



4. ENVIRONMENTAL PRINCIPLES AND FACTORS

4.1 Principles

Section 4A of the EP Act establishes the object and principles of the EP Act. In accordance with the EPA’s *Statement of Environmental Principles, Factors and Objectives* (EPA, 2018), this section describes how each of the five principles of the EP Act have been applied to the Proposal (**Table 4-1**).

Table 4-1: EP Act Principles

Principle	Consideration of Principle in the Proposal
<p>1. The precautionary principle</p> <p>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.</p> <p>In application of this precautionary principle, decisions should be guided by:</p> <ul style="list-style-type: none"> a) Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and b) An assessment of the risk-weighted consequences of various options. 	<p>A number of detailed desktop reviews and baseline surveys have been undertaken in support of the Proposal to provide a robust understanding of the existing and receiving environment. Specific studies/surveys have included flora and vegetation, terrestrial fauna, heritage (Aboriginal and historic heritage) and noise (Ambania compressor station). The information from these studies/surveys has informed the assessment of potential impacts for the key environmental factors and has reduced the uncertainty surrounding this evaluation.</p> <p>Where the potential for serious or irreversible damage has been identified, mitigation measures, including avoiding impacts where practicable, have been applied to ensure impacts are environmentally acceptable. Refer to Section 2.2.2 for discussion of key refinements that have made to the pipeline alignment to avoid and minimise potential impacts associated with the Proposal . APA has made all efforts to apply the ‘avoidance’ approach of the mitigation hierarchy for key values and sensitivities, as part of good practice in environmental management and optimisation of the NGI alignment. A precautionary approach has been taken where residual risk to the receiving environment is uncertain.</p>



Principle	Consideration of Principle in the Proposal
<p>2. The principle of intergenerational equity</p> <p>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</p>	<p>The Proposal will not result in any significant or cumulative impacts, which would pose a threat to health, diversity and productivity of the existing environment.</p> <p>The Proposal will provide growth opportunities in the Mid West and Goldfields regions and contribute to increased employment opportunities and economic growth.</p>
<p>4. Principles relating to improved valuation, pricing and incentive mechanisms</p> <p>(1) Environmental factors should be included in the valuation of assets and services.</p> <p>(2) The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</p> <p>(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</p> <p>Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.</p>	<p>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.</p> <p>APA will be responsible for funding the cost of environmental avoidance and management measures.</p> <p>APA recognise the polluter pays principle. APA has an established Health, Safety and Environment Management System that requires the implementation of management and mitigation measures that aim to mitigate pollution and waste. These measures are also applicable to, and included in, this Proposal.</p>
<p>3. The principle of the conservation of biological diversity and ecological integrity</p> <p>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</p>	<p>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. Clearing of flora and vegetation, particularly that of conservation significance, has been avoided or minimised (for example, HDD under <i>E. beardiana</i>, and narrowing of CROW to minimise disturbance to the Eucalypt Woodlands TEC/PEC). Management measures (including avoidance and rehabilitation) will be implemented to mitigate impacts to biological diversity and ecological integrity.</p>



Principle	Consideration of Principle in the Proposal
<p>5. The principle of waste minimisation</p> <p>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</p>	<p>Waste management measures will be implemented to minimise the generation of waste and its discharge to the environment. The philosophy of ‘reduce, reuse, recycle’ will be applied to the Proposal, where practicable.</p>

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. The environmental factors and EPA objectives are summarised in **Table 4-2**. The potential impacts to these factors associated with the construction, commissioning and operation of the Proposal are also outlined in **Table 4-2**.

Based on the assessment for potential impacts associated with the construction, commissioning and operation of the Proposal, the following environmental factors have been assessed in detail, as they are considered key environmental factors:

- Flora and vegetation (refer to **Section 4.3**);
- Terrestrial fauna (refer to **Section 4.4**); and
- Social surroundings (refer to **Section 4.5**).

The following other environmental factors are addressed in **Section 4.6**:

- Terrestrial environmental quality;
- Inland waters; and
- GHG.



Table 4-2: Identification of Environmental Factors

Factor	Objective	Potential for Impact	Potential Impacts Identified	Further Consideration
Sea				
Benthic Communities and Habitats	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.	No impacts expected. The Proposal is located inland and will have no impact on benthic communities and habitats.	Not applicable (N/A)	N/A
Coastal Processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.	No impacts expected. The Proposal is situated inland and will not impact coastal processes.	N/A	N/A
Marine Environmental Quality	To maintain the quality of water, sediment and biota so that environmental values are protected.	No impacts expected. The Proposal is located inland and will have no impact to marine waters, sediment and biota.	N/A	N/A



Factor	Objective	Potential for Impact	Potential Impacts Identified	Further Consideration
Marine Fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained.	No impacts expected. The Proposal is situated inland and will have no impact to marine fauna.	N/A	N/A
Land				
Flora and Vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	The Proposal requires clearing of approximately 1,934 ha of native vegetation. The Proposal has been designed to avoid and minimise clearing of native vegetation. However, clearing of 0.74 ha of the Eucalypt Woodlands of the Western Australian Wheatbelt TEC/PEC will be required (comprising < 0.01% of the development envelope). No Threatened flora will be cleared. However, a single individual of the Priority 3 <i>Petrophile ?pauciflora</i> will be cleared.	Loss of flora and vegetation Fragmentation of native vegetation Introduction and/or spread of weeds Smothering of vegetation by dust Changes to vegetation community structure and composition through altered hydrology Accidental bushfire	Section 4.3



Factor	Objective	Potential for Impact	Potential Impacts Identified	Further Consideration
Terrestrial Fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	The Proposal requires clearing of approximately 1,934 ha of native vegetation, which represents fauna habitat. Threatened fauna have the potential to occur, or have been recorded, in the development envelope and surrounds.	<p>Direct loss of fauna habitat</p> <p>Injury, mortality or displacement of conservation significant fauna</p> <p>Disturbance to native fauna from dust, light overspill and noise</p> <p>Increased competition or predation by introduced species</p> <p>Accidental bushfires</p>	Section 4.4
Subterranean Fauna	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	<p>No impacts expected.</p> <p>No suitable habitat for subterranean fauna occurs within the Proposal development envelope.</p>	N/A	N/A
Landforms	To maintain the variety and integrity of significant physical landforms so that environmental values are protected.	<p>No impacts expected.</p> <p>No distinctive physical landforms have been identified within or adjacent to the Proposal.</p>	N/A	N/A



<p>Terrestrial Environmental Quality</p>	<p>To maintain the quality of land and soils so that environmental values are protected.</p>	<p>No significant impacts expected.</p> <p>Potential acid sulfate soils (ASS) may be present in discrete locations of the Proposal based on the Commonwealth Scientific and Industrial Research Organisation’s ASS risk mapping.</p> <p>No contaminated sites are known to intersect the Proposal, from review of the DWER Contaminated Sites Database.</p> <p>Application of standard construction controls and other regulatory mechanisms, are considered to adequate to minimise and control any identified potential impacts.</p>	<p>Disturbance of ASS during earthworks resulting acidification of soils and potential leaching of metals to surface and/or groundwater</p> <p>Soil erosion from vegetation clearing and earthworks</p> <p>Disturbance of ASS during earthworks resulting in the acidification of soils and potential leaching of metals to surface and/or groundwater</p> <p>Contamination of ground and/or surface water due to release/spillage of environmentally hazardous materials</p> <p>Waste (solid and/or liquid) discharge resulting in contamination of soils, surface and groundwater.</p>	<p>Section 4.6</p>
--	--	--	--	---------------------------



Factor	Objective	Potential for Impact	Potential Impacts Identified	Further Consideration
<i>Water</i>				
Inland Waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	<p>No significant impacts expected.</p> <p>There are no conservation significant wetlands within the development envelope. A number of ephemeral creeks and tributaries intersect the Proposal. Intersection of major watercourses is limited within the alignment, with the key crossings being Tenindewa Creek, the upper reaches of the Irwin River and Salt Creek.</p> <p>The Proposal indicative disturbance footprint intersects <1% of five Priority 1 PECs related to calcrete groundwater that are recognised for supporting unique assemblages of invertebrates in the groundwater calcretes. Should dewatering be required within the mapped extents of the PECs, potential impacts are expected to be highly localised and temporary.</p>	<p>Localised alteration to surface water flows</p> <p>Localised excavation of shallow pipeline, with minimal risk of interaction with subterranean groundwater resources or assemblages.</p>	Section 4.6
<i>Air</i>				
Air Quality	To maintain air quality and minimise emissions so that environmental values are protected.	<p>No impacts expected.</p> <p>Emissions of air pollutants will be limited throughout the construction and operational phases of the Proposal.</p>	N/A	N/A



Factor	Objective	Potential for Impact	Potential Impacts Identified	Further Consideration
Greenhouse Gas Emissions	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change.	No significant impacts expected. Emissions of greenhouse gases (GHGs) will be limited throughout the construction and operational phases of the Proposal. Specifically, GHG emissions from the Proposal will not exceed 100,000 tonnes of scope 1 emissions each year measured in carbon dioxide equivalence (CO ₂ -e), which is the threshold criteria for designation of a large facility under the Australian Government’s Safeguard Mechanism.	Incremental increase in GHG emissions	Section 4.6
People				
Human Health	To protect human health from significant harm	No impacts expected. The Proposal will not emit radiation emissions.	N/A	N/A
Social Surroundings	To protect social surroundings from significant harm	Five registered Aboriginal heritage sites are known to occur in the development envelope, with only two of these intersecting the indicative disturbance footprint. The Proponent is currently undertaking detailed Aboriginal heritage surveys in support of the Proposal, with the first surveys commencing early December 2020. Two historic sites are known to intersect the development envelope; the Rabbit Proof Fence No 2 and No 3 (Emu Barrier Fence) (Place No. 5022) and Old Geraldton Road (Place No. 6170). Only the Rabbit Proof Fence No 2 intersects the indicative disturbance footprint. The fence is unable to be avoided due to its linear nature, as it runs north-south through the indicative disturbance footprint.	Disturbance to Aboriginal heritage sites Disturbance to historic heritage sites Noise emissions impacting on sensitive receptors	Section 4.5

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Factor	Objective	Potential for Impact	Potential Impacts Identified	Further Consideration
		The Proposal is not located in close proximity to densely populated residential areas, with residences (homesteads) being sparse along the Proposal alignment.		



4.3 Key Environmental Factor – Flora and Vegetation

4.3.1 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, 2016a).

For the purposes of EIA, the EPA defines flora as native vascular plants and vegetation as groupings of different flora patterned across the landscape that occur in response to environmental conditions (EPA, 2016a).

4.3.2 Policy and Guidance

Legislation, policies and guidance applicable to the assessment of flora and vegetation include:

- *Biodiversity Conservation Act 2016* (BC Act);
- Environmental Factor Guideline: Flora and Vegetation (EPA, 2016a);
- Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b);
- Environmental Protection Bulletin 20 – Protection of naturally vegetated areas through planning and development (EPA, 2013); and
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

4.3.3 Receiving Environment

4.3.3.1 Baseline Studies

APA commissioned Focused Vision Consulting (Focused Vision) to undertake a detailed flora and vegetation assessment, comprising a primary and supplementary field survey, to identify flora and vegetation values of relevance to the Proposal. The flora and vegetation assessment comprised the following:

- Desktop assessment of the project area (with a 5 km buffer applied) for flora and vegetation values;
- Detailed flora and vegetation assessment to identify flora and vegetation values, including:
 - Targeted searches for and description of populations of conservation significant species (listed under the EPBC Act, BC Act and/or the DBCA priority list);
 - Targeted searches for and description of populations of introduced plant species, particularly declared species and weeds of national significance;
 - Definition and mapping of vegetation types, with focus on mapping the boundaries of Threatened and Priority ecological communities (TECs and PECs, respectively);
 - Review of local and regional significance of the vegetation types recorded; and
 - Definition and mapping of vegetation condition.

The primary field survey was conducted between 1 to 7 September 2020 and consisted of a survey effort of 43 person-days. The survey area comprised a 50 m wide corridor for the first approximately 82 km of the NGI pipeline (to align with the width of the DBNGP easement), after which it expanded to an approximately 200 m wide corridor (nominally 100 m either side of the NGI pipeline route) for the remainder of the pipeline route. The survey area also consisted of the Ambania compressor station site, which is located in close proximity to the eastern end of the pipeline.

The subsequent targeted flora and vegetation survey was undertaken between 29 September to 2 October 2020, with the survey effort being eight person-days. The survey focussed on supplementary quadrat sampling and further targeted surveys of significant flora within the proposed NGI pipeline route. In discrete areas, the survey area was widened to allow for targeted mapping of known conservation significant values, specifically the Eucalypt Woodlands TEC/PEC and Yalgoo vegetation complexes (Banded Ironstone Formation).

The flora and vegetation surveys were undertaken in accordance with the EPA's Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b). Refer to **Appendix 1** for the Focused Vision (2020) flora and vegetation assessment report.

The outcomes of the detailed flora and vegetation survey, including the desktop assessment, are considered robust for the purposes of informing an appropriate assessment of the flora and vegetation values within the development envelope. The outcomes of the survey have informed the refinement of the pipeline alignment and identification of key 'avoidance areas' (see **Figure 2-3**).



A very small portion of the development envelope was not mapped during the flora and vegetation survey; five areas totalling approximately 0.4% or 50 ha. A localised area of approximately 4 ha in the vicinity of KP31 to KP33 was not mapped as it was inaccessible during the survey. The remaining four areas are associated with access points or routes to the development envelope and were not mapped as their location was refined post-survey. Three of four areas provide access from the Geraldton – Mount Magnet Road (approximately KP84, KP90 and KP95) and follow pre-existing tracks or cleared/revegetated areas (e.g. borrow pits). The fourth provides access from an existing track to the north of the development envelope at approximately KP545 and follows a pre-existing track. APA have proactively identified these access routes to follow existing routes and therefore the vegetation is representative of minimal intact remnant native vegetation that has been identified within the development envelope. None of the areas are in threatened or priority ecological vegetation communities. The unmapped area accounts for approximately 0.8% (approximately 18 ha) of the indicative disturbance footprint, a very small proportion of the total area relevant to the Proposal and mapped in detail (> 99%).

4.3.3.2 Flora

Flora Diversity

A total of 501 plant taxa from 58 families and 197 genera were recorded during the detailed flora and vegetation assessment and targeted flora survey (Focused Vision, 2020). The dominant families were Fabaceae (65 taxa), Chenopodiaceae (52 taxa) and Myrtaceae (40 taxa). Of the plant taxa recorded, 471 (94%) were native species and 30 (6%) were introduced (weed) species.

Conservation Significant Flora

Desktop searches of the EPBC Act Protected Matters database, the DBCA Threatened and Priority Flora database and the Western Australian Herbarium identified the potential occurrence of 106 conservation significant flora species within the development envelope and surrounding area (Focused Vision, 2020). Of the 106 species, 16 are Threatened species listed under the EPBC Act and BC Act, 25 are Priority 1, nine are Priority 2, 44 are Priority 3 and 12 are Priority 4.

This information, together with a review of regional vegetation data and aerial imagery, informed an assessment of the likelihood of each conservation significant flora species occurring within the development envelope. The likelihood of occurrence was based on four factors, with these being the presence of suitable habitat, age of previous records, proximity of previous records and current condition (e.g. pristine or modified/degraded environments). Twenty-eight of the conservation significant flora were considered 'likely' to occur in the development envelope, consisting of two Threatened species, 14 Priority 1 species, eight Priority 3 species and four Priority 4 species. Thirty-two species were considered as 'possibly' occurring in the development envelope with the remaining 46 species considered 'unlikely'.

A summary of the likelihood of occurrence of Threatened and Priority flora species considered likely to occur within the development envelope is provided in **Table 4-3** (Focused Vision, 2020). Refer to **Appendix 1** for further detail on the conservation significant flora identified from the desktop search.



Table 4-3: Conservation Significant Flora Considered Likely to Occur within the Development Envelope

Species	Conservation Status ¹		Habitat Preference	Likelihood of Occurrence
	Cth	State		
<i>Eremophila viscida</i>	EN	EN	Granitic soils, sandy loam. Stony gullies, sandplains.	Likely - previously recorded in the development envelope.
<i>Eucalyptus beardiana</i>	VU	EN	Red or yellow sand. Sand dunes and ridges.	Likely to occur (recorded) - previously recorded in the development envelope.
<i>Acacia ampliata</i>	-	P1	Red/orange sand, sandy loam, loam. Sandplains, hillsides.	Likely to occur - suitable habitat likely present in the development envelope, recorded 1 km south.
<i>Acacia lineolata</i> subsp. <i>multilineata</i>	-	P1	Sand, clay, rocky terrain. Sandplains, depressions and hillsides.	Likely to occur - recorded within 100 m of the development envelope.
<i>Aluta teres</i>	-	P1	Red/orange yellow sands. Beneath BIF, sand dunes, plains.	Likely to occur - recorded 500 m south of the development envelope.
<i>Desmocladius ferruginipes</i>	-	P1	Sand. Slopes and flats.	Likely to occur - suitable habitat may be present in the development envelope, recorded near drainage line 5 km south.
<i>Drosera eremaea</i>	-	P1	Red sand, quartz grit over white quartz. Open ground, winter wet creeks, granite outcrops.	Likely to occur - suitable habitat likely present in the development envelope, numerous records near Mount Magnet.
<i>Enekbatus dualis</i>	-	P1	Orange-brown silty sand, brown clayey sand, granite. Low hills, mid to upper slopes, rock outcrops, plains.	Likely to occur - previously recorded within 100 m of the development envelope.
<i>Frankenia bracteata</i>	-	P1	Sand, clay, saline soil. Low sandy rises, swamps, margins of salt lakes.	Likely to occur - suitable habitat likely to occur in the development envelope, previously recorded 400 m south.

Species	Conservation Status ¹		Habitat Preference	Likelihood of Occurrence
	Cth	State		
<i>Leptospermum exsertum</i>	-	P1	Sand, sandy clay soils sometimes with gravel. Flats, sandplains and road verges.	Likely to occur - suitable habitat likely present in the development envelope, recorded 1 km south.
<i>Philotheca nutans</i>	-	P1	Sandy soils. Low plains, undulating rises, edges of salt lakes.	Likely to occur - suitable habitat likely present in the development envelope, known to occur 1 km south.
<i>Prostanthera pedicellata</i>	-	P1	Red/brown clay, sandy loam or sandy soils. Plains, roadside and railway line reserves.	Likely to occur - suitable habitat likely present in the development envelope, numerous records near Pindan within 200 m of corridor.
<i>Pterostylis macrocalymma</i>	-	P1	Rocky, loamy, sandy and gravelly soil. Slopes, flats and undulating plains.	Likely to occur - suitable habitat likely present in the development envelope near Mullewa.
<i>Ptilotus procumbens</i>	-	P1	Red clay, sandy loam with lateritic gravel. Washaways, gravelly plains and flats.	Likely to occur - suitable habitat likely present in the development envelope, recorded 3 km south, near Windimurra.
<i>Stylidium pendulum</i>	-	P1	Clayey sand or sandy loam soil, granite. Upper slopes, often near rock outcrops.	Likely to occur - recorded adjacent to the development envelope near Pindar.
<i>Acacia subsessilis</i>	-	P3	Red sand or stony gravel over ironstone. Rocky hills.	Likely to occur - recorded 250 m north of the development envelope.
<i>Darwinia</i> sp. Morawa (C.A. Gardner 2662)	-	P3	Sand, sandy loam, rocky terrain. Plains, slopes and road verges.	Likely to occur - recorded 250 m north of the development envelope.
<i>Dicrastylis linearifolia</i>	-	P3	Yellow or red sand. Sand dunes, plains.	Likely to occur - recorded 100 m north of the development envelope.

Species	Conservation Status ¹		Habitat Preference	Likelihood of Occurrence
	Cth	State		
<i>Grevillea granulosa</i>	-	P3	Sand, sandy loam, occasionally with lateritic gravel. Flats, slopes, margins of salt lakes.	Likely to occur - small areas of suitable habitat likely present in the development envelope, recorded 600 m south.
<i>Grevillea tenuiloba</i>	-	P3	Sand, clay loam. Granite outcrops, road verge.	Likely to occur - recorded 100 m north of the development envelope.
<i>Melaleuca barlowii</i>	-	P3	Sand, clay, loam, gravel. Hills, slopes, BIF and road verges.	Likely to occur - recorded 300 m south of the development envelope.
<i>Persoonia pentasticha</i>	-	P3	Sandy loam, sandy clay. Slopes and flats.	Likely to occur - recorded 300 m south of the development envelope.
<i>Roebuckiella halophila</i>	-	P3	Sand. Margins of saltpans, drainage lines.	Likely to occur - recorded 100 m north of the development envelope.
<i>Verticordia chrysostachys</i> var. <i>pallida</i>	-	P3	Sand. Sandplains and dunes.	Likely to occur - recorded 600 m south of the development envelope.
<i>Acacia speckii</i>	-	P4	Sand, loam or clay. Plains, slopes, beneath rock outcrops.	Likely to occur - recorded 1 km north of the development envelope.
<i>Banksia benthamiana</i>	-	P4	Sandy loam, clay loam, sand and gravel. Ridges, plains and slopes.	Likely to occur - recorded 100 m north of the development envelope.
<i>Goodenia neogoodenia</i>	-	P4	Sand, sandy clay. Edges of wetlands, creeklines, claypans.	Likely to occur - previous record within the development envelope.
<i>Hemigenia exilis</i>	-	P4	Sand, sandy loam. Drainage lines, laterite and BIF outcrops, slopes.	Likely to occur - suitable habitat present in the development envelope.

¹ CR – Critically Endangered; EN – Endangered; VU – Vulnerable; P1-4 – Priority flora species listed by DBCA.

The detailed flora and vegetation survey recorded one Threatened and five Priority flora species (**Table 4-4**). Of these, the Priority 4 *Acacia speckii* was recorded only outside the development envelope. The location of the Threatened and Priority flora are shown on **Figure 4-1**.



