6. Terrestrial Fauna

6.1 EPA Environmental Factor and Objective

To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

For the purposes of EIA, the EPA (2016d) define terrestrial fauna as animals living on land or using land (including aquatic systems) for all or part of their lives. Terrestrial fauna includes vertebrate (birds, mammals including bats, reptiles, amphibians, and freshwater fish) and invertebrate (arachnids, crustaceans, insects, molluscs and worms) groups.

Subterranean fauna are assessed under Section 13 Other Factors.

6.2 Relevant Policy and Guidance

6.2.1 EPA policy and guidance

- *Environmental Factor Guideline – Terrestrial Fauna* (EPA 2016d)
- *Technical Guidance - Terrestrial fauna surveys* (EPA 2016h)
- *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020a)
- *Instructions on how to prepare an Environmental Review Document* (EPA 2021c)
- *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA 2020d)

6.2.2 Commonwealth policy and guidance

- *Approved Conservation Advice for Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo)* (Department of the Environment, Water, Heritage and the Arts 2009)
- *Approved Conservation Advice for Rostratula australis (Australian painted snipe)* (Canberra: Department of Sustainability, Environment, Water, Population and Communities 2013)
- *Carnaby's Cockatoo (Zanda latirostris) Recovery Plan: Western Australian Wildlife Management Program No. 52,* (Department of Parks and Wildlife October 2013).
- *Chuditch (Dasyurus geoffroii) National Recovery Plan: Wildlife Management Program No. 54* (Department of Environment and Conservation 2012)
- *Conservation Advice Atrichornis clamosus noisy scrub-bird* (Threatened Species Scientific, Department of the Environment and Energy 2018)
- *Conservation Advice Bettongia penicillata woylie (Threatened Species Scientific, Department of the Environment and Energy 2018)*
- *Conservation Advice Botaurus poiciloptilus Australasian Bittern* (Threatened Species Scientific Committee, Department of the Environment and Energy 2019*)*
- *Conservation Advice Calidris canutus Red knot (*Threatened Species Scientific Committee, Department of the Environment 2016)
- *Conservation Advice Calidris ferruginea curlew sandpiper* (Department of the Environment 2015)

- *Conservation Advice Zanda baudinii Baudin's cockatoo* (Threatened Species Scientific Committee, Department of the Environment and Energy 2018)
- *Conservation Advice Numenius madagascariensis eastern curlew* (Department of the Environment 2015)
- *Conservation Advice Phascogale calura red-tailed phascogale* (Threatened Species Scientific Committee, Department of the Environment and Energy 2016)
- *Conservation Advice Pseudocheirus occidentalis Western ringtail possum* (Threatened Species Scientific Committee, Department of the Environment and Energy 2018).
- *Conservation Advice Westralunio carteri Carter's freshwater mussel* (Threatened Species Scientific Committee, Canberra: Department of the Environment and Energy 2018).
- *Conservation Advice Myrmecobius fasciatus numbat* (Threatened Species Scientific Committee, Canberra: Department of the Environment and Energy 2018).
- Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (Department of the Environment 2015)
- *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (Department of Sustainability, Environment, Water, Population and Communities 2012).
- *EPBC Act Policy Statement 3.10: Significant impact guidelines for the vulnerable western ringtail possum (Pseudocheirus occidentalis) in the southern Swan Coastal Plain, Western Australia* (Department of the Environment, Water, Heritage and the Arts 2009)
- *EPBC Act Policy Statement 3.21 - Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (Department of the Environment 2015)
- *EPBC Act Referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo, Baudin's cockatoo and Forest red-tailed Black Cockatoo* (Department of the Sustainability, Environment, Water, Population and Communities 2012)
- *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black-cockatoo, Department of Agriculture, Water and the Environment, Canberra, February 2022.*
- *Forest Black Cockatoo (Baudin's Cockatoo Zanda baudinii and Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan,* (Department of Environment and Conservation 2008)
- National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Department of the Environment and Energy 2020)[1]
- *National Recovery Plan for Malleefowl* (Prepared by J. Benshemesh, Department for Environment and Heritage, South Australia 2007).
- *National Recovery Plan for the Woylie (Bettongia penicillata ogilbyi): Wildlife Management Program No. 51* (Department of Environment and Conservation 2012)

[1] Ceased to be in effect from 1/10/21.

- *Numbat (Myrmecobius fasciatus) Recovery Plan. Wildlife Management Program No. 60* (Prepared by J.A. Friend and M.J. Page, Department of Parks and Wildlife, Perth, WA 2017).
- *Quokka Setonix brachyurus Recovery Plan. Wildlife Management Program No. 56* (Department of Environment and Conservation 2013)
- *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (Department of Environment 2013)
- *Survey guidelines for Australia's threatened birds* (Department of the Environment, Water, Heritage and the Arts 2010)
- *Survey guidelines for Australia's threatened mammals* (Department of the Sustainability, Environment, Water, Population and Communities 2011)
- *Survey guidelines for Australia's threatened reptiles* (Commonwealth Department of the Sustainability, Environment, Water, Population and Communities 2011)
- *Threat abatement plan for competition and land degradation by rabbits* (Department of the Environment and Energy 2016)
- *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi* (Department of the Environment and Energy, Canberra: Commonwealth of Australia 2018).
- *Threat abatement plan for predation by feral cats 2024* (Commonwealth of Australia 2024).
- *Threat abatement plan for predation by the European red fox* (Department of Environment, Water, Heritage and the Arts 2008).
- *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017)* (Department of the Environment and Energy, Canberra, ACT: Commonwealth of Australia 2017).
- *Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan. Wildlife Management Program No. 58.* (Department of Parks and Wildlife 2017).
- *Threat abatement plan for competition and land degradation by unmanaged goats* (Department of the Environment, Water, Heritage, and the Arts (DEWHA), Canberra: Commonwealth of Australia 2008)
- *Wildlife Conservation Plan for Migratory Shorebirds* (Department of the Environment 2015)

6.2.3 Other policy and guidance

- *WA Environmental Offsets Policy* (Government of Western Australia 2011)
- *WA Environmental Offsets Guidelines* (Government of Western Australia 2014)
- *Statutory Guidelines for Mine Closure Plans* (Department of Mines, Industry Regulation and Safety 2020)
- *EPBC Act Environmental Offsets Policy* (DSEWPAC 2012a)
- *EPBC Act Offsets Assessment Guide* (DSEWPAC 2012b)

6.2.4 Fauna naming

This section discusses conservation significant vertebrate fauna with respect to their common names, for ease of association and reflecting the widespread use of common names for these species. Table 6.1 presents the common names of conservation significant vertebrate fauna discussed in detail in this section. Short range endemic invertebrate fauna are discussed with

respect to their scientific names. References to 'Black Cockatoos' refer to the three species listed in Table 6.1.

Table 6.1 Terrestrial vertebrate fauna common names

Common name	Scientific name
Birds	
Forest Red-tailed Black Cockatoo (FRTBC)	*Calyptorhynchus banksii naso*
Carnaby's Cockatoo	*Zanda latirostris*
Baudin's Cockatoo	*Zanda baudinii*
Masked Owl (southwest)	*Tyto novaehollandiae novaehollandiae*
Peregrine Falcon	*Falco peregrinus*
Malleefowl	*Leipoa ocellata*
Mammals	
Woylie	*Bettongia penicillata ogilbyi*
Chuditch	*Dasyurus geoffroii*
Quokka	*Setonix brachyurus*
Quenda	*Isoodon fusciventer*
Brush tailed Phascogale	*Phascogale tapoatafa wambenger*
Western Brush Wallaby	*Notamacropus irma*
Rakali	*Hydromys chrysogaster*
Western False Pipistrelle	*Falsistrellus mackenziei*
Numbat	*Myrmecobius fasciatus*
Reptiles	
Dell's Skink	*Ctenotus delli*
Southern Death Adder	*Acanthophis antarcticus*
Mollusc	
Carter's Freshwater Mussel	*Westralunio carteri*

6.3 Receiving Environment

6.3.1 Baseline studies

A summary of the key terrestrial, aquatic and short-range endemic (SRE) invertebrate fauna studies that have been undertaken in relation to the Proposal are presented in Table 6.2. These study reports are presented in Appendix B.

A summary of the baseline terrestrial fauna survey effort across the fauna habitat types in each Development Envelope is presented in Table 6.3, Table 6.4 and Table 6.5. Fauna habitat types are presented in Section 6.3.3.2.

6.3.2 Previous studies and research

Numerous previous terrestrial fauna studies and research have been undertaken within or near to the Mine DE and considered relevant to the Proposal. Twenty-six studies have been reviewed as part of the Myara North and Holyoake terrestrial fauna desktop assessment and surveys undertaken by GHD (GHD 2025a and 2025b). Relevant survey reports contain detailed summaries (Appendix B).

Table 6.7 presents a broad overview of the methods/results of the key monitoring programs which have been undertaken in the different mining regions. Figure 6.1 A shows the location of a long-term fauna monitoring program in surrounding mining regions.

6.3.2.1 *Baseline survey adequacy*

Terrestrial fauna surveys were undertaken in accordance with EPA (2020) Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment and Commonwealth survey guidelines for Black Cockatoos, threatened bats, threatened reptiles and threatened mammals (GHD 2024, 2025a, 2025b). Surveys targeted conservation significant species identified in desktop assessments. Field surveys were undertaken over June to November (Myara North), July to February (Holyoake) and June to October (O'Neil) (GHD 2024, 2025a, 2025b). Surveys included a range of observation, remote detection and trapping methods to record conservation significant fauna, as presented in the survey effort in Table 6.3, Table 6.4 and Table 6.5. Black Cockatoo foraging, breeding and roosting habitat were surveyed in accordance with the DSEWPaC (2012) referral guidelines that were current at the time of surveys, however habitat has been assessed in this ERD in accordance with the DAWE (2022) referral guidelines, including classification of nesting trees.

Targeted surveys for conservation significant fauna were undertaken at locations selected based on vegetation complexes, topography, geology and other datasets available at the time of survey. Vegetation type mapping was generally not available at the time of survey to guide selection of survey sites, as vegetation surveys were generally undertaken concurrently with or subsequent to the fauna surveys. Accordingly, fauna habitat types were mapped subsequent to the targeted surveys for fauna, however the survey effort is reasonably distributed across the fauna habitat types as presented in Table 6.3, Table 6.4 and Table 6.5 Black Cockatoo nesting trees were surveyed through transects or plots selected based on datasets available at the time of survey and the density of nesting trees across the Mine DE estimated based on statistical analysis (see Section 6.3.3.5). The approach of surveying transects or plots was adopted based on the uncertainty over the specific clearing footprints that may occur over a small portion of the tens of thousands of hectares of survey area and the consequent inefficiency of surveying nesting trees over the entirety of the survey area.

The survey reports present species accumulation curves to demonstrate the success of fauna trapping for its duration (GHD 2025a, GHD 2025b). A likelihood of occurrence and habitat assessment was undertaken for conservation significant fauna based on review of databases, fauna habitats and field survey results.

Given the representative sampling adopted over the extensive Mine DE, baseline surveys would not have captured all Black Cockatoo nesting or nighttime roosting trees, all threatened species occupancy and local habitat features such as Chuditch active dens. There remains potential therefore for habitat features and threatened species occupancy to vary at a local scale. Accordingly, targeted surveys are proposed for conservation significant fauna (including Black Cockatoo nesting and nighttime roosting trees) prior to clearing, once the specific clearing footprints have been defined within the Mine DE (see Section 6.5.1).

Short range endemic fauna surveys were conducted in accordance with EPA (2016) Technical Guidance: Sampling of short range endemic invertebrate fauna. All target SRE groups and habitats within the survey area were surveyed, with the exception of two habitats present in very low extent. This is not considered a limitation for the survey due to the very low representation of these habitats in the survey area and because similar habitats were well sampled (Phoenix 2024, Phoenix 2025). The survey reports present species accumulation curves to demonstrate the success of fauna trapping for its duration (Phoenix 2024, Phoenix 2025).

Table 6.2 Terrestrial Fauna baseline studies

Year	Author	Study Name	Summary of Key Findings	Relevant Proposal Components
2025a	GHD	Myara North – Terrestrial Fauna Survey and Black Cockatoo Assessment	Desktop assessment and two season detailed and targeted (Forest Red-tailed Black Cockatoo, Carnaby's Cockatoo, Baudin's Cockatoo, Chuditch, Quokka, and other priority species) vertebrate fauna survey. • Six broad fauna habitat types identified: Jarrah-Marri forest, Bullich forest, Granite outcrop, Blackbutt forest, Flooded Gum woodland, Melaleuca dampland. Jarrah-Marri forest predominated at 83 per cent of the survey area. A small portion of the survey area comprises highly disturbed land, including pine plantation, mine-rehabilitation area, and rural/clearing. The survey recorded 132 vertebrate fauna species utilising the Survey Area, including 23 mammals, 76 birds, 26 reptiles and seven amphibians. Of these, eight introduced species (mammals and birds) were identified. • Thirteen conservation significant fauna species were recorded. All species identified are likely to have significant populations and habitat present within the Myara North Survey Area. • The Myara North Survey Area lacks open water such as shallow shorelines or tidal zones for migratory bird foraging habitat. The creek lines and vegetated dampland areas within the Myara North Survey Area are not suitable for migratory shorebirds. • All three EPBC Act listed Black Cockatoo species were recorded primarily throughout the Jarrah - Marri Jarrah - Marri forest. All habitat types will be utilised for foraging by either one or all of the species. • Melaleuca damplands and riparian areas comprising Bullich forest, Blackbutt forest and Jarrah - Marri Jarrah - Marri forest support a Quokka (EPBC Act and BC Act Vulnerable) population with records scattered throughout the survey area. • Chuditch (EPBC Act and BC Act Vulnerable) are wide ranging and have the potential to use all habitat types at a relatively low density. • Carter's Freshwater Mussel (EPBC Act and BC Act Vulnerable) was targeted during the survey but no presence was recorded. • *Large areas of the survey area had been burnt within the last 2 to 3 years and observed to cause substantial impact to fauna habitats.*	Myara North mine region and infrastructure corridor
2025b	GHD	Holyoake – Terrestrial Fauna Survey and Black Cockatoo Assessment	Desktop assessment and two season detailed and targeted (Forest Red-tailed Black Cockatoo, Carnaby's Cockatoo, Baudin's Cockatoo, Chuditch, Quokka, and other priority species) vertebrate fauna survey. • Five broad fauna habitat types identified: Jarrah-Marri forest, Bullich forest, Granite outcrop, Blackbutt forest, Flooded Gum woodland. Jarrah-Marri forest predominant, comprising 88 per cent of the survey area. A small portion of the survey area comprises highly disturbed land, including pine plantation, mine-rehabilitation area, and rural/clearing. • The survey recorded 129 vertebrate fauna species utilising the Survey Area, including 22 mammals, 77 birds, 23 reptiles and seven amphibians. Of these, eight introduced species (mammals and birds) were identified. • Ten conservation significant fauna species were recorded. All species identified are likely to have significant populations and habitat present within the Holyoake Survey Area. • The Holyoake Survey Area lacks open water such as shallow shorelines or tidal zones for migratory bird foraging habitat. The creek lines and vegetated dampland areas within the Holyoake Survey Area are not suitable for migratory shorebirds. • All three EPBC Act listed Black Cockatoo species were recorded primarily throughout the Jarrah-Marri forest. All habitat types will be utilised for foraging by either one or all of the species. • Flooded Gum woodland and riparian areas comprising Bullich forest, Blackbutt forest and Jarrah-Marri forest support a Quokka (EPBC Act and BC Act Vulnerable) population with records scattered throughout the Survey Area. • Chuditch (EPBC Act and BC Act Vulnerable) are wide ranging and have the potential to use all habitat types at a relatively low density. • The Holyoake Survey Area is unlikely to support a population of Carter's Freshwater Mussel (EPBC Act and BC Act Vulnerable) due to the lack of permanent surface water. • *Large areas of the survey area had been burnt within the last 2 to 3 years and observed to cause substantial impact on fauna habitats.*	Holyoake mine region and infrastructure corridor
2021	WRM	Aquatic Fauna Desktop Assessment Myara North and Holyoake Regions	• Recent records of Carter's Freshwater Mussel (EPBC Act and BC Act Vulnerable) on Wungong Brook downstream and north of Myara North and in Serpentine Reservoir and on Serpentine River downstream and west of Myara North. Species has potential to occur within Myara North and Holyoake and is known to occur in Serpentine Reservoir. • Recent records of Minute Freshwater Snail (*Glacidorbis occidentalis,* P3) on Big Brook and Serpentine River upstream and south of Myara North, and on Wungong Brook downstream and north of Myara North. Species is considered likely to occur in Myara North. • Hyporheic zone affords seasonal feeding habitat for stygal amphipods (*Uroctena* sp., *Wesniphargus nicholls*i) that are potential SRE fauna. • Rakali (P4) potentially occur in both regions, and Pouched Lamprey (P1) potentially occur in Murray River tributaries in Holyoake. • No conservation significant fish or crayfish species recorded in the Huntly Mine to date, including Myara North and Holyoake regions. Distributions of native fish, crayfish and many endemic macroinvertebrate species are known to overlap both regions.	Myara North DE Holyoake DE

Year	Author	Study Name	Summary of Key Findings	Relevant Proposal Components
			• Potential for populations of macroinvertebrates to occur in streams and headwater swamps, including species of conservation interest, notably stygal amphipods and isopods, and candidate priority dragonflies and damselflies. • Holyoake region (southern portion) drains to the Murray River, which is one of the last remaining unregulated (un-dammed) rivers in the NJF subregion and may provide seasonal connectivity of headwaters for reproductive migration of native fish and habitat for native freshwater crayfish.	
2025	Phoenix	Short-range endemic invertebrate fauna survey for the Huntly Mine Extension	Desktop assessment and two season short-range endemic (SRE) invertebrate fauna survey of Myara North, Holyoake and Huntly Mine rehabilitation study areas. • SRE habitat mapping was undertaken based on vegetation mapping prepared for the Proposal (Mattiske 2021), taking into account habitat attributes relevant to SRE invertebrates. Each habitat was rated for its potential to support SREs (potential habitat rating; PHR) as High, Low or None. Ten habitats were present within the Myara North Study Areas and seven SRE habitats were present in the Holyoake Study Area. • A total of 113 taxa from groups known to include SREs were collected in the field surveys and of these, 83 taxa (73 per cent) from 19 families were classified as SREs. A total of 24 of the SRE taxa, from three SRE groups, are currently known only from sites in the baseline study area, mainly the Myara North Study Area. • Twenty-eight taxa from nine groups known to include SREs were collected from the Rehabilitation Study Area during the surveys. This indicates that SRE taxa can re-colonise rehabilitated areas but, as expected, the diversity is overall considerably lower than that of remnant native vegetation. As the numbers of SREs showed a moderate positive correlation with rehabilitation age, it may be concluded that SRE colonisation improves with age of rehabilitation. • Some overlap of SRE species was identified between the Myara North and Holyoake Study Areas, and between these study areas and records from a nearby large-scale SRE survey or other desktop sources, indicating wider distributions than the baseline study area. However, the survey results suggest at least some SRE invertebrates have narrow habitat preferences and potentially highly restricted distributions. • Overall, Myara North is of higher value for SREs than Holyoake, with greater diversity and abundance of SRE habitat features. Myara North is more likely to harbour SREs with highly restricted distributions than Holyoake.	Myara North mine region and infrastructure corridor Holyoake DE mine region infrastructure corridor
2024	GHD	Terrestrial Fauna Assessment - O'Neil Mine Development	Desktop assessment and multiple phase (seven field mobilisations) detailed and targeted vertebrate fauna survey. Species targeted during the field survey were Forest Red-tailed Black Cockatoo, Carnaby's Cockatoo, Baudin's Cockatoo, Dell's Skink, Southern Death Adder, South-west Brushtailed Phascogale, Quokka, Quenda, Chuditch, Brush Wallaby, Western Ringtail Possum, Western False Pipistrelle, Masked Owl, Malleefowl and Numbat. Targeted survey methods included: Fauna habitat assessments, Pitfall and funnel traps, Elliot box traps, Remote cameras, Acoustic bat and bird call recorders, Diurnal and nocturnal searches, opportunistic observations, comprehensive assessment of Black Cockatoo habitat quality and quantity. Key findings included: • Eight broad fauna habitat types were identified during the field survey and via recent vegetation mapping: Jarrah-Marri forest, Wandoo woodland, Mixed shrub dampland, Bullich forest, Blackbutt forest, Granite Outcrop, Rehabilitation areas, and Cleared areas. • The combined fauna surveys (Reconnaissance to Camera collection) recorded a total of 121 vertebrate fauna species utilising the Survey Area, including 19 mammals (four introduced), 68 Birds, 27 reptiles and seven frogs. • Eight significant fauna species were recorded within the survey area: Baudin's Black Cockatoo, Forest Red-tailed Black Cockatoo, Carnaby's Black Cockatoo, Chuditch, Quokka, Western Bush Wallaby, Dell's Skink, Quenda. • Seven additional significant fauna species were not recorded but are considered likely to occur based on the desktop and field assessment. These were Woylie, Numbat, Peregrine Falcon, Southwestern Brush-tailed Phascogale, Masked Own, Western False Pipistrelle, and Southern Death Adder. • The Black Cockatoo habitat assessment results concluded that breeding habitat is extensive across the Survey Area and one known nesting trees were confirmed within the Jarrah-Marri forest habitat. Foraging habitat is extensive and of high quality throughout the Jarrah-Marri forest, other forest and woodland habitats are considered moderate foraging quality with relatively low density of primary food plant species. • The most evident major threatening process to fauna habitat identified during the survey was the frequency, size and intensity of fire. Large areas of the Survey Area appeared to be burnt within the past three years impacting a large portion of the area in particular large mature hollow bearing habitat trees. Other threatening process include logging practices and feral pig activity.	O'Neil mine region
2024	Phoenix	O'Neil SRE Survey	Desktop assessment and two phase detailed short-range endemic (SRE) invertebrate fauna survey of the O'Neil mine region. The survey was undertaken between July and October 2023 across a survey area of 10,414.5 ha. Key findings included: • Native vegetation represents 9,249.8 ha (88.8%) of the O'Neil study area, with 1,020.9 ha (9.8%) comprising rehabilitated land and the remainder being cleared land, 142.2 ha (1.4%). Ten SRE habitats were defined within study area, which was dominated by Jarrah/Marri woodland/forest habitats. Six habitats were classified as having High potential habitat rating (PHR), with habitat	O'Neil mine region

Year	Author	Study Name	Summary of Key Findings	Relevant Proposal Components
			attributes that often give rise to specialisation or dependency in invertebrate fauna, particularly more mesic habitats on lower slopes and valley floors. These represented 6,624.8 ha (32.1%) of the study area. The remaining 4 habitats were classified as low PHR. • A total of 63 taxa from groups known to include SREs were collected in the field survey and of these, 44 taxa (70%) from 19 families were classified as SREs. • Of the 44 SRE taxa, 28 species are described species or are morphospecies that were matched either morphologically or genetically to previously recorded taxa, and 7 are new species not previously known from morphological or molecular analysis. The remaining 9 are indeterminate taxa. • The high proportion of taxa collected from representatives of SRE groups that were classified as SREs (70%) was consistent with previous Northern Jarrah Forest subregion SRE surveys. • All but 3 of the recorded SRE taxa have been collected from outside the study area from either reference sites in the current survey, or from other SRE surveys of the Northern Jarrah Forest subregion. All 3 were collected from only a single site; however, broader distributions are inferred for each taxon based on habitat of the collected specimens and/or wider distributional records of other (related) SREs from those locations. • Several comparable 2-phase SRE surveys have been undertaken by Phoenix since 2020 in the Northern Jarrah Forest subregion between Jarrahdale and Collie. The current survey at O'Neil recorded a high number of species or morphospecies in common with surveys at adjacent study areas Myara North and Holyoake. There was also considerable overlap in taxa at other study areas (Holyoake East Study Area, Holyoake West Study Area and at Worsley). • While the survey results broadened known distributions for many taxa (including some species previously collected only from one other survey), the absence of additional collections of other SRE taxa from adjacent study areas supports the notion of some species from the subregion having highly restricted distributions.	

Table 6.3 Baseline terrestrial fauna survey effort summary by habitat type – Myara North

Fauna habitat type	Area within survey area (ha)	Number of survey locations within habitat type														
		Visual searches							Remote detectors			Trapping program				
		Diurnal Jun-Jul 2020/Nov 2020	Nocturnal Jul 20, Nov 29	Quokka Jun-Nov 20	Rakali Nov-20	Carters freshwater mussel Nov-20	Bird surveys Jun-Jul 2020, Nov 2020	Black Cockatoo habitat transect – Area (ha) Nov-20	Remote cameras Phase 1/2 Jun-Sep 2020/Nov-Dec 2020	Bird acoustic detectors Jun-Jul 2020, Nov 2020	Bat acoustic recorders Jun-Jul 2020, Nov 2020	Cage traps Jun-Jul 2020, Nov 2020	Cage trap transects (Chuditch) Jun-Jul 2020, Nov 2020	Elliot box traps Jun-Jul 2020, Nov 2020	Pit traps Jun-Jul 2020, Nov 2020	Funnel traps Jun-Jul 2020, Nov 2020
Blackbutt Forest	673	1	2	13	6	46	2	7.8	12	3	1	4	9	20	14	24
Bullich Forest	239			1		6		0.66	3			0		0	0	0
Cleared	258						1	8.7				0		0	0	0
Flooded Gum Woodland	674	2	6	9	4	35	4	2.7	7		3	12		60	42	72
Granite Association	373	4	2		1			81.7	1		1	0		0	0	0
Jarrah-Marri Forest	14,722	39	12	5		7	23	2.5	28	10	14	32	41	160	112	192
Melaleuca Dampland	130	1		3	2	6			2			0		0	0	0
Pine plantation	162															
Rehab	402							0.04								
Unrecorded	n/a				1	10						0		0	0	0
Total	17,633	47	22	31	14	110	30	104.1	53	13	19	48	50	240	168	288

Table 6.4 Baseline terrestrial fauna survey effort summary by habitat type – Holyoake

Fauna habitat type	Area within survey area (ha)	Number of survey locations within habitat type														
		Visual searches							Remote detectors			Trapping program				
		Diurnal	Nocturnal	Quokka	Rakali	Carters freshwater mussel	Bird surveys	Black Cockatoo habitat transect - Area(ha)	Remote cameras Phase 1/2	Bird acoustic detectors	Bat acoustic recorders	Cage traps	Cage trap transects (Chuditch)	Elliot box traps	Pit traps	Funnel traps
		Jun-Jul 2020/Nov 2020	Jul 20, Nov 29	Jun-Nov 20	Nov-20	Nov-20	Jun-Jul 2020, Nov 2020	Nov-20	Jun-Sep 2020/Nov-Dec 2020	Jun-Jul 2020, Nov 2020	Jun-Jul 2020, Nov 2020	Jun-Jul 2020, Nov 2020	Jun-Jul 2020, Nov 2020	Jun-Jul 2020, Nov 2020	Jun-Jul 2020, Nov 2020	Jun-Jul 2020, Nov 2020
Blackbutt Forest	301	4	1	3	1	13	3	2.68	6	1		6	4	20	14	24
Bullich Forest	298	2	1	3	1	2	2	2.21	1	4	2	3	0	0	0	0
Cleared	45	1						0		1			0	0	0	0
Flooded Gum Woodland	391	4	6	13	3	25	6	11.25	19	3	4	3	12	60	42	72
Granite Association	0.2							0					0	0	0	0
Jarrah-Marri Forest	9,310	13	17	6		6	25	79.69	16	9	13	113	20	100	70	120
Melaleuca Dampland	0							0					0	0	0	0
Pine plantation	19							0					0	0	0	0
Rehab	175						1	0	1				0	0	0	0
Unrecorded		4		4	2	7	2		3				0	0	0	0
Total	10,539	28	25	29	7	53	39	95.83	46	18	19	125	36	180	126	216

Table 6.5 Baseline terrestrial fauna survey effort summary by habitat type – O'Neil

Fauna habitat type	Area within survey area (ha)	Number of survey locations within habitat type									
		Visual searches				Remote detectors			Trapping program[2]		
		Diurnal	Nocturnal	Carters freshwater mussel	Black Cockatoo habitat transect - Area(ha)	Remote cameras Phase 1/2	Bird acoustic detectors	Bat acoustic recorders	Elliot box traps	Pit traps	Funnel traps
		Jun-Jul 2023, Nov 2023	Jul 2023, Nov 2023	Nov 2023	Nov 2023	Jun-Sep 2023, Nov-Dec 2023	Jun-Jul 2023, Nov 2023	Jun-Jul 2023, Nov 2023	Jun-Jul 2023, Nov 2023	Jun-Jul 2023, Nov 2023	Jun-Jul 2023, Nov 2023
Blackbutt Forest	242				20	3					
Bullich Forest	216				0	2					
Cleared	301				0	1	1	1			
Granite Association	238	8			0						
Jarrah-Marri Forest	9,498	3	11		30	61	10	9	118	10	100
Wandoo woodland	67				3						
Mixed shrub damplands	579	2			0	9	1	1	12	2	20
Water bodies	15			2	0						
Rehab	1,573				0	2		1			
Unrecorded	n/a					1					
Total	11,733	13	11	2	53	79	12	12	130	12	120

[2] Cage trapping was not undertaken for O'Neil due to risks of trapping reproductive Chuditch. Consequently, remote cameras were utilised as a highly effective replacement

Table 6.6 SRE Fauna Survey effort

No.	SRE habitat type	Myara North survey area			Holyoake survey area			O'Neil survey area			Rehabilitation survey area	
		Area within survey area (ha)	No. survey sites	No. SRE records	Area within survey area (ha)	No. survey sites	No. SRE records	Area within survey area (ha)	No. survey sites	No. SRE records	No. survey sites	No. SRE records
1	Melaleuca woodlands/shrublands on seasonally wet or waterlogged clays and clay loams on valley floors	130	0	10	0	0	0	91	0	0		
2	Open Jarrah/Marri or Blackbutt woodlands on sands, clay-loam or sandy-gravel on lower slopes and valley floors	2,005	25	111	1,459	18	141	1,464	40	163		
3	Heath/shrubland/woodland on shallow soils on granite or outcrops	641	5	38	0	0	0	237	0	0		
4	Open forest to woodland of Jarrah/Marri on sandy-loam gravelly soils on mid-slopes and ridges	11,406	99	377	8,361	71	291	5,981	24	78		
5	Open forest of Jarrah/Marri forest, seasonally moist, sandy gravels on slopes	1,631	15	79	434	5	36	822	8	43		
6	Cleared land (including plantations, dams)	400	0	0	63	0	0	142	0	0		
7	Open forest to woodland of Jarrah/Marri on slopes and less undulating hills	733	11	23	1	0	0	41	0	0		
9	Open Eucalyptus woodlands (wet) on sands, clay loam or sandy gravel on lower slopes and valley floors	94	0	0	0	0	0	0	0	0		
10	Open woodlands of Flooded Gum on seasonally wet or water-logged clays and clay loams on valley floors	229	8	44	0	0	0	430	8	32		
11	Open woodlands of Wandoo with clay-loams and some gravel on upper slopes	3	0	0	0	0	0	31	0	0		
12	Rehabilitation (post-mining rehabilitation using mostly native species)	n/a	0	0	n/a	4	11	n/a	0	0	49	124
13	Bullich forest on seasonally on seasonally moister sandy-loam gravelly soil lower slopes and valley floors	0	0	0	0	0	0	153	17	65		

Table 6.7 Previous terrestrial fauna studies and research

Year	Author	Project / Study region	Summary of key methods/findings	Location in relation to the Proposal
1992, 1995, 1998, 2001, 2003, 2006, 2007	Environmental Management and Research Consultants (EMRC)	Long term fauna monitoring program (LTFMP) - Jarrahdale, Huntly, Karnet	The Alcoa Long Term Fauna Monitoring Program was designed in 1991. The program is designed to monitor fauna every three years at twenty plots located in rehabilitation and nearby forest at Jarrahdale, Huntly and Karnet (remote from mining). A variety of different survey methods were used including trapping (five successive trap nights in July, August and September), avifauna (quantitative and inventory surveys in summer and winter), reptile survey (trapping over five consecutive nights in summer with toenail clippings to indicate recapture) opportunistic survey, nocturnal surveys and active searches. The LTFMP recorded (see Table 6.8): • Huntly site: 18 mammal, 49 bird and 16 reptile species; including six conservation significant species • Jarrahdale site: 15 mammal, 56 bird and 21 reptile species; including five conservation significant species • Karnet site: 9 mammal, 44 bird and 14 reptile species; including three conservation significant species. Frog and ant species were also recorded.	Eight survey plots established in Jarrahdale, eight plots established in Huntly and four control plots at Karnet. Locations presented in Figure 6.1 A. Jarrahdale plots are mostly 3 km to the north of the Myara North DE with two transects falling within the mining region, close to Jarrahdale town.
2003, 2007, 2013	EMRC	Long Term Fauna Monitoring Program (LTFMP) – McCoy	The monitoring program involved survey of terrestrial vertebrates (including mammals, birds and reptiles) and ground invertebrates. Mammals, birds, reptiles, and frogs were surveyed in both winter (July-August) and summer (December-January). Mammal and reptile trapping were undertaken. Birds were surveyed using quantitative methods (transects) and inventory methods (opportunistic recordings). In the 2013 survey, additional methods were implemented including a single large trapping transect to sample highly mobile species, remote sensor cameras and all invertebrates collected in pitfall traps were identified to taxonomic order. The McCoy LTFMP recorded (see Table 6.8) 16 mammal, 51 bird and 10 reptile species; including four conservation significant species. Frog and ant species were also recorded.	Six plots established, two in the Cameron catchment, two in the Gordon control catchment and two between these and the current Huntly Mine McCoy region crusher site. In 2013 survey - an additional three sites established in two year old rehabilitation within the McCoy Intermediate Rainfall Zone. Locations presented in Figure 6-1C. Approximately 15 km south of the Myara North mine region and 3 km north of the Holyoake mine region.
2012	Stokes	Vertebrate fauna survey of planned mining areas at Alcoa's Keats Mining Region 2011/12	Fauna were surveyed between November 2011 and February 2012 using a range of techniques, including trapping (Elliot), remote sensor cameras, tracking tunnels, observational surveys and spotlighting across a diversity of forest types. Five areas were trapped: two *Phytophthora* dieback free Jarrah forest areas and three stream zones. Pitfall traps were not used due to time constraints. Black Cockatoo habitat, feeding and occurrence was surveyed during January 2012 covering approximately 840 ha. Recorded conservation significant fauna comprise: • Forest Red-tailed Black Cockatoo - foraging evidence, flock of 11 sighted • Baudin's Cockatoo - foraging evidence, two individuals sighted • Chuditch - one young male trapped • Western Brush Wallaby - opportunistic sighting and recorded on cameras • Carpet Python (delisted) (sighting).	Approximately 16 km south of the Holyoake mine region in the Keats mining region (Willowdale Mine), in areas to the east and south-west of Lane Poole Reserve
1999 2004, 2011, 2015	EMRC Stokes / EMRC	Orion (Willowdale Mine) related studies: 1. A fauna survey of planned mining areas at Alcoa's Orion Mining region 2. Long Term Fauna Monitoring Program (LTFMP) - Orion	1. Fauna survey conducted between February and November 1999. The habitats monitored were current mining areas that were previously not covered in detailed surveys, extensive *Phytophthora* dieback affected areas, small *Phytophthora* dieback free areas and planned sites for mining operations. A total of 46 bird species, nine mammals (six native, three introduced), 13 reptiles and five frogs were recorded. These included three threatened species (the Chuditch, Baudin's Cockatoo and possibly the Quokka) and one Specially Protected species (the Carpet Python - no longer listed). As well as these, the Noisy Scrub-bird has been reintroduced into the area and the uncommon Brush-tailed Phascogale was present in low densities. The fauna of the Orion area was largely comparable to that of existing Willowdale mining areas. Results emphasise the need for ongoing fox control. Rehabilitation using Jarrah and other native flora species offers the best prospects of successfully recreating suitable habitat for the species. 2. The Orion LTMFP was reviewed in 2003 which included a recommendation for a similar program to be established at Orion so that any changes in faunal successional processes taking place could be detected. This utilised similar techniques to those used at Jarrahdale, Huntly and McCoy. Mammals, birds, reptiles and frogs were surveyed during both summer (March) and winter (July), and ground dwelling invertebrates were sampled in summer only. Survey methods were similar to those used in the original LTFMP. A single large trapping transect designed to specifically target Chuditch was used in the later studies. The Orion LTFMP recorded (see Table 6.8): • 15 mammal, 54 bird and 19 reptile species; including five conservation significant species	Six monitoring sites within Orion mine region (Willowdale Mine) comprising two typical upland forest areas, two associated with stream zones and two within rehabilitated forest (8 years old). Roughly 15 km to the south west of the Holyoake DE.

