Australian Gas Infrastructure Group

WEST ERREGULLA PROCESSING PLANT AND PIPELINE

ENVIRONMENTAL REVIEW DOCUMENT

E-PLN-037

Revision 0

March 2021

DOCUMENT CONTROL

Rev	Date	Description
0.1	22/2/2021	Initial Draft
0	31/3/2021	Initial Submission

	Title	Name
Author	Senior HSE Advisor	Mark Brown
Reviewed	HSE Manager	John Wilson
Reviewed	Project Manager	Rick Maple
Reviewed	Head of Land Management	Neil Parry
Approved	General Manager Transmission Asset Management	Tawake Rakai

West Erregulla Proposal
Environmental Review Document

AGI Operations

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

DOCUMENT TRACKING

Project Name	Strike Energy environmental survey and approvals
Project Number	16294
Project Manager	Julia Morgan
Prepared by	Julia Morgan, Matilda Greenslade, Chelsea Pringle
Reviewed by	Lisa Adams
Approved by	Lisa Adams
Status	**Draft**
Version Number	**2**
Last saved on	**1 April 2021**

This report should be cited as 'Eco Logical Australia 2021. *Strike Energy environmental survey and approvals*. Prepared for AGI Operations

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd.

Template 2.8.1

Contents

List of Appendices

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
AGIG	Australian Gas and Infrastructure Group
AGIO	AGI Operations
AGRU	Amine Gas Removal Unit
AH Act	*Aboriginal Heritage Act 1972*
ALARP	as low as reasonably practicable
ARI	Assessment on Referral Information
BC Act	*Biodiversity Conservation Act 2016*
BYAC	Bundi Yamatji Aboriginal Corporation
CEMP	Construction Environment Management Plan
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DBNGP	Dampier to Bunbury Natural Gas Pipeline
DEA	Diesel Engine Alternator
DEWHA	Department of Environment, Water, Heritage and the Arts
DG Safety Act	*Dangerous Goods Safety Act 2004*
DJTSI	Department of Jobs, Tourism, Science and Innovation
DMIRS	Department of Mines, Industry Regulation and Safety
DPaW	Department of Parks and Wildlife
DPC	Department of the Premier and Cabinet
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
DWER	Department of Water and Environment Regulation
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPA Services	Environmental Protection Authority Services unit within DWER
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERD	Environmental Review Document
GEA	Gas Engine Alternators
GHG	Greenhouse Gas
GHGMP	Greenhouse Gas Management Plan
GL	gigalitres

Abbreviation	Description
IBRA	Interim Biogeographic Regionalisation for Australia
ILUA	Indigenous Land Use Agreements
MNES	Matters of National Environmental Significance
PB1	Production Bore
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
PP Act	*Petroleum Pipelines Act*
RiWI Act	*Rights in Water and Irrigation Act 1914*
RMP	Rehabilitation Management Plan
TEC	Threatened Ecological Community
VT	vegetation type
WA	Western Australia
WEF	gas processing facility
WEM	a custody transfer metering facility located at the DBNGP tie-in point
WEP	interconnecting buried gas pipeline between the WEF and the DBNGP tie-in point
YMAC	Yamatji Marlpa Aboriginal Corporation

Executive Summary

AGI Operations Pty Limited (AGIO; the Proponent) is proposing to construct and operate a gas processing plant and pipeline near Dongara, WA collectively referred to as the West Erregulla Gas Project (WER). The processing plant will process gas produced by Warrego Energy and Strike Energy from upstream wells. The processed gas will then be transported via a new interconnecting pipeline to tie into the Dampier to Bunbury Natural Gas Pipeline (DBNGP). The Proposed Action includes:

A summary of the Proposal, location and key elements is provided in Table ES- 1 and Table ES- 2.

Table ES- 1 Summary of the Proposal

Summary of the Proposal	
Proposal title	West Erregulla Processing Plant and Pipeline Proposal
Proponent name	Australian Gas Infrastructure Group
Short description	The Proposal involves the construction and operation of a gas processing plant and pipeline 50 km south-east of Dongara, Western Australia to transport to the existing Dampier to Bunbury Natural Gas Pipeline. The Proposal includes: • A gas processing facility • A 16.5 km interconnecting buried gas pipeline between the processing facility and the DBNGP tie-in point • Supporting infrastructure including but not limited to: a custody transfer metering facility at the DBNGP tie in point, a pig launcher station, power generation, flare system, incinerator, fire water system, water treatment package, back-up diesel system, communications and access tracks.

Table ES- 2 Location and proposed extent of physical and operational elements

Element	Location	Proposed Extent
Physical elements		
Gas processing plant, pipeline, and associated infrastructure	Figure 2-1	Clearing of up to 90 ha of native vegetation within a Development Envelope of 213 ha.
Operational elements		
Gas processing and transport	Development Envelope; Figure 2-1)	Nominal design flow of 87 terajoules per day
Water supply	Development Envelope; Figure 2-1; Figure 7-2)	Water supply of up to 20 kL/day from the existing Production Bore (PB1).

This Environmental Review Document (ERD) has been prepared in accordance with *Instructions on how to prepare an Environmental Review Document* (EPA 2020a) and presents the environmental review undertaken for the Proposal to support assessment under the *Environmental Protection Act 1986* (EP Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Proponent has undertaken stakeholder consultation with key stakeholders and is committed to continuing consultation with decision-making authorities (DWER, DJTSI, DMIRS), key stakeholders

(Traditional Owners) and other stakeholders during the environmental assessment process. The Proponent will continue to consult with relevant stakeholders throughout the EPA assessment process.

The key environmental factors relevant to the Proposal are:

- Flora and vegetation
- Terrestrial fauna
- Inland waters
- Greenhouse gas emissions.

It is noted that approximately 41.5 ha (46%) of the Disturbance Footprint is intended to be rehabilitated upon completion of construction (Table ES-3).

Table ES- 3 Indicative disturbance and rehabilitation

Item	Disturbance Footprint	Proposed Rehabilitation
Gas processing plant: • Gas plant • Evaporation pond • Evaporation pond piping • Potential construction camp • Connecting track to wellheads	42 ha	5 ha
Gas pipeline: 30 m wide right of way (6 m permanent + 24 m temporary disturbance for construction only)	43 ha*	35 ha
Support infrastructure:		
• DBNGP tie in facility	1ha	0.5 ha
• Access tracks (construction only)	1ha	1 ha
• Ancillary works (bore access, permanent access tracks)	3 ha	0 ha
TOTAL	**90 ha**	**1.5 ha**

* Note: Some of the clearing width for the 16.5 km pipeline is within the processing plant and DBNGP tie in facility footprint. Therefore, the clearing for the gas pipeline only refers to clearing outside of these infrastructure areas.

Several ecological surveys have been undertaken across the Development Envelope over multiple years, including baseline surveys and targeted conservation significant species surveys. The combined coverage of these surveys has enabled a detailed understanding of the existing flora and terrestrial fauna values.

The Proposal is predicted to result in the following impacts to flora and vegetation:

- Clearing of 90 ha of native vegetation within a 213 ha Development Envelope.
- Loss of Priority flora species including 10 individuals of *Eucalyptus macrocarpa* subsp. *elachantha* (P4) species, and up to 5,010 individuals (46.5% of individuals in recorded in Development Envelope) of *Banksia scabrella* (P4) species.
- Priority flora will continue to exist in the Development Envelope, surrounding vegetation and more broadly in the region so no impacts are considered significant.
- No impact to any Threatened Flora or listed TECs or PECs, as none are present within the Development Envelope.

The predicted outcomes of the Proposal in relation to terrestrial fauna include the clearing of up to 90 ha of fauna habitat comprising 48.5 ha of permanent clearing and 41.5 ha of temporary clearing, to be rehabilitated following construction (in accordance with the Rehabilitation Management Plan included in Appendix E). All habitats within the Development Envelope are widespread and no niche habitats are present. The potential for fragmentation is minimised as the gas pipeline is to be buried and fauna are likely to be able to move across the permanent 6 m width cleared pipeline corridor.

The Development Envelope is devoid of any significant surface water features, however small ephemeral drainage lines do dissect the Development Envelope and surrounding area and a Stormwater Management Plan has been prepared accordingly. The development of the Proposal will not have any direct impacts to surface water; however, it will require abstraction of groundwater from the Yarragadee Formation Aquifer. Changes to groundwater are not expected given the small amount of abstraction already approved under the existing licence.

The Proposal will contribute to Greenhouse Gas (GHG) emissions, primarily from removal of CO_2 from the gas stream, electricity consumption and stationary sources. The Proposal is predicted to contribute peak annual emissions of up to 96,319 tCO_2e. A Greenhouse Gas Management Plan has been prepared which outlines the Proponent's commitments to implement initiatives that either avoid where possible, reduce or offset emissions to progressively achieve a 60% reduction in GHG emissions by June 2028, a further 5% by June 2038, 5% post June 2038 and then subsequently align with the trajectory to 0 tCO_2e. The GHGMP is provided in Appendix I.

The Proposal was referred to the Commonwealth Department of Agriculture, Water and Environment (DAWE) under the EPBC Act in March 2021 (ref. EPBC 2021/8907) and has been advertised for public comment. No assessment decision has yet been made in relation to the Proposal. The relevant Matters of National Environmental Significance (MNES) which apply to this Proposal are 'nationally threatened species and ecological communities.' Specifically, two threatened species listed under the EPBC Act that have been recorded in and around the Development Envelope: Sandplain Duck Orchid *(Paracaleana dixonii)* and Carnaby's Cockatoo (*Calyptorhynchus latirostris*).

The Proposal will have the following outcomes on these species:

- No disturbance to known *Parcaleana dixonii* individuals as none have been recorded during recent surveying within the Development Envelope.
- Clearing of up to 38.3 ha of the AcEbHh vegetation community (representing 53% in the Development Envelope), where *Paracaleana dixonii* individuals were previously recorded.
- Retention of 33.9 ha of the AcEbHh vegetation community in the Development Envelope.
- No disturbance, injury or mortality to Carnaby's Cockatoo as there have been no records within the Development Envelope.
- Up to 37.7 ha of low-quality foraging habitat will be temporarily impacted by the Proposal
- Approximately 57.5 ha of low-quality foraging habitat in the wider Development Envelope will be retained.
- No impact to roosting or breeding sites, as there are no records of these sites within the Development Envelope.
- Rehabilitation will include *Banksia* spp. and *Eucalyptus* spp. that are locally occurring and suitable for foraging.

Overall, the Proposal is considered unlikely to have any significant residual impacts on *Paracaleana dixonii* or Carnaby's Cockatoo.

On the above basis, the connections and interactions between environmental factors have been identified and the mitigation proposed in this ERD for the Proposal is considered sufficient to meet the principles contained in the EP Act and the EPA's objectives for individual factors.

1. Introduction

Australian Gas Infrastructure Operations Pty Ltd. (AGI Operations; the Proponent) is proposing to construct and operate a 16.5 km pipeline and gas processing plant (the Proposal) to transport gas to the existing Dampier to Bunbury Natural Gas Pipeline (DBNGP). The processing plant and pipeline will service third party supply from the West Erregulla gas field. The Proposal is located near Dongara in Western Australia (Figure 1-1).

1.1 Purpose and scope

The purpose of this Environmental Review Document (ERD) is to present the environmental review undertaken by the Proponent for the Proposal to the Environmental Protection Authority (EPA). The ERD describes and assesses the significance of the existing environmental values in the Development Envelope and potential environmental impacts that have the potential to occur from implementation of the Proposal.

In preparing this ERD, the Proponent has considered guidance provided by the EPA in *Instructions on how to prepare an Environmental Review Document* (EPA 2020a) and *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual* (EPA 2020b).

This document also satisfies the requirements for an accredited assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and includes assessment of potential significant impacts of the Proposal to Matters of National Environmental Significance (MNES) (Section 9).

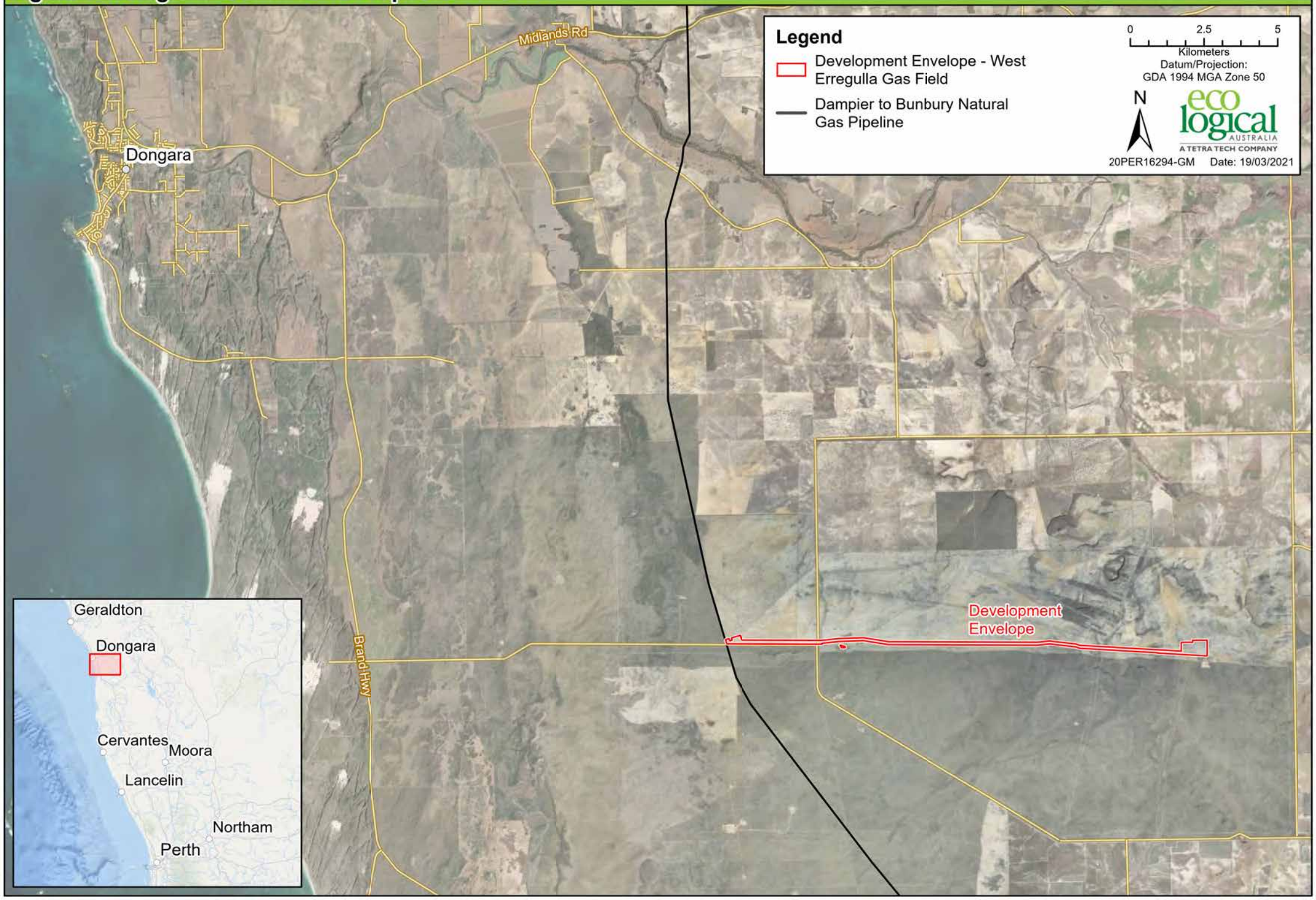
1.2 Proponent

The Australian Gas Infrastructure (AGI) Operations Pty Ltd is the Proponent for this Proposal. The Proponent details are provided in Table 1-1.

Table 1-1: Proponent identification

Item	Detail
Proponent	AGI Operations Pty Ltd
ABN	76 166 900 170
Address	Level 22/23, 140 St Georges Terrace, Perth, WA, 6000
Contact	Mark Brown Senior HSE Advisor Australia Gas and Infrastructure Group Telephone: 08 9223 4907 Email: mark.brown@agig.com.au

Figure 1-1: Regional context and Proposal location



1.3 Environmental impact assessment process

The Proposal is likely to be subject to both the Commonwealth EPBC Act and Western Australian *Environmental Protection Act 1986* (EP Act) assessment. The Proposal is anticipated to be subject to an accredited assessment in which the Commonwealth will rely on the outcomes of the assessment conducted by the Western Australian EPA to inform its consideration for approval under the EPBC Act.

1.3.1 Environmental Protection Act 1984

The EP Act is Western Australia's primary environmental legislation governing environmental protection and impact assessment. Part IV of the EP Act provides for the consideration and assessment of proposals that may, or will, have a significant impact on the environment. The impact assessment process is administered by the Environmental Protection Authority Services (EPA Services) unit within the Department of Water and Environmental Regulation (DWER).

The Proponent considers that the Proposal requires referral to the EPA under Part IV section 38 of the EP Act and considers that assessment at the level of 'Assessment on Referral Information' (ARI) would be appropriate.

1.3.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the primary piece of Commonwealth environmental legislation, which enables the protection of the Matters of National Environmental Significance (MNES) and is administered by the Department of Agriculture, Water, and the Environment (DAWE).

The Proposal was referred to the Australian Government DAWE under the EPBC Act in March 2021 (ref. EPBC 2021/8907) and has been advertised for public comment. No assessment decision has yet been made in relation to the Proposal.

The relevant Matters of National Environmental Significance (MNES) which apply to this Proposal are 'nationally threatened species and ecological communities.' Specifically, two threatened species listed under the EPBC Act that have been recorded in and around the Development Envelope:

- Sandplain Duck Orchid *(Paracaleana dixonii)*
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*)

The assessment of potential impacts to MNES is addressed in Section 9 of this ERD.

1.4 Other approvals and regulations

1.4.1 Land tenure

The Proposal will occur on a portion of Lot 11456 on DP 185714 – LR3 and occurs within Energy Permit 469. The proposed land tenure for the Proposal will comprise of the following:

- Access Right granted under the Dampier to Bunbury Pipeline Act 1997 (WA)
- Easement granted under the Petroleum Pipelines Act 1969 (WA)
- Crown lease granted under Land Administration Act 1997 (WA).

The Development Envelope is located within the Shire of Irwin and Shire of Three Springs.

1.4.2 Other approvals

Other Western Australian environmental legislation applicable to the Proposal are summarised in Table 1-2 below.

Table 1-2: Other approvals

Proposal activities	Type of approval	Legislation regulating the activity	Regulatory agency
Clearing of native vegetation	Clearing required outside of Part IV EP Act approval	*Petroleum Pipelines Act* (PP Act)	Department of Mines, Industry Regulation and Safety (DMIRS)
Biological surveys	Licensing associated with fauna and flora surveys and research Fauna Handling licence.	*Biodiversity Conservation Act* (BC Act)	Department of Biodiversity, Conservation and Attractions (DBCA)
Construction and operation of premises with potential to cause emissions and discharges to air, land, or water	Works approvals and licences.	EP Act Part V	Department of Water and Environmental Regulation (DWER)
Storage and handling of hazardous materials	Dangerous goods licence	*Dangerous Goods Safety Act* (DG Safety Act)	DMIRS
Disturbance of sites of Aboriginal heritage significance	s. 16 authorisation to enter, excavate, examine, or remove anything on an Aboriginal site. s. 18 consent for impact on an Aboriginal site.	*Aboriginal Heritage Act* (AH Act)	Department of Planning, Lands and Heritage (DPLH)
Construction and operation of a gas pipeline/ gas processing facility	Works approval	PP Act *Petroleum and Geothermal Energy Resources Act 1967 and Regulations 2012*	DMIRS

1.4.3 Decision making authorities

The decision-making authorities and their relevance to the Proposal are summarised in Table 1-3.

Table 1-3: Decision-making authorities

Decision making authority	Relevant legislation
Minister for Environment (WA)	BC Act
Chief Executive Officer, DWER	EP Act - Part V *Environmental Protection (Clearing of Native Vegetation) Regulations* 2004
Chief Executive Officer, DMIRS	DG Safety Act
Minister for Water	RiWi Act
Minister for Aboriginal Affairs	AH Act

2. The Proposal

2.1 Background

AGI Operations proposes to construct and operate a pipeline and gas processing plant, associated with development of the West Erregulla gas field, located approximately 230 kilometres (km) north-east of Perth, and 50 km south-east of Dongara, Western Australia (WA) (see Figure 1-1). The Proposal comprises a new 16.5 km pipeline that will deliver gas from the proposed processing plant to the existing DBNGP pipeline.

Subject to approval, construction of the Proposal is scheduled to commence in March 2022.

2.2 Justification for the Proposal

The Proposal has been designed to process gas from the West Erregulla gas field and transfer it to the existing DBNGP infrastructure. The Proposal will contribute significantly to economic growth, employment and infrastructure development and will positively benefit regional Western Australia, specifically the Mid-West region. Fundamental to the Proposal's projected impact will be the increase in affordable and competitive gas to ensure that the domestic market remains well supplied.

The location and design of the Proposal is determined by the location of the upstream gas field and minimising the length of the pipeline to minimise disturbance. The Proposal has been designed to avoid surface water features to minimise project risk, cost and environmental impacts.

2.3 Proposal description

The Proposal by the Proponent involves the construction and operation of a gas processing plant and pipeline near Dongara, Western Australia to transport gas from upstream wells (third party) to the existing DBNGP. The Proposal includes:

- A gas processing facility (referred to by the Proponent as the WEG), with a nominal design flow capacity of 87 terajoules per day (TJ/d).
- A 16.5 km interconnecting buried gas pipeline between the gas processing facility and the DBNGP tie-in point (WEP). The pipeline will be installed at a shallow depth and above the water table.
- Supporting infrastructure including but not limited to: a custody transfer metering facility located at the DBNGP tie-in point (WEM), a pig launcher station, power generation, flare system, incinerator, fire water system, water treatment package, back-up diesel system, communications and access tracks.

The Proposal will comprise a total Disturbance Footprint of 90 ha within a Development Envelope of 213 ha, as illustrated on Figure 2-1 and detailed in Table 2-1. It is noted that approximately 41.5 ha (46%) of the Disturbance Footprint is intended to be rehabilitated upon completion of construction.

Table 2-1: Indicative disturbance and rehabilitation

Item	Disturbance Footprint	Proposed Rehabilitation
Gas processing plant: • Gas plant • Evaporation pond • Evaporation pond piping • Potential construction camp • Connecting track to wellheads	42 ha	5 ha
Gas pipeline: 30 m wide right of way (6 m permanent + 24 m temporary disturbance for construction only)	43 ha*	35 ha
Support infrastructure:		
• DBNGP tie in facility	1ha	0.5 ha
• Access tracks (construction only)	1ha	1 ha
• Ancillary works (bore access, permanent access tracks)	3 ha	0 ha
TOTAL	**90 ha**	**2.5 ha**

* Note: Some of the clearing width for the 16.5 km pipeline is within the processing plant and DBNGP tie in facility footprint. Therefore, the clearing for the gas pipeline only refers to clearing outside of these infrastructure areas.

2.5.1 Construction

2.5.1.1 Pipeline Construction

The pipeline to be constructed is a high pressure 16" (DN400) Class 600, 10.2 MPa pipeline, approximately 16.5 km in length. The pipeline will include a pig launcher and received facilities to enable future internal (in-line) inspections to occur.

Construction of the pipeline will involve a number of activities, as summarised in Table 2-2.

Table 2-2: Pipeline construction activities

Construction activity	Description
Fencing	Where required and in consultation with landholders, construction gates shall be installed to allow access for both property boundary and internal fences.
Clear and grade	Graders and bulldozers will be used to clear the Disturbance Footprint for construction activities. This clearing will include the 30 m wide right of way pipeline, consisting of a 6 m wide corridor for the permanent location of the pipeline and an additional 24 m wide temporary disturbance corridor for construction of the pipeline. Topsoil will typically be graded to a depth of 100 to 150 mm for a blade-width over the trench line, or the entire working side or the full construction corridor, depending on factors such as the soil type, terrain, construction requirements and weather conditions. Topsoil will be stockpiled separately. Overburden related to dune crossings will be stockpiled adjacent to the excavation within the Disturbance Envelope.
Trenching	After the route is cleared, a trench (1.5-2 m deep) will be dug for the pipeline by either a trenching machine or an excavator in accordance with pre-defined depths of burial. The required depths are determined by the AS2885.1 risk assessment process and recorded on construction alignment sheets. Trench spoil will be stockpiled within the Disturbance Footprint, usually on the non-working side of the pipeline right of way. Trench spoil is stockpiled separately to topsoil. The trench will be monitored daily for fauna entrapment and refuges (hessian bags or similar) placed in the trench to provide protection for fauna that temporarily occupy the trench. The trenches will be ramped at regular intervals to allow larger fauna to escape. The period that any

Construction activity	Description
	part of a trench will be left open will be minimised. The maximum amount of time a trench will remain open is 7 days. Trenches will be stopped and started at regular intervals with "plugs" between these sections to allow for unimpeded movement of livestock and fauna. Where possible, trenching will be delayed until completion of the welding and joint coating as part of ensuring that the trench will be open for the minimum amount of time.
Hand digging	In areas that are within 1 m to any known buried service, machine excavation is not allowed. Hand digging will be used to positively identify the service(s) should this be required.
Stringing	Steel pipe will be trucked to the construction site and sections, each approximately 18 m long, and laid end-to-end next to the trench. The sections are placed on sandbags and raised on blocks of wood (timber skids) to protect the pipe from corrosion and coating damage.
Pipe bending, welding & joint coating	Where required, pipe sections will be bent to match changes in either elevation or direction of the route. Pipe sections are then welded together. The pipe welds are inspected using x-ray or ultrasonic equipment as per AS 2885.2. The area around the weld is grit blasted and coated with a protective coating to prevent corrosion.
Padding	Where required, padding machines may be used to sift the excavated subsoil to remove coarse materials to prevent damage to the pipe coating. The remaining fine material is used to pad beneath and on top of the buried pipe.
Lowering-in	Side booms (bulldozers with cranes) or excavators will be used to lower the welded pipe into the trench.
Backfilling	Trench spoil will be returned to the trench and material compacted to minimise the likelihood of subsidence of material over the pipe.
Rehabilitation	Rehabilitation works included

2.5.1.2 Processing Plant Construction

The processing plant construction will include the following key processes:

- Survey and mark out
- Clear and grade
- Civil and foundation works
- Evaporation pond and infiltration pond layout and construction
- Mechanical package assembly
- Structural and piping assembly
- Electrical installations
- Final civil and structural construction works
- Pre-commissioning
- Commissioning.