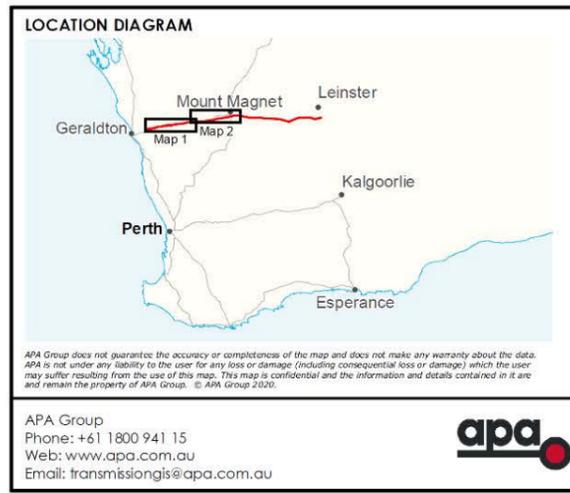
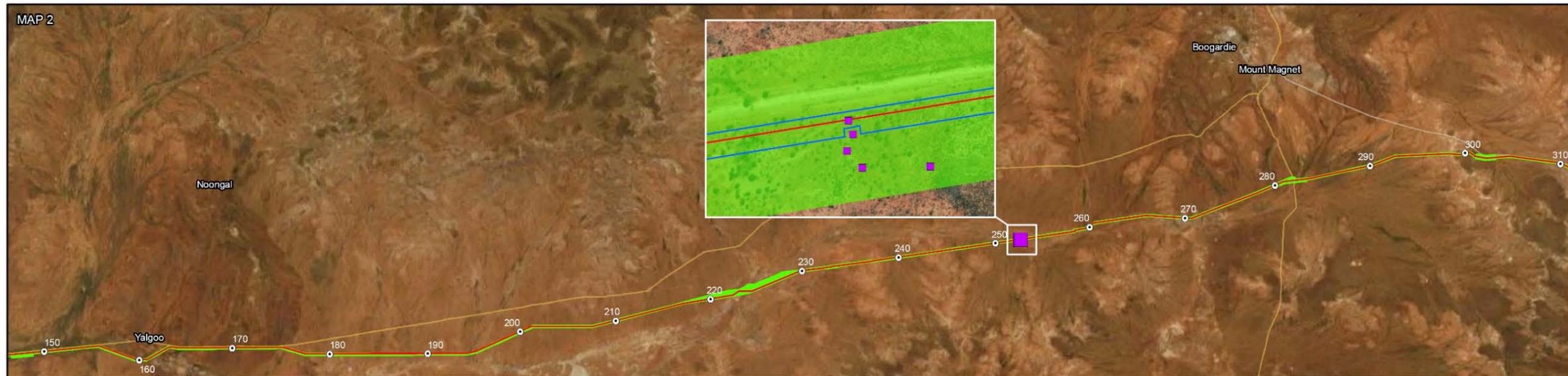
Further detail on these species is provided in **Appendix 1**.

Table 4-4: Threatened and Priority Flora Recorded

Species	Conservation Status ¹		Total Number of Individuals Recorded	Vegetation Unit
	Cth	State		
<i>Eucalyptus beardiana</i>	VU	EN	55	EbW
<i>Dicrastylis linearifolia</i>		P3	183	CcLOW
<i>Gnephosis cassiniana</i>		P3	1	TspSS
<i>Petrophile ?pauciflora</i>		P3	5	AbMpCS
<i>Ptilotus beardii</i>		P3	1	MpCS
<i>Acacia speckii</i> [^]		P4	1	AgTS

¹ CR – Critically Endangered; EN – Endangered; VU – Vulnerable; P3-4 – Priority flora species listed by DBCA.

[^] Species recorded only outside the development envelope.



LEGEND:

- Kilometre Point (KP)
- Proposed Pipeline Alignment
- ▭ Indicative Disturbance Footprint
- ▭ Development Envelope

Roads

- Freeway
- Highway
- Main, Sealed

Conservation Significant Flora

- ▭ *Eucalyptus beardiana* (Threatened)
- ▭ *Dicrastylis linearifolia* (Priority 3)
- ▭ *Gnephosis cassiniana* (Priority 3)
- ▭ *Petrophile pauciflora* (Priority 3)
- ▭ *Ptilotus beardii* (Priority 3)
- ▭ *Acacia speckii* (Priority 4)

PROJECT: Northern Goldfields Interconnect

TITLE: Conservation Significant Flora (1 of 2)

SUBTITLE: Map 1 and 2

DATE: 1/12/2020

DATA SOURCE:
KPs, Proposed Pipeline Alignment, Indicative Disturbance Footprint: APA.
Conservation Significant Flora: Focused Vision & DBCA.
Imagery: ESRI World Basemap.

DOCUMENT NUMBER: 560-MAP-L-7836

Revision	Description	Drawn	Checked/QC	Approved	DATE
0.3	Revision	SP			1/12/20
0.2	Revision	SP	KM		27/11/20
0.1	Draft	SP	KM		26/11/20

SCALE: 1:450,000 @ A3

GDA2020

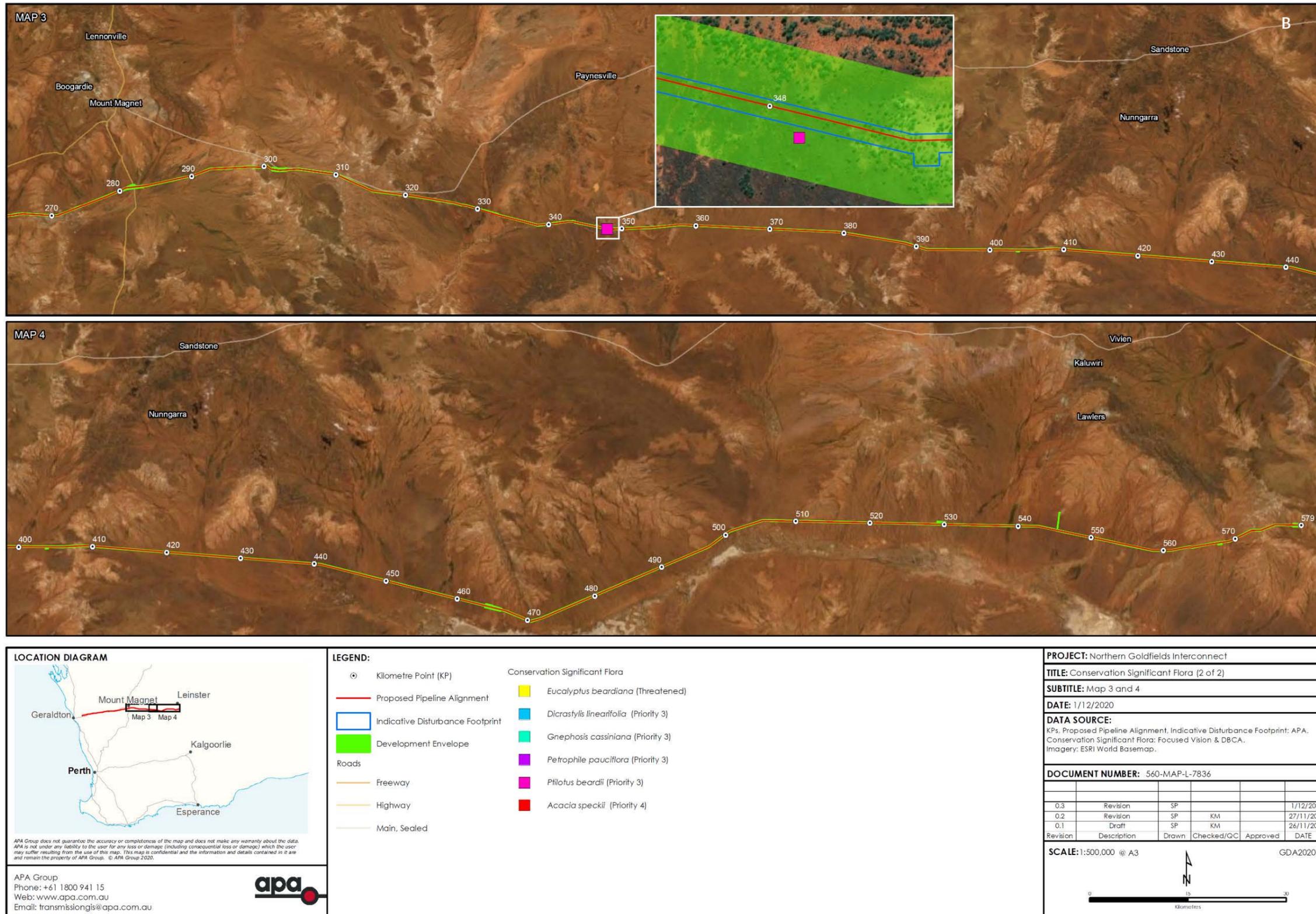


Figure 4-1: Location of Conservation Significant Flora Recorded



Introduced Flora

Thirty introduced flora species (weeds) were recorded within the development envelope. Targeted searches for weeds focused on native vegetation remnants, as opposed to pasture and other cleared areas where weeds are widespread and abundant due to historical disturbances.

Of the introduced species recorded, two are Declared Plants under the *Biodiversity and Agricultural Management Act 2007* (BAM Act) (DAFWA, 2018):

- *Echium plantagineum* (Paterson’s Curse) – one individual recorded within the development envelope at a single location; and
- *Rumex hypogaeus* (Doublegee) – a total of approximately 112 individuals were recorded within the development envelope at five locations.

None of the recorded weeds are listed as Weeds of National Significance.

4.3.3.3 Vegetation

Vegetation Associations

Broad scale (1:250,000) pre-European vegetation mapping was completed by Beard (1990). A total of 24 vegetation associations are present within the development envelope (Focused Vision Consulting, 2020). These are described in **Table 4-5**, as per Shepherd *et al.*, 2002, and shown in **Figure 4-2**.

All of the vegetation associations within the development envelope exceed the 30% threshold level, with the exception of three associations (142, 353 and 687). A level of 30% of pre-clearing extent is considered to be the level below which species loss appears to accelerate exponentially at the ecosystem level (EPA, 2008).

Table 4-5: Extent of Pre-European Vegetation Associations within the Development Envelope

Vegetation Association Number	Broad Vegetation Description	IBRA Region
18	Low woodland; mulga (<i>Acacia aneura</i>)	Yalgoo, Murchison
39	Shrublands; mulga scrub	Yalgoo, Murchison
107	Hummock grasslands, shrub steppe; mulga and <i>Eucalyptus kingsmillii</i> over hard spinifex	Murchison
142	Medium woodland; York gum & salmon gum	Geraldton Sandplains, Avon Wheatbelt, Yalgoo, Murchison
188	Shrublands; mulga and <i>Acacia sclerosperma</i> scrub	Murchison
202	Shrublands; mulga, <i>Acacia quadrimarginea</i> scrub	Yalgoo, Murchison
243	Shrublands; bowgada & minnieritchie scrub	Yalgoo
326	Low woodland over scrub; mulga over bowgada & minnieritchie scrub	Yalgoo, Murchison



Vegetation Association Number	Broad Vegetation Description	IBRA Region
339	Hummock grasslands, mixed sandplain; bowgada, sugarbrother, mallee, <i>Triodia scariosa</i>	Murchison
353	Shrublands; mallee & acacia scrub with scattered York gum	Geraldton Sandplains, Avon Wheatbelt
361	Shrublands; bowgada & minnieritchie scrub with scattered mulga	Yalgoo, Murchison
364	Shrublands; bowgada scrub with scattered eucalypts & cypress pine	Geraldton Sandplains, Avon Wheatbelt, Yalgoo, Murchison
372	Mosaic: Shrublands; scrub-heath on deep sandy flats/ Shrublands; thicket, acacia-casuarina alliance	Geraldton Sandplains
380	Shrublands; scrub-heath on sandplain	Geraldton Sandplains, Avon Wheatbelt, Yalgoo
389	Succulent steppe with open low woodland; mulga over saltbush	Yalgoo, Murchison
404	Shrublands; bowgada & <i>Acacia murrayana</i> scrub	Geraldton Sandplains, Avon Wheatbelt, Yalgoo, Murchison
415	Succulent steppe with open scrub; scattered mulga and other wattles over saltbush & bluebush	Yalgoo, Murchison
419	Shrublands; bowgada, jam and <i>Melaleuca uncinata</i> thicket	Avon Wheatbelt, Yalgoo
420	Shrublands; bowgada & jam scrub	Geraldton Sandplains, Avon Wheatbelt, Yalgoo, Murchison
676	Succulent steppe; samphire	Avon Wheatbelt, Yalgoo, Murchison
683	Succulent steppe with open scrub; scattered <i>Acacia sclerosperma</i> & snakewood over samphire	Yalgoo, Murchison
686	Medium woodland; York gum & red mallee	Avon Wheatbelt, Yalgoo
687	Shrublands; bowgada and jam scrub with scattered <i>Allocasuarina huegeliana</i> and York gum	Geraldton Sandplains, Avon Wheatbelt, Yalgoo
1413	Shrublands; acacia, casuarina & melaleuca thicket	Avon Wheatbelt, Yalgoo, Murchison



LOCATION DIAGRAM

APA Group does not guarantee the accuracy or completeness of the map and does not make any warranty about the data. APA is not under any liability to the user for any loss or damage (including consequential loss or damage) which the user may suffer resulting from the use of this map. This map is confidential and the information and details contained in it are and remain the property of APA Group. © APA Group 2020.

APA Group
Phone: +61 1800 941 15
Web: www.apa.com.au
Email: transmissiongis@apa.com.au

LEGEND:

- ⊙ Kilometre Point (KP)
- Proposed Pipeline Alignment
- Development Envelope

Pre-European Vegetation

18	339	415
35	352	419
39	353	420
125	361	676
142	364	683
202	372	686
243	380	687
326	404	1413

PROJECT : Northern Goldfields Interconnect

TITLE : Pre-European Vegetation Associations

SUBTITLE : Map 1

DATE : 2/12/2020

DATA SOURCE :
Pipelines: APA Group

DOCUMENT NUMBER : 560-MAP-L-7831

Revision	Description	Drawn	Checked/QC	Approved	DATE
0.2	Revision	ID			01/12/20
0.1	Draft	ID			19/11/20

SCALE: 1:500,000 @ A3

GDA2020



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

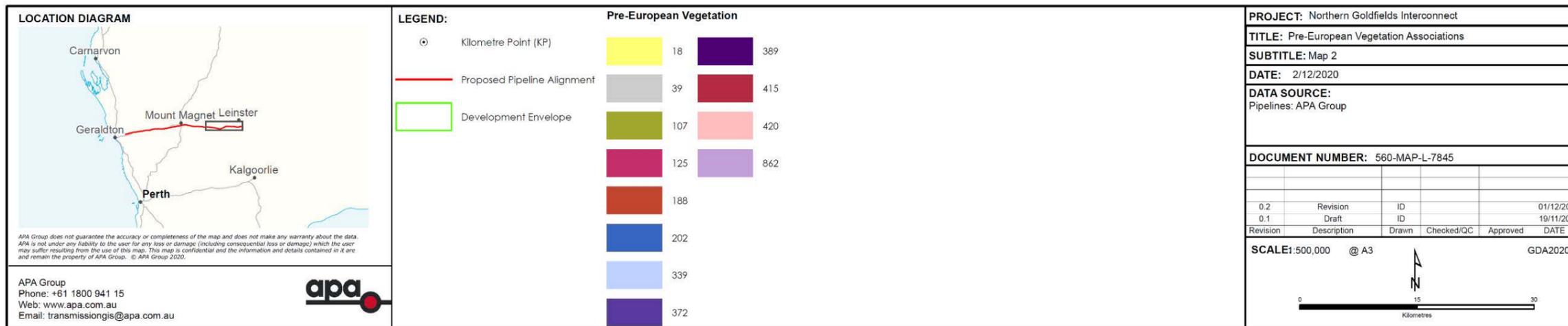


Figure 4-2: Pre-European Vegetation Associations within the Development Envelope



Vegetation Types

The detailed flora and vegetation survey identified 31 vegetation types within the development envelope (**Table 4-6**). Broadly, the vegetation units comprised of *Eucalyptus*, *Banksia*, *Callitris* or *Hakea* woodlands and *Acacia*, *Eremophila*, *Melaleuca* and *Chenopod* dominated shrublands (Focused Vision, 2020).

Approximately 1,547 ha (13%) of the development envelope is pre-existing cleared areas. Detailed mapping of the vegetation types is provided in **Appendix 1**.



Table 4-6: Vegetation Types within the Development Envelope

Vegetation Type Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)
BsCaW <i>Banksia</i> Woodland	<i>Banksia sceptrum</i> and <i>Callitris arenaria</i> Low Open Woodland over <i>Beaufortia aestiva</i> Sparse Shrubland over <i>Austrostipa elegantissima</i> Low Sparse Grassland.	0.7	< 0.1
CcLOW <i>Callitris</i> Woodland	<i>Callitris columellaris</i> , <i>Melaleuca fulgens</i> and <i>Acacia ramulosa</i> var. <i>linophylla</i> Tall Shrubland over <i>Acacia colletioides</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> and <i>Aluta aspera</i> subsp. <i>hesperia</i> Sparse Shrubland over <i>Goodenia capillosa</i> , <i>Waitzia acuminata</i> var. <i>acuminata</i> and <i>Calocephalus multiflorus</i> Low Sparse Forbland.	104.8	0.8
EbW <i>Eucalyptus</i> Woodland	<i>Eucalyptus beardiana</i> Low Woodland over <i>Pimelea microcephala</i> subsp. <i>microcephala</i> Isolated Shrubs over <i>Solanum hesperium</i> Low Sparse Forbland.	2.2	< 0.1
EcW <i>Eucalyptus</i> Woodland	<i>Eucalyptus camaldulensis</i> Woodland over <i>Acacia burkittii</i> , <i>Senna artemisioides</i> subsp. <i>artemisioides</i> Tall Sparse Shrubland over <i>Themeda triandra</i> and <i>Eragrostis tenellula</i> Low Sparse Grassland.	5.2	< 0.1
EkAcS <i>Eucalyptus</i> Woodland	<i>Eucalyptus kingsmillii</i> Mallee Woodland over <i>Acacia ?fuscanaura</i> and <i>Acacia caesaneura</i> Tall Open Shrubland over <i>Ptilotus drummondii</i> and <i>Ptilotus obovatus</i> Low Sparse Chenopod Shrubland.	60.4	0.5
EKEhW <i>Eucalyptus</i> Woodland	<i>Eucalyptus kochii</i> subsp. <i>borealis</i> , <i>Eucalyptus kochii</i> subsp. <i>plenissima</i> and <i>Eucalyptus horistes</i> Low Open Woodland over <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Acacia fuscanaura</i> , <i>Acacia aulacophylla</i> and <i>Acacia tetragonophylla</i> Tall Sparse Shrubland over <i>Ptilotus obovatus</i> and <i>Rhagodia drummondii</i> Low Sparse Shrubland.	31.2	0.3



Vegetation Type Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)
EKtbHG <i>Eucalyptus</i> Woodland	<i>Eucalyptus kingsmillii</i> Low Woodland over <i>Acacia caesaneura</i> , <i>Acacia incurvaneura</i> and <i>Acacia effusifolia</i> Tall Open Shrubland over <i>Triodia basedowii</i> Low Hummock Grassland.	195.1	1.6
EIW <i>Eucalyptus</i> Woodland	<i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i> Low Woodland over <i>Melaleuca eleuterostachya</i> Tall Sparse Shrubland over <i>Atriplex semilunaris</i> and <i>Chenopodium gaudichaudianum</i> Low Sparse Chenopod Shrubland.	2.2	< 0.1
EsBsW <i>Eucalyptus</i> Woodland	<i>Eucalyptus</i> sp., and <i>Banksia</i> sp. Low Open Woodland over <i>Acacia</i> sp. Sparse Shrubland over introduced weeds and grasses.	0.7	< 0.1
EsMnS <i>Eucalyptus</i> Woodland	<i>Eucalyptus subangusta</i> Low Open Forest over <i>Melaleuca nematophylla</i> , <i>Dodonaea inaequifolia</i> and <i>Philothea brucei</i> subsp. <i>brucei</i> Tall Open Shrubland over <i>Waitzia acuminata</i> var. <i>acuminata</i> Low Sparse Forbland.	1.7	< 0.1
HspTS <i>Hakea</i> Woodland	<i>Pittosporum angustifolium</i> isolated trees over <i>Hakea preissii</i> and/or <i>Hakea recurva</i> Tall Shrubland over <i>Acacia victoriae</i> and <i>Acacia tetragonophylla</i> Sparse Shrubland over <i>Eriachne flaccida</i> Low Sparse Shrubland.	42.6	0.3
MgCS <i>Hakea</i> Woodland	<i>Hakea preissii</i> isolated Trees over <i>Maireana glomerifolia</i> and <i>Frankenia setosa</i> Low Sparse Chenopod Shrubland.	3.3	< 0.1
AtTS <i>Acacia</i> Shrubland	<i>Acacia tysonii</i> , <i>Acacia ligulata</i> and <i>Acacia aulacophylla</i> Tall Shrubland over <i>Atriplex ?bunburyana</i> and <i>Ptilotus obovatus</i> Sparse Shrubland over <i>Frankenia ?cinerea</i> and <i>Roepera eremaea</i> Low Sparse Shrubland.	674.4	5.4

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Type Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)
AbTOS Acacia Shrubland	<i>Acacia burkittii</i> Tall Open Shrubland.	103.0	0.8
AnTOS Acacia Shrubland	<i>Acacia neurophylla</i> subsp. <i>erugata</i> , <i>Acacia</i> sp. and <i>Grevillea obliquistigma</i> subsp. <i>obliquistigma</i> Tall Open Shrubland over <i>Trachymene cyanopetala</i> and <i>Chenopodium gaudichaudianum</i> Low Sparse Shrubland.	5.7	< 0.1
AspTS Acacia Shrubland	<i>Acacia caesaneura</i> , <i>Acacia tetragonophylla</i> and <i>Acacia aptaneura</i> Tall Shrubland over <i>Senna artemisioides</i> subsp. <i>fillifolia</i> , <i>Aluta aspera</i> subsp. <i>hesperia</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> Sparse Shrubland over <i>Ptilotus obovatus</i> and <i>Maireana triptera</i> Low Sparse Shrubland.	1,237.7	10.0
AcTOS Acacia/ <i>Eremophila</i> Shrubland	<i>Acacia caesaneura</i> , <i>Acacia tetragonophylla</i> , <i>Acacia craspedocarpa</i> , <i>Acacia incurvaneura</i> Tall Shrubland over <i>Eremophila forrestii</i> , <i>Eremophila latrobei</i> and <i>Aluta aspera</i> subsp. <i>hesperia</i> Low Sparse Shrubland over <i>Eragrostis eriopoda</i> Low Open Grassland.	5,324.2	42.9
AmTS Acacia/ <i>Eremophila</i> Shrubland	<i>Acacia mulganeura</i> , <i>Acacia caesaneura</i> and <i>Acacia ramulosa</i> var. <i>ramulosa</i> Tall Shrubland over <i>Eremophila forrestii</i> Sparse Shrubland.	71.7	0.6
ArEIS Acacia/ <i>Eremophila</i> Shrubland	<i>Acacia ramulosa</i> var. <i>linophylla</i> Tall Shrubland over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Hemigenia divaricata</i> and <i>Philotheca brucei</i> subsp. <i>brucei</i> Sparse Shrubland over <i>Borya sphaerocephala</i> and <i>Waitzia acuminata</i> var. <i>acuminata</i> Low Sparse Forbland.	85.1	0.7



