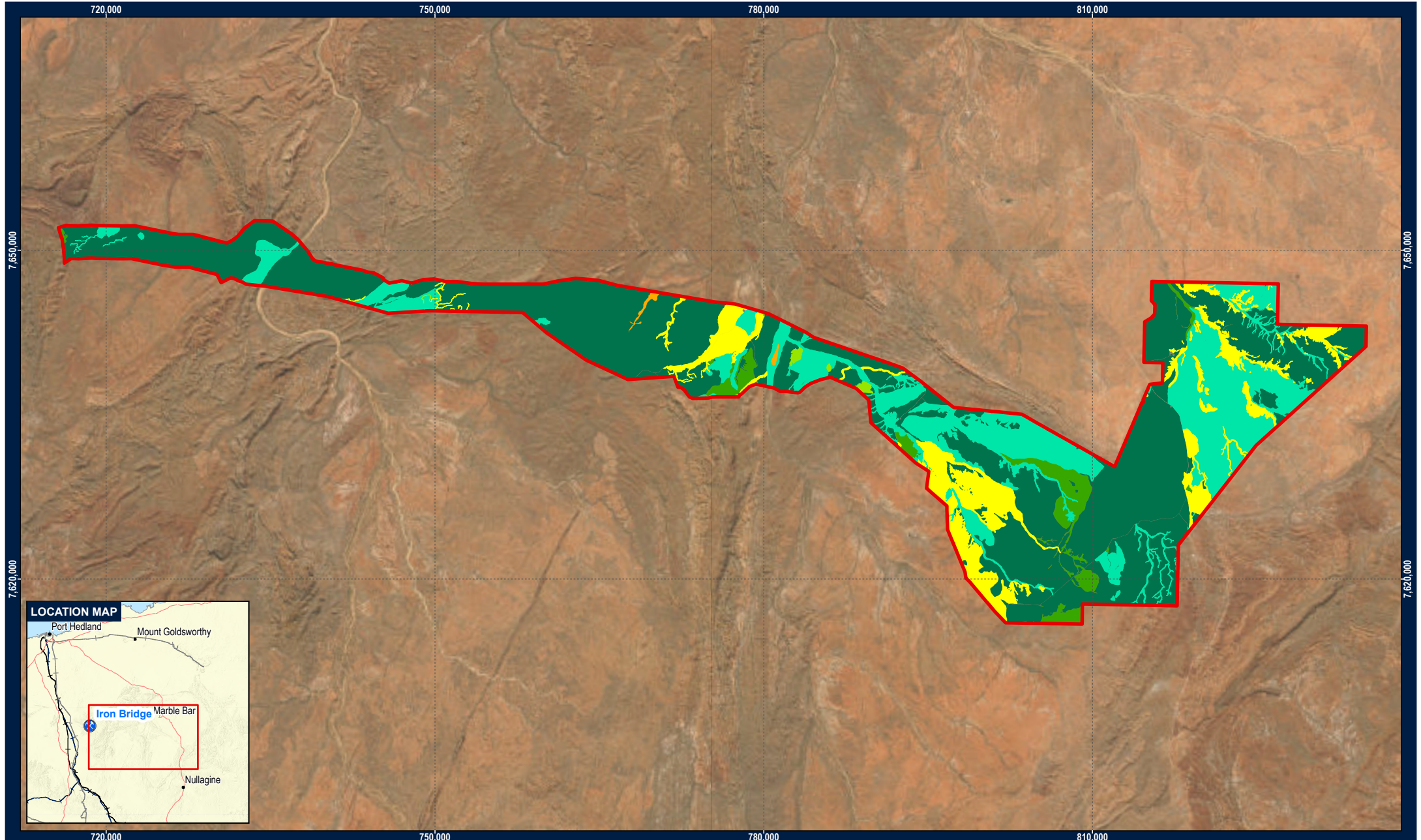


7.4.4 Vegetation Condition

The vegetation condition within the DE ranges mainly from 'Good' to 'Excellent' (total of 99.62% within the DE; Table 7-4). A small portion of the DE is 'Degraded' (0.21%) and the rest is 'Cleared' (0.17%). Vegetation in 'Excellent' condition occurs predominantly on the hills, in gorges and in areas of higher elevation. The degradation observed within the area was mostly associated with drainage areas and plains in the eastern portion of the study area, where disturbance is consistent with grazing impacts from cattle and the presence of weed species (*Cenchrus ciliaris* (Buffel Grass) and *Calotropis procera* (Calotrope)).

Table 7-4: Vegetation Condition within the Development Envelope

Vegetation Condition (VC)	Extent within DE				Proportion (VC/total) (%)
	Generation (ha)	Hub	Transmission Line (ha)	Total (ha)	
Excellent	32,163.31		28,540.97	60,704.28	61.46%
Very Good to Excellent	2,923.92		1,132.35	4,056.27	4.11%
Very Good	16,628.51		6,710.17	23,338.68	23.63%
Good to Very Good	0.00		230.16	230.16	0.23%
Good	7,980.06		2,088.85	10,068.91	10.19%
Degraded	0.00		206.24	206.24	0.21%
Cleared	86.73		81.34	168.07	0.17%
Total	59,782.53		38,990.08	98,772.61	100.00%



720,000

750,000

780,000

810,000

7,650,000

7,650,000

7,620,000

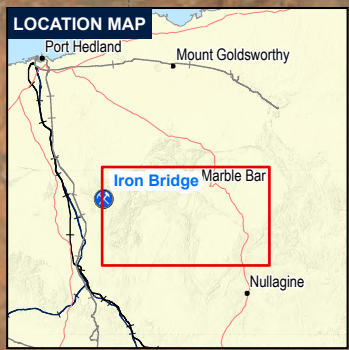
7,620,000

720,000

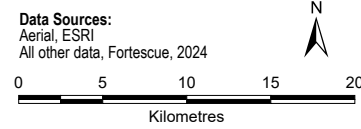
750,000

780,000

810,000



- Legend**
- Development Envelope
 - Excellent
 - Very Good-Excellent
 - Very Good
 - Good-Very Good
 - Good
 - Degraded
 - Cleared



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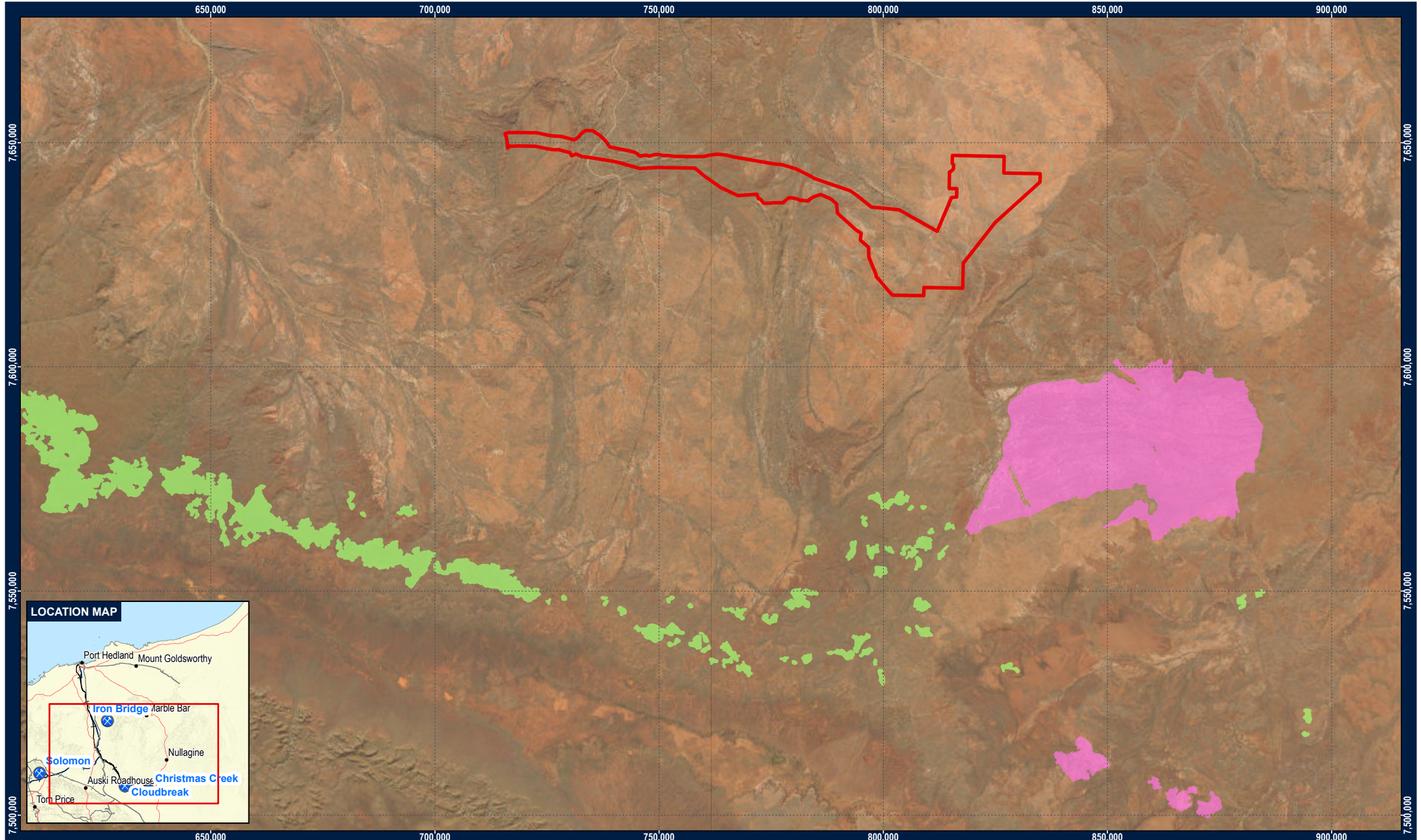
Figure 7-3
Vegetation Condition within the Development Envelope





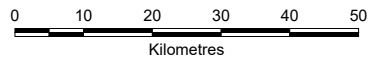
7.4.5 Threatened and Priority Ecological Communities

The DBCA database did not identify any EPBC Act or BC Act listed Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC) within the DE, or within 20 km of the DE. Additionally, FVC (2024) did not record any vegetation representative of a TEC or PEC. The closest PECs (Stony saline plains of the Mosquito Land System - Priority 3) was recorded approximately 22 km southeast of the DE as shown on Figure 7-4.



- Legend**
- ▭ Development Envelope
 - Priority Ecological Communities**
 - ▭ Stony saline clay plains of the Mosquito Land System
 - ▭ Four plant assemblages of the Wona Land System

Data Sources:
 PEC, DBCA,
 Aerial, ESRI
 All other data, Fortescue, 2024



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Figure 7-4
Threatened and Priority Ecological Communities - Desktop Survey



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7.4.6 Riparian, Groundwater Dependent and Potentially Groundwater Dependent Vegetation

The DE is situated within the Pilbara proclaimed groundwater area. The groundwater resources in this area are mainly alluvial, sedimentary or fractured rock aquifers. The DE and surrounding area occur within granitic terrain with water potentially restricted to limited weathered bedrock aquifers and thin pockets of tertiary alluvial material (Fortescue, 2022a). Water levels are shallow, approximately five to 10 m deep, with a hard water chemistry and fresh to slightly alkaline water type (arsenic and iron rich). Brackish water appears to correlate with deeper bores and potentially screened into the upper weathered horizons (Fortescue, 2022a).

Eucalyptus and *Melaleuca* species that depend on groundwater for some, or most of their water requirements were identified by FVC (2024) as being present in and around the DE, specifically within vegetation units EcMa, EcTI, EvAtEb, EvCi and EvMITe.

The vegetation units EcMa and EcTI represent groundwater dependent vegetation due to the presence of the phreatophytic² species *Melaleuca argentea* with *Eucalyptus camaldulensis*. The other three vegetation units (EvAtEb, EvCi and EvMITe) are considered potentially dependent on groundwater due to the presence of species that access or require groundwater at some stage of their life cycle (*E. victrix*). These four vegetation units are also more regularly present in medium to minor drainage lines, and seasonally flooded areas (drainage flats/floodplains) adjacent to major drainage lines. There is a total of 5,189.66 ha of groundwater dependent and potentially groundwater dependent vegetation within the DE.

The vegetation units identified as groundwater dependent vegetation (EcMa and EcTI), or potentially groundwater dependent (EvAtEb, EvCi and EvMITe), are considered riparian vegetation, due to these vegetation units growing in associations with rivers, creeks and seasonally wet areas.

7.4.7 Vegetation of Conservation Significance

The conservation significance of vegetation was assessed based on the description of the vegetation (Section 7.4.1 to Section 7.4.6) and the following flora sections (Section 7.4.7 to Section 7.4.10) of the existing environment. The criteria relevant to this assessment are:

- Nationally significant vegetation: Presence of EPBC Act listed threatened flora species or communities.
- State significant vegetation: Presence of State-listed threatened flora species or communities.
- Regionally significant vegetation:
 - Presence of DBCA listed Priority Flora species or ecological communities.
 - Important for maintaining ecological processes (e.g., Groundwater dependent vegetation and riparian vegetation).

² Phreatophytes are plants that can access groundwater directly, often found in riparian areas along streams where water is readily available. They have roots adapted to low oxygen levels in aquifers, allowing them to thrive in environments with consistent access to water.



- Providing a role as a refuge.
- Locally significant vegetation: Presence of small, isolated communities of limited extent and/or distribution (i.e., < 50 ha).

Other factors such as the presence of Ramsar wetlands, land within or in areas recommended by DBCA for inclusion in the State-managed conservation estate, presence of range extension flora, and pre-European extent below 30% were also considered; however, none of these characteristics were found within the DE (FVC, 2024). Table 7-5 summarises the conservation significant vegetation within the DE.

Table 7-5: Summary of Conservation Significant Vegetation within the Development Envelope

Scale	Significant aspects found within DE	Vegetation Units within DE
National Significance	Populations of Threatened (EPBC listed) species	AtAhTe*, EICpTb*, ElGwTw* and TcSpTl*
State Significance	Presence of State-listed Threatened flora	AtAhTe*, EICpTb*, ElGwTw* and TcSpTl*
Regional Significance	Presence of Priority flora	AiAaTe*, AiCpTe2*, AiCpTw*, AsPfTl*, AtAhTe*, AtTe*, ChTl*, CspTb*, EcMa*, EICpTb*, GwCpTe*, TcSpTl* and Tw1*
	Role in maintaining an important ecological process	EcMa, EcTl, EvAtEb, EvCi and EvMITe
	Providing a role as a refuge	AiAaTe, AiCpTw, EvCi and TcSpTl
Local Significance	Small, isolated communities of limited extent and/or distribution	AaTw2, CcTe, ChTe, CspTb, EvCi, GwTw, TcAtTe, TcSpTl and Ts

Note: * Denotes portions of vegetation units

7.4.8 Flora

A total of 581 flora species (taxa), from 165 genera and 56 families were recorded within the DE during the field assessment. The dominant families recorded were Fabaceae (136 taxa), Poaceae (86 taxa), Malvaceae (67 taxa). The dominant genera recorded were *Acacia* (47 taxa), *Sida* and *Tephrosia* (17 taxa each), *Eriachne* (16 taxa), *Indogoera* (14 taxa), *Ptilotys* and *Corchorus* (13 taxa each). The inventory of vascular flora recorded is presented in Appendix A (FVC, 2024).

7.4.9 Conservation Significant Flora

7.4.9.1 Threatened Flora

The Desktop survey identified one species, *Quoya zonalis*, listed under the EPBC Act as Endangered (as *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)) and listed as Endangered under the BC Act. There are 95 recorded locations of this species, all in the western area outside of the DE. The closest record is 300 m from the DE (Figure 7-4). FVC (2024) recorded 109 individuals within the DE during the field survey (Table 7-6).



Pilbara Foxglove - *Quoya zonalis* (Threatened)

Quoya zonalis (Pilbara Foxglove) is described as a many-branched shrub up to 2 m tall with opposite grey, densely hairy leaves and large pink, tubular flowers (Plate 7-1) that appear from July to September. The flowers have a dark pink calyx and pink markings in the lower lobe (TSSC, 2018). The species is only known from the Pilbara bioregion of Western Australia and inhabits tall shrubland of *Terminalia canescens* and *Acacia tumida* var. *pilbarensis* over hummock grassland of *Triodia longiceps*, with *Eriachne mucronata* and *Cynanchum viminale* subsp. *australe*. The species is also recorded on rocky conglomerate and granitic hill slopes with a southerly or easterly aspect and skeletal brown, sandy loam within the Capricorn Land System.

The species is geographically restricted to an area west of Marble Bar in the Pilbara, with 70 subpopulations recorded. The current total known number of individuals of Pilbara Foxglove is unclear, and the Conservation Advice (TSSC, 2018) cited an increase from 2,039 (assessed in 2015) to 9,291 in 2018. However, since the 2018 Conservation Advice, more surveys have identified the species. In 2023, 20,463 individuals from 5,761 records were recorded within the Pilbara, none of which occur within conservation reserves (Spectrum, 2023; Ecologia Environment, 2023). The species' main threats are mining activities, loss of genetic diversity and fragmentation, weeds, and altered fire regimes (TSSC, 2018).

FVC (2024) recorded 109 individuals in the survey area (all of which were within the DE) within the Capricorn, Black and Granitic Land Systems. These are particularly associated with outcropping granite occurring to the east of Shaw River, which is surrounded by volcanic metamorphic ridges. These individuals were new records not previously recorded.



Plate 7-1: *Quoya zonalis* (left – flower; right – habitat) (FVC, 2024)



7.4.9.2 Priority Flora

The Desktop survey identified 44 Priority flora species listed by DBCA that have previously been recorded within 40 km of the DE, of which seven species occurred within the DE (Figure 7-4). FVC (2024) recorded seven Priority flora species, comprising 827 individuals from within the DE, as described below and summarised in Table 7-6.

***Bulbostylis burbidgeae* (P4)**

Bulbostylis burbidgeae is a 0.03-0.25 m high tufted, erect to spreading annual, grass-like, or herb (sedge). Spikelets are simple umbel or rarely solitary, including three stamens with long hairy bracts (Plate 7-2). The species flowers between March or June to August and usually occurs on granitic soils, granite outcrops, and cliff bases (WA Herbarium, 1998-). This species is listed as Priority 4 by DBCA.

The total number of individuals of *B. burbidgeae* is unknown, however the survey data, existing Fortescue records and DBCA data (TPLF, 2024; WA Herbarium, 2024) identify in the region 1,000 individuals. Within a 40 km buffer of the DE, DBCA data records 463 individuals from 17 locations. Of these 463 individuals, two individuals were previously recorded within the DE in 1941 (TPLF, 2024; WA Herbarium, 2024). These locations were searched as part of the FVC (2024) survey, and the species was found, along with other locations not previously recorded in the broader survey area.

During the field survey, 12 records, totalling 401 individuals, were recorded within the study area on large granitic outcrops in the Macroy land system within the vegetation units AiAaTe, AiCpTw, GwCpTe and TcSpTI (FVC, 2024).



Plate 7-2: *Bulbostylis burbidgeae* (left & centre – habitat; right – seed head) (FVC, 2024)

***Cochlospermum macnamarae* (P1)**

Cochlospermum macnamarae was first recorded in September 2011 and was the first record of the genus in the Pilbara bioregion. The species is a spreading, multi-stemmed shrub



approximately 2 m high and 3 m wide (Plate 7-3), from a robust and possibly fire-tolerant rootstock (Hislop *et al.*, 2013). *C. macnamarae* is listed as Priority 1 by DBCA.

The total number of individuals of *C. macnamarae* is unknown, however the survey data, existing Fortescue records and DBCA data (TPLF, 2024; WA Herbarium, 2024) identify in the region of 300 individuals. Within a 40 km buffer of the DE, DBCA data records five individuals from five different locations (TPLF, 2024; WA Herbarium, 2024).

During the field surveys, a total of 128 individuals were recorded from two populations within the DE, both from vegetation unit AtAhTe and restricted to large, tall granite outcropping that contained a seam of quartz. All similar landforms (granite outcropping) within the study area were searched via low altitude helicopter and foot traverses, no further individuals were recorded (FVC, 2024).



Plate 7-3: *Conchlospermum macnamarae* (left – flower; right – habitat) (FVC, 2024)

***Euphorbia inappendiculata* var. *inappendiculata* (P2)**

Euphorbia inappendiculata var. *inappendiculata* is an annual, prostrate herb growing to 0.1 m tall. The leaves are dark green above and light green below, with light brownish green coloured stems (Plate 7-4). Flowering occurs between July and August and the species is typically found on flats or gentle plains, cracking clay patches and orange-brown sandy loam. The species has a current known distribution from south of Pardoo to Newman, and from Onslow to Halls Creek; a distribution of 1,350 km east to west (FVC, 2024). This species is listed as Priority 2 by DBCA.

The total number of individuals of *Euphorbia inappendiculata* var. *inappendiculata* is unknown, however the survey data, existing Fortescue records and DBCA data (TPLF, 2024; WA Herbarium, 2024) identify in the region of 1,800 individuals. There are 16 occurrences in Pilbara, according to the Atlas Living of Australia (ALA) (2024). The DBCA data has records of one individual from one location approximately 23 km from the DE (TPLF, 2024; WA Herbarium, 2024).



FVC (2024) recorded two individuals during the field survey, one in silty loam soil on a dolerite outcropping within vegetation unit Tw1 and the other in silty clay soil on a quartz seam in vegetation unit CspTb.



Plate 7-4: *Euphorbia inappendiculate* var. *inappendiculate* voucher specimen (FVC, 2024)

***Gymnanthera cunninghamii* (P3)**

Gymnanthera cunninghamii is an erect shrub, 1-2 m high, with lime green leaves. The species flowers between January and December and is typically found on sandy soils associated with drainage lines and creek banks (WAH, 1998).

The total number of individuals of *G. cunninghamii* is unknown. However, survey data, existing Fortescue records and DBCA data (TPLF, 2024; WA herbarium, 2024) identify in the region of 608 individuals. The total number is likely to be significantly more as there are 1,156 records within the ALA (2025) database distributed across Queensland, Northern Territory and WA. In WA, the species ranges from Walyarta Conservation Park in the north-east to Lake Macleod in the west (FVC, 2025). Within a 40 km buffer of the DE, DBCA data records 9 individuals from 5 locations. None of those individuals were previously recorded within the DE (TPLF, 2024; WA Herbarium, 2024).

During the field survey, a single record was recorded on the bank of a major tributary to the Coongan River drainage system, within the vegetation unit EcMa (FVC, 2024). Although targeted searches were conducted in the surrounding area and further along the drainage lines, no additional individuals were found – though it is likely that others may occur along the tributary (FVC, 2025).



Plate 7-5: *Euphorbia inappendiculate* var. *inappendiculate* voucher specimen (FVC, 2024)

***Heliotropium murinum* (P3)**

Heliotropium murinum is a short-lived perineal herb with up to 0.4m high (Plate 7-6). The species flowers in May or September (WA Herbarium 1998 -) and is mainly found on sandy-clay floodplains, restricted to the Macroy land systems. The species is associated with *Triodia epactia* low closed shrublands and *Corymbia hamersleyana* woodlands on gentle slopes of red-brown sandy clay loam soils and quartz (FVC, 2024). The species is listed as Priority 3 by DBCA.

The total number of individuals of this species is unknown, however the survey data, existing Fortescue records and DBCA data (TPLF, 2024; WA Herbarium, 2024) identify in the region of 891 individuals. There are 32 records within the ALA (2024) database, which suggests that the distribution extent of this species is 150 km between de Grey and north of Nullagine. Within a 40 km buffer from the DE, the DBCA database has records from 12 locations, of which one location (recorded in 2018) with 479 individuals is within the DE (TPLF, 2024; WA Herbarium, 2024). This location was searched as part of the FVC (2024) survey, and the species was found, along with other locations not previously recorded in the broader survey area.

A total of 432 records, totalling 1,964 individuals, were recorded during the field survey, all within vegetation units AiAaTe, AiCpTe2, AiCpTw, AsPftI, AtTe and ChTI (FVC, 2024).



Plate 7-6: *Heliotropium murinum* (left – flower; right – habitat) (FVC, 2024)

***Phyllanthus hebecarpus* (P3)**

Phyllanthus hebecarpus is a procumbent to erect tomentose shrub growing one metre high and producing green-white flowers most of the year (WA Herbarium, 1998-). This species often occurs on red sandy loam, granite outcrops or skeletal brown sand. *P. hebecarpus* is listed as Priority 3 by DBCA.

The total number of individuals of this species is unknown, however the survey data, existing Fortescue records and DBCA data (TPLF, 2024; WA Herbarium, 2024) identify in the region of 31 individuals. The ALA has 512 records across Australia; however, there are only seven records within the WA Herbarium database. The limited number of records within WA suggest little is known about the species distribution within the state, and its extent may be greater than currently recorded (FVC, 2024).

During the 2022 field survey, one individual was recorded on the loamy soil of the Granitic land system (FVC, 2024). The individual of the species located in October 2022 was found within the AtAhTe vegetation unit. Based on this we assume FVC determined the species is likely to occur elsewhere in this vegetation unit. Access permission to areas that were mapped as AtAhTe within the study area was revoked for the 2023 survey and consequently a targeted search for the species could not be completed. The areas where access restriction occurred were in a small section of the western extent of the DE and IDF. During phase 4, three large transects and two further quadrats were added in within unit AtAhTe, however, no further records of *Phyllanthus hebecarpus* were recorded.

***Ptilotus mollis* (P4)**

Ptilotus mollis (P4) is a compact perennial shrub with soft grey foliage up to 0.5m high (Plate 7-7). The species has densely clustered white or pink flower spikes that flower in May or September. *Ptilotus mollis* is known to occur on stony hills and screes (WA Herbarium, 1998-). *P. mollis* is listed as Priority 4 by DBCA.



The total number of individuals of this species is unknown, however the survey data, existing Fortescue records and DBCA data (TPLF, 2024; WA Herbarium, 2024) identify in the region of 2,800 individuals. The species is known from 43 WA Herbarium records distributed across 650 km from Karlamilyi National Park to Cane River Conservation Park, intersecting the study area (WA Herbarium, 1998-). Within the 40 km buffer from the DE, the DBCA database has records of 765 individuals from 18 locations, one of which occurs within the DE (TPLF, 2024; WA Herbarium, 2024). This location was searched as part of the FVC (2024) survey, and the species was found, along with other locations not previously recorded in the broader survey area.

During the field surveys, 81 individuals from five locations were recorded, all within vegetation unit EICpTb. All suitable habitat within the DE was searched via helicopter. Therefore, additional records within DE are unlikely (FVC, 2024).



Plate 7-7: *Ptilotus mollis* (habitat) (FVC, 2024)

Table 7-6 outlines the number of individuals of each of these species recorded within the DE and the total known number of individuals based on the currently available records of these species. An assessment can only be undertaken based on the available records and it should be noted that additional data on these species may exist that is not publically available.



Table 7-6: Conservation Significant Flora within the Development Envelope

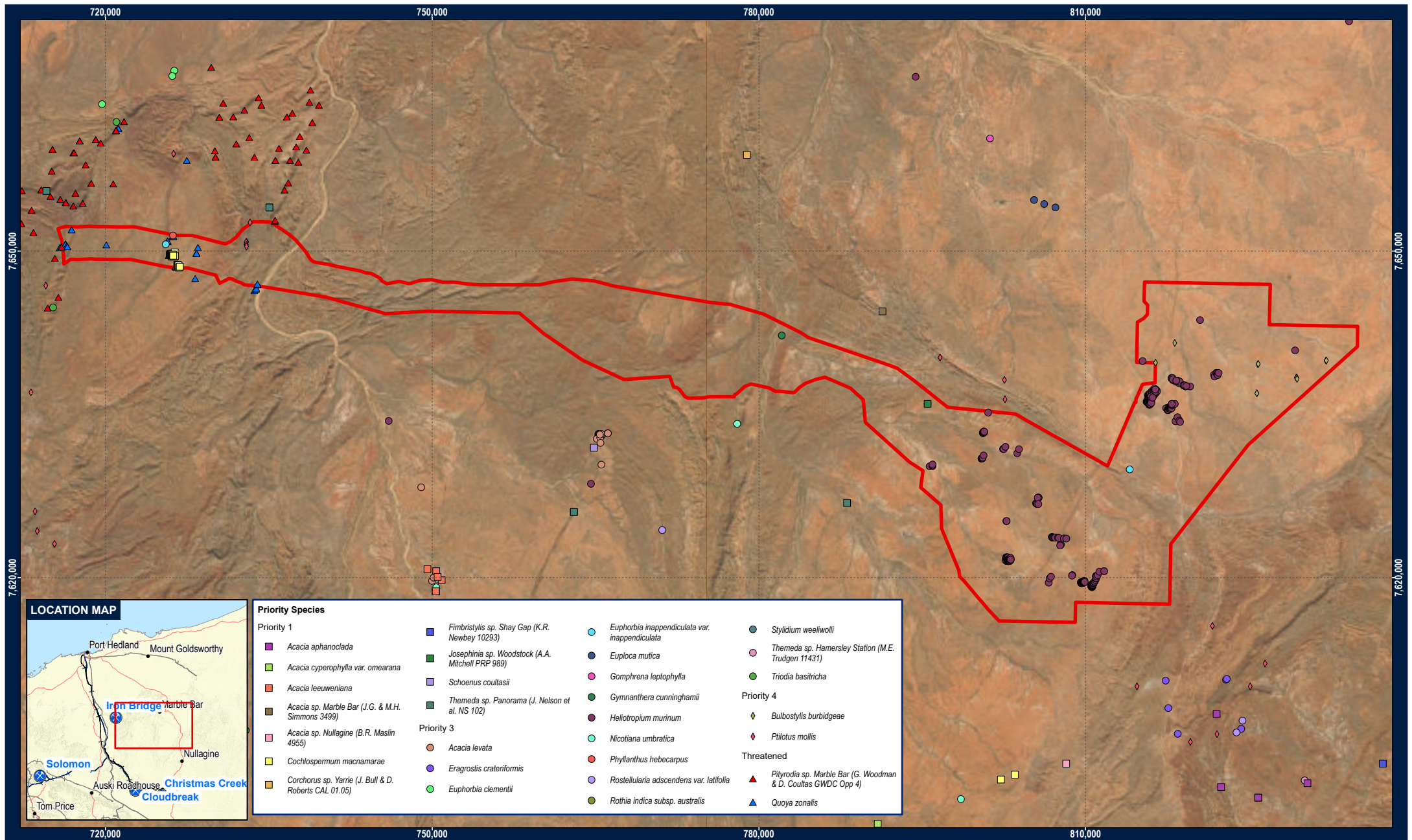
Scientific name	Listed under BC Act	Listed under EPBC Act	Location of individuals within DE	Number of occurrences recorded within the DE	Total number of existing occurrence records ¹	Percentage of recorded occurrences in the DE against total number of occurrences (%)
<i>Bulbostylis burbidgeae</i>	Priority 4	-	Generation Hub	12 (totalling 401 individuals)	117	10.3
<i>Cochlospermum macnamarae</i>	Priority 1	-	Transmission Line	42 (totalling 128 individuals)	58	72.4
<i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i>	Priority 2	-	Transmission Line - 1 Generation Hub - 1	2 (totalling 2 individuals)	25	8
<i>Gymnanthera cunninghamii</i>	Priority 3	-	Transmission Line	1 (totalling 1 individual)	1,200	0.08
<i>Heliotropium murinum</i>	Priority 3	-	Generation Hub	432 (totalling 1,964 individuals)	464	93.1
<i>Phyllanthus hebecarpus</i>	Priority 3	-	Transmission Line	1 (totalling 1 individual)	8	12.5
<i>Ptilotus mollis</i>	Priority 4	-	Transmission Line	5 (totalling 81 individuals)	347 (8,412 individuals) ²	1.4 (1% of individuals)
<i>Quoya zonalis</i> (Pilbara Foxglove)	Threatened	Endangered	Transmission Line	31 (totalling 109 individuals)	5,761 (20,463 individuals) ²	0.5 (0.5% of individuals)

1- The total number of individuals is not documented for many of the priority species, therefore for the purposes of this assessment, the total number of occurrences have been provided (FVC, 2024; TPLF, 2024; WA Herbarium, 2024).

2- Total number of individuals estimated based on *Ecologia Environment* (2023).

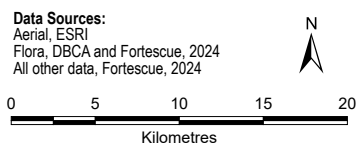


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Priority Species			
Priority 1	<i>Fimbristylis</i> sp. Shay Gap (K.R. Newbey 10293)	<i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i>	<i>Stylidium weeliwoolii</i>
<i>Acacia cyperophylla</i> var. <i>omearana</i>	<i>Josephinia</i> sp. Woodstock (A.A. Mitchell PRP 989)	<i>Euploca mutica</i>	<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)
<i>Acacia leeuweniana</i>	<i>Schoenus coultasii</i>	<i>Gomphrena leptophylla</i>	<i>Triodia basitricha</i>
<i>Acacia</i> sp. Marble Bar (J.G. & M.H. Simmons 3499)	<i>Themeda</i> sp. Panorama (J. Nelson et al. NS 102)	<i>Gymnanthera cunninghamii</i>	Priority 4
<i>Acacia</i> sp. Nullagine (B.R. Maslin 4955)	Priority 3	<i>Heliotropium murinum</i>	<i>Bulbostylis burbidigeae</i>
<i>Cochlospermum macnamarae</i>	<i>Acacia levata</i>	<i>Nicotiana umbratica</i>	<i>Ptilotus mollis</i>
<i>Corchorus</i> sp. Yarrie (J. Bull & D. Roberts CAL 01.05)	<i>Eragrostis crateriformis</i>	<i>Phyllanthus hebecarpus</i>	Threatened
	<i>Euphorbia clementii</i>	<i>Rostellularia adscendens</i> var. <i>latifolia</i>	<i>Pityrodia</i> sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)
		<i>Rothia indica</i> subsp. <i>australis</i>	<i>Quoyia zonalis</i>

Legend
 Development Envelope



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostellio
 Approved By:
 Scale: 1:450,000
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Figure 7-5
Conservation Significant Flora



7.4.10 Other Significant Flora

Undescribed Taxa

Of the flora species recorded by FVC (2024), 16 were identified as undescribed taxa, however three of these are outside of the DE. Undescribed taxa have yet to be formally described by taxonomic expert and have therefore not been given an official species name. The undescribed flora taxa recorded within the DE are:

- *Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618).
- *Abutilon* sp. Pilbara (W.R. Barker 2025).
- *Eriachne* sp. Dugald River (B.K. Simon+ 3007).
- *Josephinia* sp. Mt Edgar Station (N.T. Burbidge 1194).
- *Sida* sp. articulation below (A.A. Mitchell PRP 1605).
- *Sida* sp. Excedentifolia (J.L. Egan 1925).
- *Sida* sp. Pilbara (A.A. Mitchell PRP 1543).
- *Tephrosia* sp. B Kimberley Flora (C.A. Gardner 7300).
- *Tephrosia* sp. Bungaroo Creek (M.E. Trudgen 11601).
- *Tephrosia* sp. clay soils (S. van Leeuwen et al. PBS 0273).
- *Tephrosia* sp. Newman (A.A. Mitchell PRP 29).
- *Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356).
- *Vigna* sp. Hamersley Clay (A.A. Mitchell PRP 113).

Of these species, one (*Josephinia* sp. Mt Edgar Station (N.T. Burbidge 1194)) is considered potentially significant as there are only 13 known records, and the records for this species so far have only been recorded from a 100 km area in the Chichester subregion. It is likely this species is restricted to the plains of the Macroy land system (FVC, 2024). *Josephinia* sp. Mt Edgar Station (N.T. Burbidge 1194) was recorded within vegetation units AiAaTe and EcMa, in the east of the DE, within its current known distribution.

The remaining species are not considered significant as they are common in the Chichester subregion and, according to FVC (2024), are represented by a sufficient number of records. *Josephinia* sp. Mt Edgar Station (N.T. Burbidge 1194) has limited distribution compared to the other phrase-name species and 13 herbarium records compared to 34 to 124 records for the other species.

7.4.11 Introduced Flora

Eighteen species of introduced flora were recorded within the DE, with **Cenchrus ciliaris* (Buffel Grass) and **Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy) being the most prominent. No Weeds of National Significance (WoNs) were recorded, however, one Declared Pest for the Pilbara region under the BAM Act was recorded within the DE: **Calotropis procera* (Calotrope). Table 7-7 and Figure 7-6 shows the species and abundance within the DE.

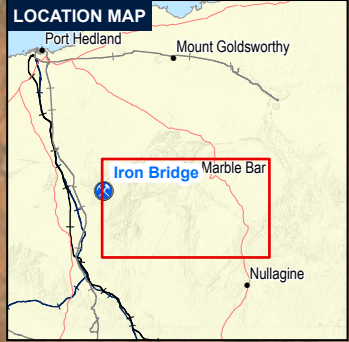


Table 7-7: Introduced Flora within the Development Envelope

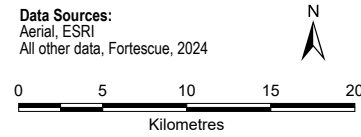
Scientific name	Common name	Individuals within the DE		
		Transmission Line	Generation Hub	Total
* <i>Aerva javanica</i>	Kapok Bush	78	66	144
* <i>Argemone ochroleuca</i> subsp. <i>ochroleuca</i>	Mexican Poppy	1	202	203
* <i>Calotropis procera</i>	Calotrope	25	128	153
* <i>Cenchrus ciliaris</i>	Buffel Grass	133	488	621
* <i>Cenchrus setiger</i>	Birdwood Grass	13	28	41
* <i>Chloris barbata</i>	Purpletop Chloris	1	7	8
* <i>Chloris virgata</i>	Feathertop Rhodes Grass	-	1	1
* <i>Citrullus colocynthis</i>	-	1	25	26
* <i>Cucumis myriocarpus</i> subsp. <i>myriocarpus</i>	Prickly Paddy Melon	-	1	1
* <i>Cynodon dactylon</i>	Couch	4	-	4
* <i>Echinochloa colona</i>	Awnless barnyard grass	1	-	1
* <i>Eragrostis minor</i>	Smaller Stinkgrass	-	3	3
* <i>Indigofera sessiliflora</i>	-	-	2	2
* <i>Malvastrum americanum</i>	Spiked Malvastrum	-	1	1
* <i>Physalis angulata</i>	Cape Gooseberry	1	2	3
* <i>Setaria verticillata</i>	Whorled pigeon grass	1	-	1
* <i>Solanum nigrum</i>	Black-berry Nightshade	1	1	2
* <i>Vachellia farnesiana</i> var. <i>farnesiana</i>	Mimosa Bush	8	63	71
Total	-	268	1,018	1,286



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- Legend**
- Introduced Species**
- *Aerva javanica*
 - *Chloris barbata*
 - ▲ *Echinochloa colona*
 - *Setaria verticillata*
 - *Argemone ochroleuca subsp. ochroleuca*
 - ▲ *Chloris virgata*
 - ▲ *Eragrostis minor*
 - + *Solanum nigrum*
 - *Cenchrus ciliaris*
 - ▲ *Citrullus colocynthis*
 - *Indigofera sessiliflora*
 - + *Vachella farnesiana var. farnesiana*
 - *Cenchrus setiger*
 - ▲ *Cucumis myriocarpus subsp. myriocarpus*
 - *Malvastrum americanum*
 - Development Envelope
 - ▲ *Cynodon dactylon*
 - *Physalis angulata*
 - Indicative Disturbance Footprint



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostello
 Approved By:
 Scale: 1:450,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066_r1
 Document Name: 4519OP002_MP_EN_0066.012_r3

Date: 29/04/2025
 Size: A4L
 Revision: 3
 Confidentiality: 0

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Figure 7-6
Introduced Flora Species
within the Development Envelope



7.4.12 Fire History

The Pilbara region is susceptible to increased bushfires during the dry season, from July to January. Most fire causes in the region are due to natural events, such as lightning strikes. However, a significant proportion of events have unknown or accidental causes. Comparatively, prescribed burns represent the smallest cause (Bryant, 2008)

According to the DBCA Fire History (DBCA, 2024a), almost all the DE had one or more fire events between 2006 and 2013, totalling 78,380.69 ha (79.28%). In 2014, the DE had a fire event over 33% of the total area; since then, 2017 had the biggest fire event (12%), with the fire records decreasing to 0.8% in 2022 and 3% in 2023 (Plate 7-8 and Figure 7-7). The frequency and intensity of fire will influence the structure and species composition of the vegetation (Fisher *et al.*, 2009).

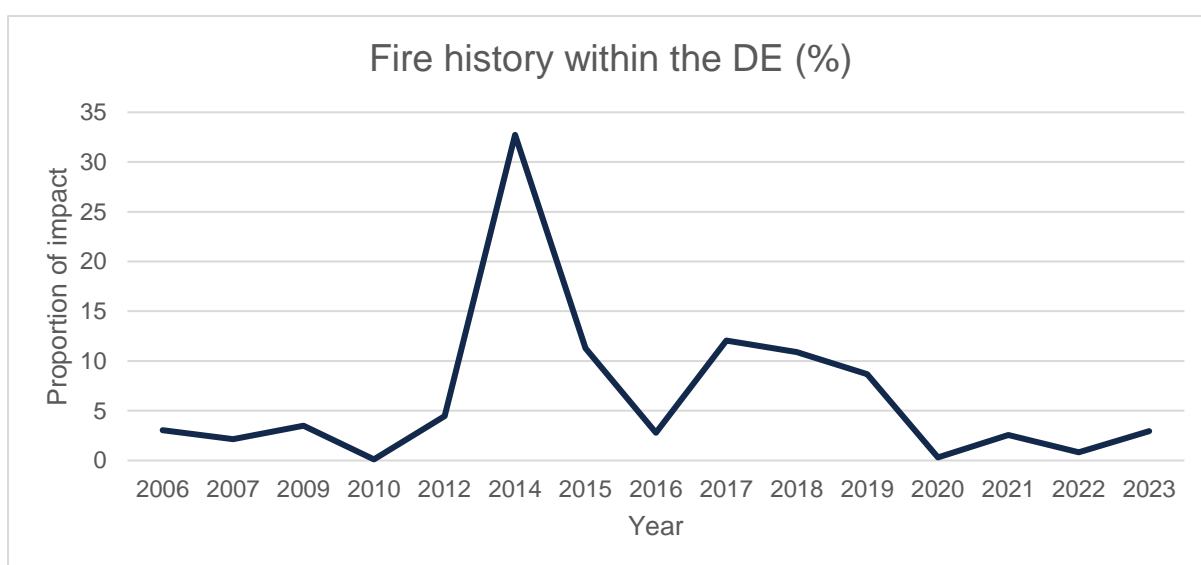
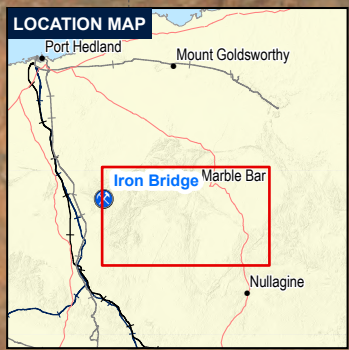
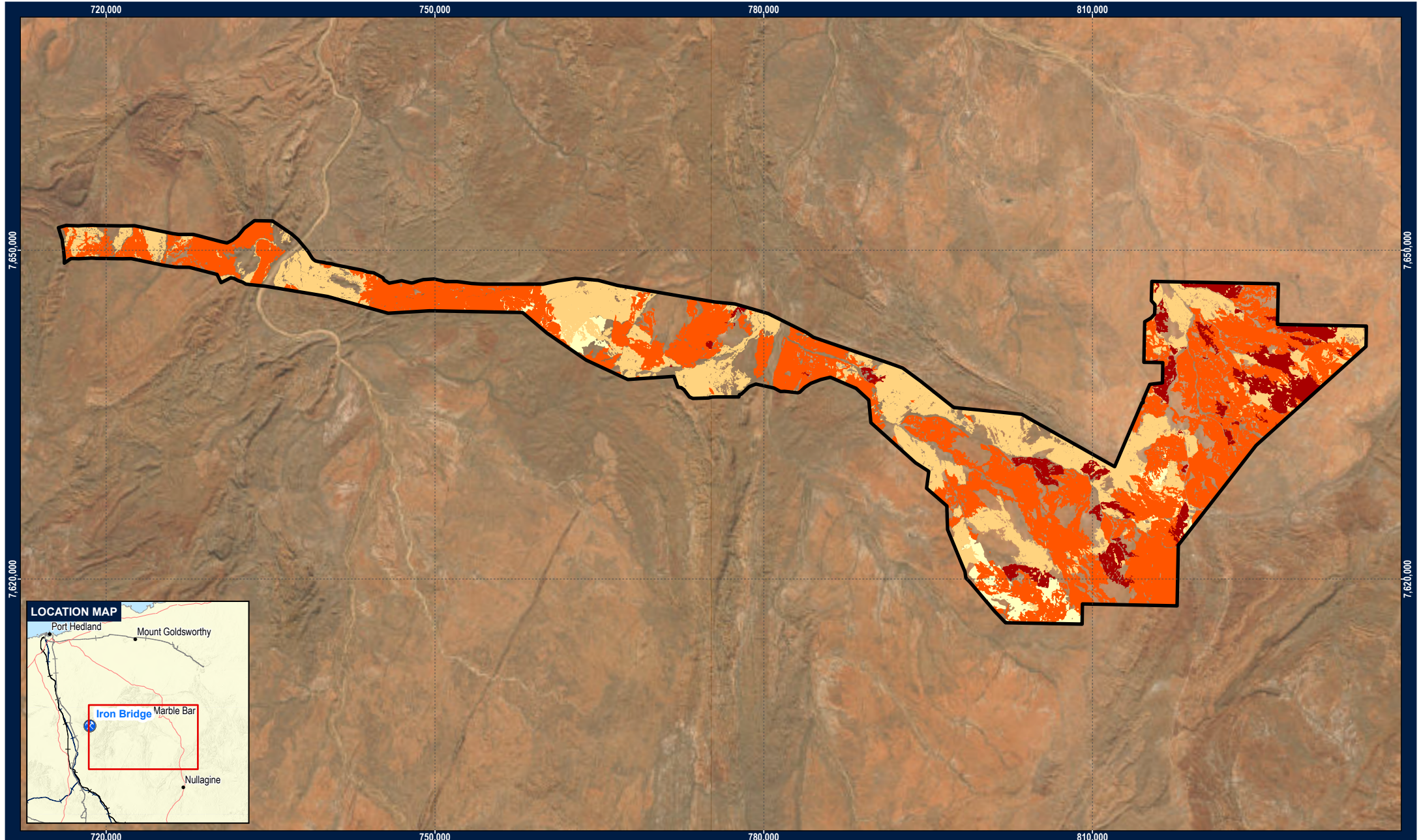


Plate 7-8: Fire history within the Development Envelope (2006 – 2023)



Legend

Fire History

- 2005-2009
- 2010-2014
- 2015-2019
- 2020-2024

Development Envelope

Data Sources:
 Aerial, ESRI
 Fire History, DBCA, 2024
 All other data, Fortescue, 2024

N

 0 5 10 15 20
 Kilometres

Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostello
 Approved By:
 Scale: 1:450,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066_r1
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Date: 29/04/2025
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Figure 7-7
Fire History Mapping (2006 - 2023)
Within the Development Envelope

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7.5 Potential Impacts

The Proposal activities that may impact flora and vegetation include:

- Clearing of flora and vegetation in the IDF to accommodate Proposal infrastructure, including access roads, turbine pads, transmission lines and substations.
- Temporary clearing for the laydown of wind turbine and transmission line infrastructure.
- Water abstraction during construction and operational activities.
- Movement of construction vehicles and machinery around the site.

The potential impacts on flora and vegetation arising from these activities include:

- Direct Impacts:
 - Clearing of up to 2,318.80 ha of native vegetation. Details on the extent of clearing by vegetation association are provided in Table 7-8. Of this total, 1,028.12 ha is temporary clearing that will be rehabilitated once construction is complete.
 - Clearing of 249 individuals of one Priority flora species (*Heliotropium murinum*).
 - Clearing of 3.41 ha of habitat for Threatened flora (*Quoya zonalis* - within 200 m of known records).
- Indirect Impacts:
 - Fragmentation of conservation significant flora species habitat.
 - Edge effects on three conservation significant flora species, totalling 895 individuals³ (predominantly *Heliotropium murinum* (P3)).
 - Impacts on groundwater dependent vegetation as a result of groundwater abstraction.
 - Introduction or spread of weed species.
 - Increase of dust deposition.
 - Increased risk of bushfire incidents.
- Cumulative impacts:
 - Combined impacts to the remaining extent of pre-European vegetation associations associated with the Proposal and other developments in the surrounding area.
 - Combined clearing of *Heliotropium murinum* individuals reducing the extent of occurrence of the species or changing its conservation status at a regional or species level.
 - Combined impacts to groundwater dependent vegetation resulting from direct clearing of vegetation associated with the Proposal and other developments in the surrounding area.

³ Edge effects can occur at the boundary between clearing and the remaining vegetation, including effects associated with increased sunlight and wind; changes in plant and animal communities supported; increased risk of invasive species; or changes in soil composition and water runoff patterns.



7.6 Assessment of Impact

7.6.1 Direct impacts

7.6.1.1 Clearing of Vegetation

The total clearing expected for the Proposal is 2,318.80 ha, including 1,290.68 ha of permanent clearing and 1,028.12 ha of temporary clearing that will be rehabilitated once construction is complete⁴. Clearing of vegetation will:

- Reduce the remaining extent of pre-European vegetation associations.
- Reduce areas of specific vegetation units.
- Remove groundwater dependent and riparian vegetation.
- Remove habitat for conservation significant flora.
- Reduce the local extent of vegetation considered to be significant at National, State or Regional level.
- Impacts to vegetation with culturally significance values – this is discussed further in Chapter 9 (Social Surroundings).

Pre-European Vegetation

Table 7-8 details the expected area of each Vegetation Association mapped by Beard *et al.* (2013) that will be cleared from the Proposal. As the current extent of these vegetation associations is above 95% of the pre-European extent, the reduction due to clearing from the Proposal comprises a very small percentage of the remaining extent for each vegetation association and scale. Consequently, the proposal will not decrease any of the vegetation associations below 30% at the State level, Pilbara IBRA bioregional and Chichester subregional levels, or the Local Government Area (Shire of East Pilbara). Therefore, the clearing of pre-European vegetation does not present a significant impact.

⁴ These clearing calculations differ slightly from the total clearing reported in Chapter 8 (Fauna) due to the differences in habitat and vegetation mapping, i.e. some areas of Plain (sand) habitat is mapped as cleared for vegetation.



Table 7-8: Clearing Area Extent of Pre-European Vegetation Associations (DPIRD, 2019)

VA	Scale	Pre-European extent (ha)	Extent remaining (ha)	Extent within IDF (ha)	Proportion impact (%)	Extent remaining after the Proposal
82	Western Australia	2,565,901.28	2,553,206.19	74.13	0.003%	99.99%
	Pilbara IBRA Bioregion	2,563,583.23	2,550,888.14	74.13	0.003%	99.99%
	Chichester IBRA Subregion	360,666.90	360,322.69	74.13	0.021%	99.98%
	Shire of East Pilbara	927,709.76	919,072.17	74.13	0.008%	99.99%
93	Western Australia	3,044,309.52	3,040,640.98	1975.14	0.065%	99.94%
	Pilbara IBRA Bioregion	3,042,114.27	3,038,471.67	1,975.14	0.065%	99.94%
	Chichester IBRA Subregion	2,940,348.04	2,936,731.54	1,975.14	0.067%	99.93%
	Shire of East Pilbara	1,709,522.24	1,706,780.57	1,975.14	0.116%	99.88%
171	Western Australia	331,951.73	330,643.09	111.76	0.034%	99.97%
	Pilbara IBRA Bioregion	331,307.41	330,026.24	111.76	0.034%	99.97%
	Chichester IBRA Subregion	31,742.84	31,195.06	111.76	0.358%	99.64%
	Shire of East Pilbara	331,951.73	330,643.09	111.76	0.034%	99.97%
173	Western Australia	1,753,104.09	1,748,260.83	-	0.000%	100%
	Pilbara IBRA Bioregion	1,752,520.89	1,747,677.63	-	0.000%	100%
	Chichester IBRA Subregion	1,744,029.51	1,739,189.58	-	0.000%	100%
	Shire of East Pilbara	1,085,704.89	1,081,937.46	-	0.000%	100%
587	Western Australia	580,728.60	580,696.99	165.32	0.028%	99.97%
	Pilbara IBRA Bioregion	580,728.60	580,696.99	165.32	0.028%	99.97%
	Chichester IBRA Subregion	570,997.04	570,965.44	165.32	0.029%	99.97%
	Shire of East Pilbara	111,906.06	111,874.46	165.32	0.148%	99.85%
619	Western Australia	119,373.78	118,205.01	5.02	0.004%	99.99%



VA	Scale	Pre-European extent (ha)	Extent remaining (ha)	Extent within IDF (ha)	Proportion impact (%)	Extent remaining after the Proposal
	Pilbara IBRA Bioregion	118,920.31	118,116.78	5.02	0.004%	99.99%
	Chichester IBRA Subregion	85,543.15	85,520.95	5.02	0.006%	99.99%
	Shire of East Pilbara	52,765.30	52,763.69	5.02	0.010%	99.99%



Vegetation Units

The Proposal will clear 2,318.80 ha of native vegetation, across 26 vegetation units. Table 7-9, Table 7-10, and Table 7-11 detail the IDF by vegetation unit and vegetation condition.

The total clearing area (2,318.80 ha) represents 2.35% of the DE (98,772.61 ha). The Proposal's highest impact within the DE is on EvCi (Drainage), affecting 10.97% of the mapped vegetation, followed by AiAaTe (Plains) at 4.47% and AiCpTe2(Plains) at 4.27% (Table 7-9). All vegetation communities will have over 89% remaining of each recorded vegetation type in the DE following implementation of the Proposal, therefore, no vegetation communities are at risk as a result of the Proposal.

The vegetation condition within the IDF generally ranges from "Good" to 'Excellent' (99.46%), with a small area cleared of vegetation (0.54%). The majority of the IDF is in 'Excellent' condition (1,538.43 ha), which represents 1.56% of the total area of the DE.



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Table 7-9: Overview of Vegetation Units – Indicative Disturbance Footprint

Landforms	Vegetation Unit	IDF - Total	Development Envelope (Ha)	Proportion of Impact (%)	Extent remaining (%)
Drainage	AhAtTa	9.51	1,274.72	0.75%	99.25
	AtTe	11.57	1,984.48	0.58%	99.42
	ChAcTw	1.14	222.55	0.51%	99.49
	ChAtTe	11.74	683.91	1.72%	98.28
	EcMa	9.78	2,676.09	0.37%	99.63
	EcTI	1.93	747.43	0.78%	99.22
	EvCi	5.83	17.59	10.97%	89.03
	EvMITE	21.09	1,545.45	1.36%	98.64
Hills	AiCpTb	96.70	7,804.34	1.24%	98.76
	AiSgTb	51.70	5,836.69	0.89%	99.11
	AiTe	81.60	6,915.46	1.18%	98.82
	CcTe	3.72	79.77	1.72%	98.28
	EiAtTe	14.01	2,039.76	0.18%	99.82
	EiGwTw	1.37	390.89	3.58%	96.42
	Tw1	2.02	415.73	0.49%	99.51
Outcropping	AiCpTe1	31.60	2,186.20	1.45%	98.55
	AtAHTe	16.24	1,358.31	1.20%	98.80
	ChTe	0.17	36.34	0.47%	99.53
	EiCpTb	5.12	672.05	0.76%	99.24
Plains	AaGwTe	20.42	1,570.80	1.30%	98.70
	AiAaTe	1037.23	23,194.92	4.47%	95.53



Landforms	Vegetation Unit	IDF - Total	Development Envelope (Ha)	Proportion of Impact (%)	Extent remaining (%)
	AiAaTw	6.50	630.37	1.03%	98.97
	AiCpTe2	467.46	10,958.97	4.27%	95.73
	AiCpTw	232.59	9,640.11	2.41%	97.59
	AsPfTI	102.92	3,106.91	3.31%	96.69
	ChTI	67.23	5,999.42	1.12%	98.88
Cleared	-	12.56	168.07	-	-



Table 7-10: Overview of Vegetation Condition – Indicative Disturbance Footprint

Vegetation Condition	Generation Hub (ha)	Transmission Line (ha)	Area within IDF (ha)	Area within DE (ha)	Proportion of impacts within the DE (%)	Extent remaining by condition (%)
Excellent	1,235.47	302.96	1,538.43	60704.28	2.53%	97.47
Very Good – Excellent	125.32	21.14	146.46	4056.27	3.61%	96.39
Very Good	453.08	61.58	514.66	23338.68	2.21%	97.79
Good – Very Good	0.00	4.71	4.71	230.16	2.05%	97.95
Good	98.40	16.13	114.53	10068.91	1.14%	98.86
Cleared	11.33	1.23	12.56	206.24		
Total	1,923.60	407.475	2,318.80	98772.61	2.35%	97.65

Table 7-11: Clearing of Vegetation Units by Condition – Indicative Disturbance Footprint

Landform	Vegetation Unit	Vegetation Condition Clearing (ha)				
		Good	Good to Very Good	Very Good	Very Good to Excellent	Excellent
Drainage	AhAtTa	1.41	0.00	2.54	0.00	5.57
	AtTe	5.80	0.00	4.11	0.07	1.59
	ChAcTw	0.00	0.00	0.78	0.00	0.35
	ChAtTe	1.47	0.38	1.69	-	8.20
	EcMa	-	-	8.18	-	1.60
	EvCi	-	-	-	-	1.93
	EcTI	2.59	-	0.49	-	2.75
	EvMITe	9.08	-	2.51	0.72	8.78
Hills	AiCpTb	0.84	-	1.13	0.00	94.72
	AiSgTb	-	-	4.67	8.53	38.50
	AiTe	1.82	0.00	34.42	-	45.36
	EIAAtTe	-	-	-	-	3.72
	EIGwTw	-	-	-	1.49	12.52
	CcTe	-	-	-	-	1.37
	Tw1	-	-	-	-	2.02
Outcropping	AiCpTe1	-	-	-	-	31.60
	AtAhtTe	-	-	-	-	23.85
	ChTe	-	-	-	-	0.17
	EICpTb	-	-	-	-	5.12
Plains	AaGwTe	-	-	-	-	20.41



Landform	Vegetation Unit	Vegetation Condition Clearing (ha)				
		Good	Good to Very Good	Very Good	Very Good to Excellent	Excellent
	AiAaTe	0.47	-	405.58	103.40	527.78
	AiAaTw	-	4.32	1.06	-	1.12
	AiCpTe2	56.26	-	27.96	13.24	370.00
	AiCpTw	24.66	-	9.94	13.67	184.32
	AsPfTI	1.08	-	0.26	5.34	96.24
	ChTI	9.06	-	9.33	-	48.84
Total		114.54	4.70	514.65	146.46	1,538.43

Conservation Significant Vegetation

There are no TECs or PECs within the IDF or wider DE.

Twenty-three vegetation units within the DE represent conservation-significant vegetation as they are habitats for threatened, priority, or undescribed species or play a role in maintaining an important ecological process. Of these 23 vegetation units, 15 occur within the IDF. vegetation types AtAhTe, EICpTb, EIGwTw and TcSpTI are of National Significance due to the presence of populations of Threatened (EPBC listed) flora species (*Quoya zonalis*). The Proposal will clear 3.35 ha of habitat for Threatened flora, considered to be 200m from known records.

Four vegetation units, located within the IDF, which are significant for 'maintaining an important ecological process' are riparian and/or groundwater dependent vegetation, these include:

- Clearing of groundwater dependent vegetation, up to 9.78 ha of EcMa and up to 5.83 ha of EcTI (representing less than 0.5% of these vegetation types recorded in the DE).
- Clearing of potentially ground water dependent vegetation, up to 1.93 ha of EvCi (representing 10.93% of this vegetation within the DE), and up to 21.09 ha of EvMITe (representing less than 1.4% of this vegetation type recorded in the DE).

Overall, the DE contains 5,189.66 ha of riparian/groundwater dependent vegetation, of which 38.63 ha occurs within the IDF. Therefore, given the relatively small scale of impact, the clearing of riparian/groundwater dependent vegetation associated with the Proposal is not anticipated to impact on the ability of the remaining vegetation to sustain itself and further degradation of this vegetation after implementation of the Proposal is not anticipated.

Four vegetation units are considered regionally important due to their role in providing refuge for flora and fauna (AiAaTe AiCpTw, EvCi and TcSpTI). The Proposal will impact 3.87% of these habitats within the DE. Further, there will be approximately 31,604 ha of intact areas of these vegetation types remaining in the DE (in Good to Excellent condition). Therefore, it is not expected that this loss of a small amount of habitat will significantly impact these species and their persistence in the local area.



A summary of the potential impacts to conservation significant vegetation is shown in Table 7-12. Overall, most of the impacts on the conservation significant vegetation occurs in the Generation Hub area due to the presence of Priority flora and undescribed flora species. The proposal will not impact more than 4.5% of the vegetation units with national, State, regional and local significance, with the exception of EvCi where the Proposal will impact 10.9% of this habitat type recorded within the DE, predominantly due to the relatively small amount of EvCi mapped in the DE (17.57 ha).



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Table 7-12: Conservation Significant Vegetation within the Indicative Disturbance Footprint

Significance	Description	Vegetation Unit	Temporary clearing (ha)	Permanent clearing (ha)	IDF - Total (ha)	DE (ha)	Proportion of impacts (%)
National	Populations of Threatened (EPBC listed) species	AtAhTe	12.23	11.62	23.85	1,358.31	1.76%
		EICpTb	2.87	2.25	5.12	672.05	0.76%
		EIGwTw	7.84	6.17	14.01	390.89	3.58%
State	Presence of State-listed Threatened flora	AtAhTe	12.23	11.62	23.85	1,358.31	1.76%
		EICpTb	2.87	2.25	5.12	672.05	0.76%
		EIGwTw	7.84	6.17	14.01	390.89	3.58%
Regional	Presence of Priority flora	AiAaTe	424.00	613.23	1,037.23	23,194.92	4.47%
		AiCpTe2	195.41	272.05	467.46	10,958.97	4.27%
		AiCpTw	118.52	114.04	232.56	9,640.11	2.41%
		AsPfTI	49.11	53.81	102.92	3,106.91	3.31%
		AtAhTe	12.23	11.62	23.85	1,358.31	1.76%
		AtTe	5.48	6.09	11.57	1,984.48	0.58%
		ChTI	34.50	32.73	67.23	5,999.42	1.12%
		EcMa	4.78	5.00	9.78	2,676.09	0.37%
		EICpTb	2.87	2.25	5.12	672.05	0.76%
		Tw1	1.14	0.88	2.02	415.73	0.49%
	Providing a role as a refuge	AiAaTe	424.00	613.23	1,037.23	23,158.31	4.48%
		AiCpTw	118.52	114.04	232.56	9,640.11	2.41%



Significance	Description	Vegetation Unit	Temporary clearing (ha)	Permanent clearing (ha)	IDF - Total (ha)	DE (ha)	Proportion of impacts (%)
		EvCi	1.07	0.86	1.93	17.59	10.97%
	Role in maintaining an important ecological process	EcMa	4.78	5.00	9.78	2,676.09	0.37%
		EcTI	3.59	2.24	5.83	747.43	0.78%
		EvCi	1.07	0.86	1.93	17.59	10.97%
		EvMITe	9.77	11.32	21.09	1,545.45	1.36%



7.6.1.2 Clearing of Conservation Significant Flora Species

Seven threatened and/or Priority flora species occur within the DE, one of which will be directly impacted by the Proposal: *Heliotropium murinum*, classified as Priority 3 by DBCA. A total of 249 individuals occur within the IDF throughout 60 occurrence records, all within the Generation Hub area. These 249 individuals represent 12.7% of the species recorded within the DE. In addition, there is potential for accidental clearing of individuals in close proximity to the IDF. This risk will be managed through clear demarcation of the areas to be cleared (further detail on demarcation of areas is provided in Section 7.7).

The direct clearing of 249 individuals of *Heliotropium murinum* is considered a small number in relation to those present within the DE and wider occurrence records. This clearing represents just 12.7% of the individuals of this species recorded within the DE, with an additional 29 occurrences recorded in the surrounding area. As this species is only recorded within the Macroy Land System, there is high potential for it to occur more broadly in the local area in similar landforms/soils and vegetation types, and the species could be more prevalent than currently known given the lack of survey on this land system. Therefore, the remaining individuals are expected to be a viable population, and this clearing will not significantly impact the species.

No undescribed taxa occur within the IDF. Therefore, no direct impacts are anticipated on these species.

7.6.2 Indirect Impacts

7.6.2.1 Fragmentation of Sub-populations

The roads and transmission lines forming part of the Proposal design are linear in nature and can therefore fragment vegetation and/or create edge effects. Habitat fragmentation can interfere with the functional connectivity between individuals of a species if they become separated across an impassable barrier, such as preventing the exchange of genes through pollen and seed flow, which is essential for maintaining sufficient genetic diversity and ensuring adaptative potential.

Due to the linear nature of the transmission line and associated road infrastructure, clearing will occur between a number of conservation significant flora species, including Pilbara Foxglove (*Quoya zonalis*), *Heliotropium murinum*, *Bulbostylis Burbidge*, *Cochlospermum macnamarae* and *Euphorbia inappendiculata* var. *inappendiculata*. Guidance from DBCA (2017b) suggests that individuals greater than 500 m from each other are considered separate sub-populations and therefore genetic transfer is likely to be limited.

The dispersal mechanism for the recorded flora species are not currently understood, however given the distances between individuals recorded in the DE the likely pollination vector is considered to be either wind, flying insect or bird. Therefore, as the clearing associated with the linear elements of the Proposal infrastructure will be up to approximately 30m wide, it is unlikely this would act as a barrier to pollination for these species within the DE. In addition, given the nature of the transmission line infrastructure being open span, and the extremely low amount of traffic anticipated on the access roads, it is not anticipated that these elements would act as a physical barrier to pollination within the area.