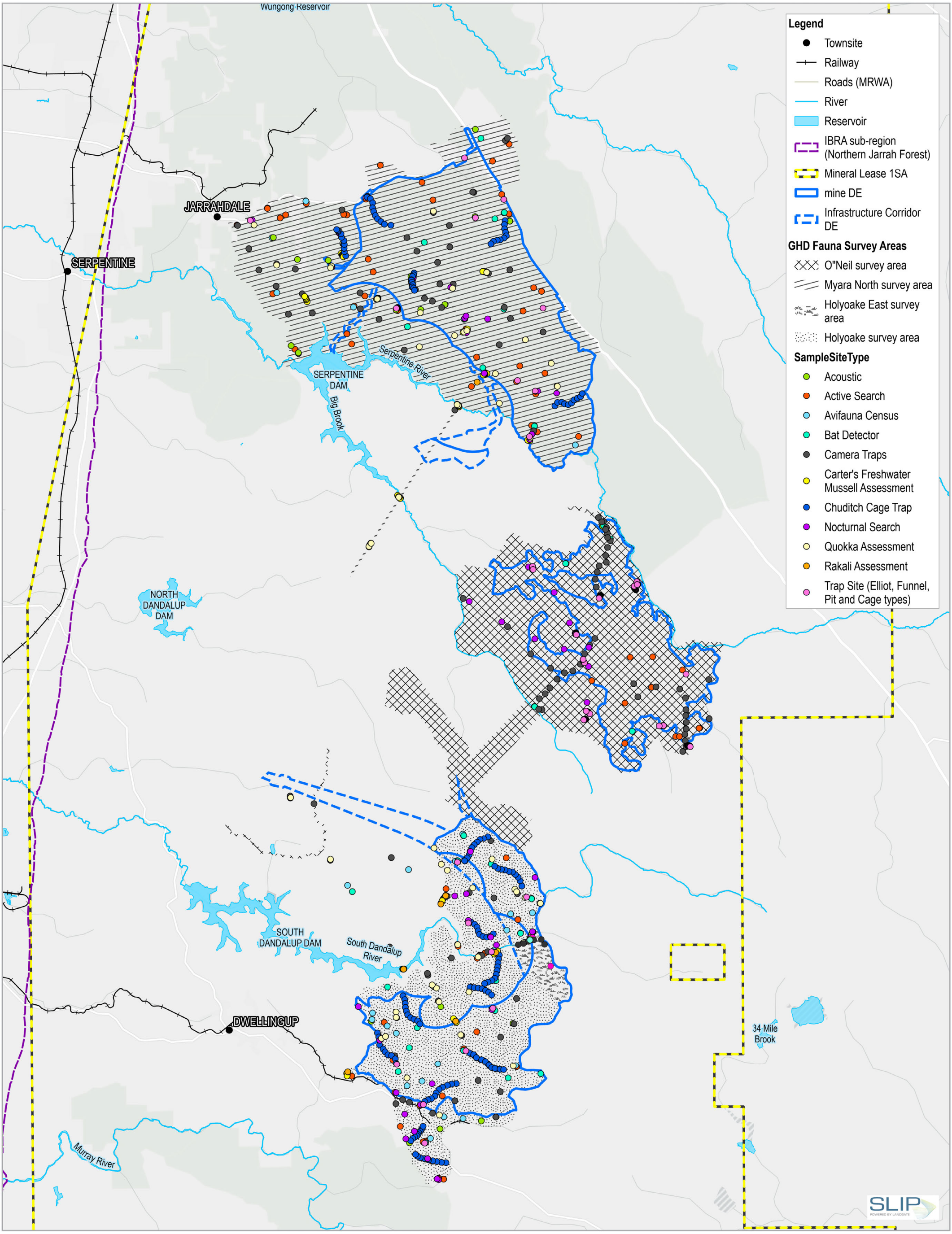
Year	Author	Project / Study region	Summary of key methods/findings	Location in relation to the Proposal
2000, 2007	EMRC	A Vertebrate Fauna Survey of Rehabilitated Areas at Alcoa's Huntly Mine site	Overview of the vertebrate fauna surveys of Alcoa's rehabilitated bauxite mines at Huntly undertaken in 1994, 2000 and 2007. Mammals, birds and reptiles were surveyed in six rehabilitated pits ranging in age from 8 to 16 years and recorded.	Historic Huntly 1 & 2 mine regions– approximately 15 km west of the Holyoake mine region and 25 km south west of the Myara North mine region.
2000	EMRC	A survey of the impact of burning on mammals and birds in Alcoa's rehabilitated Bauxite mines at Jarrahdale	To understand the impact of burning on birds and mammals, pre-burn monitoring took place 1997, with post-burn monitoring commencing in 1998 in both burnt and unburnt, rehabilitated and unmined forest sites. Low numbers of mammals were caught making it difficult to determine whether burning had an effect on most species. New epicormic growth may have attracted possums into one rehabilitated area, while mice invaded the dense rehabilitated site after the burn. There was a large decline in the numbers of birds and bird species recorded following the burn in the dense rehabilitation. Burning sparse rehabilitation only resulted in a small decline while fire had little effect on bird populations of unmined forest. The survey was conducted three years after burning in 1997, and it was concluded that more time was needed to define the longer-term effects of burning on mammals and birds.	Jarrahdale Mine (two unmined and four rehabilitated bauxite mine pits) Approximately 2 km north of the northern boundary of the Myara North mine region.
2015, 2017	Burgar *et al.*	Bat related studies: 1. The importance of mature forest as bat roosting habitat within the production landscape 2. Habitat features act as unidirectional and dynamic filters to bat use of production landscapes	Surveys undertaken in forest surrounding Huntly mine site, both unmined and different stages of vegetation succession. 1. *Nyctophilus gouldii* (Gould's long-eared bat) and *Vespadelus regulus* (Southern Forest Bat) were trapped and tracked during maternity and mating seasons using harp traps and position-sensitive radio transmitters. Few bats were captured in rehabilitated forest, so traps were relocated to water sources. Study aimed to identify roost habitat within restored forest versus unmined forest. Findings indicate that habitat restoration in production forest landscapes is unlikely to play a significant role in conserving species that rely on slow developing microhabitats such as tree hollows for decades or centuries and that retaining and managing forest remnants would be a more effective strategy to conserve populations of these species. 2. Ultrasonic detectors (Anabat Titley Electronics) were set at 64 sites four times per year between October and March 2010/2011 and 2011/2012 for a total of 512 survey nights. *Vespadelus regulus* was detected most frequently and *Falsistrellus mackenziei* (P4, BC Act) least frequently.	Historic Huntly 1 & 2 mine regions, approx. 22 km south west of the Myara North mine region and 10 km north west of the Holyoake mine region.
2013, 2014	Alcoa McGregor *et al.*	Chuditch related studies: 1. Chuditch survey raw data Myara. 2. Does forest restoration in fragmented landscapes provide habitat for a wide-ranging carnivore?	1. Trapping transects undertaken in 'Myara west' and 'Myara east'. Trapping recorded eight Chuditch captures at 'Myara west' and one Chuditch at 'Myara east' between 18-22 March 2013. Total number comprises five males and four females. 2. Fourteen Chuditch trapping sessions (13 at Huntly, one at Willowdale) across 9 trapping transects (8 at Huntly, one at Willowdale) undertaken between June 2009 and Dec 2010. The study identified 138 den sites from 11 tracked animals: 75 in unmined forest and 63 in restored forest ranging from 2-32 years old. In unmined forest, dens were mostly in hollow logs and ground burrows beneath tree stumps, but these substrates were never used in restored forest where dens were mostly ground burrows, usually associated with rock piles at the surface.	1. Location described as 'Myara west' is approx. 7 km south west of the Myara North mine region near Karnet Prison Farm and 'Myara east' is approx. 3 km south of the Myara North mine region and within the Myara North infrastructure corridor. 2. Historic Huntly 1 & 2 mine regions and Willowdale Mine approx. 10 km north west and approx.15 km south west of the Holyoake mine region respectively.
2016, 2019	Doherty *et al.* Mastrantonis *et al.*	Black Cockatoo related studies: 1. Successional changes in feeding activity by threatened cockatoos in revegetated mine sites. 2. Climate change indirectly reduces breeding frequency of a mobile species through changes in food availability.	1. 232 plots were surveyed in rehabilitated forest and 480 plots were surveyed in unmined forest to determine whether there were successional patterns in cockatoo feeding activity in revegetation aged between 4 and 23 years. The study concludes that black cockatoos feed in vegetation at all three mine sites, despite variations in vegetation age, structure and floristics. Black Cockatoos began feeding on proteaceous and myrtaceous food plants within four and seven years following revegetation, indicating that some food sources are restored quickly after mining disturbance of the Jarrah forest. The results highlight the importance of monitoring fauna recolonization over appropriate time scales to understand how successional processes in revegetation influence fauna persistence in production landscapes. 2. Using a dataset of annual breeding frequency spanning 19 years, in combination with hydrological, climatological, and remotely sensed data, the effects of environmental variation on the annual breeding frequency of Forest Red-tailed Black Cockatoo's (FRTBC) were modelled. Results found several significant relationships between annual breeding frequency of FRTBCs and environmental variation. While the model, which included a proxy for the availability of the cockatoo's primary food source and the previous season's rain, explained 49 per cent of annual breeding frequency, FRTBC breeding was found to be linked to the spatiotemporal availability of its primary food sources, the fruit from the tree species, Marri and Jarrah. However, due to climate change experienced and predicted to be experienced in the future in Western Australia, it is expected that the food resources during the breeding season for Black Cockatoos will become increasingly limited in time and space, thus threatening their persistence.	1. Historic Huntly 1 & 2 mine regions, approx. 22 km south west of the Myara North mine region and 10 km north west of the Holyoake mine region. Newmont Boddington Gold Mine, approx. 35 km south east of Myara North mine region and 12 km east of Holyoake mine region. Boddington Bauxite Mine, approx. 55 km south east of Myara North mine region and 30 km south east of Holyoake mine region. 2. Survey area within NJF of South West Western Australia over both the Swan and Murray River Catchments.

Year	Author	Project / Study region	Summary of key methods/findings	Location in relation to the Proposal
2019-2020	Tony Kirkby	Myara North Black Cockatoo surveys	Black Cockatoo surveys undertaken by a Black Cockatoo specialist ecologist as engaged by Alcoa. Surveys undertaken along tracks throughout Myara North and reviewing the trees present 30 m either side of the track. Eighty-two suitable nesting trees with suitable nest hollows were recorded.	Myara North DE

Table 6.8 Terrestrial vertebrate fauna species recorded during Alcoa Long Term Fauna Monitoring Surveys

Mine	Monitoring site	Total recorded species			Total conservation significant species recorded			Conservation significant species recorded[3]		
		Mammal	Bird	Reptile	Mammal	Bird	Reptile	Mammal	Bird	Reptile
Huntly	Huntly	18	49	16	3	2	1	Chuditch, Quokka, Brush tailed Phascogale	FRTBC, Baudin's Cockatoo	Dell's Skink
	Jarrahdale	15	56	21	2	2	1	Quokka, Brush tailed Phascogale	FRTBC, Baudin's Cockatoo	Dell's Skink
	Karnet	9	44	14	-	2	1	-	FRTBC, Baudin's Cockatoo	Dell's Skink
	McCoy	16	51	10	1	2	1	Chuditch	FRTBC, Baudin's Cockatoo	Dell's Skink
	Myara	1	-	4	1	-	-	Chuditch	-	-
Willowdale	Keats	3	25	7	1	-	-	Chuditch	-	-
	Larego	5	31	8	-	1	-	-	FRTBC	-
	Orion	15	54	19	2	3	-	Chuditch, Brush tailed Phascogale	FRTBC, Baudin's Cockatoo, Carnaby's Cockatoo	-
	Willowdale	7	32	6	2	1	-	Chuditch, Brush tailed Phascogale	FRTBC	-

[3] Refer to Section 6.3.3.4 for species listing status, habitat and population.



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0 1.5 3 4.5 6

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Baseline fauna survey locations - terrestrial vertebrate fauna

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-1.1

Baseline site:
MN, MC, HC, CMRA, OE series.

Rehabilitation site:
RH series.

Legend

- Townsite
- Railway
- Roads (MRWA)
- River
- Reservoir
- Mineral Lease 1SA
- IBRA sub-region (Northern Jarrah Forest)
- mine DEs
- Infrastructure Corridor DEs

Phoenix (2024a, 2024b) SRE Survey Locations

WRM (2019) Streamzone Monitoring Locations

RHopp01
Mundijong
MN-001
MN-012
MN-017
oppMN
MN-011
JARRAHDALE
Jarrahdale
MN-003
MN-024
MN-023
MN-013
MN-022
MN-027
MN-025
SERPENTINE
Serpentine
TL7
MN-018
MN-014
MN-010
MN-002
TL8
Serpentine National Park
5/1/g/Reserve Monadnocks
MN-026
MN-021
MN-016
MN-028
MN-004
MN-009
MN-005
MN-015
SERPENTINE DAM
Serpentine River
MN-020
MN-019
MN-006
Big Brook
MN-008
MC001
MN-007
BF01
TL9
Monadnocks Conservation Reserve
South Western Hwy
SN07
CMRA-008
Albany Hwy
MC002
MC003
SN11
OE-002
MC004
BF07
OE-004
RH10B
RH05B
CMRA-007
MC005
SE52*
SE21
CMRA-005
OE-008
RH10A
NORTH DANDALUP DAM
North Dandalup
RH05C
CMRA-003
OE-007
OE-003
RH05A
BF15
CMRA-006
RH10C
SE15
SE18
CMRA-002
BF13
SE34
SE03
OE-012
RH20A
RH20B
BF14
OE-009
SE16
OE-010
CMRA-001
SE06
OE-001
OE-006
SE14
RH20C
SE12
SE19
RH30B
H011
HC001
HC002
H010
SD27
SD26
RH30C
RH30D
H007
H002
H005
H001
TL5
Marrinup
SOUTH DANDALUP DAM
South Dandalup River
H012
H003
H016
H008
H022
H006
H009
34 Mile Brook
DWELLINGUP
Dwellingup
H020
H014
H015
H021
TLSite2
H019
Murray River
H004
H018
H013
H017
Conservation Park Lane Poole
SLIP

Scale: 1:175,000 at ISO A3

0 1.5 3 4.5 6

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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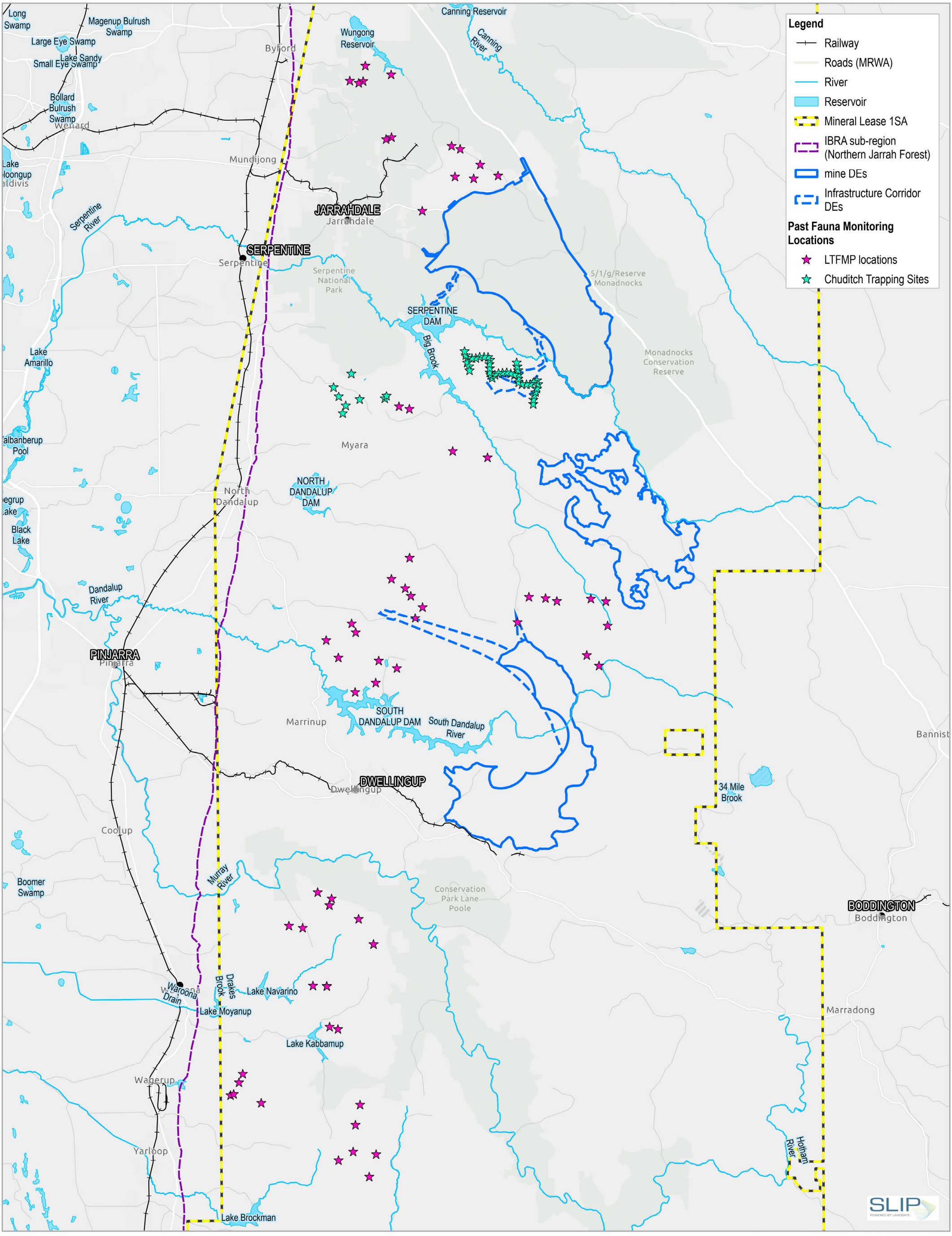
Fauna survey locations - SRE baseline survey and aquatic fauna monitoring

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-1.2



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0 2.5 5 7.5 10

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Fauna survey locations - historic and long term terrestrial vertebrate monitoring

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-1.3

6.3.3 Terrestrial vertebrate fauna

6.3.3.1 Fauna communities

GHD (2024, 2025a, 2025b) conducted detailed and targeted terrestrial fauna surveys over the Mine DE and identified three main fauna communities to be present:

- Granite outcrop
- Woodlands/forests
- Damplands/riparian.

These communities align with the major habitat types present and are further discussed in Section 6.3.3.2.

The granite fauna community is present within the granite outcrop habitat type. This habitat type provides shelter and foraging for a range of reptile and frog fauna, such as the Ornate Crevice-dragon, Barking Gecko, Speckled Stone Gecko, Gould's Hooded Snake, Southern Carpet Python, and Black-headed Monitor. Associated water courses provide seasonal breeding for locally common frog species such as Quacking Froglet and Moaning Frog.

The woodlands/forests fauna community occurs in Jarrah-Marri forest, Bullich forest, Blackbutt forest and Flooded Gum woodland habitat types. The woodland and forest habitat provides habitat for a range of species including birds (including Black Cockatoos) and mammals (including Chuditch, Brush-tailed Phascogale and Western Brush Wallaby).

The damplands/riparian fauna community occur in the low dense understory and near creek lines present in the majority of fauna habitat types (Bullich forest, Blackbutt forest, Flooded Gum woodland, Melaleuca dampland). Quokka, Quenda, Rakali and several frog and reptile species are potentially present in this community.

More detail regarding the specific fauna species present in each community is further discussed in Sections 6.3.3.3 and 6.3.3.4.

6.3.3.2 Fauna habitats

The detailed and targeted terrestrial fauna surveys (GHD 2024, 2025a, 2025b) identified nine broad fauna habitat types within the Mine DE, based on vegetation, hydrology, soil and topography. The fauna habitat types are presented in Table 6.9, Figure 6-2.1, Figure 6-2.2 and Figure 6-2.3.

The surveys covered the Mine DE and a 100 m wide corridor around the indicative conveyor routes within the infrastructure corridors. Fauna habitat types have been interpreted for the infrastructure corridor based on previous vegetation mapping by Mattiske (2021) (see Section 5.3.3).

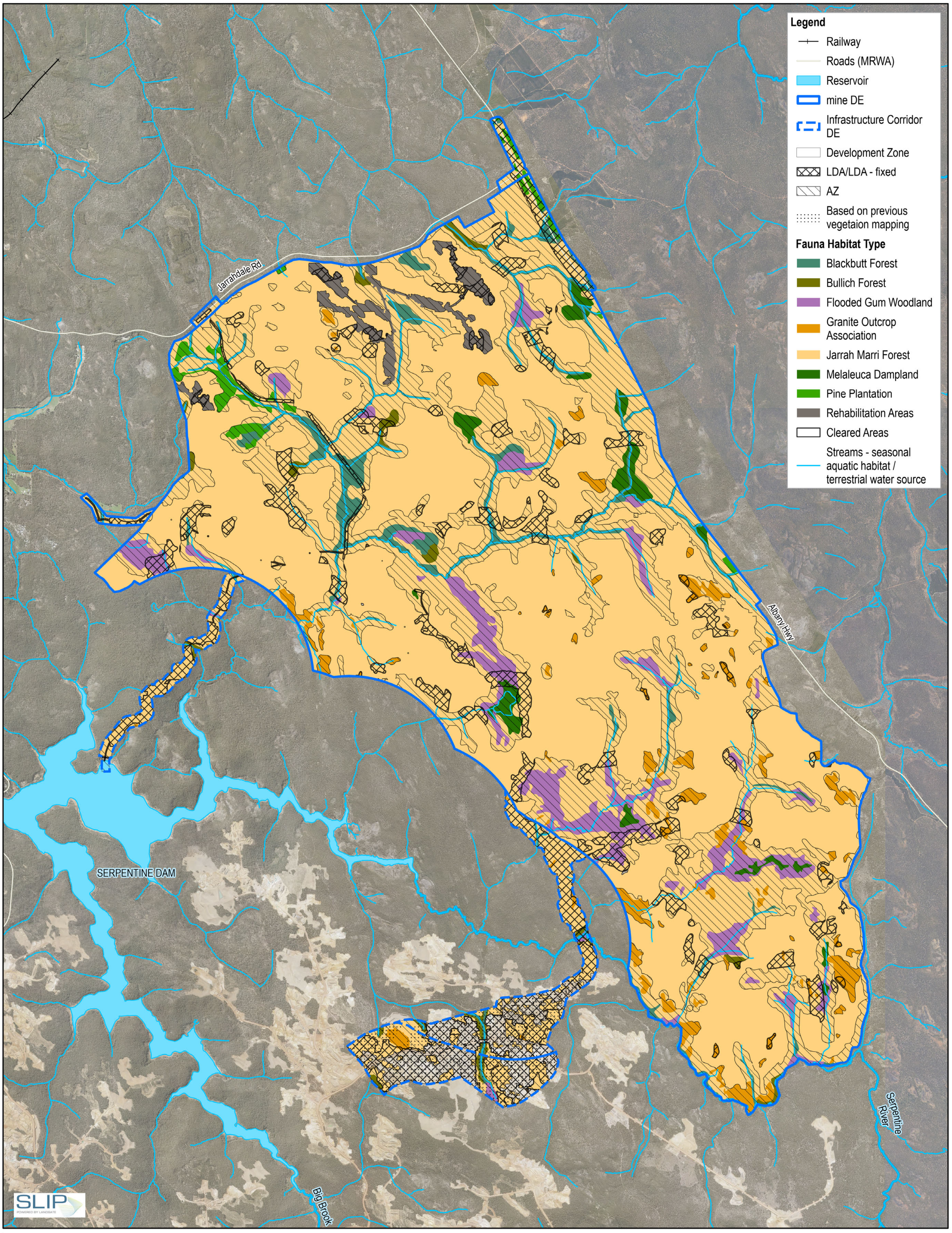
A small proportion of the Mine DE comprises cleared rural land. Cleared land has limited habitat values due to lack, paucity, or low quality of intact native vegetation.

In addition to the mapped terrestrial fauna habitats, the Mine DE contains aquatic habitat associated with seasonally flowing streams, seasonally waterlogged swamps and downstream artificial perennial water bodies (drinking water reservoirs). Aquatic habitat is described separately in Section 6.3.4.

Table 6.9 Fauna habitats present in the Mine DE

Description	Associated vegetation types (Section 5.3.4.2)	Myara North DE (ha)	Holyoake DE (ha)	O'Neil DE (ha)	Mine DE total (ha)	Mine DE (%)
Blackbutt Forest Blackbutt (*Eucalyptus patens*) open forest with occasional Bullich, and Marri over sparse *Banksia littoralis* over *Trymalium, Macrozamia, Xanthorrhoea preissii*, over *Lepidospermum tetraquetrum*, *Astartea scoparia* and areas of dense Swamp peppermint (*Taxandria linearifolia*). This habitat is limited to localised patches, often associated with creeks and drainage lines. Disturbance factors include frequent fire, feral pigs, *Phytophthora* dieback, trail bike and 4WD.	AW, C, CW	427	169	46	642	2.68
Bullich forest Valleys and drainage areas dominated by Bullich (*Eucalyptus megacarpa*) and with some Blackbutt (*E. patens*), occasional Marri (*Corymbia calophylla*), over Sheoak (*Allocasuarina fraseriana*), *Banksia littoralis* over Grass trees (*Xanthorrhoea preissii*), Bracken fern, patches of dense *Gahnia trifida* shrubland over *Lasiopetalum floribundum*, sedges and herbs. Substrate is dark clayloam soil. These areas are associated with seasonal creeks and drainage areas. This habitat is limited in extent to localised patches in the Myara North DE. Disturbance factors include frequent fire, feral pigs, *Phytophthora* dieback.	W, WA	70	187	23	280	1.17
Flooded Gum woodland Flooded Gum (*E. rudis*) open woodland with occasional Blackbutt, over open to open to sparse *Banksia littoralis* over Prickly Moses (*Acacia pulchella*), myrtaceous species such as Swamp peppermint (*Taxandria linearifolia*), *Astertea scoparia Trymalium odoratissimum*, low shrub/sedgeland. Substrate varies from dark grey to grey brown sandy clays. Associated with poorly drained broad valleys forming seasonal swamps and occasionally tall open forest along drainage lines. Disturbance factors include frequent fire, feral pigs.	AC, AD, AX	511	264	122	897	3.75
Granite outcrop Granite outcrops with associated lithic vegetation complexes and adjacent associated fringing open Jarrah and Marri areas with scattered Sheoak, Melaleuca, *Banksia ilicifolia* over occasional Grass trees over mixed open heath communities of myrtaceous and proteaceous low shrubs. Soils are pale grey to yellowish fine sand or sandy clay. Granite outcrops are often associated with seasonal watercourses and seasonally damp areas. This habitat was found as localised patches throughout the Survey Area. Disturbance factors include frequent fire, feral pigs, *Phytophthora* dieback, damage caused by rock removal, trail bike and 4WD on granite.	G, G1, G2, R	303	0	139	443	1.85
Jarrah – Marri forest *E. marginata* and *C. calophylla* open forest over Grass trees (*Xanthorrhoea preissi*), *Lasiopetalum floribundum*, Macrozamia mid shrubland. Patches have dominance of understory *Allocasuarina fraseriana* and *Banksia grandis*. Often with a complex mosaic of low shrubs such as Fabaceae, *Hibbertia*, *Leucopogon*, *Adenanthos*, and *Pteridium*. This is the most extensive habitat identified and comprises a number of vegetation types dominated by Jarrah on upper, mid and low slopes and broad valleys. Soils range from well drained gravely sand to sandy clay loam. Historical logging is a significant disturbance factor: extensive areas of forest are at varying ages of regeneration. Other disturbances include frequent fire (significant), feral pigs, *Phytophthora* dieback, trail bike, 4WD and dumped rubbish including weed plants.	D, DA, DG, E, P, PG, PS, PT, PW, Q, S, SP, ST, SW, T, TP, TS	8,750	6,799	4,707	20,255	84.75
Melaleuca dampland Paperbark (*Melaleuca pressiana*) over sparse isolated *Banksia littoralis* over open *Hakea*, occasional Woody Pear (*Xylomelum*), Grass trees and over mixed shrublayer of Cyperaceae, Restionaceae, *Babingtonia*, *Jacksonia* and *Acacia*, over low shrubs, sedges and herbs. There are areas of sparse to occasional stunted Jarrah and Marri, however these are limited to lowland transitional zones adjacent to slightly higher elevation and drainage open forest areas. Generally limited to areas of poor drainage and subject to winter inundation such as broad valleys and swamps. Substrate is grey gravely clay and clay loam. Disturbance factors include frequent fire and feral pigs.	A	129	34	34	197	0.82
Wandoo woodland Tall wandoo woodlands with occasional Jarrah and Marri trees. There is extensive recruitment of young Wandoo dominating the understory due to low level of historical logging. Shrub layers dominated by Grass trees (*Xanthorrhoea preissii*), *Macrozamia riedlei* over mixed low shrubs including Grevillea, *Banksia dallanneyi*, and Hibbertia. Substrates consist of heavy pea-gravel sandy clay loam.	Y, YG, AY	0	0	11	11	0.05
Mine rehabilitation Historical mine rehabilitation (> 20 years old) of the Huntly Mine and former Jarrahdale Mine. This is historical rehabilitation under previous completion criteria and not representative of current or future rehabilitation programs. These areas include either regrowth of native tree species or exotic eucalyptus trees.	-	156	158	391	706	2.95
Pine plantation These are monocultures of Pine timber tree species (*Pinus*). They tend to be devoid of understory and ground layer of native vegetation.	-	87	0	0	87	0.37

Description	Associated vegetation types (Section 5.3.4.2)	Myara North DE (ha)	Holyoake DE (ha)	O'Neil DE (ha)	Mine DE total (ha)	Mine DE (%)
Other Areas						
Cleared areas	-	264	13	97	374	1.57
Unsurveyed		7	0	0	8	0.03
Total Area		**10,705**	**7,624**	**5,571**	**23,900**	**100.00**



Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Terrestrial Fauna Habitats
Myara North

Project No. **12633192**
Revision No. **3**
Date **26/03/2025**

FIGURE 6-2.1

SOUTH DANDALUP DAM

Kennedy's Pool

South Dandalup River

Pinjarra Williams

Legend

- Railway
- Roads (MRWA)
- Reservoir
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

Fauna Habitat Type

- Blackbutt Forest
- Bullich Forest
- Flooded Gum Woodland
- Granite Outcrop Association
- Jarrah Marri Forest
- Melaleuca Dampland
- Rehabilitation Areas
- Cleared Areas
- Streams - seasonal aquatic habitat / terrestrial water source

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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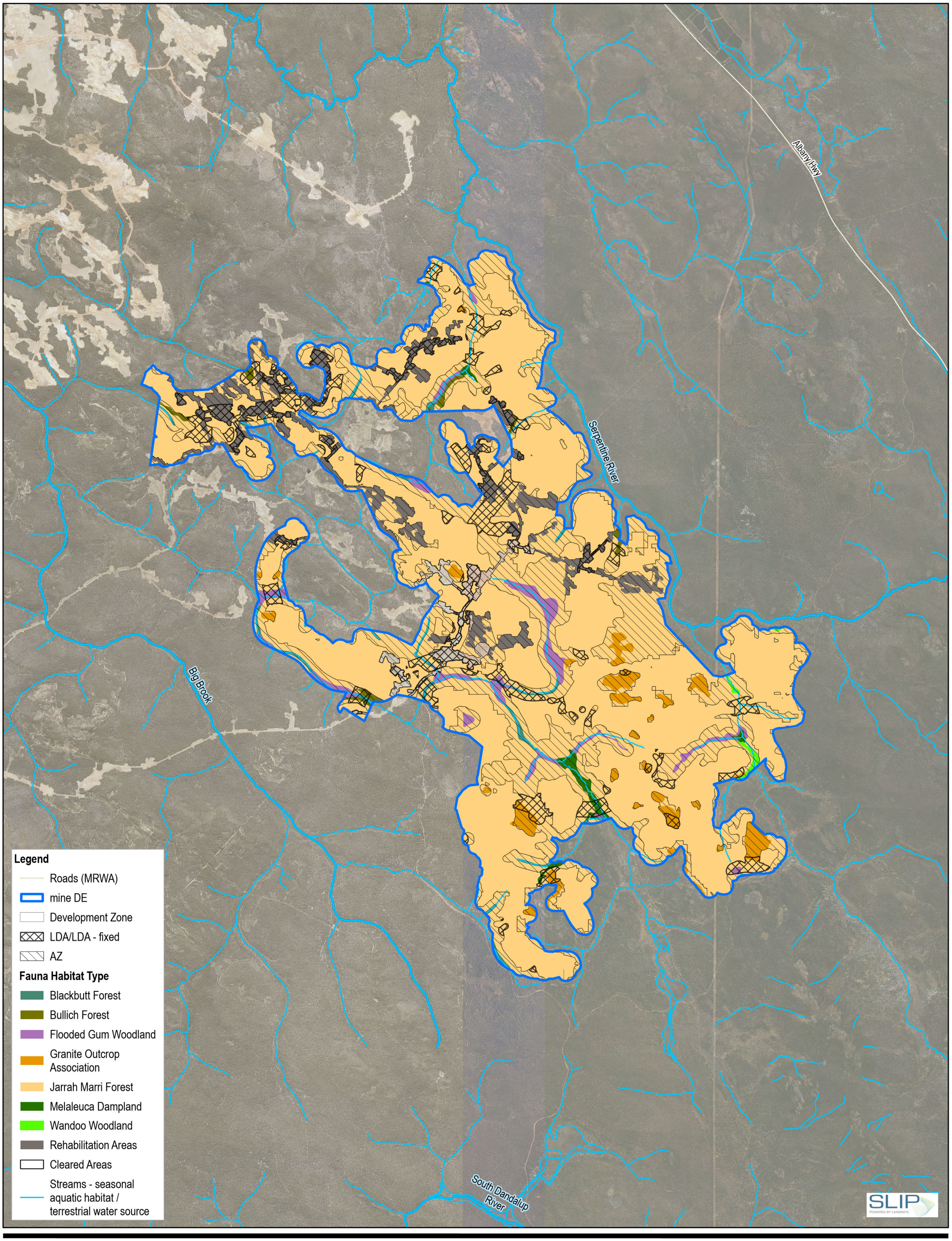
Terrestrial Fauna Habitats Holyoake

Project No. **12520591**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-2.2



Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Terrestrial Fauna Habitats
O'Neil

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-2.3

The habitat mapping results were broadly consistent with the vegetation type and complex mapping (see Sections 5.3.3.1 and 5.3.3.2). Approximately 84 per cent of the Mine DE comprises Jarrah-Marri forest, which is associated with the P, S, T, E and D dominant SVTs in uplands and slopes, and is widespread across the NJF. A further 3 per cent of the Mine DE comprise mine site rehabilitation, which is predominantly a restoration of the Jarrah-Marri forest habitat type. Portions of the Jarrah-Marri forest habitat type associated with the E and D dominant SVTs on the lower slopes are associated with potential GDEs (Section 5.3.4.6) and high-value SRE habitat (Section 6.3.5.2).

