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Anketell Road Upgrade (Leath Road to Kwinana Freeway)

EPBC 2024/09841 Preliminary Documentation

D25#920873
November 2025

EXECUTIVE SUMMARY

Main Roads Western Australia (Main Roads) is proposing to upgrade Anketell Road between Leath Road, within the Kwinana Industrial Area (KIA), and Kwinana Freeway (the Proposed Action). The Proposed Action also includes the upgrade of a short section of Anketell Road east of the Kwinana Freeway (to Treeby Road) to connect the Proposed Action to the existing Anketell Road. The Proposed Action is located approximately 29 km south of the Perth Central Business District in the City of Kwinana.

The Proposed Action aims to upgrade the existing Anketell Road to better connect Kwinana Freeway with the growing strategic KIA and future Westport terminal. The Proposed Action forms a major component of the planned regional road network for the Perth South West corridor and will improve efficiencies and amenity and provide beneficial road safety outcomes.

The Proposed Action was formally referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW)) in March 2024 (EPBC 2024/09841) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to potential impacts on Matters of National Environmental Significance (MNES). DCCEEW advised in August 2024 that the Proposed Action was a Controlled Action that would be assessed by Preliminary Documentation. The relevant MNES were listed as threatened species and communities (sections 18 and 18A).

The MNES with potential to be impacted by the Proposed Action include:

- Loss of up to 40.99 ha of Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (Tuart TEC)
- Loss of up to 14.56 ha Banksia Woodlands of the Swan Coastal Plain (Banksia TEC)
- Loss of up to 1.94 ha Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle TEC)
- Loss of up to 56.98 ha of Carnaby's Black Cockatoo (CBC) (*Zanda latirostris*) foraging habitat
- Loss of up to 38.34 ha of Forest Red-tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksii naso*) foraging habitat
- Loss of up to 592 suitable diameter at breast height (DBH) trees, including eight trees with eight hollows suitable for black cockatoo breeding
- Loss of up to 14.93 ha of potential habitat for Grand Spider Orchid (*Caladenia huegelii*), Dwarf Bee Orchid (*Diuris micrantha*), Purdie's Donkey Orchid (*Diuris purdiei*) and Glossy Leaved Hammer Orchid (*Drakaea elastica*).

The final clearing footprint is expected to be less and during the detailed design phase opportunities will be investigated to further refine the design to minimise disturbance to MNES.

Main Roads has a strong track record of both developing and implementing best practice in environmental management and implementation of management measures. The measures proposed have been successfully implemented on past projects subject to EPBC conditions and management measures.

Main Roads intends to counterbalance the significant residual impacts to Tuart TEC, Banksia TEC, Honeymyrtle TEC, CBC foraging habitat and FRTBC foraging habitat from the Proposed Action through implementation of an Environmental Offset Strategy.

Contents

Document Records

Revision	Date	Author	Reviewer
0	November 2025	GHD and Main Roads	Main Roads

1 INTRODUCTION

1.1 Overview of the Proposed Action

Main Roads Western Australia (Main Roads) is proposing to upgrade Anketell Road to an Expressway Standard between Leath Road, within the Kwinana Industrial Area (KIA), and Kwinana Freeway (Proposed Action). The Proposed Action also includes the upgrade of a short section of Anketell Road east of the Kwinana Freeway (to Treeby Road) to connect the Proposal to the existing Anketell Road. The Proposal links the Western Trade Coast (WTC), including the Kwinana Industrial Area, Rockingham Industry Zone, Australian Marine Complex and Latitude 32 and a proposed future port (Westport), to existing and future Industrial Areas via the upgraded section of Anketell Road and the existing Kwinana Freeway and Roe Highway.

The Proposed Action Area (PAA) and locality is shown in Appendix 1, Figure 1.

1.2 Purpose and Scope of this Documentation

In March 2024, Main Roads referred the Anketell Road Upgrade (Leath Road to Kwinana Freeway) (Proposed Action) to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) (EPBC 2024/09841) for assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 22 August 2024, a delegate of the Federal Minister for the Environment determined the Proposed Action was a controlled action, to be assessed by Preliminary Documentation (PD). The relevant Matters of National Environmental Significance (MNES) were listed as threatened species and communities (sections 18 and 18A). On 22 September 2024, DCCEEW requested additional information (RFI) to support the PD. This report addresses the RFI and PD requirements, with attachments as required, which includes RFI items from:

- Table A – information received in response to requests for additional information under Section 95A(2)
- Table B – specified information included in the original referral application
- Table C – DCCEEW's content, style and formatting requirements.

Details of the RFI items and specific sections of this report they are addressed within is provided in Appendix B.

1.3 Variations to the Proposed Action

Subsequent to the controlled action decision, Main Roads requested an amendment to the PAA in May 2025. This amendment was required to allow for:

- Improved integration with adjacent existing and proposed infrastructure
- Incorporation of additional design elements
- Stakeholder engagement outcomes to be achieved
- A reduced overall environmental impact
- Appropriate management measures to be applied associated with Alcoa tailings dams risks.

The variation was approved by DCCEEW on 27 June 2025.

1.4 Proponent

The proponent for the Proposed Action is the Commissioner of Main Roads and formal contact details are listed in Table 1.1.

Table 1.1: Proponent and Proposed Action Key Contact

Proponent / Contact	Contact Details
Proponent	Commissioner of Main Roads Main Roads Western Australia PO Box 6202, East Perth WA 6002 ABN/ACN 50 860 676 021
Proposed Action Key Contact	Martine Scheltema Director Environment and Heritage Planning and Technical Services Directorate PO Box 6202, East Perth WA 6002

2 PRELIMINARY DOCUMENTATION

2.1 Overview

Table 2.1 presents an overview of the key RFI items and responses. A detailed list of required information and responses is provided in Appendix 2.

Table 2.1: Request for Further Information

Content to be included	DCCEW (2024) RFI	Additional information attached	PD section number
Description of the action	Table B. 1		Section 3
Description of the environment	Table B. 2		Section 4
Relevant Matters of National Environmental Significance	Table B. 3	Biota (2025a) – Attachment 1 Biota (2024b) – Attachment 7 Biota (2025b) – Attachment 8	Section 5.2
Baseline information	Table A. 1 Table B. 4	Biota (2025a) – Attachment 1 Umwelt (2025) – Attachment 2 Biota (2024a) – Attachment 3 GHD (2025) – Attachment 5 Australian Black Cockatoo Specialists (2024) – Attachment 6 Biota (2024b) – Attachment 7 Biota (2025b) – Attachment 8 Glevan (2025) – Attachment 9	Section 5.1, 5.3 to 5.5
Likely impacts	Table A. 2 Table B. 5	Stream (2025a) – Attachment 4 GHD (2025) – Attachment 5	Section 6, Section 7, Appendix 5
Proposed avoidance and mitigation measures	Table A. 3		Section 8
Residual impacts and offsets	Table A. 4		Section 9
Ecologically Sustainable Development	Table C. 1		Section 10
Economic and social matters	Table C. 2		Section 11
Environmental record of the person proposing the action	Table C. 3		Section 12
International obligations	Table C. 4		Section 13
Other approvals and conditions	Table C. 5		Section 14

2.2 Key definitions

Proposed Action area (PAA): The PAA comprises an area of 224.83 hectares (ha) and represents the boundary surrounding the Proposed Action within which all development will be contained. The PAA also represents the disturbance footprint for the Proposed Action. The PAA varies in width to accommodate intersection upgrades, drainage and vertical profile requirements and encompasses portions of the existing Anketell Road alignment. Biological surveys have been completed across the entirety of the PAA. The PAA is shown on Appendix 1, Figure 1.

Contextual area: The Contextual area includes a 500 m buffer around the PAA which comprises an area of 1,357.09 ha. Extrapolated vegetation, vegetation condition, Threatened and Priority Ecological Communities and fauna habitat mapping cover 98.43% of the Contextual area. The remaining 1.57% is unmapped and is located at the western end of the Contextual area. A review of aerial imagery for this unmapped area shows that it contains ocean, cleared areas with built infrastructure and previously modified vegetated areas. The Contextual area is shown on Appendix 1, Figure 1.

3 DESCRIPTION OF THE ACTION

3.1 Components and Phases

The Proposed Action is the upgrade of the existing Anketell Road between Leath Road within the KIA and the Kwinana Freeway. The Proposed Action also includes the upgrade of a short section of Anketell Road east of the Kwinana Freeway (to Treeby Road) to connect the Proposed Action to the existing Anketell Road.

The Proposed Action includes the following physical elements:

- Approximately 7.5 km of new multi-lane expressway standard, dual carriageway
- Grade separated interchanges at various locations including Treeby Road, Kwinana Freeway, Mandogalup Road, Abercrombie Road, Armstrong Road and Rockingham Road
- Grade separations of Rockingham Road and Anketell Road over rail
- New local roads and existing road modifications, including upgrades at Rockingham Road
- Shared Path along the length of the Proposed Action
- Other road infrastructure and furniture, including but not limited to drainage basins, drains, culverts, lighting, fencing, landscaping, road safety barriers and signs
- Utility relocations and works to maintain access to properties.

The Proposed Action includes activities associated with pre-construction, construction, and operational phases. Decommissioning is not considered part of the Proposed Action.

The ongoing maintenance of the existing Anketell Road is not considered part of the Proposed Act.

3.2 Phase Activities

3.2.1 Pre-construction

On-ground pre-construction activities will include investigations to inform the design of this Proposed Action. Investigations are likely to include survey pick up and geotechnical investigations that do not impact on native vegetation or MNES.

There are numerous utilities and associated corridors that intersect the PAA, that may require realignment or improvements to facilitate the Proposed Action. These include both state owned and private infrastructure (e.g. high and low voltage powerlines, gas pipelines, treated wastewater pipeline, chemical pipelines and digital communication cables). Asset owners will be engaged where impacted to identify appropriate resolution of these conflicts.

The design of the Proposed Action will continue to be refined during the pre-construction phase in order to reduce the environmental impacts and improve safety and usability.

3.2.2 Construction

Construction will be undertaken using traditional earth-moving equipment and construction techniques. Construction activities required for the Proposed Action include:

- Earthworks and site preparation, including laydown
- Piling
- Excavation
- Dewatering
- Drainage improvements, and
- Landscaping.

Construction of the Proposed Action is likely to adopt a mix of earthwork batters (fill and cut) with landscaping and retaining walls. The Proposal will relocate existing utility infrastructure where required from pre-construction works. Lay down areas for construction materials will be established by the contractor in consultation with Main Roads and Local Government Authorities and will, where practicable, be located such that temporary clearing of MNES values does not occur.

Construction water will be sourced from groundwater abstraction bores within the PAA and from alternate sources outside the PAA.

3.2.3 Operation

The Proposed Action will operate as a multi-lane dual carriageway between Kwinana Freeway and Leath Road in Kwinana. The Proposed Action will be subject to normal routine, recurrent and periodic maintenance during the Road's operating lifetime. Maintenance activities will be confined to the road corridor and the road itself, typically including maintenance of vegetation, drainage, lighting, road markings, signs and the road pavement.

All MNES related impacts are associated with the clearing of MNES habitat. Accordingly, once constructed, the operation of the road is not expected to have a significant impact on MNES values.

3.3 Timing and Duration

Construction is scheduled to commence late 2027, subject to the granting of environmental and statutory approvals.

3.4 Location

The Proposed Action is located approximately 29 km south of the Perth Central Business District in the City of Kwinana Local Government Area (LGA). The Proposed Action extends from Leath Road, within the KIA, east along the existing Anketell Road to Treeby Road. The PAA is approximately 7.5 km in length and covers 224.83 ha, which includes 92.22 ha of native vegetation, 50.35 ha of non-native vegetation and 82.26 ha of cleared areas. The Proposal location and PAA are shown on Appendix 1, Figure 1.

3.5 Description and Timing of Rehabilitation Activities

Revegetation activities will be planned and implemented in accordance with clearance requirements and setback standards for new roads. Planting will predominantly utilise local native species, with efforts taken to enable this revegetation to be resilient within three years after the construction works are completed. Species of foraging habitat for Black Cockatoos, including but not limited to, *Banksia* spp., *Hakea* spp., *Grevillea* spp. and *Eucalyptus* spp. will not be planted within 10 m of the constructed road carriageway to reduce the risk of Black Cockatoo deaths due to vehicle strike.

Main Roads restricts the placement of vegetation near road infrastructure to maintain road safety. These requirements minimise ongoing maintenance and maintain a standard amenity level for road users. Landscape planning will incorporate these restrictions. Landscaping will not include areas required for ongoing operations such as drainage basins, road embankments and median strips.

3.6 Feasible Alternatives to the Proposed Action

Anketell Road has been identified as an "Other Regional Road" in the Metropolitan Regional Scheme (MRS) for a significant period of time. This recognises the importance of an efficient road network connection to the areas of Kwinana, Rockingham and Henderson. Anketell Road currently

is a single carriageway with one lane in each direction and would not accommodate the volumes of traffic forecast from the developments within Kwinana Industrial Zone, Rockingham and Henderson. A "no-build" option was not considered feasible as it would result in ongoing and increased traffic congestion, decreased freight efficiency and compromised road safety through the regional road network.

In 2017, the Westport Taskforce (Westport) was established to provide guidance to the State Government on Perth's long-term freight infrastructure needs. Westport focused on the three existing port precincts at Fremantle, Kwinana and Bunbury. This work included developing a long list of infrastructure options which was assessed through Multi-Criteria Assessment (MCA) by members of Westport and subject matter experts drawn from consultants and Western Australian Government Agencies in May 2019. The assessment resulted in a shortlist of seven options combined port and infrastructure options including various Kwinana port options with either Anketell Road or Rowley Road serving as the main road freight access.

In May 2019, a second stage MCA assessed the shortlist of seven options in more detail and identified a preferred port location, configuration and supporting road and rail networks. The criteria included complementary land use, social, heritage, environmental, economic and supply chain (which included road and rail). The MCA identified a land-backed port in Kwinana serviced by an upgraded Anketell Road and rail network as the preferred port and supply chain option. The Western Australian Government subsequently endorsed this option.

Anketell Road will provide as the key freight link between the Kwinana Freeway and the commercial/industrial precincts and the port. The Anketell Road design accommodates these consolidated functions.

4 DESCRIPTION OF THE ENVIRONMENT

4.1 Existing Land Use

The PAA intersects multiple land use zones and reservations under the MRS. The majority of land within the PAA is zoned as Rural, Primary regional roads and Other regional roads (Table 4.1 and Appendix 1, Figure 2). The PAA intersects land reserved as Freehold, Road, Easements, Crown Land and Reserves. Land within the PAA will be acquired by Main Roads and dedicated as a road under the WA *Land Administration Act 1997*.

Table 4.1: Land zoning and reservation within the PAA

MRS description	Area within the PAA (ha)	Proportion of the PAA (%)
Rural	83.24	37.02
Primary regional roads	51.73	23.01
Other regional roads	38.04	16.92
Industrial	30.31	13.48
Railways	10.11	4.50
Parks and Recreation	7.27	3.23
Urban	3.23	1.44
Parks and recreation - restricted public access	0.77	0.34
Public purposes – Water Authority of WA	0.13	0.06
Total	224.83	100

Land use surrounding the PAA includes:

- Industrial land at the western end of the PAA associated with the KIA and urban (residential) land at the eastern end of the PAA
- Rural land north and south of the PAA between Rockingham Road and Kwinana Freeway. Land use is varied with industrial/commercial operations and a small residential area west of Kwinana Freeway. Key operations include:
  - Alcoa operating tailings facilities located on the north side of Anketell Road
  - Perth Motorplex, historical Alcoa tailings facilities (or residue areas) and the Kwinana Wastewater Treatment Plant (WWTP) located on the south side of Anketell Road
- Parks and recreation areas including:
  - The Spectacles, which is part of Beeliar Regional Park and Class A Conservation Park (R 53313). The Spectacles wetland is located to the south of the PAA, west of the Kwinana Freeway
  - Mandogalup Road Bushland, Mandogalup, extending north of PAA, intersecting Mandogalup Road
  - Sandy Lake and Adjacent Bushland, Anketell, which is part of Jandakot Regional Park. This Bushland extends south of the PAA, east of Kwinana Freeway.

Land use in the vicinity of the Proposed Action is mapped on Appendix 1, Figure 3.

4.2 Topography

The topography of the PAA is gently undulating and can be broadly categorised into two topographical regions (Senversa 2025):

- Rockingham Road to Mandogalup Road, gently undulating topography ranging between 7 and 39 m Australian Height Datum (AHD)
- Mandogalup Road to Spears Drive, gently undulating topography ranging between 15 and 42 m AHD.

4.3 Geology

The 1:50,000 geology map for Fremantle (DEMIRS 2024) and FSG (2024) identifies the PAA comprising:

- West of Rockingham Road – Safety Bay Sand (S13) overlying Becher Sand, Tamala Limestone (LS1) and Osborne Formation (Kardinya Shale member)
- Rockingham Road to The Spectacles – Tamala Sand (S7) and Tamala Limestone (LS1). Guildford Formation and Bassendean Sand (S8) may be present at depth east of Hendy Road (just west of Abercrombie Road)
- The Spectacles to Treeby Road – Transition zone between Bassendean Sand (S8) and Tamala Sand (S7) at the surface underlain by Bassendean Sand (S8) and Guildford Formation at depth.

Near the existing wetlands (e.g. The Spectacles and Mandogalup), the surface geology is described as Swamp Deposits (sandy silt) (MS5).

The generalised geological conditions identified as part of a Detailed Site Investigation (DSI) completed by Senversa (2025) comprised:

- FILL: Gravely Sand (SP), SAND (SP), Gravely Silty Sand (SP): fine to coarse grained sand, fine to medium grained gravel, non-plastic silt, pale brown and pale grey generally loose dense, with thickness between 0.0 and 1 m below ground level (bgl)
- Tamala Limestone (Aeolian): Pale brown, low to high strength, slightly to highly weathered with layers of sandy or silty soils and a thickness from 4.5 m bgl up to 27 m bgl
- Bassendean Sand (Aeolian): SAND, Silty SAND (SP/SP-SM) fine to coarse grained, white/pale grey/pale brown/brown, trace/with fine silt, generally loose to medium dense, occasionally very loose, occasionally layers of silty sand and between 0 m bgl to 5 m bgl.

4.4 Soils

The majority of the PAA overlies Tamala Limestone within the Spearwood Quaternary geomorphic unit of the Swan Coastal Plain (SCP). The PAA occurs within the Bassendean and Perth Coastal Soil-Landscape Zones of the Swan Province (Schoknecht et al. 2004), and the PAA intersects four soil landscape mapping systems:

- Spearwood System, described as yellow deep sands, pale deep sands and yellow/brown shallow sands (182.11 ha of the PAA (81.0%))
- Quindalup South System, described as coastal dunes, of the SCP, with calcareous deep sands and yellow sands (36.02 ha of the PAA (16.02%))
- Vasse System, described as poorly drained estuarine flats, of the SCP; tidal flat soil, saline wet soil and pale deep sand; samphire, sedges and paperbark woodland (5.00 ha of the PAA (2.22%))

- Bassendean Sands, described as sand dunes and sandplains with pale deep sand, semi-wet and wet soil (1.7 ha of the PAA (0.76%)).

4.5 Acid sulfate soils

The eastern portion of the PAA adjacent to the Spectacles Wetlands is mapped as being a combination of high to moderate and low to moderate risk of acid sulfate soil (ASS) within 3 m of the natural surface level. The remainder of the PAA to the west is mapped as having no known risk of ASS within 3 m of the natural surface level (Senversa 2024). ASS was largely not identified during intrusive investigation completed as part of a DSI undertaken by Senversa (2025). Areas of potential acid sulfate soils, as indicated by pH change (>3 units), were potentially identified, predominantly north of The Spectacles.

ASS risk mapping is shown in Appendix 1, Figure 4.

4.6 Contaminated sites

The PAA intersects 13 mapped contaminated sites classified under the WA *Contaminated Sites Act 2003*. Of these, seven are registered as 'Contaminated – remediation required', six are registered as 'Contaminated – restricted use' and two are registered as 'Remediated for restricted use' (DWER 2025) (Appendix A, Figure 5).

The Preliminary Site Investigation identified a range of potential environmental concerns including small scale fly tipping, fuel storage and dispensing, fuel transmission pipelines, agricultural open sump and drains, fire station, wastewater treatment, recycling yard, alumina refinery, landfilling, and metal scrapyard (Senversa 2024). The presence of scattered potential asbestos containing materials debris is the only areas of potential environmental concern identified that is associated with the use of the site as a road reserve (Senversa 2024). All other areas of potential environmental concern relate to surrounding industry (Senversa 2024).

Senversa (2025) undertook soil and groundwater sampling across the PAA and concluded:

- The soil and groundwater investigation works did not indicate the presence of contamination that is likely to pose a risk as part of the Proposed Action, particularly as it relates to MNES.
- The groundwater results have provided a baseline assessment of conditions prior to any dewatering works. Based on the current groundwater conditions, groundwater would not be suitable for direct discharge to sensitive wetland environments (or indirect via connecting drainage) without prior treatment
- The DSI did not identify significant soil or groundwater impacts that would pose a risk to the environmental receptors. Any environmental risks present during construction such as potential ASS will be controlled by standard management actions.

4.7 Hydrology

4.7.1 Groundwater

The PAA occurs above three layers of aquifers, in order from topmost to bottommost layer: the unconfined Superficial Swan aquifer, the confined Leederville aquifer and the confined Yarragadee North aquifer.

The Superficial Swan aquifer receives direct recharge from groundwater infiltration and surface water. The Leederville and Yarragadee North aquifers receive direct recharge where these formations outcrop (not within the location of the Proposed Action). There is limited interaction

between the various aquifers, in terms of water exchange, and groundwater movement and recharge are very slow in the confined aquifers (Leederville and Yarragadee North).

Groundwater within the PAA is inferred to be encountered within the Superficial Swan aquifer. The groundwater monitoring events completed by Senversa (2025) identified groundwater beneath the PAA occurs between 0.611 AHD to a maximum depth of approximately 12.89 AHD with groundwater at shallower depths in the central portion of site.

Historical groundwater level contours show a consistent range of groundwater levels across the PAA, ranging between approximately Reduced Level (RL)<1 m AHD and RL 20 m AHD (FSG 2024). Whilst local groundwater flows in a westerly direction toward the Indian ocean, FSG (2024) noted:

- The groundwater level gradient is very flat in the western portion of the PAA, with some localised flow towards abstraction areas (e.g. Alcoa recovery bores)
- Groundwater mounding has been inferred at the Kwinana WWTP caused by the infiltration ponds, which direct groundwater to flow away from the ponds (radial flow), with a component of easterly flow towards The Spectacles
- Groundwater in the western portion of the PAA is subject to daily tidal influence, typically in the range of 0.2 m to 0.5 m. Tidal influences were identified up to 600 m inland from the Indian Ocean, particularly within the lower sub-aquifer (Tamala Limestone).

The DE intersects three Groundwater Areas proclaimed under the RIWI Act, Cockburn Groundwater Area, Jandakot Groundwater Area and Serpentine Groundwater Area. There are no Public Drinking Water Source Areas (PDWSAs) within the PAA. The closest PDWSA is the P1 and P2 Jandakot Underground Water Pollution Control Area PDWSA, located approximately 275 m east of the PAA, east of Lyon Road.

4.7.2 Surface water and waterways

The PAA intersects two drains and an inundation area (Appendix 1, Figure 6).

The Peel Main Drain is the main surface water feature that intersects the PAA. It is owned by Water Corporation and discharges into the Serpentine River. The Peel Main drain is an artificial, 32 km long, highly modified system constructed to drain the SCP (Stream 2025a). The drain is derived from year round surface runoff and winter groundwater discharge. Despite holding limited ecological value itself, the Peel Main Drain is important in maintaining the hydrological regime of The Spectacles Wetland (Stream 2025a). The Peel Main Drain is on the western side of the Kwinana Freeway, in the vicinity of the PAA. After passing through Mandogalup Swamp South, water flows through a culvert under Anketell Road between Mandongalup Road and Clementi Road, entering The Spectacles Wetland, before continuing south, flowing onward to Bollard Bulrush Swamp.

The Mandogalup East Drain intersects the northeastern part of the PAA, crossing the Kwinana Freeway. It joins the Peel Main Drain within Mandogalup Swamp. The Mandogalup Swamp South and East are mapped as an inundation area that intersects the edges of the PAA along Kwinana Freeway.

The existing drainage along Anketell Road and within the PAA is a mixture of unkerbed roads that sheet to the verge/roadside drains to infiltrate, and kerbed roads with localised pit and pipe networks that discharge to nearby infiltration basins (BG&E 2024).

4.7.3 Wetlands

No internationally recognised (Ramsar) wetlands or Nationally Important Wetlands intersect the PAA. The nearest Ramsar wetland occurs approximately 3.7 km north of the eastern portion of the PAA (Forrestdale and Thomsons Lakes), and the nearest Nationally Important Wetland occurs approximately 100 m south of the PAA, west of Kwinana Freeway (Spectacles Swamp).

The Spectacles represent the most significant permanent water source in proximity to the PAA. The Spectacles is part of Beeliar Regional Park and Bush Forever Site No. 269. It consists of two distinct swamps, the Big Eye Swamp in the north (113.1 ha) and the Small Eye Swamp in the south (28.4 ha). Both spectacles are round sumplands, joined to each other and nearby wetlands by a deep artificial drain (CALM 2006). Spectacles Swamp is fed by groundwater and inflow from the Peel Main Drain. Water within the wetland is seasonal however near-permanent due to the Peel Main Drain (Stream 2025a). Inflow and outflow from the Peel Main Drain along with minor contributions from rainfall influences water level of The Spectacles Wetland, with substantial flow in the winter months (Marillier *et al.* 2012; DoW 2009).

Based on the Geomorphic Wetlands of the SCP mapping (DBCA 2024a) the PAA intersects two geomorphic wetlands, a Conservation Category Wetland (CCW) (Mandogalup Swamp South, UFI 6530) and a Multiple Use Wetland (MUW) (Unknown, UFI 6538). A further four geomorphic wetlands occur within 250 m of the PAA including two Resource Enhancement Wetlands (REW) (UFI 6379 and 6380) one MUW (UFI 6381) and one CCW (UFI 6539). See Appendix 1, Figure 7.

4.8 Vegetation and Flora

4.8.1 Broad vegetation

The Proposed Action is located in the South West Botanical Province of WA (Beard 1990) and within the SCP (SWA) Bioregion and the Perth Sub-region (SWA02) as described by the Interim Biogeographic Regionalisation of Australia (IBRA). The Perth subregion is composed of colluvial and aeolian sands, alluvial river flats and coastal limestone. Heath and/or Tuart Woodlands occur on limestone, Banksia and Jarrah-Banksia Woodlands on Quaternary marine dunes of various ages and Marri on colluvial and alluvial soils. The subregion also includes a complex series of seasonal wetlands (Mitchell et al. 2002).

Broad scale (1:250,000) pre-European vegetation mapping (Beard 1979) indicates the PAA intersects five vegetation associations including:

- Medium woodland; tuart & jarrah (association 6)
- Sedgeland; reed swamps, occasionally with heath (association 51)
- Medium woodland; tuart (association 998)
- Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina (association 1001)
- Shrublands; scrub-heath on the SCP (association 3048).

Regional vegetation has been mapped by Heddle et al. (1980) based on major geomorphic units on the SCP. The PAA intersects five vegetation complexes (Appendix 1, Figure 8):

- Cottesloe Complex-Central and South – Mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri); closed heath on the Limestone outcrops
- Bassendean Complex-Central and South – Vegetation ranges from woodland of *Eucalyptus marginata* (Jarrah) - *Allocasuarina fraseriana* (Sheoak) - *Banksia* species to low woodland of

Melaleuca species, and sedgelands on the moister sites. This area includes the transition of *Eucalyptus marginata* (Jarrah) to *Eucalyptus todtiana* (Pricklybark) in the vicinity of Perth

- Karrakatta Complex-Central and South – Predominantly open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) and woodland of *Eucalyptus marginata* (Jarrah) - Banksia species. *Agonis flexuosa* (Peppermint) is co-dominant south of the Capel River
- Herdsman Complex – Sedgelands and fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca* species
- Quindalup Complex – Coastal dune complex consisting mainly of two alliances, the strand and fore-dune alliance, and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata* (Rottnest Teatree) - *Callitris preissii* (Rottnest Island Pine), the closed scrub of *Acacia rostellifera* (Summer-scented Wattle) and the low closed *Agonis flexuosa* (Peppermint) forest of Geographe Bay.

4.8.2 Vegetation types and condition

The Biota (2025a) report assessed the vegetation values of the PAA including the type, condition, and extent of native vegetation (Table 4.2). The distribution of vegetation types within the PAA is shown on Appendix 1, Figure 9 and vegetation condition on Appendix 1, Figure 10.

The PAA contains 92.22 ha (41.0%) of native vegetation mapped across 21 intact vegetation units, and 50.35 ha (22.4%) of non-native/modified vegetation (Biota 2025). The remainder of the PAA is cleared (82.26 ha; 36.6%).

The condition of the native vegetation within the PAA ranged from Very Good to Excellent condition to Completely Degraded condition (Biota 2025a). No patches of vegetation within the PAA were considered to have a Pristine or Excellent condition ranking. Numerous weed species were encountered across the PAA.

Table 4.2: Vegetation types and condition within the PAA

Vegetation Unit	Vegetation description	Extent (ha) within the PAA	Condition (ha)	
Native Vegetation				
A1	*Acacia rostellifera, (A. saligna*) tall shrubland to tall open scrubland over *Xanthorrhoea preissii* very open grass trees over *Hibbertia hypericoides* subsp. *hypericoides, Grevillea vestita* subsp. *vestita* low open shrubland over *Clematis linearifolia, *Asparagus asparagoides* scattered climbing herbs over **Ehrharta calycina* open grassland over **Euphorbia* spp., **Lysimachia arvensis* open herbland	8.93	Very Good	1.41
			Good to Very Good	4.84
			Good	0.39
			Degraded to Good	0.20
			Degraded	2.09
A2	*Banksia attenuata, B. menziesii, Eucalyptus marginata* subsp. *marginata* isolated low trees over *Acacia rostellifera, (A. pulchella)* tall open scrub over *Xanthorrhoea preissii, Macrozamia riedlei* scattered grass trees and cycads over *Hibbertia hypericoides* subsp. *hypericoides* low open shrubland over scattered *Conostylis aculeata* subsp. *preissii* herbs over **Ehrharta calycina, *Briza maxima, *Bromus diandrus* open grassland	5.39	Very Good	0.55
			Good to Very Good	0.35
			Good	4.21
			Degraded	0.28

Vegetation Unit	Vegetation description	Extent (ha) within the PAA	Condition (ha)	
A3	*Acacia rostellifera* tall shrubland to tall open scrub over *Xanthorrhoea preissii* scattered grass trees over *Austrostipa* spp. scattered tussock grasses over **Ehrharta longiflora, *Bromus diandrus (*Cenchrus setaceus)* open bunch grassland over *Acanthocarpus preissii, *Euphorbia terracina, *Sonchus oleraceus* open herbland.	2.40	Very Good	0.53
			Good	0.32
			Degraded	1.56
A4	*Acacia saligna* tall shrubland over *Xanthorrhoea preissii* tall grass trees over **Hyparrhenia hirta* open tussock grassland over **Eragrostis curvula, *Lagurus ovatus* open bunch grassland over **Oxalis pes-caprae, Sixalix atropurpurea* open herbland.	6.28	Good	3.23
			Degraded	0.77
			Completely Degraded	2.28
B2	*Banksia menziesii, (B. attenuata)* low woodland over *Kunzea glabrescens* scattered to tall open shrubland over *Xanthorrhoea preissii, (X. brunonis*) open grass trees over *Macrozamia riedlei* scattered cycads over *Hibbertia hypericoides* subsp. *hypericoides, Acacia pulchella* var. *pulchella* low to low open shrubland over *Conostylis aculeata* subsp. *aculeata* scattered to very open herbland over **Ehrharta calycina* very open grassland	6.83	Very Good to Excellent	1.12
			Very Good	0.34
			Good to Very Good	2.16
			Good	2.74
			Degraded	0.39
			Completely Degraded	0.08
B3	*Banksia menziesii, B. ilicifolia, (B. attenuata*) low to low open woodland over *Kunzea glabrescens* tall shrubland over occasional *Xanthorrhoea* spp. scattered grass trees over *Scholtzia involucrata* scattered low shrubs over *Dasypogon bromeliifolius, Phlebocarya ciliata* scattered herbland over **Briza maxima, *Ehrharta calycina, *E. longiflora* very open grassland	0.53	Good	0.36
			Degraded to Good	0.17
B4	*Banksia attenuata* low woodland over *Allocasuarina humilis* scattered shrubs with *Xanthorrhoea preissii (Macrozamia riedlei)* open grass trees and cycads over *Hibbertia hypericoides* subsp. *hypericoides* low open shrubland over *Mesomelaena pseudostygia* scattered sedges over mixed scattered herbs and **Ehrharta calycina, *Bromus diandrus* very open introduced grassland	4.22	Very Good	0.96
			Good to Very Good	0.38
			Good	0.74
			Degraded to Good	0.06
			Degraded	2.06
			Completely Degraded	0.03
B5	*Banksia sessilis* var. *cygnorum (Melaleuca huegelii* subsp. *huegelii*) tall open shrubland over *Melaleuca systena* scattered shrubs over **Ehrharta longiflora, *E. calycina, *Bromus diandrus, *Avena barbata* bunched grassland over **Trifolium campestre* var. *campestre, *Euphorbia terracina, *E. peplus, *Sonchus oleraceus* open herbland	3.79	Good	0.74
			Degraded to Completely Degraded	0.53
			Completely Degraded	2.52

Vegetation Unit	Vegetation description	Extent (ha) within the PAA	Condition (ha)	
B6	*Banksia sessilis* var. *sessilis*, *Acacia saligna, Acacia cyclops* shrubland to tall open shrubland over Acacia truncata scattered low shrubs over **Cenchrus setaceus, Austrostipa flavescens* very open tussock grassland over **Bromus diandrus* very open bunch grassland over **Euphorbia terracina, *Pelargonium capitatum, *Asparagus asparagoides, *Asphodelus fistulosus* very open herbland	1.23	Good	0.92
			Degraded	0.31
E1	*Eucalyptus gomphocephala* woodland to open forest with occasional emergent *Eucalyptus marginata* subsp. *marginata* over *Banksia attenuata, B. menziesii* low open woodland over *Acacia rostellifera, (Allocasuarina fraseriana, Kunzea glabrescens*) tall open shrubland over *Xanthorrhoea preissii* very open grass trees over **Ehrharta longiflora, *E. calycina, *Bromus diandrus, *Avena barbata* grassland to closed grassland	30.78	Very Good	4.96
			Good to Very Good	0.03
			Good	12.87
			Degraded to Good	1.64
			Degraded	7.18
			Completely Degraded	4.09
E5	*Eucalyptus decipiens* low open woodland over *Banksia sessilis* var. *sessilis* tall open shrubland *Acacia pulchella* var. *glaberrima, Hardenbergia comptoniana* shrubland over **Ehrharta calycina, *Ehrharta longiflora, *Bromus diandrus, *Lagurus ovatus, *Lolium perenne x rigidum* very open bunch grassland over **Euphorbia terracina, *Euphorbia peplus* very open herbland	0.39	Good	0.39
E6	*Eucalyptus gomphocephala* open forest over *Acacia rostellifera* tall open shrubland over *Xanthorrhoea preissii* scattered grass trees over **Ehrharta calycina, *E. longiflora, *Bromus diandrus, *Avena barbata* open bunch grassland over **Euphorbia terracina, *Euphorbia peplus, *Oxalis pes-caprae* open herbland	1.30	Degraded	1.30
E7	*Eucalyptus foecunda* subsp. *foecunda* low woodland over *Spyridium globulosum, Acacia rostellifera* tall shrubland over *Banksia sessilis* var. *sessilis* scattered shrubs over *Hibbertia hypericoides* subsp. *hypericoides* scattered low shrubs over **Ehrharta longiflora, *Briza maxima* very open bunch grassland over **Euphorbia peplus, *Asparagus asparagoides* very open herbland	0.24	Very Good	0.18
			Degraded to Good	0.06
EB1	*Eucalyptus marginata* subsp. *marginata, Banksia menziesii, B. attenuata* low open forest to open forest over *Kunzea glabrescens, Acacia cyclops* tall open shrubland over *Xanthorrhoea preissii, X. brunonis* subsp. *brunonis* open grass trees over *Hibbertia hypericoides* subsp. *hypericoides*, *Acacia pulchella* low open shrubland over **Ehrharta calycina* open grassland	7.57	Very Good	2.22
			Good to Very Good	0.19
			Good	2.56
			Degraded	2.54
			Completely Degraded	0.06
K1		0.92	Degraded	0.61

Vegetation Unit	Vegetation description	Extent (ha) within the PAA	Condition (ha)	
	Kunzea glabrescens tall shrubland to tall open scrub over very scattered *Xanthorrhoea preissii, (X. brunonis)* grass trees over *Melaleuca teretifolia, Astartea scoparia, Scholtzia involucrata* scattered open shrubland over occasional *Dasypogon bromeliifolius, Phlebocarya ciliata* scattered herbs over **Ehrharta longiflora, *Vulpia myuros, *Bromus diandrus, *Avena barbata* scattered grasses		Completely Degraded	0.31
M1	*Melaleuca preissiana* low woodland to closed forest over *Astartea scoparia* tall open shrubland to tall open scrub over **Ehrharta longiflora* open grassland.	<0.01	Good	<0.01
M2	*Melaleuca lanceolata* low woodland to low open forest over **Ehrharta calycina, *E. longiflora* open grassland over **Asparagus asparagoides* scattered herbs	1.81	Very Good	0.87
			Degraded	0.94
M4	*Melaleuca systena, Melaleuca huegelii* subsp. *huegelii* shrubland over *Xanthorrhoea preissii* scattered grass trees and *Spyridium globulosum, Templetonia retusa, Trymalium ledifolium* var. *ledifolium*, *Hardenbergia comptoniana, Acacia lasiocarpa* var. *lasiocarpa, A. rostellifera, A. truncata, Grevillea preissii, Hibbertia hypericoides subsp. hypericoides, H. aurea* low open shrubland over *Lepidosperma calcicole* scattered sedges over **Lolium perenne, *Avena barbata, *Bromus diandrus, *Lagurus ovatus, *Ehrharta longiflora* bunch grassland over *Opercularia vaginata, Lomandra maritima, Phyllanthus calycinus [Lysiandra calycina], *Asparagus asparagoides, *Trifolium campestre* var. *campestre* very open herbland	2.50	Very Good	2.21
			Completely Degraded	0.29
M5	*Melaleuca huegelii* subsp. *huegelii* tall open scrub over *Acacia rostellifera, Spyridium globulosum* shrubland over *Austrostipa elegantissima, A. flavescens* scattered bunch grasses over **Avena barbata, *Avena barbata, *Bromus diandrus, *Ehrharta longiflora* open bunch grassland over **Asparagus asparagoides, *Euphorbia terracina, *Fumaria capreolata, *Sonchus oleraceus* open herbland	0.54	Completely Degraded	0.54
M6	*Melaleuca systena, Acacia saligna* tall shrubland over *Spyridium globulosum, Templetonia retusa* open shrubland over *Acacia lasiocarpa* var. *lasiocarpa* low open shrubland over **Cenchrus setaceus* very open tussock grassland over *Lepidosperma calcicola* scattered sedges over **Avena barbata, *Lagurus ovatus* very open bunch grassland over **Romulea rosea* var. *australis* very open herbland	1.60	Completely Degraded	1.60
T1	**Leptospermum laevigatum* tall open shrubland over *Acacia saligna, Acacia cyclops, Alyxia buxifolia, Spyridium globulosum* open shrubland over **Cenchrus setaceus* scattered tussock grasses	4.98	Degraded	3.92
			Completely Degraded	1.05
Total native vegetation (ha)		**92.22 (41.0%)**		

Vegetation Unit	Vegetation description	Extent (ha) within the PAA	Condition (ha)	
Modified Areas (non-native)				
R2	Occasional *Eucalyptus rudis* subsp. *rudis, Corymbia calophylla* open woodland over **Callistemon citrinus* tall to tall open shrubland over *Calothamnus quadrifidus* subsp. *teretifolius, C. rupestris* shrubland to closed heath over **Ehrharta longiflora* very open grassland over **Euphorbia peplus, *Lotus subbiflorus, *Trifolium campestre* var. *campestre* very open herbland	5.66	Completely Degraded	5.66
R3	*Banksia menziesii* scattered low trees over *Jacksonia sternbergiana, Kunzea glabrescens* tall open shrubland over *Adenanthos cygnorum* subsp. *cygnorum* scattered shrubs over *Hibbertia hypericoides* subsp. *hypericoides, Styphelia conostephioides, Scholtzia involucrata* low open shrubland over *Dasypogon bromeliifolius, Phlebocarya ciliata, Lyginia imberbis* scattered perennial herbs with **Ursinia anthemoides* subsp. *anthemoides, *Carpobrotus edulis* very open introduced herbland	1.65	Very Good to Excellent	0.08
			Good	0.15
			Degraded	0.77
			Completely Degraded	0.65
ML	Commercial/Residential Mixed Land Use	27.23	Good	6.52
			Degraded	0.54
			Completely Degraded	20.17
D	Mosaic of highly modified degraded areas. Consists of a high proportion of introduced species, particularly grasses. Common species encountered in these areas were tussock grasslands of **Ehrharta calycina, *Bromus diandrus, *Lolium rigidum, *Cenchrus setaceus and *Avena barbata*, and introduced herblands of typically **Euphorbia terracina, *Lupinus cosentinii and *Foeniculum vulgare*	8.90	Good to Very Good	1.81
			Good	0.56
			Degraded to Good	0.36
			Degraded	1.30
			Completely Degraded	4.87
IP	Isolated Trees over Previously Cleared or Pasture. Typically consisted of acreage, exposed sands, previously cleared areas, and pasture with isolated remnant trees (either introduced, naturalised, or native)	6.92	Good to Very Good	0.73
			Degraded to Good	1.96
			Degraded	4.23
Total non-native vegetation (ha)		**50.35 (22.4%)**		
Cleared				
CL	Cleared	46.02		
RR	Roads, rail infrastructure, sandtracks	36.24		
Total cleared areas (ha)		**82.26 (36.6%)**		

Biota (2025a) mapped the following Threatened Ecological Communities (TECs) with their survey area:

- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (Tuart TEC) – Critically Endangered
- Banksia Woodlands of the Swan Coastal Plain (Banksia TEC) - Endangered
- Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle TEC) – Critically Endangered.

Umwelt (2025) completed a targeted review of the potential Honeymyrtle TEC patch identified by Biota during a 2023 survey (see Biota 2025a). This assessment determined that a portion of the patch was likely to have historically hosted the TEC, that another portion may have hosted the TEC and that neither patch now represented the TEC.

The TECs considered within this PD are discussed in more detail in section 5.3.

4.8.3 Flora

Biota (2025a) recorded 243 native vascular flora taxa representing 53 families and 130 genera in their survey area which included the PAA. The most well-represented families were Fabaceae (29 taxa) and Myrtaceae (27 taxa).

No Threatened species listed under the EPBC Act or WA BC Act were recorded within the Biota survey area or PAA (Biota 2025a).

4.8.4 Introduced and invasive species

One hundred and thirty-one (131) introduced flora species were recorded during the Biota surveys across their survey area which included the PAA (Biota 2025a). Of these, five Declared Pests (DP) listed under the WA *Biosecurity and Agriculture Management Act 2007* (BAM Act) and one Weed of National Significance (WoNS), were recorded within the PAA:

- **Asparagus asparagoides* (Bridal Creeper) – DP and a WoNS
- **Echium plantagineum* (Paterson's Curse) – DP
- **Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush) – DP
- **Morea flaccida* (One-leaf Cape Tulip) – DP
- **Zantedeschia aethiopica* (Arum Lily) – DP.

Locations of the Declared Pests and WoNS are shown in Appendix 1, Figure 11.

4.8.5 Dieback

The PAA contained 32.72 ha (14.55%) of interpretable vegetation, which was classed as Uninfested with adequate amounts of susceptible species being present. The remaining bushland and industrial zones within PAA were categorised as Excluded (45.17%), due to the complete lack of natural vegetation or Permanently Uninterpretable (7.14%) due the overall lack of sufficient indicators. The remaining 74.51 ha (33.14%) was categorised as Unknown. These areas were commonly found within private business land where access was not granted for the Phytophthora Dieback assessment. No historic or new infestations were detected within the PAA. As no symptoms consistent with Phytophthora Dieback were observed during the assessment, all areas should be managed as Protectable (Glevan 2025).

4.9 Fauna

4.9.1 Fauna habitats

The PAA contains seven fauna habitats (133.67 ha; 59.5% of the PAA), comprising native (92.22 ha) and non-native/modified (41.45 ha) vegetation. The remainder of the PAA comprised cleared

and/or degraded areas (91.16 ha; 40.05%) (Biota 2025a). A summary of fauna habitat types within the PAA is presented in Table 4.3 and shown on Appendix 1, Figure 12. The corresponding vegetation type for each fauna habitat is listed in Table 4.3 for reference.

Table 4.3: Fauna habitats within the PAA (and their corresponding vegetation units)

Fauna habitat type	Extent (ha) within the PAA
Acacia Shrubland (A1, A2, A3, A4, T1) Landforms: Gentle slopes, coastal dunes. Substrate: Limestone rock, sandy soils. Vegetation: *Acacia rostellifera* shrublands, *A. saligna* shrubland, with mixed *Banksia* spp., *Xanthorrhoea* and *Hibbertia* and isolated *Eucalyptus marginata*. *Gaudium* over *Acacia* shrubland. Values: Banksia species provide some foraging habitat for Black Cockatoos.	27.97
Banksia Woodland (B2, B3, B4, B5, B6) Landforms: Gently sloping plains. Substrate: Sandy soils. Vegetation: *Banksia attenuata, B. menziesii, B. ilicifolia, B. sessilis with Adenanthos, Jacksonia, Kunzea, Xanthorrhoea, Hibbertia* and *Conostylis*. Values: Banksia species provide foraging habitat for Black Cockatoos.	16.60
Damplands (K1, M1, M2) Substrate: Loamy sand soils. Vegetation: *Melaleuca* low woodlands with *Astartea*, generally surrounded by *Kunzea*. Landforms: Seasonally inundated damplands. Values: Not suitable for Black Cockatoos.	2.73
Eucalyptus Woodland/Forest (E1, E5, E6, E7) Landforms: Gentle undulating slopes. Substrate: Loamy sand soils. Vegetation: *Eucalyptus gomphocephala, E. decipiens, E. foecunda, E. marginata* forest over *Banksia* spp., *Acacia rostellifera*, with *Allocasuarina fraseriana* woodland and *Xanthorrhoea preissii* grass trees. Values: Potential foraging habitat for Black Cockatoo species.	32.70
Jarrah/Banksia Woodland (EB1) Landforms: Gentle slopes. Substrate: Sandy soils. Vegetation: *Eucalyptus marginata* and *Banksia menziesii/B. attenuata* woodland over *Kunzea, Hibbertia hypericoides* and *Acacia* spp. Shrublands and *Xanthorrhoea brunonis* over scattered herbland/grassland. Values: Potential foraging habitat for Black Cockatoo species.	7.57
Melaleuca Shrubland (M4, M5, M6) Substrate: Limestone rock, sandy soils. Vegetation: *Melaleuca systena, M. huegelii* over *Xanthorrhoea, Spyridium globulosum, Templetonia retusa*, and mixed *Acacia* spp.	4.64

Fauna habitat type	Extent (ha) within the PAA
Values: Not suitable for Black Cockatoos.	
Emergent Flooded Gum and Marri (R2) Vegetation: Modified/Planted *Callistemon* and *Calothamnus* on roadsides. Values: Potential foraging habitat for Black Cockatoo species.	5.66
Modified areas (IP, ML, R3) Substrate: Silt loam, loamy sand. Vegetation: Isolated trees over previously cleared areas or pasture, modified or revegetated areas of mixed *Banksia*, man-made drainages and land modified for farming or residential purposes. Values: Not suitable for Black Cockatoos.	35.79
Sub-total fauna habitat	**133.67**
Cleared/degraded areas (CL, D, RR)	91.16
Total	**224.83**

4.9.2 Fauna diversity

The Biota (2025a) report identified 49 vertebrate fauna species within their survey area which include the PAA during the field survey, including 34 birds, 9 mammals and six reptiles. Of these, 42 fauna species are native with evidence of seven introduced mammals including the Red Fox (*Vulpes vulpes*), Rabbit (*Oryctolagus cuniculus*), Domestic Dog (*Canis familiaris*), Cat (*Felis catus*), House Mouse (*Mus musculus*), Black Rat (*Rattus rattus*) and European Cattle (*Bos primigenius taurus*) recorded during the survey. The assemblage recorded within their survey area is likely to be an adequate representation of fauna values of the PAA (Biota 2025a).

Desktop searches identified 19 significant fauna species as present or potentially present within a 5 km buffer of the PAA. This included 17 vertebrate species and two invertebrate species. One MNES fauna species was recorded during Biota surveys (Biota 2025a), based on foraging evidence, Forest Red-tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksii naso*) (listed as Vulnerable under the EPBC Act and BC Act) - foraging evidence.

The MNES fauna species considered within this PD are discussed in sections 5.2 and 5.5.

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

5.1 Surveys and studies

A number of surveys and studies have been undertaken to address additional information needed to conduct a comprehensive impact assessment for the Proposed Action. A summary of surveys and studies relevant to MNES are detailed in Table 5.1 below.

Table 5.1: Surveys and studies relevant to the Proposed Action

Survey / Report	Details
Anketell Rd Upgrade – Consolidated Biological Report (Biota 2025a) (Attachment 1)	Scope: Consolidation of biological surveys conducted from 2020 to 2024, for the Proposed Action. The report provides a comprehensive biological survey report for the entire PAA and Contextual area. The scope is consistent with detailed flora and vegetation surveys including targeted surveys for significant flora and TEC / PECs under EPA (2016a). The surveys assessed the vegetation (native and non-native) values of the PAA including the type, condition and extent through detailed quadrat and relevé sampling. A combined total of 146 quadrats and three relevés were assessed during the Biota surveys. Floristic analyses were completed to validate vegetation unit classification and mapping, and determine the presence and extent of significant vegetation, including TECs and PECs. Vegetation types considered to be representative of TECs or PECs were assessed against relevant Commonwealth and State guidance. Flora diversity was derived from quadrat and relevé data as well as opportunistic collections made through the survey area. Targeted systematic searches for significant flora individuals and populations were completed throughout the survey area. Multiple targeted surveys were completed for Threatened orchid species *Caladenia huegelii, Diuris micrantha, Diuris purdiei* and *Drakaea elastica*. The surveys were conducted in 2020, 2021, 2022 and 2023 and included transects spaced at approximately 5-10 m to search areas of suitable habitat. The detailed and targeted flora and vegetation surveys were undertaken in accordance with the following guidance: – Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a) – Survey Guidelines for Australia's Threatened Orchids (DoE 2013a) – Approved Conservation Advice for the Banksia Woodlands of the Swan Coastal Plain ecological community (DEE 2016a) – Approved Conservation Advice for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community (DEE 2019) – Approved Conservation Advice for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (DCCEEW 2023a) – Factsheet: Threatened Ecological Community Banksia Woodlands of the Swan Coastal Plain Ecological Community (Main Roads 2021a) – Technical Guidance Factsheet: Threatened Ecological Community Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain (Main Roads 2020) – Methods for survey and identification of Western Australian threatened ecological communities (DBCA 2024d) – Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DoE 2013b). The scope also included combined fauna surveys incorporating a basic fauna survey specifically for vertebrate species, targeted Black Cockatoo surveys, targeted significant fauna surveys and an SRE invertebrate survey. The surveys described and mapped fauna habitats through on-ground traverses and recorded the presence and/or evidence of vertebrate fauna. Targeted surveys for significant fauna included active searches for individuals and secondary evidence, deployment of motion cameras and recording of

Survey / Report	Details
	opportunistic observations. Targeted black cockatoo surveys identified, described and mapped breeding, foraging and roosting habitat as well as presence or evidence of black cockatoos. Black cockatoo foraging habitat quality was rated using DCCEEW's Habitat Quality Scoring System for WA Black Cockatoo foraging (HQS). Targeted searches for SRE invertebrates were conducted via burrow searches, leaf litter raking, rock turning and snail searches. The basic and targeted fauna surveys were undertaken in accordance with the following guidance: – Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020) – Technical Guidance – Sampling of Short-range Endemic Invertebrate Fauna (EPA 2016b) – Referral guideline for three WA threatened black cockatoo species: Carnaby's Cockatoo Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo (DAWE 2022) – EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered), Calyptorhynchus latirostris; Baudin's cockatoo (vulnerable), Calyptorhynchus baudinii; Forest red-tailed black cockatoo (vulnerable), Calyptorhynchus banksii naso (DSEWPaC 2012a) – Protecting Black Cockatoos - Baudin's Cockatoo, Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo (Main Roads 2021b) – EPA Technical Report: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region (EPA 2019) – Survey Guidelines for Australia's Threatened Birds (DEWHA 2010) – Survey Guidelines for Australia's Threatened Mammals (DSEWPaC 2011) – Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DoE 2013b). Survey dates: Flora and vegetation surveys comprised 224 person days between October 2020 and October 2024. The timing aligns with the recommended survey timing for primary and supplementary vegetation and flora surveys on the SCP (EPA 2016a) and during peak detectability times for targeted orchid species as reported in DoE (2013a). Fauna surveys comprised 54 person days between October 2020 and October 2024. The timing aligns with the recommended timing for vertebrate surveys in the Southern region (EPA 2020), for Black Cockatoo breeding, foraging and roosting (DAWE 2022) and for target species as reported in DEWHA (2010) and DSEWPaC (2011). Survey area: The survey area covers the entirety of PAA. The report also covers a Contextual area (500 m buffer around the survey area) and a Study area (5 km buffer around the survey area). Report date: May 2025.
Assessment of FCT26a Threatened Ecological Community (Umwelt 2025) (Attachment 2)	Scope: Targeted assessment of *Melaleuca huegelii – Melaleuca systena* shrublands on limestone ridges TEC to verify the occurrence, condition and boundary of the TEC patch identified by the DBCA and by Biota (2025a). The survey method involved traversing the target area on foot to describe the vegetation, soil and landform. The survey was undertaken in accordance with: – Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a) – Melaleuca huegelii – Melaleuca systena shrublands on limestone ridges Interim Recovery Plan 2004 – 2009 (Luu & English 2005)

Survey / Report	Details
	– Approved Conservation Advice for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (DCCEEW 2023a). Survey dates: Survey conducted on 21st of November 2024, one person day. The timing aligns with the recommended survey timing for primary and supplementary vegetation and flora surveys on the SCP (EPA 2016a). Survey area: The survey area included the location of FCT 26a as mapped by Biota (2025a), and the surrounding vegetation, an area of approximately 6.3 ha, including the 1.96 ha of mapped FCT 26a occurrence. Report date: February 2025
Anketell Road Upgrade, Technical Memo: Communities of Organic Mounds (Organic Mound Springs, SCP) TEC (Biota 2024b) (Attachment 3)	Scope: Provide further information regarding the State-listed Critically Endangered Communities of Organic Mounds (Organic Mound Springs, Swan Coastal Plain) TEC, which is synonymous with the EPBC Act listed Endangered Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain TEC, and the likelihood that a specific occurrence ('WANDI01') could be affected by the Proposed Action. Survey area: The desktop assessment considered the specific occurrence 'WANDI01'. Report date: August 2024
Anketell Road characterisation and assessment of impacts on GDEs and groundwater users (Stream Environment and Water 2025a) (Attachment 4)	Scope: Assess the risks to groundwater dependent ecosystems (GDEs) (other than wetlands) and groundwater users from the Proposed Action. The key components of the assessment were: – Identify and characterise GDEs and groundwater users potentially impacted by groundwater drawdown associated with the Proposed Action – Assess the risk and potential impacts on GDEs and groundwater users of modelled groundwater drawdown from abstraction and dewatering activities. The assessment uses a methodology based on that developed by Froend and Loomes (2004) to assess the risks to GDEs from groundwater abstraction on the SCP. The methodology has been adapted from the original Froend and Loomes (2004) approach incorporating outcomes of previous consultation with the WA Department of Water and Environmental Regulation (DWER) for completion of ecological water requirements for the Peel Integrated Water Initiative and described in Braimbridge et al. (2018). Applicable area: The assessment covers the PAA and Contextual area. Report date: March 2025
Black Cockatoo Foraging Habitat Quality (GHD 2025) (Attachment 5)	Scope: Calculate the value of Carnaby's Cockatoo and FRTBC foraging habitat throughout the PAA using the Bamford Consulting Ecologists (BCE) foraging habitat scoring system. The memorandum provides an overview of the BCE foraging habitat scoring system components and application (taken from BCE 2020), and calculated value of Carnaby's Cockatoo and FRTBC foraging habitat throughout the PAA. The application of the BCE habitat scoring system was reviewed by Mike Bamford. Applicable area: The assessment covers the PAA. Report date: May 2025
Survey of 34 nominated trees in the proposed Anketell Road Upgrade for their nesting value for black cockatoos (Australian Black	Scope: Targeted assessment of suitable Diameter at Breast Height (DBH) trees with hollows to assess suitability for Black Cockatoo nesting. Targeted trees were those listed in Biota (2025) that were assigned a Category of 1-6 (34 trees) in accordance with the Main Roads Environmental Factsheet (Main Roads 2023). The scope also included a cursory assessment of Category 7 trees (547 trees). The survey method included close visual inspections using a drone, camera pole and telephoto lens to capture high resolution photographs of each hollow's nesting activity and condition. A minimum of three high-quality photographs were taken: one showing the

Survey / Report	Details
Cockatoo Specialists 2024) (Attachment 6)	tree's profile, one for each hollow entry, and one of the hollow's interior. The photographs were analysed to assess each hollow's suitability for nesting. Details of any current usage by Black Cockatoos and/or other species was recorded during the survey. The methods employed during the survey are recognised techniques to assess Black Cockatoo breeding habitat and usage and were undertaken by a suitably qualified person (DEWHA 2010, DAWE 2022). Survey dates: 14 and 15 October 2024. This survey timing aligns with recommended breeding habitat survey timing for Carnaby's Cockatoo and FRTBC (DAWE 2022). Survey area: Targeted to DBH trees with hollows (Category of 1-6, 34 trees) as reported in Biota (2025a). Report date: October 2024
Anketell Road Upgrade Targeted Chuditch Survey (Biota 2024a) (Attachment 7)	Scope: Targeted survey to assess the likelihood of occurrence of Chuditch (*Dasyurus geoffroii*) within the PAA, and whether any occurrence is likely to be as resident individuals utilising core habitat, or transitory use of secondary habitat types. The survey used baited cameras traps which are a recognised survey technique for Chuditch (DSEWPaC 2011). The survey was undertaken in accordance with the following guidance: – Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020) – Survey guidelines for Australia's threatened mammals (DSEWPaC 2011) – Chuditch Dasyurus *geoffroii* Recovery Plan (DEC 2012). Survey dates: Long-term cameras were deployed in January and February 2024 and remained at sites until 18 June 2024. Cameras were active for 141 days at the PAA area sites (total of 621 trap-nights) and 166 days at the Contextual area sites (a total of 630 trap nights). This survey timing aligns with recommended survey timing for Chuditch (DSEWPaC 2011). Survey area: The survey used long-term cameras, deployed in Chuditch preferred habitat including Jarrah woodland habitat where available or otherwise Banksia and Tuart woodlands within the PAA and Contextual area. Five camera sites were placed within the PAA and six camera sites were placed within nearby Jandakot Regional Park and Beeliar Regional Park. Report date: November 2024
Anketell Rd Upgrade *Leioproctus douglasiellus* and *Neopasiphae simplicior* Targeted Survey: Summary of Findings (Biota 2025b) (Attachment 8)	Scope: The aim of the current study was to conduct sampling for bees at two-monthly intervals, particularly targeting the listed threatened short-tongued bee species; *Neopasiphae simplicior* and *Leioproctus douglasiellus* and to assess the suitability of the habitat for these Endangered species. Sampling was conducted both within the PAA and nearby reserves Jandakot Regional Park and Beeliar Regional Park at bimonthly intervals November 2023 to January 2024, and again in October 2024, thus covering the phenological range of the bee species and their host plants. Survey dates: 27 November 2023, 13 December 2023, 29 January 2024, 19 February 2024 and 23 October 2024. Five person days. Survey area: Areas in and adjacent to the PAA were surveyed, as well as additional contextual sites at Jandakot Regional Park, Forrestdale Lake Nature Reserve and Beeliar Regional Park. Report date: January 2025
Phytophthora Dieback Occurrence Report for Anketell Road (Glevan 2025)	Scope: A Phytophthora Dieback assessment to determine the disease status of land associated with the Proposed Action. The assessment included a desktop review of available information and the collection and analysis of five soil and tissue samples within the PAA.