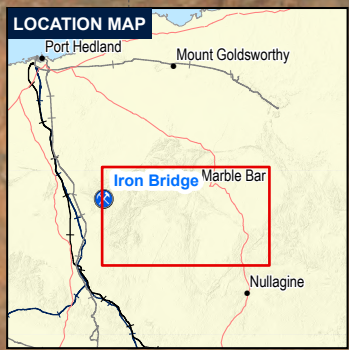
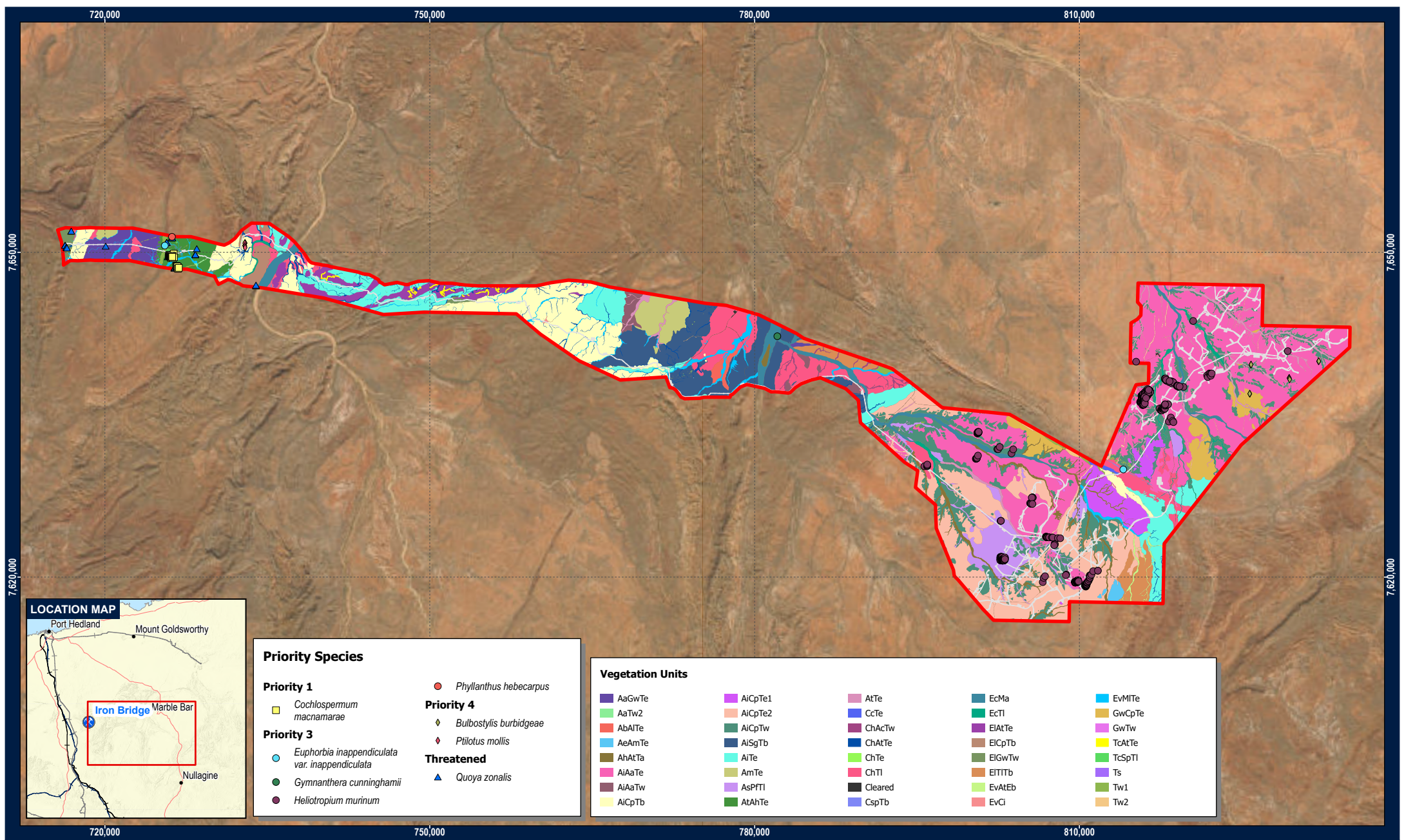
Therefore, it is not expected that the Proposal will interfere with genetic connectivity or have a significant impact on the significant flora species recorded within the DE.

7.6.2.2 Edge Effects on Conservation Significant Flora Species

Edge effects cause changes in plant communities and flora habitat through abiotic conditions (light, temperature and humidity), preventing dispersal of seeds and potential increase of weeds (Eldegard *et al.*, 2015).

There is no established conservation buffer for priority species within the DE, however the EP Act defines vegetation within 50 m of threatened individuals as an Environmentally Sensitive Area. Therefore, a 50 m buffer from the IDF was used to assess edge effects on the recorded individuals of conservation significant species. This assessment identified the Proposal may indirectly impact three individuals of *Cochlospermum macnamarae* (P1) and eight individuals of *Quoya zonalis* (EN) in the Transmission Line area. Eight hundred and eighty-four individuals of *Heliotropium murinum* (P3) may be indirectly impacted in the Generation Hub area (Figure 7-8). After the construction phase, 1,028.12 ha of the 2,318.80 ha cleared will be progressively rehabilitated throughout construction as the works in each area are complete. Therefore, the permanent clearing is not expected to have long-term indirect impacts on the species within the Transmission Line area. However, seven individuals of *Quoya zonalis* (EN) and 758 individuals of *H. murinum* (P3) will be located within a 50 m buffer of the permanent footprint, therefore may be indirectly impacted during the operational activities, such as general maintenance activities and movement of vehicles.

Indirect impacts related to dust deposition on conservation significant flora is also considered a potential impact, however dust generation during the construction phase will be managed through standard construction site control measures, such as water dust suppression techniques during dust generating activities. Therefore, dust is not anticipated to pose a risk of significant impact to conservation significant flora species in the area. Other impacts relating to dust generation are discussed further in Section 7.6.2.5.



Priority Species

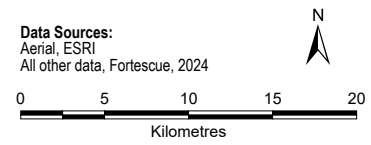
Priority 1	<i>Phyllanthus hebecarpus</i>
<i>Cochlospermum macnamarae</i>	Priority 4
Priority 3	<i>Bulbostylis burbidgeae</i>
<i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i>	<i>Ptilotus mollis</i>
<i>Gymnanthera cunninghamii</i>	Threatened
<i>Heliotropium murinum</i>	<i>Quoya zonalis</i>

Vegetation Units

AaGwTe	AaTw2	AbAtTe	AeAmTe	AhAtTa	AIAaTe	AIaAaTw	AICpTb	AICpTe1	AICpTe2	AICpTw	AISgTb	AiTe	AmTe	AsPFTI	ATAHTe	ATe	CcTe	ChACTw	ChAtTe	ChTe	Cleared	CspTb	EcMa	EcTI	EIALTe	EIGwTw	EITITb	EvAtEb	EvCi	EVMITe	GwCpTe	GwTw	TcAtTe	TcSpTI	Ts	Tw1	Tw2
--------	-------	--------	--------	--------	--------	---------	--------	---------	---------	--------	--------	------	------	--------	--------	-----	------	--------	--------	------	---------	-------	------	------	--------	--------	--------	--------	------	--------	--------	------	--------	--------	----	-----	-----

Legend

- Development Envelope
- Indicative Disturbance Footprint



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostellio
 Approved By:
 Scale: 1:450,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066_r1
 Document Name: 4519OP002_MP_EN_0066.014_r2

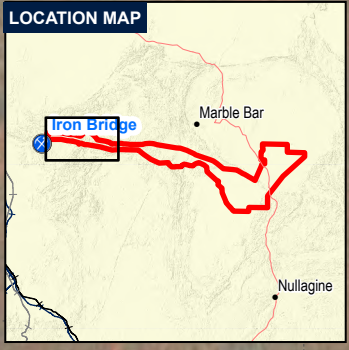
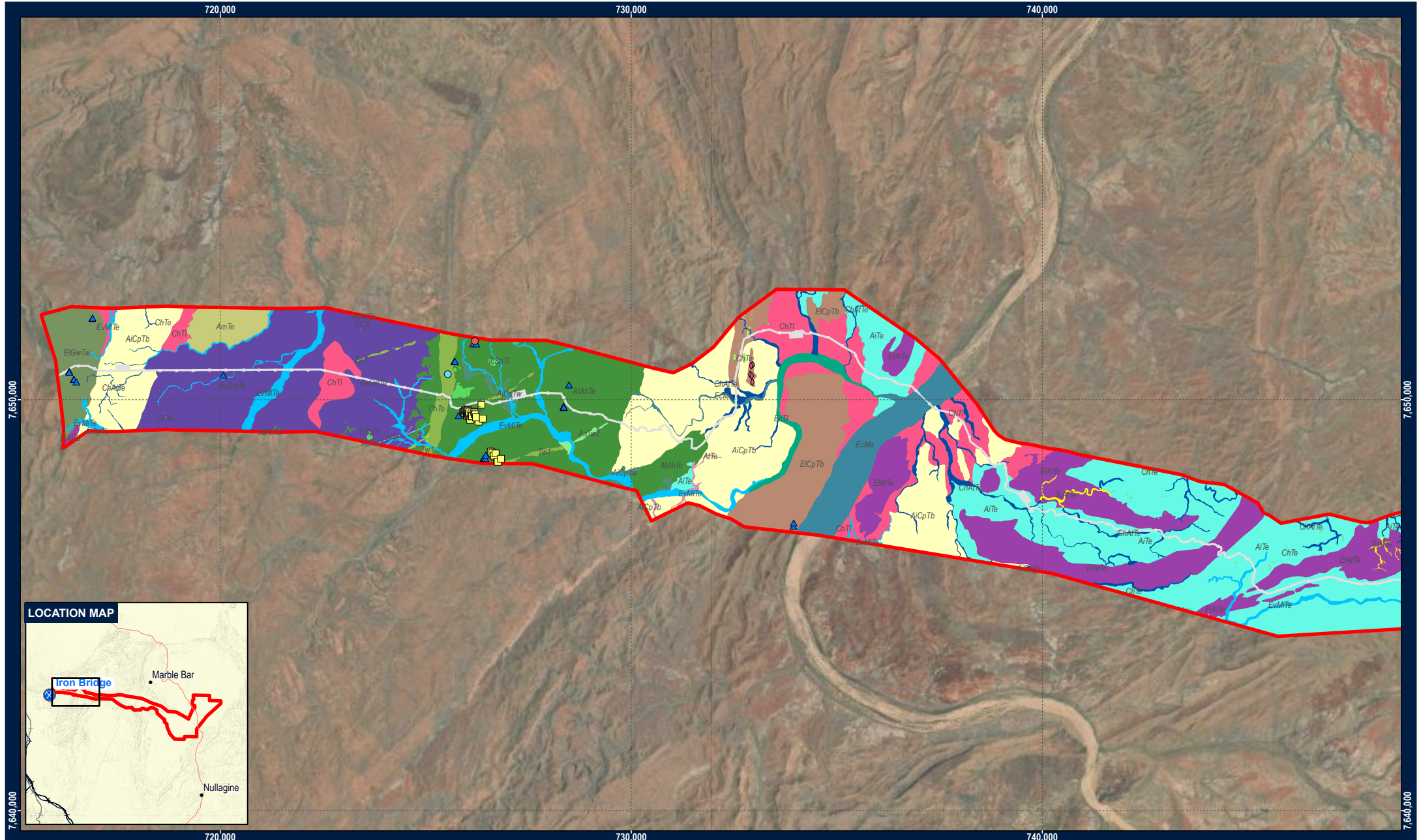
Date: 29/04/2025
 Size: A4L
 Revision: 2
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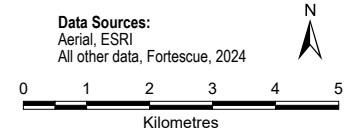
Figure 7-8
Threatened and Priority flora species -
Habitat and Occurrences within
the Development Envelope



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Development Envelope	Priority 4 Flora	AiCpTb	ChTe	EvMITe
Indicative Disturbance Footprint	<i>Ptilotus mollis</i>	AiCpTw	ChTI	TcAtTe
Priority 1 Flora	Threatened Flora	AiTe	EcMa	TcSpTI
<i>Cochlospermum macnamarae</i>	<i>Quoyia zonalis</i>	AmTe	EcTI	Tw1
Priority 3 Flora	Vegetation Unit	AtAhTe	EIAiTe	
<i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i>	AaGwTe	AtTe	EICpTb	
<i>Phyllanthus hebecarpus</i>	AaTw2	ChAtTe	EIGwTw	



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 Drawn By: S. Bowyer
 Revised By: scostellio
 Approved By:
 Scale: 1:120,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066_r1
 Document Name: 4519OP002_MP_EN_0066.015_r3

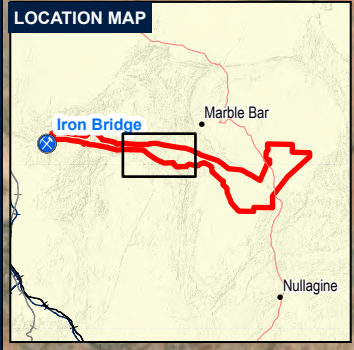
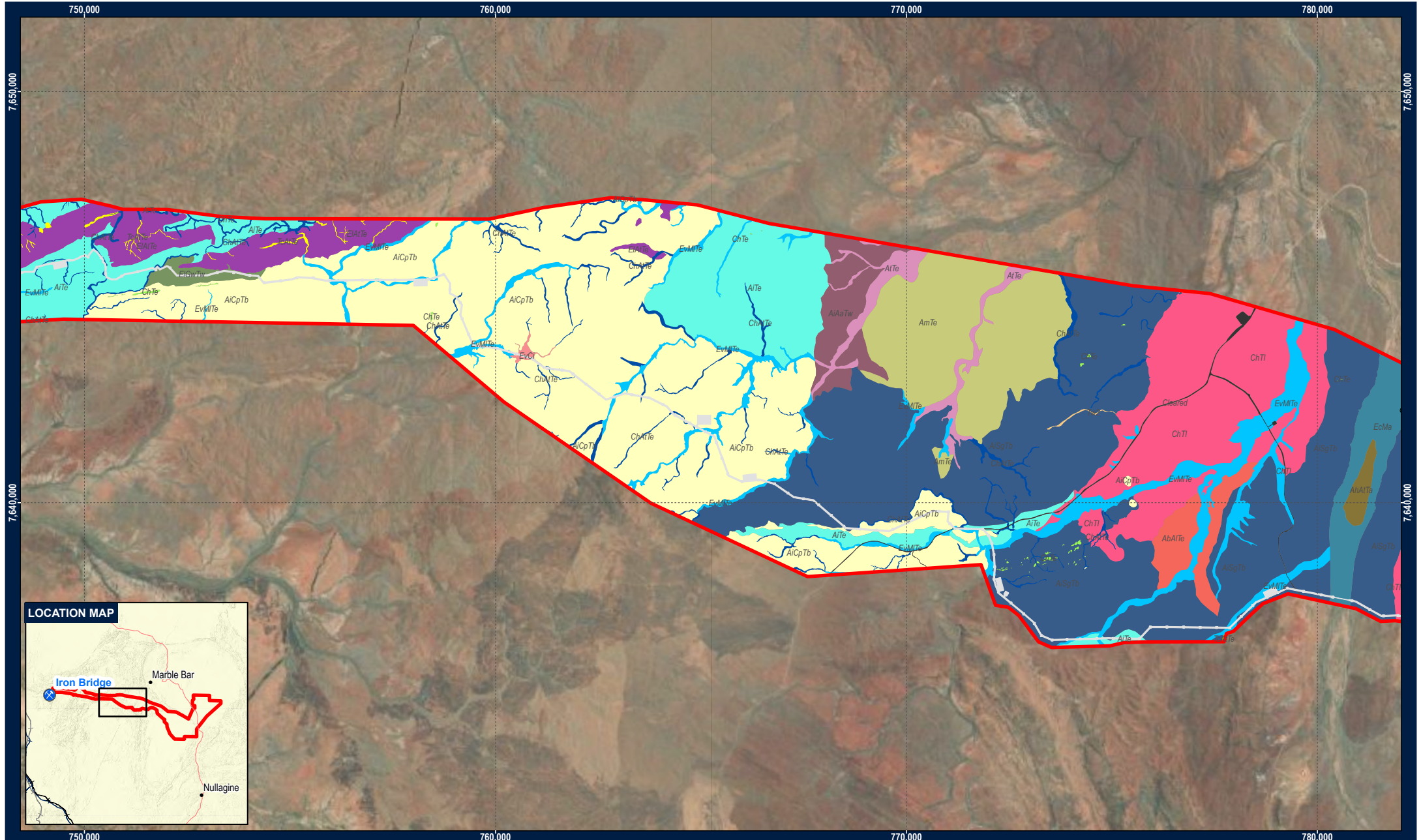
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Figure 7-8.1
Threatened and Priority flora species -
Habitat and Occurrences within
the Development Envelope

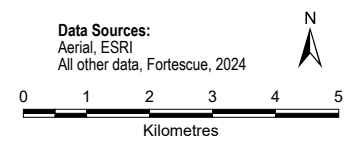


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- Development Envelope
- Indicative Disturbance Footprint
- Priority 3 Flora**
- *Gymnanthera cunninghamii*

- Vegetation Unit**
- AbAIte
 - AhAtTa
 - AiAaTw
 - AiCpTb
 - AiSgTb
 - AiTe
 - AmTe
 - AtTe
 - ChATte
 - ChTe
 - ChTI
 - EcMa
 - EIATte
 - EIGwTw
 - EvCi
 - EvMITe
 - TcAtTe
 - Tw2



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 Revised By: scostello
 Approved By:
 Scale: 1:120,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066_r1
 Document Name: 4519OP002_MP_EN_0066.015_r3

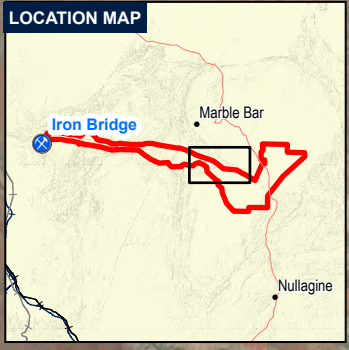
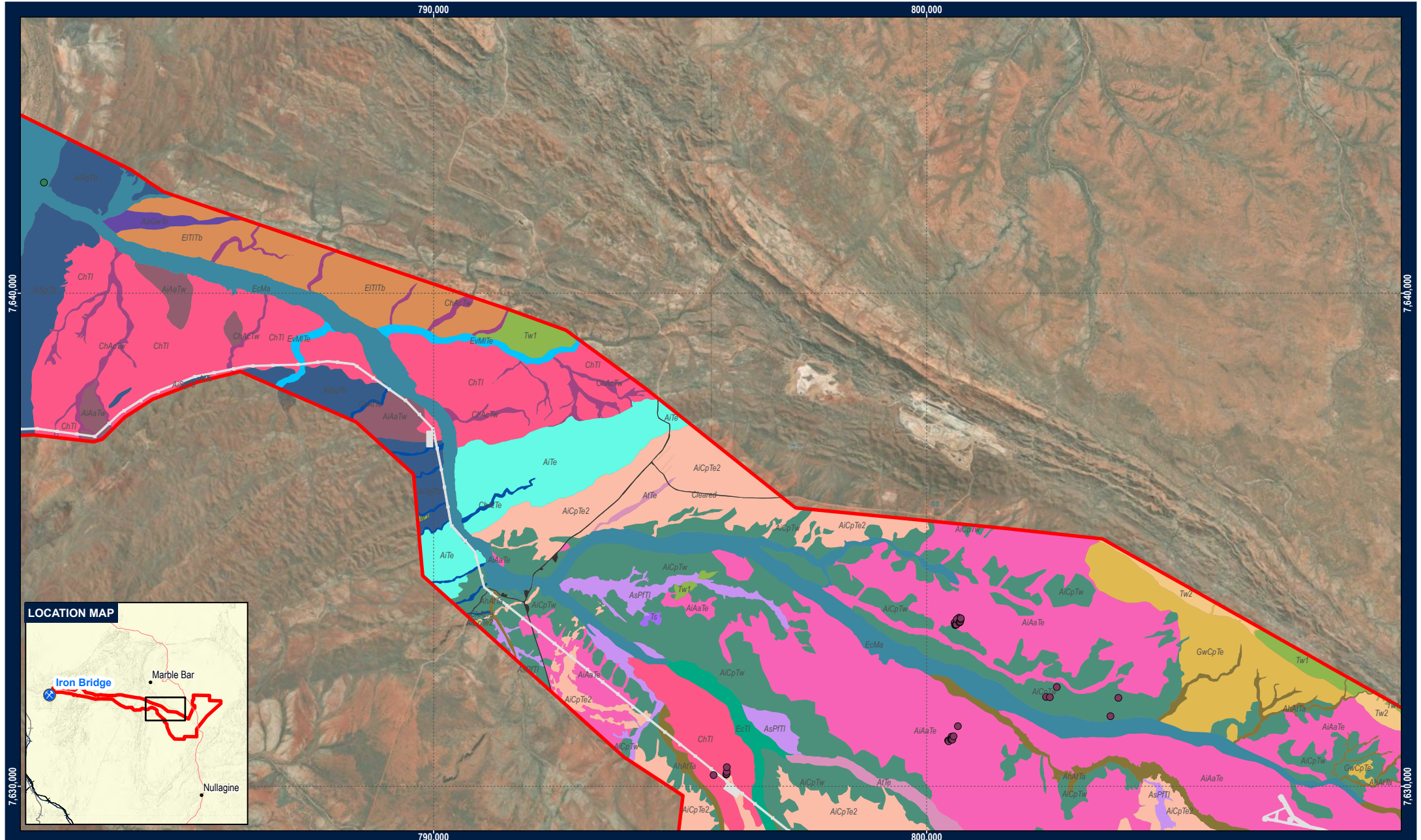
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Figure 7-8.2
Threatened and Priority flora species -
Habitat and Occurrences within
the Development Envelope



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Development Envelope	Vegetation Unit	AiCpTw	ChTe	GwCpTe
Indicative Disturbance Footprint	AaGwTe	AiSgTb	ChTI	Ts
Priority 3 Flora	AhAtTa	AiTe	Cleared	Tw1
<i>Gymnanthera cunninghamii</i>	AiAaTe	ASPFTI	EcMa	Tw2
<i>Heliotropium murinum</i>	AiAaTw	ATTe	EcTI	
	AiCpTe2	ChACTW	EITITb	
		ChATte	EvMITe	

Data Sources:
Aerial, ESRI
All other data, Fortescue, 2024

0 1 2 3 4 5
Kilometres

N

Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostellio
 Approved By:
 Scale: 1:100,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066_r1
 Document Name: 4519OP002_MP_EN_0066.015_r3

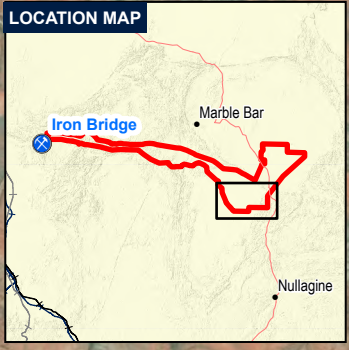
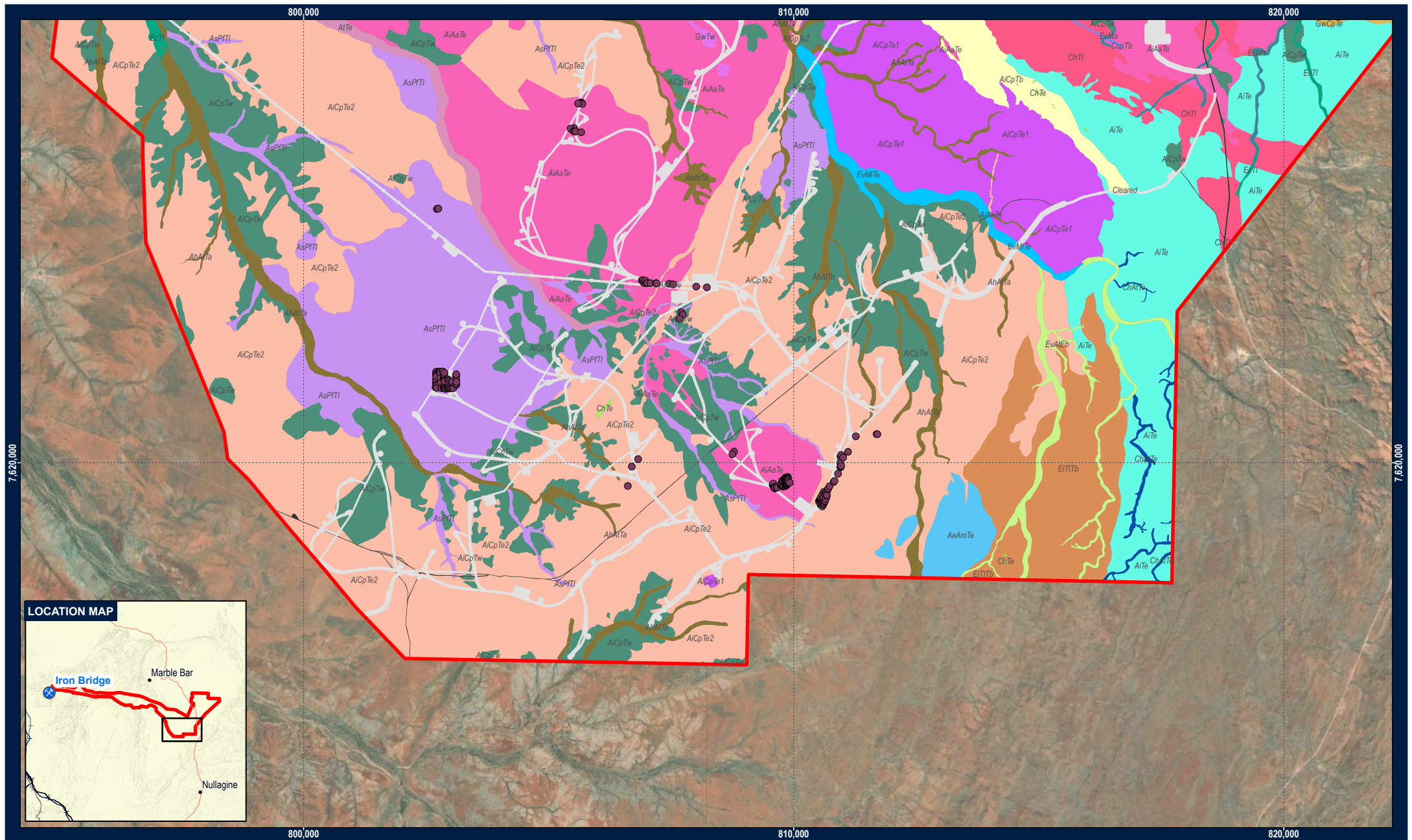
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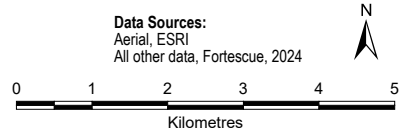
Figure 7-8.3
Threatened and Priority flora species -
Habitat and Occurrences within
the Development Envelope



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Development Envelope	AhAtTa	AiTe	Cleared	EvMITe
Indicative Disturbance Footprint	AiAaTe	AsPFTI	CspTb	GwCpTe
Priority 3 Flora	AiCpTb	AtTe	EcMa	GwTw
<i>Heliotropium murinum</i>	AiCpTe1	ChAtTe	EcTI	
Vegetation Unit	AiCpTe2	ChTe	EITITb	
AeAmTe	ChTI	EvAtEb		



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostello
 Approved By:
 Scale: 1:100,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066_r1
 Document Name: 4519OP002_MP_EN_0066.015_r3

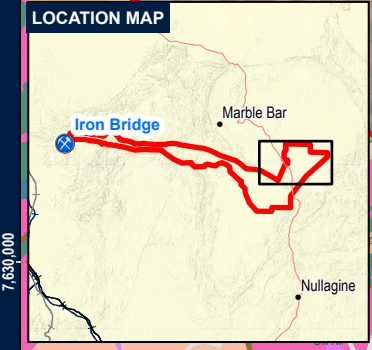
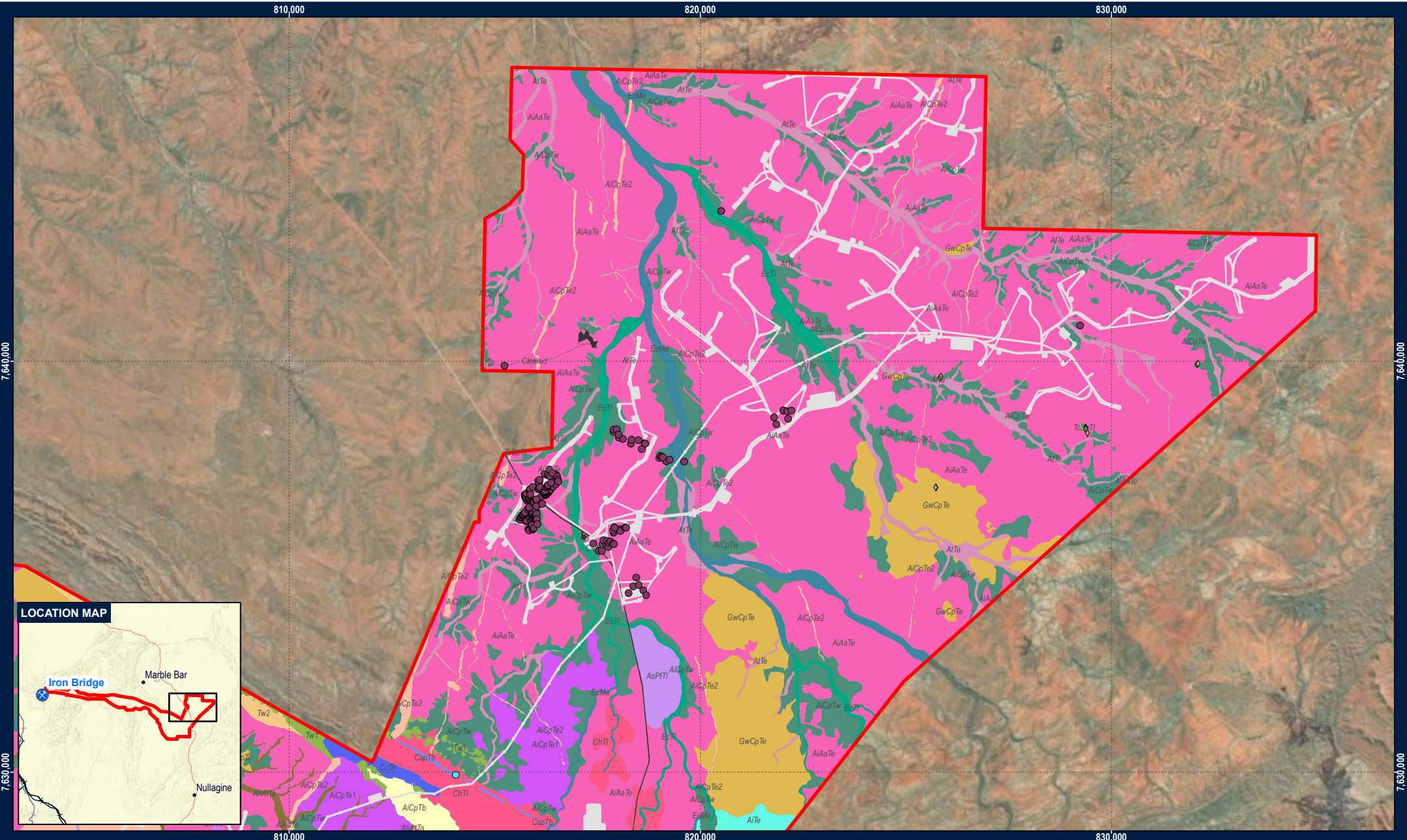
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Figure 7-8.4
Threatened and Priority flora species -
Habitat and Occurrences within
the Development Envelope



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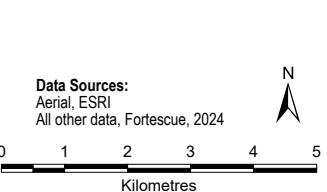


- █ Development Envelope
- █ Indicative Disturbance Footprint
- Priority 3 Flora**
- *Euphorbia inappendiculata* var. *inappendiculata*
- *Heliotropium murinum*

- Priority 4 Flora**
- ◆ *Bulbostylis burbridgeae*
- Vegetation Unit**
- █ AhATa
- █ AiAaTe
- █ AiCpTb

- █ AiCpTe1
- █ AiCpTe2
- █ AiCpTw
- █ AiTe
- █ AsPFTI
- █ ATe
- █ CcTe

- █ ChTI
- █ Cleared
- █ CspTb
- █ EcMa
- █ EcTI
- █ GwCpTe
- █ GwTw



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 Approved By:
 Scale: 1:120,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066_r1
 Document Name: 4519OP002_MP_EN_0066.015_r3

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Figure 7-8.5
Threatened and Priority flora species -
Habitat and Occurrences within
the Development Envelope



7.6.2.3 Indirect impacts to groundwater dependent vegetation

The Proposal will require water abstraction via borefields from fractured rock aquifers and, possibly, the alluvial aquifer during construction and operational activities. The water demand will be greatest during construction (700 ML/annum) and will significantly reduce during operational activities (200 ML/annum).

As described in Section 7.4.6, FVC (2024) has identified *Eucalyptus* and *Melaleuca* species that potentially depend on groundwater as present in the DE (EcMa, EvAtEb, EcTI, EvCi and EvMITe). Groundwater abstraction will be managed to prevent impacts to these vegetation types and the small volumes anticipated to be required (as reported in Section 10.1 - Inland Waters) and short duration of abstraction, means there is unlikely to be any impact to vegetation health for these areas.

7.6.2.4 Introduction and/or spread of weed species

As described in Section 7.4.11, 18 species of introduced flora (weeds) were recorded within the DE (FVC, 2024). No WoNs were recorded in the DE, however, one Declared Pest for the Pilbara region under the BAM Act was recorded within the DE: **Calotropis procera* (Calotrope). There are no specific management or eradication requirements for this species noted on the Western Australian Organism List (WAOL) database.

Weed species identified can be spread through the movement of soil or vegetative matter on boots, vehicles and machinery or the movement of topsoil and other bulk earthworks material. Additionally, rehabilitation activities pose a risk of spreading or introducing new weed species due to the re-use or importation of topsoil or other possible contaminated materials, such as tubestock/seedlings.

Construction and operational activities, such as clearing activities, traffic movements, and putrescible wastes, have the potential to introduce or spread weed species within the area.

Standard mitigation measures will be implemented to reduce the risk of introducing new weed species to the DE or spreading those species already present, in line with Fortescue's Weed Management Plan (Reference: 45-PL-EN-0033). As such, no significant impacts are expected to occur to native vegetation.

7.6.2.5 Dust Deposition

Dust deposition on vegetation can affect photosynthesis through interception of solar radiation, alteration of the radiant energy balance, and act as a barrier to gas diffusion on leaf surfaces (Doley, 2020). Research shows that the impact of dust depends on leaf traits like surface roughness and posture. Leaves that accumulate less dust (flat, smooth leaves) experience more stress as dust interferes with gas exchange. (Turner, 2013). Dust deposition impact decreases with distance from the source (Matsuki *et al.*, 2016).

There is no publicly available assessment of dust impacts on the conservation significant flora species that occur within the DE. However, monitoring undertaken by Matsuki *et al.* (2016) in other regions of Western Australia did not find evidence to support that dust accumulation on plants causes negative impacts at rates up to 20 to 77 g/m² per month. Dust generated from the construction activities will be managed in accordance with Fortescue standard measures and is not expected to pose a risk to native vegetation.



In addition, the majority of potential dust impacts associated with the Proposal will occur during construction activities, which will be short-term, temporary localised and due to the linear nature of the infrastructure. Dust generation from operational activities is anticipated to be minimal and limited to vehicle movements, which are infrequent. It is therefore considered that dust impacts during the operational phase will be negligible.

7.6.2.6 Increased Risk of Bushfires

Wind turbines pose a risk of fire incidents, mostly associated with lightning strikes (acting as conductors) and mechanical failures, often exacerbated by the presence of combustible material (You *et al.*, 2023). Similarly, transmission lines can cause wildfires through failures, pole top or transformer fires and also experience outages from wildfires (Panossian & Elgindy, 2023).

Climate projections for northern Australian Rangelands, including the Pilbara, suggest that temperatures will continue to rise. By 2030, the mean annual warming across all emissions scenarios is projected to be about 0.6 to 1.4 °C above the climate of 1986–2005. By 2090, temperatures are projected to be 1.5 to 2.9 °C warmer under an intermediate emissions scenario (RCP 4.5) (DWER, 2021b). A substantial increase in the temperature reached on the hottest days and the frequency of hot days is projected. Given these projections, it is anticipated that the bushfire risk and intensity of events will increase in response to the changing climate, which could further exacerbate the risks associated with the Proposal.

Increased frequency and intensity of fire incidents can affect vegetation through removal or reduction of biomass, alteration of vegetation structure, increase of weeds due to decrease of competition for resources and alteration of seed dispersal and germination, consequently affecting the vegetation composition within the affected area (Stavi, 2019; Fisher *et al.*, 2009). Given the regular wild fire activity in the region, as discussed in Section 7.4.12, fuel loads are considered to be generally low across the entire DE. Fire risk will be managed in accordance with Fortescue standard control measures, which aim to minimise risks as far as practical. In addition, the 2 ha cleared areas around the turbine locations are anticipated to reduce the risk of fire from lightning strikes. Therefore, increased risk of bushfires associated with the proposal is not expected to pose a significant risk to native vegetation.

7.6.3 Cumulative Impacts

Cumulative environmental impacts are the successive, incremental, and interactive impacts on the environment of a proposal with one or more past, present and reasonably foreseeable future activities (EPA, 2021b). This section outlines the potential cumulative impacts to flora and vegetation values as a result of the Proposal and other surrounding developments either recently approved or currently under assessment.

In undertaking a cumulative impact assessment, the following assumptions are noted:

- Cumulative impacts resulting from third-party operations are based on information available in the public domain for third party operators and does not encapsulate impacts for all third-party operations in the region.
- Cumulative impact calculations generally do not take into consideration areas outside of those assessed under Part IV of the EP Act, or EPBC Act referrals, for each relevant



proposal. Where relevant, large clearing permits under Part V of the EP Act may also be included depending on the quantity and quality of information available.

- The accuracy of data from external sources will not be verified and it is assumed that data publicly available is accurate and collected in accordance with standard industry guidelines.

There are several reasonably foreseeable developments within the Proposal region and, more broadly, within the Chichester subregion of the Pilbara bioregion. Although not directly comparable proposals, they do involve native vegetation removal, and therefore the projects in the Chichester subregion, and generally with similar dominant land systems (Macroy & Rocklea), have been considered in this cumulative impact assessment. This includes:

- Beatons Creek Paleoplacer Project.
- McPhee Creek Iron Ore Project.
- North Star Magnetite Extension Project.
- Warrawoona Gold Project.
- Sulphur Springs Zinc-Copper Project.
- Corunna Downs Project.

Cumulative impacts have been considered against the following flora and vegetation aspects:

- Pre-European Vegetation Associations (Beard *et al.* 2013)⁵.
- Conservation Significant Flora.
- Groundwater Dependent Vegetation.

The cumulative impacts to flora and vegetation anticipated to occur as a result of this Proposal and the projects identified above are identified in Table 7-13.

⁵ Given the differences in surveyors, methodologies and mapping between projects, direct comparison of the vegetation mapping between schemes is not always achievable. In order to determine the cumulative impacts, a comparison against the Beard Vegetation Associations remaining extents has been undertaken to provide a regional assessment.



Table 7-13: Impacts Associated with Surrounding Projects

The Proposal and Cumulative Projects	Reported Direct Impacts		
	Native Vegetation Removal that is Common Between the Cumulative Projects	Significant Flora Impacted that is Common Between the Cumulative Projects	Removal of Groundwater Dependent Vegetation (GDV) and Potential GDV
The Proposal	Chichester (82) - 74.13 ha Chichester (93) - 1,975.14 ha Chichester (171) - 111.76 ha Chichester (587) - 165.32 ha Chichester (619) - 5.02 ha	<i>Heliotropium murinum</i> - 249 individuals	38.63 ha
Beatons Creek Paleoplacer Project (38 km south of the DE)	All proposed clearing is within Chichester (173) and therefore not anticipated to cause combined impacts on a VA	No impacts to any recorded individuals of <i>Heliotropium murinum</i>	20.91 ha ¹
McPhee Creek Iron Ore Project (7 km south of the DE)	Chichester (171) - 1,322.5 ha The remaining proposed clearing is within Chichester (173) and therefore not anticipated to cause combined impacts on any other VAs	No impacts to any recorded individuals of <i>Heliotropium murinum</i>	None directly impacted
North Star Magnetite Extension Project (adjacent to the western extent of the DE)	Chichester (82) - 606.9 ha	No impacts to any recorded individuals of <i>Heliotropium murinum</i> . 132 individuals <i>Quoya zonalis</i> would be impacted by this project.	20.1 ha
Warrawoona Gold Project (adjacent to the DE in the northwest extent of the Generation Hub area)	Chichester (82) - 340 ha Chichester (93) - 36 ha	<i>Heliotropium murinum</i> - 27 individuals <i>Ptilotus mollis</i> – 612 individuals	24.5 ha
Sulphur Springs Zinc-Copper Project	Chichester (93) - 27.3 ha	No impacts to any recorded individuals of <i>Heliotropium murinum</i>	14.17 ha



The Proposal and Cumulative Projects	Reported Direct Impacts		
	Native Vegetation Removal that is Common Between the Cumulative Projects	Significant Flora Impacted that is Common Between the Cumulative Projects	Removal of Groundwater Dependent Vegetation (GDV) and Potential GDV
(7 km north of the DE)		<i>Ptilotus mollis</i> – 1 individual	
Corunna Downs Project (overlaps with a small area of the DE in the central portion)	Chichester (82) - 105.8 ha ² Chichester (93) - 105.8 ha Chichester (587) - 105.8 ha Chichester (619) - 105.8 ha	<i>Heliotropium murinum</i> - 1 individual	48.94 ha
Total Cumulative Impact	Chichester (82) - 1,126.83 ha Chichester (93) - 2,144.24 Chichester (171) - 1,434.26 ha Chichester (587) – 271.12 ha Chichester (619) - 110.82 ha	<i>Heliotropium murinum</i> - 277 individuals	167.25 ha

¹ The amount to be directly impacted is not reported in the assessment available, however 20.91 ha of potential groundwater dependant vegetation was recorded in the study area, which has all been assumed to be removed as a conservative worst-case approach.

² The amount of vegetation to be removed in each VA is not reported, therefore the total reported clearing has been split across the recorded VAs to provide an estimate.



The potential cumulative impacts on the pre-European extent of vegetation remaining in the Chichester subregion are:

- Clearing of 1,126.83 ha of VA 82.
- Clearing of 2,144.24 ha of VA 93.
- Clearing of 1,434.26 ha of VA 171.
- Clearing of 271.12 ha of VA 587.
- Clearing of 110.82 ha of VA 619.

The National Objectives and Targets for Biodiversity Conservation includes a target to avoid clearance of existing vegetation of any VA's with a pre-European extent of below 30% (Commonwealth of Australia, 2001). Taking into account the combined clearing, there would still be 99.6% of the pre-European extent of VA 82 remaining; 99.9% of VA 93 remaining; 95% of VA 171 remaining; 99.9% of VA587 remaining; and 99.9% of VA619 remaining. The proposal, in combination with other foreseeable projects in the surrounding area, will not decrease any of the VA's below 30% at any level. Cumulative impacts on native vegetation are not anticipated to be significant.

With regard to conservation significant flora, a total of 277 individuals of *Heliotropium murinum* will be directly impacted as a result of the cumulative schemes considered in this assessment. There are over 2,000 individuals recorded between the Proposal, Warrawoona Gold Project, and the Corunna Downs Project alone and a number of other occurrences recorded in the surrounding area. The total number of individuals are not reported for the other cumulative schemes considered. As discussed in section 7.6.1.2, this species is only recorded within the Macroy Land System, and there is high potential for it to occur more broadly in the local area in similar landforms/soils and vegetation types. With the additional records in the surrounding area, and the relatively low number of individuals to be cleared, the cumulative impact on this species is not anticipated to be significant at a species level.

While *Quoya zonalis* and *Ptilotus mollis* are present within the DE, they are not within the IDF and will not be directly impacted by the Proposal. No cumulative impact to these species will occur as a result of the Proposal. None of the other significant flora relevant to the DE are impacted by the cumulative schemes considered in this assessment.

The combined direct impacts to groundwater dependent vegetation as a result of implementation of the Proposal and the other projects will result in removal of 167.25 ha (as a worst case and likely to be less). Given the Proposal DE contains over 5,189 ha of groundwater dependent and potential groundwater dependent vegetation, and a much larger amount existing in the surrounding area identified in the assessments for surrounding cumulative schemes, this relatively small-scale combined clearing is not anticipated to result in a significant cumulative impact.

7.7 Mitigation

During the planning and design process for the Proposal, the mitigation hierarchy (avoid, minimise and rehabilitate) was applied to assess, avoid and minimise potential impacts to flora and vegetation as far as practicable. Following completion of the Flora and Vegetation survey, the data was reviewed against the project design to avoid/minimise clearing of significant flora and vegetation. The Proposal's IDF has been designed to avoid areas that may support



significant biodiversity values or heritage values. Areas that have been avoided, where practicable, include:

- Avoidance of major drainage / creek lines except where crossing locations are required. Consultation with Traditional Owners was undertaken to identify creek crossings in order to reduce environmental and heritage impacts.
- Avoidance of Cultural Precinct, associated with granite outcrops. An exclusion area has been placed of the precinct in consultation with the Traditional Owners.
- Avoidance of conservation significant flora, where practicable. All but one species of conservation significant flora was able to be avoided during Proposal design. Of the impacted conservation significant flora only 12.7% of the mapped population in the DE is proposed to be impacted.
- Avoidance of restricted / limited vegetation units as far as practicable.

The following mitigation measures will be implemented to avoid or minimise impacts on flora and vegetation:

Table 7-14: Avoidance, Management and Mitigation of Impacts to Flora and Vegetation

Impact	Management Actions
Avoidance	The design has avoided known locations of conservation significant flora where practicable.
	Where significant flora or vegetation occurs close to the IDF 'clearing areas will be demarcated prior to construction activities to protect the conservation significant flora species and vegetation from impacts such as accidental clearing or disturbance.
	Areas to be cleared will be demarcated on the ground (either physically or using GPS enabled methods). Ground disturbance will be undertaken in line with Fortescue's 'Ground Disturbance and Topsoil Management Procedure' (Reference: IO-PR-EN-0010).
Minimisation	All clearing areas will be checked and confirmed post-clearing through inspection of aerial imagery of clearing areas and comparison to the IDF. Site inspection will be undertaken prior to and following clearing to confirm clearing areas are appropriately demarcated. Disturbance will be managed using Fortescue's Land Use Certificate system.
	Comprehensive weed hygiene management through implementation of weed management measures. All works will be undertaken in accordance with Fortescue's Weed Management Plan (Reference: 45-PL-EN-0033) as the standard operating procedure.
	Groundwater abstraction will be managed to minimise drawdown and potential impacts on groundwater dependent vegetation This will be managed under the <i>Rights in Water and Irrigation Act 1914</i> (RIWI Act) 5C water abstraction licence.
	Dust deposition will be managed through standard construction measures (e.g., water application) to minimise dust generation and avoid impacts on vegetation in line with standard dust management measures. The following standard dust mitigation measures will be implemented throughout construction phase: <ul style="list-style-type: none"> • Use of dust suppression to manage dust generation from construction activities, access roads and cleared areas. • Use of water sprays to manage dust generation from material transport and stockpiling. • Limit the number and height of stockpiles. • Vehicles confined to designated routes with speed limits strictly enforced; and



Impact	Management Actions
	<ul style="list-style-type: none"> Adherence to Fortescue's Dust Deposition Monitoring Procedure (Reference: 45-PR-EN-0032). <p>Implementation of fire risk management measures will be undertaken, including:</p> <ul style="list-style-type: none"> Clearing activities would not be undertaken when fire danger ratings are extreme or above. Carefully manage and monitor hot works through implementation of hot works permit system. Ensuring appropriate disposal of potential fire-starting waste, e.g., cigarette butts to minimise the risk of bushfires as a result of the Proposal. Firefighting equipment will be located around the site and in vehicles. Fire response procedures and personnel training, including site inductions on fire prevention and management, will also be provided; and Maintenance of cleared areas around turbine locations.
Rehabilitation	Rehabilitation of a total of 1,028.12 ha of cleared vegetation which will be undertaken progressively after each phase of the construction activities to reduce impacts to floral and vegetation over time, including potential fragmentation (as detailed in Table 7-15). This will be undertaken in accordance with Fortescue's standard procedures including Rehabilitation and Revegetation Monitoring Procedure (Reference: 45-GU-EN-0009).

The proposed areas of rehabilitation, that will be progressively rehabilitated throughout the construction phase, are detailed in Table 7-15.

Table 7-15: Rehabilitated areas within the Indicative Disturbance Footprint

Landform	Vegetation Unit	IDF (ha)	Rehabilitation (ha)	Permanent Footprint (ha)	Development Envelope (ha)	Proportion of Residual Impact (%)
Drainage	AhAtTa	9.51	4.62	4.89	1,274.72	0.38%
	AtTe	11.57	5.48	6.09	1,984.48	0.31%
	ChAcTw	1.14	0.6	0.54	222.55	0.24%
	ChAtTe	11.74	6.36	5.38	683.91	0.79%
	EcMa	9.78	4.78	5	2,676.09	0.19%
	EvCi	67.23	34.5	32.73	747.43	4.38%
	EcTI	1.93	1.07	0.86	17.59	4.89%
	EvMITe	21.09	9.77	11.32	1,545.45	0.73%
Hills	AiCpTb	96.7	46.56	50.14	7,804.34	0.64%
	AiSgTb	51.7	27.03	24.67	5,836.69	0.42%
	AiTe	81.6	42.77	38.83	6,915.46	0.56%
	EIAAtTe	3.72	2.17	1.55	79.77	1.94%
	EIGwTw	14.01	7.84	6.17	2,039.76	0.30%
	CcTe	1.37	0.77	0.6	390.89	0.15%
	Tw1	2.02	1.14	0.88	415.73	0.21%
Outcropping	AiCpTe1	31.6	12.12	19.48	2,186.20	0.89%
	AtAHTe	16.24	4.62	11.62	1,358.31	0.86%



Landform	Vegetation Unit	IDF (ha)	Rehabilitation (ha)	Permanent Footprint (ha)	Development Envelope (ha)	Proportion of Residual Impact (%)
	ChTe	0.17	0.08	0.09	36.34	0.25%
	EiCpTb	5.12	2.87	2.25	672.05	0.33%
Plains	AaGwTe	20.42	11.5	8.92	1,570.80	0.57%
	AiAaTe	1037.23	424	613.23	23,194.92	2.64%
	AiAaTw	6.5	3.23	3.27	630.37	0.52%
	AiCpTe2	467.46	195.41	272.05	10,958.97	2.48%
	AiCpTw	232.59	118.52	114.07	9,640.11	1.18%
	AsPFTI	102.92	49.11	53.81	3106.91	1.73%
	ChTI	67.23	34.5	32.73	5,999.42	0.55%
Total		2,372.59	1,051.42	1,321.17	91,989.26	-

7.8 Residual Impact and Predicted Outcome

The Proposal will result in the clearing of 2,318.80 ha of native vegetation, including one Priority listed species and vegetation units considered to be significant. The EPA considers the clearing of 'Good' or better condition vegetation to be a significant impact that requires offsetting (GoWA, 2014). As such, the proposed permanent clearing of 'Good to Excellent' quality vegetation is considered a significant residual impact. Table 7-16 summarises the residual impacts expected after mitigation measures are applied.

Table 7-16: Summary of Residual impacts for Flora and Vegetation Following Mitigation

Potential impact	Residual impact after management	Regional significance
Clearing of native vegetation	Permanent clearing of 1,290.68 ha with 'Good to Excellent' condition.	Vegetation units and vegetation associations, as per Beard (1975), will not be cleared to an extent to reduce the remaining vegetation below 30%. However, the permanent loss of 'Good to Excellent' vegetation condition is expected to be significant. An environmental offset is proposed for this residual impact.
Clearing of conservation significant vegetation	20.04 ha of National and State Significance vegetation (AtAaTe; EiCpTb; and EiGwTw) will be permanently cleared. The significance is attributed to the presence of populations of Threatened (EPBC listed) species.	The clearing represents 0.83% of the available vegetation within the DE for these vegetation types. Therefore, it does not represent a regional significant impact on these vegetation types.
	1,156.64 ha of Regional Significance vegetation (AsPFTI, AtTe, ChTI, AtAaTe; EiCpTb; AiAaTe; AiCpTe2; AiCpTw; Tw1; EcMa; EcTI; EvCi; EvMITe) will be permanently cleared. The significance is attributed to the presence of State-listed Threatened flora, providing a role as a refuge and a role in maintaining an important ecological process.	The clearing represents 1.86% of the available vegetation within the DE for these vegetation types and therefore does not significantly impact these vegetation types.



Potential impact	Residual impact after management	Regional significance
Clearing of conservation significant flora species	Clearing of 249 individuals of <i>Heliotropium murinum</i> (P3)	The clearing of 249 individuals of <i>Heliotropium murinum</i> (P3) represents 12.7% of this species within the DE. Due to the similar conditions of that of the DE found in the surrounding land system, which provides additional areas for the species to expand into, the remaining individuals are anticipated to be a viable population. Therefore, this clearing is not expected to change the conservation status of the species and will not result in a significant regional impact.
Habitat fragmentation	The Proposal is expected to result in the fragmentation of some vegetation units. However, given the Proposal is not anticipated to prevent pollination between flora species, this fragmentation will not be significant.	Due to the remaining vegetation and the size of each vegetation unit area, fragmentation of vegetation units within the DE is not expected to be significant.
Indirect impacts on significant flora species	The Proposal may indirectly impact three conservation-significant species: <ul style="list-style-type: none"> • <i>Quoya zonalis</i> (T): eight individuals • <i>Cochlospermum macnamarae</i> (P1): three individuals • <i>Heliotropium murinum</i> (P3): 884 individuals However, with the mitigation measures in place, no residual impacts to these species from indirect impacts are anticipated.	No potential indirect impacts on these individuals are anticipated.
Indirect impacts on ground water dependent vegetation	As a result of the implementation of standard groundwater management practices, indirect impacts to groundwater dependent vegetation are not expected to be significant. The management of abstraction in line with the RIWI Act 5C licence will further reduce the risk of indirect impacts to groundwater dependent vegetation.	At a regional scale, the impact to the groundwater dependent vegetation is not expected to be significant.
Introduction and/or spread of weed species	With the implementation of mitigation measures, the introduction and/or spread of weed species is not expected.	After the implementation of mitigation measures, the introduction and/or spread of weed species is not expected.
Dust deposition	As a result of the implementation of standard dust management practices, indirect impacts to vegetation are not anticipated.	At a regional scale, the impact on the vegetation is not expected to be significant.
Increased risk of bushfires	As a result of the implementation of standard fire risk management practices, indirect impacts to vegetation are not expected.	At a regional scale, the impact on the vegetation is not expected to be significant.

Following the implementation of the management measures identified above, the following residual impacts are considered significant and will require offsetting:

- Permanent clearing of 1,290.68 ha of 'Good to Excellent' condition vegetation.



Other potential direct and indirect impacts to flora and vegetation associated with the Proposal will not be significant at the local or regional scale as the vegetation associations are generally well represented in the surrounding area. Given the small extent of the proposed clearing of vegetation identified as being locally significant, this clearing will not result in a significant residual impact.

Clearing of Priority flora species is also not considered to be significant at the local or regional scale given the small extent of clearing of these species and the wider distribution and number of known records of these species.

The predicted environmental outcomes for the Proposal are:

- Clearing of no more than 2,318.80 ha of native vegetation in 'Good or better' condition, of which no less than 1,028.12 ha will be rehabilitated.
- No more than 249 individuals of the Priority 3 species *Heliotropium murinum* will be cleared.
- No more than 38.63 ha of groundwater dependent vegetation will be cleared.
- No pre-European vegetation associations will be reduced to below the 'threshold level' of 30% of their pre-clearing extent.

This avoidance and minimisation of impacts, together with the offsetting of significant residual impacts will result in the biological diversity and ecological integrity of the study area being maintained. The Proposal is consistent with the EPA's environmental objective for Flora and Vegetation. Details of the proposed offsets are summarised in Chapter 13 (Offsets).



8 TERRESTRIAL FAUNA

8.1 EPA Objective

The WA EPA objective for the terrestrial fauna environmental factor is '*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained*' (EPA, 2021b). The WA EPA defines terrestrial fauna as '*animals living on land or using land (including aquatic systems) for all or part of their lives*' (EPA, 2016g).

8.2 Policy and Guidance

The following WA government agency policies and guidelines have been considered for the Proposal to meet the EPA's objective in relation to this factor:

- Statement of Environmental Principles, Factors and Objectives (EPA, 2021b).
- Environmental Factor Guideline – Terrestrial Fauna (EPA, 2016f).
- EPA Strategic Advice for Cumulative Environmental Impacts of Development in the Pilbara Region (EPA, 2014).
- Technical Guidance - Terrestrial Vertebrate Fauna Surveys for EIA (EPA, 2020).
- Interim Guideline for Preliminary Surveys of Night Parrot (*Pezoporus occidentalis*) in WA (DPAW, 2017).
- Guidelines for Surveys to Detect the Presence of Bilbies and Assess the Importance of Habitat in WA (DBCA, 2017c).
- Technical Guidance – Sampling of Short-Range Endemic Invertebrate Fauna (EPA, 2016g).

In addition, Commonwealth policies and guidelines have been considered for the Proposal including:

- EPBC Act Referral Guideline for the Endangered Northern Quoll *Dasyurus hallucatus*: EPBC Act Policy Statement (DoE, 2016).
- Survey Guidelines for Australia's Threatened Mammals: Guidelines for Detecting Mammals Listed as Threatened under the EPBC Act (DSEWPC, 2011a).
- Survey Guidelines for Australia's Threatened Birds: Guidelines for Detecting Birds listed as Threatened under the EPBC act (DEWHA, 2010a).
- Survey Guidelines for Australia's Threatened Reptiles: Guidelines for Detecting Reptiles listed as Threatened under the EPBC Act (DSEWPC, 2011b).
- Survey Guidelines for Australia's Threatened Bats: Guidelines for Detecting Bats listed as Threatened under the EPBC Act (DEWHA, 2010b).



- Onshore Wind Farm Guidance: Best practice approaches when seeking approval under Australia’s national environmental law (DCCEEW 2024a).
- Relevant Commonwealth Recovery Plans, Conservation Advice and/or Threat Abatement Plans, including:
 - National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill & Ward, 2010).
 - Conservation Advice for the Northern Quoll (*Dasyurus hallucatus*) (TSSC, 2005).
 - Recovery Plan for the Greater Bilby (*Macrotis lagotis*) (DCCEEW, 2023a).
 - Conservation Advice for the Greater Bilby (*Macrotis lagotis*) (TSSC, 2016a).
 - Conservation Advice for the Grey Falcon (*Falco hypoleucos*) (TSSC, 2020).
 - Conservation Advice for the Pilbara Leaf-nose Bat (*Rhinonicteris aurantia* (Pilbara Form)) (TSSC, 2016b).
 - Conservation Advice for the Olive Python (Pilbara subspecies) (*Liasis olivaceus barroni*) (DEWHA, 2008a).
 - Conservation Advice for the Ghost Bat (*Macroderma gigas*) (TSSC, 2016c).
 - Conservation Advice for the Night Parrot (*Pezoporus occidentalis*) (TSSC, 2016d).
 - Conservation Advice for the Spectacled Hare-Wallaby (*Lagorchestes conspicillatus conspicillatus*) (DEWHA, 2008b).
 - Conservation Advice for the Sharp-tailed Sandpiper (*Calidris acuminata*) (DCCEEW, 2024c).
 - Conservation Advice for the Common Greenshank (*Tringa nebularia*) (DCCEEW, 2024b).

Fauna surveys for the Proposal have been planned and executed in accordance with the EPA’s technical guidance for the fauna factor.

8.3 Studies and Surveys

8.3.1 Terrestrial Vertebrate Fauna

Ecoscape (2025) undertook a Detailed terrestrial vertebrate fauna assessment of the Proposal. The assessment incorporated data collected during eight field surveys comprising; Detailed terrestrial vertebrate fauna of Transmission line (3-18 April 2022); detailed terrestrial vertebrate fauna of Generation hub (13 – 28 June 2022); detailed survey of the Transmission Line area (3-18 May 2022 and 21-31 March 2024), detailed survey of Generation Hub area (13-28 June 2022 and April-2 May 2024) and targeted surveys (17-23 October 2023 and 12-15 Dec 2023). Survey methods included systematic trapping sites, ornithological surveys, fauna habitat assessments, motion cameras, ultrasonic (bats) and acoustic (birds) audio



recordings, and targeted searches for conservation significant species (including Greater Bilby, Northern Quoll, Night Parrot, Pilbara Olive Python, Pilbara Leaf-nosed Bat and Ghost Bat) and/or suitable habitat features.

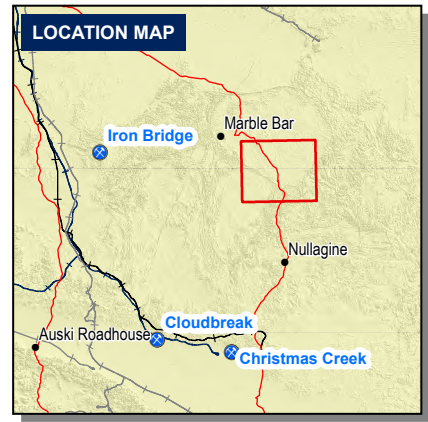
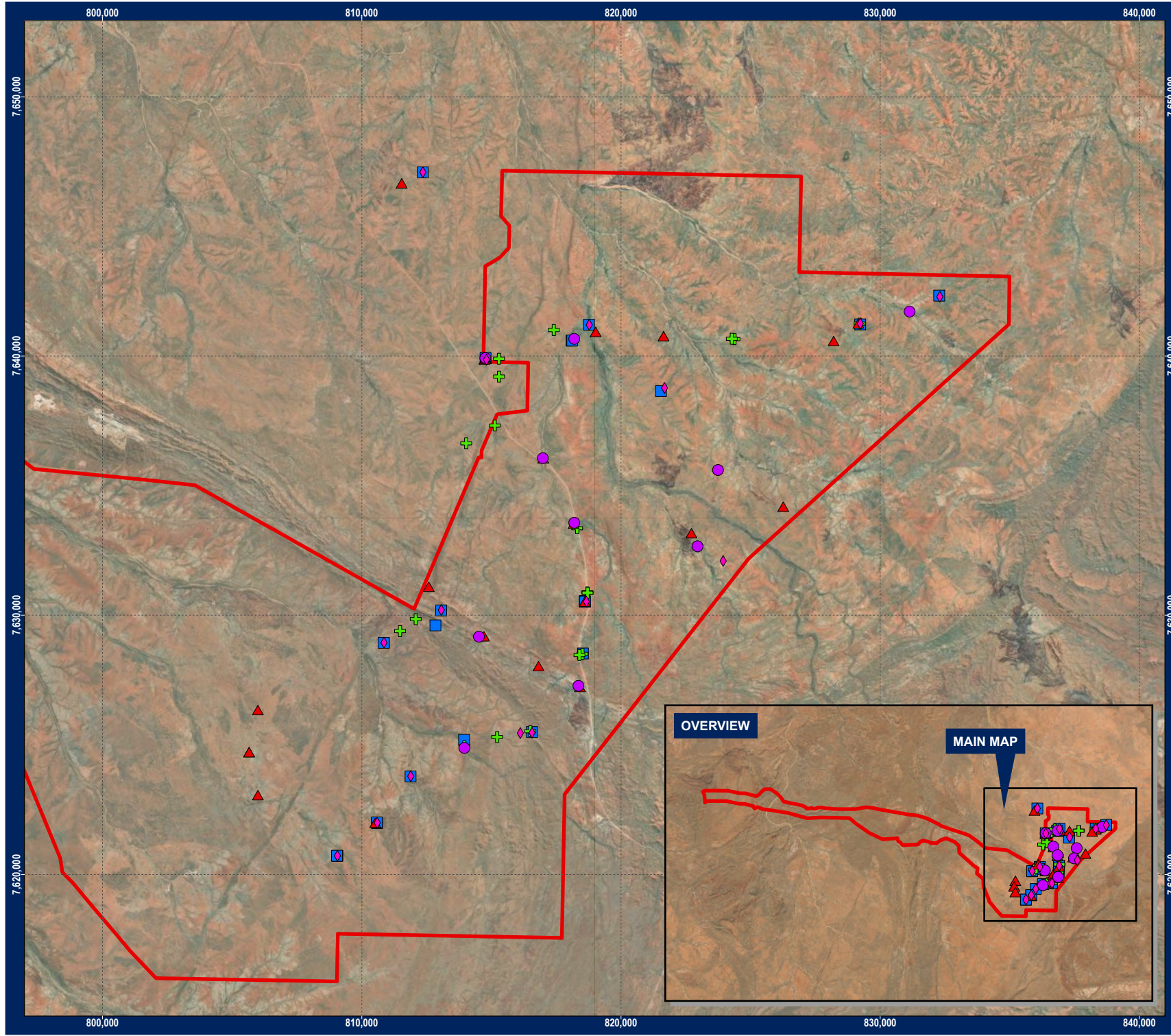
The vertebrate fauna Survey Area comprises 142,467.2 ha and has an approximately 119 km east-west and 35 km north-south span. The Survey Area covers a larger extent than the DE as the DE has been refined since the completion of the field surveys. The Survey Area is shown in Figure 1 within Appendix B and is referred to throughout this section. The Ecoscape (2025) report is provided in Appendix B.

8.3.2 Bird and Bat Site Utilisation Survey

Seasonal bird and bat site utilisation surveys were undertaken within the Generation Hub area by Spectrum (2024) to collect bird and bat species data suitable for informing potential impacts, including the risk of collision with turbine blades (survey locations identified on Figure 8-1). Background research and data sources were reviewed to identify all bird and bat species records within 20 kilometres of the DE. Information from relevant literature and species sightings during other surveys were used to inform survey design and methods. The survey locations were selected to represent a spread across the turbine positions within the Generation Hub area and to obtain data at potential impact locations. They were distributed in different habitat types to gain a thorough understanding of bird and bat utilisation across the relevant areas of the DE.



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- Legend**
- Development Envelope
 - ◆ Birding Site
 - Motion Camera
 - ▲ Acoustic recorders
 - + Opportunistic Site
 - Bat Recorder

Data Sources:
 Aerial, ESRI.
 Other data, Fortescue.

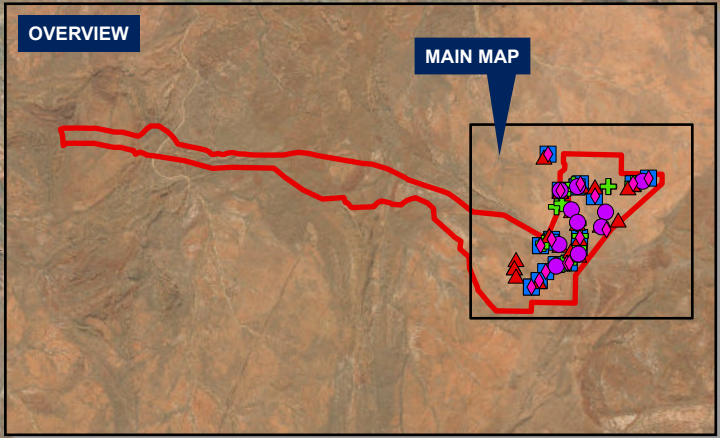
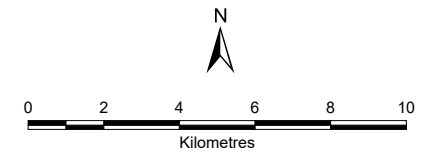


Figure 8-1
Bird and Bat Survey - Site Locations

Requested By: S. Springer	Date: 17/01/2025
Drawn By: S. costello	Size: A4L
Revised By: scostello	Revision: 0
Approved By:	Confidentiality: 0
Scale: 1:200,000	

Coordinate System: GDA 1994 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066
 Document Name: 4519OP002_MP_EN_0066.025_r0
 Fortescue accepts no liability and gives no representation or warranty, express or implied, as to the information provided including its accuracy, completeness, merchantability or fitness for purpose.





Seasonal bird and bat site utilisation surveys have been conducted over four survey events to date (October/November 2023, February/March 2024, June 2024 and August 2024) with replicated surveys planned for 2025, totalling eight seasonal bird and bat site utilisation surveys (BBSUS). Point surveys for birds were undertaken over a 30-minute period at the 14 impact sites and four control sites. Survey timing was split into five periods between pre-dawn and last light, which included two morning, one midday, and two afternoon surveys per site per survey and one in the midday period. Ultrasonic bat recorders were also deployed 1.5 metres above the ground at each impact and control site for approximately six nights. The surveys were completed over four periods per year to capture seasonal and temporal changes, including migration events and changes to species behaviour. The initial results of these surveys are outlined in Section 8.4.1.1.