Approximately 4 per cent of the Mine DE comprises Blackbutt and Bullich Forest, associated with the C and W dominant SVTs in lower slopes and creek lines, and less widespread across the NJF subregion. These habitat types are also associated with potential GDEs, seasonal aquatic fauna habitat along creek lines (Section 6.3.4) and high value SRE habitat.

Approximately 6 per cent of the Mine DE comprises Flooded Gum Woodland and Melaleuca Dampland, associated with the A dominant SVT in swamps and drainage floors, which has a relatively restricted distribution in the NJF subregion. These habitat types are also associated with potential GDEs, seasonal aquatic fauna habitat and high value SRE habitat.

Approximately 2 per cent of the Mine DE comprises Granite Outcrops, associated with the G and R dominant SVTs, comprised VTs with G and R dominant, which is relatively restricted in distribution in the NJF subregion. This habitat is also associated with high value SRE habitat.

Approximately 2 per cent of the Mine DE comprises cleared land and pine plantations.

Approximately 0.05 per cent of the Mine DE comprises Wandoo woodland, comprising VTs with Y dominant.

Habitat linkages

The Mine DE represents a large continuous tract of fauna habitat that retains high connectivity to the habitats directly adjacent. Riparian zones and swamps in the Mine DE support relatively low density vegetation which has a linkage value as preferred habitat for medium sized mammals, such as Quenda and Quokka.

The Mine DE lies within the catchments of six water supply dams. These reservoirs represent terminuses to the riparian corridor networks in the upper Serpentine River, 39 Mile Brook, Big Brook and upper South Dandalup River, creating barriers to downstream ground (and aquatic) fauna movements.

Quality of habitat

The vegetation within the Myara North DE is predominantly (89.8 per cent) in Good to Very Good condition, predominantly Very Good to Excellent (71.1 per cent) in the Holyoake DE, and predominantly Good to Excellent (69.6 per cent) in the O'Neil DE, although impacted by timber harvesting, *Phytophthora* dieback, weeds, and the presence of tracks and roads (see Section 5.3.4.3). Despite this, the Mine DE contains a large and predominantly contiguous intact forest with seasonal creeks and wetlands, providing multiple habitat types suitable for wide ranging species such as Black Cockatoos, Chuditch, Brush-tailed Phascogale and Western Brush Wallaby.

In granite outcrops, some areas showed signs of damage in the form of broken/shattered rocks with tyre tracks observed. The damaged and broken granite reduces the opportunity for species to hide or create refuge and appeared to reduce the species present. However, these areas still provide moderate quality resources for a diverse suite of fauna, particularly reptiles. Areas of undisturbed, expansive granite outcrops were also recorded throughout the Mine DE, particularly the northern portions of Myara North, and provide refuge, breeding, feeding and dispersal for reptile species. The granite outcrops support numerous reptile species including

the Barking Gecko, Ornate Crevice-dragon, Southern Carpet Python, Black-headed Monitor, South-western Earless Skink, Dell's Skink, South-western Cool-skink and Shrubland Skink.

The forested habitats provided a diversity of micro-habitats such as logs, hollows, leaf litter, soft sand and dense foliage with a broad range of flora species providing a range of foraging, roosting, denning and sheltering habitat. However, prescribed burning in spring of 2020 is likely to have destroyed several known Black Cockatoo breeding hollows in a patch of Bullich forest in the northern portion of the Myara North DE (Tony Kirkby pers. comm). The same burn occurred in mapped Quokka habitat, based on the GHD (2025a) survey, along the densely vegetated drainage line. The impact of fire on terrestrial fauna is discussed under cumulative impacts, in Section 6.4.4.5.

Riparian areas throughout the Mine DE provide access to drinking water to terrestrial vertebrate fauna on a seasonal basis. The Serpentine and South Dandalup Reservoirs, which lie within one kilometre of the Mine DE, provide accessible drinking water year-round to more mobile fauna, such as birds. Seasonally waterlogged or inundated swamps were associated with some of the streams which provide suitable Quokka and amphibian habitat. Low dense vegetation associated with riparian areas was identified as suitable habitat for Quokka, and frogs were also recorded calling during both survey phases around these areas.

The value of each habitat type for each conservation significant species known or likely to occur in the Mine DE are presented in Section 6.3.3.5 to Section 6.3.3.10. It is noted that the persistence of populations of critical weight range mammals (e.g. Chuditch, Quokka) in the habitat types is expected to be dependent on the ongoing suppression of feral predators (such as foxes and cats) that could lead to a loss of local populations. Further information on conservation

6.3.3.3 Fauna diversity

GHD (2024, 2025a, 2025b) reported that a total of 233 terrestrial vertebrate fauna species have potential to occur within the Mine DE, based on desktop review of published data and previous surveys in the vicinity. The vertebrate fauna included 33 mammals, 133 birds, 43 reptiles, and 14 amphibians previously recorded within a 20 km search radius of the proposed centroids of the Mine DE.

Detailed and targeted fauna surveys (GHD 2024, 2025a, 2025b) recorded 187 vertebrate fauna species, including 30 mammals, 113 birds, 35 reptiles and 9 amphibians. A summary of the number of species and families recorded in the Mine DE is presented in Table 6.10. The survey results compare favourably to that of the LTFMP, recording a comparable or greater number of vertebrate species to that previously recorded in the Huntly Mine and Jarrahdale Mine.

Table 6.10 Summary of fauna diversity recorded in the Mine DE

Class	Myara North DE		Holyoake DE		O'Neil DE		Huntly and Jarrahdale Mine LTFMP
	Number of species	Number of families	Number of species	Number of families	Number of species	Number of families	Number of species
Mammals	23 (6 introduced)	12	22 (6 introduced)	13	19 (4 introduced)	9	9-18
Birds	76 (2 introduced)	36	77	29	68	30	44-56
Amphibians	7	3	7	3	7	3	n/a
Reptiles	26	9	23	8	27	8	10-21
Total	**132**	**-**	**129**	**-**	**121**	**-**	**n/a**

Mammals

The Myara North survey (GHD 2025a) recorded 23 mammal species from 12 families including six species of introduced mammals and 17 native mammal species. The most speciose family was the Dasyuridae (Dasyurid mammals) and Vespertilionidae (Simple-nosed Bats) (both with four species), as well as Macropodidae (Kangaroo) (three species). Seven of the mammal species recorded are listed as conservation significant and are further discussed in Section 6.3.3.4.

The Holyoake survey (GHD 2025b) recorded 22 mammal species from 13 families including six species of introduced mammals and 16 native mammal species. The most speciose family was the Vespertilionine and Dasyuridae (three and four species respectively) and Macropodidae (three species). Six micro-chiropteran bats were positively identified from call analysis and further two species were unconfirmed. Six of the mammal species recorded are listed as conservation significant and are further discussed in Section 6.3.3.4.

The O'Neil survey (GHD 2024) recorded 19 mammal species from nine families, including four species of introduced mammals and 15 native mammal species. The most speciose families were Vespertillonidae (five species) and Muridae (Rodents) (four species). Six of the mammal species recorded are listed as conservation significant and are further discussed in Section 6.3.3.4.

Birds

The Myara North survey recorded 76 bird species from 36 families. The most speciose families were the Meliphagidae (Honeyeaters) (eight species), Acanthizidae (Weebill/Gerygone) (six species) and Psittaculidae (Parrots) (six species). Five of the bird species recorded are listed as conservation significant and are further discussed in Section 6.3.3.4.

The Holyoake surveys identified 77 bird species from 29 families. The most speciose families were the Meliphagidae (nine species), Acanthizidae (seven species) and Psittaculidae (six species). Five of the bird species recorded are listed as conservation significant and are further discussed in Section 6.3.3.4.

The O'Neil survey recorded 68 bird species from 30 families. The most speciose families were the Meliphagidae (seven species) and Acanthizidae (six species). Four of the bird species recorded are listed as conservation significant and are further discussed in Section 6.3.3.4.

No listed migratory birds were recorded during the Myara North, Holyoake, or O'Neil surveys. The Mine DE lacks large open waters with shallow shorelines for foraging habitat, with creek lines and vegetated dampland areas within the Mine DE not suitable for migratory birds.

Therefore, they are unlikely to occur within the Mine DE, and any occurrence would be as vagrant visitation due to proximity of the Serpentine and South Dandalup Reservoirs.

Amphibians

The Myara North survey recorded seven amphibians from three families. The most speciose family was Myobatrachidae (Quacking/Bleating Frog) (three species). No conservation significant amphibians were recorded.

The Holyoake survey recorded seven amphibians from three families. The most speciose family was Myobatrachidae (four species). No conservation significant amphibians were recorded.

The O'Neil survey recorded seven amphibians from three families. The most speciose family was Myobatrachidae (four species). No conservation significant amphibians were recorded.

Reptiles

The Myara North survey recorded 26 reptile species from nine families. The most speciose family was Scincidae (Skinks) (10 species) followed by Elapidae (Snakes) (four species). One conservation significant reptile was recorded during the survey, which is further discussed in Section 6.3.3.4.

The Holyoake survey recorded a total of 23 reptile species from eight families. The most speciose family was Scincidae (eight species) followed by Elapidae (six species). No conservation significant reptile species were recorded during the survey.

The O'Neil survey recorded 27 reptile species from eight families. The most speciose family was Scinidae (13 species). One conservation significant reptile was recorded during the survey, which is further discussed in Section 6.3.3.4.

Introduced Species

The Myara North, Holyoake and O'Neil fauna surveys recorded eight introduced species (in total) which are considered feral to the region, including:

- Feral Pig (Sus scrofa)
- European Fox (Vulpes vulpes)
- European Rabbit (Oryctolagus cuniculus)
- Black Rat (Rattus rattus)
- House Mouse (Mus musculus)
- Feral Cat (Felis catus)
- Rainbow Lorikeet (Trichoglossus moluccanus)
- Laughing Kookaburra (Dacelo novaeguineae).

Further information on introduced fauna species is presented in Section 6.3.3.4, in relation to conservation significant fauna.

6.3.3.4 Significant fauna occurrence

The EPA (2016) note that terrestrial fauna may be significant for a range of reasons, including:

- identified as a threatened or priority species (i.e. conservation significant)
- species with restricted distribution
- degree of historical impact from threatening processes
- providing an important function required to maintain the ecological integrity of a significant ecosystem.

Significant fauna that may occur in the Mine DE include the following:

- conservation significant fauna species
- species with restriction distribution in the landscape, including aquatic and short range endemic (SRE) species
- other significant fauna

Aquatic and SRE fauna species are presented in Section 6.3.4 and Section 6.3.5, respectively. The remainder of this section assesses non-aquatic and non-SRE significant fauna.

Conservation significant fauna

An assessment was undertaken of the likelihood of occurrence of conservation significant fauna within the Mine DE. The assessment was based on a desktop assessment and the findings of baseline surveys and previous studies and research (as summarised in Section 6.3.1 and Section 6.3.2). The desktop assessment considered modelled distributions available for EPBC Act listed species, DBCA threatened and priority fauna (TPFA) database records available over ML1SA and a 10 km buffer, Nature Map database (as available at 2020), species' biology and habitat requirements, and the quality and availability of suitable habitat within the Mine DE.

The likelihood of occurrence assessment was undertaken for all conservation significant fauna species identified in modelled distributions and/or DBCA database records within 10 km of the Mine DE. Table 6.11 presents the outcomes of the likelihood of occurrence assessment for non-aquatic species, with Section 6.3.4.4 presenting the outcomes for the assessment of aquatic species. Appendix B1 provides details of the likelihood of occurrence assessment for EPBC Act listed species, including maps of each species modelled distribution and DBCA TPFA database records over ML1SA and a 10 km buffer.

As presented in Table 6.11, a total of 17 non-aquatic conservation significant fauna species are known, likely or have potential to occur in the Mine DE. Eight of the conservation significant species are listed as threatened under the EPBC Act or BC Act, and the remaining nine are priority species listed by DBCA or other conservation significant species under the BC Act.

Six of the conservation significant species known or likely to occur in the Mine DE are listed under the EPBC Act as matters of national environmental significance (MNES). These are:

- Three Black Cockatoo species:
    - Baudin's Cockatoo (*Zanda baudinii*) - Endangered
    - Carnaby's Cockatoo (*Zanda latirostris*) - Endangered
    - Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable
- Woylie (*Bettongia penicillata ogilbyi*) - Endangered
- Quokka (*Setonix brachyurus*) - Vulnerable
- Chuditch (*Dasyurus geoffroii*) – Vulnerable.

Two EPBC act listed species were not recorded in the Mine DE but are considered to have potential to occur in the Mine DE. These are:

- Numbat (*Myrmecobius fasciatus*) – Endangered
- Western Ringtail Possum (*Pseudocheirus peregrinus occidentalis*) – Critically Endangered

As noted in Section 6.3.3.3, no migratory bird species were recorded in the Mine DE nor are they likely to occur due to the lack of wetland habitats favoured by the species. The Flooded Gum Woodland and Melaleuca Dampland habitats are seasonally waterlogged and may have areas that are seasonally inundated, however they do not contain large areas of wading habitat

with mudflat, grasses, sedges, rushes or reeds. Similarly, the Mine DE is unlikely to support populations of threatened birds that use such wetland habitats, such as the Australasian Bittern (*Botaurus poiciloptilus*) and Australian Painted Snipe (*Rostratula australis*).

There is potential for migratory birds to opportunistically use perennial waters of drinking water reservoirs downstream of the Mine DE, including Serpentine Dam and South Dandalup Dam. The drinking water reservoirs comprise inundated river valleys with relatively steep sided and lateritic soil shorelines adjacent to open forest and with varying vegetation regrowth (typically shrubs) over formerly inundated areas depending on the history of reservoir inflows and outflows. These are substantially different habitats to that of the shallow, muddy wetlands with emergent or fringing vegetation that support high levels of invertebrate productivity and the abundant food resources sought by migratory birds. Accordingly, while the drinking water reservoirs downstream of the Mine DE may be used opportunistically by migratory birds (e.g. resting between flights to food resources, or vagrants blown by storms) the reservoirs are not expected to comprise an important habitat for migratory birds.

Records of Black Cockatoos across the Huntly Mine are presented in Figure 6-3, including baseline surveys and DBCA database records. DBCA database records were provided to Alcoa by DBCA for the entirety of ML1sa to assist with cumulative impact assessment. Records of other threatened fauna (excluding Black Cockatoos) are presented in Figure 6-4. Records of other conservation significant fauna, predominantly WA listed priority species, are presented in Figure 6-5. Details of species records from baseline surveys are presented in the survey reports (GHD 2024, 2025a, 2025b) in Appendix B4-1 (Myara North), Appendix B4-2 (Holyoake) and Appendix B4-3 (O'Neil). Threatened species records from baseline surveys are also presented in species-specific habitat mapping in Section 6.3.3.5 (Black Cockatoos), Section 6.3.3.7 (Chuditch) and Section 6.3.3.8 (Quokka).

Detailed information of the conservation significant terrestrial fauna known or likely to occur in the Mine DE is included in the respective survey reports (GHD 2024, 2025a, 2025b, Appendix B2).

Table 6.11 Conservation significant (non-aquatic) fauna likelihood of occurrence in the Mine DE

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
Baudin's Cockatoo (*Zanda baudinii*)	Endangered	Endangered	**Known** Recorded in the Myara North, Holyoake and O'Neil DEs (GHD 2024, 2025a, 2025b).	Endemic to the south-west of WA. Generally found in woodland or forest habitat but can be found in fragmented forests. Species distribution confined to the south-west humid and subhumid zones with average rainfall greater than 600 mm/year, ranging from NJF east of Perth, south to Albany and Margaret River (DSEWPaC 2012, DCCEEW 2022). Known foraging areas lie in the vicinity of Jarrahdale and Dwellingup with wintering habitat throughout the NJF to the east (DSEWPaC 2012, DCCEEW 2022). The species migrates during the autumn-winter from the SJF and south coast up to the NJF (Johnstone and Kirkby 2017). The total population was previously estimated at 12,500 individuals, and the species occurs mainly in flocks (up to 300 individuals) and occasionally larger aggregations (up to 1,200 individuals) at roosts (DPC 2015). There has been a recent decline in numbers returning to traditional roost sites in the NJF during autumn-winter, with the population estimated at 5,000-8,000 (Johnstone and Kirkby 2017). Baudin's Cockatoo primarily nest in hollows of live or dead Karri, Marri, Wandoo and Tuart trees. The species breeds from August to March in the eucalypt forests of the south west of WA (DSEWPaC 2012, DCCEEW 2022). From March, the species flies north to the central and northern parts of the Darling Scarp for the non-breeding season. The species roosts in or near riparian environments or other permanent water sources. Limited breeding also occurs in Bullich and Marri at the border of the Wungong Catchment and 39 Mile Brook Catchment areas approximately 5 km to the north of the Mine DE (T. Kirkby pers. comm.). The species forages in eucalypt species of mainly Jarrah, Marri and Karri, and proteaceous woodland and heath. They also feed on nectar, buds and flowers and strip bark from dead trees to search for beetle larvae. ***Habitat critical for survival of the species*** The habitat critical to survival and important populations of Forest Black Cockatoos comprises all Marri, Karri and Jarrah forests, woodlands and remnants in the south-west of Western Australia receiving more than 600 mm of annual average rainfall (DEC 2008).	Recovery Plan (DEC 2008): • Illegal shooting • Nest competition with native and introduced birds and European honey bees • Habitat loss including selective removal of Marri • Nest site shortage
Carnaby's Cockatoo (*Zanda latirostris*)	Endangered	Endangered	**Known** Recorded in the Myara North, Holyoake and O'Neil DEs (GHD 2024, 2025a, 2025b).	Endemic to the south-west of WA. Its range and abundance has significantly reduced due to land clearing for agriculture, forestry and urban development. It faces continuing threats on the Swan Coastal Plain as important feeding habitat is cleared. The total population has been estimated at a maximum of 60,000 (Saunders *et al* 1985) and more recently at around 40,000 (Department of Parks and Wildlife 2013). Breeding range of the species comprises Eucalypt woodlands between the Stirling Range and Three Springs (DSEWPaC 2012, DCCEEW 2022). The species nests in hollows in live or dead trees of Salmon Gum, Wandoo, Tuart, Jarrah, Flooded Gum, York Gum, Powderbark, Karri and Marri. Breeding occurs mainly from July to mid-December. The breeding range of this species has undergone a shift since the middle of the last century to the west and south, with a more rapid shift in the past 10 to 30 years, moving into the Tuart forests of the Swan Coastal Plain and Jarrah-Marri forests of the Darling Scarp (Johnstone and Kirkby 2009). Breeding has been recorded in Marri at the Wungong Catchment and 39 Mile Brook Catchment approximately 5 km to the north (Johnstone and Kirkby unpublished data) The species is a post-nuptial nomad with many individuals spending the non-breeding season on the Swan Coastal Plain from December to July. The species feeds in the canopy and understorey. Important foraging species consist of Banksia, Hakea, Marri, Jarrah and non-native Pinus species (Valentine and Stock 2008, Higgins 1999, Lee *et al* 2013). ***Habitat critical for survival of the species*** • Eucalypt woodlands that provide nest hollows, with nearby feeding, roosting and watering habitat • Woodland sites known to have supported breeding in the past and which could be used in the future, provided adequate nearby feeding and/or watering habitat are available or re-established • Vegetation that provides food resources in the non-breeding season, as well as nearby roosting and watering habitat (DPAW 2013).	Recovery Plan (DPaW 2013): • Loss of breeding habitat, • Nest competition with native and introduced birds and European honey bees • Loss of non-breeding foraging and night roosting habitat in the vicinity of water availability • Decline in tree health (e.g. *Phytophthora* Dieback, Canker) • Mining and extraction • Illegal shooting and taking • Climate change, including impact to vegetation and heat stress • Collisions with motor vehicles • Disease

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)	Vulnerable	Vulnerable	**Known** Recorded in the Myara North, Holyoake and O'Neil DEs (GHD 2024, 2025a, 2025b).	Endemic to the southwest of WA and occurs in one population of approximately 15,000 birds (DEWHA 2009). Species distribution ranges from NJF at Muchea north-east of Perth, south to Albany and Margaret River (DSEWPaC 2012, DCCEEW 2022). The distribution has contracted from a former range as far north as Moora and east to Toodyay (Johnstone and Kirkby 2017). In recent years there has been a dynamic expansion of foraging from the NJF west into the Swan Coastal Plain and to a lesser extent east into the Wheatbelt (Johnstone and Kirkby 2017). FRTBC display erratic breeding activity in the summer and winter seasons, peaking from April to June and August to October (Johnston et al 2013). Although the species is known to breed all year round (T. Kirkby, pers. comm.). The species primarily nests in hollows of large, mature Marri trees and to a lesser extent Jarrah, Blackbutt, Bullich and Wandoo (Johnstone, Kirkby and Sarti 2013). Key breeding areas are within the Jarrah-Marri forest of the Darling Scarp / Plateau (Johnstone *et al.* 2017). Breeding has been recorded from adjacent areas including Serpentine National Park, Wungong Catchment, 39 Mile Brook area and Monadnocks Nature Reserve. The FRTBC is a canopy feeder, with a diet primarily consisting of seeds of Marri and Jarrah and, in recent times, the seeds of *Melia azedarach* (Cape Lilac) over the Swan Coastal Plain (Johnstone, Kirkby and Sarti 2017). Other, less important foods include Blackbutt, Karri, Sheoak, Snotty Gobble, *Hakea* spp. and Tuart (Johnstone *et al.* 2017). ***Habitat critical for survival of the species*** The habitat critical to survival and important populations of Forest Black Cockatoos comprises all Marri, Karri and Jarrah forests, woodlands and remnants in the south-west of Western Australia receiving more than 600 mm of annual average rainfall (DEC 2008).	Recovery Plan (DEC 2008): • Illegal shooting • Nest competition with native and introduced birds and European honey bees • Habitat loss including selective removal of Marri • Nest site shortage
Peregrine Falcon (*Falco peregrinus*)	-	Special Protection under BC Act (Schedule 7)	**Known** Recorded in the Myara North and Holyoake DE (GHD 2025a, 2025b). **Likely** to occur in the O'Neil DE (GHD 2024).	The Peregrine Falcon is found on and near cliffs, gorges, timbered watercourses, riverine environments, wetlands, plains, open woodlands, and pylons and spires of buildings, though less frequently in desert regions of Australia (Morcombe 2004). They are not common but can be found almost anywhere throughout WA and in the southwest, including particularly at Fitzgerald River, Stirling Range, Porongurup National Parks, Kondinin, and Peak Charles, with many more locations north of Perth. In woodlands the species is known to breed in shallow tree hollows in suitable large trees (Morcombe 2004).	N/A – not threatened
Masked Owl (southwest) (*Tyto novaehollandiae novaehollandiae*)	-	P3	**Known** Recorded in the Myara North and O'Neil DE (GHD 2024, 2025a). **Likely** to occur in the Holyoake DE (GHD 2025b).	The Masked Owl can be found in forests (wet and dry sclerophyll, non-eucalypt dominated), open woodlands, associated farmlands or scrub with large trees (12-20 m) and adjacent cleared country, timbered watercourses, paperbark woodlands, and caves (Pizzey and Knight 2012). The subspecies *Tyto novaehollandiae novaehollandiae* is restricted to the south-west corner of Western Australia from Yanchep south to Albany (Johnstone and Storr 1998). The species is generally uncommon but readily observed in the Karridale and Manjimup regions (Johnstone and Storr 1998). The species lives in pairs that forage, roost and breed within or near a territory (Birdlife Australia 2022). Based on one study in the Margaret River region, a pair has a territory of approximately 6 km in length (Nature Conservation 2022) and breeding occurs in large trees with large vertical hollows of old-growth eucalypts (Bell and Mooney 2002).	N/A – not threatened
Australasian Bittern (*Botaurus poiciloptilus*)	Endangered	Endangered	**Unlikely** Suitable habitat such as expansive wetland with emergent native reeds is not available to support this species (GHD 2025a).	The Australasian bittern occurs primarily in freshwater wetlands in the temperate southeast and southwest of Australia with preferred habitat comprising wetlands with dense vegetation, particularly where there is a mosaic of cover (DCCEEW 2022). Foraging occurs in still, shallow water up to 0.3m deep, most often at the edges of polls and waterways (DCCEEW 2022). In southern Western Australia, the species also occurs in wetlands where thickets of wetland shrubs provide patches of tall cover in sedge-dominated habitat (DCCEEW 2022). In WA the Australasian bittern was previously widespread however, following declines it is likely to only occur on the western coastal plain between Lancelin and Busselton, in the southern coastal region from Augusta to the east of Albany, and inland to some wetlands in the Jarrah forest belt (DCCEEW 2022).	N/A – unlikely to occur

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
				Habitat critical to the survival of the species Due to severe reductions in population numbers, all natural habitat, including constructed wetlands with suitable habitat, in which the Australasian bittern is known or likely to occur should be considered critical to the survival of the species (DEE 2019).	
Australian Painted Snipe (*Rostratula australis*)	Endangered; Marine	Endangered	**Unlikely** Suitable habitat is not available to support this species (GHD 2025a).	The Australian painted snipe occurs in shallow freshwater, and occasionally brackish, wetlands, generally with a good cover of grasses, rushes and reeds and low scrub (DSEWPC 2013). The species is most common in eastern Australia, and no areas of Western Australia have been identified as important areas (DSEWPC 2013). The breeding habitat of the Australian painted snipe are potentially specific, however very little is known about these specificities (DCCEEW 2022a). Breeding habitat includes shallow wetlands with areas of bare wet mud and mixed heights of low vegetation, with the majority of nest records being on or near small islands in freshwater wetlands, with a combination of very shallow water, exposed mud, dense low cover (DCCEEW 2022a). ***Habitat critical to the survival of the species*** Due to the potentially specific habitat requirements and significant decline in population of the Australian painted snipe, habitat critical to the survival of the species can be considered to include: • Any natural wetland habitat where the species is known or likely to occur, particularly that which includes breeding habitat • Any location outside the above area that may be periodically occupied by the species when wetland conditions are favourable (DCCEEW 2022a)	N/A – unlikely to occur
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered; Marine; Migratory	Critically Endangered	**Unlikely** Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species (GHD 2025a).	The curlew sandpiper is non-breeding in Australia, migrating to the northern shores of Australia in late August and early September, with some birds moving from northern WA to southern WA as early as August (DoE 2015). Key locations within WA include the Eyre Bird Observatory, Port Headland Saltworks, Eighty Mile Beach, Roebuck Bay, and Lake MacLeod (DoE 2015). The curlew sandpiper primarily roosts around intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes, and lagoons near the coast, with foraging generally occurring within mudflats and nearby shallow water (DoE 2015). ***Habitat critical to the survival of the species*** Habitat critical to the survival of the curlew sandpiper includes a mosaic of feeding and roosting habitat; feeding habitat primarily refers to upper tidal flats, whilst roosting habitat primarily refers to intertidal sandflats, spits and banks (DoE 2015). Habitat critical to the survival of the curlew sandpiper refers to areas, of the above description, that are necessary: • For activities such as foraging, breeding, roosting, or dispersal; • For the long-term maintenance of the subspecies (including the maintenance of species essential to the survival of the curlew sandpiper, such as macrobenthos); • To maintain genetic diversity and long-term evolutionary development; or • For the re-introduction of populations or recovery of the species (DoE 2015).	N/A – unlikely to occur
Eastern Curlew (*Numenius madagascariensis*)	Critically Endangered; Marine; Migratory	Critically Endangered	**Unlikely** Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species (GHD 2025a).	The far eastern curlew is non-breeding in Australia, migrating from Siberia and far eastern Russia, arriving in north-west and eastern Australia as early as July (DoE 2015). An estimated 73% of the species occurs in Australia, with a mostly coastal distribution prominently in the north, east and south-east, occurring patchily elsewhere (DoE 2015). ***Habitat critical to the survival of the species*** Habitat critical to the survival of the far eastern curlew includes a mosaic of feeding and roosting habitat (DoE 2015). Feeding habitat primarily refers to sheltered intertidal sandflats or mudflats that are open and without vegetation or covered in seagrass, and roosting habitat primarily refers to sheltered coasts particularly estuaries, bays, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats (DoE 2015).	N/A – unlikely to occur

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
				Habitat critical to the survival of the far eastern curlew refers to areas, of the above description that are necessary: • For activities such as foraging, breeding, roosting, or dispersal; • For the long-term maintenance of the subspecies (including the maintenance of species essential to the survival of the far eastern curlew such as macrobenthos); • To maintain genetic diversity and long-term evolutionary development; or • For the re-introduction of populations or recovery of the species (DoE 2015).	
Grey Falcon (*Falco hypoleucos*)	Vulnerable	Vulnerable	**Unlikely** Species has a broadly modelled distribution across Australia including broadly modelled 'may occur' distribution over a portion of the DE. Species favours arid and semi-arid environment. Species not observed during field surveys. No DBCA database records within ML1SA.	The grey falcon occurs in arid and semi-arid Australia including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia, particularly it is found where annual rainfall is less than 500mm (TSSC 2020). Occurring in low densities across Australia the grey falcon frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses (TSSC 2020). Nests are usually in the tallest trees along watercourses, particularly River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*E. coolabah*) (TSSC 2020).	N/A – unlikely to occur
Malleefowl (*Leipoa ocellata*)	Vulnerable	Vulnerable	**Unlikely** The species favours woodland and mallee over sandy soils of the semi-arid to arid zone, rather than open forest over gravelly soils as dominate the DE and surrounding Northern Jarrah Forest. The species has sparse records in the Northern Jarrah Forest and records in proximity to the DE are scattered and mostly more than 20 years old. Malleefowl mounds / nests are large, conspicuous structures that would be readily observed by qualified zoologists during survey in the open forest. No mounds (either recent or remnant) were observed during baseline surveys in open forest throughout the DE.	The malleefowl is found primarily in the semi-arid to arid zone in shrublands and low woodlands dominated by mallee and associated habitats such as Broombush (*Melaleuca uncinate)* and Scrub Pine (*Callitris verrucosa)* (Benshemesh 2007). In Western Australia they are found in some shrublands that are dominated by acacia and occasionally woodlands dominated by eucalyptus such as *Wandoo E. wandoo, Marri Corymbia calophylla and Mallet E. astringens* (Benshemesh 2007). In WA, malleefowl occurrence was associated with mallee/shrubland and thicket vegetation with woodland representing poor habitat for the species with areas typically possessing a greater amount of litter, greater cover of tall shrubs, greater abundance of food shrubs and a greater soil gravel content (Benshemesh 2007).	N/A – unlikely to occur