Survey / Report	Details
(Attachment 9)	The assessment was completed by an interpreter that is accredited in the detection, diagnosis and mapping of the Dieback disease. All Phytophthora Dieback detection, diagnosis and mapping was undertaken to standards and procedures defined in FEM047 Phytophthora Dieback Interpreter's Manual for lands managed by the department (Department of Parks and Wildlife (DPaW) 2015). Assessment dates: 3-6 June 2025 Survey area: Areas within the PAA. Access was not granted to approximately 33% of the PAA (across 14 areas). Report date: July 2025

5.2 Consideration of Matters Within the Proposed Action Area

Desktop searches of the EPBC Act PMST (DCCEEW 2024a), DBCA Threatened and Priority Ecological Communities (TEC/PEC) database (DBCA 2024b), DBCA Threatened, Specially Protected, and Priority Fauna (TPFA) database (DBCA 2024c), DBCA Threatened and Priority Flora List (TPFL) (DBCA 2023), Western Australian Herbarium (WA Herb) database (WA Herbarium 2023) and results of surveys listed in Table 5.1 identified TECs and threatened flora and fauna that may occur in the PAA. Through detailed and targeted survey efforts, the likelihood of occurrence for these TECs and species was considered. This information has been consolidated in Biota (2025a) (Attachment 1, Sections 3.2.4, 7.4) and Appendix 4.

Table 5.2 provides a summary of the Biota (2025a) likelihood of occurrence assessment for all MNES identified from the PMST, Biota (2025a) or DBCA data. Listed Marine and Cetacean species identified in the PMST report have been removed as the Proposed Action is exclusively terrestrial. There are several species / communities identified in the PMST report that were not assessed in Biota (2025a) and their likelihood of occurrence has been assessed within this document based on the known habitats and survey effort described within Biota (2025a). Criteria used to assign likelihood of occurrence follow that reported by Biota (2025a).

This revised likelihood of occurrence assessment did not identify any additional MNES considered known / likely or may occur that were not already addressed in the RFI, with the exception of the Glossy Ibis (*Plegadis falcinellus*). The communities and species considered within this PD are:

- Listed ecological communities
  - Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (Tuart TEC) – Critically Endangered
  - Banksia Woodlands of the Swan Coastal Plain (Banksia TEC) - Endangered
  - Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle TEC) – Critically Endangered
  - Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain (Organic Mounds TEC) – Endangered
- Listed fauna species
  - Carnaby's Black Cockatoo (CBC) (*Zanda latirostris*) – Endangered
  - Forest Red-tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksii naso*) – Vulnerable
  - Chuditch (*Dasyurus geoffroii*) – Vulnerable
- Listed flora species

- Grand Spider Orchid (*Caladenia huegelii*) – Endangered
- Dwarf Bee Orchid (*Diuris micrantha*) – Vulnerable
- Purdie's Donkey Orchid (*Diuris purdiei*) – Endangered
- Glossy Leaved Hammer Orchid (*Drakaea elastica*) – Endangered.

Table 5.2: MNES likelihood of occurrence assessment

Community / Taxon	EPBC Act Status	Likelihood of occurrence	Source
Threatened Ecological Communities			
Tuart TEC	Critically Endangered	Recorded. Surveys have confirmed the presence of this community within the PAA.	PMST (DCCEEW 2024a), Biota (2025a)
Banksia TEC	Endangered	Recorded. Surveys have confirmed the presence of this community within the PAA.	PMST (DCCEEW 2024a), Biota (2025a)
Honeymyrtle TEC	Critically Endangered	Recorded. Surveys have confirmed the presence of this community in the PAA.	PMST (DCCEEW 2024a), Biota (2025a)
Organic Mound TEC	Endangered	Unlikely to occur. There is one known occurrence 500 m east of the PAA within the Contextual area.	Biota (2024b), Stream (2025a)
Empodisma peatlands of southwestern Australia	Endangered	Highly unlikely to occur. None of the Biota (2025a) vegetation units align with the description of this community, none occur on peat and there are no records of *Empodisma* species within the PAA.	PMST (DCCEEW 2024a)
Flora			
Andersonia gracilis	Endangered	Would not occur.	PMST (DCCEEW 2024a), Biota (2025a)
Banksia mimica	Endangered	Unlikely to occur. Not known from DBCA database searches (DBCA 2023, WA Herbarium 2023). Given this species is a shrub and the survey effort within the PAA, it is likely that if present the species would have been recorded.	PMST (DCCEEW, 2024a)
Caladenia huegelii	Endangered	Unlikely to occur.	PMST (DCCEEW 2024a), Biota (2025a)
Diuris drummondii	Vulnerable	Would not occur.	Biota (2025a)
Diuris micrantha	Vulnerable	Unlikely to occur.	PMST (DCCEEW 2024a), Biota (2025a)
Diuris purdiei	Endangered	Unlikely to occur.	PMST (DCCEEW 2024a), Biota (2025a)
Drakaea elastica	Endangered	Unlikely to occur.	PMST (DCCEEW 2024a), Biota (2025a)

Community / Taxon	EPBC Act Status	Likelihood of occurrence	Source
Drakaea micrantha	Vulnerable	Would not occur.	PMST (DCCEEW 2024a), Biota (2025a)
Eleocharis keigheryi	Vulnerable	Would not occur.	PMST (DCCEEW 2024a), Biota (2025a)
Eucalyptus x balanites	Endangered	Would not occur.	Biota (2025a)
Grevillea curviloba	Endangered	Would not occur.	Biota (2025a)
Lepidosperma rostratum	Endangered	Would not occur.	Biota (2025a)
Morelotia australiensis	Vulnerable	Unlikely to occur. The conservation advice (DEWHA 2008c) states that the species is known from 11 locations between Perth and the South West Capes. There are no known records within 10 km of the PAA (DBCA 2023, WA Herbarium 2023). The species occurs in wetlands / drainage areas post fire (DEWHA 2008c). Given survey effort includes searches within wetland areas this species is considered unlikely to occur.	PMST (DCCEEW 2024a)
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	Critically Endangered	Would not occur.	Biota (2025a)
Synaphea sp. Pinjarra Plain (A.S.George 17182)	Endangered	Unlikely to occur.	Biota (2025a)
Synaphea sp. Serpentine (G.R.Brand 103)	Critically Endangered	Unlikely to occur.	Biota (2025a)
Fauna			
Botaurus poiciloptilus (Australasian Bittern)	Endangered	Unlikely to occur. Known to occur in wetlands. No suitable habitat within the PAA.	PMST (DCCEEW 2024a)
Calidris acuminata (Sharp-tailed sandpiper)	Migratory	Unlikely to occur.	PMST (DCCEEW 2024a), Biota (2025a)
Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo)	Vulnerable	Recorded – (Foraging evidence).	PMST (DCCEEW 2024a), Biota (2025a)
Dasyurus geoffroii (Chuditch)	Vulnerable	Unlikely to occur.	PMST (DCCEEW 2024a), Biota (2025a)
Leipoa ocellata (Malleefowl)	Vulnerable	Unlikely to occur. No suitable habitat with the PAA, not known from recent records within surrounding area (DBCA 2024c).	PMST (DCCEEW 2024a)
Limosa lapponica menzbieri (Bar-tailed godwit)	Endangered	Unlikely to occur. Known to occur in wetlands, no suitable habitat within the PAA.	PMST (DCCEEW 2024a)
Phaethon rubricauda westralis (Red-tailed Tropicbird)	Endangered	Unlikely to occur. Occurs on offshore islands, no suitable habitat within the PAA.	PMST (DCCEEW 2024a)

Community / Taxon	EPBC Act Status	Likelihood of occurrence	Source
Plegadis falcinellus (Glossy Ibis)	Migratory	May occur. There are two historic records with one within the Contextual area (Spectacles Wetland). Occurs in freshwater wetlands and pastures (Biota 2025a). Highly mobile species with some habitat in damplands. Non-breeding visitor to the SCP. This species has not been considered further in this PD, as it was not recorded during extensive fauna surveys, the PAA provides limited foraging habitat with better quality habitat within The Spectacles. Impacts would be minor given the context of the PAA.	Biota (2025a), Biota (2024c)
Pseudocheirus occidentalis (Western Ring-tail possum)	Critically Endangered	Unlikely to occur. Outside of current wild distribution.	PMST (DCCEEW 2024a)
Sternula nereis nereis (Fairy Tern)	Vulnerable	Unlikely to occur. Coastal / estuarine species with no suitable habitat within the PAA.	PMST (DCCEEW 2024a)
Westralunio carteri (Carters Freshwater Mussel)	Vulnerable	Unlikely to occur. No suitable habitat within the PAA.	PMST (DCCEEW 2024a)
Zanda baudinii (Baudins Black Cockatoo)	Endangered	Unlikely to occur.	PMST (DCCEEW 2024a), Biota (2025a)
Zanda latirostris (Carnaby's Black Cockatoo)	Endangered	Recorded (previously).	PMST (DCCEEW 2024a), Biota (2025a), DBCA (2024c)
Insects			
Neopasiphae simplicior (Native bee)	Critically Endangered	Low to moderate likelihood of occurrence (unlikely to occur).	Biota (2025b)
Leioproctus douglasiellus (Short-tongued Bee)	Critically Endangered	Low likelihood of occurrence (unlikely to occur).	Biota (2025b)

5.3 Threatened Ecological Communities

5.3.1 Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the SCP TEC

5.3.1.1 Description

The Tuart TEC is listed as Critically Endangered under the EPBC Act. The primary defining feature of this community is the presence of the *Eucalyptus gomphocephala* (Tuart) in the uppermost canopy, although this may occur with various other tree species. It can occur in a variety of forms, most commonly open forest, woodland and open woodland. There may be a substantial sub-canopy, dominated by *Agonis flexuosa*. The understorey is often relatively open, including many non-woody species from the Asteraceae, Cyperaceae, Restionaceae and Orchidaceae families (DEE 2019).

Key potential threats to the Tuart TEC identified in the Approved Conservation Advice include vegetation clearing and fragmentation, invasive introduced flora and fauna taxa, Phytophthora

dieback, altered fire regimes, climate change, and hydrological change including groundwater abstraction (DEE 2019).

In relation to critical habitat, the DEE (2019) states that, given the high rates and loss of the TEC across its range, all remnants contribute to the survival of the ecological community, but not all are protected as MNES. Areas that are included within secure conservation reserves are very important to the survival of the ecological community. Areas that meet the key diagnostic characteristics but not the minimum size and condition thresholds are also recognised as contributing to recovering the integrity of the ecological community, as are areas of nearby native vegetation be they Tuart woodlands and forests or not.

The Tuart TEC was confirmed within the PAA and Contextual area through desktop and field surveys for the Proposed Action.

5.3.1.2 Survey effort

Biota (2025a) provides information on the consolidated survey effort. All surveys were undertaken in accordance with the EPA Technical Advice (EPA 2016a) and assessed areas that potentially aligned with the Tuart TEC against the key diagnostic characteristics and condition thresholds, as per the approved conservation advice (DEE 2019). Surveys were carried out within the spring months of 2020, 2022 and 2023, with no survey limitations noted.

The Tuart TEC assessment involved:

- 30 remnant patches within the PAA and Contextual area were assessed, with a total of 84 field assessments completed
- The 84 assessments were compared against Tuart TEC diagnostic characteristics (Appendix 13 of Biota 2025a – Attachment 1) and each patch with the PAA was traversed
- Floristic analysis using PATN v4 (Belbin 2020) to compare the quadrat data against the SCP vegetation data set to assist in assigning equivalent Floristic Community Types (FCTs). The site FCT determination was compared to the known Tuart TEC FCTs to assist in patch determination (the FCT analysis is further defined in section 3.4.9 and section 4.5.3 of Biota (2025a) – Attachment 1)
- Mapping the extent of each patch of Tuart TEC involved a combination of field assessments, inferred patch occurrences (aerial imagery and desktop information for to map the full extent of the patch outside of the PAA), the location of individual trees and their canopy and applying a 30 m buffer.

Surveys were completed over multiple years in accordance with the relevant guidance, including surveys being in spring which is the optimal survey period for the SCP. Mapping and assessment criteria for the Tuart TEC have been applied to adequately analyse and map the occurrence of this community for the purposes of this assessment.

5.3.1.3 Regional and local context

The Tuart TEC occurs from Jurien, approximately 200 km north of Perth, to the Sabina River, near Busselton, 225 km south of Perth, along the Spearwood or Quindalup dunes (DEE 2019). The community is most commonly found on the Spearwood dune systems, also occurring on the Quindalup dune systems and in some places also on the Bassendean dune systems.

The current extent of the Tuart TEC as of 2015 is estimated to be >17,000 ha across its range (DEE 2019). Regionally it is estimated there is 20,833 ha of Tuart Woodlands across the SCP. Locally it is

estimated there is 950.40 ha of Tuart TEC within 10 km of the PAA. Of this, approximately 393.90 ha occurs in conservation reserves. Appendix 3 provides details on the methods used for determining local and regional extents.

Appendix 1, Figure 13 provides mapping of Tuart TEC occurrences within the 10 km buffer.

5.3.1.4 Extent within the PAA and Contextual area

Biota (2025a) (Attachment 1 – section 4.6 and Appendix 13) provides further detail on the Tuart TEC within the PAA and Contextual area.

Eleven (11) patches of Tuart TEC occur either wholly, partially or immediately adjacent to the PAA and Contextual area. In instances where the patch extended beyond the Contextual area the entire patch size was extrapolated based on aerial photography. Of the 11 patches, nine occur within the PAA with a total extent of 40.99 ha. Table 5.3 provides the details of Tuart TEC patches within the PAA.

The total extent of the 11 patches was estimated to be 119.37 ha (based on data provided in Table 4.8 and Appendix 13, Biota (2025a)). The size of patches ranges from 0.74 ha to 35.73 ha, which would be classified as small to medium in size according to Table 7, page 82 of DEE (2019). The quality of each patch was rated by Biota (2025a) and ranged from Moderate to High. The vegetation condition of each patch ranged from Completely Degraded to Very Good (Biota (2025a).

Quadrat data from the 11 patches was statistically analysed to align each patch to an FCT. The analysis identified both FCT 30b and FCT 25 within the PAA, both of which are known to be representative of the Tuart TEC (DEE 2019).

The patches of Tuart TEC along the existing Anketell Road form a minor west-east linkage to The Spectacles. However, the surrounding environment is highly modified, and this linkage contains gaps of up to 500 m between patches. The Spectacles and larger remnant vegetation to the north, south and east form a fragmented linkage through the local area. There are two Bush Forever sites No. 268 and 269, associated with the Spectacles Wetland and portions of this area are also within Beeliar Conservation Park. Tuart TEC patches TT06 and TT07 are located within these Bush Forever sites and form a patch of contiguous vegetation (made up of varying FCTs) surrounding The Spectacles.

Based on the information provided in the Conservation Advice (DEE 2019), it is considered that patches TT06, and TT07 would be considered critical habitat, as they form part of Bush forever sites and support linkages around The Spectacles. The other patches are important locally, however given the smaller size, condition and level of fragmentation they have not been considered to meet the critical habitat definition.

Appendix 1, Figure 14 and Figure 15 shows the location of the Tuart TEC within the PAA and Contextual area, including the vegetation condition and associated FCT.

Table 5.3: Tuart TEC extent within the PAA

Patch ID	Size of patch (ha)	Extent within the PAA (ha)	Extent within the PAA (%)	Condition rating of extent within the PAA	Patch quality	FCTs	Comments
TT01	8.42	2.16	25.6	Very Good (0.91 ha), Good (0.57 ha) and Degraded (0.20 ha)	High	FCT 30b	
TT02	1.03	0.98	95.5	Very Good (0.10 ha), Good (0.58 ha), Degraded (0.08 ha) and N/A (0.23 ha)	High-Med	-	
TT03	29.45	6.03	20.5	Very Good (2.41 ha), Degraded to Good (0.05 ha), Degraded (3.31 ha), Completely Degraded (0.03 ha) and N/A (0.24 ha)	High-Med	aff. FCT25	
TT04	6.34	1.16	18.3	Good to Very Good (0.05 ha), Degraded to Good (0.50 ha), Degraded (0.13 ha) and N/A (0.49 ha)	High-Med	aff. FCT25	
TT05	18.67	11.26	60.3	Good (7.50 ha), Degraded (0.65 ha), Completely Degraded (1.74 ha) and N/A (1.37 ha)	High-Med	FCT30b and aff. FCT 25	
TT06	35.73	16.85	47.2	Very Good (2.11 ha), Good (5.95 ha), Degraded (5.68 ha), Completely Degraded (1.64 ha) and N/A (1.46)	High-Med	aff. FCT25	Represents Critical Habitat Intersects Bush Forever Site no. 268 and 269
TT07	5.74	0.59	10.3	Degraded to Good (0.22 ha), Degraded (0.26 ha) and N/A (0.11 ha)	Med-Low	aff. FCT25	Represents Critical Habitat Intersects Bush Forever Site no. 269
TT08 & TT09[1]	5.11	1.95	38.2	Good (0.59 ha), Degraded to Good (0.34 ha), Completely Degraded (0.36 ha) and N/A (0.67 ha)	High-Med	-	
TT10	0.74	-	-	-	Med-Low	-	
TT11	3.03	-	-	-	High-Med	-	
Total	119.37	40.99					

[1]TEC patches were combined post-field assessment, but original patch numbering has been retained.

5.3.2 Banksia Woodlands of the Swan Coastal Plain TEC

5.3.2.1 Description

The Banksia TEC is listed as Endangered under the EPBC Act. A key diagnostic feature of this community is a prominent tree layer of Banksia, with scattered eucalypts and other tree species often present among or emerging above the Banksia canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoides and forbs. The community is characterised by high endemism and considerable localised variation in species composition across its range.

Key threats to the Banksia TEC identified in the Approved Conservation Advice include clearing and fragmentation, dieback, invasive species, changes to fire regime, hydrological degradation, climate change, grazing, decline in pollination and seed dispersing fauna and loss of keystone Banksia species (DEE 2016a).

The areas considered critical to the survival of the Banksia TEC cover all patches that meet the key diagnostic characteristics and condition thresholds for the community, plus the buffer zones, particularly where this comprises surrounding native vegetation. This is because this community occurs in a landscape that has often been very heavily cleared and modified, and now exists as mostly very small and highly fragmented patches (DEE 2016a).

The Banksia TEC was confirmed within the PAA and Contextual area through desktop and field surveys for the Proposed Action.

5.3.2.2 Survey effort

Biota (2025a) provides information on the consolidated survey effort. All surveys were undertaken in accordance with the EPA Technical Advice (EPA 2016a) and assessed areas that potentially aligned with the Banksia TEC against the key diagnostic characteristics and condition thresholds, as per the Approved Conservation Advice (DEE 2016a). Surveys were carried out within the spring months of 2020, 2022 and 2023, with no survey limitations noted.

The Banksia TEC assessment involved:

- Nine remnant patches within the PAA and Contextual area were assessed, with a total of 67 field assessments completed
- The 67 assessments were compared against Banksia TEC diagnostic characteristics (Appendix 14 of Biota 2025a – Attachment 1) and each patch with the PAA was traversed
- Floristic analysis using PATN v4 (Belbin 2020) to compare the quadrat data against the SCP vegetation data set to assist in assigning equivalent FCTs. The site FCT determination was compared to the known Banksia TEC FCTs to assist in patch determination (the FCT analysis is further defined in section 3.4.9 and section 4.5.3 of Biota (2025a) – Attachment 1)
- Mapping the extent of each patch of Banksia TEC involved a combination of field assessments and inferred patch occurrences (aerial imagery and desktop information for to map the full extent of the patch outside of the PAA).

Surveys were completed over multiple years in accordance with the relevant guidance, including surveys being in spring which is the optimal survey period for the SCP. Mapping and assessment criteria for the Banksia TEC have been applied to adequately analyse and map the occurrence of this community for the purposes of this assessment.

5.3.2.3 Regional and local context

The Banksia TEC is restricted to the SCP IBRA bioregion and immediately adjacent areas, including the Dandaragan Plateau, from Jurien Bay in the north, to Dunsborough in the south, and northwest on the Whicher and Darling escarpments (DEE 2016a). The community typically occurs on well drained, low nutrient soils in sands of dune landforms, in particular deep Bassendean and Spearwood sands, or occasionally on Quindalup sands. It is also common on sandy colluvium and aeolian (wind-blown) sands of the Ridge Hill Shelf, Whicher Scarp and Dandaragan Plateau.

The current extent of the Banksia TEC as of 2015 is estimated to be >335,000 ha covering within the subregions of Dandaragan, Perth and Jarrah Forests (DEE 2016a). Regionally it is estimated there is 190,260.18 ha of native vegetation strongly and moderately associated with the Banksia TEC across the SCP. Locally it is estimated there is 5,697.69 ha of Banksia TEC within 10 km of the PAA. Of this, approximately 1,712.49 ha occurs in conservation reserves. Appendix 3 provides details on the methods used for determining local and regional extents.

Appendix 1, Figure 16 provides mapping of Banksia TEC occurrences within 10 km of the PAA.

5.3.2.4 Extent within the PAA and Contextual area

Biota (2025a) (Attachment 1 – section 4.6 and Appendix 14) provides further detail on the Banksia TEC within the PAA and Contextual area.

Nine (9) patches of Banksia TEC occur either wholly or partially within the PAA and Contextual area. In instances where the patch extended beyond the Contextual area, the entire patch size was extrapolated based on aerial photography. The total extent Banksia TEC within the PAA is 14.56 ha. Table 5.4 provides the details of Banksia TEC patches within the PAA.

The total extent of the nine patches was estimated to be 334.1 ha (based on data provided in Table 4.8 and Appendix 14, Biota (2025a)). The size of the patches ranged from 0.61 ha to 159.6 ha and patch quality ranged from Good to Excellent as rated by Biota (2025a). The vegetation condition of each patch ranged from Degraded to Very Good to Excellent (Biota (2025a).

Quadrat data from the nine patches was statistically analysed to align each patch to an FCT. The Banksia TEC aligned with FCT21a, FCT21c, FCT24 and FCT28, all of which are known to form part of the Banksia TEC (DEE 2016). Of these, FCT 21c and FCT24 are listed as Priority 3 Priority Ecological Communities by the WA DBCA. None of the aligned FCTs are listed as TECs under the WA BC Act. The species richness of the patches was determined by reviewing quadrat data for each patch, this shows that the native species diversity ranges from 14 to 73; each patch had more than 12 introduced species. Overall, each patch had lower species diversity than the average species diversity reported in the Approved Conservation Advice (DEE 2016a) for the aligned FCT(s). The exception was patch BT08 which had medium species diversity.

There are isolated occurrences of the Banksia TEC in the western and eastern portions of the PAA, west patches BT07, BT08, BT09 and east patches BT01 and BT02. Larger patches buffer The Spectacles (patches BT03, BT04, BT05 and BT06) and form a north-south ecological linkage.

Based on the information provided in the Conservation Advice (DEE 201a6), all patches of Banksia TEC within the PAA and Contextual Area are considered to meet the critical habitat definition.

Appendix 1, Figure 17 and Figure 18 shows the location of the Banksia TEC within the PAA and Contextual area, including the vegetation condition and associated FCT.

Table 5.4: Banksia TEC extent within the PAA

Patch ID	Size of patch (ha)	Extent within the PAA (ha)	Extent within the PAA (%)	Condition rating of extent within the PAA	Patch quality	FCTs	Species richness	Comments
BT01	2.2	0.19	8.5	Good (0.19 ha)	Very Good	FCT21a	Native: 14 Non-native: 12	1 quadrat within patch. DEE (2016a) states FCT21a has average of 52 spp / 100 m^2. Patch has lower diversity.
BT02	4.9	2.06	42.0	Good to Very Good (2.06 ha)	Good to Excellent	FCT21a	Native: 33 Non-native: 17	2 quadrats within patch. DEE (2016a) states FCT21a has average of 52 spp / 100 m^2. Patch has lower diversity.
BT03	76.1	1.20	1.6	Very Good to Excellent (1.20ha)	Very Good to Excellent	FCT28	Native: 35 Non-native: 12	1 quadrat within patch. DEE (2016a) states FCT28 has average of 56 spp / 100 m^2. Patch has lower diversity. Intersects Bush Forever Site no. 270
BT04	32.7	0.87	2.7	Very Good (0.35 ha) and Good (0.52 ha)	Good to Very Good	FCT24 and FCT28	Native: 39 Non-native: 14	1 quadrat within patch. DEE (2016a) states FCT28 has average of 56 spp / 100 m^2. (no richness provided for FCT24). Patch has lower diversity. Intersects Bush Forever Site no. 269
BT05	159.6	2.49	1.6	Good to Very Good (0.06 ha), Good (0.55 ha), Degraded to Good (0.22 ha) and Degraded (1.34 ha)	Good to Very Good	FCT21c, FCT24 and FCT28	Native: 73 Non-native: 25	5 quadrats within patch. DEE (2016a) states FCT28 and FCT21c have average of 56 spp and 40 spp/ 100 m^2. (no richness provided for FCT24). Quadrats have an average diversity of 38.4. Patch has lower diversity.

Patch ID	Size of patch (ha)	Extent within the PAA (ha)	Extent within the PAA (%)	Condition rating of extent within the PAA	Patch quality	FCTs	Species richness	Comments
								Intersects Bush Forever Site no. 269
BT06	45.4	0.69	1.5	Very Good (0.34 ha) and Good (0.34 ha)	Good to Excellent	FCT24 and FCT28	Native: 73 Non-native: 31	6 quadrats within patch. DEE (2016a) states FCT28 has average of 56 spp / 100 m^2. (no richness provided for FCT24). Quadrats have an average diversity of 47.5. Patch has lower diversity. Intersects Bush Forever Site no. 268
BT07*	5.6	3.45	61.7	Very Good (1.71 ha) and Degraded (1.75 ha)	Excellent	FCT24 and FCT28	Native: 37 Non-native: 21	1 quadrat within patch. DEE (2016a) states FCT28 has average of 56 spp / 100 m^2. (no richness provided for FCT24). Patch has lower diversity.
BT08*	3.1	3.02	97.4	Very Good (1.87 ha) and Good (1.15 ha)	Very Good to Excellent	FCT24	Native: 54 Non-native: 39	2 quadrats within patch. DEE (2016a) has no richness provided for FCT24). Based on DEE (2016a) information for other FCTs this would be a medium diversity.
BT09	0.61	0.61	100	Good (0.61 ha)	Good	FCT28	Native: 40 Non-native: 25	2 quadrats within patch. DEE (2016a) states FCT28 has average of 56 spp / 100 m^2. Quadrats have an average diversity of 44. Patch has lower diversity.

* It is noted that BT07 and BT08 include portions that overlap with Tuart TEC patches TT03 and TT02, respectively.

5.3.3 Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion TEC

5.3.3.1 Description

Effective from 15 November 2023 the Honeymyrtle TEC was approved and listed as Critically Endangered under the EPBC Act. At the time of the Approved Conservation Advice listing, this ecological community is synonymous with, and corresponds to, the Critically Endangered WA TEC *Melaleuca huegelii – M. systena* shrublands of limestone ridges (FCT 26a as originally described in Gibson et al. 1994) that is on the list of TECs, under the WA BC Act.

The Honeymyrtle shrubland, is the assemblage of plants, animals and other organisms associated with a type of warm temperate shrubland or heath, dominated by *Melaleuca huegelii* (chenille honeymyrtle), *M. systena* (coastal honeymyrtle), and/or *Banksia sessilis* (parrot bush). It is a shrub-dominated ecological community, with sclerophyll shrubs forming thickets or heaths, above a typically diverse ground layer of herbs, including sedges, Restionaceae and occasional grasses (DCCEEW 2023a).

Key threats to the Honeymyrtle TEC identified in the Approved Conservation Advice include clearing, changes to fire regime, impacts from recreational uses, weed incursions and illegal rubbish dumping and climate change (DCCEEW 2023a).

Due to its restricted distribution, all areas that are at least 0.01 ha in size and meet the key diagnostic characteristics of this community, as well as areas of native vegetation within 200 m of the community are considered critical to the survival of the Honeymyrtle TEC (DCCEEW 2023a).

5.3.3.2 Survey effort

Biota (2025a) provides information on the consolidated survey effort. All surveys were undertaken in accordance with the EPA Technical Advice (EPA 2016a) and assessed areas that potentially aligned with the Honeymyrtle TEC against the key diagnostic characteristics and condition thresholds, as per the Approved Conservation Advice (DCCEEW 2023a). Surveys were carried out within the spring months of 2020, 2022 and 2023, with no survey limitations noted.

The Honeymyrtle Shrubland TEC assessment involved:

- Patch assessments and three quadrats were considered against the Honeymyrtle Shrubland TEC diagnostic characteristics (Biota (2025a) section 4.6 – Attachment 1)
- Floristic analysis using PATN v4 (Belbin 2020) to compare the quadrat data against the SCP vegetation data set to assist in assigning equivalent FCTs. The site FCT determination was compared to FCT26a, which forms the TEC (the FCT analysis is further defined in section 3.4.9 and section 4.5.3 of Biota (2025a) – Attachment 1)
- The entire extent of the two patches of Honeymyrtle TEC were ground-truthed and mapped.

Subsequently, Umwelt (2025) completed a targeted assessment of the Biota (2025a) Honeymyrtle TEC areas. The assessment of this patch included desktop and historical aerial photography review and targeted field surveys in November 2024.

Surveys for the Honeymyrtle TEC were completed over multiple years in accordance with the relevant guidance, including surveys being in spring which is the optimal survey period for the SCP. Mapping and assessment criteria for the Honeymyrtle TEC have been applied to adequately analyse and map the occurrence of this community for the purposes of this assessment.

5.3.3.3 Regional and local context

The Honeymyrtle TEC is restricted to the Perth subregion of the SCP IBRA Bioregion. Known occurrences occur from near Guilderton in the north, to near Lake Clifton/ Preston Beach in the south — between the Moore River and the Harvey River Diversion (DCCEEW 2023a). There are some occurrences in Neerabup and Yanchep National Parks.

The Honeymyrtle TEC is only known to occur on shallow skeletal soils, on the ridge slopes and tops of limestone ridges (and outcrops) associated with Tamala Limestone. It is known to occur on the Cottesloe and Karrakatta soil units, mainly within the Spearwood dune system (DCCEEW 2023a).

Regionally, there are 90 records of occurrences of this community in the WA DBCA TEC database (as of October 2023) (DBCA 2023). Six of these occurrences have been destroyed, and three require further survey. The 81 occurrences with mapped boundaries in the WA TEC database, cover a total area of 199 ha (DCCEEW 2023a). The occurrence within the PAA is an historic locality (referred to as ANKETLL01), however this locality has recently been removed from the DBCA TEC database. The Eligibility for Listing form (DBCA 2019) describes this community as appearing to have been heavily grazed historically with *Melaleuca huegelii* replanted in 2008.

To provide local context, the buffered DBCA TEC/PEC database (DBCA 2024b) was queried for a 15 km buffer of the PAA. This identified six known occurrences with an approximate total area of 22.6 ha (Manning_ML01, Manning_ML11, Manning_ML13, Manning_ML15, Manning_ML17, Manning_ML25). The six Manning occurrences are in one locality that is approximately 12 km north of the PAA, within the Manning Park Bush Forever site no. 247, in vegetation surrounding Manning Lake.

Appendix 1, Figure 19 provides mapping of the DBCA known occurrences of the Honeymyrtle TEC within 15 km of the PAA.

5.3.3.4 Extent within the PAA and Contextual area

Biota (2025a) (Attachment 1 – section 4.6) and Umwelt (2025) (Attachment 2) provides further detail on the Honeymyrtle TEC within the PAA.

Two patches of Honeymyrtle TEC, with a combined area of 1.94 ha, occur within PAA. These are situated north and south of Anketell Road, east of the Abercrombie Road intersection (these were associated with one Biota (2025a) vegetation unit). The two patches are separated by the existing Anketell Road by a distance of approximately 20 m. In accordance with the DCCEEW (2023a) the two patches would be considered one patch as the break separating them is less than 30 m. It is noted that there are no occurrences of the Honeymyrtle TEC identified within the Contextual area.

Initial mapping of the Honeymyrtle TEC was reviewed by Biota (2025a) and refined to remove areas of cleared road verge that were initially included within the patch boundary. This has resulted in a decrease in area of the Honeymyrtle TEC from 1.96 ha to 1.94 ha.

Biota (2025a) has mapped the community in Completely Degraded to Good condition, noting that it was depauperate in understory species. Of the combined species recorded from the three quadrats, 33 were introduced with only 13 native taxa recorded. DCCEEW (2023a) reports that the Honeymyrtle TEC typically has a high species richness with a mean species richness of 50 species per 100 m^2.

The patch of Honeymyrtle TEC is considered to be critical habitat based on the definition in DCCEEW (2023a).

Although the species recorded are typical of the Gibson et al (1994) community type 26a, PATN analysis of the site data against the 11 sites known to represent this TEC sampled on the SCP by Gibson et al (1994) shows very little similarity in terms of vegetation composition. From the floristic analyses, Biota (2025a) assigned these quadrats were assigned to FCT 24 (aff. 29a/30b) and FCT 24 (aff. 29a), reflecting the FCTs that were mapped for the surrounding vegetation. However, for the purposes of this assessment this patch has been considered to be FCT 26a as concluded by Biota (2025a).

The Umwelt (2025) assessment determined the patch does not currently support Honeymyrtle TEC; although the patch is likely to have historically hosted the community. The patch does not meet two of the diagnostic characteristics outlined in DCCEEW (2023a). Umwelt (2025) noted a loss of vegetation structure and species diversity, with the vegetation impacted by previous clearing, grazing and displaying a high cover of aggressive weed species. The site is currently narrow and bounded by Anketell Road, Alcoa's Waste Residue Facility and a power line, significantly influencing its potential to be sustainable in the long term. Historical aerial imagery and available information on the site history indicates that the vegetation may have undergone regrowth and regeneration in the past (aided by restoration effort (Umwelt 2025)).

The interim recovery plan (Luu & English 2005) listed several sites that were totally degraded and identified potential original areas of occupation based on soil characteristics and other local occurrences. As the Interim Recovery Plan records the patch condition in the PAA as Degraded, it is possible the site was registered at that time as a potential recovery site considering the site was under the control of Alcoa of Australia who had agreed to undertake recovery actions. However, there is no evidence of recent regeneration, and given the site has had many years to regenerate following the initial disturbance event, it is unlikely to regenerate in the future without intensive ongoing management (Umwelt 2025).

The patch has previously been identified, with the DBCA TEC/PEC database identifying the occurrence as 'ANKETELL01'. However, a recent search of this database (DBCA 2024b) shows this locality has since been removed. Following the review of Umwelt (2025) and receipt of independent expert advice, DBCA advised Main Roads the occurrence at Anketell Road would be deleted from the DBCA TEC Database due to the highly degraded condition of the native understory and due to past attempts at revegetation appearing to be unsuccessful. Based on the Umwelt (2025) study and following correspondence with DBCA it is concluded that the vegetation present within the DE does not support the BC Act listed *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges TEC.

Given there is little to no understorey present, noting a key diagnostic characteristic for this community is "*the ground layer is typically rich with numerous herbs (including grasses) and smaller shrubs and may develop a mossy ground cover*", there is doubt as to whether the patch is in fact the Honeymyrtle TEC. Despite the lack of understorey, DCCEEW has advised that it still considers the patch to be the Honeymyrtle Shrubland TEC, and, accordingly, this PD has considered this patch as a component of the Federally listed TEC but not a component of the State TEC. For the purposes of this PD, the PAA intersects the one patch of Honeymyrtle Shrubland TEC with an extent of 1.94 ha (Table 5.5). Appendix 1, Figure 20 shows the location of the patch within the PAA, the assigned FCT and the condition of the patch.

The RFI requested further information on the fire within the patch of Honeymyrtle Shrubland TEC as the biological report referenced to support the referral incorrectly noted a large portion of the identified patch was burnt to some extent in 2002/2023. Quadrat data for ANK15, ANK 16, WPT05, WPT38, WPT39, and WPT40 noted these areas are "Very long unburnt" or "No sign of recent

fire/Very long unburnt". No evidence of recent fires were recorded in the Honeymyrtle TEC patch or in the surrounding vegetation (Biota 2025a). The current biological report (Biota 2025a) has corrected the estimated fire dates to 2002/2003.

Table 5.5: Honeymyrtle Shrubland TEC patch

Patch ID	Size of patch (ha)	Extent within the PAA (ha)	Condition rating (as per Biota (2025a)	FCT	Comments
ANKETELL01	1.94	1.94	Good (0.19 ha) Degraded (0.39 ha) Completely Degraded (1.37 ha)	FCT26a	Patch intersected by Anketell Road

5.3.4 Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain TEC

5.3.4.1 Description

The Organic Mounds TEC is listed as Endangered TEC under the EPBC Act. The community is the assemblage of plants, animals and other organisms associated with a type of peatland that is found on the SCP in southwest WA. It is an assemblage of plants and invertebrates living on mounds of peat that have accumulated in areas of continuous groundwater discharge at the junction of the Guildford Clays and the Bassendean Sands on the SCP. The peat and surrounds provide a stable, permanently moist series of microhabitats (DCCEEW 2023b).

Key threats to the Organic Mounds TEC identified in the Approved Conservation Advice include clearing, declining groundwater levels, pollution of groundwater, weed invasion and changing fire regimes (DCCEEW 2023b).

Due to its restricted distribution, the area of occupancy of known occurrences, remnant vegetation that surrounds or links occurrences, and the local catchment for the surface and groundwater that maintain occurrences of the community are considered critical to the survival of the Organic Mounds TEC (DCCEEW 2023b).

This community does not occur within the PAA, but a known occurrence is located within the Contextual area, approximately 500 m east of the PAA.

5.3.4.2 Survey effort

The initial data requests made to the DBCA's TEC, PEC and ESAs database, and the EPBC Act Protected Matters database (7 August 2020 for what became the consolidated Biota report) did not return the specific occurrence of the Organic Mounds TEC (Wandi01), as it had not yet been formally accepted into the DBCA database following its survey in 2019.

Biota (2024b) was commissioned to provide information further to Biota (2025a) regarding the regarding the State-listed Critically Endangered 'Communities of Organic Mounds (Organic Mound Springs, Swan Coastal Plain)' TEC, which is synonymous with the EPBC Act Organic Mounds TEC. This desktop assessment was completed in response to DCCEEW's RFI.

5.3.4.3 Regional and local context

The Organic Mounds TEC has been identified in 11 locations from Wellard to Muchea (DCCEEW 2023b) with a geographical distribution of approximately 80 km. The total estimated area of these

11 locations is 26.5 ha. An additional 2.47 ha was identified from DBCA data for the CSQ2 occurrence, bringing the total estimated area to 28.97 ha across the SCP.

To provide local context, the buffered DBCA TEC/PEC database (DBCA 2024b) was queried for a 10 km buffer of the PAA. This identified four known occurrences:

- DuckpondSpring01, 0.7 ha (approximately 7.5 km south east of the PAA)
- Wandi01, 2.6 ha (approximately 500 m east of the PAA)
- Wellard01, 2.7 ha (approximately 6.4 km south east the PAA)
- CSQ2, 2.47 ha (approximately 3.6 km south of the PAA).

Appendix 1, Figure 21 provides mapping of Organic Mounds TEC within 10 km of the PAA.

5.3.4.4 Extent within the PAA and Contextual area

The Organic Mounds TEC does not occur within the PAA. One occurrence, the Wandi01 occurrence is intersected by the Contextual area. This occurrence is surrounded by roads and urban land development including residential housing. The Organic Mounds TEC occurrence is within the mapped boundary of the geomorphic wetland Mandogalup Swamp South (UFI 6530) (DBCA 2024a). This wetland is extensive and occurs over multiple land uses; it may still provide some hydrological function in areas outside of major road infrastructure (i.e. Anketell Road, Kwinana Freeway), however, it is highly modified due to clearing and mixed land use (Stream 2025b).

Appendix 1, Figure 22 provides mapping of Organic Mounds TEC within 10 km of the PAA and other associated buffers.

5.4 Threatened Flora

5.4.1 Grand Spider Orchid (*Caladenia huegelii*)

5.4.1.1 Description

Caladenia huegelii is listed as Endangered under the EPBC Act. This orchid grows up to 60 cm tall with a single erect, pale green, hairy leaf and one or two (rarely three) predominantly pale greenish-cream flowers 7–10 cm across, with variable suffusions, lines and spots of red-maroon (DEC 2008b). It typically flowers from September to October. The sepals end in slender light brown to yellow clubs. It generally occurs on grey or brown sand or clay loam (WA Herbarium 2025).

Threats to *C. huegelii* identified in the Recovery Plan include clearing, weed invasion, grazing, firebreak maintenance, inappropriate fire, recreational activities, dumping of rubbish, disease and poor recruitment (DEC 2008b).

Caladenia huegelii are known to occur approximately 510 m east of the PAA, potentially suitable habitat is present within the PAA, however none were recorded throughout several targeted searches over multiple years within the PAA or Contextual area.

5.4.1.2 Survey effort

Biota (2025a) states that the methodology for detailed and targeted flora surveys was developed with reference to EPA Technical Advice (EPA 2016a), the draft survey guidelines for Australia's Threatened Orchids (DoE 2013a) and the MNES Significant Impact Guidelines 1.1 (DoE 2013b). The targeted flora surveys for *C. huegelii* were also completed with consideration of the Grand Spider Orchid (*Caladenia huegelii*) Recovery Plan (DEC 2008b).

The recovery plan states that "agencies undertaking environmental and/or statutory planning assessments that involve vegetation clearing within the range of *C. huegelii* should consider the

possibility that unknown populations may be present" and that flora surveys should be undertaken during the species flowering period in spring from September to October. Targeted flora surveys have been undertaken yearly in the PAA since September 2020, with the most recent being in September 2024. A total of 224 in person days have been conducted across all flora and vegetation surveys. As included in the Biota (2025a), a targeted *C. huegelii* survey was undertaken from 18 September to 22 September 2022 which covered 126.58 ha of prospective Banksia woodland vegetation units.

Suitable habitat pertaining to *C. huegelii* was searched utilising transects spaced at approximately 5 to10 m. Any *Caladenia* specimens similar in appearance to *C. huegelii* were recorded and photographed for later identification. Orchid identification texts and reference images were used to determine any potential orchid species of significance, with assistance also sought from orchid taxonomy experts/specialists Andrew Brown (ex-DBCA) and Mark Brundrett (University of WA) for identification of images. Locations of any orchid species of significance or unknown taxa were recorded using a Unistrong tablet with a GPS accuracy of +/- 1.5 m. The number of individuals and extent of the population were also recorded.

5.4.1.3 Regional and local context

Caladenia huegelii is found on the SCP within 20 km of the coast, from just north of Perth to the Busselton area over a distance of 250 km. Throughout its range the species tends to favour areas of dense undergrowth. Soil is usually deep grey-white sand usually associated with the Bassendean sand-dune system. However, rare plants have been known to extend into the Spearwood system (in which calcareous yellow sands dominate) in some areas (DEC 2008b).

Caladenia huegelii was currently known from 33 extant populations with surveys conducted in the 2000's and over 1,614 mature plants recorded (DEC 2008b). A search of the WA TPFL (DBCA 2023) identifies six populations with an estimated 77 plants within a 5 km buffer of the PAA. These are shown in Appendix 1, Figure 23 and detailed in Table 5.6.

There are two records at approximately 510 m from the eastern end of the PAA, these are within road reserve and Crown Reserve near Wandi Nature Reserve. The records within 5 km buffer are from 2004 to 2013. Population 59 (six records with 40 plants) occurs within Wandi Nature Reserve / Crown Reserve and is in secured conservation estate. Other populations occur in private property, based on aerial photography the vegetation remains intact at all locations except two.

Table 5.6: Caladenia huegelii desktop locality results for 5 km buffer of PAA

Population ID	Population No.	Abundance	Date recorded	Distance from PAA	Source	Comment
107683	78	3	25/09/2013	515 m north	TPFL	Likely to be removed – aerial shows within housing development
106981	78	2	25/09/2012	800 m north	TPFL	Located on private property, aerial photography indicates vegetation is intact.
114909	59	8	25/09/2012	510 m east	TPFL	Crown Reserve adj. to Wandi Nature Reserve. Vegetation is intact.
97307	59	1	21/09/2004	1 km east	TPFL	Wandi Nature Reserve

Population ID	Population No.	Abundance	Date recorded	Distance from PAA	Source	Comment
97308	59	1*	04/10/2010	1.1 km east	TPFL	Wandi Nature Reserve
97306	59	1	21/09/2004	1.3 km east,	TPFL	Wandi Nature Reserve
97309	59	1	04/10/2004	1.6 km east,	TPFL	Wandi Nature Reserve
97310	59	29	25/09/2012	1.9 km east	TPFL	Wandi Nature Reserve
84970	9	1*	01/10/2004	2.3 km south	TPFL	Located on private property, aerial photography indicates vegetation is intact.
97314	60	3	16/10/2005	3.1 km north-east	TPFL	Located on private property, aerial photography indicates vegetation is intact.
97312	60	6	11/10/2005	3.7 km north-east	TPFL	Located on private property, aerial photography indicates vegetation is intact.
97313	60	11	11/10/2005	3.7 km north-east	TPFL	Located on private property, aerial photography indicates vegetation is intact.
106221	60	5	10/10/2005	3.7 km north-east	TPFL	Likely to be removed - located on private property, aerial photography shows a cleared area
84968	76	1	01/10/2009	3.5 km north-east	TPFL	Located on private property, aerial photography indicates vegetation is intact.
110509	80	4	20/10/2011	4 km north-east	TPFL	Located on private property, aerial photography indicates vegetation is intact.

*Some records have a 0 for abundance it has been assumed that this is an error and should be at least a one count.

5.4.1.4 *Caladenia huegelii* within PAA and Contextual area

Four vegetation units were considered as potential habitat for *Caladenia huegelii* (Biota 2025a) (Table 5.7). Extensive targeted searches were undertaken within these potential *C. huegelii* habitats, and this species was not recorded. It is considered unlikely that *C. huegelii* would be present within the survey area, given that significant spatial and temporal survey effort has been allocated to its detection across a minimum of three seasons (Biota 2025a).

The *C. huegelii* recovery plan (DEC 2008b) states the following areas are critical to the survival of *C. huegelii*:

- Area of occupancy of important populations
- Areas of similar habitat surrounding important populations
- All known habitat and populations for wild and translocated populations.

The habitat present within the PAA is not considered to represent critical habitat for *C. huegelii*, as it does not support an area of occupancy or provide surrounding habitat for an important population. The Wandi Nature Reserve population and population 78 is fragmented from habitat within the PAA by existing land uses and cleared areas.

Potential habitat for *C. huegelii* within the PAA and Contextual area is shown in Appendix 1, Figure 24.

Table 5.7: Areas of suitable habitat for Caladenia huegelii

Unit	Description / Condition rating	Extent within PAA (ha)	Extent within Contextual area (ha)
B1	*Banksia attenuata (B. menziesii)* over *Adenanthos, Jacksonia, Kunzea* with mixed low shrubland over mixed perennial Herbland	0	2.57
B2	*Banksia menziesii (B. attenuata)* over *Xanthorrhoea* spp. with *Hibbertia* and *Conostylis*	6.83	109.34
B3	*Banksia menziesii, B. ilicifolia* over *Kunzea* with occasional *Xanthorrhoea* spp. and *Scholtzia*	0.53	7.47
EB1	*Eucalyptus marginata* (*Banksia* spp.) over *Kunzea* and *Acacia* with *Xanthorrhoea* spp. over *Hibbertia*	7.57	37.16
Sub Total		**14.93**	**156.55**
	Very Good to Excellent	1.12	66.31
	Very Good	2.57	31.80
	Good to Very Good	2.35	19.43
	Good	5.66	28.40
	Degraded to Good	0.17	5.67
	Degraded	2.93	4.81
	Completely Degraded	0.13	0.13
Sub Total		**14.93**	**156.55**

5.4.2 Dwarf Bee Orchid (*Diuris micrantha*)

5.4.2.1 Description

Diuris micrantha, also known as Dwarf Bee-orchid, is listed as Vulnerable under the EPBC Act. This orchid has a basal tuft of narrow, linear leaves and a loose, slender inflorescence up to 60 cm high. The yellow flowers, which can number up to seven, have reddish-brown markings and are the smallest in the genus, measuring up to 1.3 cm across (DEWHA 2008a). Flowers typically appear from August to early October. The species typically occurs on brown loamy clay in inter-wet swamps and shallow water (WA Herbarium 2025).

Diuris micrantha are known to occur within 2.2 km of the PAA, suitable habitat is present within the PAA, however none were recorded throughout several targeted searches over multiple years within the PAA or Contextual area.

5.4.2.2 Survey effort

Biota (2025a) states that the methodology for detailed and targeted flora surveys was developed with reference to EPA Technical Advice (EPA 2016a), the draft survey guidelines for Australia's Threatened Orchids (DoE 2013a) and the MNES Significant Impact Guidelines 1.1 (DoE 2013b). The targeted flora surveys for *D. micrantha* were also completed with consideration of the Approved Conservation Advice for *D. micrantha* (DEWHA 2008a).

The conservation advice notes that flowers appear from August to early October, which would be the optimal time for flora surveys for *D. micrantha*. Targeted flora surveys have been undertaken yearly in the PAA since September 2020, with the most recent being in September 2024. A total of 224 in person days have been conducted across all flora and vegetation surveys. Multiple targeted surveys for the winter-emerging orchid were undertaken in the winter months of 2020, 2021, 2022, and 2023. Targeted surveys for *D. micrantha* were undertaken in prospective Banksia woodland vegetation units within the PAA. Biota (2025a) also conducted targeted searches in dampland areas within the PAA including vegetation units K1 and M1.

Suitable habitat pertaining to *D. micrantha* was searched utilising transects spaced at approximately 5 to10 m. Orchid identification texts and reference images were used to determine any potential orchid species of significance, with assistance also sought from orchid taxonomy experts/specialists Andrew Brown (ex-DBCA) and Mark Brundrett (University of WA) for identification of images. Locations of any orchid species of significance or unknown taxa were recorded using a Unistrong tablet with a GPS accuracy of +/- 1.5 m. The number of individuals and extent of the population were also recorded.

5.4.2.3 Regional and local context

Diuris micrantha occurs within the South West of WA from east of Kwinana and south towards the Frankland area. It is found in small populations, on dark, grey to blackish, sandy clay-loam substrates in winter wet depressions or swamps, with the bases of the flowering plants often covered with shallow water (DEWHA 2008a).

Diuris micrantha was known from seven populations in 2008 (DEWHA 2008a). A search of the WA TPFL (DBCA 2023) identifies two populations with only one record recording abundance within a 5 km buffer of the PAA. These are shown in Appendix 1, Figure 23 and detailed in Table 5.8.

Table 5.8: Diuris micrantha desktop locality results for 5 km buffer of PAA

Population ID	Population No.	Abundance	Date recorded	Distance from PAA	Source	Comment
101444	1		17/10/2019	3.2 km south	TPFL	Located on reserve west of Johnson road - aerial photography indicates vegetation is intact
101445	1	7	23/09/1985 24/09/2002 22/09/2009	3.3 km south	TPFL WA Herb	Located on reserve west of Johnson road - aerial photography indicates vegetation is intact

Population ID	Population No.	Abundance	Date recorded	Distance from PAA	Source	Comment
-	-	Not recorded	09/09/1985	3.2 km south	WA Herb	Located on reserve west of Johnson road - aerial photography indicates vegetation is intact
-	-	Not recorded	24/09/1984	3.4 km south	WA Herb	Located on reserve west of Johnson road - aerial photography indicates vegetation is intact
-	-	Not recorded	18/09/1977	2.2 km south	WA Herb	Located on the roadside of the Kwinana Fwy / Thomas Road offramp - aerial photography indicates vegetation has been cleared.

5.4.2.4 *Diuris micrantha* within PAA and Contextual area

Four vegetation units were considered as potential habitat for *D. micrantha* (Biota 2025a) (Table 5.9). Extensive targeted were undertaken within these potential *D. micrantha* habitats, and this species was not recorded. It is considered unlikely *D. micrantha* would be present within the survey area, given that significant spatial and temporal survey effort has been allocated to its detection across a minimum of three seasons (Biota 2025a).

The *Diuris micrantha* Conservation Advice (DEWHA 2008a) indicates that the critical habitat of *Diuris micrantha* is still being researched, however, the habitat present within the PAA is unlikely to represent critical habitat as it does not support an area of occupancy or provide surrounding habitat for an important population. It is also acknowledged that wetlands would also provide habitat for the species based on the conservation advice. The populations identified in Table 5.8 are fragmented from habitat within the PAA by existing land uses and cleared areas.

Potential habitat for *D. micrantha* within the PAA and Contextual area is shown in Appendix 1, Figure 24.

Table 5.9: Areas of suitable habitat for Diuris micrantha

Unit	Description / Condition rating	Extent within PAA (ha)	Extent within Contextual area (ha)
B1	*Banksia attenuata (B. menziesii)* over *Adenanthos, Jacksonia, Kunzea* with mixed low shrubland over mixed perennial Herbland	0	2.57
B2	*Banksia menziesii (B. attenuata)* over *Xanthorrhoea* spp. with *Hibbertia* and *Conostylis*	6.83	109.34
B3	*Banksia menziesii, B. ilicifolia* over *Kunzea* with occasional *Xanthorrhoea* spp. and *Scholtzia*	0.53	7.47
EB1	*Eucalyptus marginata (Banksia* spp.) over *Kunzea* and *Acacia* with *Xanthorrhoea* spp. over *Hibbertia*	7.57	37.16
Sub Total		**14.93**	**156.55**
	Very Good to Excellent	1.12	66.31

	Very Good	2.57	31.80
	Good to Very Good	2.35	19.43
	Good	5.66	28.40
	Degraded to Good	0.17	5.67
	Degraded	2.93	4.81
	Completely Degraded	0.13	0.13
Sub Total		**14.93**	**156.55**

5.4.3 Glossy-Leaved Hammer Orchid (*Drakaea elastica*)

5.4.3.1 Description

Drakaea elastica is listed as Endangered under the EPBC Act. This orchid has a slender flower stem up to 30 cm high and a single distinctively glossy, bright green, prostrate, heart-shaped leaf 1 to 2 cm in diameter. The leaf emerges in May and starts to wither by the time the orchid flowers in September. The single flower is 3 to 4 cm long with a hinged labellum. Flowers are first seen in late September and continue flowering until late October or more rarely early November. Individual plants may not flower every year. The plant dies back to a dormant underground tuber over summer (DEC 2008c). The species grows on bare patches of white or grey sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps, typically in banksia (*Banksia menziesii*, *B. attenuata* and *B. ilicifolia*) woodland or spearwood (*Kunzea glabrescens*) thicket vegetation (WA Herbarium 2025; DEC 2008c).

Drakaea elastica are known to occur within 600 m of the PAA, suitable habitat is present within the PAA, however none were recorded throughout several targeted searches over multiple years within the PAA or Contextual area.

5.4.3.2 Survey effort

Biota (2025a) states that the methodology for detailed and targeted flora surveys was developed with reference to EPA Technical Advice (EPA 2016a), the draft survey guidelines for Australia's Threatened Orchids (DoE 2013a) and the MNES Significant Impact Guidelines 1.1 (DoE 2013b). The targeted flora surveys for *D. elastica* were also completed with consideration of the Glossy-leafed Hammer Orchid *(D. elastica)* Recovery Plan (DEC 2008c).

The recovery plan notes that the leaf emerges in May and starts to wither by the time the orchid flowers in September, which would be the optimal time for flora surveys for *D. elastica*. Targeted flora surveys have been undertaken yearly in the PAA since September 2020, with the most recent being in September 2024. A total of 224 in person days have been conducted across all flora and vegetation surveys. Multiple targeted surveys for the winter-emerging orchid were undertaken in the winter months of 2020, 2021, 2022, and 2023. Targeted surveys for *D. elastica* were undertaken in prospective Banksia woodland vegetation units within the PAA.

Suitable habitat pertaining to *D. elastica* was searched utilising transects spaced at approximately 5 to10 m. Orchid identification texts and reference images were used to determine any potential orchid species of significance, with assistance also sought from orchid taxonomy experts/specialists Andrew Brown (ex-DBCA) and Mark Brundrett (University of WA) for identification of images. Locations of any orchid species of significance or unknown taxa were recorded using a Unistrong

tablet with a GPS accuracy of +/- 1.5 m. The number of individuals and extent of the population were also recorded.

5.4.3.3 Regional and local context

Drakaea elastica is currently known only from the SCP over a range of approximately 350 km between Cataby in the north and Busselton in the south. The species grows on bare patches of grey-white sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps and flats, typically in banksia woodland or spearwood thicket vegetation (DEC 208c).

Drakaea elastica was known from forty-two populations in 2009, twenty-seven of which contain fewer than fifteen plants. More than half of all known plants are located in just one population, while almost 90% of plants occur within seven populations (DEC 2008c). A search of the WA TPFL (DBCA 2023) and WAHERB database (WA Herbarium 2023) identifies three populations (Population IDs 97391, 97392 and 97393 considered one population) within a 5 km buffer of the PAA. These are shown in Appendix 1, Figure 23 and detailed in Table 5.10.

Table 5.10: Drakaea elastica desktop locality results for 5 km buffer of PAA

Population ID	Population No.	Abundance	Date recorded	Distance from PAA	Source	Comment
97391	2	Not recorded	28/07/2005	600 m south east	TPFL	Located on private property, aerial photography indicates vegetation is intact. TPFL states "Extinct - cleared for housing"
97392	2	Not recorded	28/07/2005	600 m south east	TPFL	Located on private property, aerial photography indicates vegetation is intact. TPFL states "Extinct - cleared for housing"
97393	2	Not recorded	28/07/2005	700 m south east	TPFL	Located on private property, aerial photography indicates vegetation is intact. TPFL states "Extinct - cleared for housing"
85074	31	Not recorded	17/08/2012	2.7 km north east	TPFL	Located on private property, aerial photography indicates vegetation is intact.
-	-	60	28/10/1982	1.4 km east	WA Herb	Located on private property, aerial photography indicates vegetation is intact.

5.4.3.4 *Drakaea elastica* within PAA and Contextual area

Four vegetation units were considered as potential habitat for *D. elastica* (Biota 2025a) (Table 5.11). Extensive targeted were undertaken within these potential *D. elastica* habitats and this species was

not recorded. It is considered unlikely that *D. elastica* would be present within the survey area, given that significant spatial and temporal survey effort has been allocated to its detection across a minimum of three seasons (Biota 2025a).

The *D. elastica* recovery plan (DEC 2008c) states that the following areas are critical to the survival of *D. elastica*:

- Area of occupancy of important populations
- Areas of similar habitat surrounding important populations
- Additional occurrences of similar habitat that may contain important populations of the species or be suitable sites for future translocations or other recovery actions
- All known habitat and populations for wild and translocated populations

The habitat present within the PAA is not considered to represent critical habitat for *D. elastica*, as it does not support an area of occupancy or provide surrounding habitat for an important population. Population 2 is marked as extinct by DBCA (2023), whereas population 31 and the population 1.4 km east is fragmented from habitat within the PAA by existing land uses and cleared areas.

Potential habitat for *D. elastica* within the PAA and Contextual area is shown in Appendix 1, Figure 24.

Table 5.11: Areas of suitable habitat for Drakaea elastica

Unit	Description / Condition rating	Extent within PAA (ha)	Extent within Contextual area (ha)
B1	*Banksia attenuata (B. menziesii)* over *Adenanthos, Jacksonia, Kunzea* with mixed low shrubland over mixed perennial Herbland	0	2.57
B2	*Banksia menziesii (B. attenuata)* over *Xanthorrhoea* spp. with *Hibbertia* and *Conostylis*	6.83	109.34
B3	*Banksia menziesii, B. ilicifolia* over *Kunzea* with occasional *Xanthorrhoea* spp. and *Scholtzia*	0.53	7.47
EB1	*Eucalyptus marginata* (*Banksia* spp.) over *Kunzea* and *Acacia* with *Xanthorrhoea* spp. over *Hibbertia*	7.57	37.16
Sub Total		**14.93**	**156.55**
	Very Good to Excellent	1.12	66.31
	Very Good	2.57	31.80
	Good to Very Good	2.35	19.43
	Good	5.66	28.40
	Degraded to Good	0.17	5.67
	Degraded	2.93	4.81
	Completely Degraded	0.13	0.13
Sub Total		**14.93**	**156.55**

5.4.4 Purdie's Donkey Orchid (*Diuris purdiei*)

5.4.4.1 Description

Diuris purdiei is listed as Endangered under the EPBC Act. *Diuris purdiei*, commonly known as Purdie's Donkey-orchid, is a slender, terrestrial orchid growing up to 45 cm tall. This species has unusual, flattened flowers, which are prominently marked with brown blotches on their under surface. Flowering occurs from late September to mid-October, but only after a summer or early autumn fire (DEWHA 2008b). It typically grows on grey-black sand to sandy clay soils, in areas subject to winter inundation, and amongst native sedges and dense heath with scattered emergent *Melaleuca preissiana*, *Eucalyptus calophylla*, *E. marginata* and *Nuytsia floribunda* (WA Herbarium 2025; DEWHA 2008b)

Diuris purdiei are known to occur within 5 km of the PAA, suitable habitat is present within the PAA, however none were recorded throughout several targeted searches over multiple years within the PAA or Contextual area.