Targeted bird and bat surveys have also been undertaken alongside the site utilisation surveys discussed above, over the four survey periods from 2023 to 2024 (Spectrum, 2024). Targeted bat searches were completed to locate potential roost locations and acoustic recorders were deployed to target Night Parrot. Opportunistic targeted bird surveys were completed at any suitable habitat feature (surface water pools) and incidental (roaming) bird observations were also recorded across the Survey Area. The results of the surveys are outlined in Section 8.4.1.1.

There is currently limited information on the species risk of wind energy for many parts of the world, and minimal to no data available for Western Australia, in particular the Pilbara region. Fortescue, in partnership with the Harry Butler Institute, Murdoch University (HBI) is implementing a research framework to understand potential impacts to avian-bat fauna from wind generation projects using the “Onshore wind Farm Guidance” (DCCEEW, 2024a) and IUCN’s Best practices for mitigating biodiversity impacts associated with solar and wind energy (Bennun *et al.*, 2021).

The research programme is investigating the use of movement detection technologies (radars, GPS tagging, ultrasound recorders etc) for analysis and mapping of bird and bat activity at wind turbine sites, and the potential for early detection/monitoring of high-risk species. This information will support the development of a Bird and Bat Adaptive Management Plan (BBAMP). Using data from the movement detection technologies and the BBSUS, collision risk modelling will be developed to inform in first instance the avoidance strategies and inform/design to understand mitigation options. Lastly, the research will investigate potential cascading ecosystem effects, including from artificial light at night, and long-term mortality monitoring and the response of scavengers and introduced predators.

8.3.3 Short-Range Endemic Terrestrial Invertebrate Survey

The Harry Butler Institute, Murdoch University (HBI) was commissioned by Fortescue to undertake the detailed short-range endemic terrestrial invertebrate (SRE) survey for the Proposal (HBI, 2025). The Study Area of this assessment extends over approximately 144,825 ha over an area larger than the DE (‘Study Area’). The objective of the survey was to define the value of the Study Area with respect to terrestrial SREs and their habitats.

The SRE assessment included a desktop review and a two-phase field survey utilising standard SRE collecting techniques (foraging, leaf litter sifting and Winkler sack litter extractions). The field survey was undertaken at 33 sites between 11–21 March and 29 April–10 May 2024. Species were identified morphologically and a representative subset of 259 specimens were identified based on molecular data (Cytochrome C oxidase subunit I (COI) barcoding gene).



The assessment was conducted in accordance with Environmental Protection Authority (EPA) guidelines and internal Fortescue guidelines.

The SRE assessment report is provided in Appendix C.

8.3.4 Limitations

No survey limitations were identified besides negligible access restrictions to heritage or third-party restricted areas. All fauna habitats were adequately sampled.

Any limitations associated with the SRE survey are reported in Appendix C (HBI, 2025).

8.4 Receiving Environment

8.4.1 Terrestrial Vertebrate Fauna

8.4.1.1 Fauna Habitats

Ecoscope (2025) mapped seven broad fauna habitats (excluding cleared areas) within the Survey Area. The majority of the identified habitats are hills/ranges/plateaux, representing 27.11% of the DE. Most of this habitat occurs within the Transmission Line area. The second most prominent habitat is plain (sand), which represents 26.39% of the DE, predominantly occurring in the Generation Hub area. The plain (boulders) habitat occurs in 24.32% of the DE, with the majority of the area occurring in the Generation Hub area. Eight percent of the DE is made up of plain (stoney/gibber). All other habitats within the DE combined make up less than 15% of the total DE (Table 8-1).

The quality of each habitat was assessed based on the level of disturbance from weeds, the extent of native vegetation, vegetation cover (density) and the context of the habitat within the surrounding landscape (Ecoscope, 2025). Fauna habitats were described as an area which is distinguishable from its surrounding area by its landform, vegetation and fauna assemblage occupying the area. In addition, its likelihood to harbour specialised fauna species which are not found in adjacent areas was taken into consideration. The following information was used to identify and map all fauna habitats within the Survey Area:

- Previous fauna habitat mapping.
- Land systems.
- Vegetation type and condition.
- Aerial imagery.
- Landforms.
- Soil characteristics.
- Fauna assemblage information.

Habitat features were also recorded within the Survey Area; however, they were at a scale too small to map. These features include caves, gorges, dense vegetation patches and



permanent/ephemeral water bodies. Their occurrence within mapped habitats is discussed further in Appendix B (Ecoscape, 2025).

Table 8-1 describes the mapped habitat types found in the DE, the significant fauna likely to be associated with each habitat and the extent of each habitat type in the DE. The Fauna habitat mapping is displayed on Figure 8-2.



Table 8-1: Fauna Habitats in the DE and BC Act Listed Fauna Associations (Ecoscape, 2025)

Habitat / Description	Significant Fauna association with Habitat ⁶	Area within the Generation Hub (ha)	Area within the Transmission Line (ha)	Total within DE (ha)	Proportion within DE (%)
<p>Drainage line/river/creek (major) Areas of drainage consisting of multiple braided channels or broad individual channels. Vegetation consists of mixed shrubs, hummock grasses, reeds and Buffel grass (*<i>Cenchrus ciliaris</i>) with dispersed areas of dense-scattered trees (<i>Eucalyptus</i> spp., <i>Corymbia</i> spp. and <i>Melaleuca</i> spp.). Ephemeral pools are expected to form after suitably heavy rainfall in both depressions in exposed bedrock and sandy creek beds. Major drainage lines typically consist of deposited medium grained soils (sand). Litter cover ranged from absent (drainage channel) to abundant (near the banks).</p> <p>Disturbance: Low - High</p>	<p>Habitat critical:</p> <ul style="list-style-type: none"> • Grey Falcon – VU (nesting and foraging) • Pilbara Olive Python – VU (dispersal and foraging) • Pilbara Leaf-nosed Bat (PLNB) – VU (foraging) • Ghost Bat – VU (foraging) <p>Supporting habitat:</p> <ul style="list-style-type: none"> • Northern quoll – EN (dispersal) • Greater Bilby – VU (dispersal) • Peregrine Falcon – OS (foraging) • Migratory Shorebirds (dispersal, foraging) 	3,528.93	2,623.42	6,152.35	6.23%
<p>Drainage line/river/creek (minor) Areas of drainage consisting of narrow individual channels or areas where water flow is evident, however, fully formed channels are absent. Vegetation features include scattered <i>Eucalyptus</i> spp., <i>Corymbia</i> spp trees over mixed shrubs, hummock grasses and Buffel grass (*<i>Cenchrus ciliaris</i>). Beds</p>	<p>Supporting habitat:</p> <ul style="list-style-type: none"> • Greater Bilby – VU (dispersal) • Grey Falcon - VU (foraging) • PLNB – VU (foraging) • Ghost Bat – VU (foraging) • Peregrine Falcon – OS (foraging) 	4,206.31	1,497.02	5,703.33	5.77%

⁶ Note the following conservation abbreviations are used: Vulnerable (VU), Endangered (EN), Other Specially Protected (OS), Critically Endangered (CR), Priority 4 (P4) and Priority 1 (P1).



Habitat / Description	Significant Fauna association with Habitat ⁶	Area within the Generation Hub (ha)	Area within the Transmission Line (ha)	Total within DE (ha)	Proportion within DE (%)
<p>typically consist of bedrock or exposed rocks and deposited sands. Water retention in little rock pools is evident in some areas. Litter cover is variable (low to abundant).</p> <p>Disturbance: Low - High</p>					
<p>Plain (stony/gibber)</p> <p>Habitat characterised as flat plains with fine grain soils (clay to sandy clay) with a gravel veneer. Vegetation is generally sparse with a very sparse mid story of mixed shrubs (dominated by <i>Acacia</i> spp.) over variable densities of hummock grassland (<i>Triodia</i> spp.). Habitat typically used by species that burrow or utilise the <i>Triodia</i> spp. hummocks as refuges.</p> <p>Disturbance: Low - High</p>	<p>Habitat critical:</p> <ul style="list-style-type: none"> Greater Bilby – VU <p>Supporting habitat:</p> <ul style="list-style-type: none"> Western Pebble-mound Mouse – P4 (construct mounds, foraging, dispersal) Gane’s Blind Snake – P1 (shelter, foraging, dispersal) Grey Falcon – VU (foraging) PLNB – VU (foraging) Ghost Bat – VU (foraging) Peregrine Falcon – OS (foraging) 	-	8,045.51	8,045.51	8.15%
<p>Plain (boulders)</p> <p>Habitat characterised as flat sandy plains or lower slopes with extensive granitic outcropping and boulder piles. The vegetation recorded from this habitat consisted of hummock (<i>Triodia</i> spp.) grassland with scattered shrubs (<i>Acacia</i> and <i>Grevillea</i> spp.) and scattered trees</p>	<p>Habitat critical:</p> <ul style="list-style-type: none"> Northern Quoll – EN (denning and shelter), with critical supporting habitat within 1km of this critical habitat Greater Bilby – VU 	22,502.93	1,520.96	24,023.89	24.32%



Habitat / Description	Significant Fauna association with Habitat ⁶	Area within the Generation Hub (ha)	Area within the Transmission Line (ha)	Total within DE (ha)	Proportion within DE (%)
<p>(<i>Corymbia</i> spp.). Litter cover is variable (low to abundant). Habitat features include a mix of sand plain (suitable burrowing substrate and <i>Triodia</i> hummocks) and rocky areas that may form suitable crevices.</p> <p>Disturbance: varying Low - High</p>	<p>Supporting habitat:</p> <ul style="list-style-type: none"> • PLNB – VU (foraging) • Ghost Bat – VU (foraging) • Brush-tailed Mulgara – P4 (shelter, foraging, dispersal) • Spectacled Hare-wallaby – P4 (shelter, foraging, dispersal) • Grey Falcon – VU (foraging) • Peregrine Falcon – OS (foraging) 				
<p>Plain (sand)</p> <p>Hummock grassland (<i>Triodia</i> spp.) on fine to medium grained red soil (clay to sand) with scattered trees and shrubs. Occasional open shrubland found growing over hummock grassland (<i>Triodia</i> spp.). Litter cover is variable (low to abundant).</p> <p>Disturbance: Low - High</p>	<p>Habitat critical:</p> <ul style="list-style-type: none"> • Greater Bilby – VU <p>Supporting habitat:</p> <ul style="list-style-type: none"> • Brush-tailed Mulgara – P4 (shelter, foraging, dispersal) • Spectacled Hare-Wallaby – P4 (shelter, foraging, dispersal) • Grey Falcon – VU (foraging) • PLNB – VU (foraging) • Ghost Bat – VU (foraging) • Peregrine Falcon – OS (foraging) 	24,053.56	2,008.94	26,062.50	26.39%
<p>Hills/ranges/plateaux</p> <p>Habitats consisting of rocky crests, hills and outcropping (Granitic, Basalt or Banded Ironstone) with associated scree slopes. Vegetation includes scattered</p>	<p>Habitat critical:</p> <ul style="list-style-type: none"> • Pilbara Olive Python – VU (foraging, dispersal and shelter) • Northern Quoll – EN (denning, shelter and foraging), with critical 	5,236.68	21,543.50	26,780.18	27.11%



Habitat / Description	Significant Fauna association with Habitat ⁶	Area within the Generation Hub (ha)	Area within the Transmission Line (ha)	Total within DE (ha)	Proportion within DE (%)
<p><i>Eucalyptus</i> trees with a very sparse mid story of mixed shrubs (dominated by <i>Acacia</i> spp.) over variable densities of hummock grassland (<i>Triodia</i> spp.). Habitat typically used by species that utilise rocky crevices and/or the <i>Triodia</i> spp. hummocks as refuges.</p> <p>Disturbance: Low</p>	<p>supporting habitat within 1km of this critical habitat</p> <p>Supporting habitat:</p> <ul style="list-style-type: none"> • Western Pebble-mound mouse – P4 (construct mounds, foraging, dispersal) • Long-tailed Dunnart – P4 (shelter, foraging, dispersal) • Gane’s Blind Snake – P1 (shelter, foraging, dispersal) • Grey Falcon – VU (foraging) • PLNB – VU (foraging) • Ghost Bat – VU (foraging) • Peregrine Falcon – OS (foraging) 				
<p>Rocky escarpments/ridges/mesa</p> <p>Rocky escarpments characterised by large rock outcrops, cliffs, ridges, crests, or a mesa. Vegetation was primarily hummock grasses (<i>Triodia</i> spp.) around the base with the occasional tree or shrub. Litter cover is variable (low to abundant). Clayey sands - rocky soils limit suitability for burrowing.</p> <p>Disturbance: Low</p>	<p>Habitat critical:</p> <ul style="list-style-type: none"> • Northern Quoll – EN (denning, shelter and foraging), with critical supporting habitat within 1km of this critical habitat • Ghost Bat – VU (roosting) • Pilbara Olive Python – VU (denning, shelter) • Peregrine Falcon – OS (nesting and foraging) • PLNB – VU (roosting) <p>Supporting habitat:</p>	226.26	1,690.48	1,916.74	1.94%

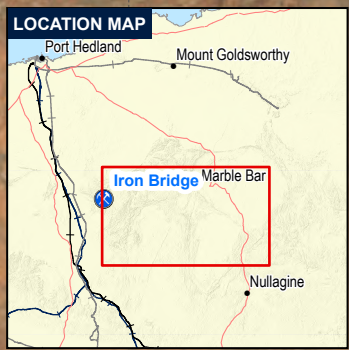
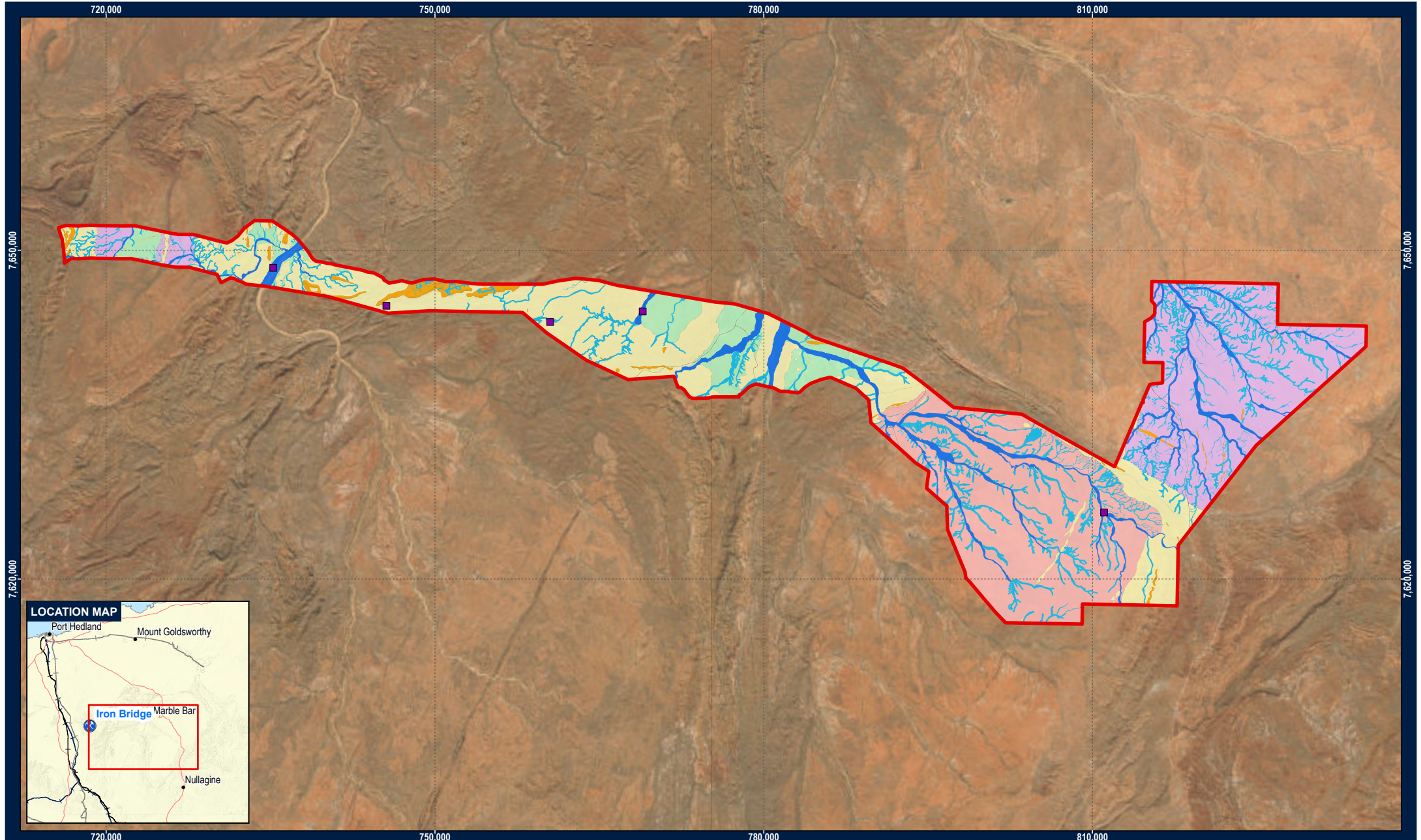


Habitat / Description	Significant Fauna association with Habitat ⁶	Area within the Generation Hub (ha)	Area within the Transmission Line (ha)	Total within DE (ha)	Proportion within DE (%)
	<ul style="list-style-type: none"> Western Pebble-mound Mouse – P4 (construct mounds, foraging, dispersal) Long-tailed Dunnart – P4 (shelter, foraging, dispersal) Gane’s Blind Snake – P1 (shelter, foraging, dispersal) Grey Falcon – VU (foraging) 				
Cleared Areas that have been cleared and do not contain intact vegetation. These areas generally considered to provide no habitat value for fauna.	-	27.88	60.22	88.10	0.09%
Total		59,782.55	38,990.05	98,772.60	100.00%

Note: Due to rounding issues attributed to the size of the DE and the diversity of habitat areas present in the region, the total area of the habitat mapping (98,772.60) is slightly different from the total area of vegetation mapped the DE (98,772.61) reported in Chapter 7 (Flora and Vegetation).

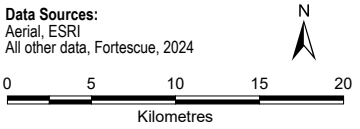


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Legend

- Development Envelope
- Mapped Fauna Habitat Features**
- Waterbody
- Fauna Habitat**
- Cleared
- Drainage line/river/creek (major)
- Drainage line/river/creek (minor)
- Hills/ranges/plateaux
- Plain (boulders)
- Plain (sand)
- Plain (stony/gibber)
- Rocky escarpments/ridges/mesa



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostello
 Approved By:
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Figure 8-2
Fauna habitats within the Development Envelope





8.4.1.2 Fauna Species

The detailed vertebrate fauna assessment completed by Ecoscape (2025) determined the likelihood of occurrence of each species in the DE and surrounding area. In addition to the species recorded during the field surveys and the previously recorded species (desktop study), the likelihood of occurrence assessment also considered the known distribution of species' habitat, habitat preferences for each species and the proximity of known records. Table 8-2 shows the likelihood of occurrence criteria (Ecoscape, 2025).

Table 8-2: Likelihood of Occurrence Criteria

Criteria	Description
Recorded	Species recorded within the Survey Area within the previous 25 years.
High	Species recorded within the Survey Area, more than 25 years ago, or Species recorded within 10 km of the Survey Area and suitable habitat occurs in the Survey Area.
Medium	Species recorded more than 10km, but within 40 km of the Survey Area and suitable habitat occurs.
Low	Species rarely or not recorded within 50 km of the Survey Area and suitable habitat occurs within the Survey Area, or, Species has been recorded within 50 km, however suitable habitat doesn't occur in the Survey Area.
Very Low	Species not recorded within 50 km despite multiple recent surveys. Suitable habitat does not occur within the Survey Area.

Note: The species' biology, detectability and frequency of records are considered in the likelihood assessment (e.g. an elusive species that is very rarely recorded may be rated more likely to occur than a species that is easily detectable).

The detailed vertebrate fauna assessment conducted by Ecoscape (2025) identified 26 conservation significant fauna species recorded within 30 km of the DE. Based on the previous records from the survey area (as defined in Ecoscape, 2025) and the likelihood of occurrence assessment (Ecoscape, 2025), the following conservation significant species were recorded, or allocated a high or medium likelihood of occurrence within the DE.

Recorded within the DE:

- Northern Quoll (*Dasyurus hallucatus*) – Endangered under the BC Act and the EPBC Act.
- Greater Bilby, Dalgyte (*Macrotis lagotis*) – Vulnerable under the BC Act and EPBC Act.
- Grey Falcon (*Falco hypoleucos*) – Vulnerable under the BC Act and EPBC Act.
- Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia* Pilbara form) – Vulnerable under the BC Act and the EPBC Act.
- Pilbara Olive Python (*Liasis olivaceous barroni*) – Vulnerable under the BC Act and EPBC Act.
- Oriental Pratincole (*Glareola maldivarum*) – Migratory under the BC Act and EPBC Act.
- Western Pebble-mound Mouse (*Pseudomys chapmani*) – Priority 4 listed by DBCA.



- Brush-tailed Mulgara (*Dasycercus blythi*) – Priority 4 listed by DBCA.
- Peregrine Falcon (*Falco peregrinus*) – Other specially protected fauna by DBCA.

High likelihood of occurrence within the DE:

- Ghost Bat (*Macroderma gigas*) – Vulnerable under the BC Act and EPBC Act.
- Pacific Swift (*Apus pacificus*) – Migratory under the BC Act and EPBC Act.
- Gane's Blind Snake (*Anilius ganei*) – Priority 1 listed by DBCA.
- Long-tailed Dunnart (*Antechinomys longicaudata*) – Priority 4 listed by DBCA.
- Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*) – Priority 4 listed by DBCA.

Medium likelihood of occurrence within the DE:

- Night Parrot (*Pezoporus occidentalis*) – Critically Endangered under the BC Act and Endangered under the EPBC Act.
- Common Greenshank (*Tringa nebularia*) – Migratory under the BC Act and Endangered and Migratory under the EPBC Act.
- Common Sandpiper (*Actitis hypoleucos*) – Migratory under the BC Act and EPBC Act.
- Sharp-tailed Sandpiper (*Calidris acuminata*) – Migratory under the BC Act and Vulnerable and Migratory under the EPBC Act.
- Oriental Plover (*Charadrius veredus*) – Migratory under the BC Act and EPBC Act.
- Wood Sandpiper (*Tringa glareola*) – Migratory under the BC Act and EPBC Act.
- Short-tailed Mouse (*Leggadina lakedownensis*) – Priority 4 under the BC Act.

Bird and Bat Site Utilisation surveys (Spectrum, 2024)

The initial results of the bird and bat site utilisation surveys (BBSUS) undertaken for the Proposal are outlined in Table 8-3.



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Table 8-3: Initial Bird and Bat Utilisation Survey Results

Survey Date	Survey Effort	Results
30 October – 6 November 2023	<p>Bird</p> <ul style="list-style-type: none"> Conducted five 30-minute point surveys at each impact and control site Completed targeted bird searches at five locations <p>Bat</p> <ul style="list-style-type: none"> Installed bat recorders at each impact and control site, in rocky hills habitat (near potential caves) and at a permanent water source. Moved impact sites I3 and I4 into rocky habitat as requested by Fortescue. 	<p>Bird</p> <ul style="list-style-type: none"> Recorded 62 species of birds from the impact sites within the Survey Area. Puddles found on the side of Marble Bar Road, outside the DE – approximately 15 km from the north-western corner. They recorded three shorebird species: <ul style="list-style-type: none"> Sharp-tailed Sandpiper (EPBC Act & BC Act: Migratory), Common Sandpiper (EPBC Act & BC Act: Migratory), and Wood Sandpiper (EPBC Act & BC Act: Migratory). <p>Bat</p> <ul style="list-style-type: none"> Recorded PLNB multiple times. Located some potential caves near the relocated sites I3 and I4, with these areas then further targeted in future surveys for bats.
26 February – 4 March 2024	<p>Bird</p> <ul style="list-style-type: none"> Conducted five 30-minute point surveys at each impact and control site except I9 & I10. Sites I9 & I10 only had four 30-minute surveys completed due to a severe storm on the afternoon of 3/3. Deployed six acoustic recorders targeting the Night Parrot. Deployed ten motion cameras to observe predator species present. Completed two opportunistic bird searches at two locations. <p>Bat</p> <ul style="list-style-type: none"> Installed bat recorders at each impact and control site, and in rocky hills habitat (near potential caves). 	<p>Bird</p> <ul style="list-style-type: none"> Recorded 47 species of birds from the impact sites within the Survey Area. Recorded 45 species of birds from the control sites within the Survey Area. Two significant species were recorded during the survey: <ul style="list-style-type: none"> Grey Falcon (EPBC Act & BC Act: Vulnerable) - a pair was sighted approximately 500 m outside of the Survey Area and then again inside the Survey Area (192827e, 7640048n, Zone 51k), and Oriental Pratincole (EPBC Act & BC Act: Migratory) - one individual was sighted approximately 360 m north of site EPGH I2 on the Marble Bar Road (196588e, 7631161e, Zone 51k). <p>Bat</p>



Survey Date	Survey Effort	Results
		<ul style="list-style-type: none"> Recorded PLNB multiple times.
17 – 24 June 2024	<p>Bird</p> <ul style="list-style-type: none"> Conducted five 30-minute point surveys at each impact and control site. Deployed six acoustic recorders targeting the Night Parrot. Completed two opportunistic bird searches at two locations. <p>Bat</p> <ul style="list-style-type: none"> Installed bat recorders at each impact and control site, and in rocky hills habitat (near potential caves). 	<p>Bird</p> <ul style="list-style-type: none"> Recorded 55 species of birds from the impact sites within the Survey Area. Recorded 43 species of birds from the control sites within the Survey Area. No significant species were recorded during the survey. <p>Bat</p> <ul style="list-style-type: none"> No significant species were recorded during the survey.
12 – 19 August 2024	<p>Bird</p> <ul style="list-style-type: none"> Conducted five 30-minute point surveys at each impact and control site. Deployed six acoustic recorders targeting the Night Parrot. Deployed nine motion cameras targeting Feral Predators. Completed four opportunistic bird searches at four locations. <p>Bat</p> <ul style="list-style-type: none"> Installed bat recorders at each impact and control site, and in rocky hills habitat (near potential caves). 	<p>Bird</p> <ul style="list-style-type: none"> Recorded 53 species of birds from the impact sites within the Survey Area. Recorded 39 species of birds from the control sites within the Survey Area. Two significant species were recorded during the survey: <ul style="list-style-type: none"> Two Grey Falcon (VU) at 192661e, 7637240n, Zone 51k). One Northern Quoll (EN) detected on a motion camera (192469e, 7629301n, Zone 51k). <p>Bat</p> <ul style="list-style-type: none"> No significant bat species were recorded during the survey.



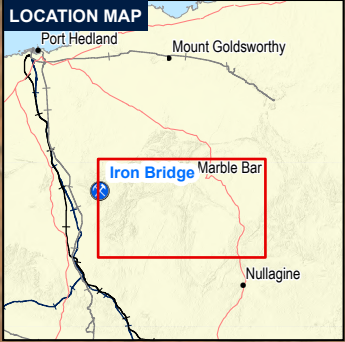
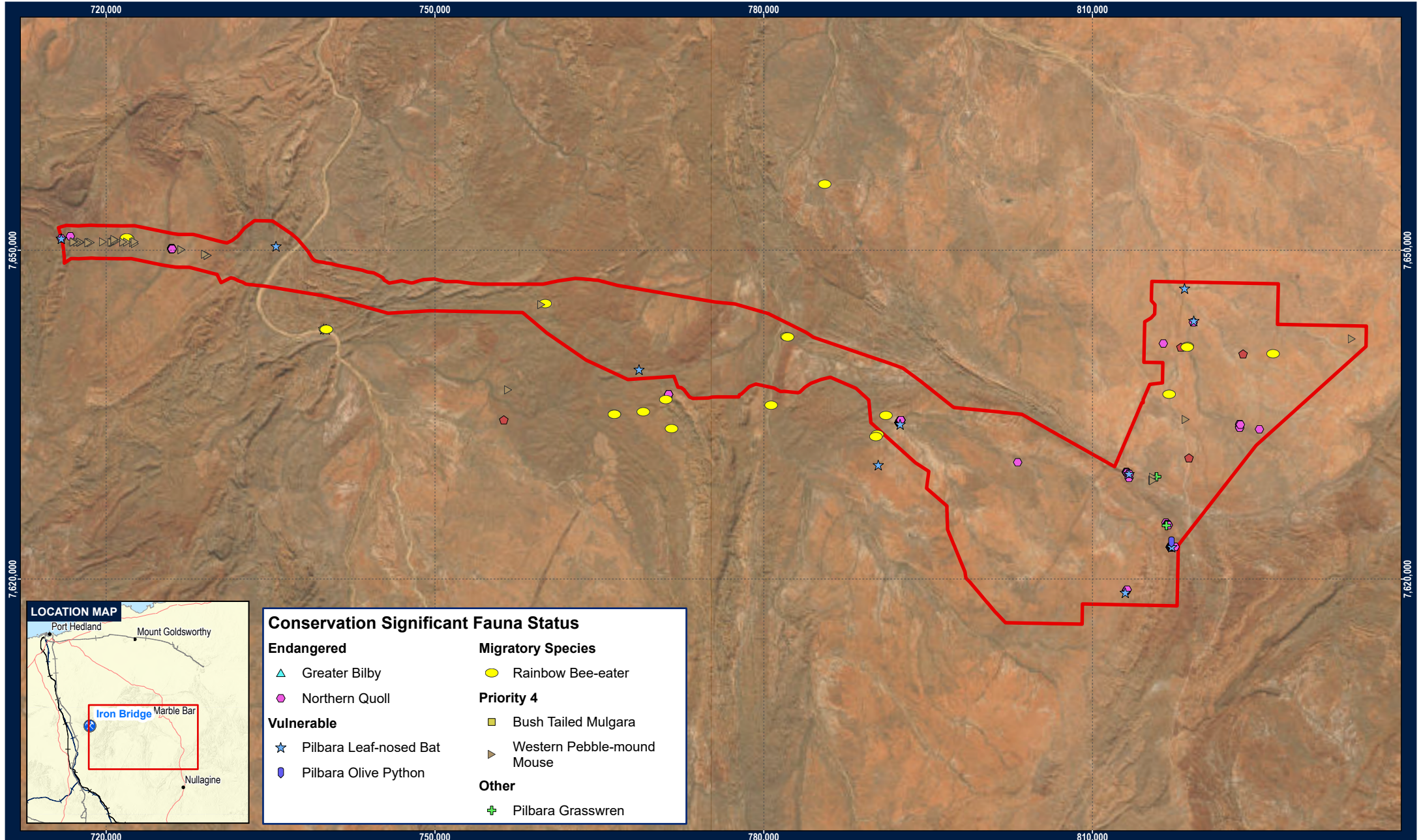
8.4.2 Conservation Significant Fauna

8.4.2.1 Threatened Fauna

Threatened fauna are protected under the BC Act and/or the EPBC Act. These species are legislatively protected and are allocated a conservation status ranging from Critically Endangered to Vulnerable. Threatened fauna recorded during the Ecoscape (2025) survey that are protected under the BC Act, along with those identified as having 'High' or 'Medium' likelihood of occurrence within the DE are discussed in this section. Further information about these species, including species presence, is discussed in the context of potential habitat within the DE. Records of conservation significant fauna species within, or in close proximity to the DE are shown on Figure 8-3.

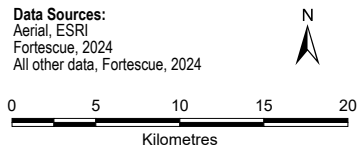


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Conservation Significant Fauna Status	
Endangered	Migratory Species
▲ Greater Bilby	● Rainbow Bee-eater
● Northern Quoll	Priority 4
Vulnerable	■ Bush Tailed Mulgara
★ Pilbara Leaf-nosed Bat	▶ Western Pebble-mound Mouse
◆ Pilbara Olive Python	Other
	✚ Pilbara Grasswren

Legend
 Development Envelope



Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostello
 Approved By:
 Scale: 1:450,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066
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Figure 8-3
Conservation Significant Fauna Records





Northern Quoll (*Dasyurus hallucatus*) - Recorded

Species background information

The Northern Quoll is a small omnivorous marsupial, predominantly nocturnal and solitary. The species is characterised by white spots on a reddish-brown coat, a long tail, and a pointy snout. The Northern Quoll is the smallest of the four Australian quolls and is listed as Endangered under the BC Act and Endangered under the EPBC Act (TSSC, 2005).

Abundance & distribution

At the time of European settlement, the species was widely distributed across northern Australia, but its range has significantly declined over the past century, particularly in lowland areas and/or the semi-arid inland fringes of its range (Hill & Ward, 2010). The species' current distribution is discontinuous across northern Australia, with populations in the Pilbara, Kimberley, parts of the Northern Territory and near-coastal Queensland (AWC, 2024). The species naturally occur on at least 32 islands, many of which are free from human disturbance and lack of introduced predators, mostly of the Northern Territory and Kimberley (Moore *et al.*, 2021). Within the Pilbara, the species is mostly found within ironstone formations, some river systems and the Burrup Peninsula and adjacent offshore islands. In this region, recently burnt areas had been negatively associated with the presence of northern quoll (Hernandez-Santin *et al.*, 2016). Females maintain territory ranges of approximately 35 ha with males estimated to range over 150 ha (TSSC, 2005).

While there is no historical data on abundance, the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' identifies several important populations for this species, including populations in the Pilbara, where the Proposal is located due to the lack of Cane Toads (Hill & Ward, 2010). Therefore, the population recorded within the DE is considered an important population.

Habitat preferences

Northern Quolls occur in a variety of habitats across their range as they do not have highly specific habitat requirements (Hill & Ward, 2010). The species' preferred habitat includes rugged and rocky landscapes, including rocky hills, rocky creek lines, gorges, patches of granite outcrops and boulder-strewn slopes, but can also be found in tropical and monsoonal rainforest, lowland savanna, vine thickets, on beaches and amongst human settlements (Moore *et al.*, 2021). They are most abundant in rocky habitats, due to the availability of shelters/dens and the presence of food resources and permanent water (Moore *et al.*, 2021). Specifically in the Pilbara, rocky dens act as thermal refuges and a refuge from predators since feral cats and dingoes are less likely to occur in rugged, rocky habitats (Hernandez-Santin *et al.*, 2016).

The species uses a range of micro-habitats for foraging and denning such as gorges, breakaways and hills. It also occurs near creeks and drainage lines, where adjacent plains and vegetated areas provide habitat for foraging and the dispersal of young. The dens are often made in rock crevices, tree holes, or occasionally termite mounds (van Dyck & Strahan, 2008).



Threats

According to the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' (Hill & Ward, 2010), the main threat to Northern Quolls is cane toads, due to lethal toxic ingestion. However, Northern Quolls have also declined from larger areas in WA where cane toads have not yet reached, such as the Pilbara region. Other key threats include predation by feral animals, especially feral cats, since the species have had limited opportunity to evolutionary adapt to this predator. Dingoes, on the other hand, are considered a threat only when associated with other factors, such as fire regimes (Moore *et al.*, 2021). Other threats include grazing by feral and managed livestock, habitat clearing, and fragmentation, mining and vehicle strikes (Moore *et al.*, 2021).

Known populations in the vicinity of the DE and broader region

During the field survey, multiple records through motion cameras, tracks or scats occurred within the DE. Spot pattern analysis suggests that at least 18 individuals occur within the area, which configures a high-density population, important for long-term survival of the species (Ecoscape, 2025). As shown Figure 8-4, this species was recorded on almost all fauna habitats within the DE, except Plain (stony/gibber), Drainages line/river/creeks minor and cleared areas (Ecoscape, 2025).

According to the DBCA database, there are 2,236 records of the species within 40 km of the DE, recorded between 1958 to 2024. Between 2011 to 2019, there are 19 known records within, or adjacent to the DE.

Species habitat extent, quality and importance

The Northern Quoll's Recovery Plan (Hill & Ward, 2010) defines habitat critical to the survival of the species as rocky areas and offshore islands (predominately of the Northern Territory and Western Australia). The diverse and dispersed nature of rocky areas makes them difficult to map on a national scale, with the Recovery Plan (Hill & Ward, 2010) not defining the location of the rocky areas. Therefore, rocky areas within the species' distribution are considered critical habitat.

Based on the EPBC Act referral guideline for the Northern Quoll (DoE, 2016) areas within 1 km of habitat critical for the survival of the Northern Quoll is considered 'critical supporting' habitat for foraging and dispersal. Therefore a 1 km buffer on the following habitats within the northern portion of the DE are considered critical supporting habitat:

- Plain (boulders).
- Rocky escarpments (ridges/mesa/cliffs/outcrops/breakaways).
- Hills/ranges/plateaux.

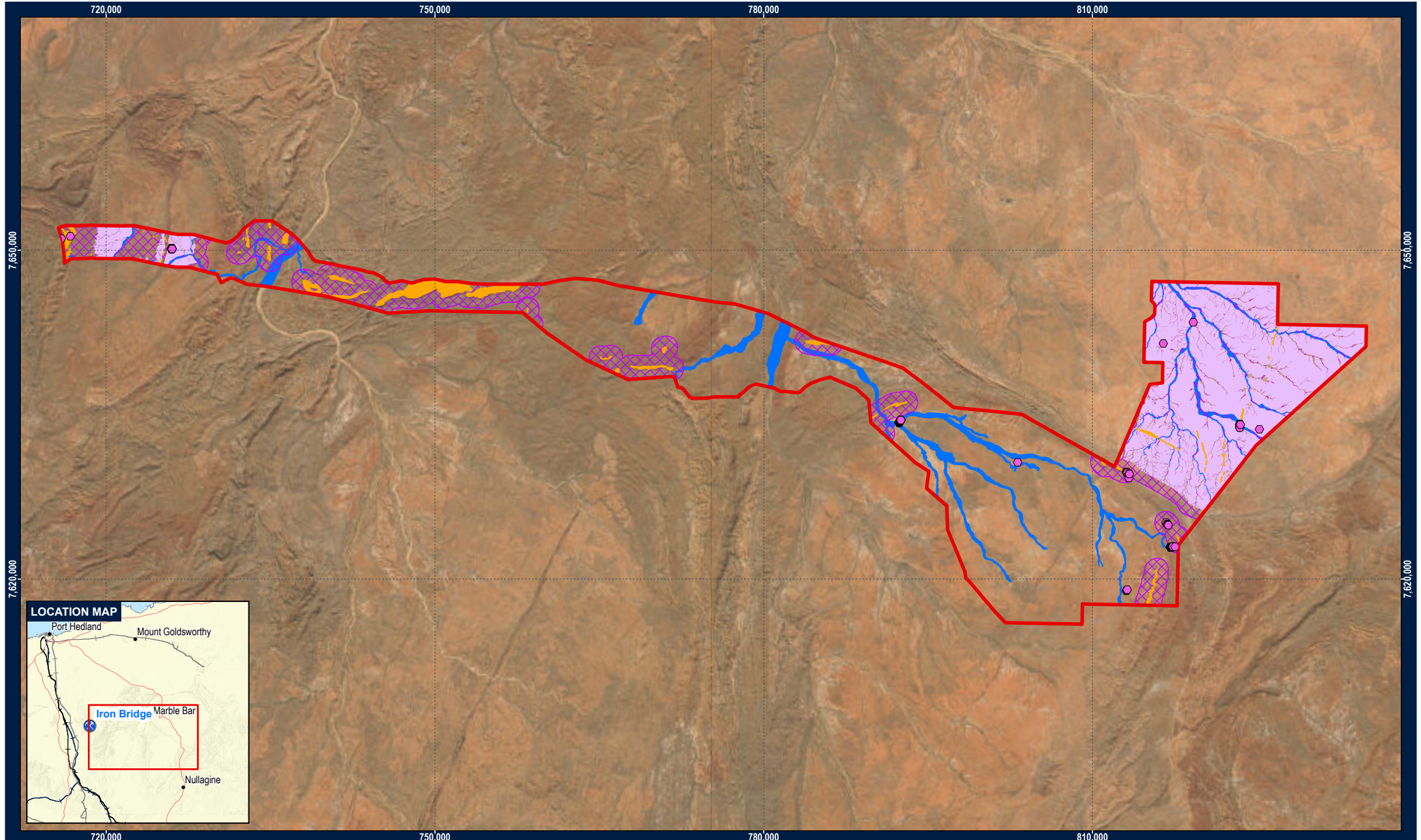
Within the DE, the species likely use the rocky escarpments/ridges/mesa and the hills/ranges/plateaux habitats for denning, shelter, and foraging. The species may also use the plain (boulders) habitat for denning and shelter, in areas where granite boulders have formed small cavities. These habitats are considered critical to the survival of the Northern Quoll. Northern Quolls may also use drainage lines/rivers/creeks (major) habitat for dispersal. The extent of potential Northern Quoll habitat types present in the DE is shown in Table 8-4 and Figure 8-4.



Table 8-4: Northern Quoll Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Rocky escarpments/ridges/mesa	Critical habitat (denning, shelter and foraging)	1,916.74
Hills/ranges/plateaux	Critical habitat (denning, shelter and foraging)	26,780.18
Plain (boulders)	Critical habitat (denning and shelter)	24,023.89
1 km buffer around Rocky escarpments/ ridges/mesa; Hills/ranges/plateaux; and Plain (boulders) – critical supporting habitat	Critical supporting habitat (foraging and dispersal)	19,533.61
Drainage lines/rivers/creeks (major)	Supporting habitat (dispersal)	6,152.35

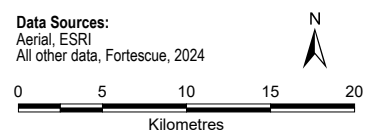
The rocky escarpment/ridges/mesa habitat and the hills/ranges/plateaux habitat were reported as having 'Low' disturbance levels (Ecoscape, 2025). Therefore, these habitats are considered to be of 'High' quality. The plains (boulders) habitat was reported as 'Low-High' disturbance level (Ecoscape, 2025). This habitat will therefore be considered to be of 'Medium' quality. The drainage lines/rivers/creeks (major) habitat was reported as 'Low-High' disturbance level (Ecoscape, 2025). Therefore, this habitat is considered to be 'Medium' quality. Due to the extent and connectivity of these habitats and the number of records within them, it is likely that these habitats support stable populations (Ecoscape, 2025).



- Legend**
- Northern Quoll
 - Development Envelope

- Critical Fauna Habitat**
- Plain (boulders)
 - Rocky escarpments/ridges/mesa
 - Critical Supporting Northern Quoll Habitat (1km from Critical Habitat)

- Supporting Fauna Habitat**
- Drainage line/river/creek (major)



Requested By: S. Springer
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 Revised By: scostello
 Approved By:
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Figure 8-4
Northern Quoll - Critical Habitat and Records





Greater Bilby (*Macrotis lagotis*) - Recorded

The Greater Bilby (herein referred to as the 'Bilby') is the only remaining member of the Genus *Macrotis* and the sole surviving representative of the Family Thylacomyidae. The species is omnivorous and often digs for food, disturbing the soil to a depth of 250 mm (DCCEEW, 2023a).

The Bilby is a medium-sized burrowing marsupial with blue-grey fur over most of its body but white to cream fur on its underside. It has large ears, a long, pointed snout with slit-like nostrils and a crested tail. The species is of high spiritual importance to indigenous people across its present and former range, as it is incorporated into their cultural stories, beliefs, and laws. The Bilby is listed as Vulnerable under the EPBC Act and the BC Act (DCCEEW, 2023a).

Abundance & Distribution

The Bilby once occupied almost 70% of the Australian mainland. However, the range of the species has been significantly reduced by more than 80%, contracting into the drier and less fertile areas of its former range (DCCEEW, 2023a). Currently, wild populations are now only found in the Northern Territory (NT), central and northern WA, and in small, isolated populations in Queensland (QLD) (DCCEEW, 2023a). The Bilby's distribution is limited by the availability of soils suitable for burrowing, such as sandy areas where burrowing is easier. More than 70% of the distribution of wild populations of the Bilby are found on indigenous lands and managed by indigenous people (DCCEEW, 2023a).

Bilbies are highly mobile and can move up to 5 km between burrows. Individuals have been recorded using up to 18 burrows concurrently over several months and constructing, on average, a new burrow every two and a half weeks (DCCEEW, 2023a).

The Recovery Plan for the species (DCCEEW, 2023a) notes that the species is considered a single population even though fragmentation and isolation may have resulted in local adaptation. The Greater Bilby now largely occurs as small groups (often referred to as populations) which are fragments of the former distribution across which gene flow occurred. The species is managed as a 'metapopulation' as this is likely to maximise the conservation outcomes for the species (DCCEEW, 2023a). Due to this management approach, the concept of 'important populations' is considered not relevant to the overall conservation of the species, however it is noted that all groups of the Greater Bilby are under threat and considered important (DCCEEW, 2023a).

Habitat preferences

Overall habitat preference of the Bilby is open tussock grasslands on uplands and hills, *Acacia aneura* (mulga) woodland/shrubland growing on ridges and rises, and hummock grasslands in plains and alluvial areas (TSSC, 2016a). In the north of WA, Bilbies can be found in woodlands (<10 m) with *Eucalypt* and *Acacia* spp., on coarse sand to light medium clay, Pindan woodlands with hummock and tussock grass; low shrub cover of *Acacia* spp. over hummock and tussock grasses, on sandy soils, loams and red earth; spinifex grasslands with low shrub cover of *Acacia* and *Melaleuca* spp. on sandy and sandy loam soils (DCCEEW, 2023a).



Threats

According to the Recovery Plan for the Bilby (*Macrotis lagotis*) (DCCEEW, 2023a), the key threats to the Bilby are predation by foxes and feral cats, habitat loss and degradation (via the introduction of weeds or grazing by domestic and other introduced species), habitat fragmentation, roadkill, unmanaged fire and inappropriate fire regimes, and loss of traditional owner knowledge and land management.

Known populations in the vicinity of the DE and broader region

Bilby evidence (individuals on motion camera and/or secondary evidence) was recorded 28 times during the field survey, most within the Generation Hub area (Ecoscape, 2025). As shown in Figure 8-5, all Bilby evidence was recorded within the plain (sand or boulder) habitat and the drainage lines/rivers/creeks (minor and major) habitats.

According to the DBCA database, there are 293 records within 40 km of the DE, with most of them (242 records) dating from 2013 to 2023. The area within 3 km of the DE has 10 previous records, while the DE itself has 6 previous records in the DBCA database. In these areas, two records were documented in 2023 for each.

The Bilby recordings during the field survey may indicate a new population of the species and the Bilby is considered a permanent resident of the survey area (Ecoscape, 2025).

Species habitat extent, quality and importance

Critical habitat for the Bilby is defined within the species' Recovery Plan (DCCEEW, 2023a) as:

- Any areas where the species is known or likely to occur as shown on the distribution map (Figure 2 in DCCEEW, 2023a).
- Any location outside the known or likely distribution where bilbies are found.
- Any area, between the areas noted above, that may be periodically occupied by bilbies.
- Any area which bilbies may naturally colonise or may be feasibly reintroduced.

Therefore, the areas where the Bilby was recorded during the field survey are habitat critical to the survival of the species (Ecoscape, 2025).

The Bilby individuals within the DE are likely to use the plain (sand), plain (boulder) and plain (stony/gibber) habitats for burrowing/shelter and foraging. The drainage lines/rivers/creeks (major and minor) habitats are potentially used for dispersal. The extent of potential Greater Bilby habitat types present in the DE is shown in Table 8-5 and Figure 8-5.

Table 8-5: Greater Bilby Habitat Types in the Development Envelope

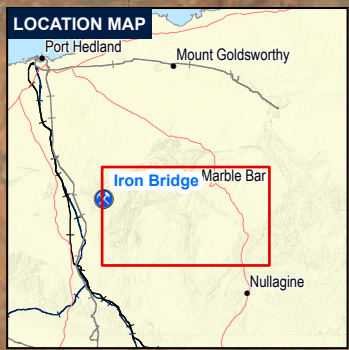
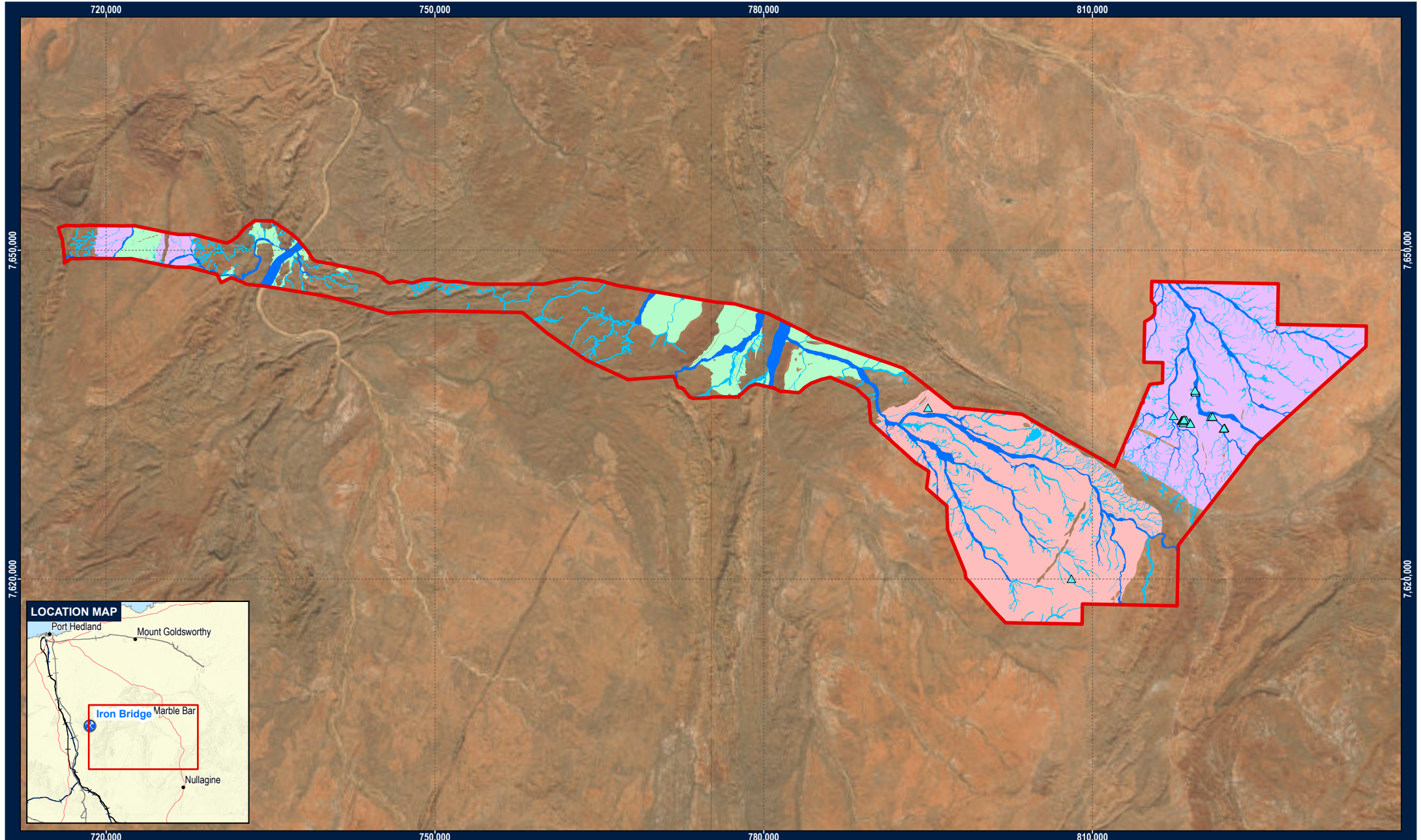
Habitat type	Habitat importance	Extent in DE (ha)
Plain (stony/gibber)	Critical habitat	8,045.51
Plain (boulders)	Critical habitat	24,023.89
Plain (sand)	Critical habitat	26,062.50



Habitat type	Habitat importance	Extent in DE (ha)
Drainage lines/rivers/creeks (major)	Critical habitat (dispersal)	6,152.35
Drainage lines/rivers/creeks (minor)	Critical habitat (dispersal)	5,703.33

The species was recorded within the plain (sand or boulder) habitats and the drainage lines/rivers/creeks (minor or major) habitats. The species was not recorded within the plain (stony/gibber) habitat; however, based on the species' habitat preferences, it is likely the species would also use this habitat. These habitats are therefore considered critical to the survival of the Bilby.

The disturbance levels of these habitats were recorded as 'Low-High' (Ecoscape, 2025). Therefore, these habitats are considered to be of 'Medium' quality.



Legend

- ▲ Greater Bilby
- ▭ Development Envelope

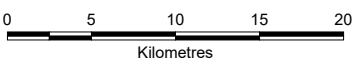
Critical Fauna Habitat

- ▭ Plain (boulders)
- ▭ Plain (sand)
- ▭ Plain (stony/gibber)

Supporting Fauna Habitat

- ▭ Drainage line/river/creek (major)
- ▭ Drainage line/river/creek (minor)

Data Sources:
 Aerial, ESRI
 All other data, Fortescue, 2024



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 Drawn By: S. Bowyer
 Revised By: scostello
 Approved By:
 Scale: 1:450,000
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Figure 8-5
Greater Bilby - Critical Habitat and Records





Grey Falcon (*Falco hypoleucos*) - Recorded

Species background information

The Grey Falcon is the rarest of the falcon species found in Australia and consists of a single population (TSSC, 2020). The species primarily preys on birds, reptiles, and mammals (NSW Government, 2017). It is a medium-sized, pale falcon with a heavy, thick chest and long wings with dark tips (TSSC, 2020). The Grey Falcon is listed as Vulnerable under the EPBC Act and the BC Act (TSSC, 2020).

Abundance & distribution

The Grey Falcon's distribution is restricted largely to areas with the highest annual average temperatures and an average annual rainfall of less than 500 mm. The species is confined to arid and semi-arid inland Australia west or north of the Great Dividing Range from Queensland to Victoria, the northern two-thirds of South Australia, and north of latitude 26°S in WA (BirdLife International, 2024).

The estimated number of mature individuals is less than 1,000 (BirdLife International, 2024). Important populations or important sites are not listed within the Conservation Advice; however, due to the species' only being a single population, the individuals recorded within the DE are regarded as part of an important population.

Habitat preferences

Grey Falcons can be found in lightly forested and not forested lowland plains crossed by tree-lined watercourses, besides grasslands and sand dune habitats (BirdLife International, 2024). The species has been observed hunting in treeless areas and frequents tussock grassland and open woodlands, especially in winter (TSSC, 2020). During the nesting season, the species can typically be found in the tallest trees along watercourses, such as river red gums (*Eucalyptus camaldulensis*), but is also known to nest in communication towers (TSSC, 2020).

The Grey Falcon is a specialist predator of birds, particularly parrots and pigeons. Individuals typically catch their prey during an aerial pursuit with a distinctive, fast, level and low-to-the ground flight (NT Government, 2021). The species is also known to capture flying insects and predate on mammals, reptiles and birds from a high perch. This suggests the species will typically fly at low altitudes within the DE, often close to the ground associated with foraging activity.

Threats

According to the Conservation Advice for Grey Falcon (TSSC, 2020), the key threats for the species are cat predation, increased temperatures in arid and semi-arid Australia, habitat loss and fragmentation (including from grazing by exotic herbivores and nest shortage). Other key threats include climate change (increased temperatures in arid and semi-arid Australia), demographic and genetic stochastic events (augmented by small population size), direct mortality (collision with traffic and collision with fences and powerlines); disturbance (birdwatchers and photographers) and harvesting (egg collecting and falconry).



Known populations in the vicinity of the DE and broader region

This species was recorded at four locations during the field survey, as shown in Figure 8-6 (Ecoscape, 2025). All observations took place whilst the species was in flight, with the species recorded within the plain (sand) and both the minor and major drainage lines/rivers/creeks habitats. The species was also recorded opportunistically during the initial bird site utilisation surveys (Spectrum, 2024), where a pair was sighted traversing through the DE.

According to the DBCA database, there are 19 records within 40 km of the DE, recorded between 2013 to 2023 (i.e., 18 individuals). There are no records within the DE, the closest record is 18 km from the DE.

Species habitat extent, quality and importance

Critical habitat is not defined within the Grey Falcon's Conservation Advice (TSSC, 2005) and this species does not have a Recovery Plan or Listing Advice. A precautionary approach has been taken for this ERD with habitats that may provide nesting habitat identified as likely to be critical to the survival of the species.

The species may use drainage line/river/creek (major) habitat for breeding since it uses refurbished nests built by other raptors and corvids in eucalypt-lined drainage lines and waterholes. All other habitats may be used for hunting. The extent of the potential Grey Falcon habitat present in the DE is shown in Table 8-6 and Figure 8-6

Table 8-6: Grey Falcon Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Drainage line/river/creek (major)	Critical habitat (nesting and hunting)	6,152.35
All other habitats	Supporting habitat (hunting)	92,532.15

The drainage line/river/creek (major) habitat is considered critical as it provides suitable nesting/breeding habitat for the species. This habitat was reported as having a 'Low-High' disturbance level (Ecoscape, 2025). Therefore, these habitats are considered to be of 'Medium' quality.

As the species is known to hunt over large areas and across a range of habitats, all other habitats within the DE provide suitable foraging habitat. These include:

- 5,703.33 ha of drainage line/river/creek (minor) habitat.
- 8,045.51 ha of plain (stony/gibber) habitat.
- 24,023.89 ha of plain (boulders) habitat.
- 26,062.50 ha of plain (sand) habitat.
- 26,780.18 ha of hills/ranges/plateaux habitat.
- 1,916.74 ha of rocky escarpments/ridges/mesa habitat.



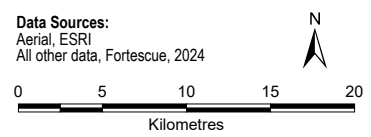
The above habitats were reported as having 'Low-High' disturbance levels by Ecoscape (2025), with the exception of the hills/ranges/plateaux and rocky escarpments/ridges/mesa habitats which were reported as having 'Low' disturbance levels. Therefore, the foraging habitats within the DE are considered 'Medium' quality for the plain habitats and 'High' quality for the rocky habitats.

Habitats likely to be used by the Grey Falcon are common and widespread within and outside the Survey Area (Ecoscape, 2025).



Legend

- ◆ Grey Falcon
- Development Envelope
- Critical Fauna Habitat**
- Drainage line/river/creek (major)



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Figure 8-6
Grey Falcon - Critical Habitat and Records





Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) - Recorded

Species background information

The Pilbara Leaf-nosed Bat (PLNB) is a subpopulation of the orange leaf-nosed bat. It is insectivorous and of moderate size, with short fur, small ears, and a fleshy diamond-shaped nose-leaf surrounding the nostrils. The PLNB is listed as Vulnerable under the EPBC Act and Endangered under the BC Act (TSSC, 2016b).

Abundance & distribution

The PLNB is endemic to WA and occurs throughout the Pilbara and adjoining regions of the Ashburton and Little Sandy Desert IBRA bioregions (Bat Call, 2021a), based on census data available up to 2020, the population estimative is approximately 10,000 and 15,000 individuals (Bat Call, 2021a). Records of occurrence of the species are spread throughout the region except for the north-western area between Karratha and the Fortescue River (Bat Call, 2021a). The species can be found roosting in natural caves in banded iron formations in the Hamersley Ranges and eastern Pilbara, also within disused underground gold and copper mines in the region (Bat Call, 2021a).

The population in the Pilbara and upper Gascoyne represents one interbreeding biological population comprising multiple colonies. This population is of national significance, and is therefore an important population, due to genetic and behavioural divergences from populations from further north (Bat Call, 2021a). The recorded individuals within the DE are therefore considered a part of an important population.

Overall, the extent of occurrence is approximately 110,000 km² and is currently stable. The area of occupancy in the Pilbara region is under 10 km², which represents the total area of its roost sites only (excluding foraging habitat) (Bat Call, 2021a). Studies with echolocation records indicate that the species has a long-range dispersal ability with a round trip of 50 km or longer in a night under favourable conditions (Bat Call, 2021a).

Habitat preferences

Because of its poor thermoregulation, the species is generally encountered in rocky areas that provide an opportunity for roosting in caves and underground mines with stable, warm, and humid microclimates. The species exhibits evaporative water loss more than double that of other bats (Bat Call, 2021a). Other confirmed roosts of the species are dolerite/gabbro formations at the southern edge of the Pilbara (in Barlee Range Natura Reserve of the upper Gascoyne region and Mt Vernon Station). The species can often share roost with the Ghost Bat (*Macroderma gigas*) and other bat species.

The species forages in a variety of habitats, including *Triodia* hummock grassland, sparse tree and shrub savannah and riparian vegetation along drainage lines (Duncan *et al.*, 1999). Other foraging habitats used by the species include gorges with pools, gullies, rocky outcrops, major watercourses and open grassland and woodland (TSSC, 2016b). The species typically forages up to 20 km from their diurnal roost and can occasionally be recorded up to 30 km distance during lower temperature months, such as April and May. This distance can differ during the dry season (January and February), with records showing a considerable reduction (10 km) (Bat Call, 2021a).



Threats

Threats to the PLNB include loss of roosts and foraging habitat, mining operational impacts (disturbances within or in close proximity to roost caves), changed water regimes, exposure to pollutants such as arsenic and/or cyanide, introduced species or zoonoses, an increase of sound, inground vibration, airborne dust and NOx, increased light, changed fire regimes and vehicle strikes (Bat Call, 2021a).

Known populations in the vicinity of the DE and broader region

This species was recorded within the Survey Area via foraging calls within the drainage habitat (major) and the hills/ranges/plateaux habitat, as shown in Figure 8-7 (Ecoscape, 2025). No confirmed roosting caves have been identified within the DE or wider survey area.

According to the DBCA database, there are 3,343 records within 40 km of the DE, mostly recorded between 2013 to 2023 (i.e., 14,179 individuals). Within 3 km from the DE, there are 94 records, while the DE itself has six previous records, recorded between 2011- 2016.

Species habitat extent, quality and importance

Critical habitat to the PLNB is defined in its Conservation Advice (TSSC, 2016b) as deep underground caves or complex mines that are used or suspected of being used for diurnal roosting with large colony sizes are critical for the species survival. The rocky escarpments/ridges/mesas habitat type is critical to the survival of the species due to potential cave formation in this habitat.

The Conservation Advice includes major watercourses as critical foraging habitat for the species (TSSC, 2016b). The drainage line/river/creek (major) habitat is also critical to the survival of the species due to the potential presence of surface water pools. This foraging habitat is important for sustaining nearby roosting colonies (TSSC, 2016). All other habitats can be used as supporting foraging. The extent of potential PLNB habitat types present in the DE is shown in Table 8-7 and Figure 8-7.

Table 8-7: PLNB Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Rocky escarpments/ridges/mesas	Critical habitat (roosting)	1,916.74
Drainage line/river/creek (major)	Critical habitat (foraging)	6,152.35
All other habitats	Supporting habitat (foraging)	90,615.41

The rocky escarpments/ridges/mesas habitat is considered critical to the survival of the species due to the potential for cave formation. This habitat occurs in small, discontinuous patches with limited extents within the Survey Area and across the broader landscape (Ecoscape, 2025).

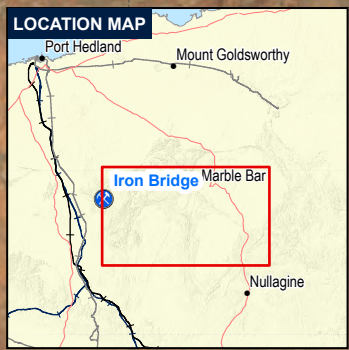
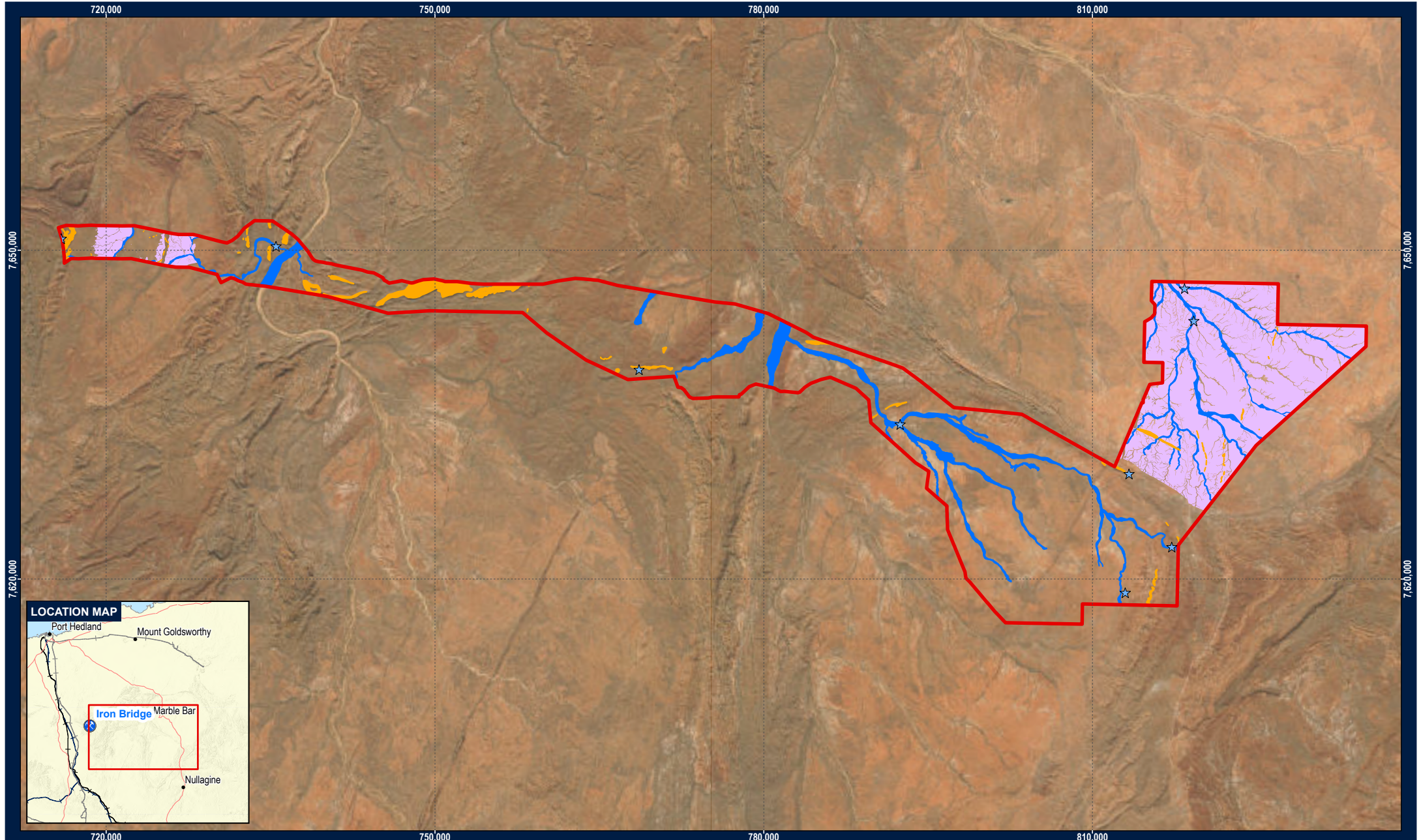
This habitat is reported to have 'Low' disturbance levels by Ecoscape (2025), and therefore the habitat is considered to be of 'High' quality.

The drainage line/river/creek (major) habitat is also critical foraging habitat of the species due to the potential presence of surface water pools. This habitat was reported as having a 'Low-High' disturbance level (Ecoscape, 2025). Therefore, these habitats are regarded as a 'High' quality.



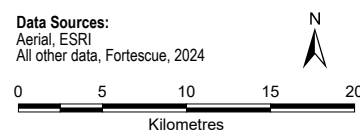
The PLNB is likely to use all other habitats for foraging:

- 5,703.33 ha of drainage line/river/creek (minor) habitat.
- 8,045.51 ha of plain (stony/gibber) habitat.
- 24,023.89 ha of plain (boulders) habitat.
- 26,062.50 ha of plain (sand) habitat.
- 26,780.18 ha of hills/ranges/plateaux habitat.