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
Noisy Scrub Bird (*Atrichornis clamosus*)	Endangered	Endangered	**Unlikely** The translocated population in the Northern Jarrah Forest has not been recorded since the mid 2000s and the closest record to the DE is dated 2004 and located approximately 9 km south of the DE. The translocated population has not been observed to be breeding and is not considered self-sustaining (TSSC 2018). The species was not observed during baseline surveys within the DE and surrounding land, including use of acoustic detectors and remote cameras in dense riparian vegetation.	The noisy scrub bird is endemic to south-west Western Australia and prefers dense unburnt understorey vegetation of low forest and scrub thicket (TSSC 2018). The noisy scrub-bird is most abundant in areas that have been unburnt for more than 20 years (TSSC 2018). Important foraging habitat consists of dense clumps of sedges and shrubs, and piles of debris provide important cover for nesting, and small, open areas with a thick accumulation of leaf litter (TSSC 2018).	N/A – unlikely to occur
Sharp-tailed Sandpiper (*Calidris acuminata*)	Vulnerable; Marine; Migratory	Migratory	**Unlikely** Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species (GHD 2025a).	The sharp-tailed sandpiper is non-breeding in Australia, migrating from Siberia, with approximately 91% of the EAAF population arriving in Australia from mid-August to September (DCCEEW 2024). The species arrives in south-west WA in November with scattered records along the Nullarbor Plain and southern areas of the Great Victoria Desert (DCCEEW 2024). Within WA they are widespread from Cape Arid to Carnarvon, around coastal and sub-coastal plains of the Pilbara though to the Kimberley (DCCEEW 2024). Foraging occurs in hypersaline environments along the edge of water on mudflats, coastal and inland wetlands, and occasionally following rainfall areas of flooded agricultural pasture (DCCEEW 2024). The sharp-tailed sandpiper roosts on rocky and sandy beaches, freshwater habitats and inland saltwater habitats (DCCEEW 2024). ***Habitat critical to the survival of the species*** The sharp-tailed sandpiper is more flexible in habitat choice than most other shorebird species, occurring both along coasts and within inland wetlands (fresh and hypersaline) (DCCEEW 2024). They are tolerant of grassy vegetation and can be found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches (DCCEEW 2024). Habitat critical to the survival of the sharp-tailed sandpiper refers to areas that meet the above description and are necessary: • For activities such as foraging, breeding, roosting, or dispersal; • For the long-term maintenance of the species (including the maintenance of species essential to the survival of the sharp-tailed sandpiper, such as macrobenthos); • To maintain genetic diversity and long-term evolutionary development; or • For the re-introduction of populations or recovery of the species.	N/A – unlikely to occur
Woylie (*Bettongia penicillata ogilbyi)*	Endangered	Critically Endangered	**Likely** Woylie individuals or signs were not recorded during baseline surveys (GHD 2025a, 2025b, 2024) including deployment of remote cameras at a total of 139	The species, in its various subspecies, once occupied most of the Australian mainland south of the tropics including the arid and semi-arid zones (DEC 2012a). The distribution has reduced such that the last four remaining indigenous populations are in Perup, Kingston, Dryandra woodland and Tutanning nature reserve in south west WA. The species has been re-established at 16 other locations within WA and at five locations interstate (DEC 2012a). Scattered Woylie populations may be found throughout the Jarrah forest in the south-west corner of WA, where predators have been controlled or excluded. Population has declined dramatically since 2000, reducing from approximately 220,000 to 11,000 individuals in the Upper Warren (a 95 per cent contraction), and other populations from approximately 45,000 to 15,000	Recovery Plan (DEC 2012a): • Fox predation • Cat predation • Land clearing • Altered fire regimes • *Phytophthora* Dieback and climate change impacts

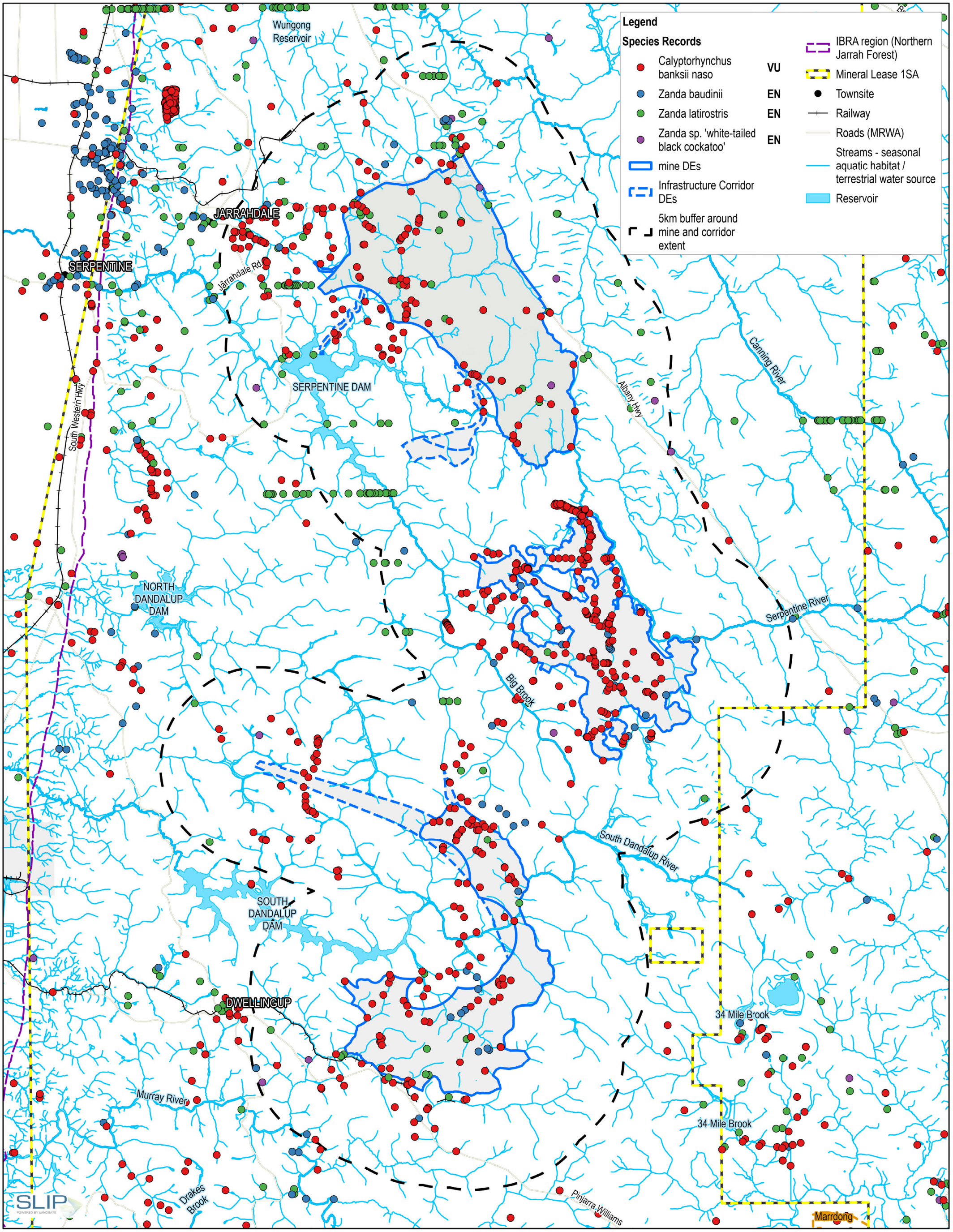
Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
			locations, and diurnal searches at a total of 88 locations (see Section 6.3.1). A population of Woylie were recorded using the same methodology as the baseline surveys, in Jarrah forest to the east of O'Neil DE (GHD 2024). DBCA (pers. comm.) advises that Woylie are present within the Myara North DE in detectable numbers, however no data has been provided on locations or dates of records.	(DEC 2012a). Research indicates that increased cat predation is the predominant cause of mortality (Marlow *et al* 2015). Preferred habitat for the Woylie includes dense undergrowth, logs and rock-cavities and occasionally in burrows (Burbidge 2004). Thickets and other suitable habitat types such as heath, provide refuge against predation (DEC 2012a). Prior to widescale European Fox baiting, the species' distribution was reduced to locations with the common characteristic of the presence of *Gastrolobium* thickets. *Gastrolobium* are referred to as 'poison plants', containing monofluoroacetic acid, which is the compound present in the toxin '1080' now used to control introduced predators in the south west region. It is thought that *Gastrolobium* thickets provided refuge from predators, partly through cover and also secondary poisoning (DEC 2012a). Woylie is nocturnal, rests during the day in a well-concealed nest, built over a shallow depression. The nest is most commonly built using long strands of grasses, but other materials such as strips of bark are also used (in the forest). The species primarily feeds on the fruiting bodies of ectomycorrhizal fungi (DEC 2012a). ***Habitat critical for survival of the species*** Known or potential Woylie occupation of habitats where there is adequate introduced predator (fox and cat) control or exclusion (DEC 2012a): • tall eucalypt forest and woodland • dense myrtaceous shrubland • kwongan (proteaceous) or mallee heath.	impact to shelter and fungi foods • Native predators • Disease • Mining
Chuditch (*Dasyurus geoffroii*)	Vulnerable	Vulnerable	**Known** Recorded in the Myara North, Holyoake and O'Neil DEs (GHD 2024, 2025a, 2025b).	Chuditch formerly ranged across nearly 70 per cent of Australia, occurring in every mainland State and Territory. Free-ranging populations of Chuditch are now restricted to WA, within an estimated 5 per cent of their former range (DEC 2012b). The species inhabits eucalypt forest (especially Jarrah), dry woodland, mallee shrublands, heaths, and desert, particularly in the south coast of WA. It occurs at lower densities in drier woodland and mallee shrubland in the Goldfields and Wheatbelt, as well as in Kalbarri National Park (translocated). The total population as of 2007 was estimated to be less than 10,000 individuals with probably 75 per cent occurring in eucalypt forests and woodlands, and mallee heath and shrublands of the south-west and south coast of WA (DEC 2012b). Chuditch are opportunistic feeders and mostly nocturnal, with a diet primarily of insects and large invertebrates but also some mammals, birds and lizards (DEC 2012b). The species are solitary for most of their life and, in the absence of foxes, occupy relatively large home ranges. Males range over 15 km² with a core area of 4 km^2 and females may range over 3-4 km² with a core area of 0.9 km^2 (DEC 2012b). In Jarrah forest, populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest. ***Habitat critical for survival of the species*** Chuditch use a range of habitats including forest, mallee shrublands, woodland and desert (DEC 2012b). The densest populations have been found in riparian jarrah forest (DEC 2012). Chuditch require adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) and sufficient prey biomass to survive (DEC 2012b). Chuditch require habitats that are of a suitable size and not excessively fragmented, as they have large home ranges and are generally present in low numbers (DEC 2012b).	Recovery Plan (DEC 2012b): • Land clearing, particularly of riparian vegetation, and the removal of suitable den logs and den sites from Chuditch habitat • Predation by, and competition from, foxes and feral cats • Deliberate and accidental mortality from poisoning, trapping, illegal shooting, and road kills
Quokka (*Setonix brachyurus*)	Vulnerable	Vulnerable	**Known** Recorded in the Myara North, Holyoake and O'Neil DEs (GHD 2024, 2025a, 2025b).	The Quokka is endemic to WA and was once widespread and abundant within the south-west of WA, ranging from Jurien Bay in the north, to east of Albany (DEC 2013, Spencer *et al* 2020). Current distribution includes Rottnest and Bald Islands, and at least 25 sites on the mainland. All mainland populations occur within areas receiving greater than 600 mm/year rainfall and most are believed to live	Recovery Plan (DEC 2013): • Predation from foxes and cats • Habitat destruction from feral pigs

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
				within areas receiving greater than 1,000 mm/year, which is likely to be due to the associated high vegetation cover and leafy digestible vegetation (DEC 2013). Total population was estimated at 2007 at approximately 9,000-13,000 individuals, of which 8,000-12,000 are on Rottnest Island (DEC 2013). The NJF population is highly fragmented and unlikely to be functioning as a metapopulation (Spencer *et al* 2020) and as of 2007 was estimated to comprise up to 210 individuals over five locations (Chandler Road, Rosella Road, Kesners Swamp, Hadfield, Victor Road) (DEC 2013). The Southern Jarrah Forest and south coast support the most extensive distribution of the species and in 2007 were estimated to comprise approximately 1,000 individuals (DEC 2013). In the Jarrah forest, Quokka occupy dense forests and thickets, streamside vegetation, heaths, shrublands, *Agonis linearifolia*-dominated swamps, and sometimes tea-tree thickets on sandy soils along creek systems. The NJF populations are small, declining, genetically differentiated and show signs of historical genetic bottlenecks (Spencer *et al* 2019). This is expected to be due to predominant open Jarrah forest structure across the NJF, with Quokka highly restricted to small home ranges (7 ha) within dense riparian and swamp habitats (Spencer *et al* 2020). Sub-adults disperse relatively small distances, with limited movements between stream systems due to the threat of predation, despite relatively short distances across ridges (Spencer *et al* 2020). ***Habitat critical for survival of the species*** • *Taxandria linearifolia* swamps, including areas of natural vegetation where the understorey is sufficiently thick and complex to provide a predation refuge close to more open, recently burnt vegetation which is used as a food source (DEC 2013). • Habitat changes seasonally, with the core home range shifting to the periphery of the inundated wetlands during wetter months, leaving the species more exposed to predation (DEC 2013).	• *Phytophthora* Dieback impact to forest structure, cover and food resources • Clearing and timber harvesting • Altered fire regimes • Altered hydrological regimes and climate change • Disease • Recreation disturbance (Rottnest)
Western False Pipistrelle (*Falsistrellus mackenziei*)	-	P4	**Known** Recorded in Myara North, Holyoake and O'Neil DE (GHD 2024, 2025a, 2025b).	Occurs in wet sclerophyll forest dominated by Karri and in high rainfall zones of the Jarrah and Tuart dry sclerophyll forests of south-western Australia (Churchill 2008). The species has been recorded on the Swan Coastal Plain but only in tall Tuart woodlands and mixed Tuart/Jarrah woodlands (Start and McKenzie 2004). Few roost sites have been identified however those described were up to 15 m above the ground in large hollows (in both Karri and Jarrah) where aggregates of bats (up to 30) have been recorded (Start and McKenzie 2004). Additionally, seasonally the species may also sex segregate (into different suitable hollows) over the breeding season (Start and McKenzie 2004). From available data, the species requires and persists around large tall eucalypts with large hollows present.	N/A – not threatened
Western Brush Wallaby (*Notamacropus irma*)	-	P4	**Known** Recorded in Myara North, Holyoake and O'Neil DE (GHD 2024, 2025a, 2025b).	There is little information on the biology of this species, with limited data on feeding/foraging behaviour, reproduction, or information on declines (Maxwell *et al* 1996). Locally common in dry sclerophyll forest and woodlands in the southwest of Western Australia particularly where fox control is undertaken (Morris and Christensen 2008). Found primarily in open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets (Morris and Christensen 2008). Also found in some areas of mallee and heathland and is uncommon in karri forest. Populations appear to persist within larger remnant areas of vegetation in reserves and forest from Kalbarri to Cape Arid National Park.	N/A – not threatened
Quenda (*Isoodon fusciventer*)	-	P4	**Known** Recorded in Myara North, Holyoake and O'Neil DE (GHD 2024, 2025a, 2025b).	The Quenda or Southern Brown Bandicoot is a small omnivorous marsupial (Paull 2008) restricted to the south west of Western Australia. The species was elevated in taxonomic status in 2018, split from its eastern cousin (Travouillon and Phillips 2018). The Quenda has a patchy distribution from around Geraldton to Cape Arid National Park and prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high (Paull 2008). Also occurs in woodlands and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. Often feeds near to dense cover so the animal can retreat if disturbed (Paull 2008). The species is known to persist in suburban areas where habitats are available for the species to utilise (Bryant 2019) regardless of predator management efforts.	N/A – not threatened

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
Rakali (*Hydromys chrysogaster*)	-	P4	**Known** Recorded in Myara North and O'Neil DE (GHD 2024, 2025a). **Likely** to occur in the Holyoake DE (GHD 2025b).	The Rakali is a large semi-aquatic rodent that is mostly carnivorous but known to eat a large range of food items (Olsen 2008). This species is widespread around Australia in every state and territory (Olsen 2008). Lives in the vicinity of permanent bodies of fresh, brackish, or marine water, lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands (Olsen 2008). In the south-west of WA they have been shown to prefer areas with riparian vegetation, better water quality and a degree of habitat complexity. This includes woody debris, rock ledges, and wetland islands are likely to be important areas for feeding and refuge. Occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Olsen 2008). The species has been known to traverse over land for considerable distances in search of suitable habitats (Olsen 2008).	N/A – not threatened
Brush tailed Phascogale (*Phascogale tapoatafa wambenger*)	-	Conservation Dependent	**Known** Recorded in the Myara North, Holyoake and O'Neil DEs (GHD 2024, 2025a, 2025b).	The species is presently sparsely distributed around the coastal zone of Australia in dry sclerophyll forest and monsoonal forest and woodland (Burbidge and Woinarski 2020). The Western Australian sub species once was more widespread throughout the south west into semi-arid areas but has now declined in distribution to persist in the Jarrah and Karri Forests. Generally rare and threatened by habitat fragmentation. Occurs at low densities in the Northern Jarrah Forest with highest densities occurring in the Perup/Kingston area, Collie River valley and near Margaret River and Busselton (DEC 2012). For populations to persist, the species generally requires large intact areas of habitat due to the large home ranges required for the species, females 20 -70 ha (Dec 2012) and males 100 ha (Burbidge and Woinarski 2020). The species requires habitat with hollow bearing trees to persist.	N/A – not threatened
Numbat (*Myrmecobius fasciatus*)	Endangered	Endangered	**Potential – at below detectable densities** The DE lies over 50 km from known Numbat subpopulations at Boyaging and Dryandra and approximately 15 km from recent Numbat records at George Block. The modelled distribution of likely occurrence in the vicinity of Jarrahdale and the DE is based on historic records and expected to represent a former distribution that no longer occurs. The species is modelled as 'may occur' over the Northern Jarrah Forest surrounding the DE. While baseline surveys did not record individuals or their signs, the species is cryptic and difficult to record when at low densities. Given the extent and duration of fox control via Western Shield over the Northern Jarrah Forest, there is potential for Numbat to have	The numbat occurs exclusively in south-west WA despite once occurring over much of arid and semi-arid Australia (TSSC 2018). Numbat original habitat ranged from *Acacia aneura* (mulga) woodland, sand plain and sand dune areas dominated by *Triodia spp*. (spinifex) hummock grassland in the arid zone to eucalypt woodlands and forests in south-west WA (TSSC 2018). Numbats seek overnight refuge in hollow logs, tree hollows and burrows (TSSC 2018). ***Habitat critical to the survival of the species*** Due to the decline in range and occupied habitat types, an exhaustive description of habitat critical to the survival of the numbat cannot be provided, however key characteristics to be considered are: • Significant abundance of termites, • Presence of eucalypt species, • Sufficient cover near ground level, and • Sufficient openness in the understory for feeding activities (DPW 2017).	• Predation by foxes and feral cats • Habitat loss and fragmentation, • Frequent and intense fires (TSSC 2018).

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
			recolonised the vicinity of the DE and to occur at below detectable densities.		
Red-tailed Phascogale (*Phascogale calura*)	Vulnerable	Conservation Dependant	**Unlikely** Not recorded during the survey. The Survey Area is beyond the known range of this species.	The red-tailed phascogale occurs in the southern wheatbelt of WA where mean annual rainfall is 400-500mm, with outlying records in Dwellingup in the Jarrah Forest region (TSSC 2016). The species is largely confined to woodlands with old growth hollow-producing eucalypts, however it has also been recorded in shrublands and The red-tailed phascogale is largely confined to woodlands with old-growth hollow-producing eucalypts, particularly Wandoo (*Eucalyptus wandoo*) and York gum (*E. loxophleba*), often with associated rock sheoak (*Allocasuarina huegeliana*), but has also been recorded in shrublands and various mosaics of woodland, shrubland and scrub-heath	N/A – not threatened
Western Ringtail Possum (*Pseudocheirus occidentalis*)	Critically Endangered	Critically Endangered	**Potential – within pockets of un-mapped suitable habitat** The DE lies more than 10 km from the three key management zones and identified populations for the species. There are very few species records in the Northern Jarrah Forest IBRA subregion north of Harvey and no recent records (i.e. within the past 10-20 years) within 10 km of the DE. Baseline surveys including nocturnal searches of the tree canopy and diurnal searches for possum scats did not record the species within the DE. However, the species is modelled as 'may occur' over the DE. While baseline surveys did not record individuals or their signs and noted a generally open canopy, there remains the potential for pockets of suitable habitat comprising dense, overlapping canopy to potentially occur within the DE. Such pockets of dense, overlapping canopy, if occurring, are more likely to be within riparian habitat, and have potential to support	The western ringtail possum occurs patchily along the south coast (from east of Albany to west of Walpole), the west coast (from Bunbury to Augusta), and inland populations in the lower Collie River Valley, at Harvey and at Perup NR and surrounding forest blocks near Manjimup. ***Habitat critical to the survival of the species*** Habitat critical to the survival of the western ringtail possum is not well understood, the three key management zones are as follows: 1. Swan Coastal Plain zone: the peppermint woodlands and peppermint/tuart forests on the southern extremity of the Swan Coastal Plain, extending from north of Bunbury to Augusta, but principally around Busselton. 2. Southern Forest zone: Jarrah forests near Manjimup where peppermint is generally absent. 3. South Coast zone: a diverse range of vegetation types between Walpole and Cheynes Beach, but principally in near-coastal limestone heath, jarrah marri thicket woodland and forest, riparian, peppermint woodland and karri forest vegetation.	• Climate change • Groundwater depletion • Altered hydrology • Increasing temperature • Feral predators • Fire • Tree decline and insect outbreaks, • Competition for tree hollows • Logging • Domestic dogs (DEE 2018).

Species	Conservation Status		Likelihood of occurrence	Distribution / Habitat Requirements (habitat critical for survival or populations – for threatened species)	Key threatening processes - for threatened species known or likely to occur
	EPBC Act	BC Act/DBCA			
			occupancy by the species.		
Southern Death Adder (*Acanthophis antarcticus*)	-	P3	**Known** Recorded in Myara North DE (*pers. comm.* L. Mattiske during Mattiske (2025a) survey. **Likely** to occur in the Holyoake and O'Neil DE (GHD 2024, 2025b).	The Southern Death Adder ranges from a small area in the south-west (Darling Range and Dryandra) of Western Australia, the Nullarbor onto Eyre Peninsula and the east coast (Wilson and Swan 2017). Therefore, the habitats within this species range include rainforest to shrublands and heaths and supportive habitat around granite outcrops. The Southern Death Adder is a cryptic ambush predator that relies on its camouflage, hiding under leaf litter and debris. Being a stout cryptic ambush predator it is likely the species utilises only small areas of suitable habitat (G. Gaikhorst pers. comm.). This species is declining in many areas, probably due to habitat destruction and altered fire regimes (Wilson and Swan 2017).	N/A
Dell's Skink (*Ctenotus delli*)	-	P4	**Known** Recorded in the O'Neil DE (GHD 2024). **Likely** to occur in Myara North and Holyoake Des (GHD 2025a, 2025b).	Dell's Skink is associated with Jarrah-Marri woodland that has a shrub-dominated understorey, on laterite, sandy or clay soils. It is found in the north Darling Range and inhabits dry sclerophyll forest on granite outcrops, stony hills and ranges. It is absent from the Swan Coastal Plain (Cogger 2014, Wilson & Swan 2013).	N/A



Scale: 1:180,000 at ISO A3

0 1 2 3

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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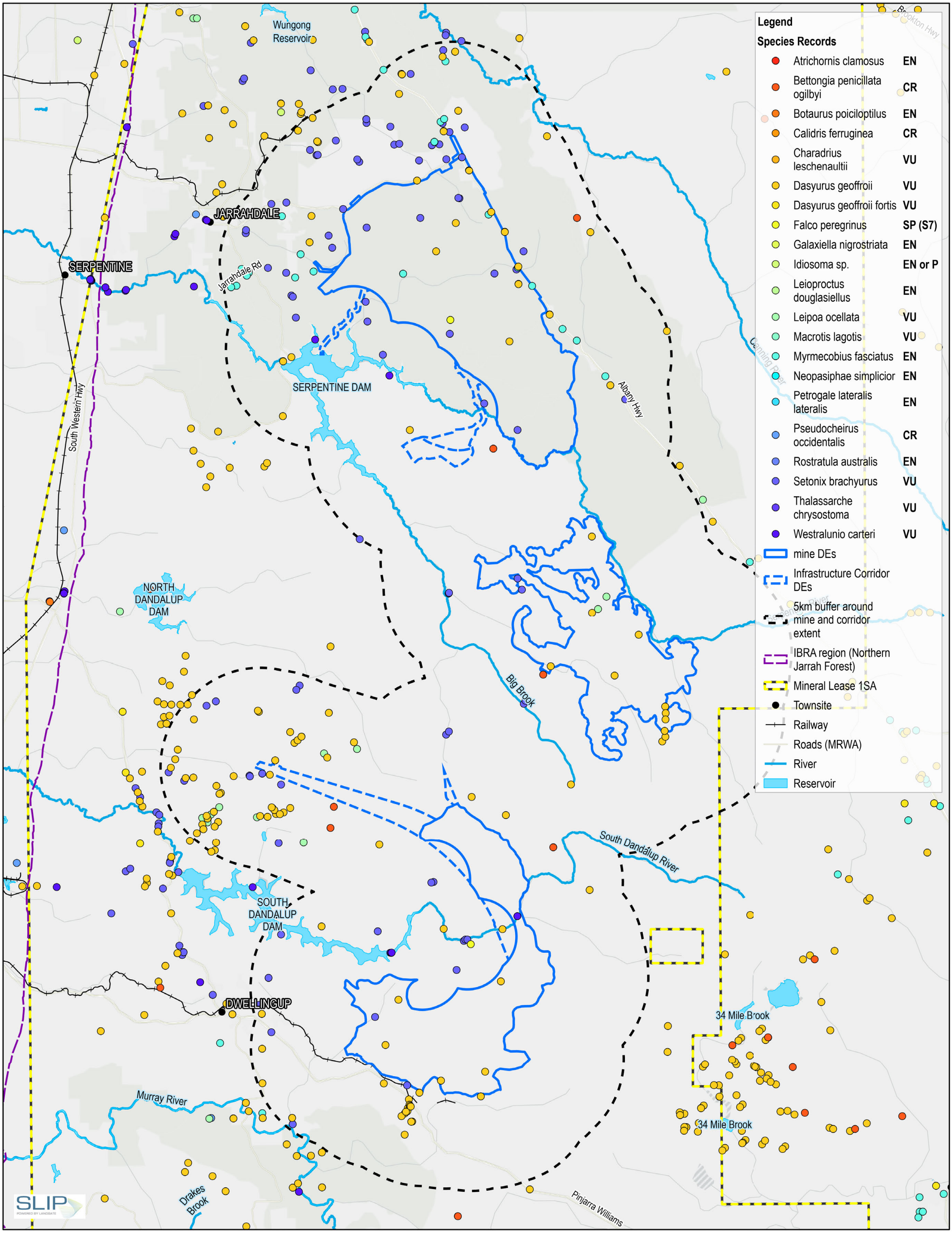
Black Cockatoo Records - Huntly Mine

FIGURE 6-3



Scale: 1:180,000 at ISO A3

0 1 2 3

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Other Threatened Fauna Records - Huntly Mine

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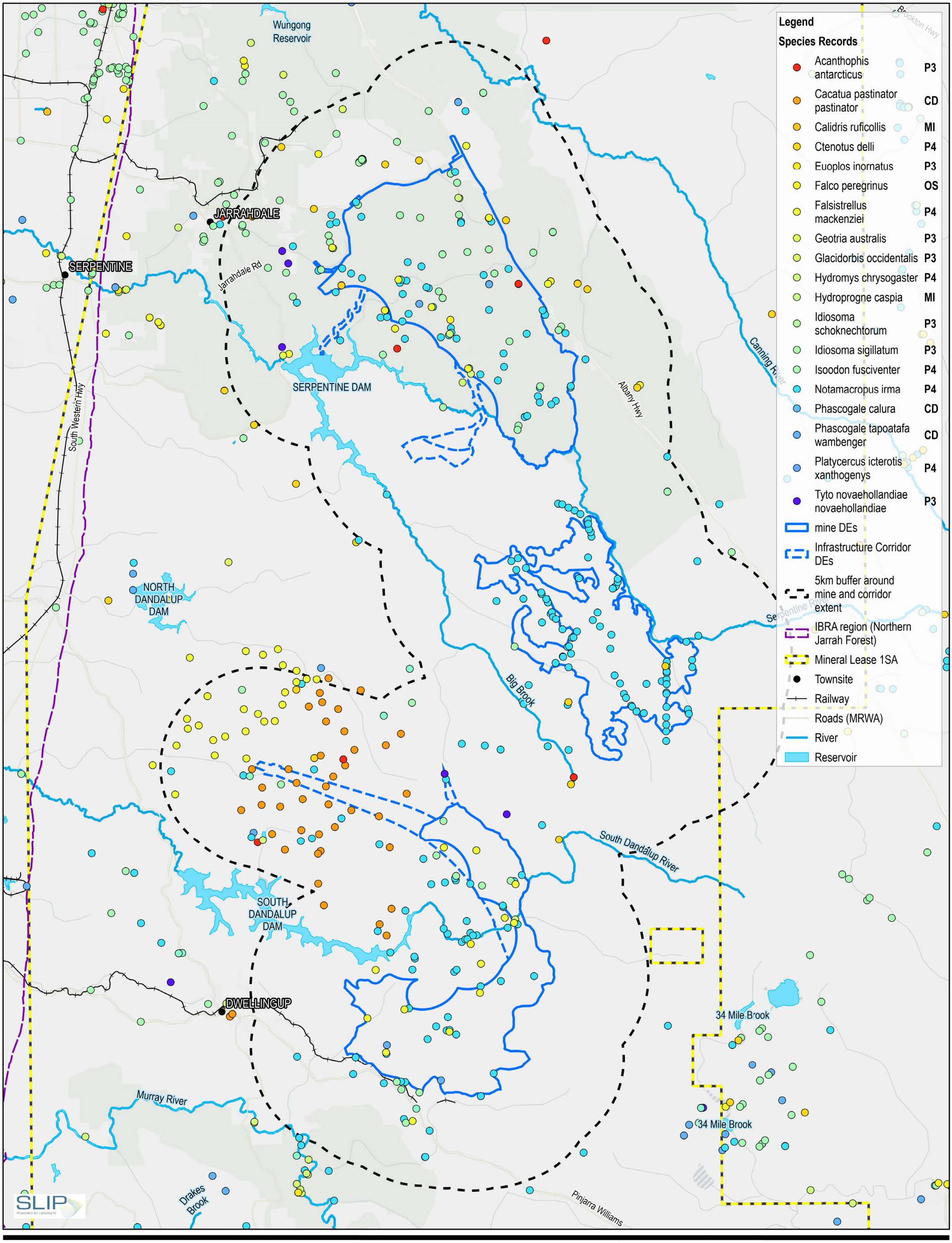
Date **12/03/2025**

FIGURE 6-4



Scale: 1:180,000 at ISO A3

0 1 2 3

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Other Conservation Significant Fauna Records - Huntly Mine

Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

FIGURE 6-5

Introduced fauna threats to conservation significant fauna

Of the introduced species recorded during the terrestrial fauna surveys (2024, 2025a, 2025b), the Feral Pig, Feral Cat, European Fox and European Rabbit, are considered key threatening processes to fauna listed under the EPBC Act that were recorded or likely to occur in the Mine DE: Black Cockatoos, Chuditch, Quokka and Woylie.

Habitat disturbance from the Feral Pig was notable in fauna habitat types that support conservation significant fauna species during the Myara North and Holyoake terrestrial surveys (GHD 2025a, 2025b). Feral Pigs are widespread in the south-west of WA. They contribute to a range of habitat changes, such as the destruction of plants, changing composition of plant communities, alteration of soil structure through digging and rooting, increased invasion and spread of weeds, reduced water quality through disturbance of riparian zones and the creation of suitable habitat for plant disease vectors. Feral Pigs also are reservoirs for endemic animal diseases or vectors for exotic animal and plant diseases (DEE 2017b). The feral pig is a known threat to the Quokka and Woylie through the degradation of their habitat (DEC 2013).

The Feral Cat is found across WA and lives in all types of habitats. The main impact that they have on native animals is through predation, as live prey is their main source of food and mammals are their dominant prey. They have contributed to the extinction of small to medium sized mammals and ground nesting birds. They also pose a threat to native predators, such as Chuditch. Feral cats may prey upon Chuditch and they also compete for food sources. Feral Cats host numerous disease-causing agents which can be transmitted to native species, particularly mammals (CoA 2024). In addition to the Chuditch, the Feral Cat is a known threat to the Quokka and Woylie (DEE 2013).

The European Fox is present across the majority of WA, except the most northern regions. The main impact they have on native animals is through predation. Terrestrial critical-weight-range mammals (35 - 5500 grams) and ground-nesting birds are at the greatest risk to predation by the fox (DEWHA 2008e). The European Fox is a known threat to the Quokka, Woylie and Chuditch (DEE 2013, DoE 2015a).

The European Rabbit is present across the majority of WA, except the most northern regions, and causes a range of impacts to native fauna and their habitats. These impacts include competition for resources (food and shelter), preventing plant regeneration, general damage to plant species, reversing the normal processes of plant succession, altering ecological communities, and changing soil structure and nutrient cycling leading to erosion, and removal of habitat for arboreal mammals and birds. The European Rabbit is a known threat to the Chuditch (DEE 2016).

Feral animal control in the Northern Jarrah Forest

Alcoa has contributed funding to feral animal control in the NJF subregion from 1994 onwards, commencing with Operation Foxglove, which was the first broadscale baiting program in the NJF subregion. Operation Foxglove involved baiting over 550,000 ha of Jarrah forest and demonstrated that baiting was effective at controlling European Fox but did not impact the Chuditch.