5.4.4.2 Survey effort

Biota (2025a) states that the methodology for detailed and targeted flora surveys was developed with reference to EPA Technical Advice (EPA 2016a), the draft survey guidelines for Australia's Threatened Orchids (DoE 2013a) and the MNES Significant Impact Guidelines 1.1 (DoE 2013b). The targeted flora surveys for *D. purdiei* were also completed with consideration of the Approved Conservation Advice for *D. purdiei* (DEWHA 2008b).

The conservation advice notes that flowers appear from late September to mid-October, which would be the optimal time for flora surveys for *D. purdiei*. Targeted flora surveys have been undertaken yearly in the PAA since September 2020, with the most recent being in September 2024. A total of 224 in person days have been conducted across all flora and vegetation surveys. Targeted surveys for *D. purdiei* were undertaken in prospective Banksia woodland vegetation units within the PAA.

Suitable habitat pertaining to *D. purdiei* was searched utilising transects spaced at approximately 5 to10 m. Orchid identification texts and reference images were used to determine any potential orchid species of significance, with assistance also sought from orchid taxonomy experts/specialists Andrew Brown (ex-DBCA) and Mark Brundrett (University of WA) for identification of images. Locations of any orchid species of significance or unknown taxa were recorded using a Unistrong tablet with a GPS accuracy of +/- 1.5 m. The number of individuals and extent of the population were also recorded.

5.4.4.3 Regional and local context

Diuris purdiei occurs in Western Australia, from Perth south to near the Whicher Range, within the Swan (Western Australia) Natural Resource Management Region. The species has been successfully propagated at Kings Park Botanic Garden (DEWHA 2008b).

Florabase indicates that *D. purdiei* is currently known from 16 locations (WA Herbarium 2025). A search of the WA TPFL (DBCA 2023) identifies one population within a 5 km buffer of the PAA. This is shown in Appendix 1, Figure 23 and detailed in Table 5.12.

Table 5.12: Diuris purdiei desktop locality results for 5 km buffer of PAA

Population ID	Population No.	Abundance	Date recorded	Distance from PAA	Source	Comment
85052	5	Not recorded	14/01/2004	4.8 km east	TPFL	Crown Freehold - Dept Managed, reserve

5.4.4.4 Diuris purdiei within PAA and Contextual area

Four vegetation units were considered as potential habitat for *D. purdiei* (Biota 2025a) (Table 5.13). Extensive targeted were undertaken within these potential *D. purdiei* habitats and this species was not recorded. It is considered unlikely that *D. purdiei* would be present within the PAA, given that significant spatial and temporal survey effort has been allocated to its detection across a minimum of three seasons (Biota 2025a).

The *D. purdiei* Conservation Advice (DEWHA 2008b) does not outline the critical habitat of *D. purdiei*, however, the habitat present within the PAA is unlikely to represent critical habitat as it does not support an area of occupancy or provide surrounding habitat for an important population. Populations 5 is fragmented from habitat within the PAA by existing land uses and cleared areas.

Potential habitat for *D. purdiei* within the PAA and Contextual area is shown in Appendix 1, Figure 24.

Table 5.13: Areas of suitable habitat for Diuris purdiei

Unit	Description / Condition rating	Extent within PAA (ha)	Extent within Contextual area (ha)
B1	*Banksia attenuata (B. menziesii)* over *Adenanthos, Jacksonia, Kunzea* with mixed low shrubland over mixed perennial Herbland	0	2.57
B2	*Banksia menziesii (B. attenuata)* over *Xanthorrhoea* spp. with *Hibbertia* and *Conostylis*	6.83	109.34
B3	*Banksia menziesii, B. ilicifolia* over *Kunzea* with occasional *Xanthorrhoea* spp. and *Scholtzia*	0.53	7.47
EB1	*Eucalyptus marginata (Banksia* spp.) over *Kunzea* and *Acacia* with *Xanthorrhoea* spp. over *Hibbertia*	7.57	37.16
Sub Total		**14.93**	**156.55**
	Very Good to Excellent	1.12	66.31
	Very Good	2.57	31.80
	Good to Very Good	2.35	19.43
	Good	5.66	28.40
	Degraded to Good	0.17	5.67
	Degraded	2.93	4.81
	Completely Degraded	0.13	0.13
Sub Total		**14.93**	**156.55**

5.5 Threatened Fauna

5.5.1 Black cockatoos (*Zanda latirostris* and *Calyptorhynchus banksii naso*)

In the assessment, CBC and FRTBC have been grouped together as 'Black Cockatoos'.

5.5.1.1 Description

CBC is listed as Endangered under the EPBC Act. It is a large, mostly black bird with white cheek patches, large white panels on the tail and a curved beak (DPaW 2013). CBC are a very mobile species with movements throughout the year determined by nesting and feeding. From early summer through autumn to winter the species live in higher rainfall coastal or near coastal areas in large flocks. July is the beginning of the move back out to Wheatbelt in search of suitable nesting hollows. Up to 12 km is a reasonable distance for the species to fly from the hollow in search of food and they are assisted in their navigation between sites by corridors or patches of vegetation (DPaW 2013).

Key threats to CBC include loss of breeding, foraging and night roosting habitat, tree health, illegal shooting and taking, climate change, collisions with motor vehicles and disease (DPaW 2013).

Habitat critical to the survival of CBC is summarised by DPaW (2013) as:

- The eucalypt woodlands that provide nest hollows used for breeding, together with nearby vegetation that provides feeding, roosting and watering habitat that supports successful breeding
- Woodland sites known to have supported breeding in the past and which could be used in the future, provided adequate nearby food and/or water resources are available or are re-established
- In the non-breeding season, the vegetation that provides food resources as well as the sites for nearby watering and night roosting that enable the cockatoos to effectively utilise the available food resources.

FRTBC is listed as Vulnerable under the EPBC Act. It is a large, mostly glossy black bird with a pair of black central tail feathers, a crest, robust beak and bright red, orange and yellow barring in the tail (DEC 2008a). The movements of FRTBC are irregular and they can now be found on the SCP at any time of year in search of food. The species leave roosts at sunrise and feed in small family groups of up to 10 birds, usually within 4 km of the roost. The young of the species are fed by the parents for three to four months after fledging (DEC 2008a).

Key threats to FRTBC include killing by illegal shooting, feral Honeybees *Apis mellifera*, habitat loss, nest hollow shortage and competition for available nest hollows. Climate change is an additional threat that is likely to exacerbate the threatening processes (DEC 2008a).

Habitat critical to the survival of FRTBC is summarised by DEC (2008a) as areas:

- Areas currently occupied by the FRTBC
- Areas not currently occupied by the FRTBC due to recent fire but capable of supporting cockatoo populations when sufficiently recovered
- Areas of natural vegetation in which the FRTBC nest, feed and roost;
- Areas of natural vegetation through which the FRTBC can move from one occupied area to another

- Areas of suitable vegetation within the recorded range in which undiscovered FRTBC populations may exist.

5.5.1.2 Survey effort

Biota (2025a) states that the methodology for black cockatoo surveys was developed with reference to EPA Technical Advice (EPA 2020), the referral guideline for three WA threatened black cockatoo species (DAWE 2022), EPBC Act referral guidelines for three threatened black cockatoo species (DSEWPaC 2012a), EPA Technical Report (EPA 2019) and Survey Guidelines for Australia's Threatened Birds (DEWHA 2010). The targeted black cockatoo surveys for CBC and FRTBC were also completed with consideration of the CBC Recovery Plan (DPaW 2013) and the FRTBC Recovery Plan (DEC 2008a).

The black cockatoo field surveys were undertaken by suitably qualified and experienced personnel, in September and October during 2020, 2022 and 2023. No site access limitations were reported by Biota (2025a). Targeted black cockatoo surveys identified, described and mapped breeding, foraging and roosting habitat as well as presence or evidence of black cockatoos within the PAA and surrounds. The timing of the surveys was within the broad breeding timing for the target black cockatoo species and so would have afforded opportunity to detect breeding if it were occurring (Biota 2025a). While foraging individuals are less likely to be present in September and October, foraging can be detected from secondary evidence (i.e. chews) and such evidence can persist for many months and in some cases years (Biota 2025a).

A follow up survey of hollow bearing trees to assess Black Cockatoo nesting value and provide further information on the suitability of hollows was undertaken by ABCS in October 2024. The assessment included performing close visual inspections using a high-resolution 14m camera pole and telephoto lens, capturing high-resolution photographs of each hollow's nesting activity and condition, analysing the photos to assess each hollow's suitability for nesting and recording details of any current usage by both target (Black Cockatoos) and non-target species. ABCS (2024) successfully located all trees within the PAA, however, access to three trees was not granted (Tree IDs 187, 188 and 270).

Black cockatoo foraging habitat quality within the PAA was rated using the draft HQS system for WA black cockatoo foraging habitat provided by DCCEEW. Considering comments, limitations and other assessment methods, Main Roads have determined that the BCE foraging habitat scoring system (BCE 2020) is more appropriate for use for the Proposed action. The BCE system has four components: site condition, site context and species density (stocking rate) to calculate an overall score out of 10 and a moderation component. The calculated numerical foraging value score reflects the significance of vegetation as foraging habitat for Black Cockatoos (BCE 2020). CBC and FRTBC foraging habitat quality within the PAA is presented in GHD (2025).

For significant species potentially occurring (including black cockatoos), Biota (2025a) gave additional consideration of habitat availability and types within their survey area against the definitions below:

- "core" – equivalent to "habitat critical to the survival of the species" as per Department of the Environment (2013b). This comprised habitat considered to potentially contain roosting, denning or breeding sites, primary foraging areas, or refugia during drought, fire or other stress; or
- "secondary" – habitats which may be used on a transitory, dispersing or occasional basis and for secondary foraging but does not represent core habitat.

It is noted that black cockatoo foraging habitat reported in this PD has been determined using the BCE foraging habitat scoring system (BCE 2020), is inclusive of (and does not give weight to) previously defined core and secondary foraging habitat.

5.5.1.3 Regional and local context

CBC is endemic to the south west of WA and have a widespread distribution extending into the Wheatbelt north to Kalbarri and east to Esperance (DPaW 2013). The species is highly mobile and displays a seasonal migratory pattern that is linked to breeding. Breeding takes place between late July and December and most breeding occurs in the inland parts of the species distribution. During the non-breeding season (January to July) most of the birds move to the higher rainfall coastal regions of their range including the midwest coast, SCP and south coast (DPaW 2013).

FRTBC is endemic to the south west humid and sub-humid zones of WA (DEC 2008a). They generally occur within forested areas south east of Perth to Albany, however in recent years their distribution has expanded on to the SCP north to around Mindarie (DEWHA 2009). Breeding on the SCP may occur in some locations containing suitable breeding tree species, including the Perth metropolitan area. FRTBC may breed at any time of the year, with peaks in April to June and August to October (DAWE 2022).

The CBC total population was estimated in the 1980s to be between 11,000 and 60,000 individuals, and in 2010 to be 40,000 individuals, and is considered to exist as one large, interconnected population (DPaW 2013). FRTBC occurs in one population of approximately 15,000 individuals (DEWHA 2009).

5.5.1.3.1 Breeding habitat

CBC nest in hollows in live or dead trees of Salmon Gum, Wandoo, Tuart, Jarrah, Flooded Gum, York Gum, Powderbark, Karri and Marri with a hollow depth ranging from 0.5 to over 2 m (Saunders 2015). The PAA falls within the known non-breeding range of CBC, but outside of the species known modelled breeding range (DAWE 2022).

FRTBC nest in hollows in live or dead trees of Marri, Karri, Wandoo, Bullich, Swan River Black Blackbutt, Tuart and Jarrah with a hollow depth ranging from 1 -5 m. The PAA falls within the likely to occur distribution range of FRTBC (DAWE 2022).

There are no known black cockatoo breeding locations within 12 km of the PAA (BirdLife 2025.)

5.5.1.3.2 Roosting habitat

CBC roost generally in or near riparian environments or natural and artificial permanent water sources. Any tall trees may provide roosting habitat, including Flat-topped Yate (*E. occidentalis*), Salmon Gum, Wandoo, Marri, Karri, Blackbutt, Tuart, introduced eucalypts and introduced pines (DAWE 2022). Any tall trees may provide roosting habitat for FRTBC, but particularly tall Jarrah, Marri, Blackbutt, Tuart and introduced eucalypt trees or large trees on the edges of forests (DAWE 2022).

Twenty-eight roost sites were returned from the BirdLife Australia data from a 12 km radius of the PAA (BirdLife Australia 2025) (Appendix 1, Figure 25). These sites are located north, east and south of the PAA and includes 10 white-tailed black cockatoo roosts, 10 joint roosts (white-tailed black cockatoos and FRTBC), 6 unconfirmed roosts and two roost sites which have since been cleared. The closest roosting site occurs approximately 2.5 km south of the eastern end of the PAA in Marri Park Golf Course. This represents a roost site for CBC and FRTBC first observed in 2010.

5.5.1.3.3 Foraging habitat

The Proposed action is surrounded by approximately 10,260.74 ha of potential CBC foraging habitat and approximately 9,414.19 ha of potential FRTBC foraging habitat within 12 km of the PAA. Of this potential foraging habitat, approximately 6,009 ha lies within reserved lands (in Bush Forever and/or DBCA managed lands). Appendix 1, Figure 26 and Figure 27 provide mapping of potential CBC and potential FRTBC foraging habitat within 12 km of the PAA. Appendix 3 provides details on the methods used for determining the extent of potential CBC and potential FRTBC foraging habitat within 12 km of the PAA.

5.5.1.4 CBC and FRTBC within PAA and Contextual area

5.5.1.4.1 Breeding habitat

No Black Cockatoo breeding activity nor definitive evidence of breeding was observed within the PAA during the Biota surveys (Biota 2025a).

There is a total of 592 suitable DBH trees within the PAA, this includes 590 trees recorded by Biota (2025a) and two trees recorded by ABCS (2024). Of these 592 trees, eight trees contained eight hollows suitable for use by Black Cockatoos, including:

- six trees recorded by Biota (2025a) and assessed by ABCS (2024) as containing six hollows suitable for use by Black Cockatoos.
- one tree recorded by Biota (2025a) containing one potential hollow, which could not be accessed by ABCS (2024) and was rated as Unknown (Tree ID 270).
- one tree recorded and assessed by ABCS (2024) as containing one hollow suitable for use by Black Cockatoos.

Two trees recorded by Biota (2025a) that could not be assessed by ABCS (2024) and were rated as Unknown (Tree ID 187) and Unlikely (Tree ID 188) were not considered to contain suitable hollows and have not been included in the tree and hollow totals above.

Suitable DBH trees with hollows suitable for use by black cockatoos are summarised in Table 5.14. The suitable DBH trees within the PAA are shown in Appendix 1, Figure 28.

Table 5.14: Summary of suitable DBH trees with hollows suitable for black cockatoos within the PAA

Tree ID	Species	DBH	Hollow no.	Suitability	Comments (ABCS 2024)
186	Jarrah	610	3	Yes	Fragile dead stag. Top hollow too small, Middle hollow duck eggs, suitable size for black cockatoos, lower hollow some duck down however too shallow. No sign of black cockatoo use.
269	Eucalyptus	960	1	Yes	Duck eggs and down. One suitable black cockatoo hollow.
275	Eucalyptus	1270	1	Yes	Dead stag, one hollow that joins other, one suitable size for black cockatoos.
281	Tuart	1160	2	Yes	Little Corella flushed from upper hollow. Brooding four nestlings, Suitable black cockatoo hollow (one).
459	Tuart	1230	1	Yes	Upper hollow Suitable for black cockatoos, small amount of duck down.

Tree ID	Species	DBH	Hollow no.	Suitability	Comments (ABCS 2024)
460	Jarrah	1210	1	Yes	Middle hollow suitable size black cockatoo hollow, suspect all hollows are joined together.
270	Jarrah	710	1	Unknown	Unable to get access to land. Unable to get Drone close enough to assess potential hollow.
187	Jarrah	1150	1	Unknown	Unable to get access to land. Drone photos not conclusive. Galah's prospecting in the upper and middle hollows. Bees in lower hollow. Biota (2025) categorised this tree as being a suitable DBH tree with a marginally unsuitable hollow with no signs of use.
188	Jarrah	710	1	Unlikely	No access to area. From the size (DBH of 710) of the tree and hollow entries (burnt) viewed by 500mm lens camera it is unlikely to have suitable black cockatoo hollows.
AI02	Tuart	1001	1	Yes	Chipping on entry most like Corella or Galah. One suitable black cockatoo hollow.

5.5.1.4.2 Roosting habitat

No evidence of roosting was recorded within the PAA and no roosting habitat has been mapped within the PAA by Biota (2025a).

A portion of the PAA intersects the northernmost fringes of the Spectacles Wetland, which represents a significant permanent water source in proximity to the PAA. The larger Tuart and Jarrah trees bordering this wetland represent some of the most prospective roosting habitat in the Contextual area.

5.5.1.4.3 Foraging habitat

Foraging evidence for FRTBC was recorded from the Biota surveys within the Jarrah/Banksia woodland fauna habitat type in the PAA (Biota 2025). Foraging resources for Black Cockatoo species are available within the PAA.

Table 5.15 summarises the CBC and FRTBC foraging habitat quality within the PAA using the BCE system. The extent of CBC foraging habitat within the PAA (based on the BCE system) is shown in Appendix 1, Figure 29 and the extent of FRTBC foraging habitat within the PAA (based on the BCE system) is shown in Appendix 1, Figure 30.

There is 56.98 ha of foraging habitat for CBC within the PAA based on the BCE system (GHD 2025). This includes 16.58 ha of Moderate or Moderate – High foraging habitat and 40.40 ha of Low – Moderate foraging habitat. The CBC foraging habitat included *Banksia* dominated communities or where *Banksia* species were present in the mid-storey with Eucalyptus species present in the overstorey (GHD 2025). The CBC foraging habitat within the PAA is considered critical habitat based on the definition in DPaW (2013) and is located in a critical foraging area (on the SCP) based on the referral guideline for 3 WA threatened black cockatoo species (DAWE 2022).

There is 38.34 ha of foraging habitat for FRTBC within the PAA based on the BCE system (GHD 2025). This includes 7.57 ha of Moderate – High foraging habitat and 30.77 ha of Low – Moderate foraging habitat. The FRTBC foraging habitat included two vegetation units, E1 that contained occasional *Eucalyptus marginata* subsp. *marginata* in the overstory and EB1 that was dominated by

Eucalyptus marginata subsp. *marginata* in the overstorey (GHD 2025). The FRTBC foraging habitat within the PAA is considered critical habitat based on the definition in DEC (2009).

Table 5.15: CBC and FRTBC foraging habitat quality scores using the BCE system (GHD 2025)

BCE system quality score	Habitat area (ha): CBC	Habitat area (ha): FRTBC
7 (Moderate – High)	7.57	7.57
6 (Moderate)	7.36	-
5 (Moderate)	1.65	-
4 (Low – Moderate)	40.40	30.77
Total	**56.98**	**38.34**

The RFI also requests the DCCEEW HQS system; Table 5.16 summarises the CBC and FRTBC foraging habitat within the PAA using the DCCEEW HQS system. It is considered that this foraging model grossly mis-represents the value of foraging habitat by automatically assigning a score of 3 to any vegetation being considered, due to the site context scoring. For example, according to DCCEEW's HQS, a mowed school oval in the south west of WA will be assigned a score of 3 despite having zero actual foraging value as every oval is "within 12 km of other foraging resources." As such, using DCCEEW's HQS, despite have zero foraging habitat present, 82.26 ha of the PAA is considered to have a habitat quality score of 3.

Table 5.16: CBC and FRTBC foraging habitat quality scores using the DCCEEW HQS system (Biota 2025a)

Site condition	Site context	Overall Score	Habitat area (ha): CBC	Habitat area (ha): FRTBC
0. No potential sources of food	3. Site is within 12 km of other foraging resources with site condition of at least 3.	3	82.26	82.26
1. Negligible to Low	3. Site is within 12 km of other foraging resources with site condition of at least 3.	4	85.59	104.22
2. Low	3. Site is within 12 km of other foraging resources with site condition of at least 3.	5	40.40	30.78
4. Moderate	3. Site is within 12 km of other foraging resources with site condition of at least 3.	7	9.01	-
7. Very High	3. Site is within 12 km of other foraging resources with site condition of at least 3.	10	7.57	7.57
Total			**224.83**	**224.83**

5.5.2 Chuditch (*Dasyurus geoffroii*)

5.5.2.1 Description

The Chuditch (*Dasyurus geoffroii*) is listed as Vulnerable under the EPBC Act. At maturity, the Chuditch is about the size of a small domestic cat, males weighing an average of 1.3 kg and females an average of 0.9 kg. It is the largest carnivorous marsupial (family Dasyuridae) occurring in WA. The Chuditch is distinguishable from other mammals within its present range by its white spotted brown pelage, large rounded ears, pointed muzzle, large dark eyes and a non-hopping

gait. The tail is about three quarters of the head and body length and has a black 'brush' over the dorsal surface of the distal portion (DEC 2012).

Key threats to the Chuditch include land clearing and habitat alteration including the removal of suitable den logs and den sites from Chuditch habitat, introduction of fauna (mainly fox and cats) leading to predation and deliberate or accidental injury or death from vehicle collision, poisoning, trapping and illegal shooting (DEC 2012).

5.5.2.2 Survey effort

Biota (2025a) provides information on the consolidated survey effort. All surveys were undertaken in accordance with the EPA Technical Advice (EPA 2020). Biota (2025a) completed targeted surveys for significant fauna including active searches for individuals and secondary evidence, deployment of motion cameras and recording of opportunistic observations. Motion-sensor cameras were deployed within favourable habitat types for Quenda, Western Brush Wallaby and Chuditch (127 camera-nights in total). Surveys were carried out within the spring months of 2020, 2022 and 2023, with no survey limitations noted.

A separate targeted Chuditch survey was completed to assess the likelihood of occurrence within the PAA and whether any occurrence is likely to be as resident individuals utilising core habitat, or transitory use of secondary habitat types (Biota 2024a). Long-term cameras were deployed at 11 sites between January 2024 and February 2024, with cameras remaining on site until 18 June 2024. Five cameras were located within the PAA for total of 621 trap-nights, with the remaining six cameras placed within nearby Jandakot Regional Park and Beeliar Regional Park for a total of 630 trap nights. The camera trapping program was timed to span the periods of greatest movements of individuals when young disperse from dens in late summer and the mating season when males search for females from April through to June (Biota 2024a).

5.5.2.3 Regional and local context

The Chuditch formerly ranged across nearly 70 percent of the continent, occurring in every mainland State and Territory. Free-ranging populations of Chuditch are now restricted to WA, within an estimated 5% of their former range. The total Chuditch population as of 2007 was estimated to be less than 10,000 individuals with an estimated 75% of these occurring in the eucalypt forests and woodlands, and mallee heath and shrublands of the south-west and south coast of WA. There are also occasional records from drier woodland and mallee shrubland in the Wheatbelt and Goldfield Regions (DEC 2012).

Chuditch have historically been present in a large variety of habitats. Some key aspects are required for Chuditch survival in an area, these include adequate den resources (e.g. hollow logs, burrows or rock crevices), adequate prey resources (particularly large invertebrates) and sizeable areas (> 20 000 ha.) (DEC 2012). Chuditch need large natural areas because of their large home ranges and resource requirements. Corridors of retained vegetation are also important to Chuditch as links between larger reserves (DEC 2012).

A search of the WA Fauna database (DBCA 2024c) identified 11 records of Chuditch within a 15 km buffer of the PAA. These are shown in Appendix 1, Figure 31 and detailed in Table 5.17. The records within the 15 km buffer are from 1974 to 2017. Two records of Chuditch are within 3 km of the PAA. This includes one record from 2009 at the Wandi Nature Reserve, approximately 2.4 km east-northeast of the PAA and the other from 2013 at Beeliar Conservation Park, located south adjacent to the eastern part of the PAA. The other records are located at Lowlands Nature Reserve and on

private property on the eastern edge of the SCP. Three of the records are located within cleared residential areas.

Table 5.17: Chuditch desktop locality results for 15 km buffer of PAA

ID	Observation Method	Observation Type	Date recorded	Distance from PAA	Source	Comment
124214	Certain	Survey	18/07/2013	200 m south	FAUNA SURVEY	Beeliar Conservation Park
1078	Certain	Targeted survey	01/07/1995	13.28 km east	TFAUNA	Likely to be removed – aerial shows within housing development
3090	Certain	Survey	05/05/2000	12.68 km south east	TFAUNA	Lowlands Nature Reserve
6783	Certain	Survey	28/04/2000	13.35 km south east	TFAUNA	Lowlands Nature Reserve
6784	Certain	Survey	29/04/2000	12.39 km south east	TFAUNA	Lowlands Nature Reserve
16557	Certain	Survey	24/03/2009	2.36 km east	TFAUNA	Wandi Nature Reserve Located on private property, aerial photography indicates vegetation is intact.
19146	Certain	Opportunistic sighting	26/01/2010	14.07 km south east	TFAUNA	Located on private property, aerial photography indicates vegetation is intact.
89665	Very Certain	Monitoring	11/04/2017	14.64 km south	TFAUNA	Lowlands Nature Reserve
92903	Very Certain	Monitoring	06/10/2017	14.64 km south	TFAUNA	Lowlands Nature Reserve
96518	Certain	Survey	01/01/1974	13.92 km north east	TFAUNA	Likely to be removed – aerial shows within housing development
261539	WAM Vouchered	Collection	17/05/1994	14.64 km north east	WAM Mammal Collection	Likely to be removed – aerial shows within housing development

It is estimated there is approximately 1,180.41 ha of potential Chuditch habitat within 15 km of the PAA. This habitat is restricted to large reserves on the SCP including Beeliar Conservation Park and Lowlands Nature Reserve. Appendix 1, Figure 31 provides mapping of potential Chuditch habitat and historical records within 15 km of the PAA. Appendix 3 provides details on the methods used for determining the extent of potential Chuditch habitat within 15 km of the PAA.

There are four ecological corridors within 15 km of the PAA (Appendix 1, Figure 31). These include:

- A corridor that runs north-south of the PAA and includes Mandogalup Road Bushland (Bush Forever Site no. 268) and The Spectacles (Bush Forever Site no. 269 and part of Beeliar Regional

Park). This corridor is already fragmented by the existing Anketell Road. Beyond these bushland areas north and south, the corridor is fragmented by industrial and residential areas as well as a train line. This corridor forms part of Link ID 50 (as defined in Perth Regional Ecological Linkages, WALGA 2004). There is no ecological corridor connecting Mandogalup Road Bushland or The Spectacles to Lowlands Nature Reserve or bushland on the eastern side of the SCP or the Darling Scarp.

- A corridor that runs west-east of the PAA from The Spectacles (Bush Forever Site no. 269) and parts of Beeliar Regional Park to Wandi Nature Reserve and Jandakot Regional Park through existing bushland and semi-rural properties. This corridor is fragmented by the existing Kwinana Freeway which is a major barrier to fauna movement. This corridor forms part of Link ID 59 (as defined in Perth Regional Ecological Linkages, WALGA 2004). There is no ecological corridor connecting Jandakot Regional Park to Lowlands Nature Reserve or bushland on the eastern side of the SCP or the Darling Scarp.
- A corridor approximately 1.8 km south of the PAA that runs north-south connecting bushland south of Thomas Road, Leda Nature Reserve and Rockingham Lakes Regional Park. This corridor is fragmented by major roads including Mandurah Road and train lines. This corridor forms part of Link ID 76 (as defined in Perth Regional Ecological Linkages, WALGA 2004).
- A corridor approximately 12 km south of the PAA that runs west-east connecting Lowlands Nature Reserve to bushland on the eastern side of the SCP and the Darling Scarp via the Serpentine River. This corridor forms part of Link ID 71 (as defined in Perth Regional Ecological Linkages, WALGA 2004).

5.5.2.4 Chuditch within PAA and Contextual area

Three fauna habitat types were previously considered as secondary habitat for the Chuditch (Biota 2025a) (Table 5.18). Biota (2025a) defined secondary habitat as habitat which may be used on a transitory, dispersing or occasional basis and for secondary foraging, but does not represent core habitat. All of the potential habitat for the Chuditch within the PAA and surrounding Contextual area was considered low quality habitat. This is due to the vegetation occurring as narrow strips and/or small fragmented patches mostly in flat areas, varying in condition and lacking adequate den resources (e.g. hollow logs, burrows or rock crevices). It is also assumed to have moderate to high levels of predator species due to its location in the Perth Metropolitan area.

The Chuditch was not recorded during the targeted surveys in the PAA or surrounds for the Proposed Action (Biota 2024a, 2025a). It is considered highly unlikely that the Chuditch occurs or utilises the PAA as a thoroughfare with no evidence of a population occurring even in the larger reserves nearby, Jandakot Regional Park and Beeliar Regional Park. There are no ecological corridors connecting the PAA or Contextual area to Lowlands Nature Reserve or bushland on the eastern side of the SCP or the Darling Scarp where Chuditch are known to occur. Though Chuditch once occurred in areas now associated with the PAA and its surrounds, given it is now unlikely to occur and given the lack of connection to existing Chuditch populations, the Banksia Woodland, Eucalypt Woodland/Forest and Jarrah/Banksia Woodland within the PAA is not considered Chuditch habitat.

Table 5.18: Areas previously considered potential habitat for Chuditch

Fauna habitat type	Corresponding Vegetation Units	Area in PAA (ha)	Area in Contextual area (ha)
Banksia Woodland	B1, B2, B3, B4, B5, B6	16.60	132.15
Eucalypt Woodland/Forest	E1, E5, E6, E7	32.70	137.69
Jarrah/Banksia Woodland	EB1	7.57	37.16
Total		**56.87**	**307.00**

6 ASSESSMENT OF IMPACTS

This section addresses the Proposed Action's potential direct and indirect impacts on MNES that are known and likely to occur within the PAA and surrounds. The potential impacts on each MNES are assessed in accordance with Matters of National Environmental Significance: Significant Impact Guidelines 1.1 which identifies 'significant impact criteria' to assist in determining whether the environmental impacts of a Proposal are likely to be significant (DoE 2013b). Conservation advice, recovery plans and other relevant guidance were considered where applicable to specific MNES.

6.1 Summary of impacts

6.1.1 Direct impacts

Implementation of the Proposed Action will result in the direct loss of MNES through clearing. Table 6.1 below provides a summary of the potential direct impacts of the Proposed Action. These potential impacts are conservative, representing the full extent of MNES values within PAA that will be cleared by the Proposed Action, representing the preliminary impact footprint. The actual clearing footprint may decrease as the planning process continues and following further refinement of the design.

Table 6.1 Summary of direct impacts

MNES	Direct Impact
Tuart TEC	Loss of 40.99 ha
Banksia TEC	Loss of 14.56 ha
Honeymyrtle TEC	Loss of 1.94 ha
Organic Mounds TEC	None
Grand Spider Orchid (*Caladenia huegelii*)	All four species were considered unlikely to occur by Biota (2025a). There is potential habitat present, however there is no current or historical known occupation by these species. The areas of higher quality habitat coincide with areas of TEC (Banksia Woodland) and as such the impact assessment and mitigation applied to this community is applicable to the habitat for these threatened orchid species. No further assessment of impacts for the four threatened orchid species has been completed.
Dwarf Bee Orchid (*Diuris micrantha*)	
Glossy-Leaved Hammer Orchid (*Drakaea elastica*)	
Purdie's Donkey Orchid (*Diuris purdiei*)	
Black cockatoo species	Loss of 56.98 ha of CBC foraging habitat Loss of 38.34 ha of FRTBC foraging habitat Loss of 592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding.
Chuditch *(Dasyurus geoffroii*)	The Chuditch is considered highly unlikely to occur in the PAA and surrounds following targeted survey work by Biota (2024a). As the Chuditch is highly unlikely to occur and there is a lack of connection(s) from the PAA to existing Chuditch populations, the PAA is not considered Chuditch habitat. No further assessment of impacts for the Chuditch has been completed.

6.1.2 Indirect impacts

The Proposed Action has the potential to cause indirect impacts to MNES that occur adjacent to the PAA. Potential indirect impacts that could impact on MNES are listed below and further discussed under each MNES where relevant.

- Fragmentation and edge effects including:
  - Loss of patch viability (condition and/or size thresholds no longer met)
  - Fragmentation of existing wildlife corridors increasing barriers to fauna movement
- Changes to hydrology including:
  - Surface water flows
  - Water quality (erosion, sedimentation and contamination)
  - Groundwater drawdown from water abstraction and dewatering
- Disturbance of known or existing ASS and/or contaminated soils
- Introduction and/or spread of weeds
- Introduction and/or spread of dieback
- Altered fire regimes
- Fauna injury and/or death from strike
- Noise, light, vibration and dust emissions.

6.2 Tuart TEC

6.2.1 Direct impacts

Clearing within the PAA will result in the direct loss of 40.99 ha of Tuart TEC mapped as eight patches. Clearing will occur on the edges of most patches, except for patch TT02, which will be entirely removed. Post clearing, patches TT01, TT03, TT04 and TT07 will be greater than 5 ha and therefore meet the size threshold to be representative of the Tuart TEC. Patches TT05 and TT06 will be split into smaller patches, with some parts of the original patch remaining Tuart TEC and other parts no longer representing Tuart TEC. Patch TT08 & TT09 will be reduced in size to <5 ha, but still meets the size and condition thresholds to remain a Tuart TEC patch. Patches TT10 and TT11 are not impacted by the Proposal and will remain Tuart TEC. Direct clearing impacts on Tuart TEC patches mapped within or intersecting the PAA is outlined in Table 6.2 and shown in Appendix 1, Figure 32.

6.2.2 Indirect impacts

6.2.2.1 Fragmentation and edge effects

The Tuart TEC is fragmented by the existing Anketell Road, associated road corridors and surrounding land uses. Clearing required for the Proposed Action will result in increased fragmentation of the Tuart TEC increasing distances between patches of the TEC, reducing patch size exposing it to increased edge effects and the indirect loss of 3.39 ha of Tuart TEC across two patches. However, the Proposed Action is unlikely to result in fragmentation that would significantly impact the function of the Tuart TEC. In the Contextual area and surrounds, the Tuart TEC patches will still retain the role of 'stepping stones' and provide some ecological connectivity north and south along Anketell Road.

The Approved Conservation Advice describes the minimum size and condition thresholds required to be representative of the Tuart TEC (DEE 2019). As the Proposed Action is linear, it intersects and

fragments some patches. An assessment was completed for each Tuart TEC patch to determine if the extent of the patch remaining (following clearing of the PAA) still met the minimum size and condition thresholds required to be representative of the TEC. The assessment identified that patches TT05 and TT06 will be fragmented with some areas no longer viable as Tuart TEC and other areas representing smaller patches of Tuart TEC. Patch TT05 will be reduced to a single patch and patch TT06 will be split into three separate patches. Indirect loss of Tuart TEC patches mapped within or intersecting the PAA is outlined in Table 6.2 and shown in Appendix 1, Figure 32.

6.2.2.2 Introduction and/or spread of weeds

The Proposed Action has the potential to introduce and/or spread weeds through ground disturbing activities such as clearing, increased movement of vehicles or earth-moving machinery and import or reuse of weed infested topsoil. This may result in weeds establishing or spreading from the PAA into adjacent areas of Tuart TEC. Five significant weeds (Declared Pests and/or WoNS) were recorded in the PAA during the Biota surveys (Biota 2025a). The presence of significant weeds could directly impact the integrity of intact Tuart TEC vegetation. Main Roads routinely manages weeds and has established mitigation and monitoring measures detailed in Section 8. Given the high weed load currently within the PAA and surrounds and proposed mitigation measures, the Proposed Action is not expected to result in the introduction and/or spread of weeds that could result in significant indirect impacts to the Tuart TEC.

6.2.2.3 Introduction and/or spread of Phytophthora cinnamomi Dieback

The Proposed Action has the potential to introduce and/or spread dieback through ground disturbing activities such as clearing, increased movement of vehicles or earth-moving machinery and import or reuse of dieback infested topsoil. The Proposed Action is not expected to spread *Phytophthora* dieback through sediment in stormwater runoff as the drainage strategy is to provide infiltration at the source, or as close to the source as possible, using permeable base pits via infiltration basins. Tuart is not considered to be susceptible to *P. cinnamomi* but is susceptible to other *Phytophthora* species (DEE 2019). Main Roads routinely manages dieback and has established dieback hygiene controls detailed in Section 8. Given the disturbed nature of the overall PAA, previous and currently land uses, the proposed mitigation measures and the low susceptibility of the Tuart TEC to Dieback, the Proposed Action is not expected to result in the introduction and/or spread of dieback that could result in significant indirect impacts to the Tuart TEC.

Table 6.2 Direct clearing impacts and indirect patch loss of Tuart TEC patches mapped within or intersecting the PAA

Patch ID	Size of patch (ha)	Direct clearing impact		Indirect impact	Total patch loss		Comments
		ha	%	ha	ha	%	
TT01	8.42	2.157	25.6	-	2.157	25.6	Clearing on western edge of patch. Patch will meet size threshold (>5 ha) post clearing. Remains Tuart TEC patch.
TT02	0.98	0.984	100	-	0.984	100	Entirety of patch removed. No longer Tuart TEC patch.
TT03	29.45	6.032	20.5	-	6.032	20.5	Clearing on southern edge of patch. Patch will meet size threshold (>5 ha) post clearing. Remains Tuart TEC patch.
TT04	6.34	1.162	18.3	-	1.162	18.3	Clearing on northern edge of patch. Patch will meet size threshold (>5 ha) post clearing. Remains Tuart TEC patch.
TT05	18.67	11.264	60.3	2.055	13.319	71.3	Clearing southern portion of patch. Patch split and size reduced to <5 ha. Remaining northern patch assessed by Biota (2025a) and has moderate condition and meets biotic thresholds. Remaining east part of patch unlikely to meet size and condition thresholds. Part of existing patch remains Tuart TEC patch.
TT06	35.73	16.850	47.2	1.338	18.189	50.9	Clearing bisects (fragments) patch. Remaining northern patch likely to meet size and condition thresholds. Remaining southern patch unlikely to meet size and condition thresholds. Part of existing patch remains Tuart TEC patch.
TT07	5.74	0.591	10.3	-	0.591	10.3	Clearing northern edge of patch. Patch will meet size threshold (>5 ha) post clearing. Remains Tuart TEC patch.
TT08 & TT09[1]	5.11	1.954	38.2	0	1.954	38.2	Clearing northern portion of patch. Patch size reduced to <5 ha. Remaining part pf patch assessed by Biota (2025a) and has moderate to high condition and meets biotic thresholds. Remains Tuart TEC patch.
TT10	0.74	-	-	-	-	-	Not impacted by Proposal. Will remain Tuart TEC patch.
TT11	3.03	-	-	-	-	-	
Total		40.99		3.39	44.39		

6.2.2.4 Altered fire regimes

The Proposed Action has the potential to impact Tuart TEC through the accidental generation of fire during construction, however, this potential is considered low. The risk of fire during construction is temporary and no permanent changes to existing fire regimes are expected from the Proposed Action. Tuart is a relatively thick barked species and is able to resprout from epicormic buds following fire (Ruthrof et al 2002). The species also predominantly relies on fire for recruitment of seedlings (Ruthrof 2002).

Main Roads will implement standard construction and operational controls to appropriately control the risk of fire. This will include identifying potential ignition sources and/or activities with the potential to lead to fire, and preventable measures. Weed management will reduce the risk of fires caused by the Proposed Action spreading to nearby Tuart TEC. Given the existing infrastructure and industries currently present within and adjacent to the PAA, the overall degraded nature of the PAA and that fire is manageable, the implementation of the Proposed Action is not expected to impact existing fire regimes, nor increase the likelihood of fires.

6.2.2.5 Changes to hydrology

6.2.2.5.1 Surface water flows

The existing Anketell Road and interchanges have modified surface water flows and the construction of the Proposed Action has little potential of altering these modified surface water flows and adversely impacting Tuart TEC. Drainage design will consider the local drainage network. The Proposed Action drainage strategy is to use permeable base pits via infiltration basins and swales where possible to infiltrate surface water runoff and minimise runoff outside of the PAA. Clearing for the Proposed Action is not expected to be of sufficient scale to cause substantial hydrological changes in the local area. Infiltration of surface water runoff within the PAA will maintain the existing hydrological regimes, predominately within the Spearwood System (characterised by sand dunes and plains) and the Quindalup South System (characterised by coastal dunes and yellow sands). Based on the above, no hydrology related impacts on Tuart TEC are expected.

6.2.2.5.2 Water quality

The proposed works primarily relate to the upgrading of existing road corridors, including drainage infrastructure. The Proposed Action is expected to have little potential of impacting on water quality through erosion, sedimentation and/or contamination of surface water and groundwater during construction and adversely impacting Tuart TEC. Construction works have the potential to destabilise soils and, if unmanaged, result in erosion of the PAA and sedimentation of surrounding drainage infrastructure and vegetation including Tuart TEC.

To manage a temporary increase in the risk of water contamination through potential hydrocarbon spills and leaks during construction, the Proposed Action will implement management measures for erosion, sedimentation and drainage control. This will include ensuring that no refuelling or serving of vehicles/machinery occurs in the vicinity of a wetland or areas of Tuart TEC and ensuring appropriate spill response equipment is available. Also, surface runoff within the PAA will drain into permeable base pits via infiltration basins and swales where possible.

Spills that occur during the Proposed Action operations will be managed through standard emergency response procedures by Main Roads and the relevant authorities. Based on the above

and subject to implementation of measures detailed in Section 8, the residual indirect impacts on Tuart TEC are anticipated to be negligible in the local context.

6.2.2.5.3 Groundwater drawdown

Dewatering

The Proposed Action includes the construction of bridge piers, abutment footings and drainage structures, and dewatering is likely to be required to install some road structures such as bridges and underpasses. The depth to groundwater is approximately 5-30m below ground level across the PAA (DWER 2023). Main Roads have indicated dewatering for construction will likely be required east of the freeway near the Wandi Nature Reserve and potentially at other sites where shallow water table and swamp deposit soils occur. Depending on the location, current groundwater level, depth of excavation required and duration, dewatering will cause temporary and localised groundwater drawdown.

The Proposed Action may result in short-term changes to groundwater levels and groundwater flow where temporary dewatering is required during construction. Stream (2025a) assessed the risk to GDEs from potential groundwater drawdown associated with dewatering for the Proposed Action. The assessment considered two dewatering scenarios including 1) dewatering during the dry season without recharge (i.e. infiltration of the abstracted groundwater back into the aquifer) and 2) dewatering during the dry season with recharge (i.e. infiltration of some of the abstracted groundwater back into the aquifer). No Tuart TEC is mapped in the vicinity of dewatering bores nor is Tuart TEC mapped within modelled dewatering drawdown extent. Accordingly, the Proposed Action's dewatering activities are not predicted to impact on Tuart TEC.

Abstraction

Main Roads proposes to abstract up to 485,000 kL from three groundwater bores within the PAA to meet part of the Proposed Action's total water demand during construction. FSG (2024) modelled the groundwater level drawdown from potential construction water supply bores. The assessment of potential impacts was completed by Stream (2025a) at two points for scenario 3. Once after 413 days of abstraction for construction demand and dust suppression (Scenario 3a) and once after an additional 210 days of abstraction for dust suppression only (Scenario 3b). Under both scenarios, the risk of impact on Tuart TEC was considered low. The modelled drawdown area is very small and depth of drawdown in areas of Tuart TEC are 0.1 m or less (Stream 2025a). Accordingly, no impacts to Tuart TEC from abstraction associated with the Proposed Action are expected.

6.2.2.6 Disturbance of known or existing ASS and/or contaminated soils

The Proposed Action has the potential to disturb ASS during excavation activities and/or dewatering. The eastern portion of the PAA adjacent to the Spectacles Wetlands is mapped as being a combination of high to moderate and low to moderate risk of ASS. Two Tuart TEC patches (TT07 and TT08 & TT09) occur in the vicinity of the Spectacles Wetlands. Main Roads will implement management measures to avoid or manage impacts from potential ASS disturbance such as minimising disturbance of ASS, stockpile management protocols and disposal or treatment of ASS material. Even where disturbance of ASS is unavoidable, the implementation of appropriate management measures will result in the risk of impact on Tuart TEC being low.

There are known and suspected contaminated sites within and adjacent to the PAA. Indirect impacts associated with the movement of contaminated soil will be managed during construction through early identification of soil contamination, using an unexpected finds Protocol and adhering

to requirements in accordance with the *Contaminated Sites Act 2006*. The Proposed Action is not expected to result in the disturbance or spread of contaminated soils that could result in significant indirect impacts to the Tuart TEC.

6.2.2.7 Dust generation

The Proposed Action will involve vegetation clearing and earthworks, which will potentially generate dust, however, given its temporary nature and the management measures proposed, it will not have significant impact on Tuart TEC. The impact on Tuart TEC from dust would be mainly due to deposition of dust on the foliage, in dry weather, that would disrupt photosynthesis.

In order to suppress dust generation, Main Roads will implement standard management measures such as water sprinkling on the exposed grounds and restricting vehicle access and controlling speed. Implementation of these management measures will minimize the impacts on vegetation health of the Tuart TEC. Given the limited amount of dust from the Proposed Action and exposure of the ground being temporary, the impact on vegetation condition of the TEC is not expected to be significant.

6.2.3 Assessment against MNES Significant Impact Guidelines

Table 6.3 provides an assessment of the potential impact of the Proposed Action to the Tuart TEC using the Critically Endangered and Endangered ecological communities significant impact criteria (DoE 2013b).

The assessment concludes that the direct clearing of 40.99 ha and indirect loss of 3.39 ha of Tuart TEC as part of the Proposed Action is likely to be significant. The Proposed Action will reduce the extent of the ecological community, increase fragmentation and adversely affect habitat critical to the survival of the Tuart TEC. Indirect impacts will be avoided through standard construction management practices when implementing the Proposed Action, to prevent significant impacts outside the PAA, however, an indirect impact of 3.39 ha to the TEC will occur due to direct clearing.

Table 6.3 Assessment of significant impact criteria for Tuart TEC

Criteria	Assessment
Reduce the extent of an ecological community	The landscape where the Tuart TEC community occurs has been heavily cleared, with approximately 80-86 % of the estimated original extent cleared (DEE 2019). The Proposed Action will result in the direct clearing of up to 40.99 ha and the indirect loss of 3.39 ha of Tuart TEC (Table 6.2). Biota (2025a) mapped 11 patches of Tuart TEC occur either wholly, partially or immediately adjacent to the PAA and Contextual area. Locally, there are areas of potential TEC extending north and south of the Contextual Area. The current extent of the Tuart TEC as of 2015 is estimated to be >17,000 ha across its range (DEE 2019). Regionally it is estimated there is 20,833 ha of Tuart Woodlands across the SCP. Locally it is estimated there is 950.40 ha of Tuart TEC within 10 km of the PAA. Of this, approximately 393.90 ha occurs in conservation reserves (refer to Section 5.3.1.3 and Appendix 3). The Proposed Action clearing will reduce the Tuart TEC regionally by approximately 0.24% (across the SCP) and locally by approximately 4.67%. The Proposed Action will reduce the extent of the Tuart TEC. **Likely to be significant.**
Fragment or increase fragmentation of an ecological community, for example by	Clearing for the Proposed Action will increase distances between mapped patches of Tuart TEC and result in the indirect loss of 3.39 ha of Tuart TEC across two patches. Patches TT05 and TT06 will be fragmented with some areas no longer viable as Tuart TEC and other areas representing smaller patches of Tuart

Criteria	Assessment
clearing vegetation for roads or transmission lines	TEC. Patch TT05 will be reduced to a single patch and patch TT06 will be split into three separate patches. The Proposed Action is likely to fragment or increase fragmentation of the Tuart TEC. **Likely to be significant.**
Adversely affect habitat critical to the survival of an ecological community	Based on the information provided in the Approved Conservation Advice (DEE 2019), it is considered that Tuart TEC patches TT06, and TT07 would be considered critical habitat, as they form part of Bush forever sites and support linkages around The Spectacles. The other patches are important locally, however given the smaller size, condition and level of fragmentation they have not been considered to meet the critical habitat definition. The Proposed Action involves the direct clearing of up to 17.44 ha of Tuart TEC and the indirect loss of 1.34 ha of Tuart TEC within patches TT06 and TT07, considered critical habitat. The Proposed Action is likely to adversely affect habitat critical to the survival of the Tuart TEC. **Likely to be significant.**
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	Clearing for the Proposed Action is not expected to be of sufficient scale to cause substantial hydrological changes in the local area. Drainage design will consider the local drainage network. The Proposed Action drainage strategy is to use permeable base pits via infiltration basins and swales where possible to infiltrate surface water runoff and minimise runoff outside of the PAA. Infiltration of surface water runoff within the PAA will maintain the existing hydrological regimes. The Proposed Action may result in short-term changes to groundwater levels and groundwater flow where temporary dewatering is required during construction. Stream (2025a) undertook an assessment to assess the risk of impact on GDEs from potential groundwater drawdown associated with dewatering for the Proposed Action. No Tuart TEC is mapped in the vicinity of dewatering bores nor within dewatering drawdown extent. The Proposal's dewatering activities are not predicted to impact on Tuart TEC. The Proposed Action is proposing to abstract groundwater within the PAA to meet part of the total water demand during construction. The potential impacts of this modelled abstraction were assessed by Stream (2025a) who considered two production scenarios. Under both scenarios, the risk of impact on Tuart TEC was considered low. The Proposed Action's abstraction activities are not predicted to impact on Tuart TEC. The Proposed Action will use native species on local topsoil for landscaping, restrict the use of fertilisers to the establishment phase of landscaping on a case-by-case basis, and incorporate treatment of stormwater during infiltration. Accordingly, the Proposed Action is not expected to result in a substantial change in nutrient cycles that could impact on Tuart TEC. The Proposed Action is not expected to modify or destroy abiotic factors necessary for the Tuart TEC's survival. **Unlikely to be significant.**
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The Proposed Action will not cause a substantial change to the species composition of the Tuart TEC. Weeds will be managed through standard routine road maintenance activities and planting of native vegetation within the road reserve (where possible) will provide a buffer to adjacent TEC patches. Standard Dieback hygiene measures will be implemented to ensure that Dieback does not spread as a result of implementation of the Proposed Action. No burning will be undertaken on the road reserve and no flora/fauna harvesting will occur following completion of clearing activities for the Proposed Action.

Criteria	Assessment
	Substantial changes in the species composition of the Tuart TEC patches adjacent to the PAA are not expected to result from implementation of the Proposed Action. Similarly, no decline or loss of functionally important species is expected to occur. **Unlikely to be significant.**
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – Assisting invasive species, that are harmful to the listed ecological community, to become established, or – Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	The Proposed Action is not expected to result in a substantial reduction in quality or integrity of Tuart TEC patches retained outside the PAA. The Proposed Action involves direct clearing of 40.99 ha and indirect loss of 3.39 ha of TEC that is generally in a similar condition compared to the adjacent TEC. The Proposed Action is not expected to result in the introduction or spread of weeds that will significantly impact Tuart TEC surrounding the PAA. This is due to implementation of standard management measures including weed treatment and hygiene, and revegetation / landscaping with native species on locally harvested topsoil with restricted use of fertiliser. Ongoing road maintenance will be undertaken to prevent spread of weeds into adjacent Tuart TEC patches. **Unlikely to be significant.**
Interfere with the recovery of an ecological community	There is no recovery plan in place for the Tuart TEC. The Approved Conservation Advice outlines priority research and conservation actions (DEE 2019). Planning and design of the Proposed Action will align with relevant protection and recovery measures in the Approved Conservation Advice, including: – Preventing invasion by weeds, introduced animals, 'Tuart decline', dieback and other diseases, detrimental fire impacts and grazing damage. – Re-vegetation and regeneration and restore habitat features. Given the planning, design, construction measures and implementation of standard management measures, the Proposed Action is not expected to interfere with the recovery of the Tuart TEC. **Unlikely to be significant.**

6.3 Banksia TEC

6.3.1 Direct impacts

Clearing within the PAA will result in the direct loss of 14.56 ha of Banksia TEC mapped as nine patches. Clearing will occur on the edges of most patches, with the exception of patches BT08 and BT09. Post clearing, patches BT02, BT03, BT04, BT05, and BT06 will remain greater than 2 ha with vegetation in Good or better condition, representative of the Banksia TEC. Patches BT01 and BT07 will be reduced in size nearing the 2 ha extent, however, will meet condition thresholds based on patch quality reported by Biota (2025a) to remain a Banksia TEC patch. Up to 97.4% of patch BT08 will be removed and patch BT09 will be removed entirely. Direct clearing impacts on Banksia TEC patches mapped within or intersecting the PAA is outlined in Table 6.4 and shown in Appendix 1, Figure 33.

Direct clearing of the Banksia TEC will remove vegetation representative of FCT21a, FCT24 and FCT28. Of these FCT24 is listed as a Priority 3 PEC by the WA DBCA. The direct clearing will impact

FCT28 (68%), followed by FCT24 (16.6%) and FCT21a (15.4%). Removal of these FCTs is a minor component of the overall extent of these FCTs and is highly unlikely to result in the listing or uplifting of conservation status of any FTCs.

6.3.2 Indirect impacts

6.3.2.1 Fragmentation and edge effects

The Banksia TEC is fragmented by the existing Anketell Road, associated road corridors and surrounding land uses. Clearing required for the Proposed Action will result in increased fragmentation of the Banksia TEC increasing distances between patches of the TEC, reducing patch size exposing it to increased edge effects and the indirect loss of 0.08 ha of Banksia TEC across one patch. However, the Proposed Action is unlikely to result in fragmentation that would significantly impact the function of the Banksia TEC. In the Contextual area and surrounds, the Banksia TEC patches will still retain the role of 'stepping stones' and provide ecological connectivity particularly between Mandogalup Road Bushland and The Spectacles.

The Approved Conservation Advice describes the minimum size and condition thresholds required to be representative of the Banksia TEC (DEE 2016a). As the Proposed Action is linear, it intersects and fragments some patches. An assessment was completed for each Banksia TEC patch to determine if the extent of the patch remaining (following clearing of the PAA) still met the minimum size and condition thresholds required to be representative of the TEC. The assessment identified that patch BT08 will be fragmented with the remaining area no longer viable as Banksia TEC. Indirect loss of Banksia TEC patches mapped within or intersecting the PAA is outlined in Table 6.4 and shown in Appendix 1, Figure 33.

Table 6.4 Direct clearing impacts and indirect patch loss of Banksia TEC patches mapped within or intersecting the PAA

Patch ID	Size of patch (ha)	Direct clearing impact		Indirect impact	Total patch loss		FCT impacted	Comments
		ha	%	ha	ha	%		
BT01	2.2	0.187	8.5	-	0.187	8.5	FCT21a	Clearing on edge of patch. Patch will meet size threshold and condition thresholds (>2 ha and Good condition or better condition) post clearing. Remains Banksia TEC patch.
BT02	4.9	2.056	42.0	-	2.056	42.0	FCT21a	Clearing southern portion of patch. Patch will meet size threshold and condition thresholds (>2 ha and Good or better condition) post clearing. Remains Banksia TEC patch.
BT03	76.1	1.198	1.6	-	1.198	1.6	FCT28	Clearing on edge of patch. Patch will meet size threshold and condition thresholds (>2 ha and Good or better condition) post clearing. Remains Banksia TEC patch.
BT04	32.7	0.867	2.7	-	0.867	2.7	FCT24, FCT28	Clearing on north east edge of patch. Patch will meet size threshold and condition thresholds (>2 ha and Good or better condition) post clearing. Remains Banksia TEC patch.
BT05	159.6	2.490	1.6	-	2.490	1.6	FCT24, FCT28	Clearing on northern edge of patch. Patch will meet size threshold and condition thresholds (>2 ha and Good or better condition) post clearing. Remains Banksia TEC patch.
BT06	45.4	0.690	1.5	-	0.690	1.5	FCT24, FCT28	Clearing on southern edge of patch. Patch will meet size threshold and condition thresholds (>2 ha and Good or better condition) post clearing. Remains Banksia TEC patch.
BT07	5.6	3.454	61.7	-	3.454	61.7	FCT24, FCT28	Clearing southern portion of patch. Patch likely to meet size threshold and condition thresholds (>2 ha and Good or better condition) post clearing. Remains Banksia TEC patch.
BT08	3.1	3.020	97.4	0.077	3.097	100	FCT24	Clearing majority of patch. Patch size reduced to <0.5 ha. No longer Banksia TEC patch.
BT09	0.61	0.605	100	-	0.605	100	FCT28	Clearing patch. No longer Banksia TEC patch.
Total		14.56		0.08	14.64			

6.3.2.2 Introduction and/or spread of weeds

The Proposed Action has the potential to introduce and/or spread weeds through ground disturbing activities such as clearing, increased movement of vehicles or earth-moving machinery and import or reuse of weed infested topsoil. This may result in weeds establishing or spreading from the PAA into adjacent areas of Banksia TEC. Five significant weeds (Declared Pests and/or WoNS) were recorded in the PAA during the Biota surveys (Biota 2025a). The presence of significant weeds could directly impact the integrity of intact Banksia TEC vegetation. Main Roads routinely manages weeds and has established mitigation and monitoring measures detailed in Section 8. Given the high weed load currently within the PAA and surrounds and proposed mitigation measures, the Proposed Action is not expected to result in the introduction and/or spread of weeds that could result in significant indirect impacts to the Banksia TEC.

6.3.2.3 Introduction and/or spread of Phytophthora cinnamomi Dieback

The Proposed Action has the potential to introduce and/or spread dieback through ground disturbing activities such as clearing, increased movement of vehicles or earth-moving machinery and import or reuse of dieback infested topsoil. The Proposed Action is not expected to spread *Phytophthora* dieback through sediment in stormwater runoff as the drainage strategy is to provide infiltration at the source, or as close to the source as possible, using permeable base pits via infiltration basins. Banksia is susceptible to *P. cinnamomi* and impacts to the Banksia TEC can be severe (DEE 2016a). Main Roads routinely manages dieback and has established dieback hygiene controls detailed in Section 8. Given the disturbed nature of the overall PAA, previous and currently land uses and the proposed mitigation measures, the Proposed Action is not expected to result in the introduction and/or spread of dieback that could result in significant indirect impacts to the Banksia TEC.

6.3.2.4 Altered fire regimes

The Proposed Action has the potential to impact Banksia TEC through the accidental generation of fire during construction, however, this potential is considered low. The risk of fire during construction is temporary and no permanent changes to existing fire regimes are expected from the Proposed Action. Key Banksia species of the TEC (i.e. diagnostic species) have particular responses to fire and require fire-free intervals to increase fire tolerance and/or to allow a build up of seed resources (DEE 2016a). Increased fire frequency can also promote grassy weed invasion which in turn can increase fire risk (DEE 2016a).

Main Roads will implement standard construction and operational controls to appropriately control the risk of fire. This will include identifying potential ignition sources and/or activities with the potential to lead to fire, and preventable measures. Weed management will reduce the risk of fires caused by the Proposed Action spreading to nearby Banksia TEC. Given the existing infrastructure and industries currently present within and adjacent to the PAA, the overall degraded nature of the PAA and that fire is manageable, the implementation of the Proposed Action is not expected to impact existing fire regimes, nor increase the likelihood of fires.

6.3.2.5 Changes to hydrology

6.3.2.5.1 Surface water flows

The existing Anketell Road and interchanges have modified surface water flows and the construction of the Proposed Action has little potential of altering these modified surface water flows and adversely impacting Banksia TEC. Drainage design will consider the local drainage

network. The Proposed Action drainage strategy is to use permeable base pits via infiltration basins and swales where possible to infiltrate surface water runoff and minimise runoff outside of the PAA. Clearing for the Proposed Action is not expected to be of sufficient scale to cause substantial hydrological changes in the local area. Infiltration of surface water runoff within the PAA will maintain the existing hydrological regimes, predominately within the Spearwood System (characterised by sand dunes and plains) and the Quindalup South System (characterised by coastal dunes and yellow sands). Based on the above, no hydrology related impacts on Banksia TEC are expected.

6.3.2.5.2 Water quality

The proposed works primarily relate to the upgrading of existing road corridors, including drainage infrastructure. The Proposed Action is expected to have little potential of impacting on water quality through erosion, sedimentation and/or contamination of surface water and groundwater during construction adversely impacting Banksia TEC. Construction works have the potential to destabilise soils and, if unmanaged, result in erosion of the PAA and sedimentation of surrounding drainage infrastructure and vegetation including Banksia TEC.