2.5.1.3 Exclusions

The upstream gas production and all associated transfer infrastructure beyond the plant custody transfer point is outside of the scope of this Proposal. The upstream project will be developed by the Strike Energy and Warrego Energy Joint Venture under the broader West Erregulla development.

2.5.2 Resource requirements

2.5.2.1 Power generation

Three Gas Engine Alternators (GEAs) (required duty being approximately 875 kVa) will be installed and a backup Diesel Engine Alternator (DEA) of 250 kVa to ensure power supply to the plant. The GEAs will be fed from a fuel gas skid using natural gas with a minor amount of diesel stored on site for the DEA and for vehicle refuelling.

An Uninterrupted Power Supply system shall provide both 24 VDC and 230 VAC 50 Hz essential power for a full rating of 30 minutes or 48 hours (critical services only). The backup supply will be provided by batteries.

2.5.2.2 Water Supply

Water supply for the Proposal will be sourced from the existing Production Bore (PB1) at a proposed rate of 20 kL/day for operations from the Yarragadee Aquifer. This bore will support the construction and operational needs of the Proposal, which is predominately for dust suppression. Wherever water demand is above this threshold, it will be trucked to site from local sources for the required duration or potential other existing bores in consultation with the licensee. Water demand is expected to be greatest during the construction phase with minimal demand during operations. This is further addressed in Section 7.

2.5.2.3 Fill

Additional fill may be required for backfill, pipe protection and bedding within the trench. All fill will consist of locally derived soils, supplied from a third-party supplier and transported to site as required. As per management controls in the Construction Environmental Management Plan (CEMP), weed free certification will be required for any fill imported to site.

2.5.3 Commissioning

Commissioning of the pipeline and associated processing plant will involve the progressive introduction of gas, commissioning each item of equipment sequentially until the whole system is capable of operating as a unit. The station piping is vented with natural gas to ensure cleanliness. A vent pipe with an outlet 2.2 m above ground level is used. Volumes of natural gas to be vented will be minimised and calculated as part of the emissions reporting requirements.

The station pipe work is pressurised to line pressure, pressure reduction valves set (if installed) and electrical equipment energised and tested. Following successful commissioning first gas to the client can be delivered.

2.5.4 Post construction site clean-up and rehabilitation

Upon completion of testing and commissioning, all machinery, equipment, and temporary buildings will be disassembled and removed from site. All waste and surplus materials will be removed from site and disposed of at the appropriate class landfill facility. Those areas required for construction purposes only, will be rehabilitated. Of the 90 ha Disturbance Footprint, 41.5 ha (46%) is intended to be rehabilitated following completion of construction works.

2.5.5 Closure and decommissioning

Closure will include removal of all above ground facilities and decommissioning in accordance with DMIRS process for closure of a pipeline and removal of all plant related infrastructure. Rehabilitation of the disturbed areas shall be in accordance with an end land use agreed with stakeholders and include a set of completion criteria.

Figure 2-1: Disturbance Footprint and Development Envelope - Page 1 of 3

Figure 2-1: Disturbance Footprint and Development Envelope - Page 2 of 3

Figure 2-1: Disturbance Footprint and Development Envelope - Page 3 of 3

2.6 Key characteristics of the Proposal

The key characteristics of the Proposal are summarised in Table 2-3 and Table 2-4.

Table 2-3: Key characteristics

Summary of the Proposal	
Proposal title	West Erregulla Processing Plant and Pipeline Proposal
Proponent name	Australian Gas Infrastructure Group
Short description	The Proposal involves the construction and operation of a gas processing plant and pipeline 50 km south-east of Dongara, Western Australia to transport to the existing Dampier to Bunbury Natural Gas Pipeline. The Proposal includes: • A gas processing facility • A 16.5 km interconnecting buried gas pipeline between the processing facility and the DBNGP tie-in point • Supporting infrastructure including but not limited to: a custody transfer metering facility at the DBNGP tie in point, a pig launcher station, power generation, flare system, incinerator, fire water system, water treatment package, back-up diesel system, communications and access tracks.

Table 2-4: Location and proposed extent of physical and operational elements

Element	Location	Proposed Extent
Physical elements		
Gas processing plant, pipeline, and associated infrastructure	Figure 2-1	Clearing of up to 90 ha of native vegetation within a Development Envelope of 213 ha.
Operational elements		
Gas processing and transport	Development Envelope; Figure 2-1)	Nominal design flow of 87 terajoules per day
Water supply	Development Envelope; Figure 2-1; Figure 7-2)	Water supply of up to 20 kL/day during operations from the existing Production Bore (PB1).

2.7 Local and regional context

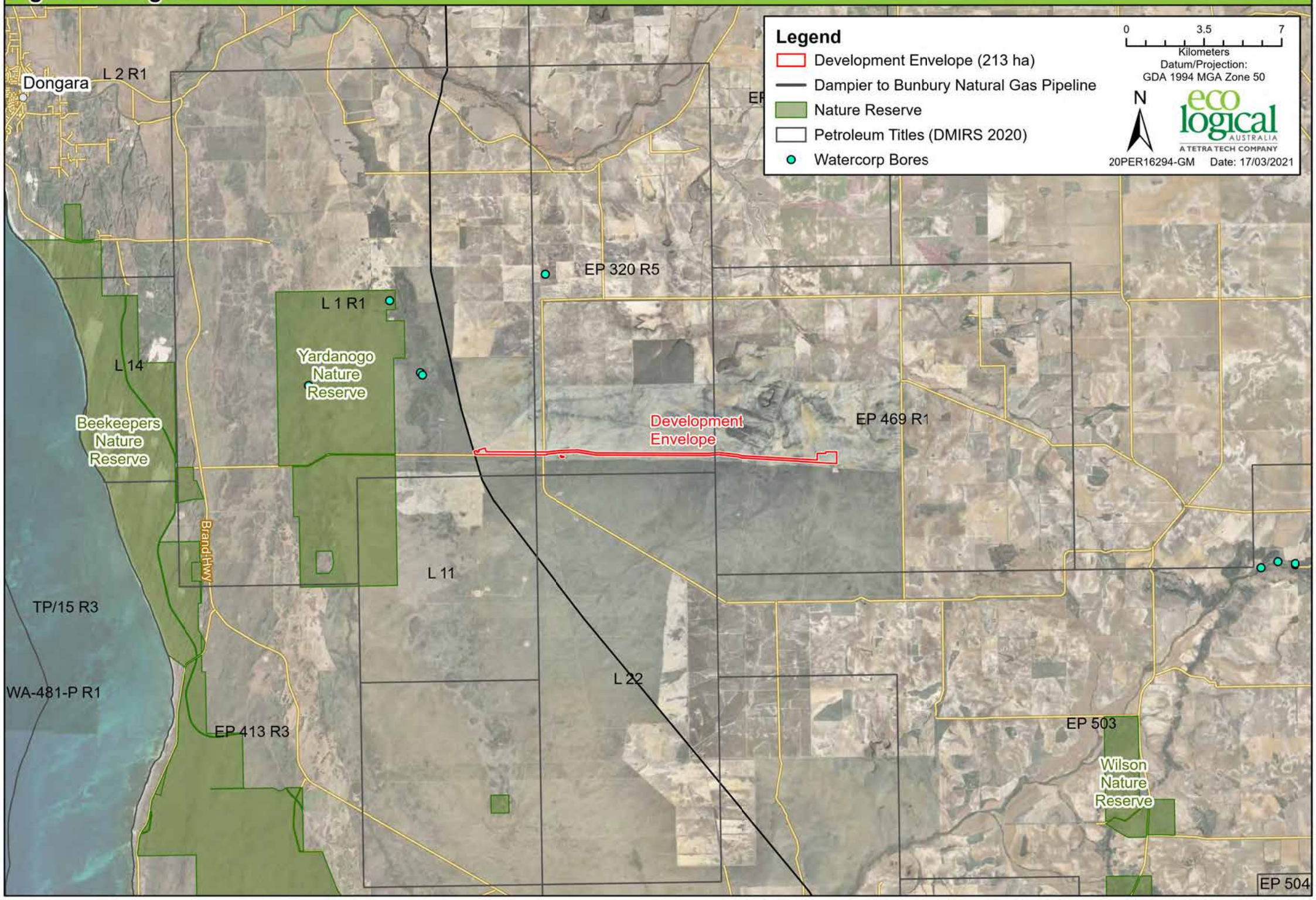
The Proposal is located in the mid-west region of Western Australia approximately 400 km north of Perth. The eastern portion of the Proposal (including the gas processing plant) is located within the Shire of Three Springs, while the majority of the gas pipeline is located within the Shire of Irwin.

The Development Envelope is also located within the Bundi Yamatji Aboriginal Corporation (BYAC) representative area.

The nearest populated centres include Mingenew and Dongara, located approximately 25 km north-east (approximately 35 km by road) and approximately 30 km north-west (approximately 70 km by road) from the Development Envelope respectively.

Existing land uses in the region are petroleum and mineral exploration and operations, conservation, tourism, and agricultural activities (Figure 2-2). There are no sensitive light or noise receptors such as populated dwellings within a 5 km radius of the Development Envelope.

Figure 2-2 Regional land-use



3. Stakeholder engagement

3.1 Key stakeholders

Key stakeholders for the Proposal include:

- Yamatji Marlpa Aboriginal Corporation (YMAC)
- Bundi Yamatji Aboriginal Corporation (BYAC)
- Tronox Holdings
- Shire of Irwin
- Shire of Three Springs
- Department of Biodiversity, Conservation and Attractions (DBCA)
- Department of Water and Environmental Regulation (DWER)
- Environmental Protection Authority Services
- Department of Agriculture, Water and Environment (DAWE)
- Department of Planning, Lands and Heritage (DPLH)
- Department of Premier and Cabinet (DPC)
- Department of Jobs, Tourism, Science and Innovation (JTSI)
- Department of Mines, Industry Regulation and Safety (DMIRS).

3.2 Stakeholder consultation

The Proponent has undertaken stakeholder consultation with key stakeholders and is committed to continuing consultation with decision-making authorities (DWER, DJTSI, DMIRS), key stakeholders (Traditional Owners) and other stakeholders during the environmental assessment process.

A summary of specific consultation undertaken with key stakeholders to date is provided in Table 3-1.

It is noted that there has been ongoing consultation with the BYAC to develop a Heritage Agreement and the completion of a cultural heritage survey with YMAC. The cultural heritage survey was completed by YMAC, Extent Heritage Advisors and 6 Southern Yamatji representatives in December 2020 and confirmed that no ethnographic or archaeological sites were recorded within the Development Footprint.

The Proponent will continue to consult with relevant stakeholders throughout the EPA assessment process.

Table 3-1: Stakeholder consultation register

Stakeholder	Date	Purpose of contact	Proponent response/outcome
Department of Premier and Cabinet	25 September 2020	Discussion	Discussion relating to Indigenous Land Use Agreements (ILUA) and project
	3 November 2020	Joint meeting with representatives from JTSI, DPC and DPLH	Project update
Department of Planning, Lands and Heritage (DPLH)	2 November 2020	Project briefing	Initial project briefing
	28 May 2020	Meeting update	Project update
	11 June 2020	Formal request for grant of land tenure for pipeline easement, processing plant lease and access right	Submitted Crown Land Enquiry Form
	16 July 2020	Project briefing update	Project update
	28 July 2020	Project briefing	Project update
	21 September 2020	Project briefing – email / phone	Project update
	3 November 2020	Joint meeting with representatives from JTSI, DPC and DPLH	Meeting to discuss operation of ILUA and tenure position for project
	2 February 2021	Teleconference	Confirmed State's position on grant of tenure
	5 February 2021	Email	Confirmed State's position on grant of tenure
Department of Jobs, Tourism, Science, and Innovation (JTSI)	15 July 2020	Meeting	Initial presentation of project and JTSI's facilitation role. JTSI made enquiries with DPLH and likely processes for grant of land tenure under ILUA.
	15 October 2020	Meeting	Discussed status of negotiations with BYAC
	3 November 2020	Joint meeting with representatives from JTSI, DPC and DPLH	Meeting to discuss operation of ILUA and tenure position for project
	21 January 2021	Meeting with EPA and JTSI	Project update meeting on referrals and timeframes
Department of Mines, Industry Regulation and Safety (DMIRS)	TBC	Project briefing – virtual meeting	Initial project briefing
Shire of Irwin	6 July 2020	Telephone call	Initial project discussions and access to Reserve 40805

Stakeholder	Date	Purpose of contact	Proponent response/outcome
Stakeholders – Tronox Holdings	15 September 2020	Principal Geologist	AGI Operations will design a suitable crossing for heavy equipment on Tronox tenement.
Department of Water and Environmental Regulation (DWER)	21 December 2020	Project briefing – virtual meeting with EPA services – pre-referral meeting	Project update meeting on referrals and timelines.
Environmental Protection Authority (EPA)	21 December 2020	Project briefing with pre-referral document	Initial project meeting
	21 January 2021	Project update meeting with EPA and JTSI	Project update meeting
Ministerial Briefings	25 August 2020	Minister and Staff	
	2 September 2020	Minister and Staff	
	26 August 2020	Office of the Premier	
Yamatji Marlpa Aboriginal Corporation (YMAC)	27 August 2020	Project briefing – in person briefing	Commence development of Heritage Agreement
	2 September 2020	Consultation on Heritage Agreement draft	Progress Heritage Agreement
		Further consultation on Heritage Agreement draft	Progress Heritage Agreement
	18 September 2020	Issued Heritage Notice for proposed survey	Formal request for heritage survey
	22 September 2020	Finalised Heritage Agreement	Signing of Heritage Agreement
	1 October 2020	Various discussions relating to heritage survey	Arranging heritage survey for week commencing 2 November 2020
	8 December 2020	Cultural survey undertaken by YMAC, Extent Heritage Advisors and 6 Southern Yamatji representatives	Cultural survey completed. Confirmed no ethnographic or archaeological sites were identified during survey.
Bundi Yamatji Aboriginal Corporation (BYAC)	28 July 2020	Initial briefing with BYAC representative in Adelaide (Teams Meeting)	PC to brief interim BYAC board
	26 August 2020	Letter to BYAC	Update on project matters and ongoing engagement
	-	Follow up meeting (via Teams)	Update on project matters and ongoing engagement
	6 October 2020	Letter to BYAC	Update on project matters and ongoing engagement
	16 October 2020	Presentation to BYAC board sub-committee (in person)	Discussions on project and ongoing engagement

Stakeholder	Date	Purpose of contact	Proponent response/outcome
	15 December 2020	Meeting with BYAC Board Sub Committee	Meeting with BYAC via Teams on project matters
	28 January 2021	Meeting with BYAC Negotiation Team	Meeting with BYAC via Teams on project matters
	28 January 2021	Forwarding heritage survey reports to BYAC	
	2 February 2021	Email	Confirmed discussions at DPLH

4. Environmental principles and factors

This section identifies the environmental factors relevant to the Proposal and outlines the overall assessment methodology presented in this document. A summary of the detailed environmental impact assessment of each preliminary key environmental factor is provided in the following sections.

4.1 Principles

The Proponent acknowledges the environmental protection principles of *Environmental Impact Assessment (EIA)* listed in section 4A of the EP Act and presented in the EPA's Statement of Environmental Principles, Factors and Objectives (EPA 2016c).

Table 4-1 provides a description of how the Proponent has considered and/or addressed each of these environmental protection principles in relation to the Proposal.

Table 4-1: Consideration of environmental principles

Principle	Consideration given to this principle
The precautionary principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decision should be guided by: a) Careful evaluation to avoid, where practicable, serious, or irreversible damage to the environment. b) An assessment of the risk-weighted consequences of various options.	The Proponent has conducted biological studies within the Development Envelope to understand the environmental values and the potential impacts of the Proposal. These studies have informed the design of the Proposal and modifications to the Disturbance Footprint, specifically the gas processing plant footprint, have been made to reduce the extent of clearing required. The Proponent also commits to implement a Construction Environment Management Plan (CEMP) to ensure ongoing avoidance and minimisation of impacts to environmental values in the Development Envelope. A precautionary approach has therefore been undertaken where residual risk to the receiving environment is uncertain.
The principle of intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Proposal has been designed to address the EPA's objectives for the key environmental factors, with mitigation measures to reduce residual environmental impacts for any significant residual impacts. The Proposal responds to a growing demand for natural gas and will contribute significantly to economic growth, employment and infrastructure development in the Mid-West region. Fundamental to the Proposal's projected impact will be the increase in affordable and competitive gas to ensure that the domestic market remains well supplied. The assessment contained in this report demonstrates that the Proposal can be implemented to avoid significant impacts on the health, diversity, or productivity of the environment for the benefit of future generations.
The principle of the conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Comprehensive baseline flora, vegetation and terrestrial fauna surveys have been undertaken to understand existing biological diversity in the area. The results of these surveys have informed a robust assessment of the potential impacts to biological diversity and ecological integrity.

Principle	Consideration given to this principle
	Clearing of flora and vegetation, particularly that of conservation significance, has been avoided or minimised. A number of measures will be undertaken to minimise impacts to significant environmental values such as regular and ongoing inspections of open trenches, vehicle speed limits and travel restrictions, Clean on Entry procedures and controls for dust and noise generating activities. A pre-clearance site walkover with a qualified ecologist will also be undertaken prior to commencement of clearing and clearing will be undertaken progressively to allow for the movement of fauna into areas outside the Disturbance Footprint.
Principles relating to improved valuation, pricing, and incentive mechanisms Environmental factors should be included in the valuation of assets and services. a) The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. b) 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 wastes. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	All costs associated with the environmental constraint avoidance and management costs throughout the life of the Proposal have been considered in the planning and design of the Proposal. This has included provision for rehabilitation and decommissioning costs.
The principle of waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	The Proponent commits to minimising waste as far as practicable during construction, operation, and closure by adopting the hierarchy of waste controls: avoid, reduce, reuse, recycle and safe disposal.

4.2 Identification of environmental factors

Environmental factors are those parts of the environment that may be impacted by an aspect of a Proposal. The EPA has 14 environmental factors, organised into five themes: sea, land, water, air and people. Based on an assessment of potential impacts associated with the Proposal, the key environmental factors considered relevant to the Proposal are:

- Flora and vegetation (Section 5)
- Terrestrial fauna (Section 6)
- Inland waters (Section 7)
- Greenhouse gas emissions (Section 8).

As this ERD also satisfies the requirements for an accredited assessment pursuant to the EPBC Act, an additional assessment of potential significant impacts of the Proposal on MNES is provided in Section 9.

5. Flora and vegetation

5.1 EPA objective

The EPA's objective for flora and vegetation is to *protect flora and vegetation so that biological diversity and ecological integrity are maintained* (EPA 2020a).

5.2 Policy and guidance

The following policies and guidance are relevant to the flora and vegetation factor:

- Instructions on how to prepare an Environmental Review Document (EPA 2020a)
- Statement of Environmental Principles, Factors and Objectives (EPA 2020c)
- Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA 2020d)
- BC Act
- Environmental Factor Guideline: Flora and Vegetation (EPA 2016a)
- Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b).

5.3 Receiving environment

5.3.1 Previous studies

Several ecological surveys have been undertaken across the Development Envelope over multiple years, including baseline surveys and targeted conservation significant species surveys. The combined coverage of these surveys has enabled a detailed understanding of the existing flora and terrestrial fauna values. A summary of the supporting flora and vegetation studies is provided in Table 5-1 and Appendix A; B; C and D).

Table 5-1: Summary of supporting flora and vegetation studies

Survey/Investigation	Summary	Survey date	Outcomes
Woodman Environmental Consulting (2013) (Appendix A) West Erregulla Project; Flora and Fauna Vegetation Assessment	A desktop review of the flora and vegetation of the West Erregulla study area, followed by a flora and vegetation survey to identify and map vegetation and flora cover in the study area as well as identifying conservation significant flora taxa.	Phase 1: 26th to 30th September 24th to 27th October 20th to 26th November Phase 2: 10th to 13th September 2nd to 5th October	The survey identified three threatened (Declared Rare Flora) flora (*Thelymitra stellata, Paracaleana dixonii* and *Eucalyptus crispata).* The survey identified 23 confirmed priority flora taxa. No Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) were recorded.
Ecologica (2018) (Appendix B) Targeted Threatened Flora Survey	A desktop assessment of threatened flora species to identify the proximity of threatened flora species to the proposed location of the exploration well.	30th and 31st October 2018	The survey did not identify any individuals of the targeted threatened taxa *Thelymitra stellata*, *Paracaleana dixonii* and *Eucalyptus crispata*. No TECs and PECs were recorded.
Mattiske Consulting (2020) (Appendix C) Review of Key Potential Flora, Vegetation and Fauna Values on the Proposed Pipeline for Strike Energy Near Dongara	A desktop assessment of the potential flora, vegetation and fauna values present on areas near the proposed pipeline.	28th February 2020	The survey identified 12 threatened and 18 priority flora species which have the potential to occur. The survey identified four TECs and six PECs and ten threatened fauna species which have the potential to occur.
Eco Logical (2020) (Appendix D) West Erregulla Pipeline Flora and Fauna survey	A detailed and targeted flora survey and vegetation condition assessment of the West Erregulla Pipeline Project consisting of numerous quadrats and opportunistic sampling in other areas.	Phase 1: 7th to 10th September Phase 2: 8th to 9th October	The survey found no individuals of the targeted threatened taxa *Paracaleana dixonii*. The survey identified eight confirmed Priority flora taxa. No TECs and PECs were recorded.

Figure 5-1: Flora and vegetation survey effort within the Development Envelope

Legend

- Development Envelope (213 ha)
- ELA (2020) survey area
- Woodman (2013) survey Area
- Road

0 1.5 3
Kilometers

Scale: 1:80,000 (A4)
Datum/Projection:
GDA 1994 MGA Zone 50

N

eco logical AUSTRALIA A TETRA TECH COMPANY

Prepared by: GM Date: 17/03/2021

5.3.2 Vegetation

5.3.2.1 IBRA region

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. The *Interim Biogeographic Regionalisation for Australia* (IBRA) (Thackway & Creswell 1995) divides Western Australia into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation (DAWE 2020).

The Development Envelope is situated within the Geraldton Sandplains bioregion (Lesueur Sandplain subregion, GS3). The Geraldton Sandplains bioregion (GS3) is composed mainly of proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain (Desmond and Chant 2001). More specifically, the Lesueur Sandplain subregion comprises Aeolian and limestones, Jurassic siltstones and sandstones of central Perth Basin. Alluvials are associated with drainage systems and there are extensive yellow sandplains in south-eastern parts. Shrub-heaths rich in endemics occur on a mosaic of lateritic mesas, sandplains, coastal sands, and limestones and heath on lateritised sandplains along the subregions north-eastern margins (Desmond and Chant 2001).

5.3.2.2 Land systems

The Department of Primary Industries and Regional Development (DPIRD) has mapped and described the land systems of Western Australian rangelands, providing comprehensive description of biophysical resources, including soil and vegetation condition. Two land systems occur within the Development Envelope (Table 5-2), with the Mount Adams land system accounting for approximately 88% of the Development Envelope.

Table 5-2: Land systems within the Development Envelope

Land system	Land system description	Total extent within the Geraldton Sandplains bioregion (ha)	Total extent within the Development Envelope (ha)
Mount Adams System (224Ma)	Gently undulating sandplain with low gravel ridges and occasional laterite breakaways.	86,963.2	187.3
Correy System (221Cy)	Broad sandy alluvial fan of the lower Arrowsmith River. Pale deep sands predominate with grey shallow sandy duplexes, moderately deep sandy gravels with yellow deep sands less common. Banksia woodlands and heathlands.	27,252.6	25.0
TOTAL		**114,214.8**	**212.2**

5.3.2.3 Vegetation associations

The pre-European vegetation of the Development Envelope was defined and mapped by Beard (1976) and within the broader region by Beard (1990) in the Irwin Botanical District as coastal scrub heath on sandplains, with *Acacia* and *Allocasuarina* thickets further inland, and hard-setting loams with *Acacia* scrub and scattered *Eucalyptus loxophleba*. Three vegetation associations are present within the Development Envelope (Table 5-3).

Table 5-3: Beard (1976) vegetation associations in the Lesueur Sandplain subregion

Vegetation association	Description	Pre-European extent (ha)	Current extent remaining (ha)	% of pre-European extent remaining	Extent in Development Envelope (ha)
49	Shrublands; mixed heath	33,139.33	13,618.88	41.10	12.1
378	Shrublands; scrub heath with scattered *Banksia* spp., *Eucalyptus todtiana* and *Xylomelum angustifolium* on deep sandy flats in the Geraldton sandplains bioregion	90,922.87	60,668.26	66.72	46.2
379	Shrublands; scrub heath on lateritic sandplain in the central Geraldton sandplains bioregion	370,029.76	111,632.48	30.17	153.9

5.3.2.4 Vegetation communities

A total of six vegetation communities have been delineated within the Development Envelope (ELA 2021). Vegetation types are described in Table 5-4 and depicted in Figure 5-2.