- Legend**
- ★ Pilbara Leaf-nosed Bat
 - Development Envelope
 - Critical Fauna Habitat**
 - Rocky escarpments/ridges/mesa

- Supporting Fauna Habitat**
- Drainage line/river/creek (major)
 - Plain (boulders)



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Figure 8-7
Pilbara Leaf-nosed Bat and Ghost Bat - Critical Habitat and Records





Pilbara Olive Python (*Liasis olivaceous barroni*) - Recorded

Species background information

The Pilbara Olive Python is a subspecies of the Olive Python. The species has a white/cream belly with the dorsal body being a dull olive-brown to pale fawn or rich brown colour, averages 2.5 m in length and differs from *Liasis olivaceous* in mid-body and ventral scale counts. The Pilbara Olive Python is listed as Vulnerable under the EPBC Act and the BC Act (DEWHA, 2008a).

Abundance & distribution

The Pilbara Olive Python can be found only in ranges within the Pilbara region of northwestern Australia, such as the Hamersley Range, and islands of the Dampier Archipelago. Twenty-one populations are known to occur across the Pilbara, including at Pannawonica, Millstream, Tom Price and Burrup Peninsula (DEWHA, 2008a). Important populations are not defined for the species.

It is difficult to estimate the Pilbara Olive Python's population size due to its cryptic nature and lack of reliable trapping or census techniques (DEWHA, 2008a). However, a study states that the subspecies population is sizable in pockets, with some remote populations restricted from threatening processes (DEWHA, 2008a).

Habitat preferences

The Pilbara Olive Python prefers gorges, escarpments, water holes and rocky outcrops in the ranges of the Pilbara region (Pearson, 1993; Wilson & Swan, 2003). They are adept at swimming and hunting in waterholes or along tracks and find shelter in caves, under boulders, in water and in trees overhanging water (Bush & Maryan, 2011). During the winter, the species hides in caves and rock crevices away from water. In the summer, individuals move around widely, usually in close proximity to water and rock outcrops (DEWHA, 2008a). Though the species is often associated with ephemeral or permanent water, individuals have large home ranges (between 88 ha and 449 ha) and can be recorded in rocky habitats some distance from these features.

Threats

According to the Conservation Advice for the Pilbara Olive Python (DEWHA, 2008a), the main threats to the species include predation by feral animals (cats and foxes), predation of food sources by foxes, habitat loss, deliberate roadkill and death resulting from mistaken identification as a poisonous brown snake.

Known populations in the vicinity of the DE and broader region

The remains of an individual of this species were recorded within the major drainage habitat during a targeted field survey, as shown in Figure 8-8 (Ecoscape, 2025).

According to the DBCA database, there are 88 records within 40 km of the DE, recorded mostly between 2013 to 2023. Within 3 km of the DE, there are 23 records, most of them



located in the extreme west area. The DE itself has seven previous records, recorded between 2011- 2014.

Species habitat extent, quality and importance

Critical habitat for the Pilbara Olive Python is not listed within the species' Conservation Advice, however, it does state that the species will spend the cooler months hiding in caves and rocky crevices (DEWHA, 2008a).

Within the Survey area, the remains of a Pilbara Olive Python individual were found within a drainage line adjacent to hills/ranges/plateaux and rocky escarpments/ridges mesa habitats. The species is likely to use drainage lines or areas adjacent to hills/ranges/plateaux and rocky escarpment/ridges mesas habitats. The extent of potential Pilbara Olive Python habitat types present in the DE is shown in Table 8-8 and Figure 8-8.

Table 8-8: Pilbara Olive Python Habitat Types in the Development Envelope

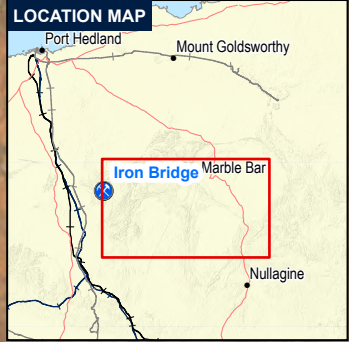
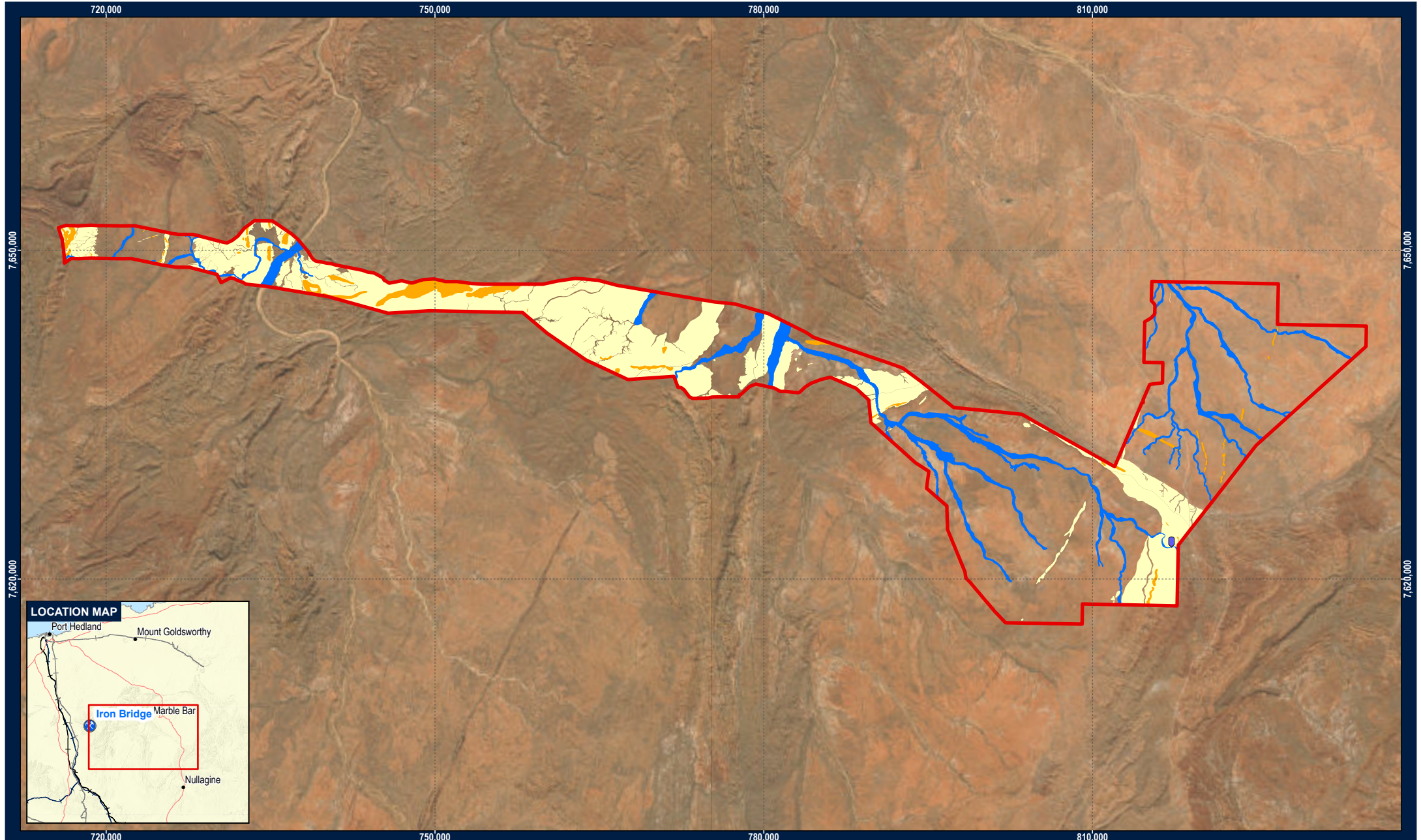
Habitat type	Habitat importance	Extent in DE (ha)
Hills/ranges/plateaux	Critical habitat (hunting, dispersal and shelter)	26,780.18
Rocky escarpments/ridges/mesa	Critical habitat (shelter)	1,916.74
Drainage lines (major)	Critical habitat (dispersal and hunting)	6,152.35

The hills/ranges/plateaux and rocky escarpment/ridges/mesa habitats are considered critical habitat for the species, as they provide suitable shelter habitat. Both habitats were reported to have a 'Low' disturbance level (Ecoscape, 2025). Therefore, these critical habitats are considered 'High' quality.

The drainage lines (major) may be used as critical dispersal and hunting habitat. This habitat was recorded as having 'Low-High' disturbance levels (Ecoscape, 2025) and are therefore considered 'Medium' quality.

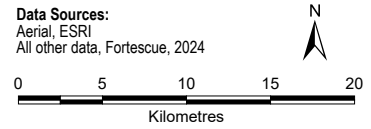


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- Legend**
- Pilbara Olive Python
 - Development Envelope

- Critical Fauna Habitat**
- Drainage line/river/creek (major)
 - Hills/ranges/plateaux
 - Rocky escarpments/ridges/mesa



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 Revised By: scostello
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Figure 8-8
Pilbara Olive Python
Critical Habitat and Records





Ghost Bat (*Macroderma gigas*) – High Likelihood

Species background information

The Ghost Bat is a large, carnivorous bat, light to dark grey, with long ears, large eyes, a simple nose-leaf and no tail. The species is listed as Vulnerable under the BC Act and EPBC Act (TSSC, 2016c).

Abundance & distribution

The Ghost Bat was once distributed widely over Australia, except Victoria and Tasmania (TSSC, 2016c). Currently, the species' range is discontinuous, with geographically disjunct colonies occurring in the Pilbara, Kimberley, Northern Territory (NT), the Gulf of Carpentaria and coastal and near coastal eastern Queensland (TSSC, 2016c). Due to the geographic isolation between populations, this species displays genetic variation, with Pilbara populations being distinguished from the Kimberley and NT populations (TSSC, 2016c). Therefore, the individuals that are potentially present within the DE are considered a part of an important population.

There are no robust measures of abundance across the species range. It is estimated that the WA population is around 4,300 – 6,000 individuals, with approximately 1,500 within the Chichester subregion, 350 within the Hamersley subregion and around 3,000 – 4,000 individuals within Kimberley. The current population within Pilbara is estimated to be 1,300 – 2,000 individuals (TSSC, 2016c).

Habitat preferences

Ghost Bats move between a number of caves seasonally or as dictated by weather conditions and/or foraging opportunities (Bat Call, 2021b). The species can occur over a range of landforms and inhabit areas with caves suitable for roost sites (Churchill, 2009), which includes deep natural caves, disused mines and rock crevices that have a stable temperature and moderate to high relative humidity (TSSC, 2016c).

In the Pilbara, the preferred roosting habitat is caves in Brockman and Marra Manda banded iron formation, Robe Pisolite channel iron deposit geology and abandoned underground mines and caves in ironstone geology and granite rockpiles (Bat Call, 2021b).

Currently, there is limited confirmed data regarding foraging habitat. Studies using VHF radio tracking and GPS/satellite tracking technologies show that the species can forage over larger areas, up to 12 km from their diurnal roost, with trip lengths of up to 30 km (Augusteyn et al., 2017). A more recent study shows the average radial distance from the roost was 8.5 km, and the maximum distance recorded was 17.7 km (Bat Call, 2023). Bats transiting to distant sites have also been recorded between 20 and 30 km from their diurnal roost at night (Bat Call, 2021b). A study in the Pilbara suggests that Ghost Bats prefer to forage in productive plain areas, such as isolated trees and trees on the edge of thin thickets on the plains or trees along the edges of watercourse woodlands, compared to thin mature woodland over patchy or clumped tussock or hummock grass on sand or stony ground (Bat Call, 2021b).

The species may forage over large areas, depending on the productivity of the landscape (Churchill, 1998). The occurrence of pools of water is a critical component of Ghost Bat foraging habitat (Armstrong, 2001). They forage in cave entrances, drainage lines, along riparian corridors, on alluvial plains, and in supporting mulga woodland and tussock



grasslands (Cramer *et al.*, 2022). There is no documented information on the importance of surface drinking water for Ghost Bats; however, it is suggested that this species requires surface water for drinking, and water sources in proximity to day roost caves are therefore likely to be important (Bat Call, 2021b). Based on a foraging range of 12 km from a roost, the species is likely to require at least one drinking water source within this range.

Threats

According to the species' Conservation Advice (TSSC, 2016c), the key threat to the species is habitat loss and degradation, especially due to mining activities. However, other threats include disturbance of breeding sites, modification of foraging habitat, collision with fences, collapse or reworking of old mine adits, contamination by mining residue at roost sites which may reduce rates of survival or reproduction, disease, poison by cane toads and competition for prey with foxes and feral cats.

Known populations in the vicinity of the DE and broader region

According to the DBCA database, there are 2,957 records within 40 km of the DE, recorded predominantly between 2013 to 2023. In the vicinity of the DE there are 34 records, while the species has been previously recorded in the DE itself, these are dated from 1955 - 1957.

Despite a targeted search for this species, it was not recorded during the field surveys (Ecoscape, 2025).

Species habitat extent, quality and importance

Ghost Bats have similar roosting requirements to PLNB and often occupy the same cave systems and feed on PLNB (Bat Call, 2021b). Potential roosting habitat occurs within the rocky escarpments/ridges/mesa habitat. It is considered possible that Ghost Bat roost habitat may be present within the same geological formation.

Habitat critical to the survival of the Ghost Bat is not defined in the Conservation Advice. However, the rocky escarpments/ridges/mesas habitat is considered critical to the survival of the species due to potential cave formation in the habitat. The rocky escarpments/ridges/mesa habitat is limited across the Survey Area and surrounding area due to the limited extents of habitats within which they are found (Ecoscape, 2025).

The drainage line/river/creek (major) habitat is considered critical to the survival of the species due to the potential presence of surface water pools. All other habitats can be used for foraging. The extent of the potential Ghost Bat's habitat present in the DE is shown in Table 8-9 and Figure 8-7.

Table 8-9: Ghost Bat Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Rocky escarpments/ridges/mesa	Critical habitat (roosting)	1,916.74
Drainage line/river/creek (major)	Critical habitat (foraging)	6,152.35
All other habitats	Supporting habitat (foraging)	90,615.41

The rocky escarpments/ridges/mesas habitat type is considered critical to the survival of the species due to potential cave formation in the habitat. This habitat is reported to have 'Low' disturbance by Ecoscape (2025), and therefore the habitat is considered 'High' quality.



The drainage line/river/creek (major) habitat is also habitat critical to the survival of the species due to the potential presence of surface water pools. This habitat was reported as having a 'Low-High' disturbance (Ecoscape, 2025). Therefore, these habitats are regarded as a 'High' quality.

The Ghost Bat is likely to use all other habitats for foraging:

- 5,703.33 ha of drainage line/river/creek (minor) habitat.
- 8,045.51 ha of plain (stony/gibber) habitat.
- 24,023.89 ha of plain (boulders) habitat.
- 26,062.50 ha of plain (sand) habitat.
- 26,780.18 ha of hills/ranges/plateaux habitat.

Night Parrot (*Pezoporus occidentalis*) – Medium Likelihood

Species background information

The Night Parrot is a nocturnal, ground-feeding parrot that is medium sized and approximately 22-25 cm long. The species is characterised by their bright-green colour with black and yellow markings and a yellow belly (Higgins, 1999). The Night Parrot is Critically Endangered under the BC Act and Endangered under the EPBC Act (TSSC, 2016d).

Abundance & distribution

This species was previously found throughout most of arid and semi-arid WA. The current distribution of the Night Parrot in Western Australia is now thought to be associated with the northern and central areas of WA's interior (DBCA, 2024b). This includes records in the Pilbara region of WA, indicating that populations may persist in the area (Night Parrot Recovery Team, pers comm., 2016).

Habitat preferences

Night Parrots can be found in a wide range of habitats, mostly associated with structurally complex long- unburnt *Triodia* spp. on low/flat terrain and fertile plains supporting vegetation dominated by chenopod and/or grass species (Murphy *et al.*, 2017). Recent studies suggested that roost sites occur within 10km of feeding grounds with key seed-producing species, rather than an association with spinifex or samphire alone (Murphy *et al.*, 2017). The species also relies on succulent vegetation in areas in the absence of standing water (Kearney *et al.*, 2016). Evidence suggests that when permanent water is available, the species is sedentary, continuously occupying the same area for years (Murphy *et al.*, 2017). In areas where surface water is ephemeral, increased movement associate with available water is expected.

Threats

Threats to the Night Parrot include introduced predators, inappropriate fire regimes, possibly competition with introduced herbivores, such as cattle, sheep and European Rabbits (Lesenberg *et al.*, 2023) and climate change due to heat-induced water stress (Kearney *et al.*, 2016). Additionally, the species' conservation advice lists the following assumed threats:



invasive and domestic species, human induced fire events, disease, collection of bird and/or eggs and habitat loss disturbance and modifications (TSSC, 2016d).

Known populations in the vicinity of the DE and broader region

Despite targeted searches in suitable habitats for this species, using the latest detection techniques, it has not been recorded (Ecoscape, 2025).

According to the DBCA database, there are no records of this species within 40 km of the DE. However, this is a highly cryptic species so a lack of records cannot be used to adequately justify that this species does not occur within the DE.

Species habitat extent, quality and importance

Habitat critical to the survival of the species has not been defined in the Conservation Advice (TSSC, 2016d). However, this species is highly cryptic and a lack of records has contributed to the inability to adequately identify and define critical habitat. The Generation Hub area and eastern extent of the Transmission Line area contains several habitat features considered suitable for night parrots. The landscape is generally flat, treeless (or at very low density) spinifex hummock grassland, with *Triodia longiceps* recorded from drainage line habitats and other adjacent vegetation units.

However, when fire scar data is overlaid with the habitat mapping, it indicates that the majority of the DE is prone to frequent fires. Only a few small areas associated with the major drainage lines have areas that have been protected from fire and some of these areas appear to have suitably complex spinifex hummocks, although they do not appear to be very complex (e.g. predominantly only single hummock rings present). On a landscape level the DE, and the area with 10 km of the DE, does not appear to be suitable for the formation of critical roost habitat for Night Parrot, and therefore no critical habitat has been recorded within the DE.

Within the DE, the species may use the plain (sand), plain (boulder), and drainage lines/rivers/creeks (minor) habitats for foraging. However, the lack of roost habitat within 10km would indicate that any potential foraging habitat present is not likely to be used by Night Parrot. The extent of potential Night Parrot habitat types present in the DE is shown in Table 8-10.

Table 8-10: Night Parrot Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)*
Drainage lines/rivers/creeks (minor)	Supporting habitat (foraging)	1,437.33
Plain (sand)	Supporting habitat (foraging)	6,275.17
Plain (boulder)	Supporting habitat (foraging)	3,571.19

*The extent in the DE was calculated using the total mapped habitat and where it intersects with fire scar data.

The plain (sand) and plain (boulder) habitats, and the drainage lines/rivers/creeks (minor) habitat, could be used for foraging and is therefore considered potential supporting habitat for this species. There is 11,283.69 ha of this supportive habitat mapped within the DE. The disturbance levels of the drainage lines/rivers/creeks (minor) habitat was reported as Low – High (Ecoscape, 2025). Therefore, this supportive habitat is considered to be ‘Medium’ quality.



8.4.2.2 Other Specially Protected Fauna

Other Specially Protected Fauna are fauna of special conservation need that are dependent on ongoing conservation intervention, to prevent them becoming eligible for listing as Threatened under the BC Act. The Peregrine Falcon was the only Other Specially Protected Fauna recorded in the Ecoscape (2025) survey. Information about this species, including species presence, is discussed in the context of potential habitat within the DE. No Other Specially Protected Fauna were categorised as 'Recorded', 'High' or 'Medium' likelihood of occurrence within the DE (as listed in Section 8.4.1).

Peregrine Falcon (*Falco peregrinus*) – Recorded

Species background information

The Peregrine Falcon is a large bird of prey with a yellow eye ring, and a yellow bill with a black tip. The species has a black hood, blue-black upper parts, and a creamy white chin (Birdlife Australia, 2024). It is classified as Other Specially Protected under BC Act.

Abundance & distribution

The Peregrine Falcon is widespread in many parts of Australia and even some continental islands, the species is absent from most deserts and the Nullarbor Plain (Ecoscape, 2025). The species is found in most habitats, from arid zones to rainforests and at most altitudes. The adults have a home range of 20 km to 30 km throughout the year. However, young individuals disperse widely but often return to their original home area to breed (BirdLife Australia, 2017).

Habitat preferences

Peregrine Falcons mostly occur near cliffs along coasts, river ranges, and around wooded watercourses and lakes (Ecoscape, 2025). The species hunts in all habitats. Rather than building a nest, the species lays its eggs in recesses of cliff faces, tree hollows, or large abandoned nests of other birds (BirdLife Australia, 2017).

Threats

Threats to the Peregrine Falcon include land clearing as well as chemical residues, which cause reproductive failure and an inability to maintain populations (BirdLife Australia, 2023).

Known populations in the vicinity of the DE and broader region

The field survey did not record this species (Ecoscape, 2025). There are six records from the DBCA database search within a 40 km buffer area, including three records from 2019 approximately 30 km from the DE.

Species habitat extent, quality and importance

The extent of the potential Peregrine Falcon habitat present in the DE is shown in Table 8-11. Neither critical nor important habitat has been defined for this species, however it is assumed that nesting habitat is important for the species. The Peregrine Falcon typically nests on high cliff faces and forages in low open areas and drainage systems. Therefore, the species may use the rocky escarpments/ridges/mesa habitat within the DE for nesting and foraging and



this is considered critical habitat. This habitat is reported as having a ‘Low’ disturbance by Ecoscape (2025) and is therefore regarded as ‘High’ quality. The rest of the habitats within the DE may be used for foraging.

Table 8-11: Peregrine Falcon Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Rocky escarpments/ridges/mesa	Critical habitat (nesting and foraging)	1,916.72
All other habitats	Supporting habitat (foraging)	96,765.07

All other habitats within the DE provide suitable foraging habitat, this includes:

- 6,152.35 ha of drainage line/river/creek (major) habitat.
- 5,703.33 ha of drainage line/river/creek (minor) habitat.
- 8,045.51 ha of plain (stony/gibber) habitat.
- 24,023.89 ha of plain (boulders) habitat.
- 26,062.50 ha of plain (sand) habitat.
- 26,780.18 ha of hills/ranges/plateaux habitat.

The above habitats were reported as having ‘Low-High’ disturbance levels by Ecoscape (2025), with the exception of the hills/ranges/plateaux habitat which was reported as ‘Low’ disturbance level. Therefore, the foraging habitats within the DE are considered ‘Medium’ quality for the plain habitats and ‘High’ quality for the rocky habitats.

This species is unlikely to be restricted to, or reliant on, the habitat within the DE and is likely to be a transient visitor only (Ecoscape, 2025).

8.4.2.3 Priority Fauna

DBCA maintains a list of Priority species that have not been assigned statutory protection under the BC Act. This system ranks priority species from Priority 1 to Priority 4. The following sections will discuss priority fauna that was recorded during the Ecoscape (2025) survey, was previously recorded, or is considered highly likely to occur in the DE.

Western Pebble-mound Mouse (*Pseudomys chapmani*) - Recorded

Species background information

The Western Pebble-mound Mouse is a rodent with light brown hair with fawn sides and a darker head, weighing about 10 g (Hamersley Iron, 2023). The species is listed as Priority 4 by DBCA.

Abundance & distribution

The species has a scattered distribution with abundant habitat across the entire Pilbara region and into the Gascoyne (van Dyck & Strahan, 2008). Initially, it was believed that the species was confined to a small section of the Central Pilbara. However, they have been confirmed to



occur from the Chichester Range in the north-west to the Rudall River in the east (Hamersely Iron, 2023).

Habitat preferences

The species' preferred habitat is shallow soils or exposed patches of bed rock. Vegetation is dominated by hummock grasslands with *Triodia* grasses, and a variety of shrubs, commonly *Acacia* and *Senna* (Lee, 1995; Menkhorst & Knight, 2010). The species builds pebble mounds from small stones, which are restricted to suitable-class stones and are usually found on gentle slopes and spurs that are often vegetated by hard spinifex. The species can also be found on ridge tops and flatter lower areas. Occasional eucalypts or scattered shrubs are often present (Hamersely Iron, 2023).

The estimated home range sizes are 14.4 ha (+/- 6.7 ha) for males and 4.6 ha (+/- 2.7 ha) for females. Core home areas range between 0.93 ha (+/- 0.29 ha) for males and 0.29 ha (+/- 0.16 ha) for females (Anstee *et al.*, 1997).

Known populations in the vicinity of the DE and broader region

The DBCA database has 230 records within 40 km of the DE. Within the DE, there are 7 records, of which four occurred in 2016.

During the field survey, one individual was captured and mounds attributed to the Western Pebble-mound Mouse have been recorded from 29 locations (Ecoscape, 2025). Of these mounds, 27 could not be verified by Ecoscape (2025) as they were recorded and provided to Ecoscape by Fortescue Heritage Officers. The two mounds recorded by Ecoscape (2025) were classified as inactive and were recorded in the following habitats:

- Hills/ranges/plateaux habitat - 12 mounds recorded
- Plain (stony/gibber) habitat - 5 mounds recorded
- Plain (boulder) – 12 mounds recorded.

Species habitat extent, quality and importance

Habitat critical to the survival of the Western Pebble-mound Mouse is not defined. However, the plain (stony/gibber), hills/ranges/plateaux and rocky escarpments/ridges/mesa habitats are likely to be used by the species for mound construction, foraging and dispersal and is considered supporting habitat.

As discussed, mounds attributed to the Western Pebble-mound mouse were recorded 29 times across three habitat types: hills/ranges/plateaux, plain (stony/gibber) and plain (boulder). The hills/ranges/plateaux and plain (stony/gibber) habitats are expected to support the species as they typically have readily available stones for mound construction (Dunlop & Pound, 1981). The plain (boulder) habitat does not meet the typical habitat description for the mound (Ecoscape, 2025). The plain (stony/gibber), hills/ranges/plateaux and rocky escarpments/ridges/mesa habitats likely to be used by the species for mound construction, foraging and dispersal and is considered supporting habitat. Table 8-12 shows the extent of potential Western Pebble-mound mouse habitat types present in the DE.



Table 8-12: Western Pebble-mound Mouse Habitat Type in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Plain (stony/gibber)	Supporting habitat (construct mounds, foraging, dispersal)	8,045.51
Hills/ranges/plateaux	Supporting habitat (construct mounds, foraging, dispersal)	26,780.18
Rocky escarpments/ridges/mesa	Supporting habitat (construct mounds, foraging, dispersal)	1,916.74

The disturbance levels of the hills/ranges/plateaux and rocky escarpments/ridges/mesa habitats is 'Low' (Ecoscape, 2025) and is therefore considered to be of 'High' quality.

The plain (stony/gibber) habitats were recorded as having 'Low-High' disturbance levels (Ecoscape, 2025) and is there considered to be of 'Medium' quality.

Brush-tailed Mulgara (*Dasycercus blythi*) - Recorded

Species background information

Mulgaras are small carnivorous marsupials found throughout Australia's arid and semi-arid regions (Newman-martin *et al.*, 2023). The species is characterised by a black and bushy tail that is short and pointed at the end. The species is 15-20 cm long with sandy-brown fur on the back and has greyish underparts (NESP Threatened Species Recovery Hub, 2021). It is listed as Priority 4 by DBCA.

Abundance & distribution

The population of the Brush-tailed Mulgara fluctuates in response to seasonal conditions (Woinarski *et al.*, 2012). Its distribution is bound broadly by the Tanami Desert in the north, the Simpson Desert in the east, the Great Victoria Desert in the south and the Carnarvon, Murchison and Pilbara regions in the west (Woinarski *et al.*, 2012).

Since the European arrival, Mulgaras have declined in their geographic distribution, mostly due to domestic cat predation (Newman-martin *et al.*, 2023), but also due to factors such as rainfall, food resources, burrow availability and fire (Pavey *et al.*, 2011). Although the Brush-tailed Mulgara population has declined, it is considered stable, persisting in small, low-density isolated populations during periods of low rainfall (Molyneux *et al.*, 2018).

Habitat preferences

This species is associated with hummock grasslands and assorted tussock grasses, but also uses other vegetation types (often sandplains, grasslands, and woodlands) when mixed with or adjacent to hummock grasslands. It is mainly nocturnal and shelters during the day in burrow systems.

Known populations in the vicinity of the DE and broader region

One Brush-tailed Mulgara was recorded with a trail camera (MC10) during the Ecoscape (2025) survey, which was deployed on the plain (boulder) habitat type. There are approximately 15 DBCA records located to the south of the Survey Area.



Species habitat extent, quality and importance

Habitat critical to the survival of the Brush-tailed Mulgara is not defined. The extent of potential Brush-tailed Mulgara habitat types present in the DE is shown in Table 8-13. The species is likely to use plain (sand) habitats dominated by hummock grasslands and shrublands on sandy soils within the DE; equally, it may also use plain (boulders) habitats as supporting habitat for shelter, foraging and dispersal. Habitats likely to be used by this taxon are common and widespread within and outside the DE, so it is unlikely to be restricted to or reliant on the habitat within the DE.

Table 8-13: Brush-Tailed Mulgara Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Plain (sand)	Supporting habitat (shelter, foraging, dispersal)	26,062.50
Plain (boulders)	Supporting habitat (shelter, foraging, dispersal)	24,023.89

The plain (sand) and plain (boulder) habitats was recorded as having 'Low-High' disturbance levels (Ecoscape, 2025). Therefore, this habitat is considered to be of 'Medium' quality.

Long-tailed Dunnart (*Antechinomys longicaudata*) – High Likelihood

Species background information

The Long-tailed Dunnart is a small, carnivorous marsupial, distinguished from other Sminthopsinae species by the length of its brush-tipped tail; more than twice the head-body length (Burbidge, McKenzie & Fuller 2008). The species has a long muscular tail as well as striated foot pads, suggesting it is adapted to climbing (Burbidge, McKenzie & Fuller 2008). It is listed as Priority 4 by DBCA.

Abundance & distribution

Long-tailed Dunnarts are thought to occur in low population densities across the Gascoyne, Pilbara and Gibson Desert regions of WA (Ecoscape, 2025).

Habitat preferences

The Long-tailed Dunnart generally occurs in rugged rocky landscapes. Their habitat includes *Acacia*, rocky screes with hummock grass and shrubs, and tall open shrubland and woodlands (Burbidge, McKenzie & Fuller 2008).

Known populations in the vicinity of the DE and broader region

The Long-tailed Dunnart was not recorded during the Ecoscape (2025) survey. There are five records of this species within the 40 km of the DE, including two DBCA records within the Survey Area close to the Marble Bar-Nullagine Road.

Species habitat extent, quality and importance

Habitat critical to the survival of the Long-tailed Dunnart is not defined. The extent of potential Long-tailed Dunnart habitat types present in the DE is shown in Table 8-14. The species is likely to use hills/ranges/plateaux and rocky escarpments/ridges/mesa habitats within the DE



for shelter, foraging and dispersal. This is considered supporting habitat. The habitats used by this species within the DE are common and widespread within the surrounding region.

Table 8-14: Long-tailed Dunnart Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Hills/ranges/plateaux	Supporting habitat (shelter, foraging, dispersal)	26,780.18
Rocky escarpments/ridges/mesa	Supporting habitat (shelter, foraging, dispersal)	1,916.74

The hills/ranges/plateaux and rocky escarpments/ridges/mesa habitats were reported by Ecoscape (2025) to have 'Low' disturbance and therefore the habitat is considered 'High' quality.

Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*) – High Likelihood

Species background information

The Spectacled Hare-wallaby is a small brown wallaby with a conspicuous orange ring around its eye. There are two subspecies with one occurring on Barrow Island (*Lagorchestes conspicillatus conspicillatus*), and the other (*Lagorchestes conspicillatus Leichhardt*) on the mainland (DEWHA, 2008b). It is listed as Priority 4 by DBCA.

Abundance & distribution

The Spectacled Hare-wallaby is rare and scattered in WA but more common in the Northern Territory and Queensland. In the Pilbara region, the species has declined dramatically due to fox predation and the loss of large spinifex hummocks due to frequent burning (van Dyck & Strahan, 2008).

Habitat preferences

The species inhabits woodlands, open forests, hummock and tussock grassland and shrublands, preferring areas where there is a mosaic of vegetation due to differences in fire history (DEWHA, 2008b). They spend the daytime in tunnels below hummocks (Menkhorst & Knight, 2010).

Known populations in the vicinity of the DE and broader region

The species was not detected during the Ecoscape (2025) survey, however there are 151 DBCA records within 40 km of the DE. With records within 5 km of the DE.

Species habitat extent, quality and importance

Habitat critical to the survival of the Spectacle Hare-wallaby is not defined.

The extent of potential Spectacled Hare-wallaby habitat types present in the DE is shown in Table 8-15. The species uses the plain (sand), and plain (boulders) habitats, which are dominated by hummock grasslands, for shelter, foraging and dispersal. Habitats likely to be used by them are common and widespread within and outside the DE, so it is unlikely to be restricted to or reliant on the habitat within the DE.



Table 8-15: Spectacled Hare-Wallaby Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Plain (sand)	Supporting habitat (shelter, foraging, dispersal)	26,062.50
Plain (boulders)	Supporting habitat (shelter, foraging, dispersal)	24,023.89

The plain (sand) and plain (boulder) habitats was recorded as having ‘Low-High’ disturbance levels (Ecoscape, 2025). Therefore, this habitat is considered to be of ‘Medium’ quality.

Gane’s Blind Snake (*Anilios gane*) – High Likelihood

Species background information

The Gane’s Blind Snake is a blind snake with intense grey-brown dorsal surface colour and paler flanks (Aplin, 1998). It is listed as Priority 1 by DBCA.

Abundance & distribution

The species is known from scattered and discontinuous distribution locations across the Pilbara, from the Newman area in the east and west to Pannawonica and Millstream (Aplin, 1998).

Habitat preferences

Previous records of the species indicate that the species may be associated with moist microhabitats (Aplin, 1998) such as moist gorges and gullies (Wilson & Swan, 2003), they have since also been recorded from mulga woodland and rocky scree slopes. However, the habitat preferences of the species are still poorly understood, making accurate assessment of habitat suitability difficult.

Known populations in the vicinity of the DE and broader region

No individuals were observed during the Ecoscape (2025) survey; however, there are three records within 40 km of the Survey Area. Two of these records are from 2005 and one from 2011, all within the same area approximately 23 km north-west of the DE.

Species habitat extent, quality and importance

Habitat critical to the survival of the Gane’s Blind Snake is not defined. The species likely uses the plain (stony/gibber), hills/ranges/plateaux and rocky escarpments/ridges/mesa habitat types within the DE, as shelter, foraging and dispersal. Habitats likely to be used by this species are common and widespread within and outside the DE; therefore, it is unlikely to be restricted to or reliant on the habitat within the DE. Table 8-16 shows the Gane’s Blind Snake potential habitat within the DE.

Table 8-16: Gane’s Blind Snake Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Plain (stony/gibber)	Supporting habitat (shelter, foraging, dispersal)	8,045.51



Habitat type	Habitat importance	Extent in DE (ha)
Hills/ranges/plateaux	Supporting (shelter, foraging and dispersal)	26,780.18
Rocky escarpments/ridges/mesa	Supporting habitat (shelter, foraging and dispersal)	1,916.74

The disturbance level of the hills/ranges/plateaux and rocky escarpments/ridges/mesa habitats is 'Low' (Ecoscape, 2025). Therefore, these habitats are considered to be of 'High' quality.

The plain (stony/gibber) habitats were recorded as having a 'Low-High' disturbance level (Ecoscape, 2025). Therefore, this habitat is considered to be of 'Medium' quality.

Northern Short-tailed Mouse (*Leggadina lakedownensis*) – Medium Likelihood

Species background information

The Northern Short-tailed mouse is one of two species of short-tailed mice endemic to Australia (Kutt & Kemp, 2005). It is a small mouse weighing 15-40 g with dorsal light grey-brown pelage, grading to pure white on the belly (DBCA, 2022). It is listed as Priority 4 by the DBCA.

Abundance & distribution

The Northern Short-tailed Mouse has a broad distribution across much of northern Australia and occurs in a range of habitat types. It is distributed from Cape York to the Pilbara, with one population on Thevenard Island (DBCA, 2022). It has also been recorded in hilltops and sandy coastal areas near Onslow and from cracking clay communities from Cape Preston in the west to the northern flanks of the Fortescue Marshes in the east (Halpern Glick Maunsell *et al.*, 2001).

Habitat preferences

The Northern Short-tailed Mouse habitat includes spinifex and *Acacia* on seasonally inundated sandy-clay soils as well as sandy soils and cracking clays to build burrows which they shelter in during the day (Van Dyck & Strahan 2008). In the Pilbara, it is mainly found on cracking clays (DBCA, 2022), however it also occurs on stony hummock grassland (Kutt & Kemp, 2005). It is generally rare, with scattered populations, and very little is known of its biology (Van Dyck & Strahan 2008).

Known populations in the vicinity of the DE and broader region

The Northern Short-tailed Mouse was not recorded during the Ecoscape (2025) survey. There are eight records of this species within 40 km of the DE, including from 2005 of a vouchered specimen within 1 km of the Survey Area boundary, where the Shaw River intersects outside of the Survey Area.



Species habitat extent, quality and importance

The Northern Short-tailed Mouse is typically recorded in habitats with heavy soils such as cracking clays. As noted above, the species can also occur on stony hummock grasslands. Therefore, the species will potentially use the plain (stony/gibber) habitat within the DE.

Habitat critical to the survival of the Northern Short-tailed Mouse is not defined. The extent of potential Northern Short-tailed Mouse habitat types present in the DE is shown in Table 8-14. The species is likely to use the plain (stony/gibber) habitat as supporting habitat. This habitat used by this species within the DE is common and widespread within the surrounding region.

Table 8-17: Northern Short-tailed Mouse Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Plain (stony/gibber)	Supporting habitat	8,045.51

The plain (stony/gibber) habitat is likely to be used by the species for foraging and is considered supporting habitat. There is 8,045.51 ha of this habitat within the DE.

The plain (stony/gibber) habitat was reported by Ecoscape (2025) to have 'Low-High' disturbance. Therefore, the habitat is considered to be of 'Medium' quality.

8.4.2.4 Migratory fauna

Migratory fauna are protected under the BC Act and/or the EPBC Act. Migratory species are also protected under the following international agreements:

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention),
- China–Australia Migratory Bird Agreement (CAMBA),
- Japan–Australia Migratory Bird Agreement (JAMBA), and
- Republic of Korea –Australia Migratory Bird Agreement (ROKAMBA).

No Migratory fauna species were recorded within the DE during the Ecoscape (2025) survey. The DE is also not located within or in close proximity to any Important Bird and Biodiversity Areas. All species discussed in the following sections have a high or medium likelihood of occurrence in the DE. Information about each species, including species presence, is discussed in the context of potential habitat extents within the DE.

Pacific Swift (*Apus pacificus*) – High Likelihood

Species background information

The Pacific Swift has a length of 18-21 cm, a wingspan of 40-42 cm and weighs around 30-40 g (DoE, 2024a). It is mainly black with a white band across the rump and has a slim body with long scythe-shaped wings that taper finely. It is characterised by a long and forked tail (DoE, 2024a). The Pacific Swift is listed as Migratory under the BC Act and the EPBC Act. The species is also listed under CAMBA, JAMBA and ROKAMBA.



Abundance & distribution

The global population of the Pacific Swift is not quantified (DoE, 2024a); however, populations are believed to be stable throughout most of its range, except in Pakistan (del Hoyo *et al.* 1996). There are no measures of abundance in Australia (DoE, 2024a). It is noted as a species of least concern on the IUCN Red List of Threatened Species.

The Pacific Swift is a non-breeding visitor to all states and territories of Australia (Higgins, 1999). The Pacific Swift usually arrives in Australia around October and departs around April. In WA, there are scattered records along the south coast from the Eyre Bird Observatory to Denmark. They occur along coastal and subcoastal areas (including nearshore and offshore islands) between Augusta and Carnarvon. They are also scattered along the coast from the south-west Pilbara to the north and east Kimberley. Inland records are sparse, especially in the Wheatbelt and they are also recorded in the Timor Sea (DoE, 2024a).

Habitat preferences

The Pacific Swift does not breed in Australia (DoE, 2024a).

The Pacific Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above the ground (DoE, 2024a). The Pacific Swift occurs over varied habitats, ranging from rainforest to semi-deserts (Morcombe, 2003). In Australia, they mostly occur over inland plains, but sometimes above foothills or in coastal areas (DoE, 2024a). They also occur over cliffs, beaches, islands, urban areas and sometimes well out to sea. They mostly occur over dry or open habitats such as riparian woodland and tea-tree swamps, low scrub, heathland, saltmarsh, treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (Higgins, 1999).

Threats

There are no significant threats to the Pacific Swift in Australia. Potential threats include habitat destruction and predation by feral animals (DoE, 2024a).

Known populations in the vicinity of the DE and broader region

According to the DBCA database, there are seven records of this species within 40 km of the DE. The records range from 1998 – 2014. None of these records intersect the DE, with the closest record from 2011 approximately 14 km west of the DE.

Species habitat extent, quality and importance

Although the Pacific Swift has the potential to occur in the airspace above the DE, it is not reliant on the habitats within the DE.

Common Sandpiper (*Actitis hypoleucos*) – Medium Likelihood

Species background information

This species is approximately 19-21 cm in length with a wingspan of 32-35 cm (DoE, 2024b). The breeding plumage of the Common Sandpiper is dark brown, with the cap, hindneck and mantle having a greenish gloss. The species has a prominent white eye-ring and indistinct dark eye-stripe from the bill to the rear of the ear coverts (Higgins & Davies, 1996). The



Common Sandpiper is listed as Migratory under the BC Act and EPBC Act. The species is also listed under CAMBA, JAMBA and ROKAMBA.

Abundance & distribution

The total population of the Common Sandpiper is in the order of 2.5 million to 4 million (Bamford *et al.*, 2008). It is estimated that 3,000 individuals are present in Australia during the non-breeding season, arriving from July onwards (Geering *et al.*, 2007). The non-breeding movements of the species within Australia are poorly known (Higgins & Davies 1996). It is noted as a species of least concern on the IUCN Red List of Threatened Species.

The Common Sandpiper is widespread in small numbers, found along the entire Australian coastline and also many inland areas. They are most common in northern and western Australia (Higgins & Davies, 1996). In WA, areas of national importance are Nuytsland Nature Reserve and Roebuck Bay.

Habitat preferences

This species does not breed in Australia (DoE, 2024b).

The Common Sandpiper is a migratory species that uses varied coastal and interior wetlands including narrow muddy edges of billabongs, river pools, mangroves among rocks and snags, reefs, or rocky beaches (Morcombe, 2003). The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties (DoE, 2024b). Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves (Higgins & Davies 1996).

Threats

According to Species Profile and Threats Database (DoE, 2014), the threats to the Common Sandpiper are human activities (habitat changes, regulation of rivers, pollution, use of pesticides), habitat loss, reduction of quality and quantity of water and global warming.

Known populations in the vicinity of the DE and broader region

Most records are associated with the Pilbara coastline as this forms the main migration flyway. According to the DBCA database, there are five records within 40 km of the DE. One record is from 1980 with the rest from 2005. None of these records intersect the DE, with the closest record from 2005 approximately 11 km north of the DE. This indicates that the species may be an uncommon visitor to the area.

Species habitat extent, quality and importance

Habitat critical to the survival of the Common Sandpiper is not defined. Within the DE, the species may use the drainage line/river/creek (major) habitat for dispersal and foraging. The extent of potential Common Sandpiper habitat types present in the DE is shown in Table 8-18.

Table 8-18: Common Sandpiper Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Drainage lines/rivers/creeks (major)	Supporting habitat (dispersal and foraging)	6,152.35



The Common Sandpiper has the potential to occasionally use drainage lines/rivers/creeks (major) habitat that occurs within the DE that have fringing vegetation, such as pools along the Shaw River. This habitat may be used for dispersal or foraging but the species is unlikely to rely on the habitat.

The disturbance levels of the drainage lines/rivers/creeks (major) habitat was recorded as Low – High (Ecoscape, 2025). Therefore, the fauna habitat quality within the DE can be considered to be of a 'Medium' quality.

Sharp-tailed Sandpiper (*Calidris acuminata*) – Medium Likelihood

Species background information

The Sharp-tailed Sandpiper is approximately 17 – 22 cm long, have a wingspan of 36 – 43 cm, and weigh around 65 g (DCCEEW, 2024c). They have a potbelly, a drawn-out rear end, short neck and a small, flat head. Both sexes appear similar but show marked seasonal variation in plumage. Juveniles are distinct from adults (DCCEEW, 2024c). The Sharp-tailed Sandpiper is listed as Vulnerable under the EPBC Act and Migratory under the BC Act and EPBC Act. The species is also listed under Bonn, CAMBA, JAMBA and ROKAMBA.

Abundance & distribution

There are currently estimated to be 71,000 (range 9,500–268,900) mature individuals in the wild with a continuing declining trend (Clemens *et al.* 2021). It is noted as vulnerable on the IUCN Red List of Threatened Species.

During the non-breeding season Sharp-tailed Sandpipers occur within all states of Australia (DCCEEW, 2024). They occur in both inland and coastal locations, and in freshwater and saline habitats (Higgins & Davies 1996). In WA, records are scattered along the Nullarbor Plain and the southern areas of the Great Victoria Desert. They are present from Cape Arid to Carnarvon, around coastal and sub-coastal plains of Pilbara Region, through to the Kimberley Division (Higgins & Davies 1996).

Habitat preferences

This species does not breed in Australia (DCCEEW, 2024c).

The Sharp-tailed Sandpiper is typically found in muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation (Pizzey & Knight, 2013). The foraging habitat of the species includes fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland wetlands, and sewage ponds (Higgins & Davies 1996). The Sharp-tailed Sandpiper roosts on rocky and sandy beaches, freshwater habitats, and inland saltwater habitats (Higgins & Davies 1996).

Threats

According to the Conservation Advice for the Sharp-tailed Sandpiper (DCCEEW, 2024c), threats to the species include habitat loss, degradation, and fragmentation, climate change, invasive species, pollution and exploitation.



Known populations in the vicinity of the DE and broader region

Most records of this species are associated with the Pilbara coastline as this forms the main migration flyway. According to the DBCA database, there are eight records of this species within 40 km of the DE. All records are from 2005. None of these records intersect the DE, with the closest record approximately 20 km north of the DE. This indicates that the species may be an uncommon visitor to the area.

Species habitat extent, quality and importance

The Conservation Advice for the Sharp-tailed Sandpiper (DCCEEW, 2024c), defines habitat critical to the survival of the species as areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal,*
- *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the sharp-tailed sandpiper, such as macrobenthos),*
- *To maintain genetic diversity and long-term evolutionary development, or*
- *For the re-introduction of populations or recovery of the species.*

Within the DE, the species may use the drainage lines/rivers/creeks (major) for dispersal and foraging. The extent of potential Sharp-tailed Sandpiper habitat types present in the DE is shown in Table 8-19.

Table 8-19: Sharp-tailed Sandpiper Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Drainage lines/rivers/creeks (major)	Supporting habitat (dispersal and foraging)	6,152.35

The Sharp-tailed Sandpiper has the potential to occasionally use drainage lines/rivers/creeks (major) habitat that occur within the DE that have fringing vegetation, such as pools along the Shaw River. The species is unlikely to rely on the habitat, and therefore it is not considered habitat critical to the survival of the species.

The disturbance level of the drainage lines/rivers/creeks (major) habitat was recorded as Low – High (Ecoscape, 2025). Therefore, the fauna habitat quality within the DE is considered to be of a 'Medium' quality.

Oriental Plover (*Charadrius veredus*) – Medium Likelihood

Species background information

The Oriental Plover is a medium-sized plover with a length of 21–25 cm and weight of 95 g (DoE, 2024c). In breeding plumage, the male has a whitish head and neck, except for a darker brown patch at the rear of the crown. The rest of the upperparts of the bird are dark brown. The female in breeding plumage appears similar to birds in non-breeding plumage (Hayman *et al.* 1986; Marchant & Higgins 1993). In non-breeding plumage, both sexes have a brown crown and nape, a pale brown hindneck, and the rest of the upperparts are brown. The Oriental Plover is listed as Migratory under the BC Act and EPBC Act. The species is also listed under CAMBA, JAMBA and ROKAMBA.



Abundance & distribution

The entire global population of the Oriental Plover spends the non-breeding season in Australia, however the population of the Oriental Plover in Australia is unknown (Bishop, 2006; Stewart *et al.*, 2007). It is noted as a species of least concern on the IUCN Red List of Threatened Species.

Oriental Plovers arrive in north-western Australia in early to mid-September and occur in both coastal and inland areas (DoE, 2024c). The species mostly occurs along the north-western coast, between Exmouth Gulf and Derby in WA. The species often occurs further inland in northern WA, the Northern Territory and north-western Queensland (DoE, 2024c).

Habitat preferences

The Oriental Plover does not breed in Australia (DoE, 2024c).

Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland (DoE, 2024c). When they are further inland, they are generally found in flat, open, semi-arid or arid grasslands, where the grass is short and sparse. During wet season, they can be found in lightly wooded grasslands or estuarine and littoral environments (DoE, 2024c).

The species forages among short grass, on hard stony bare ground, mudflats or among beachcast seaweed on beaches (DoE, 2024c). Oriental Plovers roost on soft wet mud, shallow water of beaches and tidal mudflats, and dry, open habitats, such as saltmarsh or paddocks

Threats

According to the Species Profile and Threats Database (DoE, 2024c), threats include disturbance from human recreation, aircraft strike at airports and vehicle strike.

Known populations in the vicinity of the DE and broader region

Most records for this species are associated with the Pilbara coastline as this forms the main migration flyway. According to the DBCA database, there are six records of this species within 40 km of the DE. The records range from 1999 - 2022. None of these records intersect the DE, with the closest record from 2005 and approximately 11 km north of the DE. This indicates that the species may be an uncommon visitor to the area.

Species habitat extent, quality and importance

Habitat critical to the survival of the Oriental Plover is not defined. Within the DE, the species may use the drainage lines/rivers/creeks (major) for dispersal and foraging and all other habitats as dispersal and foraging habitat. The extent of potential Oriental Plover habitat types present in the DE is shown in Table 8-20.



Table 8-20: Oriental Plover Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Drainage lines/rivers/creeks (major)	Supporting habitat (dispersal and foraging)	6,152.35
All other habitats	Supporting habitat (dispersal and foraging)	92,532.15

The Oriental Plover has the potential to occasionally use drainage lines/rivers/creeks (major) that occur within the DE that have fringing vegetation, such as pools along the Shaw River. This habitat may be used for dispersal or foraging but the species is unlikely to rely on the habitat.

All other habitats within the DE provide suitable foraging and dispersal habitat, this includes:

- 5,703.33 ha of drainage line/river/creek (minor) habitat,
- 8,045.51 ha of plain (stony/gibber) habitat,
- 24,023.89 ha of plain (boulders) habitat,
- 26,062.50 ha of plain (sand) habitat,
- 26,780.18 ha of hills/ranges/plateaux habitat, and
- 1,916.74 ha of rocky escarpments/ridges/mesa habitat.

The disturbance of all habitats was reported as 'Low-High', except for the hills/ranges/plateaux and rocky escarpment/rides/mesa habitats which were reported as 'Low' (Ecoscape, 2025). Therefore, all habitats are considered to be 'Medium' quality, except for the hills/ranges/plateaux and rocky escarpment/rides/mesa habitats which are considered 'High' quality.

Wood Sandpiper (*Tringa glareola*) – Medium Likelihood

Species background information

The Wood Sandpiper is a small thin wader with a length of 19-23 cm, a wingspan of 56-57 cm and weight of 55 g (DoE, 2024d). The species has a short straight bill, long legs and is mostly dark grey-brown or plain brown (DoE, 2024d). The Wood Sandpiper is listed as Migratory under the BC Act and EPBC Act. The species is also listed under CAMBA, JAMBA and ROKAMBA.

Abundance & distribution

The abundance of the Wood Sandpiper is greatest in northwest Australia; however, there are widespread and scattered records in most regions of WA. The global population is estimated to be 3,055,000 to 4,320,000 (Bamford *et al.*, 2008). It is noted as a species of least concern on the IUCN Red List of Threatened Species.



Habitat preferences

The Wood Sandpiper does not breed in Australia (DoE, 2024d).

The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes (DoE, 2024d). They are typically associated with aquatic plants with taller fringing vegetation, especially *Melaleuca* and River Red Gums (*Eucalyptus camaldulensis*). They also occur in inundated grasslands, short herbage or wooded floodplains. The species forages on moist or dry mud at the edges of wetlands (Higgins & Davies, 1996). The Wood Sandpiper has been recorded roosting on low, grassy hillock in a flooded meadow, on low in trees and on fences (Higgins & Davies 1996).

Threats

According to the Species Profile and Threats Database (DoE, 2024d), threats include habitat loss, habitat degradation, human disturbance and direct mortality.

Known populations in the vicinity of the DE and broader region

According to the DBCA database, there are 11 records of this species within 40 km of the DE. One record is from 1957 with the rest from 2005. None of these records intersect the DE, with the closest record from 2005 and approximately 18 km north of the DE. This indicates that the species may be an uncommon visitor to the area.

Species habitat extent, quality and importance

Habitat critical to the survival of the Wood Sandpiper is not defined. Within the DE, the species may use the drainage lines/rivers/creeks (major) habitat for dispersal and foraging. The extent of potential Wood Sandpiper habitat types present in the DE is shown in Table 8-21.

Table 8-21: Wood Sandpiper Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Drainage lines/rivers/creeks (major)	Supporting habitat (dispersal and foraging)	6,152.35

The Wood Sandpiper has the potential to occasionally use drainage lines/rivers/creeks (major) habitat that occurs within the DE, particularly permanent or semi-permanent pools with fringing vegetation, such as pools along the Shaw River. This habitat may be used for dispersal or foraging but the species is unlikely to rely on the habitat.

The disturbance level of the drainage lines/rivers/creeks (major) habitat was recorded as Low – High (Ecoscape, 2025). Therefore, the fauna habitat quality within the DE can be considered to be of a ‘Medium’ quality.

Common Greenshank (*Tringa nebularia*) – Medium Likelihood

Species background information

The Common Greenshank is a large and heavily built wader with a long and slightly upturned bill. They are 30–35 cm in length, with a wingspan of 55–65 cm, and they weigh approximately 170 g (DCCEEW, 2024b). The species shows no difference in colouration or feature between males and females but does exhibit some seasonal variation in plumage and juveniles are



distinct from adults. The Common Greenshank is listed as Endangered under the EPBC Act and Migratory under the BC Act. The species is also listed under CAMBA, JAMBA and ROKAMBA.

Abundance & distribution

The abundance of the Common Greenshank is estimated to be 16,300–33,400 mature individuals in the wild with a continuing declining trend (DCCEEW, 2024b). In Australia, the Common Greenshank is distributed across coastal regions, occurring in all types of wetlands (Higgins & Davies 1996). In WA, the species is generally absent from the Western Deserts, occurring mostly around the coast from Cape Arid to Carnarvon. In the Kimberley, it is recorded in the south-west and the northeast (Higgins & Davies 1996). It is noted as a species of least concern on the IUCN Red List of Threatened Species.

Habitat preferences

The Common Greenshank does not breed in Australia (DCCEEW, 2024b).

Foraging habitat for the Common Greenshank includes the edge of wetlands, in soft mud on mudflats, in channels, or within shallows around the edge of waterbodies. These are usually situated near or among mangroves or other sparse, emergent or fringing vegetation. The species roosts on the coast and inland in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms, and flooded crops (BirdLife Australia, 2021).

Threats

According to the Conservation Advice for the Common Greenshank (DCCEEW, 2024b), threats to the species include habitat loss, degradation and fragmentation, anthropogenic disturbance, climate change, invasive species, exploitation and pollution.

Known populations in the vicinity of the DE and broader region

According to the DBCA database, there are two records of this species within 40 km of the DE. Both records are from 2005. None of these records intersect the DE, with both records approximately 17 km north-east of the DE. This indicates that the species may be an uncommon visitor to the area.

Species habitat extent, quality and importance

Habitat critical to the survival of the Common Greenshank is defined in the species Conservation Advice (DCCEEW, 2024b), and refers to areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal,*
- *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the common greenshank, such as macrobenthos),*
- *To maintain genetic diversity and long-term evolutionary development, or*



- For the re-introduction of populations or recovery of the species. Habitat critical to the survival of common greenshank includes a mosaic of feeding and roosting habitat. Common greenshank frequents a variety of freshwater, marine, and artificial wetlands.

Within the DE, the species may use the drainage lines/rivers/creeks (major) habitat for dispersal and foraging. The extent of potential Common Greenshank habitat types present in the DE is shown in Table 8-22.

Table 8-22: Common Greenshank Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Drainage lines/rivers/creeks (major)	Supporting habitat (dispersal and foraging)	6,152.35

The Common Greenshank has the potential to occasionally use drainage lines/rivers/creeks (major) habitat that occur within the DE, particularly permanent or semi-permanent pools with fringing vegetation, such as pools along the Shaw River. The species is unlikely to rely on the habitat, and therefore it is not considered habitat critical to the survival of the species.

The disturbance levels of the drainage lines/rivers/creeks (major) habitat were recorded as Low - High (Ecoscape, 2025), and the fauna habitat quality within the DE is therefore considered to be of a 'Medium' quality.

Oriental Pratincole (*Glareola maldivarum*) – Medium Likelihood

Species background information

The Oriental Pratincole is a medium-sized tern-like shorebird with long, pointed wings and a forked tail. They are approximately 23–24 cm long and weigh about 75 g. Their back and upper rump is generally dark olive-brown. The sexes are alike, with seasonal variation, and juveniles are separable (DoE, 2024e). The Oriental Pratincole is listed as Migratory under the BC Act and EPBC Act. The species is also listed under CAMBA, JAMBA and ROKAMBA.

Abundance & distribution

The total population of the species is estimated to be between 2.5 million to 2.88 million birds (Stewart *et al.* 2007; Birdlife International, 2007b). Most of the migratory population of the species is thought to spend the non-breeding season in Australia (Higgins & Davies 1996). In Australia, the Oriental Pratincole is mostly distributed in the northern areas, especially along the coasts of the Pilbara Region and the Kimberley Division in WA, the Northern Territory, and parts of the Gulf of Carpentaria (DoE, 2024e). The species also occurs inland and in southern Australia with scattered records. It is noted as a species of least concern on the IUCN Red List of Threatened Species.

Habitat preferences

The Oriental Pratincole does not breed in Australia (DoE, 2024e).

In Australia, the Oriental Pratincole usually inhabits open plains, floodplains, short grassland and terrestrial wetlands. The species also occurs along the coast in habitats such as mudflats and islands, or around coastal lagoons (DoE, 2024e). Roosting habitat includes near water at the edges of terrestrial wetlands, bare areas such as claypans or areas with low vegetation, such as saltmarsh or airfields (DoE, 2024e).



Threats

As the Oriental Pratincole occurs in sparsely-settled areas in Australia, there are no immediate threats to the species (Higgins & Davies 1996). According to the Species Profile and Threats Database (DoE, 2024e), threats may include vehicle strike, aircraft strike, cattle grazing and disturbance from human recreation.

Known populations in the vicinity of the DE and broader region

According to the DBCA database, there are no records of this species within 40 km of the DE; however, one individual was sighted during the recent bird utilisation surveys within the DE and close to Marble Bar Road (196588 Easting, 7631161 Northing, Zone 51).

Species habitat extent, quality and importance

Habitat critical to the survival of the Oriental Pratincole is not defined. Within the DE, the species may use the drainage lines/rivers/creeks (major) habitat for dispersal and foraging. The extent of potential Oriental Pratincole habitat types present in the DE is shown in Table 8-23.

Table 8-23: Oriental Pratincole Habitat Types in the Development Envelope

Habitat type	Habitat importance	Extent in DE (ha)
Drainage lines/rivers/creeks (major)	Supporting habitat (dispersal and foraging)	6,152.35

The Oriental Pratincole has the potential to occasionally use drainage lines/rivers/creeks (major) habitat that occur within the DE, particularly permanent or semi-permanent pools with fringing vegetation, such as pools along the Shaw River. This species is unlikely to rely on the habitat and therefore it is not considered habitat critical to the survival of the species. There is 6,152 ha of this habitat within the DE.

The disturbance level of the drainage lines/rivers/creeks (major) habitat was recorded as Low – High (Ecoscape, 2025). Therefore, the fauna habitat quality within the DE can be considered to be of a ‘Medium’ quality.

8.4.3 Short -Range Endemic Invertebrates

The desktop review focussed on Western Australia (WA) Museum and Harry Butler Institute, Murdoch University (HBI) database records from an approximately 40,000 km² area that was centred in the middle of the Study Area (as defined in Section 8.3.3). The desktop review recorded 371 taxa in the SRE target groups in 5,184 records including 11,868 specimens (HBI, 2025). Of these, 17 taxa were recorded inside the Study Area and twelve of these are only known from the Study Area, including:

- Four species of spiders (Araneae).
- One harvestman (Opiliones).
- One pseudoscorpion (Pseudoscorpiones).
- One soil centipede (Geophilomorpha).



- Five slaters (Isopoda).

A total of 2,434 specimens in the SRE target groups were collected during the field survey, dominated by pseudoscorpions (1,284 specimens) and slaters (735 specimens). A total of 131 taxa from SRE target groups were recorded in the survey. Of these, 99 morphospecies were potential SREs; 14 were widespread and 18 were not assessed; but belong to higher taxonomic ranks or species-complexes that contain SREs.

A total of 91 species from the field survey are Study Area SRE (i.e. only found in the study area), including:

- Spiders (Araneae – 2 species).
- Harvestmen (Opiliones – 5 species).
- Pseudoscorpions (Pseudoscorpiones – 41 species).
- Soil centipedes (Geophilomorpha – 9 species).
- Stone centipedes (Lithobiomorpha – 1 species),
- Tropical centipedes (Scolopendromorpha – 8 species).
- Keeled millipedes (Polydesmida – 2 species).
- Two-pronged bristletails (Diplura – 1 species).
- Slaters (Isopoda – 17 species).
- Land snails (Eupulmonata – 1 species).

Two Study Area endemics were shared between the desktop review and field survey, resulting in a total of 101 SRE species that are currently only known from the Study Area. One species collected during the field survey, the Abydos Antichiropus Millipede, *Antichiropus forcipatus*, is a DBCA Priority 1 listed species.

The field sites were in four broad habitat types. “Grassland on plain/slope” and “Woodland in drainage line” yielded the most SRE taxa, whereas “Woodland along rockface/gully” and “Woodland on plain/slope” had the fewest records. “Woodland in drainage line” yielded significantly more SRE target taxa than expected by the number of sites within this habitat type. Habitat was not a good predictor of the SRE target group communities at each site and similar, broad-scale vertebrate fauna habitat types showed poor predictive power for the SRE communities.

In summary, the DE and wider Study Area are species rich with respect to terrestrial invertebrates based on the total number of SREs encountered during the survey, showing comparatively high abundances of some taxa (harvestmen, keeled millipedes) in comparison with other recent assessments in the Pilbara (e.g. Volschenk *et al.* 2024; Framenau *et al.* 2023).



8.4.4 Introduced Fauna

The following introduced fauna species have been recorded within the DE and/or immediate surrounds (Ecoscape, 2025):

- European Cattle (*Bos primigenius taurus*).
- Dromedary Camel (*Camelus dromedarius*).
- Cat (*Felis catus*).
- Dog/Dingo (*Canis familiaris*).
- Rabbit (*Oryctolagus cuniculus*).

8.5 Potential Impacts

The Proposal activities that may impact terrestrial fauna include:

- Habitat loss from direct clearing of terrestrial vertebrate fauna and SRE habitat in the disturbed footprint to accommodate the Proposal infrastructure, including access roads, turbine pads, transmission lines and substations.
- Fauna mortality and disturbance due to increase vehicle movement during the construction and operational phases.
- Habitat fragmentation and behavioural change due to the long-term (30 years) operation of the wind farm, which includes the turbine movements and operation of the transmission line infrastructure.
- Behavioural change resulting from disturbance associated with general construction and operational-related activities (i.e., artificial light, noise, increase of human activities).

The potential impacts on terrestrial fauna arising from these activities include:

- Direct impacts:
 - Clearing of fauna habitat within the DE, including some permanent clearing and some areas of temporary clearing.
 - Clearing of habitat critical for the survival of Threatened species (Curlew Sandpiper; Northern Quoll; Greater Bilby; Grey Falcon; PLNB; Pilbara Olive Python; and Ghost Bat) and Priority and Migratory species.
 - Clearing critical supporting habitat for the Northern Quoll.
 - Barrier effect to fauna movement from closely spaced turbines, roads and transmission lines.
 - Bird and bat collision with the wind turbines or the transmission lines, as well as possibly barotrauma.
 - Birds and bats mortality through electrocution on distribution lines.
 - Fauna mortality through collision with vehicles during the construction and operational phase.



- Indirect impacts:
 - Introduction of invasive alien species (weeds etc).
 - Trophic cascade effect predator-prey dynamic and ecosystem function.
 - Potential increase of artificial nesting or use of artificial features as habitat.
 - Disruption to behaviour of nocturnal fauna due to artificial light during construction and operational activities.
 - Pollution (dust, light, noise and vibration).
 - Potential for alteration or creation of microclimates.
 - Increased risk of bushfires associated with construction activities and operation of new electrical infrastructure.
- Cumulative impacts:
 - Combined impacts from clearing on general fauna habitats associated with the Proposal and other developments in the surrounding area.
 - Combined impacts from clearing of habitat critical for the survival of Threatened species associated with the Proposal and other developments in the surrounding area.
 - Combined disturbance to Threatened species from construction and operational activities associated with the Proposal and other developments in the surrounding area.

8.6 Assessment of Impacts

8.6.1 Direct Impacts

8.6.1.1 Habitat loss

The Proposal includes construction of up to 200 wind turbines and associated infrastructure to support the safe transmission of energy via transmission lines and substations to Iron Bridge. Each turbine will require up to 2 ha for construction, which includes a permanent footprint of 1 ha. Overall, the total habitat clearing is expected to be 2,328.23 ha (not including cleared areas), including 1,297.88 ha of permanent clearing and 1,030.35 ha of temporary clearing that will be progressively rehabilitated on completion of construction. The permanent and temporary clearing of fauna habitat is described in Table 8-24 and its importance for each species presented in Table 8-25.



Table 8-24: Clearing of Fauna Habitat within the Development Envelope

Habitat	Total mapped extent in DE (ha)	Permanent Clearing (ha)	Temporary Clearing (ha)	Total IDF (ha)	Proportion of impacts within DE
Plain (stony/gibber)	8,045.51	30.37	34.97	65.34	0.81%
Hills/ranges/plateaux	26,780.18	141.77	141.76	283.53	1.06%
Plain (boulders)	24,023.89	534.26	388.71	922.97	3.84%
Drainage line/river/creek (major)	6,152.35	15.30	15.04	30.34	0.49%
Drainage line/river/creek (minor)	5,703.33	45.54	40.90	86.44	1.52%
Plain (sand)	26,062.50	527.39	404.73	932.12	3.58%
Rocky escarpments/ridges/mesa	1,916.74	3.25	4.24	7.49	0.39%
Total*	98,684.50	1,297.88	1,030.35	2,328.23	2.36%

*All totals not including existing cleared areas. These numbers differ slightly from the total clearing reported in Chapter 7 (Flora and Vegetation) due to the differences in habitat and vegetation mapping, i.e. some areas of Plain (sand) habitat mapped as cleared for vegetation.