The success of Operation Foxglove in the NJF subregion led to the implementation of Western Shield, DBCA's flagship wildlife recovery program. Western Shield expanded baiting and feral animal control to cover large areas of DBCA managed lands in WA and resulted in the recovery of several critical weight range mammals including Woylie, Chuditch and Quokka.

Due to the program's success, the species Quenda and Tammar Wallaby (*Macropus eugenii*) were de-listed as endangered species and the Chuditch re-listed from Endangered to Vulnerable under the BC Act and EPBC Act. Woylie was also de-listed, however its population

subsequently declined, primarily due to Feral Cat predation with the removal of European Fox as the top predator, and the species has been re-listed as Endangered under the EPBC Act.

Recognition of the increase in Feral Cat predation led to the development and deployment of Eradicat baits as part of Western Shield. During 2020-2021, approximately 3.8 million ha of DBCA managed and adjoining lands were baited using approximately 410,000 fox baits and 648,000 Eradicat baits. Integrated baiting has been demonstrated to reduce the abundance of European Fox by 80 per cent and Feral Cat by 70 per cent.

6.3.3.5 Black Cockatoos

A Black Cockatoo habitat assessment was undertaken in accordance with EPBC referral guidelines (DSEWPAC 2012)[4], Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020a), and Survey guidelines for Australia's threatened birds (DEWHA 2010), addressing foraging, breeding and roosting habitat.

Black Cockatoo habitat within the Mine DE is summarised in Table 6.12 and mapped for each species as follows:

- Figure 6-6 1 to Figure 6-6.3: Forest Red-tailed Black Cockatoo
- Figure 6-7.1 to Figure 6-7.3: Carnaby's Cockatoo
- Figure 6-8.1 to Figure 6-8.3: Baudin's Cockatoo

The mapping also includes baseline survey results (GHD 2024, 2025a, 2025b) for Black Cockatoos within the Mine DE. DBCA database search records cannot be presented at a scale of 1:200,000 or less.

Foraging habitat

Table 6.12 presents the foraging habitat across the Mine DE. Foraging habitat was assessed for each Black Cockatoo species, based on foraging evidence and presence of foraging species (GHD 2021a, 2021b).

As presented in Table 6.12, the Mine DE predominantly comprises foraging habitat for all three species of Black Cockatoos, due to the prevalence of Jarrah-Marri Forest which contains key foraging species including Marri, Jarrah and proteaceous species. Historic mine rehabilitation and small areas of Wandoo Woodland within the O'Neil DE also comprise foraging habitat for all three species. Blackbutt Forest provides foraging habitat for FRTBC and small areas of Pine Plantation provide habitat for Carnaby's Cockatoo and Baudin's Cockatoo. Flooded Gum Woodland and Melaleuca Dampland comprise limited foraging habitat, as they contain foraging species that are sub-dominant to the main canopy vegetation.

In total, the Mine DE comprises approximately 23,431 ha (98.0 per cent) of foraging habitat for FRTBC, 23,518 ha (98.4 per cent) of foraging habitat for Baudin's Cockatoo and 23,518 ha (98.4 per cent) of foraging habitat for Carnaby's Cockatoo.

GHD (2025a) recorded foraging evidence at a total of 71 sites within and in the vicinity of the Myara North DE, including 67 sites of FRTBC, three sites of Carnaby's Cockatoo and one site from Baudin's Cockatoo. GHD (2025b) recorded foraging evidence at a total of 57 sites within and in the vicinity of the Holyoake DE, including 52 sites of FRTBC, one site of Carnaby's

[4]Surveys conducted prior to release of Referral Guideline for 3 WA Threatened Black Cockatoo Species (DAWE 2022)

Cockatoo and three sites from Baudin's Cockatoo. GHD (2024) recorded foraging evidence at a total of 258 sites within and in the vicinity of the O'Neil DE, including 235 sites of FRTBC, two sites of Carnaby's Cockatoo and 21 sites of Baudin's Cockatoo.

Regional foraging habitat

Figure 6.9 presents indicative mapping of Black Cockatoo foraging habitat within 12 km of the Mine DE, based on publicly available spatial datasets and mapping of Alcoa mined and rehabilitated areas. Habitat is mapped to a distance of 12 km from the Mine DE, being the distance that Black Cockatoos will mainly forage out to from their nest (DAWE 2022). The mapping is indicative and in the absence of ground truthing, such as assessment of habitat types and foraging evidence. However, based on vegetation mapping to date over the Huntly Mine and the vegetation complexes mapped in the vicinity of the Mine DE (see Section 5.3.4.1), native vegetation within 12 km of the Mine DE is expected to predominantly comprise Jarrah-Marri Forest with areas of Wandoo Woodland in the east; minor areas of Blackbutt Forest, Bullich Forest, Flooded Gum Woodland and Melaleuca Dampland in valleys; and minor areas of Granite Outcrop Association.

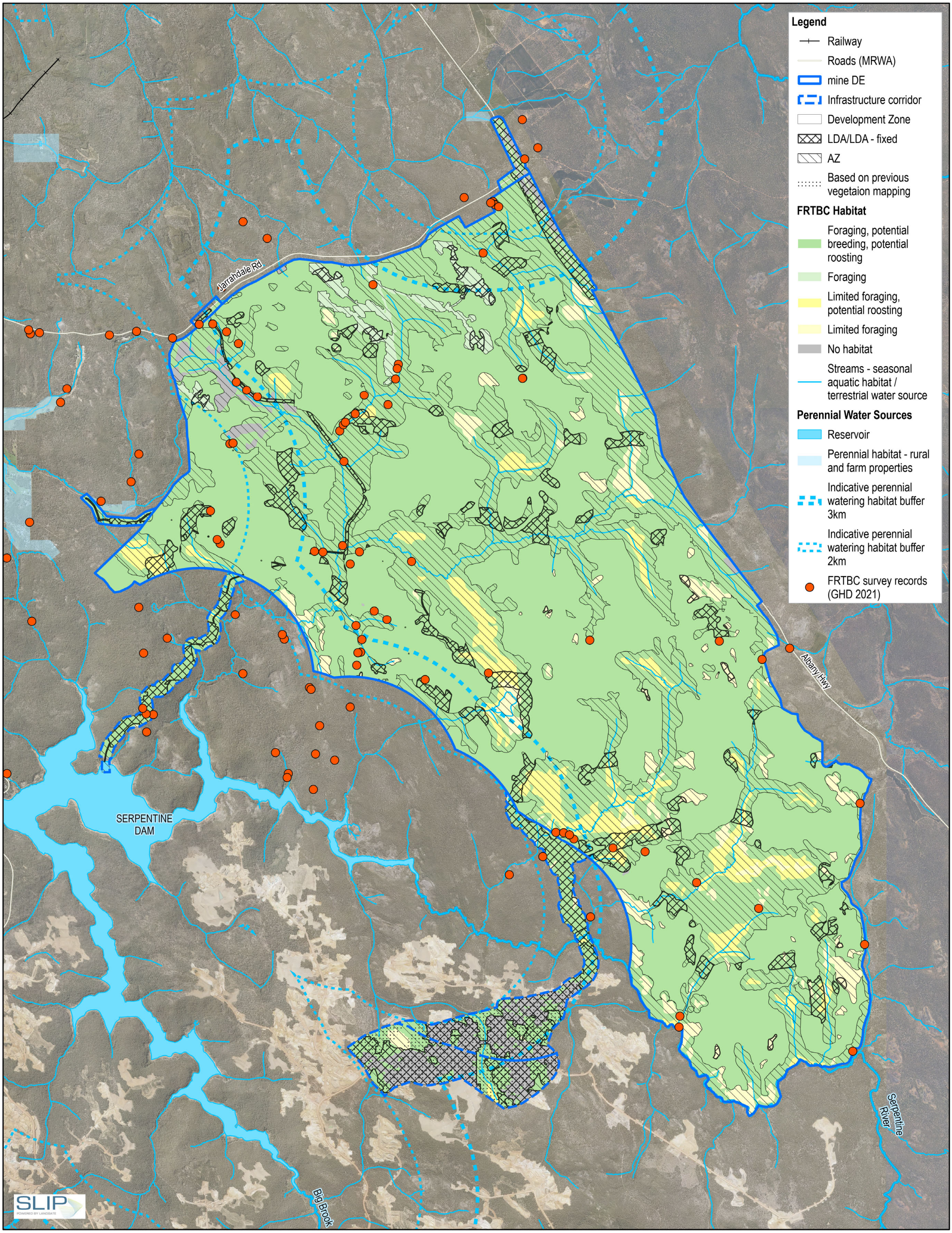
Table 6.13 presents a summary of the indicative regional foraging habitat, which indicates that approximately 223,300 ha of foraging habitat lies within 12 km of the Mine DE, including approximately 207,700 ha (93 per cent) that is un-mined native vegetation, and approximately 10,700 ha (5 per cent) that is mine rehabilitation from 3 to 35 years of age. Black Cockatoo foraging on mine rehabilitation is discussed in Section 6.4.4.2. In addition to native vegetation, approximately 4,823 ha of exotic plantations (FPC and mine rehabilitation) are mapped within 12 km of the Mine DE. These exotic plantations contain pine trees that comprise foraging habitat for Carnaby's and Baudin's cockatoos.

Table 6.12 Black Cockatoo habitat classification

Fauna habitat type	Forest Red-tailed Black Cockatoo - habitat classification	Baudin's Cockatoo - habitat classification	Carnaby's Cockatoo - habitat classification	Extent within Myara North DE (ha)	Extent within Holyoake DE (ha)	Extent within O'Neil DE (ha)	Total extent within Mine DE (ha)
Conservation status	**Vulnerable (EPBC Act, BC Act)**	**Endangered (EPBC Act, BC Act)**	**Endangered (EPBC Act, BC Act)**				
Likelihood of occurrence	**Known**	**Known**	**Known**				
Blackbutt Forest	Foraging, potential breeding, potential roosting	Limited foraging, potential roosting	Limited foraging, potential roosting	427	169	46	642
Bullich Forest	Foraging, potential breeding, potential roosting	Limited foraging, potential breeding, potential roosting	Limited foraging, potential roosting	70	187	23	280
Granite Outcrop	Limited foraging, potential roosting	Limited foraging, potential roosting	Limited foraging, potential breeding, potential roosting	303	0	139	443
Flooded Gum Woodland	Limited foraging	Limited foraging	Limited foraging, potential breeding habitat	511	264	122	897
Jarrah-Marri Forest	Foraging, potential breeding, potential roosting	Foraging, potential breeding, potential roosting	Foraging, potential breeding, potential roosting	8,750	6,799	4,707	20,255
Melaleuca Dampland	Limited foraging	Limited foraging	Limited foraging	129	34	34	197
Wandoo Woodland	Foraging, potential breeding, potential roosting	Foraging, potential breeding, potential roosting	Foraging, potential breeding, potential roosting	0	0	11	11
Mine Rehabilitation	Foraging	Foraging	Foraging	156	158	391	706
Pine Plantation	None	Foraging	Foraging, potential roosting	87	0	0	87
Cleared land	No habitat	No habitat	No habitat	264	13	97	374
Unsurveyed	n/a	n/a	n/a	7	0	0	8
			Total area within DE	**10,705**	**7,624**	**5,571**	**23,900**
Species habitat total within Mine DE	**23,431**	**23,518**	**23,518**				
Total foraging habitat	21,894	21,060	21,060				
Total limited foraging habitat	1,537	2,458	2,458				
Total potential breeding habitat	21,188	20,547	21,152				
Total potential roosting habitat	21,631	21,631	21,718				

Table 6.13 Black Cockatoo indicative regional foraging habitat

Fauna habitat type	Extent (ha) within 12 km of Mine DE (and within 2 km of perennial water sources)	Extent (ha) within 12 km of Mine DE (and within 2-3 km of perennial water sources)	Extent (ha) within 12 km of Mine DE (and more than 3 km from perennial water sources)	Total extent (ha) within 12 km of Mine DE	Extent (ha) within 6 km of Mine DE (and within 2 km of perennial water sources)	Extent (ha) within 6 km of Mine DE (and within 2-3 km of perennial water sources)	Extent (ha) within 6 km of Mine DE (and more than 3 km from perennial water sources)	Total extent (ha) within 6 km of Mine DE
Foraging habitat for all three species of Black Cockatoos								
Native vegetation extent (un-mined)	63,817	20,514	123,408	207,740	33,034	13,899	74,141	121,073
Mine rehabilitation aged 3-7 years (proteaceous foraging species)	783	204	915	1902	151	70	626	847
Mine rehabilitation aged 7-35 years (myrtaceous foraging species)	1,490	922	6,426	8,838	2,787	1,115	7,735	11,636
Subtotal	66,090	21,640	130,749	218,480	35,972	15,084	82,502	133,556
Foraging habitat for Carnaby's and Baudin's Cockatoos – pines								
FPC plantations	785	224	341	1,351	677	175	329	1,181
Mine rehabilitation aged 36+ years	2,756	474	242	3,472	1,106	363	242	1,711
Subtotal	3541	698	583	4823	1783	538	571	2892
Total Black Cockatoo habitat	69,631	22,338	131,332	**223,303**	37,755	15,622	83,073	**136,448**



Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Forest Red Tailed Black Cockatoo Habitat Myara North

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-6.1

SOUTH DANDALUP DAM

Kennedy's Pool

South Dandalup River

Pinjarra Williams

Legend

- Railway
- Roads (MRWA)
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

FRTBC Habitat

- Foraging, potential breeding, potential roosting
- Foraging
- Limited foraging, potential roosting
- Limited foraging
- No habitat
- Streams - seasonal aquatic habitat / terrestrial water source

Perennial Water Sources

- Reservoir
- Perennial habitat - rural and farm properties
- Perennial - river pool
- Indicative perennial watering habitat buffer 3km
- Indicative perennial watering habitat buffer 2km
- FRTBC survey records (GHD 2021)

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Forest Red Tailed Black Cockatoo Habitat Holyoake

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-6.2

Albany Hwy
Serpentine River
Big Brook
South Dandalup River

Legend

- Roads (MRWA)
- mine DEs
- Infrastructure Corridor DEs
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

FRTBC Habitat

- Foraging, potential breeding, potential roosting
- Foraging
- Limited foraging, potential roosting
- Limited foraging
- No habitat
- Streams - seasonal aquatic habitat / terrestrial water source

Perennial Water Sources

- Indicative perennial watering habitat buffer 3km
- Indicative perennial watering habitat buffer 2km
- FRTBC survey records (GHD 2021)

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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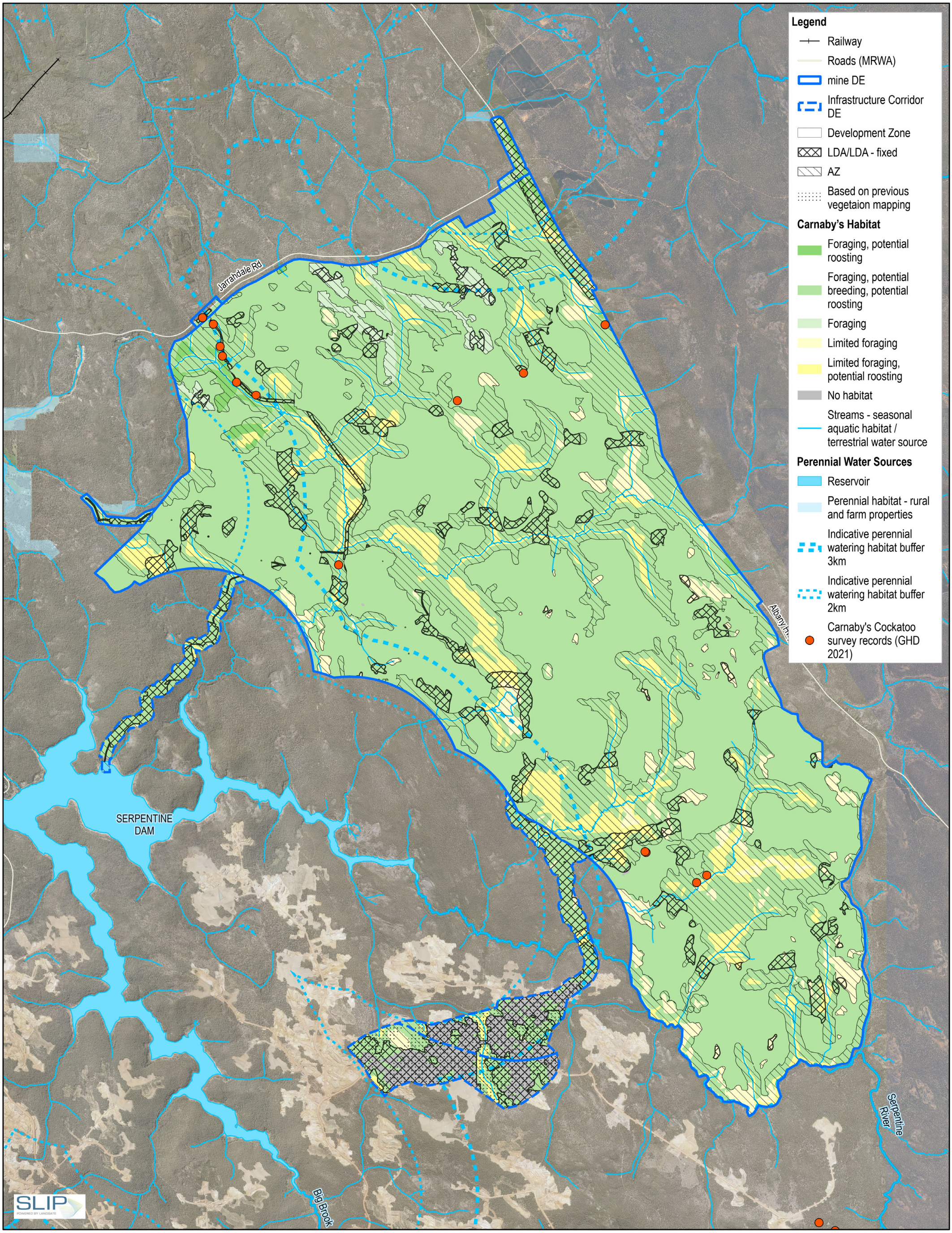
Forest Red Tailed Black Cockatoo Habitat O'Neil

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-6.3



Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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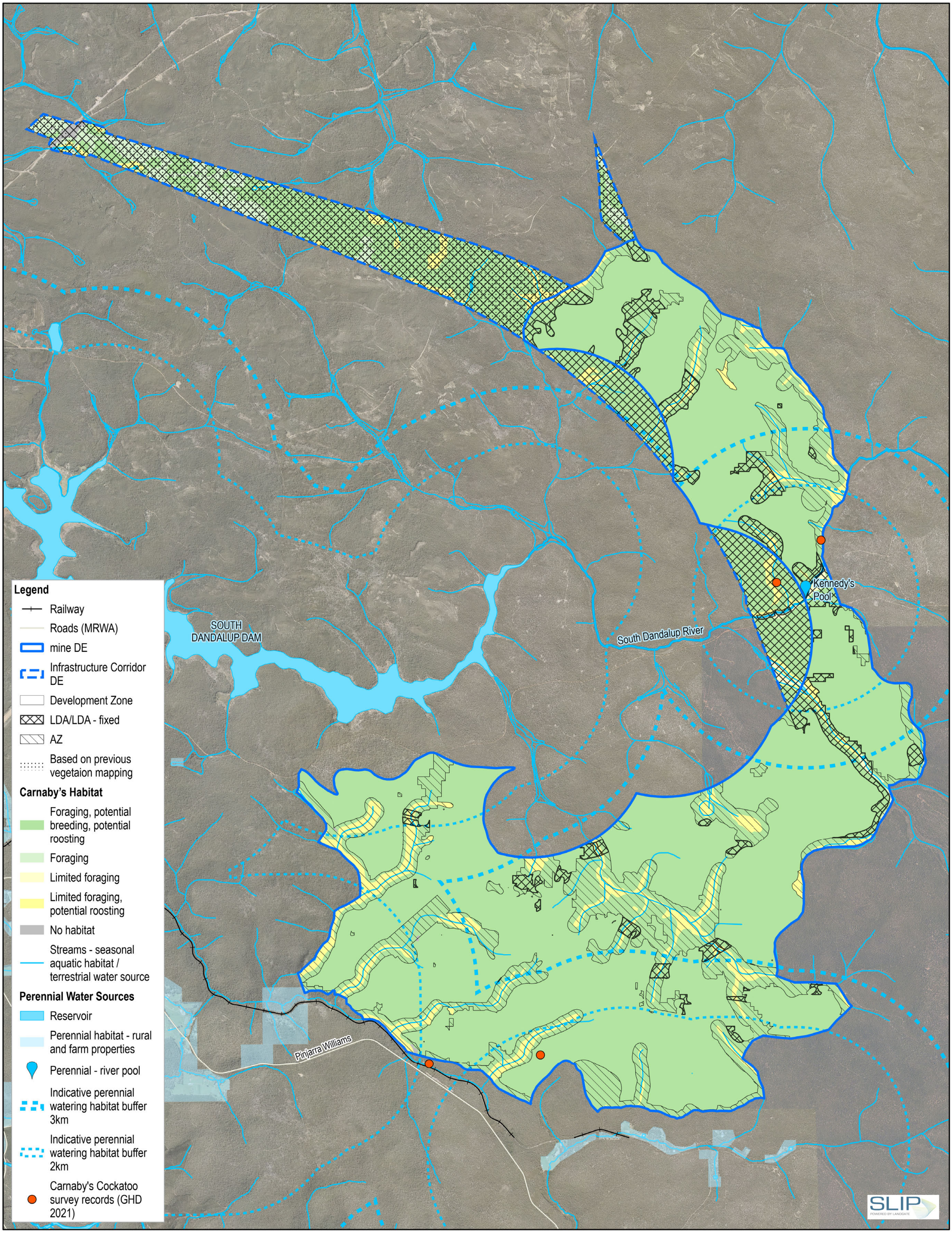
Carnaby's Cockatoo Habitat
Myara North

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-7.1



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Carnaby's Cockatoo Habitat
Holyoake

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-7.2

Albany Hwy

Serpentine River

Big Brook

South Dandalup River

Legend

- Roads (MRWA)
- mine DEs
- Infrastructure Corridor DEs
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

Carnaby's Habitat

- Foraging, potential roosting
- Foraging, potential breeding, potential roosting
- Foraging
- Limited foraging
- Limited foraging, potential roosting
- No habitat
- Streams - seasonal aquatic habitat / terrestrial water source

Perennial Water Sources

- Indicative perennial watering habitat buffer 3km
- Indicative perennial watering habitat buffer 2km
- Carnaby's Cockatoo survey records (GHD 2021, 2024)

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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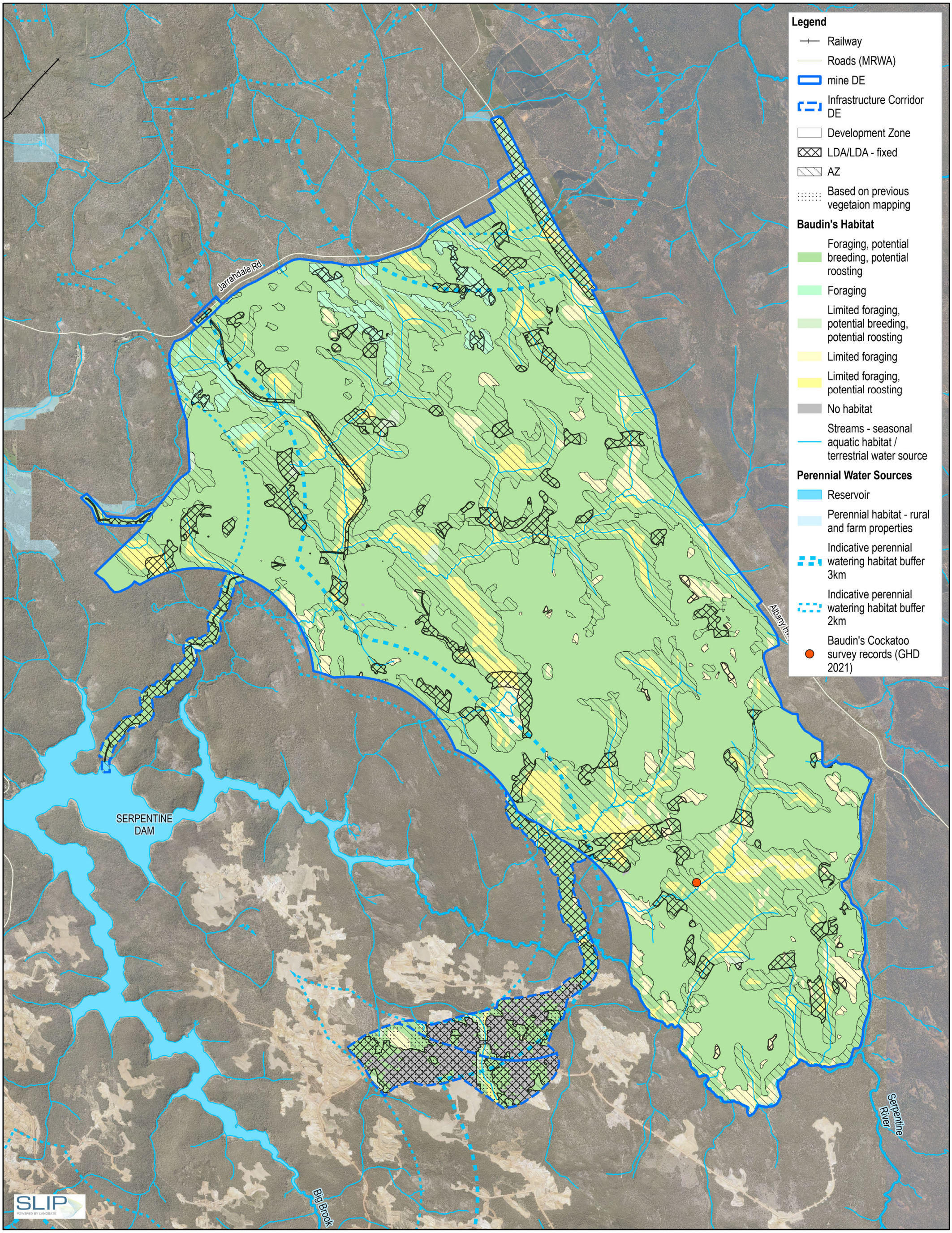
Carnaby's Cockatoo Habitat
O'Neil

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-7.3



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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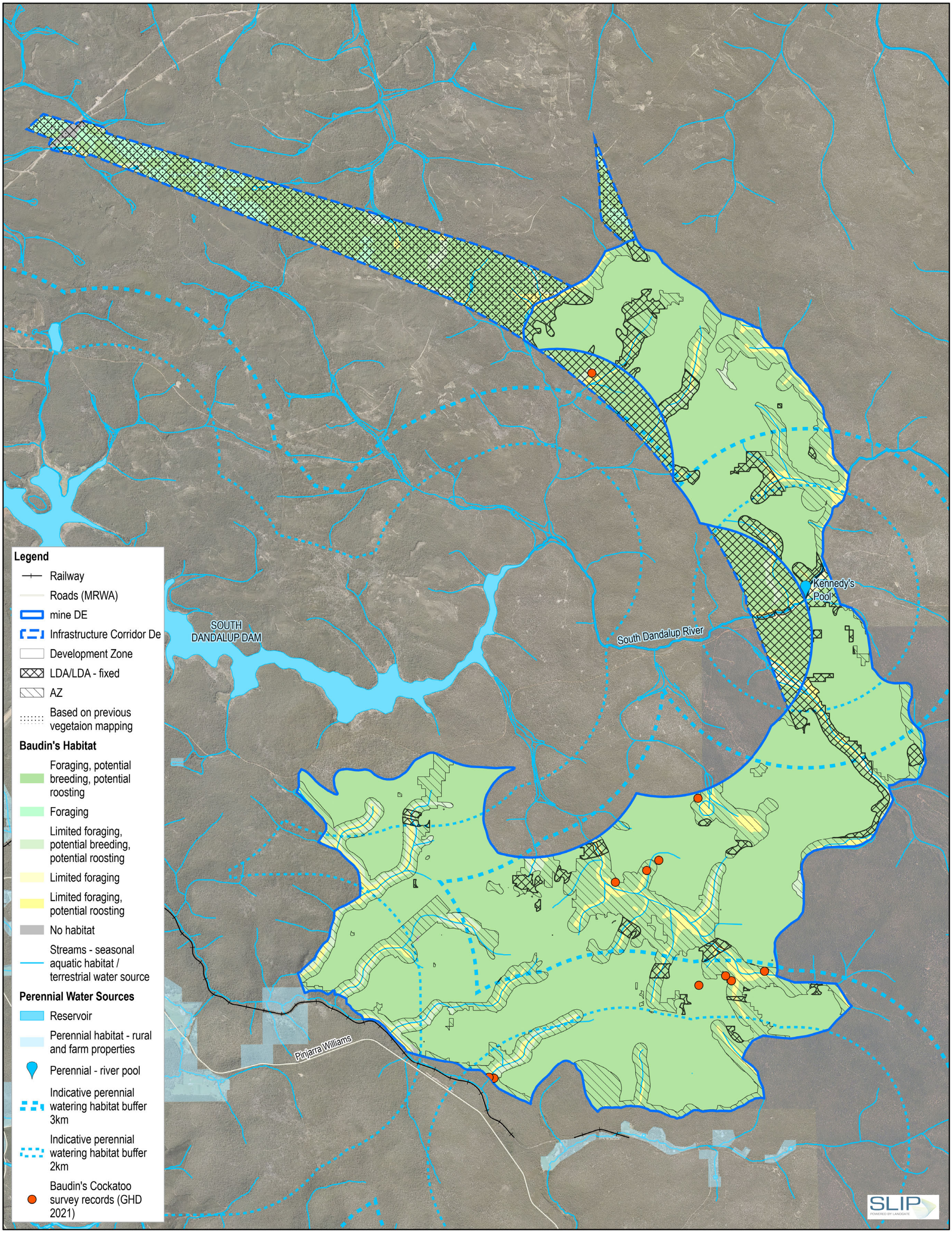
Baudin's Cockatoo Habitat
Myara North

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-8.1



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Pinjarra Refinery Revised Proposal - Environmental Review Document

Baudin's Cockatoo Habitat Holyoake

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-8.2

Albany Hwy

Serpentine River

Big Brook

South Dandalup River

Legend

- Roads (MRWA)
- mine DEs
- Infrastructure Corridor DEs
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

Baudin's Habitat

- Foraging, potential breeding, potential roosting
- Foraging
- Limited foraging, potential breeding, potential roosting
- Limited foraging
- Limited foraging, potential roosting
- No habitat
- Streams - seasonal aquatic habitat / terrestrial water source

Perennial Water Sources

- Indicative perennial watering habitat buffer 3km
- Indicative perennial watering habitat buffer 2km
- Baudin's Cockatoo survey records (GHD 2021, 2024)

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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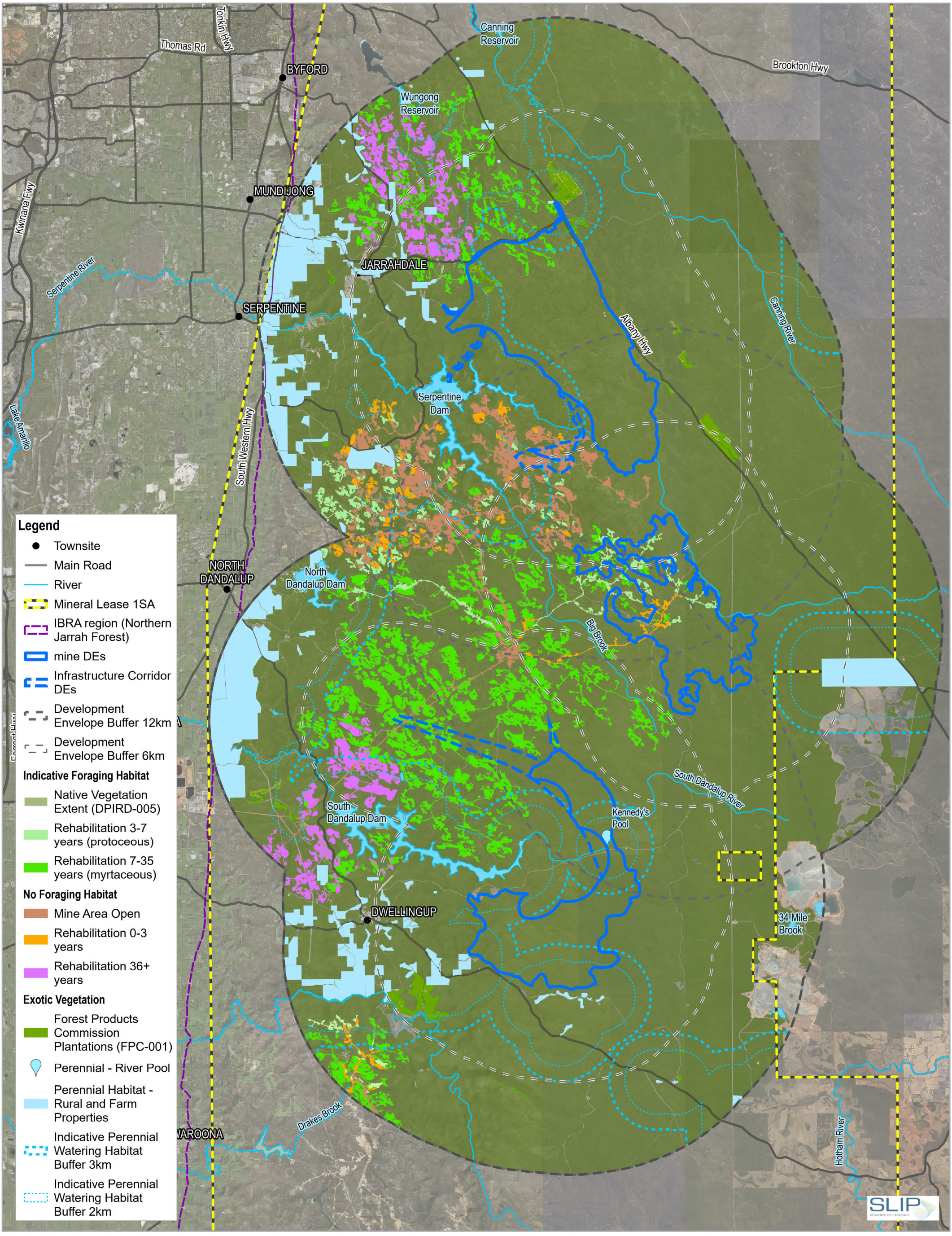
Baudin's Cockatoo Habitat
O'Neil

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-8.3



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0 2 4 6 8 10

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Black Cockatoo Indicative Regional Foraging Habitat

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-9

Data source: World Topographic Map: Esri, HERE, Garmin, FAO, NOAA, USGS
WANow: .