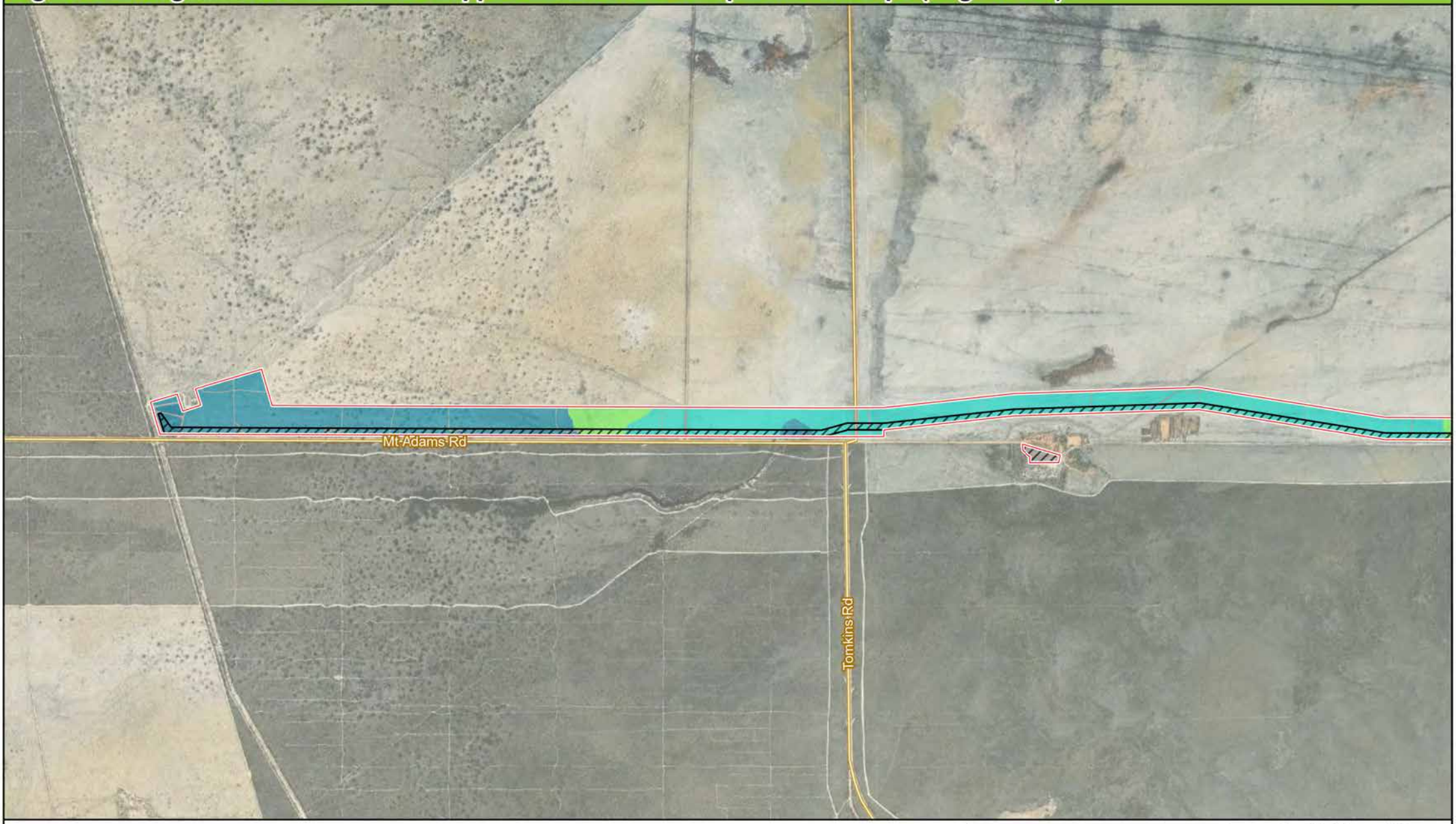
Table 5-4: Vegetation communities mapped within the Development Envelope

Vegetation type	Description	Extent within Development Envelope (ha)	% of Development Envelope
AcEbHh	*Allocasuarina campestris* tall sparse shrubland over *Eremaea beaufortioides*, *Calothamnus quadrifidus* subsp. *angustifolius*, *Isopogon tridens* mid sparse shrubland over *Hibbertia hypericoides*, *Melaleuca leuropoma* low open shrubland and *Ecdeiocolea monostachya* low open sedgeland.	72.2	34.02
EtAhHh	*Eucalyptus todtiana* mid open woodland over *Allocasuarina humilis*, *Banksia scabrella* (P4), *Calothamnus sanguineus* mid open shrubland over *Hibbertia hypericoides*, *Melaleuca leuropoma* low open shrubland and *Caustis dioica* low open sedgeland.	55	25.92
BpDdHh	*Banksia prionotes* mid open woodland over *Daviesia divaricata*, *Conospermum boreale*, *Allocasuarina humilis* mid open shrubland over *Hibbertia hypericoides* low open shrubland and *Ecdeiocolea monostachya*, *Mesomelaena pseudostygia* low open sedgeland.	12	5.66
AcAhGp	*Allocasuarina campestris* tall sparse shrubland over *Allocasuarina humilis*, *Hakea auriculata*, *Petrophile shuttleworthiana* mid open shrubland over *Gastrolobium plicatum* low open shrubland and *Ecdeiocolea monostachya*, *Schoenus armeria* low open sedgeland.	5.5	2.59
AcDdMl	*Allocasuarina campestris* tall isolated shrubs over *Daviesia divaricata*, *Conospermum boreale*, *Beaufortia elegans* mid open shrubland over *Melaleuca leuropoma*, *Hibbertia hypericoides* low open shrub over *Ecdeiocolea monostachya* low open sedgeland.	35.9	16.92

Vegetation type	Description	Extent within Development Envelope (ha)	% of Development Envelope
EtBaHh	*Eucalyptus todtiana* mid open woodland over *Banksia attenuata*, *Calothamnus blepharospermus*, *Eremaea beaufortioides* mid open shrubland over *Hibbertia hypericoides*, *Melaleuca leuropoma* low open shrubland and *Ecdeiocolea monostachya* low open sedgeland.	28.1	13.24
Cleared	Cleared	3.5	1.65
TOTAL		**212.2**	**100**

*Note: The size of the Development Envelope has been rounded from 212.2 ha to 213 ha throughout the document.

Figure 5-2: Vegetation communities mapped within the Development Envelope (Page 1 of 3)

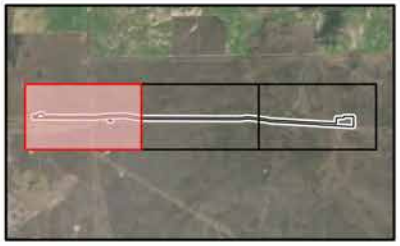


Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Vegetation communities

- AcDdMl
- AcEbHh
- EtBaHh
- Cleared



0 125 250 500
Metres

Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

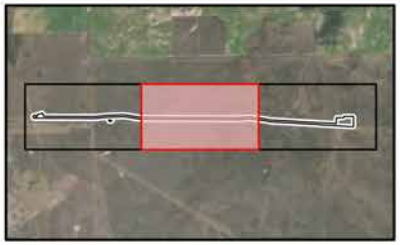
Figure 5-2: Vegetation communities mapped within the Development Envelope (Page 2 of 3)

Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Vegetation communities

- AcAhGp
- AcDdMl
- AcEbHh
- BpDdHh
- EtAhHh
- Cleared



0 125 250 500
Metres

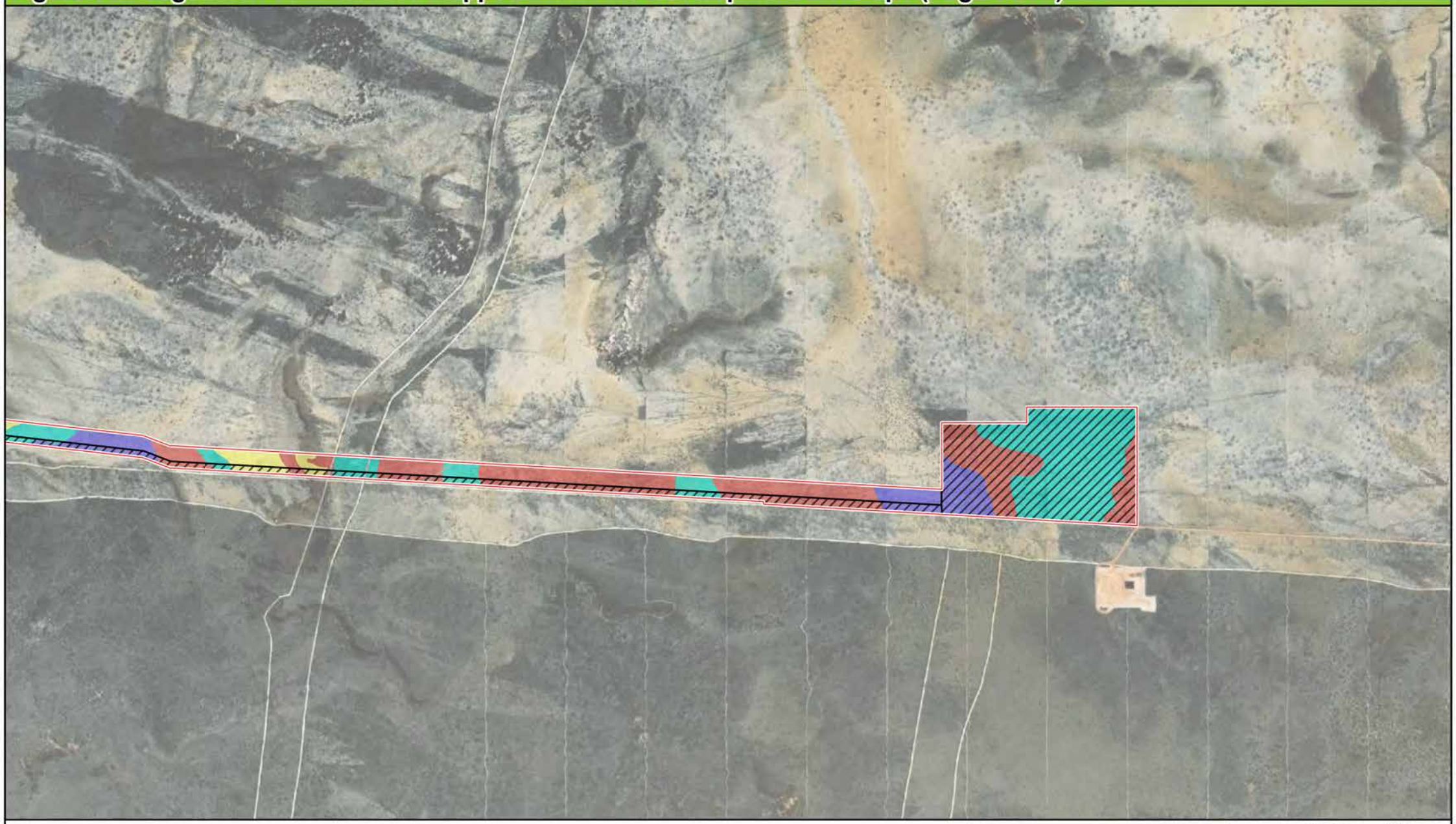
Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

Figure 5-2: Vegetation communities mapped within the Development Envelope (Page 3 of 3)

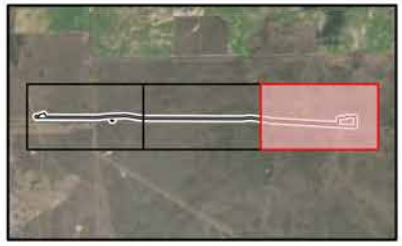


Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Vegetation communities

- AcAhGp
- AcEbHh
- BpDdHh
- EtAhHh
- Cleared



0 125 250 500
Metres

Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

ecological AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

5.3.2.5 Vegetation condition

The majority of intact vegetation in the Development Envelope is considered to be in Excellent condition based on the Keighery (1994) vegetation scale provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016b) (Table 5-5).

Vegetation within the Development Envelope has been affected by a prescribed burn in April 2019. On ground surveys revealed that the fire has altered the structural elements of vegetation communities present within the Development Envelope. However, a strong post-fire recovery was observed, with the majority of flora species expected to occur being present. Flora species with more rapid post-fire recovery strategies were naturally more dominant than those which take longer to re-establish (ELA 2021). Overall, the fire did not affect the vegetation condition rating.

Table 5-5: Vegetation condition in the Development Envelope

Vegetation condition	Extent in Development Envelope (ha)	% of Development Envelope
Excellent	208.7	98.35
Cleared (not vegetated)	3.5	1.65
TOTAL	**212.2**	**100**

5.3.2.6 Threatened and Priority Ecological Communities

No vegetation communities delineated within the Development Envelope were inferred to represent any potential conservation significant communities listed under the Commonwealth EPBC Act, the BC Act or by the DBCA.

5.3.2.7 Conservation significant flora

Conservation significant flora are species listed under the EPBC Act, the BC Act, or Priority species identified by DBCA as requiring further protection.

No threatened flora species listed under the EPBC Act or the BC Act have been recorded within the Development Environment in the recent detailed flora and vegetation survey (ELA 2021). It is noted that one threatened flora species, *Paracaleana dixonii* (listed as Endangered under the EPBC Act and Vulnerable under the BC Act) was previously recorded within the Development Envelope from a database search (2011 record); however, this species was not recorded in the recent targeted flora survey (ELA 2021). This species is a MNES and therefore, potential impacts to this species is discussed in Section 9.

Eight flora species listed as Priority by DBCA were recorded within the Development Envelope from the 2020 field survey, including:

- DBCA Priority 1 (P1)
  - *Micromyrtus rogeri*
  - *Lasiopetalum ogilvieanum*
- DBCA Priority 3 (P3)
  - *Guichenotia alba*
  - *Mesomelaena stygia* subsp. *deflexa*
  - *Stylidium drummondianum*

- DBCA Priority 4 (P4)
  - *Banksia scabrella*
  - *Eucalyptus macrocarpa* subsp. *elachantha*
  - *Stawellia dimorphantha.*

The location and details of the conservation significant flora recorded in the Development Envelope are provided in ELA (2021). Figure 5-3 details records of Priority flora within the Development Envelope.

Table 5-6: Conservation significant flora recorded in the Development Envelope

Species	Habitat	Vegetation type	No. of populations (individuals) in Development Envelope	Other previous records of species
Micromyrtus rogeri Priority 1	Yellow-brown sandy soils, gravel, laterite, breakaways	AcAhGp EtAhHh	18 (939)	17 records across a range of 175 km, from Dongara to Dandaragan
Lasiopetalum ogilvieanum Priority 1	White/grey or yellow sand, stony loam on undulating plains, lateritic rises	AcDdMI AcEbHh EtAhHh	21 (100)	21 records across a range of 85 km, north and south of Dongara
Guichenotia alba Priority 3	Sandy and gravelly soils on low-lying flats	AcDdMI AcEbHh EtBaHh	63 (607)	38 records across a range of 170 km from Dongara south
Mesomelaena stygia subsp. *deflexa* Priority 3	White, grey, or lateritic sand, clay, gravel	AcEbHh EtAhHh	55 (4,648)	29 records across a range of 70 km from Dongara south
Stylidium drummondianum Priority 3	Sand or clayey sand over laterite on upper hillslopes, breakaways in low heath, mallee shrubland	AcAhGp AcEbHh EtAhHh	10 (54)	40 records across a range of 175 km from Geraldton to Dongara
Banksia scabrella Priority 4	White, grey, or yellow sand, sometimes with lateritic gravel, on sandplains and lateritic ridges	AcAhGp AcDdMI AcEbHh BpDdHh EtAhHh	485 (10,776)	53 records across a range of 110 km from Geraldton to Dongara
Eucalyptus macrocarpa subsp. *elachantha* Priority 4	White or grey sand over laterite on hillslopes, ridges, and sandplains	AcEbHh	1 (10)	73 records across a range of 230 km south of Geraldton to south of Dongara
Stawellia dimorphantha Priority 4	White, grey, and yellow sand	AcDdMI AcEbHh EtBaHh	45 (298)	67 records across a range of 90 km north and south of Dongara

5.3.2.8 Introduced flora

Two introduced (weed) flora species were recorded as occurring within the Development Envelope, *Hypochaeris glabra* and *Echium plantagineum*.

H. glabra occurs within the AcEbHh, EtAhHh and EtBaHh vegetation communities. It is likely this weed is being spread via the movement of cattle and other introduced fauna species (ELA 2021). This species is not listed as a Weed of National Significance or as a Declared Pest under the State BAM Act, and is listed on the Western Australian Organism List database as s11 (permitted).

E. plantagineum is listed as a Declared Pest under the State BAM Act and on the Western Australian Organism List database. This species was recorded once opportunistically in the Development Envelope (ELA 2021).

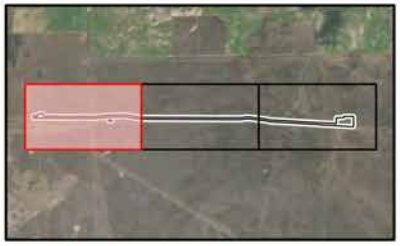
Figure 5-3: Conservation significant flora recorded in the Development Envelope (Page 1 of 3)

Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Species

- *Guichenotia alba* (P3)
- *Banksia scabrella* (P4)
- *Stawellia dimorphantha* (P4)



0 125 250 500
Metres

Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

ecological AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

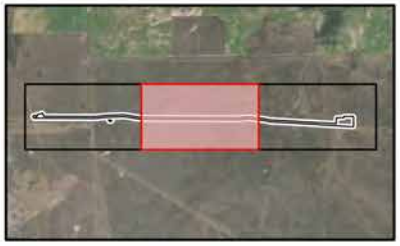
Figure 5-3: Conservation significant flora recorded in the Development Envelope (Page 2 of 3)

Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Species

- *Lasiopetalum ogilvieanum* (P1)
- *Micromyrtus rogeri* (P1)
- *Guichenotia alba* (P3)
- *Stylidium drummondianum* (P3)
- *Banksia scabrella* (P4)
- *Eucalyptus macrocarpa* subsp. *elachantha* (P4)



0 125 250 500
Metres

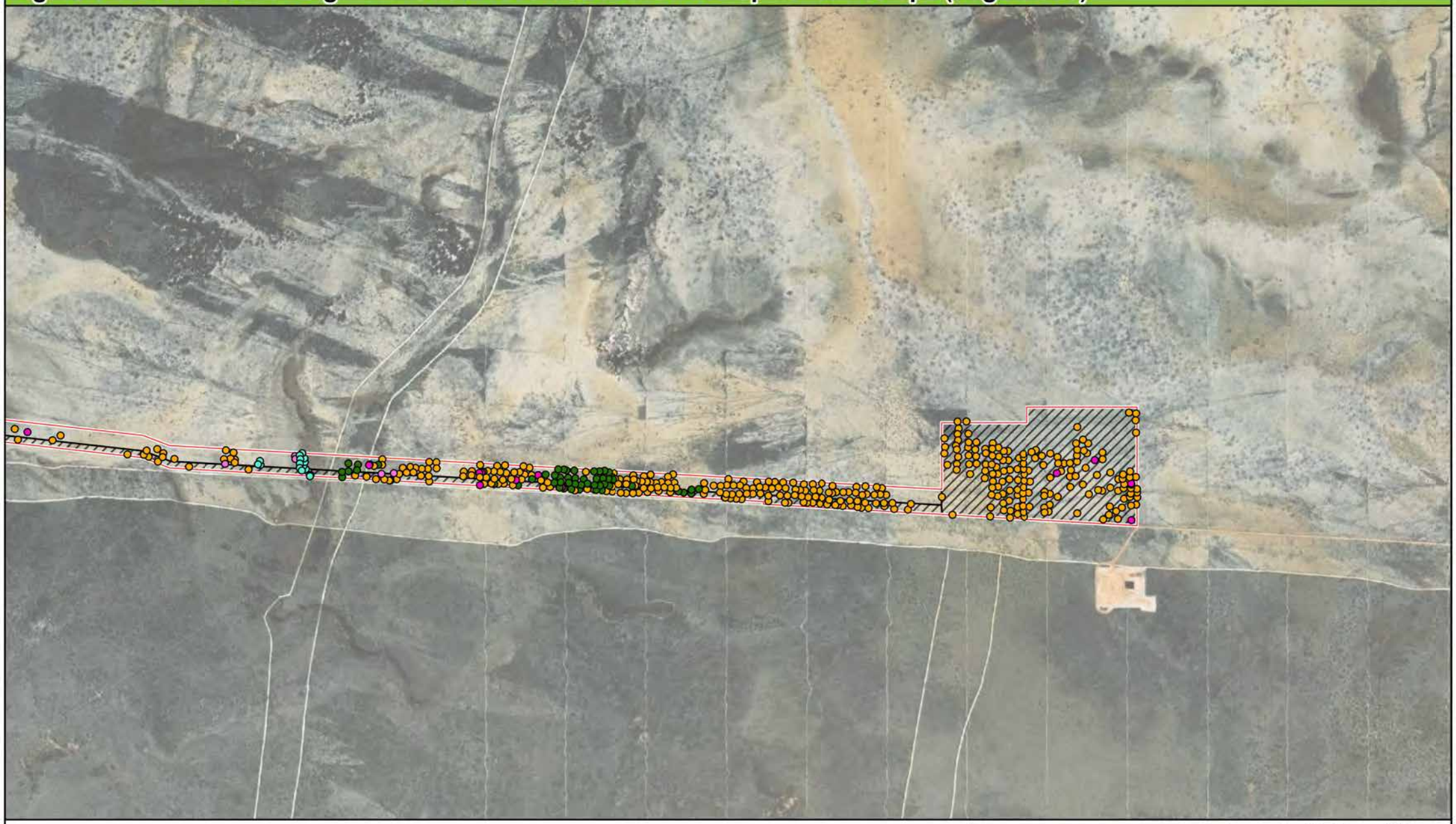
Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

ecological AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

Figure 5-3: Conservation significant flora recorded in the Development Envelope (Page 3 of 3)



Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Species

- *Lasiopetalum ogilvieanum* (P1)
- *Micromyrtus rogeri* (P1)
- *Mesomelaena stygia* subsp. *deflexa* (P3)
- *Stylidium drummondianum* (P3)
- *Banksia scabrella* (P4)

0 125 250 500
Metres

Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

5.4 Potential impacts

The Proposal will result in the direct loss of flora and vegetation through clearing. Impacts to conservation significant flora and vegetation have been minimised where possible.

The Proposal may also result in indirect impacts on flora and vegetation, including:

- Fragmentation of native vegetation
- Introduction and/or spread of weeds to surrounding vegetation
- Smothering of vegetation by dust generated from construction of the Proposal
- Damage or loss of surrounding vegetation through accidental bushfires.

5.5 Assessment of impacts

5.5.1 Loss of Flora and Vegetation

The Proposal will result in clearing of up to 90 ha of native vegetation, approximately 42% of the Development Envelope.

At a regional scale, the percentage impact to Beard (1976) vegetation associations (49, 378 and 379) and land systems (Mount Adams and Correy; DPIRD 2020) as a result of the project is low. Each of these land systems is well represented across the broader landscape, with the survey area representing a small percentage of the current extent of each (0.2% and 0.1% respectively).

Two land systems will be impacted by the clearing associated with the Proposal (Table 5-7).

Table 5-7: Potential impact on land systems within the Development Envelope

Land system	Extent within Geraldton Sandplains Bioregion (ha)	Extent within Development Envelope (ha)	Extent within Disturbance Footprint (ha)	% reduction in Geraldton Sandplains Bioregion as a result of Proposal clearing
Mount Adams	86,963.2	187.3	85.1	0.1
Correy	27,251.6	25	4.8	0.02
TOTAL	**114,214.8**	**212.2**	**89.9**	**0.1**

Three pre-European vegetation associations (Beard 1976) will be impacted by clearing for the Proposal (Table 5-8).

Table 5-8: Potential impact on pre-European vegetation associations in the Lesueur Sandplain subregion

Vegetation association	Current extent remaining (ha)	% of pre-European extent remaining	Extent in Disturbance Footprint (ha)	% of pre-European extent remaining after Proposal clearing
49	13,618.88	41.10	3.7	41.08
378	60,668.26	66.72	9.7	66.71
379	111,632.48	30.17	76.6	30.15

At a local scale, the Proposal will clear up to 90 ha of native vegetation across seven (including cleared) mapped vegetation communities (Table 5-9). However, impacts to individual communities as a result

of the project are considered low. Of particular note is vegetation community EtAhHh which comprises *Banksia scabrella* as the main component. This community is similar to Woodman (2013) mapped vegetation type (VT) 13a, of which 1,740 ha was mapped. Therefore, it is unlikely that the proposed pipeline would appreciably reduce the representativeness of either vegetation communities in the local area or at a regional scale.

Table 5-9: Proposed clearing of vegetation communities

Vegetation community	Extent in Development Envelope (ha)	Extent in Disturbance Footprint (ha)	% retained in Development Envelope after Proposal clearing
AcEbHh	72.2	38.3	47
EtAhHh	55	24.4	55.6
BpDdHh	12	7.4	38.4
AcAhGp	5.5	1.5	73.2
AcDdMl	35.9	11.1	69.2
EtBaHh	28.1	5.9	79.1
Cleared	3.5	1.5	58.5
TOTAL	**212.2**	**89.9**	**57.6**

The wider Development Envelope contains eight conservation significant flora species. Implementation of the Proposal will result in clearing of individuals from all eight Priority flora species in the Development Envelope. The loss of individuals and populations in the Disturbance Footprint is shown in Table 5-10.