All the fauna habitats will have greater than 96% remaining of their mapped extent recorded within the DE. Although the total IDF represents an extensive area (2,328.23 ha), the proportion of impacts within the mapped extent is minor (0.39 to 3.84%), which indicates that the habitats are well represented in the surrounding areas. Therefore, no fauna habitat will be significantly impacted on a local or regional scale due to the clearing associated with the Proposal.

Following completion of construction, 1,030.35 ha of habitat will be rehabilitated, reducing the permanent clearing to 1,297.88 ha. This would further reduce any potential impacts on the habitat types recorded in the DE.

Conservation Significant Fauna

Potential impacts to significant fauna species, including consideration of critical and important habitat, are detailed in Table 8-25.



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Table 8-25: Threatened Species Habitat Clearing within the Development Envelope

Threatened and other Specially Protected Species	Habitat Importance	Total mapped extent in DE (ha)	Total Indicative Disturbance Footprint (ha)	Proportion of impacts within mapped extent (%)
Night Parrot*	Plain (sand) – supporting habitat	6,275.17	226.27	3.61%
	Plain (boulders) – supporting habitat	3,571.19	175.06	4.90%
	Drainage line/river/creek (minor) – supporting habitat	1,437.33	26.37	1.83%
	Total Night Parrot supporting habitat	11,283.69	427.70	3.79%
Northern Quoll	Rocky escarpments/ ridges/ mesa – critical habitat	1,916.74	7.49	0.39%
	Hills/ranges/plateaux – critical habitat	26,780.18	283.53	1.06%
	Plain (boulders) – critical habitat	24,023.89	922.97	3.84%
	1 km buffer around Rocky escarpments/ ridges/ mesa; Hills/ranges/plateaux; and Plain (boulders) – critical supporting habitat	19,533.61	377.71	1.73%
	Drainage line/river/creek (major) – supporting habitat	6,152.35	30.34	0.49%
	Total Northern Quoll critical habitat	52,720.81	1,213.99	2.30%
	Total Northern Quoll critical supporting habitat	19,533.61	377.71	1.73%
	Total Northern Quoll supporting habitat	6,152.35	30.34	0.49%
Greater Bilby	Plain (stony/gibber) – critical habitat	8,045.51	65.34	0.81%
	Plain (boulders) – critical habitat	24,023.89	922.97	3.84%
	Plain (sand) – critical habitat	26,062.50	932.12	3.58%
	Drainage line/river/creek (major) – critical habitat	6,152.35	30.34	0.49%
	Drainage line/river/creek (minor) – critical habitat	5,703.33	86.44	1.52%
	Total Greater Bilby critical habitat	69,987.58	2,037.21	2.91%
Grey Falcon	Drainage line/river/creek (major) – critical habitat	6,152.35	30.34	0.49%
	All other habitats – supporting habitat	92,532.15	2,297.89	2.48%



Threatened and other Specially Protected Species	Habitat Importance	Total mapped extent in DE (ha)	Total Indicative Disturbance Footprint (ha)	Proportion of impacts within mapped extent (%)
	Total Grey Falcon critical habitat	6,152.35	30.34	0.49%
	Total Grey Falcon supporting habitat	92,532.15	2,297.89	2.48%
PLNB	Rocky escarpments/ ridges/mesa – critical habitat	1,916.74	7.49	0.39%
	Drainage line/river/creek (major) – critical habitat	6,152.35	30.34	0.49%
	All other habitats – supporting habitat	90,615.41	2,290.40	2.53%
	Total PLNB critical habitat	8,069.09	37.83	0.47%
	Total PLNB supporting habitat	90,615.41	2,290.40	2.53%
Pilbara Olive Python	Hills/ranges/plateaux – critical habitat	26,780.18	283.53	1.06%
	Rocky escarpments/ ridges/mesa – critical habitat	1,916.74	7.49	0.39%
	Drainage line/river/creek (major) – critical habitat	6,152.35	30.34	0.49%
	Total Pilbara Olive Python critical habitat	34,849.27	321.36	0.92%
Ghost Bat	Rocky escarpments/ ridges/mesa – critical habitat	1,916.74	7.49	0.39%
	Drainage line/river/creek (major) – critical habitat	6,152.35	30.34	0.49%
	All other habitats – supporting habitat	90,615.41	2,290.40	2.53%
	Total Ghost Bat critical habitat	8,069.09	37.83	0.47%
	Total Ghost Bat supporting habitat	90,615.41	2,290.40	2.53%
Peregrine Falcon (other specially protected)	Rocky escarpments/ ridges/mesa – critical habitat	1,916.74	7.49	0.39%
	All other habitats – supporting habitat	96,767.76	2,320.74	2.40%
	Total Peregrine Falcon critical habitat	1,916.74	7.49	0.39%
	Total Peregrine Falcon supporting habitat	96,767.76	2,320.74	2.40%

*Note: The habitat area calculations for Night Parrot only consider the relevant mapped habitat within unburnt areas given this species habitat preferences.



Night Parrot

Clearing up to 427.70 ha of supporting habitat for the Night Parrot represents 3.79% within the mapped extent of these habitats. Fire scar data from 2000-2024 shows that the entire DE is subjected to frequent fires, forming a mosaic of fire ages. This indicates that the area does not support many landscape features that limit the spread of fire, which has prevented suitably complex spinifex hummocks to form. Some areas adjacent to major drainage lines appear to have suitable long unburnt spinifex, however assessment of aerial imagery indicates a lack of structurally complex spinifex that would limit its use by Night Parrot. Given the lack of roost habitat or occurrence records within 10 km of the DE, this indicates that any potential supporting foraging habitat is not likely to be used by Night Parrot. Clearing of this supporting habitat is therefore not expected to result in a significant impact for this species.

Northern Quoll

Clearing up to 30.34 ha of supporting habitat for the Northern Quoll represents 0.49% within the mapped extent of this habitat in the DE and is therefore not expected to result in a significant impact to this species. The clearing of up to 7.49 ha of rocky escarpment/ridges/ mesa, 283.53 ha of hills/ranges/plateaux and 922.97 ha of plain (boulders) represents only 0.39%, 1.06% and 3.84% respectively within the mapped extent of these habitats. The clearing of 337.71 ha of critical supporting habitat (area of habitats within 1km of critical habitats) represents 1.73% of the mapped extent of these habitat types within the DE. With regard to the critical habitat for the Northern Quoll, the clearing of up to 1,213.99 ha of habitat critical to the survival of the Northern Quoll is considered a significant impact to this species due to the level of activity recorded in the DE during the surveys.

Greater Bilby

The major and minor drainage lines represent critical habitat for the Greater Bilby, however given the clearing of 116.78 ha of these habitats represent less than 1% of their mapped extent in the DE, the proposed clearing is not expected to result in a significant impact to the species. Additionally, the plain (stony/gibber), plain (boulders) and plain (sand) habitats are also considered critical habitat for the species. There is 65.34 ha, 922.97 ha and 932.12 ha of these habitats respectively. This clearing represents only 0.81%, 3.84% and 3.58% respectively within the mapped extent of remaining critical habitat in the DE for the species. Regardless, as discussed in Section 8.4.2.1, this is considered a new population of the species and the clearing of up to 2,037.21 ha of critical habitat is considered a significant impact to this important population of the Greater Bilby.

Grey Falcon

Clearing of 30.34 ha of critical habitat for the Grey Falcon represents just 0.49% of the mapped extent within the DE. Clearing of up to 2,297.89 ha of supporting habitat for this species (all other habitat types) represents 2.48% of the habitat's mapped extent within the DE. Clearing of this critical and supporting habitat for the Grey Falcon is not considered to have a significant impact on the species due to the relatively limited activity recorded during the surveys and the abundance of additional habitat remaining in the DE and wider area, as detailed in Table 8-25. Impacts related to collision risk for this species is discussed in Section 8.6.1.2.



Ghost Bat and PLNB

Clearing of 37.83 ha of critical habitat for both the PLNB and Ghost Bat represents just 0.47% of the mapped extent of these habitat types in the DE. Additionally, clearing of up to 2,290.40 ha of supporting habitat for these species (all other habitat types) represents less than 2.53% of each habitat's mapped extent within the DE. Clearing of this critical and supporting habitat for the PLNB and Ghost Bat is not considered to have a significant impact on these species due to the abundance of habitat remaining in the DE and wider area, as detailed in Table 8-25, and the fact no roosting caves have been identified for these species within the DE or wider Survey Area. Impacts related to collision risk for this species is discussed in Section 8.6.1.2.

Pilbara Olive Python

Clearing of 321.36 ha of critical habitat for the Pilbara Olive Python represents less than 1% of the mapped critical habitat for this species within the DE. Given the abundant habitat remaining in the DE and further suitable habitat in the wider area, this clearing is not considered to result in a significant impact to this species.

Peregrine Falcon

The Peregrine Falcon is listed as 'other specially protected species'. Clearing of 7.49 ha of critical habitat for this species represents just 0.39% of the mapped extent of critical habitat within the DE. Clearing of up to 2,320.74 ha of supporting habitat for this species (all other habitat types) represents 2.4% of these habitat's mapped extent within the DE. Given the abundant habitat remaining in the DE and further habitat in the wider area, and the relatively limited records in the DE and surrounding area, this clearing is not considered to result in a significant impact to this species. Impacts related to collision risk for this species is discussed in Section 8.6.1.2.

Priority Fauna

Six species of Priority fauna have been recorded from within the DE or have a medium or high likelihood of occurrence, as detailed in Section 8.4.1. Given these are all ground dwelling species of marsupials, rodents and reptiles, the primary impacts from the Proposal relating to these species will be associated with clearing of the habitat within the DE. The relevant Priority species and their associated habitat are reported in Table 8-26 with details of the proportionate impact to each species habitat.



Table 8-26: Clearing of Priority Fauna Habitat

Species	Status	Habitat	Habitat Importance	Total Disturbance Footprint (ha)	Proportion of impacts within mapped extent
Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>)	Priority 4	Plain (stony/gibber)	Supporting habitat (construct mounds, foraging, dispersal)	65.34	0.81%
		Hills/ranges/plateaux		283.53	1.06%
		Rocky escarpments/ ridges/mesa		7.49	0.39%
Gane's Blind Snake (<i>Anilius ganei</i>)	Priority 1	Plain (stony/gibber)	Supporting (shelter, foraging and dispersal)	65.34	0.81%
		Hills/ranges/plateaux		283.53	1.06%
		Rocky escarpments/ ridges/mesa		7.49	0.39%
Spectacled Hare-wallaby (<i>Lagorchestes conspicillatus leichardti</i>)	Priority 4	Plain (sand)	Supporting habitat (shelter, foraging, dispersal)	932.12	3.58%
		Plain (boulders)		922.97	3.84%
Brush-tailed Mulgara (<i>Dasyercus clythi</i>)	Priority 4	Plain (sand)	Supporting habitat (shelter, foraging, dispersal)	932.12	3.58%
		Plain (boulders)		922.97	3.84%
Northern Short-tailed Mouse (<i>Leggadina lakedownensis</i>)	Priority 4	No suitable habitat within the DE, however Medium likelihood due to DBCA records within 1 km	N/A	-	-
Long-tailed Dunnart (<i>Sminthopsis longicaudata</i>)	Priority 4	Hills/ranges/plateaux	Supporting habitat (shelter, foraging, dispersal)	283.53	1.06%
		Rocky escarpments/ridges/mesa		7.49	0.39%



As detailed in Table 8-26, the Proposal will not disturb any defined critical habitat associated with the Priority species potentially occurring in the DE. Supporting habitat will be cleared for all the species with the exception of the Northern Short-tailed Mouse. However, greater than 96% of the mapped extent of all habitat types recorded in the DE will remain, which will increase further with the proposed rehabilitation of 1,030.35 ha post construction. In addition, the Priority fauna habitat types recorded are part of much larger units extending beyond the DE and therefore the removal of the areas detailed in Table 8-26 will be negligible in relation to the full extent of these habitat types in the surrounding area.

Migratory Fauna

Six of the seven migratory bird species that are likely to occur within the DE may utilise the drainage line/river/creek (major) as a foraging and/or dispersal habitat for the species. The Oriental Plover may also utilise all other habitat for the same activities and, exceptionally, the Pacific Swift has flying behaviour and does not rely on terrestrial habitat for survival. The Proposal will impact 30.34 ha of drainage line/river/creek (major) habitat of which 15.04 ha will be rehabilitated after construction activities. Therefore, 15.30 ha will be permanently impacted by the Proposal. This represents 0.25% of the total habitat within the DE (6,152 ha).

The overall permanent and temporary clearing of fauna habitat is described in Table 8-24 and its importance for each species presented in Table 8-27.

Table 8-27: Clearing of Migratory Species Habitat

Migratory fauna species	Habitat importance	Total mapped extent in DE (ha)	Total IDF (ha)	Proportion of impacts within mapped extent
Common Greenshank	Drainage lines/River/creeks (major) – Supporting habitat	6,152.35	30.34	0.49%
Common Sandpiper	Drainage lines/River/creeks (major) – Supporting habitat	6,152.35	30.34	0.49%
Oriental Plover	Drainage lines/River/creeks (major) – Supporting habitat	6,152.35	30.34	0.49%
	All other habitats – supporting habitat	92,532.15	2,297.89	2.48%
Oriental Pratincole	Drainage lines/River/creeks (major) – Supporting habitat	6,152.35	30.34	0.49%
Pacific Swift	Does not rely on terrestrial habitat	-	-	-
Sharp-tailed Sandpiper	Drainage lines/River/creeks (major) – Supporting habitat	6,152.35	30.34	0.49%
Wood Sandpiper	Drainage lines/River/creeks (major) – Supporting habitat	6,152.35	30.34	0.49%

Given that migratory bird species are only likely to utilise the DE occasionally, that the habitat within the IDF is not critical habitat for the species and that the total habitat loss represents 0.25% of the DE, impacts associated with habitat loss are not considered to be significant for any of the migratory species.

Additionally, given that the Oriental Plover’s habitat for foraging and dispersal activities is not restricted to the DE, the habitat loss as a consequence of the Proposal does not present a significant impact, due to the extent of available habitat within the regional area. Impacts to



these Migratory species in relation to direct collisions with wind turbines and transmission lines is discussed in Section 8.6.1.2.

Short Range Endemic Invertebrates

The survey sampled four major habitat types but found that habitat type does not reliably predict species composition (HBI, 2025). Within the "Woodland along rockface/gully" habitat, there are some similarities in the SRE community, likely due to high levels of rockiness or shade. However, ecological factors influencing SRE distribution were not analysed in detail. Ecoscape's broadscale vertebrate fauna habitat types, based on geomorphological features like plains or drainage lines, also showed low predictive value for SRE composition. These habitats do not consider factors like vegetation cover and soil type at smaller scales, which are important for invertebrates.

The high number of singletons (species found only at one site) creates statistical challenges in comparing species composition between sites. Increasing the number of identified specimens, especially cryptic species like olpiid pseudoscorpions and armadillid slaters, using molecular techniques could improve habitat correlations. "Woodland in drainage line" yielded more SRE target taxa than expected, while other habitat types yielded fewer. This suggests that further testing with higher taxonomic resolution is needed to better understand the habitat requirements of these species.

The (HBI, 2025) survey resulted in a comparatively large number of SRE species in relation to other surveys undertaken in the region and some taxa, such as assamiid harvestmen and Antichiropus millipedes were also found in comparatively high abundances. The diversity of olpiid pseudoscorpions was particularly high. Optimal conditions due to rainfall before and during the surveys are likely contributing to these high numbers. Clearing of SRE habitat associated with the Proposal will be limited to the IDF area which has been minimised as far as possible through the design process. Given the majority of the DE will remain undisturbed; the access roads are proposed to be a maximum of 8 m wide; the turbine structures will be widely spaced with up to 2 km between each turbine; and the transmission line will allow for some areas to remain undisturbed between poles, it is considered unlikely that the clearing would present a significant impact to SRE habitat.

8.6.1.2 Bird and Bat Collision with the operational wind farm infrastructure

The presence of wind turbines and transmission lines is a potential risk for bird and bat collision during operational activities. This risk is mainly due to rotating wind turbine blades; however, collisions with turbine towers and motionless blades can also occur, especially among birds. A review of existing literature in relation to bird and bat impacts of wind farms has been undertaken and is presented in Appendix D. The key points identified relevant to the assessment are summarised below:

Direct Strikes

- **Birds:** While bird strike impacts from wind farms are extensively studied internationally, Australia lacks comprehensive data. This gap limits understanding of species-specific and landscape-scale differences in impacts. Wind farms contribute to about 0.1% of global bird deaths, which is relatively low compared to other infrastructures like aviation and roadkill.



- **Bats:** Bat fatalities have been associated with habitat preference, wing shape, behavioural characteristics and echolocation difficulties of the moving turbines. Bat species that are highly vulnerable to collisions are often aerial insectivores, especially those in the functional groups of open-space and edge-space foragers.
- **Species-Specific Risks:** The impact of wind farms varies by species, season, and site. Migratory species are at greater risk. Recent studies suggest that turbine height can be correlated to the mortality of some species; however, they cannot predict the number of fatalities for all species since specific-species behaviour (i.e., flight altitude), proximity of wind energy facilities to key habitats, migration corridors and roosts, plays a role. Soaring birds with higher wing loading, which fly at fast speeds and utilise updrafts, have lower manoeuvrability, increasing their collision risk. Vultures and ravens are frequently involved in collisions. Raptors are vulnerable to collisions. However, they can exhibit avoidance behaviour, being capable of detecting the presence of the turbines.
- **Australian Study:** In southeastern Australia, studies recorded fatalities of 24 bird species and 4 bat species at wind farms. Medium to large birds that commonly fly at turbine heights (over 50m) are most frequently impacted.
- **Species Presence vs. Collision Risk:** The presence and abundance of species at a site do not necessarily indicate collision risk.
- **Flight Height:** Higher flying species of bats are more prone to collisions. Echolocation difficulties with moving turbines contribute to bat fatalities. For example, Gould's wattled bat and two *Vespardelus* species have recorded collisions, while lower flying species like the Lesser Long-eared bat have not.

Barotrauma

- **Definition:** Barotrauma refers to damage to the lungs and air-containing tissues caused by changes in air pressure created by wind turbines.
- **Bat Injuries:** Barotrauma does not seem to be a potential risk for Bat species. Recent studies indicate that low and high-pressure regions generated by the turbine blade are localised to small regions near the leading edge of the blade and decay rapidly with increasing distance from the blade. Further, the highest magnitude pressure is more than 80 times below the LD50 exposure level for animals with similar body mass.
- **Birds:** Birds are less susceptible to barotrauma due to their lung structure. Most birds are diurnal, which helps them visually avoid barotraumatic zones created by wind turbines.

Collision data of currently operational wind farms in Australia

There is limited publicly available collision data for operational wind farms in Western Australia, and therefore available collision data from wind farms in New South Wales (NSW) has been reviewed to provide context for the Proposal. Although not directly comparable given the differences in species throughout the geographical regions, and size of turbines, the data can be used to analyse trends and similarities in potential fauna impacts.



Collision and mortalities data are difficult to directly compare between wind farms as they utilise different survey effort and methodologies, and differ in various features including their size, location and surrounding habitat. However, trends and similarities in fauna impacts can be observed. Strike rates are generally relatively low with an estimated mortality rate of about 3.22 birds per turbine per year, and an estimated mortality rate of 2.38 bats per turbine per year (Eco Logical Australia, 2023). Collision rates also need to be considered with regard to the wind turbine rotor sweep height as the majority of bird species are known to fly more frequently at lower heights (i.e. 0-30 m) whilst utilising the canopy vegetation or flying slightly above the canopy. In addition, Migratory shorebirds typically fly at high altitudes during migration, with flight heights of 1,000-5,000 m reported as typical for some species (Geering *et al.*, 2007). As such, the higher the rotor sweep area is, potentially the less likely interactions would occur with lower flying species.

It should be noted that data for each wind farm that is publicly available has utilised different survey periods and survey efforts. As such, the total number at each wind farm cannot be directly compared. Additionally, the carcasses of some species would disappear faster than others, and thus likely be underrepresented in the data. For example, bat species and smaller bird species are removed by scavengers faster than larger bird species (Brett Lane & Associates, 2017).

Bird and bat site utilisation surveys across the DE are currently ongoing for the Proposal, however data from the first year of survey effort is discussed in the following section.

Potential Collision Impacts on Avifauna and Bats

Based on initial survey feedback with regard to bird species in the DE, the utilisation surveys recorded one listed Vulnerable species (Grey Falcon) listed under the EPBC Act and BC Act and four migratory species (Sharp-tailed Sandpiper, Common Sandpiper, Wood Sandpiper, and Oriental Pratincole) listed under the EPBC Act and BC Act.

The potential collision impacts associated with the Proposal on avifauna and bats are related to the rotor swept area (RSA) for the proposed wind turbines. That is the area swept by the rotating blades during turbine operation. For the Proposal, this is anticipated to be between 90 m above ground level (i.e., minimum ground clearance) and 290 metres above ground level (i.e., the maximum blade tip height). Therefore, species typically flying below 90 m or above 290 m in flight height will be at a lower risk of collision with the operational turbines, even in the event that they fly directly across any given turbine location.

Threatened Fauna

With regard to the Grey Falcon species recorded during the survey, as discussed in Section 8.4.2.1, the species is likely to predominantly use the DE for foraging across all habitats and potentially breeding associated with the major drainage line/river/creek habitat. The Grey Falcon is a specialist predator of birds (Schoenjahn, 2013), typically flying at low altitudes, often close to the ground associated with hunting activity (NT Government, 2021). The species is highly mobile and forages in open landscapes such as rocky plains with hummock grasslands, lower shrublands, and small drainage lines (Olsen and Olsen, 1986; Schoenjahn, 2013). This species is prone to collision with wind turbines due to its soaring behaviour within RSA heights whilst foraging or dispersing. The Grey Falcon was recorded during the BBSUs adjacent to the potential impact sites and observed to fly at heights intersecting with the RSA. Given the species EPBC listing and assumed relatively low abundance, individual mortality would present a potentially significant impact.



The Night Parrot is also likely to have relatively low flight heights below the RSA for the Proposal. The Night Parrot is thought to be mostly ground dwelling as it relies on dense vegetation such as old-growth spinifex, lignum thickets, or dense shrubby samphire for shelter and nesting. This elusive bird is rarely seen flying, except when disturbed or in search of water (Olsen, 2018) and, therefore, is unlikely to have significant activity within the RSA. It is noted that this species has not been recorded in the site utilisation surveys undertaken to date and has limited preferred habitat within the DE.

The Peregrine Falcon is likely to be active in the RSA given their typical hunting behaviour soaring from high altitudes (American Bird Conservancy, 2024), known to soar at heights up to 1,200 m and therefore does have the potential to be impacted through collision with the operational turbine infrastructure. Although this species has not been recorded in the site utilisation surveys to date.

Potential impacts on Threatened fauna from the operational Proposal will be considered further as part of the ongoing research and collision risk modelling discussed in Section 8.3.

Migratory Fauna

The migratory species recorded during the BBSUS typically fly at heights significantly higher than the RSA for the Proposal during migration, with typical flight heights of 1,000-5,000 m reported as typical (Geering *et al.*, 2007), however for foraging and roosting it is likely the flight heights would be much closer to ground level.

Data collected as part of another wind farm development within the Pilbara (Biota, 2019) noted the Oriental Pratincole was observed flying at ranges between ground level and 35 m elevation on multiple occasions. This is substantially below the RSA height for the Proposal, reducing any potential risk of collision for Oriental Pratincole. Other data confirms these flight height results, suggesting foraging elevations for Oriental Pratincoles are relatively low. Piersma and Hassell (2010) documented several observations of the species' foraging in north-western Australia flying several meters above the low grass or saltmarsh vegetation. However, Piersma and Hassell (2010) also report one observation of thermal soaring at approximately 600-700 m above ground. Birds, especially migratory species, use these thermals to gain elevation from lower altitudes without expending much energy, especially during long flights or while searching for food. The Pilbara's arid environment, with its varied topography and vegetation, provides suitable conditions for the formation of thermals, which birds use for soaring. Therefore, where individuals of Oriental Pratincole or other relevant migratory species are engaging in thermal soaring activity, gaining altitude from the lower elevations recorded, they would be at a heightened risk of collision with the operation turbines and as such, a residual risk of bird mortalities from collision remains.

Given the numbers of the migratory species recorded in the initial survey effort, all these species are likely to occur only periodically within the habitats of the DE and at relatively low abundance. Estimates of Oriental Pratincole numbers for the East Asian Flyway population of this species is 2.88 million individuals (Bamford *et al.* 2008) and therefore the relatively low number of mortalities that could potentially occur as a result of the Proposal is not anticipated to be significant at a species or population level. The total estimated East Asian Flyway population of the other relevant migratory species are (Hansen *et al.*, 2016):

- 190,000 birds - Common Sandpiper.
- 85,000 birds - Sharp-tailed Sandpiper.



- 230,000 birds - Oriental Plover.
- 130,000 birds - Wood Sandpiper.
- 110,000 birds - Common Greenshank.

Given the relative abundance of these species at a population level, the low abundance of these species recorded in the DE would not represent a substantial portion of the wider population. Therefore, any potential impacts to these species from collision are not anticipated to be significant at a regional or population level.

Population estimates for the Pacific Swift are unknown, however populations are believed to be stable throughout most of its range, except Pakistan (del Hoyo *et al.* 1996). There are currently no measures of abundance in Australia (DoE, 2024a). As the Pacific Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above the ground (DoE, 2024a), there is potential for this species to be impacted through collision with the operational wind turbines. Although there have been no records of this species within the DE, there are 7 records within 40 km, with the closest record from 2011 approximately 14 km west of the DE. Therefore, a residual risk of bird mortalities associated with the Proposal for this species remains.

Potential impacts on Migratory species from the operational Proposal will be considered further as part of the ongoing research and collision risk modelling discussed in Section 8.3.

Any potential impacts will be minimised as far as practical through implementation of the mitigation measures outlined in Section 8.7, including adherence to the BBAMP.

Non-conservation Significant Avifauna

The BBSUS (Spectrum, 2024) also recorded non-conservation significant avifauna movements and considered potential impacts to these species from operation of the Proposal. Flight height analysis was undertaken and from all bird observations across the Survey Area, 14 different species flew within the proposed RSA range of 80-220 m, often with large flocks making up a significant proportion of the recordings. The families Artamidae and Falconidae both had three species represented in this range. The most commonly recorded species flying at RSA level was the Masked Woodswallow (Observation Count = 73), followed by the Budgerigar (Observation Count = 30).

In addition to the EPBC & BC Act listed Grey Falcon, the following non-conservation significant species were recorded at over 220 m height range which were represented by Accipitridae and Falconidae:

- Masked Woodswallow - *Artamus personatus*.
- Brown Falcon - *Falco berigora*.
- Australian Pelican - *Pelecanus conspicillatus*.

The vast majority of bird observations recorded across all four trips were between ground level (i.e. 0 m) and 40 m above the ground. This was consistent between both the proposed impact sites and control sites. Additionally, 31 of the 32 opportunistic observations were recorded between ground level (0 m) and 40 m above ground.



Potential Bat Collision Impacts with Proposal Wind Turbines

The PLNB was recorded within the DE (five records in the Generation Hub area and three records in the Transmission Line area) via foraging calls within the drainage habitat (major) and the hills/ranges/plateaux habitat during the Ecoscape (2025) survey. No confirmed roosting caves have been identified within the DE or wider Survey Area and the initial bird and bat site utilisation surveys have not recorded any significant bat species to date. The Ghost Bat has also been recorded in the DE from one previous DBCA record, although there are no recent records of this species, and this record was from the Transmission Line area.

An additional seven microbat species were recorded within the DE across Trip 1 and 2, all of which were identified via ultrasonic echolocation call analysis. These included:

- Common Sheath-tailed Bat - *Taphozous georgianus*.
- Finlayson's Cave Bat - *Vespadelus finlaysoni*.
- Gould's Wattled Bat - *Chalinolobus gouldii*.
- Greater Northern Free-tailed Bat - *Chaerephon jobensis*.
- Little Broad-nosed Bat - *Scotorepens greyii*.
- Northern Free-tailed Bat - *Ozimops lumsdenae*.
- Yellow-bellied Sheath-tailed Bat - *Saccolaimus flaviventris*.

The potential collision impacts associated with the Proposal on bats are also related to the RSA for the proposed wind turbines. Bat Call (2021a) suggests the PLNB forages at low height and (TSSC, 2016b) advise Ghost Bats often fly at about fence height. Bat Call (2021b) confirmed altitude data from the GPS collars in one study suggests that Ghost Bats generally flew close to the ground (1-2 m). As such, given the habitat for these species with the DE is predominantly foraging habitat, and the typical expected foraging heights are substantially lower than the RSA for the Proposal, significant impacts on these bat species from collision with the operational turbines are not anticipated.

The potential impacts on bats from the operational Proposal will be investigated further as part of the ongoing research and collision risk modelling discussed in Section 8.3.

Potential Collision Impacts with Transmission Line Infrastructure

With the installation of new transmission line infrastructure, there is a risk of collision impacts for bird and bat species with the operational infrastructure. A review of available literature on the collision risk is provided in Appendix D.

A technical study recently undertaken for another transmission line project in the Pilbara (Jacobs, 2023) found that for the Common Sandpiper, Sharp-tailed Sandpiper, Oriental Plover, Wood Sandpiper, Common Greenshank, and Oriental Pratincole were all of minimal concern when considering collision risk associated with transmission line infrastructure. Despite varying in levels of absolute threat and overall rarity, these species share the characteristic of having low reporting rates in the area (similar to that recorded for the DE)



which along with their general physiological attributes resulted in being of least concern with regard to collision impacts.

Although relatively minimal, an inherent residual risk will remain with regard potential bird collisions with the Proposal transmission line infrastructure. Given the low utilisation of the DE by the threatened and migratory species recorded, these impacts are not anticipated to be significant at a population level.

To reduce potential risks of collision with the Proposal transmission line infrastructure, the design of both power lines and poles will comply with recommendations developed by BirdLife International to inform the drafting of international conventions on the protection of birds from collision with power lines (BirdLife International, 2007a). These recommendations have been included in Section 8.7 and ensure that components of transmission networks pose the lowest practicable risk of both electrocution and collision to all birds. This guidance confirms the lowest risk for above ground power poles with upright insulators, such as those proposed, are poles with suspended insulators provided the distance between a likely perch (crossarm) to the energized parts (conductors) is at least 60 cm. Conductors will be spaced at least 140 cm apart.

Particularly for birds of prey, it has been documented that the way they use their vision during hunting may render them vulnerable to collisions with power lines (Martin & Shaw, 2010). Line marking balls are simple and cost-effective installations which make power lines more easily visible to birds and improve their ability to accurately perceive depth in relation to power lines (Avian Power Line Interaction Committee, 2006; and 2012). Line marking will be considered along the transmission line route as identified in Section 8.7.

8.6.1.3 Increased risk of vehicle strike

During the construction phase, vehicle movements will increase throughout the DE, associated with the transit of the personnel increasing the risk of vehicle strikes within the area. This risk will be reduced during the operational phase, though a camp of up to 100 personnel will be established for maintenance and operational activities. In addition, there is also risk of fauna mortality caused by operation of heavy plant and machinery during clearing activities (for example collision with dozers as they clear).

The risk of vehicle strike will remain throughout the construction phase and this impact would be similar for all diurnal species likely to occur in the DE (some of the Threatened and Migratory species discussed in this report). However, for those that are predominantly nocturnal, including the Night Parrot, Northern Quoll, Greater Bilby, PLNB, Ghost Bat, and most of the Priority fauna considered, there would be a relatively lower risk of collision with construction or operational vehicles given the anticipated substantial reduction in site activity during the night when these species are most active.

Collision with vehicles could lead to injury or mortality of fauna species. However, with implementation of the standard mitigation measures as outlined in Section 8.7, the anticipated collision numbers would be low. Therefore, the potential collision impacts are not considered to be significant for any of the species identified.



8.6.2 Indirect Impacts

8.6.2.1 Habitat fragmentation and Proposal infrastructure acting as a barrier to fauna movement

Many species in the Pilbara are adapted to specific habitats, the clearing of which can threaten their survival. Habitat fragmentation will occur due to permanent clearing associated with the Proposal, specifically new roads and access tracks within the IDF. These roads will intersect drainage lines, plain (stony/gibber), hills/ranges/plateaux, plain (boulders), plain (sand), plain (stony/gibber) and rocky escarpments/ridges/mesa habitats. The Proposal's infrastructure also poses a potential impact on loss of fauna habitat and fragmentation through the creation of a physical barrier (Dai *et al.*, 2015) and the associated avoidance behaviour of some species. This is especially the case for birds and bats, but also non-flying wildlife, which avoid flying between blades and foraging or transiting within the habitat between the infrastructure (Barre *et al.*, 2018, Marques *et al.*, 2019).

Clearing of habitat for the Proposal may cause barriers to fauna movement for the Threatened and Priority species likely to occur in the DE, in particular those species with lower mobility such as small mammals like the Western Pebble-mound Mouse, Long-tailed Dunnart and the Northern Short-tailed Mouse. This can cause individuals in a population to become isolated from one another or prevent individuals from moving from their nesting or denning habitat to areas where they may forage. However, given the majority of the DE will remain undisturbed; the access roads are proposed to only be up to 8 m wide; the turbine structures will be widely spaced with up to 2 km between each turbine and a minimum of 600 m, and the transmission line will not prevent the movement of fauna underneath, it is likely that clearing for the Proposal and the placement of infrastructure will not cause a barrier to species movement within their home ranges. In addition, large areas of undisturbed habitat will remain intact within the DE and surrounding area post-disturbance and populations in these areas will not be impacted.

For the migratory bird species likely to occur in the DE, fragmentation is generally not considered to be a significant issue given they can easily traverse from one area to another, unless the clearing creates a sufficient barrier that they cannot fly over. As discussed above, the proposed clearing will be dispersed over a large area and will be relatively narrow associated primarily with the access roads and turbine pads, and is therefore not anticipated to result in significant fragmentation impacts or act as a substantial barrier for these species (collision impact has been discussed in Section 8.6.1.2).

Following construction, the rehabilitation of cleared areas can help to reduce any potential fragmentation or barrier impacts, which is discussed further in Sections 8.7 and 0.

8.6.2.2 Increasing access and Attraction of scavenger and feral animals

Feral predators (i.e., foxes and cats) are known to thrive in areas of reduced vegetation, as it removes vegetation cover for native fauna and improves hunting success. Given the existing nature of the Project Area (incorporating vast expanses of open spaces), it is considered that clearing associated with the Proposed Action will not significantly increase accessibility to the area for feral animals due to the openness of the current landscape and existing presence of feral animals in the area.

Additionally, the Proposal will have an associated camp to accommodate up to 1,000 personnel during construction, and up to 100 personnel during operational activities. Waste disposal facilities associated with the camp can attract scavenging and feral fauna species if they are not appropriately managed. The presence of animal carcasses resulting from roadkill



or collision with infrastructure can also act as an attractance for scavengers and feral fauna. This can result in increased pressure on the surrounding populations of native fauna species, including increased predation of Threatened and Migratory species by attracted introduced animals. Therefore, mitigation measures have been set out in Section 8.7 to minimise this risk as far as practical. As part of the standard operation of the camp, food waste will be removed at the end of each shift and waste stored at the depot and regularly removed. Given the existing presence of feral animals in the area, the Proposed Action is not anticipated to substantially increase feral animal activity and no significant impacts from feral animals on native fauna are anticipated.

8.6.2.3 Increase risk of weed introduction

The Proposal includes construction of approximately 290 km of roads for access between infrastructure and the main access via Marble Bar Road. The construction activities can increase the risk of weed introduction through machines and personnel. Weed introduction can also be influenced by edge effects⁷ on vegetation, due to clearing activities (Rowley, Edwards & Kelly, 1993).

Clearing for the Proposal will increase movement of vehicles in the DE during construction, including earth moving machinery which could result in the establishment of new populations of weed species. Areas of dense weed infestation can reduce the ability of fauna to traverse through their associated habitat and impact on their ability to forage (Stewart *et al.*, 2021). In addition, weed species that are palatable to feral herbivores can cause an increase of these animals within the area thereby causing potential land degradation and further spreading of weed species either by movement of soil or in the animal's dung (Hartley *et al.*, 2022; Norris & Low, 2005). Increased numbers of weeds can also significantly increase the risk of fire, which can impact on fauna habitat value (see Section 8.6.2.7).

As discussed in Section 8.4.2.1, according to the Recovery Plans for Northern Quoll and Greater Bilby, weed infestation is one of the key threats to each of these the species and therefore may be at elevated levels of risk with regard to this potential impact. However, given the effects of weed impacts on fauna habitat previously mentioned, the other ground dwelling species could also be impacted.

Comprehensive weed hygiene management will be enforced during construction and operation to maintain the quality of habitats, as detailed in Section 8.7. These mitigation measures will include adherence to weed management control measures. All works will be undertaken in accordance with Fortescue's Weed Management Plan (Reference: 45-PL-EN-0033) as the standard operating procedure. With these measures in place, any risk of spreading weeds can be appropriately managed such that no significant impacts are anticipated.

8.6.2.4 Disrupted behaviour of nocturnal fauna due to artificial light

Artificial light can impact migratory and/or nocturnal threatened species by changing predator and prey dynamics and movement, interfering with navigation, and impacting the physiology of circadian rhythm and reproduction (Biodiversity Council, 2023).

⁷ Edge effects can occur at the boundary between cleared areas and the remaining vegetation, including effects associated with increased sunlight and wind; changes in plant and animal communities supported; increased risk of invasive species; or changes in soil composition and water runoff patterns.



The construction of the Proposal will involve the use of artificial light to illuminate specific working areas throughout the DE, although the majority of the works are anticipated to occur during daylight hours which will reduce the need for substantial areas of artificial lighting. During operations, artificial light may be used for safety purposes and within facilities such as the maintenance staff camp.

Altered ambient lighting and increased artificial light may cause behavioural changes to all the Threatened, Priority and Migratory species likely to occur within the DE. The artificial light can cause changes to invertebrate behaviours, such as increased concentrations of individuals around heat and light sources, consequently causing changes to the behaviour of species that predate on the insects, in particular the Northern Quoll, Ghost Bat and PLNB.

Further, the predominantly nocturnal species likely to occur in the DE, including the Night Parrot, Northern Quoll, Greater Bilby, PLNB, Ghost Bat, and most of the Priority fauna considered, would be at increased risk of impacts due to their increased activity during the darker periods when artificial light is more likely to be required. Conversely, diurnal species such as the Grey Falcon would be impacted to a lesser extent.

To minimise the potential impacts of artificial light on fauna in the surrounding area, mitigation measures have been proposed and are presented in Section 8.7, which align with the National Light Pollution Guidelines for Wildlife (DCCEE, 2023c). Given the extremely low levels of current ambient light sources in the DE, some increases in temporary and permanent lighting will inevitably be required and thus a residual impact on fauna in close proximity to the Proposal will remain. However, through the implementation of these mitigation measures outlined in Section 8.7, these impacts will be minimised such that the Proposal is unlikely to have a significant residual impact with regard to light impacts on fauna during construction or operation.

8.6.2.5 Disturbance from noise and vibration

Noise and vibration increases will occur mainly due to construction activities and will then decrease, though remaining slightly higher than baseline levels during the operational phase of the Proposal.

During the construction phase, noise and vibration are expected from the operation of construction plant and machinery, earthworks and general ground disturbing activities. It is not anticipated that a significant amount of blasting will take place.

During the operational activities, noise and vibration will occur as a constant, but with low intensity. The noise impacts of wind farms can be distinguished between two types: mechanical noise and aerodynamic noise. Overall, mechanical noise is not of high concern since it can be minimised through soundproofing materials. However, aerodynamic noise due to the wind turbine blades' rotation can affect fauna species (Pinto, Martins & Pereira, 2017) and is more challenging to mitigate. The sound associated with these activities can impact an animal's behaviour (i.e., avoidance, masking) or have physiological effects, reducing their overall survival and fitness (Teff-seker *et al.*, 2022). Elevated noise levels can also reduce reproductive success and, in severe cases, lead to complete abandonment of an area, such as caves.

Noise attributable to the Proposal above baseline levels may impact sensitive species, such as the Ghost Bat and PLNB as mammals with superior hearing capabilities (Bat call, 2021a), as well as potentially causing changes to the fauna assemblage within habitats in close



proximity to the construction working areas. According to the Noise Assessment undertaken for the Proposal (Talis Consultants, 2024), the highest noise levels will be experienced during the construction phase. Sound power levels of 120 to 150 dBZ may be generated by various types of equipment such as haul trucks, loaders/excavators, dozers, drill rigs and service trucks, therefore where any Ghost Bat or PLNB roosts in close proximity to the construction works, they may be temporarily impacted. However, no impacts from noise on these two species are anticipated, since no roosts have been identified during the field survey, however clearing of 7.49 ha of rocky escarpments/ridges/mesa which is potential roosting habitat is required.

The loudest construction activities would predominantly occur during the day when construction activity is generally higher, and therefore nocturnal species would be at a lower risk of impact given their reduced activity during the day. Operational noise is expected to be lower and not substantially above background levels, and fauna is likely to habituate to continuous sound levels over time.

Potential vibration impacts from operation of the Proposal arise from the rotating parts of the turbines in wind farms, such as rotor blades and generators. The rotation of these parts generates periodic vibrations that are transmitted to the ground via the foundations of the wind farm (Bosnjakovic et al., 2024). These vibrations could impact ground dwelling fauna in the surrounding area, especially on their sensitive acoustic perception. However, studies have shown that in most cases, wind farms had no significant effect on ground-dwelling animals (de Lucas et al., 2005, Walter et al., 2006, Helldin et al., 2012, Łopucki and Mróz, 2016, Łopucki et al., 2018). Although more research is needed to determine the full effects of vibration from wind farm operation on fauna, it is considered that any potential vibration impacts would be localised and given the surrounding availability of similar habitats in the wider area, operational vibration impacts from the Proposal are unlikely to result in a significant impact to the conservation significant fauna species within the DE.

Standard construction noise management measures will be implemented, as set out in Section 8.7, which will reduce the construction noise as far as reasonably practicable. Additionally, it is expected that the increase in noise will naturally dissipate to imperceptible levels with relatively short distances from the source (Talis Consultants, 2024). Given the extensive surrounding habitat that the fauna species can utilise, significant noise impacts are not anticipated for any of the species during construction. As operational noise levels would only increase in the immediate vicinity of the Proposal, significant impacts to fauna are not anticipated. Therefore, no specific mitigation measures are proposed.

8.6.2.6 Alteration or creation of microclimates

Wind farms have the potential to influence local and regional climates due to their modification of surface-atmosphere exchanges and the transfer of energy, momentum, mass, and moisture within the atmosphere (Zhou *et al.*, 2012). The land in and around the wind farm infrastructure can experience related temperature changes. Some studies have shown evidence of cooling during the day and warming temperatures during the night (Qin *et al.*, 2022). These differences in temperature can alter vegetation cover (Qin *et al.*, 2022) and consequently impact fauna habitat.

The exact mechanisms underlying these microclimate effects are not fully understood, however they arise from changes in local temperature, moisture and CO₂ levels due to vertical mixing, turbulence, and wakes created by wind turbines that extend well-beyond their local footprint (in the order of 10 km or more) (Fitch *et al.*, 2013a, Lundquist *et al.*, 2019). Given



climate variables such as temperature and precipitation affect vegetation, in terms of plant growth and species composition, and habitat values, these microclimate effects created by wind farms in turn could impact the Threatened, Priority and Migratory species likely to occur within the DE by influencing the habitat and food sources for these species.

Without further data on the effects of wind turbines in this specific area of the Pilbara region, a worst-case approach has been taken assuming that implementation of the Proposal would alter local wind patterns by increasing wind speed and changing wind direction around the turbines, which would affect the distribution of heat and moisture in the area. It has also been assumed that the presence of the wind turbines would lead to slight increases in surface temperatures, particularly at night (Kaffine, 2019). This can occur due to the mixing of air layers caused by the turbine blades, which can bring warmer air down to the surface. Even in this scenario, given the low abundance of species likely to occur within the DE and surrounding region (Section 8.6.1.1), it is considered any localised impacts from alteration of microclimates would not significantly impact the vegetation and habitat composition in the wider area, and therefore would not be likely to impact these populations.

The species recorded in the DE are well adapted to the extreme hot summers and low or occasionally variable rainfall events associated with the existing Pilbara climate, therefore any slight increases in temperature or rainfall events would not be likely to cause significant impact to the fauna species present within the DE. Given the wide spacing distances between each of the turbines, any local microclimate changes are considered to be insignificant with regard to fauna behaviour impacts.

As no significant impacts are anticipated from alteration or creation of microclimates, no mitigation measures are proposed.

8.6.2.7 Increased risk of bushfires

The Pilbara region bushfire season occurs from July to January, during the dry season. Most fire causes in the region are due to natural events, such as lightning strikes. However, a significant proportion of events have unknown or accidental causes. Comparatively, prescribed burns represent the smallest cause (Bryant, 2008)

According to the DBCA Fire History (DBCA, 2024a), almost all the DE had one or more fire events between 2006 and 2013, totalling 78,144.71 ha (79.22%). In 2014, the DE had a fire event within 32.73% of the total area; since then, 2017 had the biggest fire event (12.06%), with the fire records decreasing to 0.81% in 2023 and 2.95% in 2023.

Wind turbines pose a risk of fire incidents, mostly associated with lightning strikes (acting as conductors) and mechanical failures, often exacerbated by the presence of combustible material (You *et al.*, 2023). Similarly, transmission lines can cause wildfires through failures, pole top or transformer fires and also experience outages from wildfires (Panossian and Elgindy, 2023). Bushfires can have a detrimental effect on fauna habitat and lead to direct mortality of fauna.

Climate projections for northern Australian Rangelands, including the Pilbara, are that temperatures will continue to rise. By 2030, the mean annual warming across all emissions scenarios is projected to be about 0.6 to 1.4 °C above the climate of 1986–2005. By 2090, temperatures are projected to be 1.5 to 2.9 °C warmer under an intermediate emissions scenario (RCP 4.5) (DWER, 2021b). A substantial increase in the temperature reached on the hottest days and the frequency of hot days is projected. Given these projections, it is



anticipated that the bushfire risk and intensity of events will increase in response to the changing climate, which could further exacerbate the risks associated with the Proposal, thus impacting on fauna habitats.

It should be noted that due to the extensive recent fire history throughout the DE, the potential fuel load for bushfires is substantially reduced, which lowers the risk of further bushfires occurring within the DE.

Fire risk will be managed in accordance with Fortescue standard control measures, which aim to minimise risks as far as practical, as set out in Section 8.7, and is therefore not expected to pose a significant risk to fauna habitat or any of the Threatened, Priority or Migratory species considered.

8.6.3 Cumulative Impacts

Cumulative environmental impacts are the successive, incremental, and interactive impacts on the environment of a proposal with one or more past, present and reasonably foreseeable future activities (EPA, 2021). This section outlines the potential cumulative impacts to terrestrial fauna as a result of the Proposal and other surrounding developments either recently approved or currently under assessment.

In undertaking a cumulative impact assessment, the following assumptions are noted:

- Cumulative impacts resulting from third-party operations are based on information available in the public domain for third party operators and does not encapsulate impacts for all third-party operations in the region.
- Cumulative impact calculations generally do not take into consideration areas outside of those assessed under Part IV of the EP Act, or EPBC Act referrals, for each relevant proposal. Where relevant, large clearing permits under Part V of the EP Act may also be included depending on the quantity and quality of information available.
- The accuracy of data from external sources will not be verified and it is assumed that data publicly available is accurate and collected in accordance with standard industry guidelines.

When assessing cumulative impacts on terrestrial fauna, the impacts assessment boundary should take account of local population (as defined by Conservation Advice/Recovery Plan where relevant). For restricted species this may be the same as the defined extent of occurrence or area of occupancy for that species. Similar projects within the same IBRA sub-region(s) should also be considered, using land systems as surrogate for habitat overlaid with known range/records of occurrence for the species.

There are several reasonably foreseeable developments within the Proposal region and, more broadly, within the Chichester subregion of the Pilbara bioregion. Although not directly comparable proposals they do involve habitat removal, and therefore the projects in the Chichester subregion, and generally with similar dominant land systems (Macroy and Rocklea), have been considered in this cumulative impact assessment. This includes:

- Beatons Creek Fresh Rock Expansion Project.
- McPhee Creek Iron Ore Project.



- North Star Magnetite Extension Project.
- Warrawoona Gold Project.
- Sulphur Springs Zinc-Copper Project.
- Corunna Downs Project.

The Asian Renewable Energy Hub project has been included as a cumulative scheme in this assessment given the similarities between the operational facilities as another proposed large scale wind farm in the Pilbara. We acknowledge this Project is located approximately 100 km to the northeast of the DE and not situated in the same IBRA sub-region or dominant land systems.

The cumulative impacts to terrestrial fauna anticipated to occur as a result of this Proposal in combination with the projects identified above are summarised in Table 8-28.



Table 8-28: Impacts Associated with Surrounding Projects

The Proposal and Cumulative Projects	Reported Direct Impacts	
	Habitat Removal	Significant Species Impacted
The Proposal	Removal of 2,328.23 ha of terrestrial fauna habitat, including: <ul style="list-style-type: none"> • Plain (stony/gibber) – 65.34 ha • Hills/ranges/plateaux - 283.53 ha • Plain (boulders) – 922.97 ha • Drainage line/river/creek (major) - 30.34 ha • Drainage line/river/creek (minor) - 86.44 ha • Plain (sand) – 932.12 ha • Rocky escarpments/ ridges / mesa - 7.49 ha. 	Clearing of critical habitat for: <ul style="list-style-type: none"> • Northern Quoll - 1,213.99 ha • Greater Bilby – 2,037.21 ha • Grey Falcon - 30.34 ha • PLNB - 37.83 ha • Pilbara Olive Python - 321.36 ha • Ghost Bat - 37.83 ha • Peregrine Falcon - 7.49 ha
Beatons Creek Fresh Rock Expansion (38 km south of the DE)	A quantifiable amount of terrestrial fauna habitat to be removed is not available however no significant impacts are reported.	A quantifiable amount of critical habitat to be removed is not available however no significant impacts are reported.
McPhee Creek Iron Ore Project (7 km south of the DE)	Removal of 1,913 ha of similar terrestrial fauna habitat to the Proposal, including those similar to the Proposal: <ul style="list-style-type: none"> • Drainage Lines - 55 ha. 	Clearing of critical habitat for: <ul style="list-style-type: none"> • Northern Quoll - 615.2 ha • Ghost Bat - 110.6 ha • PLNB - 165.6 ha • Pilbara Olive Python - 670.2 ha • Greater Bilby - 24.5 ha • Grey Falcon - 55 ha
North Star Magnetite Extension Project (adjacent to the western extent of the DE)	Removal of 606.9 ha of terrestrial fauna habitat, including those similar to the Proposal: <ul style="list-style-type: none"> • Hills, Ranges and Plateaux - 566.8 ha • Minor Drainage Lines - 6.4 ha • Rocky Escarpment - 14.9 ha. 	Clearing of critical habitat for: <ul style="list-style-type: none"> • Northern Quoll - 178 ha • PLNB - 18.8 ha • Ghost Bat - 18.8 ha • Pilbara Olive Python - 69 ha



The Proposal and Cumulative Projects		Reported Direct Impacts	
	Habitat Removal	Significant Species Impacted	
Warrawoona Gold Project (adjacent to the DE in the northwest extent of the Generation Hub area)	398.5 ha of habitat clearance, with some similar habitat types across the project areas including: <ul style="list-style-type: none"> • Stony Plain - 141.7 ha • Drainage lines (major) - 5.8 ha • Drainage lines (minor) - 8.5 ha • Sandplain - 11.1 ha 	Clearing of critical habitat for: <ul style="list-style-type: none"> • Northern Quoll - 0.8 ha • Pilbara Olive Python - 0.8 ha • Greater Bilby - 11.1 ha 	
Sulphur Springs Zinc-Copper Project (7 km north of the DE)	313.7 ha of habitat clearance, with some similar habitat types across the project areas including: <ul style="list-style-type: none"> • Spinifex Stony Plains - 38.8 ha • Drainage Lines - 4.7 ha • Rocky Ridges and Gorges - 39.7 ha 	A quantifiable amount of critical habitat to be removed is not available however no significant impacts are reported.	
Corunna Downs Project (overlaps with a small area of the DE in the central portion)	423.11 ha of habitat clearance, with some similar habitat types across the project areas including: <ul style="list-style-type: none"> • Spinifex Stony Plain – 100.45 ha • Rocky Ridge and Gorge - 39.82 ha • Drainage Line - 3.4 ha • Spinifex Sandplain - 20.35 ha 	Clearing of critical habitat for: <ul style="list-style-type: none"> • Northern Quoll - 56.39 ha • PLNB - 39.82 ha • Ghost Bat - 39.82 ha • Pilbara Olive Python - 44.95 ha 	
Asian Renewable Energy Hub (100 km northeast of the DE)	Removal of 11,962 ha of habitat, however none of which are the same specific habitats as the Proposal.	Clearing of critical habitat for: <ul style="list-style-type: none"> • Northern Quoll - 3.7 ha • Greater Bilby - 12,129 ha 	
Cumulative Total	17,941.97 ha of habitat clearance, with some similar habitat types across the project areas including: <ul style="list-style-type: none"> • Hills, Ranges and Plateaux - 850.33 ha • Drainage line/river/creek (major) - 99.24 ha 	Clearing of critical habitat for: <ul style="list-style-type: none"> • Northern Quoll - 2,068.08 ha • Ghost Bat – 207.05 ha • PLNB - 262.05 ha 	



The Proposal and Cumulative Projects	Reported Direct Impacts	
	Habitat Removal	Significant Species Impacted
	<ul style="list-style-type: none">• Drainage line/river/creek (minor) - 101.34 ha• Rocky escarpments/ ridges / mesa - 101.91 ha• Plain (sand) – 963.57 ha• Plain (stony/gibber) - 346.29 ha	<ul style="list-style-type: none">• Pilbara Olive Python - 1,106.31 ha• Greater Bilby - 14,201.81 ha• Grey Falcon - 85.34 ha



8.6.3.1 Northern Quoll

The combined clearing of critical habitat for the Northern Quoll from the cumulative assessment was calculated to be 2,068.08 ha. The Proposal clearing represents 59% of the estimated total cumulative clearing of habitat critical for this species. Northern Quoll critical habitat within the Pilbara predominantly occurs in the Rocklea and Capricorn Land Systems. The cumulative clearing represents just 0.08% of the mapped extent of these land systems. This combined total is unlikely to impact the species at a population level given the relatively abundant areas of intact habitat outside of the Proposal clearing areas.

8.6.3.2 Greater Bilby

For the Greater Bilby, the total cumulative clearing of critical habitat is anticipated to be 14,201.81 ha. The Proposal clearing represents 14% of the estimated total cumulative clearing of habitat critical for this species. Greater Bilby critical habitat within the Pilbara predominantly occurs in the Macroy Land System. The cumulative clearing represents just 1% of the of the mapped extent of this land system. Therefore, these habitat types are likely to be widely represented outside the DE and the actual proportion of available habitat for this species is significantly more than that mapped in the DE and the cumulative impact on the local and regional extent would be orders of magnitude lower. Therefore, no significant cumulative impacts are anticipated for this species over and above that reported for the Proposal.

8.6.3.3 Ghost Bat and PLNB

The combined habitat removal for Ghost Bat is anticipated to be 207.05 ha and for the PLNB, 262.05 ha. The Proposal clearing represents 18% and 14% of the estimated total cumulative clearing of habitat critical for this species respectively. Ghost Bat and PLNB critical habitat within the Pilbara predominantly occurs in the Capricorn Land System. The cumulative clearing represents just 0.03% of the of the mapped extent of this land system.

8.6.3.4 Pilbara Olive Python

The cumulative impact for the Pilbara Olive Python habitat would be 1,106.31 ha. The Proposal clearing represents 29% of the estimated total cumulative clearing of habitat critical for this species. Pilbara Olive Python critical habitat within the Pilbara predominantly occurs in the Rocklea Land System. The cumulative clearing represents just 0.08% of the of the mapped extent of this land system.

8.6.3.5 Grey Falcon

The cumulative impact for Grey Falcon would be removal of 85.34 ha of the critical habitat. The Proposal clearing represents 36% of the estimated total cumulative clearing of habitat critical for this species. Grey Falcon critical habitat within the Pilbara predominantly occurs in the River Land System. The cumulative clearing represents just 0.03% of the of the mapped extent of this land system.

Given the low proportionate impacts on the habitat for these species within the DE, and the wider habitat available outside of the DE for all species discussed, cumulative impacts on the species are not anticipated to be significant. The remaining species considered in the Proposal assessment were not identified in the various assessment for cumulative projects and are therefore not considered to be cumulatively impacted.



8.7 Mitigation

During the planning and design process for the Proposal, the mitigation hierarchy (avoid, minimise and rehabilitate) was applied to assess, avoid and minimise potential impacts to terrestrial fauna as far as practicable. Following completion of the fauna surveys, the data was reviewed against the Proposal design to avoid/minimise clearing of significant species habitat. The Proposal's indicative disturbance footprint has been designed to avoid areas that may support significant biodiversity values or heritage values. Areas that have been avoided, where practicable, include:

- Avoidance of major drainage / creek lines except where crossing locations are required, which are associated with specific fauna habitats. Consultation with Traditional Owners was undertaken to identify creek crossings in order to reduce environmental and heritage impacts.
- Avoidance of Cultural Precinct, associated with granite outcrops. An exclusion area has been placed of the precinct committing in consultation with the Traditional Owners.
- Avoidance of conservation significant fauna, where practicable, avoiding all existing records of conservation significant fauna.

Mitigation measures that will be implemented to avoid or minimise impacts on terrestrial fauna are summarised in Table 8-29.



Table 8-29: Avoidance, Management and Mitigation of Impacts to Terrestrial Fauna

Impact	Management Actions
Avoidance	Prior to conducting ground disturbance activities, ensure known locations of environmentally sensitive areas (such as areas of critical habitat) to be retained and protected from disturbance are identified on the ground by appropriate signage, fencing or flagging. Clearing areas will be demarcated on Proposal drawings and physically on site prior to clearing activities.
Minimisation	<p>Clearing and ground disturbing activities limited to the defined clearing limits and boundaries described within the approval documentation. The extent of the approved clearing will be clearly communicated in documentation and site inductions. Pre-clearing photos to be documented and post clearing inspections to be undertaken.</p> <p>All site operatives and personnel attending the site will undergo an induction regarding threatened fauna and direct and indirect impacts (e.g., risk of vehicle strike, interaction with construction activities, waste management and introduction of feral animals).</p> <p>Strict speed limits will be enforced around the site in order to avoid fauna strikes during clearing and construction.</p> <p>Consideration will be given to the use of line marking along the transmission line route to increase visibility to birds and bats and improve their ability to accurately perceive depth in relation to power lines. Ultraviolet (UV) line marking, if available, should also be considered, particularly with a view to minimising risks of nocturnal collisions (Dwyer <i>et al.</i>, 2020). The design of both power lines and poles will comply with recommendations developed by BirdLife International (BirdLife International, 2007a) to minimise potential for impacts to birds.</p> <p>Comprehensive weed hygiene management through implementation of weed management measures. All works will be undertaken in accordance with Fortescue’s Weed Management Plan (Reference: 45-PL-EN-0033) as the standard operating procedure.</p> <p>Implementation of fire risk management measures will be undertaken, including:</p> <ul style="list-style-type: none"> • Clearing activities would not be undertaken when fire danger ratings are extreme or above. • Where increased risk of fire is identified, fire-resistant barriers like screens will be employed to confine sparks generated by welders and other hot work activities. • Carefully manage and monitor hot works through implementation of hot works permit system. • Ensuring appropriate disposal of potential fire-starting waste, e.g., cigarette butts to minimise the risk of bushfires as a result of the Proposal. • Firefighting equipment will be located around the site and in vehicles. Fire response procedures and personnel training, including site inductions on fire prevention and management, will also be provided. <p>All food waste will be removed from site at the end of each shift. Waste will be stored at the depot and regularly removed to minimise attraction of feral animals.</p>



Impact	Management Actions
	<p>Lighting will be designed and managed in accordance with the National Light Pollution Guidelines for Wildlife (DCCEEW, 2023c). These include:</p> <ul style="list-style-type: none"> • Permanent lighting will be installed only where required, within operational areas. • Permanent and temporary lighting will be shielded to minimise light spill. This includes directional or shielded lighting, the mounting of light fittings as low as practicable, or louvered lighting on low-level bollards. • Automatic timers or photovoltaic switches. • Black-out blinds on windows in accommodation camps. • Permanent and temporary lighting will be directed away from sensitive areas where possible such as areas of critical habitat (e.g. significant caves). <hr/> <p>Standard construction noise management measures will be implemented, including:</p> <ul style="list-style-type: none"> • Machinery and vehicles are regularly serviced and operated/maintained in accordance with the manufacturer's specifications, and preferential use of modern equipment that generally operate more quietly. • Using techniques that reduce noise, such as employing hydraulic, rather than impact, methods. Training workers on best practices for minimizing noise. • Plant and machinery on site will be switched off and not left idling when not in use. • Planning the construction schedule so that the noisiest tasks occur during times when they will cause the least disturbance. <hr/> <p>Operational measures to reduce potential impacts associated with collision of the wind turbines includes:</p> <ul style="list-style-type: none"> • Large turbines are more visible and have lower blade rotational speeds than smaller turbines. Collision rates also appear to be related to ease of visibility. The Proposal will incorporate some of the largest turbines available. • Turbines are designed to be widely spaced to reduce the diversionary responses by birds and bats. • Design and implementation of a bird and bat monitoring programme, which will record bird activity in the DE during construction and operation. This will include best practice estimation of actual mortality rates using current techniques (Korner-Nievergel <i>et al.</i> 2015).
Rehabilitation	Rehabilitation of 1,030.35 ha after each phase of the construction activities will reduce impacts to fauna habitat over time, including potential fragmentation impacts.



8.8 Residual Impact and Predicted Outcome

The Proposal will result in the clearing of 2,328.23 ha of fauna habitat, some of which will provide habitat for conservation significant fauna. Table 8-30 summarises the residual impacts expected after mitigation measures are applied.



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Table 8-30: Summary of Residual impacts for Terrestrial Fauna after Mitigation measures

Potential impact	Residual impact after management	Regional significance
Loss of fauna habitat	<p>Loss of 2,328 ha of fauna habitat. Rehabilitation post construction will re-establish fauna habitat in some disturbed areas. There will be some permanent loss of habitat for Plain (stony/gibber); Hills / ranges / plateaux; Plain (boulders); Drainage line/river/creek (major); Drainage line/river/creek (minor); Plain (sand); Rocky escarpments/ridges/mesa.</p> <p>Critical habitat will be lost for Northern Quoll, Greater Bilby, Grey Falcon, PLNB, Pilbara Olive Python, Ghost Bat, and Peregrine Falcon.</p>	<p>Although the habitats are critical for the listed fauna species, the habitat types are common throughout the local area and wider region. The proportionate impact on the regional habitat availability is negligible for all species. Although residual impacts are considered minimal in relation to conservation significant habitat at a regional scale, as these habitats are considered critical to the species identified. The clearing will be offset in line with State and Commonwealth offsets policies and requirements.</p>
Fragmentation of habitat and creating a barrier to fauna movement	<p>Given the linear nature of the Proposal, the infrastructure and associated clearing will fragment some areas of habitat, however the areas of intact habitat will be substantial and transmission line structures will not prevent the passage of fauna between units. In addition, following construction, rehabilitation of cleared areas can help reduce the magnitude of potential fragmentation impacts. Therefore, overall significant impacts as a result of habitat fragmentation or barrier to fauna movement are not anticipated for any of the species considered.</p>	<p>Due to the size of the remaining habitat areas, fragmentation of habitat types within the DE is not expected to be significant.</p>
Collision with the operational wind turbines or transmission line	<p>A residual risk of collision with some significant fauna species will remain, including listed threatened and migratory bird species. Given the relatively low abundance of all the species recorded during the surveys, and therefore relatively low mortality rates expected, it is not anticipated that the impact of collision with the operational infrastructure will pose a significant impact that would effect the majority of species on a population level.</p> <p>With regards to the Grey Falcon, as the species was recorded within the DE during the BBSUSs (Spectrum, 2025) and field surveys (Ecoscape, 2025) observed flying at heights intersecting with the RSA. Given the species EPBC listing (Vulnerable) and assumed relatively low abundance, individual mortality could present a potentially significant impact. However, with the implementation of mitigation measures outlined in Section 8.7, such as adequate spacing and size of turbines, and adherence to a BBAMP, the potential collision risk will be minimised as far as possible.</p>	<p>Due to the abundant habitat existing outside the DE for the significant avifauna and bat species likely to occur in the DE, and the relatively low abundance of species utilising the DE compared to elsewhere, any impacts from collision are not likely to be significant on a regional scale, with the exception of Grey Falcon that could experience a potentially significant impact as a result of collision with operational wind turbines.</p>
Vehicle Interactions	<p>There is a residual risk of fauna collision with vehicles associated with construction and operation of the Proposal, however with the implementation of</p>	<p>No significant impacts anticipated on a regional scale.</p>



Potential impact	Residual impact after management	Regional significance
	the recommended mitigation measures, such as adherence to strict speed limits on site, impacts are not anticipated to be significant.	
Attraction of scavenger's and feral animals	A residual risk will remain, however standard mitigation measures will be implemented to minimise possible introduction or increase of feral animals within the DE, including ensuring appropriate food waste management from site operatives. Consequently, with the appropriate waste control measures in place and education through inductions for all site operatives, the risk of attracting scavenger's and feral animals is considered to be appropriately managed such that no significant impacts are anticipated.	No significant impacts anticipated on a regional scale.
Increase risk of weeds introduction	Following implementation of the recommended weed hygiene measures outlined in Section 8.7, the risk of introducing and spreading weeds will be appropriately managed such that no significant impacts are anticipated.	No significant impacts anticipated on a regional scale.
Disturbance from noise and vibration and artificial lighting	<p>A residual risk remains for disturbance of fauna from elevated levels of noise or artificial light during the construction phase. Fauna may be attracted to areas where prey such as insects are attracted to the light emissions. Light emissions may also cause other behaviour responses such as changing the timing of fauna individuals activities or avoidance of the area. Noise is an environmental stressor and can potentially affect fauna in a number of ways including avoidance of noisy habitats or reduction in foraging success due to masking. However, due to the temporary and localised nature of the construction noise and light emissions, and the ample habitat for the recorded species to move into in the surrounding area, these impacts are not expected to be significant. The operational noise and light emissions are anticipated to be relatively minimal.</p> <p>Overall, the construction and operational impacts outline above for the species potentially occurring in the DE are anticipated to be appropriately controlled through standard best practice construction site management measures as set out in Section 8.7. As such, no significant impacts on these species are anticipated during the construction or operation phase.</p>	No significant impacts anticipated on a regional scale.
Alteration or creation of microclimates around turbines or cleared areas	Localised microclimate impacts could occur causing alterations in temperature and moisture levels which could impact the Threatened, Priority and Migratory fauna that are adapted to specific conditions within the Pilbara. However, given the low abundance of species recorded and extensive surrounding areas of habitat for all the species likely to occur within the DE, it is considered any	No significant impacts anticipated on a regional scale.



Potential impact	Residual impact after management	Regional significance
	localised impacts from alteration of microclimates would not be significant at a species or regional level.	
Increased risk of bushfires	Following implementation of the recommended fire risk management measures outlined in Section 8.7, the increased risk of bushfires as a result of the Proposal will be appropriately managed such that no significant impacts are anticipated.	No significant impacts anticipated on a regional scale.



Following the implementation of the management measures identified above, the residual impacts described in Table 8-31 are considered significant and will require offsetting.