To manage a temporary increase in the risk of water contamination through potential hydrocarbon spills and leaks during construction, the Proposed Action will implement management measures for erosion, sedimentation and drainage control. This will include ensuring that no refuelling or serving of vehicles/machinery occurs in the vicinity of a wetland or areas of Banksia TEC and ensuring appropriate spill response equipment is available. Also, surface runoff within the PAA will drain into permeable base pits via infiltration basins and swales where possible.

Spills that occur during the Proposed Action operations will be managed through standard emergency response procedures by Main Roads and the relevant authorities. Based on the above and subject to implementation of measures detailed in Section 8, the residual indirect impacts on Banksia TEC are anticipated to be negligible in the local context.

6.3.2.5.3 Groundwater drawdown

Dewatering

Main Roads have indicated dewatering for construction of the Proposed Action will likely be required east of the freeway near the Wandi Nature Reserve and potentially at other sites where shallow water table and swamp deposit soils occur. Depending on the location, current groundwater level, depth of excavation required and duration, dewatering will cause temporary and localised groundwater drawdown.

The Proposed Action may result in short-term changes to groundwater levels and groundwater flow where temporary dewatering is required during construction. The dominant Banksia species of the Banksia TEC are considered to be groundwater dependant and are susceptible to impacts from groundwater drawdown (DEE 2016). Dewatering can also result in changes to groundwater chemistry including those resulting from oxidation of ASS.

Stream (2025a) assessed the risk to GDEs from potential groundwater drawdown associated with dewatering for the Proposed Action. The assessment considered two dewatering scenarios including 1) dewatering during the dry season without recharge (i.e. infiltration of the abstracted groundwater back into the aquifer) and 2) dewatering during the dry season with recharge (i.e. infiltration of some of the abstracted groundwater back into the aquifer). In scenario one (1) approximately 2.27 ha of Banksia TEC occurred within the modelled drawdown area. In scenario

two (2) approximately 2.06 ha of Banksia TEC occurred within the modelled drawdown area. Stream (2025a) assessed the risk of impact to GDEs from dewatering under both scenarios as generally low. Stream (2025a) reported the majority of areas of identified as the Banksia TEC within the drawdown extent occur where the depth to groundwater is >10 m and therefore they are considered to have limited dependence on groundwater. The remaining areas have a depth to groundwater of 6-10 m and are predicted to be subject to 0.1 to 0.25 m of drawdown which is considered low risk. Based on the Stream (2025a) assessment, the Proposed Action is not expected to result in groundwater drawdown that could result in significant indirect impacts to the Banksia TEC.

Abstraction

Main Roads proposes to abstract up to 485,000 kL from three groundwater bores within the PAA to meet part of the Proposed Action's total water demand during construction. FSG (2024) modelled the groundwater level drawdown from potential construction water supply bores. The assessment of potential impacts was completed by Stream (2025a) at two points for scenario 3. Once after 413 days of abstraction for construction demand and dust suppression (Scenario 3a) and once after an additional 210 days of abstraction for dust suppression only (Scenario 3b). Under both scenarios, the risk of impact on Banksia TEC was considered low. The modelled drawdown area is very small and the depth of drawdown in areas of Banksia TEC is 0.1 m or less (Stream 2025a). Accordingly, no impacts to Banksia TEC from abstraction associated with the Proposed Action are expected.

6.3.2.6 Disturbance of known or existing ASS and/or contaminated soils

The Proposed Action has the potential to disturb ASS during excavation activities and/or dewatering. The eastern portion of the PAA adjacent to the Spectacles Wetlands is mapped as being a combination of high to moderate and low to moderate risk of ASS. Three Banksia TEC patches (BT04, BT05 and BT06) occur in the vicinity of the Spectacles Wetlands. Main Roads will implement management measures to avoid or manage impacts from potential ASS disturbance such as minimising disturbance of ASS, stockpile management protocols and disposal or treatment of ASS material. Even when disturbance of ASS is unavoidable, the implementation of appropriate management measures will result in the risk of impact on Banksia TEC being low.

There are known and suspected contaminated sites within and adjacent to the PAA. Indirect impacts associated with the movement of contaminated soil will be managed during construction through early identification of soil contamination, using an unexpected finds Protocol and adhering to requirements in accordance with the *Contaminated Sites Act 2006*. The Proposed Action is not expected to result in the disturbance or spread of contaminated soils that could result in significant indirect impacts to the Banksia TEC.

6.3.2.7 Dust generation

The Proposed Action will involve vegetation clearing and earthworks, which will potentially generate dust, however, given its temporary nature and the management measures proposed, it will not have significant impact on Banksia TEC. The impact on Banksia TEC from dust would be mainly due to deposition of dust on the foliage, during the dry weather, that would disrupt photosynthesis.

In order to suppress dust generation, Main Roads will implement standard management measures such as water sprinkling on the exposed grounds and restricting vehicle access and controlling speed. Implementation of these management measures will minimize the impacts on vegetation health of the Banksia TEC. Given the limited amount of dust from the Proposed Action and

exposure of the ground being temporary, the impact on vegetation condition of the TEC is not expected to be significant.

6.3.3 Assessment of significance

Table 6.5 provides an assessment of the potential impact of the Proposed Action to the Banksia TEC, using the Critically Endangered and Endangered ecological communities significant impact criteria (DoE 2013b).

The assessment concludes that the direct clearing of 14.56 ha and indirect loss of 0.08 ha of Banksia TEC as part of the Proposed Action is likely to be significant. The Proposed Action will reduce the extent of the ecological community and adversely affect habitat critical to the survival of the Banksia TEC. Indirect impacts will be avoided through standard construction management practices when implementing the Proposed Action, to prevent significant impacts outside the PAA, however, an indirect impact of 0.08 ha to the TEC will occur due to direct clearing.

Table 6.5 Assessment of significant impact criteria for Banksia TEC

Criteria	Assessment
Reduce the extent of an ecological community	The Proposed Action will result in the direct clearing of 14.56 ha and the indirect loss of 0.08 ha of Banksia TEC (Table 6.4 and Appendix 1, Figure 33). Biota (2025a) mapped nine patches of Banksia TEC occur either wholly, partially or immediately adjacent to the PAA and Contextual area. Locally, there are areas of potential TEC extending north and south of the Contextual Area. The current extent of the Banksia TEC as of 2015 is estimated to be >335,000 ha covering within the subregions of Dandaragan, Perth and Jarrah Forests (DEE 2016a). Regionally it is estimated there is 190,260.18 ha of native vegetation strongly and moderately associated with the Banksia TEC across the SCP. Locally it is estimated there is 5,697.69 ha of Banksia TEC within 10 km of the PAA. Of this, approximately 1,712.49 ha occurs in conservation reserves (refer to Section 5.3.2.3 and Appendix 3). Proposed Action clearing will reduce the Banksia TEC regionally by approximately 0.01% (across the SCP) and locally by approximately 0.26%. The Proposed Action will reduce the extent of the Banksia TEC. **May be significant.**
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The Proposed Action will not fragment any existing Banksia TEC patches into 2 or more patches. Clearing will occur on the edges of most patches, with the exception of patches BT08 and BT09. Up to 97.4% of patch BT08 will be removed and patch BT09 will be removed entirely. Clearing for the Proposed Action will increase distances between mapped patches of Banksia TEC and result in the indirect loss of 0.08 ha of Banksia TEC across one patch. The proposed clearing is considered unlikely to result in fragmentation that would significantly impact the viability of remaining TEC. **Unlikely to be significant.**
Adversely affect habitat critical to the survival of an ecological community	Based on the information provided in the Approved Conservation Advice (DEE 2016a), all patches of Banksia TEC within the PAA and Contextual Area are considered to meet the critical habitat definition. The Proposed Action involves the direct clearing of up to 14.56 ha of Banksia TEC and the indirect loss of 0.08 ha of Banksia TEC that would be considered critical habitat. The Proposed Action is likely to adversely affect habitat critical to the survival of the Banksia TEC. **Likely to be significant.**

Criteria	Assessment
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	Clearing for the Proposed Action is not expected to be of sufficient scale to cause substantial hydrological changes in the local area. Drainage design will consider the local drainage network. The Proposed Action drainage strategy is to use permeable base pits via infiltration basins and swales where possible to infiltrate surface water runoff and minimise runoff outside of the PAA. Infiltration of surface water runoff within the PAA will maintain the existing hydrological regimes. The Proposed Action may result in short-term changes to groundwater levels and groundwater flow where temporary dewatering is required during construction. Stream (2025a) undertook an assessment to assess the risk to GDEs from potential groundwater drawdown associated with dewatering for the Proposed Action. Stream (2025a) reported that the majority of areas of identified as the Banksia TEC within the total drawdown extent occur where the depth to groundwater is >10 m and therefore they are considered to have limited dependence on groundwater. The remaining areas have a depth to groundwater of 6-10 m and are predicted to be subject to 0.1 to 0.25 m of drawdown which is considered low risk. Based on the Stream (202a5) assessment, the Proposed Action is not expected to result in groundwater drawdown that could result in significant indirect impacts to the Banksia TEC. The Proposed Action is proposing to abstract groundwater within the PAA to meet part of the total water demand during construction. The potential impacts of this modelled abstraction were assessed by Stream (2025a) who considered two production scenarios. Under both scenarios, the risk of impact on Banksia TEC was considered low. No impacts to Banksia TEC from abstraction associated with the Proposed Action are expected. The Proposed Action will use native species on local topsoil for landscaping, restrict the use of fertilisers to the establishment phase of landscaping on a case-by-case basis, and incorporate treatment of stormwater during infiltration. Accordingly, the Proposed Action is not expected to result in a substantial change in nutrient cycles that could impact Banksia TEC. The Proposed Action is not expected to modify or destroy abiotic factors necessary for the Banksia TEC's survival. **Unlikely to be significant.**
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The Proposed Action will not cause a substantial change to the species composition of the Banksia TEC. Weeds will be managed through standard routine road maintenance activities and planting of native vegetation within the road reserve (where possible) will provide a buffer to adjacent TEC patches. Standard Dieback hygiene measures will be implemented to ensure that Dieback does not spread as a result of implementation of the Proposed Action. No burning will be undertaken on the road reserve and no flora/fauna harvesting will occur following completion of clearing activities for the Proposed Action. Substantial changes in the species composition of the Banksia TEC patches adjacent to the PAA are not expected to result from implementation of the Proposed Action. Similarly, no decline or loss of functionally important species is expected to occur. **Unlikely to be significant.**
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:	The Proposed Action is not expected to result in a substantial reduction in quality or integrity of Banksia TEC patches retained outside the PAA. The Proposed Action involves direct clearing of 14.56 ha and indirect loss of 0.08 ha of TEC that is generally in a similar condition compared to the adjacent TEC. The Proposed Action is not expected to result in the introduction or spread of weeds that with significantly impact Banksia TEC surrounding the PAA. This is due

Criteria	Assessment
– Assisting invasive species, that are harmful to the listed ecological community, to become established, or – Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	to implementation of standard management measures including weed treatment and hygiene, and revegetation / landscaping with native species with restricted use of fertiliser. Ongoing road maintenance will be undertaken to prevent spread of weeds into adjacent Banksia TEC patches. **Unlikely to be significant.**
Interfere with the recovery of an ecological community	There is no recovery plan in place for the Banksia TEC. The Approved Conservation Advice instead outlines priority research and conservation actions (DEE 2016a). Planning and design of the Proposed Action will align with relevant protection and recovery measures in the conservation advice, including: – Preventing impacts to native vegetation, hydrology and soil structure from construction. This will be through clearing controls, revegetation / landscaping with native species, stormwater drainage and topsoil management – Mapping of existing weed and Phytophthora infestations, preconstruction treatment of weeds and implementation of standard hygiene management measures – Establishing native vegetation using local native species within the road reserve where possible to provide a buffer to adjacent TEC patches Given the planning, design, construction measures and implementation of standard management measures, the Proposed Action is not expected to interfere with the recovery of the Banksia TEC. **Unlikely to be significant.**

6.4 Honeymyrtle TEC

6.4.1 Direct impacts

As discussed in Section 5.3.3, given there is little to no understorey present, noting a key diagnostic characteristic for this community is "*the ground layer is typically rich with numerous herbs (including grasses) and smaller shrubs and may develop a mossy ground cover*", there is doubt as to whether the patch is in fact the Honeymyrtle TEC. Despite the lack of understorey, DCCEEW has advised that it still considers the patch to be the Honeymyrtle Shrubland TEC, and, accordingly, this PD has been prepared on the basis that this patch as a component of the Federally listed TEC, but not a component of the State TEC.

Clearing within the PAA will result in the direct loss of up to 1.94 ha of Honeymyrtle TEC, which represents one patch of the community at a single locality. Locally (within 15 km of the PAA) there are six occurrences of the Honeymyrtle TEC from a single locality in Manning Park, situated in the Perth suburb of Hamilton Hill, with an approximate extent of 22.6 ha (DBCA 2024). Regionally there are 81 confirmed occurrences of the Honeymyrtle TEC with an approximate extent of 199 ha (DBCA 2024, DCCEEW 2023a). Clearing for the Proposed Action will reduce the Honeymyrtle TEC by approximately 8.06% locally and 0.97% regionally.

The Honeymyrtle TEC patch is isolated from other known occurrences of this community. Over 90% of the patch was mapped as Degraded or Completely Degraded condition, it has lost structure and

has low species diversity. Recent surveys by Umwelt (2025) considered that the patch in its current state does not meet the TEC thresholds (DCCEEW 2023a) and that there is no evidence of recent regeneration despite the area not being subject to recent fire or other disturbance. As noted in Section 5.3.3, no recent fires were recorded in the Honeymyrtle TEC patch or in the surrounding vegetation (Biota 2025a).

The Honeymyrtle TEC within the PAA is not located as an outlier, with the TEC known to extend from Guilderton to Lake Clifton / Preston Beach. The loss of this patch will not reduce the range of the TEC. Confirmed occurrences of the Honeymyrtle TEC north and south of the PAA are the six Manning Park occurrences located approximately 12 km north of the PAA and occurrences located approximately 65 km south of the PAA near Lake Clifton. Loss of the Honeymyrtle TEC patch within the PAA will increase the distances between patches of its closest confirmed occurrences.

The Honeymyrtle TEC within the PAA is isolated (>12 km from the closest confirmed occurrences), mostly in Degraded to Completely Degraded condition and has low diversity. The patch within the PAA is in a narrow strip of vegetation bounded by Alcoa's Waste Residue Facility to the north, cleared areas and a power line to the south and intersected by the existing Anketell Road. It does not occur within a contiguous or well-connected corridor of vegetation nor a known wildlife corridor. It is not likely that Honeymyrtle TEC patch within the PAA is providing an ecological stepping stone, providing a linkage between larger remnants of the community or contributing to the broader diversity of other occurrences of Honeymyrtle TEC. The loss of this patch is not considered to impact in the short or long term on other occurrences of this community.

The Honeymyrtle TEC within the PAA is surrounded by E1 vegetation types mapped by Biota (2025a) and vegetation representative of the FCT 24. Direct clearing will remove the entirety of the Honeymyrtle TEC patch and surrounding and intergrading vegetation.

It is noted that climate change is a key threat to this community, with increased temperature and declining rainfall, fires and drought potentially having a greater effect on this community because of the shallow soils (DCCEEW 2023a). This could see further reductions in the extent and range of the community within the SCP. As part of the Proposed Action, Main Roads will consider and adopt where appropriate best practice design, technology and management in line with the mitigation hierarchy to avoid, reduce and offset emissions.

6.4.2 Indirect impacts

The Proposed Action will not have an indirect impact on the Honeymyrtle TEC as there are no occurrences of this TEC within the Contextual area. The closest confirmed occurrence of the Honeymyrtle TEC is approximately 12 km north of the PAA.

6.4.3 Assessment against MNES Significant Impact Guidelines

Table 6.6 provides an assessment of the potential impact of the Proposed Action to the Honeymyrtle TEC using the Critically Endangered and Endangered ecological communities significant impact criteria (DoE 2013b).

The assessment concludes that the direct clearing of 1.94 ha of Honeymyrtle TEC as part of the Proposed Action is likely to be significant. The Proposed Action will reduce the extent of the ecological community, adversely affect habitat critical to the survival of the community and interfere with the recovery of the Honeymyrtle TEC.

Table 6.6 Assessment of significant impact criteria for Honeymyrtle TEC

Criteria	Assessment
Reduce the extent of an ecological community	The Proposed Action will result in the direct clearing of 1.94 ha of Honeymyrtle. The current extent of the Honeymyrtle TEC is estimated to be 199 ha from 81 occurrences (DCCEEW 2023a). Locally (within 15 km of the PAA), there are six occurrences of the TEC at one locality, Manning Park. Proposed Action clearing will reduce the Honeymyrtle TEC regionally by approximately 0.97% (across the SCP) and locally by approximately 8.06%. The Proposed Action will reduce the extent of the Honeymyrtle TEC. **Likely to be significant.**
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The Proposed Action will not fragment the existing Honeymyrtle TEC patch. Proposed clearing will remove the entire patch. The proposed clearing is considered unlikely to result in fragmentation that would significantly impact the viability of remaining TEC. **Unlikely to be significant.**
Adversely affect habitat critical to the survival of an ecological community	Based on the information provided in the Approved Conservation Advice (DCCEEW 2023a), the patch of Honeymyrtle TEC within the PAA is considered to meet the critical habitat definition. The Proposed Action involves the direct clearing of up to 1.94 ha of Honeymyrtle TEC that is considered critical habitat. The Proposed Action is likely to adversely affect habitat critical to the survival of the Honeymyrtle TEC. **Likely to be significant.**
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The closest occurrences of Honeymyrtle TEC to the PAA are approximately 12 km north. Clearing for the Proposed Action is not expected to be of sufficient scale to cause substantial hydrological changes in the local area. The Proposed Action may result in short-term changes to groundwater levels and groundwater flow where temporary dewatering is required during construction. The Proposed Action is also proposing to abstract groundwater within the PAA to meet part of the total water demand during construction. Stream (2025a) undertook an assessment to assess the risk of impact on GDEs from potential groundwater drawdown associated with dewatering for the Proposed Action and of the modelled abstraction. Based on the Stream (2025a) assessment, the Proposed Action is not expected to result in groundwater drawdown that could result in significant indirect impacts to the other occurrences of Honeymyrtle TEC. The Proposed Action is not expected to modify or destroy abiotic factors necessary for the Honeymyrtle TEC's survival. **Unlikely to be significant.**
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The Proposed Action will not cause a substantial change to the species composition of the Honeymyrtle TEC. Weeds will be managed through standard routine road maintenance activities and planting of native vegetation within the road reserve (where possible) will provide a buffer to adjacent TEC patches. Standard Dieback hygiene measures will be implemented to ensure that Dieback does not spread as a result of implementation of the Proposed Action. No burning will be undertaken on the road reserve and no flora/fauna harvesting will occur following completion of clearing activities for the Proposed Action. Substantial changes in the species composition of the Honeymyrtle TEC patches in the local area are not expected to result from implementation of the

Criteria	Assessment
	Proposed Action due to distance from the Proposed Action. Similarly, no decline or loss of functionally important species is expected to occur. **Unlikely to be significant.**
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – Assisting invasive species, that are harmful to the listed ecological community, to become established, or – Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	The Proposed Action is not expected to result in a substantial reduction in quality or integrity of Honeymyrtle TEC patches outside the PAA. The Proposed Action will not result in the introduction or spread of weeds that with significantly impact Honeymyrtle TEC in the local area. This is due to implementation of standard management measures including weed treatment and hygiene, and revegetation / landscaping with native species on locally harvested topsoil with restricted use of fertiliser. **Unlikely to be significant.**
Interfere with the recovery of an ecological community	There is no recovery plan in place for the Honeymyrtle TEC. The Approved Conservation Advice outlines priority conservation and research actions (DCCEEW 2023a). The priority conservation actions are grouped under the following key approaches: – Protect – Restore – Communicate, engage with and support – Research and monitoring. The Proposed Action precludes the recovery of the Honeymyrtle TEC within the PAA through direct clearing of 1.94 ha of the TEC. **Likely to be significant.**

6.5 Organic Mounds TEC

6.5.1 Direct impacts

The Proposed Action will not have a direct impact on the Organic Mounds TEC as there are no recorded occurrences of this TEC within the PAA and no clearing of this TEC anticipated.

6.5.2 Indirect impacts

6.5.2.1 Introduction and/or spread of weeds

The occurrence of the Organic Mounds TEC is approximately 500 m north east of the PAA and buffered from the PAA by roads and commercial/residential mixed land use. The8 Proposed Action will not introduce and/or spread of weeds that could result in significant indirect impacts to the Organic Mounds TEC.

6.5.2.2 Introduction and/or spread of Phytophthora cinnamomi Dieback

The Proposed Action is not expected to spread *Phytophthora* dieback through sediment in stormwater runoff as the drainage strategy is to provide infiltration at the source, or as close to the

source as possible, using permeable base pits via infiltration basins. 8The occurrence of the Organic Mounds TEC is approximately 500 m north east of the PAA and buffered from the PAA by roads and commercial/residential mixed land use. The Proposed Action will not result in the introduction and/or spread of dieback that could result in significant indirect impacts to the Organic Mounds TEC.

6.5.2.3 Altered fire regimes

The occurrence of the Organic Mounds TEC is approximately 500 m north east of the PAA and buffered from the PAA by roads and commercial/residential mixed land use. The risk of Proposed Action-related fire impacting the Organic Mounds TEC during construction is considered nil.

6.5.2.4 Changes to hydrology

6.5.2.4.1 Water quality

The occurrence of the Organic Mounds TEC is approximately 500 m north east of the PAA and buffered from the PAA by roads and commercial/residential mixed land use. There is little to no potential of the Proposed Action impacting water quality through erosion, sedimentation and/or contamination of surface water and groundwater during construction that would result in the Organic Mounds TEC being adversely impacted.

6.5.2.4.2 Groundwater drawdown

Dewatering

Dewatering for construction of the Proposed Action will likely be required east of the freeway near the Wandi Nature Reserve, and potentially at other sites where shallow water table and swamp deposit soils occur. Depending on the location, current groundwater level, depth of excavation required and duration, dewatering will cause temporary and localised groundwater drawdown.

The Proposed Action may result in short-term changes to groundwater levels and groundwater flow where temporary dewatering is required during construction. Changes in the groundwater levels are very likely to influence the hydrology of the Organic Mounds TEC which are likely to be entirely dependent on groundwater for water supply (CALM 2006; DCCEEW 2023b). Dewatering can also result in changes to groundwater chemistry including those resulting from oxidation of ASS.

Stream (2025a) assessed the risk to GDEs from potential groundwater drawdown associated with dewatering for the Proposed Action. The assessment considered two dewatering scenarios including 1) dewatering during the dry season without recharge (i.e. infiltration of the abstracted groundwater back into the aquifer) and 2) dewatering during the dry season with recharge (i.e. infiltration of some of the abstracted groundwater back into the aquifer). In scenario one (1) approximately 0.026 ha of Organic Mounds TEC occurred within the total drawdown area, intersecting the 0.1 m drawdown contour. Stream (2025a) reported a low risk of impact, and that groundwater flow modelling indicates flow paths in the vicinity of the TEC are very slightly altered under the dewatering scenario. Under scenario two (2) the drawdown contours do not extend to the Organic Mounds TEC occurrence and therefore no impact from dewatering is expected under this scenario. Based on the Stream (2025a) assessment, the Proposed Action is not expected to result in groundwater drawdown that could result in significant indirect impacts to the Organic Mounds TEC.

Abstraction

Main Roads proposes to abstract up to 485,000 kL from three groundwater bores within the PAA to meet part of the Proposed Action's total water demand during construction. FSG (2024) modelled the groundwater level drawdown from potential construction water supply bores. The assessment of potential impacts was completed by Stream (2025a) at two points for scenario 3. Once after 413 days of abstraction for construction demand and dust suppression (Scenario 3a) and once after an additional 210 days of abstraction for dust suppression only (Scenario 3b). Under both scenarios, the risk of impact on GDEs was considered low to negligible as the modelled drawdown area is very small and degree of drawdown is low (Stream 2025a). No Organic Mounds TEC occurs within the drawdown extent under each scenario. No impacts to Organic Mounds TEC from abstraction associated with the Proposed Action are expected.

6.5.3 Assessment against MNES Significant Impact Guidelines

Table 6.7 provides an assessment of the potential impact of the Proposed Action to the Organic Mounds TEC using the Critically Endangered and Endangered ecological communities significant impact criteria (DoE 2013b).

The Proposed Action is not expected to have significant impacts (direct or indirect) on the Organic Mounds TEC.

Table 6.7 Assessment of significant impact criteria for Organic Mounds TEC

Criteria	Assessment
Reduce the extent of an ecological community	The Proposed Action will not result in the direct clearing of any occurrences of the Organic Mounds TEC. No impacts to Organic Mounds TEC associated with the Proposed Action are expected, nor will the Proposed Action result in a reduction of the extent of this ecological community. **Unlikely to be significant.**
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The Proposed Action will not clear or fragment the Organic Mounds TEC as no clearing of any TEC occurrences are anticipated. The Proposed Action is considered unlikely to result in fragmentation that would significantly impact the viability of remaining TEC. **Unlikely to be significant.**
Adversely affect habitat critical to the survival of an ecological community	Based on the information provided in the Approved Conservation Advice (DCCEEW 2023b), the occurrence of Organic Mounds TEC within the Contextual Area is considered to meet the critical habitat definition. The Proposed Action will not clear any occurrence of the Organic Mounds TEC. The Proposed Action is not expected to cause any indirect impacts that may affect the occurrence of Organic Mounds TEC within the Contextual Area. The Proposed Action is unlikely to adversely affect habitat critical to the survival of the Organic Mounds TEC. **Unlikely to be significant.**
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	Clearing for the Proposed Action is not expected to be of sufficient scale to cause substantial hydrological changes in the local area. The Proposed Action may result in short-term changes to groundwater levels and groundwater flow where temporary dewatering is required during construction. The Proposed Action is also proposing to abstract groundwater within the PAA to meet part of the total water demand during construction. Stream (2025a) undertook an assessment to assess the risk of impact on GDEs from potential groundwater drawdown associated with dewatering for the

Criteria	Assessment
	Proposed Action and of the modelled abstraction. Based on the Stream (2025a) assessment, the Proposed Action is not expected to result in groundwater drawdown that could result in significant indirect impacts to the occurrence of Organic Mounds TEC within the Contextual Area. The Proposed Action is not expected to modify or destroy abiotic factors necessary for the Organic Mounds TEC's survival. **Unlikely to be significant.**
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The Proposed Action will not cause a substantial change to the species composition of the Organic Mounds TEC. Weeds and dieback will be managed through standard measures to avoid spread outside of the PAA as a result of Proposed Action implementation. The closest occurrence of the Organic Mounds TEC is approximately 500 m east of the PAA and buffered from the PAA by roads and commercial/residential mixed land use. No burning will be undertaken on the road reserve and no flora/fauna harvesting will occur following completion of clearing activities for the Proposed Action. Substantial changes in the species composition of the Organic Mounds TEC is not expected to result from implementation of the Proposed Action. Similarly, no decline or loss of functionally important species is expected to occur. **Unlikely to be significant.**
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – Assisting invasive species, that are harmful to the listed ecological community, to become established, or – Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	The Proposed Action is not expected to result in a substantial reduction in quality or integrity of the Organic Mounds TEC. The Proposed Action will not result in the introduction or spread of weeds that will significantly impact the Organic Mounds TEC in the local area. This is due to implementation of standard management measures including weed treatment and hygiene, and revegetation / landscaping with native species on locally harvested topsoil with restricted use of fertiliser. **Unlikely to be significant.**
Interfere with the recovery of an ecological community	There is a recovery plan in place for the Organic Mounds TEC. The recovery plan states the recovery objective is "To maintain or improve the overall condition of the Organic Mounds TEC and the associated fauna and plant community in the known locations and reduce the level of threat" (CALM 2006). The Proposed Action is not expected to have any direct or indirect impacts on the Organic Mounds TEC. The Proposed Action will not interfere with the recovery of the Organic Mounds TEC. **Unlikely to be significant.**

6.6 *Caladenia huegelii, Diuris micrantha, Drakaea elastica* and *Diuris purdiei*

6.6.1 Direct impacts

Extensive targeted searches within areas of suitable habitat for *Caladenia huegelii, Diuris micrantha, Drakaea elastica* and *Diuris purdiei* were undertaken by Biota (2025a) during surveys for the Proposed Action. None of the species were recorded and it is considered unlikely that they would be present in the PAA (refer to Section 5.4.4). The Proposed Action will not result in direct impacts to *Caladenia huegelii, Diuris micrantha, Drakaea elastica* or *Diuris purdiei* individuals.

There is 14.93 ha of potential habitat for *Caladenia huegelii, Diuris micrantha, Drakaea elastica* and *Diuris purdiei* within the PAA. This potential habitat is aligned with areas of Banksia TEC and/or areas of CBC foraging habitat. Clearing within the PAA will result in the direct loss of 14.93 ha of potential habitat for *Caladenia huegelii, Diuris micrantha, Drakaea elastica* and *Diuris purdiei*.

6.6.2 Indirect impacts

The Proposed Action has the potential to indirectly impact on potential orchid habitat through increased fragmentation and edge effects, introduction and/or spread of weeds and dieback, altered fire regimes and changes to hydrology. Clearing required for the Proposed Action will result in increased fragmentation of the potential orchid habitat, however, it is unlikely to result in fragmentation that would significantly impact the function of the potential orchid habitat. Main Roads routinely manages weeds and dieback and has established hygiene protocols, mitigation and monitoring measures detailed in Section 8. Given the proposed mitigation measures, the Proposed Action is not expected to result in the introduction and/or spread of weeds or dieback that could result in significant indirect impacts to the potential orchid habitat. Similarly, Main Roads will implement standard construction and operational controls to appropriately control the risk of fire. As outlined in Section 6.3.2.5, no hydrology related impacts on Banksia TEC (and aligned potential orchid habitat) are expected. The residual indirect impacts on potential orchid habitat associated with the Proposed Action are considered negligible.

6.6.3 Assessment of significance

No individuals of *Caladenia huegelii, Diuris micrantha, Drakaea elastica* or *Diuris purdiei* were recorded within the PAA and it is considered unlikely that they would be present in the PAA. There is potential orchid habitat within the PAA, but this habitat is not considered critical habitat for any of the species. The Proposed Action will not lead to a long-term decrease in the size of a *Caladenia huegelii, Diuris micrantha, Drakaea elastica* or *Diuris purdiei* population, nor reduce the area of occupancy or fragment an existing population into two or more populations given none were recorded in the PAA. The Proposed Action will not adversely affect habitat critical to the survival of these species or affect habitat to the extent that the species are likely to decline. The Proposed Action is not expected to result in the introduction or spread of invasive species or diseases that would impact *Caladenia huegelii, Diuris micrantha, Drakaea elastica* or *Diuris purdiei* individuals or their potential habitat. The Proposed Action will not interfere with the recovery of *Caladenia huegelii, Diuris micrantha, Drakaea elastica* or *Diuris purdiei*. Overall, based on the above the Proposed Action is not expected to have significant impacts (direct or indirect) on potential orchid habitat.

6.7 Black Cockatoos

6.7.1 Direct impacts

Clearing within the PAA will result in the direct loss of up to 592 suitable DBH trees. Of these, 8 trees contained 8 hollows that were considered of suitable depth and shape for Black Cockatoo breeding. The Proposed action will not result in clearing of known breeding hollows.

No direct impacts to roosting habitat are anticipated from the Proposed action.

Clearing within the PAA will result in the direct loss of up to 56.98 ha of foraging habitat for CBC and 38.34 ha of foraging habitat for FRTBC. The foraging habitat is located along the length of the PAA and includes Low – Moderate to Moderate – High quality foraging habitat as assessed using the BCE foraging habitat scoring system (BCE 2020) (see Section 5.5.1.4.3). Black Cockatoos are highly mobile species and are expected to forage both within and outside the PAA amongst foraging resources in the local area. They are unlikely to be dependent on a particular patch of foraging habitat within the PAA. While the PAA occurs within a modified landscape, it is adjacent/nearby to Jandakot and Beeliar Regional Parks, which are likely to provide better foraging habitat for both CBC and FRTBC.

Implementation of the Proposed Action will reduce the available foraging habitat in the local area (12 km buffer of the PAA) by 0.55% for CBC and by 0.41% for FRTBC. The PAA contains common foraging resources for CBC and FRTBC including Banksia spp. and Jarrah respectively. Loss of foraging habitat within the PAA is unlikely to contribute to potential nutrient deficits in CBC and FRTBC. The PAA represents a small extent of the foraging habitat and contains common foraging resources that are available across the SCP.

6.7.2 Indirect impacts

6.7.2.1 Fragmentation and edge effects

Black cockatoo habitat is fragmented by the existing Anketell Road, associated road corridors and surrounding land uses. Black cockatoo foraging habitat is located along the length of the PAA. The PAA is 300 m wide at its widest point. Clearing within the PAA is unlikely to fragment the surrounding foraging habitat to an extent that it represents a barrier to movement of black cockatoos through the local area. Furthermore, the removal of foraging habitat within the PAA will not create a gap of 1 km or more between patches of available habitat.

6.7.2.2 Introduction and/or spread of weeds

The Proposed Action has the potential to introduce and/or spread weeds through ground disturbing activities such as clearing, increased movement of vehicles or earth-moving machinery and import or reuse of weed infested topsoil. Main Roads routinely manages weeds and has established mitigation and monitoring measures detailed in Section 8. Given the existing high weed load within the PAA and surrounds and proposed mitigation measures, the Proposed Action is not expected to result in the introduction and/or spread of weeds that could result in significant indirect impacts to black cockatoo habitat.

6.7.2.3 Introduction and/or spread of Phytophthora cinnamomi Dieback

The Proposed Action has the potential to introduce and/or spread dieback through ground disturbing activities such as clearing, increased movement of vehicles or earth-moving machinery and import or reuse of dieback infested topsoil. Main Roads routinely manages dieback and has established dieback hygiene controls detailed in Section 8. Given the disturbed nature of the

overall PAA, previous and current land uses and the proposed mitigation measures, the Proposed Action is not expected to result in the introduction and/or spread of dieback that could result in significant indirect impacts to to black cockatoo habitat.

6.7.2.4 Altered fire regimes

The Proposed Action has the potential to impact black cockatoo habitat through the accidental generation of fire during construction. Main Roads will implement standard construction and operational controls to appropriately control the risk of fire. This will include identifying potential ignition sources and/or activities with the potential to lead to fire, and preventable measures. Weed management will reduce the risk of fires caused by the Proposed Action spreading to nearby black cockatoo habitat. Given the existing infrastructure and industries currently present within and adjacent to the PAA, the overall degraded nature of the PAA and that fire is manageable, the implementation of the Proposed Action is not expected to impact existing fire regimes, nor increase the likelihood of fires.

6.7.2.5 Fauna injury and/or death from strike

Implementation of the Proposed Action will result in increased vehicle movements within and around the PAA. No construction related mortalities are expected during construction given the works largely related to the upgrade of existing road infrastructure, and vehicle access and speeds will be limited to manage other potential impacts such as weed and dieback and dust emissions. Due to the high mobility of Black Cockatoos, clearing conducted for the Proposed Action is not expected to directly affect individuals that may move through the area.

The potential for mortality of Black Cockatoo chicks in nest hollows during the clearing of native vegetation will be avoided. Although no Black Cockatoo breeding activity nor definitive evidence of breeding was observed within the PAA during the Biota surveys, a pre-clearing fauna survey of potential nesting hollows will be undertaken to determine if they are being used by Black Cockatoos. If a hollow is occupied by nesting Black Cockatoos, clearing within a 10 m radius of the occupied hollow will not occur until a subsequent fauna survey has confirmed the breeding event is completed.

Accordingly to Coyle (2021), the project area has a “Very Low” hotspot intensity for both CBC and FRTBC vehicle collisions. It is unlikely the operation of the Proposed Action will increase the potential for black cockatoo strike, given the Proposed Action relates to the upgrade of existing roads, the degraded condition of most areas adjacent to the road corridor and the removal of foraging habitat within 10 m of the road edge.

Main Roads will implement mitigation measures to minimise the risk of vehicle strike as far as practicable. Revegetation works within the PAA will ensure that vegetation suitable for Black Cockatoo foraging is not established within 10 m of the road edge. Proposal design will incorporate road drainage to direct water run off away from the road to avoid pooling which may attract black cockatoos for drinking; such that black cockatoos are less likely to be present near the road formation. Given the proposed mitigation measures, the Proposed Action is not expected to result in significant impacts on black cockatoos from strike.

6.7.2.6 Noise, light, vibration and dust emissions

The Proposed Action is likely to result in increased noise, light and vibration emissions during construction.

No breeding activity or definitive evidence of breeding was recorded within or adjacent to the PAA.

No known roosting habitat was recorded within the PAA, with the closest known roosting site approximately 2.5 km east of the PAA. Advice from Black Cockatoo species experts suggest CBC have adapted to urban and peri-urban environments and can be found nesting in noisy area areas such as next to major highways where suitable trees and hollows occur. Main Roads will implement standard management measures to minimise noise, light and vibration emissions during construction. The Proposed Action involves the upgrade of the existing Anketell Road and therefore is not expected to have substantially increased noise, light and vibration emissions during operation. The potential impact to Black Cockatoos from noise, light and vibration associated with the Proposed Action is considered negligible.

The Proposed Action will involve vegetation clearing and earthworks, which will potentially generate dust, however it will not have a significant impact on the surrounding vegetation include black cockatoo foraging habitat. The impact on vegetation from dust would be primarily due to deposition of dust on foliage during the dry weather that would disrupt photosynthesis. Main Roads will implement standard management measures such as water sprinkling on exposed grounds, restricting vehicles access and controlling speeds as a measure to supress dust generation. Implementing these management measures will minimise the impacts on foraging vegetation of the two species of Black Cockatoo. Given the limited amount of dust from the Proposed Action and exposure of ground being temporary, the indirect impact of dust on black cockatoos is not significant.

6.7.3 Assessment of significance

Table 6.8 provides an assessment of the potential impact of the Proposed Action to CBC using the Critically Endangered and Endangered species significant impact criteria (DoE 2013b). Table 6.9 provides an assessment of the potential impact of the Proposed Action to FRTBC using the using the Vulnerable species significant impact criteria (DoE 2013b).

The criteria in the significant impact guidelines refer to 'populations' and 'important populations'. The 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area (DoE 2013b). An 'important population' is defined as population that is necessary for the species' long-term survival and recovery (DoE 2013b).

'Populations' and 'important populations' have not been defined for Black Cockatoos, due to the mobile and widely-distributed nature of these species, and the variation in flock compositions (for example, between breeding and non-breeding seasons). For Black Cockatoos, it is more appropriate to consider significance in terms of impacts on habitat and individuals rather than a population (DAWE 2022).

The assessment concludes that the direct clearing of 56.98 of CBC foraging habitat and 38.34 ha of FRTBC foraging habitat as part of the Proposed Action is likely to be significant. The Proposed Action is likely to adversely affect habitat critical to the survival of the CBC and FRTBC. Indirect impacts will be avoided through standard construction management practices when implementing the Proposed Action, to prevent significant impacts outside the PAA.

Table 6.8: Assessment of significant impact criteria for CBC

Criteria	Assessment
Lead to a long-term decrease in the size of a population	The Proposed Action is not expected to lead to a long-term decrease in the size of the CBC population, given the lack of roosting habitat, no known breeding activity and extent of available foraging habitat in the local area (10,260.74 ha within a 12 km buffer of the PAA; Appendix 3) (Biota 2025a). Black Cockatoos

Criteria	Assessment
	are highly mobile species and are expected to forage both within and outside the PAA amongst foraging resources in the local area. While the PAA occurs within a modified landscape, it is adjacent/nearby to Jandakot and Beeliar Regional Parks, which are likely to provide better foraging habitat for CBC. The small reduction in foraging habitat (0.55% reduction in the local area) is unlikely to contribute to a long-term decrease in the population. **Unlikely to be significant.**
Reduce the area of occupancy of the species	The PAA is within the mapped distribution of CBC (DAWE 2022). Clearing within the PAA will result in the direct loss of up to 592 suitable DBH trees. Of these, 8 trees contained 8 hollows that were considered of suitable depth and shape for Black Cockatoo breeding. The Proposed action will not result in clearing of known breeding hollows. Clearing within the PAA will result in the loss of up to 56.98 ha of foraging habitat for CBC. This will reduce the available foraging habitat in the local area (12 km buffer of the PAA) by 0.55% for CBC (Appendix 3). Given the available habitat within the local area, the proposed clearing of foraging and potential breeding habitat is unlikely to significantly reduce the area of occupancy of the species. **Unlikely to be significant.**
Fragment an existing population into two or more populations	The Proposed Action is not expected to fragment populations of CBC. The CBC population is considered to exist as one large, interconnected population (DPaW 2013). The Proposed Action is within an area where habitat is fragmented. The gap created by the Proposed Action will be approximately 300 m wide at its widest and is unlikely to fragment an existing population into two or more populations. **Unlikely to be significant.**
Adversely affect habitat critical to the survival of a species	The Proposed Action is likely to adversely affect habitat critical to the survival of the CBC. The CBC foraging habitat within the PAA is considered critical habitat based on the definition in DPaW (2013) and is located in a critical foraging area (on the SCP) based on the referral guideline for 3 WA threatened black cockatoo species (DAWE 2022). Clearing within the PAA will result in the loss of up to 56.98 ha of foraging habitat for CBC. This will reduce the available foraging habitat in the local area (12 km buffer of the PAA) by 0.55% for CBC (Appendix 3). **Likely to be significant.**
Disrupt the breeding cycle of a population	The Proposed Action is not expected to disrupt the breeding cycle of a population of CBC as no breeding activity nor definitive evidence of breeding was observed within the PAA during the surveys (Biota 2025a). There are no known black cockatoo breeding locations within 12 km of the PAA (BirdLife 2025.) **Unlikely to be significant.**
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Proposed Action is not expected to impact the availability or quality of habitat to the extent that CBC are likely to decline. The Proposed Action will result in the clearing of up to 56.98 ha of foraging habitat and up to 592 suitable DBH trees (8 trees with 8 hollows suitable for black cockatoos). This reduction in foraging and potential future breeding habitat for CBC may result in a minor residual impact associated with the Proposed Action. However, it is not expected to result in the decline of the species, due to the availability of suitable habitat outside the PAA.

Criteria	Assessment
	Unlikely to be significant.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat	The Proposed Action is not expected to result in the introduction or spread of weeds that would result in significant impacts to CBC habitat. This is due to the implementation of management actions including weed management and hygiene, and revegetation / landscaping with native species. Ongoing road maintenance will be undertaken to prevent spread of weeds into adjacent habitat. The Proposed Action is unlikely to result in the introduction of new species to the area. However, competition currently exists for nest hollows with European honeybees and other bird species. The Proposed Action will result in the loss of up to eight hollows that are suitable for black cockatoo nesting. This loss has the potential to marginally increase the competition for remaining hollows by a variety of species. The overall impact on CBC will not be significant as the Proposed Action is not envisaged to introduce invasive species. **Unlikely to be significant.**
Introduce disease that may cause the species to decline	The Proposed Action is not expected to introduce or spread disease that could cause the CBC population to decline. The Proposed Action will include dieback hygiene measures during construction to protect adjacent Black Cockatoo habitat. The Proposed Action is not expected to spread Phytophthora dieback through sediment in stormwater runoff as the drainage strategy is to provide infiltration at the source, or as close to the source as possible, using permeable base pits via infiltration basins. The recovery plan (DPaW 2013) identifies potential bird diseases such as Beak and Feather Disease (BFDV), Avian Polymovirus (APV), and Carnaby's Hindlimb Paralysis Syndrome (CHiPs) that could pose a threat to CBC but does not identify any high-risk activities for spreading disease or any management measures that could prevent disease. The presence of any such disease within the PAA or surrounds is unknown. It is assumed that the highest risk of introducing/spreading disease would be associated with handling of Black Cockatoos. The Proposed Action is expected to involve none to minimal handling of Black Cockatoos, other than rescue. A suitably qualified fauna handler (with an understanding of animal disease control) will be engaged to undertake this task, if required. **Unlikely to be significant.**
Interfere with the recovery of the species	The Proposed Action is not inconsistent with the CBC recovery plan which includes recovery actions to identify, protect and manage habitat. The Proposed Action will result in clearing 56.98 ha of CBC foraging habitat and potential breeding habitat, however, this loss is unlikely to interfere with the recovery of the species in the local area. **Unlikely to be significant.**

Table 6.9: Assessment of significant impact criteria for FRTBC

Criteria	Assessment
Lead to a long-term decrease in the size of an important population	The Proposed Action is not expected to lead to a long-term decrease in the size of an important FRTBC population, given the lack of roosting habitat, no known breeding activity and extent of available foraging habitat in the local area (9,414.19 ha within a 12 km buffer of the PAA; Appendix 3) (Biota 2025a). Black Cockatoos are highly mobile species and are expected to forage both within and

Criteria	Assessment
	outside the PAA amongst foraging resources in the local area. While the PAA occurs within a modified landscape, it is adjacent/nearby to Jandakot and Beeliar Regional Parks, which are likely to provide better foraging habitat for FRBC. The small reduction in foraging habitat (0.41% reduction in the local area) is unlikely to contribute to a long-term decrease in the population. **Unlikely to be significant.**
Reduce the area of occupancy of an important population	The PAA is within the mapped distribution of FRTBC (DAWE 2022). Clearing within the PAA will result in the direct loss of up to 592 suitable DBH trees. Of these, 8 trees contained 8 hollows that were considered of suitable depth and shape for Black Cockatoo breeding. The Proposed action will not result in clearing of known breeding hollows. Clearing within the PAA will result in the loss of up to 38.34 ha of foraging habitat for FRTBC. This will reduce the available foraging habitat in the local area (12 km buffer of the PAA) by 0.41% for FRTBC (Appendix 3). Given the available habitat within the local area, the proposed clearing of foraging and potential breeding habitat is unlikely to significantly reduce the area of occupancy of an important population of FRTBC. **Unlikely to be significant.**
Fragment an existing important population into two or more populations	The Proposed Action is not expected to fragment populations of FRTBC. The FRTBC population is considered to exist as one population (DEWHA 2009). The Proposed Action is within an area where habitat is fragmented. The gap created by the Proposed Action will be approximately 300 m wide at its widest and is unlikely to fragment an existing important population into two or more populations. **Unlikely to be significant.**
Adversely affect habitat critical to the survival of a species	The Proposed Action is likely to adversely affect habitat critical to the survival of the FRTBC. The FRTBC foraging habitat within the PAA is considered critical habitat based on the definition in DEC (2008a). Clearing within the PAA will result in the loss of up to 38.34 ha of foraging habitat for FRTBC. This will reduce the available foraging habitat in the local area (12 km buffer of the PAA) by 0.41% for FRTBC (Appendix 3). **Likely to be significant.**
Disrupt the breeding cycle of an important population	The Proposed Action is not expected to disrupt the breeding cycle of a population of FRTBC as no breeding activity nor definitive evidence of breeding was observed within the PAA during the surveys (Biota 2025a). There are no known black cockatoo breeding locations within 12 km of the PAA (BirdLife 2025.) **Unlikely to be significant.**
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Proposed Action is not expected to impact the availability or quality of habitat to the extent that FRTBC are likely to decline. The Proposed Action will result in the clearing of up to 38.34 ha of foraging habitat and up to 592 suitable DBH trees (8 trees with 8 hollows suitable for black cockatoos). This reduction in foraging and potential future breeding habitat for FRTBC may result in a minor residual impact associated with the Proposed Action. However, it is not expected to result in the decline of the species, due to the availability of suitable habitat outside the PAA. **Unlikely to be significant.**

Criteria	Assessment
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	The Proposed Action is not expected to result in the introduction or spread of weeds that would result in significant impacts to FRTBC habitat. This is due to the implementation of management actions including weed management and hygiene, and revegetation / landscaping with native species. Ongoing road maintenance will be undertaken to prevent spread of weeds into adjacent habitat. The Proposed Action is unlikely to result in the introduction of new species to the area. However, competition currently exists for nest hollows with European honeybees and other bird species. The Proposed Action will result in the loss of up to eight hollows that are suitable for black cockatoo nesting. This loss has the potential to marginally increase the competition for remaining hollows by a variety of species. The overall impact on FRTBC will not be significant as the Proposed Action is not envisaged to introduce invasive species. **Unlikely to be significant.**
Introduce disease that may cause the species to decline	The Proposed Action is not expected to introduce or spread disease that could cause the FRTBC population to decline. The Proposed Action will include dieback hygiene measures during construction to protect adjacent Black Cockatoo habitat. The Proposed Action is not expected to spread Phytophthora dieback through sediment in stormwater runoff as the drainage strategy is to provide infiltration at the source, or as close to the source as possible, using permeable base pits via infiltration basins. **Unlikely to be significant.**
Interfere with the recovery of the species	The Proposed Action is not inconsistent with the FRTBC recovery plan which includes recovery actions to minimise key threats and increase recruitment (DEC 2008a). The Proposed Action will result in clearing 38.34 ha of FRTBC foraging habitat and potential breeding habitat, however, this loss is unlikely to interfere with the recovery of the species in the local area. **Unlikely to be significant.**

6.8 Chuditch

6.8.1 Direct impacts

The Chuditch was not recorded during the targeted surveys in the PAA or surrounds for the Proposed Action (Biota 2024a, 2025a). It is considered highly unlikely that the Chuditch occurs or utilises the PAA as a thoroughfare with no evidence of a population occurring even in the larger reserves nearby, Jandakot Regional Park and Beeliar Regional Park where it has been historically recorded twice, in 2009 and 2013 (refer to Section 5.5.2). The Proposed Action will not result in direct impacts to Chuditch individuals or potential habitat.

6.8.2 Indirect impacts

The Proposed Action will not have any indirect impact on the Chuditch or potential Chuditch habitat as this species is considered highly unlikely to occur or utilise the PAA and surrounds (Biota 2024a; Biota 2025a). As discussed in Section 5.5.2.3, there are four ecological corridors within 15 km of the PAA. None of these ecological corridors connect the PAA or Contextual area to Lowlands Nature Reserve or bushland on the eastern side of the SCP or the Darling Scarp where Chuditch are known to occur. The PAA and surrounds are not considered potential Chuditch habitat.

6.8.3 Assessment of significance

Overall, based on the above the Proposed Action is not expected to have impacts (direct or indirect) on Chuditch individuals or potential Chuditch habitat. Therefore, no further assessment against the significant impact guidelines is considered necessary.

7 RISK ASSESSMENT

A risk assessment has been undertaken for the Proposed Action (Appendix 5). The risk assessment addresses the likelihood and consequence of potential impacts to MNES based on the information presented in Sections 5 and 6 of this PD, whether nature and/or scale of impacts are unknown, unpredictable or irreversible and the confidence of impacts predictions. The risk assessment adopts likelihood and consequence criteria and a risk matrix, presented in Table 7.1, Table 7.2 and Table 7.3, taken from DCCEEW (2024b).

The risk assessment indicates that the Proposed Action poses a low residual risk to MNES, with the exception of the following potential impacts summarised in Table 7.4.

Table 7.1: Likelihood criteria

Likelihood	Criteria
Highly likely	Is expected to occur during the construction/operation period
Likely	Will probably occur during the construction/operation period
Possible	Might occur during the construction/operation period
Unlikely	Could occur during construction/operation but considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Table 7.2: Consequence criteria

Consequence	Criteria
Minor	Minor environmental impact that can be reversed
Moderate	Isolated but substantial environmental impact that could be reversed with intensive efforts
High	Substantial environmental impact that could be reversed with intensive efforts
Major	Major loss of environmental value and real danger of continuing
Critical	Severe widespread loss of environmental value and irrecoverable environmental damage

Table 7.3: Risk ranking matrix

Likelihood	Consequence				
	Minor	Moderate	High	Major	Critical
Highly likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possible	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

Table 7.4: Summary of risk assessment (residual risk rating medium or high)

Impact	Cause	Residual Risk Rating
Direct impact causing loss of up to: – 1.94 ha Honeymyrtle Shrubland TEC	Authorised clearing of native vegetation with the PAA.	High (Offset Strategy to counter balance residual risk)
Direct impact causing loss of up to: – 40.99 ha Tuart TEC – 14.56 ha Banksia TEC – 56.98 ha CBC foraging habitat – 38.34 ha FRTBC foraging habitat	Authorised clearing of native vegetation with the PAA.	High (Offset Strategy to counter balance residual risk)
Direct impact causing loss of up to: – 592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding. – 14.93 ha potential orchid habitat	Authorised clearing of native vegetation with the PAA.	Medium
Indirect impact to Tuart TEC patches due to patch size and condition threshold not being met.	Authorised clearing of native vegetation within the PAA fragmenting existing patches of Tuart TEC to the extent that they no longer met TEC thresholds.	Medium
Indirect impact to Banksia TEC patches due to patch size and condition threshold not being met.	Authorised clearing of native vegetation within the PAA fragmenting existing patches of Banksia TEC to the extent that they no longer met TEC thresholds.	Medium

8 AVOIDANCE AND MITIGATION MEASURES

8.1 Application of the mitigation hierarchy

The DCCEEW offsets policy (DSEWPAC 2012b) identifies that mitigation and management actions should prioritise the avoidance of environmental effects over reduction measures. Mitigation of environmental impacts from the Proposed Action have been assessed through a hierarchy of avoid, minimise, reduce, rehabilitate and offset environmental impacts. This hierarchy is achieved primarily through changes in scope and design to avoid and minimise impacts; development and implementation of management measures to mitigate and manage environmental impacts during construction and operation. An Offset Strategy will also be developed to mitigate significant residual MNES impacts.

8.2 Impact avoidance and minimisation

The Proposed Action is being designed to avoid and/or mitigate impacts to Tuart TEC, Banksia TEC, Honeymyrtle TEC, Organic Mounds TEC, potential orchid habitat and black cockatoos where possible. Measures considered and incorporated in the Proposed Action planning are discussed in Table 8.1 with locations shown on Figure 34, Appendix A.

Further opportunity to reduce the Proposed Action's impacts on TEC and species habitat may be possible during the detailed design phase and through the implementation of specific construction methodologies.

Table 8.1: Summary of impact avoidance and/or minimisation measures undertaken during design

Location and Figure reference	Discussion
Whole design	The design solution follows the existing Anketell Road alignment, predominantly within the disturbed road corridor to avoid and reduce impacts on TEC and species habitat, including avoiding additional movement barries to black cockatoos. The existing road infrastructure consists of a 10 m wide pavement with previously cleared verges. Drainage basins will be located in disturbed/cleared areas where possible to avoid impacts on TEC and species habitat. Narrow medians will be maintained where practicable to reduce direct impacts on TEC and species habitat.
Rockingham Road interchange (1)	Rockingham Road is raised over Anketell Road to allow freeflow direct access to the west of Rockingham Road. Anketell Road will service trucks with loads up to 5.3m. This configuration keeps the road infrastructure as low as possible thus reducing the PAA and minimising direct impacts on CBC and FRTBC foraging habitat.
Armstrong Road interchange (2)	Armstrong Road provides access to Latitude 32. A conventional interchange would have ramp spacing at 150 m. A compact interchange is proposed which has reduced ramp spacing to approximately 100 m, reducing the PAA at this location. The reduced footprint does require significant retaining walls. This has minimised direct impacts on CBC and FRTBC foraging habitat. South of Armstrong Road the proposed new access into the Motorplex site has been designed to avoid excavating a historical residue storage pond. This minimises potential indirect impacts to the condition of foraging and potential breeding habitat for Black Cockatoos due to disturbance of known or existing contamination.

Location and Figure reference	Discussion
Abercrombie Road interchange (3)	Anketell Road over Abercrombie Road. A conventional interchange would have ramp spacing at 150 m. A compact interchange is proposed which has reduced ramp spacing to approximately 100 m, reducing the PAA at this location. The reduced footprint does require significant retaining walls. Unavoidable associated works such as realignment of the Alcoa access road has resulted in the majority of Tuart TEC patch TT05 being directly impacted.
Abercrombie Road to McLaughlan Road (4)	From Abercrombie Road to McLaughlan Road, the PAA follows the existing Anketell Road. The design is located to the south of Anketell Road to allow sufficient separation and avoid Alcoa residue storage areas. This avoids potential disturbance of contamination minimising indirect impact on Tuart TEC and foraging and potential breeding habitat for Black Cockatoos. The design has a narrow median and retaining wall on the northern side of Anketell Roads to minimise direct impacts on Tuart TEC and foraging and potential breeding habitat for Black Cockatoos.
McLaughlan Road Intersection (5)	McLaughlan Road intersection will not allow right turn movements. This prevents the need to have an additional interchange which significantly reduces the PAA and minimised direct impacts on Tuart TEC, Banksia TEC, foraging and potential breeding habitat for Black Cockatoos and potential orchid habitat.
McLaughlan Road to Clementi Road (6)	The Anketell Road cross section is narrow with no median reduce the PAA and minimise impacts on Banksia TEC, foraging and potential breeding habitat for Black Cockatoos and potential orchid habitat. Drainage basins are provided in cleared or sparsely vegetated areas where possible.
Clementi Road to Mandogalup Road (7)	Anketell Road has been aligned to the north of existing road to minimise direct clearing impacts on Banksia TEC, foraging and potential breeding habitat for Black Cockatoos and potential orchid habitat.
Mandogalup Road (8)	The interchange at Mandogalup Road has been designed to provide access for the existing and future development within the Mandogalup area, while facilitating safe movements along Anketell Road by separating the freight and general traffic. The interchange is located as far north as reasonably possible and extensive retaining walls are proposed to minimise direct impacts on Banksia TEC and foraging and potential breeding habitat for Black Cockatoos.
Mandogalup Road to Kwinana Freeway (9)	It is proposed to raise Anketell Road on retaining walls to limit the PAA in this area. If retaining walls were not utilised the PAA would need to be up to 40 m wider at this location. The alignment has been moved as far north as practical to minimise direct impacts on Banksia TEC, foraging and potential breeding habitat for Black Cockatoos and potential orchid habitat while also tying into the existing bridge over Kwinana Freeway.
Kwinana Freeway interchange (10)	The Kwinana Freeway interchange upgrades have been positioned to the north of the existing bridge over Kwinana Freeway. This keeps the impacts as far north as possible, limiting direct clearing of Banksia TEC, foraging and potential breeding habitat for Black Cockatoos and potential orchid habitat.
Kwinana Freeway to Treeby Road (11)	A compact interchange is proposed at Anketell Road and Treeby Road and there is no median on Anketell Road. The PAA is reduced to minimise impacts on Banksia TEC, foraging habitat for CBC, and potential breeding habitat for Black Cockatoos and potential orchid habitat.

8.3 Performance standards

The DCCEEW RFI (Appendix 2) identifies the application of 'SMART' (specific, measurable, achievable, relevant and time-bound) performance standards to be applied.

SMART performance standards are intended to relate to measurable (numerical) values which can be applied to a Proposed Action (rather than qualitatively measured management/monitoring actions) and may include measurements such as threshold criteria, performance indicators, corrective actions and completion criteria.

Table 8.2 shows the SMART performance standards that relate to the measurable impacts of the Proposed Action. These SMART performance standards complement the management measures, performance targets and completion criteria, monitoring and reporting arrangements and potential risk/threats identified in Table 8.3.

The threshold criteria and completion criteria are considered to be achievable, with the risk potential of not achieving the proposed SMART performance standards captured by the risk assessment presented in Appendix 5.

The SMART performance standards do not require detailed statistical analysis to determine if the threshold criteria and completion criteria have been met, nor require statistical power to detect change (for example, climatic or seasonal variability), or control of reference sites for comparative purposes).

Table 8.2 SMART performance standards

Threshold criteria	Performance indicators	Corrective actions	Corrective Action Responsibility	Completion criteria
Clearing of 40.99 ha of Tuart TEC	Area (ha) of Tuart TEC	Clearing in the direct vicinity will cease immediately if trigger is met. Clearing will not recommence until clearing area boundaries have been reviewed and confirmed to be in place correctly and Main Roads Superintendent provides approval to recommence. Environmental incident will be recorded and the cause investigated. Incident will be reported to DCCEEW along with the cause identified from the investigation. Incorrectly cleared areas will be assessed for potential remediation in consultation with DCCEEW. These areas for remediation will be included in the Landscape and Revegetation Plan for the Proposed Action within 6 months of completion of clearing for revegetation with TEC, threatened fauna and flora species/habitat.	Construction Contractor Environmental Representative Main Roads Superintendent	No more than 40.99 ha of Tuart TEC cleared
Clearing of 14.56 ha of Banksia TEC	Area (ha) of Banksia TEC			No more than 14.56 ha of Banksia TEC cleared
Clearing of 56.98 ha of CBC foraging habitat	Area (ha) of CBC foraging habitat cleared			No more than 56.98 ha of CBC foraging habitat cleared
Clearing of 38.34 ha of FRTBC foraging habitat	Area (ha) of FRTBC foraging habitat cleared			No more than 38.34 ha of FRTBC foraging habitat cleared
Clearing of 592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding	592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding cleared			No more than 592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding cleared
Clearing of 14.93 ha of potential orchid habitat	Area (ha) of potential orchid habitat cleared			No more than 14.93 ha of potential orchid habitat cleared

8.4 Management measures

Management measures for the Proposed Action will be implemented for the following aspects:

- Clearing and access controls
- Weed and dieback management
- Fauna management
- Sediment and erosion control
- Drainage management
- Soil management
- Water abstraction and dewatering management
- Revegetation and landscaping.