Ten *Eucalyptus macrocarpa* subsp. *elachantha* (P4) individuals were recorded in the Development Envelope and all are within the indicative Disturbance Footprint. However, this species is known from 73 DBCA records across a wider range of 230 km south of Geraldton to south of Dongara (DBCA 2007-2020). Therefore, this loss of ten P4 individuals is not considered significant.

The number of *Banksia scabrella* (P4) populations in the Development Envelope will be reduced by 52%. Given the retention of 5761 individuals within the Development Envelope, this loss of a P4 species is not considered significant.

The majority of all other Priority species in the Development Envelope will be retained and therefore, no significant impacts are expected (Table 5-10).

Table 5-10: Impacts to Priority flora

Species	No. of populations (individuals) in the Development Envelope	No. of populations (individuals) in the Disturbance Footprint	Percentage (%) loss of population known within Development Envelope
Micromyrtus rogeri (P1)	18 (939)	5 (129)	27.8
Lasiopetalum ogilvieanum (P1)	21 (100)	8 (58)	38.1
Guichenotia alba (P3)	63 (607)	4 (9)	6.3
Mesomelaena stygia subsp. Deflexa (P3)	55 (4,648)	15 (1737)	27.3
Stylidium drummondianum (P3)	10 (54)	2 (12)	20
Banksia scabrella (P4)	484 (10,776)	252 (5015)	52
Eucalyptus macrocarpa subsp. *Elachantha* (P4)	1 (10)	1 (10)	100
Stawellia dimorphantha (P4)	45 (298)	16 (116)	35.6

5.5.2 Fragmentation of native vegetation

Clearing of native vegetation for the construction of the Proposal has the potential to result in the fragmentation of vegetation. Fragmentation occurs when the continuity of vegetation is disrupted and reduced into a smaller number of patches. The spatial and temporal isolation of patches can lead to a decline in biodiversity due to a reduced ability for flora species recruitment, which can result in an altered community structure.

It is considered that the narrow and linear nature of the proposed pipeline is not sufficient to cause significant fragmentation of native vegetation. In addition, native vegetation within the proposed gas processing plant location is well represented within the wider Development Envelope.

5.5.3 Introduction and/or spread of weeds

Clearing, vehicle and machinery movements have the potential to increase the spread and/or introduce weed species. Weeds are often able to rapidly invade locations due to disturbance, land clearing and/or altered hydrological regimes. One weed species has been recorded within the Development Envelope, *Hypochaeris glabra,* however this is not a Declared Pest or listed Weeds of National Significance species (ELA 2021).

The Proponent has established weed and hygiene management measures in the CEMP (E-PLN-034) to reduce the risk of existing weeds being spread or new weeds being introduced into the Development Envelope. These measures of weed control include:

- regular and ongoing inspections
- monitoring and auditing of the pipeline corridor
- compliance with Clean on Entry procedures where soil, topsoil, rehabilitation and vehicle movements occur
- targeted control of infestations.

5.5.4 Smothering of vegetation by dust generated during construction

Dust will be generated from construction activities, such as vegetation clearing and excavations, and from vehicle movements. Excessive dust deposition on vegetation foliage has the potential to affect vegetation health and condition.

Dust mitigation measures are provided in the CEMP (E-PLN-034) to reduce impacts to surroundings. Measures to be implemented include:

- ensuring vehicles with dust emitting loads are covered (except when loading and unloading)
- reducing speed limits on unsealed roads and right of way
- minimising time between clearing and grading and backfill/reinstatement
- application of water or stabilisers via water trucks and sprayers to dampen down soil as required
- potential use of dust stabilisers, water, tarps or geo-textile materials to suppress dust from stockpiles.

These measures are expected to effectively mitigate risk to surrounding vegetation from dust.

5.5.5 Accidental bushfires

Construction activities, particularly clearing of native vegetation and welding, and the movement of vehicles and heavy machinery have the potential to result in a bushfire that could cause widespread damage and loss of native vegetation and flora.

A number of mitigation measures are identified in the CEMP to be implemented in relation to minimising bushfire risk, including:

- Abiding by all Bushfire Regulations including total fire ban requirements (daily checks on fire danger rating to be undertaken).
- Ensuring activities are conducted in accordance with relevant first restrictions (local, state), notifications and permitting procedures, such as:
  - designated smoking areas
  - all plant and equipment to comply to fire safety standards
  - fire breaks are in place and maintained
  - high gas risk areas demarcated and appropriately signposted
  - appropriate, maintained firefighting equipment available at all times
  - selected personnel trained in responding to fires.

These measures are expected to effectively mitigate fire risks.

5.5.6 Cumulative impacts

There are a number of existing and reasonably foreseeable projects in the Mid-West region which have been considered in the assessment of cumulative impacts:

- Existing and historic projects: West Erregulla 2 Exploration Well
- Reasonably foreseeable projects: Dongara Titanium Minerals Project, Northern Goldfields Interconnect Pipeline, Waitsia Gas Project Stage 2, Raven 2D Seismic Acquisition Survey and the Cervantes-01 Conventional Well Drilling Proposal.

The predicted extents of cumulative impacts from the Proposal, the existing West Erregulla 2 Exploration Well and the abovementioned foreseeable future projects are provided in Table 5-11.

Table 5-11: Cumulative native vegetation clearing from foreseeable future projects in proximity to the Proposal

Project	Proposed extent of native vegetation disturbance (ha)
Proposal	90
Dongara Titanium Minerals Project	1,315
Northern Goldfields Interconnect Pipeline	1,934
Waitsia Gas Project Stage 2	17
Raven 2D Seismic Acquisition Survey	40
Cervantes-01 Conventional Well Drilling Proposal	5.3
West Erregulla 2 Exploration Well	70
TOTAL	**3,471.3**

Based on the above predicted impacts, the Proposal will contribute to approximately 2.6% of the foreseeable cumulative impact of clearing in the region (Table 5-12).

The six vegetation types that occur within the Development Envelope correlate to three of the broad-scale Pre-European vegetation associations (Beard 1976; Table 5-3).

All of the recently approved and foreseeable projects, to some extent, fall within the Geraldton Sandplains Bioregion, however not all of the projects impact on the three Pre-European Associations (Table 5-12). Northern Goldfields Interconnect Pipeline, Raven 2D Seismic Survey and the Cervantes 1 Conventional Oil Exploration Well projects do not contain the three vegetation associations present in the Development Envelope, which can be attributed to the small extent of the Development Envelope and high variability of Vegetation Associations found in the Geraldton Sandplains Bioregion.

The potential impacts to the three Pre-European vegetation associations within the Development Envelope for relevant projects are presented in Table 5-12, however should be treated as indicative estimates only.

The Proposal will account for 0.04%, 0.2% and 0.0005% of clearing to Tathra 49, Eridoon 378 and Tathra 379 Pre-European extents respectively (Table 5-12). The Proposal, when totalled with reasonably foreseeable projects in the region (that detail quantitative impacts of clearing), will cumulatively increase the total impact to Pre-European vegetation by less than 0.3%. As such, the Proposal is not expected to have a significant cumulative impact.

Table 5-12: Proposed clearing of Pre-European vegetation units within the Lesueur Sandplains subregion (GoWA 2018)

Vegetation association	Pre-European extent (ha)	Current extent remaining (ha)	% of pre-European extent remaining	Proposal clearing (ha) (% of Pre-European extent)	Dongara Titanium Minerals Project (ha) (% of pre-European extent)	Waitsia Gas Project Stage 2 (ha) (% of pre-European extent)	West Erregulla 2 Exploration Well[3]	Total cumulative clearing (ha) (% of pre-European extent)
49	33,139.33	13,618.88	41.10	12.1 (0.04)	N/A	N/A	N/A	12.1 (0.04)
378	90,922.87	60,668.26	66.72	46.1 (0.05)	1385 (1.5)	6.1 (0.007)	N/A	1437.2 (0.2)
379	370,029.76	111,632.48	30.17	154 (0.04)	15 (0.004)	N/A	N/A	169 (0.0005)

[1] Includes Existing and historic projects

[2] Total cumulative clearing = historical + proposed + reasonably foreseeable

[3]Extent of impact on Tathra 49 and Tathra 379 vegetation associations is not disclosed in publicly available data.

5.6 Mitigation

The mitigation hierarchy (avoid, minimise, and rehabilitate) has been applied to reduce the potential impacts of the Proposal to flora and vegetation. A summary of mitigation measures is provided in Table 5-13 below.

Table 5-13: Application of mitigation hierarchy for flora and vegetation

Potential impact	Avoidance	Minimisation	Rehabilitation
Loss of flora and vegetation	A pre-clearance site walkover with a qualified ecologist will be undertaken to avoid conservation significant flora or fauna where practicable.	The footprint for the gas processing plant has been minimised as far as practicable to reduce the extent of clearing required. Vegetation clearing shall be kept to the minimum amount necessary to allow access or approved works and stockpiled separately.	Approximately 24 m of the 30 m wide pipeline corridor will be rehabilitated. In total 41.5 ha of the Disturbance Footprint is proposed to be rehabilitated following completion of construction activities.
Fragmentation of native vegetation	Existing tracks and other infrastructure (e.g. fence lines) will be utilised to the maximum extent practicable.	Vegetation clearing to be minimised.	
Introduction and/or spread of weeds	One weed species is currently present within the Development Envelope.	The Proponent commits to undertake weed control and hygiene management in accordance with the CEMP.	
Smothering of vegetation by dust	Dust suppression measures will be utilised as required in accordance with the CEMP.	Topsoil stockpiles will not exceed to 2 m in height and traffic speed limits reduced	

Potential impact	Avoidance	Minimisation	Rehabilitation
	Vehicle and equipment access will be restricted to designated roads/tracks and cleared areas.	on unsealed roads and right of way.	
Accidental bushfires	Vehicle and equipment access will be restricted to designated roads/tracks and cleared areas. DFES alerts regarding fire ban days will be monitored during high risk activities.	All machinery and vehicles undertaking clearing activities will have fire extinguishers. The construction works will be undertaken in accordance with the CEMP.	

5.7 Predicted outcome

After the application of the mitigation hierarchy, the Proposal is predicted to result in the following impacts to flora and vegetation:

- Clearing of 90 ha of native vegetation within a 213 ha Development Envelope.
- Loss of Priority flora species including 10 individuals of *Eucalyptus macrocarpa* subsp. *elachantha* (P4) species, and up to 5,010 individuals (46.5% of individuals in recorded in Development Envelope) of *Banksia scabrella* (P4) species.
- Priority flora will continue to exist in the Development Envelope, surrounding vegetation and more broadly in the region so no impacts are considered significant.
- No impact to any Threatened Flora or listed TECs or PECs, as none are present within the Development Envelope.

The Proponent considers that impacts after the application of the mitigation hierarchy from the Proposal can be managed to meet the EPA's objective for flora and vegetation.

6. Terrestrial fauna

6.1 EPA objective

The EPA's objective for terrestrial fauna is to '*protect terrestrial fauna so that biological diversity and ecological integrity are maintained*' (EPA 2020c).

6.2 Policy and guidance

6.2.1 EPA policy and guidance

The following EPA Technical Guidance documents are relevant to the terrestrial fauna factor:

- Instructions on how to prepare an Environmental Review Document (EPA 2020a)
- Statement of Environmental Principles, Factors and Objectives (EPA 2020c)
- BC Act
- Environmental Factor Guideline – Terrestrial Fauna (EPA 2016c)
- Technical Guidance: Terrestrial Fauna Surveys (EPA 2016d)
- Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020e)
- Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna (EPA 2016e)
- Technical Guidance: Sampling Methods for Short Range Endemic Invertebrate Fauna (EPA 2016f).

6.2.2 Other policy and guidance

Other policy and guidance relevant to terrestrial fauna includes:

- EPBC Act Environmental Offsets Policy (DSEWPAC 2012b)
- Survey guidelines for Australia's threatened birds (Department of Environment, Water, Heritage and the Arts (DEWHA 2010a)
- Survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC 2011a)
- Survey guidelines for Australia's threatened reptiles (DSEWPaC 2011b)
- Survey guidelines for Australia's threatened bats (DEWHA 2010b)
- Threat abatement plan for predation by feral cats (DoE 2015)
- Threat Abatement Plan for Predation by the European Red Fox (DEWHA 2008a)
- Threat Abatement Plan for competition and land degradation by unmanaged goats (DEWHA 2008b)
- Threat Abatement Plan for competition and land degradation by rabbits (DotEE 2016)
- WA Environmental Offsets Policy (Government of Western Australia 2011)
- WA Environmental Offsets Guidelines (Government of Western Australia 2014).

6.3 Receiving environment

6.3.1 Previous studies

The fauna habitat and values in the Development Envelope are generally well understood. Relevant terrestrial fauna surveys undertaken in areas that intersect the Development Envelope are summarised in Table 6-1 and Appendix C and Appendix D.

Table 6-1: Terrestrial fauna surveys conducted within the Development Envelope

Study	Survey type and location	Summary
ELA 2021 (Appendix D) West Erregulla Pipeline Flora and Fauna Survey	Detailed and Targeted flora survey and vegetation condition assessment, Basic fauna survey, Targeted Black Cockatoo habitat assessment and Targeted Malleefowl survey (of the Development Envelope).	No individuals of the targeted threatened species Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Malleefowl (*Leipoa ocellata*) recorded.
Mattiske Consulting Pty Ltd 2020 (Appendix C) Review of Key Potential Flora, Vegetation and Fauna values on the proposed pipeline for Strike Energy near Dongara	Desktop assessment of the potential flora, vegetation and fauna values present.	10 threatened fauna species have the potential to occur.

6.3.2 Fauna habitat

Three fauna habitats have been mapped within the Development Envelope, covering a total of 208.7 ha (98.33% of the Development Envelope). The remaining 3.5 ha (1.67% of the Development Envelope) is described as Cleared areas, providing limited fauna habitat values.

The fauna habitats identified within the Development Envelope are described in Table 6-2.

Fauna habitat areas (outside of cleared areas) are considered to be in Excellent condition (ELA 2021). However, habitats identified within the area are considered unlikely to support conservation significant species, except potentially low-quality foraging habitat for the Carnaby's Cockatoo (*Calyptorhynchus latirostris*).

None of these habitats are restricted to the Development Envelope. All habitat types are relatively common in the region and wider subregion.

Table 6-2: Terrestrial fauna habitats

Fauna habitat code	Fauna habitat description	Extent in Development Envelope (ha)	Extent in Disturbance Footprint (ha)
Fauna habitat 1	*Allocasuarina campestris* tall sparse shrubland over shrubs and sedgeland on sandy plains	72.2	38.3
Fauna habitat 2	*Banksia* spp. and occasional *Eucalyptus todtiana* mid open woodland over shrubs and sedgeland on sandy plains	95.1	37.7
Fauna habitat 3	*Allocasuarina campestris* tall sparse shrubland over shrubs and sedgeland on stony rises	41.4	12.5
Cleared	-	3.5	1.5
Total		**212.2**	**89.9**

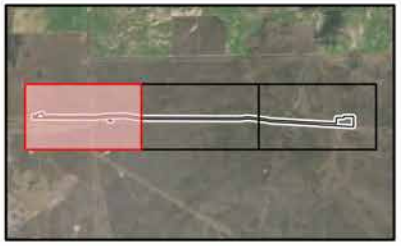
Figure 6-1: Fauna habitat recorded within the Development Envelope (Page 1 of 3)

Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Fauna Habitat

- Fauna Habitat 1: *Allocasuarina campestris* tall sparse shrubland over shrubs and sedgeland on sandy plains
- Fauna Habitat 2: *Banksia* spp. and occasional *Eucalyptus todtiana* mid open woodland over shrubs and sedgeland on sand plains
- Fauna Habitat 3: *Allocasuarina campestris* tall sparse shrubland over shrubs and sedgeland on stony rises
- Cleared



0 125 250 500
Metres

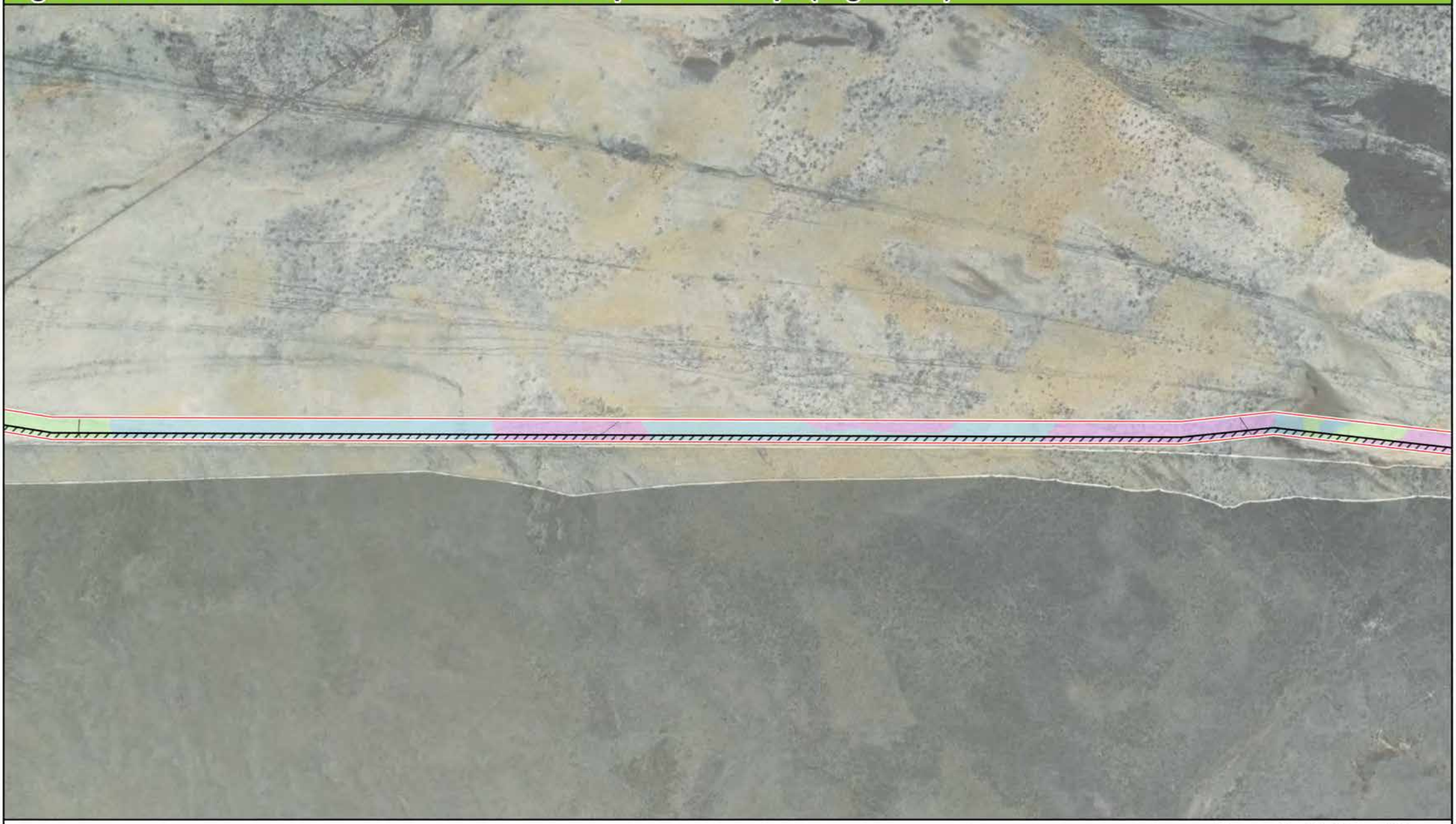
Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

ecological AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

Figure 6-1: Fauna habitat recorded within the Development Envelope (Page 2 of 3)

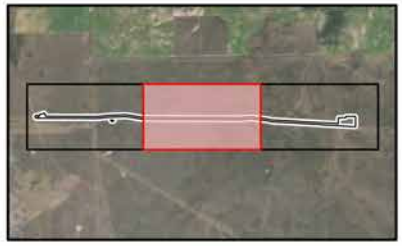


Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Fauna Habitat

- Fauna Habitat 1: *Allocasuarina campestris* tall sparse shrubland over shrubs and sedgeland on sandy plains
- Fauna Habitat 2: *Banksia* spp. and occasional *Eucalyptus todtiana* mid open woodland over shrubs and sedgeland on sand plains
- Fauna Habitat 3: *Allocasuarina campestris* tall sparse shrubland over shrubs and sedgeland on stony rises
- Cleared



0 125 250 500
Metres

Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

ecological AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

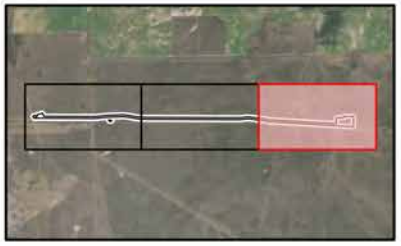
Figure 6-1: Fauna habitat recorded within the Development Envelope (Page 3 of 3)

Legend

- Development Envelope (213 ha)
- Disturbance Footprint (90 ha)

Fauna Habitat

- Fauna Habitat 1: *Allocasuarina campestris* tall sparse shrubland over shrubs and sedgeland on sandy plains
- Fauna Habitat 2: *Banksia* spp. and occasional *Eucalyptus todtiana* mid open woodland over shrubs and sedgeland on sand plains
- Fauna Habitat 3: *Allocasuarina campestris* tall sparse shrubland over shrubs and sedgeland on stony rises
- Cleared



0 125 250 500
Metres

Scale: 1:20,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

ecological AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 19/03/2021

6.3.3 Species diversity

A total of 35 fauna species (31 native and four introduced species) have been recorded within the Development Envelope (ELA 2021). This number comprised 28 bird species, five mammal species and two reptile species.

Avifauna

Twenty-eight bird species have been recorded within the Development Envelope. Bird species were predominantly observed where a definitive canopy was present and vegetation cover was thickest.

Mammals

Five mammal species were identified in the Development Envelope, of which four are introduced species. These include:

- Cattle (*Bos taurus)*
- Domestic Dog (*Canis lupus familiaris)*
- Goat (*Capra hircus)*
- European Rabbit (*Oryctolagus cuniculus).*

The Wester Grey Kangaroo (*Macropus fuliginosus)* is the only native mammal species recorded within the Development Envelope (ELA 2021).

Reptiles

Two reptile species were recorded by ELA (2021) including:

- Spotted military dragon (*Ctenophorus maculatus* subsp. *maculatus*)
- Western Spiny-tailed Skink (*Egernia stokesii badia*).

No conservation significant reptile species were recorded within the Development Envelope.

Invertebrates

Two invertebrate species were recorded by ELA (2021) including:

- Scorpion (*Cercophonius michaelseni*)
- Shield-backed Trapdoor Spider (*Idiosoma nigrum*).

6.3.4 Conservation significant fauna

Database searches identified 46 conservation significant fauna species as possibly occurring within the Development Envelope. Of these, only four conservation significant fauna species were identified as potentially occurring, based on the species habitat preferences and proximity of records to the survey area (ELA 2021). These are:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*; listed as EN under the EPBC Act and BC Act)
- Fork-tailed Swift (*Apus pacificus;* listed as MI under the EPBC Act and BC Act)
- Grey Falcon (*Falco hypoleucos*; listed as VU under the BC Act)
- Peregrine Falcon (*Falco peregrinus*; listed as OS under the BC Act).

The Carnaby's Cockatoo and Fork-tailed Swift are MNES under the EPBC Act. These species are discussed separately in the MNES section (Section 9) and not addressed further in this section.

Historical records of conservation significant fauna species previously found within 20 km of the Development Envelope are shown in Figure 6-2. Although historically recorded within 2 km of the Development Envelope, the Western brush wallaby (*Phasmoes jeeba*) was not recorded by ELA (2021) and is considered unlikely to occur due to unsuitable habitat for the species within the Development Envelope.

No direct (observations) or indirect (scats, tracks, diggings) evidence of conservation significant fauna species listed under the Commonwealth EPBC Act, the State BC Act or by the DBCA were recorded within the Development Envelope.

The Grey Falcon (*Falco hypoleucos*) and Peregrine Falcon (*Falco peregrinus*) have diverse and wide-ranging habitats, including those which occur within the Development Envelope. However, these species are not considered likely to utilise the Development Envelope regularly due to lack of access to appropriate nesting habitat, water, and preferred and abundant prey species. As a result, these species are described below but not assessed further.

Figure 6-2: Conservation significant fauna species previously found within 20km of the Development Envelope

Legend

Development Envelope (213 ha)

Conservation significant fauna species (DBCA 2020c)

- Carnaby's cockatoo (*Calyptorhynchus latirostris*, EN)
- White-tailed black cockatoo (*Calyptorhynchus* sp. 'white-tailed black cockatoo', EN)
- Malleefowl (*Leipoa ocellata*, VU)
- Black-striped snake (*Neelaps calonotos*, P3)
- Western brush wallaby (*Phasmodes jeeba*, P4)

0 2.5 5
Kilometers

Scale: 1:200,000
Datum/Projection:
GDA 1994 MGA Zone 50

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

Project: 20PER16294-GM Date: 17/03/2021

6.4 Potential impacts

The Proposal has the potential to directly and indirectly impact on terrestrial fauna values. The direct impacts from the Proposal include:

- Loss of fauna habitat
- Injury, mortality or displacement of conservation significant fauna.

The potential indirect impacts on terrestrial fauna as a result of the Proposal include:

- fragmentation of fauna habitat
- disturbance to native fauna from dust, light overspill and noise
- increased competition or predation by introduced species
- accidental bushfires.