Vegetation Type Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)
AvS Acacia/ Eremophila Shrubland	<i>Acacia victoriae</i> , <i>Acacia ?inaequilatera</i> and <i>Eremophila ?longiflora</i> Tall Shrubland <i>Ptilotus aevoides</i> and <i>Ptilotus obovatus</i> Sparse Shrubland.	26.4	0.2
AcEspS Acacia/ Eremophila Shrubland	<i>Acacia caesaneura</i> , <i>Acacia incurvaneura</i> , <i>Acacia mulganeura</i> Tall Open Shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Eremophila compacta</i> subsp. <i>compacta</i> Low Sparse Shrubland.	1,524.0	12.3
AtHpS Acacia/Hakea Shrubland	<i>Acacia tetragonophylla</i> , <i>Acacia incurvaneura</i> and <i>Hakea preissii</i> Tall Open Shrubland over <i>Eremophila clarkeii</i> and <i>Eremophila latrobei</i> subsp. <i>latrobei</i> Sparse Shrubland over <i>Ptilotus obovatus</i> , <i>Maireana trichoptera</i> and <i>Maireana georgei</i> Low Chenopod Shrubland.	183.0	1.5
AcMIS Acacia/ Melaleuca Shrubland	<i>Acacia caesaneura</i> , <i>Acacia acuminata</i> and <i>Melaleuca leiocarpa</i> Tall Shrubland over <i>Philothea brucei</i> Sparse Shrubland over <i>Waitzia acuminata</i> var. <i>acuminata</i> Low Sparse Forbland.	201.2	1.6
AbMpCS Chenopod Shrubland	<i>Atriplex ?bunburyana</i> , <i>Maireana pyramidata</i> and <i>Cratystylis subspinescens</i> Low Open Chenopod Shrubland.	506.8	4.1
MpCS Chenopod Shrubland	<i>Hakea preissii</i> or <i>Acacia ?fusca</i> isolated Trees over <i>Maireana pyramidata</i> , <i>Maireana triptera</i> and <i>Frankenia setosa</i> Low Sparse Chenopod Shrubland.	28.0	0.2



Vegetation Type Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)
McS <i>Melaleuca/</i> <i>Acacia</i> Shrubland	<i>Eucalyptus ?oleosa</i> or <i>Eucalyptus comitae-vallis</i> Low isolated Trees over <i>Melaleuca concreta</i> , <i>Melaleuca stereophloia</i> and <i>Acacia acuminata</i> Tall Shrubland over <i>Waitzia acuminata</i> var. <i>acuminata</i> Low Sparse Forbland..	14.5	0.1
MaTS <i>Melaleuca</i> Shrubland	<i>Melaleuca atroviridis</i> , <i>Melaleuca acutifolia</i> and <i>Melaleuca eleuterostachya</i> Tall Shrubland over <i>Acacia latior</i> , <i>Acacia acuminata</i> and <i>Acacia tetragonophylla</i> Sparse Shrubland.	285.3	2.3
MsFIS <i>Melaleuca</i> Shrubland	<i>Melaleuca stereophloia</i> Tall Shrubland over <i>Frankenia laxiflora</i> Low Open Shrubland.	26.4	0.2
TSP Pasture	Isolated Trees and/or shrubs in pasture.	105.7	0.9
TspSS Samphire Shrubland	<i>Tecticornia</i> spp. Low Open Samphire Shrubland.	58.3	0.5
SsTS <i>Stylobasium</i> Shrubland	<i>Stylobasium spathulatum</i> Tall Sparse Shrubland over <i>Melaleuca fillifolia</i> Sparse Shrubland over <i>Seringia hermannifolia</i> , <i>Podotheca gnaphalioides</i> and <i>Schoenia cassiniana</i> Low Open Forbland.	0.8	< 0.1
Cleared		1,440.9	11.6
Not mapped*		50.4	0.4



Vegetation Type Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)
Total		12,403.6	100

* A small portion of the development envelope was not mapped during the flora and vegetation survey, predominantly due to refinements in the access points or routes post-survey. These access points/routes follow pre-existing tracks and/or intersect cleared/revegetated areas. Therefore, the vegetation is considered to be representative of minimal intact remnant native vegetation that has been identified within the development envelope. Refer to **Section 4.3.3.1** for further detail. For the purposes of this Proposal, a conservative approach has been taken as it has been assumed that the entire 'not mapped' area is characterised by remnant native vegetation. Therefore, the area of remnant vegetation within the development envelope is considered to be an overestimate.



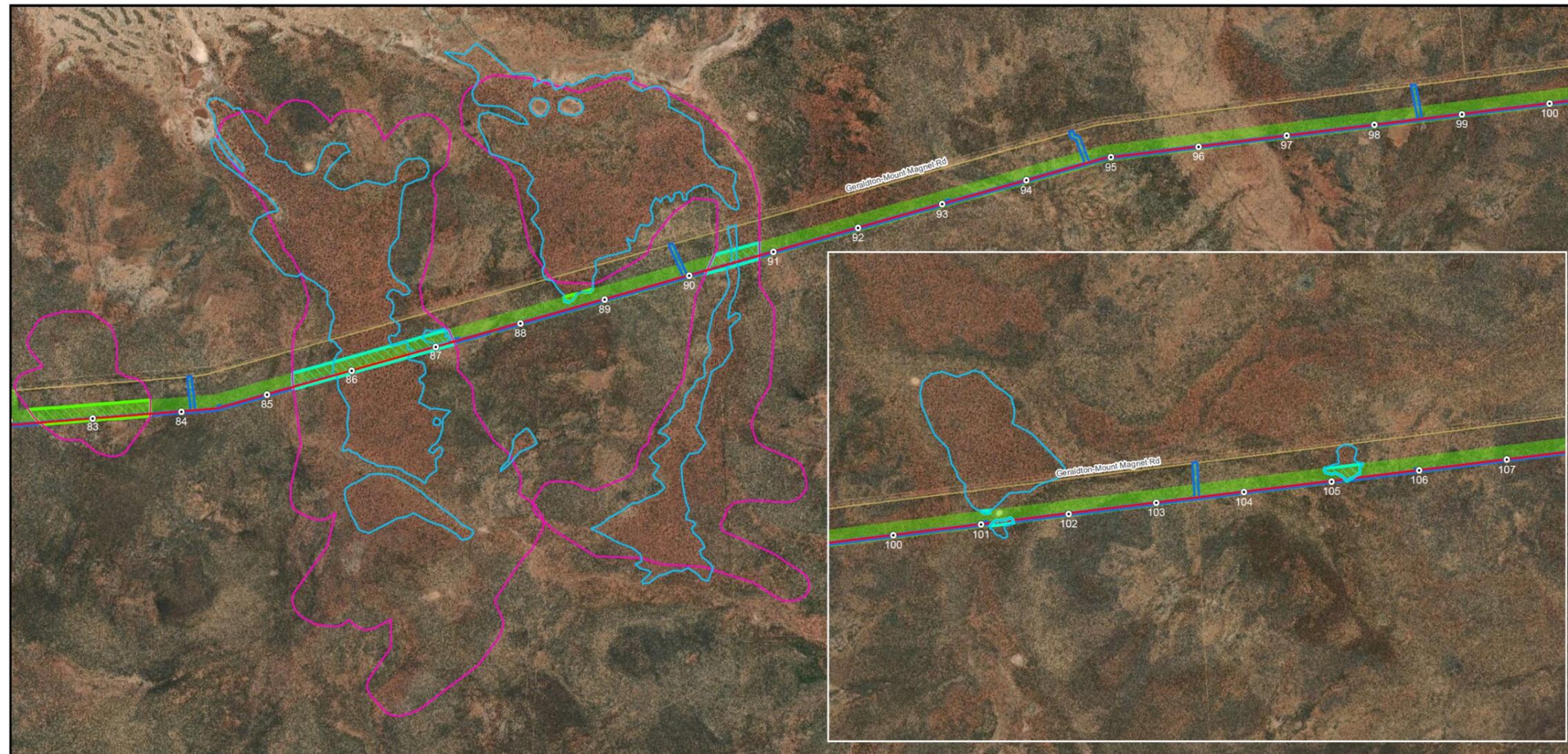
Threatened and Priority Ecological Communities

The presence of one Commonwealth-listed Critically Endangered TEC and one State listed Priority 3 Ecological Community related to vegetation was identified from the desktop search as occurring within the development envelope (Focused Vision, 2020):

- Eucalypt Woodlands of the Western Australian Wheatbelt – Critically Endangered (EPBC Act) and Priority 3 (DBCA) (herein referred to as the Eucalypt Woodlands TEC/PEC). The TEC/PEC is generally associated with flatter landscapes and lower rises of the Wheatbelt and consists of a complex mosaic of approximately 30 Eucalypt species that typically have a single trunk (Department of the Environment and Energy (DoEE) 2016); and
- Yalgoo vegetation complexes (Banded Ironstone Formation) – Priority 3 (DBCA) (herein referred to as the Yalgoo Banded Ironstone Formation (BIF) PEC). The Yalgoo BIF PEC is comprised of five major groups or flora community types (Markey and Dillon, 2011) and typically comprises of Acacia shrublands on BIF.

The detailed flora and vegetation survey undertook detailed mapping of the TEC/PECs to verify and ground-truth the DBCA boundaries. This allowed local, fine scale mapping of the extent of TEC/PECs within the development envelope and the surrounding area. Therefore, there is a high degree of confidence of the local extent and boundaries of these conservation significant vegetation communities in this area. The Eucalypt Woodlands TEC/PEC broadly aligned with vegetation unit EkEhW and the extent within the development envelope was mapped as approximately 31 ha (Focused Vision, 2020; **Figure 4-3**). The condition of the Eucalypt Woodlands TEC/PEC within the development envelope was 'Very Good' (approximately 1 ha) to 'Excellent' (approximately 30 ha).

The survey did not record suitable substrate or landforms considered to be representative of the Yalgoo BIF PEC within the development envelope and, therefore, it is considered unlikely that this vegetation community occurs (Focused Vision, 2020; **Figure 4-4**). The floristic analysis also supports this conclusion. The extent of the PEC within the vicinity of the development envelope was mapped through a combination of ground-truthing and extrapolation using aerial imagery and areas that appeared of similar appearance. The mapping concluded that the Yalgoo BIF PEC was restricted to the smaller, more localised area than the DBCA mapping (**Figure 4-4**).



<p>LOCATION DIAGRAM</p> <p><small>APA Group does not guarantee the accuracy or completeness of the map and does not make any warranty about the data. APA is not under any liability to the user for any loss or damage (including consequential loss or damage) which the user may suffer resulting from the use of this map. This map is confidential and the information and details contained in it are and remain the property of APA Group. © APA Group 2020.</small></p>	<p>LEGEND:</p> <ul style="list-style-type: none"> ○ Kilometre Point (KP) — Proposed Pipeline Alignment ■ Development Envelope ▨ Indicative Disturbance Footprint ▭ TEC / PEC (DBCA) ▭ TEC / PEC (Focused Vision 2020) ▭ Eucalypt woodlands of the Western Australian Wheatbelt ▭ Eucalypt woodlands of the Western Australian Wheatbelt <p>Vegetation Condition (Focused Vision 2020)</p> <ul style="list-style-type: none"> ▨ Very Good ▨ Excellent 	<p>PROJECT: Northern Goldfields Interconnect</p> <p>TITLE: Eucalypt Woodland TEC / PEC and Vegetation Condition</p> <p>SUBTITLE:</p> <p>DATE: 11/01/2021</p> <p>DATA SOURCE: KPs: Indicative Disturbance Footprint, Development Envelope: APA Group, Eucalypt Woodland TEC: Focused Vision / DBCA, Vegetation Condition: Focused Vision, Roads: Landgate.</p> <p>DOCUMENT NUMBER: 560-MAP-L-7838</p> <table border="1"> <thead> <tr> <th>Revision</th> <th>Description</th> <th>Drawn</th> <th>Checked/QC</th> <th>Approved</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>0.3</td> <td>Revision</td> <td>SP</td> <td></td> <td></td> <td>11/01/21</td> </tr> <tr> <td>0.2</td> <td>Revision</td> <td>SP</td> <td>KM</td> <td></td> <td>1/12/20</td> </tr> <tr> <td>0.1</td> <td>Draft</td> <td>SP</td> <td>KM</td> <td></td> <td>30/11/20</td> </tr> </tbody> </table> <p>SCALE: 1:50,000 @ A3 GDA2020</p>	Revision	Description	Drawn	Checked/QC	Approved	DATE	0.3	Revision	SP			11/01/21	0.2	Revision	SP	KM		1/12/20	0.1	Draft	SP	KM		30/11/20
Revision	Description	Drawn	Checked/QC	Approved	DATE																					
0.3	Revision	SP			11/01/21																					
0.2	Revision	SP	KM		1/12/20																					
0.1	Draft	SP	KM		30/11/20																					
<p>APA Group Phone: +61 1800 941 15 Web: www.apa.com.au Email: transmissiongis@apa.com.au</p>																										

Figure 4-3: Extent of Eucalypt Woodlands TEC/PEC and Vegetation Condition within the Development Envelope and Surrounds

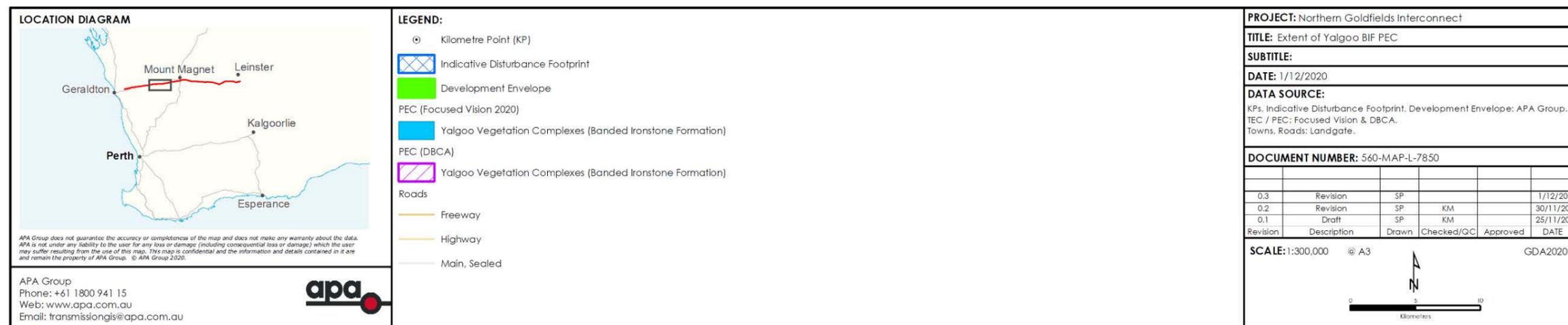
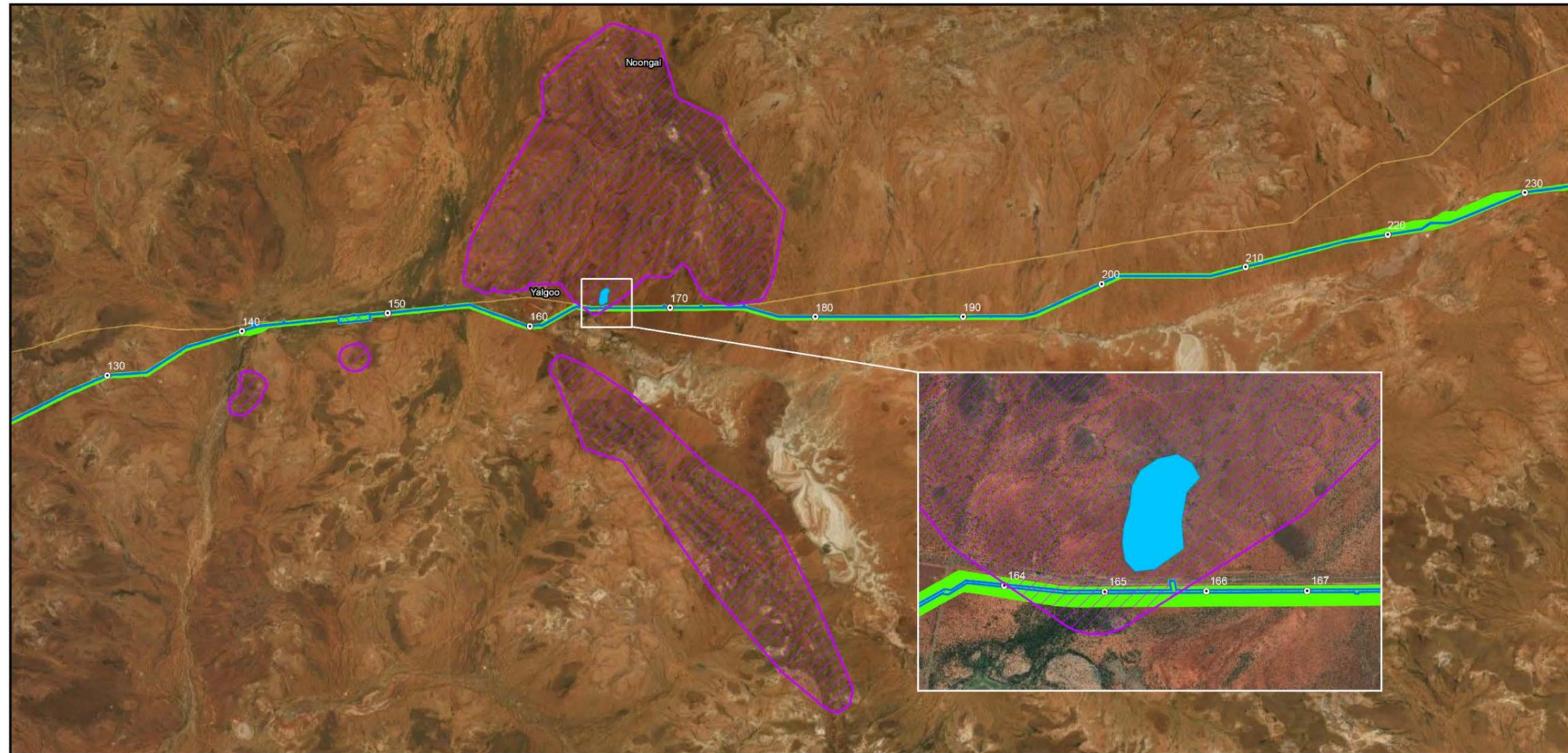


Figure 4-4: Extent of Yalgoo BIF PEC within the Development Envelope and Surrounds



Other Conservation Significant Vegetation

Eighteen vegetation types within the development envelope were considered to be locally or regionally significant. These are presented in **Table 4-7**. The vegetation types supporting Priority flora were mapped as accounting for approximately 698 ha (6%) of the development envelope, while these supporting undescribed species comprise approximately 8,295 ha (67%). Vegetation in which species were recorded outside their current known range was mapped as approximately 5,571 ha (45%) of the development envelope. Those vegetation types that were mapped as having limited representation (< 1 ha or < 0.01%) or restricted distribution (< 5 ha or < 0.04%) within the development envelope (approximately 11 ha or 0.11%) are expected to extend outside the development envelope into the broader surrounding area. The vegetation types with < 30% of their pre-European vegetation remaining within the IBRA region account for approximately 0.5% of the development envelope.

Table 4-7: Other Conservation Significant Vegetation within the Development Envelope

Vegetation Type Code	Conservation Value
BsCaW <i>Banksia</i> Woodland	Locally significant – limited representation within the development envelope (<1 ha)
CcLOW <i>Callitris</i> Woodland	Locally significant – support Priority flora and undescribed flora species
EbW <i>Eucalyptus</i> Woodland	Regionally significant – support Threatened <i>Eucalyptus beardiana</i> , restricted distribution within the development envelope (< 5 ha)
EcW <i>Eucalyptus</i> Woodland	Locally significant – support flora exhibiting range extensions Regionally significant – extent restricted to specific and limited landforms within the development envelope (i.e. rivers and creeklines)
EKEhW <i>Eucalyptus</i> Woodland	Locally significant – support undescribed flora
EIW <i>Eucalyptus</i> Woodland	Regionally significant – restricted distribution within the development envelope (< 5 ha), < 30% of pre-European extent remaining within the IBRA region
EsBsW <i>Eucalyptus</i> Woodland	Locally significant – limited representation within the development envelope (< 1 ha)
EsMnS <i>Eucalyptus</i> Woodland	Regionally significant – restricted distribution within the development envelope (< 5 ha)
HspTs <i>Hakea</i> Woodland	Locally significant – support flora exhibiting range extensions



Vegetation Type Code	Conservation Value
AspTS <i>Acacia</i> Shrubland	Locally significant – support undescribed flora species
AcTOS <i>Acacia/Eremophila</i> Shrubland	Locally significant – support undescribed flora and flora exhibiting range extensions
AcEspS <i>Acacia/Eremophila</i> Shrubland	Locally significant – support undescribed flora
AtHpS <i>Acacia/Hakea</i> Shrubland	Locally significant – support flora exhibiting range extensions
AbMpCS Chenopod Shrubland	Locally significant – support Priority flora
MpCS Chenopod Shrubland	Locally significant – support Priority flora
McS <i>Melaleuca/Acacia</i> Shrubland	Locally significant – support undescribed flora
TspSS Samphire Shrubland	Regionally significant – < 30% of pre-European extent remaining within the IBRA region Locally significant – support Priority flora, undescribed flora species and flora exhibiting range extensions
SsTS <i>Stylobasium</i> Shrubland	Locally significant – limited representation within the development envelope (<1 ha)

Vegetation Condition

Vegetation condition ranged from ‘Completely Degraded’ to ‘Excellent’, with the majority of vegetation recorded to be in ‘Very Good’ condition or better (approximately 71%) (Focused Vision, 2020). Areas of ‘Degraded’ to ‘Completely Degraded’ vegetation account for approximately 13% of the development envelope, while ‘Excellent’ vegetation condition comprised approximately 17%. Detailed vegetation condition mapping is provided in **Appendix 1**.

The majority of the western portion of the development envelope has been subject to a high degree of disturbance with large sections characterised by cleared agricultural properties with degraded isolated remnants within cleared paddocks (Focused Vision,



2020). Some areas of poorer quality vegetation were recorded adjacent to or near areas of disturbance (Focused Vision, 2020).

The eastern portion of the development envelope was considered to be ‘Good’ or better condition, with some areas of lower quality vegetation occurring adjacent to, or near, areas of disturbance, such roads or historical mineral exploration areas. Localised disturbance from pastoral activities, such as grazing, weed invasion and soil erosion from cattle, were also noted. However, impacts from clearing were considered to be minimal (Focused Vision, 2020). The higher quality of vegetation in the eastern portion of the pipeline is likely due to the isolated location of the development envelope, as it is removed from townsites and other large-scale clearing disturbances.