Pre-construction and construction procedures have been developed to ensure MNES are adequately outlined in the field, protected and managed to minimise impacts. These are detailed in Table 8.3 along with performance and completion criteria as well as monitoring and reporting arrangements.

Where disturbance is unavoidable, additional management actions will be implemented to minimise the extent of impacts. Main Roads intends to counterbalance the significant residual impacts of the Proposed Action via implementation of an Environmental Offset Strategy (Section 9).

Table 8.3 Management measures to mitigate impacts to MNES

Management Objective/Desired Outcomes	Management Measures	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Potential Risk/Threat
Prevent unauthorised clearing of Tuart TEC, Banksia TEC, foraging and potential breeding habitat for black cockatoos, potential orchid habitat outside of the PAA. **Achieve SMART performance standards** (Table 8.2, Section 8)	Identification and demarcation of clearing area boundaries. Vegetation to be retained to be clearly demarcated prior to clearing commencing. Pre-clearing inspection of boundaries and approval by Main Roads prior to clearing works.	No unauthorised clearing of Tuart TEC, Banksia TEC, foraging and potential breeding habitat for black cockatoos, potential orchid habitat.	During construction: – Site inspections prior to clearing confirm clearing areas are demarcated. – Post-clearing survey confirms clearing remained within approved limits. – Areas cleared will be recorded by construction contractor and reported to Main Roads	Clearing more than: – 40.99 ha of Tuart TEC – 14.56 ha of Banksia TEC – 56.98 ha CBC foraging habitat – 38.34 ha FRTBC foraging habitat – 592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding – 14.93 ha potential orchid habitat
Prevent indirect impacts to condition of adjacent Tuart TEC, Banksia TEC, foraging and potential breeding habitat for black cockatoos, potential orchid habitat outside of the PAA.	Weed management: – Declared Plants within the PAA will be treated according to WA Government advice, with the aim of eradication where possible but as a minimum prevent off site movement. – WoNS and environmental weeds within the PAA will be treated according to Weeds Australia guidance with the aim of controlling off-site movement. – Topsoil containing Declared Pests or WoNS will not be reused in landscaping or revegetation. – All heavy plant and machinery will be inspected prior to entry at the work site and confirmed to be clean and free of vegetation and soil material.	No new WoNS or Declared Pests identified in the PAA or vegetation adjacent to the PAA, attributable to the Proposed Action. Topsoil records show topsoil containing WoNS or Declared Pests was treated or appropriately disposed. All plant and machinery will be verified clean on arrival at site.	Pre-construction: – Baseline weed mapping During construction: – Maintain maps and records of existing weeds and newly identified weeds through periodic inspections. – Records verifying plant and machinery arriving on site is clean	Decline in the extent or condition of TEC and species habitat adjacent to the PAA due to weed introduction and spread, attributed to the Proposed Action
	Dieback management: – All heavy plant and machinery will be inspected prior to entry at the work site and confirmed to be clean and free of vegetation and soil material. – Dieback management will be carried out in accordance with DBCA's Phytophthora Dieback Management Manual 2020	No new Phytophthora dieback infestations identified adjacent to the PAA, attributed to the Proposed Action	During construction: – Records verifying plant and machinery arriving on site is clean. – Develop and implement a dieback hygiene program.	Decline in the extent or condition of TEC and species habitat adjacent to the PAA due to dieback introduction and spread, attributed to the Proposed Action
	Water abstraction and dewatering management: – Identification and demarcation of potential GDV/GDEs that may be affected by groundwater drawdown. – Groundwater level monitoring and vegetation condition monitoring will be undertaken at all identified areas of potentially affected GDV, to identify any early impacts of groundwater drawdown. – If GDV are exhibiting signs of impact from groundwater drawdown, remedial measures (e.g. infiltration trenches, diaphragm walls) will be implemented to restore groundwater levels to pre-construction levels.	No visible signs of impact to potential GDV/GDEs within the zone of influence, attributed to the Proposed Action's construction water abstraction and/or dewatering.	Pre-construction: – Potential GDV report/mapping. During water abstraction/dewatering: – Groundwater level monitoring and vegetation condition monitoring and reporting. – Record(s) of remedial measures implementation if required.	Decline in the extent or condition of TEC and species habitat adjacent to the PAA due construction water abstraction and/or dewatering, attributed to the Proposed Action
	Sediment and erosion management: – Temporary erosion and sediment controls will be maintained within the PAA during construction to prevent stormwater runoff from construction areas	No evidence of erosion or sedimentation identified adjacent to the PAA, attributed to the Proposed Action.	During construction: – Records of monthly site inspections for scouring and erosion during construction.	Decline in the extent or condition of TEC and species habitat adjacent to the PAA due surface water runoff causing erosion and sedimentation, attributed to the Proposed Action

Management Objective/Desired Outcomes	Management Measures	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Potential Risk/Threat
	from eroding or causing sediment deposition in adjacent native vegetation. – Drainage design will integrate Water Sensitive Urban Design principles. – Drainage strategy to use permeable base pits via infiltration basins and swales where possible to infiltrate surface water runoff and minimise runoff outside of the PAA.			
	Spills management: – Fuel and chemicals to be stored in bunded areas located away from drainage lines and adjacent areas of TEC or species habitat. – Safety Data Sheets (SDS) will be maintained for all hazardous materials stored or used on site. – Any hazardous material storage will be in accordance with Australian standards and SDS. – Spill management procedures to be developed prior to construction. – On-site refuelling of machinery and plant to be away from all drainage areas. – Provision of spill response kits at refuelling locations and any locations where hydrocarbons or chemicals are stored. – Construction waste material appropriately managed and disposed of off-site at an appropriately licenced facility.	No adverse impacts to MNES habitat from hazardous materials, chemicals, hydrocarbons and waste discharge, attributed to the Proposed Action.	During construction: – Record of storage and spill management procedures. – Records of weekly inspections of hazardous materials and waste storage and handling areas to identify spills/leaks and discharges. In addition, check that storage, handling and signage is appropriate. – Site hazardous materials inventory – Site waste disposal register	Decline in the extent or condition of TEC and species habitat adjacent to the PAA due surface spills causing contamination, attributed to the Proposed Action
	Fire management: – All hot work will be undertaken in accordance hot work procedures. – All vehicles, plant and equipment to be fitted with fire extinguishers and restricted to designated cleared areas unless involved in clearing operations. – Fire danger ratings and Local Government vehicle movement bans to be observed and then requirements of these implemented.	No fires in MNES habitat adjacent to the PAA, attributable to the Proposed Action.	During construction: – Daily check of fire risk ratings and Local Government warnings. – Weekly vehicle inspections. – Monthly site inspections. – Compliance with hot work permits.	Decline in the extent or condition of TEC and species habitat adjacent to the PAA due accidental fires, attributed to the Proposed Action
	ASS and contamination management: – Avoid excavation in areas of high-risk ASS where possible. – Minimise disturbance of contaminated or potentially contaminated areas. – Construction bore locations to be outside of high and moderate risk areas as determined by FSG (2024).	No adverse impacts from pre-existing contamination or ASS in MNES habitat attributable to the Proposed Action.	During construction:	Decline in the extent or condition of TEC and species habitat adjacent to the PAA due disturbance of known or existing ASS and/or contaminated sites, attributed to the Proposed Action
Prevent indirect impacts to condition of Organic Mounds TEC occurrence within the Contextual Area.	– Construction bore locations to be outside of high and moderate risk areas as determined by FSG (2024). – Groundwater level monitoring and vegetation condition monitoring will be undertaken at Organic Mounds TEC occurrence within the Contextual Area, to identify any early impacts of groundwater drawdown.	No visible signs of impact to Organic Mounds TEC occurrence within the Contextual Area, attributed to the Proposed Actions' construction water abstraction and/or dewatering.	During water abstraction/dewatering: – Groundwater level monitoring and vegetation condition monitoring and reporting of Organic Mounds TEC occurrence within the Contextual Area. – Record(s) of remedial measures implementation if required.	Decline in the extent or condition of Organic Mounds TEC occurrence within the Contextual Area.

Management Objective/Desired Outcomes	Management Measures	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Potential Risk/Threat
	– If Organic Mounds TEC occurrence is exhibiting signs of impact from groundwater drawdown, consultation to be undertake with DBCA to determine if project related and, if so, remedial measures (e.g. infiltration trenches, diaphragm walls) will be implemented to restore groundwater levels to pre-construction levels.			
Avoid injury or mortality to black cockatoo individuals during construction and operation	– Speed limits will be reduced below existing posted speeds throughout the construction site for safety purposes, which will consequently reduce the risk of fauna strikes during construction. – A list of local wildlife rescue organisations and carers will be maintained on site to contact in the event of fauna injury. – Within 7 days prior to clearing, trees with hollows used by or suitable for use by CBC and FRTBC will be inspected by a suitably qualified ecologist to confirm that there are no hollows being used by CBC and FRTBC within the area to be cleared. – If black cockatoo breeding is detected in any hollows, then all the trees within 10m of the hollow will be demarcated and retained until hollows are no longer in use. – Any tree and vegetation within 10m of the tree identified as being used by black cockatoo for nesting will not be cleared until a suitably qualified person has verified that the tree is no longer being used for black cockatoo breeding. – Revegetation within the PAA that is within 10 m of the road seal will not be planted with black cockatoo foraging species.	No incidents of speeding within the construction site boundary. Survey of trees with hollows suitable for use by Black Cockatoos undertaken within 7 days prior to clearing events. No clearing of trees used by black cockatoos. Landscaping designs exclude foraging or breeding plant species within 10 m of the road.	During construction: – Black cockatoo encounters (injured/killed) recorded. – Record of inspection of trees with hollows used by or suitable for use by CBC and FRTBC within 7 days prior to area being cleared. – Pre-clearing inspection to verify that trees used for nesting have been flagged and have a 10 m exclusion zone. – Record of inspection of nesting trees and confirmation of not in use. – Review and approval of landscape design drawings showing location of revegetation, and summarising plant species mix	Direct impacts to black cockatoos (injury or mortality), attributed to the Proposed Action
Avoid disturbance to black cockatoos during construction and operation	– Construction works will be undertaken in accordance with the Environmental Protection (Noise) Regulations 1997. – During construction lighting will be directed toward the construction area and not into adjacent native vegetation, particularly The Spectacles. – Dust emissions will be controlled through appropriate measures where practicable including hydro mulch, water application through water carts and chemical dust suppressants. – Lighting will be implemented in accordance with Main Roads Lighting Design Guideline for Roadway and Public Space and relevant Australian Standards.		During construction: – Weekly site inspection of noise and dust controls. – Review and approval of design drawings and lighting plan.	Disturbance of black cockatoos adjacent to the PAA due noise, light, vibration and dust emissions, attributed to the Proposed Action

8.5 Effectiveness of avoidance and mitigation measures

Main Roads has a strong track record of developing and implementing best practice in environmental management and implementation of management measures. The measures proposed herein have been successfully implemented on past projects subject to EPBC conditions and management measures, including the following projects for which Compliance Reports have been issued in the past year.

1. Bunbury Outer Ring Road Project - Southern Section (EPBC 2019/8543)
2. Bunbury Outer Ring Road Project - Northern and Central Sections (EPBC 2019/8471)
3. Bussell Highway Duplication Hutton to Sabina (EPBC 2020/8800)
4. Mitchell Freeway Extension and Wanneroo Road Upgrade, WA (EPBC 2018/8367)
5. Great Northern Highway, Muchea to Wubin Upgrade Stage 2-Walebing to Wubin (EPBC 2016/7761)
6. Perth-Darwin National Highway alignment (Swan Valley Section), WA (EPBC 2013/7042)
7. Pinjarra-Williams & Williams-Narrogin Hwy Maintenance Zone Establishment Project, WA (EPBC 2016/7698)
8. Toodyay Road Widening and Upgrade Project (EPBC 2016/7665)

Main Roads is a State agency with an assured record of responsible environmental management and environmental management systems. Main Roads is not subject to any past or present proceedings under Commonwealth or State law for protection of the environment or conservation and sustainable use of natural resources. Main Roads' track record indicates a history of effective implementation and monitoring of management measures to ensure effectiveness. Main Roads has also demonstrated effective implementation of corrective actions when effectiveness does not meet completion criteria.

8.5.1 Tuart TEC and Banksia TEC

There are three Tuart TEC patches (TT05 and TT06b and TT06c) and three Banksia TEC patches (BT01, BT02 and BT07) that intersect the PAA and will be cleared to near the minimum size and condition thresholds. Main Roads will implement the management measures outlined in Table 8.3, to minimise indirect impacts to the condition of the remaining patch areas during construction of the Proposed Action. To minimise indirect impacts to condition during operation, Main Roads will undertake maintenance of the road corridor to treat weeds and reduce fuel build up consistent with current maintenance programs.

The remaining Tuart TEC and Banksia TEC patches are located on lands adjacent to the road corridor and not under Main Roads' control. Tuart TEC patches TT05 and TT06b are located on Alcoa land and are within fenced areas. Limited access may assist in minimising weed and dieback impacts on the patches. Parts of Tuart TEC patch TT06b are also located within Bush Forever site no. 268, which is managed for conservation. Tuart TEC patch TT06c is located within the boundary of the Kwinana Wastewater Treatment Plant and provides a vegetated buffer between Anketell Road and the Plant. Banksia TEC patch BT07 is located within the Hope Valley Wattleup Redevelopment Project Master Plan area. The Latitude 32 Planning Policy 3.1 - Biodiversity Planning indicates the patch is within the Conway Road Swamp and Bushland Key Natural Area and is afforded some protection. Banksia TEC patches BT01 and BT02 are located on land zoned urban under the MRS.

8.6 Reporting

Results of monitoring and compliance with proposed management actions will be reported to DCCEEW as part of the Annual Compliance Report in line with the Annual Compliance Report Guideline. The format of this report will be consistent with requirements stipulated in DCCEEW. The report will document compliance with condition of approval.

Environmental incidents are defined as events that cause or potentially cause harm to the environment. These incidents are to be reported to the Environmental Manager by the person responsible for the incident or the first person to observe the incident. The Environmental Manager will assess the type and severity of the incident in accordance Main Roads' standard incident procedures. Relevant personnel will be notified, including reporting to regulatory authorities.

The number and type of contingency actions to be implemented in the case of environmental incidents, will depending upon various factors. These include the state of the natural surrounding environment, the location of the trigger and the works undertaken at the time of the exceedance. The contingency actions will include changes to equipment/processes/management measures if required. Any changes to processes/management will be updated in the management actions. These changes will be communicated through site inductions/toolbox meetings.

9 RESIDUAL IMPACTS AND OFFSETS

9.1 Residual Impacts

Table 9.1 provides a summary of the residual impacts on MNES from the Proposed Action following the application of proposed mitigation and management measures.

Table 9.1 Summary of residual impacts

MNES	Direct impacts	Indirect impacts
Tuart TEC	Loss of 40.99 ha	Loss of 3.39 ha
Banksia TEC	Loss of 14.56 ha	Loss of 0.08 ha
Honeymyrtle TEC	Loss of 1.94 ha	-
Organic Mounds TEC	-	Not expected
Grand Spider Orchid (*Caladenia huegelii*)	Loss of 14.93 ha of potential habitat	Not expected
Dwarf Bee Orchid (*Diuris micrantha*)		
Glossy-Leaved Hammer Orchid (*Drakaea elastica*)		
Purdie's Donkey Orchid (*Diuris purdiei*)		
CBC and FRTBC	Loss of 56.98 ha of CBC foraging habitat Loss of 38.34 ha of FRTBC foraging habitat Loss of 592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding	Not expected
Chuditch (Dasyurus geoffroii)	Not expected	Not expected

9.2 Acceptability of residual impacts

Following the avoidance and minimisation measures outlined in Section 8.2, the Proposed Action will result in the residual impacts summarised in Table 9.1. The direct impacts will be further minimised, where practicable during detailed design and construction planning. Avoidance and minimisation have limitations as the Proposed Action is required to meet road safety standards. Road vertical and horizontal geometry, land widths, steepness of roadside batters and road pavements construction are dictated by a series of Australian Standards and Austroads guidelines. This therefore may only allow a further small reduction in residual impacts.

Every effort has been taken to avoid direct impact on the patch of Honeymyrtle TEC within the PAA. Initial design work explored moving the road alignment north and/or south of the existing Anketell Road and changing the connection into Abercrombie Road. These options were discounted as the location of the Honeymyrtle TEC within the PAA is highly constrained. The location is surrounded by other environmental values including Tuart TEC, CBC foraging habitat and FRTBC foraging habitat. It is also constrained by existing infrastructure. As shown in Appendix 1, Figure 3 the area surrounding the Honeymyrtle TEC patch includes Alcoa's operating tailings facilities located both north and south of the Anketell Road, Alcoa's pipeline route south of Anketell Road connecting the operating tailings facilities to the Alumina Refinery within the KIA, a utility corridor south of Anketell Road that includes above and below ground infrastructure, and surrounding industrial and commercial land uses such as the Kwinana Wastewater Treatment Plant, WA Limestone and Eclipse Soils. Main Roads are unable to relocate existing third-party

infrastructure to facilitate realignment of Anketell Road and any realignment would significantly impact on other environmental values including MNES. Therefore, due to the highly constrained location there are no opportunities to avoid the Honeymyrtle TEC patch within the PAA.

Main Roads acknowledges that the priority conservation actions outlined in the Approved Conservation Advice for the Honeymyrtle TEC include protect the ecological community to prevent further losses (DCCEEW 2023a). The patch of Honeymyrtle TEC within the PAA is largely in Degraded to Completely Degraded condition (Biota 2025a; Umwelt 2025) and occurs as single patch isolated from other occurrences of Honeymyrtle TEC. The patch has recently been removed from the DBCA TEC Database as it is not considered to represent the BC Act listed *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges TEC. DBCA noted the highly degraded condition of the native understory and past attempts at revegetation appearing to be unsuccessful. This was also reiterated by Umwelt (2025) who reported that there was no evidence of recent regeneration, and the patch is unlikely to regenerate in the future without intensive ongoing management. Therefore, it is considered the longevity of the Honeymyrtle TEC patch within the PAA is uncertain.

Main Roads considers the provision of offsets for the significant residual impacts of the Proposal to the Honeymyrtle TEC is acceptable. As discussed above, the long-term sustainability of the degraded and isolated patch of Honeymyrtle TEC within the PAA is uncertain and avoidance of direct impacts to this patch was unavoidable. Main Roads are proposing an offset package that includes restoration of an existing patch of Honeymyrtle TEC located in Myalup. There are approximately five occurrences of Honeymyrtle TEC in this locality indicating the patch is locally connected and likely contributes to landscape scale connectivity and diversity of this ecological community. This offset aligns with the priority conservation action of restore and manage the ecological community as outlined in the Approved Conservation Advice for the Honeymyrtle TEC (DCCEEW 2023a).

9.3 Proposed Offset Strategy

Main Roads has developed an offset package to counterbalance the significant residual impacts of the Proposed Action to MNES. Table 9.2 provides a summary of the significant residual impacts on MNES for the Proposed Action. The Offset Strategy is provided in Attachment 10.

Table 9.2 Summary of significant residual impacts

MNES	Conservation Significance of Environmental Value	Significant Impact
Tuart TEC	Critically Endangered	40.99 ha
Banksia TEC	Endangered	14.56 ha
Honeymyrtle TEC	Critically Endangered	1.94 ha
CBC foraging habitat	Endangered	56.98 ha
FRTBC foraging habitat	Vulnerable	38.34 ha

10 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

Ecologically Sustainable Development is defined by the National Strategy for Ecologically Sustainable Development (1992) as "Using, conserving and enhancing the community's resources so that ecological processes, in which life depends, are maintained, and the total quality of life, now and in the future, can be increased." Section 3A of the EPBC Act defines the principles of ecologically sustainable development. Table 10.1 outlines how each of the five principles has been applied to the Proposed Action.

Table 10.1: EPBC Act Principles of Ecologically Sustainable Development

No.	Principle	Consideration of Principle in the Proposal
a)	Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations	A holistic decision making process has been established for the Proposed Action, with the aim to provide an integrated and transparent approach. Multi-Criteria Assessments (MCAs) with criteria including complementary land use, social, heritage, environmental, economic and supply chain (which included road and rail) were completed to identify a preferred port location, configuration and supporting road and rail networks. The MCAs allow some flexibility in the weightings allocated to each aspect, whilst maintaining a holistic balance. The MCAs assisting in making a range significant decisions, through consideration of the triple bottom line (local economic, environmental and social).
b)	If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation	Comprehensive desktop and field studies were conducted to assess the baseline conditions and impact of the Proposed Action (Table 5.1). Information gathered during these studies was used to inform this Proposed Action and has reduced the uncertainty surrounding the prediction of impacts for the assessment (Section 6). Main Roads has ensured that, where possible, the Proposed Action design avoids serious or irreversible damage to the environment. Impacts to MNES have been identified and described in Section 6. Mitigation and management measures have been proposed to ensure they are environmentally acceptable.
c)	The principle of intergenerational equity That the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Proposed Action will ensure the health, diversity and productivity of the environment is maintained through retaining as much habitat as possible. The Proposed Action will contribute to improve transport efficiency and safety, contributing to the well-being of the surrounding community.
d)	The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making	Main Roads has reduced impacts on the following MNES species – Tuart TEC 0.66 ha (1.6%) decrease – Carnaby's Cockatoo foraging habitat 0.88 ha (1.5%) decrease – FRBTC foraging habitat 0.45 ha (1.2%) decrease – Black Cockatoo suitable DBH trees, decrease by 16 trees (2.6%) – Black Cockatoo suitable DBH trees that contain hollows considered potentially suitable for Black Cockatoo breeding, decrease of 10 trees (55.6%) and decrease of 17 hollows (68%) Further refinement of the design will aim to minimise impacts on MNES where practicable.

No.	Principle	Consideration of Principle in the Proposal
e)	Improved valuation, pricing and incentive mechanisms should be promoted	Main Roads acknowledges the need for improved valuation, pricing and incentive mechanisms and endeavours to pursue these principles when appropriate. For example, environmental factors will greatly determine the location of road corridors, with the Proposed Action having a strong focus on reducing its direct and indirect impacts. Impacts on flora, vegetation and terrestrial fauna have been assessed and mitigation and management measures proposed. Main Roads accepts that the Proposed Action's overall must include costs for environmental impact avoidance, mitigation and management. The Proposed Action is currently being assessed under the Infrastructure Sustainability Council (ISC) Infrastructure Sustainability (IS) rating framework, which considers environmental, social and economic impacts to project outcomes. The framework supports the integration of sustainability on infrastructure projects and provides criteria beyond the business-as-usual approach, against which projects are assessed. The Proposed Action is aiming for Gold IS accreditation for planning.

11 ECONOMIC AND SOCIAL MATTERS

11.1 Economic and social impacts

The Proposed Action will provide an important new freight connection to the Western Trade Coast, including the Kwinana Strategic Industrial Area (SIA), Rockingham Industry Zone, Australian Marine Complex (AMC) Henderson, Latitude 32 Industrial Area and existing Outer Harbour port facilities, while providing major benefits to accessibility, safety and congestion.

The upgraded link will enhance freight links by providing a fit-for-purpose RAV7 connection from Kwinana Freeway directly into the Kwinana SIA via the grade separation of Rockingham Road, a key commuter north-south commuter route currently servicing approximately 40,000 vehicles per day. This link will enable 36.5m high productivity vehicles (HPVs) to access Kwinana SIA and broader Western Trade Coast precincts without interaction with built-up residential areas and commuter traffic.

The Western Trade Coast is a combination of strategic industrial areas of high national significance. The area contributes $14.8 billion annually to the economy and supports around 42,900 direct and indirect jobs. Under the Western Trade Coast Infrastructure Strategy, the Western Australian Government plans to transform the area into a Global Advanced Industry Hub – a global hub for sustainable trade, advanced manufacturing and innovation. Specific target industries include:

1. Renewable hydrogen: leading the emergence of the hydrogen economy by leveraging local industry demand and access to global markets.
2. Future facing minerals processing: value-added battery and critical mineral processing to support global decarbonisation and electrification initiatives.
3. Shipbuilding and sustainment: supporting Australia's defence industries through vessel manufacturing, maintenance and sustainment.
4. Port-related logistics, manufacturing and processing activities: recognising the growth of diverse industrial activity that occurs around ports, and the benefits on surrounding commercial activity

These objectives align with the commitment from the Commonwealth Government to establishing a multi-billion dollar consolidated Defence Precinct at Henderson as a critical next step in delivering continuous naval shipbuilding in Western Australia, which will compliment the estimated $8 billion expansion of HMAS Stirling naval base. The construction and ongoing operations at both facilities will benefit from the improved connectivity provided by the Anketell Road upgrades.

Today Anketell Road is limited to trucks up 27.5m in length. Even at this service level the connection accommodates approximately 2,500 heavy vehicle movements per day. This utilisation is expected to approximately triple by 2050 in combination with steady population driven commuter traffic growth.

The Proposed Action will improve the safety standard of this connection including the key intersection of Anketell Road and Rockingham Road. Over the past five years the Proposed Action location has experienced a total of 16 fatal and serious injury crashes. The upgrades include a range of treatments, including road widening, grade separation, round-abouts and improved pedestrian and cycling facilities, to address the current increasing safety issues.

The Proposed Action will have the major benefit of creating largely free-flow conditions for large heavy vehicles travelling to and from the precinct and avoiding the large current delays at the at-grade intersection of Anketell Road and Rockingham Road. Together these enhancements are

expected to provide significant economic benefits in terms of travel time savings and safety benefits.

Once completed, the project will form the key access route for the Western Trade Coast, providing a safe, efficient and suitable level of connectivity for what is a significant area for economic growth in Western Australia, supporting broader plans to build on the area's current diversity of key businesses with the additional growth of nationally significant strategic industries.

11.2 Details of public and stakeholder consultation activities

Westport has undertaken stakeholder engagement for the greater program, including the Westport Proposal and the Proposed Action, since 2018. Westport developed a comprehensive information and engagement plan (Westport 2020) based on inputs from:

- Main Roads
- The Westport Taskforce Reference group comprising community groups, peak bodies, government agencies, universities, and research institutions
- Aboriginal groups and stakeholders
- A Westport Governance Committee
- Organisations not on the Reference group
- The broader community.

Engagement on the long-term Anketell Thomas Road Freight Corridor began in August 2021, following selection of the future terminal location in Kwinana. Specific, targeted engagement for the Proposed Action and Kwinana Freeway commenced in late 2023. Community and stakeholder engagement for the Proposed Action is ongoing.

Engagement to date has included stakeholder and community discussions about the Proposed Action and associated field surveys and approvals.

11.2.1 Stakeholders

Stakeholders that have an interest in the planning and development phase of the Proposed Action are listed in Table 11.1. The stakeholders include all three levels of government, regulators, landowners, residents, business owners and operators, environmental groups, special interest groups, communities, and road users.

Further stakeholders may be identified as the planning progresses from early concept design to detailed design and development.

Table 11.1: Stakeholders

Stakeholder group	Stakeholder	Influence
State Government	Main Roads	Leading concept design development, as well as landowner engagement throughout environmental referral and future planning and development of road corridor.
	Department of Planning, Lands and Heritage (DPLH)	Program partner Managing land protection and acquisition process during planning Landowner in the PAA.
	Western Australian Planning Commission (WAPC)	Program partner

Stakeholder group	Stakeholder	Influence
		Decision maker for land protection and acquisition during the planning process. Landowner in the PAA.
	Department of Biodiversity, Conservation and Attractions (DBCA)	Program partner involved in the environmental referral process and land management in the PAA
	Department of Water and Environmental Regulation (DWER)	Manage the environmental referral process (State)
	Department of Transport, Public Transport Authority (PTA) and METRONET	Program partners
	Department of Primary Industries and Regional Development	Program partner
	Environmental Protection Authority	Provides advice regarding environmental impact assessments and approvals to the Minister for Environment
	Department of Fire and Emergency Services (DFES)	Manage emergency service operations in the area and provide advice regarding the provision of these services during planning, development and delivery.
	Venues West	Manages the commercial operations / operator of the Motorplex site.
	Member for Kwinana	Premier of Western Australia, Roger Cook, MLA is the key sponsor for the Proposed Action.
Traditional landowners	Westport's Noongar Advisory Group	Key stakeholder can influence Aboriginal heritage approvals
	South West Land and Sea Council (SWALSC)	Key stakeholder can influence Aboriginal heritage approvals
Federal Government	DCCEEW	Provide approvals under the EPBC Act
Local Government	City of Kwinana	Local Government Authority (LGA) directly affected by the road corridor
	Shire of Serpentine-Jarrahdale (neighbour)	LGA - Proposed Action neighbour
	City of Cockburn (neighbour)	LGA - Proposed Action neighbour
	Westport LGA Reference group	Members include: – City of Armadale – City of Belmont – City of Canning – City of Cockburn – City of East Fremantle – City of Kalamunda – City of Kwinana – City of Melville – City of Rockingham – City of Swan

Stakeholder group	Stakeholder	Influence
		– PEEL Alliance – Shire of Serpentine Jarrahdale – Southwest Group
Business	Bunbury Dampier Natural Gas Pipeline Motorplex Alcoa Wider Kwinana Industrial Area, Anketell and Wandi commercial centres Services Authorities (Water Corp, ATCO, Western Power) Freight and logistics industry Land Developers ARC Infrastructure (freight rail operator) Eclipse Resources WA Limestone Latitude 32 Industrial Park (off Armstrong Road) Lee Road Industrial Precinct	External stakeholder groups affected directly or indirectly by the Proposed Action's development and access changes. Manage/own land in or adjacent to the PAA.
Landowners	Directly impacted landowners/ residents	External stakeholder groups directly impacted by the Proposed Action's development and access changes.
Community/ interest/ environmental groups	Wandi Progress Association Medina Residents Group Honeywood Residents' Group Casuarina Wellard Progress Association Conservation Groups Mandogalup Volunteer Bush Fire Brigade Beeliar Regional Park Community Advisory Committee BirdLife Australia (member of Westport reference group) Conservation Council WA Friends of Kwinana Bushland Friends of The Spectacles Greening Australia ((member of Westport reference group) Kwinana in Transition KiT Community Group Kaarakin Black Cockatoo Conservation Centre Naragebup - Rockingham Regional Environment Centre Perth NRM (member of Westport reference group) Sustainable Built Environment National Research Centre The Beeliar Group	External stakeholder groups interested in the Proposed Action's development and access changes.

Stakeholder group	Stakeholder	Influence
	The Wetlands Centre, Cockburn The Wilderness Society Trillion Trees - Rockingham Kwinana Urban Bushland Council (member of Westport reference group) WA Wildlife – previously known as Native Ark WA Naturalists' Club Kwinana Rockingham Mandurah Branch Wetlands Research Association Wetlands Conservation Society Wildflower Society of WA World Wildlife Fund Wellard Village People Medina Residents' Group Homestead ridge progress association	
General community	Residents, businesses and road users not directly affected by the Proposed Action but who are neighbours and may have indirect impacts like travel times and methods etc. People who have attended previous project engagement event/ participated in My Say Survey	External stakeholder groups affected by the Proposed Action's development and access changes.

11.2.2 Stakeholder engagement process

Westport has developed an engagement strategy to facilitate input from the community and stakeholders for the Westport Proposal, which has also encompassed information about the Proposed Action. A summary of community consultation undertaken to inform the Proposed Action's planning and development to date is provided in Table 11.2.

Table 11.2: Community consultation strategy summary – Westport

Audience / Stakeholders	Engagement medium	Timing
All community and stakeholders	Website updates	2021 onwards
Email subscribers	Monthly project newsletter updates	November 2021 onwards
Residents in the City of Kwinana and Shire of Serpentine-Jarrahdale (12,000 letters)	Letterbox drop – Westport Navigate newsletter with project information	March 2021
Shire of Serpentine-Jarrahdale and City of Cockburn, targeting people near Anketell Road	Community pop-up events at shopping centres and local markets	March 2022
All community and stakeholders	Community Survey on the Anketell-Thomas Road Freight Corridor, via My Say Transport.	July 2022

Audience / Stakeholders	Engagement medium	Timing
All community and stakeholders	Social media advertising via Department of Transport Facebook page	2022 onwards
Sample of 805 residents from Perth and Peel metropolitan area (including Kwinana and Fremantle)	Biannual community perceptions surveys to determine sentiment / understanding of Westport and preferences for engagement.	March 2022 July 2022 May 2023
Residents in Kwinana and Cockburn	Community pop-up events at local shopping centres to provide project information and answer questions.	September and October 2023
Residents in City of Cockburn, City of Kwinana, City of Rockingham, and Shire of Serpentine-Jarrahdale (110,000 letters)	Letterbox drop – letter and flyer outlining Westport preferred design.	December 2023
All community and stakeholders	Community survey seeking broad feedback on the Westport project, via My Say Transport	September 2023 – January 2024
Horse owners who visit the Naval Base horse beach	Community pop-up events at the Naval Base horse beach to provide project information and answer questions	December 2023
Recreational fishers who access Cockburn Sound	Community pop-up events at various fishing locations to provide project information and answer questions	January – March 2024
Community in Cockburn and surrounding areas	Westport marquee at Coogee Live community event	March 2023

The Westport community survey ran from September 2023 to May 2024, receiving 812 responses, with the most represented areas being the Cities of Rockingham, Cockburn and Kwinana. This survey addressed the Westport Program of works (port, road and rail), which the Proposed Action is one component. Respondents listed the environment, the redevelopment of Fremantle Port, and recreation in Cockburn Sound as the top three areas of interest. Road, rail and port design also had significant interest. Specific stakeholder feedback for themes relevant to the Proposed Action, were:

- Road upgrades:
  - "Forward planning of road upgrades, not waiting for traffic issues to arise following the project completion."
  - "Ensure that the proposed rail and road links can handle the volume of traffic including non-port traffic."
  - "Traffic in Perth is terrible. Westport should be designed in such a way that it improves traffic flow."
- Terrestrial environment:
  - "In the creation of the new port, opportunities should be explored to create green corridors for local fauna."

  - "Care for environment in construction and including impact of rail and road links for the areas surrounding those links. The impact is huge for residential and environment."
  - "There will be significant impacts to the local natural terrestrial and marine environments. How will the planning and subsequent works manage/minimise these impacts, and any environmental offsets should be secured within the local area to ensure that the local community can benefit from these."

- Local traffic:
  - "The most important thing is that transport to and from the port reduces congestion not only for the goods itself but for the people who must transit through the area."
  - "The design of the Proposed Action needs to be carefully considered to minimise the impact on those of us living in the adjacent suburbs."
  - "Minimise the impact of freight transport on residential areas."

11.2.2.1 Communication and stakeholder engagement methodology

During 2024 Main Roads implemented a targeted, specific Community and Stakeholder Engagement plan to inform the early planning of the Proposed Action. Stakeholder and community engagement is a key input into the planning, development, design and, subject to approvals, construction of the Proposal as shown in Plate 1:

- Planning assessment following corridor selection, develop early concept design to confirm corridor alignment, land requirements and proposed access strategy Planning and development – identify issues and constraints, develop a shared understanding of constraints and develop solutions and scope and undertake more refined concept design work including environmental studies for noise, visual amenity etc.
- Procurement – secure a contractor and undertake detailed design
- Construction – inform the community about construction requirements and build understanding of the implications of construction.

Plate 1 Stakeholder engagement in the road planning process

11.2.2.2 Proposed Action design

As concept design information has become available, Main Roads has been engaging with directly affected landowners regarding direct land impacts, Proposed Action investigations and future steps. Special interest groups including local environment groups and local government have also

been engaged. A summary of 2024 Main Roads led engagement in regards to the Proposed Action is in Table 11.3.

Table 11.3: Main Roads Engagement Matrix 2024

Date	Engagement Activity	Objective	Audience	Status
20 March 2024	Environmental Stakeholder Group Briefing	Engage groups to provide Proposed Action overview – Environmental referral process has begun	Special interest groups – Environmental	Complete
March 2024	EPA (State) Environmental Referral Comment Period	Starts the Proposed Action environmental referral process (State)	All	Complete
March to June 2024	Impacted landowner direct mail and meetings –	Invite contact to overview the Planning Concept and Planning Control Areas Seek contact information Request meetings with key landowners – Alcoa Motorplex and private landowners	Landowners	Complete / as required. 6 out of 8 impacted landowners met with by 23/05/2024
10 April 2024	Heritage workshop	Engage Traditional Owners to undertake heritage survey of Anketell Road to inform heritage planning	Aboriginal groups	Complete Walk through survey conducted 13 – 15 May 2024
May 2024	Ministerial media statement	Announce State and Federal Government funding for planning and project development	All	Complete Link
May 2024	Email update	Advise community and stakeholders of funding for further planning	Email customers subscribed for Westport and Proposed Action updates.	Complete
May to Dec 2024	Briefings – MP	Offered via Minister's office Overview and communication activities Opportunity to raise issues and concerns	Local members State and Federal	Ongoing
Ongoing	Main Roads Customer Information Centre Connect database	Create project page Input stakeholder enquiries and contact details Manage customer enquiries	Main Roads	Complete Ongoing
Ongoing	Main Roads website	Create page with high level overview and status information Establish and invite customers to subscribe to electronic mail updates for project	All	Proposed Action page and email subscriber live February 2024

Date	Engagement Activity	Objective	Audience	Status
13-24 May	Heritage survey	Traditional Owners undertook heritage survey on site	Aboriginal groups	Complete
28 May 2024	Stakeholder briefing Environmental Referral and Project Overview	Engage Local Government stakeholder Focus on environmental referral processes Opportunity to raise issues and concerns.	City of Kwinana	Complete
21 August	Stakeholder Briefing - Mandogalup Volunteer Bush Fire Brigade	Proposed Action update. Overview of project case versus ultimate. Access and property implications discussed.	Mandogalup Volunteer Bush Fire Bridge and City of Kwinana Emergency Response Officers	Complete
4 Oct 2024	Direct mail to wider landowners – Lee Road Industrial Precinct and Latitude 32 – Armstrong Road Precinct	Provide access information to surrounding property owners along the PAA	All	Complete

As the Proposed Action moves through the planning, design and environmental approval process, Main Roads, as the Proposed Action proponent, will continue to develop and implement an extensive communications and stakeholder engagement plan.

11.2.2.3 Targeted stakeholder engagement – November and December 2023 – Westport

Stakeholder engagement for the Westport Program increased following the Premier of Western Australia's announcement of the Westport's preferred design on 29 November 2023. This included a letter and flyer sent to 110,000 residents and businesses near the PAA in December 2023, to provide information on the preferred design for the port and freight network, including the Proposed Action (see Table 3.2 above).

11.2.2.4 Engagement 2024 onward

In addition to direct engagement with adjacent landowners and businesses during 2024, since referral of the Proposed Action to the DCCEEW engagement has continued with community webinars and in-person pop-up events:

- 21 March 2024 - Community Webinar 5 - Westport's EPA referral
- 23 March 2024 - Community in-person pop-up at Rockingham Centre
- 18 April 2024 - Community in-person pop-up at Cockburn Gateway
- 18 May 2024 - Community in-person pop-up at Cockburn Power Boats Club
- 23 May 2024 - Community Webinar 'Your Questions Answered'
- 26 May 2024 - Community in-person pop-up at The Local Farmers Market, Honeywood
- 13 June 2024 - Community in-person pop-up at Rockingham Centre, Rockingham
- 27 June 2024 - Community in-person pop-up at Coogee Village, North Coogee
- 18 July 2024 - Community in-person pop-up at Kwinana Marketplace

- 27 July 2024 - Community in-person pop-up at the Local Farmers Market, Cockburn
- 11 August 2024 - Community in-person pop-up at Rockingham Rotary Market
- 6 - 9 September 2024 - Community in-person pop-up at The Club Marine Perth Boat Show
- 15 September 2024 - Community in-person pop-up at the Local Farmers Market Wandi
- 28 September 2024 - Community in-person pop-up at the Local Farmers Market Cockburn
- 16 October 2024 - Community in-person pop-up at the Local Farmers Market Coogee Beach
- 27 October 2024 - Community in-person pop-up at the Rockingham Rotary Market
- 2 November 2024 - Community in-person pop-up at Fremantle Ports Maritime Day
- 17 November 2024 - Community in-person pop-up at Freo Farmers Market
- 19 November 2024 - Westport Community Webinar
- 6 December 2024 - Community in-person pop-up at North Freo Bowlo
- 15 January 2025 - Community in-person pop-up at Kwinana Marketplace.

Main Roads as a program partner, contributes to Westport's governance via the Project's Steering Group and Control Group, a mechanism for integrated management of infrastructure development. Main Roads has commenced selected stakeholder engagement specific to the Proposed Action's potential environmental impacts and management strategies.

Main Roads will continue to engage with directly impacted property owners, stakeholders and the wider community regarding the Proposed Action throughout the planning and development phase of the road planning process, subject to any statutory obligations including requirements arising from environmental approvals.

11.3 Aboriginal Peoples participation

Aboriginal Participation is of critical importance to the planning and development of the Proposed Action. The Proposed Action occurs within the Gnaala Karla Booja (GKB) Indigenous Land Use Agreement (ILUA) area, made with the GKB Traditional Owners under the South West Native Title Settlement. The GKB region refers to the Noongar language or dialectical groups of the Binjareb/Pinjarup, Wilman and Ganeang. Through the ILUA, the Main Roads GKB Standard Heritage Agreement has come into effect, which is an agreement to ensure that proposed activities are carried out in a manner that protects Aboriginal Heritage Places and Objects to the greatest extent possible.

Prior to conducting ethnographic and archaeological heritage surveys, Main Roads engaged with South West Aboriginal Land and Sea Council (SWALSC) and the GKB Aboriginal Corporation in accordance with the Main Roads GKB Standard Heritage Agreement Activity Notice process. This engagement determined the need for further consultation, pre survey meetings and surveys based on the nature of the proposed works.

As part of the Westport Program, a Noongar Advisory Group has been established and the Noongar Opportunities Strategy has been developed as a share strategy for how Westport and local Noongar people should develop together. The Noongar Advisory Group is made up of Traditional Owners, Elders and Leaders of the local Noongar people elected by Noongar communities. The group was formed to ensure Westport was guided appropriately by Noongar people with the authority to provide cultural advice. The Noongar Advisory Group brings together Noongar people from across the Perth Region, including member of GKB and Whadjuk Regional Corporations.

In alignment with Main Roads' Aboriginal Engagement Strategy, Main Roads will adopt a whole of project approach to Aboriginal participation for the Proposed Action and will implement the

project specific Aboriginal Participation Plan (Westport 2025). This plan includes targets for Aboriginal employment, Aboriginal business procurement and training, cultural awareness training and mentorship opportunities for Aboriginal people. A Cultural Working Group is currently being established that allows for engagement and input into project design, opportunity identification for future engagement and procurement post design. Additional Aboriginal engagement will be undertaken as part of the standard heritage agreement and permit process.

11.4 Projected economic costs and benefits and basis for estimation

No projected economic costs available at time of document preparation.

Projected benefits of the Proposed Action will include:

- Improving the safety standard of Anketell Road including the key intersection of Anketell Road and Rockingham Road. The upgrades include a range of treatments, including road widening, grade separation, round-abouts and improved pedestrian and cycling facilities, to address the current increasing safety issues.
- Creating largely free-flow conditions for large heavy vehicles travelling to and from the precinct and avoiding the large current delays at the at-grade intersection of Anketell Road and Rockingham Road. Together these enhancements are expected to provide significant economic benefits in terms of travel time savings and safety benefits.

11.5 Potential Employment Opportunities

The Proposed Action has the potential to increase local direct and indirect employment opportunities during pre-construction and construction phase. There will be further employment opportunities to maximise participation of Aboriginal employees during design development and construction.

12 ENVIRONMENTAL RECORD OF THE PERSON PROPOSING TO TAKE THE ACTION

Main Roads is a State agency with an assured record of responsible environmental management and a certified Environmental Management System (EMS). Main Roads is not subject to any past or present proceedings under Commonwealth or State law for protection of the environment or conservation and sustainable use of natural resources. All work undertaken by Main Roads is completed in accordance with their Environmental Policy and EMS, which is certified with the requirements of ISO 14001:2015

EMS comprising 'Activities, products and services associated with delivering Road Management (planning, building and maintaining) on Western Australia's State Road Network' (Certificate #MRWQ51-CCE04). Main Roads' environmental policy can be found at https://www.mainroads.wa.gov.au/OurRoads/Environment/Pages/environmentalmanagement.aspx#policy

Main Roads EMS is independently certified and covers the processes, activities and products that have the potential to impact the environment, including mitigation and management measures proposed as part of the action. The EMS ensures compliance with Main Roads environment and heritage compliance obligations, providing the framework for driving environmental requirements through leadership, planning, support, operation, performance evaluation and improvement actions. The Proposed Action, therefore, will be undertaken, monitored and measured in accordance with the Main Roads EMS.

Main Roads EMS covers processes and activities that have the potential to impact on the environment and ensures compliance with environment and heritage compliance obligations. The EMS responsibilities include appropriate resource allocation to ensure compliance costs are appropriately budgeted and assessed as part of the overall business case for the project. This ensures that the costs of proposed management measures and offsets is considered in the budget approvals and ensures compliance is appropriately funded and resourced.

Compliance with the Main Roads' EMS is regularly audited both internally and by independent third parties in order to ensure compliance and identify any changes which may improve the environmental outcomes. The regular auditing of the EMS is consistent with Main Roads' Environmental Policy to implement and maintain an effective EMS so as to ensure operations are managed in compliance with all environmental requirements

13 INTERNATIONAL OBLIGATIONS

Australia has played an important role in international cooperation to conserve migratory birds in the East Asian - Australasian Flyway, entering into bilateral migratory bird agreements with Japan in 1974, China in 1986 and most recently the Republic of Korea in 2007. Each of these agreements provides for the protection and conservation of migratory birds and their habitats, protection from take or trade except under limited circumstances, the exchange of information, and building cooperative relationships (DCCEEW 2025). Australia also has further international commitments to protect migratory birds under the Bonn Convention.

Migratory species listed under the EPBC Act have been considered in the flora and fauna surveys completed for the Proposed Action (Biota 2025a), with further discussion on migratory bird potential habitat within the PAA and more broadly the adjacent wetland, The Spectacles (Spectacles Swamp) in Biota (2024c). Biota (2024c) reports that core habitat for migratory shorebirds and water habitats, in the form of permanent or semi-permanent water and associated shorelines and fringing vegetation, is completely absent from the PAA. The PAA does contain a small amount of seasonally inundated dampland habitat (approximately 2.74 ha), which has the potential to represent temporary secondary habitat for some species with broader habitat requirements (Biota 2024c).

Spectacles Swamp is listed as a Nationally Important Wetland and occurs approximately 100 m south of the PAA. Biota (2024c) reports "No Migratory-listed shorebirds breed in Australia, so the wetland [Spectacles Swamp] does not constitute suitable breeding habitat for these species. Based on the available data, it is also clear that The Spectacles does not meet any of the criteria for a wetland of national or international significance for Migratory-listed shorebirds." No other Migratory-listed bird species (that are not shorebirds) have been recorded at the Spectacles Swamp except for one record of Glossy Ibis (*Plegadis falcinellus*) (Biota 2024b). This species is highly mobile and unlikely to be using the Spectacles Swamp for breeding given their rarity of occurrence at the site (Biota 2024c).

Clearing for the Proposed Action will not remove core or important habitat for listed migratory birds. Main Roads will implement a range of management measures to prevent indirect impacts to adjacent areas including the Spectacles Swamp. Therefore, implementation of the Proposed Action is not inconsistent with Australia's obligations under:

- The BONN Convention
- Japan-Australia Migratory Bird Agreement
- China-Australia Migratory Bird Agreement
- Republic of Korea-Australia Migratory Bird Agreement.

Caladenia huegelii is listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), ratified by Australia in July 1976, under 'Orchidaceae'. Main Roads support the full range of domestic measures Australia has adopted for improved conservation and tighter restrictions on trade of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listed species. The Proposed Action does not involve international trade in flora and does not threaten wild populations of any listed plants and animals.

14 OTHER APPROVALS AND CONDITIONS

A summary of the approvals or conditions that apply or are likely to apply to the Proposed Action (in addition to an approval under the EPBC Act) are outlined below. No approvals have been received to date for the Proposed Action.

14.1 *Environmental Protection Act 1986*, Part IV Environmental Impact Assessment

The Proposed Action was referred to the Western Australian Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986* (EP Act) in February 2024. The EPA decided to assess the Proposal and determined the level of assessment as Referral Information with additional information (required under s. 40(2)(a) of the EP Act) and a four week public review for Additional Information.

Main Roads has undertaken further studies to inform a Revised Supporting Document. The Revised Supporting Document was submitted to the EPA in June 2025 and will be published on the EPA website for public review in July 2025.

14.2 Other approvals and regulation

Following primary environmental approval of the Proposed Action under Part IV of the EP Act, additional regulatory approvals will be required to develop and operate the Proposed Action. These are summarised in Table 14.1.

Table 14.1: Summary of other regulatory approvals required

Proposed activities	Type of approval	Regulatory agency	Legislation regulating the activity
All activities associated with the Proposed Action	Development Application	Western Australian Planning Commission (WAPC)	Planning and Development Act 2005
Abstraction and discharge of water during construction.	Licence to take	DWER	Rights in Water and Irrigation Act 1914
Authorisation to take (flora and fauna) and modify TEC	Threatened Flora Authorisation, Authorisation to Take or Disturb Threatened Fauna, Authorisation to Modify a TEC	DBCA	Biodiversity Conservation Act 2016

14.3 Planning approvals

The alignment of the Proposed Action will not be fully located within land currently reserved under the Metropolitan Region Scheme (MRS) for Primary Regional Roads or Other Regional Roads. Areas outside the MRS will be subject to a development approval through the Western Australian Planning Commission (WAPC). No development approval is required for road construction works on land reserved by the MRS for the purpose of Primary Regional Roads or Other Regional Roads.

Following completion of the Proposed Action all areas outside the existing Primary Regional Roads reservation will be incorporated into Primary Regional Roads, or zoned appropriately, through an ominibus amendment to the MRS pursuant to section 28 (1) of the *Land Administration Act 1997*.

15 APPLICATION OF RECOVERY PLANS AND THREAT ABATEMENT PLANS

The Proposed Action is not inconsistent with the relevant Recovery Plans, Threat Abatement Plans and Conservation Advice relating to the MNES identified as known or likely to occur within the PAA, as shown in Table 15.1.

Table 15.1: Assessment against Recovery and Threat Abatement Plans

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community (DEE 2019) The Approved Conservation Advice recommends the following priority protection and restoration actions: – Prevent vegetation clearance and direct habitat degradation, through: • Prevent further clearance, fragmentation or detrimental modification of remnants of the ecological community and of surrounding native vegetation, particularly for higher condition patches and older growth areas • Ensure that planning supports increased resilience within the landscape • Avoid sudden or substantial modifications to hydrology quality and quantity (including groundwater depth and salinity) • All possible options for avoiding impacts should be exhausted before mitigation and offsets are considered. – Preventing invasion by weeds, introduced animals, 'Tuart decline', dieback and other diseases, through: • Minimise soil disturbance. • Avoid introduction and spread of weeds • Prevent introduction of feral and domestic animals • Use local plants from accredited nurseries • Appropriate weed and disease hygiene. – Manage fire, through identifying appropriate fire regimes, weed control and implementing fire management. – Preventing grazing damage, through fencing and managing populations. – Re-vegetation and regeneration, including: • Aim to increase the overall extent that meets the description and condition thresholds for the ecological community. Aim to increase condition and appropriate landscape scale connectivity • Use local seeds for canopy/understorey • Consider different germination techniques. • Restore wildlife corridors and linkages (where appropriate). – Restore habitat features.	The Proposed Action is consistent with the recommendations outlined in the Tuart TEC Approved Conservation Advice, through the following: – Minimised clearance of Tuart TEC, avoiding fragmentation of TEC patches, where possible. – Avoided and mitigated impacts to Tuart TEC (see Sections 8 and 9), and provision of offsets. – Local harvesting and reuse of topsoil for revegetation within the road reserve. – Revegetation to use local, native species to provide buffer to TEC. – Weed and Dieback surveys, treatment and hygiene to avoid the introduction and spread of weeds and Dieback – Access controls and fencing to prevent unauthorised access that could introduce or spread weeds, Dieback or fire. – Ongoing monitoring and treatment of weeds in road reserves. – The Proposed Action is not expected to alter the fire regime or introduce grazing pests or feral/domestic animals within Tuart TEC patches. – Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community.

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
– Weed and disease management. – Communication and support, including information products, signage, education programs, local participation, promotion of awareness with agencies and industries, and measures for new residential areas.	
Approved Conservation Advice (incorporating listing advice} for the Banksia Woodlands of the Swan Coastal Plain ecological community (DEE 2016a) The Approved Conservation Advice recommends the following priority protection and restoration actions: – Prevent vegetation clearance and direct habitat damage, through: • Prevent further clearance, fragmentation or detrimental modification of remnants of the ecological community and of surrounding native vegetation, particularly for high conservation value, unmodified and old growth areas • Consider important landscape connections for reservation or other conservation tenure • Reduce cumulative impacts through liaison and planning with Local and State Government • Avoiding and mitigating impacts before offsetting, and match offsets to the same sub-community • Protect soil seed bank • Retain fauna habitat features and protect fauna during construction. – Prevent weeds, feral animals, dieback and other diseases, though: • Minimise soil disturbance • Avoid introduction and spread of weeds • Prevent introduction of feral and domestic animals • Monitor *P. cinnamomi* and manage early for local eradication • Appropriate weed and disease hygiene. – Manage groundwater abstraction. – Manage fire, through identifying appropriate fire regimes, weed control and implementing fire management. – Preventing grazing damage, through fencing and managing populations. – Revegetation, including: • Use local seeds for canopy/understorey and species resilient to climate change • Site specific restoration with appropriate FCT • Restore wildlife corridors and linkages	The Proposed Action is consistent with the recommendations outlined in the Banksia TEC Approved Conservation Advice, through the following: – Minimised clearance of Banksia TEC, avoiding fragmentation of TEC patches, where possible. – Avoided and mitigated impacts to Banksia TEC (see Sections 8 and 9), and provision of offsets from the same sub-community where possible. – Local harvesting and reuse of topsoil for revegetation within the road reserve. – Revegetation to use local, native species to provide buffer to TEC. – Weed and Dieback surveys, treatment and hygiene to avoid the introduction and spread of weeds and Dieback – Access controls and fencing to prevent unauthorised access that could introduce or spread weeds, Dieback or fire. – Ongoing monitoring and treatment of weeds in road reserves. – Management of groundwater abstraction during construction. – The Proposed Action is not expected to alter the fire regime, hydrological regimes or introduce grazing pests or feral/domestic animals within Banksia TEC patches. – Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community.

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
• Habitat for conservation significant species, including CBC • Adaptive management regimes – Weed management. Communication and support, including a communication strategy, education programs, local participation, promotion of awareness with agencies and industries, and measures for new residential areas.	
Approved Conservation Advice for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (DCCEEW 2023a) The Approved Conservation Advice recommends the following priority protection and restoration actions: – Plan for protection, through: • Zoning and development planning decisions • Reduce cumulative impacts through liaison and planning with Local and State Government • Undertake activities to mitigate future climate change impacts. – Conserve remaining patches, through: • Preventing further clearance or destruction, and not exacerbating other threats • Retaining native vegetation near patches, particularly where important for connectivity and act as buffer zones. • Supporting regeneration. – Manage actions to minimise impacts through application of the mitigation hierarchy. – Apply buffer zones to patches of this ecological community to minimise 'offsite' or indirect impacts – Prevent the introduction and spread of exotic species and diseases through appropriate weed and disease hygiene. – Restore and manage this ecological community with appropriate fire management. – Communication and support, including distributing relevant publications, signage, education programs, local participation, promotion of awareness with landholders/managers, relevant agencies and industries, groups and the public, supporting opportunities for Traditional Owners/Custodians, or other Indigenous community members, and coordinating efforts – Research and monitoring.	The Proposed Action is consistent with the recommendations outlined in the Honeymyrtle TEC Approved Conservation Advice, through the following: – Minimising impacts through application of the mitigation hierarchy. – Reducing cumulative impacts and supporting regeneration through offsetting. – Weed and Dieback surveys, treatment and hygiene to avoid the introduction and spread of weeds and Dieback – The Proposed Action is not expected to alter the fire regime, hydrological regimes or introduce grazing pests or feral/domestic animals. – Supporting research and monitoring through offsetting. – Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community. While the Proposed Action will clear a patch of Honeymyrtle TEC (i.e. at variance to conserving remaining patches), the Proposed Action is not inconsistent with other priority protection and restoration actions in the Approved Conservation Advice for Honeymyrtle TEC (DCCEEW 2023a).
Assemblages of Organic Mound (Tumulus) Springs of the Swan Coastal Plain Recovery Plan (DEC 2006)	The Proposed Action is consistent with the recommendations of the Recovery Plan, through the following:

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
The objective of this Recovery Plan is to maintain or improve the overall condition of the Organic Mounds TEC and the associated fauna and plan community in the known locations and reduce the level of threat. The recovery actions within the Plan include: Coordinate recovery actions Map habitat critical to survival Clarify and continue to monitor extent and boundaries Liaise with current land owners, land managers and other interested groups Disseminate information about the community Monitor water levels and quality (at occurrences 1, 2, 3 and 4) Manage water quality and quantity Monitor flora and fauna Develop and implement Fire Management Plans Ensure earthworks in area of influence do not impact community Design and conduct research Ensure hygiene conditions near the community Continue to monitor dieback Implement weed control Rehabilitate recharge catchment zones and adjacent wetland areas Report on success of management strategies.	– The Proposed Action will not have a direct impact on the Organic Mounds TEC as there are no recorded occurrences of this TEC within the PAA. The closest occurrence of the Organic Mounds TEC is approximately 500 m north east of the PAA and buffered from the PAA by roads and commercial/residential mixed land use. – The Proposed Action will implement management measures during construction for weeds, dieback and fire to avoid indirect impact on native vegetation in adjacent areas. – Groundwater abstraction and dewatering for the Proposed Action has been planned to avoid impact on the occurrence of the Organic Mounds TEC. – Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community.
Grand Spider Orchid (*Caladenia huegelii*) Recovery Plan (DEC 2008b) The objective of this Recovery Plan is to maintain or improve the conservation status of this species by ensuring the continued survival of known populations, abating identified threats to populations, and supporting future increases in area of occupancy and numbers of mature plants through translocations once successful techniques are established. The recovery actions within the Plan include: a) Coordinate recovery actions Liaise with land managers Carry out appropriate management of bushland that contains *Caladenia huegelii*	The Proposed Action is consistent with the recommendations of the Recovery Plan, through the following: – The Proposed Action will not clear any known *Caladenia huegelii* populations or individuals. The closest *C. huegelii* record is 510 m east of the PAA. – The Proposed Action has been subject to targeted surveys over multiple years to identify King Spider Orchid. No individuals were recorded, but 14.93 ha of potentially suitable habitat is present within the PAA. – The Proposed Action will implement management measures during construction for weeds, dieback and fire

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
Carry out environmental assessment of developments or actions that have the potential to damage *C. huegelii* plants or habitat Seek positive conservation outcomes for future development proposals for lands containing *C. huegelii* Monitor populations Increase area of *C. huegelii* habitat on secure tenure Manage access Assess and install Declared Rare Flora markers Undertake weed control Conduct further surveys Clarify identification of unconfirmed populations Develop and implement a fire management strategy Develop and implement a grazing control strategy Collect and store seed and fungal material Promote awareness Manage small populations to increase numbers of individuals and area of occupancy Research and develop best practice protocols for translocations Plan conservation translocations Obtain biological and ecological information Map habitat critical to survival Review the need for further recovery actions.	to avoid indirect impact on native vegetation in adjacent areas. – Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community.
Approved Conservation Advice for *Diuris micrantha* (Dwarf Bee-orchid) (DEWHA 2008a) The Approved Conservation Advice recommends the following priority actions: – Minimise habitat loss, disturbance and modification through managing threats to areas of vegetation that contain populations/occurrences of Dwarf Bee-orchid, managing changes to hydrology and disruptions to water flows, ensuring infrastructure or development activities do not adversely impact on known populations. – Control invasive weeds and feral animals – Implement appropriate fire management – Manage grazing pressures	The Proposed Action is consistent with the recommendations of the Approved Conservation Advice, through the following: – The Proposed Action will not clear any known *Diuris micrantha* populations or individuals. The closest *D. micrantha* record is approximately 2.2 to 3.2 km south of the PAA. – The Proposed Action has been subject to targeted surveys over multiple years to identify Dwarf Bee-orchid.