Table 8-31: Significant Impacts Requiring Offsets

Fauna habitat type	Species critical habitat	Permanent clearing (ha)
Plain (stony/gibber)	Bilby	30.37
Hills/ranges/plateaux	Northern Quoll, Pilbara Olive Python	141.77
Plain (boulders)	Northern Quoll, Bilby	534.26
Drainage line/river/creek (major)	Bilby, Grey Falcon, PLNB, Pilbara Olive Python, Ghost Bat	15.30
Drainage line/river/creek (minor)	Bilby	45.54
Plain (sand)	Bilby	527.39
Rocky escarpments/ ridges/mesa	Northern Quoll, PLNB, Pilbara Olive Python, Ghost Bat, Peregrine Falcon	3.25
Total		1,297.88

Other potential direct and indirect impacts to terrestrial fauna associated with the Proposal will not be significant at the local or regional scale as they are anticipated to be appropriately managed through standard construction site good practice measures and site specific mitigation outlined in Section 8.7. Given the relatively small extent of the proposed clearing of habitat types identified as being significant for conservation listed species, this clearing will not result in a significant residual impact.

The predicted environmental outcomes for the Proposal are:

- Clearing of no more than 1,244.33 ha of potential Northern Quoll denning, shelter, foraging and dispersal habitat within the DE will occur. Of this clearing, no more than 1,213.99 ha is of habitat identified as being critical to the survival of the Northern Quoll. Clearing of no more than 377.71 ha of critical supporting habitat for the Northern Quoll.
- Clearing of no more than 2,037.21 ha of critical habitat for the Bilby within the DE will occur.
- Clearing of no more than 2,328.23 ha of potential Grey Falcon nesting and hunting habitat within the DE will occur. Of this clearing, no more than 30.34 ha is of habitat identified as being critical to the survival of the Grey Falcon.
- Clearing of no more than 2,328.23 ha of potential PLNB and Ghost Bat foraging habitat within the DE will occur. Of this clearing, no more than 37.83 ha is of habitat identified as being critical to the survival of the PLNB and Ghost Bat.
- No direct or indirect impacts to Ghost Bat caves will occur.
- Clearing of no more than 321.36 ha of critical habitat for the Pilbara Olive Python within the DE will occur.



- Clearing of no more than 2,328.23 ha of potential Peregrine Falcon nesting and foraging habitat within the DE will occur. Of this clearing, no more than 7.49 ha is of habitat identified as being critical to the survival of the Peregrine Falcon.
- Clearing of Priority Fauna habitat will be avoided where possible and otherwise minimised.
- Clearing of SRE habitat will be avoided where possible and otherwise minimised.
- Direct and indirect impacts to terrestrial fauna will be avoided where possible and otherwise minimised.

This avoidance and minimisation of impacts, together with the offsetting of significant residual impacts will result in the biological diversity and ecological integrity of the study area being preserved. The Proposal is consistent with the EPA's environmental objective for Terrestrial Fauna.



9 SOCIAL SURROUNDINGS

9.1 EPA Objective

The WA EPA defines this factor as '*social surroundings is a part of the environment that may require consideration*' where there is a '*clear link between a proposal or scheme's impact on the physical or biological surroundings and the subsequent impact on a person's aesthetic, cultural, economic or social surroundings*' (EPA, 2023a).

The WA EPA objective for the social surroundings environmental factor is '*To protect social surroundings from significant harm*' (EPA, 2023a).

9.2 Policy and Guidance

The following EPA policies and guidelines have been considered for the Proposal in order to meet the EPA's objective in relation to this factor:

- Statement of Environmental Principles, Factors and Objectives (EPA, 2021),
- Environmental Factor Guideline – Social Surroundings (EPA, 2023a), and
- Technical Guidance: EIA of Social Surroundings – Aboriginal Cultural Heritage (EPA, 2023b).

Other policy and guidance relevant to this factor includes:

- *Environmental Protection (Noise) Regulations 1997* (Noise Regulations),
- *Aboriginal Heritage Act 1972* (AH Act),
- ICOMOS Burra Charter 2013,
- *Native Title Act 1993*,
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*,
- *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design* (WAPC, 2007),
- *Planning Bulletin 67 Guidelines for Wind Farm Development* (WAPC, 2004),
- *State Planning Policy No 2 Environment and Natural Resources* (WAPC, 2003),
- *Environmental, health, and safety guidelines for wind energy* (World Bank Group, 2015),
- *Aboriginal Heritage Due Diligence Guidelines* (DIA & DPC, 2013), and
- *Draft Guideline: Dust Emissions* (DWER, 2021c).



9.3 Survey and Studies

The technical studies relating to social surroundings undertaken for the Proposal are described in Table 9-1 and Table 9-2.

Table 9-1: Social Surroundings Studies Undertaken for the Proposal

Report/study	Organisation	Scope
East Pilbara Generation Hub Visual Impact Assessment (2024)	Ecoscape and Viewport XR	<p>Reports the outcome of the technical assessment undertaken to describe the potential visual impacts of the Proposal to support consultation with the Nyamal Traditional Owners and the approvals application process.</p> <p>The focus for the Visual Impact Assessment (VIA) is on large pieces of infrastructure that can be seen from a substantial distance, which include the:</p> <ul style="list-style-type: none"> • Wind turbines, and • 220kV transmission line. <p>The Visual Landscape Evaluation (VLE) stage is undertaken to understand the context of the Proposal and the surrounding landscape. It is also undertaken to set objectives for managing the visual landscape character. The VIA describes the potential impacts in context of the landscape evaluation.</p>
East Pilbara Generation Hub Environmental Noise Assessment (2024)	Talis Consultants	The report provides a summary of an environmental noise assessment for the Proposal. The aim of the study is to quantify the potential noise impacts from EPGH construction activities and wind farm operations on surrounding areas including towns and points of interest (POI).
East Pilbara Generation Hub Environmental Construction Vibration Assessment (2024)	Talis Consultants	This report provides an overview of possible vibration impacts during construction of the East Pilbara Generation Hub (EPGH) and the Pilbara Transmission Project 6 (the Project).
East Pilbara Generation Hub Construction Phase Dust Risk Assessment (2024)	Environmental Technologies & Analytics	The Dust Risk Assessment considered dust impacts related to construction activities associated with the Proposal. The key environmental value considered within the Dust Risk Assessment is the potential air quality impacts to social surroundings (as indicated by the POI) from dust deposition.
Traditional Ecological Knowledge	Biologic	<p>Traditional Ecological Knowledge (TEK) surveys were undertaken to identify and document plants and animals of traditional use or value to Nyamal. Cultural associations to ecological features and areas containing these culturally significant species were also documented. These surveys are undertaken in consultation with Nyamal knowledge holders for the area.</p> <p>TEK surveys are still ongoing for the EPGH project. Surveys conducted to date are outlined in Table 9-2.</p>
Archaeological Surveys	Echoes Cultural Heritage Management	These surveys are undertaken to identify and record archaeological heritage sites (such as artefact scatters, engravings (rock art), and grinding patches) as defined under the AH Act. Archaeological surveys are undertaken in consultation with Nyamal knowledge holders for the area.



Report/study	Organisation	Scope
		Archaeological surveys are still ongoing for the EPGH project. Surveys conducted to date are outlined in Table 9-2.
Ethnographic Surveys	Heritage WA	These surveys are undertaken to identify and record ethnographic heritage sites (such as mythological or ceremonial places, or song lines) as defined under the AH Act. Ethnographic surveys are undertaken in consultation with Nyamal knowledge holders for the area. Ethnographic surveys are still ongoing for the EPGH project. Surveys conducted to date are outlined in Table 9-2.



Table 9-2: Heritage and Traditional Ecological Knowledge surveys undertaken in relation to the Proposal

Survey ID	Date	Consultancy	Survey Type	Key Outcomes	Report Reference
2022_NJA_Trip8	01 – 09 Oct 2022	Terra Rosa	Archaeological Survey	[REDACTED]	Terra Rosa, T. Reid et al, December 2022
2022_NJA_Trip8	01 – 09 Oct 2022	Terra Rosa	Ethnographic Survey	No ethnographic constraints identified in the completed scope of works.	Terra Rosa, T. Reid et al, December 2022
2022_NJA_Trip10	24 Nov – 4 Dec 2022	Terra Rosa	Ethnographic Survey	[REDACTED]	Terra Rosa, E. Jones & E. Biggs, February 2023
2023_NJA_Trip2	27 Apr – 08 May 2023	Gavin Jackson Cultural Heritage Management	Archaeological Survey	1 [REDACTED]	GJCRM, P. Ryan, I. Ryan & M. Walsh, August 2023a GJCRM, P. Ryan, I. Ryan & M. Walsh, August 2023b
2023_NJA_Trip4a	22 June – 03 July 2023	Gavin Jackson Cultural Heritage Management	Archaeological Survey	[REDACTED]	GJCRM, P. Ryan, I. Ryan & M. Walsh, August 2023a GJCRM, P. Ryan, I. Ryan & M. Walsh, August 2023b GJCRM, M. Walsh, J. Brown & P. Ryan, September 2023



Survey ID	Date	Consultancy	Survey Type	Key Outcomes	Report Reference
				[REDACTED]	Echoes, M. Walsh, J. Brown & P. Ryan, November 2023
2023_NJA_Trip4b	26 – 29 Jun 2023	Heritage WA	Ethnographic Survey	[REDACTED]	Heritage WA, P. Czerwinski, July 2023
2023_NJA_Trip5	20 – 31 July 2023	Gavin Jackson Cultural Heritage Management	Archaeological Survey	[REDACTED]	GJCRM, P. Ryan, I. Ryan & M. Walsh, August 2023b GJCRM, M. Walsh, J. Brown & P. Ryan, September 2023 Echoes, M. Walsh, J. Brown & P. Ryan, November 2023
2023_NJA_Trip6a	17 – 28 August 2023	Gavin Jackson Cultural Heritage Management	Archaeological Survey	[REDACTED]	GJCRM, M. Walsh, J. Brown & P. Ryan, September 2023 Echoes, M. Walsh, J. Brown & P. Ryan, November 2023



Survey ID	Date	Consultancy	Survey Type	Key Outcomes	Report Reference
2023_NJA_Trip6b	21 – 25 August 2023	Heritage WA	Ethnographic Survey	[REDACTED]	Heritage WA, P. Czerwinski, November 2023
2023_NJA_Trip7	15 – 25 September 2023	Gavin Jackson Cultural Heritage Management	Archaeological Survey	[REDACTED]	Echoes, M. Walsh, J. Brown & P. Ryan, November 2023 Echoes, M. Walsh, J. Brown & P, Ryan, December 2023
2023_NJA_Trip8	12 – 23 October 2023	Echoes Cultural Heritage Management	Archaeological Survey	[REDACTED]	Echoes, M. Walsh, J. Brown & P. Ryan, November 2023 Echoes, M. Walsh, J. Brown & P, Ryan, December 2023 Echoes, J. Brown, N. Quinn & P. Ryan, March 2024



Survey ID	Date	Consultancy	Survey Type	Key Outcomes	Report Reference
2023_NJA_Trip9a	9 – 20 November 2023	Echoes Cultural Heritage Management	Archaeological Survey	[REDACTED]	Echoes, M. Walsh, J. Brown & P, Ryan, December 2023 Echoes, J. Brown, N. Quinn & P. Ryan, March 2024
2023_NJA_Trip9b	9 -14 Nov 2023	Heritage WA	Ethnographic Survey	[REDACTED]	Heritage WA, P. Czerwinski, November 2023
2024_NJA_Trip1	15 – 26 Feby 2024	Echoes Cultural Heritage Management	Archaeological Survey	[REDACTED]	Echoes, C. Callaway & P. Ryan, April 2024



Survey ID	Date	Consultancy	Survey Type	Key Outcomes	Report Reference
2024_NJA_Trip2	14 – 25 Mar 2024	Echoes Cultural Heritage Management	Archaeological Survey	[REDACTED]	Echoes, N. Quinn & P. Ryan, May 2024a
2024_NJA_Trip3a	11 – 22 Apr 2024	Echoes Cultural Heritage Management	Archaeological Survey	[REDACTED]	Echoes, N. Quinn & P. Ryan, May 2024b
2024_NJA_Trip3b	11 – 16 Apr 2024	Heritage WA	Ethnographic Survey	[REDACTED]	Heritage WA, P. Czerwinski, April 2024
2024_NJA_TEK_Trip1	9-14 May 2024	Biologic	TEK Survey	[REDACTED]	Biologic, B. O'Connell & S. Coultas, September 2024



Survey ID	Date	Consultancy	Survey Type	Key Outcomes	Report Reference
2024_NJA_Trip4	9 – 20 May 2024	Echoes Cultural Heritage Management	Archaeological Survey	[Redacted]	Echoes, N. Quinn & P. Ryan, May 2024b
2024_NJA_Trip5	6 – 17 Jun 2024	Echoes Cultural Heritage Management	Archaeological Survey	[Redacted]	Echoes, N. Quinn & JJ. McDermott, August 2024
2024_NJA_Trip6a	4 – 15 Jul 2024	Echoes Cultural Heritage Management	Archaeological Survey	[Redacted]	Echoes, N. Quinn, C. Melville-Smith & P. Ryan, September 2024



Survey ID	Date	Consultancy	Survey Type	Key Outcomes	Report Reference
2024_NJA_Trip6c	7 – 9 Jul 2024	Heritage WA	Ethnographic Survey	[Redacted]	Heritage WA, P. Czerwinski & H. Builth, July 2024
2024_NJA_Trip7	18 – 29 Jul 2024	Echoes Cultural Heritage Management	Archaeological Survey	[Redacted]	Echoes, JJ. Mcdermott & P. Ryan, August 2024
2024_NJA_Trip8	1 – 12 Aug 2024	Echoes Cultural Heritage Management	Archaeological Survey	[Redacted]	Echoes, C. Melvill-Smith & JJ. McDermott, August 2024
2024_NJA_TEK_Trip2	5 – 9 Aug 2024	Biologic	TEK Survey	Outcomes pending receipt of trip report.	To be advised.



Survey ID	Date	Consultancy	Survey Type	Key Outcomes	Report Reference
2024_NJA_Trip9	29 Aug – 9 Sep 2024	Echoes Cultural Heritage Management	Archaeological Survey	[Redacted]	Echoes, N. Quinn & P. Ryan, September 2024



9.4 Receiving Environment

9.4.1 Native Title

The Proposal is located within Nyamal People #1 and #10 native title determination areas and is relevant to the Nyamal People (Nyamal). The Nyamal People were granted native title in September 2019 over 28,479 km² of land in the northern portion of the DE (Federal Court file no: WAD20/2019) and in January 2024 over 9,238.25 km² of land in the southern portion of the DE (Federal Court file no: WAD20/2019, WAD23/20).

Nyamal Aboriginal Corporation (NAC) is the Prescribed Body Corporate (PBC) representing Nyamal. Consultation with Nyamal on the Proposal was facilitated through NAC and their delegated heritage service provider Barlbinybiny Aboriginal Corporation (BAC).

9.4.2 Aboriginal Cultural Heritage and Cultural Values

9.4.2.1 Social Surrounds Consultation

Consultation with the Nyamal native title stakeholders was facilitated through their representative body, Nyamal Aboriginal Corporation. Consultation on the Proposal commenced in February 2023 where the Fortescue decarbonisation strategy and Proposal concept was first introduced at a NAC Board Meeting. A summary of consultation with Nyamal in relation to the Proposal is provided in Table 4-2 in Chapter 4.

Since then, Fortescue has engaged BAC to facilitate heritage surveys and Traditional Ecological Knowledge (TEK) surveys (outlined in Table 9-2), and on-country social surrounds consultation (outlined in Table 9-3) to understand the social, cultural, and heritage values within, and surrounding the DE.

In addition to these surveys and social surrounds consultation trips, Fortescue undertook regular meetings with the Nyamal Heritage Sub-Committee (HSC) to provide updates on the Proposal, approval requirements, and outcome of heritage surveys and social surrounds consultation. These meetings ensure regular two-way communication is maintained and to address any issues that might arise.

The social, cultural, and heritage values identified during the social surrounds consultation trips, heritage surveys, and TEK surveys are described in Sections 9.4.2.2 to 9.4.2.4.



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Table 9-3: Summary of Social Surrounds Consult Trips with Nyamal Knowledge Holders

Consultation Trip	Summary of Consultation
Social Surrounds Consult Trip 1	<p>Date of consultation trip: 14 – 18 August 2023</p> <p>Purpose of consultation trip: Discuss and introduce the Proposal and identify key environmental features / attributes of social, cultural, or heritage value important to Nyamal in the area that may be impacted by the Proposal and understand any concerns Nyamal may have regarding the Proposal.</p> <p>Outcomes consultation of trip:</p> <ul style="list-style-type: none">• No significant objections raised by Nyamal for development of the Proposal in the general area.• Nyamal noted the northwest portion of the DE was likely to contain a high concentration of significant heritage sites with engravings.• Nyamal noted the presence of granite outcrops was an indication that engravings were likely to be present• Nyamal requested for the Proposal to be situated in the southwest area and away from the granite outcropping to ensure the protection of Heritage Places.• Nyamal has principles to protect and manage water ways, providing a hierarchy for disturbance near creek lines to inform Proposal design and investigation programs. This included the use of existing tracks, especially where crossing creeks and major drainage, and spacing out potential water supply bores to minimise risk of increasing salinity in the groundwater. These values were also linked to maintaining the health of pools and associated ecosystems.• Nyamal noted weed and feral animal management to maintain healthy country.
Social Surrounds Consult Trip 2	<p>Date of consultation trip: 16 – 19 October 2023</p> <p>Purpose of consultation trip: Build on the Nyamal’s values within the DE and provide updates on the progress of studies or requests for further information. Trip 2 focused on the southwest of the DE.</p> <p>Outcomes of consultation trip:</p> <ul style="list-style-type: none">• Nyamal reiterated that avoidance of the granite outcropping would likely result in less impact to heritage values and associated cultural landscapes.• Fortescue presented how Nyamal’s principles for minimising disturbance to creek lines had been incorporated into creek crossing designs, which was well received by Nyamal. The surface water principles were expanded further to include Nyamal’s preferred criteria for groundwater bore locations within proximity to granite outcropping and distance from creek lines.• Nyamal noted importance of minimising “scarring” of country from ground clearing activities.• Discussions around decommissioning of the Proposal, including impacts to aesthetics of the landscape, particularly near culturally significant areas such as the Cultural Precinct.• Nyamal’s preference of wind turbine options was for the Nabralift Tower as this was not solid and was thought to be invisible in the landscape.



Consultation Trip			Summary of Consultation
			<ul style="list-style-type: none"> Nyamal provided suggested locations for inclusion in the Visual Impact Assessment.
Social Trip 3	Surrounds	Consult	<p>Date of consultation trip: 25 – 31 May 2024</p> <p>Purpose of consultation trip: Opportunity for Fortescue to present outcomes of studies and provide answers to questions and request for further information. Address key concerns relating to potential visual and noise impacts from the Proposal on culturally significant areas or areas of interest identified by Nyamal. Nyamal flew over the transmission line alignment options to better understand where they would traverse country and identify potential high-risk areas containing cultural values that may be of concern. Fortescue presented outcomes of the Visual Impact Assessment and preliminary noise impact assessment.</p> <p>Outcomes of consultation trip:</p> <ul style="list-style-type: none"> Continued discussions and feedback around creek crossing options and how these had been designed to incorporate Nyamal's principles on minimising impacts to creek lines. This included the transmission line crossing the Coongan and Shaw Rivers. Fortescue noted that the pole locations within the rivers would be outside the main flow channels. Nyamal provided their preference for Sandy Creek crossing (Alternative Option 1) but preferred to wait until further heritage surveys had been undertaken before providing feedback on those options. Nyamal acknowledged the need for transmission poles to be placed within the rivers; however, reiterated the preference to minimise impacts to water flow and the creek beds / banks themselves. Nyamal confirmed the noise levels from operation of the turbines were acceptable and understood construction noise would be a temporary impact but not a significant one. Concerns regarding potential vibration on native animals in the area, including the Greater Bilby, were raised by Nyamal and requested Fortescue provide further information on this. Nyamal also confirmed that viewing the turbines and transmission line from the various locations used in the VIA was considered acceptable and was unlikely to impact on cultural values in the area. Nyamal explored the potential for the Proposal to enhance importance of cultural values (including song lines).
Social Trip 4	Surrounds	Consult	<p>Date of consultation trip: 14 – 17 Oct 2024</p> <p>Purpose of consultation trip: Opportunity for Fortescue to present final outcomes of impact assessments on the key Environmental Factors and other values of importance to Nyamal. The trip focused on presenting management strategies that will be implemented to avoid or minimise impacts to cultural values and provide Nyamal with an opportunity to provide feedback on this prior to reviewing the draft ERD.</p> <p>Outcomes of consultation trip:</p> <ul style="list-style-type: none"> Nyamal confirmed they have no significant concerns regarding the Proposal and accepted the impacts and management strategies presented for the Environmental Factors. There are still some concerns regarding management of Bilbies and ensuring their population numbers are not significantly impacted. Nyamal requested Fortescue provide further information on feral management in relation to protection of Bilbies as part of ongoing consultations.



Consultation Trip	Summary of Consultation
	<ul style="list-style-type: none"><li>• Nyamal acknowledged that while the ERD is being prepared for submission to the EPA, the consultation process is ongoing and there will be further opportunity to discuss specific Proposal designs as these are developed. <p>At the time of writing this document, the consultation report for Trip 4 is pending. Outcomes from the report will be managed as part of Fortescue's ongoing consultation framework with Nyamal.</p>



9.4.2.2 Aboriginal Cultural Heritage

Heritage Places

A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Cultural Heritage Inquiry System (ACHIS) was undertaken on 11 August 2024, to identify any Registered Sites, Lodged Places, and Historic Places within the DE (DPLH, 2024). A search of ACHIS assists in identifying Heritage Places that may have been identified through heritage surveys conducted by third party proponents, allowing a full understanding of the potential heritage values in the area. The search identified 10 Registered Places and one Lodged Place within the DE (Table 9-4), which are shown on Figure 9-1. There are no gender restrictions places noted in ACHIS for these places.

Table 9-4: DPLH Heritage Places within the Development Envelope

DPLH Site ID	Name	DPLH Status	Site type	Location in DE
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
11091	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

A search of Fortescue’s internal heritage database system was also undertaken. Based on surveys completed at the time of writing this report, a total of 314 Heritage Places are located within the DE (Table 9-5).

Table 9-5: Fortescue Heritage Places within the Development Envelope

Number of Sites	Site Type
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]



Number of Sites	Site Type
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]



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Heritage Restriction Zones

Heritage Restriction Zones (HRZs) are a defined area containing social, cultural, or heritage values whereby restrictions (or preceding actions) may apply prior to the commencement of any works within the HRZ boundary. Restrictions applied to HRZs may include (but are not limited to):

- Further consultation or recording of cultural values contained within,
- Limitations or restrictions on access requirements, or
- Limitations on the types of works that may be undertaken within the HRZ boundary.

HRZs are an internal management measure implemented by Fortescue to provide an additional layer of protection for places of cultural significance.

To date, 71 HRZs have been recorded across the DE (see Table 9-5). These HRZs were identified during heritage and TEK Surveys. For the heritage surveys relating to the EPGH development area, Fortescue requested that any heritage places identified outside 200 m of the proposed survey areas, be recorded as HRZs. Similarly, any cultural landscapes, or areas of importance, or of concern to Nyamal, were also requested to be recorded as HRZs. Major waterways and creeklines of importance to Nyamal were also recorded as HRZs.

Several HRZs are located in proximity to and surrounding the DE, as shown on Figure 9-2, and detailed in Table 9-6.



HRZ_ID	HRZ Type	Restriction Type	Description	Related Site ID (where applicable)
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]



HRZ_ID	HRZ Type	Restriction Type	Description	Related Site ID (where applicable)
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]





HRZ_ID	HRZ Type	Restriction Type	Description	Related Site ID (where applicable)
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

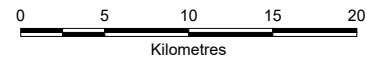


HRZ_ID	HRZ Type	Restriction Type	Description	Related Site ID (where applicable)
			[REDACTED]	
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]		[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]		[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]		[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]		[REDACTED]	[REDACTED]	n/a

Legend

-  FMG Heritage Restricted Zone
-  Development Envelope

Data Sources:
Aerial, ESRI
All other data, Fortescue, 2024



Requested By: S. Springer
Drawn By: S. Bowyer
Revised By: scostello
Approved By:
Scale: 1:450,000
Coordinate System: GDA2020 MGA Zone 50
Project Name: 4519OP002_MP_EN_0066
Document Name: 4519OP002_MP_EN_0066.026

Date: 20/11/2023
Size: A4L
Revision: 1
Confidentiality: 0

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Figure 9-2
Heritage Restriction Zones
within the Development Envelope





9.4.2.3 Culturally Significant Water Sources

Ethnographic surveys, four Social Surrounds consultation reports and the first Traditional Ecological Knowledge reports for this area all reference the importance of water sources as a significant cultural value to the Nyamal People.

“We Nyamal are a river people” (Nyamal representative, 17 August 2023).

As the above statement suggests, Nyamal people ascribe significant social surroundings values to water and watercourses (GJCRM Sept 2023). Several water sources within and surrounding the development envelope have been identified as culturally significant to Nyamal. Where these culturally significant water sources may not meet the criteria under the AH Act as a Heritage Place, these have been delineated as Heritage Restriction Zones (HRZs).

Culturally significant rivers and creek lines (including associated tributaries) identified by Nyamal within and surrounding the DE include:

- Shaw and Coongan Rivers.
- Sandy, Camel, Honeyeater and Ram Creek.
- Channels leading into Yandicoogina, Soak, Cattle and House creeks.

Water is considered a cultural link to other neighbouring Native Title groups, with Nyamal explaining their cultural responsibility for maintaining water flows and quality to their downstream neighbours, in the event that the Proposal changed flows or water quality. Fortescue’s modelling suggests there will be only limited impacts, if at all, to flow and quality, possibly resulting from minor upgrades to three low level river crossings in the wind farm area and transmission lines crossing two rivers in the central and west part of the transmission corridor.

Water Values (Rivers)

Nyamal’s values regarding water are summarised below:

- **Historical value.** Rivers serve as a medium through which to orientate individual biographies, and to locate specific events of collective memory (and memorialisation).
- **Aesthetic value.** The rivers’ wide variety of luscious vegetation may thrive even during the driest times of the year.
- **Social value.** This is central to Nyamal’s collective sense of identity as River people as the perceived primary physical medium which connects Nyamal country to the countries of neighbouring traditional owner groups.
- **Economic and social value.** Nyamal representatives’ forebears relied upon natural water sources to sustain their hunter-gather system of subsistence (fishing, hunting and foraging). As a result, they developed wider social significance with, for example, kin sections – and their associated territories.



- **Social and spiritual value.** This is intrinsically interconnected with all other aspects of the surrounding cultural landscape. Rivers' lifegiving qualities are relied upon by 'everything' in the environment around them:
 - In a specific sense, where they lie on the path of a songline.
 - As sites for general ceremonial activity.
- Spiritual value, as the resting place of the mythological creator being, the rainbow serpent. The Nyamal representatives described that the serpent lives permanently in water holes, but travels along rivers following rains.

Water Principles

Seven surface water impact principles were identified by Nyamal to be utilised by the Proposal:

1. Minimise the overall number of roads crossing through rivers and creeks.
2. Minimise impact to any heritage sites or features that are adjacent to rivers.
3. Build new river crossings on top of existing pastoral tracks/crossings, wherever it is possible to do so.
4. Design river crossings which minimise impacts to volume and flow rates of rivers, including through the use of a combination of floodways and culverts (as appropriate).
5. Design river crossings which minimise the gradient of road entry and exit points (and which explore all options for cut-ins vs. bridges).
6. Monitor the health of rivers over the life of the Proposal, including in relation to sediment levels, and size and health of fish stocks, long-neck turtles and other species of significance.
7. Implement 'healthy country' practices to support the removal of rubbish from riverbeds, the growth of healthy foliage along riverbanks, and healthy fish and turtle stocks etc. These practices should be ongoing over the life of the Proposal, and they should be also an integral part of the Proposal's Closure Plan (including of that Plan's remediation components).

9.4.2.4 Traditional Ecological Values

Traditional ecological values are another aspect of social surroundings that plays an important role in Nyamal culture and traditional practices. This includes culturally significant plants and animals used for bush tucker or medicine, areas used for traditional activities such as camping and hunting, as well as important ecological features with cultural associations.

The results of the TEK surveys and social surrounds consultation have been used to inform the traditional ecological values in relation to the Proposal.

Culturally Significant Flora

Forty-nine (49) plant species used by Nyamal were observed during the survey (Biologic, 2024). The plants recorded are broadly categorised into use for food, medicine, tools/other, or



for ceremony. The plants recorded are broadly able to be categorised into use for food, medicine, tools/other, or for ceremony. Of the species identified to date:

- 33 species are edible.
- 19 have medicinal properties.
- 25 are used as tools or for other reasons.
- 11 are used in ceremony.

One plant species identified in the DE is considered of additional cultural significance to Nyamal. This species is the *Melaleuca argentea* (Silver Cadjeput / Paperbark; 'jalkupurta' / 'gulawar'). It has multiple uses to Nyamal, in addition to providing cool shade and shelter, and is an indicator of water presence and healthy Country. Meat or fish is cooked in sheets of bark and leaves *Melaleuca* species. The Tea Tree was also identified by Nyamal as an important indicator of healthy country, in particular as an indicator for potential sub-surface water.

Wood, branches and/or bark from the following ten plant species are used to make ceremonial tools, dancing sticks, and weapons (spears, shields, boomerangs), these include:

- *Acacia coriacea* (Wire Wattle).
- *Acacia ancistrocarpa* (Fitzroy Wattle).
- *Acacia tumida* (Pindan Wattle; *mukarli*).
- *Corymbia hamersleyana* (Bloodwood; *punara*).
- *Terminalia circumalata*.
- *Acacia ampliceps* (Salt Wattle; *walykarri*).
- *Eucalyptus leucophloia* (Snappy Gum).
- *Eucalyptus victrix* (Blackheart Gum; *piyarr*) – soft wood makes good navigating scar trees.
- *Melaleuca argentea* (Silver Cadjeput / Paperbark; *jalkupurta* / *gulawar*).
- *Tinospora smilacina* (Snake vine).

Six species recorded in the DE are used in ceremonies for decoration and body painting, these include:

- *Acacia inaequilatera* (Camel Bush; *partirri*) and Honey Hakea (*Hakea lorea* subsp. *lorea*, *H. chordophylla*; *marruwa*) – the black bark is used as colouring for skin by mixing with water to make a blackened paint for ceremony.
- *Grevillea pyramidalis* (Caustic Bush; *wirliny*) - yellow paint from bark, branches, and leaves and caustic green seeds are used for men's scarring in the lore ceremony.



- Flowers and/or vegetative parts of Honey Hakea (*Hakea lorea* subsp. *lorea*, *H. chordophylla*; *marruwa*), *Atalaya hemiglauca* (Whitewood), and *Cassytha filiformis* (Dodder Vine / Love Vine; *yukurlil* / *yugali*) are used for decoration.

The native tobacco, *Nicotiana benthamiana* (*purlku*) is chewed and smoked and is used for healing and in ceremonies.

Meat or fish for large feasts is cooked in sheets of bark and leaves from *Melaleuca argentea* (Silver Cadjeput / Paperbark; *jalkupurta* / *gulawar*). Leaves, stems and branches of the two shrub *Melaleuca* species (*Melaleuca glomerata* and *Melaleuca linophylla*) are also used to splay cooked meat out on for feasts.

The second TEK Trip recorded a six additional HRZs containing culturally significant flora. These include four large creeks (HRZ-1626, HRZ-1628, HRZ-1629, and HRZ-1630), that contain large eucalyptus trees (*Eucalyptus victrix* and/or *E. camaldulensis*), known to the Nyamal people as *piyarr* and *parrkunya* respectively, *Marrkara*, a small shrub, commonly known as vicks plant (*Stemodia grossa*) and *purlku* (native tobacco, *Nicotiana benthamia*).

One punara (*Corymbia hamersleyana*) tree observed in the western survey area was also recorded as a new HRZ. This tree contains a significant number of *pirna* (bush coconuts), active finch nests (food source), and an old wedge-tailed eagle (*warinpirna*) nest. The eagle is believed by Nyamal to be culturally significant.

The second TEK trip has also resulted in Fortescue being made aware that one plant, the *Gyrocarpus americanus* (helicopter/ propeller tree), a species usually found in the Kimberley region, was identified in the survey area. Although the plant was not known to or used by Nyamal, due to its rarity in the Pilbara (only one other plant has been recorded in the Pilbara), Nyamal requested a HRZ-1627 over this plant due to the belief held by Nyamal representatives that it would have been brought to the area by ancestors.

Other species noted during social surrounds consultation were Sandpaper fig (*ficus coronate*) used by Nyamal ancestors to sand down wooden artefacts using rough leaves, and Bush tomatoes (*Solanum orbiculatum*) used as a common food source in the area.

Culturally Significant Fauna

Six animal species of traditional use by and/or cultural value to Nyamal were documented or recorded during the survey within the DE:

- Euro (*widjину* / *wiyunu*) and Red Kangaroo (*parlkarrakapu* / *warrinykura*) – food source, clothing and ceremony.
- Echidna (*Manganya*) – eaten by ancestors.
- Emu (*karlaya* / *galaya*) – food source, feathers.
- Australian Bustard / Bush Turkey (*dardgee* / *karlgi* / *parntakura* / *parturra*) – food source, feathers.
- *Ngarramukal* / *windigidy*– food source.
- Grubs (*yamala*) – food source.



Two fauna species were identified by Nyamal as being of additional cultural value:

- Emu (*karlaya / galaya*) – Feather from emu's are used in ceremonies. The men wear these on their head and their arms. Emu is also an important food source. Feathers from other bird species are also used, such as those from Corellas and Bush Turkey (*Ardeotis australis; parntakura*).
- Pilbara Olive Python (*Liaisis olivaceus barroni*) – this species was not observed during the survey, but almost certainly occurs near waterholes in gorges. This species was talked about in the context of the rainbow serpent, for which the moonlight shines on the scales and shows the rainbow in the sky. It is a culturally significant species to Nyamal and is the basis of a men's only song.

The Greater Bilby was not recorded during the first TEK survey; however, was also identified as another fauna species of value to Nyamal, while Herons were noted as spiritually significant given their representation in rock art. White cockatoo feathers are used in lore ceremonies and the sparrow bird noted as weather indicator when high river level are expected.

9.4.2.5 Aesthetics and Visual Amenity

During the social surrounds consultation, considerations for potential impacts from changes to the visual amenity of the area or from noise or dust generated by Fortescue's activities were discussed with Nyamal. Specific locations were identified, and modelling undertaken based on those locations.

Most of the locations used in the dust, noise, and visual impacts assessments were general locations (or points of interest (POIs)) to understand the potential impacts across the entire area. This approach assists with Traditional Owners narrowing down specific locations of concerns, especially where there is general use of the wider area.

Noise was considered a potential impact to Nyamal's ability to enjoy or use country, and therefore, had the potential to impact traditional activities. Four locations were selected for baseline noise monitoring and inclusion in the noise impact assessments (see Figure 9-3). All four locations were selected as potential areas where Nyamal use to hunt or camp, or where Nyamal have indicated during social surrounds consultation they would like to access.

Maintaining the aesthetics of the natural landscape and important cultural landscapes within and surrounding the proposed development was identified a key value to Nyama. Potential visual impacts on the use of cultural places or song lines were also considered in regards to maintaining visual amenity and use of country. During Trip 3, Nyamal representatives were provided the outcomes of the VIA from 12 locations throughout the DE. These locations were selected as potential areas Nyamal may visit (or requested to maintain access to) and could potentially see the proposed infrastructure from.

As with noise and changes to the landscape, dust is another factor that has the potential to impact on visual amenity and thus aesthetics of the area. High levels of dust may also have an impact on Nyamal's ability to enjoy and use the area from a human health perspective. Nyamal also raised the concerns around the potential for dust to impact on the integrity of engravings (and potentially grinding patches) within heritage places. Dust assessments are still ongoing and therefore Nyamal have not been able to confirm if potential impacts on visual amenity, use of country, or on significant heritage values are acceptable or be viewed as a significant impact. Principles for the locations selected for use in the dust assessment is



outlined in Table 9-7. This approach assisted with Traditional Owners narrowing down specific locations of concern.

Table 9-7: Principles for Dust locations

Dust Sensitive Feature	Concern
Water source (e.g. creek line or pool)	<ul style="list-style-type: none">• Contamination from dust/chemicals• Dust settling in the water and changing colour• Additional sediment buildup
Engravings / Grinding Patches	Degradation or erosion by dust build up
Aesthetics	Dust covering surfaces to a level that impacts aesthetics of the place (e.g. potential for high dust deposition)



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9.4.2.6 Access to Country

No specific areas for hunting or camping were identified during the social surrounds consultation, as these activities are undertaken generally throughout Nyamal country. However, Nyamal have identified the Cultural Precinct area (HRZ-1599) as an area requiring ongoing access for cultural practices and education of younger generations.

It was also requested that access to country and waterways are not restricted by the Proposal, nor are any restrictions expected to be required ongoing by Fortescue.

9.4.3 Non-Aboriginal Heritage

Database searches were undertaken to identify non-Aboriginal heritage values relevant to the Proposal. No heritage values were identified within the DE from a search of the InHerit Database, Heritage Council WA State Register database, World Heritage list or Commonwealth Heritage list.

The DE intersects the current boundary of the North Pole Dome / Meentheena site, which is nominated to be included on the National Heritage List, within the Transmission Line area around the location of the Shaw River crossing. The North Pole Dome contains some of the best preserved, oldest geology in Australia and provides evidence of life on Earth from 3.5 to 2.7 billion years ago (DAWE, 2022). Meentheena is a world-best example of fossilised stromatolites, when oxygen was first released into the atmosphere allowing multicellular life to develop. In addition, early geological processes are visible including impact from meteorites, volcanism, and rifting (DAWE, 2022). The assessment completion date for this nominated National Heritage site is 30 June 2027. The IDF crosses through boundary of the North Pole Dome / Meentheena site and is discussed further in Section 9.6.2.

The DE also intersects Camel Creek which is a rare physiographic feature that is listed on the WA register of geoheritage sites (DEMIRS, 2024). Camel Creek runs horizontally through the central portion of the DE, then exits northward. Geoheritage sites are natural features of the Earth that are considered to be unique within WA and to have significant geoscientific and educational values.

The Corunna Downs Station and Corunna Downs Wartime Air Base are located in close proximity to the DE (2 km south-west). The Corunna Downs Wartime Air Base was constructed from 1942 and has historic, scientific, and social significance. This base was maintained under top secret security and never located by the Japanese. Military based at Corunna hit Japanese targets in occupied Indonesia, these were the longest bombing raids flown anywhere before 1943 (GoWA, 2023a). All that remains of the base buildings are concrete-raft floors and sewerage pits, with clearance sales in 1946 completely demolishing removable materials. Airbase runways/revetments are intact and in fair condition (GoWA, 2023a).

The Corunna Downs Station was constructed in 1890 and has aesthetic and historic significance. The homestead was built of 'anthill' brick and granite and was distinguished within the north-west station homes for its comfort and modern equipment (GoWA, 2023b).

9.4.4 Amenity

9.4.4.1 Noise and Vibration

The DE is located approximately 40km from the nearest noise sensitive receivers (as defined in the Environmental Protection (Noise) Regulations) at Marble Bar (40km) and Nullagine



(60km). This assessment therefore focuses on cultural points of interest and ethnographic areas in proximity to the turbines associated with the Nyamal Traditional Owners. As discussed in Section 9.4.2.6, no specific areas for hunting or camping were identified during the social surrounds consultation, although hunting and camping activities are undertaken generally throughout Nyamal country. As no receptors were identified based on the definition of noise sensitive receivers in the Environmental Protection (Noise) Regulations, the cultural points of interest discussed in Section 9.4.2.5 have been considered relevant for this assessment.

The electrical infrastructure aspects of the Proposal will have no significant noise impacts to consider aside from typical construction, decommissioning works and the ongoing operational impacts from the wind turbines.

The WAPC (2004) guidelines have been used for considering potential operational noise impacts from wind farms. These guidelines state that:

“To avoid adverse noise impacts on the amenity of the surrounding community, wind farm developments should include sufficient buffers or setbacks to noise sensitive premises. As a guide, the distance between the nearest turbine and a noise-sensitive building not associated with the wind farm, is likely to be 1 km. The ultimate distance between sensitive uses and the wind turbine, may be determined on the basis of acoustical studies. It is expected that the proponent will undertake noise monitoring and acoustical modelling against the relevant criteria, to enable the relevant planning authority to determine the acceptability of the development and the merits of a lesser separation distance. Until such time as a formal policy is adopted in Western Australia, the Department of Environment (DoE) endorses the criteria and approach of assessing wind farms based on background noise levels, as described in the South Australian guidelines Environmental Protection Authority – Wind Farms Environmental Noise Guidelines. These guidelines provide that wind farm developments should be constructed and designed to ensure that noise generated will not exceed 5dB(A) above the background sound level or 35dB(A) using a 10-minute LA eq, whichever is the greater, at surrounding noise-sensitive premises.”

Fortescue engaged Talis Consultants (Talis) (2024) to undertake a noise assessment of the potential noise impacts from the Proposal construction activities and the wind farm operations on surrounding areas. This noise assessment is summarised in this document and provided in Appendix E.

In accordance with the *Environmental Protection (Noise) Regulations 1997*, the nearest noise sensitive receivers are Marble Bar and Nullagine, which are approximately 40 km and 60 km respectively away from the Proposal. The Talis (2024) report therefore focused on ethnographical areas in proximity to the Proposal, developing noise targets to evaluate if noise received in these areas could be considered unreasonable.

Traditional Activities which have noise related value and may be considered noise sensitive include:

- Camping (at night): Noise could result in sleep disturbance and annoyance.
- Hunting: It is expected that hunting will only take place during daylight hours where the hunter uses visual cues. Night-time hunting is not expected but if undertaken will require low noise levels as the hunter is dependent on auditory cues.



- Day use / Ceremonial use: speech intelligibility and annoyance needs to be considered when considering activities during the day or ceremonial use.

These are not defined in the *Environmental Protection (Noise) Regulations 1997*; however, they have been assessed in the Talis (2024) report to ensure a comprehensive and robust assessment. The target noise levels adopted for this Proposal are outlined in Table 9-8.

Table 9-8: Activity based noise target levels (Talis, 2024)

Activity	Target Noise Level (dB(A))		Comment
	Satisfactory	Maximum	
Camping (night-time)	25	30	The night-time threshold levels are based on avoiding noise induced sleep disturbance and annoyance. The threshold levels adopted have used the Noise Regulations and AS2107 noise levels for sleeping areas.
Hunting (daytime)	40	45	The day time hunting threshold levels are based on the assigned levels in the Noise Regulations and assume that the hunter uses visual cues during the day (whereas the hunter is more dependent on auditory cues during night).
Day use / Ceremonial	30	35/45	The threshold levels are based on avoiding annoyance. It should be noted that these levels are set for activities where speaking to others is involved. The threshold levels adopted are based on AS2107 levels for educational buildings. 45 dB(A) applies to ceremonies if amplification through a microphone speaker system is used.

To develop an understanding of the baseline noise levels within the area, Talis (2024) undertook baseline noise monitoring. Four monitoring locations: Logger 1, Logger 2, Logger 3 and Logger 4 were selected within the DE. The identified sensitive receptors and noise monitoring locations are shown on Figure 9-3.

Table 9-9 provides a summary of the noise results at each monitoring location, separated into day (7am to 7pm), evening (7pm to 10pm) and night (10pm to 7am). The noise parameter LAeq which is the average noise level during each time of the day has been used.



Table 9-9: Baseline noise monitoring results summary (Talis, 2024)

Monitoring Location	Time of Day	Average (LAeq)
Logger 1: West end of transmission corridor.	Day	43
	Evening	35
	Night	35
Logger 2: East end of transmission corridor.	Day	45
	Evening	40
	Night	40
Logger 3: Within the proposed wind farm area (south).	Day	42
	Evening	36
	Night	36
Logger 4: Within the proposed wind farm area (north).	Day	44
	Evening	41
	Night	40

9.4.4.2 Visual Amenity

The EPA objectives relevant to visual and landscape impacts are those regarding the protection of social surroundings, and specifically the protection of social surroundings from harm (EPA, 2023a). This includes protecting modifications to sensitive viewsheds and changes to landscape amenity.

Given the difference in visual and landscape considerations for wind turbines compared to other structures such as solar farms and electrical infrastructure, Section 6.1 of Planning Bulletin 67 of the Western Australian Planning Commission (WAPC, 2007) has been used to inform this assessment. The Landscape and visual Impact Assessment is provided in Appendix F.

This document states that:

“The degree to which a wind farm development will impact on the landscape will depend on:

- *Siting, layout and design of the turbines, infrastructure, signage and ancillary facilities, including provision for tourism.*
- *Number, colour, shape, height and surface reflectivity of the towers and blades.*
- *Visibility of the development, having regard to the location, distance from which the development is visible, skyline and view sheds.*
- *Significance and sensitivity of the landscape, having regard to topography, the extent and type of vegetation, natural features, land use patterns, built form character and community values.*



Methods to ameliorate visual impact include:

- *Ensuring turbines look alike, have a clean, sleek appearance and that the blades rotate in the same direction.*
- *Minimising the number of turbines, as appropriate, by using the largest possible model (subject to the visual absorption capabilities and environmental considerations of the site) rather than numerous small ones.*
- *Sitting the wind farm, ancillary buildings, access roads and transmission infrastructure to complement the natural landform contours and landform backdrop, including ridgelines.*
- *Ensuring the choice of materials and colour (e.g. off-white and grey for turbines, low contrast for roads) for the development complements the skyline and the backdrop of the view sheds.*
- *Minimising removal of vegetation and using advanced planting of vegetation screens as visual buffers where appropriate.*
- *Ensuring good quality vegetation and landform rehabilitation, on-site and off-site, where appropriate.*
- *Locating turbines to reflect landscape and topographical features (e.g. a random pattern may suit a rolling, varied landform and a linear pattern may suit a coastal edge, farm or industrial site).*
- *Avoiding clutter, such as advertisements and apparatus.”*

Visual Landscape Evaluation

A landscape study undertaken by the former Department of Conservation and Land Management (CALM, 1994) classified WA landscapes into broad Landscape Character Types (LCT). The Proposal is located within the Nullagine Hills LCT (Figure 9-2). This LCT is variable, characterised by a gradual spinifex plain and rugged hills dissected by drainage lines at an elevation of 160-480 m Australian Height Datum (AHD). The land surface elevation where the wind turbines are proposed, ranges from 256 – 339 m AHD (Geoscience Australia, 2010).

A Landscape Character Unit (LCU) is a smaller unit than an LCT, providing information on the variations within the LCU at a local scale. The landscape within the DE was characterised into four landscape character units (Ecoscape, 2024b), as shown on Figure 9-2:

- **Open Spinifex Plain (LCU 1):** characterised by a flat to gently undulating plain covered in hummock grasses with scattered tall shrubs. Elevation ranging from 160-350 m AHD.
- **Stony Spinifex Hills (LCU 2):** characterised by a rolling to rugged terrain, covered in sparse to open hummock grasses on stony soils. Elevation ranging from 160-480 m AHD.

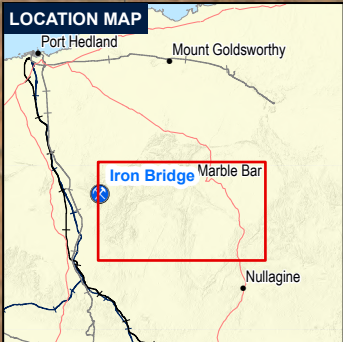
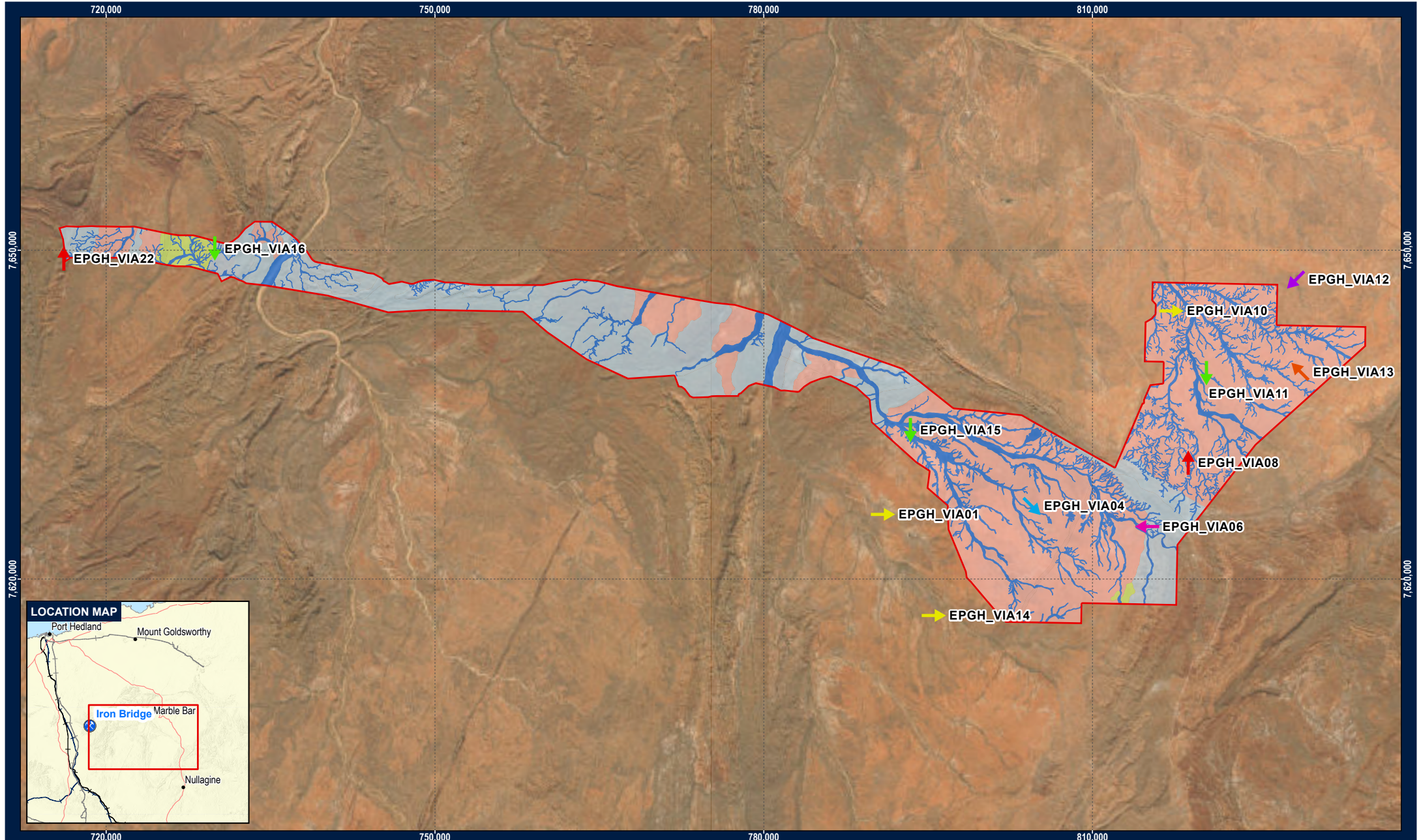


- Drainage Lines (LCU 3): characterised as green bands of dense vegetation containing shrublands and distinctive white barked Eucalypt trees. Elevation ranging from 160-380 m AHD.
- Bare Stony Hills (LCU 4): characterised by hilly terrains devoid of vegetation. Elevation ranging from 200-390 m AHD.

Impacts associated with visual amenity are related to how an individual or group perceives and uses an area. Given the limited public access to the majority of the DE and lack of receptors in the surrounding area, the relevant receptors for this assessment are predominately related to the Traditional Owner use of the area, and are considered to be the points of interest discussed in Section 9.4.2.5.



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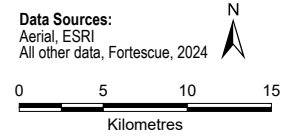
Legend

VIA View Direction

- East
- North
- North-west
- South
- South-east
- South-west
- West
- Development Envelope

Landscape Character Units

- Bare stony hills
- Drainage line
- Open spinifex plain
- Stony spinifex hills



Requested By: S. Springer
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**Figure 9-4
 Landscape Character Units**





9.4.4.3 Dust

Fortescue engaged Environmental Technologies and Analytics (ETA) (2024) to undertake a dust risk assessment related to potential impacts of dust deposition. The outcomes of the assessment are discussed in Section 9.6.1.2.

The Pilbara region is a naturally dusty area with wind-blown dust a significant contributor to particulate loading (ETA, 2024). An aggregated emission inventory for the Pilbara was undertaken by SKM (2000) for the 1999/2000 financial year. This study calculated approximately 170,000 tonnes were emitted as a result of wind erosion and approximately 195,000 from wildfires.

Other existing land uses within a 2 km buffer of the DE includes two mining railways operated by Roy Hill and Fortescue. Further, existing dust sources in the local area include (ETA, 2024):

- Dust entrainment due to vehicle movements along unsealed public roads.
- Episodic emissions from prescribed and controlled burning as well as wildfires.
- High wind events.
- Local agricultural/pastoral activities.
- Dust emissions from iron ore moved along private railways.

Given the limited public access to the majority of the DE and lack of receptors in the surrounding area, the relevant receptors for this assessment are predominately related to the Traditional Owner use of the area and are considered to be the points of interest discussed in Section 9.4.2.5.

9.4.5 Economic Activity

The region's economy is dominated by the mining industry accounting for 88% of total economic output. The region's iron ore and liquefied natural gas industries represent more than 70% of mineral and energy production in Western Australia. These industries continue to grow in the region (Pilbara Development Commission, 2024).

9.4.6 Towns & Population Centres

The Proposal is located in a large-scale landscape setting in a remote area of east Pilbara and is not close to any towns or population centres. The nearest towns are Nullagine and Marble Bar which are approximately 60 km south and 40 km north- of the DE respectively. There is one unsealed main road that runs through the eastern portion of the DE, Marble Bar Road. This unsealed road connects the remote Aboriginal Community, Five Mile, located 50 km south of the DE, to the Great Northern Highway. Two more remote communities (family-based outstations) are located approximately 14 km north of the Proposal, Gooda Binya and Pipunya. These communities have minor unsealed roads running through the DE including Hillside-Marble Bar Road, Corunna Downs Road and other unnamed roads (Figure 9-1) that connect them to main roads.



9.4.7 Recreation and Tourism

As discussed, the DE is located in a remote area in the Pilbara region with no significant public recreation or tourism activities occurring in the immediate vicinity.

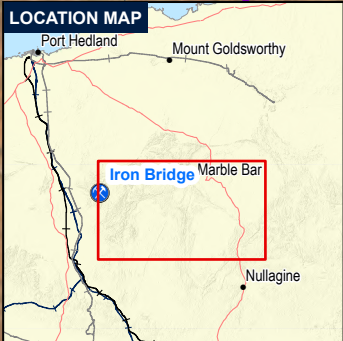
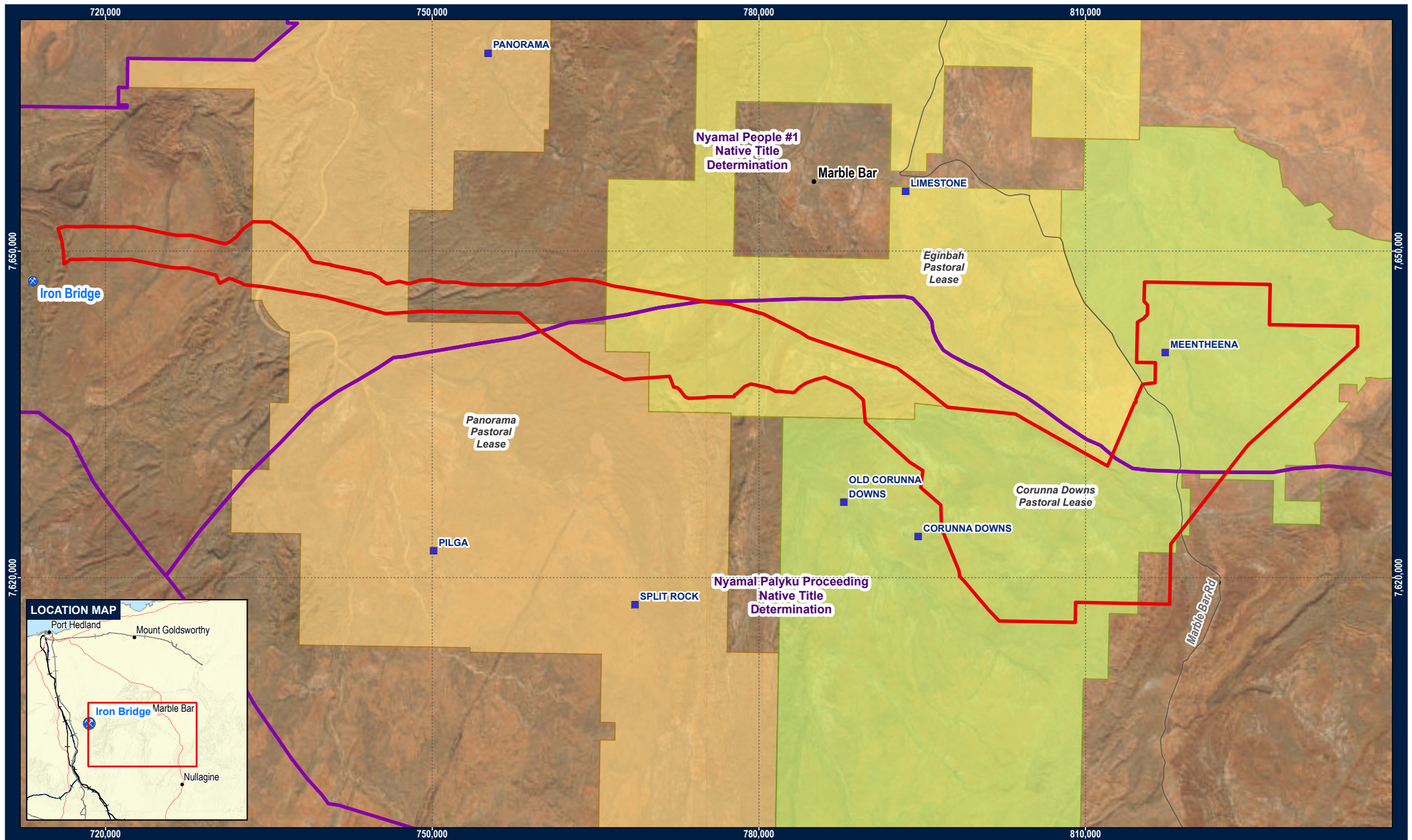
9.4.8 Pastoral

The DE is situated on the Eginbah, Panorama and Corunna Downs pastoral leases. The Panorama, Eginbah and Corruna homesteads are outside of the DE. The Eginbah homestead building is in ruins and not occupied and the Corruna homestead is permanently closed.

Figure 9-5 shows the location of the towns and surrounding social setting.



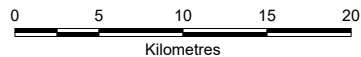
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Legend

- Towns
- Homesteads
- ⊗ FMG Mines
- Road
- ▭ Development Envelope
- ▭ Native Title Determination
- Pastoral Lease**
- ▭ Corunna Downs
- ▭ Eginbah
- ▭ Panorama

Data Sources:
 Aerial, ESRI
 Localities, Roads and Tenure, Landgate
 NTD, NNTT, 2024
 All other data, Fortescue, 2024



Requested By: S. Springer
 Drawn By: S. Bowyer
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 Approved By:
 Scale: 1:450,000
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Figure 9-5 - Social Setting and Land Use Associated with the Development Envelope



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9.5 Potential Impacts

9.5.1 Aboriginal Cultural Heritage & Cultural Values

The Potential direct and indirect impacts from the Proposal on Aboriginal Cultural Heritage and Cultural values are outlined in Table 9-10.



Table 9-10: Potential direct and indirect impact on Cultural Values from the Proposal

Theme / Topic	Concerns / Query Raised by Nyamal	Potential Impact to Value / Receptor	Potential Consequence
Direct Impacts			
Heritage Places	<ul style="list-style-type: none"> Disturbance to heritage places and heritage features by proposed activities. Unauthorised access by Fortescue personnel and contractors. 	<ul style="list-style-type: none"> Removal or damage to cultural material, including engravings and grinding materials. Unauthorised disturbance to Heritage Places and objects within. Unauthorised access by Fortescue personnel and contractors. 	<ul style="list-style-type: none"> Loss of cultural information and connection to ancestors. Potential breach of AH Act (WA) for unauthorised impact to heritage sites.
Plants & Animals	<ul style="list-style-type: none"> Loss of plant species used as bush medicines. 	<ul style="list-style-type: none"> Loss of plant species used for medicinal purposes 	<ul style="list-style-type: none"> Loss of traditional medicines and cultural practices
Water	<ul style="list-style-type: none"> Minimise impacts / disturbance to creek lines where possible by reducing number of crossings. 	<ul style="list-style-type: none"> Disturbance to creek lines or banks from proposed crossings or widening of existing tracks over creeks 	<ul style="list-style-type: none"> Loss of healthy waterways and country Potential breach of AH Act (WA) for unauthorised impact to heritage sites (where water sources are recorded as Heritage Places).
Indirect Impacts			
Dust	<ul style="list-style-type: none"> Increased dust from clearing large areas land. Dust deposition impacting on visibility and integrity of archaeological features (e.g. engravings and grinding patches) and vegetation health. 	<ul style="list-style-type: none"> Increased dust from construction and operation reducing aesthetics at culturally significant areas and the wider cultural landscape. Dust deposition impacting on visibility and integrity of engravings. Decline of plant health for culturally significant flora in high-risk areas. 	<ul style="list-style-type: none"> Loss of cultural information and connection to ancestors. Potential breach of AH Act (WA) for unauthorised impact to heritage sites.
Visual amenity	<ul style="list-style-type: none"> Potential visibility of the Proposal from access roads and sites of significance. 	<ul style="list-style-type: none"> Reduced aesthetics at culturally significant areas and wider cultural landscape. No longer use or visit the area to undertake traditional activities. 	<ul style="list-style-type: none"> Loss of natural landscape and connection to Country / culturally to this area.



Theme / Topic	Concerns / Query Raised by Nyamal	Potential Impact to Value / Receptor	Potential Consequence
Noise and vibration	<ul style="list-style-type: none"> Cumulative impacts of noise from construction and operation of wind turbines. Vibration from operating wind turbines affecting native animals (e.g. Greater Bilby). 	<ul style="list-style-type: none"> Reduced use of the area for traditional activities due to noise from construction and operation of wind turbines. Noise and Vibration from operating wind turbines resulting in altered animal behaviour (discussed further in Chapter 8: Terrestrial Fauna). This may result in loss of connection to Country. 	<ul style="list-style-type: none"> Loss of connection to Country and culture to this area.
Access to Country	<ul style="list-style-type: none"> Maintain access to the development area. 	<ul style="list-style-type: none"> Reduced use of the area or inability of access the area for traditional activities resulting in loss of connection to Country and cultural practices. 	<ul style="list-style-type: none"> Loss of connection to Country and culture to this area.
Plants and animals	<ul style="list-style-type: none"> Preference to maintain biodiversity of the area, including revegetation as part of decommissioning. Impact of clearing or vibrations on animal habitats, resulting in fewer animals and birds in the area. Impacts to population numbers and presence of Greater Bilby from the proposed activity. 	<ul style="list-style-type: none"> Inability to access areas for traditional activities (e.g. resource gathering / hunting). Loss of habitats removing animals from the area (with particular concern for the Greater Bilby and Long-neck Turtle). Impacts to the Greater Bilby from increased feral species and Proposal activities. Reduction in vegetation health of culturally significant species within river tributaries. 	<ul style="list-style-type: none"> Loss of traditional medicines and cultural practices. Loss of cultural totem.
Water	<ul style="list-style-type: none"> Impacts to water flow and quality of rivers and creek lines. 	<ul style="list-style-type: none"> Altered hydrological regime of rivers and creek lines impacting health of waterways and natural characteristics. 	<ul style="list-style-type: none"> Loss of healthy waterways and country Loss of traditional medicines, bush foods, and other resources within these water ways Cultural responsibility for downstream impacts on neighbouring language group country.



9.5.2 Non-Aboriginal Heritage

Potential direct impacts from the Proposal on Non-Aboriginal heritage include damage or degradation of North Pole Dome / Meentheena site and Camel Creek from construction and operation of the Proposal.

9.5.3 Amenity

9.5.3.1 Visual Amenity

The construction and decommissioning phase of the Proposal could have temporary impacts on visual amenity through the movement of construction vehicles through the site and surrounds, changing the activity and character of the area in an otherwise remote and natural landscape.

The operation phase of the Proposal will result in permanent visual impacts due to the placement of man-made form of structures in an otherwise natural landscape.

9.5.3.2 Noise and Vibration

Potential impacts include:

- An increase in noise levels compared to baseline during construction.
- An increase in noise levels compared to baseline during wind farm operations.

9.5.3.3 Dust

There are potential impacts in relation to the Proposal resulting from dust on Aboriginal Cultural Heritage and Nyamal aesthetic values, which are discussed further in Section 9.6.1.

9.6 Assessment of Impacts

9.6.1 Cultural Values and Aboriginal Cultural Heritage

Assessment of the potential impacts detailed in Section 9.5 is provided below.

9.6.1.1 Heritage Places

Removal or damage of Heritage Places and heritage features and unauthorised access to Heritage Places by Fortescue personnel may result in loss of cultural information, loss of connection to ancestors and potential breach of AH Act for unauthorised impact to heritage sites.

The IDF has been designed to avoid all registered Heritage Places and minimises impacts to areas of cultural significance (where practicable). If required, Fortescue will seek heritage approvals under relevant heritage legislation in consultation with Nyamal. As such, significant impacts to Heritage Places from the Proposal are not expected.

9.6.1.2 Dust

High levels of dust may have an impact on Nyamal's ability to enjoy and use the DE from an amenity perspective. Dust deposition may also impact on the integrity of engravings (and potentially grinding patches) within Heritage Places. Nyamal also raised concerns around



decline of culturally significant flora, contamination of water sources, and reduced aesthetics at significant places and wider landscape as a result of dust emissions.

Dust assessments are still ongoing and therefore Nyamal have not been able to confirm if potential impacts on visual amenity, use of country, or on significant heritage values are acceptable or may be viewed as significant.

Site specific dust assessments will be completed to identify potential impacts to dust sensitive sites in high-risk areas. Standard management protocols will be implemented during construction, and operation where required, to minimise dust generated from the Proposal as set out in Section 9.7.3.3.

General dust impacts associated with amenity are discussed further in Section 9.6.3.

9.6.1.3 Visual Amenity

Maintaining the aesthetics at culturally significant areas and wider cultural landscape within and surrounding the Proposal was identified as a key value to Nyamal. Potential visual impacts on the use of cultural places or song lines were also considered in regard to maintaining visual amenity and use of country. Nyamal representatives have been provided the outcomes of the visual impact assessment from twelve locations throughout the DE. Nyamal concluded that they have no concerns about viewing the Proposal from these locations (or other locations within the area) and would have no impacts on cultural values or their ability to use and enjoy country (Social Surrounds Consult Trip 4, 2024). As such, significant impacts to Aboriginal Cultural Heritage due to changes in visual amenity are not expected.

General visual impacts associated with amenity are discussed further in Section 9.6.3.

9.6.1.4 Noise and Vibration

Noise was considered a potential impact to Nyamal's ability to enjoy or use country, and therefore, had the potential to impact traditional activities. Four locations were selected for baseline noise monitoring and inclusion in the noise impact assessments (see Figure 9-3). All four locations were selected as potential areas where Nyamal use to hunt or camp, or where Nyamal have indicated during social surrounds consultation they would like to access. Following an on-country demonstration, of the expected noise generated by an operating wind turbine during Trip 3, Nyamal representatives confirmed there was no significant concern about the noise that would be generated by the Proposal if it was built and found the predicted noise levels to be acceptable. As such, significant impacts to Aboriginal Cultural Heritage from noise are not expected.