Table 4-8: Vegetation Condition within the Development Envelope

Vegetation Condition Rating	Extent in the Development Envelope (ha)	Percentage of the Development Envelope (%)
Excellent	2,143.3	17.3
Very Good – Excellent	2,032.1	16.4
Very Good	4,688.3	37.8
Good – Very Good	844.4	6.8
Good	1,014.5	8.2
Degraded – Good	49.5	0.4
Degraded	36.2	0.3
Completely Degraded – Degraded	53.6	0.4
Completely Degraded	1,491.3	12.0
Not mapped*	50.4	0.4
Total	12,403.6	100.0

* Refer to **Section 4.3.3.1** for further detail.

4.3.4 Potential Impacts

The Proposal will result in the direct loss of flora and vegetation through clearing. Impacts to conservation significant flora and vegetation will be minimal, and include clearing of only a single Priority 3 individual (*Petrophile ?pauciflora*) and loss of approximately 0.74 ha of the Eucalypt Woodlands TEC/PEC.

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 the construction of the Proposal;
- Changes to vegetation community structure and composition (including flora) through altered hydrology (i.e. surface water drainage); and
- Damage or loss of surrounding vegetation through accidental bushfires.

4.3.5 Assessment of Impacts

4.3.5.1 Loss of Flora and Vegetation

The Proposal will result in the clearing of approximately 1,934 ha (18%) of native vegetation within the development envelope¹. Approximately 353 ha (15%) of the indicative disturbance footprint is pre-existing cleared areas/pasture.

The proposed clearing will be primarily located within the regional vegetation association 18, which is mapped at a regional scale as overlapping approximately 54% of the indicative disturbance footprint. Other dominant regional vegetation associations within the development envelope include 372, 415 and 683, which collectively account for 21% of the indicative development envelope. All of the dominant vegetation types overlapping the development envelope are well-represented (> 97%). **Table 4-9** shows the current extents of all vegetation complexes mapped as occurring in the indicative disturbance footprint.

Some clearing will be undertaken in three regional vegetation complexes that have < 30% of their pre-European extent remaining State-wide:

- Vegetation association 142 (26.44% remaining) – approximately 1.4 ha overlaps the indicative disturbance footprint, representing < 0.01% of the pre-European extent;
- Vegetation association 353 (7.89% remaining) – approximately 22.6 ha occurs within the indicative disturbance footprint, representing 0.02% of the pre-European extent; and
- Vegetation association 687 (28.15% remaining) – approximately 41.6 ha overlaps the indicative disturbance footprint, representing 0.07% of the pre-European extent.

Clearing associated with the Proposal will represent < 0.4% of the State-wide pre-European extent remaining of all mapped vegetation associations within the development envelope. Clearing of those vegetation associations with < 30% of their pre-European extent remaining will not significantly further reduce their extent as it represents < 0.1% of their current extent (**Table 4-9**). Therefore, implementation of the Proposal will not significantly impact on the current representation of any regional vegetation associations.

Thirty-one vegetation types will be directly affected by vegetation clearing for the Proposal, including a small portion of the Eucalypt Woodlands TEC/PEC. The extent of clearing within each vegetation type is shown in

¹ For the purposes of this Proposal, a conservative approach has been taken as it has been assumed that the entire 'not mapped' area is characterised by remnant native vegetation. Therefore, the area of remnant vegetation within the indicative disturbance footprint is considered to be an overestimate.



Table 4-10. The dominant vegetation types within the indicative disturbance footprint are the Acacia/Eremophila Shrubland vegetation types of AcTOS (approximately 1,068 ha or 46%) and AcEspS (approximately 212 ha or 9%) and Acacia Shrubland (AspTS) (approximately 195 ha or 9%). Collectively, these vegetation types account for 64% of the proposed clearing area. These vegetation types are considered locally significant as they support undescribed flora and flora exhibiting range extensions (Focused Vision, 2020). All of the vegetation types recorded are represented outside the indicative disturbance footprint within the development envelope and are expected to occur in the broader surrounds. Clearing for the Proposal will not reduce the representation of the vegetation types mapped within the development envelope below 75%, with the exception of the *Banksia* woodland (BsCaw) (71%) and *Melaleuca* Shrubland (MaTs) (56%). Therefore, at a local scale, clearing will not result in the loss or a significant reduction of any vegetation types in the area.

While clearing of the Eucalypt Woodlands TEC/PEC has sought to be avoided to the extent practicable (through route alignment optimisation, use of HDD construction methods and narrowing the CROW), some disturbance will occur. Approximately 0.74 ha of the TEC/PEC will be required to be cleared, which represents approximately 0.1% of the mapped extent in the local area. Therefore, clearing for the Proposal will not result in a significant reduction of the representation of this TEC/PEC in the local area.

Of the five Threatened and Priority flora species recorded within the development envelope, only one individual of the Priority 3 *Petrophile ?pauciflora* will be cleared by the Proposal (**Table 4-11**). All other locations and individuals of Threatened and Priority flora have been avoided through the refinement of the alignment and indicative disturbance footprint. Specifically, there will be no clearing of the Threatened *Eucalyptus beardiana* in the vicinity of KP36.5 as HDD construction methods will be used to underbore the pipeline, as opposed to standard open trench construction method.

The Proposal is not expected to significantly impact flora and vegetation at a local or regional scale. Clearing associated with the Proposal will result in the loss of approximately 0.1% of the Eucalypt Woodlands TEC/PEC at a local scale and only a single individual of conservation significant flora. Therefore, implementation of the Proposal is not expected to result in significant local or regional impacts to flora and vegetation.

With regard to the Ex Barnong Station, which will likely represent a future National Park, this has been excised from the GNEGIC. The indicative disturbance footprint is wholly contained within the GNEGIC within this area. As part of the route alignment and refinement process, APA has also avoided the requirement to create any additional access into/through the Ex Barnong Station, by staying within the GNEGIC corridor.



Table 4-9: Impacts to Pre-European Vegetation Associations from the Proposal

Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
18	State: WA	19,892,306.46	19,843,148.07	99.75	6,435.4 (0.03%)	1,231.1 (0.01%)	19,841,916.97 (99.75%)
	IBRA Region: Yalgoo	101,331.17	101,232.93	99.90	6,435.4 (6.4%)	1,231.1 (1.21%)	100,001.83 (98.69%)
	IBRA Region: Murchison	12,403,172.30	12,363,252.47	99.68	6,435.4 (0.05%)	1,231.1 (0.01%)	12,362,021.37 (99.67%)
39	State: WA	6,613,567.48	6,602,578.44	99.83	94.1 (< 0.01%)	14.6 (< 0.01%)	6,602,563.84 (99.83%)
	IBRA Region: Yalgoo	9,574.62	9,574.62	100.00	94.1 (0.98%)	14.6 (0.15%)	9,560.02 (99.85%)
	IBRA Region: Murchison	1,148,400.30	1,138,064.63	99.10	94.1 (0.01%)	14.6 (< 0.01%)	1,138,050.03 (99.10%)
107	State: WA	2,815,387.35	2,813,995.93	99.95	117.9 (< 0.1%)	18.1 (< 0.01%)	2,813,977.83 (99.95%)
	IBRA Region: Murchison	2,792,383.45	2,790,992.03	99.95	117.9 (< 0.1%)	18.1 (< 0.01%)	2,790,973.93 (99.95%)
142	State: WA	787,948.47	208,347.17	26.44	8.8 (< 0.01%)	1.4 (< 0.01%)	208,345.77 (26.44%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
	IBRA Region: Geraldton Sandplains	8,761.03	933.45	10.65	8.8 (0.1%)	1.4 (0.2%)	932.05 (10.64%)
	IBRA Region: Avon Wheatbelt	637,707.53	79,309.95	12.44	8.8 (< 0.1%)	1.4 (< 0.01%)	79,308.55 (12.44%)
	IBRA Region: Yalgoo	9,197.62	9,197.62	100.00	8.8 (0.1%)	1.4 (0.02%)	9,196.22 (99.98%)
	IBRA Region: Murchison	61.05	61.05	100.00	8.8 (14.48%)	1.4 (2.37%)	59.65 (97.71%)
188	State: WA	25,640.25	25,582.19	99.77	57.8 (0.23%)	8.9 (0.03%)	25,573.29 (99.74%)
	IBRA Region: Murchison	11,922.20	11,864.15	99.51	57.8 (0.48%)	8.9 (0.07%)	11,855.25 (99.44%)
202	State: WA	448,529.31	448,343.80	99.96	22.9 (0.01%)	3.7 (< 0.01%)	448,340.10 (99.96%)
	IBRA Region: Yalgoo	45,096.14	45,011.91	99.81	22.9 (0.05%)	3.7 (0.01%)	45,008.21 (99.81%)
	IBRA Region: Murchison	339,742.69	339,641.41	99.97	22.9 (0.01%)	3.7 (< 0.01%)	339,637.71 (99.97%)
243	State: WA	148,432.56	148,426.20	100.00	43.6 (0.03%)	3.2 (< 0.01%)	148,423.00 (99.99%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
	IBRA Region: Yalgoo	40,588.09	40,581.74	99.98	43.6 (0.11%)	3.2 (0.01%)	40,578.54 (99.98%)
326	State: WA	1,034,327.64	1,034,301.01	100.00	597.5 (0.06%)	74.5 (0.01%)	1,034,226.51 (99.99%)
	IBRA Region: Yalgoo	539,810.76	539,784.14	100.00	597.5 (0.11%)	74.5 (0.01%)	539,709.64 (99.98%)
	IBRA Region: Murchison	494,516.87	494,516.87	100.00	597.5 (0.12%)	74.5 (0.02%)	494,442.37 (99.98%)
339	State: WA	27,109.86	27,108.54	100.00	155.8 (0.57%)	14.6 (0.05%)	27,093.94 (99.94%)
	IBRA Region: Murchison	27,109.86	27,108.54	100.00	155.8 (0.57%)	14.6 (0.05%)	27,093.94 (99.94%)
353	State: WA	97,371.14	7,681.12	7.89	136.4 (0.14%)	22.6 (0.02%)	7,658.52 (7.87%)
	IBRA Region: Geraldton Sandplains	96,823.77	7,546.36	7.79	136.4 (0.14%)	22.6 (0.02%)	7,523.76 (7.77%)
	IBRA Region: Avon Wheatbelt	547.37	134.76	24.62	136.4 (24.92%)	22.6 (4.13%)	112.16 (20.49%)
361	State: WA	87,511.09	87,484.57	99.97	292.0 (0.33%)	46.9 (0.05%)	87,437.67 (99.92%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
	IBRA Region: Yalgoo	76,479.74	76,453.22	99.97	292.0 (0.38%)	46.9 (0.06%)	76,406.32 (99.90%)
	IBRA Region: Murchison	11,031.35	11,031.35	100.00	292.0 (2.65%)	46.9 (0.43%)	10,984.45 (99.57%)
364	State: WA	510,984.96	506,124.98	99.05	67.5 (0.01%)	8.1 (< 0.01%)	506,116.88 (99.05%)
	IBRA Region: Geraldton Sandplains	1,248.42	1,203.86	96.43	67.5 (5.41%)	8.1 (0.65%)	1,195.76 (95.78%)
	IBRA Region: Avon Wheatbelt	2.63	2.63	100.00	67.5 (2,566.54%)	8.1 (307.98%)	-5.57 (-207.98%)
	IBRA Region: Yalgoo	509,047.32	504,231.90	99.05	67.5 (0.01%)	8.1 (< 0.01%)	504,223.80 (99.05%)
	IBRA Region: Murchison	87.86	87.86	100.00	67.5 (76.83%)	8.1 (9.22%)	79.76 (90.78%)
372	State: WA	82,083.78	31,680.07	38.59	485.8 (0.59%)	169.4 (0.21%)	31,510.67 (38.39%)
	IBRA Region: Geraldton Sandplains	82,083.78	31,680.07	38.59	485.8 (0.59%)	169.4 (0.21%)	31,510.67 (38.39%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
380	State: WA	580,374.88	351,916.10	60.64	167.2 (0.03%)	28.5 (< 0.01%)	351,887.60 (60.63%)
	IBRA Region: Geraldton Sandplains	507,696.88	319,288.64	62.89	167.2 (0.03%)	28.5 (0.01%)	319,260.14 (62.88%)
	IBRA Region: Avon Wheatbelt	23,170.14	3,444.86	14.87	167.2 (0.72%)	28.5 (0.12%)	3,416.36 (14.74%)
	IBRA Region: Yalgoo	15,145.44	14,824.97	97.88	167.2 (1.10%)	28.5 (0.19%)	14,796.47 (97.70%)
389	State: WA	642,356.85	640,468.79	99.71	185.6 (0.03%)	28.2 (< 0.01%)	640,440.59 (97.70%)
	IBRA Region: Yalgoo	687.19	687.19	100.00	185.6 (27.01%)	28.2 (4.10%)	658.99 (95.90%)
	IBRA Region: Murchison	493,977.54	492,089.49	99.62	185.6 (0.04%)	28.2 (0.01%)	492,061.29 (99.61%)
404	State: WA	206,553.92	198,504.92	96.10	21.4 (0.01%)	3.0 (< 0.01%)	198,501.92 (96.10%)
	IBRA Region: Geraldton Sandplains	85.22	17.03	19.99	21.4 (25.11%)	3.0 (3.52%)	14.03 (16.46%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
	IBRA Region: Avon Wheatbelt	391.86	276.58	70.58	21.4 (5.46%)	3.0 (0.77%)	273.58 (69.82%)
	IBRA Region: Yalgoo	151,772.33	143,906.80	94.82	21.4 (0.01%)	3.0 (< 0.01%)	143,903.80 (94.82%)
	IBRA Region: Murchison	54,304.50	54,304.50	100.00	21.4 (0.04%)	3.0 (0.01%)	54,301.50 (99.99%)
415	State: WA	105,976.76	105,976.76	100.00	1,126.6 (1.06%)	132.8 (0.13%)	105,843.96 (99.87%)
	IBRA Region: Yalgoo	31,462.20	31,462.20	100.00	1,126.6 (3.58%)	132.8 (0.42%)	31,329.40 (99.58%)
	IBRA Region: Murchison	74,514.56	74,514.56	100.00	1,126.6 (1.51%)	132.8 (0.18%)	74,381.76 (99.82%)
419	State: WA	313,225.36	296,195.63	94.56	488.8 (0.16%)	86.9 (0.03%)	296,108.73 (94.54%)
	IBRA Region: Avon Wheatbelt	10,517.64	6,370.07	60.57	488.8 (4.65%)	86.9 (0.83%)	6,283.17 (59.74%)
	IBRA Region: Yalgoo	302,707.72	289,825.56	95.74	488.8 (0.16%)	86.9 (0.03%)	289,738.66 (95.72%)
420	State: WA	859,632.11	830,216.12	96.58	582.1 (0.07%)	94.4 (0.01%)	830,121.72 (96.57%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
	IBRA Region: Geraldton Sandplains	1,708.68	1,233.33	72.18	582.1 (34.07%)	94.4 (5.52%)	1,138.93 (66.66%)
	IBRA Region: Avon Wheatbelt	44,968.05	17,161.76	38.16	582.1 (1.29%)	94.4 (0.21%)	17,067.36 (37.95%)
	IBRA Region: Yalgoo	621,396.05	620,265.57	99.82	582.1 (0.09%)	94.4 (0.02%)	620,171.17 (99.80%)
	IBRA Region: Murchison	191,449.75	191,445.88	100.00	582.1 (0.30%)	94.4 (0.05%)	191,351.48 (99.95%)
676	State: WA	2,063,413.95	1,963,881.55	95.18	329.2 (0.02%)	59.3 (< 0.01%)	1,963,822.25 (95.17%)
	IBRA Region: Murchison	382,818.77	382,704.49	99.97	329.2 (0.09%)	59.3 (0.02%)	382,645.19 (99.95%)
	IBRA Region: Avon Wheatbelt	124,573.10	30,418.61	24.42	329.2 (0.26%)	59.3 (0.05%)	30,359.31 (24.37%)
	IBRA Region: Yalgoo	28,955.02	28,560.65	98.64	329.2 (1.14%)	59.3 (0.20%)	28,501.35 (98.43%)
683	State: WA	50,318.87	49,976.10	99.32	543.1 (1.08%)	167.6 (0.33%)	49,808.50 (98.99%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
	IBRA Region: Yalgoo	50,075.10	49,732.32	99.32	543.1 (1.08%)	167.6 (0.33%)	49,564.72 (98.98%)
	IBRA Region: Murchison	243.77	243.77	100.00	543.1 (222.79%)	167.6 (68.75%)	76.17 (31.25%)
686	State: WA	13,135.07	8,436.97	64.23	50.1 (0.38%)	4.6 (0.04%)	8,432.37 (64.20%)
	IBRA Region: Avon Wheatbelt	8,800.29	4,156.84	47.24	50.1 (0.57%)	4.6 (0.05%)	4,152.24 (47.18%)
	IBRA Region: Yalgoo	4,334.78	4,280.12	98.74	50.1 (1.16%)	4.6 (0.11%)	4,275.52 (98.63%)
687	State: WA	56,441.24	15,890.72	28.15	257.0 (0.46%)	41.6 (0.07%)	15,849.12 (28.08%)
	IBRA Region: Geraldton Sandplains	17,556.79	5,005.13	28.51	257.0 (1.46%)	41.6 (0.24%)	4,963.53 (28.27%)
	IBRA Region: Avon Wheatbelt	37,458.98	10,242.84	27.34	257.0 (0.69%)	41.6 (0.11%)	10,201.24 (27.23%)
	IBRA Region: Yalgoo	1,425.47	642.75	45.09	257.0 (18.03%)	41.6 (2.92%)	601.15 (42.17%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Association Number	Scale	Pre-European Extent (ha)	Current Extent (ha)	Percentage Remaining (%)	Extent within the Development Envelope (ha) (%)*	Extent within the Indicative Disturbance Footprint (ha) (%)*	Current Extent Remaining after Proposal Clearing (ha) (%)*
1413	State: WA	1,679,916.32	1,286,855.48	76.60	137.0 (0.01%)	22.4 (< 0.01%)	1,286,833.08 (76.60%)
	IBRA Region: Avon Wheatbelt	546,675.55	174,102.84	31.85	137.0 (0.03%)	22.4 (< 0.01%)	174,080.44 (31.84%)
	IBRA Region: Yalgoo	12,495.12	11,301.19	90.44	137.0 (1.10%)	22.4 (0.18%)	11,278.79 (90.27%)
	IBRA Region: Murchison	29,688.38	29,688.38	100.00	137.0 (0.46%)	22.4 (0.08%)	29,665.98 (99.92%)

* The extents are reported as per the 2018 Statewide Vegetation Statistics report (DBCA, 2020). The data has been verified and presented at both State (WA) and IBRA region scales, to extent that data is available. This does create some artificial anomalies with regards to two pre-European extent values, specifically vegetation association 364 within the Avon Wheatbelt IBRA region and vegetation association 863 within the Murchison IBRA region. This is due to their minor representations within those specific IBRA regions. However, this has no material impact on the assessment of disturbance and potential impact associated with the Proposal.



Table 4-10: Impacts to Vegetation Types from the Proposal

Vegetation Unit Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
BsCaW Banksia Woodland	<i>Banksia sceptrum</i> and <i>Callitris arenaria</i> Low Open Woodland over <i>Beaufortia aestiva</i> Sparse Shrubland over <i>Austrostipa elegantissima</i> Low Sparse Grassland.	0.7	< 0.1	0.2	0.5 (71.4%)
CcLOW Callitris Woodland	<i>Callitris columellaris</i> , <i>Melaleuca fulgens</i> and <i>Acacia ramulosa</i> var. <i>linophylla</i> Tall Shrubland over <i>Acacia colletioides</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> and <i>Aluta aspera</i> subsp. <i>hesperia</i> Sparse Shrubland over <i>Goodenia capillosa</i> , <i>Waitzia acuminata</i> var. <i>acuminata</i> and <i>Calocephalus multiflorus</i> Low Sparse Forbland.	104.8	0.8	15.8	89.0 (84.9%)
EbW Eucalyptus Woodland	<i>Eucalyptus beardiana</i> Low Woodland over <i>Pimelea microcephala</i> subsp. <i>microcephala</i> Isolated Shrubs over <i>Solanum hesperium</i> Low Sparse Forbland.	2.2	< 0.1	0.1	2.1 (95.5%)
EcW Eucalyptus Woodland	<i>Eucalyptus camaldulensis</i> Woodland over <i>Acacia burkittii</i> , <i>Senna artemisioides</i> subsp. <i>artemisioides</i> Tall Sparse Shrubland over <i>Themeda triandra</i> and <i>Eragrostis tenellula</i> Low Sparse Grassland.	5.2	< 0.1	1.0	4.2 (80.8%)
EkAcS Eucalyptus Woodland	<i>Eucalyptus kingsmillii</i> Mallee Woodland over <i>Acacia ?fuscanaura</i> and <i>Acacia caesaneura</i> Tall Open Shrubland over <i>Ptilotus drummondii</i> and <i>Ptilotus obovatus</i> Low Sparse Chenopod Shrubland.	60.4	0.5	6.3	54.1 (89.6%)
EkEhW Eucalyptus Woodland	<i>Eucalyptus kochii</i> subsp. <i>borealis</i> , <i>Eucalyptus kochii</i> subsp. <i>plenissima</i> and <i>Eucalyptus horistes</i> Low Open Woodland over <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Acacia fuscanaura</i> , <i>Acacia aulacophylla</i> and <i>Acacia tetragonophylla</i> Tall Sparse Shrubland over <i>Ptilotus obovatus</i> and <i>Rhagodia drummondii</i> Low Sparse Shrubland.	31.2	0.3	0.7	30.5 (97.8%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Unit Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
EKTbHG <i>Eucalyptus</i> Woodland	<i>Eucalyptus kingsmillii</i> Low Woodland over <i>Acacia caesaneura</i> , <i>Acacia incurvaneura</i> and <i>Acacia effusifolia</i> Tall Open Shrubland over <i>Triodia basedowii</i> Low Hummock Grassland.	195.1	1.6	43.6	151.5 (77.7%)
EIW <i>Eucalyptus</i> Woodland	<i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i> Low Woodland over <i>Melaleuca eleuterostachya</i> Tall Sparse Shrubland over <i>Atriplex semilunaris</i> and <i>Chenopodium gaudichaudianum</i> Low Sparse Chenopod Shrubland.	2.2	< 0.1	0.3	1.9 (86.4%)
EsBsW <i>Eucalyptus</i> Woodland	<i>Eucalyptus</i> sp., and <i>Banksia</i> sp. Low Open Woodland over <i>Acacia</i> sp. Sparse Shrubland over introduced weeds and grasses.	0.7	< 0.1	0.1	0.6 (85.7%)
EsMnS <i>Eucalyptus</i> Woodland	<i>Eucalyptus subangusta</i> Low Open Forest over <i>Melaleuca nematophylla</i> , <i>Dodonaea inaequifolia</i> and <i>Phyllothea brucei</i> subsp. <i>brucei</i> Tall Open Shrubland over <i>Waitzia acuminata</i> var. <i>acuminata</i> Low Sparse Forbland.	1.7	< 0.1	0.2	1.5 (88.2%)
HspTS <i>Hakea</i> Woodland	<i>Pittosporum angustifolium</i> isolated trees over <i>Hakea preissii</i> and/or <i>Hakea recurva</i> Tall Shrubland over <i>Acacia victoriae</i> and <i>Acacia tetragonophylla</i> Sparse Shrubland over <i>Eriachne flaccida</i> Low Sparse Shrubland.	42.6	0.3	6.9	35.7 (83.8%)
MgCS <i>Hakea</i> Woodland	<i>Hakea preissii</i> isolated Trees over <i>Maireana glomerifolia</i> and <i>Frankenia setosa</i> Low Sparse Chenopod Shrubland.	3.3	< 0.1	0.7	2.6 (78.8%)
AtTS <i>Acacia</i> Shrubland	<i>Acacia tysonii</i> , <i>Acacia ligulata</i> and <i>Acacia aulacophylla</i> Tall Shrubland over <i>Atriplex ?bunburyana</i> and <i>Ptilotus obovatus</i> Sparse Shrubland over <i>Frankenia ?cinerea</i> and <i>Roepera eremaea</i> Low Sparse Shrubland.	674.4	5.4	106.3	568.1 (84.2%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Vegetation Unit Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
AbTOS Acacia Shrubland	<i>Acacia burkittii</i> Tall Open Shrubland.	103.0	0.8	16.0	87.0 (84.5%)
AnTOS Acacia Shrubland	<i>Acacia neurophylla</i> subsp. <i>erugata</i> , <i>Acacia</i> sp. and <i>Grevillea obliquistigma</i> subsp. <i>obliquistigma</i> Tall Open Shrubland over <i>Trachymene cyanopetala</i> and <i>Chenopodium gaudichaudianum</i> Low Sparse Shrubland.	5.7	< 0.1	0.9	4.8 (84.2%)
AspTS Acacia Shrubland	<i>Acacia caesaneura</i> , <i>Acacia tetragonophylla</i> and <i>Acacia aptaneura</i> Tall Shrubland over <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Aluta aspera</i> subsp. <i>hesperia</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> Sparse Shrubland over <i>Ptilotus obovatus</i> and <i>Maireana triptera</i> Low Sparse Shrubland.	1,237.7	10.0	194.8	1,042.9 (84.3%)
AcTOS Acacia/ Eremophila Shrubland	<i>Acacia caesaneura</i> , <i>Acacia tetragonophylla</i> , <i>Acacia craspedocarpa</i> , <i>Acacia incurvaneura</i> Tall Shrubland over <i>Eremophila forrestii</i> , <i>Eremophila latrobei</i> and <i>Aluta aspera</i> subsp. <i>hesperia</i> Low Sparse Shrubland over <i>Eragrostis eriopoda</i> Low Open Grassland.	5,324.2	42.9	1,057.8	4,266.4 (80.1%)
AmTS Acacia/ Eremophila Shrubland	<i>Acacia mulganeura</i> , <i>Acacia caesaneura</i> and <i>Acacia ramulosa</i> var. <i>ramulosa</i> Tall Shrubland over <i>Eremophila forrestii</i> Sparse Shrubland.	71.7	0.6	4.7	67.0 (93.4%)
ArEIS Acacia/ Eremophila Shrubland	<i>Acacia ramulosa</i> var. <i>linophylla</i> Tall Shrubland over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Hemigenia divaricata</i> and <i>Philotheca brucei</i> subsp. <i>brucei</i> Sparse Shrubland over <i>Borya sphaerocephala</i> and <i>Waitzia acuminata</i> var. <i>acuminata</i> Low Sparse Forbland.	85.1	0.7	14.3	70.8 (83.2%)