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
– Raise awareness of Dwarf Bee-orchid – Enable recovery of additional sites and/or populations through appropriate seed and mycorrhizal fungi collection and storage, investigate options for linking, enhancing or establishing additional populations and implementing national translocation protocols if establishing additional populations.	No individuals were recorded, but 14.93 ha of potentially suitable habitat is present within the PAA. – The Proposed Action will implement management measures during construction for weeds, dieback and fire to avoid indirect impact on native vegetation in adjacent areas. – Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community.
Approved Conservation Advice for *Diuris purdiei* (Purdie's Donkey-orchid) (DEWHA 2008b) The Approved Conservation Advice recommends the following priority actions: – Minimise habitat loss, disturbance and modification through managing threats to areas of vegetation that contain populations/occurrences/remnants of Purdie's Donkey-orchid, managing changes to hydrology and minimising adverse impacts from land use at known sites. – Control invasive weeds and feral animals – Implement appropriate fire management – Raise awareness of Purdie's Donkey-orchid – Enable recovery of additional sites and/or populations through appropriate seed collection and storage, undertaking seed germination and/or vegetative propagation trials, investigate options for linking, enhancing or establishing additional populations and implementing national translocation protocols if establishing additional populations.	The Proposed Action is consistent with the recommendations of the Approved Conservation Advice, through the following: – The Proposed Action will not clear any known *Diuris purdiei* populations or individuals. The closest *D. puriei* record is approximately 4.8 km east of the PAA. – The Proposed Action has been subject to targeted surveys over multiple years to identify Purdie's Donkey-orchid. No individuals were recorded, but 14.93 ha of potentially suitable habitat is present within the PAA. – The Proposed Action will implement management measures during construction for weeds, dieback and fire to avoid indirect impact on native vegetation in adjacent areas. – Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community.
Glossy-leafed Hammer Orchid (*Drakaea elastica*) Recovery Plan (DEC 2008c) The objective of this Recovery Plan is to abate identified threats and maintain or enhance viable *in situ* populations to ensure the long-term preservation of the species in the wild. The recovery actions within the Plan include: a) Coordinate recovery actions Liaise with appropriate stakeholders	The Proposed Action is consistent with the recommendations of the Recovery Plan, through the following: – The Proposed Action will not clear any known *Drakaea elastica* populations or individuals. The closest *D. elastica* record is 600 m south east of the PAA. – The Proposed Action has been subject to targeted surveys over multiple years to identify Glossy-leafed

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
Reduce impact of grazing on seed production Negotiate agreements that protect *D. elastica* and habitat Undertake hand pollination Collect and store seed Monitor populations Obtain biological and ecological information Implement weed control Develop and implement a fire management strategy Develop and implement a phytophthora strategy Conduct further surveys Develop best practice protocols for translocations Promote awareness Map habitat critical to survival Review the Plan.	Hammer orchid. No individuals were recorded, but 14.93 ha of potentially suitable habitat is present within the PAA. – The Proposed Action will implement management measures during construction for weeds, dieback and fire to avoid indirect impact on native vegetation in adjacent areas. – Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community.
Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan (DPaW 2013) The objective of this Recovery Plan is to stop further decline in the distribution and abundance of Carnaby's Cockatoo by protecting the birds throughout their life stages and enhancing habitat critical for survival throughout their breeding and non-breeding range, ensuring that the reproductive capacity of the species remains stable or increases. The recovery actions within the Plan include: – Protect and manage breeding habitat and associated feeding habitat – Protect and manage of non-breeding habitat – Undertake regular monitoring – Conduct research to inform management – Manage other impacts – Engage with the broader community – Undertake information and communication activities. – The Recovery Plan specifies activities that will adversely affect Carnaby's Cockatoo should be avoided, and then minimised or mitigated if avoidance cannot be achieved.	The Proposed Action is consistent with the recommendations of the Recovery Plan, through the following: – The Proposed Action will not involve clearing of any known breeding trees/hollows. The PAA is >12 km from the closest breeding record for CBC. – The Proposed Action will not involve clearing of any known roosting trees. – The Proposed Action has been subject to targeted surveys to identify CBC habitat; and consideration of CBC, habitat mapping by DBCA. – The Proposed Action has been planned and designed to minimise clearing of potential breeding and foraging habitat for CBC. – The Proposed Action incorporates design and management measures to protect potential breeding and foraging habitat in adjacent native vegetation.

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
	– Planning and design of the Proposed Action has involved consultation with relevant stakeholders including the broader community.
Forest Black Cockatoo (Baudin's Cockatoo *Calyptorhynchus baudinii* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*) Recovery Plan (DEC 2008a) The objective of this Recovery Plan is to stop further decline in the breeding populations of Baudin's Cockatoo and FRTBC and to ensure their persistence throughout their current range in the south-west of WA. Priority actions within the Plan relevant to FRTBC include: – Seek the funding required to implement future recovery actions – Eliminate illegal shooting – Determine and implement ways to remove feral Honeybees from nesting hollows – Identify factors affecting the number of breeding attempts and breeding success and manage nest hollows to increase recruitment – Determine and implement ways to minimise the effects of mining and urban development on habitat loss – Determine and implement ways to manage forests for the conservation of Forest Black Cockatoos – Identify and manage important sites and protect from threatening processes – Map feeding and breeding habitat critical to survival and important populations, and prepare management guidelines for these habitats – Monitor population numbers and distribution – Determine the patterns and significance of movement – Maintain the Cockatoo Care program and use other opportunities to promote the recovery of Forest Black Cockatoos.	The Proposed Action is consistent with the recommendations of the Recovery Plan, through the following: – The Proposed Action is not related to mining, orchards or forest management, nor is the Proposed Action expected to increase the prevalence of feral honeybees or risk of illegal shooting. – As a component of urban development, the Proposed Action has been subject to surveys to identify Black Cockatoo habitat (including consideration of Black Cockatoo habitat mapping by DBCA and breeding records from WA museum). – The Proposed Action will not involve clearing of any known breeding trees/hollows. The PAA is >12 km from the closest breeding record for FRTBC. – The Proposed Action will not involve clearing of any known roosting trees. – The Proposed Action has been planned and designed to minimise clearing of potential breeding and foraging habitat for FRTBC. – The Proposed Action incorporates design and management measures to protect potential breeding and foraging habitat in adjacent native vegetation.
Chuditch (Dasyurus geoffroii) National Recovery Plan (DEC 2012) The objective of the Recovery Plan is to reduce threats to the Chuditch and increase population densities to ensure long-term survival. The recovery actions within the Plan include: a) Retain and improve habitat critical for survival Determine impacts of feral cats on Chuditch	The Proposed Action is consistent with the recommendations of the Recovery Plan, through the following: – The Proposed Action will not clear any habitat or potential Chuditch habitat. – The Proposed Action has been subject to a targeted Chuditch survey to assess the likelihood of occurrence within the PAA and whether any occurrence is likely to be

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
Determine impacts of feral cat control methods on Chuditch Continue, expand and improve baiting program of feral cats and foxes Determine population abundance and distribution of Chuditch populations Establish reference sites for monitoring Chuditch population abundance to evaluate the effectiveness of fox and cat control Undertake and monitor translocations to increase the extent of occurrence Increase public awareness through community education and enforcement of regulations Coordinate recovery implementation	as resident individuals utilising core habitat, or transitory use of secondary habitat types. The Chuditch was not recorded during the targeted surveys in the PAA or surrounds for the Proposed Action (Biota 2024a, 2025a). It is considered highly unlikely that the Chuditch occurs or utilises the PAA as a thoroughfare with no evidence of a population occurring even in the larger reserves nearby, Jandakot Regional Park and Beeliar Regional Park.
Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi* (DEE 2018) The goal of this Threat Abatement Plan is to minimise the impacts of dieback on MNES under the EPBC Act and priority biodiversity assets identified by the actions of this Plan. The Plan has four objectives: a) Identify and prioritise for protection biodiversity assets that are, or may be, impacted by dieback. Protect priority biodiversity assets through reducing the spread and mitigating the impacts of dieback. Inform and engage the community by promoting information about Phytophthora, its impacts on biodiversity and actions to mitigate these impacts. Encourage research on *Phytophthora* species and options to manage infestations and protect biodiversity assets	The Proposed Action is consistent with the goal and/or objectives of the Threat Abatement Plan. – A Dieback Occurrence Assessment was undertaken for the Proposed Action, which identified uninfested, excluded, permanently uninterpretable and unknown areas along the PAA. As no symptoms consistent with Phytophthora Dieback were observed during the assessment, all areas should be managed as Protectable. – The Proposed Action will incorporate Dieback hygiene during construction to protect adjacent native vegetation. – The Proposed Action is not expected to spread Phytophthora dieback through sediment in stormwater runoff as the drainage strategy is to provide infiltration at the source, or as close to the source as possible, using permeable base pits via infiltration basins.
Threat abatement plan for predation by feral cats (DCCEEW 2024c). The Plan has nine objectives: a) Coordinate and enhance the legislative, regulatory and planning frameworks. Plan and implement cat management programs within an evidence-based framework, and use this to help maintain broad community and stakeholder support. Undertake research on cat ecology and impacts to inform management undertaken across multiple objectives.	The Threat Abatement Plan is not directly relevant to the Proposed Action, however the Proposed Action is consistent with the Plan. – The Proposed Action will not increase the prevalence of feral cats in the area, as it will encourage through traffic and not provide a destination or increase public access

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
Refine existing tools and their use, and develop new tools, for directly controlling feral cats. Prevent cats from spreading further, to islands that are currently without cats. Protect the most cat-susceptible species: Remove and exclude cats from an expanded network of cat-free islands and fenced havens, and manage those havens to maintain or enhance their conservation values. Protect species with moderate to high cat-susceptibility: Suppress feral cat density in and near prioritised populations of these species. Reduce the burden of cat predation across all native species using integrated management of habitat and species interactions over large areas. Reduce density of free-roaming cats around areas of human habitation and infrastructure.	to surrounding vegetation. The Proposed Action will not increase food sources that may attract cats. – The PAA is not considered to be existing breeding habitat for Black Cockatoos, therefore predation of chicks from nesting hollows is unlikely to occur.
Threat abatement plan for competition and land degradation by rabbits (DEE 2016b) The goal of this Threat Abatement Plan is to minimise the impact of rabbit competition and land degradation on biodiversity in Australia and its territories by protecting affected threatened species and ecological communities and preventing further species and ecological communities from becoming threatened. The Plan has four objectives: a) Strategically manage rabbits at the landscape scale and suppress rabbit populations to densities below threshold levels in identified priority areas. Improve knowledge and understanding of the impact of rabbits and their interactions with other species and ecological processes. Improve the effectiveness of rabbit control programs. Increase engagement of, and awareness by, the community of the environmental impacts of rabbits and the need for integrated control.	The Threat Abatement Plan is not directly relevant to the Proposed Action, however the Proposed Action is consistent with the Plan. – The Proposed Action will not increase the prevalence of rabbits in the area, as it will encourage through traffic and not provide a destination or increase public access to surrounding vegetation.
Threat abatement plan for predation by the European Red Fox (DEWHA 2008d). The Plan has the following objectives: – Prevent foxes occupying new areas in Australia and eradicate foxes from high-conservation-value 'islands' – Promote the maintenance and recovery of native species and ecological communities that are affected by fox predation – Improve knowledge and understanding of fox impacts and interactions with other species and other ecological processes – Improve the effectiveness, target specificity, integration and humaneness of control options for foxes	The Threat Abatement Plan is not directly relevant to the Proposed Action, however the Proposed Action is consistent with the Plan. – The Proposed Action will not increase the prevalence of the Red Fox in the area, as it will encourage through traffic and not provide a destination or increase public access to surrounding vegetation. The Proposed Action will not increase food sources that may attract the Red Fox.

PRIORITY ACTIONS	ASSESMENT AGAINST PLAN
	– The PAA is not considered to be existing breeding habitat for Black Cockatoos, therefore predation of chicks from nesting hollows is unlikely to occur.

16 INFORMATION SOURCES

The reliability and uncertainties in the technical studies undertaken in preparation of the Proposed Action have been outlined in Table 16.1.

Table 16.1: Reliability and uncertainties in technical studies used in preparing the PD

Reference Source	Reliability	Uncertainties
ABCS (2024). Survey of 34 nominated trees in the proposed Anketell Road Upgrade for their nesting value for black cockatoos. Unpublished report prepared for Main Roads, Western Australia.	Information is reliable	Access to three trees within the PAA categorised as 'Suitable DBH Tree with hollow(s) requiring further investigation' (Biota 2025a) was not granted to ABCS (2024). Of the three trees that couldn't be accessed, two were assessed as Unknown to contain suitable hollows and one was assessed as Unlikely to contain suitable hollows (ABCS 2024).
Biota (2024a). Anketell Road Upgrade Targeted Chuditch Survey. Unpublished report prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties
Biota (2024b). Anketell Road Upgrade, Technical Memo: Communities of Organic Mounds (Organic Mound Springs, SCP). Unpublished memorandum prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties
Biota (2024c). Anketell Road Upgrade Proposal, Technical Memo: Migratory Shorebirds and The Spectacles. Unpublished technical memorandum prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties
Biota (2025a). Anketell Rd Upgrade – Consolidated Biological Report. Unpublished report prepared for Main Roads, Western Australia.	Information is reliable	There are no uncertainties. A review of Tuart TEC and Banksia TEC patch data included in Biota (2025a) indicates patches TT02 and BT09 are borderline on meeting TEC condition and size thresholds. Therefore, the Biota (2025a) data is likely to overestimate the extent of Tuart TEC and Banksia TEC within the PAA. These patches have been included in the assessment (application of the precautionary principle).
Biota (2025b). Anketell Rd Upgrade Leioproctus douglasiellus and Neopasiphae simplicior Targeted Survey: Summary of Findings. Unpublished letter prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties
FSG (2024). Anketell Road Upgrade Project - Preliminary Groundwater Level Assessment. FSG Geotechnics and Foundations.	Information is reliable	There are no uncertainties

Reference Source	Reliability	Uncertainties
Unpublished report prepared for Main Roads, Western Australia		
GHD (2025). Black Cockatoo Foraging Habitat Quality. Unpublished report prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties. The report was reviewed by Bamford, creator of the BCE system.
Glevan Consulting (2025). Phytophthora Dieback Occurrence Report for Anketell Road. Unpublished report prepared for Westport Roads IPT	Information is reliable	There are no uncertainties
Senversa (2024). Preliminary Site Investigation, Anketell Road and Thomas Road Transport Corridor (West Site). Unpublished report prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties
Senversa. (2025). Detailed Site Investigation, Anketell Road Transport Corridor, Western Australia. Unpublished report prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties
Stream Environment and Water (Stream) (2025a). Anketell Road characterisation and assessment of impacts on GDEs and groundwater users. Unpublished memorandum prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties
Stream Environment and Water (Stream) (2025b). Anketell Road Upgrade Wetland Assessment. Unpublished memorandum prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties
Umwelt (2025). Assessment of FCT 26a Threatened Ecological Community. Unpublished report prepared for Main Roads, Western Australia	Information is reliable	There are no uncertainties

17 REFERENCES

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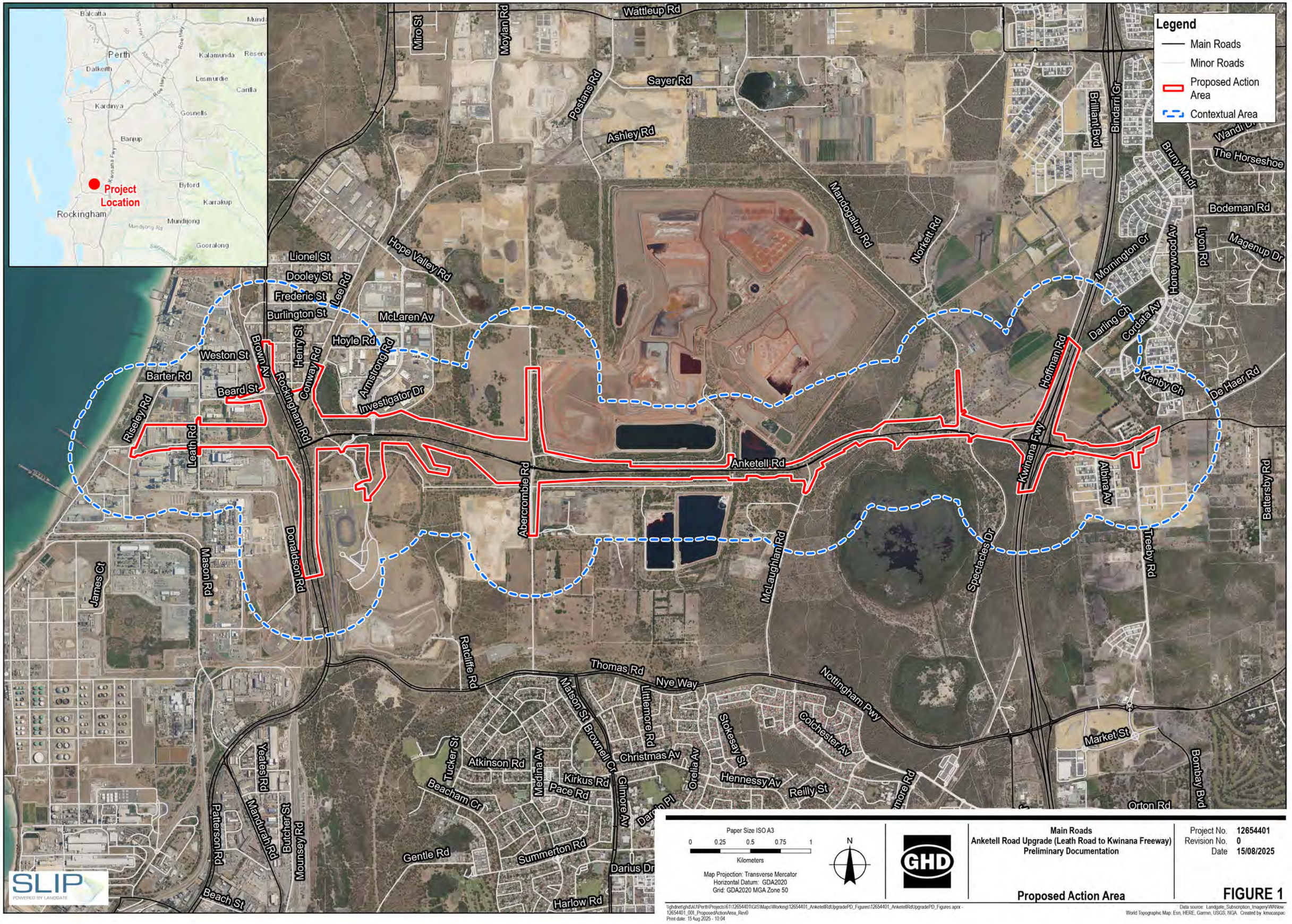
18 APPENDICIES

Appendix	Title
Appendix 1	Figures
Appendix 2	RFI tables
Appendix 3	Methods Statement
Appendix 4	Occurrence records
Appendix 5	Risk Assessment

Appendix 1: Figures



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Kilometers

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GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No.	**12654401**
Revision No.	**0**
Date	**15/08/2025**

Proposed Action Area

FIGURE 1

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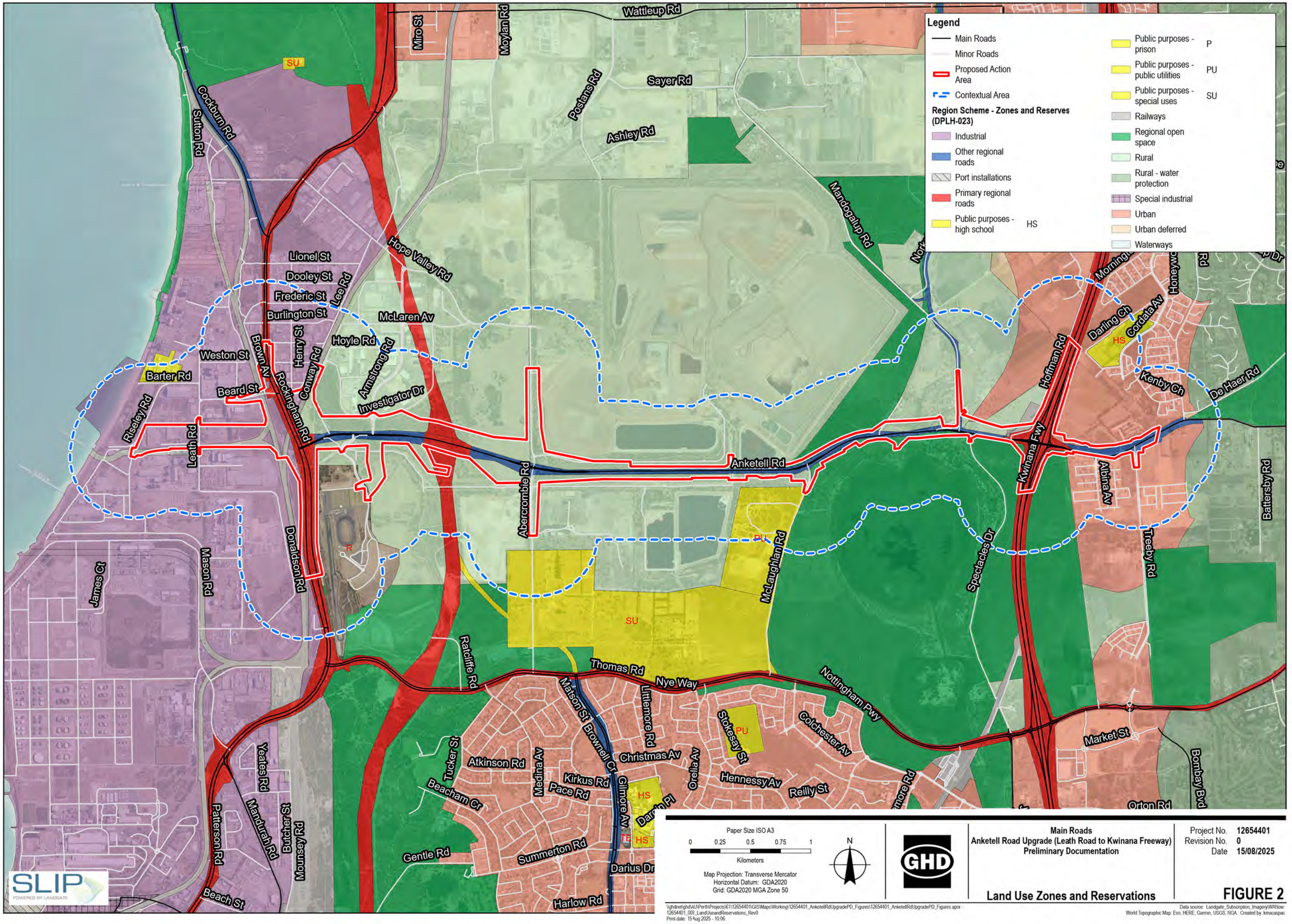

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Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Land Use Zones and Reservations

FIGURE 2

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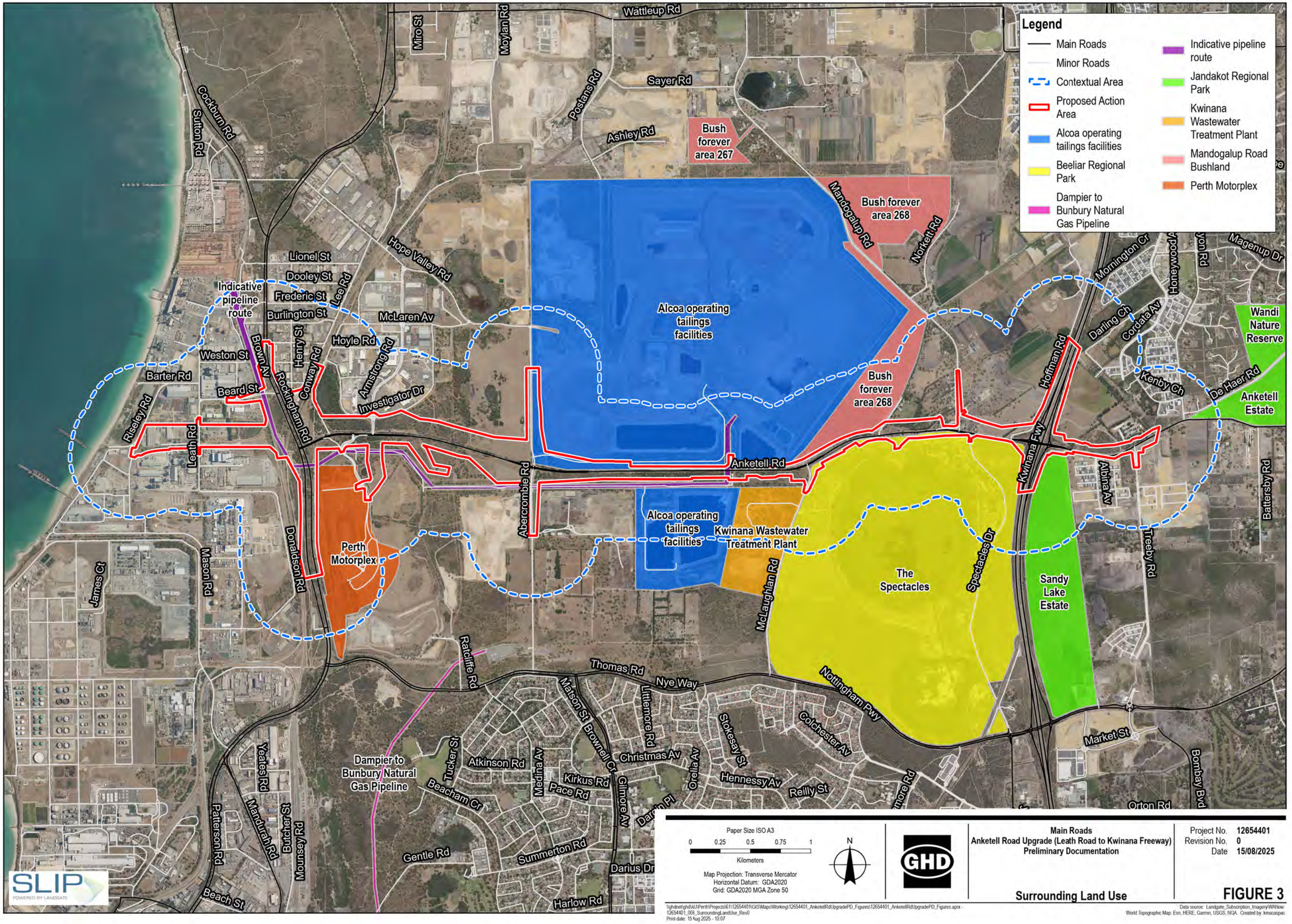

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Kilometers

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Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Surrounding Land Use

FIGURE 3

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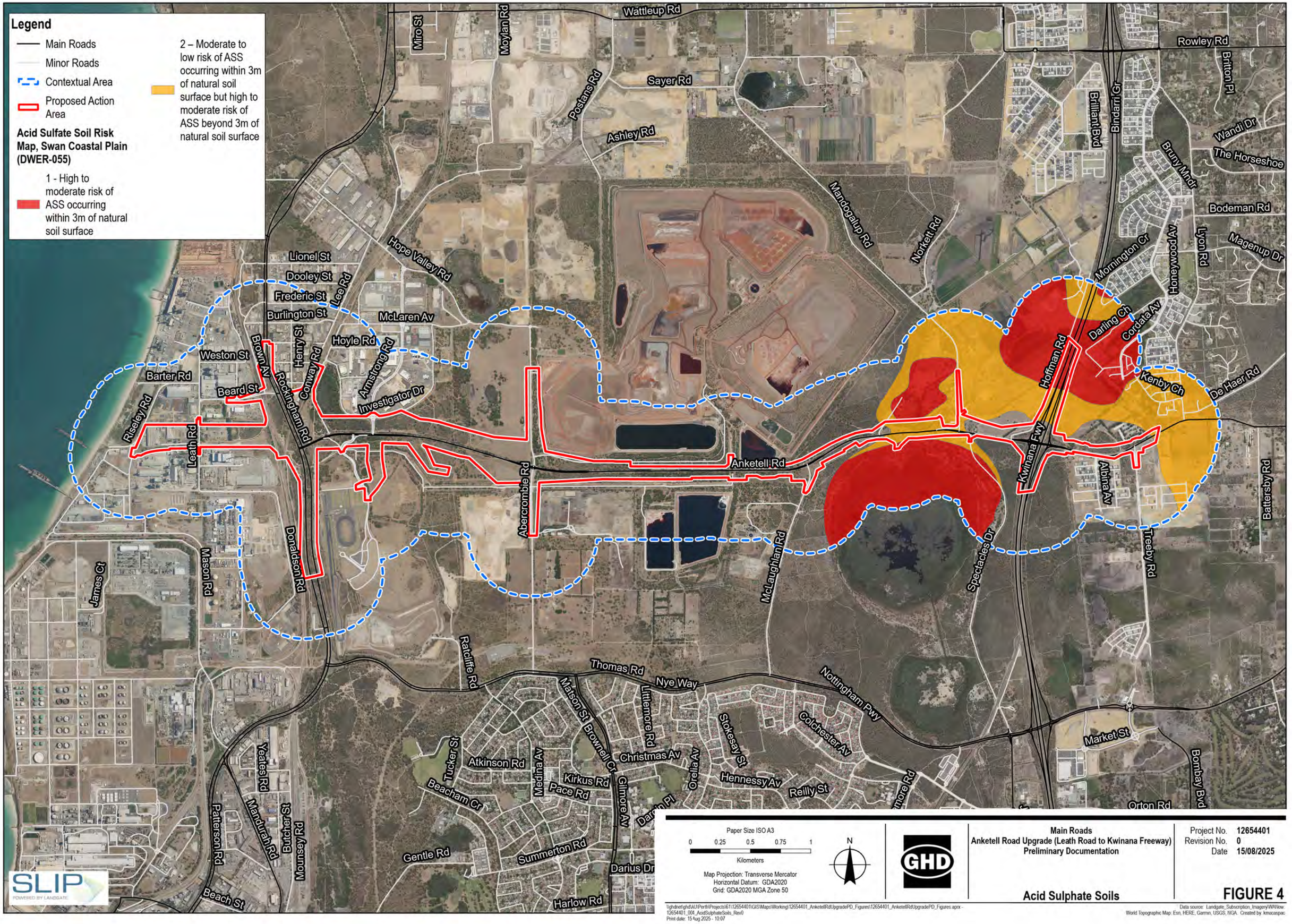

Paper Size ISO A3

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No.	**12654401**
Revision No.	**0**
Date	**15/08/2025**

Acid Sulphate Soils

FIGURE 4

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_004_AcidSulphateSoils_Rev0
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Data source: Landgate_Subscription_Imagery\WANow. World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Contaminated Sites Database (DWER-059)

Contaminated Sites

- Contaminated - remediation required
- Contaminated - restricted use
- Remediated for restricted use

Wattleup Rd
Miro St
Moylan Rd
Rowley Rd
Britton Pl
Sayer Rd
Postans Rd
Cockburn Rd
Sutton Rd
Ashley Rd
Brilliant Blvd
Bindarri Gr
Wandi Dr
The Horseshoe
Bruny Mndr
Mandogalup Rd
Norkett Rd
Bodeman Rd
Hope Valley Rd
Lionel St
Dooley St
Frederic St
Lee Rd
Burlington St
McLaren Av
Hoyle Rd
Armstrong Rd
Henry St
Brown Av
Conway Rd
Rockingham Rd
Weston St
Barter Rd
Beard St
Investigator Dr
Riseley Rd
Leath Rd
Anketell Rd
Abercrombie Rd
Donaldson Rd
Mason Rd
James Ct
Ratcliffe Rd
Thomas Rd
Nye Way
Matson St
Brownell Cr
Littlemore Rd
Nottingham Pwy
Stokesay St
Golchester Av
Christmas Av
Orelia Av
Hennessy Av
Reilly St
Tucker St
Atkinson Rd
Medina Av
Kirkus Rd
Pace Rd
Glimore Av
Beacham Cr
Darcy Pl
Yeates Rd
Mandurah Rd
Butcher St
Mounsey Rd
Patterson Rd
Gentle Rd
Summerton Rd
Darius Dr
Harlow Rd
Beach St
Mormington Cr
Honeywood Av
Lyon Rd
Magenup Dr
Darling Ch
Cordata Av
Kenby Ch
De Haer Rd
Hoffman Rd
Kwinana Fwy
Albina Av
Battersby Rd
Treeby Rd
Spectacles Dr
McLaughlan Rd
Market St
Bombay Blvd
Orton Rd

SLIP
POWERED BY LANDGATE

Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Contaminated Sites

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 5

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_009_ContaminatedSites_Rev0
Print date: 15 Aug 2025 - 10:08

Data source: Landgate_Subscription_ImageryWANow. World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Hydrography Linear (Hierarchy) (DWER-031)

- Coastal Waterline
- Minor River
- Major Trib
- Minor Trib
- Insignificant Trib
- Inundation Area
- Infrastructure

Public Drinking Water Source Areas (DWER-033)

- Protection Area-P1
- Protection Area-P2
- Protection Area-P3
- Protection Area-P3*

Wattleup Rd
Miro St
Moylan Rd
Postans Rd
Sayer Rd
Ashley Rd
Rowley Rd
Britton Pl
Bindarri Gr
Brilliant Blvd
Peel Main Drain
Wandi Dr
The Horseshoe
Bruny Mndr
Bodeman Rd
Magenup Dr
Lyon Rd
Honeywood Av
Mornington Cr
Darling Ch
Cordata Av
Kenby Ch
De Haer Rd
Hoffman Rd
Kwinana Fwy
Albina Av
Battersby Rd
Treeby Rd
Spectacles Dr
McLaughlan Rd
Mandogalup Rd
Norkett Rd
Hope Valley Rd
Lionel St
Dooley St
Frederic St
Burlington St
Lee Rd
McLaren Av
Hoyle Rd
Armstrong Rd
Investigator Dr
Henry St
Conway Rd
Brown Av
Rockingham Rd
Weston St
Barter Rd
Beard St
Riseley Rd
Leath Rd
Donaldson Rd
Mason Rd
James Ct
Abercrombie Rd
Anketell Rd
Ratcliffe Rd
Thomas Rd
Nye Way
Nottingham Pwy
Matson St
Brownell Cr
Littlemore Rd
Christmas Av
Stokesay St
Colchester Av
Market St
Bombay Byd
Orton Rd
Tucker St
Atkinson Rd
Medina Av
Kirkus Rd
Pace Rd
Beacham Cr
Gilmore Av
Orelia Av
Hennessy Av
Reilly St
Darius Dr
Gentle Rd
Summerton Rd
Harlow Rd
Yeates Rd
Mandurah Rd
Butcher St
Mounsey Rd
Patterson Rd
Beach St

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Hydrology

FIGURE 6

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_006_Hydrology_Rev0
Print date: 15 Aug 2025 - 10:09

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area
- Directory of Important Wetlands in Australia - Western Australia (DBCA-045)

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation
- Multiple Use
- Not Applicable
- Resource Enhancement

Wattleup Rd
Miro St
Moylan Rd
Postans Rd
Sayer Rd
Ashley Rd
Rowley Rd
Britton Pl
Brilliant Blvd
Bindarri Gr
Wandi Dr
The Horseshoe
Bruny Mndr
Bodeman Rd
Magenup Dr
Lyon Rd
Honeywood Av
Mornington Cr
Darling Ch
Cordata Av
Kenby Ch
De Haer Rd
Hoffman Rd
Kwinana Fwy
Albina Av
Battersby Rd
Treeby Rd
Mandogalup Rd
Norkett Rd
Hope Valley Rd
Lionel St
Dooley St
Frederic St
Burlington St
Lee Rd
McLaren Av
Hoyle Rd
Armstrong Rd
Investigator Dr
Henry St
Brown Av
Conway Rd
Rockingham Rd
Weston St
Barter Rd
Beard St
Riseley Rd
Leath Rd
Donaldson Rd
Mason Rd
James Ct
Abercrombie Rd
Anketell Rd
Spectacles Swamp
Spectacles Dr
McLaughlan Rd
Ratcliffe Rd
Thomas Rd
Nye Way
Nottingham Pwy
Matson St
Brownell Cr
Littlemore Rd
Christmas Av
Stokesay St
Colchester Av
Hennessy Av
Reilly St
Orelia Av
Gilmore Av
Darcy Pl
Tucker St
Atkinson Rd
Medina Av
Kirkus Rd
Pace Rd
Beacham Cr
Yeates Rd
Mandurah Rd
Butcher St
Mounsey Rd
Patterson Rd
Gentle Rd
Summerton Rd
Darius Dr
Harlow Rd
Beach St
Market St
Orton Rd
Bombay Byd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Wetlands

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 7

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_007_Wetlands_Rev0
Print date: 15 Aug 2025 - 10:10

Data source: Landgate_Subscription_ImageryWANow. World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Vegetation Complexes - Swan Coastal Plain (DBCA-046)

- Bassendean Complex-Central and South
- Cottesloe Complex-Central and South
- Herdsman Complex
- Karrakatta Complex-Central and South
- Quindalup Complex

Wattleup Rd
Miro St
Moylan Rd
Postans Rd
Sayer Rd
Ashley Rd
Rowley Rd
Britton Pl
Brilliant Bvd
Bindarri Gr
Wandi Dr
The Horseshoe
Bruny Mndr
Bodeman Rd
Magenup Dr
Lyon Rd
Honeywood Av
Mornington Cr
Darling Ch
Cordata Av
Kenby Ch
De Haer Rd
Hoffman Rd
Kwinana Fwy
Albina Av
Battersby Rd
Mandogalup Rd
Norkett Rd
Hope Valley Rd
Lionel St
Dooley St
Frederic St
Burlington St
Lee Rd
McLaren Av
Hoyle Rd
Armstrong Rd
Henry St
Brown Av
Weston St
Barter Rd
Beard St
Conway Rd
Rockingham Rd
Investigator Dr
Riseley Rd
Leath Rd
Anketell Rd
Abercrombie Rd
Donaldson Rd
James Ct
Mason Rd
Ratcliffe Rd
McLaughlan Rd
Spectacles Dr
Treeby Rd
Thomas Rd
Nye Way
Nottingham Pwy
Matson St
Brownell Ct
Littlemore Rd
Christmas Av
Stokesay St
Colchester Av
Market St
Bombay Blvd
Orton Rd
Tucker St
Atkinson Rd
Medina Av
Kirkus Rd
Pace Rd
Glimore Av
Beacham Cr
Oretta Av
Hennessy Av
Reilly St
Yeates Rd
Mandurah Rd
Butcher St
Mounsey Rd
Patterson Rd
Gentle Rd
Summerton Rd
Darius Dr
Harlow Rd
Beach St

SLIP
POWERED BY LANDGATE

Paper Size ISO A3
0 0.25 0.5 0.75 1
Kilometers
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Vegetation Complexes

FIGURE 8

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_008_VegetationComplexes_Rev0
Print date: 15 Aug 2025 - 10:11

Data source: Landgate_Subscription_ImageryWANow. World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmoscaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Types

Intact Vegetation

A1, A2, A3, A4, A5, B2, B4, B6, DU1, DU2, E1, E5, E6, E7, EB1, K1, M1, M2, M4, M5, M6, T1

Modified Areas

D, IP, ML, R3

Cleared Areas

CL

RR, B, O

Unmapped

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Weston St
Brown Av
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Investigator Dr
Riseley Rd
Leath Rd
Anketell Rd
Rockingham Rd
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Vegetation Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 9

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Print date: 15 Aug 2025 - 10:13

Data source: Landgate_Subscription_ImageryWANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Types

Intact Vegetation

A1, A2, B2, B3, B4, B5, E1, E5, EB1, K1, M1, M2, M4, M5

Modified Areas

D, IP, ML, R3

Cleared Areas

CL, RR

Unmapped

Rette Way
McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
Norketti Rd
Mandogalup Rd
Clementi Rd
Anketell Rd
Abercrombie Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way
Nye

SLIP
POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Vegetation Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

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Print date: 15 Aug 2025 - 10:13

Data source: Landgate_Subscription_ImageryWANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Types

Intact Vegetation
- B1
- B2
- B3
- E1
- EB1

Modified Areas
- D
- IP
- ML
- R2
- K1
- M1

Cleared Areas
- CL
- RR
- R3

Unmapped

Windjana Rise
Honeywood Av
Mornington Cr
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
Cassowary Ch
Lyon Rd
Blackboy Gr
De Haer Rd
Darling Ch
Cordata Av
Saltbush St
Coomallo Blvd
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
Turnix St
Hoffman Rd
Anketell Rd
Clementi Rd
Kwinana Fwy
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Battersby Rd
Scovell Cr
Miyak Ct
Lilli Pl
McLaughlan Rd
Spectacles Dr
Treeby Rd
Broadwater Av
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Vegetation Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 9

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Print date: 15 Aug 2025 - 10:13

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Condition

- Excellent
- Very Good to Excellent
- Very Good
- Good to Very Good
- Good
- Degraded to Good
- Degraded
- Completely Degraded
- Clear
- Unmapped

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Brown Av
Weston St
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Investigator Dr
Riseley Rd
Anketell Rd
Leath Rd
Rockingham Rd
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Vegetation Condition

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 10

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_010_VegetationCondition_Rev0
Print date: 15 Aug 2025 - 10:15

Data source: Landgate_Subscription_Imagery\WANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Condition

- Very Good to Excellent
- Very Good
- Good to Very Good
- Good
- Degraded to Good
- Degraded
- Completely Degraded
- Clear
- Unmapped

Everette Way
McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
Norkett Rd
Mandogalup Rd
Clementi Rd
Anketell Rd
Abercrombie Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Vegetation Condition

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

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Print date: 15 Aug 2025 - 10:15

Data source: Landgate_Subscription_Imagery\WANow. World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Condition

- Very Good to Excellent
- Very Good
- Good to Very Good
- Good
- Degraded to Good
- Degraded
- Completely Degraded
- Clear
- Unmapped

Windjana Rise
Honeywood Av
Mornington Cr
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
Mandogalup Rd
Darling Ch
Cassowary Ch
Lyon Rd
Blackboy Gr
Cordata Av
Saltbush St
De Haer Rd
Coomallo Byd
Sida St
Turnix St
Hoffman Rd
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
Clementi Rd
Anketell Rd
Kwinana Fwy
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Battersby Rd
McLaughlan Rd
Spectacles Dr
Treeby Rd
Scovell Cr
Miyak Ct
Lilli Pl
Broadwater Av
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Vegetation Condition

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 10

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Print date: 15 Aug 2025 - 10:16

Data source: Landgate_Subscription_Imagery\WANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Weeds of National Significance

- **Asparagus asparagoides*

Declared Pests

- **Echium plantagineum*
- **Moraea flaccida*
- **Zantedeschia aethiopica*

Wattleup Rd
Miro St
Moylan Rd
Sayer Rd
Postans Rd
Ashley Rd
Cockburn Rd
Sutton Rd
Mandogalup Rd
Norkett Rd
Rowley Rd
Britton Pl
Brilliant Blvd
Bindarri Gr
Wandi Dr
The Horseshoe
Bruny Mndr
Bodeman Rd
Honeywood Av
Lyon Rd
Magenup Dr
Mornington Cr
Darling Ch
Cordata Av
Kenby Ch
De Haer Rd
Hoffman Rd
Hope Valley Rd
Lionel St
Dooley St
Frederic St
Burlington St
Lee Rd
McLaren Av
Hoyle Rd
Armstrong Rd
Henry St
Brown Av
Conway Rd
Weston St
Barter Rd
Beard St
Rockingham Rd
Investigator Dr
Riseley Rd
Leath Rd
Anketell Rd
Abercrombie Rd
Kwinana Fwy
Albina Av
Battersby Rd
Treeby Rd
Spectacles Dr
McLaughlan Rd
Donaldson Rd
Mason Rd
James Ct
Ratcliffe Rd
Thomas Rd
Nye Way
Nottingham Pwy
Market St
Bombay Byd
Orton Rd
Littlemore Rd
Stokesay St
Colchester Av
Christmas Av
Hennessy Av
Reilly St
Orelia Av
Gilmore Av
Brownell Cr
Matson St
Tucker St
Atkinson Rd
Medina Av
Kirkus Rd
Pace Rd
Beacham Cr
Darcy Pl
Summerton Rd
Gentle Rd
Darius Dr
Harlow Rd
Beach St
Patterson Rd
Mandurah Rd
Butcher St
Mounsey Rd
Yeates Rd

SLIP
POWERED BY LANDGATE

Paper Size ISO A3
0 0.25 0.5 0.75 1
Kilometers
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Introduced Flora

Project No.	**12654401**
Revision No.	**0**
Date	**15/08/2025**

FIGURE 11

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_011_IntroducedFlora_Rev0
Print date: 15 Aug 2025 - 10:25

Data source: Landgate_Subscription_ImageryWANlow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Significant Fauna

- FRTBC (*Calyptorhynchus banksii naso*) (VU)
- Quenda (*Isoodon fusciventer*) (P4)

Fauna Habitat

- Acacia Shrubland
- Banksia Woodland
- Beach/Ocean
- Coastal Moort Woodland
- Damplands
- Dune
- Eucalyptus Woodland/Forest
- Jarrah/Banksia Woodland
- Melaleuca Shrubland
- Cleared/degraded Areas
- Modified Areas
- Unmapped

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Weston St
Brown Av
Morley St
Conway Rd
Carpentaria Link
Barter Rd
Bickley St
Beard St
Investigator Dr
Riseley Rd
Anketell Rd
Leath Rd
Rockingham Rd
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Fauna Habitat and Significant Fauna

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 12

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_012_FaunaHabitatandSignificantFauna_Rev0
Print date: 15 Aug 2025 - 10:27

Data source: Landgate_Subscription_ImageryWANlow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Significant Fauna

- FRTBC (*Calyptorhynchus banksii naso*) (VU)
- Quenda (*Isoodon fusciventer*) (P4)

Fauna Habitat

- Acacia Shrubland
- Banksia Woodland
- Damplands
- Eucalyptus Woodland/Forest
- Jarrah/Banksia Woodland
- Melaleuca Shrubland
- Cleared/degraded Areas
- Modified Areas
- Unmapped

Hoyle Rd
Armstrong R
Carpentaria Link
Investigator Dr
Norketti Rd
Mandogalup Rd
Clementi Rd
Anketell Rd
Abercrombie Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP POWERED BY LANDGATE

Paper Size ISO A3
0 100 200 300 400
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Fauna Habitat and Significant Fauna

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

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Print date: 15 Aug 2025 - 10:27

Data source: Landgate_Subscription_ImageryWANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Significant Fauna

- Quenda (*Isoodon fusciventer*) (P4)

Fauna Habitat

- Banksia Woodland
- Damplands
- Emergent Flooded Gum and Marri, planted eucalypts
- Eucalyptus Woodland/Forest
- Jarrah/Banksia Woodland
- Cleared/degraded Areas
- Modified Areas
- Unmapped

Windjana Rise
Honeywood Av
Mornington Cr
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
Cassowary Ch
Lyon Rd
Blackboy Gr
De Haer Rd
Darling Ch
Cordata Av
Saltbush St
Coomallo Blvd
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
Turnix St
Hoffman Rd
Anketell Rd
Clementi Rd
Kwinana Fwy
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Battersby Rd
Scovell Cr
Miyak Ct
Lilli Pl
McLaughlan Rd
Spectacles Dr
Treeby Rd
Broadwater Av
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Fauna Habitat and Significant Fauna

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 12

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Print date: 15 Aug 2025 - 10:27

Data source: Landgate_Subscription_Imagery\WANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- 10km Buffer
- Tuart Woodlands (DBCA-048)
- Tuart Woodlands and Forests of the SCP TEC (buffered) (DBCA 2024b)

Phoenix Rd
Bibra Dr
Roe Hwy
Karel Av
Nicholson Rd
Holmes St
Verna St
Corfield St
Clifton St
Connolly Dr
Stock Rd
Speanwood Av
North Lake Rd
Berrigan Dr
Acourt Rd
Warton Rd
Ranford Rd
Southern River Rd
Barrington St
Jandakot Rd
Beeliar Dr
Verde Dr
Tonkin Hwy
Gilwell Av
Cammillo Rd
Westfield Rd
Seville Dr
Champion Av
Railway Av
Albany Hwy
Stretch Rd
Third Rd
Ansley Rd
Avres Rd
Lake Rd
Armadale Rd
Eighth Rd
Church Av
Forrest Rd
Wungong Rd
Eleventh Rd
Hammond Rd
Cockburn Rd
Rockingham Rd
Russell Rd
Gibbs Rd
Liddelow Rd
Lyon Rd
Frankland Av
Wattleup Rd
Rowley Rd
Anketell Rd
Thomas Rd
Bombay Bvd
Orton Rd
Hopkinson Rd
Nettleton Rd
Turner Rd
South Western Hwy
Soldiers Rd
Kwinana Beach Rd
Patterson Rd
Rockingham Beach Rd
Henley Bvd
Challenger Av
Johnson Rd
Bertram Rd
Wellard Rd
Mortimer Rd
Coyle Rd
Castarina Rd
King Rd
Kargotich Rd
Gilmore Av
Millar Rd
McWhirter Prom
Railway
Tce
Parkin St
Dixon Rd
Day Rd
Boundary Rd
Areadia Dr
Council Av
Ennis Av
Millar Rd West
Kulija Rd
Mundijong Rd
Rae Rd
Malibu Rd
Safety Bay Rd
Read St
Sound Av
Wanbro
Mandurah Rd
Kerosene Lane
Fifty Rd
Paterson St
Watkins Rd
Jarrahdale

Paper Size ISO A3

0 1 2 3 4 Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP TEC Greater Regional Context

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 13

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_013_TuartWoodlandsandForestsoftheSCPTECgreaterregionalcontext_Rev0
Print date: 15 Aug 2025 - 10:28

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

SLIP POWERED BY LANDGATE

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Patch Quality

- Very High
- High
- Moderate-High
- Moderate

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Weston St
Brown Av
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Riseley Rd
TT01
Investigator Dr
TT03
TT02
Leath Rd
Rockingham Rd
Anketell Rd
TT05
TT04
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd
TT11
TT10
TT12

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP TEC

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 14

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Print date: 15 Aug 2025 - 10:29

Data source: Landgate_Subscription_ImageryWAN low; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Patch Quality

- Very High
- Moderate-High
- Moderate

Hope Valley Rd
Everette Way
McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
Norketti Rd
Mandogalup Rd
Clementi Rd
TT01
TT02
TT03
TT04
TT05
TT06
TT07
TT08
TT09
Anketell Rd
Abercrombie Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP
POWERED BY LANDGATE

Paper Size ISO A3
0 100 200 300 400
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP TEC

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 14

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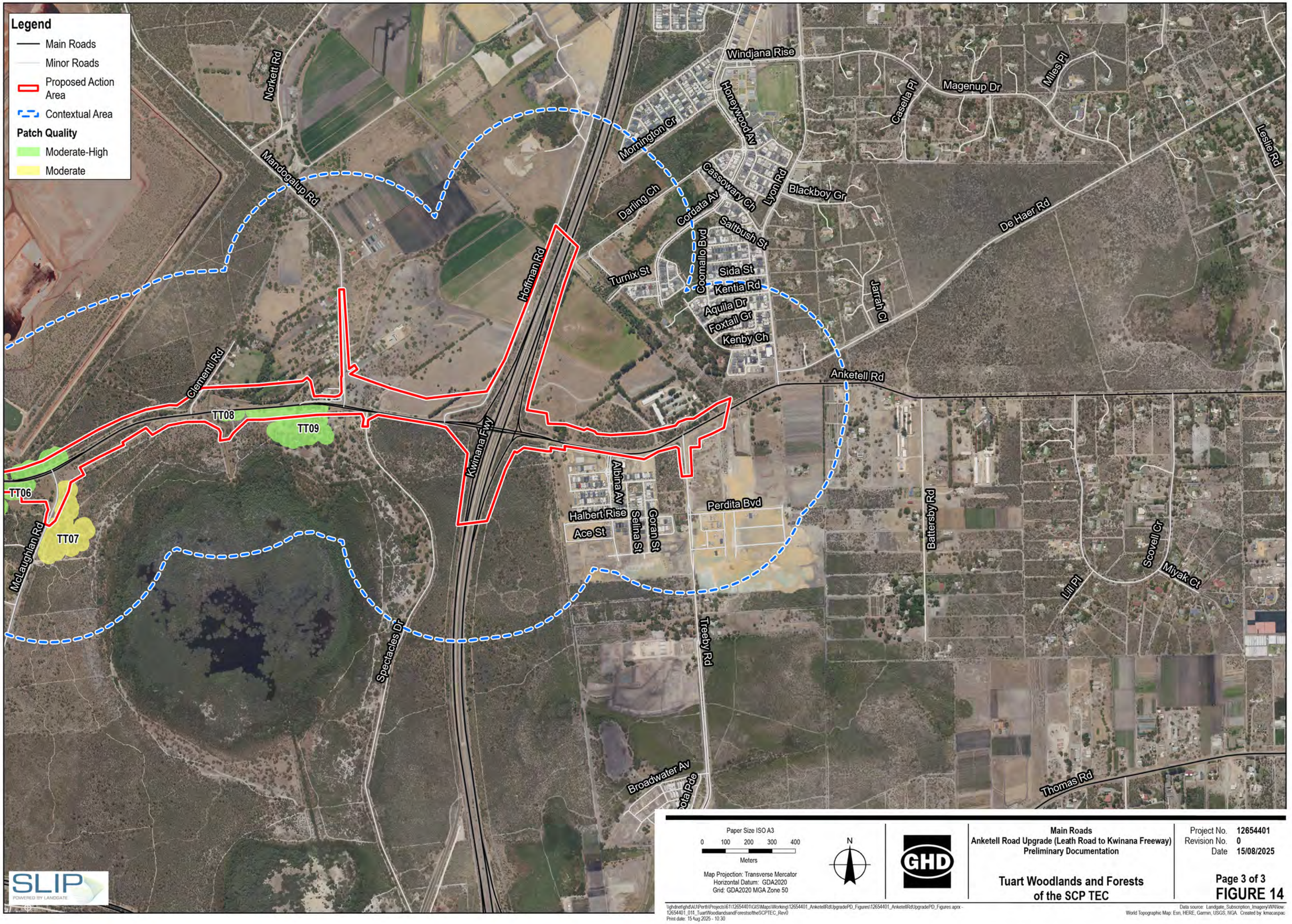

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP TEC

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 14

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_011_TuartWoodlandsandForestsoftheSCPTEC_Rev0
Print date: 15 Aug 2025 - 10:30

Data source: Landgate_Subscription_ImageryWANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Floristic Community Type

- Northern Spearwood shrublands and woodlands
- Quindalup E. gomphocephala and/or A. flexuousa woodlands
- Spearwood Banksia attenuata or Banksia attenuata-Eucalyptus woodlands
- N/A

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Link Rd
Henry St
Frederic St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Weston St
Brown Av
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Riseley Rd
TT01
Investigator Dr
TT03
TT02
Leath Rd
Rockingham Rd
Anketell Rd
TT05
TT04
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd
TT11
TT10
TT12

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP TEC Floristic Community Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 15

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Print date: 15 Aug 2025 - 10:30

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Floristic Community Type

- M. huegelii - M. acerosa shrublands of limestone ridges
- Northern Spearwood shrublands and woodlands
- Quindalup E. gomphocephala and/or A. flexuousa woodlands
- Spearwood Banksia attenuata or Banksia attenuata-Eucalyptus woodlands
- N/A

Hoyle Rd
Armstrong Rd
Carpentaria Link
Investigator Dr
TT01
TT02
TT03
TT04
TT05
TT06
TT07
TT08
TT09
Anketell Rd
Abercrombie Rd
Norketti Rd
Mandogalup Rd
Clementi Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP TEC Floristic Community Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 2 of 3
FIGURE 15

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Print date: 15 Aug 2025 - 10:30

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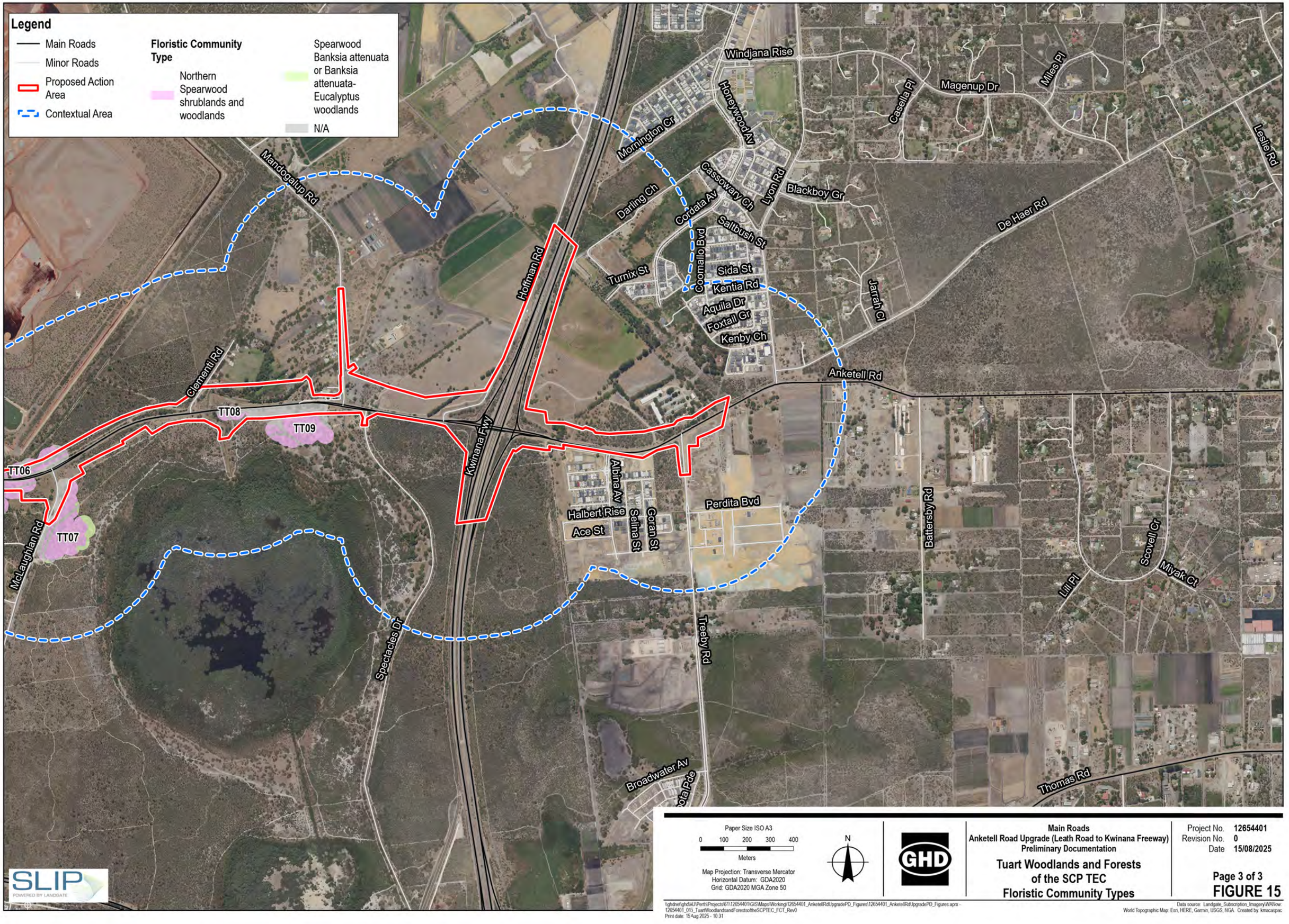

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP TEC Floristic Community Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 15