6.5 Assessment of impacts

6.5.1 Direct loss of fauna habitat

Vertebrate fauna habitats that will potentially be directly impacted by the Proposal are presented in Table 6-2 and include three broad fauna habitat types.

Clearing for the Proposal will result in disturbance of 90 ha of fauna habitat within a 213 ha Development Envelope to enable the construction and operation of the Proposal. This includes approximately 1.5 ha (1.6%) of areas already cleared. The maximum extent of clearing for each habitat type is identified in Table 6-3 below.

Following completion of construction, approximately 41.5 ha (46%) of the Disturbance Footprint will be progressively rehabilitated. Therefore, the permanent habitat loss will be 48.5 ha.

None of the fauna habitats present are restricted to the Development Envelope, nor are they restricted at local, sub-regional or regional scales. Therefore, habitat loss is not considered significant. At least 47% of each habitat type will be retained within the Development Envelope (Table 6-3).

Table 6-3: Extent of habitats proposed to be cleared for the Proposal

Habitat type (as mapped by ELA 2021)	Total in Development Envelope (ha)	Proposed to be cleared (ha)	Percentage in Development Envelope proposed to be cleared (%)	Remaining in Development Envelope (%)
Fauna habitat 1	72.2	38.2	53	47
Fauna habitat 2	95.1	37.7	39.6	60.4
Fauna habitat 3	41.4	12.5	30.3	69.7

The Proposal will clear up to 90 ha of fauna habitat within the Development Envelope, with 41.5 ha of disturbance proposed to be rehabilitated following construction. The greatest potential for fragmentation is along the 16.5 km pipeline corridor, which is surrounded be remnant vegetation. However, fauna species are expected to be able to freely cross this corridor following construction as

the pipeline will be buried and only a 6 m width cleared access corridor and an access track will remain. Therefore, no significant fragmentation of habitat is expected to occur as a result of the Proposal.

6.5.2 Injury, mortality or displacement of conservation significant fauna

Vehicle and machinery movements for construction and operation of the Proposal may result in fauna strike, causing injury or death of individuals. In the event of a fauna strike, the impact will be limited to an individual and will not result in population-wide impacts. Vehicle movements restricted to existing tracks and the implementation of speed limits on unsealed roads, will reduce the potential for a strike. Vehicle movement will take place mainly in the daytime and will be minimised in dawn and dusk periods, which will avoid interaction with nocturnal species. As a result, the potential impacts on fauna from interactions with vehicles and machinery are not expected to be significant and will not affect the conservation status of any of the species present.

There is also the potential for the mortality of individual fauna species from being trapped in an open trench during construction. The risk of mortality of fauna due to excavation shall be managed by the implementation of a range of management measures. Open trench lengths will not exceed lengths capable of being practically inspected and cleared by the available fauna teams at any time. Other management measures include:

- Completion of daily trench inspections within 3 hours of sunrise
- Installation of fauna exit ramps every 500 m of trench at a minimum
- Pipes will be inspected by fauna handlers prior to welding and observed fauna removed
- Fauna shelters will be installed every 100 m if trench is >500 m in length
- Fauna ramps to be placed at both ends of trenches
- All open trenches will be inspected within half an hour prior to backfilling and any entrapped fauna cleared by a fauna handler before backfilling can be completed
- Trench open time will be minimised
- All trenches shall be rehabilitated progressively.

On this basis, the use of vehicles and machinery and excavation activities associated with the Proposal is unlikely to result in injury or mortality of fauna species that will cause significant impact or result in the significant decline of a population of any native fauna species including conservation significant fauna known to occur within the Development Envelope.

6.5.3 Disturbance to native fauna from light, dust, noise and/or vibration

Light, noise, dust, and vibration have the potential to impact terrestrial fauna within direct proximity to construction and operational activities.

Noise emissions and vibration

Mechanical noise and vibration caused by construction and operational activities, particularly from blasting, has the potential to impact terrestrial fauna in the vicinity of the Proposal. These impacts may cause temporary disturbance and avoidance behaviour but are not likely to have long term effects in the vicinity of the pipeline and have very localised long-term effects adjacent to the gas processing facility. The Proponent has blast management strategies in place to minimise blasting activity where possible and potential impacts, and it is expected that the indirect impact to these habitats will not be significant.

Light emissions

Increased exposure to artificial light as a result of construction (and future operation) of the Proposal has the potential to impact on resident bird, reptile and mammal species. There are no known threatened nocturnal species or threatened bats species likely to occur in the area (which would be of most concern) and no recent records of threatened bird species utilising the area.

Dust emissions

Dust emissions have the potential to occur during clearing activities and from vehicle movement along access tracks during construction. Increased dust can disturb the vision of bird species and impact their ability to capture prey. In high wind conditions, dust may be temporarily generated during the construction phase. Any potential dust generation is expected to be of a short-duration and minimised in accordance with standard operational dust management measures in accordance with the CEMP and will not result in permanent impacts to fauna habitat.

It is not expected that light, dust, noise and vibration as a result of construction and operation activities of the Proposal will permanently deter native fauna, including conservation significant fauna, from the local area. The design of the plant also utilises equipment to minimise noise creation. Any impacts that may occur can be appropriately managed with the implementation of standard operational dust management practices and therefore, no significant impacts to terrestrial fauna are expected to occur as a result of the Proposal.

6.5.4 Increased competition or predation of native fauna by feral species

Five introduced fauna species have been recorded within the Development Envelope, including Cattle, Domestic Dog, Goat and European Rabbit. Feral species are widespread in the region surrounding the Development Envelope. The Proposal will not increase food or water availability for these species and numbers would not be expected to increase.

6.5.5 Reduction or loss of habitat due to increased fire frequency or intensity

The Proposal has the potential to increase the risk of accidental fires through ignition from vehicles, hot works (grinding, welding etc.) or other activities such as smoking. To minimise this fire risk, all construction activities will be carried out in accordance with the requirements of regulatory and local fire authorities, including daily checks on fire danger rating, ensuring first response equipment is available and maintained in safe working order, and training selected personnel as specified in the CEMP.

Where possible, works involving welding and grinding will be undertaken offsite (i.e. in workshops, laydown yards) to reduce the amount of welding or ignition sources near gas risk areas or in fauna habitat. The Permit to Work System includes requirements for Hot Work Certificates to manage this activity including vehicle movement in hazardous areas. Fire control equipment will be available at all times and smoking will only be permitted within designated areas. These management measures will reduce the potential risk of fire in the Development Envelope and ensure procedures, personnel and equipment are available to respond to any fire that occurs in the vicinity of the Development Envelope. It is not considered that increased fire frequency or intensity is a significant impact as a result of the Proposal. All works will abide by the *Bush Fires Regulations 1954* requirements including a clear understanding of daily fire ratings. A Bushfire Management Plan is also being prepared to manage the

bushfire risk through implementation of a range of bushfire management measures in accordance with the *Guidelines for Planning in Bushfire Prone Areas v 1.3* (the Guidelines; WAPC 2017).

6.5.6 Cumulative impacts

The Proposal will contribute to regional cumulative impacts to the fauna habitats and species which are present in the Development Envelope.

Detailed fauna habitat mapping has been completed for the Development Envelope, however detailed mapping at the same scale is not available for the Lesueur Sandplain subregion. Land System mapping at a regional level by Department of Primary Industries and Regional Development (DPIRD) provides an opportunity to assess cumulative impacts on broad landscape units, as a surrogate for fauna habitat.

Cumulative impacts to broad-scale vegetation for all reasonably foreseeable projects is described in detail in Section 5.5.6. The estimated combined impacts of the Proposal, the existing West Erregulla-2 Exploration Well Project, and two reasonably foreseeable projects in the region will increase the total impact to each of the three pre-European vegetation types occurring in the Development Envelope by 0.3%.

6.6 Closure

A Rehabilitation Management Plan (RMP) has been developed for the Proposal and is included in Appendix E. The RMP includes objectives to ensure native vegetation and conservation significant species habitat is re-established in line with pre-disturbance conditions and that there is no increase in invasive weeds within the Development Envelope.

The Disturbance Footprint will be re-contoured to match the surrounding landforms and erosion controls constructed where necessary. Separately stockpiled topsoil will then be respread evenly across the Disturbance Footprint and any stockpiled vegetation placed to assist in soil retention, provision of seed stock and fauna shelter. Reseeding or revegetation (using appropriate species) of temporary disturbance areas of the Proposal may be undertaken to restore vegetation cover if and where areas do not respond to the initial rehabilitation treatment, as evaluated by monitoring.

The Proponent has successfully completed reinstatement and rehabilitation works on over 3,000 km of gas transmission pipelines. Rehabilitation will be consistent with this standard process, with potential for targeted management actions to be implemented, in particular, rehabilitation zones as relevant.

6.7 Mitigation

Mitigation strategies to address the potential impacts to terrestrial fauna and predicted outcomes in relation to potential impacts, are presented in Table 6-4.

Table 6-4: Application of mitigation hierarchy for terrestrial fauna

Potential Impact	Avoidance	Minimisation	Rehabilitation	Residual Impact
Habitat reduction and fragmentation as a result of clearing and construction	The final footprint will be informed by pre-clearance surveys and may enable avoidance of larger trees or other habitat features.	Habitat connectivity will be largely maintained with only a 6 m wide permanent corridor, buried pipeline and sufficient habitat will remain available in the Development Envelope to allow fauna to move around installed infrastructure and active mining.	Areas of vegetation disturbance not required for future operational use shall be rehabilitated in accordance with the RMP.	Residual impacts from the Proposal include the removal of: • permanent clearing of 48.5 ha of fauna habitat • temporary clearing of 41.5 ha of fauna habitat.
Interactions with vehicles or infrastructure, causing injury to, or mortality of individuals	Not applicable	Vehicle speed limits will be implemented, and vehicle movements will be restricted to existing tracks predominately during the daytime and limited at dusk and dawn periods. The Proponent commits to daily trench inspections and the installation of fauna egress from excavations or trenches and fauna shelters and ramps as far as practicable.	Construction roads no longer required will be removed and rehabilitated progressively. The final access road for operations will be retained and appropriately sealed.	Vehicle movements and entrapment may result in mortality for fauna. The Proponent expects this can be appropriately managed. These impacts affect individuals and are not likely to cause a significant impact on a species population.
Disturbance to fauna from light, dust, noise and vibration	Lighting will be restricted to daytime operation and will not occur during night works (unless authorised under CEMP procedures).	The Proponent will implement standard operational dust management measures, such as dust suppression, to minimise disturbance to fauna habitats. Standard design and operating procedures to minimise noise including mobile plant and blasting.	Not applicable	The Proponent considers the Proposal can be managed to address any potential disruption from noise, vibration, dust and light on fauna occurring within the Development Envelope.

Potential Impact	Avoidance	Minimisation	Rehabilitation	Residual Impact
Introduction or spread of feral predators	The Proposal will not directly introduce animals to the Development Envelope, including feral animals or domestic pets.	The Proponent will implement environmental management measures (e.g. pest control)	The Proponent will undertake progressive rehabilitation to restore vegetation and habitats within cleared areas.	The Proponent considers the Proposal can be managed to minimise any potential impact to fauna from feral predators. The Proponent anticipates no significant residual impact on terrestrial fauna with respect to this potential impact.
Reduction or loss of habitat due to increased fire frequency or intensity	Abide by all Bushfire Regulations including total fire ban requirements (conduct daily checks on fire danger rating for daily prestart)	All activities are conducted in accordance with relevant fire restrictions (local, state), notifications and permitting procedures.	Not applicable	The Proponent considers the Proposal can be managed to minimise the ignition of accidental fires. The Proponent anticipates no significant residual impact on terrestrial fauna with respect to this potential impact.

6.8 Predicted outcome

The predicted outcomes of the Proposal in relation to terrestrial fauna include the clearing of up to 90 ha of fauna habitat comprising 48.5 ha of permanent clearing and 41.5 ha of temporary clearing, to be rehabilitated following construction. All habitats within the Development Envelope are widespread and no niche habitats are present. The potential for fragmentation is minimised as the gas pipeline is to be buried and fauna are likely to be able to move across the permanent 6 m width cleared pipeline corridor.

Indirect impacts are expected to be localised and unlikely to significant affect fauna. Through the implementation of the EPA's mitigation hierarchy, the residual impacts of the Proposal are unlikely to cause significant local or regional impacts to terrestrial fauna including any of the conservation significant fauna species As a result, the EPA's objective for terrestrial fauna will be met and biological diversity and ecological integrity will be maintained.

7. Inland Waters

7.1 EPA objective

The EPA's objective for inland waters is to *'maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected'* (EPA 2020c).

7.2 Policy and guidance

The following policy and guidance documents have been considered in the assessment of the inland waters factor:

- Environmental Factor Guideline: Inland Waters (EPA 2018)
- Statement of Environmental Principles, Factors and Objectives (EPA 2020c)
- Instructions on how to prepare an Environmental Review Document (EPA 2020a)
- Statutory Guidelines for Mine Closure Plans (DMIRS 2020)
- Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA 2020d)
- Water Quality Guidelines (ANZECC/ARMCANZ 2018).

7.3 Receiving environment

7.3.1 Previous studies

The Proponent has conducted a number of hydrological and hydrogeological studies relating to the Proposal (Table 7-1). Key studies relevant to the Proposed Change are provided in Appendix F, G and H.

Table 7-1: Summary of technical studies for Inland Waters

Report	Summary
ELA 2020 (Appendix F) Hydrology and Hydrogeology Baseline Report	Desktop and field assessment of existing regional hydrogeology and hydrology reports and characterise these conditions for the West Erregulla Project (this Proposal). This report summarises the baseline hydrogeological environment from monitoring data.
ELA 2018 (Appendix G) West Erregulla-2 Exploration Well – Groundwater Monitoring Plan	Groundwater Monitoring Plan prepared to support the drilling and construction of West-Erregulla 2 exploration well. This Monitoring Plan outlines the hydrogeological environment the well is installed in and groundwater monitoring requirements for Western Bore and Eastern Bore.
RPS 2011 (Appendix H) West Erregulla Groundwater Assessment	Groundwater assessment of the hydrogeological environment undertaken as part of preliminary investigations for the installation of West Erregulla 2 exploration well. This assessment determined possible water supplies for drilling operations, licencing requirements and an investigation into the ability of the Yarragadee Formation to meet operational demands.

7.3.2 Climate and rainfall

The Geraldton Sandplains bioregion (Lesueur Sandplain subregion, GS3) is characterised by a Mediterranean climate with dry, warm summers and wet, cool winters (Desmond and Chant 2002).

Eneabba and Carnamah weather stations are the closest Bureau of Meteorology weather stations from the Development Envelope, located approximately 50 km south and 65 km south-east respectively.

Climate data shows average rainfall is highest during the cooler months (May and August) recording 84.2 mm per month at Eneabba and 62 mm per month at Carnamah (BoM 2020). The driest months (November and March) range from 11.2 mm at Eneabba and 12.4 mm at Carnamah.

Available climate data indicates the Proposal is likely to experience a large rainfall gradient between coastal and inland areas due to its location approximately 20 km inland (RPS 2011). For example, the mean annual rainfall for coastal towns Geraldton and Eneabba is 447 and 490 mm respectively, while the long-term average for inland Carnamah and Morawa is 376 and 332 mm respectively (BoM 2020). Evaporation data is only available for Geraldton where the average annual pan evaporation is 2,445 mm, more than five times greater than average annual rainfall. Peak evaporation occurs in January with an average of 334.8 mm and the lowest evaporation occurs in July with an average of 93 mm (BoM 2020).

7.3.3 Surface water

The Development Envelope extends across the catchment divide of the Arrowsmith and Irwin River Catchments (Figure 7-1). The Arrowsmith Catchment (160,418 ha) contains the Arrowsmith River, approximately 15 km south of the Development Envelope, which flows in a westerly direction for 85 km before terminating in Arrowsmith Lake. The Irwin River Catchment (607,253 ha) incorporates four main tributaries of the Irwin River that discharge to the coast approximately 30 km northwest of the Development Envelope.

The Development Envelope is devoid of any significant surface water features, however small ephemeral drainage lines do dissect the Development Envelope and surrounding area (Figure 7-2). The nearest watercourse is Sand Plain Creek approximately 6 km north of the Development Envelope, a tributary to the Irwin River (RPS 2011).

The Development Envelope is not within any Surface Water Proclamation Areas pursuant to the *Rights in Water and Irrigation Act 1914* (RiWI Act). The nearest proclaimed area is the Greenough River and Tributaries Catchment Area, located approximately 60 km to the north of the Development Envelope.

Vegetation within the Development Envelope is unlikely to be riparian or Groundwater Dependant Ecosystems (GDEs), due to a lack of significant surface water features within or proximal to the Development Envelope and a depth to groundwater in excess of 130 metres below ground level (mbgl).

Given the lack of any significant surface water features in the Development Envelope, no surface water sampling has been undertaken. In addition, there has been no long-term surface water monitoring of the Arrowsmith or Irwin Rivers.

Figure 7-1: Regional Hydrology

Legend

- Towns (Statewide)
- Watercourse
- Catchment Boundaries
- Development Envelope

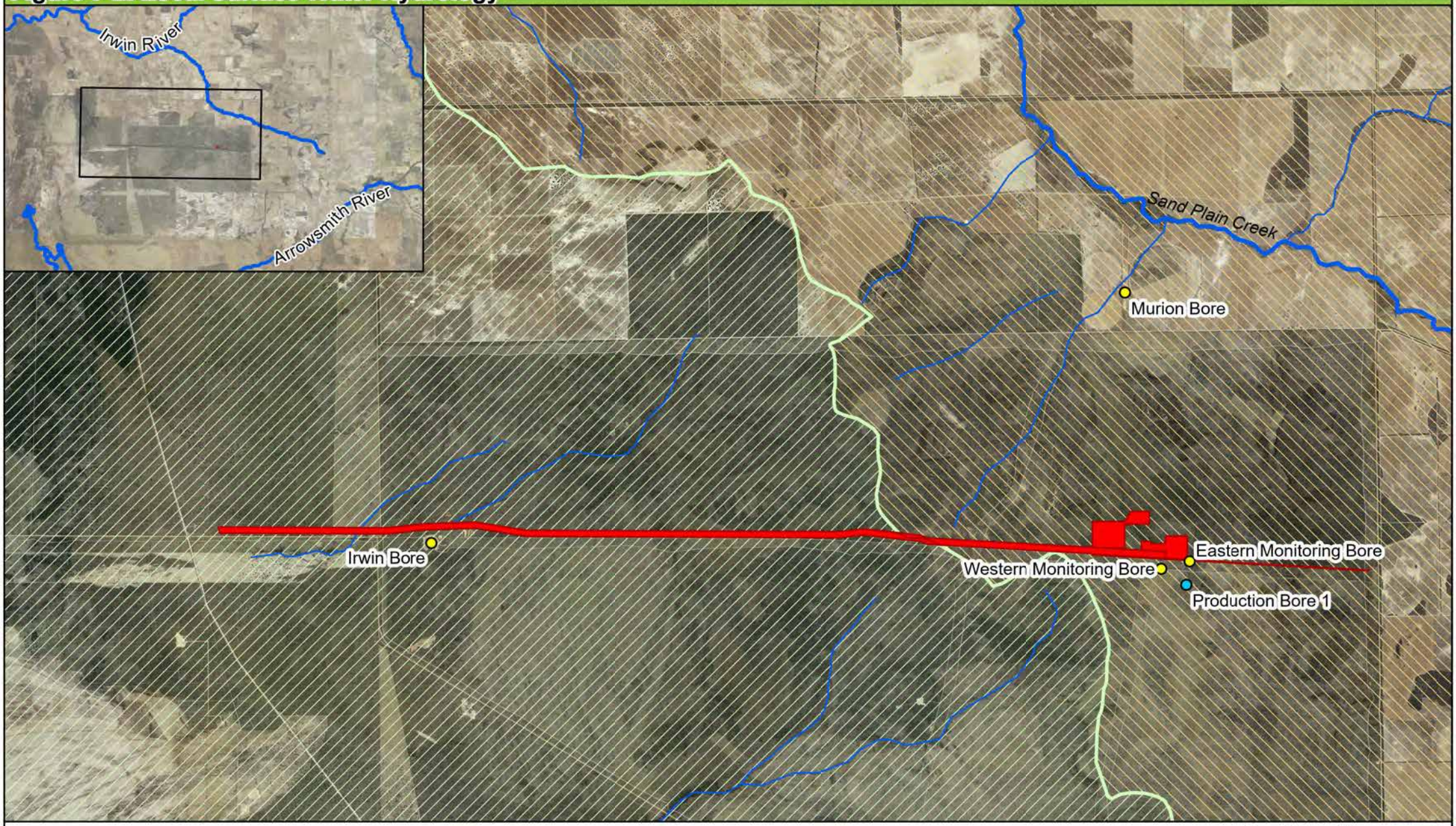
0 6.25 12.5 25
Kilometers
Datum/Projection:
GCS GDA 1994

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

16294-DD Date: 1/04/2021

Figure 7-2: Local Surface Water Hydrology



Legend

- Monitoring Bore
- Production Bore
- Watercourse
- Development Envelope
- Arrowsmith River Catchment
- Irwin River Catchment

0 0.75 1.5 3
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 50

N

ecological AUSTRALIA
A TETRA TECH COMPANY

16294-DD Date: 1/04/2021

7.3.4 Groundwater

7.3.4.1 Regional aquifers and use

Two major regional aquifers exist below the Development Envelope: the Yarragadee Aquifer and underlying Lesueur Sandstone. The two aquifers are separated by the Cadda Formation, Cattamarra Coal Measures and Eneabba Formation, of which the latter two contain groundwater but are understood to be internally confined by coal seams. Figure 7-3 displays a representative stratigraphy of geological formations underlying the Development Envelope (RPS 2011; Geoscience Australia 2021).

The Yarragadee Aquifer is the largest economic aquifer in the Northern Perth Basin extending from north of Dongara to the Nannup area south of Perth to a depth of 1,700 mbgl (RPS 2011). The Proposal will utilise groundwater from the Yarragadee Aquifer and therefore deeper units are not described further.

The Proposal is also located within the Twin Hills Groundwater Area, a sub-area of the Arrowsmith Groundwater Area proclaimed under the RiWI Act. Within the Northern Perth Basin there is an estimated 3 million gigalitres stored within the Yarragadee Aquifer, with approximately several hundred gigalitres of this classified as renewable (Pennington Scott 2010). Groundwater extracted from the Yarragadee Aquifer is currently utilised for town water supplies, mining and oil and gas operators, crop and fruiting agriculture and cattle grazing (RPS 2011).

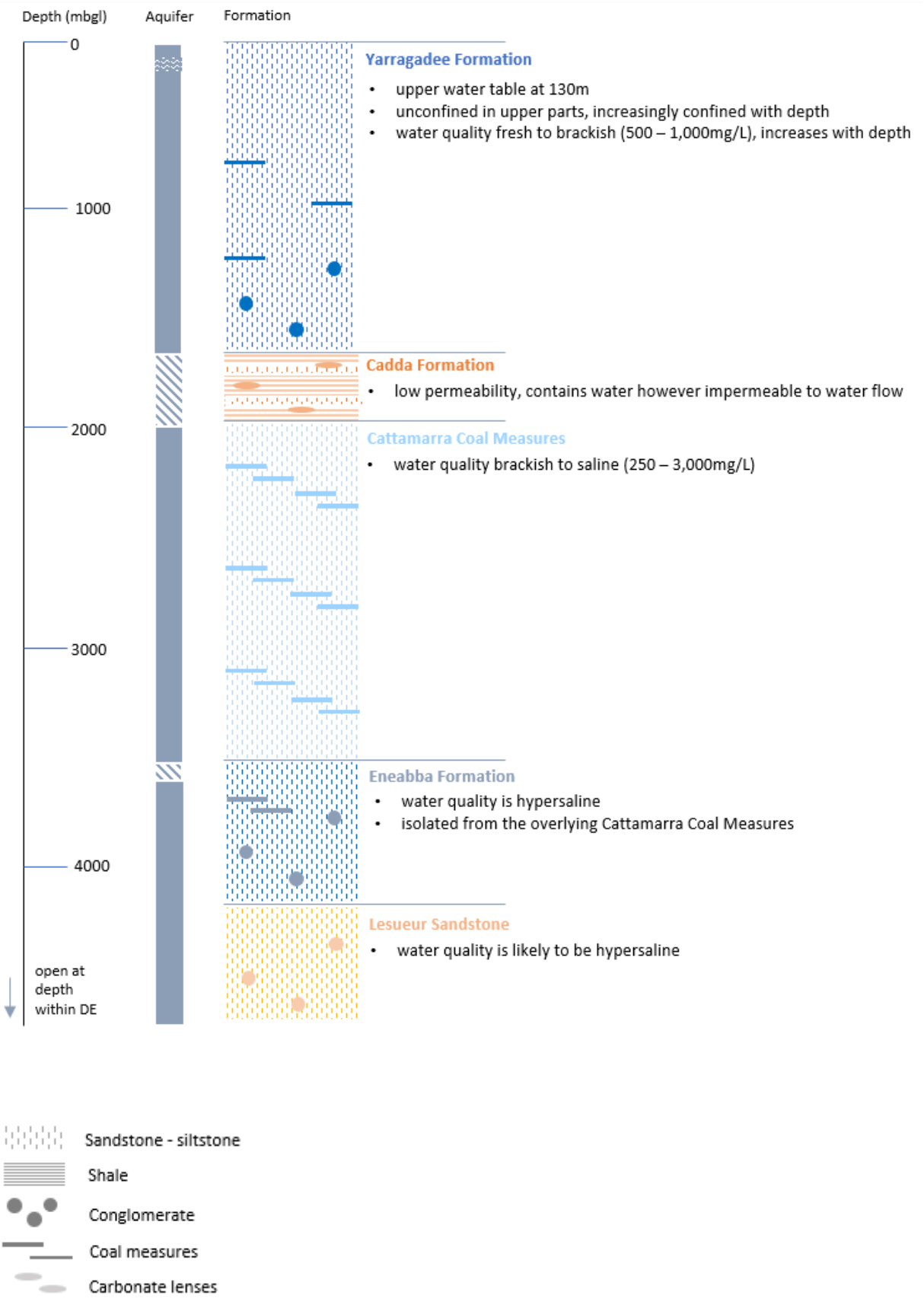
7.3.4.2 Regional groundwater levels and groundwater flows

Discharge from the Yarragadee Aquifer occurs as subsurface, artesian flow on the Swan Coastal Plain and locally as spring flow to the Irwin, Lockier and Arrowsmith Rivers (RPS 2011). The water table is mostly flat in the region, however, drops off significantly to the west far beyond the extent of the Development Envelope towards the Swan Coastal Plain (RPS 2011).