Vegetation Unit Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
AvS Acacia/ Eremophila Shrubland	<i>Acacia victoriae</i> , <i>Acacia ?inaequilatera</i> and <i>Eremophila ?longiflora</i> Tall Shrubland <i>Ptilotus aervoides</i> and <i>Ptilotus obovatus</i> Sparse Shrubland.	26.4	0.2	3.5	22.9 (86.7%)
AcEspS Acacia/ Eremophila Shrubland	<i>Acacia caesaneura</i> , <i>Acacia incurvaneura</i> , <i>Acacia mulganeura</i> Tall Open Shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Eremophila compacta</i> subsp. <i>compacta</i> Low Sparse Shrubland.	1,524.0	12.3	211.6	1,312.4 (86.1%)
AtHps Acacia/ Hakea Shrubland	<i>Acacia tetragonophylla</i> , <i>Acacia incurvaneura</i> and <i>Hakea preissii</i> Tall Open Shrubland over <i>Eremophila clarkeii</i> and <i>Eremophila latrobei</i> subsp. <i>latrobei</i> Sparse Shrubland over <i>Ptilotus obovatus</i> , <i>Maireana trichoptera</i> and <i>Maireana georgei</i> Low Chenopod Shrubland.	183.0	1.5	26.4	156.6 (85.6%)
AcMIS Acacia / Melaleuca Shrubland	<i>Acacia caesaneura</i> , <i>Acacia acuminata</i> and <i>Melaleuca leiocarpa</i> Tall Shrubland over <i>Philothea brucei</i> Sparse Shrubland over <i>Waitzia acuminata</i> var. <i>acuminata</i> Low Sparse Forbland.	201.2	1.6	31.7	169.5 (84.2%)
AbMpCS Chenopod Shrubland	<i>Atriplex ?bunburyana</i> , <i>Maireana pyramidata</i> and <i>Cratystylis subspinescens</i> Low Open Chenopod Shrubland.	506.8	4.1	30.4	476.4 (94.0%)
MpCS Chenopod Shrubland	<i>Hakea preissii</i> or <i>Acacia ?fuscanera</i> isolated Trees over <i>Maireana pyramidata</i> , <i>Maireana triptera</i> and <i>Frankenia setosa</i> Low Sparse Chenopod Shrubland.	28.0	0.2	3.7	24.3 (86.8%)
McS Melaleuca / Acacia Shrubland	<i>Eucalyptus ?oleosa</i> or <i>Eucalyptus comitae-vallis</i> Low isolated Trees over <i>Melaleuca concreta</i> , <i>Melaleuca stereophloia</i> and <i>Acacia acuminata</i> Tall Shrubland over <i>Waitzia acuminata</i> var. <i>acuminata</i> Low Sparse Forbland.	14.5	0.1	2.5	12.0 (82.8%)



Vegetation Unit Code	Vegetation Description	Extent within the Development Envelope (ha)	Percentage of the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
MaTS Melaleuca Shrubland	<i>Melaleuca atroviridis</i> , <i>Melaleuca acutifolia</i> and <i>Melaleuca eleuterostachya</i> Tall Shrubland over <i>Acacia latior</i> , <i>Acacia acuminata</i> and <i>Acacia tetragonophylla</i> Sparse Shrubland.	285.3	2.3	125.6	159.7 (56.0%)
MsFIS Melaleuca Shrubland	<i>Melaleuca stereophloia</i> Tall Shrubland over <i>Frankenia laxiflora</i> Low Open Shrubland.	26.4	0.2	4.0	22.4 (84.8%)
TSP Pasture	Isolated Trees and/or shrubs in pasture.	105.7	0.9	20.5	85.2 (80.6%)
TspSS Samphire Shrubland	<i>Tecticornia</i> spp. Low Open Samphire Shrubland.	58.3	0.5	5.2	53.1 (91.1%)
SsTS Stylobasium Shrubland	<i>Stylobasium spathulatum</i> Tall Sparse Shrubland over <i>Melaleuca filifolia</i> Sparse Shrubland over <i>Seringia hermannifolia</i> , <i>Podotheca gnaphalioides</i> and <i>Schoenia cassiniana</i> Low Open Forbland.	0.8	< 0.1	0.2	0.6 (75.0%)
Cleared		1,440.9	11.6	333.2	1,108.6 (76.9%)
Not mapped*		50.4	0.4	18.2	32.2 (63.9%)
Total		12,403.6	100	2,286.4	10,117.2 (81.6%)

* Refer to **Section 4.3.3.1** for further detail. As noted on **Table 4-6**, a conservative approach has been taken for the purposes of this Proposal, i.e. it is assumed that the entire 'not mapped' area is characterised by remnant vegetation. Therefore, the area of remnant native vegetation that is proposed to be cleared is considered to be an overestimate.



Table 4-11: Impacts to Conservation Significant Flora from the Proposal

Species	Total Number within the Development Envelope and Surrounds	Number of Individuals within the Development Envelope	Number of Individuals within the Indicative Disturbance Footprint	Proportion of Individuals to be Cleared by the Proposal (%)
<i>Eucalyptus beardiana</i> (Threatened)	55	37	0	0%
<i>Dicrastylis linearifolia</i> (Priority 3)	183	114	0	0%
<i>Gnephosis cassiniana</i> (Priority 3)	1	1	0	0%
<i>Petrophile ?pauciflora</i> (Priority 3)	5	6	1	17%
<i>Ptilotus beardii</i> (Priority 3)	1	1	0	0%
<i>Acacia speckii</i> (Priority 4)	1	0	0	0%



4.3.5.2 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. However, the resulting effects of fragmentation reflect the degree of isolation, reduced habitat area, changes in fragment composition and structure, and the species individual habitat requirements and dispersal ability. The resilience of the vegetation fragments is integrally linked to the size of the fragments and their proximity to each other. The smaller and more isolated the remnants, the less viable they become as they are exposed to more external pressures (edge effects) and disturbances.

The western portion of the Proposal is situated in an already highly disturbed and fragmented landscape, which is the result of large-scale clearing for agricultural and pastoral activities. The narrow and linear nature of the Proposal is not sufficient to cause significant fragmentation of native vegetation. Where the indicative disturbance footprint intersects the Eucalypt Woodlands TEC/PEC (representing 0.03% of the indicative disturbance footprint), clearing has been avoided (i.e. HDD) or minimised and the route selected to reduce the creation of small patches to the extent practicable.

4.3.5.3 Introduction and/or Spread of Weeds

The movement of vehicles, heavy machinery, soil and plant material, as well as ground disturbance during clearing and operations, associated with the Proposal has the potential to introduce and spread weeds.

A number of weeds were recorded in the flora and vegetation survey, two of which are listed as Declared Plants. Weeds will be managed through the implementation of a Hygiene Management Plan, which will include weed hygiene measures.

4.3.5.4 Smothering of Vegetation by Dust

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. It may result in reduced plant health and stunted growth due to reduced photosynthetic and transpirational efficiencies as a result of blocked stomata.

Dust mitigation measures will be provided in the CEP. Measures to be implemented will include ensuring vehicles are limited to designated access routes where dust production can be mitigated and dust suppression, such as the use of water trucks along the CROW and the restriction of vehicle speeds to minimise the generation of dust. With the implementation of these mitigation measures, dust emissions are expected to be reduced such that there are no significant impacts within or outside the indicative disturbance footprint.



4.3.5.5 Changes to Vegetation Community Structure and Composition through Altered Hydrology

The clearing of vegetation and temporary excavations have the potential to alter surface water drainage patterns and flows, which can result in erosion and changes to vegetation structure and floristic composition in surrounding/adjacent areas. The Proposal is predominantly situated on flat to gently sloping plains with salt lakes and associated fringes occurring intermittently within the vicinity of the development envelope. Therefore, some sheet flooding is likely to occur from high rainfall events. However, the annual rainfall in the area averages between 7 mm – 38 mm in the summer months to 16 mm – 75 mm in the winter months across the development envelope.

None of the vegetation types identified within the development envelope are known to be dependent on surface water flows. Given the small, and predominantly linear, nature of the indicative disturbance footprint, and considering the majority of the infrastructure will be buried and the remnant native vegetation cleared rehabilitated (approximately 89%), no significant changes to surface water flows due to the construction and operation of the Proposal are anticipated. Therefore, it is highly unlikely that there will be any potential for impacts to vegetation as a result of changes to surface water drainage patterns.

4.3.5. 6 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. The potential impacts to vegetation are reduced in the western portion of the Proposal due to widespread historical clearing. A suite of mitigation measures will be implemented to ensure the management of activities that could lead to a bushfire (**Table 4-12**), and will be detailed in the CEP.

4.3.6 Mitigation

Mitigation and management measures that will be implemented to minimise potential impacts to flora and vegetation are summarised in **Table 4-12**.

Table 4-12: Proposed Management Measures for Flora and Vegetation

Potential Impact	Management Measures
Loss of flora and vegetation	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Baseline flora and vegetation survey completed in the early design phase of the Proposal to characterise the receiving environment values and inform route selection. ▪ No direct clearing of the Threatened <i>Eucalyptus beardiana</i> in the vicinity of KP36.5 through the use of HDD construction methods, as opposed to the standard open trench. ▪ The refinement of the pipeline alignment has avoided the Eucalypt Woodlands TEC/PEC to the maximum extent possible. To further minimise impact, the CROW has been narrowed to the minimum practicable working area (15 m) and HDD construction methods will be



	<p>used where the alignment intersects the widest patch of the TEC/PEC (approximately KP86).</p> <ul style="list-style-type: none"> ▪ The indicative disturbance footprint has been refined to avoid and minimise clearing of Priority flora. ▪ No clearing of vegetation within the Ex Barnong Station, which is proposed by DBCA to be listed as a National Park. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Clearing of vegetation will be minimised. ▪ Pipeline laydown areas and construction facilities (e.g. construction camps, mobile offices and ablutions, equipment laydown areas, and turkey nests) will be co-located and preferentially located in areas with limited vegetation or pre-existing disturbed areas. ▪ The construction boundary will be clearly delineated to prevent encroachment of construction. ▪ Access points to the CROW constructed along existing tracks to the maximum extent practicable. <p>Rehabilitate</p> <ul style="list-style-type: none"> ▪ A Rehabilitation Plan will be developed and implemented to guide the reinstatement and regeneration of temporary construction areas. At a minimum, the Rehabilitation Plan will include: <ul style="list-style-type: none"> ○ Upon completion of works in discrete sections, the disturbance area will be scarified, stockpiled topsoil re-spread evenly to a maximum depth of approximately 10 cm (or reflective of that which was stripped) and stockpiled vegetative material spread over topsoil to encourage vegetation re-establishment; and ○ Rehabilitation of temporary cleared areas will be undertaken progressively and as soon as practicable following pipeline installation.
<p>Fragmentation of native vegetation</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Use of existing third-party access roads, tracks and other infrastructure (e.g. fencelines) to the maximum extent practicable. ▪ The refinement of the pipeline alignment has avoided the Eucalypt Woodlands TEC/PEC to the maximum extent possible. To further minimise impact, the CROW has been narrowed to the minimum practicable working area (15 m) and HDD construction methods will be used where the alignment intersects the widest patch of the TEC/PEC (approximately KP86). <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Vegetation clearing to be minimised.



<p>Introduction and/or spread of weeds</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Declared Plants will be managed in accordance with the BAM Act. ▪ Vehicle movements limited to within the Proposal development envelope. ▪ Access for vehicles and equipment will be restricted to designated roads/tracks and cleared areas. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ A Hygiene Management Plan will be developed and implemented for the project to ensure that weeds are not introduced or spread to adjacent vegetation. The plan will include, as a minimum: <ul style="list-style-type: none"> ○ Machinery and equipment to be cleaned of soil clumps and vegetative matter prior to accessing site; ○ Weed and seed inspection certificate for all equipment, machinery and vehicles prior to mobilisation to site; and ○ If required, clean fill/gravel will be locally sourced from approved borrow pits and/or registered supplier. ○ Hygiene measures implemented in accordance with the APA Pest Disease and Weed Management Procedure (APA HSE EP 13.02.03). ▪ A CEP will be submitted and accepted by DMIRS prior to the commencement of construction. The CEP will include a suite of management and mitigation measures that will address all environmental aspects and potential risks/impacts associated with the project. The CEP will include the management of weeds. ▪ The project induction will address weed management requirements. ▪ Known Declared Plant locations will be mapped and provided to the construction Contractor. ▪ Compliance with any landholder requests with regards to biosecurity requirements.
<p>Smothering of vegetation by dust</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Dust suppression will be utilised along the CROW as required. If hypersaline water is required to be used due to water availability constraints, a risk assessment will be undertaken prior to use. There will be no overspray of the hypersaline water such that it interacts with topsoil stockpiles and cleared vegetation. ▪ Access for vehicles and equipment will be restricted to designated roads/tracks and cleared areas. ▪ Consideration may be given to the use of alternative dust control solutions, if required. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Topsoil stockpile heights will be limited to 2 m and stored along the edge of the CROW.



	<ul style="list-style-type: none"> ▪ Reduce the number of vehicles travelling to site through transporting the workforce via minibus, where practicable. ▪ Incident reporting to include unreasonable/excessive dust generation. ▪ A Traffic Management Plan will be implemented, which will include the use of signage regarding site speed limits.
<p>Changes to vegetation community structure and composition through altered hydrology</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Measures to maintain surface water flows (e.g. culverts/floodways on access roads, breaks in soil/spoil stockpiles etc.) and sediment control structures (sediment fences, berms, etc.) may be used as required, in line with site-specific procedures. ▪ A Water Management Plan will be developed and implemented for the Proposal. The plan will include the management of dewatering, if required, to ensure that this activity does not impact on existing and future uses of aquifers or surrounding vegetation. ▪ The NGI pipeline will be buried so as to not impede surface water or sheet flows of the area. The aboveground facility footprints will be minimised to that required for operations. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Watercourse crossing design will take into consideration the management of sediment, including drainage/sediment controls. ▪ Watercourse crossings will be completed in the shortest possible time. <p>Rehabilitate</p> <ul style="list-style-type: none"> ▪ Construction corridor rehabilitated as soon as practicable to stabilise disturbed soils and restore resistance to erosion.
<p>Accidental bushfires</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Access for vehicles and equipment will be restricted to designated roads/tracks and cleared areas. ▪ Inductions and training will address bushfire management, fire response and use of fire response equipment. ▪ Department of Fire and Emergency Service (DFES) alerts regarding fire ban days will be monitored during high risk activities. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Water truck(s) will be on site during construction. ▪ All machinery and vehicles undertaking clearing activities will have fire extinguishers. ▪ A Hot Work Permit system will be implemented by APA for live welding works. ▪ The project will be undertaken in accordance with the requirements of the total fire ban exceptions, under the Bush Fires Regulations 1954, for off-road activities (as defined as the use or operation of any engine,



	<p>vehicle, plant, equipment or machinery on land on which there is bush, crop, pasture, stubble or grassland).</p> <ul style="list-style-type: none"> ▪ Welding to be undertaken post-clearing, therefore the risk of vegetation catching fire is low. ▪ Welding crew will have a dedicated fire water trailer. ▪ Maintenance of fire response equipment on site, which will include fire water trailers located along the CROW. ▪ Permit system to be used for commissioning works. ▪ Fire awareness to be reinforced at toolbox meetings. ▪ Permit system to be used for commissioning works. ▪ Fire awareness to be reinforced at toolbox meetings.
--	--

4.3.7 Predicted Outcome

The predicted impacts to flora and vegetation from the Proposal after applying avoidance and mitigation (**Table 4-12**) include:

- Clearing of approximately 1,934 ha of native vegetation within an approximately 12,404 ha development envelope;
- Some clearing will be undertaken in three regional vegetation complexes that have < 30% of their pre-European extent remaining State-wide (142, 353 and 687). However, clearing associated with the Proposal will not significantly further reduce the extent of these associations as it represents < 0.1% of their current extents;
- Clearing of up to approximately 0.74 ha of the Eucalypt Woodlands TEC/PEC, which represents approximately 0.1% of the mapped extent in the local area;
- No impact to Threatened flora, specifically *Eucalyptus beardiana*; and
- Clearing of only one individual of the Priority 3 *Petrophile ?pauciflora* within the development envelope.

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

4.4 Key Environmental Factor – Terrestrial Fauna

4.4.1 EPA Objective

The EPA's objective for flora and vegetation is *'To protect terrestrial fauna so that biological diversity and ecological integrity are maintained'* (EPA, 2016c).

For the purposes of EIA, the EPA defines terrestrial fauna as animals living on land or using land for all or part of their lives. Terrestrial fauna includes vertebrate and invertebrate groups (EPA, 2016c).

4.4.2 Policy and Guidance

Legislation, policies and guidance applicable to the assessment of terrestrial fauna include:

- BC Act;
- Environmental Factor Guideline: Terrestrial Fauna (EPA, 2016c);
- Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna (EPA, 2020b); and
- Technical Guidance: Sampling of Short Range Endemic Invertebrate Fauna (EPA, 2016d).

4.4.3 Receiving Environment

4.4.3.1 Baseline Studies

APA commissioned Kingfisher Environmental (Kingfisher) to undertake a basic and targeted fauna assessment, comprising of a reconnaissance and primary field survey, to identify fauna values of relevance to the Proposal. The fauna assessment comprised of the following:

- Desktop review of technical reports and relevant databases (with up to a 50 km buffer applied) to determine the potential fauna (terrestrial vertebrates and short-range endemic fauna) and habitats within the survey area. The desktop review included searches of the EPBC Act Protected Matters database, DBCA Threatened and Priority Fauna database, BirdLife Australia Atlas Database, Atlas of Living Australia and NatureMap. A number of fauna surveys have also been previously undertaken in the region and provided valuable information on the distribution of significant fauna and their associated habitat types;
- Fauna survey, building upon the results of the desktop review, including:
 - Compilation of fauna recorded (or expected) along the survey corridor;
 - Targeted searches for species of conservation significance, including those listed under the EPBC Act, BC Act and DBCA Priority fauna; and
 - Habitat assessment, the suitability of habitats present to provide habitat or linkage for fauna, particularly those of conservation significance. The mapping of the fauna habitats was based on the detailed vegetation mapping, as completed by Focused Vision (2020). The fauna habitat mapping was further



refined to take into account the species known range and distribution within land systems, as these are important considerations that influence the likelihood of a species occurrence.

The fauna survey was undertaken over two periods:

- A reconnaissance survey, which was completed between the 3–10 August 2020 and consisted of a survey effort of eight person days; and
- A basic and targeted fauna survey, which was conducted between the 31 August – 11 September 2020 and consisted of a survey effort of 24 person days. The basic survey included the collection of information at a local scale to gather broad fauna and habitat information to verify the overall adequacy of the desktop review and map and describe fauna habitats. The targeted survey focused on significant fauna and/or habitats.

The fauna survey area comprised the same areas as the flora and vegetation assessment, as described in **Section 4.3.3**. The survey area was also widened to a width of approximately 500 m in areas considered to be of higher environmental sensitivity, such as habitats deemed suitable to support conservation significant fauna.

The fauna survey was undertaken in accordance with the EPA's Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna (EPA, 2020b). Refer to **Appendix 2** for the Kingfisher (2020) fauna assessment report.

4.4.3.2 Vertebrate Fauna

Fauna Diversity

A total of 119 species were recorded during the survey, comprising nine reptile, 87 bird, 16 native mammals and seven introduced mammals (Kingfisher, 2020). Seven species of conservation significance fauna were recorded within the development envelope, with additional species recorded in the broader surrounds.