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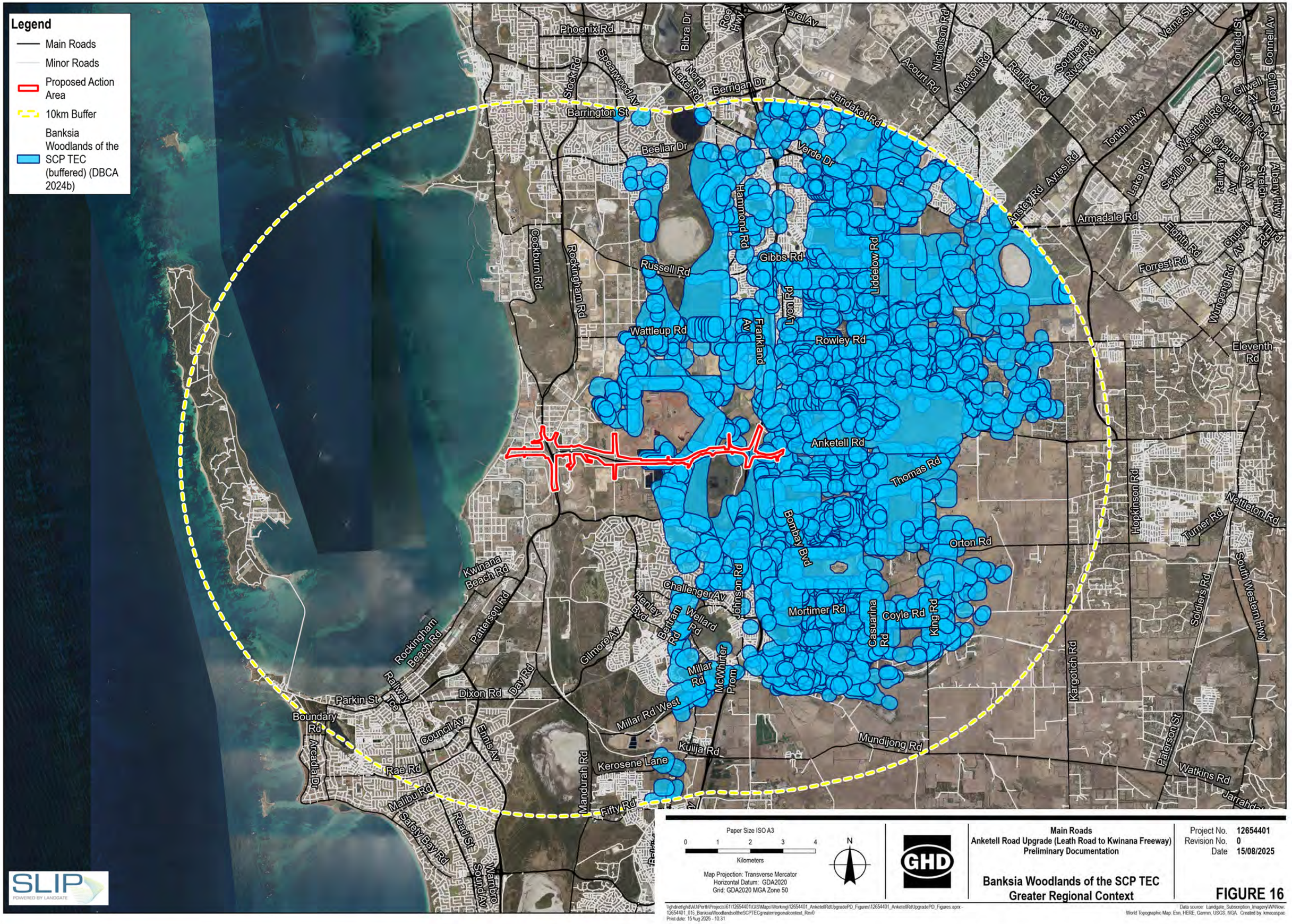
Print date: 15 Aug 2025 - 10:31

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac


Legend
Main Roads
Minor Roads
Proposed Action Area
10km Buffer
Banksia Woodlands of the SCP TEC (buffered) (DBCA 2024b)
Phoenix Rd
Bibra Dr
Karel Av
Nicholson Rd
Holmes St
Verna St
Corfield St
Clifton St
Connolly Dr
Stock Rd
Speanwood Av
North Lake Rd
Berrigan Dr
Acourt Rd
Warton Rd
Ranford Rd
Southern River Rd
Barrington St
Jandakot Rd
Tonkin Hwy
Gilwell Av
Westfield Rd
Camillo Rd
Beeliar Dr
Verde Dr
Seville Dr
Railway Dr
Champion Av
Stretch Rd
Albany Hwy
Ansety Rd
Ayres Rd
Lake Rd
Armadale Rd
Hammond Rd
Cockburn Rd
Rockingham Rd
Gibbs Rd
Liddelow Rd
Eighth Rd
Church Av
Third Rd
Russell Rd
Forrest Rd
Wungong Rd
Lyon Rd
Frankland Av
Wattleup Rd
Rowley Rd
Eleventh Rd
Anketell Rd
Thomas Rd
Hopkinson Rd
Nettleton Rd
Bombay Blvd
Orton Rd
Turner Rd
Kwinana Beach Rd
Challenger Av
Johnson Rd
Henley Blvd
Patterson Rd
Bertram Rd
Wellard Rd
Mortimer Rd
Coyle Rd
King Rd
Casuarina Rd
Soldiers Rd
South Western Hwy
Rockingham Beach Rd
Gilmore Av
Millar Rd
McWhirter Prom
Kargotich Rd
Railway Tce
Dixon Rd
Day Rd
Parkin St
Boundary Rd
Millar Rd West
Council Av
Ennis Av
Kulija Rd
Mundijong Rd
Patterson St
Watkins Rd
Arcadia Dr
Rae Rd
Kerosene Lane
Mandurah Rd
Malibu Rd
Safety Bay Rd
Read St
Wanbro Sound Av
Fifty Rd
Jarrahdale
SLIP
POWERED BY LANDGATE
Paper Size ISO A3
0 1 2 3 4
Kilometers
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50
N
GHD
Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation
Banksia Woodlands of the SCP TEC
Greater Regional Context
Project No. 12654401
Revision No. 0
Date 15/08/2025
FIGURE 16
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Print date: 15 Aug 2025 - 10:31
Data source: Landgate_Subscription_ImageryWANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Patch Quality

- Excellent
- Very Good to Excellent
- Good

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Weston St
Brown Av
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Investigator Dr
Riseley Rd
BT08
BT07
Leath Rd
BT09
Anketell Rd
Rockingham Rd
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd
SLIP POWERED BY LANDGATE

Paper Size ISO A3
0 100 200 300 400
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Banksia Woodlands of the SCP TEC

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 17

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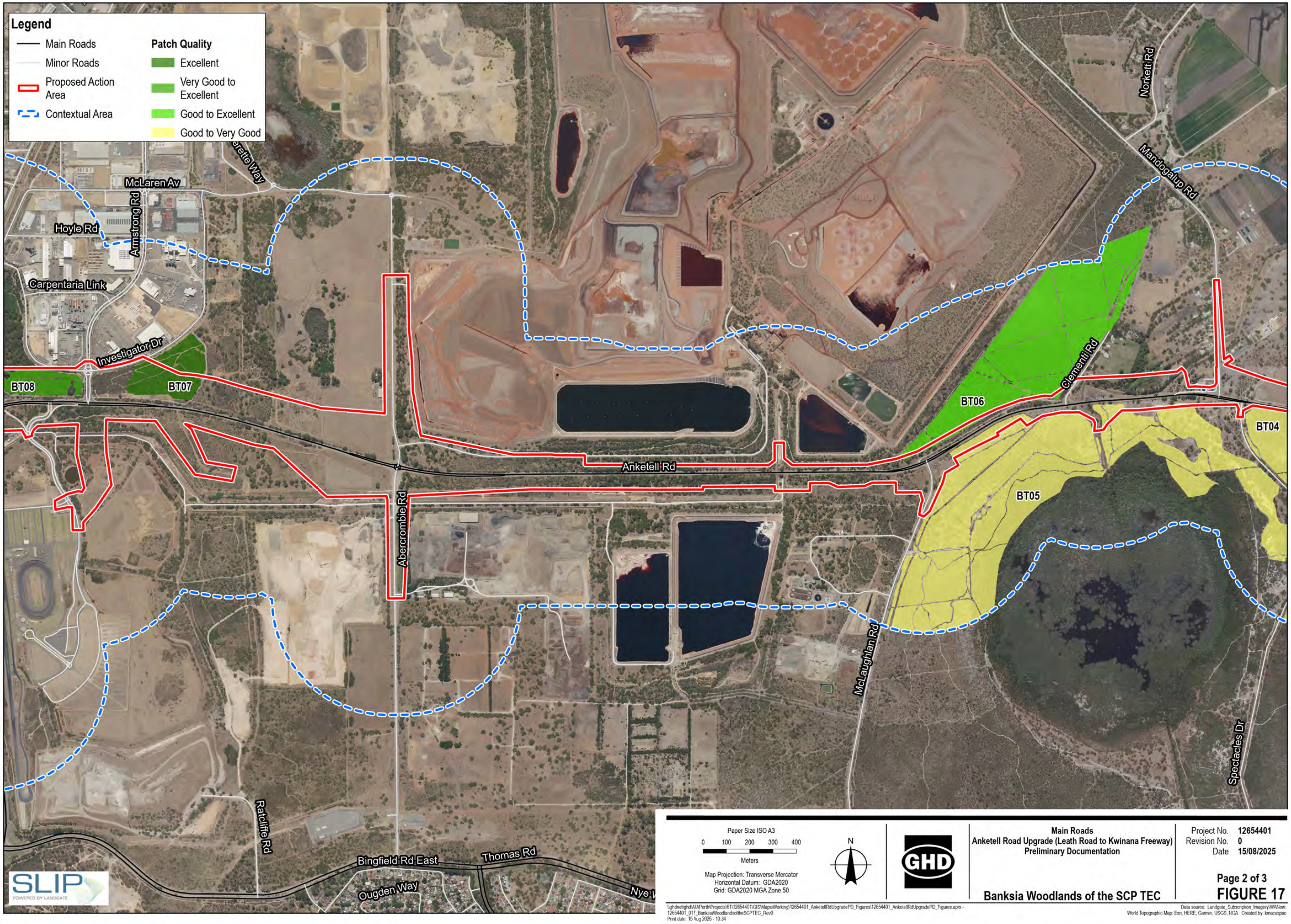
Print date: 15 Aug 2025 - 10:34

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac


Legend
Main Roads
Minor Roads
Proposed Action Area
Contextual Area
Patch Quality
Excellent
Very Good to Excellent
Good to Excellent
Good to Very Good
McLaren Av
Hoyle Rd
Armstrong Rd
Carpentaria Link
Investigator Dr
BT08
BT07
BT06
BT05
BT04
Abercrombie Rd
Anketell Rd
Clementi Rd
Mandogalup Rd
Norkett Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way
Paper Size ISO A3
0 100 200 300 400
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50
N
Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation
Project No. 12654401
Revision No. 0
Date 15/08/2025
Page 2 of 3

Banksia Woodlands of the SCP TEC

FIGURE 17

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Print date: 15 Aug 2025 - 10:34

Data source: Landgate_Subscription_Imagery\WANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Patch Quality

- Very Good to Excellent
- Good to Excellent
- Very Good
- Good to Very Good

Norkett Rd
Mandogalup Rd
Clementi Rd
Hoffman Rd
Kwinana Fwy
Windjana Rise
Honeywood Av
Mornington Cr
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
Darling Ch
Cassowary Ch
Lyon Rd
Blackboy Gr
Cordata Av
Saltbush St
De Haer Rd
Coomallo Byd
Turnix St
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
Anketell Rd
BT06
BT02
BT01
BT05
BT04
BT03
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Battersby Rd
Scovell Cr
Miyak Ct
Lilli Pl
McLaughlan Rd
Spectacles Dr
Treeby Rd
Broadwater Av
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Banksia Woodlands of the SCP TEC

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 17

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_017_BanksiaWoodlandsoftheSCPTEC_Rev0
Print date: 15 Aug 2025 - 10:34

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Floristic Community Type

- Northern Spearwood shrublands and woodlands
- Quindalup E. gomphocephala and/or A. flexuousa woodlands
- Spearwood Banksia attenuata or Banksia attenuata-Eucalyptus woodlands

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Link Rd
Henry St
Frederic St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Brown Av
Weston St
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Investigator Dr
Riseley Rd
BT08
BT07
Anketell Rd
Leath Rd
BT09
Rockingham Rd
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Banksia Woodlands of the SCP TEC Floristic Community Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 18

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_013_BanksiaWoodlandsoftheSCPTEC_FCT_Rev0
Print date: 15 Aug 2025 - 10:39

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Floristic Community Type

- Low lying Banksia attenuata woodlands or shrublands
- Northern Spearwood shrublands and woodlands
- Quindalup E. gomphocephala and/or A. flexuousa woodlands
- Spearwood Banksia attenuata or Banksia attenuata-Eucalyptus woodlands

Norketti Rd
Mandogalup Rd
McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
Clementi Rd
BT08
BT07
BT06
BT04
BT05
Anketell Rd
Abercrombie Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Banksia Woodlands of the SCP TEC Floristic Community Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_013_BanksiaWoodlandsoftheSCPTEC_FCT_Rev0
Print date: 15 Aug 2025 - 10:39

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Floristic Community Type

- Central Banskia attenuata-Eucalyptus marginata woodlands
- Low lying Banskia attenuata woodlands or shrublands
- Northern Spearwood shrublands and woodlands
- Spearwood Banksia attenuata or Banksia attenuata-Eucalyptus woodlands

Windjana Rise
Honeywood Av
Mornington Cr
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
Darling Ch
Cordata Av
Cassowary Ch
Lyon Rd
Blackboy Gr
De Haer Rd
Saltbush St
Coomallo Blvd
Turnix St
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
Hoffman Rd
Clementi Rd
Anketell Rd
Kwinana Fwy
BT06
BT05
BT04
BT03
BT02
BT01
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Battersby Rd
Scovell Cr
Miyak Ct
Lill Pl
McLaughlan Rd
Spectacles Dr
Treeby Rd
Broadwater Av
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3
0 100 200 300 400
Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Banksia Woodlands of the SCP TEC Floristic Community Types

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_013_BanksiaWoodlandsoftheSCPTEC_FCT_Rev0
Print date: 15 Aug 2025 - 10:39

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- 15km Buffer
- Honeymyrtle shrubland on limestone ridges of the SCP Bioregion TEC (buffered) (DBCA 2024b)

Paper Size ISO A3

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Honeymyrtle on Limestone Ridges of the SCP TEC Greater Regional Context

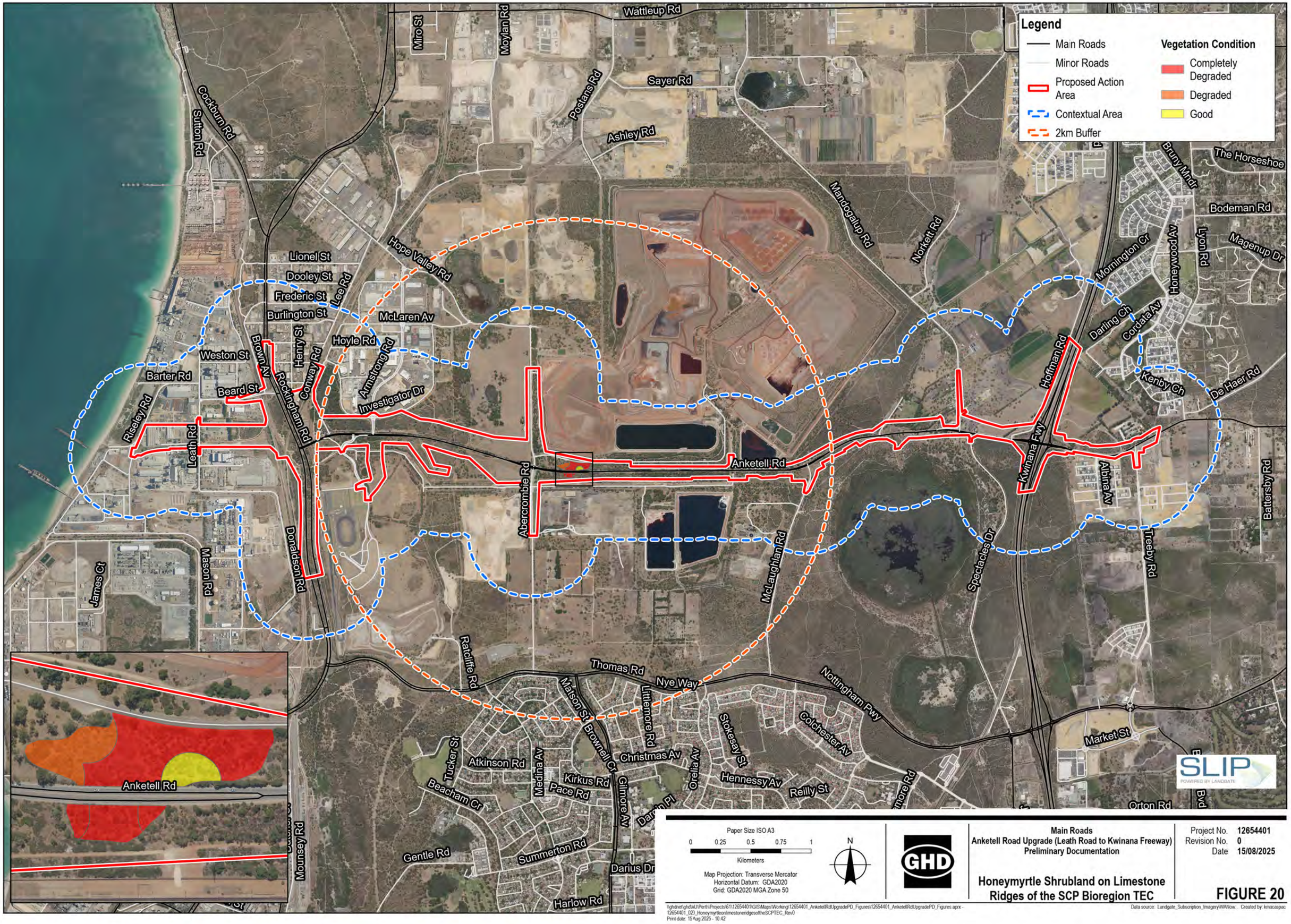
Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 19

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_019_HoneymyrtleonlimestoneridgesoftheSCPTECgreaterregionalcontext_Rev0
Print date: 15 Aug 2025 - 10:41

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

SLIP POWERED BY LANDGATE



Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

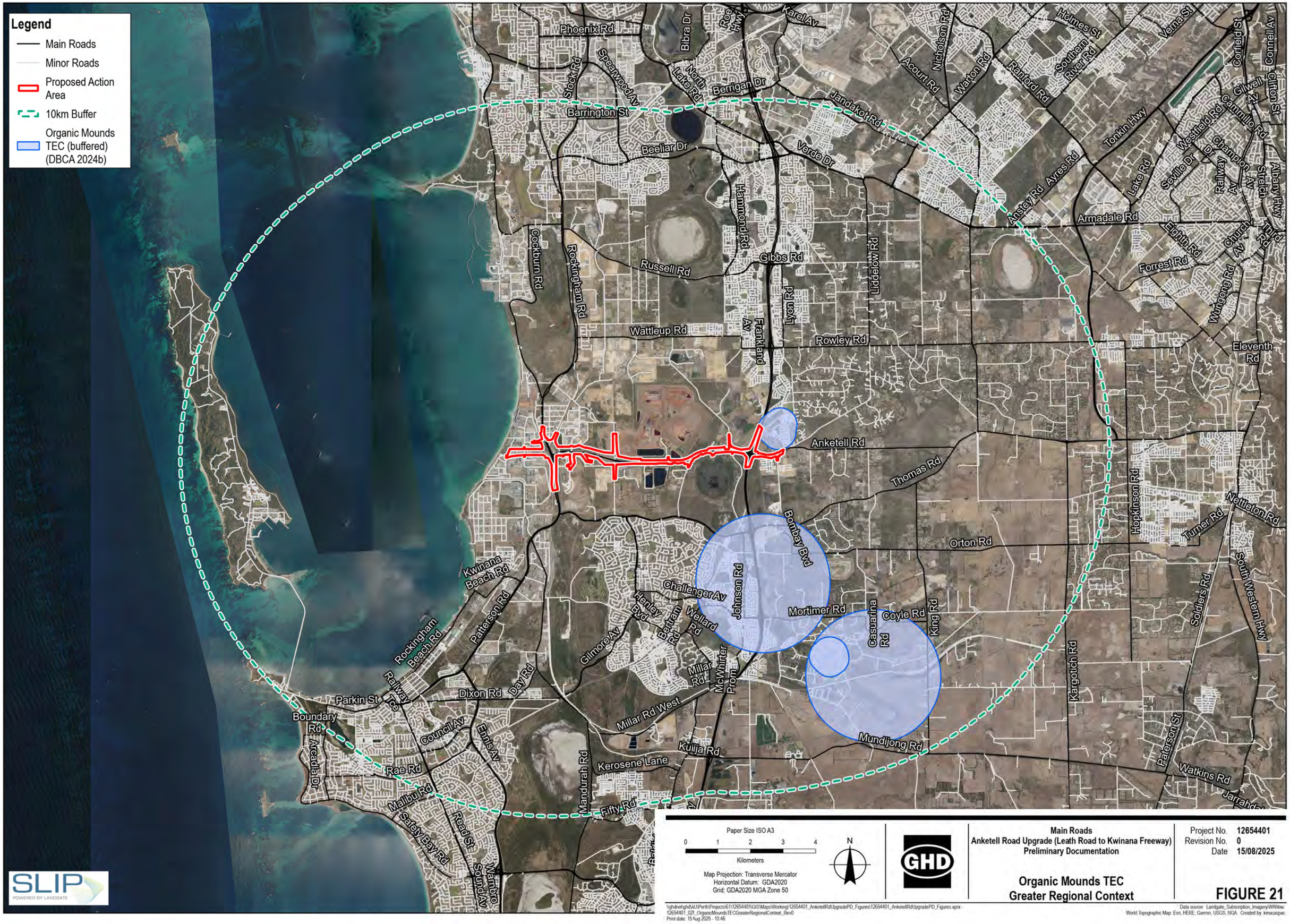
Honeymyrtle Shrubland on Limestone Ridges of the SCP Bioregion TEC

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 20

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_020_Honeymyrtleonlimestoneridgesofthe SCPTEC_Rev0
Print date: 15 Aug 2025 - 10:42

Data source: Landgate_Subscripton_Imagery\WANow... Created by: kmacaspac



Paper Size ISO A3

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

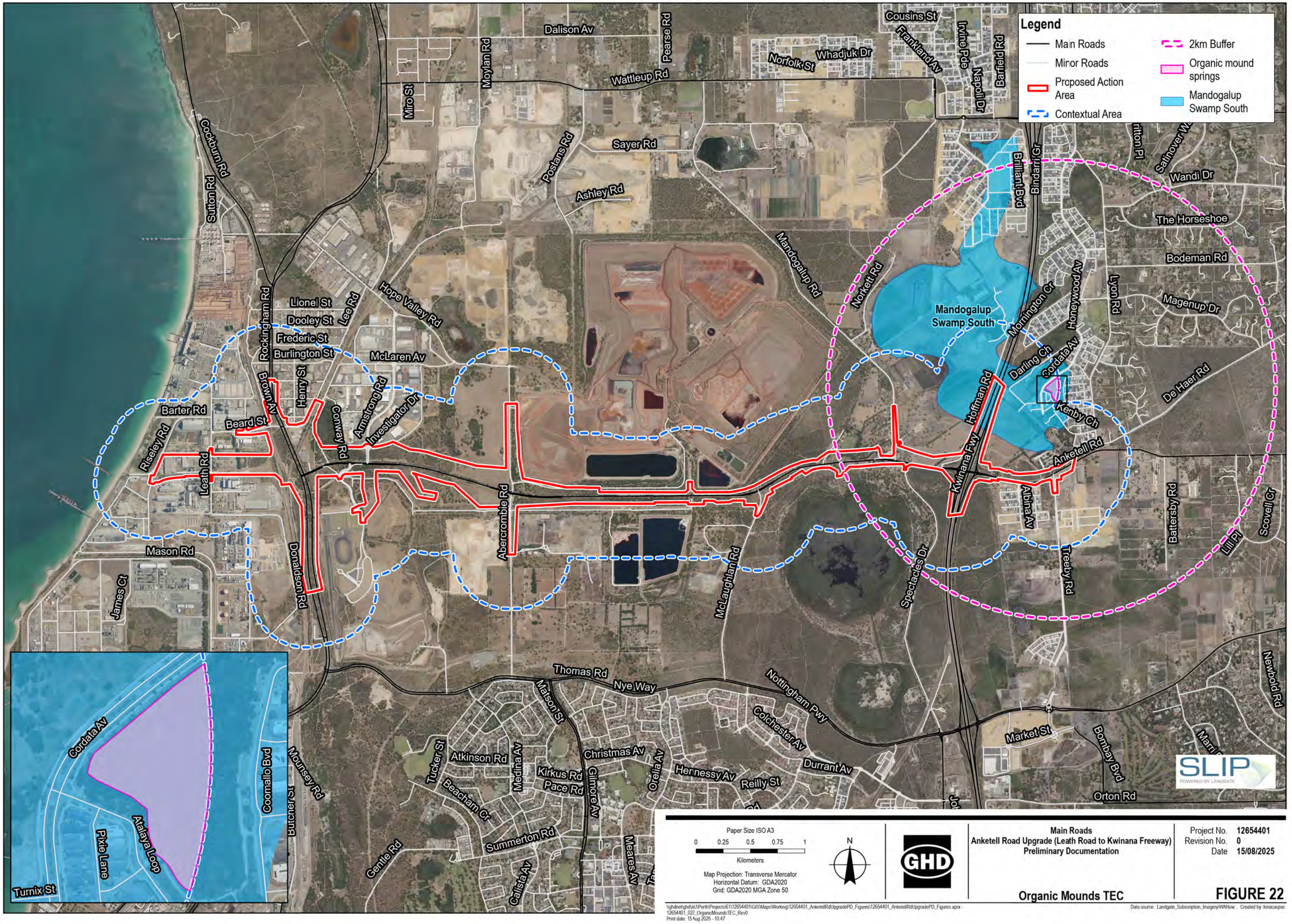
Organic Mounds TEC
Greater Regional Context

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 21

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_021_OrganicMoundsTECGreaterRegionalContext_Rev0
Print date: 15 Aug 2025 - 10:46

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac



Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Organic Mounds TEC

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 22

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_022_OrganicMoundsTEC_Rev0
Print date: 15 Aug 2025 - 10:47

Data source: Landgate_Subscription_Imagery\WANow... Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- 5km Buffer

Orchid species

- Grand Spider Orchid (*Caladenia huegelii*)
- Dwarf Bee Orchid (*Diuris micrantha*)
- Purdie's Donkey Orchid (*Diuris purdiei*)
- Glossy-leaved Hammer Orchid (*Drakaea elastica*)

Cockburn Rd
Russell Rd
Hammond Rd
Gibbs Rd
Armadale Rd
Lyon Rd
Liddelow Rd
Nicholson Rd
Wattleup Rd
Frankland Av
Rowley Rd
Rockingham Rd
Anketell Rd
Kwinana Fwy
Thomas Rd
Bombay Blvd
Orton Rd
Kwinana Beach Rd
Challenger Av
Johnson Rd
King Rd
Henley Blvd
Bertram Rd
Mortimer Rd
Casuarina Rd
Coyle Rd
Mandurah Rd
Gilmore Av
Wellard Rd
Rockingham Beach Rd
Patterson Rd
Ennis Av
Dixon Rd
Day Rd
Railway Tce
Road

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 0.5 1 1.5 2

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No.	**12654401**
Revision No.	**0**
Date	**15/08/2025**

Historical Records for Orchid Species

FIGURE 23

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_023_Historicalrecordsfororchidspecies_Rev0
Print date: 15 Aug 2025 - 10:48

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Condition

- Very Good
- Good to Very Good
- Good
- Degraded
- Completely Degraded

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Weston St
Brown Av
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Investigator Dr
Riseley Rd
Anketell Rd
Leath Rd
Rockingham Rd
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Potential Orchid Habitat

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 24

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_021_PotentialOrchidhabitat_Rev0
Print date: 15 Aug 2025 - 10:49

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Condition

- Very Good to Excellent
- Very Good
- Good to Very Good
- Good
- Degraded to Good
- Degraded
- Completely Degraded

Hope Valley Rd
Everette Way
McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
Norketti Rd
Mandogalup Rd
Clementi Rd
Anketell Rd
Abercrombie Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Potential Orchid Habitat

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 24

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_021_PotentialOrchidhabitat_Rev0
Print date: 15 Aug 2025 - 10:49

Data source: Landgate_Subscription_ImageryWANlow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Vegetation Condition

- Very Good to Excellent
- Very Good
- Good to Very Good
- Good
- Degraded to Good
- Degraded

Norkett Rd
Mandogalup Rd
Clementi Rd
McLaughlan Rd
Spectacles Dr
Kwinana Fwy
Hoffman Rd
Mornington Cr
Windjana Rise
Honeywood Av
Darling Ch
Cassowary Ch
Lyon Rd
Blackboy Gr
Cordata Av
Saltbush St
Coomallo Blvd
Turnix St
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
De Haer Rd
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
Anketell Rd
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Treeby Rd
Broadwater Av
Battersby Rd
Scovell Cr
Miyak Ct
Lilli Pl
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Potential Orchid Habitat

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 24

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_021_PotentialOrchidhabitat_Rev0
Print date: 15 Aug 2025 - 10:50

Data source: Landgate_Subscription_Imagery\WANow World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Cleared
- White tail Cockatoo
- White tail Cockatoo and FRTBC
- Unconfirmed Roost
- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area
- 12km Buffer
- DBCA - Legislated Lands and Waters (DBCA-011)
- Carnabys Cockatoo Confirmed Roost Sites (DBCA-050)
- Black Cockatoo Roosting Sites - Buffered (DBCA-064)

Paper Size ISO A3

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Black Cockatoo Roosting Records Local Context

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 25

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_025_BlackCockatooRoostingRecordsLocalContext_Rev0
Print date: 15 Aug 2025 - 10:52

Data source: Landgate_Subscription_ImageryWANlow. World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

SLIP POWERED BY LANDGATE

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- 12km Buffer
- Carnabys Cockatoo Areas requiring investigation as feeding habitat in the Swan Coastal Plain (SCP) IBRA Region (DBCA-057)

Paper Size ISO A3

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

CBC (*Zanda latirostris*)
Foraging Habitat Local Context

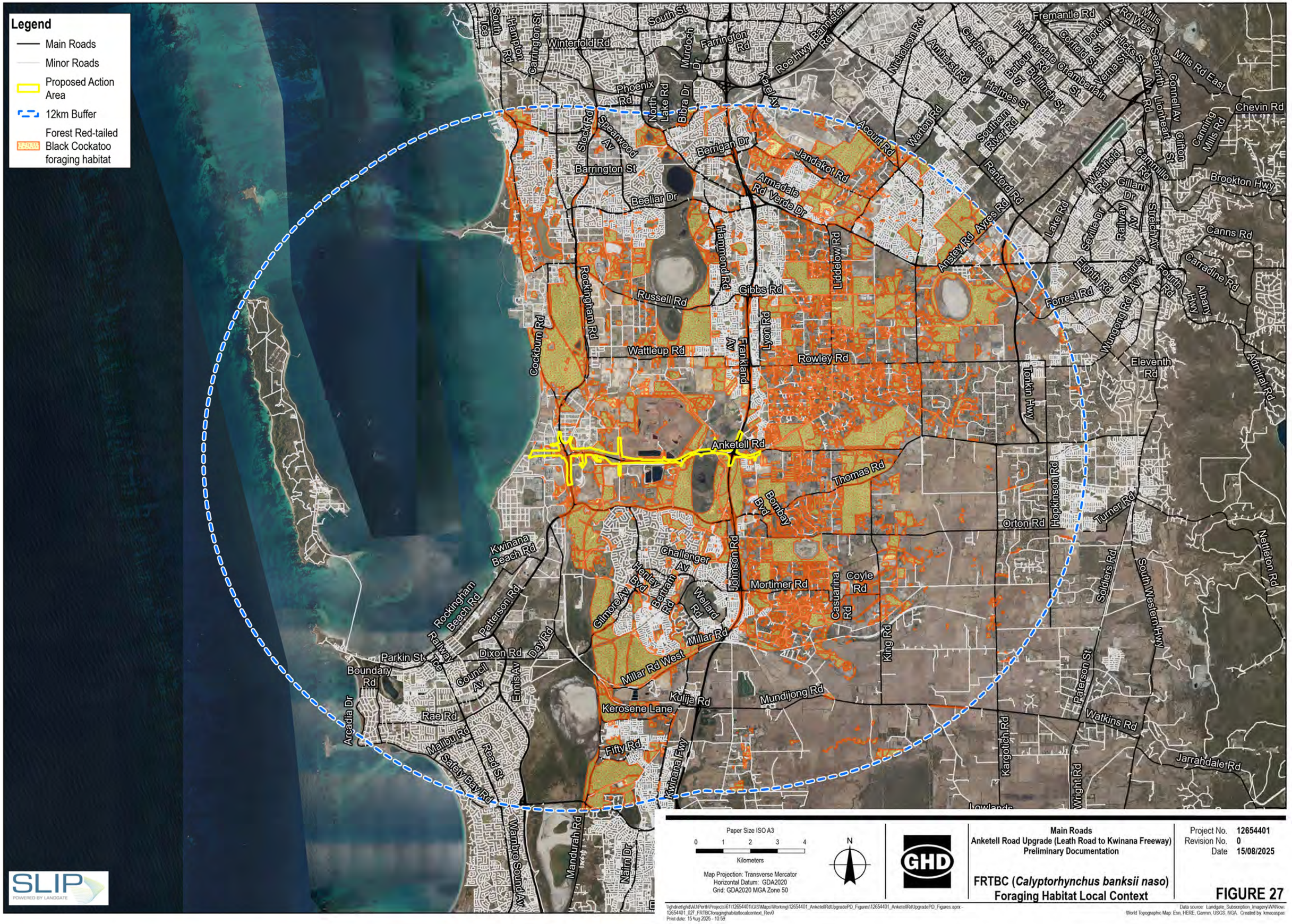
Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 26

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_025_CBCoforaginghabitatlocalcontext_Rev0
Print date: 15 Aug 2025 - 10:57

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

SLIP POWERED BY LANDGATE


Legend
Main Roads
Minor Roads
Proposed Action Area
12km Buffer
Forest Red-tailed Black Cockatoo foraging habitat
South Tce
Hamond Rd
Carrington St
Winterfold Rd
South St
Murdoch Dr
Farrington Rd
Roe Hwy
Bannister Rd
Nicholson Rd
Amherst Rd
Garden St
Fremantle Rd
Huntingdale Rd
Balfour St
Bullfinch St
Holmes St
Southern River Rd
Warton Rd
Acourt Rd
Garfield St
Dorothy St
Verna St
Chamberlain St
Hicks St
Mills Rd West
Seaforth Av
Connell Av
Lionheart Rd
Clifton St
Mills Rd East
Chevin Rd
Canning Mills Rd
Cammillo Rd
Brookton Hwy
Westfield Rd
Gillam Dr
Ranford Rd
Ayres Rd
Anstey Rd
Lake Rd
Seville Dr
Railway Av
Stretch Av
Canns Rd
Carradine Rd
Albany Hwy
Fourth Rd
Church Av
Eighth Rd
Forrest Rd
Wungong Rd
Eleventh Rd
Admiral Rd
Tonkin Hwy
Phoenix Rd
North Lake Rd
Bibra Dr
Karel Av
Stock Rd
Speanwood Av
Barrington St
Berrigan Dr
Jandakot Rd
Armadale Rd
Verde Dr
Beeliar Dr
Liddelow Rd
Hammond Rd
Gibbs Rd
Russell Rd
Rockingham Rd
Cockburn Rd
Wattleup Rd
Frankland Av
Lyon Rd
Rowley Rd
Anketell Rd
Thomas Rd
Bombay Byd
Orton Rd
Hopkinson Rd
Turner Rd
Nettleton Rd
South Western Hwy
Soldiers Rd
Kargotich Rd
Watkins Rd
Jarrahdale Rd
Wright Rd
Paterson St
King Rd
Mundijong Rd
Millar Rd West
Millar Rd
Kulija Rd
Kerosene Lane
Fifty Rd
Kwinana Fwy
Challenger Av
Johnson Rd
Mortimer Rd
Coyle Rd
Casuarina Rd
Wellard Rd
Bertram Rd
Henley Byd
Gilmore Av
Kwinana Beach Rd
Rockingham Beach Rd
Patterson Rd
Railway Tce
Parkin St
Dixon Rd
Day Rd
Ennis Av
Council Av
Boundary Rd
Arcadia Dr
Rae Rd
Mallbu Rd
Safety Bay Rd
Read St
Warnbro Sound Av
Mandurah Rd
Nairn Dr
Paper Size ISO A3
0 1 2 3 4
Kilometers
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50
N
GHD
Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation
FRTBC (Calyptorhynchus banksii naso) Foraging Habitat Local Context
Project No. 12654401
Revision No. 0
Date 15/08/2025
FIGURE 27
\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_027_FRTBCforaginghabitatlocalcontext_Rev0
Print date: 15 Aug 2025 - 10:59
Data source: Landgate_Subscription_ImageryWANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac
SLIP
POWERED BY LANDGATE

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area
- Suitable DBH Tree with a suitable hollow with no signs of use
- Suitable DBH Tree with unsuitable hollows
- Suitable DBH Tree without hollows

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Link Rd
Henry St
Frederic St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Brown Av
Weston St
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Investigator Dr
Riseley Rd
Anketell Rd
Leath Rd
Mason Rd
James Ct
Donaldson Rd
Rockingham Rd
Abercrombie Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Black Cockatoo Habitat Trees

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 28

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_028_BlackCockatoohabitattrees_Rev0
Print date: 15 Aug 2025 - 11:02

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area
- Suitable DBH Tree with a suitable hollow with no signs of use
- Suitable DBH Tree with unsuitable hollows
- Suitable DBH Tree without hollows

McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
Anketell Rd
Norketti Rd
Mandogalup Rd
Clementi Rd
Abercrombie Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Black Cockatoo Habitat Trees

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_028_BlackCockatoohabitattrees_Rev0
Print date: 15 Aug 2025 - 11:02

Data source: Landgate_Subscription_Imagery\WAN low: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area
- Suitable DBH Tree with a suitable hollow with no signs of use
- Suitable DBH Tree with unsuitable hollows
- Suitable DBH Tree without hollows

Norkett Rd
Mandogalup Rd
Clementi Rd
McLaughlan Rd
Spectacles Dr
Hoffman Rd
Kwinana Fwy
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Broadwater Av
Perdita Bvd
Treeby Rd
Windjana Rise
Honeywood Av
Mornington Cr
Darling Ch
Cassowary Ch
Lyon Rd
Blackboy Gr
Cordata Av
Saltbush St
Coomallo Blvd
Turnix St
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
De Haer Rd
Anketell Rd
Battersby Rd
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
Scovell Cr
Miyak Ct
Lilli Pl
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Black Cockatoo Habitat Trees

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 28

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Print date: 15 Aug 2025 - 11:02

Data source: Landgate_Subscription_Imagery\WANow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Habitat Quality Score

- 4
- 5
- 6
- 7

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Weston St
Brown Av
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Investigator Dr
Riseley Rd
Anketell Rd
Leath Rd
Rockingham Rd
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd

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Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

CBC (*Zanda latirostris*) Foraging Habitat

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 1 of 3
FIGURE 29

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Print date: 15 Aug 2025 - 11:03

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

Main Roads
Minor Roads
Proposed Action Area
Contextual Area

Habitat Quality Score
4
5
6
7

Everette Way
McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
Anketell Rd
Abercrombie Rd
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way
Nye
Norkett Rd
Mandogalup Rd
Clementi Rd
McLaughlan Rd
Spectacles Dr

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Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

CBC (*Zanda latirostris*) Foraging Habitat

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

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Print date: 15 Aug 2025 - 11:03

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

Main Roads
Minor Roads
Proposed Action Area
Contextual Area

Habitat Quality Score
4
5
6
7

Norkett Rd
Mandogalup Rd
Clementi Rd
McLaughlan Rd
Spectacles Dr
Hoffman Rd
Kwinana Fwy
Windjana Rise
Honeywood Av
Mornington Cr
Darling Ch
Cassowary Ch
Lyon Rd
Blackboy Gr
Cordata Av
Saltbush St
Coomallo Blvd
Turnix St
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
De Haer Rd
Magenup Dr
Casella Pl
Miles Pl
Leslie Rd
Anketell Rd
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Treeby Rd
Broadwater Av
Battersby Rd
Scovell Cr
Miyak Ct
Lill Pl
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3
0 100 200 300 400
Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

CBC (*Zanda latirostris*) Foraging Habitat

Project No. **12654401**
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Page 3 of 3
FIGURE 29

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Print date: 15 Aug 2025 - 11:04

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- *Calyptorhynchus banksii naso* foraging evidence
- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Habitat Quality Score

- 4
- 8

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Brown Av
Weston St
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Investigator Dr
Riseley Rd
Anketell Rd
Leath Rd
Rockingham Rd
Abercrombie Rd
Mason Rd
James Ct
Donaldson Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

FRTBC (*Calyptorhynchus banksii naso*) Foraging Habitat

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 30

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Print date: 15 Aug 2025 - 11:08

Data source: Landgate_Subscription_ImageryWANlow; World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- *Calyptorhynchus banksii naso* foraging evidence
- Main Roads
- Minor Roads
- Proposed Action Area
- Contextual Area

Habitat Quality Score

- 4
- 8

Norkett Rd
Mandogalup Rd
Clementi Rd
McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
Anketell Rd
Abercrombie Rd
McLaughlan Rd
Spectacles Dr
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

FRTBC (*Calyptorhynchus banksii naso*) Foraging Habitat

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

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Print date: 15 Aug 2025 - 11:08

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend
Main Roads
Minor Roads
Proposed Action Area
Contextual Area
Habitat Quality Score
4
8
Norkett Rd
Mandogalup Rd
Clementi Rd
McLaughlan Rd
Spectacles Dr
Hoffman Rd
Kwinana Fwy
Windjana Rise
Honeywood Av
Mornington Cr
Darling Ch
Cassowary Ch
Lyon Rd
Blackboy Gr
Cordata Av
Saltbush St
Coomallo Blvd
Turnix St
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
De Haer Rd
Anketell Rd
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Treeby Rd
Broadwater Av
Battersby Rd
Scovell Cr
Miyak Ct
Lill Pl
Thomas Rd
SLIP POWERED BY LANDGATE

Paper Size ISO A3
0 100 200 300 400
Meters
Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50
N
GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

FRTBC (*Calyptorhynchus banksii naso*) Foraging Habitat

Project No. 12654401
Revision No. 0
Date 15/08/2025

Page 3 of 3
FIGURE 30

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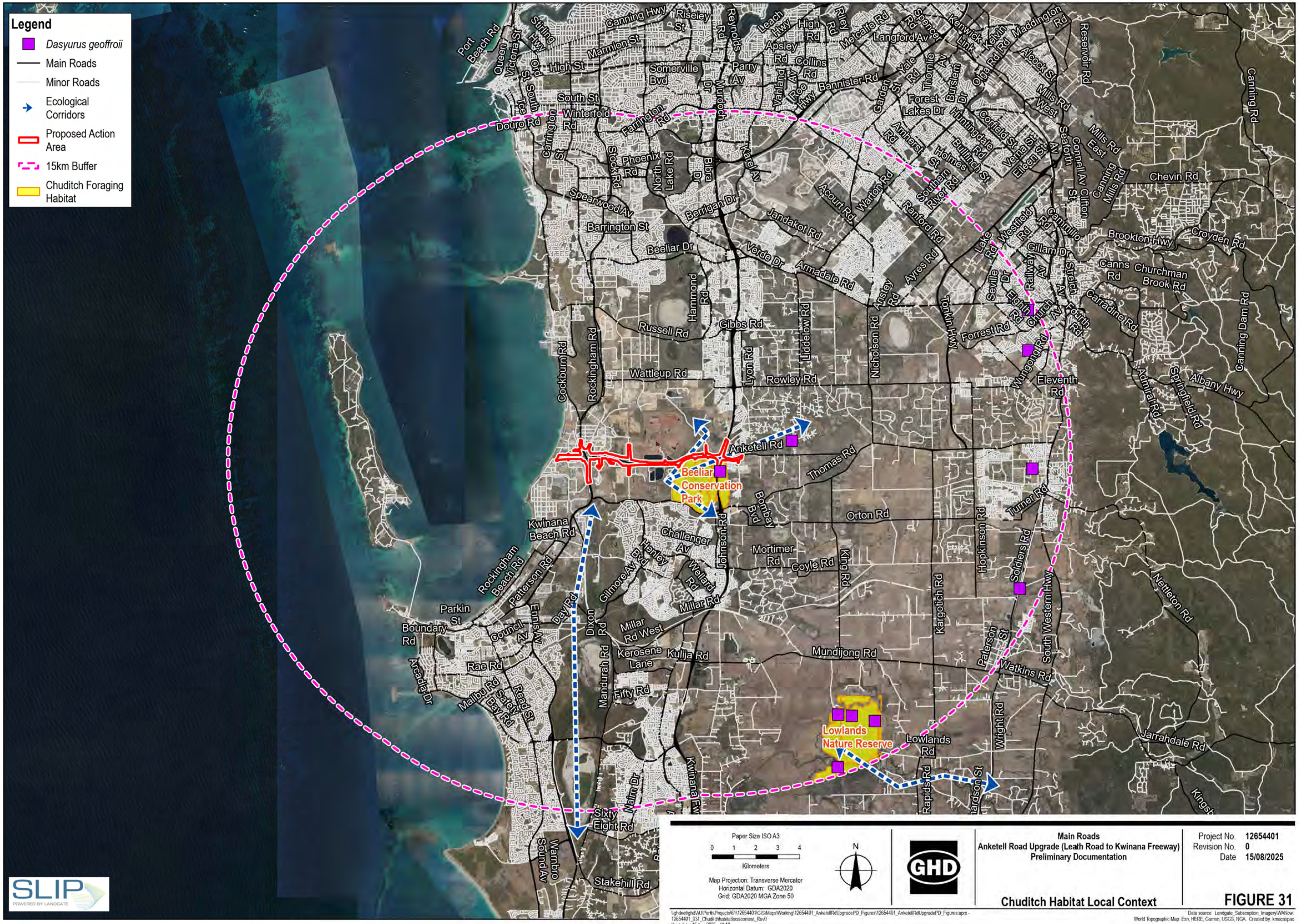
Print date: 15 Aug 2025 - 11:08

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac



Paper Size ISO A3

0 1 2 3 4 Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No. 12654401
Revision No. 0
Date 15/08/2025

Chuditch Habitat Local Context

FIGURE 31

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Print date: 15 Aug 2025 - 11:10

Data source: Landgate_Subscription_Imagery\WANow. World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Patch Assessment

- Retained
- Lost
- Cleared

Lionel St
Dooley St
Reliance Bend
Hope Valley Rd
Everette Way
Frederic St
Link Rd
Henry St
Burlington St
Lee Rd
McLaren Av
Armstrong Rd
Macedonia St
Hoyle Rd
Weston St
Brown Av
Morley St
Barter Rd
Bickley St
Conway Rd
Carpentaria Link
Beard St
Riseley Rd
Investigator Dr
Anketell Rd
Leath Rd
Rockingham Rd
Mason Rd
James Ct
Donaldson Rd
Abercrombie Rd
TT01
TT03
TT04
TT05
TT10
TT11
TT12

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

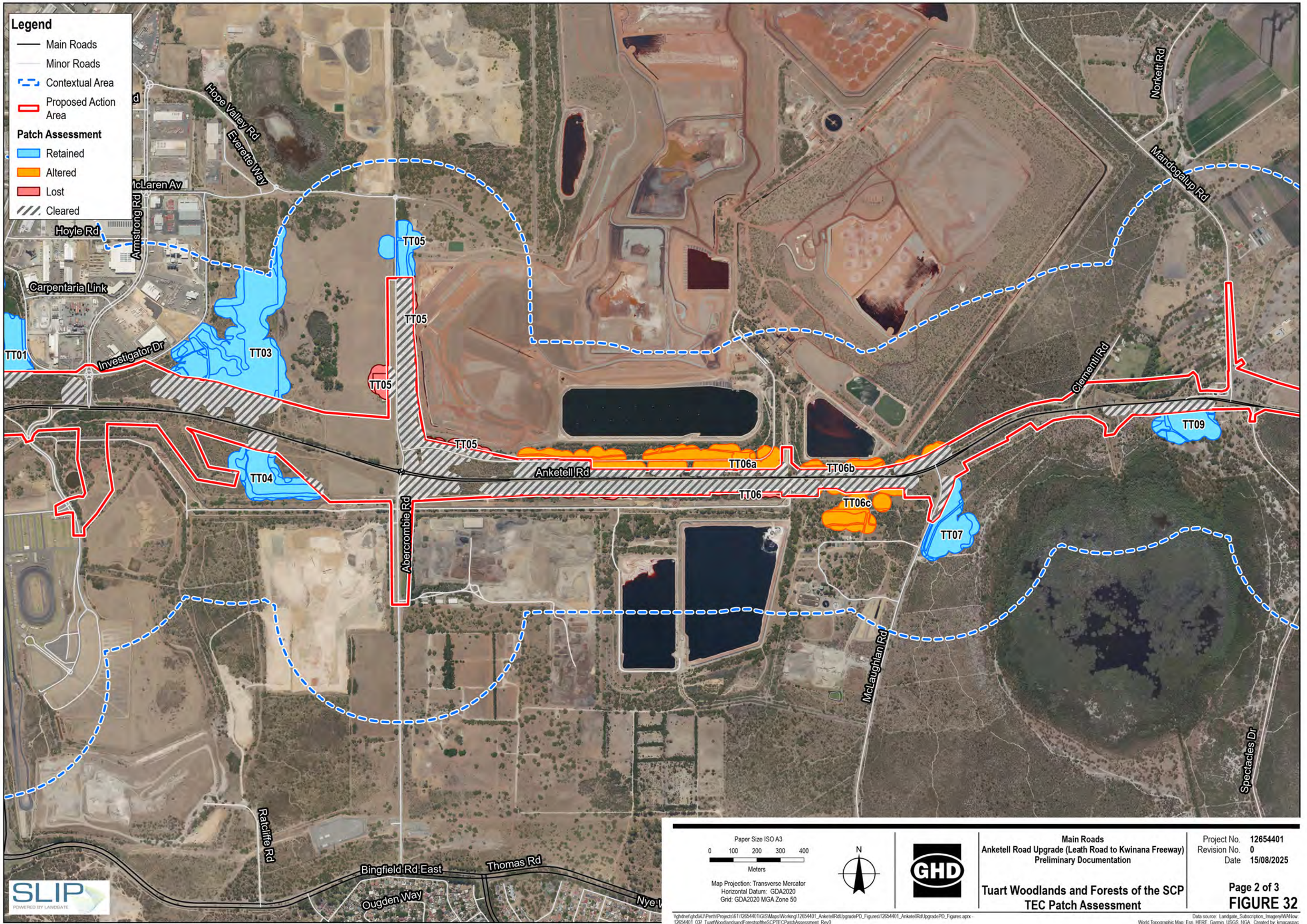
Tuart Woodlands and Forests of the SCP
TEC Patch Assessment

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 32

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_032_TuartWoodlandsandForestsoftheSCPTECPatchAssessment_Rev0
Print date: 15 Aug 2025 - 11:12

Data source: Landgate_Subscription_ImageryWANow
World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac



Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP
TEC Patch Assessment

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 2 of 3
FIGURE 32

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_032_TuartWoodlandsandForestsoftheSCPTECPatchAssessment_Rev0
Print date: 15 Aug 2025 - 11:12

Data source: Landgate_Subscription_ImageryWANow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Patch Assessment

- Retained
- Altered
- Cleared

Norkett Rd
Mandogalup Rd
Clementi Rd
Hoffman Rd
Kwinana Fwy
Windjana Rise
Honeywood Av
Mornington Cr
Darling Ch
Cassowary Ch
Lyon Rd
Blackboy Gr
Cordata Av
Saltbush St
Coomallo Byd
Turnix St
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
De Haer Rd
Casella Pl
Magenup Dr
Miles Pl
Leslie Rd
Anketell Rd
TT09
TT06b
TT06c
TT07
McLaughlan Rd
Spectacles Dr
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Treeby Rd
Battersby Rd
Lilli Pl
Scovell Cr
Miyak Ct
Broadwater Av
Thomas Rd

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Tuart Woodlands and Forests of the SCP TEC Patch Assessment

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 3 of 3
FIGURE 32

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_032_TuartWoodlandsandForestsoftheSCPTECPatchAssessment_Rev0
Print date: 15 Aug 2025 - 11:12

Data source: Landgate_Subscription_ImageryWAMow: World Topographic Map: Esri, HERE, Garmin, USGS, NGA. Created by: kmacaspac

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Banksia Woodlands of the SCP
TEC Patch Assessment

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

FIGURE 33

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_033_BanksiaWoodlandsoftheSCPTECPatchAssessment_Rev0
Print date: 15 Aug 2025 - 11:14

Data source: Landgate_Subscription_ImageryWANow: . Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Patch Assessment

- Lost
- Retained
- Cleared

Hope Valley Rd
Everette Way
McLaren Av
Armstrong Rd
Hoyle Rd
Carpentaria Link
Investigator Dr
BT08
BT07
Norkett Rd
Mandogalup Rd
Clementi Rd
BT06
BT04
BT05
Anketell Rd
Abercrombie Rd
McLaughlan Rd
Ratcliffe Rd
Bingfield Rd East
Thomas Rd
Ougden Way

SLIP
POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

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Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Banksia Woodlands of the SCP
TEC Patch Assessment

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

Page 2 of 3
FIGURE 33

\\ghdnet\ghd\AU\Perth\Projects\61\12654401\GIS\Maps\Working\12654401_AnketellRdUpgradePD_Figures\12654401_AnketellRdUpgradePD_Figures.aprx - 12654401_033_BanksiaWoodlandsoftheSCPTECPatchAssessment_Rev0
Print date: 15 Aug 2025 - 11:14

Data source: Landgate_Subscription_Imagery\WANow... Created by: kmacaspac

Legend

- Main Roads
- Minor Roads
- Contextual Area
- Proposed Action Area

Patch Assessment

- Retained
- Cleared

Norkett Rd
Mandogalup Rd
Clementi Rd
McLaughlan Rd
Spectacles Dr
Hoffman Rd
Kwinana Fwy
Albina Av
Halbert Rise
Ace St
Selina St
Goran St
Perdita Bvd
Treeby Rd
Broadwater Av
Thomas Rd
Windjana Rise
Honeywood Av
Mornington Cr
Darling Ch
Cassowary Ch
Lyon Rd
Blackboy Gr
Cordata Av
Saltbush St
Coomallo Blvd
Turnix St
Sida St
Kentia Rd
Aquila Dr
Foxtail Gr
Kenby Ch
Jarrah Cl
Anketell Rd
Casella Pl
Magenup Dr
Miles Pl
De Haer Rd
Leslie Rd
Battersby Rd
Lilli Pl
Scovell Cr
Miyak Ct

BT01
BT02
BT03
BT04
BT05
BT06

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 100 200 300 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Banksia Woodlands of the SCP
TEC Patch Assessment

Project No. **12654401**
Revision No. **0**
Date **15/08/2025**

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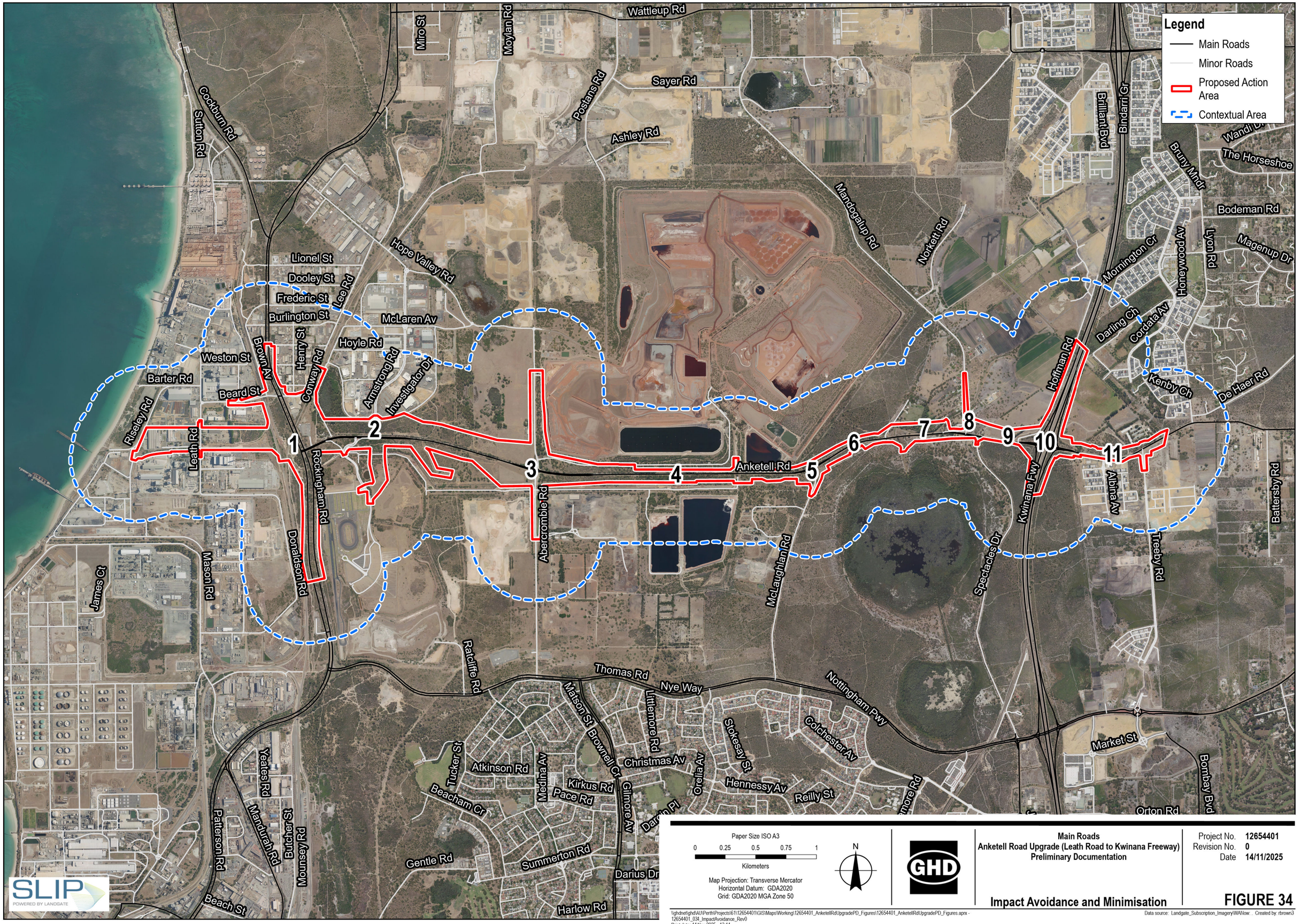
Print date: 15 Aug 2025 - 11:14

Data source: Landgate_Subscription_Imagery\WANow:. Created by: kmacaspac



Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 50

N

GHD

Main Roads
Anketell Road Upgrade (Leath Road to Kwinana Freeway)
Preliminary Documentation

Project No. **12654401**
Revision No. **0**
Date **14/11/2025**

Impact Avoidance and Minimisation

FIGURE 34

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Print date: 14 Nov 2025 - 13:14

Data source: Landgate_Subscription_Imagery\WANow; Created by: rbrown3

Appendix 2: RFI tables

Table A: Request for Further Information

Information Request		PD Section Reference
Baseline Information		
1.1. All EPBC listed threatened species and communities identified by the PMST report, plus any additional MNES identified by field survey activities, with a specific focus on: a) Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community (Tuart TEC) b) Banksia Woodlands of the Swan Coastal Plain ecological community (Banksia TEC) c) Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle Shrubland TEC) d) Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) e) Forest Red-tailed black cockatoo (*Calyptorhynchus banksii naso*) f) Chuditch (*Dasyurus geoffroii*) g) Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain (Organic Mounds TEC) h) The following species of orchids: i. Grand Spider Orchid (*Caladenia huegelii*) ii. Dwarf Bee Orchid (*Diuris micrantha*) iii. Glossy Leaved Hammer Orchid (*Drakaea elastica*) iv. Purdie's Donkey Orchid (*Diuris purdiei*)	1.1.1. The department requires updated maps and information that clarify the current extent of vegetation, TECs and habitat, ecological linkages and the expected impact of clearing and other direct and indirect impacts.	Consideration of all MNES in section 5.2, Table 5.2. Section 5 provides updated baseline information for each of the requested communities and species.
	1.1.2. In the case of potential future project revisions and further avoidance of MNES, it is important that changes to the project impacts can be tracked through time. The PD must present a summary table for each MNES, stating the quantity and quality of TEC/species habitat impacted: a) For TECs, this must be broken down by patch. b) For species, this must be broken down by habitat quality classification.	Section 5.3, 5.4 and 5.5
1.2 Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (Tuart TEC) and Banksia Woodlands of the Swan Coastal Plain ecological community (Banksia TEC)	1.2.1. The PD must explain the characteristics and role of the TEC in the Proposed Action Area (PAA) within the immediate and regional context in forming ecological links across the landscape. Provide the following information: a) A map showing the current extent of Banksia and Tuart TEC within the greater regional context (10km radius).	Tuart TEC a) Appendix 1, Figure 13 b) Appendix 1, Figure 14 c) Appendix 1, Figure 15

Information Request		PD Section Reference
	b) A map showing the condition of all patches in the contextual area (defined as 500m from the PAA), with the PAA overlay. c) A map and table showing percentages of the Banksia and Tuart TEC by associated floristic community types. Maps must be prepared in accordance with the Departmental guidelines at Table C Item 7 and 9 (9.1).	Banksia TEC a) Appendix 1, Figure 16 b) Appendix 1, Figure 17 c) Appendix 1, Figure 18
	1.2.2. The conservation advice for Banksia TEC outlines information on patch size and condition and the sub-communities/floristic community types (FCTs) that best correspond to Banksia TEC, and their own landscape-level distribution and species richness. The PD must clearly identify the size, condition, FCT type, and species richness of each patch.	Section 5.3.2, Table 5.4
1.3. Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle Shrubland TEC).	1.3.1. The department considers that there is enough information in the Consolidated Biological Report to demonstrate that the 1.96ha patch is representative of Honeymyrtle Shrubland TEC, and no further effort is required to diagnose it.	Noted.
	1.3.2. The Honeymyrtle Shrubland TEC within the PAA is in a post-fire regenerative state and current condition metrics may not reflect the normal state of the patch. It is important that baseline information that informs offsetting efforts reflects the patch when it is most healthy. As such, the following information is required: a) A follow-up survey of the TEC that captures the condition of the regenerated vegetation after the fire in 2023. The conservation advice recommends surveys should be delayed until there has been opportunity for regeneration (ideally at least 2 years after the disturbance event (natural or human-induced), and at least 2 months after adequate rainfall to initiate some recovery), and the timeframes exclude the existing survey. b) Provide evidence of the quality of the TEC immediately before the fire. This may require consultation with the land managers of the patch. The department will use the quality obtained before the fire and after the regeneration to inform the quality figure chosen for offsets. Maps must be prepared in accordance with the Departmental guidelines at Table C Item 7 and 9 (9.1).	No longer relevant. Section 5.3.3.4.
	1.3.3. The department requires information regarding the characteristics of this TEC patch, and the location of this patch in the wider restricted regional distribution of	a) Appendix 1, Figure 19 b) Appendix 1, Figure 20

Information Request		PD Section Reference
	the TEC to inform the department's understanding of its landscape-level role. Provide the following information: a) A map of the TEC within 15km of the PAA. b) A map showing the patch, with PAA overlay, with the buffer zone distance recommended for hydrological alterations (2km) in the conservation advice shown. Patch quality (informed by the updated survey and the conservation advice) must be shown on the map. Maps must be prepared in accordance with the Departmental guidelines at Table C Item 7 and 9 (9.1).	
	1.3.4. A statement and discussion of the patch status following the application of the '30m' break rule between areas that meet the key diagnostic characteristics, as discussed in the conservation advice.	Section 5.3.3.4
1.4. Black cockatoos: a) Forest Red-tailed Black Cockatoo (FRBC) (*Calyptorhynchus banksii naso*) b) Carnaby's Black Cockatoo (CBC) (*Calyptorhynchus latirostris*)	1.4.1. The proposed action will clear habitat for black cockatoos (BCs). The PD must demonstrate the value of the PAA habitat for ecological functions as foraging and/or breeding habitat and as ecological linkages across the landscape. Provide the following mapping information: a) A map showing the quality of all foraging habitat in the PAA for both species. The quality of habitat should be presented on a 1 to 10 scale (where 10 is pristine) that draws upon attributes in the conservation advice. b) A map showing all suitable foraging habitat available for the species. The map should at least show 12km surrounding the proposed action site. c) A map showing the closest breeding locations and roosting to the PAA, within 12km. d) A map showing conservation reserves and connectivity of habitat within the home range of black cockatoos that use the nearby breeding and roosting sites. e) A map of breeding habitat in the PAA that has features correlating to 'known' 'suitable' and 'potential' nesting trees as defined in the referral guidelines for black cockatoos. f) If further checking is needed to distil the information into these categories, complete these checks within the breeding season of both species and provide the results.	a) Appendix 1, Figure 29 and Figure 30 b) Appendix 1, Figure 26 and Figure 27 c) Appendix 1, Figure 25 d) Appendix 1, Figure 25 e) Appendix 1, Figure 28 f) Not applicable.