The limited data available for groundwater flow in the region precludes the identification of local influence of structural control on groundwater flow in the Development Envelope, however detailed studies elsewhere in the region have shown a close correlation between the regional water table configuration and the major regional faults (RPS (2011). This indicates that the major faults may inhibit groundwater flow and compartmentalise the main aquifers with water levels “stepping down” to the west.

Recharge rates have been inferred (based on a rainfall infiltration study of the Parmelia Formation, 20 to 30 km northeast of the Development Envelope) to be approximately 4% to 11% of annual rainfall (RPS 2011).

Figure 7-3: Stratigraphy of Development Envelope



7.4 Potential impacts

Potential direct impacts of the Proposal on Inland waters have been identified as:

- Drawdown of the Yarragadee Aquifer for water supply

In addition, activities that have the potential to cause indirect impacts to Inland Waters include:

- Alteration of surface water hydrological regime from installation of infrastructure
- Contamination of surface water due to increased erosion and sedimentation
- Contamination of surface water and groundwater quality from hazardous materials.

7.4.1 Direct impacts

7.4.1.1 Surface water

The Proposal will not have any direct impacts to surface water features as there are no surface water features within the Development Envelope or the smaller Proposal Disturbance Footprint. The closest watercourse, Sand Plain Creek is located 6 km from the Development Envelope.

The Proposal will require ground disturbing earthworks to a maximum depth of 5 mbgl for construction of a linear trench and as there are no surface water features within the Development Envelope, there will be no interaction with surface water that would disturb flow channels.

7.4.1.2 Groundwater

Water supply for the Proposal will be sourced from the existing Production Bore (PB1) at a rate of up to 20 kL/day from the Yarragadee Aquifer. This water will support the construction and operational needs of the Proposal, which is predominately for dust suppression. Wherever water demand is above this threshold, it will be trucked to site from local sources for the required duration. Water demand is expected to be greatest during the construction phase with minimal demand during operations.

7.4.2 Indirect impacts

The installation of infrastructure within the gas processing plant area has the potential to alter surface water regimes through the creation of diversion channels around ancillary infrastructure areas. However, the constructed pipeline will be installed below ground level and therefore only temporarily interrupt surface runoff.

Surface water runoff in the region naturally has the potential for increased sediment load during periods of intense rainfall. Disturbed material resulting from construction activities and areas where vegetation cover has been removed may increase the volume of sediment available to be mobilised during these events.

The Proposal has the potential to contaminate surface water and groundwater due to storage and handling of hazardous materials and waste. A Stormwater Management Plan (Enscope 2021) has been developed as part of the planning approval requirements and addresses the management of stormwater and water flow across the plant location. This includes the capture and management of stormwater to ensure no contamination before release to the environment.

7.4.3 Cumulative impacts

Cumulative impacts associated with the Proposal have been considered in the assessment of potential impacts. Within the Dongara-Eneabba specific users of the Yarragadee Aquifer include:

- Allanooka-Dongara Water Reserve
- Waitsia Gas Project Stage 2.

The Allanooka-Dongara Water Reserve consists of three borefields that supply the Geraldton Dongara Regional Water Scheme (DWER 2019). This Water Scheme provides drinking water for eight townships within the Mid-West region as well as services that draw water directly from the Geraldton – Mullewa pipeline. The Scheme is currently licenced for 14,650,000 kilolitres per year (kL/yr) of abstraction from the Yarragadee Formation.

The Waitsia Gas Project, located approximately 16 km east of Dongara, is facilitated by on-site bores that are estimated to extract 43,800 kL/yr. This water abstraction supplies utility stations and is used as a firefighting medium.

7.5 Assessment of impacts

7.5.1 Direct impacts

7.5.1.1 Drawdown of Yarragadee Formation Aquifer

Abstraction from the Yarragadee Aquifer for this Proposal will be from Bore PB1 in accordance with existing Licence 202299 (held by Strike Energy). No abstraction above this licence limit is proposed. The depth to groundwater in the Development Envelope is approximately 130 mbgl and therefore no groundwater dependent ecosystems occur.

7.5.2 Indirect impacts

7.5.2.1 Alteration of surface water hydrological regime from installation of infrastructure

The installation of this infrastructure at the processing plant, will cause a reduction in catchment areas that contribute to larger watercourses in the region. The Arrowsmith River Catchment will not experience any catchment loss as there will only be temporary disturbance through installation of the Pipeline. The Irwin River Catchment however will experience loss of up to 0.009% (53 ha of the total 607,253 ha catchment area) from the Proposal due to long term positioning of plant infrastructure (DWER 2018). Due to the minor amount of catchment decrease this impact is not considered significant.

7.5.2.2 Contamination of surface water due to increased erosion and sedimentation

Surface water management measures will be undertaken to capture and minimise sediment runoff to undisturbed areas and drainage lines, such as using bunding and other drainage features such as silt traps and sediment basins. Where practicable, natural runoff will be diverted around infrastructure to localised drainage channels through geomorphic design principles such that the natural sediment transport through the channel is maintained and the structure itself doesn't become a sediment source. As there are no significant surface water features in the Development Envelope, residual impacts from the Proposal are not considered significant.

7.5.2.3 Contamination of surface water and groundwater quality from hazardous materials

The drainage infrastructure within the Development Envelope will be designed to minimise or eliminate surface water runoff into areas where hydrocarbon contamination could occur. Hydrocarbon storage facilities will be appropriately constructed and bunded in accordance with Australian Standards. A CEMP has been developed for the Proposal that outlines appropriate transporting, storage handling and disposal of chemicals and facility inspection, maintenance and spill management procedures respectively to effectively mitigate the risk of contamination (both included in the CEMP). Therefore, residual impacts from the Proposal are not considered significant.

7.5.3 Cumulative impacts

The Yarragadee Aquifer is estimated to measure 3,000,000 gigalitres (GL) of groundwater (Pennington 2010). In addition to this figure, approximately several hundred GL of this resource is considered renewable (Pennington 2010). Within the region, approximately 14.7 GL is licenced to be extracted from the Yarragadee Aquifer annually which equates to less than 20% of the renewable aquifer resource (when assuming a conservative minimum of 100 GL). Therefore, it is not considered that the Proposal or cumulative projects within the region will have a significant impact on the Yarragadee Aquifer.

Abstraction from the Yarragadee Aquifer is managed by DWER under the RiWI Act with consideration of sustainable yields. This regulatory framework is considered to adequately manage any potential impacts associated with cumulative groundwater abstraction in the region.

The Proposal is not located near any other existing or reasonably foreseeable Proposals, or new or significant water users. Therefore, cumulative impacts are not expected to apply with respect to Inland Waters.

7.6 Closure

A Rehabilitation Management Plan (RMP) has been developed for the Proposal that aims for rehabilitation in line with pre-disturbance conditions (Appendix E). The closure strategy includes the decommissioning of water bores and all above ground infrastructure. The design life of the Proposal is 60 years and at such a time that the Proposal activities are nearing cessation, DMIRS approval will be sought to ensure all risks are controlled during the decommissioning phase.

7.7 Mitigation and predicted outcome

Mitigation measures and the predicted outcome for the Proposal on Inland Waters Factors are outlined in Table 7-2. The Proponent considers that the Proposal can be managed to meet the EPA's objective for the Inland Waters Factor.

Table 7-2: Mitigation measures and predicted outcomes to Inland Waters

Potential Impact	Assessment of potential impacts	Mitigation	Predicted outcomes
The development of the Proposal will not have any direct impacts to surface water, however, will require abstraction of groundwater from the Yarragadee Formation Aquifer. Potential indirect impacts to surface water and groundwater from the Proposal include: • Alteration of surface water hydrological regime from installation of infrastructure • Contamination of surface water due to increased erosion and sedimentation • Contamination of surface water and groundwater quality from hazardous materials	Changes to surface water flow are not expected given there are no major surface water features intersecting the Development Envelope. Surface water management measures will be undertaken to capture and minimise sediment runoff to undisturbed areas and drainage lines, such as using bunding and other drainage features such as silt traps and sediment basins. Changes to groundwater are not expected given the small amount of abstraction already approved under the DWER. There are no GDEs in the vicinity of the Development Envelope as groundwater is 130 mbgl.	The following key management strategies will be implemented to manage impacts to Inland Waters as a result of the Proposal. **Avoid** The Development Envelope is not intersected by any surface water features. No new groundwater supplies are proposed. **Minimise** The Proposal has been designed to minimise reduction of water catchment areas. Surface water management structures (e.g. bunds) will be installed as part of infrastructure installation to divert rainfall, minimise erosion and minimise transport of sediments to the surrounding environment. This will be facilitated through the Proposal CEMP. Transportation, storage, handling and disposal of hazardous materials will be undertaken in accordance with CEMP procedures to minimise potential contamination.	No direct impacts to surface water or groundwater are expected as a result of the Proposal. The Irwin River Catchment will experience loss of up to 0.009% (53 ha of the total 607,253 ha catchment area) as a result of the Proposal due to long term positioning of plant infrastructure It is not expected that the Proposal will have any significant indirect impacts to surface water or groundwater given that lack of significant surface water or groundwater features in the Development Envelope as well as the implementation of appropriate water management methods. The Proponent considers that the Proposal can be managed to meet the EPA's objective for this Factor.

8. Greenhouse Gases

8.1 EPA objective

The EPA objective for greenhouse gas emissions is to *reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change* (EPA 2020c).

8.2 Policy and guidance

The following policies and guidance are relevant to the Greenhouse Gas (GHG) emissions factor:

- Instructions on how to prepare an Environmental Review Document (EPA 2020a)
- Statement of Environmental Principles, Factors and Objectives (EPA 2020c)
- Greenhouse Gas Emissions Policy for Major Projects (State GHG Policy) (Government of Western Australia 2020)
- Environmental Factor Guideline: Greenhouse Gas Emissions (Guideline) (EPA 2020f)
- National Greenhouse and Energy Reporting Act 2007 (NGER Act)
- National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015
- Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth).

The NGER Act is relevant to all facilities within Australia with GHG emissions. It provides a single national framework for the reporting and dissemination of information relating to GHG emissions, energy production and energy consumption.

8.3 Scope of assessment

The Proposal is for the processing and transport of gas to the DBNGP pipeline. The boundary for assessment of GHG emissions from the Proposal include the processing (midstream) plant and 16.5 km gas pipeline. It is noted that the upstream emissions (wellheads, flowlines and slugcatcher) are excluded from the emissions profile in Section 8.5.

Emissions from the DBNGP tie-in point will be included in the DBNGP gas accounting under the NGER Act. The Proposal assessment boundary utilises the NGER Act description in terms of defining a facility and operational control. Areas under the Proponent's operational control have been included in the emissions profile of this Proposal.

8.4 Receiving environment

GHG emissions are a key contributor to climate change, with the effects of a changing climate predicted to be significant in Western Australia (EPA 2020f).

GHG emissions are classified as the following (EPA 2020f):

- Scope 1: emissions generated as a direct result of an activity e.g. diesel combustion by vehicles or gas consumption for on-site power generation
- Scope 2: emissions generated from the consumption of an energy commodity
- Scope 3: indirect emissions, other than Scope 2 emissions, that are generated in the wider community.

The EPA's GHG Factor Guideline provides advice that emissions from a Proposal will generally be assessed where Scope 1 emissions exceed 100,000 tonnes of CO_2 equivalent (t CO_2-e) (EPA 2020f). GHG emissions for the Proposal are currently measured at 96,319 t CO_2-e (exclusively Scope 1). Assessment against the GHG Environmental Factor has therefore conservatively been included despite potentially not exceeding the general assessment threshold.

The Proposal may also qualify for designation as a large facility under the Australian Government's NGER (Safeguard Mechanism) Rule 2015 if there is a possibility it may emit more than 100,000 t CO_2-e ('safeguard threshold') covered emissions (i.e. scope 1 emissions) in a financial year. Together with the reporting obligations under the NGER Act, the safeguard mechanism provides a framework for Australia's largest emitters to measure, report and manage their emissions. A facility that qualifies for the safeguard mechanism (referred to as a 'safeguard facility') is required to keep its net emissions levels at or below its emissions baseline set by the Clean Energy Regulator.

The Proponent will utilise the first two years of full operations to set the baseline emissions profile for the Proposal. This will allow for commissioning processes to be completed for all equipment and a period of time to ensure efficient running of the Proposal.

8.5 Potential impacts

The Proposal involves the construction and operation of a gas pipeline and gas processing plant. It includes the processing of gas from upstream wells (third party) and transport of the gas to the DBNGP. On this basis, the potential impacts from GHG emissions associated with the Proposal solely relate to the contribution to global GHG concentrations from Scope 1 emissions.

Scope 2 emissions are not relevant to the Proposal as no energy generated within the Development Envelope will be exported, nor will any energy be imported for consumption. Scope 3 emissions are also not relevant to the Proposal as the sales agreement for downstream gas use is undertaken by a third party process, outlined in Section 8.3.

Scope 1 GHG emissions from the Proposal will result from stationary and transport diesel combustion and gas processing emissions, with peak annual GHG emissions up to 96,319 t CO_2-e. Specifically, GHG emissions associated with the Proposal will derive from:

- Removal of CO_2 from the gas stream through gas processing systems (Amine Gas Removal Unit (AGRU) and Oxidiser)
- Combustion of natural gas fuel for the generation of electricity onsite (fuel gas)
- Vessel push/pull
- Flaring
- Vessel or plant blow down (to flare)
- Minor operation of mobile equipment and vehicles.

8.6 Assessment of impacts

8.6.1 GHG emission sources

The estimated GHG emissions for the Proposal total 96,319 t CO_2-e per annum, as detailed in Table 8-1.The proponent has committed in the GHGMP to avoid, mitigate or offset all of the reservoir

emissions (56,907 t CO_2-e per annum) which is ~60% of the overall emissions from the commencement of operations.

Table 8-1: Estimated GHG emissions profile for the Proposal

Emission	Activity	Predicted annual emissions (t CO_2-e)
Reservoir gas	Amine Gas Removal Unit (AGRU)(CO_2)	56,907
Processing gas	Oxidiser burned gas (includes AGRU hydrocarbons in waste and flash gas)	32,354
Processing gas – power consumption	Fuel Gas 0 GEA Power Generation	6,076
Processing gas	Flare	39
Processing gas	Flare blowdown (maintenance)	208
Processing gas	Liquid circuit atmospheric vents	71
Fugitive gas	Pipeline	172
Other	Vessel push/pull	492
TOTAL		**96,319**

8.6.2 Projected emissions intensity

Based on the emissions profile, the Proposal has a projected emissions intensity of 2.93 t CO_2-e/TJ. This includes all processing, reservoir and other emissions but does not include fugitive gas in the pipeline as this makes comparison (benchmarking) difficult given it is based on distance of pipeline and not efficient plant design and operations.

8.6.3 Benchmarking against comparable Proposals

Two existing and proposed gas plants within WA have been utilised for benchmarking plant emissions and emission intensities: Macedon Gas Plant and Waitsia Gas Plant. It is noted that both of these gas plants are larger in size than the Proposal but detail the emissions expected and actually released from the plants.

8.6.3.1 Macedon (BHP)

The BHP operated Macedon Gas Plant only has trace amounts of carbon dioxide within the upstream gas field and minimal to no processing is required to remove this from the gas flow to meet sales gas specification. Macedon emissions are therefore based more on the gas plant operating equipment (gas production) rather than reservoir gas. Public documentation available as part of the approvals of Macedon include an emissions output of 115,000 t CO_{2e} per annum (Mitsui E&P Australia 2020) with an emissions intensity of 3.15 t CO_2-e/TJ (EPA 2010).

However, based on the 3.15 t CO_2-e/TJ being wholly for production, and not including reservoir gas, the emissions intensity for gas production at Macedon Gas Plant is 1.04 t CO_2-e/TJ which is a reduction in intensity level of ~67%.

8.6.3.2 Waitsia (Mitsui)

Waitsia's GHGMP (Revision 5) (Mitsui E&P Australia 2020) outlines the emissions profile, intensity and overall targets for emission reductions for the 250 TJ / day processing facility. Emissions intensity figures are comparable with the total intensity difference in line with the smaller West Erregulla plant size. With

overall emissions predicted at 300,000 t CO_2-e/TJ Waitsia is comparable to the Proposal however is slightly larger in throughput and emissions profile.

Waitsia outlines its proposed emissions intensity at 3.29 tCO_2-e/TJ (Mitsui E&P Australia 2020) which is slightly higher than the 2.93 tCO_2-e/TJ calculated for the Proposal.

8.6.4 Cumulative impacts

The Proposal adds to Western Australia's contribution of GHG emissions from the resources sector. For the 2019-2020 year, corporations required to report under the NGER Act reported a total of 327 million tonnes of CO_2 equivalent (Scope 1) and 86 million tonnes of CO_2 equivalent (Scope 2) emissions (Clean Energy Regulator 2021).

In 2019-2020, Western Australia contributed approximately 20.9% (68.3 million tonnes of CO_2 equivalent) of Australia's total Scope 1 emissions (Clean Energy Regulator 2021). Based on these figures, the peak Scope 1 emissions for the Proposal would represent approximately 0.03% of the national Scope 1 emissions. However, it is acknowledged that Australia's total emissions are not predominately from large single source emissions and that cumulative emissions are significant.

8.7 Mitigation

The Proponent is committed to a global effort to limit GHG emissions, including reducing through design, avoidance, mitigation, and where necessary offsetting emissions from the Proposal. The Project will offset all of it's reservoir emissions from the commencement of the project.

Specific measures implemented to avoid and minimise GHG emissions through design of the Proposal are identified in the Proponent's Greenhouse Gas Management Plan (Appendix I) and summarised in Table 8-2.

In addition, the Proponent commits to an annual review of potential new technology, design plant efficiency and emissions capture to assess feasible options for further reducing emissions associated with the Proposal.

Table 8-2: Design avoidance measures

Design aspect	Detail
Utilisation of the waste gas and flash gas from the amine package within the Hot Oil / Thermal Oxidiser Package	In many natural gas processing plants, the waste gas from the amine regeneration column and flash gas from the amine flash drum is cold vented locally (normally at the highest point of the facility). The Proposal will instead utilise the waste gas and flash gas from the amine package within the Hot Oil / Thermal Oxidiser Package. By doing so, the fuel gas consumption within the Hot Oil Package is reduced, increasing the overall facility yield and decreasing the GHG emissions. An additional impact of the Thermal Oxidiser is that pollutants that are contained within the waste gas, flash gas and fuel gas are destroyed completely, for the expected gas composition these pollutants are H2S and BTEX.

Design aspect	Detail
Utilisation of produced condensate as a fuel source	Produced condensate is often flared or trucked off site for disposal elsewhere in natural gas processing plants. For the Proposal, the condensate will be utilised as a fuel source for the Hot Oil / Thermal Oxidiser Package. By utilising produced condensate, the total fuel gas requirements for this package are decreased which increases the facility yield and decreases the GHG emissions.
Installation of a flare as opposed to cold venting	The use of a flare to burn any gas that would otherwise have been cold vented is a method of GHG reduction. This is considered better than cold venting natural gas which has a larger impact on the environment due to methane having a global warming potential of 28[1] compared to the CO_2 generated from combustion.
Fugitive emissions reduction	To minimise fugitive emissions, manual valves, instrumentation and control valves, isolation valves, piping and equipment, is designed, tested, supplied and installed as per the appropriate codes, standards and company install procedures. By doing this, the likelihood of fugitive emissions from leaking flanges, valve bodies etc. is reduced.
Gas detection equipment	The Proposal will include line of sight (LOS) gas detectors. If a gas leakage occurs the LOS gas detectors will initiate an Emergency Shutdown and shut in the facility to reduce the available inventory for leakage and complete a facility blowdown. By completing the facility blowdown, a large inventory of gas will be flared but without the LOS detectors, if a leak is to occur the leak will be continuous for an extended period of time which will result in a higher rate of GHG emissions.

8.8 Predicted outcome

The Proposal will contribute to GHG emissions, primarily from removal of CO_2 from the gas stream, electricity consumption and stationary sources. The Proposal is predicted to contribute peak annual emissions of up to 96,319 tCO_2e.

A GHGMP has been prepared which outlines the Proponent's commitments to implement initiatives that either avoid where possible, reduce or offset emissions to achieve a 60% reduction in GHG emissions from commencement of the project, a further 5% by June 2028, an additional 5% by June 2038 and then subsequently align with the trajectory to zero net emissions. The GHGMP is provided in Appendix I.

Given the mitigation measures implemented to avoid emissions through best practice design (Table 8-2), as well as the Proponent's commitment to continuous improvement to reduce emissions over the project life, it is considered that the Proposal can be managed to meet the EPA's objective for GHG emissions.

[1] Australian Government Department of the Environment and Energy, 2020. National Greenhouse Accounts Factors. Australia: Department of the Environment and Energy.

In addition, the Proposal may qualify for designation as a large facility under the Australian Government's NGER (Safeguard Mechanism) Rule and therefore would be required to keep its net emissions levels at or below its baseline. The Proponent will utilise the first two years of full operations to set the baseline emissions profile for the Proposal, and ensure that the GHGMP is regularly reviewed, evaluated, and updated as required or in response to the following triggers:

- Introduction of a new process or activity that could introduce new, or amend existing, GHG emissions
- Outcomes of relevant technical studies and investigations into new GHG emission reduction opportunities or new energy efficiency technologies or techniques
- Changes in relevant State or Commonwealth legislation
- Comments from the EPA during the environmental assessment process.

9. Matters of National Environmental Significance

To be consistent with specified EPBC Act terminology, the Proposal is referred to as the Proposed Action in Section 9. This chapter provides a comprehensive assessment of potential impacts of the Proposed Action on two MNES recorded in the Development Envelope.

9.1 Proposed Action description

The Proposed Action is located in the Mid-West region of Western Australia and includes a Disturbance Footprint of 90 ha to support development, operation and rehabilitation of the gas processing plant and pipeline within a Development Envelope of approximately 213 ha. The Proposed Action includes:

- A gas processing facility with a nominal design flow capacity of 87 terajoules per day (TJ/d)
- A 16.5 km interconnecting buried gas pipeline between the Development Envelope and the DBNGP tie-in point
- A custody transfer metering facility located at the DBNGP tie-in point
- A pig launcher station
- Supporting infrastructure proposed to include but not limited to power generation, flare system, incinerator, fire water system, water treatment package, back-up diesel system and communications.

9.1.1 Exclusions

Wellhead connections and gathering lines from wellheads to the midstream tie-in point A are not included in the Proposed Action.

9.2 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act is Australia's key piece of environmental legislation, which enables protection of the environment and in particular MNES).

The Proposed Action was referred to DAWE under the EPBC Act in March 2021 (ref. EPBC 2021/8907) and is currently being advertised for public comment.

9.2.1 Controlling provisions

A comprehensive assessment of the potential impacts of the Proposed Action on MNES recorded or likely to occur in the Development Envelope, is provided in subsequent sections. The expected relevant controlling provisions of the EPBC Act are:

- Listed threatened species and communities (s. 18 and s. 18A of the EPBC Act).

9.2.2 Policy and guidance

The Significant Impact Guidelines 1.1 (DoE 2013) inform whether a referral is required under the EPBC Act. In accordance with these guidelines, the impact assessment of MNES has the following key concepts:

- Habitat critical to the survival of a species
- Any population for species listed as Endangered or Critically Endangered under the EPBC Act and an 'important population' for species listed as Vulnerable under the act. 'Habitat critical to the survival of a species,' refers to areas that are necessary:
  - For activities such as foraging, breeding, roosting, or dispersal
  - For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
  - To maintain genetic diversity and long-term evolutionary development
  - For the reintroduction of populations or recovery of the species or ecological community
- Such habitat may include, but is not limited to, habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community, and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DoE 2013).

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

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity
- Populations that are near the limit of the species range (DoE 2013).

An assessment of significance for each MNES species is presented in this chapter and reflects additional information provided by survey information presented after the submission of the EPBC referral.

9.3 MNES values of the Development Envelope

The following section provides an overview of the findings for MNES 'Listed under threatened species and communities' under s. 18 and 18A within the Development Envelope.

9.3.1 Flora and fauna surveys

Numerous fauna and flora investigations, including targeted fauna and flora searches have been undertaken within the Development Envelope and surrounding area. Key flora and fauna assessments undertaken for MNES investigations are described in Section 5.3.1 and Section 6.3.1.

9.3.2 EPBC Protected Matters Search Tool

A Protected Matters Search Tool (PMST) database search was undertaken as part of ELA's most recent ecological assessment for MNES (see Appendix D of ELA 2021). The PMST search recorded 14 EPBC listed flora species, and 32 EPBC listed fauna species as potentially occurring within the Development Envelope (ELA 2021).