Eighteen fauna species were identified from the motion cameras installed during the survey. This comprised two reptile, seven bird, eight native mammal and one introduced mammal species.

Refer to **Appendix 2** for further detail on the species recorded during the fauna survey.

Conservation Significant Fauna

The desktop review identified 36 conservation significant vertebrate fauna species with the potential to occur within the development envelope and surrounding area (**Table 4-13**). An assessment of the likelihood of occurrence of each fauna species was undertaken, with species presence classified as:

- Recorded – either during the survey or from previous observations within the development envelope;
- Likely Resident – recorded nearby (within 100 km) and suitable habitat present within the survey area;
- Potential Resident – recorded in region (not within 100 km) and suitable habitat present within the survey area;
- Visitor – expected to occur within the survey area at least on a seasonal basis;



- Foraging Visitor – expected to forage within the survey area only (i.e. breeding habitat is absent);
- Vagrant – rare visitor occurring outside the species usual range; or
- Unlikely – suitable habitat absent.

Five of the conservation significant fauna species have been recorded within the development envelope, consisting of one bird species listed under the EPBC Act, one bird listed under the BC Act, two Priority 4 mammal species and one locally significant bird species. Five of the species were considered likely to be resident and included two reptiles (one BC Act listed and one locally significant) and three locally significant birds. Six species (three reptiles and three birds) were considered potential residents to the development envelope. Fifteen species were considered as to be vagrants or visitors (mostly migratory birds), with the remaining five species considered unlikely to occur in the development envelope. A summary of the likelihood of occurrence of the conservation significant fauna species occurring within the development envelope is provided in **Table 4-13** (Kingfisher, 2020). Additional information on conservation significant fauna species can be found in **Appendix 2**.

Most of the fauna likely or potentially occurring within the development envelope are likely to be widespread, as the fauna habitats present are dominated by those with extensive representation across the region (Kingfisher, 2020).



Table 4-13: Conservation Significant Fauna Potentially Occurring within the Development Envelope

Taxa	Conservation Status ¹				Local Records	Preferred Habitat Type	Nearest Record to the Development Envelope	Likelihood of Occurrence ²
	EPBC Act	BC Act	DBCA	Local				
Reptiles								
Western Spiny-tailed Skink	EN	VU			Yalgoo	Woodland, outcrops	100 m (north)	Potential Resident
Gilled Slender Blue-tongue		VU			Mt Magnet	Mallee, shrublands	2 km (south)	Likely Resident
Yuna Broad-blazed Slider			P3		Mullewa	Shrublands, sandy soils	4 km (north)	Potential Resident
Woma			P1		Eradu	Sandplains	14 km (south-west)	Potential Resident (albeit unlikely)
Carpet Python				L	Yalgoo	Woodland, outcrops	1 km (north)	Likely Resident
Birds								
Malleefowl	VU	VU			Yalgoo	Acacia, rocky hills	Recorded	Recorded (confirmed)
Carnaby's Cockatoo	EN	EN			Tenindewa	Woodlands, Heath	5 km (south)	Foraging Visitor
Princess Parrot	VU		P4		Mt Magnet	Marble Gum woodland	12 (north)	Vagrant
Peregrine Falcon		OS			Lawlers	Shrubland, woodland	Recorded	Recorded (confirmed)
Grey Falcon		VU			Mullewa	Open grasslands	1 km (south)	Vagrant
Fork-tailed Swift	M	IA			Mullewa	Aerial	1 km (south)	Vagrant

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Taxa	Conservation Status ¹				Local Records	Preferred Habitat Type	Nearest Record to the Development Envelope	Likelihood of Occurrence ²
	EPBC Act	BC Act	DBCAs	Local				
Night Parrot	EN	CR			Mt Farmer	Spinifex, chenopod	48 km (north)	Unlikely
Blue-billed Duck			P4		Wurarga	Wetlands	6 km (north)	Vagrant
Striated Grasswren			P4		Sandstone	Spinifex sandplain	27 km (north) – recorded in survey	Unlikely
Hooded Plover			P4		Lake Barlee	Salt lakes	80 km (south)	Unlikely
Letter-winged Kite			P4		Urawa	Eucalypt woodland	12 km (north)	Vagrant
Major Mitchell's Cockatoo				L	Mullewa	Woodland, mallee	1 km (south)	Potential Resident
Slender-billed Thornbill				L	Mt Magnet	Samphire, chenopods	12 (north)	Likely Resident
Scarlet-chested Parrot				L	Cue	Shrublands	83 km (north)	Visitor (potential)
Regent Parrot				L	Yalgoo	Eucalypt woodland	1 km (north)	Likely Resident
Bush Stone-curlew				L	Atley	Acacia shrublands	4 km (north)	Likely Resident
Rufous Treecreeper				L	Yalgoo	Eucalypt woodland	1 km (north)	Potential Resident
Western Yellow Robin				L	Wilroy	Shrublands, woodland	Recorded	Recorded (confirmed)
Southern Scrub-robin				L	Wilroy	Mallee, shrublands	13 km (south)	Potential Resident
Glossy Ibis	M	IA			Ellendale Pool	Wetlands, salt lakes	28 km (south-west)	Vagrant



Taxa	Conservation Status ¹				Local Records	Preferred Habitat Type	Nearest Record to the Development Envelope	Likelihood of Occurrence ²
	EPBC Act	BC Act	DBCA	Local				
Common Sandpiper	M	IA			Barnong	Wetlands, salt lakes	27 km (south)	Vagrant
Pectoral Sandpiper	M	IA			Pindar	Wetlands, salt lakes	1 km (south)	Vagrant
Common Greenshank	M	IA			Yalgoo	Wetlands, salt lakes	16 km (south)	Vagrant
Curlew Sandpiper	M	IA			Durawah	Wetlands, salt lakes	21 km (west)	Vagrant
Sharp-tailed Sandpiper	M	IA			Yalgoo	Wetlands, salt lakes	28km (south)	Vagrant
Wood Sandpiper	M	IA			Yuna	Wetlands, salt lakes	37 km (north-west)	Vagrant
Gull-billed Tern	M	IA			Yalgoo	Wetlands, salt lakes	15 km (south)	Vagrant
Osprey	M	IA			Ellendale Pool	Rivers, wetlands	28 km (south-west)	Unlikely
Mammals								
Sandhill Dunnart	EN	EN			Yalgoo	Sandplains, dunes	18 km (north)	Unlikely
Brush-tailed Mulgara			P4		Black Range	Spinifex sandplains	Recorded	Recorded (confirmed)
Long-tailed Dunnart			P4		Mt Anderson	Stony hills and ridges	Recorded	Recorded (confirmed)

¹ EN – Endangered; VU – Vulnerable; M – Migratory; OS – Other Specially Protected; CR – Critically Endangered; IA – listed under International Agreements; P1 to P4 – Priority fauna species listed by DBCA; L – Locally significant fauna, due to distribution or habitat limitations.

² The conservation significant species recorded or likely to be resident in the development envelope are shaded.

Of the 42 species identified to potentially occur, five Threatened or Priority fauna species were recorded within or in close proximity to the development envelope (Table 4-14; Kingfisher, 2020):

- Malleefowl (*Leipoa ocellata*) – Vulnerable (EPBC Act and BC Act);
- Western Spiny-tailed Skink (*Egernia cygnitos*) – Endangered (EPBC Act), Vulnerable (BC Act);
- Brush-tailed Mulgara (*Dasyercus blythi*) – Priority 4 (DBCAs);
- Long-tailed Dunnart (*Sminthopsis longicaudata*) – Priority 4 (DBCAs); and
- Peregrine Falcon (*Falco peregrinus*) – Other Specially Protected Species (BC Act).

Further discussion of these species is provided below.

An additional two species were recorded during the survey (Table 4-14):

- Striated Grasswren (*Amytornis striatus*) – Priority 4 (DBCAs). The species was recorded opportunistically approximately 27 km north of the survey area during transit. However, the species is considered unlikely to occur in the development envelope as suitable habitat of long unburnt spinifex grasslands on yellow sandplains with tall dense shrubs is absent; and
- Western Yellow Robin (*Neophema elegans*) – locally significant. The species was recorded in close proximity to the development envelope in densely vegetated shrublands east of Mullewa (near KP98) (Kingfisher, 2020). The sighting is likely to be near the arid extreme of the species range.

While not recorded during the survey, several species have the potential to occur within the development envelope based on the review of previous records. These include species that may occur as resident populations and wide-ranging species that may periodically visit the area:

- Carnaby's Cockatoo (Endangered, EPBC Act and BC Act) – the species is likely to pass through and forage in the area. The portion of the development envelope between Ambania to near Mullewa occurs within the species predicted range (Kingfisher, 2020). However, due to pre-existing widescale clearing for agriculture, there is limited breeding and foraging present in the development envelope (Kingfisher, 2020). The Eucalypt Woodlands (Wheatbelt) and Banksia Shrublands provide potential suitable habitat and these only represent < 0.1% (approximately 4 ha) of the development envelope within the species range. No suitable breeding trees were recorded in the development envelope and, therefore, breeding is not expected to occur (Kingfisher, 2020).
- Gilled Slender Blue-tongue (Vulnerable, BC Act) – the species is likely to be resident in the area as there are several historical records in surrounds of the development envelope in vegetated remnants in the Wheatbelt, including Mullewa and Urawa Nature Reserve, and low stony rises near Mount Magnet. The closest record is approximately 4 km to the south of the development envelope. The species range is confined to the Mid West coast, in the Murchison and Irwin River areas, inland to Mount Magnet (Kingfisher, 2020). Due to the small size of habitat fragments, the Gilled Slender Blue-tongue is unlikely to occur in the native vegetation within the wheatbelt, however it may be present within the expansive Acacia shrublands east of Pindar to Mount



Magnet (approximately KP69 to KP281) (Kingfisher, 2020). Based on the land systems within which this species has been recorded, the development envelope represents < 0.1% of that regionally present (Kingfisher, 2020).

- Yuna Broad-blazed Slider (Priority 3) – the species may potentially reside in the development envelope. The Yuna Broad-blazed Slider has a highly restricted distribution, being known only from the Yuna area, which is in the western end of the development envelope (Kingfisher, 2020). The species has been recorded adjacent to the development within the Urawa Nature Reserve and at Tenindewa. The fauna habitats of Eucalypt Woodland, Acacia Shrubland and Banksia Woodland provide suitable habitat for the species. These habitats comprise approximately 4 ha of the development envelope within the species range (Kingfisher, 2020). Therefore, the development envelope represents a very small portion of that present within the species known range (Kingfisher, 2020).
- Woma (Priority 1) – historical records for the species from DBCA (1965) occur in the western portion of the development envelope at Yuna and Eradu (Kingfisher, 2020). The last confirmed Wheatbelt record was in 1989 and located near Watheroo, which is approximately 203 km south of the development envelope. While the species may be present in cleared or regrowth landscapes, it typically requires extensive areas of native vegetation to enable it to persist. Given the fragmented nature of the remnant vegetation, and small size of the fragments, within the Wheatbelt, the Woma is unlikely to occur, or be resident, in the development envelope (Kingfisher, 2020).
- Carpet Python (locally significant) – the species may reside in the development envelope as suitable habitat is present. The Carpet Python occurs in Eucalypt woodland, forests, dense coastal scrub, rocky outcrops and along watercourses, and has been previously recorded in proximity to the development envelope near Mullewa and Yalgoo (Kingfisher, 2020).
- Eight locally significant bird taxa may occur in small populations in discrete areas of the development envelope. The taxa includes declining woodland species and species occurring at the extreme of their range, such as the Rufous Treecreeper, Major Mitchell's Cockatoo, Southern Scrub-robin, Regent Parrot, Western Yellow Robin, Slender-billed Thornbill, Scarlet-chested Parrot and Bush Stone-curlew. These species are highly mobile.



Table 4-14: Threatened, Priority and Locally Significant Fauna Species Recorded

Species	Conservation Status ¹				Evidence	Number of Locations/ Individuals	Fauna Habitat
	EBPC Act	BC Act	DBCA	Other			
Malleefowl	VU	VU			Old, inactive mounds, fresh tracks	8 (including 5 inactive mounds and 3 fresh tracks)	Callitris Woodland, Acacia/Melaleuca Shrubland (Plains), Mixed Acacia Shrubland (Plains), Mulga Shrublands (Plains)
Western Spiny-tailed Skink [^]	EN	VU			Scat latrines (fresh and old)	5 (including 4 fresh and 1 old scat latrine)	Rocky Outcrop, Wheatbelt: Eucalypt Woodland
Brush-tailed Mulgara			P4		Active burrow, fresh scats	6 locations	Mulga/Spinifex
Long-tailed Dunnart [^]			P4		Direct sighting	1 location	Rocky Outcrop
Peregrine Falcon			OS		Direct sighting	2 locations (one outside the development envelope) – single individual at each location	Open Acacia Shrubland, Mulga/Spinifex
Striated Grasswren [^]			P4		Direct sighting	Group of birds	Yellow Sandplain
Western Yellow Robin [^]				L	Direct sighting	2 locations – single individual at each location	Callitris Woodland, Mixed Acacia Shrubland (Plains)

¹ EN – Endangered; VU – Vulnerable; P4 – Priority fauna species listed by DBCA.

[^] Species recorded only outside the development envelope.

Malleefowl

Malleefowl generally occur within areas of dense vegetation, particularly Mulga shrublands on sandplains or rocky habitats, that have not been burnt for many years (Kingfisher, 2020). This is due to the species use of large amounts of leaf litter for egg incubation in mounds.

Suitable habitat for the species in the development envelope occurs within the expansive Acacia shrublands west of Pindar (Kingfisher, 2020). The majority of habitat suitable (dense vegetation) for Malleefowl breeding within the development envelope occurs between Pindar (approximately KP69) and Wurarga (approximately KP120), which is approximately 40 km west of Yalgoo. The Joseph Land System is the dominant system present in this area and is characterised by undulating sandplains supporting dense mixed shrublands with patchy mallees (**Table 2-7**). Within this area, the species is unlikely to breed within the Eucalypt Woodlands fauna habitat due to the open understorey typically present (Kingfisher, 2020).

A total of five inactive mounds and distinctive tracks were recorded from three locations (**Figure 4-5**). The mounds were located within Acacia dominated vegetation types, with the inclusion of *Callitris* and *Melaleuca*, and some *Mallee* and *Eucalyptus* species (**Table 4-14**). All mounds were recorded from the Joseph Land System, which encompasses 3% (approximately 397 ha) of the development envelope.

Western Spiny-tailed Skink

The northern, rock dwelling form of the Western Spiny-tailed Skink is restricted to a select, small number of granite outcrops, and rocky ridges, scattered through the Murchison from Boolardy Station in the north to near Yalgoo in the south (Kingfisher, 2020). The southern form typically inhabits suitable log piles within Eucalypt woodlands.

No evidence of the Western Spiny-tailed Skink was recorded within the development envelope, with records of the species being in adjacent rocky outcrop or Eucalypt woodland habitats (**Figure 4-5**). Rocky outcrops or logs piles with the potential to support a colony were also not observed within the development envelope. Therefore, the potential for this species, both the northern, rock dwelling form and southern, woodland inhabiting form, to reside in the development envelope is considered to be low. Suitable habitat available within the development is also limited to approximately 7 ha of Eucalypt woodland, which may be utilised by the southern form.

Brush-tailed Mulgara

The Brush-tailed Mulgara has a scattered occurrence across the Murchison, with few regional records (Kingfisher, 2020). The species was recorded within the development envelope with a number of active burrows recorded (**Figure 4-5**). The active burrows were recorded from sandplains dominated by *Triodia basedowii* with mixed *Acacia* shrubs. These records represent significant regional records and lie on the species southern range extreme (Kingfisher, 2020). Approximately 10 km of suitable habitat is traversed by the development envelope in the vicinity of the recorded burrows (vegetation type EkTbHG). Minor areas of spinifex may occur outside of this and have the potential to support the species (Kingfisher, 2020).

Minimal habitat suitable for the Brush-tailed Mulgara occurs within the development envelope area, with much of the area traversing shrublands devoid of spinifex. Suitable

habitat (represented by vegetation type EkTbHG) accounts for approximately 2% (approximately 195 ha) of the development envelope is considered suitable habitat for the species. The recording of the species within the Kalli and Tyrrell land systems represents a previously undocumented population (Kingfisher, 2020). These land systems are widespread in the region and account for approximately 5% of the development envelope.

Long-tailed Dunnart

The Long-tailed Dunnart is known from few scattered localities across arid western and central Australia (Kingfisher, 2020). In Western Australia, the species has been recorded from few widely separated populations, extending from the Pilbara south to the Murchison and Gibson Desert (Kingfisher, 2020). The Long-tailed Dunnart is a specialist of rugged, rocky landscapes and typically inhabits rocky ridges, hills and breakaways (Pavey, 2006).

The development envelope occurs near the southern extent of the Long-tailed Dunnart's distribution based on DBCA records (Kingfisher, 2020). A single record of the Long-tailed Dunnart was recorded during the survey, approximately 300 m north of the development envelope in the Brooking Land System (near KP471). The species was observed on a stony scree slope adjacent to a heavily dissected area of ironstone outcropping near the crest of an ironstone ridge (**Figure 4-5**).

The stony slopes associated with the Brooking Land System only intersect a small portion of the development envelope (approximately 0.03% or 4 ha). As the Long-tailed Dunnart is mobile, it has the potential to traverse the development envelope, although suitable rocky habitat appears minimal, occurring only adjacent to the ironstone ridge. The Long-tailed Dunnart is likely to occur throughout the wider area, however, restricted to rocky habitats.

Peregrine Falcon

The Peregrine Falcon is found in a variety of habitats, including rocky ledges, cliffs, watercourses, open woodland and acacia shrublands (Johnstone and Storr, 1998). The species appears to prefer mountain ranges, river valleys, coastlines, and is increasingly being observed in cities (Ferguson-Less and Christie, 2001). The Peregrine Falcon nests in recesses of cliff faces, tree hollows or in large abandoned nests of other birds (Johnstone and Storr, 1998).

The Peregrine Falcon was recorded outside the development envelope during the fauna assessment (**Figure 4-5**). Although the species is likely to forage in the development envelope, potential breeding habitat is limited as suitable cliffs are absent and suitably tall trees rare (Kingfisher, 2020).

4.4.3.3 Fauna Habitat

Twenty fauna habitats covering were identified within the development envelope (Kingfisher, 2020) (**Table 4-17** and **Figure 4-5**). Fauna habitats mostly comprised Acacia, include Mulga shrublands (approximately 43%), open Acacia or mixed shrublands (approximately 15%) and mixed Acacia shrublands (approximately 10%). Disturbed areas characterised by cleared areas or isolated trees/shrubs in pasture accounted for approximately 13% of the development envelope.



As outlined in **Section 4.3.3**, the mapping of the fauna habitats has been aligned with the detailed vegetation mapping undertaken by Focused Vision (2020).



Table 4-15: Fauna Habitats within the Development Envelope

Fauna Habitat	Habitat Description	Corresponding Vegetation Type (Focused Vision, 2020)	Extent within the Development Envelope (ha)	Extent within the Development Envelope (%)
Banksia Woodland	Sandplain with <i>Banksia sceptrum</i> and <i>Callitris arenaria</i> Low Open Woodland.	BsCaW	0.7	< 0.1
Callitris Woodland	Sandplain and rises supporting mixed <i>Acacia shrublands</i> and <i>Callitris columellaris</i> Woodland.	CcLOW	104.8	0.8
Eucalyptus Woodland (Plains)	Plains supporting Eucalypt woodlands (<i>Eucalyptus kochii</i> and <i>Eucalyptus horistes</i>) with mixed <i>Acacia</i> shrubs.	EKEhW	31.2	0.3
Eucalyptus Woodland (Drainages)	Major drainage lines supporting fringing Eucalypts (<i>Eucalyptus camaldulensis</i>).	EcW	5.2	< 0.1
Breakaways	Lateritic duricrust (breakaways) supporting <i>Acacia shrublands</i> or sparse chenopods.	N/A	1.5	< 0.1
Granite Outcrops	Granite outcrops and adjacent plains supporting <i>Acacia shrublands</i> and chenopod shrublands.	N/A	15.8	0.1
Acacia Sandplains	Undulating sandplains supporting mixed <i>Acacia</i> (<i>Acacia mulganeura</i> , <i>A. caesaneura</i> and <i>A. ramulosa</i>) shrublands with scattered Mallee (<i>Eucalyptus kingsmillii</i>).	AmTS, EkAcS	132.1	1.1
Acacia/Melaleuca shrublands (Plains)	Undulating plains supporting mixed <i>Acacia</i> and <i>Melaleuca</i> shrublands (including <i>Acacia caesaneura</i> , <i>A. acuminata</i> and <i>Melaleuca leiocarpa</i>) with scattered Mallee (<i>Eucalyptus</i> species).	AcMIS	201.2	1.6