Temporary vibrations will occur mainly due to construction activities including operation of construction plant and machinery, earthworks and general ground disturbing activities. It is not anticipated that a significant amount of blasting will take place. The vibration from construction activities will be temporary and is not expected to significantly impact Aboriginal Cultural Heritage. Vibration impacts during construction will be managed under Fortescue's '*Blasting Near Heritage Places Procedure*' (100-PR-HE-0003). As such, significant impacts to Aboriginal Cultural Heritage from vibration during blasting are not expected.

During consultation with Nyamal, queries were raised with regards to potential impacts of operational vibration on burrowing fauna species that are culturally significant. A study has been commissioned to assess the potential for vibration impacts on burrowing species and will be incorporated into the assessment once available. Vibration resulting from operation of



turbines is anticipated to be very low level and likely to be experienced in the immediate vicinity of the turbine. This will be confirmed as part of the ongoing vibration study.

General noise impacts associated with amenity are discussed further in Section 9.6.3.

9.6.1.5 Access to Country

Reduced access to Country may result in loss of connection to Country and cultural practices. Access to culturally important places including Shaw River, Coogan River and tributaries and the cultural precinct will be maintained throughout construction and operation of the Proposal. Access to Country will also be managed under the existing land use agreements. As such, a significant impact to Nyamal from changes to access to Country is not expected.

9.6.1.6 Plants and Animals

Nyamal have expressed concern that the Proposal may result in loss of animal habitats, plant species and reduced vegetation health resulting in loss of traditional medicines and cultural practices. Additionally, concerns were raised that the Proposal may impact the Greater Bilby from increased feral species and Proposal activities, resulting in a loss of cultural totem and loss of an indicator of health of Country.

Fortescue has undertaken TEK surveys to identify plant and animal species of traditional use or cultural significance. Consultation with Nyamal will ensure that appropriate criteria / thresholds for managing areas of culturally significant plants or animals in high-risk areas will be established.

As reported in Section 9.4.2.4, six animal species of traditional use by, and/or cultural value to, Nyamal were documented or recorded within the DE during the survey (predominantly related to food sources), including Euro and Red Kangaroo; Echidna; Emu; Australian Bustard/ Bush Turkey; *Ngarramukal / windigidy*, and Grubs. Two fauna species of additional cultural value were identified by Nyamal during the survey, including Greater Bilby and Pilbara olive python. The Greater Bilby was not recorded during the first TEK survey; however, was noted to be culturally significant to Nyamal and have been recorded in other fauna surveys of the area.

The Greater Bilby and Pilbara Olive Python are discussed in Chapter 8 (Terrestrial Fauna), with a significant impact expected to the Greater Bilby due to clearing of up to 2,037.21 ha of critical habitat and the recording of an important population of the species. Therefore, there is potential for a significant cultural impact to the Greater Bilby related to habitat clearing in the absence of mitigation and offsetting. When considering concerns raised around increases in feral species, given the nature of the DE and surrounding area (vast open expanse), it is considered that the Proposal will not significantly increase accessibility to the area for feral animals due to the openness of the current landscape and existing presence of feral animals in the area. Additionally, appropriate waste management will be implemented during construction and operation to ensure food wastes do not increase attraction of feral animals.

The Proposal will result in the clearing of up to 321.36 ha of critical habitat for the Pilbara Olive Python, however, this represents less than 1% of the mapped vegetation type in the DE. Due to the abundant remaining habitat within the DE and further habitat in the wider area, this clearing is not considered to result in a significant impact to this species. Therefore, a significant cultural impact is not anticipated for the Pilbara Olive Python.



The remaining species are not discussed within Chapter 8 (Terrestrial Fauna), as they are common and widespread within the region. The Proposal activities that may impact culturally significant fauna include:

- Habitat loss from direct clearing of fauna habitat in the IDF to accommodate the Proposal infrastructure, including access roads, turbine pads, transmission lines and substations.
- Fauna mortality and disturbance due to increase vehicle movement during the construction and operational phases.
- Habitat fragmentation and behavioural change due to the long-term (30 years) operation of the wind farm, which includes the turbine movements and operation of the transmission line infrastructure.
- Behavioural change resulting from disturbance associated with general construction and operational-related activities (i.e., artificial light, noise, increase of human activities).

Any disturbance to fauna during construction will be minimised through standard construction site control measures for noise, lighting, dust and enforcement of speed limits (as discussed in Chapter 8, Section 8.7). The Proposal is unlikely to cause significant mortality numbers of these species during the operational phase given the negligible traffic numbers associated with maintenance and operation. As these species are ground dwelling there is no potential to interact with the operational wind turbines. These species are all common and widespread the region and any potential impacts from the Proposal would not result in effects at a species level. Suitable habitat for these species is widespread and extensive in the region and none would be reliant on the habitats within the DE. Therefore, the Proposal will not significantly deplete the traditional food resources for Nyamal associated with these species. Overall, it is considered the Proposal will not result in a significant cultural impact to these species.

Clearing for the Proposal will be minimised to reduce loss of culturally significant fauna habitat as discussed in Chapter 8. Additionally, assessments will be undertaken to understand potential impacts from vibrations of operating wind turbines on animal behaviour, in particular the Greater Bilby, although it is expected that the vibration levels associated with the operational turbines would be low and their effects contained to the immediate surrounds of the infrastructure.

With regard to the plants recorded in the TEK survey, as detailed in Section 9.4.2.4, during the planning and design process for the Proposal, the mitigation hierarchy (avoid, minimise and rehabilitate) was applied to assess, avoid and minimise potential impacts to flora and vegetation as far as practicable. The IDF has been designed to avoid areas that may support significant biodiversity values or heritage values, such as avoidance of groundwater dependent and riparian vegetation to minimise disturbance to these vegetation types, as discussed in Chapter 7 (Flora and Vegetation). The flora species of cultural significance recorded in the DE are predominantly all common across the Pilbara region or specifically common through drainage lines or sandy plains which are widespread throughout the DE. The design seeks to avoid major drainage / creek lines except where crossing locations are required and consultation with Traditional Owners was undertaken to identify creek crossings in order to reduce environmental and heritage impacts.



Therefore, as these species are widespread in the region, and that the Proposal has been designed to minimise potential impacts to culturally significant flora as far as possible, any potential impacts related to clearing or disturbance are not anticipated to be significant.

9.6.1.7 Water

Should the Proposal result in disturbance to water sources, it may have an impact on healthy Country, traditional medicines, bush foods, and other resources. It may also impact downstream neighbouring language group Country. Water sources are an important cultural value to the Nyamal People and the Proposal has been designed to minimise impacts to creeks from crossings, and where poles are required to be installed adjacent to rivers, pole locations have predominantly been selected outside of high flow areas.

Surface and groundwater impacts are discussed further in the Chapter 10 (Other Factors) in the Inland Waters section (Section 10.1). The hydrological assessment (Fortescue, 2024) concludes that the Proposal's impact on surface water flow would be localised, mainly around turbine access tracks and waterway crossings, with negligible disruptions to regional flows downstream. The low-level floodway crossings have minor impacts on creek hydrology and morphology and culverted crossings may alter flow regimes locally but are unlikely to affect areas immediately beyond the structures. Through the implementation of a construction surface water management plan, and standard pollution prevention measures, increases to flood risk and erosion will be minimised and the risk of impacts to water quality will be adequately controlled.

When assessing groundwater, under the modelled hydrogeological scenarios, drawdown does not impact upon the identified GDEs, subterranean fauna and other groundwater users during construction or operation of the Proposal. It is expected that groundwater levels will recover relatively rapidly at the conclusion of abstraction. The groundwater assessment will be used to support the application for licence to take water under Section 5C of the RIWI Act. As a condition of this licence, a Groundwater Operating Strategy (GWOS) will be developed, which will detail the groundwater monitoring programme to be conducted before, during and after the Proposal construction period. The GWOS will also outline management and mitigation procedures should adverse impacts occur to identified receptors, minimising any potential impacts as far as possible. This is discussed further in Section 10.1.

As such, with incorporation of design avoidance measures and implementation of mitigation measures, significant impacts to water resources are not anticipated.

9.6.2 Non-Aboriginal Heritage

The DE intersects the current boundary of the North Pole Dome / Meentheena site, which is nominated to be included on the National Heritage List. The site overlaps the transmission line portion of the IDF, with approximately 76 ha of the IDF running through the southwest corner of the boundary of this nominated National Heritage List site. However, the North Pole Dome / Meentheena site is over 84,218 ha in area and therefore the potential disturbance represents just 0.09% of this area. In addition, the stromatolite features of this site do not cover the entire boundary, and the transmission line installation will require minimal ground disturbance, with the exception of the transmission towers, and no deep excavation anticipated. Therefore, the actual potential disturbance to the stromatolite features will be substantially lower than the 76 ha IDF area, and no significant impacts resulting from the Proposal are expected on this site.

The DE also intersects Camel Creek, which is a rare physiographic feature that is listed on the WA register of geoheritage sites. The IDF does not overlap this site, and therefore there



will be no direct impacts to the creek. No significant impacts resulting from the Proposal are expected on this site.

9.6.3 Amenity

9.6.3.1 Visual Amenity

View locations were selected for VIA by Fortescue in consultation with the Nyamal People as likely to be used for traditional / cultural activities or were in proximity to culturally sensitive places. One location was chosen for potential impacts to the general public as it is located along the Marble Bar Road. Following the WAPC (2007) guidance, the majority of the view locations selected are 'Level 3: Local Significance' as they are not located on main roads or highways, and most are not accessible to the general public. This is with the exception of view location 8 (VIA 8) which is located on Marble Bar Road, a Primary Distributor Road which connects Marble Bar with Newman to the south and Port Hedland to the north. VIA 8 is therefore categorised as 'Level 1: National / State Significance' (Ecoscape, 2024b).

Many of the areas within and surrounding the Proposal contain multiple view types depending on the variations in topography and density of taller vegetation. The difference in view types ranged drastically from panoramic, elevated, open, enclosed by landform/vegetation, focal view or filtered (Ecoscape, 2024b).

The visual management objective (VMO) of best practice siting and design was identified as the most appropriate VMO for the majority of the visual landscape within the DE due to the overall sensitivity of the landscape being considered as Level 3. To meet this VMO, it is expected that any Proposal elements are blending, meaning that Proposal elements (i.e. wind turbines) can be evident but are generally not prominent in that it borrows from the existing landscape setting. Strategies to meet this objective include (Ecoscape, 2024b):

- The application of practical and sensitive siting and design techniques.
- Retaining dominant landscape features and characteristics.
- Enhancing or restoring landscape features.

Visual management objectives (VMO) developed by WAPC (2007) provide criteria to enable assessment of visual impacts for each LCU, these are:

- Best practice siting and design, which should be the baseline objective for all landscapes.
- Protection and maintenance.
- Restoration of degraded character and potential enhancement opportunities.

The 12 view locations have been assessed for visual impacts through the analysis of viewshed mapping and photo montages. The outcome of this assessment is summarised below. The ratings are based on the significance level of the view location and the VMO for managing the landscape character.

Of the twelve view locations that were assessed by Ecoscape (2024b), the Proposal was at variance to the VMO for nine sites. Many of these sites are located in the eastern section of



the DE within the mid-ground of the Proposal. The visual assessment framework assumes that a development that is highly visible may not satisfy best practice siting and design principles. Therefore, it is important that wind farms are sited and designed in a way that minimises impacts to landscape character and allows the retention of landscape values (SNH, 2017).

However, in the case of wind farms it is almost impossible to conceal them within the landscape, given the inherent requirement for openness associated with areas of adequate wind conditions (Ecoscape, 2024b). Therefore, the WAPC (2007) guidelines may not be the most suitable tool for assessment of impacts of wind farms; though have been used in the absence of anything more fit for purpose.

The Proposal has been sited within the Open Spinifex Plain LCU, which is a vast open landscape. This landscape is considered an appropriate scale for a wind farm of this size as landscape scale and openness are important characteristics for wind farm developments (SNH, 2017). Despite this variance, the sensitive receptors in the area from a visual perspective are minimal, and therefore the following factors should be considered when discussing the acceptability of impacts with the Nyamal People (Ecoscape, 2024b):

- The natural landscape character of the DE remains prominent due to the simple design and repetitive pattern of the wind turbines.
- The rugged terrain of the Stony Spinifex Hills and Bare Stony Hills LCUs remain a prominent landscape feature.
- The Proposal consists of tall individual structures leaving the bulk of horizontal views unaffected, which allows for the continuation of the views.
- From a 360-degree view perspective, the Proposal is often surrounded by a larger proportion of open space compared to the development footprint, except for two view locations (VIA 11 and VIA 13), which are located within the footprint area and have views of the development in most directions.

9.6.3.2 Noise and Vibration

Talis (2024) reported noise impacts from the construction of the Proposal will be higher than the background noise level of 33 and 38 dBA (LA90⁸). The highest modelled construction noise levels anticipated were up to 46 dBA (LA10⁹) at one location (Noise monitor 4). These modelling results show some construction activities will be above the selected targets and will be audible at the monitoring locations, therefore having the potential to negatively impact the Nyamal People when they are utilising the area. However, these noise impacts will be temporary and localised in nature.

In the operational phase, the wind turbines are predicted to generate noise higher than the noise targets identified by Talis (2024) at two noise monitor locations (NM03 and NM04) when wind speed is above or equal to 6 m/s at the turbine hub heights (assumed to be 250m above ground level). These wind speeds translate to approximately 3.5m/s at 10 m above the ground. When the wind speeds are higher at ground level (e.g. 4m/s) the noise generated by the wind travelling through the vegetation will result in higher background noise, potentially masking

⁸ LA90 is the noise level that is present for 90% of time.

⁹ LA10 is the noise level that is present for 10% of time.



noise from the turbines, and therefore less noise impact during operation at nearby receptors. Wind speeds at the nearest weather station at Marble Bar (Site 004106) average at 9 km/hr (2.5 m/s) – 10 km/hr (2.78 m/s) for 9 am and 3 pm respectively (BoM, 2024).

Therefore, it can be expected that the noise receptors selected within the DE will receive noise greater than that recommended by WAPC (2004), potentially negatively impacting culturally important activities (such as hunting, ceremonial and camping) for the Nyamal People.

Further, as discussed in Section 9.4 although there are some remote communities situated approximately 5km from the DE, there are no sensitive receptors protected under the *Environmental Protection (Noise) Regulations 1997* within 40 km of the DE. Therefore, no significant impacts from noise are anticipated.

With regard to vibration impacts, given the limited receptors in the surrounding area, this will be managed during construction under Fortescue's 'Blasting Near Heritage Places Procedure' (100-PR-HE-0003). Vibration levels resulting from operation of turbines is anticipated to be very low level and likely to be experienced in the immediate vicinity of the turbine. This will be confirmed as part of the ongoing vibration study, however significant impacts on amenity are considered unlikely.

9.6.3.3 Dust

Dust impacts will reduce significantly over short distances from the site and generally would not be anticipated further than 500 m from the construction areas (Holman *et al.*, 2014). Standard construction site best practice measures will be implemented during the construction phase with regard to dust generation, as detailed in Section 9.7.3.3. Given the remote location of the DE, there are limited sensitive receptors within close proximity and as such, the risk of significant dust impacts is considered to be low.

Impacts associated with dust on Aboriginal Cultural Heritage and Nyamal aesthetic values are discussed in Section 9.5.3.3.

9.6.4 Cumulative Impacts

Cumulative environmental impacts are the successive, incremental, and interactive impacts on the environment of projects with one or more past, present and reasonably foreseeable future activities (EPA, 2021). This section outlines the potential cumulative impacts to social surroundings as a result of the Proposal and other surrounding developments either recently approved or currently under assessment.

In undertaking a cumulative impact assessment, the following assumptions are noted:

- Cumulative impacts resulting from third-party operations are based on information available in the public domain for third party operators and does not encapsulate impacts for all third-party operations in the region.
- Cumulative impact calculations generally do not take into consideration areas outside of those assessed under Part IV of the EP Act, or EPBC Act referrals, for each relevant proposal. Where relevant, large clearing permits under Part V of the EP Act may also be included depending on the quantity and quality of information available.



- The accuracy of data from external sources will not be verified and it is assumed that data publicly available is accurate and collected in accordance with standard industry guidelines.

There are several reasonably foreseeable developments within the Proposal area and the broader region, including the Chichester subregion of the Pilbara bioregion. With respect to noise, dust and visual impacts, implementation of any single project may not significantly impact a sensitive receptor. However, a combination of current and reasonably foreseeable future projects may generate cumulative emissions or changes to views that are above acceptable levels. The only identified receptors in close proximity to the DE are associated with Traditional Owner use of the area. Given this, the primary consideration of cumulative impacts associated with the Proposal is the consideration of cultural values.

The following active projects have been identified as potentially relevant cumulative developments given they are within the same Native Title Determination Area, and have not yet commenced construction or are still under construction:

- Beatons Creek Fresh Rock Expansion (38 km south of the Proposal).
- McPhee Creek Iron Ore Project (7 km south of the Proposal).
- North Star Magnetite Project (adjacent to the western extent of the Proposal).
- Warrawoona Gold Project (partially overlaps a small area of the DE).
- Sulphur Springs Zinc-Copper Project (7 km south of the Proposal).
- Corunna Downs Project (overlaps with a small area of the DE in the central portion).

There is limited information available for the majority of the above cumulative developments in relation to noise, dust, access, or visual amenity impacts on cultural values. Furthermore, it is noted that these projects are related to mining operations and therefore are considered to have substantially different impacts to the Proposal. The cumulative developments associated with copper/gold and iron ore mines having acute, long-lasting impacts that are not specifically comparable to that of a wind farm development for which impacts from dust, noise, and access are short term and otherwise considered to be insignificant. The potential for amenity impacts associated with a large-scale wind farm are predominantly associated with visual impacts, for which the mining operations are considered to have lower potential or limited information on their impacts on visual amenity. Therefore, the Proposal is not anticipated to have any potential for cumulative impacts with regards to noise, dust, access (which would be improved) or visual amenity.

With regard to surface water and groundwater, the Beatons Creek project is not situated in the same catchment as the Proposal and so cumulative impacts on water resources are not anticipated. The other five cumulative schemes are all located within, or partially within, the same catchments as the Proposal (Coongan River, Shaw River, and Strelley River catchments) and therefore have the potential to cumulatively interact with the Proposal and result in associated cumulative impacts on surface water and groundwater.

All of these projects will be subject to the regulation by other Decision Making Authorities with regard to permitting and licensing requirements related to water resources (i.e. 26D and 5C



licenses and Permits to Interfere with Bed and Banks under the RIWI Act where required). As discussed in Chapter 10, implementation of the GWOS for each project, conditioned under Section 5C of the RIWI Act, will ensure any potential adverse impacts to identified receptors (Other Groundwater Users; Groundwater Dependent Ecosystems; and Subterranean Fauna) will be appropriately managed such that no significant impacts as a result of groundwater abstraction will occur. In addition, the projects all propose standard pollution prevention measures and erosion control as part of their construction environmental management procedures to minimise the risk of impacts to water quality. With these measures in place, and the control provided through other consenting regimes, potential for cumulative impacts can be significantly reduced and no significant cumulative impacts are anticipated.

9.7 Mitigation

9.7.1 Cultural Values & Aboriginal Cultural Heritage

Fortescue is working collaboratively with Nyamal to outline the management measures that will be implemented by the Proposal to avoid or minimise impacts to Nyamal's social, cultural, and heritage values. Key mitigation measures are outlined in Section 9.7 and would be implemented to appropriately manage the potential environment impacts to cultural values.

Fortescue is committed to ongoing consultation with Nyamal and their representative body, NAC, and their heritage service provider (BAC), in relation to construction and operation of the Proposal. Engagement with NAC and BAC has identified a preference for regular consultation regarding the Proposal rather than consultation timing to be linked only to Proposal stages. Therefore, the timing for ongoing consultation with Nyamal, NAC, and BAC, will be undertaken in accordance with:

- Fortescue's Native Title Partner Engagement Strategy,
- Relevant Native Title agreement(s) with Nyamal,
- Relevant management or procedural requirements, or
- As requested by Nyamal.

Management measures to address the potential impacts detailed in Section 9.6.1 are provided in Table 9-11.



Table 9-11: Management Measures to address Potential Impacts on Cultural Values & Aboriginal Cultural Heritage

Impact	Impact topic	Mitigation
Avoidance	Heritage Places	<ul style="list-style-type: none"> • Undertake heritage surveys and consultation to identify Heritage Places and areas of cultural significance. • Undertake relevant impact assessments / studies to assess potential impacts as designs plan change (where applicable). • All Heritage Places and HRZs are identified in Fortescue's GIS system. • Footprint designed to avoid all Heritage Places and areas of cultural significance (where practicable). • Fencing (and signage where required) of Heritage Places in proximity to ground disturbance works.
	Dust	<ul style="list-style-type: none"> • Complete relevant dust assessments / modelling to identify potential impacts to dust sensitive sites in high-risk areas. • Where identified, dust sensitive sites are recorded as such in Fortescue's GIS system.
	Access to Country	<ul style="list-style-type: none"> • Access to Shaw and Coongan Rivers and tributaries is maintained. • Access to cultural precinct is maintained.
	Plants and Animals	<ul style="list-style-type: none"> • Undertake TEK surveys to identify plant and animal species of traditional use, including areas of culturally significant plants or animals, prior to ground clearing works. • Undertake relevant assessments to understand potential impacts from vibration of operating wind turbines on animal behaviour, in particular Greater Bilby.
	Water	<ul style="list-style-type: none"> • Culturally significant water sources are recorded in Fortescue's GIS system as Heritage Places or HRZs.
Minimisation	Heritage Places	<ul style="list-style-type: none"> • Relevant Heritage conditions applied to Land Use Certificates (LUCs) prior to undertaking works in the DE. • Inspection of Heritage Places or HRZs within proximity to Fortescue activities during construction (as required). • Undertake Heritage LUC Audits during construction phase and ground disturbing activities. • All personnel mobilised to site to undertake general and site-specific inductions regarding Fortescue's heritage management procedures. • Undertake blasting activities in accordance with Fortescue's Blasting Near Heritage Place Procedure (100-PR-HE-0003). • Where required, seek heritage approvals under relevant heritage legislation in consultation with Nyamal.
	Dust	<ul style="list-style-type: none"> • Implement general dust management protocols (as discussed in Section 9.7.3.3) to minimise dust generated from Fortescue activities.



Impact	Impact topic	Mitigation
	Access to Country	<ul style="list-style-type: none">• Ensure consultation with Nyamal regarding Decommissioning Plan (where required).
	Plants and Animals	<ul style="list-style-type: none">• Establish appropriate criteria / thresholds for managing areas of culturally significant plants or animals in high-risk areas, including Groundwater Dependent Vegetation (where existing management strategies or procedures may not apply).• Clearing of land kept to a minimum to reduce loss of traditional flora species and culturally significant fauna habitat.
	Water	<ul style="list-style-type: none">• Proposal designed to minimise impacts to creeks from crossings.• Pole locations placed outside of high flow areas, where required to be installed within rivers, as far as possible.• Standard construction site pollution prevention measures will be implemented throughout the construction phase.
Rehabilitation	Plants and Animals / Aesthetics	<ul style="list-style-type: none">• Rehabilitation of a total of 1,030.35 ha of cleared vegetation which will be undertaken progressively after each phase of the construction activities to reduce impacts to floral and vegetation over time, including potential fragmentation. This will be undertaken in accordance with Fortescue's standard procedures including Rehabilitation and Revegetation Monitoring Procedure (Reference: 45-GU-EN-0009).

As discussed in Section 9.6, no residual visual, noise or vibration impacts to Cultural Values have been identified. Therefore, no further mitigation measures are required.



9.7.2 Non-Aboriginal Heritage

As discussed in Section 9.6.2, no residual impacts from the Proposal are expected on Camel Creek. Therefore, no mitigation measures are required. As the North Pole Dome / Meentheena site overlaps the IDF, it will be identified in Fortescue's GIS system and impacts to the site from ground disturbance will be minimised during the design phase, and overseen during the construction phase to ensure all clearing is within approved areas.

9.7.3 Amenity

9.7.3.1 Visual Amenity

As discussed in Section 9.6.3.1, no significant residual visual or landscape impacts from the Proposal have been identified with regard to social surroundings. Therefore, no mitigation measures are proposed.

9.7.3.2 Noise and Vibration

As discussed in Section 9.6.3.2, no residual noise or vibration impacts from the Proposal have been identified. Therefore, no mitigation measures are required. Vibration resulting from operation of turbines is anticipated to be very low level and likely to be experienced in the immediate vicinity of the turbine. This will be confirmed as part of the ongoing vibration study. Vibration impacts will be managed under Fortescue's '*Blasting Near Heritage Places Procedure*' (100-PR-HE-0003).

9.7.3.3 Dust

As discussed in Section 9.6.3.3, no residual dust impacts from the Proposal have been identified to date. Dust deposition will be managed through standard construction measures (e.g., water application and exposed surface stabilisation) to minimise dust generation and avoid impacts on social surroundings. The following standard dust mitigation measures will be implemented throughout construction phase:

- Use of dust suppression to manage dust generation from construction activities, access roads and cleared areas.
- Use of water sprays to manage dust generation from material transport and stockpiling.
- Complete relevant dust assessments / modelling to identify potential impacts to dust sensitive sites in high-risk areas.
- Limit the number and height of stockpiles.
- Vehicles confined to designated routes with speed limits strictly enforced.

9.8 Residual Impact and Predicted Outcome

No impacts to nearby towns, surrounding industry, visual amenity, landscape or non-Aboriginal heritage are anticipated to occur as a result of the Proposal. Additionally, the noise, vibration and dust impacts from the Proposal are not expected to have a significant impact on social surroundings.



Fortescue is committed to minimising impacts on Heritage Places in all of its project areas which includes wherever possible avoidance of impacts on Heritage Places. Where the Proposal cannot avoid impact to Heritage Places or potential Heritage Places, Fortescue will consult with Nyamal and apply for relevant approvals under the AH Act. Fortescue will comply with the AH Act and any approval conditions set by the Minister of Aboriginal Affairs at all times during construction and operation of the Proposal. With respect to access to country, dust management on heritage places, culturally significant plants and animals, and water sources, Fortescue will continue to consult with Nyamal to ensure that impacts are minimised.

The predicted environmental outcome for the Proposal is:

- No direct or indirect impacts to the environment which significantly impact the Nyamal social and cultural values, aesthetics, amenity, or other economic and social surrounding values, from implementation of the Proposal.

No significant residual impacts to social surroundings have been identified and the EPA's objective for the Social Surroundings factor 'to protect social surroundings from significant harm' can be met.



10 OTHER FACTORS

As discussed in Chapter 6, some environmental factors were eliminated from further assessment given there are no credible impact pathways identified, such as the marine related factors. Other environmental factors were identified as requiring a less detailed assessment than the preliminary key environmental factors as they are either subject to controls under other legislation, are effectively managed through routine/business as usual environmental management procedures or the Proposal poses a very low risk of impact to these factors. The factors requiring a less detailed impact assessment are:

- Inland Waters.
- Subterranean Fauna.
- Terrestrial Environmental Quality.

10.1 Inland Waters

10.1.1 EPA Objective

The WA EPA's objective for the inland waters environmental factor is '*To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*' (EPA, 2021).

Inland waters are defined as '*The occurrence, distribution, connectivity, movement, and quantity (hydrological regimes) of inland water including its chemical, physical, biological and aesthetic characteristics (quality)*' (EPA, 2018).

10.1.2 Policy and Guidance

The following policies and guidelines have been considered for the Proposal in order to meet the EPA's objective in relation to this factor:

- Statement of Environmental Principles, Factors and Objectives (EPA, 2021).
- Environmental Factor Guideline – Inland Waters (EPA, 2018).
- Water Quality Protection Note no.25. Land use compatibility tables for public drinking water source areas (DoW 2016a).
- Water Quality Protection Note no.65. Toxic and hazardous substances (DoW 2015).
- Water Quality Protection Note no.84. Rehabilitation of disturbed land in public drinking water source areas (DoW 2009).
- Contaminated Sites Guidelines (DWER, 2020).

The Environmental Factor Guideline for Inland Waters has been considered during the identification of values within the DE and the issues identified in the guideline considered in relation to potential impacts from the Proposal.



10.1.3 Studies and Surveys

A baseline hydrological assessment for EPGH was undertaken by Advisian (2022), which assessed the existing surface water flow regime in support of design and approvals submissions. The report is provided in Appendix G.

A baseline hydrology study and impact assessment were also undertaken for the Transmission Line area (Worley, 2024) and is provided in Appendix H. This assessment presented the baseline hydrology study, and the qualitative impact assessment conducted for the transmission line corridor to analyse placement of structure systems and support regulatory approval submissions. The report assessed six waterway crossings in detail. These crossings were identified upon review of the transmission corridors as named water courses or crossings that were likely to have a flood extent greater than 400 m in the 1% AEP and require guidance for placing transmission line structure systems.

Following this, a post development hydrological assessment (Fortescue, 2024) was undertaken for the Proposal to evaluate the potential impacts of the Proposal design and layout on the existing surface water flow regime. This report is provided in Appendix I and summarises the post development assessment, post development hydrology and flood modelling results, and findings of the surface water impact assessment.

A desktop Groundwater Assessment was undertaken by Fortescue (2022a) to identify available information, aquifers and potential water related risks associated with the Proposal (Appendix J). An analytical assessment was also undertaken using desktop data to identify the risks associated with groundwater abstraction associated with relevant receptors, groundwater dependent systems and subterranean fauna (Fortescue, 2022b). The objective of this study was to conduct a preliminary drawdown assessment to determine potential groundwater drawdown and impacts to receptors and nearby users.

A site investigation has been undertaken, in the form of a groundwater exploratory drilling programme, to frame the baseline setting and determine the impact of abstraction. The objectives of the programme are to:

- Drill a series of investigation pilot holes (16 in total within the southern Generation Hub area) to ascertain suitability for water supply
- Convert pilot holes of suitable yield to production bores and complete test pumping
- Drill and install a series of monitoring bores to characterise the baseline hydrogeological setting and provide key monitoring data.

The investigation commenced in September 2024 and was completed in December 2024. Drilling was undertaken in accordance with the conditions of 26D Licence to Construct or Alter Well CAW210169(1).

The Fortescue (2022b) groundwater assessment has been updated as part of the Construction Water Supply Hydrogeological Assessment (Fortescue, 2025) (Appendix K) with consideration of the latest Proposal design and preliminary site investigation information. The results of drilling and testing, and measurements from the nearby pastoral wells (Links Well and Tony's Well), have been used to develop a conceptual hydrogeological model of the site, which in turn has been used to develop a high level numerical hydrogeological model, to allow assessment of groundwater abstraction impacts during project construction and operation.



The model is discussed in detail in Appendix K (Fortescue, 2025) and the results are summarised in Section 10.1.4.2.

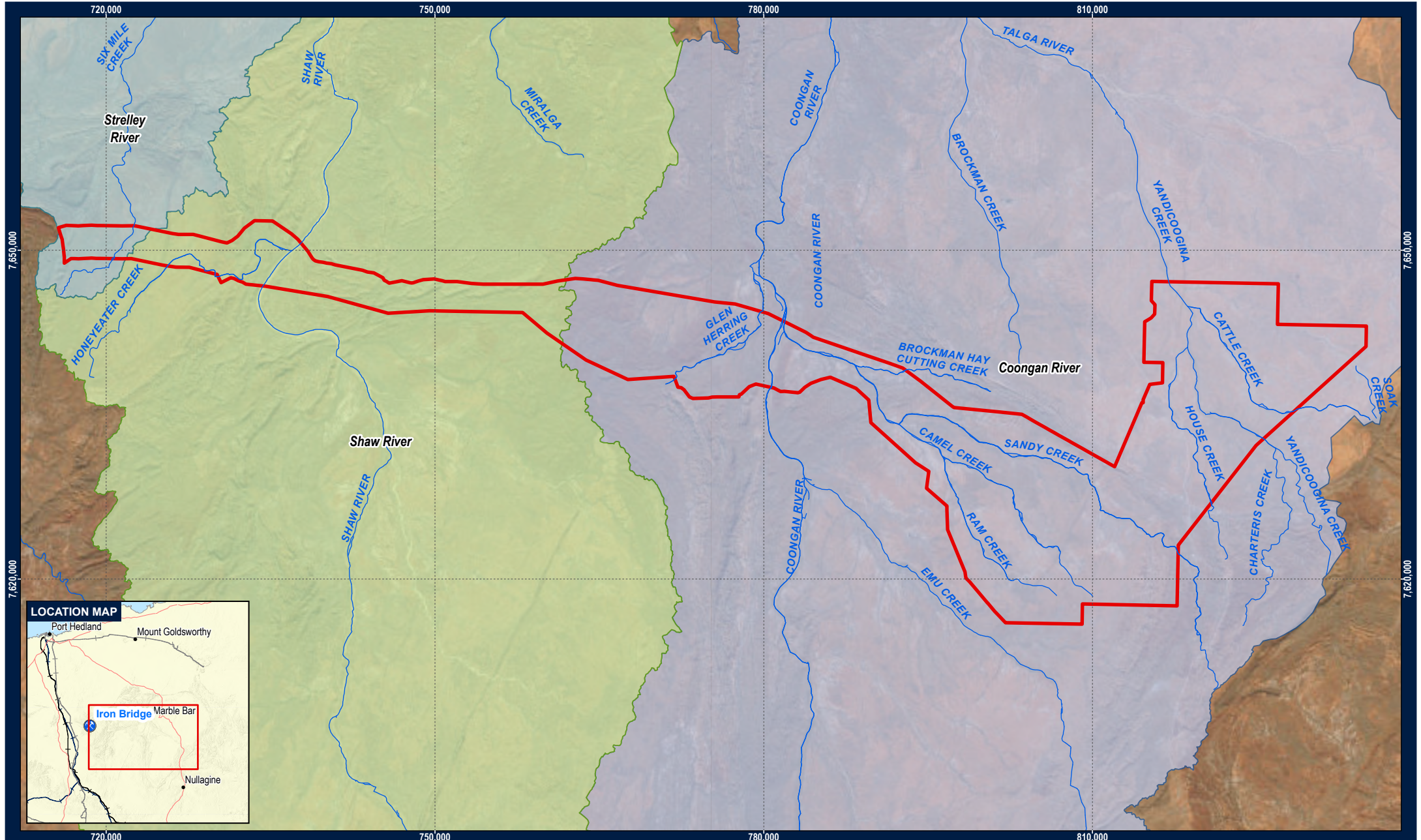
10.1.4 Receiving Environment

10.1.4.1 Surface Water

The DE is located within the Pilbara Surface Water Area proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act) (DWER,2018a), but outside any Public Drinking Water Source Areas (DWER,2018b). The Proposal occurs within the De Grey River Basin and overlaps three catchments: (1) Coongan River, (2) Shaw River and (3) Strelley River (DWER, 2018c). These catchments are displayed on Figure 10-1.



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Legend

- Drainage
- Development Envelope

De Grey River Basin Catchments

- Coongan River
- Shaw River
- Strelley River

Data Sources:
 Aerial, ESRI
 Catchments, DWER.
 Drainage, GA.
 All other data, Fortescue, 2024

N

 0 5 10 15 20
 Kilometres

Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostellio
 Approved By:
 Scale: 1:450,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066
 Document Name: 4519OP002_MP_EN_0066.022

Date: 20/01/2025
 Size: A4L
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 Confidentiality: 0

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Figure 10-1
Inland Water Features

Fortescue.



The De Grey River has the highest mean annual discharge of all rivers in the Pilbara (GoWA, 2012). The flow in the De Grey River system is the primary recharge into the alluvial aquifer, which is an important water supply in Pilbara. The alluvial aquifer is located approximately 70 km north of the DE. The other main rivers, Coongan, Shaw and Strelley, are very wide, sandy and sometimes braided, with permanent and semi-permanent pools and flow intermittently in the northwest direction. These rivers typically flow only two or three times during the summer, mostly following cyclonic and other major rainfall events (McFarlane, 2015).

The DE overlaps 12 major and minor non-perennial watercourses that are named (there are other minor non-perennial watercourses however they are unnamed), as shown in Table 10-1. These watercourses include the Coongan River (Major River), Shaw River (Mainstream), and Yandicoogina Creek (a tributary of Talga River). The Talga River discharges into the Coongan River approximately 55 km downstream of the DE, with the Coongan River then discharging into the De Grey River (Advisian, 2022). Inspection of the 1:250,000 topography maps and Fortescue’s internal environmental datasets within these river basins show no permanent pools within these sub-catchments in the Generation hub area of the DE (Fortescue, 2025).

Table 10-1: Watercourses within the Development Envelope

Watercourse	Perenniality	Hierarchy	Area within DE
Brockman hay cutting creek	Non-Perennial	Minor	Transmission Line
Camel creek	Non-Perennial	Major	Transmission Line
		Minor	Transmission Line, Generation Hub
Cattle creek	Non-Perennial	Minor	Generation Hub
Coongan river	Non-Perennial	Major, Minor	Transmission Line
Glen herring creek	Non-Perennial	Minor	Transmission Line
Honeyeater creek	Non-Perennial	Minor	Transmission Line
House creek	Non-Perennial	Minor	Generation hub
Ram creek	Non-Perennial	Minor	Generation Hub
Sandy creek	Non-Perennial	Major	Transmission Line, Generation hub
Shaw river	Non-Perennial	Major	Transmission Line
Soak creek	Non-Perennial	Minor	Generation hub
Yandicoogina creek	Non-Perennial	Major, Minor	Generation Hub

The catchments within which the Generation Hub area of the DE is located generally drain in a north-westerly direction towards the Coongan/Talga Rivers. The estimated flood peaks, total flow volume, maximum flood depth and velocity for the modelled watercourses are provided in Appendix I. Inspection of the 1:250,000 topography maps and Fortescue’s internal environmental datasets within these river basins show no permanent pools within these sub-catchments.

Within the Transmission Line area, the main water courses are the Coongan River and Shaw River which are ephemeral and flow in a northerly direction before discharging into the De Grey River, as discussed further below. The total catchment area of the Coongan River is 7,090 km² (Fortescue, 2025) and the area upstream of the transmission corridor represents approximately 47% of the total catchment. The total catchment area of the Shaw River is



approximately 7,900 km², of which approximately 77% of the catchment is located upstream of the transmission line (Worley, 2024).

The Generation Hub area is also located within the Coongan River catchment (Fortescue, 2025). The headwaters of the Coongan River are located in the Chichester Range. The river flows in a northerly direction past Marble Bar then through the Gorge Range before discharging into the De Grey River, approximately 115 km downstream of EPGH. Major tributaries of the Coongan River include Camel Creek, Talga River and Emu Creek. The Coongan River catchment contains one DWER gauging station at Marble Bar (DWER ref: 710204), which has been in operation since 1966. Detailed analysis of observed streamflow records at the gauging station has been carried out as part of the baseline hydrological assessment presented in Appendix I, to inform the hydrologic and hydraulic modelling for the development area.

Flow gauging data across the region indicates the Coongan River (and creeks nearby) are ephemeral with runoff limited to significant rainfall events (Fortescue, 2024b). Typically, over three quarters of the annual streamflow occurs during January, February and March with local rivers usually drying up around July or August. The Marble Bar gauging station covers a catchment area of 3,736 km² (Table 10-2). Surface flow data indicates variable annual and monthly flows with several order of magnitude differences between minimum and maximum values. The Coongan River median annual flow at Marble Bar is in the order of 144 GL/year which represents an average runoff yield of about 11% of the median annual rainfall of 344 mm/year (Groundwater Resource Management, 2019). Table 10-2 illustrates the peak flow estimates for the Coongan River catchment based on Flood Frequency Analysis of streamflow records at Marble Bar (also displayed on Figure 10-2). This is reported in relation to the different Annual Exceedance Probability¹⁰ (AEP) of various flood events (Fortescue, 2024). For comparison, the peak flow estimates are also detailed for the Shaw River, which are based on streamflow records from North Pole Mine.

Table 10-2: Peak Flow Estimates for the Coongan River Catchment

DWER Stream Gauge	Catchment Area to Gauge (km ²)	Peak Flow (m ³ /s)					
		50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
Coongan River at Marble Bar (710204)	3,736	508	1,148	1,736	2,463	3,721	4,972
Shaw River – North Pole Mine (710229)	6,479	847	2,455	3,518	4,483	5,622	6,388

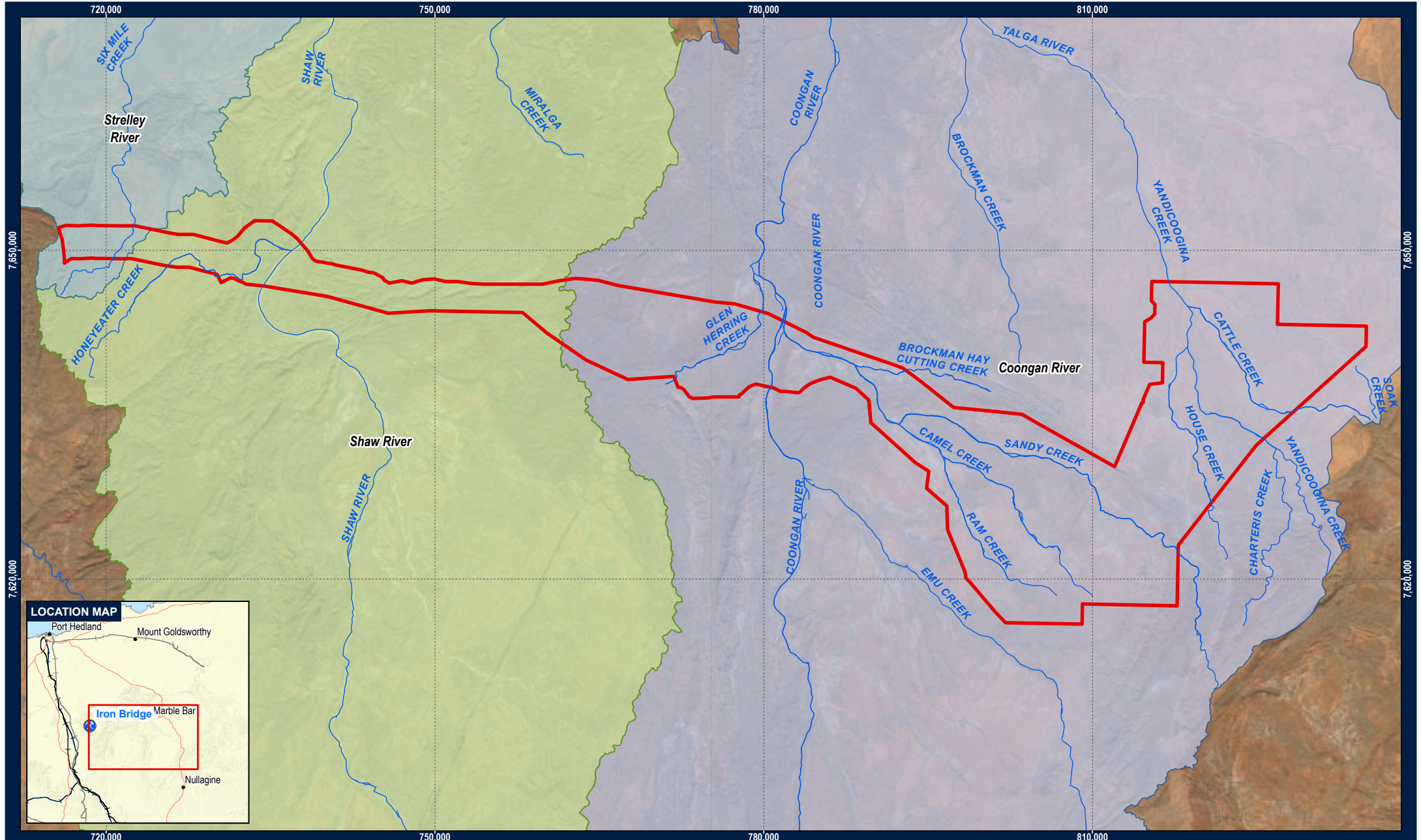
The baseline hydrology study by Advisian (2022) notes that within the southern portion of the Generation Hub area, higher hydraulic intensities were typically limited to the Sandy Creek and Emu Creek watercourses due to their larger contributing catchment areas and hence higher runoff generating potential. Other creeks such as Ram Creek and Camel Creek were predicted to be generally of lower hydraulic intensity. Flood behaviour in the northern portion of the Generation Hub area is typified by higher hydraulic intensities in Yandicoogina Creek due to the large upstream catchment area. Peak velocities in the smaller creek systems

¹⁰ Annual Exceedance Probability (AEP) is a term used in flood risk assessment to describe the likelihood of a flood event occurring in any given year. It is expressed as a percentage, for example, a 1% AEP means there is a 1 in 100 chance of a flood of that magnitude happening in any given year.



flowing through the development site are predicted to have typically lower hydraulic intensities (Advisian, 2022).

Sensitivity assessment of the 2050 future climate scenario using predicted rainfall intensity increases was undertaken for the intermediate scenario (representative Concentration Pathways (RCP) 4.5) and worst-case scenario (RCP8.5) in the baseline modelling (Advisian, 2022). For the intermediate scenario, increases in peak flood levels are predicted to be typically up to 150 mm in the main creeks flowing through the DE. For the worst-case scenario, peak flood level increases are predicted to increase slightly to be up to approximately 200 mm in the main creek systems.



Legend

- Drainage
- Development Envelope
- De Grey River Basin Catchments**
- Coongan River
- Shaw River
- Strelley River

Data Sources:
 Aerial, ESRI
 Catchments, DWER.
 Drainage, GA.
 All other data, Fortescue, 2024

N

 0 5 10 15 20
 Kilometres

Requested By: S. Springer
 Drawn By: S. Bowyer
 Revised By: scostellio
 Approved By:
 Scale: 1:450,000
 Coordinate System: GDA2020 MGA Zone 50
 Project Name: 4519OP002_MP_EN_0066
 Document Name: 4519OP002_MP_EN_0066.022

Date: 20/01/2025
 Size: A4L
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Figure 10-1
Inland Water Features

Fortescue.



10.1.4.2 Groundwater

The DE is located within the Pilbara groundwater area, proclaimed under the RIWI Act. Groundwater resources in the Pilbara groundwater area are managed through the Pilbara Groundwater Allocation Plan, which covers an area of 200,000 km², including Port Hedland and extends inland, covering Marble Bar, Wittenoom, Nullagine, Tom Price and Newman (WA Government, 2023).

The groundwater resources within Pilbara are a mix of alluvial, sedimentary and fractured rock aquifers (WA Government, 2023). These resources can be grouped into three categories (Fortescue, 2022a):

- Tertiary Alluvials following the larger river systems discharging into the ocean (Fortescue, De Grey Aquifers).
- Fractured weathered bedrock, especially banded-iron formations (BIF) within the Hamersley Basin and within the granite terrain in East Pilbara.
- Intermediate depth sheared zones within the greenstone belt.

The DE is expected to feature a superficial aquifer of limited thickness (approximately 3-10m) hosted in the alluvial sequence, overlying potential weathered and fractured rock aquifers linked to faults and fractures in the Granite basement (Fortescue, 2025). The site is bisected in the south by a major dyke striking southwest-northeast, which may compartmentalise the aquifer systems, and/or potentially facilitate groundwater flow across its margins. The northern and southern areas of the site are separated by a greenstone belt which likely host aquifers associated with shearing (Figure 5). The underlying fresh granitic bedrock likely has little to no storage and permeability in absence of secondary features (Fortescue, 2025).

Locally, there is limited data to identify potential groundwater resources. The main sources of information are shallow pastoral bores (5-10 m deep), DWER's Water Information Reporting database and nearby projects (Fortescue, 2022b). Although there are up to 54 known bores within the DE, many of them have been destroyed or abandoned, and there is limited groundwater data available (Fortescue, 2022a).

Permanent, semi-permanent and intermittent pools may be associated with current day drainage lines. However, no pools were identified during the initial site reconnaissance visit (Fortescue, 2025).

The site investigation and associated pilot hole drilling indicates relative consistency with respect to the stratigraphic profile across the Generation Hub area of the DE, which consists of:

- A superficial sequence of alluvial and colluvial sediments, consisting of brown, silty and sandy, poorly sorted, sub rounded to sub angular gravels, generally 2m to 6m thick. The alluvial/colluvial sediments appear to be dry, although may be partially saturated in some areas after significant recharge events.
- An underlying unit of brown, pink and grey weathered granite, generally 2m to 20m thick. The weathered granite appears to host the water table and is saturated through the majority of its thickness.



- An underlying fractured granite bedrock unit which contains sparse local fractures of low storage value.
- Underlying basement of fresh granite, with alternating dominance of biotite and/or amphibole minerals and pink orthoclase feldspar, with little to no fracturing. The fresh granite appears to be dry.

Drilling investigation results indicate a generally low yielding aquifer within the weathered bedrock unit and underlying fractured bedrock. Groundwater is of fresh to brackish and slightly alkaline quality. Groundwater levels are relatively consistent, in the range of 6.96 to 13.61 mbgl (meters below ground level), and flowing to the northwest under relatively steep hydraulic gradient.

Aquifer tests provide hydraulic conductivity values of 2.9 m/day in the weathered bedrock to the east of the site across the alluvial channel domain, and 0.14 m/day throughout the remainder of the weathered bedrock domain. The underlying fractured bedrock is conceptualised to feature an average hydraulic conductivity of 0.007 m/day.

Groundwater Dependant Ecosystems

Groundwater dependent ecosystems (GDEs) are those that require access to groundwater on a permanent or intermittent basis to meet their water requirements. The function and composition of these ecosystems is often highly responsive to changes in groundwater availability (Murray *et al.* 2003). The groundwater regime is a key factor influencing the composition of flora and fauna, ecological processes and ecosystem services associated with GDEs (Hatton and Evans 1998; Evans and Clifton 2001).

Flora and vegetation surveys undertaken for the Proposal (FVC, 2024) identified GDEs as being present in and around the DE. Vegetation units EcMa, EcTI, EvAtEb, EvCi and EvMITe were identified as either potential or actual GDEs (discussed further in Chapter 7).

Vegetation units EcMa and EcTI represent groundwater-dependent vegetation due to the presence of the phreatophytic¹¹ species *Melaleuca argentea* with *Eucalyptus camaldulensis*. The other three vegetation units (EvAtEb, EvCi and EvMITe) are potentially dependent on groundwater due to the presence of species that access or require groundwater at some stage of their life cycle (*E. victrix*). These three vegetation units are more regularly present in medium to minor drainage lines and seasonally flooded areas (drainage flats/floodplains) adjacent to major drainage lines than EcMa and EcTI. There is a total of 5,545 ha of groundwater dependent and potentially groundwater dependent vegetation within the DE.

Water Supply Strategy

Fresh to marginal water from groundwater sources will be targeted to meet construction demands for the Proposal. During construction (anticipated to last approximately two years), an estimated peak water demand of 0.7 Gigalitres (GL) per annum has been calculated. This demand will reduce to 0.1 GL per annum in subsequent years for operational purposes.

¹¹ Phreatophytes are plants that can access groundwater directly, often found in riparian areas along streams where water is readily available. They have roots adapted to low oxygen levels in aquifers, allowing them to thrive in environments with consistent access to water.



The southern section of the Generation Hub area is the first priority for groundwater bore targets, and it is noted that there is potential need to use alternative sources to supplement supply which will be confirmed through the ongoing investigations. The specific locations of the current drill target bores are shown in Appendix J, however it is noted that these are primarily for investigation and the majority of these will not be converted to production bores

To abstract groundwater for use during construction and operations, a 5C groundwater licence must be granted by DWER, in accordance with the requirements of the RIWI Act 1914. A licence application has been submitted to cover water abstraction for the construction and operational phases, and will be assessed by DWER upon completion of the drilling and testing programme and subsequent reporting.

As discussed, the Proposal is located within the larger Pilbara Groundwater Management Area which consists of a mix of alluvial, sedimentary and fractured rock aquifers. The site itself is characterised as 'Fractured Rock' (DoW, 2013 & DWER, 2024). Allocation limits have not been set for fractured rock aquifers as water availability is assessed on a case-by-case basis through licensing.

10.1.5 Potential Impacts and Mitigation

10.1.5.1 Surface water

Turbine hardstand areas, access tracks and waterway crossings have the potential to cause local level impact on surface hydrology and morphology through altered water flow, increased sedimentation and bank erosion.

Through comparison of modelling of baseline and proposed post-development scenarios, areas affected by the Proposal have been identified to assess potential impacts. The assessment concluded the Proposal's impact on surface water flow in the Generation Hub area would be localised, mainly around turbine access tracks and waterway crossings, with negligible disruptions to regional flows downstream. Post-development, runoff volume to main creeks will slightly increase due to reduced rainfall infiltration due to a change in land use (increased paved/compacted areas due to the Proposal). However, the change is minimal (<1%) given the relatively small size of the DE compared to the contributing catchments of the creek systems (Fortescue, 2024).

There would be slight reduction of flood peaks in the northern section of the Generation Hub area due to the presence of more significant crossing structures causing backwater effects, but this would not be anticipated to significantly affect total flow volume. Changes in maximum flood depths and velocities downstream are marginal (<1%), indicating minimal impact on downstream hydrology and morphology (Fortescue, 2024).

The modelling shows low-level floodway crossings have minor impacts on creek hydrology and morphology. Culverted crossings may alter flow regimes locally but are unlikely to affect areas beyond the structures. Flow velocity changes in the vicinity of crossings may influence geomorphological conditions of the creek systems, potentially increasing sediment deposition upstream, but this is considered to be negligible as significant erosion is not expected due to relatively minor velocity increases (within + 0.5 m/s).

Sensitivity assessment of the 2050 future climate scenario as well as increased floodplain roughness typically showed peak flood level increases of up to approximately 200 mm and it is expected that the uncertainties and associated risks relating to both the exact floodplain



roughness across the study area and future climate hydrologic uncertainty could be mitigated by adoption of a standard design freeboard of 300 mm (Advisian, 2022). This has been accounted for within the design freeboard for the Proposal.

With regard to the transmission line area, empirical loss parameters for the region were derived from a regional hydrological analysis for the Shaw and Coongan River catchments. Hydraulic modelling was completed to determine the hydraulic characteristics within the waterway crossings of interest. It is noted that four of the foundation pads for the transmission line poles will need to be situated within the floodplain as the estimated 1% AEP flood extents of these watercourses are wider than the maximum practical span length between poles of 600 m. A list of the transmission line structure systems within the 1% AEP flood extent is presented below, with detailed hydraulic results presented in Appendix I.

- Coongan River – Pad 407 and 408.
- Shaw River– Pad 80 and 81.

Generally, the locations of the pads (and proposed transmission line structure systems) were located on the flood plain of the waterway crossings and were not exposed to high velocities and depths experienced in the main low flow channel.

A sensitivity analysis to account for potential climate change scenarios and changes in hydraulic roughness resulting from differing vegetation conditions was completed. The results indicate that some crossings were more sensitive to these changes. Larger changes in peak water levels were predicted in the Coongan and Shaw Rivers, though it is not expected that these changes will result in additional pads being located within the 1% AEP floodplain (with the exception of the Coongan River crossing where Pad 406 is impacted in the RCP 8.5 Climate Change scenario).

The impact assessment for the transmission line area concluded:

- Changes in water level: There is potential for changes in water level upstream of the proposed structures. It is expected that due to the expansive size of the waterway crossings and the relatively small size of the structures, these changes in water level will be localised and minor.
- Scour potential: There is potential for scour to occur at structures located within the flood extent. The location of the poles are outside of the main flow path, which limits the potential for scour in small to medium events. Scour potential in larger events can be managed through the use of rock protection and other design elements.
- Alterations to flow paths: Due to the relatively small footprint of the structure on the broader floodplain, it is unlikely that there will be significant changes to the flow paths.
- Vegetation impact: The current locations of the proposed structure are typically outside of areas of high vegetation density. It is unlikely that there will be a significant impact to riparian vegetation.
- Water Quality: There is not expected to be a significant impact to water quality as a result of the transmission line structures being located in the 1% AEP flood extent. Increased sediment loads may occur as a result of construction activities, but could be



adequately managed through standard construction phase erosion and sediment control principles.

Therefore overall, the Proposal design and layout are anticipated to have very low impacts on the existing surface water flow regime. To further reduce potential impacts, the following mitigation is proposed:

- A surface water management plan will be developed and implemented to manage flood risk and minimise soil erosion and the potential for the transport of sediment to downstream waters during the construction phase.
- Construction and maintenance of the waterway crossings will be scheduled outside of the wet season where possible, or for a time period when rainfall and runoff are unlikely.
- Erosion control measures will be installed at the inlet and outlet of the culvert structures to minimise the risk of bed and bank erosion and local scour, and to prevent undermining of the structures.
- The floodway batters and driving surface will be armoured to minimise erosion and scour as water flows over the road.

With regard to potential bed and bank erosion and local scour as a result of specific construction works associated with water course crossings, this will be managed through the permit to interfere with the bed or banks of a watercourse under the RIWI Act where required. Conditions and requirements of the permits would include requirements for erosion control, vegetation management, and maintaining natural water flow in order to minimise potential impacts to surface watercourses as far as possible.

10.1.5.2 Groundwater

Simulations of groundwater drawdown were undertaken using the numerical model to estimate the impacts to identified receptors (Other Groundwater Users; Groundwater Dependent Ecosystems; and Subterranean Fauna) due to abstraction of construction water, as discussed in Section 10.1.3. The model used existing production bore EPGH-PB012, as well as four additional scenarios with different abstraction rates, timeframes and hydraulic conductivity (Appendix K; Fortescue, 2025).

Modelled predictions indicate a sustainable abstraction volume of 0.31 GL/yr, approximately 46% of the required construction volume, is available in the southern section of the Generation hub area within the DE. The impacts of abstraction related drawdown at this rate are not predicted to reach any of the key receptors, including pastoral wells, known stygofauna habitats or areas of groundwater dependent vegetation.

No impacts to groundwater quality are anticipated during the Proposal. Laboratory analysis of samples shows consistent quality across shallow and deep aquifers, and pumping tests revealed no significant changes in groundwater quality parameters.

It is recognised that Fortescue will need to source the remainder of the water requirement from alternative sources, as the modelled abstraction accounts for only 46% of the total required construction volume. The risk of impacts from excessive drawdown related to the Proposal is relatively low given the short-term nature of the construction period (approximately 2 years),



and the negligible water requirements during the operational phase of the Proposal. The water supply will be supplemented with alternate supply sources and limit abstraction volumes to ensure no adverse impacts occur. In addition, through design avoidance measures implemented throughout the design process, there are limited environmental values within the DE that could be impacted by the quantity of abstraction Proposed. It is also expected that groundwater levels will recover relatively rapidly at the conclusion of abstraction.

The groundwater assessment will be used to support the application for licence to take water under Section 5C of the RIWI Act. As a condition of this licence, a Groundwater Operating Strategy (GWOS) will be developed, which will detail the groundwater monitoring programme to be conducted before, during and after the Proposal construction period. The GWOS will also outline management and mitigation procedures to further reduce the potential for adverse impacts to identified receptors. Indicatively, the monitoring programme will include:

- Monthly measurement of baseline static water levels (SWLs), for period of six months in advance of construction commencement, from all site monitoring bores and pastoral bores.
- Monthly measurement of SWLs from all monitoring, production and pastoral bores through the construction period and for at least six months post-construction.
- Quarterly measurements of field Electrical Conductivity (EC), pH and temperature from all monitoring and pastoral bores through the baseline, construction and post construction periods.
- Monthly abstraction volumes (metered) from all active production bores. Analysis will be in the form of annual groundwater assessments which will be required as a condition of the 5C licence and accompanying groundwater operating strategy. The annual reports will include sections which interpret the monitoring data described here, to quantify impacts to any receptors, and include drawdown contour maps, graphs, etc. The operating strategy will describe mitigation measures.
- Annual sampling and laboratory analysis for major analytes (in accordance with Fortescue's Water Supply and Treatment Engineering Requirements (FFI-0000-WM-SOR-0002)).

10.1.6 Residual Impact and Predicted Outcome

No significant impacts are anticipated as a result of construction or operation of the Proposal with regard to inland waters. The turbines have been designed to be positioned to avoid major watercourses and outside of the 1% Annual Exceedance Probability (AEP) floodplain area. The transmission line poles may be required to be located within the 1 % AEP floodplain of the Coongan and Shaw Rivers as the floodplain extent is larger than the practical maximum 600 m span that our design allowed for. However, the assessment showed that the impacts are minor, and mitigation measures have been recommended to further minimise impacts.

Potential impacts to all inland water elements are covered through regulation by other Decision Making Authorities with regard to permitting and licensing requirements (i.e. 26D and 5C licenses and Permits to Interfere with Bed and Banks under the RIWI Act). As discussed in Section 10.1.5.2, implementation of the GWOS conditioned under Section 5C of the RIWI Act will ensure any potential adverse impacts to identified receptors (Other Groundwater Users; Groundwater Dependent Ecosystems; and Subterranean Fauna) will be appropriately



managed such that no significant impacts as a result of groundwater abstraction will occur. Water abstraction will be limited to rates/volumes that result in acceptable and manageable impact, with alternate supply to supplement abstraction from the DE where required.

10.2 Subterranean Fauna

10.2.1 EPA Objective

The WA EPA's objective for Subterranean Fauna is '*to protect subterranean fauna so that biological diversity and ecological integrity are maintained*' (EPA, 2016a).

Subterranean Fauna is defined as '*fauna which live their entire lives (obligate) below the surface of the earth. They are divided into two groups:*

1. *Stygofauna - aquatic and living in groundwater.*
2. *Troglofauna – air-breathing and living in caves and voids'* (EPA, 2016a).

10.2.2 Policy and Guidance

- Statement of Environmental Principles, Factors and Objectives (EPA, 2021)
- Environmental Factor Guideline – Subterranean Fauna (EPA, 2016a).

10.2.3 Studies and Surveys

Fortescue engaged Bennelongia Environmental Consultants (Bennelongia) in 2022 and 2024 to undertake a desktop assessment and field surveys of subterranean fauna and habitat.

The Bennelongia (2025) desktop assessment and stygofauna survey included a literature and database review within a 150 km by 150 km area (search area) and following the results of the desktop assessment, a basic stygofauna survey was completed to evaluate the community present. This search area for the desktop assessment covered a larger extent than the DE and is referred to throughout this section.

A basic stygofauna survey (Bennelongia, 2025) was conducted on the eastern side of the DE between the 27 and 28 June 2022. Nine bores were targeted, but only eight bores were sampled for stygofauna to collect information on the likelihood of subterranean fauna to be present within the prospective habitats recognised during the Desktop assessment. Standard sampling techniques were used which followed the EPA 2021 guidelines for subterranean fauna surveys (EPA, 2021).

The Bennelongia (2025) survey (Appendix L) was undertaken between 5 and 9 June 2024 and involved a targeted stygofauna field survey to confirm the findings of the 2022 assessment. A total of 17 bores were successfully sampled for stygofauna. These sites represent the potential locations of the production bores within the DE. Eight of the 17 sites sampled, had been previously sampled for stygofauna.

10.2.4 Limitations

No specific limitations were identified that would have relevant to this assessment.



10.2.5 Receiving Environment

Geological and hydrogeological characteristics of the DE provide suitable habitats for subterranean fauna, particularly for stygofauna given the presence of palaeovalleys and regional drainage lines (Bennelongia, 2025). A summary of the geology and hydrology present within the DE is provided below.

Geology

The DE mainly consists of granites and granodiorites, with a small section (within the Transmission Line area) predominantly comprising of basalts. The eastern part of the DE lies in the East Pilbara Terrain of the Pilbara Craton, which includes some of the oldest rocks in the world (Hickman 1983). The geology consists of granitic, sedimentary and volcanic sequences.

Surface geology in the DE is mapped as predominantly exposed rock (Bennelongia, 2025) but, in fact, has a layer of sandy colluvium formed by sand, silt, scree and gravel. Alluvium and thicker areas of colluvium occur on drainage lines as well as on floodplains around rivers. Overall, the thickness of the colluvium varies from 3-10 m. Bedrock geology consists predominantly of granite, gneiss and mafic/ultramafic, with some basalt and a small area of dolerite in the south-east close to the location of production bores.

In general, alluvium and colluvium are prospective for stygofauna if saturated and of uncertain prospectivity (although troglofauna species have been found in them) for troglofauna in the Pilbara (Bennelongia, 2025). The main rock geologies in the DE - basalt, granite and gneiss - are not prospective for subterranean fauna unless strongly weathered. Greenstone areas sometimes support moderate troglofaunal communities, depending on the extent of weathering present.

Hydrology and Hydrogeology

The surface water and groundwater conditions of the DE are discussed in detail in Section 10.1.4. The DE lies within the De Grey River basin (WRC, 1996). There are three types of groundwater aquifers with the possibility to provide habitat for stygofauna in the Central Pilbara. These are considered indicative of potential stygofauna habitat in the Pilbara region (Johnson & Wright, 2001):

- Unconsolidated sedimentary aquifer.
- Chemically deposited aquifer.
- Fractured-rock aquifer.

Unconsolidated sedimentary aquifers (particularly when alluvium/colluvium or detritals are present) and chemically deposited aquifers (especially those of calcrete or channel iron) signify strongly prospective habitats for stygofauna (Bennelongia, 2025). The unconsolidated sedimentary aquifers are present across larger areas of the DE compared to the chemically deposited aquifers which represent little of the total area of the DE. The sampled potential bore sites are predominantly situated across the Generation Hub area. This area is expected to feature a superficial aquifer of limited thickness (approximately 3 to 10m) hosted in the alluvial sequence, overlying potential weathered and fractured rock aquifers linked to faults and fractures in the Granite basement.



The underlying fresh granitic bedrock likely has little to no storage and permeability in absence of secondary features. An inspection of the Water Information Reporting database from the DWER website (DWER, 2024) indicates the existence of 25 bores within the Generation Hub area. Unfortunately, data from these bores is limited as many bores have been destroyed or abandoned. From those bores with water level records, most show Static Water Levels (SWL) within 0 to 5 mbgl and fewer, within 5 to 10 mbgl. Groundwater levels measured from pastoral bores range from about 2 to 7 mbgl. The groundwater system within the DE is likely limited in storage and is highly dependent on direct rainfall recharge to the local aquifers. The DE receives limited groundwater throughflow due to its location within the upper part of the catchment in an elevated position in the landscape, and the nature of fracture rock systems (Fortescue, 2025).

Stygofauna in general is more common in sedimentary and chemically deposited aquifers (especially alluvium and calcrete) than in fractured rock aquifers (Bennelongia, 2025). However, the abundance of stygofauna in alluvium and calcrete decreases significantly where depth to groundwater is more than 30 m (Halse et al. 2014). Occasionally fractured rock aquifers contain significant stygofauna and occurrence of stygofauna in such aquifers is relatively independent of depth.

10.2.5.1 Stygofauna

The desktop review by Bennelongia (2025) found diverse communities of stygofauna, with 244 species identified, in a search area around the DE. Very few records were identified within the DE during desktop review, but this was shown by field sampling to be principally the result of little previous sampling in the area.

The Bennelongia (2025) survey collected 185 stygofauna specimens from at least 19 different species. This includes four species of Annelid worms, one undescribed species of Nematode, at least three species of Amphipod, at least three species of Cyclopoid, at least three species of Harpacticoid and two species of Ostracod. The dominant stygofauna groups identified within the search area were crustaceans (amphipods, ostracods, cyclopoids and harpacticoid), representing 64% of stygofauna recorded.

Of the 19 potential species, four were found within the DE: Amphipods *Bogidiella* 'BAM216', Paramelitidae 'BAM214', Paramelitidae Genus 2 'BAM215', and Harpacticoid copepod, *Parastenocaris* 'BHA331'. Bennelongia (2025) reported that it is considered unlikely that these four species are restricted to the DE as the same geological formations are found inside and outside of the boundaries. However, Bennelongia (2025) stated further baseline surveys were required, which were subsequently completed in 2024.