9.3.3 Likelihood of occurrence assessment

A likelihood of occurrence assessment was undertaken based on the results of the PMST search to identify conservation listed species that are likely to occur in the Development Envelope (Appendix D in ELA 2021).

Of the 14 listed flora species, five were determined to have the potential to occur due to the presence of some suitable habitat in the area, with one species, *Paracaleana dixonii* considered likely to occur.

Only 1 of the 32 fauna species were determined to have potential to occur within the Development Envelope (ELA 2021). The majority of the Development Envelope was not considered suitable habitat the other fauna species, including Malleefowl (*Leipoa ocellata*) where a recent fire had destroyed previously suitable habitat (ELA 2021).

The two MNES likely or with potential to occur within the Development Envelope are summarised in Table 9-1 and further discussed in Sections 9.4 and 9.5.

Table 9-1: MNES species, conservation status and likelihood of occurrence in the Development Envelope (ELA 2021)

Species	Status	Likelihood	Occurrence within the Development Envelope
Sandplain Duck Orchid *(Paracaleana dixonii)*	Endangered	Confirmed	One record from within the Development Envelope from 2011 and multiple records surrounding (DBCA 2020). Also recorded from Woodman (2013). Suitable habitat within the Development Envelope.
Carnaby's Cockatoo (*Calyptorhynchus latirostris)*	Endangered	Potential	This species is likely to utilise the Development Envelope for feeding habitat. Potentially suitable foraging habitat occurs within the Development Envelope, however no potential or confirmed breeding or roosting trees were recorded as occurring.

9.4 Paracaleana dixonii

Paracaleana dixonii is listed as Endangered under the EPBC Act and Vulnerable under the BC Act. Conservation listing advice is available for *Paracaleana dixonii* (DoE 2008); however, there are no species-specific referral guidelines or recovery plans in place for this species. The conservation listing advice describes the species' distribution, habitat preferences and identifies known threats to the species (DoE 2008).

9.4.1 Habitat and distribution

Paracaleana dixonii is endemic to Western Australia where it occurs in small isolated colonies in deep sand in open areas beneath dense tall shrubland with scattered emergent banksias, or in shallow sand over laterite in heathland (DoE 2021b).

The species is known from eight populations in an area bounded by Arrowsmith, Eneabba and Jurien Bay (including Lesueur National Park, Coomallo Nature Reserve and South Eneabba Nature Reserve). Five of these populations occur on nature reserves that are partially overlain by active mining leases and an adjacent railway reserve, two in national parks and one on private property. There has been record of 11 other populations in the region, however these plants have not been recorded since the early 1990s and are considered extinct. Extinct populations were located on road verges, unallocated Crown land and within national parks (DoE 2021b).

The extent of occurrence is estimated to be 540 km^2 from 57 mature plants within the known eight populations (DEC 2008). When including all known previous populations, the extent of occurrence is roughly 1170 km^2 (DoE 2008). The distribution of this species is not known to overlap with any EPBC Act-listed threatened ecological community.

In a survey conducted 50 km south-east of Dongara, that encompassed the Development Envelope in 2013, Woodman (2013) noted *Paracaleana dixonii* to be associated with three vegetation associations/habitat types. These habitat types are summarised in Table 9-2, with the first and last broadly corresponding to AcEbHh within the Development Envelope.

Table 9-2: Predominant *Paracaleana dixonii* locations 50 km southeast of Dongara (Woodman 2013)

Habitat description	Records
Low open woodland of Pricklybark (*Eucalyptus todtiana*) over mid to low shrubland of mixed species dominated by Dwarf Sheoak (*Allocasuarina humilis*), Burma Road Banksia (*Banksia scabrella*), *Calothamnus sanguineus*, *Eremaea beaufortioides* var. *microphylla*, *Melaleuca aff. leuropoma* and *Hibbertia hypericoides* over low shrubland and sedgeland of mixed species including *Banksia dallanneyi* subsp. *media*, *Conostylis canteriata*, *Mesomelaena pseudostygia* and *Caustis dioica* on grey or brown sand on lower and mid slopes	70
Mid sparse to open shrubland of mixed species including *Calothamnus quadrifidus* subsp. *angustifolius*, *Grevillea biformis* subsp. *biformis* and Coast Banksia (*Banksia attenuata*) over low shrubland and sedgeland of mixed species dominated by *Ecdeiocolea monostachya*, *Melaleuca leuropoma*, *Daviesia divaricata* subsp. *divaricata ms*, *Mesomelaena pseudostygia* and *Banksia shuttleworthiana* on yellow-brown or occasionally grey sand on slopes and valley floors	39
Mid mallee woodland to isolated mallees of *Eucalyptus conveniens* or mid open shrubland of *Allocasuarina campestris* over low shrubland and sedgeland of mixed species dominated by Pink Dryandra (*Banksia carlinoides*), *Ecdeiocolea monostachya*, *Hakea incrassata*, *Hibbertia hypericoides* and *Melaleuca aspalathoides* on gravelly grey or brown clay loams or sands, usually with laterite on or near the surface, on slopes and crests.	29

9.4.2 Key threats and recovery actions

Key threats to the *Paracaleana dixonii* population include inappropriate fire regimes, land clearing, road works, and infrastructure (rail, road and powerline) maintenance. Fire may be detrimental if it occurs during the growing period (May to December).

9.4.3 Relevant policy and guidance

Policy and guidance documents relevant to this species are:

- Conservation Advice *Paracaleana dixonii* Sandplain Duck Orchid (DoE 2008)
- Threat abatement plan for predation by feral cats (DoE 2015)
- Threat abatement plan for predation by the European red fox (DEWHA 2008a)
- Threat abatement plan for competition and land degradation by unmanaged goats (DEWHA 2008b)
- Threat abatement plan for competition and land degradation by rabbits (DotEE 2016).

9.4.4 Occurrence in the Development Envelope

A database search indicates that *Paracaleana dixonii* was recorded from one location (24 plants) in the Development Envelope in 2011. The species was recorded in the AcEbHh vegetation community, deemed *Paracaleana dixonii* habitat, which is described as *Allocasuarina campestris* tall sparse

shrubland over *Eremaea beaufortioides, Calothamnus quadrifidus subsp. angustifolius, Isopogon tridens* mid sparse shrubland over *Hibbertia hypericoides, Melaleuca leuropoma* low open shrubland and *Ecdeiocolea monostachya* low open sedgeland. Within the Development Envelope there is 72.2 ha of this habitat available as shown on Figure 9-1.

A targeted MNES survey (ELA 2021) did not record *Paracaleana dixonii* despite extensive survey effort. *Paracaleana dixonii* has previously been recorded in the area, however due to a recent (April 2019) fire the habitat for this species is currently not suitable habitat and the species has not been recorded in the region since. The species is cryptic in nature and therefore although not recorded during the most recent survey, it's potential occurrence at this location cannot be discounted.

9.4.5 Assessment of impacts

The Proposed Action may result in direct and indirect impacts to *Paracaleana dixonii* through:

- Loss of habitat due to clearing
- Introduction and/or spread of weeds as a result of disturbance and vehicle/machinery movements
- Accidental bushfires.

These impacts coincide with key threats determined for the species in the approved conservation advice (DoE 2008). No cumulative impacts are considered for the species.

9.4.5.1 Loss of habitat due to clearing

The Proposed Action will clear up to 38.3 ha (53%) of the AcEbHh vegetation type within the Development Envelope (72.2 ha), identified as supporting habitat for *Paracaleana dixonii*. Of this 13.2 ha will be progressively rehabilitated within 2-3 years post construction. Therefore 25.1 ha (34% of potential habitat in the Development Envelope) will be permanently disturbed by the Proposed Action. Due to the small number of records in the Development Envelope (one historical population, and the retention of habitat both within and surrounding the Development), this local loss of potential habitat is not considered significant.

A recent fire in April 2019, known to occur during the species growing period, deemed habitat within the Development Envelope as not suitable (ELA 2021). As a result, no individuals of *Paracaleana dixonii* are expected to be cleared due to minimal clearing of habitat and lack of suitable habitat in the Development Envelope at present.

Figure 9-1: *Paracaleana dixonii* potential habitat within the Disturbance Footprint and previous records Page 1 of 3

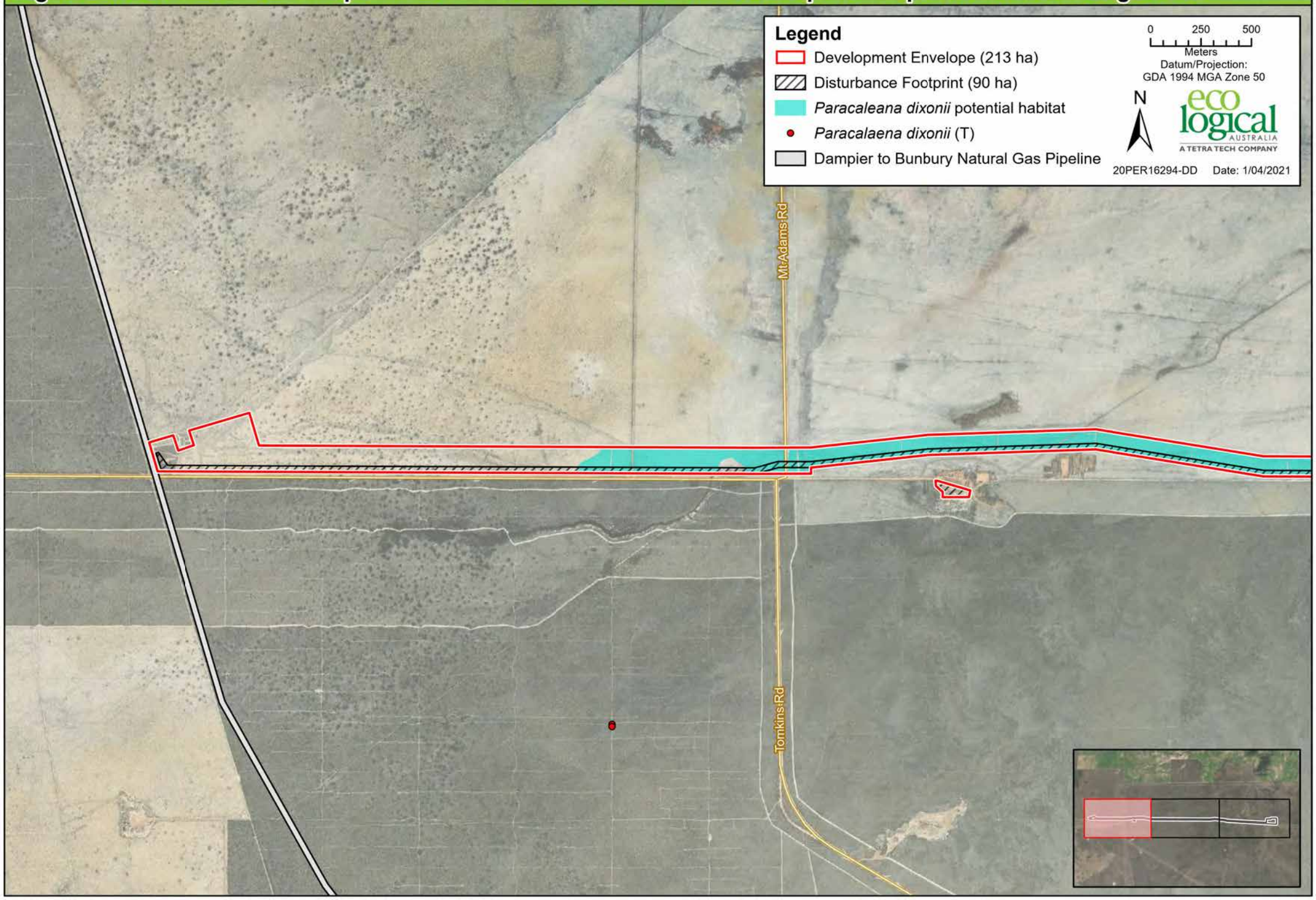


Figure 9-1: *Paracaleana dixonii* potential habitat within the Disturbance Footprint and previous records Page 2 of 3

Figure 9-1: *Paracaleana dixonii* potential habitat within the Disturbance Footprint and previous records Page 3 of 3

9.4.5.2 Introduction and/or spread of weeds as a result of disturbance and vehicle/machinery movements

Clearing, vehicle and machinery movements have the potential to increase the spread and/or introduce weed species. Weeds are often able to rapidly invade locations due to disturbance, land clearing and/or altered hydrological regimes. One weed species has been recorded within the Development Envelope, *Hypochaeris glabra*, which is not a Declared Pest or listed as Weeds of National Significance species (ELA 2021).

The Proponent has established weed and hygiene management measures in the CEMP to reduce the risk of existing weeds being spread or new weeds being introduced into the Development Envelope. These measures of weed control include:

- Regular and ongoing inspections
- Monitoring and auditing of the pipeline corridor
- Compliance with Clean on Entry procedures where soil, topsoil, rehabilitation and vehicle movements occur
- Targeted control of infestations.

These measures are expected to effectively mitigate risk of weeds to *Paracaleana dixonii.*

9.4.5.3 Accidental bushfires

Construction activities, particularly clearing of native vegetation and welding, and the movement of vehicles and heavy machinery have the potential to result in a bushfire that could cause widespread damage and loss of *Paracaleana dixonii.*

A number of mitigation measures are identified in the CEMP to be implemented in relation to minimising bushfire risk, including:

- Abiding by all Bushfire Regulations including total fire ban requirements (daily checks on fire danger rating to be undertaken).
- Ensuring activities are conducted in accordance with relevant first restrictions (local, state), notifications and permitting procedures, such as:
    - designated smoking areas
    - all plant and equipment to comply to fire safety standards
    - fire breaks are in place and maintained
    - high gas risk areas demarcated and appropriately signposted
    - appropriate, maintained firefighting equipment available at all times
    - selected personnel trained in responding to fires.

These measures are expected to effectively mitigate fire risks to *Paracaleana dixonii.*

9.4.6 Significance of impacts

An assessment of the Proposed Acton impacts to *Paracaleana dixonii* with reference to the Significant Impact Guidelines is provided in Table 9-3 (DoE 2013). Based on this assessment, the Proposed Action is not likely to result in a significant residual impact to *Paracaleana dixonii*.

Table 9-3: Assessment of significance of impacts to *Paracaleana dixonii* (Sandplain Duck Orchid)

Significant impact criteria	Likelihood of significant impact	Assessment of impacts to *Paracaleana dixonii*
Potential to cause a long-term decrease in the size of a population	Unlikely	*Paracaleana dixonii* was recorded from one location within the Development Envelope in 2011 (Woodman 2013). A targeted threatened flora survey conducted in October 2018 (ecologia 2018) failed to identify any *Paracaleana dixonii* and a subsequent targeted threatened flora survey including locations of previous 2011 records, was undertaken in October 2020, coinciding with the flowering period for this species. This combined survey effort did not record any individuals of *Paracaleana dixonii* within the Development Envelope since 2011. The species is potentially vulnerable to fire and land clearance (DoE 2008). A fire event in April 2019 impacted the majority of vegetation in the Development Envelope and likely impacted any individuals that may have been present at that time and the habitats required to support the species may have been altered. Given the lack of current records of *Paracaleana dixonii* in the Development Envelope, the Proposed Action will not cause a long-term decrease in the size of a population.
Potential to reduce the area of occupancy of the species	Unlikely	The species has previously been recorded in the Development Envelope, however, is not currently within the Development Envelope. While the species is understood to be cryptic, it is believed that if the species were present in the Development Envelope, it would have been detected given the detailed and targeted survey effort (ELA 2021). Therefore, given the lack of current records, the Proposed Action will not reduce the area of occupancy of the species.
Potential for fragmentation of an existing population into two or more populations	Unlikely	There is no evidence of an existing population being present within the Development Envelope. Detailed and targeting survey effort in October 2020 did not record any individuals. Given the lack of current records, the Proposed Action will not fragment an existing population into two or more populations.
Potential to adversely affect habitat critical to the survival of a species	Unlikely	The conservation advice for the species does not define what constitutes critical habitat for the species. Given previous records from the Development Envelope from 2011, it is likely that some habitat present in the Development Envelope has the potential to support *Paracaleana dixonii;* however, this habitat is likely to have been altered by the recent fire event. In addition, there are no current records of the species from the Development Envelope. On this basis, the Proposed Action is not expected to adversely impact habitat critical to the survival of the species.
Potential to disrupt the breeding cycle of a population	Unlikely	Given the lack of current records, the Proposed Action is not expected to disrupt the breeding cycle of a population.
Potential to modify, destroy, remove isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The Proposed Action will result in clearing of some habitat which has the potential to support the species. However, given the recent fire event which likely altered habitats present and the lack of current records of the species in the Development Envelope, the Proposed Action is not expected to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Significant impact criteria	Likelihood of significant impact	Assessment of impacts to *Paracaleana dixonii*
Potential for the establishment of invasive species in the endangered species' habitat that are harmful to the endangered species	Unlikely	*Phytophthora cinnamomic* (dieback), a root fungus is considered a main potential threat to the species (DoE 2008). The Proponent commits to implementing hygiene procedures to avoid the introduction of dieback to the Development Envelope. The Proposed Action is unlikely to result in the establishment of invasive species that are harmful to *Paracaleana dixonii.*
Potential for the introduction of disease that may cause the species to decline	Unlikely	There is no evidence to suggest that the Proposed Action would introduce disease that may cause the species to decline.
Potential interference with the recovery of the species	Unlikely	There is no current evidence of *Paracaleana dixonii* or habitat critical to the survival of the species in the Development Envelope. Given the lack of current records, the Proposed Action is not expected to interfere with the recovery of the species.

9.4.7 Predicted outcome

The Proposed Action will have the following outcomes:

- No disturbance to known *Parcaleana dixonii* individuals as none have been recorded during recent surveying within the Development Envelope
- Clearing of up to 38.3 ha of the AcEbHh vegetation community (representing 53% in the Development Envelope), where *Paracaleana dixonii* individuals were previously recorded
- Retention of 33.9 ha of the AcEbHh vegetation community in the Development Envelope.

Overall, the Proposed Action is considered unlikely to have any significant residual impacts to *Paracaleana dixonii.*

9.5 Carnaby's Cockatoo

Carnaby's Cockatoo (*Calyptorhynchus latirostris*) is listed as Endangered under the EPBC Act and as Endangered under Schedule 2 of the BC Act. A National Recovery Plan is in place (DPaW 2013); however, there is no Approved Conservation Advice or Listing Advice for the species. The National Recovery Plan describes the species' distribution, habitat and population and identifies known threats to the species (DPaW 2013).

9.5.1 Habitat and distribution

Carnaby's Cockatoo is endemic to the south-west of Western Australia (WA), ranging from the Lower Murchison in the north, Esperance in the south and Forrestania in the east. Carnaby's Cockatoo exists as two genetically distinct subpopulations: a western and an eastern (EPA 2019). The individuals that may utilise the Development Envelope represent the western subpopulation (EPA 2019).

There is no accurate estimate of the population number and little is known about the species' occurrence within the region. Smaller, important populations for the long-term survival of the species have not been defined for black cockatoos, due to the mobile and widely dispersed nature of the species, and the variation in flock compositions (DSEWPaC 2012a; DotEE 2017). For black cockatoos, it is more appropriate to consider significance in terms of impacts on habitat and individuals rather than a resident population (DoEE 2017).

Carnaby's Cockatoo is predominantly restricted to areas of remnant native woodland with an understory dominated by proteaceous species such as *Banksia*, *Hakea* and *Grevillea*. However, as the species is highly mobile and adaptive, they are able to access resources spread over a relatively large area (DPaW 2013). Mapping of the species has proven difficult due to seasonal migration and movement over long distances. This in combination with the adaptive behaviour of the species indicates that the significance of locations within the species' range, especially in reference to breeding, is likely to continue to change over time (DPaW 2013). Breeding occurs mainly in the Wheatbelt and extends to Hopetoun and Ravensthorpe (DotEE 2017). The Development Envelope does not occur within the species breeding range. During the non-breeding season, the majority of individuals migrate to the Midwest, Swan Coastal Plain and South coastal regions (January to July; DPaW 2013).

Identified breeding and nearby feeding habitat, former breeding habitat that has hollows intact and vegetation that provides habitat for feeding, watering and regular night roosting for Carnaby's Cockatoo is defined as 'habitat critical to the survival' of the species (DPaW 2013). This includes all areas of breeding habitat including known nesting trees, and foraging areas that support breeding.

9.5.2 Key threats and recovery actions

Known and potential threats for Carnaby's Cockatoo include the loss of habitat from clearing or degradation, competition for nest hollows and loss of individuals due to illegal shooting, collisions with motor vehicles and disease (DPaW 2013). A further significant threat is the clearing, fragmentation and degradation of foraging and night roosting habitat in the non-breeding areas of the species' range in WA (DPaW 2013).

Recovery actions to help reduce threatening processes on Carnaby's Cockatoo are outlined in the Recovery Plan, including the control of grazing on habitat by native and introduced species (DPaW 2013).

9.5.3 Relevant policy and guidance

Policy and guidance documents relevant to this species are:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan (DPaW 2013)
- EPBC Act Referral Guidelines for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (Vulnerable) *Calyptorhynchus baudinii*, Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksia naso* (DSEWPaC 2012a)
- Revised draft referral guideline for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (Vulnerable) *Calyptorhynchus baudinii*, Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksii naso* (DoEE 2017)
- Survey guidelines for Australia's threatened birds (Department of Environment, Water, Heritage and the Arts (DEWHA 2010a).
- Threat abatement plan for predation by feral cats (DoE 2015)
- Threat abatement plan for predation by the European red fox (DEWHA 2008a)
- Threat abatement plan for competition and land degradation by unmanaged goats (DEWHA 2008b)
- Threat abatement plan for competition and land degradation by rabbits (DotEE 2016).

9.5.4 Occurrence in the Development Envelope

There are currently no records of individuals of Carnaby's Cockatoo within the Development Envelope. The recent survey conducted by ELA (2021) identified no potential or confirmed breeding or roosting trees within the Development Envelope. There is no evidence (direct observations or indirect evidence such as chewed cones, scats or feathers) that Carnaby's Cockatoos are utilising the habitats within the Development Envelope for foraging or roosting despite targeted surveys over multiple years (Woodman 2013, ELA 2021). However, similar habitat does exist outside the Development Envelope such as Beekeepers Nature Reserve, which supports Carnaby's Cockatoo (Saunders et al. 2014).

A total of 37.7 ha (17.7% of the Development Envelope) is considered as providing 'Low' quality foraging habitat for Carnaby's Cockatoo; namely Fauna habitat 2: *Banksia* spp. and occasional *Eucalyptus todtiana* mid open woodland over shrubs and sedgeland on sandy plains (Figure 9-2). This habitat type provides suitable foraging species (*Banksia* spp. and *Hakea* spp.) at a low density (<10%).

The presence of low-quality foraging habitat and recent fire activity has decreased the likelihood of the species utilising the Development Envelope in the short term. However, *Banksia* spp. and *Hakea* spp.

are predicted to increase in density quality, and structural complexity over time, which could provide potentially suitable foraging habitat for the species in the future (ELA 2021).

9.5.5 Assessment of potential impacts

The Proposed Action may result in direct and indirect impacts to Carnaby's Cockatoo through:

- Loss and fragmentation of habitat
- Injury or mortality of fauna individuals as a result of interaction with vehicles/machinery
- Reduction or loss of Carnaby's Cockatoo habitat due to increased fire frequency or intensity
- Disturbance to Carnaby's Cockatoo and Carnaby's Cockatoo habitat from dust, noise and vibration.

These impacts are consistent with key threats determined for the species in the approved conservation advice (DoE 2013). Cumulative impacts to Carnaby's Cockatoo from existing and reasonably foreseeable projects are summarised in Section 9.5.5.5.

9.5.5.1 Loss and fragmentation of habitat

The Proposed Action will result in clearing of up to 37.7 ha of Fauna habitat 2 that provides low-quality foraging habitat for Carnaby's Cockatoo (DSEWPaC 2012a; DotEE 2017). Of this 37.7 ha, 37.68 ha will be rehabilitated within 2-3 years post construction. Therefore, only 0.02 ha (0.05% of available habitat) will be permanently disturbed by the Proposed Action, which is not considered a significant loss of habitat.

The greatest potential for fragmentation is along the 16.5 km pipeline corridor, which is surrounded by remnant vegetation. However, Carnaby's Cockatoo are expected to be able to freely cross this corridor, therefore no significant fragmentation of habitat is expected to occur as a result of the Proposed Action.