Breeding habitat

Black cockatoos breed in trees of a species known to form hollows. Hollows generally start to form in trees that have a diameter at breast height (DBH) exceeding 50 cm, which indicates an age of approximately 100 to 150 years for Jarrah and Marri (Whitford 2014). Trees senesce at variable ages over this period, with hollows increasingly forming after 130 years of age (see Section 5.3.4.4).

Potential nesting trees are therefore trees without suitable nest hollows at present but are at an age where they have potential to form hollows over a period of a few to several decades. Within the Northern Jarrah Forest IBRA subregion this includes Jarrah, Marri, Blackbutt, Bullich and Flooded Gum trees with DBH exceeding 50 cm and Wandoo with DBH exceeding 30 cm. Other nesting tree species are used by Black Cockatoos in the Southern Jarrah Forest, Swan Coastal Plain and Avon-Wheatbelt IBRA subregions. By comparison, smaller diameter trees are typically immature or juvenile and may take several decades to a century or more to reach an age where they have potential to form hollows.

Suitable nesting trees are potential nesting trees that have hollows of suitable diameter, height above ground and aspect that are potentially suitable for nesting (i.e. suitable nest hollows) and are not impacted by feral bees. Known nesting trees are trees (live or dead but still standing) that have hollows with evidence of past use, such as a chewed entrance or are currently known to be used by Black Cockatoos.

Nesting tree survey

GHD (2024, 2025a, 2025b) undertook a survey of nesting trees within and in the vicinity of the Mine DE. The survey comprised a total of 84 plots, each approximately 3 ha (60 m by 500 m) for Myara North and Holyoake and approximately 2 ha (40 m by 500 m) for O'Neil. The plots comprised a total of 241.5 ha and recorded a total of 14 known nesting trees, 33 suitable nesting trees and 4126 potential nesting trees.

Survey data was subject to bootstrapping statistical analysis to calculate the median density of potential nesting trees (trees per hectare) and the 95 per cent confidence intervals, which are presented in Table 6.14. The frequency distribution of the density of potential nesting trees is presented in Chart 6-1 and the frequency distribution of the density of known and suitable nesting trees is presented in Chart 6-2. A breakdown of the tree species of the known, suitable and potential nesting trees is presented in Table 6.15 (Myara North), Table 6.16 (Holyoake) and Table 6.17 (O'Neil).

The locations of plots and recorded nesting trees are presented in Figure 6-9.1 (Myara North), Figure 6-9.2 (Holyoake) and Figure 6-9.3 (O'Neil). Insets are provided for plots that recorded known or suitable nesting trees. In addition to the survey plots, a visual survey of hollow bearing trees was undertaken by Tony Kirkby within Myara North by driving along the network of forest tracks. This survey along forest tracks recorded additional known and suitable nesting trees, which are also presented in Figure 6.9 1, including a cluster identified in Balmoral in the vicinity of rural properties west of the Myara North DE.

As presented in Table 6.14, the Mine DE is estimated to contain approximately 314,200 potential nesting trees, with a 95 per cent confidence interval of 256,600 – 422,500. As presented in Table 6.14 and Chart 6-1, the density of potential nesting trees is expected to vary substantially within and between the three DEs, with higher densities estimated for Holyoake and O'Neil compared to Myara North. As presented in Table 6.14 and Chart 6-2, known and suitable nesting trees are estimated to be relatively rare, at approximately 1-2 per cent of potential nest trees in Myara North and less than 1 per cent of potential nest trees in Holyoake. No suitable or known nesting trees were recorded in plots within O'Neil. Based on the estimated number of potential nesting trees, the Mine DE is expected to comprise a large number (in the order of thousands) of known and suitable nesting trees, the locations of which may vary

substantially and cannot be estimated from the baseline surveys. Known nesting trees are expected to be predominantly located in proximity to perennial water sources based on research (Craig et al. 2022, see below under watering habitat). Actual locations of known and suitable nesting trees will be determined in the field by pre-clearance surveys undertaken for clearing footprints once defined (see Section 6.5.1).

As presented in Table 6.15, Table 6.16, and Table 6.17, the surveyed nest trees were predominantly (65 per cent) Jarrah with smaller numbers of Marri (19 per cent) and Blackbutt (13 per cent). Known nesting trees were predominantly (57 per cent) Marri and Bullich (21 per cent). Suitable nesting trees were a mix of Jarrah (45 per cent), Marri (30 per cent) and Blackbutt (24 per cent).

Johnstone *et al* (2013) surveyed 128 FRTBC actual breeding trees across 19 sites from 1993 to 2010, reporting that the majority (84 per cent) of FRTBC nests were in very old and very large Marri trees (estimated 140-410 years of age). Most nests were in living Marri trees (74 per cent of total). Only 8 per cent of nests were recorded in Jarrah, despite its predominance in the forest canopy, and 2 per cent of nests were each recorded in Blackbutt and Bullich. The survey indicated the importance of Marri for Black Cockatoo nesting, as this tree species appears to be more subject to large hollow formation compared to Jarrah (T. Kirkby, pers. comm).

Breeding records

The nearest confirmed breeding sites to the Myara North DE are approximately 6 km to the north at 31 Mile Brook and 5 km to the west near the Darling Scarp. The nearest confirmed breeding sites to the Holyoake DE are a Baudin's cockatoo breeding record approximately 30 km to the north at Myara North, and the nearest Carnaby's Cockatoo breeding record approximately 18 km to the east near Bannister.

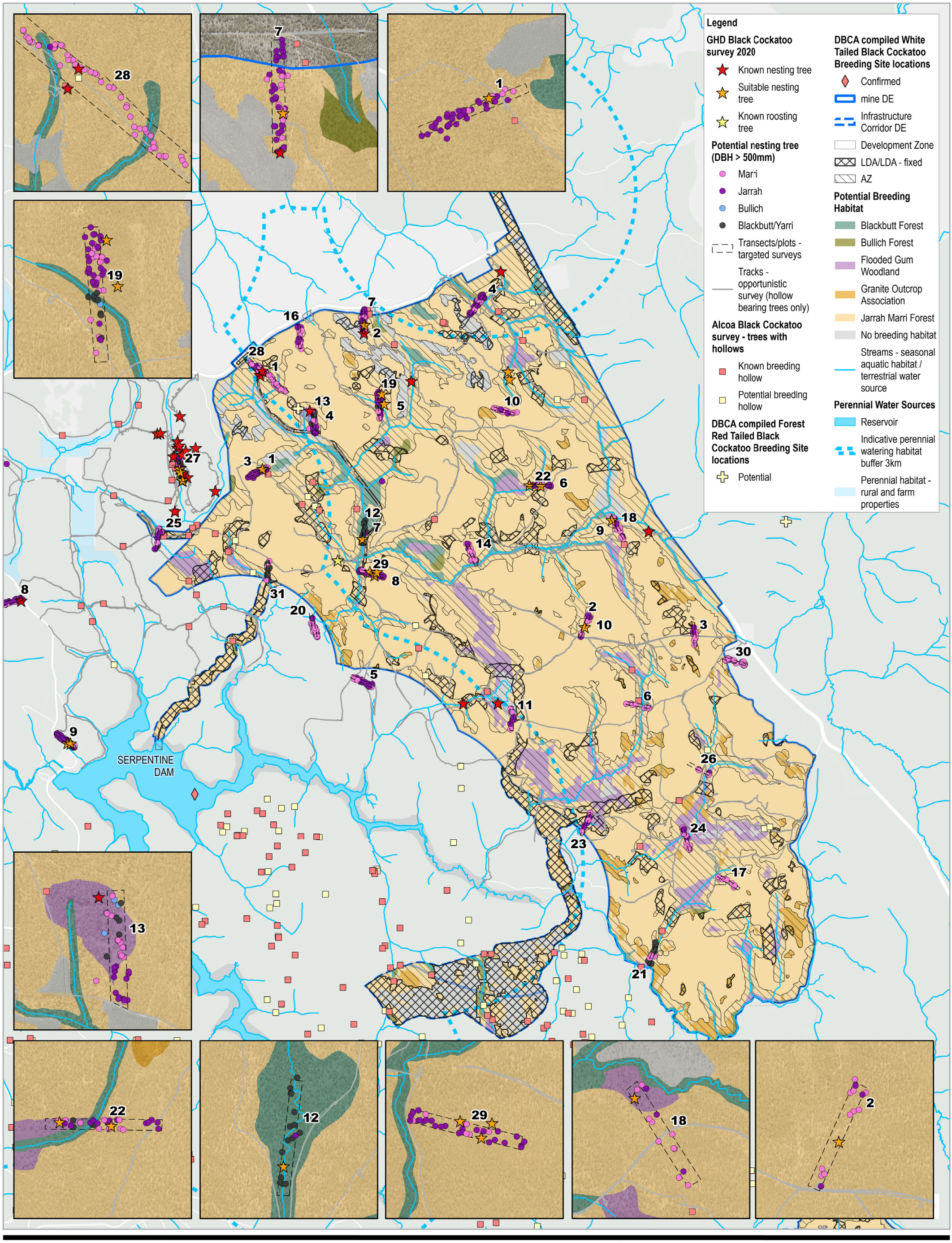
Tony Kirby (pers comm) suggests FRTBC and Baudin's Cockatoo breed in the southern portion of the Myara North DE, and that Carnaby's cockatoo are suspected to breed near Solus Road in the Myara North infrastructure corridor. Tony Kirby also suggests the Holyoake DE is known to support FRTBC breeding.

Roosting habitat

Baseline surveys (GHD 2024, 2025a, 2025b) identified a single known roost tree in the Myara North DE (see Figure 6-9.1) and no roost trees in the Holyoake DE or O'Neil. Given the extent of mapped potential roosting habitat and the observations of Black Cockatoos (particularly FRTBC) across the Mine DE, the Mine DE is expected to comprise numerous temporary roost trees and a smaller number of large, permanent roost trees, the locations of which may vary substantially and cannot be estimated from the baseline surveys. Actual locations of roost trees will be determined in the field by pre-clearance surveys undertaken for clearing footprints once these are defined (see Section 6.5.1).

Table 6.14 Black Cockatoo breeding habitat surveyed in the Mine DE

Habitat element	Myara North DE	Holyoake DE	O'Neil DE	Mine DE Total
No. plots surveyed	31	28	25	84
Area of plots surveyed	104.4	87.0	50.1	241.5
Total no. potential nest trees recorded in plots within DE	849	1,912	1,152	3,913
Total no. suitable nest trees recorded in plots (per cent of potential nest trees)	17 (2.00)	5 (0.26)	5 (0.42)	n/a
Total no. known nest trees recorded in plots (per cent of potential nest trees)	9 (1.06)	1 (0.05)	3 (0.25)	n/a
Density of potential nest trees – median (95 per cent confidence internal)	6.5 (5.4 – 10.0)	20.8 (15.5 – 28.4)	22.0 (20.0 – 26.5)	n/a
Area of potential breeding habitat within DE	9,247	7,154	4,787	21,188
Estimated no. potential nest trees within DE – median (95 per cent confidence interval)	60,100 (49,900 – 92,500)	148,800 (110,900 – 201,200)	105,300 (95,700 – 126,900)	314,200 (256,600 – 422,500)



Scale: 1:70,000 at ISO A3

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Kilometres

Insets not to scale

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Black Cockatoo Breeding Habitat – Myara North

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Revision No. **3**
Date **12/03/2025**

FIGURE 6-9.1

Data source: Light Gray Base: Esri, TomTom, Garmin, METI/NASA, USGS
WANow: Landgate / SLIP. Created by: nrama

SOUTH DANDALUP DAM

Legend

GHD Black Cockatoo survey 2020
- Known nesting tree
- Suitable nesting tree

Potential nesting tree (DBH > 500mm)
- Marri
- Jarrah
- Bullich
- Blackbutt/Yarri
- Transects/plots - targeted surveys

Alcoa Black Cockatoo survey - trees with hollows
- Known breeding hollow
- Potential breeding hollow
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ

Potential Breeding Habitat
- Blackbutt Forest
- Bullich Forest
- Flooded Gum Woodland
- Granite Outcrop Association
- Jarrah Marri Forest
- No breeding habitat
- Streams - seasonal aquatic habitat / terrestrial water source

Perennial Water Sources
- Reservoir
- Indicative perennial watering habitat buffer 3km
- Perennial habitat - rural and farm properties

Scale: 1:65,000 at ISO A3

0 0.5 1 1.5 2

Kilometres

Insets not to scale

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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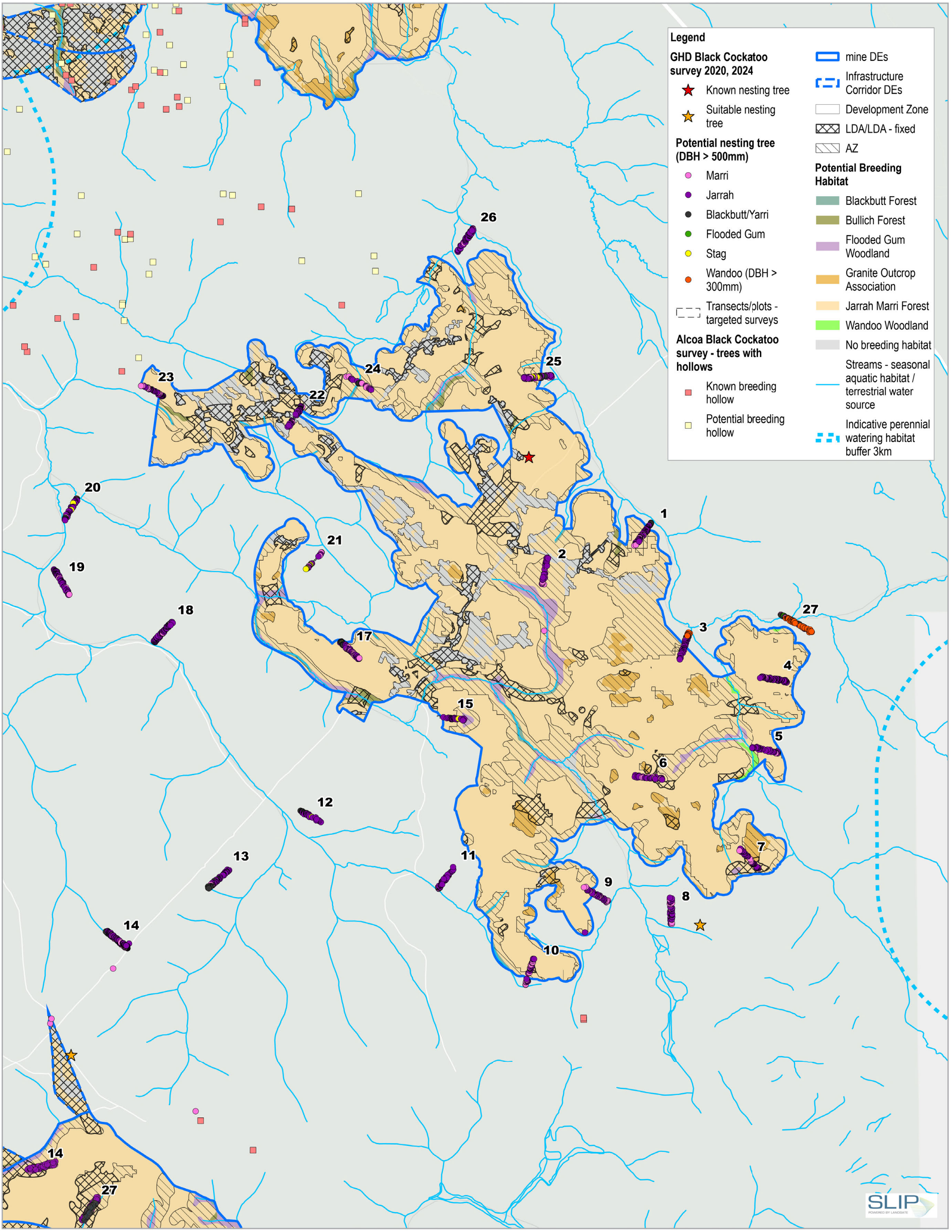
Black Cockatoo Breeding Habitat – Holyoake

Project No. 12633192
Revision No. 3
Date 12/03/2025

FIGURE 6-9.2



Scale: 1:60,000 at ISO A3

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Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Black Cockatoo Breeding Habitat – O'Neil

Project No. 12633192
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Date 12/03/2025

FIGURE 6-9.3

Data source: Light Gray Base: Esri, TomTom, Garmin, METI/NASA, USGS
WANow: Landgate / SLIP
Light Gray Base: Esri Community Maps Contributors, Esri, TomTom, Garmin, METI/NASA, USGS

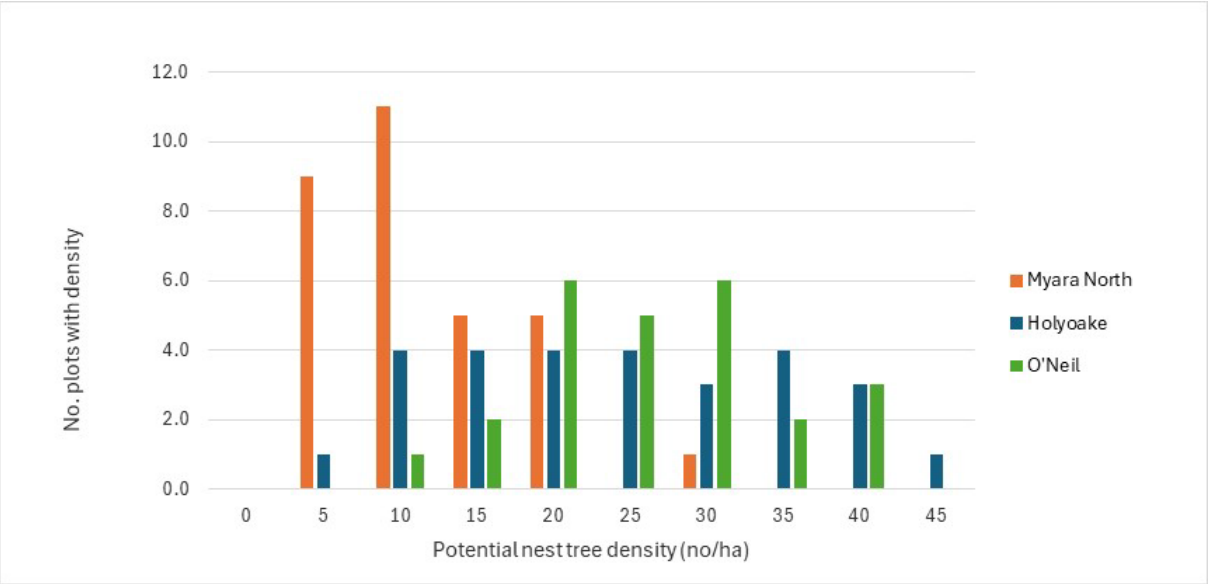


Chart 6-1 **Black Cockatoo potential nesting tree frequency distribution**

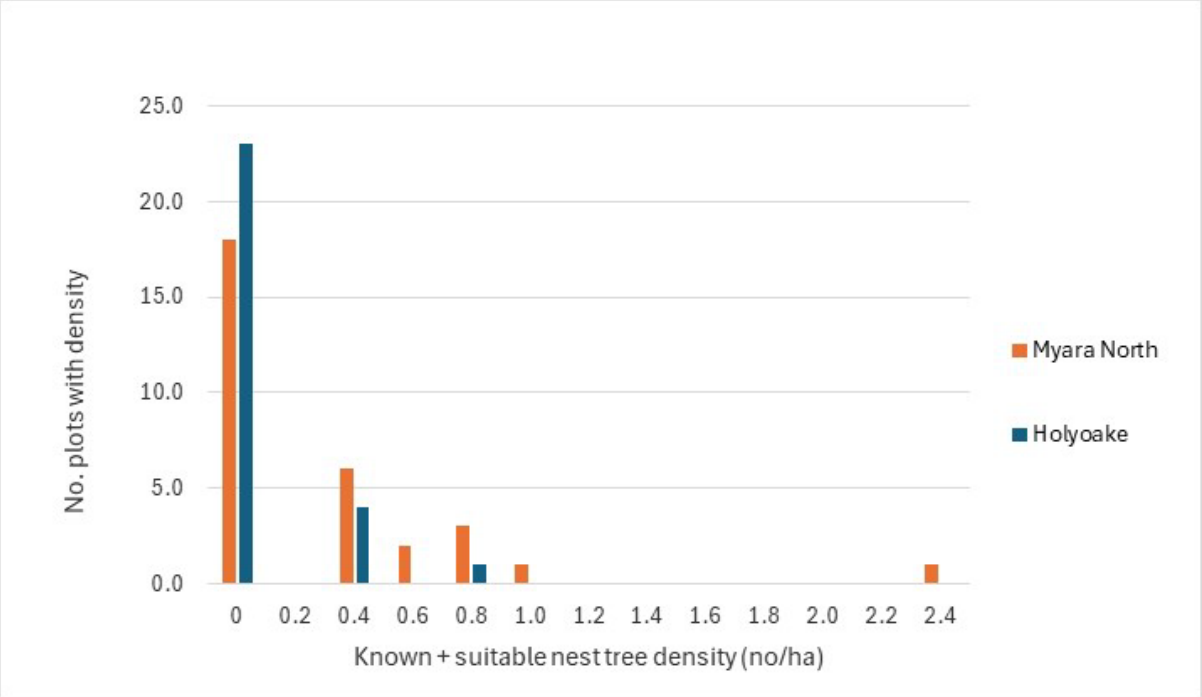


Chart 6-2 **Black Cockatoo known and suitable nesting tree frequency distribution[5]**

[5]No suitable or known nesting trees were recorded in plots within O'Neil

Table 6.15 Black Cockatoo nesting trees surveyed in Myara North

Tree species	Known nesting tree	Suitable nesting tree	Potential nesting tree	Total
Marri	4	5	361	370
Jarrah	1	10	380	391
Bullich	3		15	18
Blackbutt	2	4	90	96
Flooded Gum	-	0	3	3
Total	10	19	849	878

Table 6.16 Black Cockatoo nesting trees surveyed in Holyoake

Tree species	Known nesting tree	Suitable nesting tree	Potential nesting tree	Total
Marri	1	1	193	195
Jarrah	-	4	1,314	1,318
Bullich	--		1	1
Blackbutt	-	4	360	364
Flooded Gum	-	-	43	43
Total	1	9	1,911	1,921

Table 6.17 Black Cockatoo nesting trees surveyed in O'Neil

Tree species	Known nesting tree	Suitable nesting tree	Potential nesting tree	Total
Marri	3	4	223	230
Jarrah	-	1	1,004	1,005
Bullich	-	-	5	5
Blackbutt	-	-	75	75
Flooded Gum	-	0	1	1
Wandoo	-	-	40	40
Stag	-	-	18	18
Total	3	5	1,366	1,374

Watering habitat

Black Cockatoos prefer to drink from trees (e.g. water filled hollows and boughs) and from pools formed in granite outcrops and streams but will also drink from artificial water sources such as farm troughs and dams, mine sumps (if not steep sided) and ponds formed in mine rehabilitation (T. Kirkby, pers. comm.). Baudin's and Carnaby's Cockatoos are known to drink from reservoirs and running streams (T. Kirkby, pers. comm.). FRTBC may also drink from reservoirs in low numbers (M. Craig, pers. comm) and does not drink from running streams, as the species appears to have limited mobility on the ground and lacks the ability for quick take-off (T. Kirkby, pers. comm.).

Craig et al (2022) found 79 per cent of known nest hollows used by FRTBC were within 2 km of seasonal water bodies and 74 per cent were within 3 km of perennial water bodies. Unpublished data (M. Craig, pers. comm.) found statistically significant increase in FRTBC foraging residues within 2 km of permanent water bodies compared to further than 2 km from perennial water bodies, with use of nests unrelated to seasonal water sources (streams, rock outcrops).

Indicative perennial water sources have been mapped as reservoirs, rural properties and river pools and are presented on the habitat mapping in Figure 6-6.1 to Figure 6-6.3 (FRTBC), Figure 6-7.1 to Figure 6-7 3 (Carnaby's Cockatoo) and Figure 6-8.1 to Figure 6-8.3 (Baudin's Cockatoos).

The habitat maps also present 2km and 3km buffers from the indicative perennial water sources, to indicate the potential for increased foraging and breeding activity by Black Cockatoos as suggested by research. As presented in the maps, Myara North lies in proximity to perennial water sources of Serpentine Dam and rural properties in Balmoral west of Jarrahdale, whereas Holyoake contains Kennedy's Pool and lies in proximity to perennial water sources of South Dandalup Dam and rural properties at Inglehope. By comparison, O'Neil lies relatively distant from perennial water sources and so may be subject to lower levels of Black Cockatoo activity during the summer and autumn as seasonal water sources dry out.

Seasonal watering habitat is not mapped as it is expected to occur throughout the canopy, streams and granite outcrops within the Mine DE.

Species movements

The FRTBC is residential within a locality, with movements driven by changing food and water resources in the locality. Seasonal movements occur in response to the drying of natural water sources in the Northern Jarrah Forest. Local populations are expected to move to the vicinity of perennial water sources near Jarrahdale and Dwellingup in summer-autumn and disperse further away in winter-spring (T. Kirkby, pers. comm.). The species can also move away from perennial water sources if local foraging resources are limited (e.g. Marri and/or Jarrah low fruiting year). FRTBC typically move in large flocks of up to 100 birds but can be in small groups of about 5 birds (T. Kirkby, pers. comm.).

Baudin's Cockatoo undergoes a seasonal migration within the Jarrah Forest (Johnstone and Kirkby 2008) although there is a small resident population in the vicinity of the Mine DE (T. Kirkby, pers. comm.). Baudin's Cockatoo breeds during spring-summer, primarily in the Southern Jarrah Forest IBRA subregion, east to Kojonup, and near Albany (Johnstone and Kirkby 2008). Following breeding, birds leave the nesting areas and form large foraging flocks that move to non-breeding roosts in the western Northern Jarrah Forest. Flocks begin to arrive in the Northern Jarrah Forest in late summer/autumn, with the largest groups (> 600 birds) recorded in late autumn/winter (Johnstone and Kirkby 2008). Baudin's forage predominantly (about 90 per cent) on Marri (T. Kirkby, pers. comm.). By mid-October, most birds have returned south to their breeding range. As noted above, there is a small resident population near the Mine DE, which breeds locally and does not migrate.

Similar to Baudin's Cockatoo, Carnaby's Cockatoo also undergoes a seasonal migration and has a small residential population near the Mine DE. During the spring/summer the majority of birds are in the breeding range of the Wheatbelt region, then in autumn/winter flocks move west to forage in the Northern Jarrah Forest. In the vicinity of the Mine DE flocks of Carnaby's Cockatoo forage on pine plantations as well as proteaceous species (e.g. *Banksia*) rather than feeding on the dominant Marri / Jarrah canopy (T. Kirkby, pers. comm.). Although the majority of Carnaby's Cockatoos are seasonal foraging visitors, there is a small breeding population that is resident in the vicinity of the Mine DE (T. Kirkby, pers. comm.).

Species population

Resident FRTBC populations are expected to occur in the Myara North and Holyoake mine regions in association with water sources, including natural (39 Mile Brook and Kennedy's Pool) or artificial, urban and rural properties near Jarrahdale (Balmoral) and Dwellingup (Inglehope, Emilynn, Holyoake). FRTBC numbers are greater on the western side of Myara North, closer to a higher concentration of water sources, and comparatively sparse on the eastern side (T. Kirkby, pers. comm.), however occupancy can change in response to foraging resources (see under population movements below) and presence of surface water at certain times of year. Similarly, FRTBC numbers are expected to be greater on the southern side of Holyoake closer to water sources.

The local population within Myara North is not known but is expected to be a few hundred birds, whereas the population in Alcoa's adjacent Myara mining region is estimated at approximately 450 birds (T. Kirkby, pers. comm.).

Baudin's Cockatoo and Carnaby's Cockatoo have small residential populations in the vicinity of the Mine DE, with foraging flocks visiting during autumn/winter.

Habitat quality – FRTBC

Table 6.18 and Figure 6-10.1 to Figure 6-10.3 to present the habitat quality for FRTBC. Habitat quality has been scored from 0 (no habitat) to 10 (excellent) based on site condition (vegetation condition and presence of foraging, breeding and roosting habitat), site context (proximity to perennial water sources and surrounding foraging habitat), and species stocking rate (population), as detailed in the habitat scoring framework presented in Appendix B5. The habitat scoring framework has been developed with consideration to EPBC Act and WA environmental offsets guidance and the habitat descriptions in the Black Cockatoo referral guidelines (DAWE 2022) and relevant Recovery Plans (DEC 2008, DPaW 2013).

As presented in Table 6.18 and Figure 6-10.1 to Figure 6-10.3, the Mine DE comprises predominantly (87.2 per cent) High to Excellent quality habitat for FRTBC. Very High to Excellent quality habitat is located in the west of Myara North and central and south of Holyoake in proximity to perennial water sources. Minor areas of Moderate to High quality habitat lie in riparian areas with limited foraging habitat (e.g. Flooded Gum Woodland, Melaleuca Dampland).

Habitat quality – Carnaby's Cockatoo

Table 6.20 and Figure 6-11.1 to Figure 6-11.3 present the habitat quality for Baudin's Cockatoo. The Mine DE comprises predominantly (84.4 per cent) Moderate to Very High quality habitat for Carnaby's Cockatoo. The slightly lower assessed quality for Carnaby's Cockatoo is due to a lower stocking rate score reflecting the lower importance of the Mine DE for the species population compared to that of the two forest Black Cockatoo species.

Habitat quality – Baudin's Cockatoo

Table 6.19 and Figure 6-12.1 to Figure 6-12.3 present the habitat quality for Baudin's Cockatoo. The Mine DE comprises predominantly (84.4 per cent) High to Excellent quality habitat for Baudin's Cockatoo. As with FRTBC, Very High to Excellent quality habitat is located in Myara North and Holyoake in proximity to perennial water sources. Minor areas of Moderate to High quality habitat lie in riparian areas with limited foraging habitat.