The Bennelongia (2025) survey recorded 28 species of stygofauna. Crustaceans dominated the fauna, with cyclopoid and harpacticoid copepods, amphipods and ostracods prominent in the community of the survey area in terms of species richness, though worm species were often represented by many individuals.

Stygofauna species were collected from all eight bores sampled in 2022 and all 17 species sampled in 2024. Many of the holes contained little water and only the very surface of the aquifer was sampled. Eight of the species collected during sampling are known only from the DE. These comprise three species of amphipod, one cyclopoid copepod and four species of harpacticoid copepod, and include:

- *Bogidiella* 'BAM216'.



- *Paramelitidae* `BAM214`.
- *Paramelitidae Genus 2* `BAM215`.
- *Diacyclops* `BCY113`.
- *Megastygonoitocrella* `BHA256`.
- *Ectinosomatidae* `BHA413`.
- *Parastenocaris* `BHA331`.
- *Parastenocaris* `BHA412`.

The cyclopid species, *Diacyclops* 'BCY113' is a genetic variant of the widespread species complex *Diacyclops humphreyis* and, based on the distributions of other variants, probably has a range extending beyond the DE. A ninth species, the isopod *Microcerberidae* 'BIS580', is known only from the Proposal surveys Bennelongia (2025) but at bore hole CRD0058, which is just north of the DE.

Overall, the DE hosts a diverse stygofauna community (Bennelongia, 2025). Field surveys indicate that a moderately rich stygofauna community exists in the DE, with stygofauna being collected from all holes sampled. The short distance between standing water level and end of hole is likely to mean that less than the full range of stygofauna species in the aquifer below each site was sampled (Stumpp and Hose 2013), with the 33 species collected under-representing the richness of the community in the DE.

10.2.5.2 Troglifauna

Desktop searches of the Western Australia Museum's (WAM) and Bennelongia databases provided 795 troglifauna records, representing 128 species of troglifaunal (Bennelongia, 2025). Troglifauna species in the search area are taxonomically extremely diverse and include araneomorph spiders, harvestmen (Opiliones), palpigrads, pseudoscorpions, true scorpions, schizomids, millipedes, centipedes, diplurans, cockroaches, beetles, dipterans, hemipterans, silverfish, isopods, pauropods, and symphylans.

Geological characteristics and troglifauna records suggest the DE may represent moderately suitable habitat for troglifauna. However, the nature of the Proposal poses little threat to troglifauna, as operations will be limited to above ground activities. Small amounts of dewatering do not impact troglifauna (Halse 2018). On this basis, it was concluded that there is no requirement for field survey of troglifauna (Bennelongia 2025) and are therefore not considered further in this assessment.

The stygofauna survey did not collect any troglifaunal specimens as bycatch (Bennelongia, 2025).

10.2.6 Potential Impacts and Mitigation

The footings required for the wind turbines are restricted to approximately 10 m below surface. This represents a negligible direct risk for troglifaunal and stygofauna (Bennelongia, 2025). However, water extraction for construction and operation of the Proposal poses a direct impact



to stygofauna. It should be noted that that drawdown will be significantly reduced during operation of the Proposal.

As discussed in Section 10.2.5.1, eight species of stygofauna have been recorded only from the DE. The single record of the isopod *Microcerberidae* 'BIS580' recorded in 2024 was from just north of the DE and is not treated as a restricted species. Five of the eight species known only from the DE occur at multiple sites across the DE, suggesting the species are widespread at the anticipated scale of drawdown associated with the Proposal, which is less than 1 km² at the largest of the drawdown areas (Bennelongia, 2025). Maximum drawdown within these areas will be 4 m and will occupy only a small proportion of the drawdown area.

The locally widespread distributions of the eight species discussed in Section 10.2.5.1 is highlighted by the distribution of the two species collected closest to potential drawdown, namely the amphipod *Bogidiella* 'BAM216' and *harpacticoid Parastenocaris* 'BHA412'. Both have been shown to have linear ranges of at least 35 km through field sampling. Both these field survey results, and the more theoretical results of general modelling by Eberhard *et al.* (2009) and Halse *et al.* (2014), suggest there is extremely low likelihood of any stygofauna species having highly restricted ranges in the homogeneous habitat that occurs in the areas of potential groundwater drawdown. Furthermore, with a maximum drawdown of only 4 m that occupies a very small part of each drawdown area, there is very low likelihood of impact on a restricted species in the unlikely event that one occurs.

The groundwater abstraction required for construction and operation of the Proposal will be licenced under Section 5C of the RIWI Act. As a condition of this licence, a GWOS will be developed and implemented, which will specify the detailed groundwater monitoring programme to be undertaken. The GWOS will also outline further management and mitigation procedures required to prevent any significant adverse impacts to groundwater, and in turn minimise any potential impacts to stygofauna from groundwater drawdown. Furthermore, fractured rock aquifers have rapid rates of recharge after rainfall and therefore no long-term impacts are anticipated on stygofauna habitat.

Accordingly, the threat to subterranean fauna conservation values from construction and operation of the Proposal, for both troglofauna and stygofauna, is very low.

10.2.7 Residual Impact and Predicted Outcome

As impacts to groundwater drawdown will be appropriately managed through the RIWI Act licencing process, and following implementation of the recommended mitigation measures, significant residual impacts to subterranean fauna are not anticipated. It is considered the EPA objective '*to protect subterranean fauna so that biological diversity and ecological integrity are maintained*' can be achieved without any additional control measures.

10.3 Terrestrial Environmental Quality

10.3.1 EPA Objective

The WA EPA objective for the terrestrial environmental quality environmental factor is '*to maintain the quality of land and soils so that environmental values are protected*' (EPA, 2016).

Terrestrial Environmental Quality is defined as '*the chemical, physical, biological and aesthetic characteristics of soils. Soils are the layer of organic and inorganic weathered material that accumulates at the Earth's surface*' (EPA, 2016b).



10.3.2 Policy and Guidance

The following policy and guidance have been considered in this section:

- Statement of Environmental Principles, Factors and Objectives (EPA, 2021).
- Environmental Factor Guideline – Terrestrial Environmental Quality (EPA, 2016).
- Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes. (DER, 2015a).
- Treatment and Management of Soil and Water in Acid Sulfate Soil Landscapes (DER, 2015b).

10.3.3 Studies and Surveys

No specific studies or surveys have been completed for the Proposal in relation to terrestrial environmental quality.

10.3.4 Receiving Environment

Notable considerations regarding terrestrial environmental quality for the Proposal are acid sulfate soils (ASS), land erosion and contaminated sites. According to the Acid Sulfate Soil Risk Map (DWER, 2017), there is no risk of ASS within the DE. However, the Atlas of Australian ASS shows that 2.4% of the DE is described as having high probability of occurrence of ASS, predominantly associated with the Shaw River and associated drainage lines. The remaining 97.6% is classified as having low or extremely low probability of occurrence of ASS.

According to the Contaminated Sites Database (DWER, 2020), no confirmed contaminated sites overlap the DE. There is an area of ongoing mineral abstraction land use that overlaps a small portion of the DE towards the eastern extent of the Transmission Line area associated with the Corunna Downs Iron Ore Project. There is potential for unknown contamination to have occurred in relation to this land use.

There are 13 land systems within the DE (DPIRD, 2022), of which the Macroy system covers more than 55%. The majority of land systems within the DE (as listed in Chapter 3, Table 3-2) are not highly susceptible to erosion (Van Vreeswyk *et al.*, 2004) due to their specific soil and landscape characteristics, such as hardpan plains, low stony rises, or stony plains and low hills with a surface cover of gravel and rock, which help to protect the soil from erosion or which are more resistant to erosion compared to other soil types. However, disturbance to the Black Land System and the River Land System may initiate erosion (Van Vreeswyk *et al.*, 2004). These land systems cover 0.9% and 2.4% of the DE, respectively. For the Black Land System, rocky mantles provide effective protection against soil erosion, however disturbance or removal of stone mantles on footslopes can initiate erosion. The River Land system is largely stabilised by buffel grass and spinifex and accelerated erosion is uncommon, however, susceptibility to erosion is high or very high if vegetative cover is removed.

10.3.5 Potential Impacts and Mitigation

Potential impacts as a result of the Proposal are construction works disturbing ASS, land erosion and contamination of soil resulting in a decline in terrestrial environmental quality.



Given the limited potential for ASS or historic contamination throughout the DE, and the fact the majority of land systems of the DE are not highly susceptible to erosion, these potential impacts to terrestrial environmental quality can be mitigated through standard environmental management actions. As detailed in Section 10.1.5.1, with regard to construction of creek crossings, the minor changes in maximum flow velocities are not expected to alter the erosional and depositional regime of the creek systems. The following activities will be undertaken to mitigate the risk of disturbing ASS, exacerbating erosion or contamination of soils:

- Investigatory studies will be undertaken prior to ground disturbance works within the areas at high risk of ASS to verify the presence of ASS within the DE. These studies will be undertaken in accordance with 'Identification and investigation of acid sulfate soils and acidic landscapes' (DWER, 2015).
- Should investigatory studies identify ASS and/or should construction works result in the disturbance of ASS, these ASS will be treated and/or managed in accordance with 'Treatment and management of soil and water in acid sulfate soil landscapes' (DWER, 2015).
- All soils potentially contaminated as a result of spills or leaks will be remediated on site where practical, in line with Fortescue's spill response procedure. Where the volume or type of contamination requires excavation and disposal of contaminated soils, disposal shall be undertaken by an appropriately licenced contractor.
- Hazardous materials used during construction will be stored in compliance with relevant Australian Standards and Regulations.
- On-site refuelling of machinery and plant to occur on sealed or bunded areas and at least 50m away from all drainage lines or water bodies, or use of drip trays in remote areas where this is not feasible. Provision of spill response kits at refuelling locations, and appropriate spill response training for site operatives with incident recording procedures in place throughout construction and operation.
- Cleared vegetation will be stockpiled onsite for use post works completion to encourage soil stability and revegetation. Where possible direct return of topsoil material will be undertaken.
- Establishment of designated access roads and demarcated clearing areas to prevent unauthorised disturbance.
- Erosion and sediment control measures will be applied to prevent erosion of exposed areas and sediment discharge to adjacent areas, where practicable.
- Laydown areas will be rehabilitated or otherwise stabilised as early as practicable to minimise the potential for erosion.
- Armouring the floodway batters and driving surface to minimise erosion and scour as water flows over the road.



10.3.6 Residual Impact and Predicted Outcome

With the implementation of mitigation measures listed in Section 10.3.5, no significant residual impacts to terrestrial environmental quality have been identified and the EPA's objective for the terrestrial environmental quality factor '*to maintain the quality of land and soils so that environmental values are protected*' can be met.



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11 HOLISTIC IMPACT ASSESSMENT

The EIA process needs to consider the benefits and impacts of the Proposal in a holistic manner. As noted in the EPA's guidance, where the combination of environmental effects of two or more environmental factors has the potential to result in a significant impact, a holistic impact assessment should consider how these factors interact through the application of the EPA's objectives for environmental factors.

The Proposal's predicted impacts have been considered independently against each of the EPA's environmental factors and in relation to the EPA's environmental principles in previous sections of this ERD. Fortescue recognises there are complex linkages between Flora and Vegetation, Terrestrial Fauna, Social Surroundings, Inland Waters, Terrestrial Environmental Quality, and Subterranean Fauna. These connections are illustrated in Figure 11-1. A holistic impact assessment has been undertaken in this chapter to determine if these interactions could result in a significant impact.

11.1 Assessment Approach

The following process has been implemented to determine and assess the holistic impacts of the Proposal:

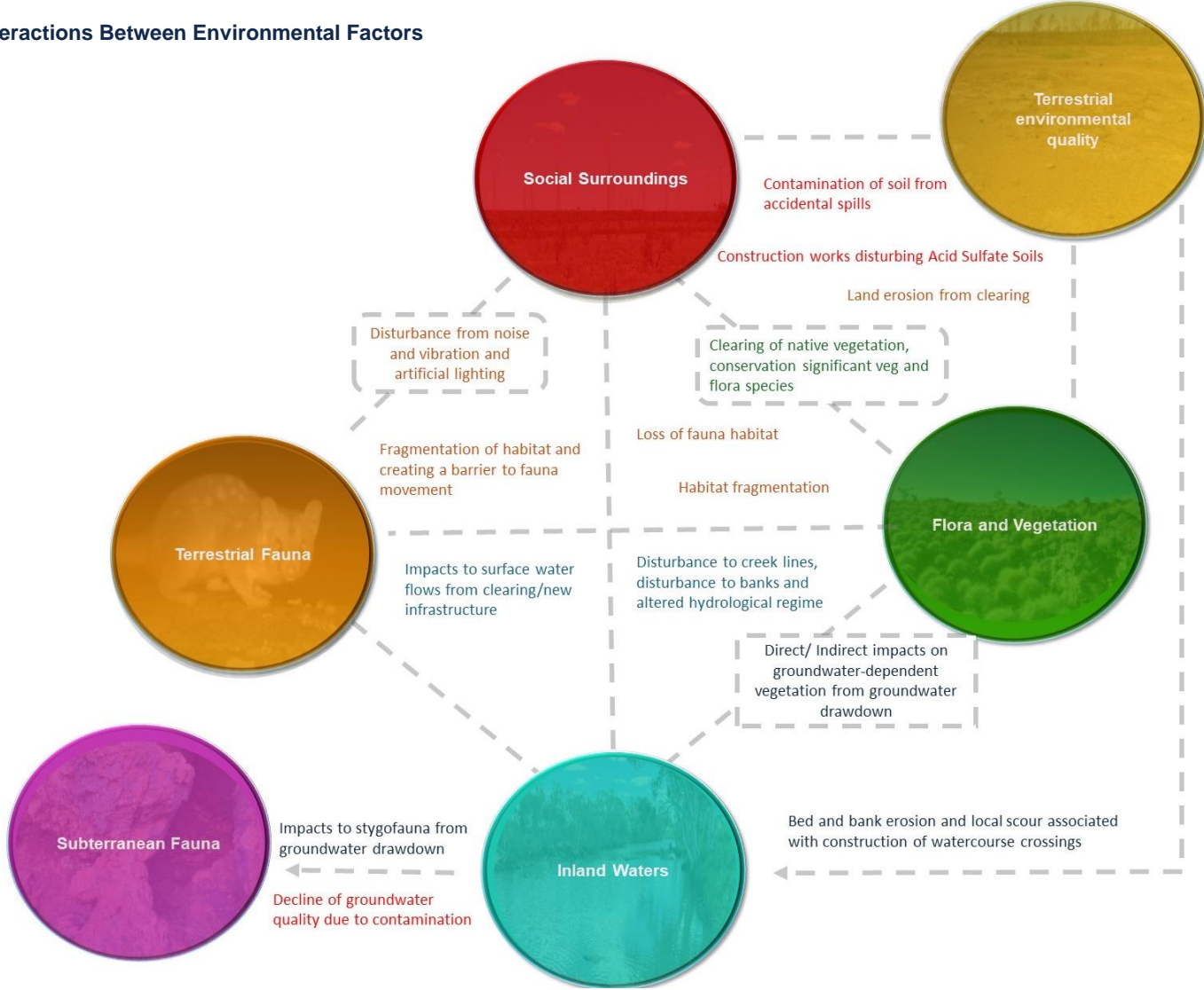
1. Identify connections and interactions between environmental factors (Figure 11-1).
2. Identification of holistic impacts:
 - a) Where a potential impact(s) has been completely avoided, it will not contribute to holistic impacts.
 - b) Where a predicted impact is considered likely to affect only one factor it is unlikely to contribute to holistic impacts and additional mitigation measures are not required.
 - c) Where an activity has been considered to likely result in a significant impact across two or more factors, and the mitigation hierarchy has been applied in isolation per factor, consideration will be given if further measures are required to mitigate this combined impact.
 - d) Where there are multiple overlapping minor impacts, or a minor impact affects multiple values and has been assessed as insignificant in the context of an individual factor, these may require further holistic consideration.
 - e) The environmental principles of intergenerational equity, and conservation of biological diversity and ecological integrity are considered the most relevant and have been a foundation when considering potential significance of the holistic impact of the Proposal.



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Figure 11-1: Intrinsic Interactions Between Environmental Factors





11.2 Consideration of Holistic Impacts

By understanding the intricate connections between the factors identified in Figure 11-1, we can assess how changes in one aspect of the environment cascade through others, creating combined and sometimes compounding impacts on the same receptors.

The key Proposal activities likely to result in impacts across multiple environmental factors and combined impacts to environmental receptors are:

- Vegetation and land clearing
- General Construction and Maintenance Activities
- Works Affecting Watercourses and Groundwater Abstraction

These are discussed in further detail in Sections 11.2.1 to 11.2.3. Table 11-1 summarises the relevant holistic impacts associated with construction and operation of the Proposal.

11.2.1 Vegetation and Land Clearing

To facilitate construction and operation of the Proposal, the works will result in the permanent clearing of 1,290.68 ha of 'Good to Excellent' condition native vegetation. The combined impacts associated with vegetation clearing include:

- Loss of priority flora and supporting habitat (Flora and Vegetation).
- Loss of culturally significant flora (Flora and Vegetation and Social Surroundings).
- Loss of habitat for conservation significant and culturally significant fauna species (Terrestrial Fauna and Social Surroundings).
- Habitat fragmentation for conservation significant and culturally significant fauna species (Terrestrial Fauna and Social Surroundings).
- Direct fauna mortality through collisions with plant and machinery (Terrestrial Fauna and Social Surroundings).
- Altered surface water regimes resulting in a potential increase in flooding and erosion events, loss in catchment area (Inland Waters and Social Surroundings).
- Introduction and spread of weeds which can outcompete conservation and culturally significant flora, reduce the quality of fauna habitat, increase feral herbivore activity and increase the risk of bushfires (Flora and Vegetation, Social Surroundings and Terrestrial Fauna).

Therefore, through the clearing of vegetation, which primarily effects flora and vegetation, the Proposal has the potential to result in impacts terrestrial fauna by removing and altering fauna habitat, or direct mortality through collision with construction machinery. Clearing of vegetation may also affect inland waters, with impacts to the hydrology of surface waters features surrounding the Proposal through altering surface water flow paths or volumes and through erosion of watercourse banks. These impacts to terrestrial fauna and watercourses in turn can



impact social surroundings, in particular Aboriginal cultural heritage values, given the cultural significance of some of the watercourses and fauna occurring in the DE.

Vegetation units and vegetation associations, as per Beard *et al.* (2013), will not be cleared to an extent that will reduce the remaining vegetation below 30%, with over 97% of all vegetation associations remaining at the State level, Pilbara IBRA bioregional and Chichester subregional levels, or the Local Government Area (shire of East Pilbara). Therefore, clearing of vegetation at a regional scale will not lead to compounding impacts that would result in significant effects on the identified environmental values and their connections, including the provision of habitat for conservation and culturally significant flora and fauna species.

However, the overall impact on the Flora and Vegetation environmental factor is considered significant at a local scale, requiring offset of the residual impact (Chapter 12). The longer-term impacts of the Proposal to both Flora and Vegetation and Terrestrial Fauna will be predominantly mitigated through progressive and post-construction rehabilitation, which seeks to restore environmental values impacted throughout the implementation of the Proposal. Application of offsets will counterbalance potential operational impacts, while successful rehabilitation following construction and decommissioning will mitigate long-term effects on vegetation communities and fauna habitats. In turn, minimising potential long-term impacts to fauna of cultural significance to the Traditional Owners.

Vegetation clearing can lead to changes in overland (surface water runoff) flow paths and quantities of runoff entering waterways, which are considered culturally significant within the DE. The potential for changes to overland flows as a result of vegetation clearing for the Proposal is considered to be low. Vegetation clearing will be relatively narrow and predominantly linear in nature, thereby reducing the extent of unimpeded overland flows adjacent to waterways. To minimise the potential for erosion from destabilised banks, vegetation removal adjacent to the banks has been reduced through avoidance measures during the design process. Further measures to control sediment runoff during the construction phase will be included in the surface water management plan (SWMP) and considered as part of a Construction Environmental Management Plan (CEMP) to be produced by the appointed contractor, and areas that do not require permanent clearing will be progressively revegetated throughout construction. As such, potential for erosion impacts are considered minimal.

Changes to surface water flow paths, quantity, and quality can harm riparian vegetation health and, due to the cultural significance of the creeks within the DE, may result in a broader impact on Social Surroundings. Impacts to riparian vegetation through changes to surface water quality and flows have been assessed in Section 10.5. Impacts were determined to be not significant, as the Proposal's potential impacts on surface water flow are expected to be localised, mainly associated with turbine access tracks and waterway crossings, with negligible disruptions to regional flows downstream. In addition, the major creek crossings have been engineered to maintain natural flow paths as far as possible through the iterative design process, and the locations were selected through consultation with Nyamal Traditional Owners as being the areas with minimal potential cultural impacts.

Clearing activities and associated vehicle movements can introduce invasive plant species. These weeds often outcompete native species, leading to reduced plant diversity and altered habitat structure. High weed coverage can alter fire regimes by increasing flammable biomass, which may raise the frequency and intensity of bushfires, further degrading habitats. It is anticipated that the introduction and spread of weeds will be adequately controlled during the construction phase through the implementation of specific weed management measures in



accordance with Fortescue's Weed Management Plan (Reference: 45-PL-EN-0033), such that no significant holistic impacts would occur.

Overall, the proposed mitigation and management measures for each environmental factor, as summarised in Table 11-1, along with offsets to address impacts on vegetation and flora, will ensure that impacts on other environmental factors, including terrestrial fauna, social surroundings, and inland waters, align with the EPA's environmental objectives.

11.2.2 General Construction and Maintenance Activities

The construction period for the Proposal is anticipated to take up to 24 months. Combined impacts resulting from vegetation clearing during construction are addressed above. Other construction activities (such as operation of plant and machinery, earthworks, and installation of infrastructure), and to a lesser extent some operational maintenance activities, can simultaneously increase noise, dust and artificial light emissions, increase the risk of spills and attract feral fauna to the DE, resulting in combined impacts to Terrestrial Fauna, Flora and Vegetation, Inland Waters, Terrestrial Environmental Quality and Social Surroundings. General construction activities can lead to the following combined impacts:

- Disturbance to fauna and social surroundings from noise and vibration (Terrestrial Fauna and Social Surroundings).
- Increased dust emissions generated during construction can settle on plants, ultimately affecting the health of flora and vegetation of conservation and cultural significance (Flora and Vegetation, and Social Surroundings).
- Attraction of feral animals causing impacts to flora and vegetation, and terrestrial fauna of conservation and cultural significance through predation, competition and degradation of habitat (Flora and Vegetation, Terrestrial Fauna and Social Surroundings).
- Disturbance of fauna and social surroundings from artificial lighting (Terrestrial Fauna and Social Surroundings).
- Contamination of soil and watercourses through accidental spills (Inland Waters and Social Surroundings).

Holistic impacts on terrestrial fauna and social surroundings receptors may arise from combined disturbances during construction, including noise and vibration, artificial lighting, and increased dust emissions. Noise and light emissions can cause fauna to avoid certain areas, and given the cultural significance of some species (as discussed in Chapter 8), this may affect the Nyamal Traditional Owner's ability to continue their traditional use of/practices on country if these fauna species become less common. However, with the implementation of an Environmental Management Plan (EMP) (Appendix M), and subsequent CEMP produced by the appointed contractor, during construction and the mitigation measures outlined in Table 11-1, potential impacts will be minimised to a level where they are not considered significant, either individually or holistically. In addition, any impacts from disturbance during construction would be temporary, for intermittent periods, and therefore no long-term significant holistic impacts on surrounding receptors are likely.

Construction activities have the potential to impact on terrestrial environmental quality and inland waters through accidental contamination incidents. This could lead to holistic impacts



on social surroundings given the cultural value of the creeks within the DE, should the water quality be impacted it could affect the Nyamal Traditional Owner's spiritual and physical connection to the land. It could also impact fauna or vegetation that rely on these watercourses.

Similarly, the SWMP will include pollution prevention measures to minimize the risk of spills and reduce the potential for significant land or water contamination.

Overall, it is considered that the proposed mitigation and management measures, as summarised in Table 11-1, and the implementation of the EMP will ensure impacts on values that are interconnected between the identified factors are likely to be consistent with the EPA's environmental factor objectives.

11.2.3 Works Affecting Watercourses and Groundwater Abstraction

Several elements of the Proposal interact with inland waters, including construction of watercourse crossings and abstraction of groundwater. Inland surface waters and groundwater systems are linked to vegetation health, subterranean ecosystems, terrestrial fauna (e.g. important for species such as the Pilbara Olive Python) and Social Surroundings (significance for Aboriginal Cultural Heritage). Disruptions to these systems can affect both above ground and below ground biodiversity, as well as social surroundings due to their cultural significance. The combined impacts associated with works affecting water resources include:

- Groundwater drawdown can lead to reduced stygofauna habitat availability and altered water chemistry, endangering these species (Inland Waters and Subterranean Fauna).
- Groundwater drawdown can reduce water availability for groundwater-dependent vegetation, which relies on a stable water supply. This can impact the health of these communities, potentially causing plant death, loss of vegetation, and degradation of fauna habitats (Inland Waters, Social Surroundings, Flora and Vegetation, and Terrestrial Fauna).
- When disturbed, Acid Sulfate Soils (ASS) can release sulfuric acid, lowering pH levels in both groundwater and surface waters. This can lead to toxic conditions that harm aquatic life and reduce soil fertility. Acidification can leach heavy metals into waterways, contaminating drinking water supplies and affecting both terrestrial and aquatic organisms (Inland Waters, Flora and Vegetation, Social Surroundings, Subterranean Fauna, and Terrestrial Fauna).
- The construction of watercourse crossings or other infrastructure can alter natural water drainage patterns or increase erosion rates (Inland Waters, Social Surroundings, and Terrestrial Environmental Quality).
- Changes to surface water flows can impact the recharge rates of aquifers, indirectly affecting groundwater availability for vegetation and subterranean ecosystems (Inland Waters, Flora and Vegetation, and Subterranean Fauna).
- Impacts to watercourses and groundwater can affect Nyamal Traditional Owners' spiritual and physical connection to the land due to the cultural significance of these water resources (Inland Waters and Social Surroundings).



Given the interconnected nature of several environmental factors related to the water resources within the DE, there is potential for combined impacts on receptors associated with all the factors considered in this assessment. Changes to the volume or quality of surface and/or ground waters may impact the health of fauna habitat and vegetation, particularly that habitat associated with riparian vegetation. The hydrological assessment concluded that the design and layout of the Proposal are expected to have minimal impact on the existing surface water flow regime, with any changes being localised, primarily around turbine access tracks and waterway crossings, and negligible increases in flood depths and velocities. Therefore, effects on surface watercourses are anticipated to be negligible and the associated holistic impacts related to erosion rates, riparian vegetation or cultural significance would not be significant.

Regarding abstraction of groundwater, fresh to marginal water from groundwater sources will be targeted to meet construction demands for the Proposal. During construction (anticipated to last two years), an estimated peak water demand of 0.7 GL per annum has been calculated. This demand will reduce to 0.1 GL per annum in subsequent years for operational purposes. A modelling exercise was undertaken to assess the potential impacts of groundwater abstraction during construction and operation of the Proposal. The groundwater assessment will be used to support the application for licence to take water under Section 5C of the *Rights in Water and Irrigation Act 1914* (RIWI Act). As a condition of this licence, a Groundwater Operating Strategy (GWOS) will be developed to outline management and mitigation procedures, ensuring that groundwater abstraction does not impact the groundwater resource within the DE and maintains environmental values.

As groundwater abstraction will be managed in accordance with the relevant licensing under the RIWI Act to prevent negative impacts on environmental values, holistic impacts to receptors associated with subterranean fauna, social surroundings, and vegetation are not anticipated as a result of the Proposal.

The potential impacts from the disturbance of ASS could affect inland waters (surface watercourses and groundwater), social surroundings and terrestrial environmental quality, leading to holistic impacts on these receptors. The mobilisation of ASS in the DE could degrade the water quality of the creeks, potentially affecting the Nyamal Traditional Owners' spiritual and physical connection to the land due to the cultural significance of the watercourses. This could also affect fauna that rely on the watercourse and negatively impact vegetation health. Investigatory studies will be conducted prior to ground disturbance works within the areas at high risk of ASS to confirm its presence within the DE. These studies will be undertaken in accordance with the 'Identification and investigation of acid sulfate soils and acidic landscapes' guideline (DWER, 2015). Should investigatory studies identify ASS, and/or if construction disturb ASS, the soils will be treated and managed in accordance with the guidelines outlined in 'Treatment and management of soil and water in acid sulfate soil landscapes' (DWER, 2015). These mitigation measures will reduce the potential for holistic impacts on receptors associated with disturbance of ASS, such that no significant impacts are anticipated.

Overall, it is considered that the proposed mitigation and management measures (Table 11-1) together with conditions from other approval regimes, such as the RIWI Act, will ensure that impacts on interconnected environmental factors – including the values associated with terrestrial environmental quality, subterranean fauna social surroundings, flora and vegetation, and inland waters - are likely to align with the EPA's environmental factor objectives.



Table 11-1: Holistic Impact Assessment Summary

Proposal Activity	Holistic Impacts	Mitigation and Management Measures	Offsets Relevant?	EPA Objective Achieved?	Additional Mitigation Required for Holistic impact?
Vegetation and land clearing	<ul style="list-style-type: none"> Loss of priority flora and supporting habitat. Loss of culturally significant flora. Loss of habitat for conservation significant and culturally significant fauna species. Habitat fragmentation for conservation significant and culturally significant fauna species. Direct fauna mortality through collisions with plant and machinery. Altered surface water regimes resulting in a potential increase in flooding and erosion events, loss in catchment area. Introduction and spread of weeds, outcompeting flora and fauna and increasing risk of bushfires. 	<ul style="list-style-type: none"> Where significant flora or vegetation occurs close to the IDF clearing areas will be demarcated prior to construction activities to protect the conservation significant flora species and vegetation from impacts such as accidental clearing or disturbance (Chapter 7). Areas to be cleared will be demarcated on the ground (either physically or using GPS enabled methods) (Chapter 7). Comprehensive weed hygiene management through implementation of specific weed management measures. All works will be undertaken in accordance with Fortescue's Weed Management Plan (Reference: 45-PL-EN-0033) as the standard operating procedure (Chapter 7). Strict speed limits will be enforced around the site to avoid fauna strikes during clearing and construction (Chapter 8). Rehabilitation of a total of 1,028.124 ha of cleared vegetation which will be undertaken progressively after each phase of the construction activities to reduce impacts to floral and vegetation over time, including potential fragmentation (in accordance with Fortescue's standard procedures including Rehabilitation and Revegetation Monitoring Procedure (Reference: 45-GU-EN-0009) (Chapter 7). 	Yes - monetary contribution will be made into the Pilbara Environmental Offset Fund.	Yes – When considered holistically, the likely environmental effects from the Proposal will not result in combined environmental effects that significantly impact the environment as a whole.	No



Proposal Activity	Holistic Impacts	Mitigation and Management Measures	Offsets Relevant?	EPA Objective Achieved?	Additional Mitigation Required for Holistic impact?
Disturbance from Construction works	<ul style="list-style-type: none"> • Disturbance to fauna and social surroundings from noise and vibration. • Increased dust emissions generated during construction can settle on plants, ultimately affecting the health of flora and vegetation of conservation and cultural significance. • Attraction of feral animals causing impacts to flora and vegetation, and terrestrial fauna of conservation and cultural significance through predation, competition and degradation of habitat. • Disturbance of fauna and areas of cultural significance from artificial lighting. • Contamination of soil and watercourses through accidental spills. 	<ul style="list-style-type: none"> • Dust deposition will be managed through standard construction measures (e.g., water application) to minimise dust generation and avoid impacts on vegetation in line with standard dust management measures (Chapter 7). • All food waste will be removed from site at the end of each shift. Waste will be stored at the depot and regularly removed to minimise attraction of feral animals (Chapter 8). • Lighting will be designed and managed in accordance with the National Light Pollution Guidelines for Wildlife (DCCEEW, 2023c) (Chapter 8). • Standard construction noise management measures will be implemented (Chapter 8), including: <ul style="list-style-type: none"> ○ Machinery and vehicles are regularly serviced and operated/maintained in accordance with the manufacturer's specifications, and preferential use of modern equipment that generally operate more quietly. ○ Using techniques that reduce noise, such as employing hydraulic, rather than impact, methods. Training workers on best practices for minimizing noise. ○ Plant and machinery on site will be switched off and not left idling when not in use. 	No	Yes – When considered holistically, the likely environmental effects from the Proposal will not result in combined environmental effects that significantly impact the environment as a whole.	No



Proposal Activity	Holistic Impacts	Mitigation and Management Measures	Offsets Relevant?	EPA Objective Achieved?	Additional Mitigation Required for Holistic impact?
		<ul style="list-style-type: none"> Scheduling the construction activities to ensure the noisiest tasks occur during times that will cause the least disturbance. Undertake blasting activities in accordance with Fortescue's Blasting Near Heritage Place Procedure (100-PR-HE-0003) (Chapter 9). Any identified ASS will be managed in accordance with 'Treatment and management of soil and water in acid sulfate soil landscapes' (DWER, 2015) (Chapter 10). Spills will be managed through standard site pollution prevention measures (Chapter 10). 			
Works Affecting Watercourses and Groundwater Abstraction	<ul style="list-style-type: none"> Groundwater drawdown can lead to reduced stygofauna habitat availability and altered water chemistry, endangering these species Groundwater drawdown can reduce the water available to groundwater-dependent vegetation, which relies on a stable supply, impacting the health of these communities and potentially causing plant death, loss of vegetation, and degradation of fauna habitats. When disturbed, ASS can effect quality of groundwater and 	<ul style="list-style-type: none"> Groundwater abstraction will be managed to minimise drawdown and potential impacts on groundwater dependent vegetation This will be managed under the RIWI Act 5C water abstraction licence (Chapter 10). Culturally significant water sources are recorded in Fortescue's GIS system as Heritage Places or HRZs (Chapter 9). Pole locations placed outside of high flow areas, where required to be installed within rivers 25(Chapter 10). A surface water management plan will be developed and implemented to manage flood risk and minimise soil erosion and the potential for the transport of sediment 	No	Yes – When considered holistically, the likely environmental effects from the Proposal will not result in combined environmental effects that significantly impact the environment as a whole.	No



Proposal Activity	Holistic Impacts	Mitigation and Management Measures	Offsets Relevant?	EPA Objective Achieved?	Additional Mitigation Required for Holistic impact?
	<p>surface waters. This can lead to toxic conditions that harm aquatic life and reduce soil fertility, affecting both terrestrial and aquatic organisms.</p> <ul style="list-style-type: none"> • The construction of watercourse crossings or other infrastructure can alter natural water drainage patterns or increase erosion rates. • Changes to surface water flows can impact the recharge rates of aquifers, indirectly affecting groundwater availability for vegetation and subterranean ecosystems. • Impacts to watercourses and groundwater can affect Nyamal Traditional Owners' spiritual and physical connection to the land due to the cultural significance of these water resources. 	<p>to downstream waters during the construction phase (Chapter 10).</p> <ul style="list-style-type: none"> • Construction and maintenance of the waterway crossings will be scheduled outside of the wet season where possible, or for a time period when rainfall and runoff are unlikely (Chapter 10). • Erosion control measures will be installed at the inlet and outlet of the culvert structures to minimise the risk of bed and bank erosion and local scour, and to prevent undermining of the structures (Chapter 10). • The floodway batters and driving surface will be armoured to minimise erosion and scour as water flows over the road (Chapter 10). 			



12 OFFSETS

12.1 Background

The WA Environmental Offsets Guidelines (Government of WA, 2014) defines environmental offsets as '*actions that provide environmental benefits which counterbalance the significant residual environmental impacts or risks of a project or activity*'. Unlike mitigation actions, which are implemented on-site to reduce the direct impacts of the project, offsets are undertaken outside of the project area and counterbalance significant residual impacts.

Environmental offsets are applied when the residual impacts of a project are deemed significant, after efforts to avoid, minimise, and rehabilitate have been exhausted. As outlined in Chapters 7 and 8, the Proposal may result in significant residual impacts on flora and vegetation, as well as terrestrial fauna habitat. In response to these potential impacts, Fortescue intends to implement an environmental offset strategy, tailored to/proportionate to the scale and significance of the residual environmental impact.

Fortescue proposes to use the Pilbara Environmental Offsets Fund (PEOF) as the offsets mechanism for the Proposal with the intention of maximising regional biodiversity benefits.

12.2 WA Environmental Offsets Policy

The WA Environmental Offsets Policy (GoWA, 2011) requires the following Principles to be considered when developing an offset proposal:

- Environmental offsets will only be considered after avoidance and mitigation options have been pursued,
- Environmental offsets are not appropriate for all projects,
- Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted,
- Environmental offsets will be based on sound environmental information and knowledge,
- Environmental offsets will be applied within a framework of adaptive management, and
- Environmental offsets will be focussed on longer term strategic outcomes.

An assessment of the residual impacts of the Proposal as outlined in the Environmental Offset Guidelines (Government of WA, 2014) is provided below in Table 12-1.



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Table 12-1: Residual Impact Significance Model

Residual Impact Classification	Flora and Vegetation	Terrestrial Fauna
Residual impact that is environmentally unacceptable or cannot be offset	None	None
Significant residual impacts that will require an offset – All significant residual impacts to species and ecosystems protected by statute or where the cumulative impact is already at a critical level	Permanent clearing of 1,290.68 ha of 'Good to Excellent' condition vegetation	<ul style="list-style-type: none"> • Permanent clearing of up to 679.28 ha of habitat that is identified as habitat critical to the survival of the Northern Quoll. • Permanent clearing of up to 1,152.86 ha of habitat that is identified as habitat critical to the survival of the Greater Bilby. • Permanent clearing of up to 15.3 ha of habitat that is identified as habitat critical to the survival of the Grey Falcon. • Permanent clearing of up to 18.55 ha of habitat that is identified as habitat critical to the survival of the PLNB. • Permanent clearing of up to 160.32 ha of habitat that is identified as habitat critical to the survival of the Pilbara Olive Python. • Permanent clearing of up to 18.55 ha of habitat that is identified as habitat critical to the survival of the Ghost Bat. • Permanent clearing of up to 3.25 ha of habitat that is identified as habitat critical to the survival of the Peregrine Falcon.
Significant residual impacts that may require an offset – Any significant residual impact to potentially threatened species and ecosystems, areas of high environmental value or where the cumulative impact may reach critical levels if not managed	None	None



Residual Impact Classification	Flora and Vegetation	Terrestrial Fauna
<p>Residual impacts that are not significant</p>	<ul style="list-style-type: none"> • Clearing of 8.21 ha of National and State Significance vegetation (AtAhTe; EICpTb; and EIGwTw) • Clearing of 1,060.41 ha of Regional Significance vegetation (AtAhTe; EICpTb; EIGwTw; AiAaTe; AiCpTe2; AiCpTw; Tw1; EcMa; EcTl; EvCi; EvMIT) • Clearing of small areas of groundwater dependent vegetation (EcMa and EcTl), and potentially groundwater dependent vegetation (EvAtEb, EvCi and EvMITe) • Clearing of 249 individuals of <i>Heliotropium murinum</i> (P3) • The Proposal is expected to result in the fragmentation of some vegetation units. • The Proposal may indirectly impact three conservation-significant flora species: <ul style="list-style-type: none"> ○ <i>Quoya zonalis</i> (T): one individual ○ <i>Cochlospermum macnamarae</i> (P1): three individuals ○ <i>Heliotropium murinum</i> (P3): 11 individuals 	<ul style="list-style-type: none"> • Loss of non-critical fauna habitat. Rehabilitation post construction will re-establish fauna habitat in some disturbed areas. There will be some permanent loss of habitat associated with Plain (stony/gibber); Hills / ranges / plateaux; Plain (boulders); Drainage line/river/creek (major); Drainage line/river/creek (minor); Plain (sand); Rocky escarpments/ridges/mesa. • Given the linear nature of the Proposal, the infrastructure and associated clearing will fragment some areas of habitat. • A residual risk of collision with the operational infrastructure with some significant fauna species will remain, including listed threatened and migratory bird species.



12.3 Pilbara Environmental Offsets Fund

The Pilbara Conservation Strategy outlines a landscape-scale approach to biodiversity conservation across the Pilbara region and provides strategic direction for conservation actions that may be funded from a variety of sources, including through offsets to counterbalance the residual impacts of infrastructure projects (GoWA, 2017). The top four outcomes that will be delivered through the Pilbara Conservation Strategy are (GoWA, 2017):

1. Landscape-scale conservation through improved management of key threats,
2. Improved condition of threatened and other important species and communities,
3. Evidence-based conservation management, and
4. Conservation through partnerships.

The outcomes “*Landscape-scale conservation through improved management of key threats*” and “*Evidence-based conservation management*” are relevant to the significant residual impacts of the Proposal to flora and vegetation, and terrestrial fauna.

Of these outcomes, “Improved condition of threatened and other important species and communities” is of particular relevance to the Proposal and the predicted significant residual impacts resulting from clearing of habitat critical to the survival of a number of listed species. The Pilbara Conservation Strategy specifically notes the Northern Quoll, among other species, as one of the species that is the focus of this objective (GoWA, 2017). The Pilbara Conservation Strategy also outlines a number of priority areas that will be the focus of the projects implemented to meet the objectives of the Strategy.

In July 2016, the Western Australian Government approved the establishment of the Pilbara Strategic Conservation Initiative, now known as the Pilbara Environmental Offsets Fund (the ‘fund’), to maximise the value of environmental offsets from projects in the Pilbara (DPAW, 2017). The fund facilitates the coordinated delivery of environmental offset projects within the Pilbara bioregion of WA. The fund was established to invest in strategic conservation projects in the Pilbara bioregion to improve vegetation and species habitat impacted by development. The fund combines money from individual offset payments required under the WA EP Act and the EPBC Act into a special purpose account. This enables the delivery of larger and more strategic landscape-scale projects than would occur if individual offset projects were delivered independently, leading to better biodiversity conservation outcomes (DWER, 2019).

Fortescue recognises that the effective implementation of offsets in the Pilbara is hampered by the region’s unique land tenure (being all Crown land with overlapping mining, native title and pastoral interests). This makes traditional land acquisition and access for on-ground offset activities difficult. The fund was established to overcome these barriers and as such, Fortescue proposes to use the fund to facilitate offsets for the Proposal. Table 12-2 outlines how the use of fund is consistent with the Principles of the WA Environmental Offsets Policy (GoWA, 2011).



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Table 12-2: Principles of the WA Environmental Offsets Policy

Principle	How the Proposed Offset Strategy Addresses this
<p>Environmental offsets will only be considered after avoidance and mitigation options have been pursued.</p>	<p>As detailed in Sections 7.7; 8.7; 9.7; and in Chapter 10, avoidance and mitigation measures have been implemented wherever practicable.</p>
<p>Environmental offsets are not appropriate for all projects.</p>	<p>The Proposal is appropriate for environmental offsets, particularly in light of the availability of the Pilbara Environmental Offset Fund.</p> <p>Fortescue recognises that the effective implementation of offsets in the Pilbara is hampered by the region's unique land tenure (being all crown land with overlapping mining, native title and pastoral interests). This makes traditional land acquisition and access for on-ground offset activities difficult. The fund was established to overcome these barriers and as such, Fortescue proposes to use the fund to facilitate offsets for the Proposal.</p>
<p>Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted.</p>	<p>The offset rates paid to the fund are established by DWER and are <i>'based on the level of biodiversity protection in the region, and cumulative impacts to environmental values, including high quality vegetation and the conservation of significant-species habitat (DWER 2019)'</i>. These rates include base rates for Good to Excellent quality vegetation and 'higher rates' for specialised environmental values such as threatened fauna habitat. It is anticipated that the higher rate will apply to offset clearing of habitat critical to the survival of Northern Quoll, Greater Bilby, Grey Falcon, PLNB, Pilbara Olive Python, Ghost Bat, and the Peregrine Falcon.</p> <p>It is further anticipated that the base rate will apply to offset clearing of vegetation in Good to Excellent condition (where not already offset as part of the other environmental values). As such, it is considered that the proposed offsets are proportionate to the level of statutory protection that applies to the environmental values being impacted.</p>
<p>Environmental offsets will be based on sound environmental information and knowledge.</p>	<p>The fund has an Implementation Plan which outlines the criteria that are used to select projects that are supported through the fund. These criteria include (DWER, 2019):</p> <p><i>"Be designed to align with the offset principles of the Western Australian and Australian governments and the implementation principles in Chapter 2 (of the Implementation Plan) so that the outcomes of projects:</i></p> <ul style="list-style-type: none"> • Tangibly and measurably improve environmental matters. • Are value for money and have a high chance of success.



Principle	How the Proposed Offset Strategy Addresses this
<p>Environmental offsets will be applied within a framework of adaptive management.</p>	<ul style="list-style-type: none"> • Are strategic and have landscape-scale outcomes where achievable. • Are long term and enduring (ideally outcomes will endure for at least 20 years). • Are additional to activities that are already required as a condition of approval or lease or a legislative requirement”. <p>The fund Implementation Plan states that <i>“The fund will be adaptively managed to plan, implement, monitor, evaluate and adjust its delivery over time”</i> (DWER, 2019). The Governance Framework for the fund states that <i>“Evaluation of the strategic objectives, outcomes and priorities of the Implementation Plan will be completed every three years to inform adaptive management of the Fund, consistent with Principle 5 of the WA Offset Policy which is that ‘environmental offsets will be applied within a framework of adaptive management’”</i> (DWER, 2019).</p> <p>Impact Seed (2024) were commissioned by DWER on behalf of the PEOF board to undertake an evaluation of PEOF. This review concluded that there are several complex factors preventing PEOF projects being approved and delivered and therefore preventing PEOF from achieving its intended environmental outcomes. The following strategic recommendations were identified:</p> <ul style="list-style-type: none"> • <i>“Undertake an options analysis and risk assessment to determine the immediate next steps for PEOF.</i> • <i>Determine an approach and allocate resourcing to address cross-government issues relevant to PEOF.</i> • <i>Review and reform policies to enable flexible application.”</i> <p>Additionally, the following design and implementation actions were recommended:</p> <ul style="list-style-type: none"> • <i>“Refine, optimise and clarify governance structures that support PEOF.</i> • <i>Review capabilities and resources needed to deliver PEOF.</i> • <i>Review PEOF offset pricing.”</i> <p>Incorporation of these recommendations aims to improve the PEOF process and aid the implementation of effective offset projects.</p>
<p>Environmental offsets will be focussed on longer term strategic outcomes.</p>	<p>Strategic focus items of the fund relevant to longer term strategic outcomes include:</p> <ul style="list-style-type: none"> • projects will maintain a strategic, landscape-scale focus; and • projects will balance significant impacts identified in state and Commonwealth approvals, reducing duplication and allowing strategic project delivery.



Principle	How the Proposed Offset Strategy Addresses this
	<p>The funds approach of combining money from offsets under the EP Act and EPBC Act to deliver larger and more strategic landscape-scale projects than would occur if individual offset projects were delivered independently, effectively manages the risk of offsets not succeeding when compared to smaller individual offset projects implemented by Proponents. The benefit of contributing to strategic landscape-scale projects also includes the opportunity to achieve net ecological gain due to a coordinated approach and the ability to achieve positive biodiversity outcomes on a large scale outside of the project's IDF.</p>



12.4 Significant Residual Impacts

The significant residual impacts of the Proposal, with reference to the Pilbara Environmental Offsets Fund, include:

- Permanent clearing of 1,290.68 ha of ‘Good to Excellent’ condition vegetation.
- Permanent clearing of the fauna habitat identified in Table 12-3.

Table 12-3: Significant Impacts Requiring Offsets

Fauna habitat type	Species critical habitat	Permanent clearing (ha)
Plain (stony/gibber)	Greater Bilby	30.37
Hills/ranges/plateaux	Northern Quoll, Pilbara Olive Python	141.77
Plain (boulders)	Northern Quoll, Greater Bilby	534.26
Drainage line/river/creek (major)	Greater Bilby, Grey Falcon, PLNB, Pilbara Olive Python, Ghost Bat	15.30
Drainage line/river/creek (minor)	Greater Bilby	45.54
Plain (sand)	Greater Bilby	527.39
Rocky escarpments/ ridges/mesa	Northern Quoll, PLNB, Pilbara Olive Python, Ghost Bat, Peregrine Falcon	3.25
Total		1,297.88

12.5 Implementation

It is envisaged that the conditions of any approval for the Proposal under the EP Act will require Fortescue to contribute to the fund. An Impact Reconciliation Procedure will be developed for approval by the DWER CEO.

Impact Reconciliation Reports (IRR) will then be submitted biennially (from the time the Proposal is approved). The IRR will advise DWER on the amount of clearing that has been undertaken each year during the biennial reporting period. This clearing is then used to define the financial contribution to the fund for areas cleared during the reporting period, with the rate per hectare determined in accordance with the fund’s implementation plan. The calculations for the fund include a base rate for vegetation in Good to Excellent condition, and a higher rate for areas of specialised environmental values.

12.6 Offset Fund Contribution

Based on the Pilbara Environmental Offsets Fund Implementation plan (DWER, 2019), it is expected that Fortescue will be required to pay a rate per hectare of impact to native vegetation in Good to Excellent condition, and for the critical habitat for the Northern Quoll, Greater Bilby, Grey Falcon, PLNB, Pilbara Olive Python, Ghost Bat, and Peregrine Falcon.

The base rate will apply for “*impacts to native vegetation in Good to Excellent condition, which may include impacts to fauna habitat (including threatened fauna)*”. It is noted that The Proposal is located entirely within the Chichester IBRA subregion (PIL1) and therefore one rate will apply across this subregion.



However, it is expected that a higher rate will apply to the Proposal’s impact on critical habitat for threatened fauna species, with a portion of some of these species’ habitats overlapping and requiring only a single offset (DWER, 2019). All areas to be cleared that are critical habitat are in Good to Excellent condition. To avoid double offsetting, the entire area will be offset at the higher rate, and the base rate will not be applied.

The estimated financial contribution is based on the 2023/2024 rates as published on the PEOF website (GoWA, 2024), and anticipated hectares to be directly impacted (i.e. permanently cleared). However, the financial contribution will be based on actual clearing, and this can only be calculated after clearing has been conducted.

It is anticipated that the value of expenditure per hectare of clearing will be annually adjusted in accordance with the Perth All Groups Consumer Price Index (CPI) fluctuations from 1 July 2025. The Australian Bureau of Statistics (ABS) publish the annual CPI for Australian cities in September of each year and will be referenced when calculating the annual adjustments.

Table 12-4: Significant Residual Impacts Requiring an Offset

Environmental Feature	Clearing	Contribution	IBRA Subregion	Offset Rate	Area (ha)	Total
Clearing of habitat critical to the survival of Northern Quoll, Greater Bilby, Grey Falcon, PLNB, Pilbara Olive Python, Ghost Bat, and the Peregrine Falcon	Up to 1,297.88ha	Based on DWER (2019), it is expected that a higher rate per hectare of clearing should be contributed to the fund for the 1,297.88 ha of critical habitat	Chichester	\$1,864	1,297.88	2,419,248.32
Total						\$2,419,248.32



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13 CONCLUSION

Fortescue is proposing to develop a renewable energy hub, the East Pilbara Generation Hub, comprising of wind generation and a 220 kV transmission line connecting to Fortescue's Iron Bridge Project, in the Pilbara region of Western Australia.

The Proposal includes the installation of up to 200 wind turbines and five substations, with a total capacity of up to 2.1 GW. The proposed 220 kV transmission line will be built to enable energy transfer to Fortescue's mining operations from the wind farm. The Proposal involves clearing of up to 2,318.80 ha of vegetation within a 98,772.61 ha Development Envelope (DE).

The Proposal has the potential to adversely impact the environmental and social values within the DE. These factors and any significant residual impacts are discussed below.

Flora and Vegetation

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

The Proposal will result in the clearing of 2,318.80 ha of Native Vegetation. The following significant residual impacts are expected after mitigation measures are applied:

- Permanent clearing of 1,290.68 ha of 'Good to Excellent' condition vegetation. An environmental offset is proposed for this residual impact.

Other potential impacts are not significant at the local or regional scale. The avoidance and minimisation of impacts, as well as offsetting of the significant residual impact (see Chapter 7) will result in the biological diversity and ecological integrity of the study area being maintained. The Proposal is therefore consistent with the EPA's environmental objective for flora and vegetation.

Terrestrial Fauna

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

The Proposal will result in the clearing of 2,328.23¹² ha of fauna habitat, some of which provides habitat for conservation significant fauna. The following residual impacts are expected after mitigation measures are applied:

- Permanent clearing 30.37 ha of plain (stony/gibber) habitat which is critical habitat for the Bilby.
- Permanent clearing 141.77 ha of hills/ranges/plateaux habitat which is critical habitat for the Northern Quoll and Pilbara Olive Python.

¹² This numbers differs slightly from the total clearing reported for vegetation clearing above due to the differences in habitat and vegetation mapping, i.e. some areas of Plain (sand) habitat mapped as cleared for vegetation.



- Permanent clearing 534.26 ha of plain (boulders) habitat which is critical habitat for the Northern Quoll and Bilby.
- Permanent clearing 15.30 ha of the drainage line/river/creek (major) habitat which is critical habitat for the Bilby, Grey Falcon, PLNB, Pilbara Olive Python and Ghost Bat.
- Permanent clearing 45.54 ha of the drainage line/river/creek (minor) habitat which is critical habitat for the Bilby.
- Permanent clearing 527.39 ha of the plain (sand) habitat which is critical habitat for the Bilby.
- Permanent clearing 3.25 ha of the rocky escarpments/ridges/mesa habitat which is critical habitat for the Northern Quoll, PLNB, Pilbara Olive Python, Ghost Bat and Peregrine Falcon.

Other potential direct and indirect impacts to terrestrial fauna associated with the Proposal will not be significant at a local or regional scale. The avoidance and minimisation of impacts, as well as offsetting of the significant residual impacts (see Chapter 12) will result in the biological diversity and ecological integrity of the study area being maintained. The Proposal is therefore consistent with the EPA's environmental objective for fauna.

Social Surrounds

To protect social surroundings from significant harm.

No impacts to nearby towns, surrounding industry, amenity (visual amenity, noise, vibration or dust), landscape or non-Aboriginal heritage are expected to occur as a result for the Proposal.

Fortescue is committed to minimising impacts on Heritage Places and will consult with Nyamal and apply for relevant approvals under the AH Act. Fortescue will comply with the AH Act and any approval conditions set by the Minister of Aboriginal Affairs at all times during construction and operation of the Proposal. With respect to access to country, dust management on heritage places, culturally significant plants and animals, and water sources, Fortescue will continue to consult with Nyamal to ensure that impacts are minimised. No significant residual impacts to social surrounds have been identified and the Proposal is consistent with the EPA's objective for social surrounds.

Other Factors

Through the implementation of standard mitigation measures and controlled through other consenting regimes (e.g. RIWI Act), no significant impacts are anticipated as a result of the Proposal to inland waters, subterranean fauna and terrestrial environmental quality.



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APPENDIX A FLORA AND VEGETATION ASSESSMENT REPORT (FOCUS VISION, 2024)



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APPENDIX B TERRESTRIAL FAUNA SURVEY REPORT (ECOSCAPE, 2025)



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**APPENDIX C SHORT-RANGE ENDEMIC TERRESTRIAL
INVERTEBRATE SURVEY (HARRY BUTLER INSTITUTE, 2025)**



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APPENDIX D BIRD AND BAT COLLISION LITERATURE REVIEW (JACOBS, 2025)

Potential Collision Impacts with Wind Turbines

Direct strikes

Internationally, strike impacts to birds from wind farms have been extensively studied, however, little research has been undertaken in onshore areas of Australia. Some research was undertaken on Victoria (Hull *et al.*, 2013a; Symbolix, 2020; Moloney *et al.*, 2019; Australian Ecological, 2021) and offshore Wind Farms (DCCEEW, 2022). However, the overall lack of onshore data limits understanding of species-specific and landscape scale differences in impacts (Hull, Stark, Peruzzo, & Sims, 2013). Although not yet scientifically clarified, globally bats seem to have an increased mortality rate compared to avifauna species (Palmer and Gordon, 2017; Thaxter *et al.*, 2017). Overall, collision impacts are related to specific characteristics of each ecosystem (i.e., close proximity to forest areas has increased mortality compared to dry and open areas), and bats' species-specific- behaviour and season (Palmer and Gordon, 2017). Compared to other infrastructures, such as aviation and roadkill, the impacts of wind farms are considered relatively low (Burgin & Brainwood, 2008; Smales, 2014). It is estimated that wind farms account for about 0.1% of global anthropogenic causes of bird deaths (Bennett, 2019).

It is generally agreed that the impacts of wind farms are species-, season- and site-specific with migratory species at greater risk (Cryan & Barclay, 2009; Grodsky *et al.*, 2011; Hull & Cawthen, 2013; Langston & Pullan, 2003; Rollins *et al.*, 2012). Recent studies suggest that turbine height can be correlated to the mortality of some species; however, they cannot predict the number of fatalities for all species since specific-species behaviour (i.e., flight altitude), proximity of wind energy facilities to key habitats, migration corridors and routes, plays a role (Anderson *et al.*, 2022). Another recent study suggests a positive correlation between rotor diameter and power rating with bird fatality rates (Garvin *et al.*, 2024).

There is a broad consensus that soaring birds, especially raptors, are vulnerable to wind farm collisions. This vulnerability varies depending on morphology, home range behaviour, flight type and habitat for each species (Estelles- Domingo *et al.*, 2024). A recent study shows that raptors can exhibit avoidance behaviour, being capable of detecting the presence of wind turbines, regardless of the species of their size. However, this is not an overall rule since certain species, such as vultures, are more vulnerable to collisions due to their decreased capacity to detect wind turbines since they predominantly have a downward vision in search of carcasses (Estelles – Domingo *et al.*, 2024).

In a study of bird and bat fatalities from eight wind farms in south-eastern Australia, 24 bird species and four bat species have been recorded (Smales, 2014). The most frequently impacted species are medium to large birds which commonly fly at turbine heights (typically over 50m).

In a Tasmanian study at two wind farms, only 18% and 21% of bird species known to use the sites have recorded collisions (Hull *et al.*, 2013b). However, Hull *et al.* (2015) states that there is no evidence to suggest that collision risk is related to bird age, poor weather, foraging behaviour, territorial disputes or eagle displaying behaviour at these sites.



Flight height has been attributed to greater collision risk. The height at which birds fly is recognised as one of the most important risks of collision with wind farms. However, further research is necessary to elucidate Australian bird's flight behaviour and associated risks (Reid *et al.*, 2023).

Bat fatalities have been associated with habitat preference, wing shape, behavioural characteristics (NatureScot, 2020) and echolocation difficulties of the moving turbines (Cryan & Barclay, 2009). In a North American study, it was estimated that bats have about 0.25 seconds to change path due to the maximum distance of echolocation and the speed moving blades (Grodsky *et al.*, 2011). Lower bat fatalities have also been recorded at non-operational wind turbines and meteorological towers (Arnett *et al.*, 2008).

It has been postulated that vegetation clearing for the construction of roads, powerline corridors, and turbine foundations can create habitat for open- and edge-space -foraging bats, resulting in increased activities near wind turbines in forested areas (Ellerbrok *et al.*, 2023), however, others cause for underlying drivers of attraction are currently unknown (Voigt *et al.*, 2024).

Bat species that are highly vulnerable to collisions are often aerial insectivores, especially those in the functional groups of open-space and edge-space foragers. These bats hunt for insects and travel at heights that overlap with the range of turbine blades (Voigt *et al.*, 2024).

Barotrauma

Barotrauma is damage to the lungs and air-containing tissues as a result of changes in air pressure. Wind turbines create zones of low pressure as air flows over the blades in which flying fauna may be impacted (Baerwald, D'Amours, Klug, & Barclay, 2008; Kunz *et al.*, 2007). Some microbats killed at wind farm sites have shown no signs of external injuries; however, they have demonstrated internal haemorrhaging consistent with barotrauma (Baerwald *et al.*, 2008; Kunz *et al.*, 2007).

Several recent studies (Grodsky *et al.*, 2011; Lawson *et al.*, 2020; Rollins *et al.*, 2012) have questioned the prevalence of barotrauma impacts, indicating that direct strikes are likely the major cause of fatalities. In bats, it is unlikely that air pressure could impact bats, since the lowest magnitude pressure that they are exposed to is 8 times smaller than the pressures that cause mortality in other small species, and the highest magnitude is more than 80 times below the LD50 exposure level for animals with similar body mass (i.e., rats). Further, low- and high-pressure regions generated by the turbine blade are localised to small regions near the leading edge of the blade and decay rapidly with increasing distance from the blade. Therefore, to cause fatalities by barotrauma alone, a flight path that skim the surface of the blades would be required (Lawson *et al.*, 2020).

Birds are considered less susceptible to barotrauma due to their lung structure (Baerwald *et al.*, 2008), as such barotrauma is rarely considered to be a likely impact. Additionally, as most birds are diurnal, visual diversion out of a barotraumatic range is considered likely. Lawson *et al.* (2020) also shows that pressures created by turbine blades are unlikely to be able to cause barotrauma due to their relatively low altitude and the fact fauna needs to be in very close proximity. Loew *et al.* (2013) states it is not possible to detect internal haemorrhage related to barotrauma from salvaged bat carcasses. It is therefore considered that barotrauma does not pose a significant risk to avifauna and bats with regard to wind farm development.



Potential Collision Impacts with Transmission and Distribution Line Infrastructure

Bird collisions with static power infrastructure (power transmission and distribution lines; poles and associated fencing) are not well quantified in Australia (Lumsden, Moloney, & Smales, 2019). However, studies from North America suggest bird mortality runs into the millions (annually) in the case of electrocutions and pole collisions, and into the tens of millions for deaths directly attributable to collisions with power lines alone (Loss, Will, & Marra, 2015). Some research also suggests that the risk of both collision and electrocution is higher in regard to distribution power lines than transmission powerlines, as transmission lines, compared to distribution lines, are larger infrastructures with greater spacing of conductors. While the scale of this problem in Australia is likely to be proportionally smaller than it is elsewhere, it may still represent a significant threat to local populations of birds, including threatened species (Shaw J. M., 2009; Schaub & Pradel, 2004; Shaw, *et al.*, 2021).

Collision

A diversity of factors can influence the potential bird collision to transmission lines, including species-specific characteristics, such as sensory perception (e.g., the morphology and physiology of the avian eye), aerodynamic characteristics, flight behaviour, migration and circadian habits. Other site-specific factors (e.g., topography, weather, light) and power line-specific factors (e.g., number of vertical wire levels, wire diameter, wire height) are also important to the design of a transmission line (Bernardino *et al.*, 2018). On the other hand, the understanding of how transmission lines affect other species, including birds, is not well established. A recent study in Brazil found that there is no positive or negative correlation between transmission lines and bat collision; however, further studies are necessary (Falcao *et al.*, 2024)

According to a systematic review of factors that influence bird collisions on transmission lines undertaken by Bernardino *et al.*, 2018, birds classified as “poor fliers”, such as Anseriformes, Charadriiformes and Gruiformes, are more vulnerable to collision due to heavy body and wingspan ratio. However, other factors, such as different flight behaviours and local/regional abundance have an important contribution. Overall, gregarines species are more susceptible than solitary ones, but flocks bigger than 10 individuals can positively impact the avoidance behaviour on transmission lines.

Other flight behaviour such as high-speed flights, can increase the collision risk (Bernardino *et al.*, 2018). Peregrine Falcons (*Falco peregrinus*), the fastest birds, can exceed 320 km/h in diving-flight while hunting prey (Ponitz, Schmitz, Fischer, Bleckmann, & Brucker, 2014). At this speed, a collision with any fixed object is catastrophic and will result in almost certain immediate death or traumatic injury followed by death a short time later. But even comparatively slow-flying birds like swans, pelicans and bustards with flight speeds as low as 30 km/h are likely to suffer injury and indirect mortality from collisions (Silva *et al.*, 2014).

As an adaptation for flight, most birds' bones are hollow with internal reinforcing structures (struts and ridges). This allows bones to be as light as possible while remaining strong enough to withstand tensional and torsional forces related to flight (Gill, 2007). This structure renders birds' bones less resistant to compression and shearing forces, which are those typically experienced during collisions in flight (Novitskaya, *et al.*, 2017), making them prone to breaking due to collisions.



Another important factor is the circadian and migratory habits. During the migration, birds overfly long distances in unknown terrain, sometimes with large aggregations and fly at lower altitudes, especially near stopover areas, which increases the probability of collision (Bernardino *et al.*, 2018). Nocturnal migrants, such as starlings and rails, tend to be more susceptible to collisions than diurnal migrants, except for owls and nighthawks (Bernardino *et al.*, 2018).

Electrocution

Electrocution is death resulting from contact with an electrical current. Birds will only suffer electrocution if they simultaneously come into contact with electrical grounding wires or a second live wire (Bernardino *et al.*, 2018).

Both avian collisions and electrocutions can result in damage to electrical infrastructure, causing power outages. In some cases, bushfires can also be caused by avian collisions and electrocutions (Dorin & Spiegel, 2005).

While electrocution is usually a result of a bird physically closing the connection between energised components, on rare occasions, a faecal ejection can also cause electrocution. Large birds sometimes eject long 'streamers' of excrement when they take off from a perch. If perched on a tower or power line when they take flight, these streamers can cause flashovers if they span energised components. Such incidents often result in power outages, but they only rarely cause the death of a bird (Avian Power Line Interaction Committee (APLIC), 2006).

Transmission lines, compared to distribution lines, are larger infrastructures with greater spacing of conductors and are thus less likely to cause electrocution. The literature suggests spacing of conductors as 140 cm (Birdlife International, 2007) and 150 cm to avoid electrocution (APLIC, 2006).

The risk of electrocution is influenced by factors such as the ecosystem where the power lines are installed, bird size and species behaviour (Hamal *et al.*, 2023). Transmission lines in urban areas or traversing human settlements and agricultural landscapes that serve as important foraging and roosting areas have a high risk of electrocution (Hamal *et al.*, 2023). Additionally, large-bodied birds are more vulnerable than small birds and bats, with the exception of flying foxes' bats (Tella *et al.*, 2020), which does not occur in WA (Australian Museum, 2022).

Large- and medium-sized diurnal birds, such as hawks, eagles, kites, vultures, and falcons, are the most common electrocution victims. Due to their broad wingspan, diurnal raptors and waterbirds are susceptible to electrocution (Hamal *et al.*, 2023). Birds with long wingspans are able to complete the circuit between any two energised components (Janss, 2000 *apud* Hamal *et al.*, 2023).



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APPENDIX E NOISE ASSESSMENT (TALIS, 2024)



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APPENDIX F LANDSCAPE AND VISUAL IMPACT ASSESSMENT (ECOSCAPE, 2024)



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APPENDIX G EPGH BASELINE HYDROLOGY STUDY



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**APPENDIX H EPGH TO THE IRON BRIDGE TRANSMISSION
CORRIDOR (PTP STAGE 6) BASELINE HYDROLOGY AND
IMPACT ASSESSMENT (WORLEY, 2024)**



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APPENDIX I EPGH POST DEVELOPMENT HYDROLOGY STUDY (FORTESCUE, 2024)



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APPENDIX J EPGH DESKTOP GROUNDWATER ASSESSMENT (FORTESCUE, 2022)



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APPENDIX K CONSTRUCTION WATER SUPPLY HYDROLOGICAL ASSESSMENT (FORTESCUE, 2025)



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APPENDIX L EPGH SUBTERRANEAN FAUNA SURVEY ASSESSMENT (BENNELONGIA, 2025)



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APPENDIX M ENVIRONMENTAL MANGEMENT PLAN



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