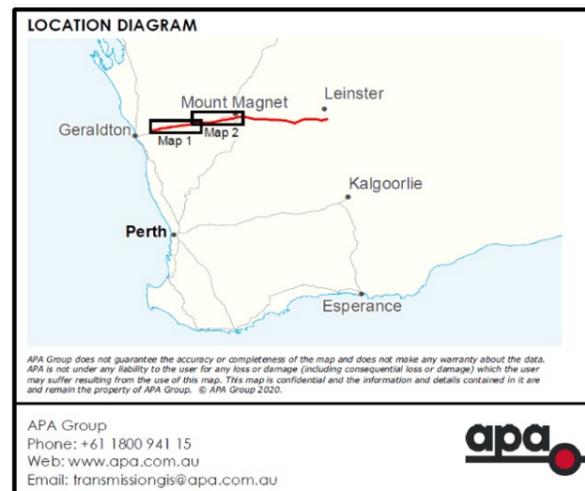
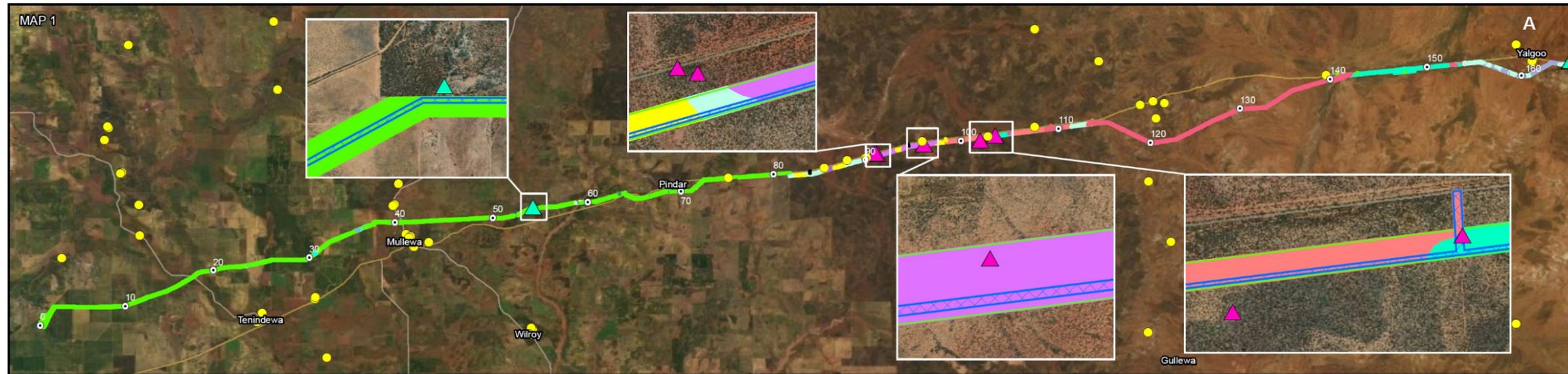
Fauna Habitat	Habitat Description	Corresponding Vegetation Type (Focused Vision, 2020)	Extent within the Development Envelope (ha)	Extent within the Development Envelope (%)
Acacia/Melaleuca shrublands (drainages)	Drainage tracts supporting dense Melaleuca and Acacia shrublands (dominated by <i>Melaleuca atroviridis</i> , <i>M. acutifolia</i> , <i>M. eleuterostachya</i> , <i>Acacia latior</i> , <i>A. acuminata</i>).	MaTS	285.3	2.3
Mulga Shrublands (Plains)	Plains supporting Mulga (<i>Acacia</i> species) shrublands, including <i>Acacia caesaneura</i> , <i>A. incurvaneura</i> and <i>Eremophila forrestii</i> , <i>E. latrobei</i> , <i>E. clarkei</i> and <i>Aluta aspera</i> over tussock grasses.	AcTOS	5,322.7	42.9
Mixed Acacia Shrublands (Plains)	Plains supporting mixed shrublands dominated by <i>Acacia</i> (<i>A. caesaneura</i> , <i>A. tetragonophylla</i> and <i>A. aptaneura</i>) with <i>Senna artemisioides</i> , <i>Aluta aspera</i> and <i>Eremophila fraseri</i> .	AspTS	1,232.1	9.9
Mulga/Spinifex	Sandplains supporting Mallee (<i>Eucalyptus kingsmillii</i>), Mulga (<i>Acacia</i> spp.) and Spinifex (<i>Triodia basedowii</i>).	EkTbHG	195.1	1.6
Acacia/Eremophila shrublands	Sandplains supporting mixed shrublands dominated by <i>Acacia</i> (particularly <i>Acacia ramulosa</i>) with <i>Eremophila latrobei</i> and mixed shrubs.	ArEIS	85.1	0.7
Open Mixed Shrublands (Plains)	Open plains and drainage tracts supporting open shrublands with <i>Acacia</i> (including <i>A. caesaneura</i> , <i>A. incurvaneura</i> , <i>A. tetragonophylla</i> , <i>A. victoriae</i> , <i>A. burkittii</i>), and <i>Eremophila</i> (species) and/or halophytic low shrubs.	AvS, MsFIS, HspTS, AbTOS, AtHpS, AcEspS	1,895.2	15.3
Open Acacia Shrublands (Plains)	Plains supporting mixed <i>Acacia</i> shrublands including <i>A. tysonii</i> , <i>A. ligulata</i> and <i>A. aulacophylla</i> .	AtTS	674.4	5.4
Chenopod Shrublands	Low lying plains supporting Chenopod (Samphire, Saltbush, Bluebush) shrublands.	AbMpCS, MpCS, MgCS	538.0	4.3

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Fauna Habitat	Habitat Description	Corresponding Vegetation Type (Focused Vision, 2020)	Extent within the Development Envelope (ha)	Extent within the Development Envelope (%)
Wheatbelt: Eucalypt	Remnant vegetation within the Wheatbelt: Eucalypt Woodland.	EbW, EIW, EsMnS, EsBsW	6.8	0.1
Wheatbelt: Shrublands	Remnant vegetation within the Wheatbelt: Mixed Shrubland.	AnTOS, SsTS, McS	21.1	0.2
Wheatbelt: Chenopods	Remnant vegetation within the Wheatbelt: Chenopod Shrubland.	TspSS	58.3	0.5
Disturbed	Cleared vegetation or Isolated trees or shrubs in pasture.	TSP, Cleared	1,546.6	12.4
Not mapped*		Not mapped	50.4	0.4
Total			12,403.6	100

* Refer to **Section 4.3.3.1** for further detail.



LEGEND:

- Kilometre Point (KP)
- ▨ Indicative Disturbance Footprint
- ▭ Development Envelope
- DBCA Conservation Significant Fauna

Kingfisher (2020) Conservation Significant Fauna

- ▲ Western Spiny-tailed Skink (Endangered)
- ▲ Brush-tailed Mulgara (Priority 4)
- ▲ Long-tailed Dunnart (Priority 4)
- ▲ Striated Grasswren (Priority 4)
- ▲ Malleefowl (Vulnerable)
- ▲ Peregrine Falcon (Other Specially Protected)

Fauna Habitat (Kingfisher 2020)

- Acacia / Eremophila Shrublands
- Acacia / Melaleuca Shrublands
- Acacia / Melaleuca Shrublands in Drainages
- Acacia Dominated Sandplain
- Banksia Woodland
- Breakaway
- Callitris Woodland
- Chenopod Shrublands
- Eucalypt Woodland
- Eucalypt Woodland (Drainage)
- Granite Outcrop
- Mixed Acacia Shrublands
- Mulga / Spinifex Association
- Mulga Shrublands
- Open Acacia Shrublands
- Open Mixed Shrublands
- Wheatbelt: Chenopod
- Wheatbelt: Eucalypt Woodland
- Wheatbelt: Shrublands
- Disturbed
- Not Assigned

PROJECT: Northern Goldfields Interconnect

TITLE: Fauna Habitats and Significant Fauna Recorded (1 of 2)

SUBTITLE: Map 1 and 2

DATE: 12/01/2021

DATA SOURCE:
KPs: APA Group.
Fauna Habitat, Kingfisher Recorded Fauna: Kingfisher.
DBCA Recorded Fauna: DBCA.
Imagery: ESRI World Basemap.

DOCUMENT NUMBER: 560-MAP-L-7848

Revision	Description	Drawn	Checked/QC	Approved	DATE
0.6	Revision	SP			12/01/21
0.4	Revision	SP	KM		1/12/20
0.3	Revision	SP	KM		27/11/20
0.2	Revision	SP	KM		26/11/20
0.1	Draft	SP	KM		24/11/20

SCALE: 1:450,000 @ A3

GDA2020

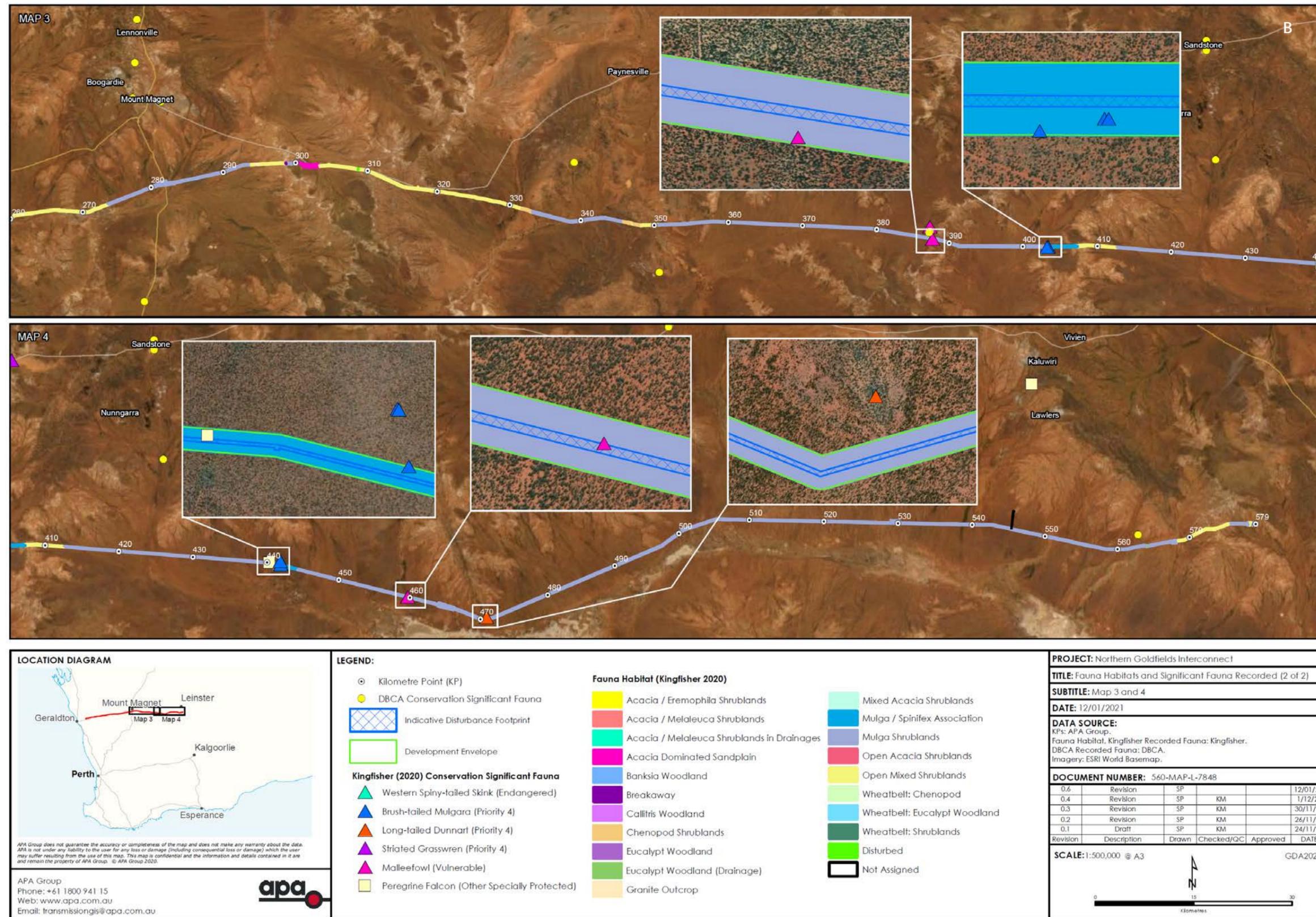


Figure 4-5: Fauna Habitats and Conservation Significant Fauna Recorded within the Development Envelope

Conservation Significant Habitats

Of the 20 fauna habitats within the development envelope, several were of higher value as they represent uncommon or regionally restricted habitats or support conservation significant fauna. This is due to the development envelope traversing from the temperate south-west into the arid interior. These habitats include:

- Granite Outcrops – this fauna habitat type occurs in isolated pockets throughout the development envelope (approximately 16 ha or 0.1%). This habitat may support the Western Spiny-tailed Skink and short-range endemic (SRE) fauna.
- Breakaways – as with the Granite Outcrops, this habitat type is isolated throughout the development envelope (1.5 ha or < 0.01%) and has potential to support the Western Spiny-tailed Skink and SREs.
- Eucalypt Woodland (vegetation types EkEhW and EbW) – this habitat is likely to support several woodland fauna species that occur near the northern extreme of their range, such as the locally significant fauna of Rufous Treecreeper, Western Yellow Robin and Carpet Python. The habitat also has potential to support the Western Spiny-tailed Skink (southern form), although the species was not recorded within the development envelope. Approximately 33 ha of the development envelope supports this habitat.
- Spinifex Sandplains – a portion of this habitat types associated with vegetation type EkTbHG supports the Priority 4 Brush-tailed Mulgara (approximately 195 ha of 2%);
- Densely vegetated Acacia Shrublands – supports the Threatened Malleefowl and has the potential to support the Northern Shield-backed Trapdoor Spider (Priority 3). The Joseph Land System (as described in **Section 2.11.2**) encompasses approximately 397 hectares (or approximately 3%) of the development envelope.
- Remnant native vegetation of the Wheatbelt – while the majority of the remnant vegetation is unlikely to support conservation significant fauna, high value areas of remnant vegetation include Eucalypt woodlands (specifically vegetation types EbW, EIW and EsMnS) as it has the potential to provide nesting and sheltering for a range of fauna (approximately 6 ha). The Acacia shrublands (specifically AnTOS and McS) (approximately 20 ha) have the potential to support the Gilled Slender Blue-tongue and Yuna broad-blazed slider, however, this will be dependent on the size of the remnant vegetation. While the Banksia Woodland fauna habitat may support the restricted Yuna broad-blazed slider and provide foraging habitat for the Carnaby's Cockatoo, the area of habitat within the development envelope is small (approximately 0.7 ha).

4.4.3.4 Short-Range Endemic Fauna

The desktop review identified eight short-range endemic (SRE) invertebrate taxa had previously been recorded within 10 km of the development envelope (Kingfisher, 2020). The review also identified six conservation significant invertebrate fauna species with the potential to occur within the development envelope and surrounding area, as summarised in **Table 4-16**. Of these, only one is considered likely to be present in the area; the Northern Shield-backed Trapdoor Spider (*Idiosoma clypeatum*; Priority 3) (Kingfisher, 2020).

The Northern Shield-backed Trapdoor Spider has a scattered distribution through the Yalgoo and Murchison Bioregions with several historical records occurring within 20 km of



the development envelope, south of Wurarga (Kingfisher, 2020). The species has been recorded in the Challenge, Kalli and Violet land systems, which are characterised by Acacia shrublands on plains (Challenge, Kalli) or Acacia shrublands on gravelly plains (Violet) (Kingfisher, 2020). The Challenge and Kalli land systems encompass approximately 5% (approximately 632 ha) of the development envelope. The Violet land system does not intersect the development envelope. These land systems are widespread throughout the Murchison region. Therefore, while the Northern Shield-backed Trapdoor Spider is likely to occur in the development envelope, suitable habitat for the species is extensive both within the development envelope and throughout the region (Kingfisher, 2020).

The distribution of the Shield-backed Trapdoor Spider has been undergone taxonomic revision in 2018 (Kingfisher, 2020). While the species was formerly thought to occur in the region, it is now restricted to the central and central-western Wheatbelt (Rix et al., 2018, cited in Kingfisher, 2020). Considering this, the Shield-backed Trapdoor Spider is unlikely to occur within the development envelope (Kingfisher, 2020).



Table 4-16: Conservation Significant SRE Fauna Potentially Occurring within the Development Envelope

Taxa	Conservation Status ¹			Local Records	Preferred Habitat Type	Nearest Record to the Development Envelope	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA				
Shield-backed Trapdoor Spider	VU	EN		Mt Gibson	Woodland, hills	None	Unlikely
Tree-stem Trapdoor Spider			P4	Mt Gibson	Woodland, hills	150 km (south)	Unlikely
Minnivale Trapdoor Spider (<i>Teyl</i> species)		CR		Mellenbye	Perched swamps	46 km (south)	Unlikely
Trapdoor Spider (<i>Kwonkan moriartii</i>)			P2	Kathleen	Unknown	84 km (north)	Unlikely
Trapdoor Spider (<i>Idiosoma arenaceum</i>)			P3	Sundown	Geraldton Sandplains	11 km (south)	Potential/Unlikely
Northern Shield-backed Trapdoor Spider (<i>Idiosoma clypeatum</i>)			P3	Wurarga	Shrubland, hills	26 km (south)	Likely Resident

¹ EN – Endangered; VU – Vulnerable; CR – Critically Endangered; P2 to P4 – Priority fauna species listed by DBCA.

² The conservation significant species likely to be resident in the development envelope are shaded.



4.4.4 Potential Impacts

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

- Direct loss of fauna habitat; and
- 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; and
- Accidental bushfires.

4.4.5 Assessment of Impacts

4.4.5.1 Direct Loss of Fauna Habitat

Vertebrate Fauna

The Proposal will result in the clearing of approximately 1,934 ha (18%) of native vegetation within the development envelope. Approximately 353 ha (15%) of the indicative disturbance footprint is represented by cleared vegetation or isolated trees and/or shrubs in pasture.

The extent of clearing within each fauna habitat type is shown in **Table 4-17**. The dominant fauna habitats within the indicative disturbance footprint are Mulga shrublands (plains) (approximately 1,058 ha), open mixed shrublands (plains) (approximately 267 ha) and mixed Acacia shrublands (approximately 193 ha), which collectively account for approximately 66% of the proposed clearing area. None of these fauna habitats are considered locally significant. All fauna habitats are represented outside the indicative disturbance footprint within the development envelope. Therefore, at a local scale, clearing will not result in the loss of any fauna habitats in the area.

As part of the iterative route selection process, the pipeline alignment has been refined to avoid disturbance of fauna habitats that support (or have the potential to support) conservation significant fauna, specifically granite outcrops, breakaways and banded ironstone ridges. As such, these habitat types represent a small portion (0.1%) of the indicative disturbance envelope.

The Proposal is not expected to significantly impact fauna or fauna habitats at a local or regional scale.



Table 4-17: Impacts to Fauna Habitat from the Proposal

Fauna Habitat	Habitat Description	Extent within the Development Envelope (ha)	Extent within the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
Banksia Woodland	Sandplain with <i>Banksia sceptrum</i> and <i>Callitris arenaria</i> Low Open Woodland.	0.7	< 0.1	0.2	0.5 (71.4%)
Callitris Woodland	Sandplain and rises supporting mixed <i>Acacia shrublands</i> and <i>Callitris columellaris</i> Woodland.	104.8	0.8	15.8	89.0 (84.9%)
Eucalyptus Woodland (Plains)	Plains supporting Eucalypt woodlands (<i>Eucalyptus kochii</i> and <i>Eucalyptus horistes</i>) with mixed <i>Acacia</i> shrubs.	31.2	0.3	0.7	30.5 (97.8%)
Eucalyptus Woodland (Drainages)	Major drainage lines supporting fringing Eucalypts (<i>Eucalyptus camaldulensis</i>).	5.2	< 0.1	1.0	4.2 (80.8%)
Breakaways	Lateritic duricrust (breakaways) supporting <i>Acacia</i> shrublands or sparse chenopods.	1.5	< 0.1	0.2	1.3 (86.7%)
Granite Outcrops	Granite outcrops and adjacent plains supporting <i>Acacia</i> shrublands and chenopod shrublands.	15.8	0.1	2.9	12.9 (81.6%)
Acacia Sandplains	Undulating sandplains supporting mixed <i>Acacia</i> (<i>Acacia mulganeura</i> , <i>A. caesaneura</i> and <i>A. ramulosa</i>) shrublands with scattered Mallee (<i>Eucalyptus kingsmillii</i>).	132.1	1.1	10.9	121.2 (91.7%)



Fauna Habitat	Habitat Description	Extent within the Development Envelope (ha)	Extent within the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
Acacia/Melaleuca shrublands (Plains)	Undulating plains supporting mixed Acacia and Melaleuca shrublands (including <i>Acacia caesaneura</i> , <i>A. acuminata</i> and <i>Melaleuca leiocarpa</i>) with scattered Mallee (<i>Eucalyptus</i> species).	201.2	1.6	31.7	169.5 (84.2%)
Acacia/Melaleuca shrublands (drainages)	Drainage tracts supporting dense Melaleuca and Acacia shrublands (dominated by <i>Melaleuca atroviridis</i> , <i>M. acutifolia</i> , <i>M. eleuterostachya</i> , <i>Acacia latior</i> , <i>A. acuminata</i>).	285.3	2.3	125.6	159.7 (56.0%)
Mulga Shrublands (Plains)	Plains supporting Mulga (Acacia species) shrublands, including <i>Acacia caesaneura</i> , <i>A. incurvaneura</i> and <i>Eremophila forrestii</i> , <i>E. latrobei</i> , <i>E. clarkeii</i> and <i>Aluta aspera</i> over tussock grasses.	5,322.7	42.9	1,057.5	4,265.2 (80.1%)
Mixed Acacia Shrublands (Plains)	Plains supporting mixed shrublands dominated by Acacia (<i>A. caesaneura</i> , <i>A. tetragonophylla</i> and <i>A. aptaneura</i>) with <i>Senna artemisioides</i> , <i>Aluta aspera</i> and <i>Eremophila fraseri</i> .	1,232.1	9.9	193.4	1,038.7 (84.3%)
Mulga/Spinifex	Sandplains supporting Mallee (<i>Eucalyptus kingsmillii</i>), Mulga (<i>Acacia</i> spp.) and Spinifex (<i>Triodia basedowii</i>).	195.1	1.6	43.6	151.5 (77.7%)



Fauna Habitat	Habitat Description	Extent within the Development Envelope (ha)	Extent within the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
Acacia/Eremophila shrublands	Sandplains supporting mixed shrublands dominated by Acacia (particularly <i>Acacia ramulosa</i>) with <i>Eremophila latrobei</i> and mixed shrubs.	85.1	0.7	14.3	70.8 (83.2%)
Open Mixed Shrublands (Plains)	Open plains and drainage tracts supporting open shrublands with Acacia (including <i>A. caesaneura</i> , <i>A. incurvaneura</i> , <i>A. tetragonophylla</i> , <i>A. victoriae</i> , <i>A. burkittii</i>), and Eremophila (species) and/or halophytic low shrubs.	1,895.2	15.3	267.0	1,628.2 (85.9%)
Open Acacia Shrublands (Plains)	Plains supporting mixed Acacia shrublands including <i>A. tysonii</i> , <i>A. ligulata</i> and <i>A. aulacophylla</i> .	674.4	5.4	106.3	568.1 (84.2%)
Chenopod Shrublands	Low lying plains supporting Chenopod (Samphire, Saltbush, Bluebush) shrublands.	538.0	4.3	34.7	503.3 (93.6%)
Wheatbelt: Eucalypt	Remnant vegetation within the Wheatbelt: Eucalypt Woodland.	6.8	0.1	0.7	6.1 (89.7%)
Wheatbelt: Shrublands	Remnant vegetation within the Wheatbelt: Mixed Shrubland.	21.1	0.2	3.6	17.5 (82.9%)
Wheatbelt: Chenopods	Remnant vegetation within the Wheatbelt: Chenopod Shrubland.	58.3	0.5	5.2	53.1 (91.1%)
Disturbed	Cleared vegetation or isolated trees or shrubs in pasture.	1,546.6	12.4	352.9	1,193.7 (77.2%)



Fauna Habitat	Habitat Description	Extent within the Development Envelope (ha)	Extent within the Development Envelope (%)	Extent within the Indicative Disturbance Footprint (ha)	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
Not mapped*		50.4	0.4	18.2	32.2 (63.9%)
Total		12,403.6	100	2,286.4	10,117.2 (18.6%)

* Refer to **Section 4.3.3.1** for further detail.