Table 6.18 Forest Red-tailed Black Cockatoo habitat quality

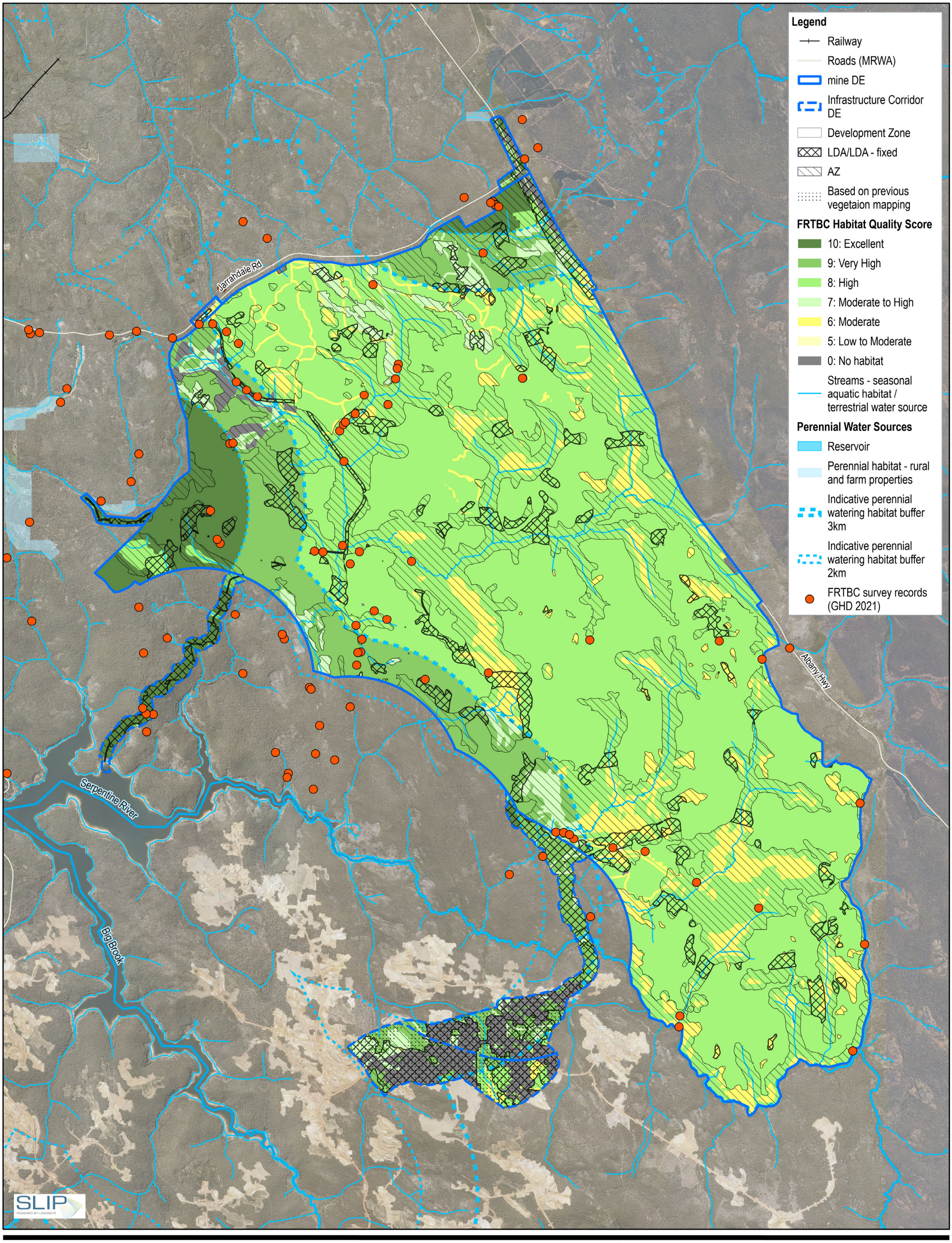
Score	Habitat quality	Extent within Myara North DE (ha)	Extent within Holyoake DE (ha)	Extent within O'Neil DE (ha)	Total extent within Mine DE (ha)	Proportion of Mine DE (per cent)
10	Excellent	585	1,878	-	2,463	10.3
9	Very High	1,286	1,738	-	3,024	12.7
8	High	7,117	3,562	4,653	15,332	64.2
7	Moderate to High	382	144	370	897	3.8
6	Moderate	970	290	447	1,706	7.1
5	Low to Moderate	6	0	3	9	0
4	Low	-	-	-	-	-
3	Marginal to Low	-	-	-	-	-
2	Marginal	-	-	-	-	-
1	Negligible	-	-	-	-	-
Total habitat within the DE		**10,346**	**7,611**	**5,474**	**23,431**	**98.0**
0	No habitat	351	13	97	462	1.9
-	Unsurveyed	7	0	0	8	0
Total area of DE		**10,705**	**7,624**	**5,571**	**23,900**	**100**

Table 6.19 Baudin's Cockatoo habitat quality

Score	Habitat quality	Extent within Myara North DE (ha)	Extent within Holyoake DE (ha)	Extent within O'Neil DE (ha)	Total extent within Mine DE (ha)	Proportion of Mine DE (per cent)
10	Excellent	561	1,751	-	2,312	9.7
9	Very High	1,215	1,654	-	2,869	12.0
8	High	6,841	3,548	4,586	14,975	62.7
7	Moderate to High	465	227	370	1,063	4.4
6	Moderate	1,340	429	512	2,281	9.5
5	Low to Moderate	12	1	6	19	0.1
4	Low	-	-	-	-	-
3	Marginal to Low	-	-	-	-	-
2	Marginal	-	-	-	-	-
1	Negligible	-	-	-	-	-
Total habitat within the DE		**10,434**	**7,611**	**5,474**	**23,518**	**98.4**
0	No habitat	264	13	97	374	1.6
	Unsurveyed	7	0	0	8	0.0
Total area of DE		**10,705**	**7,624**	**5,571**	**23,900**	**100**

Table 6.20 Carnaby's Cockatoo habitat quality

Score	Habitat quality	Extent within Myara North DE (ha)	Extent within Holyoake DE (ha)	Extent within O'Neil DE (ha)	Total extent within Mine DE (ha)	Proportion of Mine DE (per cent)
10	Excellent	-	-	-	-	-
9	Very High	561	1,751	-	2,312	9.7
8	High	1,215	1,654	-	2,869	12.0
7	Moderate to High	6,841	3,548	4,586	14,975	62.7
6	Moderate	465	227	370	1,063	4.4
5	Low to Moderate	1,340	429	512	2,281	9.5
4	Low	12	1	6	19	0.1
3	Marginal to Low	-	-	-	-	-
2	Marginal	-	-	-	-	-
1	Negligible	-	-	-	-	-
Total habitat within the DE		**10,434**	**7,611**	**5,474**	**23,518**	**98.4**
0	No habitat	264	13	97	374	1.6
	Unsurveyed	7	0	0	8	0.0
Total area of DE		**10,705**	**7,624**	**5,571**	**23,900**	**100.0**



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0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Forest Red Tailed Black Cockatoo Habitat Quality Score Myara North

Project No. **12633192**
Revision No. **3**
Date **21/03/2025**

FIGURE 6-10.1

SOUTH DANDALUP DAM

Kennedy's Pool

South Dandalup River

Pinjarra Williams

Legend

- Railway
- Roads (MRWA)
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

FRTBC Habitat Quality Score

- 10: Excellent
- 9: Very High
- 8: High
- 7: Moderate to High
- 6: Moderate
- 5: Low to Moderate
- 0: No habitat
- Streams - seasonal aquatic habitat / terrestrial water source

Perennial Water Sources

- Reservoir
- Perennial habitat - rural and farm properties
- Perennial - river pool
- Indicative perennial watering habitat buffer 3km
- Indicative perennial watering habitat buffer 2km
- FRTBC survey records (GHD 2021)

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Forest Red Tailed Black Cockatoo Habitat Quality Score Holyoake

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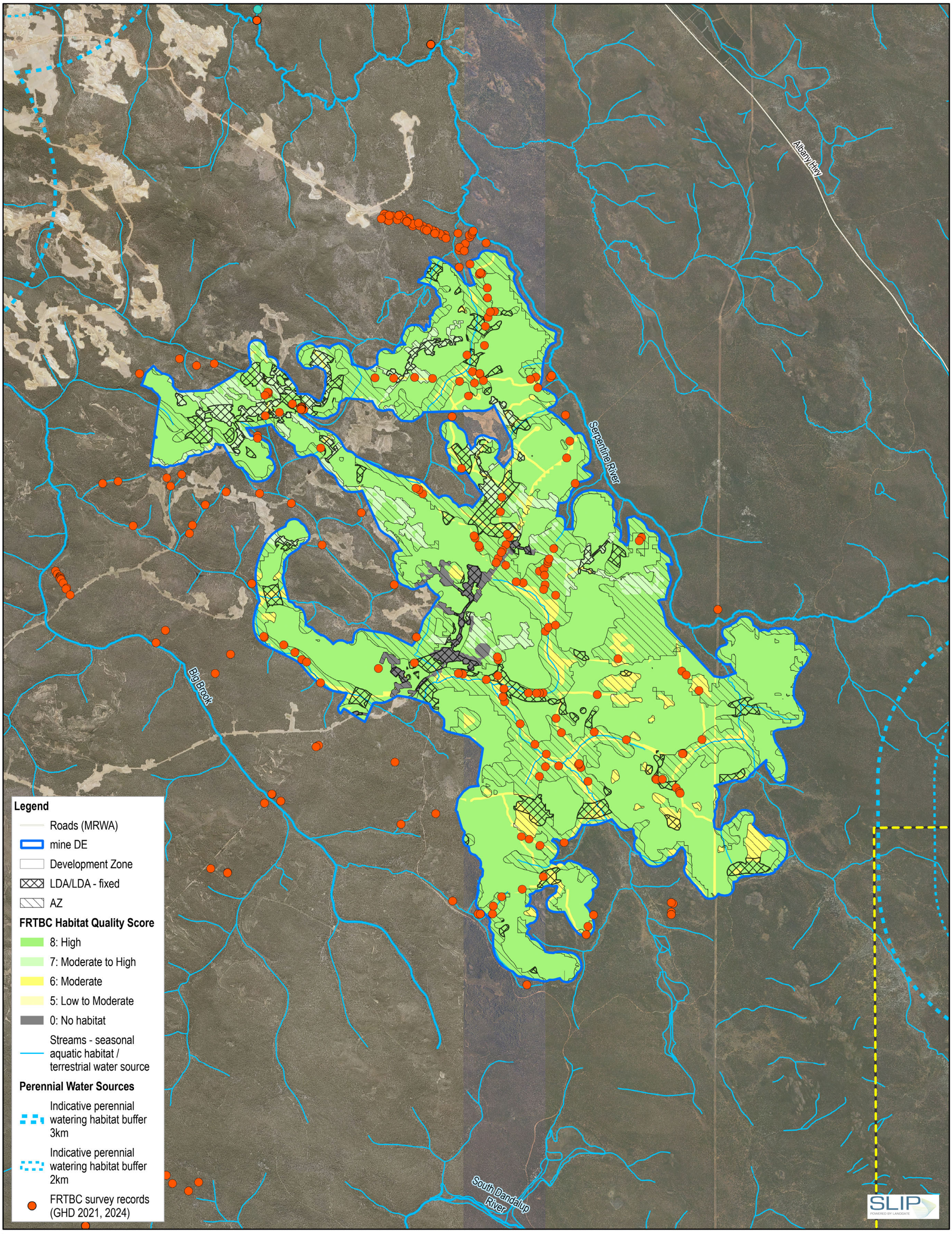
Revision No. **3**
Date **22/03/2025**

FIGURE 6-10.2



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Kilometres

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Grid: GDA 1994 MGA Zone 50

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Forest Red Tailed Black Cockatoo Habitat Quality Score O'Neil

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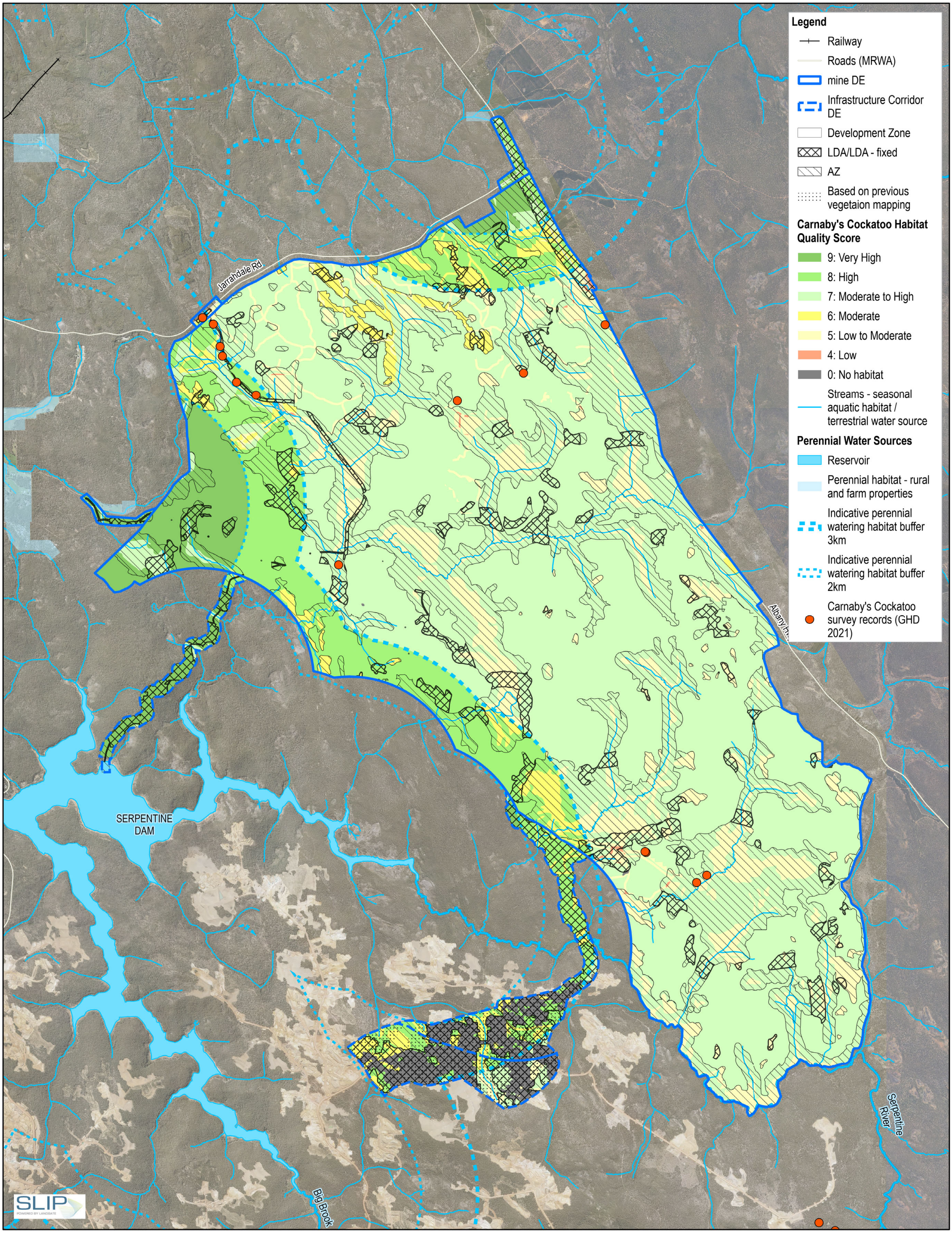
Date **22/03/2025**

FIGURE 6-10.3



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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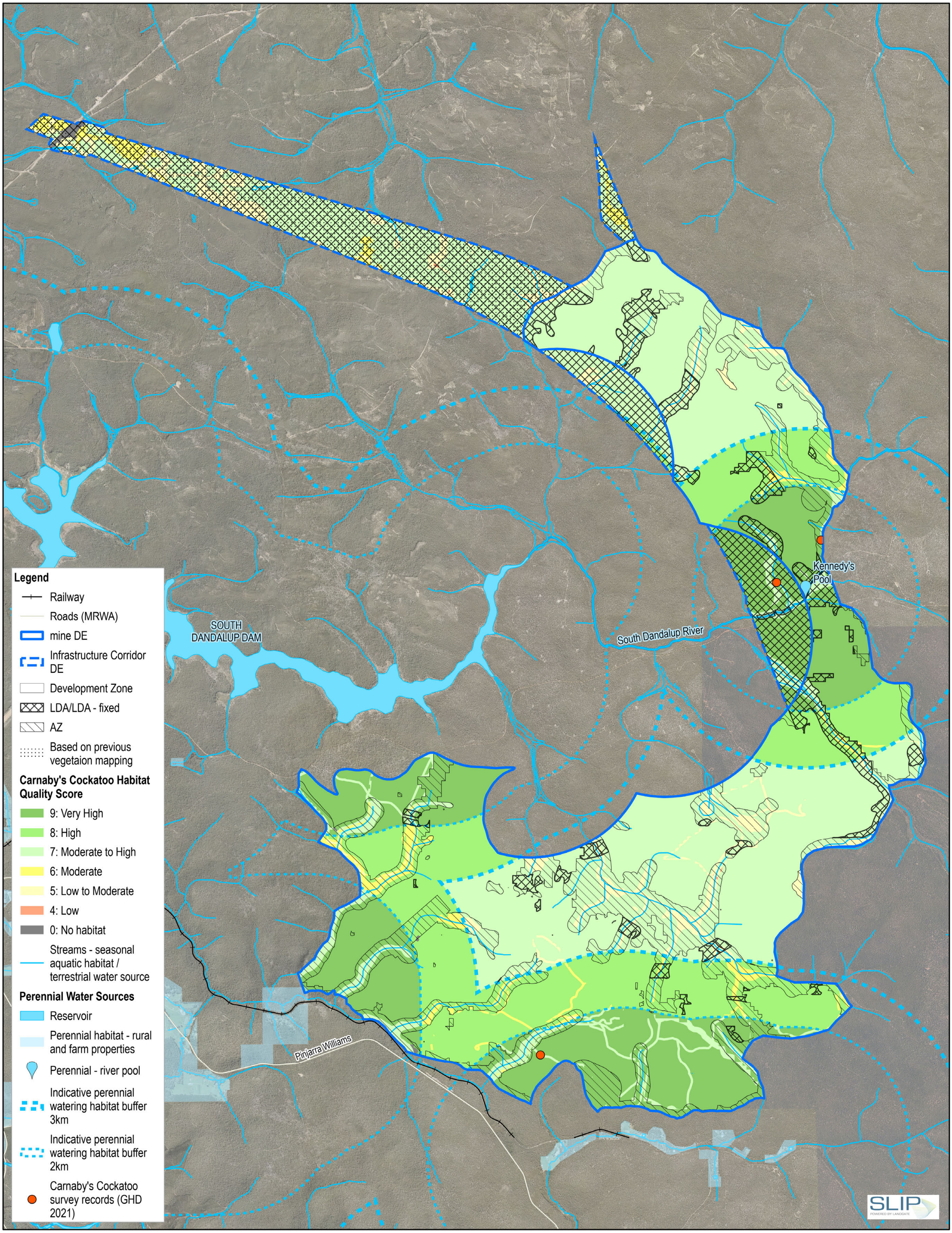
Carnaby's Cockatoo Habitat Quality Score Myara North

Project No. **12633192**
Revision No. **3**
Date **21/03/2025**

FIGURE 6-11.1



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Carnaby's Cockatoo Habitat Quality Score Holyoake

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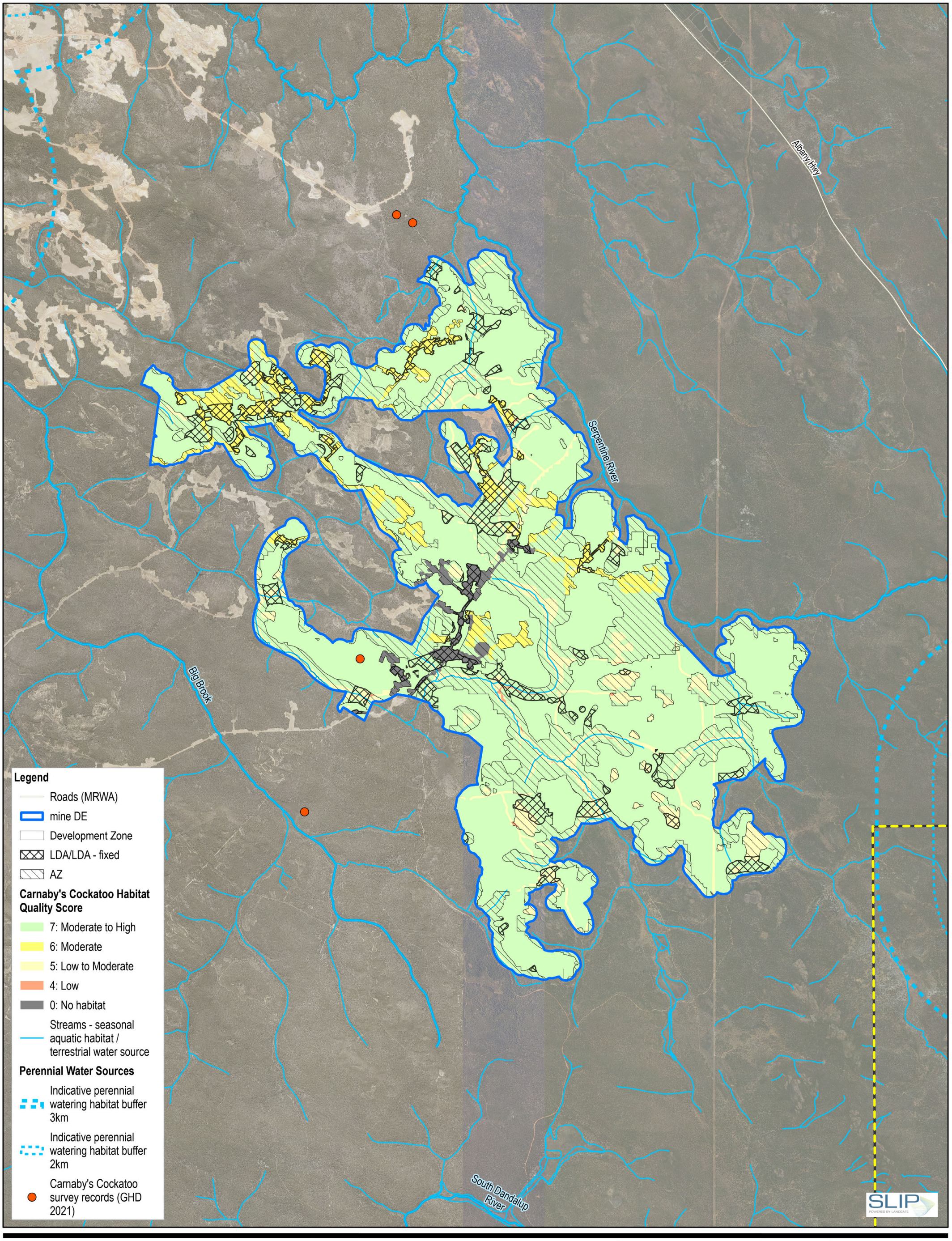
Revision No. **3**
Date **21/03/2025**

FIGURE 6-11.2



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Carnaby's Cockatoo Habitat Quality Score O'Neil

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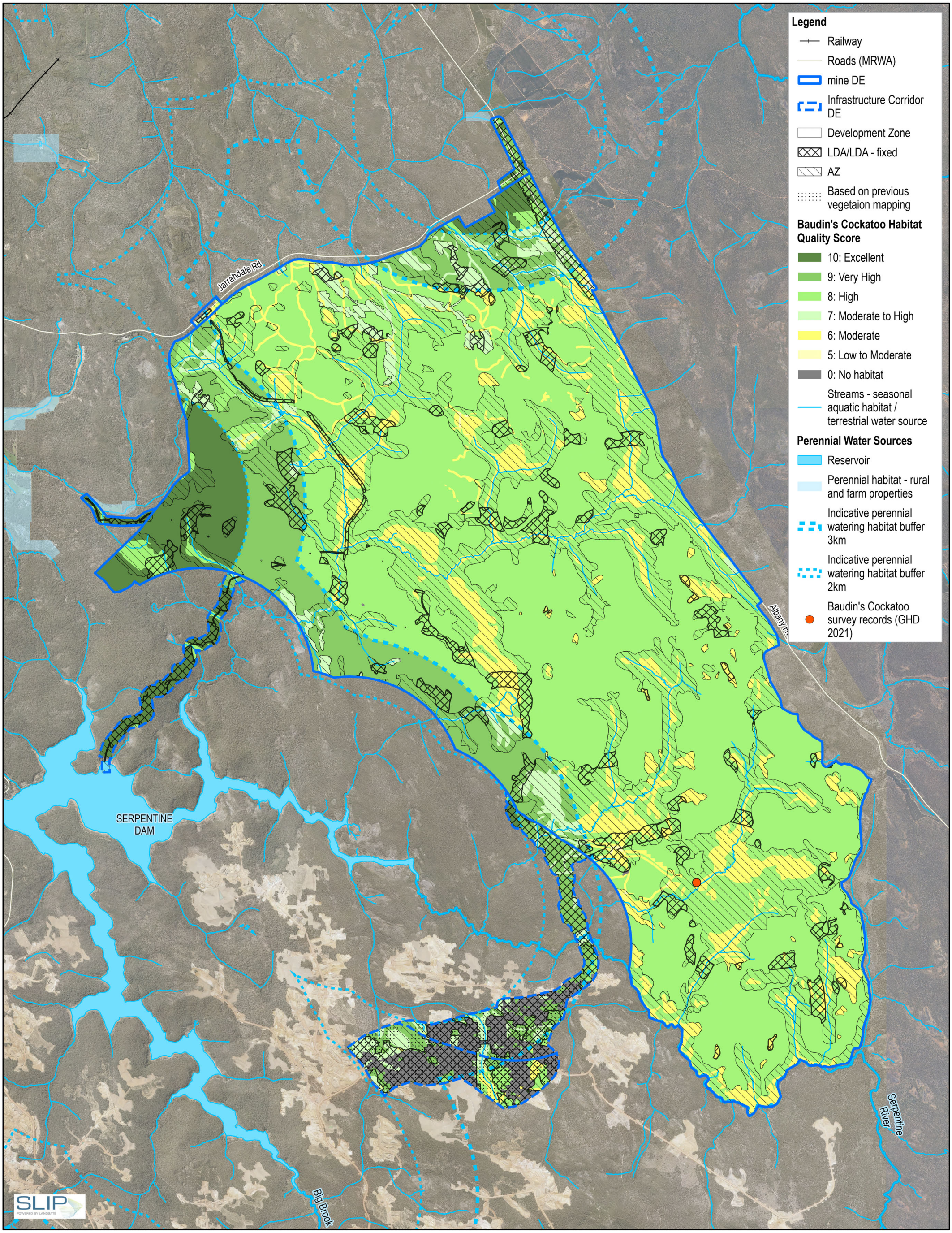
Revision No. **3**
Date **21/03/2025**

FIGURE 6-11.3



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Kilometres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

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Baudin's Cockatoo Habitat Quality Score Myara North

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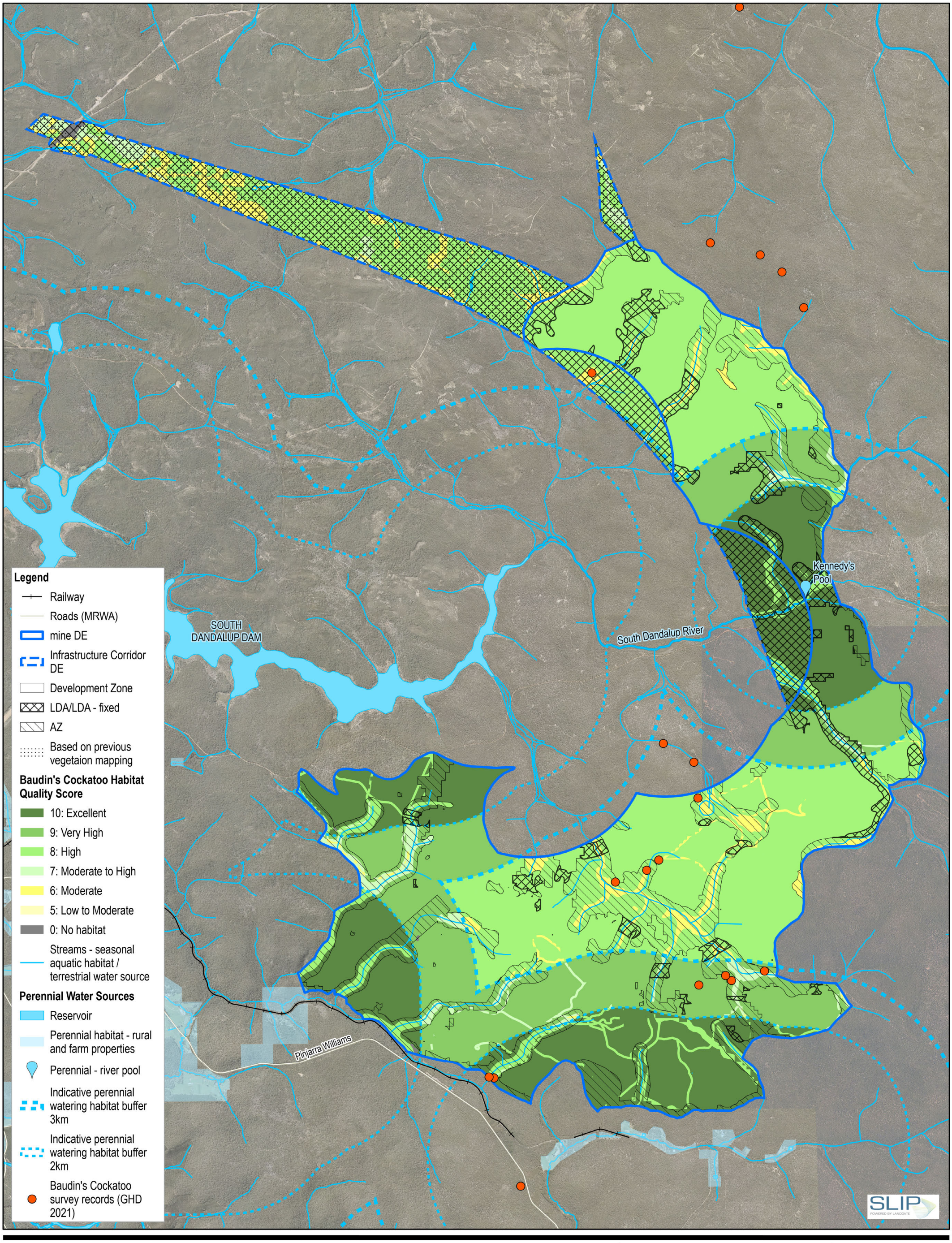
Revision No. **3**
Date **21/03/2025**

FIGURE 6-12.1



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Baudin's Cockatoo Habitat Quality Score Holyoake

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Revision No. **3**
Date **21/03/2025**

FIGURE 6-12.2

Albany Hwy
Serpentine River
Big Brook
South Dandalup River

Legend

- Roads (MRWA)
- mineDE
- Development Zone
- LDA/LDA - fixed
- AZ

Baudin's Cockatoo Habitat Quality Score

- 8: High
- 7: Moderate to High
- 6: Moderate
- 5: Low to Moderate
- 0: No habitat
- Streams - seasonal aquatic habitat / terrestrial water source

Perennial Water Sources

- Indicative perennial watering habitat buffer 3km
- Indicative perennial watering habitat buffer 2km
- Baudin's Cockatoo survey records (GHD 2021)

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Baudin's Cockatoo Habitat Quality Score O'Neil

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Revision No. **3**
Date **21/03/2025**

FIGURE 6-12.3

6.3.3.6 *Woylie*

Habitat

The Mine DE contains a total of 23,518 ha of potential suitable habitat for Woylie, broken down as shown in Table 6.21 below. As presented, a total of 2,016 ha (8.5 per cent) of Woylie habitat within the Mine DE comprises dense riparian vegetation habitat, which may provide Woylie with shelter from feral predators. Granite associations, while including areas of bare rock, also include fringing vegetation that may be habitat for Woylie. Habitat for Woylie is presented on Figure 6-13.1 (Myara North), Figure 6-13.2 (Holyoake) and Figure 6-13.3 (O'Neil).

Woylie populations, if present within the DE, are expected to feed, breed and move throughout home ranges within the potential suitable habitat. Woylies are not expected to drink from water sources but obtain their water from their food.

The potential suitable habitat within the DE may not be habitat critical to the survival of the species, as there is no evidence of recent occupancy within the DE, and it is uncertain whether there is currently adequate predator control to support occupancy within the DE. This is evidenced by the lack of Woylie records during baseline surveys, compared to other critical weight range mammals recorded (e.g. Chuditch, Quokka, Quenda) and that Woylie was recorded elsewhere using the same baseline survey methodology. As a conservative assessment, based on a likely occurrence within the DE, the DE has been assessed as comprising habitat critical to the survival of Woylie.

Habitat quality for Woylie has been scored from 0 (no habitat) to 10 (excellent) based on site condition (vegetation condition), site context (presence of key threats and habitat connectivity), and species stocking rate (population), as detailed in the habitat scoring framework presented in Appendix B5. The habitat scoring framework has been developed with consideration to EPBC Act and WA environmental offsets guidance, and Woylie habitat description in the Recovery Plan (Yeatman and Groom 2012). The habitat quality is presented in Figure 6-14.1 (Myara North), Figure 6-14.2 (Holyoake) and Figure 6-14.3 (O'Neil) and summarised in Table 6.22.

Population

Woylie populations are estimated to be sparse over the Northern Jarrah Forest, at approximately 400 animals (range 50 to 2,000) over 7,750 km^2 as of 2010 (TSSC 2018) and persisting as of 2016 but with no new estimates available (TSSC 2018). The Northern Jarrah Forest population is estimated at 0.5 per cent of the total species population (National Environmental Science Program 2019).

The total Woylie population was estimated at approximately 86,000 as of 2016, up from an estimated 18,500 as of 2010 (TSCC 2018). Of the total population, approximately 75,000 were estimated for Upper Warren (Perup and Kingston) in the Southern Jarrah Forest IBRA subregion, and approximately 4,000 at Dryandra National Park as of 2016. There are also a number of translocated populations in offshore islands and fenced sanctuaries that provide refuge from feral predators (TSSC 2018).

The species population declined dramatically from the year 2000, reducing by about 95 per cent from approximately 220,000 to 11,000 individuals in the Upper Warren, and other populations from approximately 45,000 to 15,000 (Yeatman and Groom 2012). Research indicates that increased cat predation is the predominant cause of mortality (Marlow et al 2015).

Movements

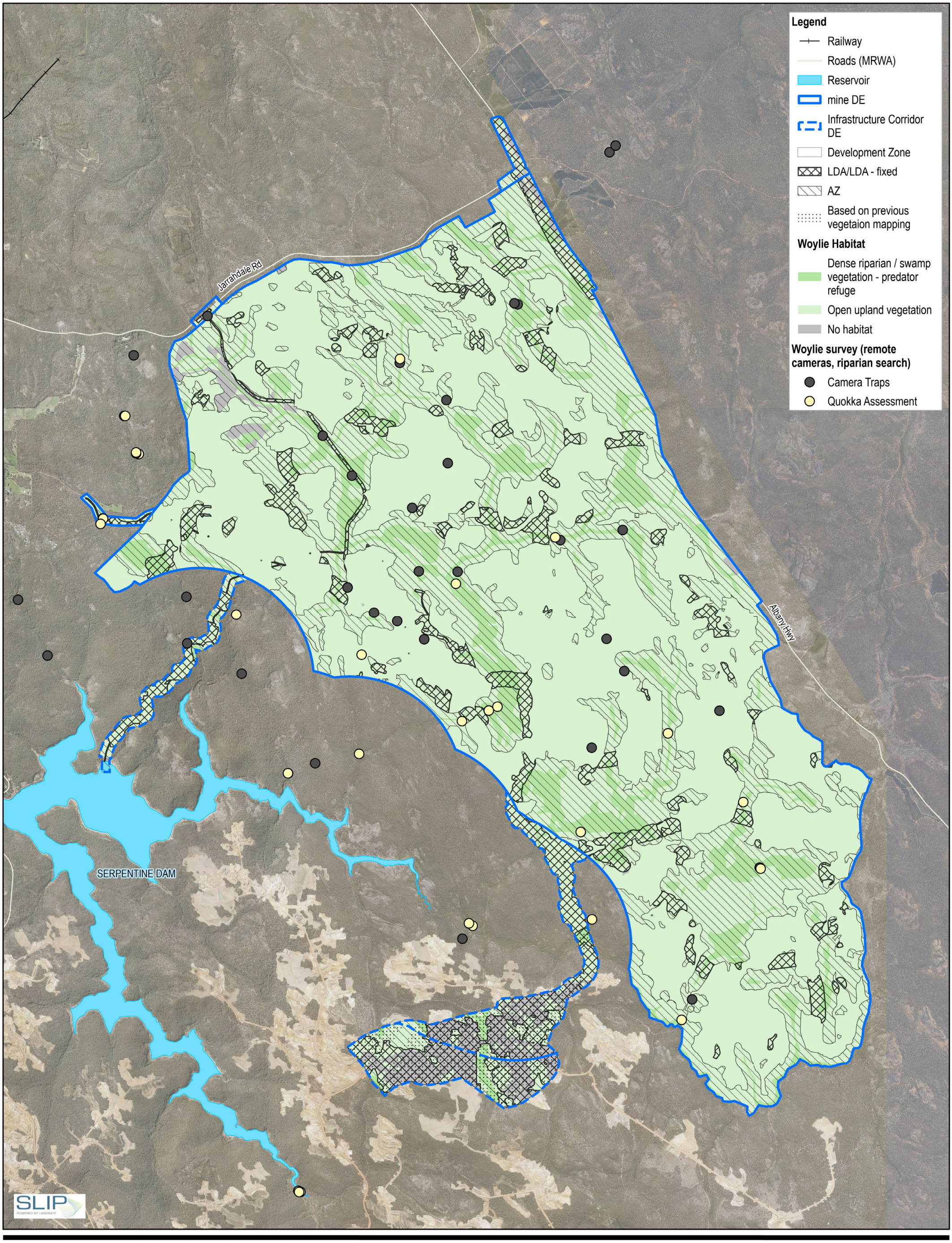
No information is available in the Conservation Advice (TSSC 2018) or Recovery Plan (Yeatman and Groom 2012) in relation to Woylie movements.