Figure 9-2: Carnaby's Cockatoo potential habitat in the Disturbance Footprint - Page 1 of 3

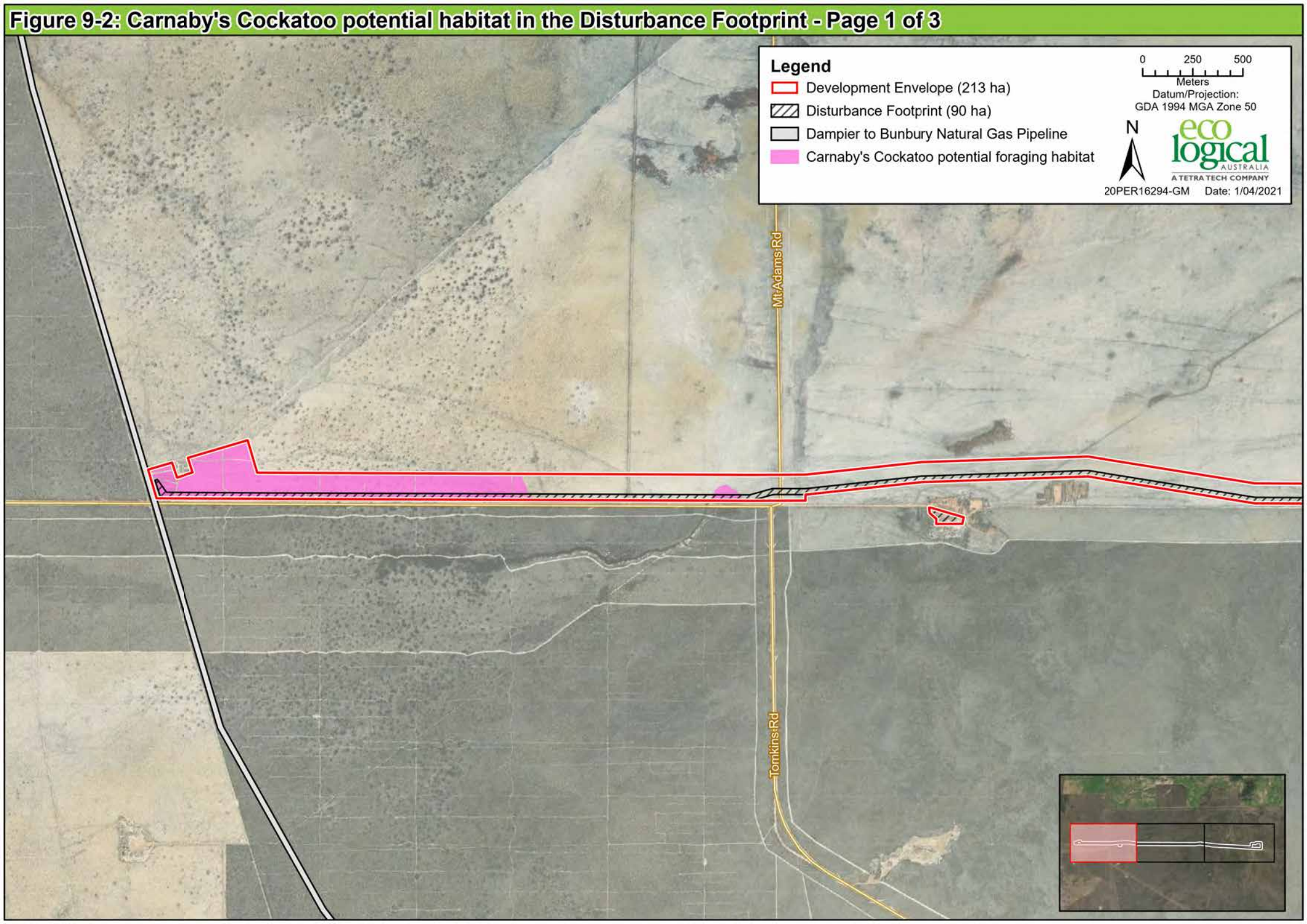


Figure 9-2: Carnaby's Cockatoo potential habitat in the Disturbance Footprint - Page 2 of 3

Figure 9-2: Carnaby's Cockatoo potential habitat in the Disturbance Footprint - Page 3 of 3

9.5.5.2 Injury or mortality of fauna individuals as a result of interaction with vehicles/machinery

Vehicle and machinery movements for construction and operation of the Proposal may result in fauna strike, causing injury or death of individuals. In the event of a fauna strike, the impact will be limited to an individual and will not result in population-wide impacts. Vehicle movements restricted to existing tracks and the implementation of speed limits on unsealed roads, will reduce the potential for a strike. As a result, the potential impacts on Carnaby's Cockatoos from interactions with vehicles and machinery are not expected to be significant.

9.5.5.3 Reduction or loss of Carnaby's habitat due to increased fire frequency or intensity

The Proposal has the potential to increase the risk of accidental fires through ignition from vehicles, hot works (grinding, welding etc.) or other activities such as smoking. Fire ignition sources will be strictly managed in the gas processing facility and pipeline as detailed in the CEMP, therefore the Proposed Action is not expected to increase fire risk.

9.5.5.4 Disturbance to fauna individuals and fauna habitat from dust, noise and vibration

The mechanical noise and vibration caused by construction may impact the Carnaby's Cockatoo in the vicinity of the Development Envelope, potentially interrupting feeding and resting behaviour and may cause temporary abandonment of available habitat. These impacts may cause temporary disturbance and avoidance behaviour but are not likely to have long term effects in the vicinity of the pipeline and have very localised long term effects adjacent to the gas processing facility, therefore it is expected that indirect impacts to Carnaby's Cockatoo will not be significant.

Increased dust emissions have the potential to occur during clearing activities and from vehicle movement along access tracks during construction which may impact Carnaby's Cockatoo foraging habitat. Any potential dust generation will be short-duration and minimised in accordance with standard operational dust management measures in accordance with the CEMP, therefore no significant impacts are expected to occur.

9.5.5.5 Cumulative impacts to Carnaby's Cockatoo

There are no conservation significant fauna species currently known to occur within the Development Envelope. However, Carnaby's Cockatoo will be impacted by this Proposal with the temporary clearing of 37.7 ha of 'low' quality potential foraging habitat. This conservation significant species will be affected by cumulative impacts from existing and reasonably foreseeable future projects in the wider Mid-West region as the species utilises various habitats and flora species for foraging (Table 9-4).

Table 9-4: Cumulative impacts to Carnaby's Cockatoo foraging habitat from existing and foreseeable projects

Extent proposed to be cleared						
Proposed Project	**Dongara Titanium Minerals Project ***	**Waitsia Gas Project Stage 2 ****	**Raven 2D Seismic Survey *****	**West Erregulla-2 Exploration Well ********	**Proposal**	**Total amount proposed for clearing**
Proposed extent of potential suitable foraging habitat to be cleared (ha)	Up to 1200	3	37.6	Up to 150	37.7	1,428.3

* Strategen 2012, ** Mitsui E&P Australia 2019, *** Strategen &JBS&G Australia 2020, **** Warrego Energy 2014.

Four of the projects assessed in the Mid-West region for cumulative impacts will impact upon Carnaby's Cockatoo foraging habitat. All the above foreseeable projects include rehabilitation of areas cleared for construction activities, which will lessen the impact on the fauna species foraging behaviour throughout the region in the near future, with most rehabilitation activities proposed to occur within 2-3 years post-construction.

9.5.6 Significance of impacts

An assessment of the potential impacts against the Significant Impact Criteria for Carnaby's Cockatoo, listed as Endangered under the EPBC Act, is provided in Table 9-5 (DoE 2013). Based on this assessment, the Proposed Action is unlikely to have a significant residual impact on Carnaby's Cockatoo.

Table 9-5: Assessment of significance of impacts to Carnaby's Cockatoo

Significant impact criteria	Likelihood	Assessment of impacts to Carnaby's Cockatoo
Potential to cause a long-term decrease in the size of a population	Unlikely	Carnaby's Cockatoo has not been recorded in the Development Envelope; however, the species has potential to occur given the presence of low-quality foraging habitat due to the presence of *Banksia* and *Hakea* shrubland. The Development Envelope is in the non-breeding range for Carnaby's Cockatoo. While the Proposed Action will result in the loss of up to 37.7 ha of low-quality foraging habitat in the Development Envelope, approximately 57.5 ha of low-quality foraging habitat will be retained. The species is vulnerable to vehicle strike causing injury or mortality (DSEWPaC 2012a). The Proponent will implement vehicle speed limits to avoid and minimise the potential for fauna strike. On this basis, the Proposed Action is not expected to result in a long-term decrease in the size of a population within the Development Envelope.
Potential to reduce the area of occupancy of the species	Unlikely	The species has not been recorded in the Development Envelope; however, it has the potential to occur given the presence of low-quality foraging habitat due to the presence of Banksia and Hakea shrubland. While the Proposed Action will result in the loss of up to 37.7 ha of low-quality foraging habitat in the Development Envelope, approximately 57.5 ha of low-quality foraging habitat will be retained. The Proposed Action is therefore not expected to reduce the area of occupancy of the species.
Potential for fragmentation of an existing population into two or more populations	Unlikely	The species has not been recorded in the Development Envelope, therefore there is no evidence of an existing population being present. The species is highly mobile and the Proposed Action is not expected to impede the movement of individuals and is not expected to fragment an existing population into two or more populations.
Potential to adversely affect habitat critical to the survival of a species	Unlikely	There has been no direct or indirect evidence of Carnaby's Cockatoo in the Development Envelope. The Development Envelope is in the non-breeding range for Carnaby's Cockatoo and provides low-quality foraging habitat only. The habitats present are therefore unlikely to represent critical habitat for the species. The Proposed Action is therefore not expected to adversely affect habitat critical to the survival of the species and habitats retained in the Development Envelope will continue to support foraging of any individuals that may visit intermittently.
Potential to disrupt the breeding cycle of a population	Unlikely	The Development Envelope is in the non-breeding range for Carnaby's Cockatoo and has the potential to provide low-quality foraging habitat only. Given the lack of suitable breeding habitat in the Development Envelope, the Proposed Action is not expected to disrupt the breeding cycle of a population

Significant impact criteria	Likelihood	Assessment of impacts to Carnaby's Cockatoo
Potential to modify, destroy, remove isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The Proposed Action will result in the clearing of up to 37.7 ha of low-quality foraging habitat, representing approximately 39.6% of the low-quality foraging habitat present in the Development Envelope. A total of 57.5 ha of low-quality foraging habitat will be retained. Given the lack of records of the species from the Development Envelope, this is not expected to impact any individuals and is unlikely to cause the species to decline.
Potential for the establishment of invasive species in the endangered species' habitat that are harmful to the endangered species	Unlikely	Injury and death from European Honeybees and competition for nesting hollows by invading bird species are identified as key threats to the species (DSEWPaC 2012a). The Development Envelope is in the non-breeding range for Carnaby's Cockatoo and has the potential to provide low-quality foraging habitat only and as such nesting does not occur in the Development Envelope. In addition, the Proposed Action is unlikely to result in the introduction or spread of European honeybees or invasive bird species to the Development Envelope.
Potential for the introduction of disease that may cause the species to decline	Unlikely	Carnaby's Cockatoo are vulnerable to Psittacine Beak and Feather Disease. There is no evidence to suggest that the Proposed Action would introduce or spread disease to the Development Envelope.
Potential interference with the recovery of the species	Unlikely	Although the Proposed Action will result in the clearing of up to 37.7 ha of low-quality foraging habitat, 57.5 ha of low-quality foraging habitat present in the Development Envelope and wider region will remain. The Development Envelope is in the non-breeding range for Carnaby's Cockatoo. On this basis, the Proposed Action is not expected to interfere with the recovery of the species.

9.5.7 Predicted outcome

Carnaby's Cockatoo have not been recorded within the Development Envelope despite targeted surveys undertaken.

In summary, the Proposed Action is expected to result in the following outcomes:

- No disturbance, injury or mortality to Carnaby's Cockatoo as there have been no records within the Development Envelope
- Up to 37.7 ha of low-quality foraging habitat will be temporarily impacted by the Proposal
- Approximately 57.5 ha of low-quality foraging habitat in the wider Development Envelope will be retained
- No impact to roosting or breeding sites, as there are no records of these sites within the Development Envelope
- Rehabilitation will include *Banksia* spp. and *Eucalyptus* spp. that are locally occurring and suitable for foraging.

Overall, the Proposed Action is considered unlikely to have any significant residual impacts to Carnaby's Cockatoo.

10. Holistic impact assessment

This ERD has provided a detailed assessment of the potential environmental impacts associated with the Proposal and the management strategies for each applicable environmental factor.

The key environmental factors relevant to the Proposal are:

- flora and vegetation
- terrestrial fauna
- inland waters
- greenhouse gas emissions.

These factors are addressed separately in Sections 5 to 8 and a review of how the Proposal addresses the principles outlined in the EP Act is provided in Table 4-1. MNES are also addressed in Section 9.

The Proponent acknowledges the relationships between environmental factors and that those interrelationships may require consideration and management to achieve good environmental outcomes.

The main environmental impact of the Proposal is the clearance of a 90 ha Disturbance Footprint within a 213 ha Development Envelope. It is noted that approximately 41.5 ha (46%) of the Disturbance Footprint is intended to be rehabilitated upon completion of construction.

While the native vegetation to be cleared within the Disturbance Footprint is primarily in excellent condition, impacts to flora or ecological communities of conservation significance are limited to the removal of individuals from Priority flora species. Furthermore, the lineal nature of the Proposal and temporary extent of clearing in the pipeline corridor is unlikely to considerably impact on fauna of conservation significance, with the permanent 6 m width of the pipeline able to be traversed.

The Development Envelope is not intersected by any significant surface water features and does not contain groundwater dependent ecosystems. Water supply is from an existing bore adjacent to the Development Envelope. A small pipe will be run from the bore to the plant site, but this will not require any additional clearing (alongside of the road, above ground). Given the lack of water dependent features in the Development Envelope and no proposed modification to hydrological regimes; the Proposal has negligible potential to affect Inland Waters or any environmental values that are linked to hydrological systems.

The Proposal is predicted to contribute peak annual GHG emissions of up to 96,319 tCO_2e. A Greenhouse Gas Management Plan has therefore been prepared which outlines the Proponent's commitments to implement initiatives that either avoid where possible, reduce or offset emissions to progressively achieve a 60% reduction in GHG emissions by June 2028, a further 5% by June 2038, 5% post June 2038 and then subsequently align with the trajectory to 0 tCO_2e. This factor does not have direct connections with other factors.

On the above basis, the connections and interactions between environmental factors have been identified and the mitigation proposed in this ERD is considered sufficient to meet the principles

contained in the EP Act and the EPA's objectives for individual factors. Where practicable, management and mitigation measures have been considered from a holistic perspective.

11. References

APA 2021. *Northern Goldfields Interconnect Pipeline - EPA Environmental Referral Supporting Document*.

Australian and New Zealand and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2018. *Water Quality Guidelines*.

Beard, J. S. 1976. *Vegetation Survey of Western Australia: Murchison 1:1 000 000.* Map and Explanatory Notes to Sheet 6. University of Western Australia Press, Perth.

Beard, J. S. 1990. *Plant Life of Western Australia*. Kangaroo Press, NSW.

Birdlife International 2009. *Apus pacificus In: IUCN 2009. IUCN Red List of Threatened Species*. Version 2009.2. Apus pacificus. IUCN Red List.

Bureau of Meteorology (BoM) 2020. Climate Data Online. Available: http://www.bom.gov.au/climate/data/

Clean Energy Regulator 2021. *National Greenhouse and Energy Reporting 2019-2020 Highlights*. Commonwealth of Australia

Commonwealth of Australia 2017. *National Carbon Offset Standard for Products & Services*.

Department of Agriculture, Water and the Environment (DAWE) 2018. *CAPAD 2019: Terrestrial Protected Area Data*. Available from: https://www.environment.gov.au/land/nrs/science/capad/2018

Department of Agriculture, Water and the Environment (DAWE) 2020. *Australia's bioregions (IBRA).* Available from: https://www.environment.gov.au/land/nrs/science/ibra.

Department of Agriculture, Water and the Environment (DAWE) 2021. *SPRAT Profile Apus Pacificus – Fork-tailed Swift*. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=678.

Department of Biodiversity, Conservation and Attractions (DBCA) 2007 - 2020. *NatureMap*. Department of Parks and Wildlife and WA Museum. Accessed September 2020. Available: https://naturemap.dpaw.wa.gov.au/.

Department of Biodiversity, Conservation and Attractions (DBCA) 2020. *Threatened and Priority Flora database search*. Reference number 58-0820FL. Perth, Western Australia.

Department of the Environment and Conservation (DEC) 2008. *Records held in DEC's Declared Flora Database and rare flora files.* WA Department of Environment and Conservation (DEC).

Department of the Environment (DoE) 2008. *Approved conservation advice for Paracaleana dixonii Hopper & A.P.Br.nom.inval. (Sandplain Duck Orchid)*, Commonwealth of Australia. Available from: http://environment.gov.au/biodiversity/threatened/species/pubs/82050-conservation-advice.pdf.

Department of the Environment (DoE) 2013. *Matters of National Environmental Significance: Significant Impact Guidelines 1.1*, Australian Government, Canberra.

Department of the Environment (DoE) 2015. *Threat abatement plan for predation by feral cats*. Canberra, ACT: Commonwealth of Australia.

Department of the Environment (DoE) 2021a. *Calyptorhynchus latirostris in Species Profile and Threats Database*. Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bim/sprat/public/publicspecies.pl?taxon_id=59423.

Department of the Environment (DoE) 2021b. *Paracaleana dixonii in Species Profile and Threats Database*. Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=86882.

Department of the Environment and Energy (DotEE) 2016. *Threat abatement plan for competition and land degradation by rabbits*. Canberra, ACT: Commonwealth of Australia.

Department of the Environment and Energy (DotEE) 2017. *Revised draft referral guideline for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) Calyptorhynchus latirostris, Baudin's Cockatoo (Vulnerable) Calyptorhynchus baudinii, Forest Red-tailed Black Cockatoo (Vulnerable) Calyptorhynchus banksia naso,* Commonwealth of Australia. Department of Environment and Energy, Australian Government.

Department of Environment and Energy (DotEE) 2019. *Species Profile and Threats Database, Commonwealth of Australia*. Department of Environment and Energy, Australian Government, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl. [3 April 2019].

Department of the Environment, Heritage, Water and the Arts (DEWHA) 2008a. *Threat abatement plan for predation by the European Red Fox.* Canberra, ACT: Commonwealth of Australia.

Department of the Environment, Heritage, Water and the Arts (DEWHA) 2008b. *Threat abatement plan for the competition and land degradation by unmanaged goats*. Canberra, ACT: Commonwealth of Australia.

Department of the Environment, Heritage, Water and the Arts (DEWHA) 2010a. *Survey guideline's for Australia's threatened birds*. Canberra, ACT: Commonwealth of Australia.

Department of the Environment, Heritage, Water and the Arts (DEWHA) 2010b. *Survey guideline's for Australia's threatened bats*. Canberra, ACT: Commonwealth of Australia.

Department of Mining, Industry Regulation and Safety (DMIRS) 2020. *Statutory Guidelines for Mine Closure Plans.*

Department of Parks and Wildlife (DPaW) 2013. *Carnaby's Black cockatoo (Calytorhynchus latirostris) Recovery Plan*. Department of Parks and Wildlife, Perth, Western Australia.

Department of Primary Industries and Regional Development (DPIRD) 2020. Soil Landscape Mapping – Systems, Western Australia. Mapping scale: 1:250,000. Available from: https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-systems.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011a. *Survey guidelines for Australia's threatened mammals*. Canberra, ACT: Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011b. *Survey guidelines for Australia's threatened reptiles*. Canberra, ACT: Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012a. *EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species: Carnaby's Cockatoo (Endangered) Calyptorhynchus latirostris, Baudin's Cockatoo (Vulnerable) Calyptorhynchus baudinii, Forest Red-tailed Black Cockatoo (Vulnerable) Calyptorhynchus banksia naso*. Canberra, ACT: Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012b. *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, Commonwealth of Australia.

Department of Water and Environmental Regulation (DWER) 2018. *Hydrographic Catchments – Catchments (DWER-028).* Western Australian Land Information Authority, 2021. Available from: https://catalogue.data.wa.gov.au/dataset/hydrographic-catchments-catchments.

Department of Water and Environmental Regulation (DWER) 2019. *Allanooka-Dongara Water Reserve drinking water source protection review*.

Desmond A., and Chant, A. 2001. *Geraldton Sandplains 3 (GS3 – Lesueur Sandplain subregion).* In: Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002. Prepared by the Department of Conservation and Land Management. Available from: https://www.dpaw.wa.gov.au/images/documents/about/science/projects/waaudit/geraldton_sandplains03_p293-313.pdf.

ecologica 2018. *West Erregulla targeted threatened flora survey*.

Eco Logical Australia (ELA) 2018. *West Erregulla-2 Exploration Well – Groundwater Monitoring Plan*.

Eco Logical Australia (ELA) 2020. *West Erregulla Environmental Survey and Approvals Hydrology and Hydrogeology Baseline and Preliminary Impact Assessment Report.* Prepared for AGIG.

Eco Logical Australia (ELA) 2021. *West Erregulla Pipeline Flora and Fauna survey*. Prepared for Australian Gas Infrastructure Group.

Environmental Protection Authority (EPA) 2010. *Macedon Gas Development – BHP Billiton Petroleum Pty Ltd – Report and recommendations of the Environmental Protection Authority*. Available from: http://www.epa.wa.gov.au/sites/default/files/EPA_Report/3219_Rep1360MacedonEPS5710.pdf.

Environmental Protection Authority (EPA) 2016a. *Environmental Factor Guideline: Flora and Vegetation*. Perth, Western Australia. Published December 2016.

Environmental Protection Authority (EPA) 2016b. *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment*. Perth, Western Australia. Published December 2016.

Environmental Protection Authority (EPA) 2016c. *Environmental Factor Guideline: Terrestrial Fauna*. EPA, Perth, Western Australia.

Environmental Protection Authority (EPA) 2016d. *Technical Guidance: Terrestrial Fauna Surveys*. EPA, Perth, Western Australia.

Environmental Protection Authority (EPA) 2016e. *Technical Guidance: Sampling methods for Terrestrial Vertebrate Fauna.* EPA, Western Australia. December 2016.

Environmental Protection Authority (EPA) 2016f. *Technical Guidance: Sampling Methods for Short Range Endemic Invertebrate Fauna*. EPA, Western Australia. December 2016.

Environmental Protection Authority (EPA) 2018. *Environmental Factor Guideline: Inland Waters*. EPA, Western Australia.

Environmental Protection Authority (EPA) 2019. *Technical Report: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region Advice of the Environmental Protection Authority under Section 16(j) of the Environmental Protection Act 1986*.

Environmental Protection Authority (EPA) 2020a. *Instructions on how to prepare an Environmental Review Document,* EPA, Western Australia. Published in March 2020.

Environmental Protection Authority (EPA) 2020b. *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual*, Perth WA, March.

Environmental Protection Authority (EPA) 2020c. *Statement of Environmental Principles, Factors and Objectives*. June. Environmental Protection Authority, Perth, Western Australia.

Environmental Protection Authority (EPA) 2020d. *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*. EPA, Western Australia. Published March 2020.

Environmental Protection Authority (EPA) 2020e. *Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment*. EPA, Western Australia. June 2020.

Environmental Protection Authority (EPA) 2020f. *Environmental Factor Guidance: Greenhouse Gas Emissions.*

Geoscience Australia 2021. *Perth Basin*. Geoscience Australia, Canberra Australia. Available from: https://www.ga.gov.au/scientific-topics/energy/province-sedimentary-basingeology/petroleum/offshore-southwest-australia/perth-basin.

Government of Western Australia (GoWA) 2011. *WA Environmental Offsets Policy*. Environmental Protection Authority, Western Australia. September 2011.

Government of Western Australia (GoWA) 2014. *WA Environmental Offsets Guidelines*. Environmental Protection Authority, Western Australia. August 2014.

Government of Western Australia 2018. *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)*. Current as of December 2019. WA Department of Biodiversity, Conservation and Attractions. Available from: https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics.

Government of Western Australia (GoWA) 2020. *Greenhouse Gas Emissions Policy for Major Projects*.

Higgins, P.J. (ed.) 1999. *Handbook of Australian, New Zealand and Antarctic Birds.* Volume Four – Parrots to Dollarbird. Oxford University Press, Melbourne.

Hydroconcept Pty Ltd 2015. *Preliminary Groundwater Assessment of the Midlands Region*. Hydroconcept 2015.

Keighery, B. J. 1994. Bushland Plant Survey: *A guide to plant community survey for the community.* Wildflower Society of Western Australia, Nedlands.

Mattiske Consulting Pty Ltd 2020. *Review of key potential flora, vegetation and fauna values on the proposed pipeline for Strike Energy near Dongara/*.

Mitchell, D., Williams, K and Desmond, A. 2002. *Swan Coastal Plain (SWA2 – Swan Coastal Plain subregion)*. In: (CALM (Ed) A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, pp. 606-623. Department of Conservation and Land Management, Perth, Western Australia.

Mitsui E&P Australia 2019. *Waitsia Gas Project Stage 2 - Environmental Referral Supporting Repor*t.

Mitsui E&P Australia 2020*. Waitsia Gas Project Stage 2 - Greenhouse Gas Management Plan.*

Pennington Scott 2010. *Northern Perth Basin Groundwater Bulletin: for Department of Water* (unpublished).

RCMA Australia 2020. *Cervantes 1 Conventional Oil Exploration Well – Section 38 Referral Supporting Documentation.*

RPS Aquaterra, 2011. *West Erregulla Groundwater Assessment*. Prepared for Warrego Energy Pty Ltd, 22 August 2011.

Saunders, D, Dawson, R, Doley, A, Lauri, J, Le Soeuf, A, Mawson, P, Warren, K & White, N 2014. *Nature conservation on agricultural land: a case study of the endangered Carnaby's Cockatoo Calyptorhynchus latirostris breeding at Koobabbie in the northern wheatbelt of Western Australia*. Nature Conservation 9:19-43.

Strategen 2012. *Dongara Titanium Minerals Project – Public Environmental Review.* Prepared for Tiwest Pty Ltd.

Strategen & JBS&G Australia 2020. *Energy Resources Limited: Raven 2D Seismic Survey Section 38 Referral* - Environmental Protection Act 1986.

Thackway, R. and Cresswell, I. D (Eds) 1995. *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves,* Version 4.0. Australian Nature Conservation Agency, Canberra.

Warrego Energy 2014. *West Erregulla-2 Exploration Well EPA Referral*.

Woodman Environmental Consulting 2013. West Erregulla Project Flora and Vegetation Assessment.

eco logical AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au