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	Maps must be prepared in accordance with the Departmental guidelines at Table C Item 7 and 9 (9.1).	
	1.4.2. The referral states that 47.98ha of non-native vegetation will be cleared. Non-native vegetation that is foraging habitat must be included in the impact total, as required to be mapped in 1.4.1.	Section 5.5.1.4.3
	1.4.3. Please complete the department's HQS for black cockatoo foraging habitat. An alternative rating scale may also be provided in addition to the HQS, with an accompanying explanation of the method of deriving habitat quality.	Section 5.5.1.4.3 Attachment 5, GHD 2025
1.5. Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain (Organic Mound TEC)	1.5.1. The department requires information to demonstrate the proximity of this TEC to the PAA and whether the TEC and the PAA are likely to be hydrologically linked. Provide the following maps and information: a) A map showing the location of the Organic Mound TEC patch in relation to the PAA, with the recommended buffer zones shown. b) A map showing the Organic Mound TEC distribution within 10km of the PAA. c) Map/s, and associated descriptions of the hydrology, including groundwater that feeds the TEC occurrence and its recharge areas. Maps must be prepared in accordance with the Departmental guidelines at Table C Item 7 and 9 (9.1).	a) Appendix 1, Figure 22 b) Appendix 1, Figure 21 c) Appendix 1, Figure 22 and section 5.3.4.4
1.6. Chuditch (*Dasyurus geoffroii*)	1.6.1. The department requires the PD to demonstrate how the site has been used in the past, and may be used now and in future, by Chuditch. The following information is required: a) A map showing the location, quantity and quality of all Chuditch foraging and breeding habitat in the PAA, and the contextual area. The map must include current and historic records of Chuditch, and their date (if any). b) A map showing the location and extent of any known Chuditch habitat within 15km of the proposed action, if possible, specify whether this habitat supports foraging and/or breeding. c) A map showing the quality and condition of the total amount (in hectares) of suitable habitat for Chuditch that will be cleared by the proposed action. This should be accompanied by a discussion on whether this habitat supports foraging, breeding, and/or dispersal.	a) Not applicable. Historic records of Chuditch are shown on Appendix 1, Figure 31 and provided in section 5.5.2.3 b) Appendix 1, Figure 31 c) Section 5.5.2.4 d) Appendix 1, Figure 31 and section 5.5.2.3.

Information Request		PD Section Reference
	d) Map of all known ecological corridors within 15km of the project area, and discussion surrounding the potential use of these areas as remnant vegetation by Chuditch. This discussion should consider whether there is potential for Chuditch to use the PAA for thoroughfare, both now and in the future. Maps must be prepared in accordance with the Departmental guidelines at Table C Item 7 and 9 (9.1).	
	1.6.2. Provide the Targeted Chuditch Survey, commenced in December 2023.	Attachment 7, Biota 2024a
1.7. The following species of orchids: a) Grand Spider Orchid (*Caladenia huegelii*) b) Dwarf Bee Orchid (*Diuris micrantha*) c) Glossy Leaved Hammer Orchid (*Drakaea elastica*) d) Purdie's Donkey Orchid (*Diuris purdiei*)	1.7.1. The PD must indicate the likely location of orchid populations, and the habitat they are likely to occupy, in the proximity of the PAA. The following information is requested: a) A map showing historic datapoints for the specified species of orchid, as mentioned in Appendix 4 of the Consolidated Biological report, with a PAA overlay, within 5km b) A table showing the dates of these records. c) A map showing locations of known orchid populations in relation to the PAA; and d) Quantify the amount of habitat in the PAA, and the contextual area, available for each species of orchid. Maps must be prepared in accordance with the Departmental guidelines at Table C Item 7 and 9 (9.1).	a) Appendix 1, Figure 23 b) Table 5.6, Table 5.8, Table 5.10 and Table 5.12Table 5.12 c) Not applicable. d) Table 5.7, Table 5.9, Table 5.11 and Table 5.13
	1.7.2. Provide the results of a survey for areas of the PAA not included in the previous orchid surveys. This survey must be consistent with the Draft survey guidelines for orchids	Attachment 1, Biota 2025a
1.8 General	1.8.1. Describe the survey effort and results of any further surveys that have not be provided to the department, for example, for Chuditch, orchid species and the Short-tongued Bee, *Neopasiphae simplicior*.	Section 5.1, Table 5.1 Attachment 7, Biota 2024a Attachment 8, Biota 2025b
Likely impacts		
2.1. All species and ecological communities, including (but not limited to): a) Tuart TEC	2.1.1. The preliminary documentation must include a description of all the potential impacts, including direct, indirect, and offsite impacts, as outlined in the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (SIG) that will or will likely occur on MNES that are likely to be present within the proposed action	Section 6

Information Request		PD Section Reference
b) Banksia TEC c) Honeymyrtle TEC d) Carnaby's Black Cockatoo e) Forest Red-tailed black cockatoo f) Orchids: i. Grand Spider Orchid (*Caladenia huegelii*) ii. Dwarf Bee Orchid (*Diuris micrantha*) iii. Glossy Leaved Hammer Orchid (*Drakaea elastica*) iv. Purdie's Donkey Orchid (*Diuris purdiei*) g) Chuditch h) Organic Mounds TEC	area and surrounds, including the matters listed in 1.1 as a result of the proposed action. The impacts of the proposed action on these MNES should be considered in the broadest scope, with all components considered, including any associated supporting infrastructure. Impacts during the construction and operational phases must be considered.	
	a) Identify, characterise and quantify the nature of all direct and indirect impacts for each species, including timing and whether the impact is likely to be temporary or permanent. Include the following assessment as it relates to the proposed action: i) A risk assessment of all identified direct and indirect (and offsite) impacts from the proposed action to listed threatened species and ecological communities, including whether the nature and/or scale of the potential impacts are unknown, unpredictable, or irreversible, and what the mitigated risk level is. Include and reference page numbers of any relevant policy guidelines, studies, surveys, management plans, or consultations with subject matter experts to support the arguments in the risk assessment of these impact pathways and include these as attachments. ii) Any impacts resulting from clearing for the proposed action and increased operation of the road, such as noise, dust generation, and edge effects. iii) Any impacts arising from fragmentation and edge effects due to the proposed action on TEC and species habitat, within the PAA and the surrounding area, referencing research, case studies and expert advice. This must include discussion of barriers to fauna movement and key ecological processes. iv) Any impacts on abiotic factors (such as water, salinity, nutrients, and soil) necessary for the survival of flora and fauna species in the proposed action area and surrounding areas which support the continuation of habitat for listed threatened species and communities, referencing research, case studies and expert advice. This must include modelling and analysis of impacts from changes to hydrology (e.g., surface water diversions, groundwater drawdown and water quality impacts) on the TECs outside the PAA.	Section 6 i) Section 7 and Appendix 5 ii) Sections 6.2.2.7, 6.3.2.7, 6.7.2.6 iii) Sections 6.2.2.1, 6.3.2.1 6.7.2.5 and 6.7.2.1 iv) Sections 6.2.2.5, 6.3.2.5, 6.5.2.4 v) Sections 6.2.2.2, 6.2.2.3, 6.3.2.2, 6.3.2.3, 6.5.2.1, 6.5.2.2, 6.7.2.2, 6.7.2.3 vi) Sections 6.2.2.4, 6.3.2.4, 6.5.2.3, 6.7.2.4 vii) Sections 6.2.2.6, 6.3.2.6

Information Request		PD Section Reference
	v) The impact of invasive species (including weeds) and dieback within the project area and surrounding areas. This must be supported with a map showing the location of weeds and dieback in and around the PAA, and must reference case studies, research and expert advice. vi) Information on the risk and impact of existing fire regimes and other indirect threats impacting habitats that support listed threatened species within and surrounding the proposed action area. vii) Impacts arising (where relevant) from acid sulphate soils and contaminants on TEC and habitat, supported with a map showing the location of acid sulphate soils and contaminants in the PAA.	
	b) Provide an assessment of the acceptability of impacts (direct, indirect, and offsite) on listed threatened species and communities, considering the proposed avoidance and mitigation measures (see section 3. Avoidance and mitigation of this table), the statutory documents for each matter (Table C, section 9 (9.1)), the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance and relevant EPBC policies (including those listed in Table C below and relevant policies accessible via EPBC Act publications and resources - DCCEEW). i) The assessment must demonstrate that the proposed action has had regard to the Conservation Advice for the relevant matter and is not inconsistent with the Recovery Plan for the relevant matter.	Section 9.2 and Table 15.1
	c) If there are residual adverse impacts, after avoidance and mitigation measures, then provide an offset proposal/strategy as detailed in section 4 of this table.	Attachment 10
2.2. Tuart TEC and Banksia TEC	2.2.1. The impact discussion must be based on accurate estimates of impact area. Some patches are being partially cleared to the extent that they will be below the size-quality thresholds following clearing and will no longer qualify or be viable as a 'patch'. The thresholds are defined in the relevant conservation advices. a) Provide a quantification of the amount of TEC in patches that are below the condition-size thresholds following clearing, supported with maps. This amount must be included in the total impact amount for TEC.	Tuart TEC: Section 6.2.2.1, Table 6.2 and Appendix 1, Figure 32 Banksia TEC: Section 6.3.2.1, Table 6.4 and Appendix 1, Figure 33
	2.2.2. Banksia TEC encompasses a number of recognised sub-communities (e.g. Floristic Community Types). Some of these sub-communities have a higher threatened status, where listed individually on the WA lists of threatened and priority	Section 6.3.1

Information Request		PD Section Reference
	ecological communities. The PD must incorporate discussion of the FCTs and sub-communities that constitute Banksia TEC on and nearby the site when providing the information required in 2.1.1.	
	2.2.3. The PD must also discuss the implications of the removal of, and indirect impacts on, the subcommunities, given that some FCTs tend to have higher representation on the Swan Coastal Plain and have varying species richness.	Section 6.3.1
2.3. Honeymyrtle Shrublands TEC	2.3.1. Even small patches are critical to the survival of Honeymyrtle TEC. Provide information on the implications of the removal of this TEC patch for the TEC as a whole. This includes: a) Investigation and modelling of the implication of removal of this TEC patch for the future and longevity of the TEC. This modelling must consider the implications of climate change on the extent and range of the TEC. b) Consideration of this patch as an 'ecological stepping stone', and analysis of the effects of disrupting landscape-level ecological processes. c) Consideration of the impact affecting the intergrading. d) Discussion of the implications of the removal of this patch for the TEC as a whole, in the short and long term. This discussion must be supported by strong evidence.	a) Section 6.4.1 b) Section 6.4.1 c) Section 6.4.1 d) Section 6.4.1
	2.3.2. Given that a large portion of the patch was burnt in 2023, discussion of the direct impacts must be informed by studies of suitable time since the fire event, as requested in 1.3.2	No longer relevant, Section 6.4.1
	2.3.3. If further avoidance results in part or all of the TEC patch being retained, the PD must contain the discussion of impacts on abiotic factors, invasive species, dieback, fire, and acid sulfate soils, contaminants, fire, as requested in 2.1.1.	Not relevant, Section 6.4.2
	2.3.4. The PD must address the priority conservation and research actions discussed in the conservation advice. The department notes that the conservation advice recommends that, "There should be no further clearance of, or deliberate damage to, patches of this ecological community" and recommends that offsetting is not suitable for Honeymyrtle Shrubland TEC, in part due to the low total quantity of the TEC and that any loss or damage should be avoided.	Section 9.2
	2.3.5. The department also notes that the conservation advice recommends that the Restore and manage this ecological community priority includes approaches to "(a)ct	Section 9.2

Information Request		PD Section Reference
	to increase the remaining extent, condition, and landscape scale connectivity of this ecological community (particularly connectivity with other surrounding native vegetation types)."	
2.4. FRBC and CBC	2.4.1. The PD must provide a discussion of the possible biotic impacts such as loss of foraging habitat and subsequent potential nutrient deficits, as well as the short-term and long-term impacts to local flocks of CBC and FRTBC	Section 6.7.1
	2.4.2. Provide an explanation of how 'core' and 'secondary' habitat was defined and classified for black cockatoos, ie, what is 'primary' and 'secondary' foraging habitat? All habitat viable for black cockatoos (regardless of it being classed as 'core' or 'secondary'), must be included in impact analysis and offset calculations.	Section 5.5.1.2
2.5. Chuditch	2.5.1. If the PAA or surrounds has the capacity to be used by individuals from a Chuditch population, discuss the impacts on the population.	Section 6.8
	2.5.2. Provide the results of the Chuditch survey due to be finalised in 2024.	Section 5.5.2.4 Attachment 7, Biota 2024a
2.6. Orchids	2.6.1. If orchid populations occur nearby the PAA, a discussion of impacts to their habitat is required. This must include (but is not limited to) consideration of impacts to hydrology, fragmentation, and edge effects.	Section 6.6
Avoidance and mitigation		
3.1. All species and ecological communities, including (but not limited to): a) Tuart TEC b) Banksia TEC c) Honeymyrtle TEC d) Carnaby's Black Cockatoo e) Forest Red-tailed black cockatoo f) Orchids: i. Grand Spider Orchid (*Caladenia huegelii*) ii. Dwarf Bee Orchid (*Diuris micrantha*) iii. Glossy Leaved Hammer Orchid (*Drakaea elastica*)	3.1.1. The preliminary documentation must provide strong evidence that direct and indirect impacts have been avoided and managed as much as possible. The documentation must demonstrate how the mitigation hierarchy (avoid, mitigate and offset) has been applied for this proposed action, including details of the reason/s why no avoidance was proposed. Refer to the following link for more information on the mitigation hierarchy: https://www.dcceew.gov.au/environment/epbc/advice-for-complying-with-the-epbc-act/environmentaloffsets-under-epbc/environmental-offsets- guidance/offsets-mitigation-hierarchy.	Sections 8.1 and 8.2 Figure 34
	3.1.2. The PD must identify alternative project footprints that avoid more TEC/habitat and explain why these options were or were not selected.	Sections 1.3 and 3.6
	3.1.3. For any of the matters listed in 1.1. that occur within the proposed action area, provide the following maps of the proposed action area with hectare amounts:	Figures: Figure 34

Information Request		PD Section Reference
iv. Purdie's Donkey Orchid (*Diuris purdiei*) g) Chuditch h) Organic Mounds TEC	a) The extent and quality of the species habitat/community that will be directly impacted by the proposed action, prior to avoidance measures. b) The extent and quality of species habitat/community that will be indirectly impacted by the proposed action, prior to avoidance measures. c) The extent and quality of species habitat/community that will be directly impacted by the proposed action, after avoidance measures. d) The extent and quality of species habitat /community that will be indirectly impacted by the proposed action, after avoidance measures.	a) Figure 14, Figure 17, Figure 20, Figure 24, Figure 28, Figure 29, Figure 30 b) Figure 14, Figure 17, Figure 20, Figure 24, Figure 28, Figure 29, Figure 30 c) Figure 14, Figure 17, Figure 20, Figure 24, Figure 28, Figure 29, Figure 30 d) Figure 32 and Figure 33
	3.1.4. Provide details of all mitigation measures that will be implemented during construction and ongoing road operation to minimise the risks contained within the Risk Assessment of the PD (section 2.1). All mitigation measures must have standards, controls and monitoring measures detailed. As a guide, all proposed mitigation/avoidance measures should be specific, measurable, achievable, realistic and time-bound (SMART). For each proposed mitigation measure, include: a) Performance and completion criteria. b) Monitoring and reporting arrangements. c) Potential risks/threats and any measures that would be implemented to mitigate against these risks, and any proposed monitoring to confirm the effectiveness of these measures.	Sections 8.3 and 8.4 Appendix 5
	3.1.5. Provide evidence supporting the effectiveness of avoidance and mitigation measures mentioned above (reference your intended use of best practice techniques, standards and accepted industry guidance), noting that the effectiveness of a particular measure is a reflection of the confidence in the ability of the measure to reduce the risk or threat.	Section 8.5 Appendix 5
3.2. Banksia TEC and Tuart TEC	3.2.1. For patches that are being cleared down to close to the minimum thresholds for protection under the EPBC Act, demonstrate how their condition will be maintained, and provide strong evidence to support the confidence of the outcome.	Sections 8.4 and 8.5.1

Information Request		PD Section Reference
	If this cannot be confidently demonstrated, adverse residual impacts calculations will need to account for this loss of the patch and/or reduction in quality.	
Residual impacts and offsets		
4.1. All species and ecological communities, including (but not limited to): a) Tuart TEC b) Banksia TEC c) Honeymyrtle TEC d) Carnaby's Black Cockatoo e) Forest Red-tailed black cockatoo f) Orchids: i. Grand Spider Orchid (*Caladenia huegelii*) ii. Dwarf Bee Orchid (*Diuris micrantha*) iii. Glossy Leaved Hammer Orchid (*Drakaea elastica*) iv. Purdie's Donkey Orchid (*Diuris purdiei*) g) Chuditch h) Organic Mounds TEC	4.1.1. The preliminary documentation must include an assessment of the likelihood of residual adverse impacts occurring, after mitigation and management measures relating to the project have been applied. This includes direct impacts such as habitat clearing and indirect impacts such as degradation of retained habitat.	Section 9.1, Table 9.1
	4.1.2. The Department notes that no offsets have been proposed in the referral documentation to address residual impacts. An offset is required to compensate for all predicted or potential residual significant impacts (direct and indirect) to EPBC Act listed threatened species and communities. This residual significant impact includes the total area of habitat lost and/or degraded for each EPBC species. Please provide: a) Details of an offset package (this may be in the form of an offset management plan) proposed to be implemented to compensate for the residual impacts of the project, such as how, when and where the offsets will be delivered and managed. b) Details of how the offset(s) will compensate for the significant residual impacts upon protected matters, resulting from the action. c) A description of how the offset(s) will ensure the protection, conservation and management of protected matters for the duration of the impact. d) A description of how the offset(s) are consistent with relevant Commonwealth policies and guidance documents on offsets under the EPBC Act. These documents can be found at the following link: EPBC Act environmental offsets policy - DCCEEW. e) The anticipated cost (financial and other) of delivery of the offsets(s).	a) Attachment 10 b) Attachment 10, Section 3-10 c) Attachment 10, 4-10, 12-14 d) Attachment 10, Section 11 e) Unknown.
	4.1.3. The offset proposal should include, but not be limited to: a) The location, description and suitability of the proposed offset site, including baseline conditions, environmental values and connectivity with other relevant habitat. b) The extent to which the proposed offset actions correlate to, and adequately compensate for, the impacts of protected matters and habitat critical to the survival of protected matters.	a) Attachment 10, Sections 3-10 b) Attachment 10, Sections 4-10 c) Attachment 10, Sections 4-10

Information Request		PD Section Reference
	c) A description of the conservation gain to be achieved by the offset, i.e. positive management strategies that improve the site or avert the future loss, degradation or damage of the ecological community and protected matter habitat. d) Information on current land tenure of any proposed offset and the method of legally securing the offset for at least the duration of the impact. e) Measures to protect, and\or manage and rehabilitate the ecological community and protected matter habitat at the offset site, including timing, frequency and longevity for each measure and performance criteria that must be met. f) Details of monitoring and reporting activities to assess the success of the offset. g) An assessment of the proposed offset, using the Department's Offsets Assessment Guide, and clear justification for each input entered.	d) Attachment 10, Sections 4-10 e) Attachment 10, Sections 4-10 f) Attachment 10, Sections 4-10, 13 g) Attachment 10, Sections 4-10
	4.1.4. The offset package must provide a succinct summary statement that justifies why the specific offset site is considered suitable relative to the characteristics of specific matter/s on the impact site for which the offset is being sought. It must also demonstrate that methods used to obtain the quality of TEC/ MNES habitat are equivalent and are applied consistently between the impact site and the offset site.	Attachment 10, Sections 4-10
	4.1.5. Offsets must be built around direct offsets, which should form a minimum of 90% of the total offset requirement. Other compensatory measures may satisfy up to 10% of the offset requirement. Offsets must meet the principles of the EPBC Act Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (2012).	Attachment 10
	4.1.6. The offset package can comprise a combination of direct offsets and other compensatory measures, so long as it meets the requirements of the EPBC Act Environmental Offset Policy. Offsets should align with conservation priorities and be tailored specifically to the attributes of the protected matter that is impacted, in order to deliver a conservation gain.	Attachment 10
	4.1.7. Offsets should compensate for an impact for the full duration of the impact.	Attachment 10
	4.1.8. Offsets must directly contribute to the ongoing viability of protected matters and deliver an overall conservation outcome that improves or maintains the viability of the ecological community and habitat for protected matters, as compared to what is likely to have occurred under the status quo, i.e. if neither the action nor the offset had taken place.	Attachment 10

Information Request		PD Section Reference
4.2. Honeymyrtle Shrublands TEC	4.2.1. The conservation advice states that offsetting is not suitable for Honeymyrtle Shrubland TEC. Any proposed offset strategy for the loss of this TEC must have strong evidence to demonstrate that adequate compensation can be achieved within a reasonable timeframe. General statements will not be accepted as evidence. The success of this offset given climate change must also be considered.	Attachment 10, Section 9
	4.2.2. Offset impact site numbers must be obtained from an updated survey which is consistent with the recommended period following fire in the conservation advice (refer 1.3.1).	No longer relevant

Table B: Information from the referral and associated documents

Information section request		PD Section Reference
1. Description of the action	1.1. A description of all components of the action, as described in the referral documentation and supplementary information	Section 3
2. Description of the environments	2.1. A description of all environments, as it relates to the proposed action, as described in the referral documentation and supplementary information.	Section 4
3. Relevant Matters of National Environmental Significance	3.1. Details of the relevant MNES, as described in the referral and supplementary documentation including: a) Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (Tuart TEC) b) Banksia Woodlands of the Swan Coastal Plain ecological community (Banksia TEC) c) Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle shrubland TEC) d) Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) e) Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) f) Grand Spider Orchid (*Caladenia huegelii*) g) Glossy Leaved Hammer Orchid (*Drakaea elastica*) h) Purdie's Donkey Orchid (*Diuris purdiei*) i) Dwarf Bee Orchid (*Diuris micrantha*) j) Chuditch (*Dasyurus geoffroii*) k) Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain (Organic Mound TEC)	Section 5
	3.2. Description of the baseline data contained in the referral documentation and references to attached assessments/surveys as it pertains to each MNES	Section 5 Attachment 1, Biota 2025a Attachment 2, Umwelt 2025 Attachment 5, GHD 2025 Attachment 6, ABCS 2024 Attachment 7, 2024a
4. Baseline information	4.1. Description of the baseline data contained in the referral documentation, including: a) Historic land use	a) Section 4.1 b) Sections 4.8 and 4.9

Information section request		PD Section Reference
	b) Species occurrence c) Site and regional context maps d) Method, results, and discussion of the flora and fauna survey	c) Figures 2 to 13 d) Section 5.1, Table 5.1 and Sections 4.8 and 4.9
5. Impacts	5.1. Description of the direct and indirect impacts contained in the referral documentation, including: a) Loss of Tuart TEC, Banksia TEC, and Honeymyrtle TEC, and indirect impacts to these. b) Loss of foraging and potential breeding habitat for Black cockatoos, and indirect impacts to these. c) Loss of potential Chuditch habitat d) Potential indirect impacts to Grand Spider Orchid, Glossy-leafed Hammer Orchid, Dwarf Bee Orchid, and Purdie's Donkey Orchid habitat e) Potential indirect impacts to Organic Mounds TEC	a) Sections 6.2, 6.3 and 6.4 b) Section 6.7 c) Section 6.8 d) Section 6.6 e) Section 6.5

Table C: General Content, Style, and formatting requirements

Information section request		PD Section Reference
1. Ecologically sustainable development (ESD)	1.1. The description of how the proposed action meets the principles of ESD, as defined in section 3A of the EPBC Act should consider and address the following principles of ecologically sustainable development: a) decision making processes should effectively integrate both long term and short term economic, environmental, social, and equitable considerations. b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. c) the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations. d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making. e) improved valuation, pricing and incentive mechanisms should be promoted.	Section 10
2. Economic and social matters	2.1. An analysis of the economic and social impacts of the action, both positive and negative.	Section 11.1

Information section request		PD Section Reference
	2.2. Details of any public consultation activities undertaken and their outcomes.	Section 11.2
	2.3. Indigenous engagement: a) Details of any consultation with Indigenous stakeholders, or will be undertaken, in relation to the proposed action and their outcomes. b) Identify existing or potential native title rights and interests, including any areas and objects that are of particular significance to Indigenous peoples and impacted by the proposed action and the potential for managing those impacts. c) Best practice consultation, in accordance with the Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999 (dcceew.gov.au) includes: i. Identifying and acknowledging all relevant affected indigenous peoples and communities ii. Commuting to early engagement iii. Building trust through early and ongoing communication for the duration of the project, including approvals, implementation, and future management iv. Setting appropriate timeframes for consultation, and v. Demonstrating cultural awareness.	Section 11.3
	2.4. Describe any state requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action with regards to Indigenous peoples and communities.	Not relevant
	2.5. Projected economic costs and benefits of the project, including the basis for their estimate through cost/benefit analysis or similar studies.	Section 11.4
	2.6. Employment opportunities to be generated by the project (including construction and operational phases).	Section 11.5
3. Environmental record of the person(s) proposing to take the action	3.1. Include details of any past or present proceedings under a commonwealth, state, or territory law for the protection of the environment or the conservation and sustainable use of resources against: a) The person proposing to take the action. b) For an action for which a person has applied for a permit, the person making the application.	Section 12

Information section request		PD Section Reference
	c) If the person is a body corporate- the history of its executive officers in relation to environmental matters; and d) If the person is a body corporate that is a subsidiary of another body or company (the parent body)- the history in relation to environmental matters of the parent body and its executive officers.	
4. International obligations	4.1. Demonstrate, with supporting evidence, how the proposed action will not be inconsistent with Australia's obligations under: a) The Bonn Convention b) China-Australia Migratory Bird Agreement c) Japan- Australia Migratory Bird Agreement d) International agreement- Republic of Korea-Australia Migratory Bird Agreement; and e) Any international agreement approved under subsection 209(4) of the EPBC Act	Section 13
5. Other approvals and conditions	5.1. The preliminary documentation must include information on any other requirements for approval or conditions that apply, or that you reasonably believe are likely to apply, to the proposed action if applicable. This must include: a) A description of any approval obtained or required to be obtained from a state or commonwealth agency or authority (other than an approval under the EPBC act), including any conditions that apply (or are reasonably expected to apply) to the action; and b) A description of the monitoring, enforcement, and review procedures that apply, or are proposed to apply, to the action.	Section 14
6. Style	6.1. Be written so that any conclusions reached can be independently assessed. Includes all key claims, findings, proposals, and undertakings in the main document.	Noted.
7. Format	7.1. Be in a suitable format to be published in hardcopy (A4 and A3 size, with maps and diagrams in A4 or A3 size and in colour) and published in an electronic format (e.g. MS word or PDF) on the internet.	Noted.
8. Content	8.1. Includes a cross-reference table indicating where the information fulfilling the requirements in table A, B, and C is included in the preliminary documentation.	Appendix 2
9. Relevant standards, policies and other guidance material	9.1. Refer to all relevant standards, polices, and other guidance material published by the department. Any instances where published guidance is not followed must be justified. Where no commonwealth standards exist, state government and industry standards may be useful.	Noted.

Information section request		PD Section Reference
10. Maps, diagrams, and images	10.1. Maps, plans, diagrams, technical information (e.g. specifications, schematics) and images provided must be clearly annotated, in colour and of high resolution.	Noted. Appendix 1
	10.2. All maps submitted as part of the response must be consistent with the department's guide for providing maps and boundary data for EPBC Act projects (see item 9a).	Noted. Appendix 1
11. Referencing standards	11.1. Reference all sources using the Harvard standard of referencing. Ensure that other supporting documents (e.g. academic studies, regulatory standards) are publicly accessible, with electronic links provided where possible.	Section 17
12. Evidence-based conclusions	12.1. Where appropriate, the information provided must be supported by: a) Evidence-based conclusions based on the best available peer reviewed scientific literature with supporting references cited or expert opinion provided and/or views of suitably qualified experts. b) Scientifically robust methodologies that are appropriate for purpose, and sufficient description of the methodology used and justification of why the methodology was selected. c) Include detailed technical information, studies, or investigations necessary to support the information in the stand-alone document as appendices	a) Noted. b) Appendix 3 c) Noted. Section 19
13. Inclusion of sensitive information	13.1. The response will form part of the preliminary documentation that must be published for public comment. Therefore, the contact details of departmental officers must not be included in the response. The response should not contain commercial in confidence markings. If the response contains sensitive information, please discuss with the department.	Noted.

Appendix 3: Methods Statement

The methods used to estimate the extent of TEC and species habitats' locally and regionally as requested throughout the RFI are described below.

Tuart TEC

Datasets from DataWA and Find Environmental Data were used to estimate the extent of the Tuart TEC locally (within 10 km of the PAA) and regionally (SCP). A pairwise intersect of the Tuart Woodlands (DBCA-048) and Native Vegetation Extent (DPIRD-005) datasets was completed with the resulting output clipped to a 10 km buffer of the PAA or the Swan Coastal Plain (SWA IBRA Bioregion). A pairwise intersect with DBCA - Legislated Lands and Waters (DBCA-011) was completed to estimate the extent within conservation reserves (within 10 km buffer of the PAA).

The DBCA TEC/PEC database (DBCA 2024b) provided buffered occurrences of Tuart TEC within 10 km of the PAA. This extent was queried and produced the same extent for a 10 km buffer of the PAA as calculated via the method outlined above.

Banksia TEC

Datasets from DataWA and Find Environmental Data were used to estimate the extent of the Banksia TEC locally (within 10 km of the PAA) and regionally (SCP). A pairwise intersect of the Vegetation Complexes - Swan Coastal Plain (DBCA-046) and Native Vegetation Extent (DPIRD-005) was completed with the resulting output clipped to a 10 km buffer of the PAA or the Swan Coastal Plain (SWA IBRA Bioregion). A filter for Vegetation Complexes strongly and moderately associated with the Banksia TEC was applied (DEE 2016a, Table C2 a) & b)).

The DBCA TEC/PEC database (DBCA 2024b) provided buffered occurrences of Banksia TEC within 10 km of the PAA. This extent was queried and produced the same extent for a 10 km buffer of the PAA as calculated via the method outlined above.

CBC

Datasets from DataWA and Find Environmental Data were used to estimate the extent of Carnaby's Cockatoo foraging habitat within 12 km of the PAA. A pairwise intersect of the Carnabys Cockatoo Areas requiring investigation as feeding habitat in the Swan Coastal Plain (SCP) IBRA Region (DBCA-057) and Native Vegetation Extent (DPIRD-005) was completed with the resulting output clipped to a 12 km buffer of the PAA.

FRTBC

Datasets from DataWA and Find Environmental Data were used to estimate the extent of FRTBC foraging habitat within 12 km of the PAA. A pairwise intersect of the Vegetation Complexes - Swan Coastal Plain (DBCA-046) and Native Vegetation Extent (DPIRD-005) was completed with the resulting output clipped to a 12 km buffer of the PAA. A filter for Vegetation Complexes likely to provide foraging resources, based on a vegetation summary description and reported FRTBC foraging species (DAWE 2022) was applied. This included the following vegetation complexes: Abba, Bassendean-Central and South, Bassendean-Central and South Transition, Beermullah, Cannington, Cartis Cottesloe-Central and South, Dardanup, Forrestfield, Gingin, Guildford, Karamal-North, Karamal-South, Karrakatta-Central and South, Mogumber-South, Mungala, Pinjar, Southern River, Vasse, Wannamal, Yoongarillup.

Chuditch

Datasets from DataWA and Find Environmental Data were used to estimate the extent of potential Chuditch habitat within 15 km of the PAA. The DBCA Threatened, Specially Protected, and Priority Fauna Database (DBCA 2024c) was reviewed to identify Chuditch records on the Swan Coastal Plain and adjacent areas of the Jarrah Forest (SWA and JAF IBRA Bioregions). Chuditch need large natural areas because of their large home ranges and resource requirements (DEC 2012). Existing Chuditch records and larger reserves within a 15 km buffer of PAA (identified through Region Scheme - Zones and Reserves (DPLH-023)) were overlaid to determine areas of potential Chuditch habitat. A Principal Zoologist with 20 years of experience in southwest WA and who is familiar with Chuditch habitat requirements reviewed and confirmed potential habitat areas. A pairwise intersect with Native Vegetation Extent (DPIRD-005) was then completed to determine the extent (in ha) of potential habitat areas.

Appendix 4: Occurrence records

TaxonName	CommonName	Datum	Latitude	Longitude	Precision	SiteName	DateObs	Abundance
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	GDA2020	-32.208002	115.789882	15	No site	12/11/2020	0

ObsMethod	EPBCActRef	Author
Feeding sign	2024 09841	Biota Environmental Sciences

Citation
Biota Environmental Sciences (2025). Anketell Road Upgrade (Leath Road to Kwinana Freeway) Consolidated Biological Report. Unpublished report prepared for MRWA

Appendix 5: Risk Assessment

Impact	Cause	Is the scale and/or nature of the impact unknown, unpredictable or irreversible? Level of uncertainty	Summary of Mitigation	Residual Risk		
				Likelihood	Consequence	Risk rating
Direct impact causing loss of up to: – 1.94 ha Honeymyrtle Shrubland TEC	Authorised clearing of native vegetation with the PAA.	Scale and nature of the potential impact is known and predictable based on surveys within the PAA, undertaken in accordance with EPA and Commonwealth guidance (Biota 2025a). The PAA will be partially revegetated with native vegetation, although not with vegetation likely to represent the Honeymyrtle TEC. Honeymyrtle TEC can be revegetated/ rehabilitated with intensive efforts. High confidence in prediction of direct impacts within PAA. Potential to reduce direct impacts during detailed design and construction planning, however this cannot be confirmed at this stage.	None.	Likely	High	High (Offset Strategy to counter balance residual risk)
Direct impact causing loss of up to: – 40.99 ha Tuart TEC – 14.56 ha Banksia TEC – 56.98 ha CBC foraging habitat – 38.34 ha FRTBC foraging habitat	Authorised clearing of native vegetation with the PAA.	Scale and nature of the potential impact is known and predictable based on surveys within the PAA, undertaken in accordance with EPA and Commonwealth guidance (Biota 2025a). The PAA will be partially revegetated with native vegetation. Tuart TEC, Banksia TEC and black cockatoo foraging habitat can be revegetated/ rehabilitated with intensive efforts. High confidence in prediction of direct impacts within PAA. Potential to reduce direct impacts during detailed design and construction planning, however this cannot be confirmed at this stage.	Reduction of direct impacts through planning and design to minimise impacts to MNES within the PAA. CEMP to include measures to prevent unauthorised clearing.	Likely	High	High (Offset Strategy to counter balance residual risk)
Direct impact causing loss of up to: – 592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding – 14.93 ha potential orchid habitat	Authorised clearing of native vegetation with the PAA.	Scale and nature of the potential impact is known and predictable based on surveys within the PAA, undertaken in accordance with EPA and Commonwealth guidance (Biota 2025a) The PAA will be partially revegetated with native vegetation. Potential black cockatoo breeding habitat and orchid habitat can be revegetated/ rehabilitated with intensive efforts. High confidence in prediction of direct impacts within PAA. Potential to reduce direct impacts during detailed design and construction planning, however this cannot be confirmed at this stage.	Reduction of direct impacts through planning and design to minimise impacts to MNES within the PAA. CEMP to include measures to prevent unauthorised clearing.	Likely	Moderate	Medium
Direct impact causing loss exceeding: – 40.99 ha Tuart TEC – 14.56 ha Banksia TEC – 56.98 ha CBC foraging habitat – 38.34 ha FRTBC foraging habitat – 592 suitable DBH trees, including eight trees with eight hollows suitable for black cockatoo breeding – 14.93 ha potential orchid habitat	Unauthorised clearing of native vegetation outside of PAA.	The nature of potential impact is known and predictable based on surveys in land adjacent to the PAA, undertaken in accordance with EPA and Commonwealth guidance (Biota 2025a). The scale of potential impacts is unpredictable as it relates to unauthorised clearing, however, should it occur it is only likely to be isolated and of a much smaller scale than the authorised clearing. Rehabilitation will be undertaken in impacted areas. Black Cockatoo foraging habitat is expected to establish within rehabilitated areas in the mid term (10+ years) and breeding trees in the long term (100+ years). Tuart TEC, Banksia TEC and potential orchid habitat can be established with intensive effort (20+ years). High confidence in prediction of nature of impacts and moderate confidence in prediction of scale of impacts.	Identification and demarcation of clearing area boundaries. Pre-clearing inspection of boundaries and approval prior to clearing works. Temporary construction areas will be located in existing cleared areas, areas to be cleared for permanent works, or in areas devoid of MNES. CEMP to include measures to prevent unauthorised clearing.	Unlikely	Moderate	Low
Indirect impact to Tuart TEC patches due to patch size and condition threshold not being met.	Authorised clearing of native vegetation with the PAA fragmenting existing patches of Tuart TEC to the extent that they no longer met TEC thresholds.	Patch assessment completed and two patches fragmented to the extent that they do not meet Tuart TEC thresholds (3.39 ha additional Tuart TEC loss) (Section 6.2.2.1 in PD). Scale and nature of the potential impact is known and predictable based on surveys within the PAA, undertaken in accordance with EPA and Commonwealth guidance (Biota 2025a). Potential impact is isolated and small in scale. The PAA will be partially revegetated with native vegetation. Tuart TEC can be revegetated/ rehabilitated with intensive efforts. High confidence in prediction of nature and scale of impacts.	Identification and demarcation of clearing area boundaries. Pre-clearing inspection of boundaries prior to clearing works. Prevent further degradation of Tuart TEC through weed and dieback controls during construction.	Likely	Moderate	Medium

Impact	Cause	Is the scale and/or nature of the impact unknown, unpredictable or irreversible? Level of uncertainty	Summary of Mitigation	Residual Risk		
				Likelihood	Consequence	Risk rating
Indirect impact to Banksia TEC patches due to patch size and condition threshold not being met.	Authorised clearing of native vegetation with the PAA fragmenting existing patches of Banksia TEC to the extent that they no longer met TEC thresholds.	Patch assessment completed and one patch fragmented to the extent that it does not meet Banksia TEC thresholds (0.08 ha additional Banksia TEC loss) (Section 6.3.2.1 in PD). Scale and nature of the potential impact is known and predictable based on surveys within the PAA, undertaken in accordance with EPA and Commonwealth guidance (Biota 2025a). Potential impact is isolated and small in scale. The PAA will be partially revegetated with native vegetation. Banksia TEC can be revegetated/ rehabilitated with intensive efforts. High confidence in prediction of nature and scale of impacts.	Identification and demarcation of clearing area boundaries. Vegetation to be retained to be clearly demarcated prior to clearing commencing. Pre-clearing inspection of boundaries and approval by Main Roads prior to clearing works. Prevent further degradation of Banksia TEC through weed and dieback controls during construction.	Likely	Moderate	Medium
Indirect impacts to condition of adjacent native vegetation including: – Tuart TEC – Banksia TEC – Foraging and potential breeding habitat for Black Cockatoos – Potential orchid habitat	Construction plant, equipment and soil movement introducing or spreading weeds to uninfested vegetation. Unauthorised site access introducing or spreading weeds to uninfested vegetation.	The nature of potential impact is known and predictable based on surveys undertaken in PAA and Contextual area (Biota 2025a). Biota identified Declared Plants, WONS and environmental weeds, and mapped locations of Declared Plants and WONS within the PAA. There is an existing high weed load in local environment. The scale of the potential impact is expected to be within the area of native vegetation that lies between the PAA and un-vegetated areas (e.g. roads, cleared land) in the urban environment. The impact from weeds is potentially reversible with intensive efforts using established methods (e.g. mechanical removal, targeted herbicide, replanting native species). High confidence in prediction of nature of impacts and moderate confidence in prediction of scale of impacts.	Declared Plants within the PAA will be treated according to WA Government advice, with the aim of eradication where possible but as a minimum prevent off site movement. WoNS and environmental weeds within the PAA will be treated according to Weeds Australia guidance with the aim of controlling off-site movement. Topsoil containing Declared Pests or WoNS will not be reused in landscaping or revegetation. All heavy plant and machinery will be inspected prior to entry at the work site and confirmed to be clean and free of vegetation and soil material.	Unlikely	Moderate	Low
Indirect impacts to condition of adjacent native vegetation including: – Tuart TEC – Banksia TEC – Foraging and potential breeding habitat for Black Cockatoos – Potential orchid habitat	Construction plant, equipment and soil movement introducing or spreading dieback to uninfested vegetation. Unauthorised site access introducing or spreading dieback to uninfested vegetation.	The nature of potential impact is known and predictable based on a dieback survey that has been undertaken in PAA (Glevan 2025). Glevan mapped Uninfested, Permanently Uninterpretable, Excluded and Unknown locations with the PAA. No infestations of Phytophthora Dieback observed within the PAA (Glevan 2025). The scale of the potential impact is expected to be within the area of native vegetation that lies between the PAA and un-vegetated areas (e.g. roads, cleared land) in the urban environment. The impact from dieback is considered effectively irreversible. Phosphite treatment is effective at controlling the spread and impact of dieback in infested areas for periods of up to five years. Moderate confidence in prediction of nature of impacts and confidence in prediction of scale of impacts.	All heavy plant and machinery will be inspected prior to entry at the work site and confirmed to be clean and free of vegetation and soil material. Dieback management will be carried out in accordance with DBCA's Phytophthora Dieback Management Manual 2020.	Unlikely	Moderate	Low
Indirect impacts to condition of adjacent native vegetation including: – Tuart TEC – Banksia TEC – Foraging and potential breeding habitat for Black Cockatoos – Potential orchid habitat	Construction water abstraction and dewatering causing groundwater drawdown.	The nature of the potential impact is known as Conservation Advice (DEE 2016) states that the dominant Banksia species of the Banksia TEC are vulnerable to impact from groundwater lowering. Stream (2025a) mapped potential GDEs across the PAA and Contextual area. These areas are likely to be more susceptible to negative impacts from groundwater drawdown. Stream (2025a) assessed the risk of impacts from drawdown and groundwater abstraction and considered the risks to be low. The impact is expected to be reversible as groundwater levels will recover once groundwater abstraction and dewatering ceases. GDV is expected to recover with groundwater availability as long as dieback has not occurred. High confidence in prediction of nature and scale of impacts.	Identification and demarcation of potential GDV that may be affected by groundwater drawdown. Groundwater level monitoring and vegetation condition monitoring undertaken at all identified areas of potentially affected GDV, to identify any early impacts of groundwater drawdown. If GDV are exhibiting signs of impact from groundwater drawdown, remedial measures (e.g. infiltration trenches, diaphragm walls) will be implemented to restore groundwater levels to pre-construction levels.	Unlikely	Moderate	Low

Impact	Cause	Is the scale and/or nature of the impact unknown, unpredictable or irreversible? Level of uncertainty	Summary of Mitigation	Residual Risk		
				Likelihood	Consequence	Risk rating
Indirect impacts to condition of adjacent native vegetation including: – Tuart TEC – Banksia TEC – Foraging and potential breeding habitat for Black Cockatoos – Potential orchid habitat	Surface water runoff and spills during construction causing erosion, sedimentation and/or contamination.	The nature of the potential impact is known as construction will involve ground disturbance, generation of wastes and use of hazardous materials (e.g. diesel fuel), and will occur adjacent to MNES habitat. The scale of the potential impact is unpredictable as it relates to major storm or spill events, however it is expected to be localised to land in the vicinity of the PAA. The impact is expected to be reversible as erosion, sediment deposition and contamination can be remediated with established technologies. Moderate confidence in prediction of nature and scale of impacts.	Temporary erosion and sediment controls will be maintained within the PAA during construction to prevent stormwater runoff from construction areas from eroding or causing sediment deposition in adjacent native vegetation. Drainage strategy to use permeable base pits via infiltration basins and swales where possible to infiltrate surface water runoff and minimise runoff outside of the PAA. Waste and hazardous materials management measures will be implemented in construction to prevent contaminant discharges to adjacent native vegetation. On-site refuelling of machinery and plant to occur in designated areas, subject to appropriate spill controls and away from MNES habitat. Provision of spill response kits at refuelling locations and any locations where hydrocarbons or chemicals are stored.	Unlikely	Moderate	Low
Indirect impacts to condition of adjacent native vegetation including: – Tuart TEC – Banksia TEC – Foraging and potential breeding habitat for Black Cockatoos – Potential orchid habitat	Accidental fires caused by construction activities.	The nature of the potential impact is known, as the Banksia TEC is known to be vulnerable to more frequent/intense fire regimes. Other MNES are expected to be resilient to fire in the urban environment. The scale of the potential impact is expected to be within the area of native vegetation that lies between the PAA and un-vegetated areas (e.g. roads, cleared land) that will form firebreaks and fire suppression lines in the urban environment. The impact from fires is expected to be reversible through recovery of most vegetation that is adapted to fires. Moderate confidence in prediction of nature and scale of impacts.	All hot work will be undertaken in accordance hot work procedures. All vehicles, plant and equipment to be fitted with fire extinguishers and restricted to designated cleared areas unless involved in clearing operations. Fire danger ratings and Local Government vehicle movement bans to be observed and then requirements of these implemented. On-site refuelling of machinery and plant to occur in designated areas, away from MNES habitat.	Rare	Moderate	Low
Indirect impacts to condition of adjacent native vegetation including: – Tuart TEC – Banksia TEC – Foraging and potential breeding habitat for Black Cockatoos – Potential orchid habitat	Disturbance of known or existing ASS and/or contaminated sites caused by construction activities.	The nature of the potential impact is known as existing contaminated sites and areas of high risk ASS are known within the PAA (Senversa 2025) and are adjacent to MNES habitat. The scale of the potential impact is unpredictable as it is dependent on the location and extent of excavation, dewatering and groundwater abstraction activities. However, the scale of the impact is expected to be localised to land in the vicinity of the PAA. The impact is expected to be reversible as ASS and contamination can be remediated/managed with established technologies. Moderate confidence in prediction of nature and scale of impacts.	Avoid excavation in areas of high-risk ASS where possible. Avoid disturbance of contaminated or potentially contaminated areas. Construction bore locations to be outside of high and moderate risk areas as determined by FSG (2024).	Unlikely	Moderate	Low
Indirect impacts to condition of Organic Mounds TEC occurrence within the Contextual Area.	Construction water abstraction and dewatering causing groundwater drawdown.	The nature of the potential impact is known as an occurrence of the Organic Mounds TEC is located within 500 m of the PAA, and the TEC is known to be impacted by changes in hydrological processes including groundwater drawdown. Stream (2025a) assessed the risk of impact from drawdown and groundwater abstraction on the Organic Mounds TEC occurrence and considered the risk to be low. The scale of the potential impact is expected to be localised to the Organic Mounds TEC occurrence.	Construction bore locations to be outside of high and moderate risk areas as determined by FSG (2024).	Rare	Minor	Low

Impact	Cause	Is the scale and/or nature of the impact unknown, unpredictable or irreversible? Level of uncertainty	Summary of Mitigation	Residual Risk		
				Likelihood	Consequence	Risk rating
		The impact is expected to be reversible as groundwater levels will recover once groundwater abstraction and dewatering ceases. The Organic Mounds TEC would be expected to recover with groundwater availability. High confidence in prediction of nature and scale of impacts.				
Indirect impacts to *Caladenia huegelii* individual within Contextual Area	Construction plant, equipment and soil movement introducing or spreading weeds and dieback to uninfested vegetation.	The nature of potential impact is known and predictable based on surveys undertaken in PAA and Contextual area (Biota 2025a; Glevan 2025). There is an existing high weed load in local environment. No infestations of Phytophthora Dieback observed within the PAA (Glevan 2025). The scale of the potential impact is expected to be within the area of native vegetation that lies between the PAA and un-vegetated areas (e.g. roads, cleared land) in the urban environment. The closest record of *C. huegelii* lies 510 m east of the PAA and is separated by cleared areas and roads (e.g. Lyon Road). The impact from weeds is potentially reversible with intensive efforts using established methods (e.g. mechanical removal, targeted herbicide, replanting native species). The impact from dieback is considered effectively irreversible. Phosphite treatment is effective at controlling the spread and impact of dieback in infested areas for periods of up to five years. Moderate confidence in prediction of nature and scale of impacts.	Declared Plants within the PAA will be treated according to WA Government advice, with the aim of eradication where possible but as a minimum prevent off site movement. WoNS and environmental weeds within the PAA will be treated according to Weeds Australia guidance with the aim of controlling off-site movement. Topsoil containing Declared Pests or WoNS will not be reused in landscaping or revegetation. All heavy plant and machinery will be inspected prior to entry at the work site and confirmed to be clean and free of vegetation and soil material.	Rare	Minor	Low
Injury or mortality to Black Cockatoo individuals.	Vehicle collision with birds during construction.	The nature of the potential impact is known, as the PAA contains and lies adjacent to Black Cockatoo habitat, and Black Cockatoos have been known to be killed through vehicle strike. The potential scale of the impact is unpredictable as it relates to unplanned events and bird/flock behaviour. Collisions are expected to impact individuals or small numbers of birds, however the number of collisions is unpredictable. The loss of a limited number of birds to mortality/injury over a temporary period is considered reversible, as the population is expected to recover over time once construction is completed. Moderate confidence in prediction of nature and scale of impacts.	Speed limits between 40-60km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during construction. A list of local wildlife rescue organisations and carers will be maintained on site to contact in the event of fauna injury. Induction of construction personnel on reducing the risk of fauna injury and the procedure in the event of fauna injury or death.	Unlikely	Moderate	Low
Injury or mortality to Black Cockatoo individuals.	Clearing of active breeding trees during construction.	The nature of the potential impact is known, as the PAA contains 8 trees with 8 hollows suitable for Black Cockatoo nesting that could potentially be used during construction. However, no trees have breeding records and they are not expected to be utilised for breeding during construction. The scale of the potential impact is unpredictable as it is uncertain whether breeding will be occurring during construction, however it is considered unlikely given the lack of breeding records in the vicinity. The loss of small numbers of birds to mortality/injury over a temporary period is considered reversible, as the population is expected to recover over time once construction is completed. Moderate confidence in prediction of nature and scale of impacts.	Within 7 days prior to clearing, trees with hollows used by or suitable for use by CBC and FRTBC will be inspected by a suitably qualified person to confirm that there are no hollows being used by CBC and FRTBC within the area to be cleared.	Rare	Moderate	Low
Disturbance of Black Cockatoo individuals.	Construction activities causing noise, light, vibration and dust emissions.	The nature of the potential impact is known as the PAA is adjacent to Black Cockatoo foraging and potential breeding habitat and construction activities will result in noise, light, vibration and dust emissions. The scale of the potential impact is predictable as no Black Cockatoo breeding activity nor definitive evidence of breeding was observed within the PAA or surrounds during the surveys (Biota 2025). Furthermore, no evidence of roosting was recorded within the PAA. It is unlikely breeding or roosting will occur in adjacent vegetation during construction.	Construction works will be undertaken in accordance with the Environmental Protection (Noise) Regulations 1997. Lighting will be directed toward the construction area and not into adjacent native vegetation, particularly The Spectacles. Dust emissions will be controlled through appropriate measures where practicable including	Unlikely	Minor	Low

Impact	Cause	Is the scale and/or nature of the impact unknown, unpredictable or irreversible? Level of uncertainty	Summary of Mitigation	Residual Risk		
				Likelihood	Consequence	Risk rating
		The disturbance of a limited number of birds from noise, light, vibration and dust emissions over a temporary period is considered reversible, as no population impacts are expected. High confidence in prediction of nature and scale of impacts.	hydro mulch, water application through water carts and chemical dust suppressants.			
Fragmentation of existing wildlife corridors affecting Black Cockatoos	Authorised clearing of native vegetation within the PAA.	The nature of the potential impact is known as potential foraging habitat for black cockatoos has been mapped in the local area (12 km buffer of the PAA). Black cockatoo habitat is fragmented by the existing Anketell Road, associated road corridors and surrounding land uses. The scale of the potential impact is predictable as it is limited to potential foraging habitat in the PAA. The PAA will be partially revegetated with native vegetation. Black Cockatoo foraging habitat can be revegetated/ rehabilitated with intensive efforts. High confidence in prediction of nature and scale of impacts.	Reduction of direct impacts through planning and design to minimise impacts to MNES within the PAA. CEMP to include measures to prevent unauthorised clearing. Identification of movement corridors will be undertaken to determine the number and location of any necessary wildlife underpasses.	Rare	Minor	Low
Indirect impacts to condition of adjacent native vegetation including: – Tuart TEC – Banksia TEC – Foraging and potential breeding habitat for Black Cockatoos – Potential orchid habitat	Surface water runoff from road surface causing erosion, sedimentation and/or contamination (additional impact above and beyond existing road).	The nature of the potential impact is known as the PAA will comprise upgraded expressway and intersections that will generate stormwater runoff, and lie adjacent to MNES habitat. The scale of the potential impact is unpredictable as it relates to major storm or spill events, however it is expected to be localised to land in the vicinity of the PAA. The impact is expected to be reversible as erosion, sediment deposition and contamination can be remediated with established technologies. Moderate confidence in prediction of nature and scale of impacts.	Drainage design will integrate Water Sensitive Urban Design principles. Drainage design will be implemented to maintain hydrological flow regimes and control stormwater run-off.	Rare	Moderate	Low
Indirect impacts to condition of adjacent native vegetation including: – Tuart TEC – Banksia TEC – Foraging and potential breeding habitat for Black Cockatoos – Potential orchid habitat	Fires caused by weed growth or fuel build up in road verge during operation.	The nature of the potential impact is known, as the Banksia TEC is known to be vulnerable to more frequent fire regimes. Other MNES are expected to be resilient to fire in the urban environment. The scale of the potential impact is expected to be within the area of native vegetation that lies between the PAA and un-vegetated areas (e.g. roads, cleared land) that will form firebreaks and fire suppression lines in the urban environment. The impact from fires is expected to be reversible through recovery of most vegetation that is adapted to fires. Moderate confidence in prediction of nature and scale of impacts.	Regular maintenance of road verge during operations to treat weeds and reduce fuel build up consistent with current maintenance programs.	Rare	Moderate	Low
Injury or mortality to Black Cockatoo individuals	Vehicle collision with birds during operations (additional impact above and beyond existing road)	The nature of the potential impact is known, as the PAA lies adjacent to Black Cockatoo habitat and Black Cockatoos have been known to be killed through vehicle strike. The scale of the potential impact is unpredictable as it relates to unplanned events and bird/flock behaviour. Collisions are expected to impact individuals or small numbers of birds, however the frequency of collisions is unpredictable. The ongoing loss of birds to mortality/injury is considered to be effectively irreversible, as the population will be continually affected by vehicle movements over the long term. However, the additional impact above the existing road will be marginal. Moderate confidence in prediction of nature and scale of impacts.	Revegetation within the PAA that is within 10 m of the road seal will not be planted with Black Cockatoo foraging species.	Rare	Moderate	Low
Disturbance of Black Cockatoo individuals.	Operation of the road causing noise, light and vibration emissions (additional impact above and beyond existing road).	The nature of the potential impact is known as the PAA is adjacent to Black Cockatoo foraging and potential breeding habitat and operation of the road will result in noise, light, vibration emissions. No dust emissions are anticipated during operation. The scale of the potential impact is unpredictable as it relates to the future behaviour of black cockatoos. However, no Black Cockatoo breeding activity nor definitive evidence of breeding was observed within the PAA or surrounds during the surveys (Biota 2025a). Furthermore, no evidence of roosting was recorded within the PAA.	Lighting will be implemented in accordance with Main Roads Lighting Design Guideline for Roadway and Public Space and relevant Australian Standards.	Rare	Minor	Low

Impact	Cause	Is the scale and/or nature of the impact unknown, unpredictable or irreversible? Level of uncertainty	Summary of Mitigation	Residual Risk		
				Likelihood	Consequence	Risk rating
		The disturbance of a limited number of birds from noise, light, vibration emissions over a temporary period is considered reversible, as no population impacts are expected. Moderate confidence in prediction of nature and scale of impacts.				

19 ATTACHMENTS

Attachment	Title	Source
Attachment 1	Anketell Rd Upgrade – Consolidated Biological Report	Biota 2025a
Attachment 2	Assessment of FCT26a Threatened Ecological Community	Umwelt 2025
Attachment 3	Anketell Road Upgrade, Technical Memo: Communities of Organic Mounds (Organic Mound Springs, SCP) TEC	Biota 2024b
Attachment 4	Anketell Road characterisation and assessment of impacts on GDEs and groundwater users	Stream Environment and Water 2025a
Attachment 5	Black Cockatoo Foraging Habitat Quality	GHD 2025
Attachment 6	Survey of 34 nominated trees in the proposed Anketell Road Upgrade for their nesting value for black cockatoos	Australian Black Cockatoo Specialists 2024
Attachment 7	Anketell Road Upgrade Targeted Chuditch Survey	Biota 2024a
Attachment 8	Anketell Rd Upgrade *Leioproctus douglasiellus* and *Neopasiphae simplicior* Targeted Survey: Summary of Findings	Biota 2025b
Attachment 9	Phytophthora Dieback Occurrence Report for Anketell Road	Glevan Consulting (2025)
Attachment 10	Anketell Road Upgrade Offset Strategy	Main Roads 2025