Table 6.21 Woylie habitat assessment

Fauna habitat type	Woylie – habitat classification	Extent within Myara North DE (ha)	Extent within Holyoake DE (ha)	Extent within O'Neil DE (ha)	Total extent within Mine DE (ha)
Conservation status	**Endangered (EPBC Act) / Critically Endangered (BC Act)**				
Likelihood of occurrence	**Likely**				
Blackbutt Forest	Foraging, breeding, dispersal Dense riparian vegetation – predator refuge	427	169	46	642
Bullich Forest	Foraging, breeding, dispersal Dense riparian vegetation – predator refuge	70	187	23	280
Flooded Gum Woodland	Foraging, denning, dispersal Dense riparian vegetation – predator refuge	511	264	122	897
Granite Outcrop	Foraging, denning, dispersal Open upland vegetation – high predator risk	303	0	139	443
Jarrah-Marri Forest	Foraging, denning, dispersal Open upland vegetation – high predator risk	8,750	6,799	4,707	20,255
Melaleuca Dampland	Foraging, breeding, dispersal Dense riparian vegetation – predator refuge	129	34	34	197
Wandoo Woodland	Foraging, denning, dispersal Open upland vegetation – high predator risk	0	0	11	11
Mine Rehabilitation	Foraging, denning, dispersal Open upland vegetation – high predator risk	156	158	391	706
Pine Plantation	No habitat	87	0	0	87
Cleared land	No habitat	264	13	97	374
Unsurveyed	n/a	7	0	0	8
Total habitat		10,434	7,611	5,474	23,518
	Total habitat in dense riparian vegetation	**1,137**	**654**	**225**	**2,016**
	Total habitat in open upland vegetation	**9,209**	**6,957**	**5,249**	**21,415**

Table 6.22 Woylie habitat quality

Score	Habitat quality	Extent within Myara North DE (ha)	Extent within Holyoake DE (ha)	Extent within O'Neil DE (ha)	Total extent within Mine DE (ha)	Proportion of Mine DE (per cent)
10	Excellent	-	-	-	-	-
9	Very High	-	-	-	-	-
8	High	128	324	121	574	2.4
7	Moderate to High	980	318	100	1,398	5.9
6	Moderate	238	671	867	1,775	7.4
5	Low to Moderate	8,619	6,063	4,232	18,914	79.1
4	Low	267	225	154	646	2.7
3	Marginal to Low	-	-	-	-	-
2	Marginal	-	-	-	-	-
1	Negligible	-	-	-	-	-
Total habitat within the DE		**10,232**	**7,602**	**5,474**	**23,308**	**97.5**
0	No habitat	465	22	97	584	2.4
	Unsurveyed	7	0	0	8	0.0
Total area of DE		**10,705**	**7,624**	**5,571**	**23,900**	**100.0**



Scale: 1:60,000 at ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

Woylie Habitat Myara North

FIGURE 6-13.1

SOUTH DANDALUP DAM

Kennedy's Pool

Pinjarra Williams

Legend

- Railway
- Roads (MRWA)
- Reservoir
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

Woylie Habitat

- Dense riparian / swamp vegetation - predator refuge
- Open upland vegetation
- No habitat

Woylie survey (remote cameras, riparian search)

- Camera Traps
- Quokka Assessment

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Woylie Habitat Holyoake

Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

FIGURE 6-13.2

Albany Hwy

Legend

- Roads (MRWA)
- mine DE
- Development Zone
- LDA/LDA - fixed
- AZ

Woylie Habitat

- Dense riparian / swamp vegetation - predator refuge
- Open upland vegetation
- No habitat

Woylie survey (remote cameras, riparian search)

- Camera Traps

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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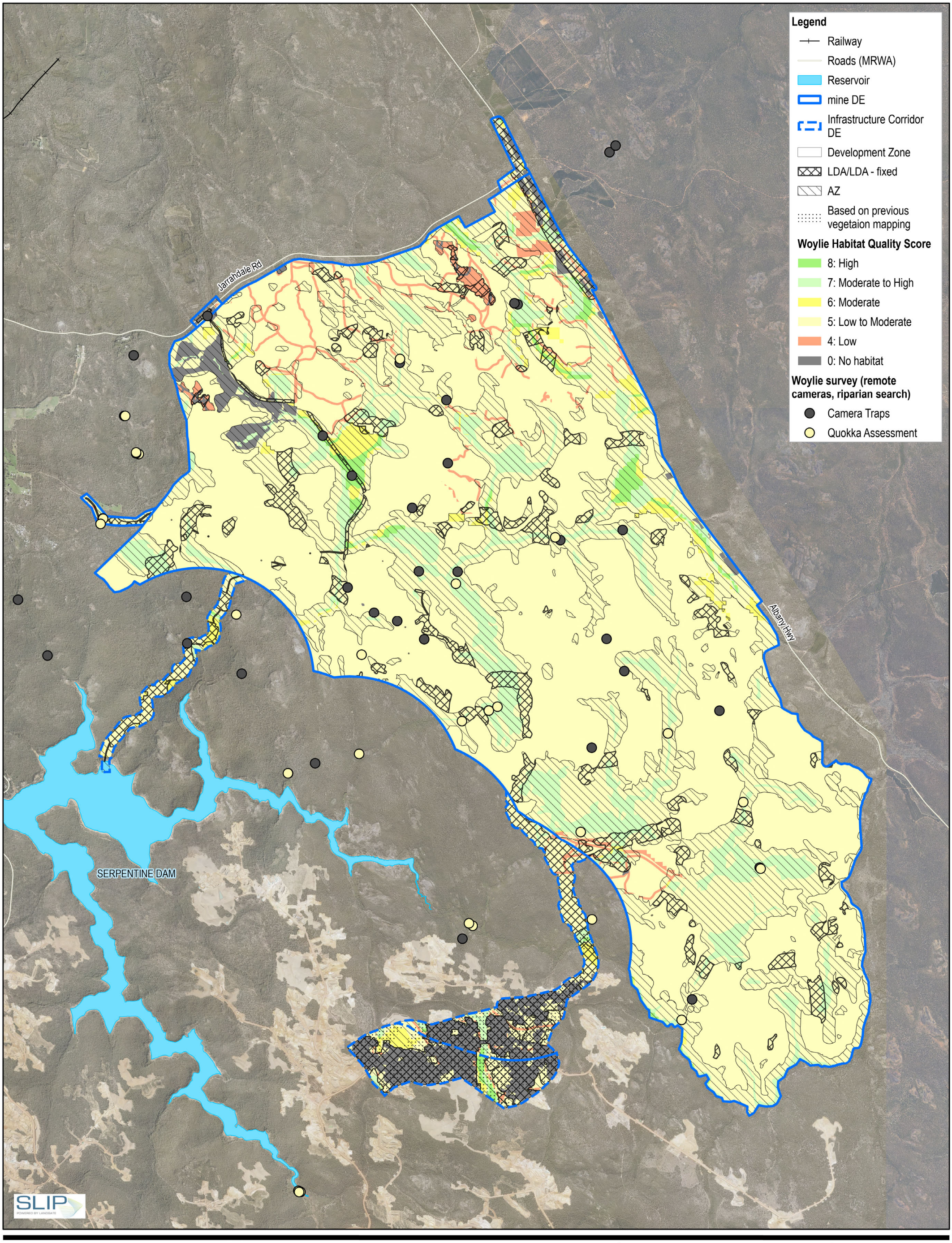
Project No. **12633192**
Revision No. **3**
Date **11/03/2025**

Woylie Habitat O'Neil

FIGURE 6-13.3



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Woylie habitat quality score - Myara North

Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

FIGURE 6-14.1

SOUTH DANDALUP DAM

Kennedy's Pool

Pinjarra Williams

Legend

- Railway
- Roads (MRWA)
- Reservoir
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

Woylie Habitat Quality Score

- 8: High
- 7: Moderate to High
- 6: Moderate
- 5: Low to Moderate
- 4: Low
- 0: No habitat

Woylie survey (remote cameras, riparian search)

- Camera Traps
- Quokka Assessment

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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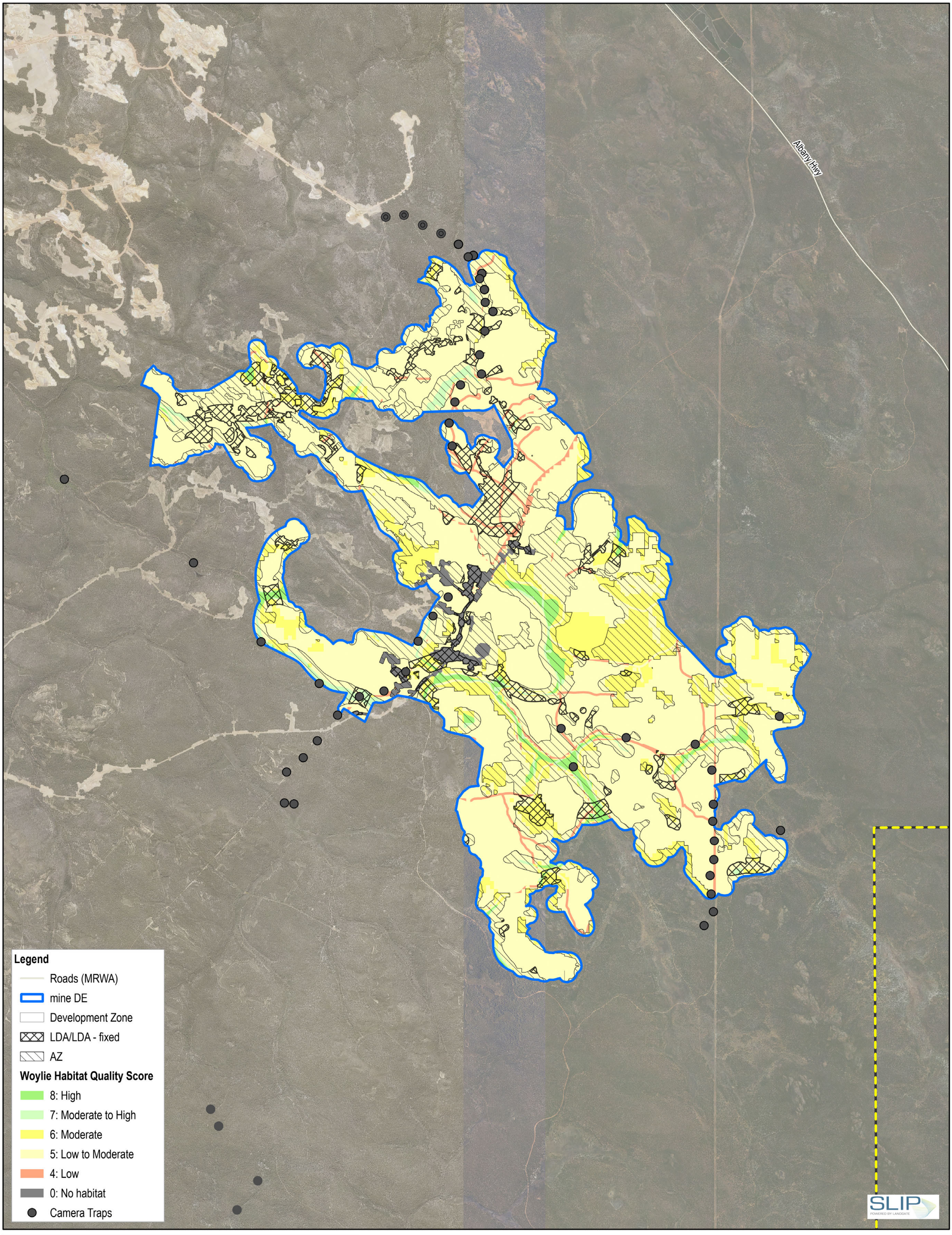
Woylie habitat quality score - Holyoake

Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

FIGURE 6-14.2



Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Woylie habitat quality score - O'Neil

Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

FIGURE 6-14.3

6.3.3.7 Chuditch

Habitat

The Mine DE contains a total of 23,518ha of Chuditch habitat, which comprises all fauna habitat types comprising native vegetation, as shown in Table 6.23 below. The fauna habitat types are mapped in Figure 6-15.1 (Myara North), Figure 6-15.2 (Holyoake) and Figure 6-15.3 (O'Neil).

As presented in Table 6.23, the Mine DE contains a total of 2,016ha of riparian habitat associated with seasonal streams. The Mine DE does not contain perennial riparian habitat, with the closest perennial river being the Murray River located approximately 5km south-west of the Holyoake DE at its closest point. Accordingly, the Mine DE is not expected to support the density of Chuditch reported by Serena et al (1991) within 2km of the Murray River at Lane Poole Reserve.

The 2,016ha of habitat is expected to contain numerous dens that are currently or have previously been used by Chuditch. The location and density of dens are expected to vary across the Mine DE and be mostly associated with tree logs, stumps, fallen trees and rock outcrops. Mine rehabilitation is expected to contain dens particularly associated with rock piles (McGregor et al 2014).

All habitat mapped within the Mine DE is considered to be habitat critical to the survival of Chuditch, given the demonstrated occupancy and the presence of suitable vegetation within the recorded range.

Habitat quality for Chuditch has been scored from 0 (no habitat) to 10 (excellent) based on site condition (vegetation condition), site context (presence of key threats and habitat connectivity), and species stocking rate (population), as detailed in the habitat scoring framework presented in Appendix B5. The habitat scoring framework has been developed with consideration to EPBC Act and WA environmental offsets guidance, and the habitat description for Chuditch in the Recovery Plan (DEC 2012). The habitat quality is presented in Figure 6-16.1 (Myara North), Figure 6-16.2 (Holyoake) and Figure 6-16.3 (O'Neil) and summarised in the Table 6.24 below.

Population

The total population of the Jarrah forest (north and south) is estimated by different studies at various dates at approximately 1,400 to 12,500 adults, however the sparse and dispersed/nomadic nature of the species makes it difficult to accurately estimate abundance and/or density, and to define key populations (DEC 2012). Given approximately 24,000 km2 of native vegetation remaining over the Northern Jarrah Forest and Southern Jarrah Forest IBRA subregions, this equates to an average of one adult per approximately 1.9 to 17.1 km^2. No estimates are available of local populations in the vicinity of the Mine DE.

All populations of Chuditch are considered important to the survival of the species (DEC 2012).

Movements

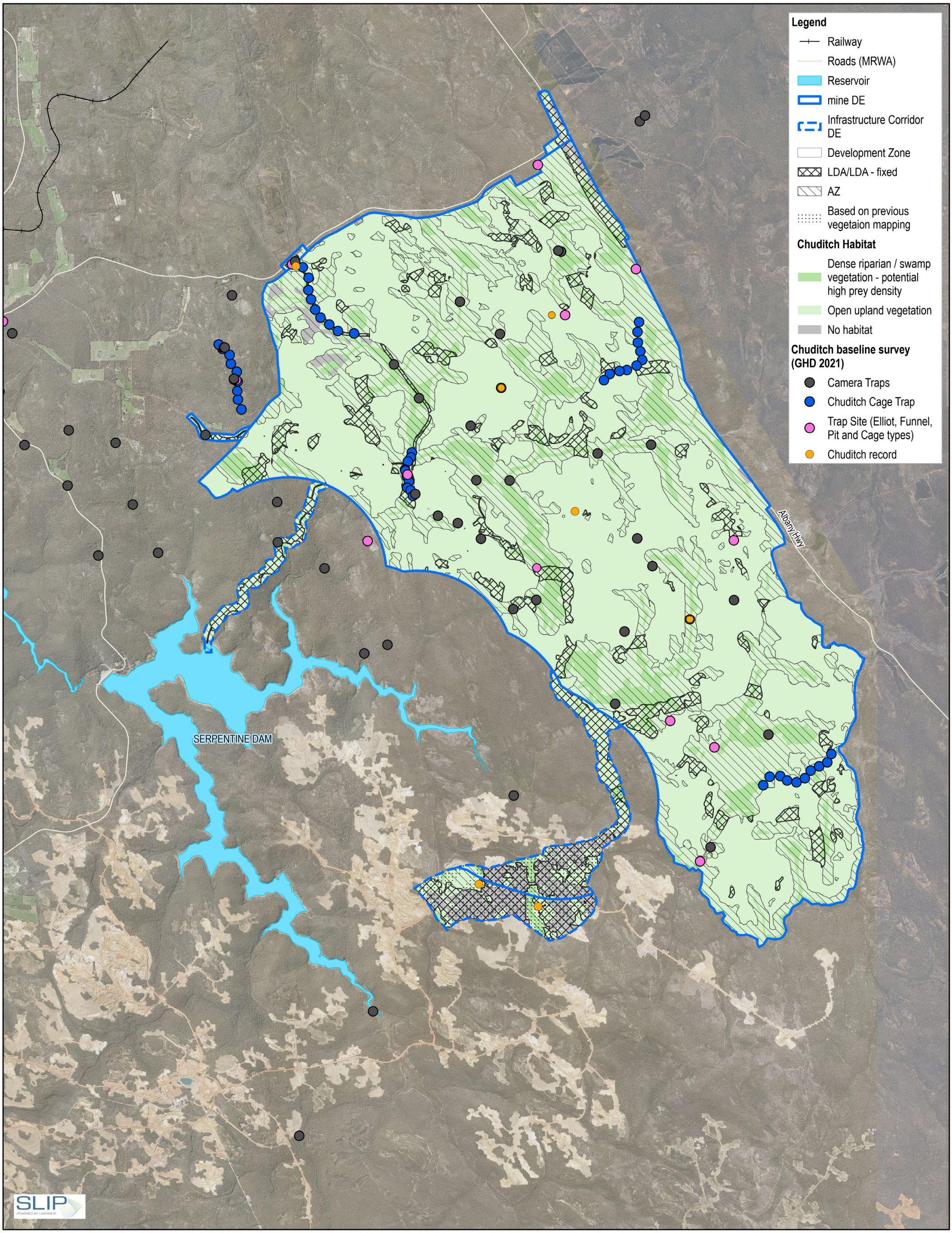
Chuditch disperse after they are fully weaned from November to January (Serena et al 1991). The species is solitary and occupies numerous dens within a stable core area (Serena and Soderquist 1989). Females typically have little to no overlap of core areas and rarely move outside their core area, with vacant female core areas colonized by juveniles rather than adults (Serena and Sodequist 1989). Males have much larger core areas and their ranges overlap broadly with females and other males (Serena and Soderquist 1989). Chuditch are expected to move throughout their home ranges within the Mine DE, with overlapping movements of males across female home ranges. Juveniles are expected to disperse from November to January, increasing the number of transient individuals within and outside of adult home ranges. The species is expected to move throughout the contiguous native vegetation of the Mine DE, including mine rehabilitation (McGregor et al 2014) and not be confined to specific movement corridors, as may occur in fragmented landscapes.

Table 6.23 Chuditch habitat assessment

Fauna habitat type	Chuditch – habitat classification	Extent within Myara North DE (ha)	Extent within Holyoake DE (ha)	Extent within O'Neil DE (ha)	Total extent within Mine DE (ha)
Conservation status	**Vulnerable (EPBC Act, BC Act)**				
Likelihood of occurrence	**Known**				
Blackbutt Forest	Foraging, denning, dispersal Dense riparian vegetation – high prey density	427	169	46	642
Bullich Forest	Foraging, denning, dispersal Dense riparian vegetation – high prey density	70	187	23	280
Granite Outcrop	Foraging, denning, dispersal	303	0	139	443
Flooded Gum Woodland	Foraging, denning, dispersal Dense riparian vegetation – high prey density	511	264	122	897
Jarrah-Marri Forest	Foraging, denning, dispersal	8,750	6,799	4,707	20,255
Melaleuca Dampland	Foraging, denning, dispersal Dense riparian vegetation – high prey density	129	34	34	197
Wandoo Woodland	Foraging, denning, dispersal	0	0	11	11
Mine Rehabilitation	Foraging, denning, dispersal	156	158	391	706
Pine Plantation	Limited foraging	87	0	0	87
Cleared land	No habitat	264	13	97	374
Unsurveyed	n/a	7	0	0	8
Total habitat		10,434	7,611	5,474	23,518
	Total habitat in dense riparian vegetation	**1,137**	**654**	**225**	**2,016**
	Total habitat in open upland vegetation	**9,209**	**6,957**	**5,249**	**21,415**

Table 6.24 Chuditch habitat quality

Score	Habitat quality	Extent within Myara North DE (ha)	Extent within Holyoake DE (ha)	Extent within O'Neil DE (ha)	Total extent within Mine DE (ha)	Proportion of Mine DE (per cent)
10	Excellent	-	-	-	-	-
9	Very High	-	-	-	-	-
8	High	193	932	983	2,108	8.8
7	Moderate to High	8,132	6,175	4,417	18,724	78.3
6	Moderate	316	286	171	772	3.2
5	Low to Moderate	1,482	210	-	1,691	7.1
4	Low	126	3	-	129	0.5
3	Marginal to Low	-	-	-	-	-
2	Marginal	-	-	-	-	-
1	Negligible	-	-	-	-	-
Total habitat within the DE		**10,249**	**7,606**	**5,571**	**23,425**	**98.0**
0	No habitat	449	18	0	468	2.0
-	Unsurveyed	7	0	0	8	0.0
Total area of DE		**10,705**	**7,624**	**5,571**	**23,899**	**100.0**



Scale: 1:70,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Chuditch Habitat Myara North

Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

FIGURE 6-15.1

SOUTH DANDALUP DAM

Kennedy's Pool

Pinjarra Williams

Legend

- Railway
- Roads (MRWA)
- Reservoir
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

Chuditch Habitat

- Dense riparian / swamp vegetation - potential high prey density
- Open upland vegetation
- No habitat

Chuditch baseline survey (GHD 2021)

- Camera Traps
- Chuditch Cage Trap
- Trap Site (Elliot, Funnel, Pit and Cage types)
- Chuditch record

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

Chuditch Habitat Holyoake

FIGURE 6-15.2

Path: \\ghdnet.internal\ghd\AU\Perth\Projects\61\12520591\GIS\Maps\Working\12520591_ERD_Ch6\12520591_ERD_Ch6_Pt2a.aprx\12520591_6-15_2_ChuditchHabitat_HO_Rev3

SOUTH DANDALUP DAM

Kennedy's Pool

Pinjarra Williams

Legend

- Railway
- Roads (MRWA)
- Reservoir
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

Chuditch Habitat

- Dense riparian / swamp vegetation - potential high prey density
- Open upland vegetation
- No habitat

Chuditch baseline survey (GHD 2021)

- Camera Traps
- Chuditch Cage Trap
- Trap Site (Elliot, Funnel, Pit and Cage types)
- Chuditch record

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

Chuditch Habitat Holyoake

FIGURE 6-15.2

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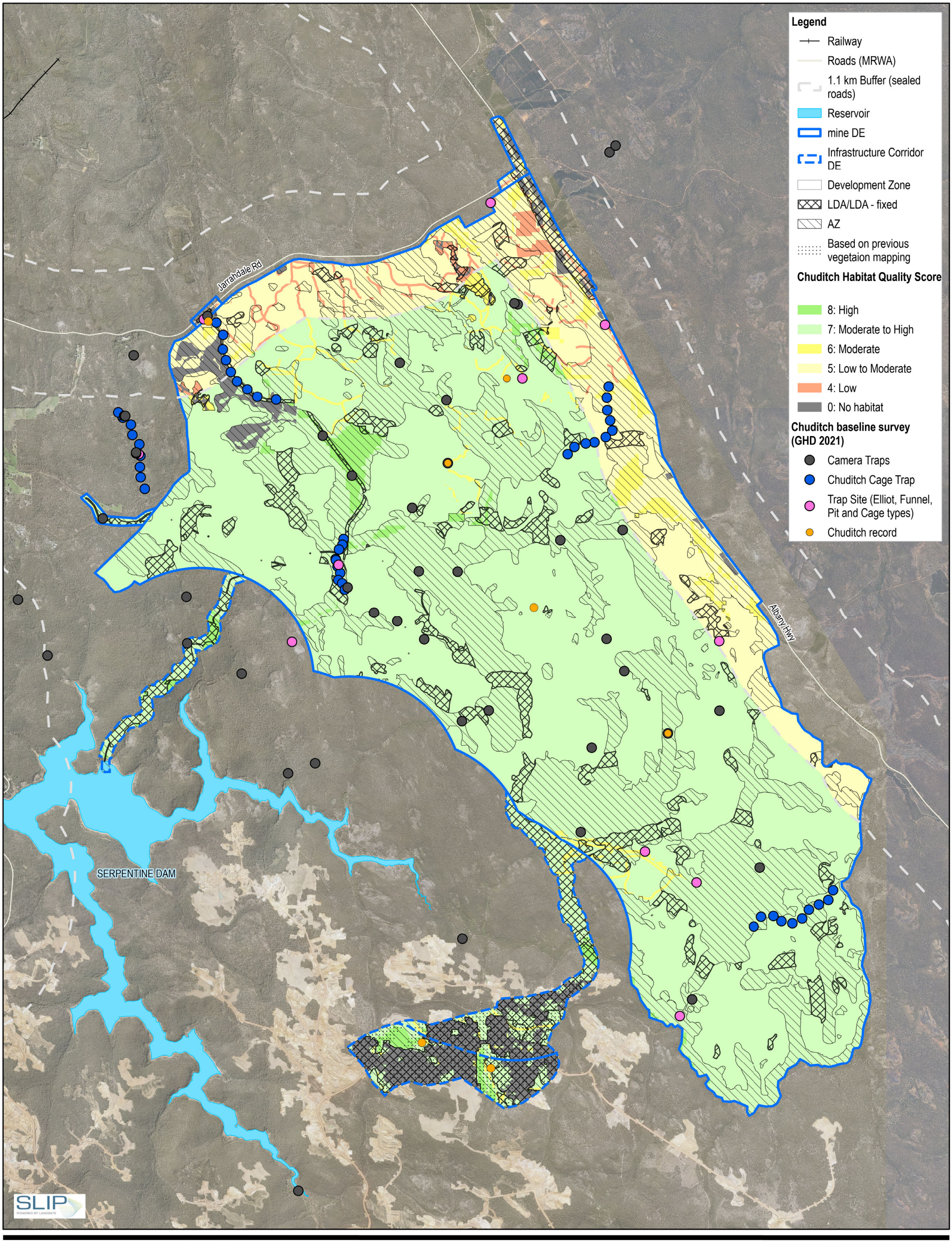

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Chuditch habitat quality score - Myara North

Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

FIGURE 6-16.1

SOUTH DANDALUP DAM

Kennedy's Pool

Pinjarra Williams

Legend

- Railway
- Roads (MRWA)
- 1.1 km Buffer (sealed roads)
- Reservoir
- mine DE
- Infrastructure Corridor DE
- Development Zone
- LDA/LDA - fixed
- AZ
- Based on previous vegetaion mapping

Chuditch Habitat Quality Score

- 8: High
- 7: Moderate to High
- 6: Moderate
- 5: Low to Moderate
- 4: Low
- 0: No habitat

Chuditch baseline survey (GHD 2021)

- Camera Traps
- Chuditch Cage Trap
- Trap Site (Elliot, Funnel, Pit and Cage types)
- Chuditch record

SLIP POWERED BY LANDGATE

Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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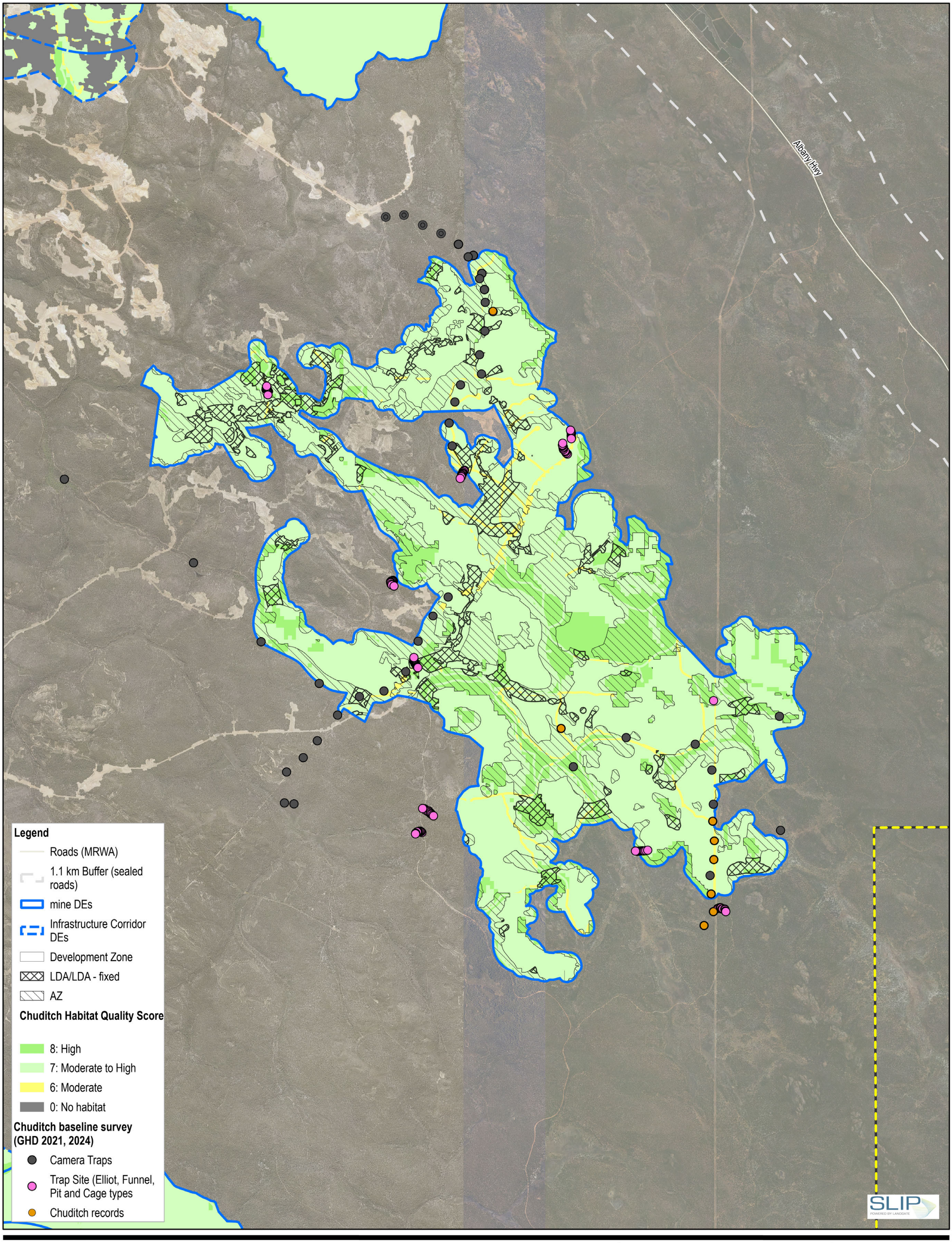
Chuditch habitat quality score - Holyoake

Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

FIGURE 6-16.2



Scale: 1:60,000 at ISO A3

0 0.6 1.2 1.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Chuditch habitat quality score - O'Neil

Project No. **12633192**
Revision No. **3**
Date **12/03/2025**

FIGURE 6-16.3

6.3.3.8 Quokka

Habitat

The Mine DE contains a total of 2,016 ha of habitat critical for the survival of Quokka, comprising fauna habitat types with dense vegetation in riparian and swamp areas, as shown in Table 6.25. The Mine DE contains a further 21,415 ha of fauna habitat types comprising open vegetation that would be subject to a higher predation risk and represent a lower quality habitat for Quokka. The fauna habitat types are mapped in Figure 6-17.1 (Myara North), Figure 6-17.2 (Holyoake) and Figure 6-17.3 (O'Neil).

Habitat quality for Quokka has been scored from 0 (no habitat) to 10 (excellent) based on site condition (vegetation condition), site context (presence of key threats and habitat connectivity), and species stocking rate (population), as detailed in the habitat scoring framework presented in Appendix B5. The habitat scoring framework has been developed with consideration to EPBC Act and WA environmental offsets guidance, peer-reviewed literature (Hayward et al 2004, Hayward et al 2005, Dundas et al 2017) and the habitat description in the Recovery Plan (DEC 2013). The habitat quality is presented in Figure 6-18.1 (Myara North), Figure 6-18.2 (Holyoake) and Figure 6-18.3 (O'Neil) and summarised in Table 6.26 below.

Population

Quokka populations in the Northern Jarrah Forest persist in small, isolated populations around favoured riparian habitat (Dundas et al 2017). Trapping over 13 sites in the Northern Jarrah Forest during 2010/2011 recorded a total of 153 adults and 14 subadults, with approximately 5-25 adults recorded in each swamp (Dundas et al 2017).

The major populations for Quokka are located at Rottnest Island (8,000-12,000 animals), Bald Island (600-1,000 animals) and the Southern Jarrah Forest (more than 700 animals) as estimated in 2007 (DEC 2013).

Movements

Quokkas are thought to have previously occurred as metapopulations within the Northern Jarrah Forest, dispersing from swamp to swamp over time as vegetation structure changes with time since fire (Hayward et al 2005). Hayward et al 2004 recorded limited to no dispersal of Quokka in swamps studied within the Northern Jarrah Forest, which may be due to predation suppressing the population to below the habitat carrying capacity, therefore preventing a population boom that would otherwise drive dispersal.

Sub adults disperse relatively small distances, with limited movements between stream systems due to the threat of predation, despite relatively short distances across ridges (Spencer et al 2020).