SRE Fauna

Eight SRE taxa have previously been recorded within the surrounds of the development envelope. A number of these records are associated with habitats known to promote short-range endemism, such as isolated hills or rocky outcrops (Kingfisher, 2020). These habitats are avoided by the proposed pipeline route.

Overall, the distinctive and isolated geological features known to promote short-range endemism in invertebrates, such as isolated rocky ridges, deep caves, salt lakes, relictual habitats, are either absent or very limited in their intersection with the development envelope. The development envelope is predominantly characterised by widespread and extensive vegetation and soil types. Although some restricted habitats are present and have potential to support SRE fauna, such as small, scattered granite outcrops and breakaways and minor drainage lines, they comprise a small portion of the overall development envelope (Kingfisher, 2020). Granite outcrops and breakaways intersect approximately 0.1% (approximately 3 ha) of the indicative disturbance footprint with fauna habitat associated with drainage lines accounting for approximately 6% (approximately 127 ha).

The NGI pipeline will be buried and the majority of the remnant native vegetation cleared rehabilitated (approximately 89%). Consequently, long term impacts to any SREs present are considered to be limited (Kingfisher, 2020). Significant impacts to SREs are also unlikely considering the linear nature of the NGI pipeline, which means disturbance in any given habitat type is restricted.

Impacts to Conservation Significant Fauna

None of fauna habitat types present within the development envelope will be substantially cleared (**Table 4-17**). Therefore, direct and indirect impacts to terrestrial fauna on a local and regional scale are not considered significant.

Table 4-18 presents the fauna habitat that may be utilised by conservation significant fauna recorded within the development envelope and the extent that will be cleared as a result of the Proposal. The assessment of the potential impacts takes into consideration both vegetation and land system mapping, and the species' range, as these factors influence the availability of suitable habitat in the development envelope.

The Malleefowl and Brush-tailed Mulgara are likely to have a limited occurrence within the development envelope, as suitable breeding habitat (dense Acacia shrublands or spinifex dominated sandplains) represents a small proportion of the vegetation present (< 3%) (Kingfisher, 2020). Such habitat also occurs widely throughout the region. The indicative disturbance footprint has also been refined to avoid disturbance to conservation significant fauna, particularly inactive Malleefowl mounds and Brush-tailed Mulgara burrows

While habitats known to support the Gilled Slender Blue-tongue Lizard and Northern Shield-backed Trapdoor Spider occur within the development envelope, these species also have a widespread occurrence throughout the region (Kingfisher, 2020). Therefore, conservation significant fauna that occur within the development envelope are expected to be widespread, as the fauna habitats present are dominated by those with extensive representation across the region (Kingfisher, 2020). Consequently, the implementation of the Proposal is not expected to result in any significant impacts to conservation significant fauna.



Table 4-18: Conservation Significant Fauna Habitat Loss

Taxa	Fauna Habitat with the Development Envelope (Kingfisher, 2020)	Habitat Occurrence based on Land Systems and Species Range (Kingfisher, 2020)	Extent of Suitable Habitat within the Development Envelop (ha) ^	Extent within the Indicative Disturbance Footprint (ha) ^	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
Malleefowl (Vulnerable, EPBC Act and BC Act)	Callitris Woodland, Acacia/Melaleuca Shrubland (Plains), Mixed Acacia Shrubland (Plains), Mulga Shrublands (Plains)	Foraging – woodland and shrublands Breeding – from Pindar to Wurarga within the Joseph land system (398 ha)	6,861 ha (of which 398 ha is suitable breeding habitat)	1,298 ha (of which 69 ha is suitable breeding habitat)	Foraging – 5,562.4 (81.1%) Breeding – 329 (82.6%)
Western Spiny-tailed Skink (Endangered, EPBC Act; Vulnerable, BC Act)	Rocky Outcrop (northern form), Wheatbelt: Eucalypt Woodland (southern form)	Wheatbelt: Eucalypt Woodland within the Yalgoo and Mullewa area	7.0	0.7	6.3 (90.0%)
Brush-tailed Mulgara (Priority 4)	Mulga/Spinifex	Limited to approximately 10 km of sandplain (corresponding to vegetation type EKTbHG)	195.1	43.6	151.5 (77.7%)
Long-tailed Dunnart (Priority 4)	Rocky Outcrop	Minimal – Brooking Land System north of Lake Noondie (approximately 4 ha)	4.0	0.6	3.4 (85.0%)
Peregrine Falcon (Other Specially Protected, BC Act)	All	All	10,857.0	1,933.5	8,923.5 (82.1%)

NGI PIPELINE – EPA ENVIRONMENTAL REFERRAL
SUPPORTING DOCUMENT



Taxa	Fauna Habitat with the Development Envelope (Kingfisher, 2020)	Habitat Occurrence based on Land Systems and Species Range (Kingfisher, 2020)	Extent of Suitable Habitat within the Development Envelop (ha)^	Extent within the Indicative Disturbance Footprint (ha) ^	Extent Remaining within the Development Envelope after Proposal Clearing (ha) (%)
Gilled Slender Blue-tongue (Vulnerable, BC Act)	Acacia Shrublands	Gabanintha and Tindalarra land systems	1,302.8	183.0	1,119.8 (86.0%)
Northern Shield-Trapdoor Spider (<i>Idiosoma clypeatum</i>) (Priority 3)	Acacia Shrublands	Challenge and Kalli land systems	631.8	102.5	529.3 (83.8%)

^ The extent of suitable fauna habitat has been derived from considering the fauna habitat and land system mapping, and the species known ranges.



4.4.5.2 Injury, Mortality or Displacement of Conservation Significant Fauna

Fauna may be at risk of injury, mortality or displacement due the movement of vehicles and machinery/equipment or entrapment in the pipeline trench during construction. The results of the baseline fauna survey have been considered and the indicative disturbance footprint refined to avoid disturbance to conservation significant fauna, particularly inactive Malleefowl mounds and Brush-tailed Mulgara burrows.

Construction activities will be undertaken in accordance with measures identified in the CEP, which will include the establishment of site speed limits, restriction of access for vehicles and equipment to designated roads/tracks and cleared areas. Targeted pre-clearance surveys for Malleefowl mounds and Brush-tailed Mulgara burrows will also be undertaken prior to clearing to validate the active use of the areas in which these species were recorded. A suite of management measures will also be implemented to manage potential entrapment of fauna in the pipeline trench, including daily trench inspections and gaps retained in the pipeline trench with ramps to allow fauna egress points.

The risks to fauna are significantly reduced during operations, given the nature of the Proposal and remote operations. The operation of the NGI pipeline will be through APA's Integrated Operations Centre remotely as the normal operating control mode. Vehicle movements within the Proposal area after construction will be limited to maintenance requirements.

Any isolated individual fauna mortalities are unlikely to affect the conservation status and distribution of any fauna species. Therefore, implementation of the Proposal will not adversely impact conservation significant fauna species.

4.4.5.2 Fragmentation of Fauna Habitat

Clearing of vegetation due to the implementation of the Proposal may lead to localised fragmentation of fauna habitat and increased resource competition. Clearing of up to approximately 1,934 ha of vegetation will reduce the extent of available habitat for fauna known or considered likely to occur within the development envelope (**Figure 4-5**). This may include habitat suitable for breeding, denning, foraging and dispersal, including that for conservation significant species.

Fragmentation due to habitat loss reduces the ability of fauna to move freely between habitat areas or to access dispersed or temporary resources. Habitat fragmentation may also exacerbate other threats, such as predation by feral species, by providing access into habitats that were previously dense and difficult to traverse. However, the resulting effects of fragmentation reflect the degree of isolation, reduced habitat area, changes in fragment composition and structure, and the species individual habitat requirements and dispersal ability. The resilience of the vegetation fragments is integrally linked to the size of the fragments and their proximity to each other. The smaller and more isolated the remnants, the less viable they become as they are exposed to more external pressures (edge effects) and disturbances.

The western portion of the Proposal is situated in an already highly disturbed and fragmented landscape, which is the result of large-scale clearing for agricultural activities. While the Proposal will increase the degree of fragmentation in this area, the linear nature of the Proposal, with a limited permanent disturbance footprint, is unlikely to result in significant fragmentation of fauna habitat. Following construction the pipeline route will



be rehabilitated such that only an approximately 4 m wide track remains for access during operations. Clearing has also been avoided and minimised around the Eucalypt Woodlands TEC/PEC, which is likely to support several woodland species near the northern extent of their ranges, such as the locally significant fauna of the Western Yellow Robin and Carpet Python and the Threatened Western Spiny-tailed Skink (southern form).

4.4.5.3 Disturbance to Native Fauna from Dust, Light Overspill and Noise

Implementation of the Proposal will introduce localised disturbances to fauna species due to dust, light and noise from vehicles, heavy machinery (e.g. trenching) and the presence of personnel. These disturbances may temporarily alter fauna behaviour and use of habitat within the development envelope. Individual fauna are likely to avoid the area during construction. However, due to the localised and short-term nature of the construction activities, significant impacts are not anticipated and impacts are not expected to affect the viability of species populations. Furthermore, the fauna habitats within the development envelope are widely represented in the surrounding area and broader region.

4.4.5.4 Increased Competition or Predation by Introduced Species

Feral fauna, particularly predators such as foxes, cats and wild dogs, have the potential to negatively impact native fauna, particularly ground-dwelling species. Predation by feral cats and foxes and also recognised as key threatening processes.

The construction of the Proposal is unlikely to result in the introduction of new feral animal species to the area or cause an increase in abundance of feral animals. The controls proposed to be implemented are considered to be appropriate to prevent an increase in the abundance of feral animals within the development envelope (**Table 4-19**).

4.4.5.5 Accidental Bushfires

Increased human activity is correlated with increased fire risk and/or altered fire regimes. The potential for altered fire regime is discussed in **Section 4.3**. Fire can lead to temporary destruction of fauna habitat or more lasting degradation due to increased intensity and/or frequency, reduced food sources and increase in predation. A suite of mitigation measures will be implemented to manage key activities that could lead to a bushfire (**Table 4-19**).

4.4.6 Mitigation

Mitigation and management measures that will be implemented to minimise potential impacts to terrestrial fauna are summarised in **Table 4-19**.



Table 4-19: Proposed Management Measures for Terrestrial Fauna

Potential Impact	Management Measures
Direct loss of fauna habitat	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Baseline fauna survey completed in the early design phase of the Proposal to characterise the receiving environment values and inform route selection. ▪ Avoid removal of large, mature canopy trees as far as practical. ▪ The indicative disturbance footprint has been refined to avoid disturbance to conservation significant fauna, particularly inactive Malleefowl mounds and Brush-tailed Mulgara burrows. ▪ The refinement of the pipeline alignment has avoided fauna habitats that support (or have the potential to support) conservation significant fauna, specifically granite outcrops, breakaways and banded ironstone ridges. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Clearing of vegetation (which represents fauna habitat) will be minimised. ▪ Pipeline laydown areas and construction facilities (e.g. construction camps, mobile offices and ablutions, equipment laydown areas, and turkey nests) will be co-located and preferentially located in areas with limited vegetation or pre-existing disturbed areas. ▪ The construction boundary will be clearly delineated to prevent encroachment of construction. ▪ Access points to the CROW constructed along existing roads and tracks where possible. <p>Rehabilitate</p> <ul style="list-style-type: none"> ▪ A Rehabilitation Plan will be developed and implemented to guide the reinstatement and regeneration of temporary construction areas. At a minimum, the Rehabilitation Plan will include: <ul style="list-style-type: none"> ○ Upon completion of works in discrete sections, the disturbance area will be scarified, stockpiled topsoil re-spread evenly to a maximum depth of approximately 10 cm (or reflective of that which was stripped) and stockpiled vegetative material spread over topsoil to encourage vegetation re-establishment; and ○ Rehabilitation of temporary cleared areas will be undertaken progressively and as soon as practicable following pipeline installation.



Potential Impact	Management Measures
<p>Injury, mortality or displacement of conservation significant fauna</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ The indicative disturbance footprint has been refined to avoid disturbance to conservation significant fauna, particularly inactive Malleefowl mounds and Brush-tailed Mulgara burrows. ▪ Vehicle speed limits will be established, signed and enforced along the CROW. ▪ Access for vehicles and equipment will be restricted to designated roads/tracks and cleared areas. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Targeted pre-clearance surveys for Malleefowl mounds and Brush-tailed Mulgara burrows will be undertaken prior to clearing to validate the active use of the areas in which these species were recorded. ▪ Prior to conducting clearing, known locations of Malleefowl mounds and Brush-tailed Mulgara burrow outside the indicative disturbance footprint but within the development envelope will be fenced or flagged to prevent disturbance to these features. ▪ A Traffic Management Plan will be implemented to control vehicle movements, which will reduce the likelihood/severity of injury/disturbance to fauna. ▪ Gaps will be left in the pipeline trench every 1 km or less with ramps at approximately 45 degrees providing fauna egress points, to allow fauna to escape. ▪ Fauna shelters (e.g. hessian bags) placed a minimum of approximately every 50 m in open trench. ▪ Trench inspections completely daily (morning and evening), and fauna retrieval and release, by licensed handlers meeting training requirements of DBCA. ▪ Trench backfilled (to at least cover pipe) as soon as practicable after pipe laying to reduce the time the pipeline trench remains open. ▪ HDD entry and exit pits will be ramped and fenced, and inspected daily.



Potential Impact	Management Measures
<p>Fragmentation of fauna habitat</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ The indicative disturbance footprint has been refined to avoid disturbance to conservation significant fauna, particularly inactive Malleefowl mounds and Brush-tailed Mulgara burrows. ▪ The location of the camps and permanent aboveground infrastructure locations chosen to avoid restricted conservation significant fauna habitat. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Clearing of vegetation (which represents fauna habitat) will be minimised. ▪ Access points to the CROW constructed along existing roads and tracks where possible. <p>Rehabilitate</p> <ul style="list-style-type: none"> ▪ A Rehabilitation Plan will be developed and implemented to guide the reinstatement and regeneration of temporary construction areas. At a minimum, the Rehabilitation Plan will include: <ul style="list-style-type: none"> ○ Upon completion of works in discrete sections, the disturbance area will be scarified, stockpiled topsoil re-spread evenly to a maximum depth of approximately 10 cm (or reflective of that which was stripped) and stockpiled vegetative material spread over topsoil to encourage vegetation re-establishment; and ○ Rehabilitation of temporary cleared areas will be undertaken progressively and as soon as practicable following pipeline installation.



Potential Impact	Management Measures
<p>Disturbance to native fauna from dust, light overspill and noise</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Construction will be predominately undertaken during daylight hours only. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Lighting to be minimal for safety purposes, if night time works are required. ▪ Lighting towers directed downward to minimise light spread to the surrounding area. ▪ All vehicles and fixed and mobile plant will be maintained according to manufacturer specifications ▪ Extent and size of blasts limited to the minimum practicable for pipeline corridor excavations. ▪ All blasting carried out by licensed and experienced specialist contractor. ▪ Dust suppression will be utilised along the CROW as required.
<p>Increased competition or predation by introduced species</p>	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Pets will not be brought to site. ▪ No feeding of native or feral animals. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Introduced fauna will be controlled around camps and other work areas. ▪ Project induction to communicate that native or introduced fauna are not to be fed by site personnel. ▪ Food wastes will be stored in bins with lids closed and disposed of at a licenced waste facility/landfill.



Potential Impact	Management Measures
Accidental bushfires	<p>Avoid</p> <ul style="list-style-type: none"> ▪ Access for vehicles and equipment will be restricted to designated roads/tracks and cleared areas. ▪ Inductions and training will address bushfire management, fire response and use of fire response equipment. ▪ Department of Fire and Emergency Service (DFES) alerts regarding fire ban days will be monitored during high risk activities. <p>Minimise and Mitigate</p> <ul style="list-style-type: none"> ▪ Water truck(s) will be on site during construction. ▪ All machinery and vehicles undertaking clearing activities have fire extinguishers. ▪ A Hot Work Permit system will be implemented by APA for live welding works. ▪ The project will be undertaken in accordance with the requirements of the total fire ban exceptions, under the Bush Fires Regulations 1954, for off-road activities (as defined as the use or operation of any engine, vehicle, plant, equipment or machinery on land on which there is bush, crop, pasture, stubble or grassland). Welding to be undertaken post-clearing, therefore the risk of vegetation catching fire is low. ▪ Welding crew will have a dedicated fire water trailer. ▪ Maintenance of fire response equipment on site, which will include fire water trailers located along the CROW. ▪ Permit system to be used for commissioning works. ▪ Fire awareness to be reinforced at toolbox meetings.

4.4.7 Predicted Outcome

The predicted impacts to terrestrial fauna from the Proposal after applying mitigation (Table 4-19):

- Clearing of approximately 1,934 ha of fauna habitat within an approximately 12,404 ha development envelope;
- Potential clearing of up to approximately 69 ha (17%) of breeding habitat for Malleefowl within the development envelope;
- Potential clearing of up to approximately 44 ha (22%) of denning habitat for Brush-tailed Mulgara within the development envelope;
- No clearing of identified Brush-tailed Mulgara burrows; and
- Clearing of a single inactive Malleefowl mound.

APA considers that impacts after the application of the mitigation hierarchy from the Proposal can be effectively managed and meet the EPA’s objective for terrestrial fauna.

4.5 Key Environmental Factor – Social Surroundings

4.5.1 EPA Objective

The EPA's objective for social surroundings is *'To protect social surroundings from significant harm'* (EPA, 2016e).

For the purposes of EIA, the EPA defines social surroundings as aesthetic, cultural, economic and social surroundings to the extent that those surroundings directly affect or are affected by physical or biological surroundings (EPA, 2016e).

4.5.2 Policy and Guidance

Legislation, policies and guidance applicable to the assessment of social surroundings include:

- Environmental Factor Guideline: Social Surroundings (EPA, 2016e);
- *Aboriginal Heritage Act 1972* (AHA) (WA; currently under revision);
- *Heritage Act 2018* (WA);
- *Native Title Act 1993* (Cth);
- *Aboriginal Heritage – Due Diligence Guidelines (Version 3.0)* (DPLH and Department of the Premier and Cabinet, 2013); and
- *Environmental Protection (Noise) Regulations 1997*.

The Proponent acknowledges that the AHA is undergoing reform, through a phased review and consultation process. New legislation, the *Aboriginal Cultural Heritage Bill 2020*, will replace the outdated AHA. The draft Bill is proposed to be introduced into State Parliament in 2021. The draft Bill includes transitional provisions that allow the current AHA to continue to operate for at least one year after the Bill is enacted.

4.5.3 Receiving Environment

4.5.3.1 Historic Heritage

A desktop review was undertaken to identify recorded locations of historic heritage that may be affected by the implementation of the Proposal.

The review identified two historic heritage places (locally listed sites) as intersecting the development envelope:

- *Rabbit Proof Fence No 2 and No 3* (Emu Barrier Fence) (Place No. 5022), at approximately 7 km west-south-west of Yalgoo (approximately KP154) (**Figure 4-6**); and
- *Old Geraldton Road* (Place No. 6170), near the western end of the alignment (approximately KP14.6) (**Figure 4-6**). While this heritage site intersects the development envelope, it does not overlap the indicative disturbance footprint.

There are no Commonwealth or State listed historic heritage sites identified within the development envelope (Heritage Council, 2020).

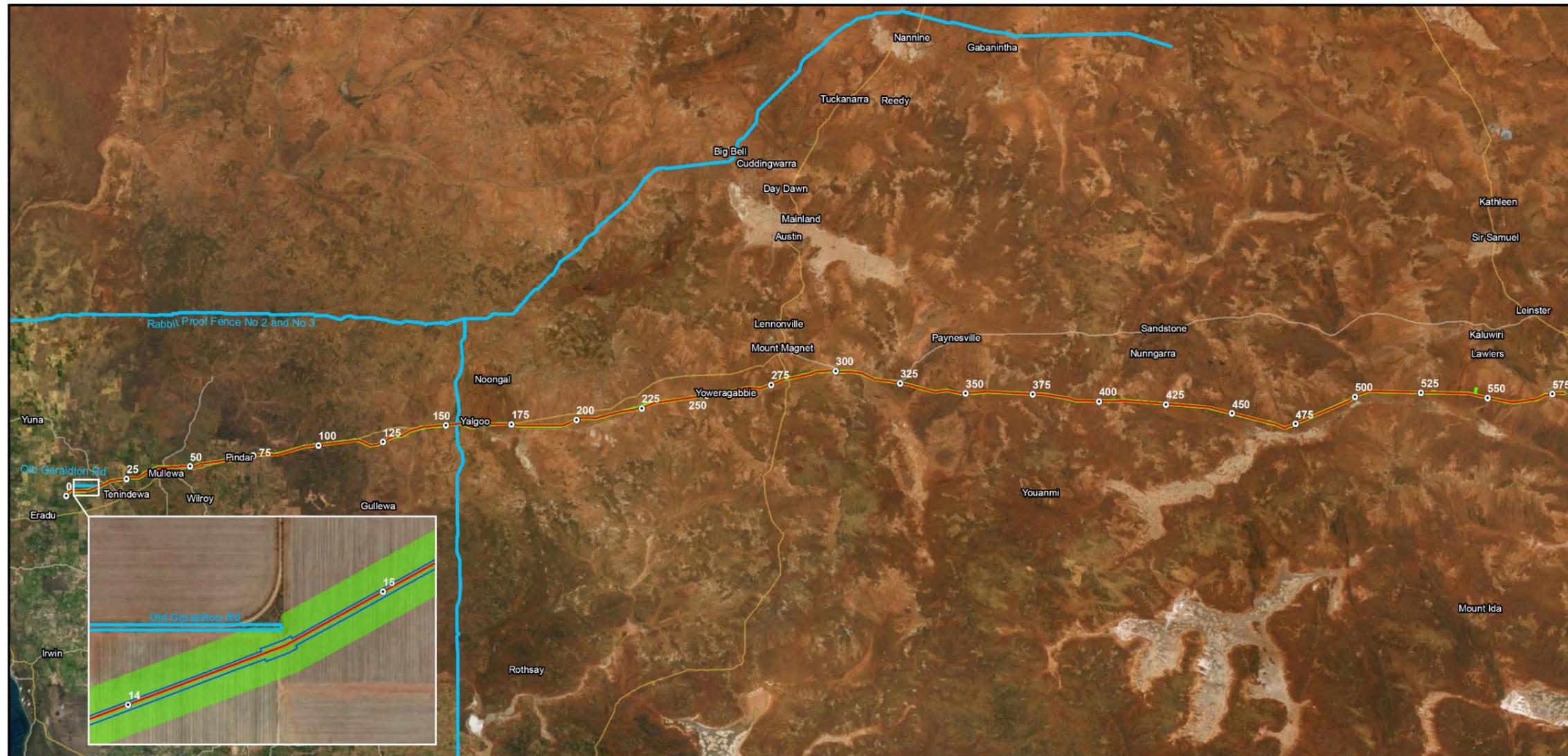


Figure 4-6: Historic Heritage Sites within the Development Envelope and Surrounds