Prepared for
Holcim (Australia) Pty Ltd
ABN: 87 099 732 297

Bunbury Quarry Native Vegetation Clearing Permit Application

Supporting Document

21-Dec-2022
Bunbury Quarry
Doc No. 60670845_0

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Supporting Document

Client: Holcim (Australia) Pty Ltd

ABN: 87 099 732 297

Prepared by

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Quality Information

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Checker/s	James Pederick
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Rev	Revision Date	Details	Approved	
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Rev A	30 November-2022	For Client Review	Kate Thomson Technical Director Impact Assessment and Permitting	
Rev 0	21-Dec-2022	Final	Margaret Dunlop Principal Environmental Scientist	

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1.0 Introduction

1.1 Project Background

Holcim (Australia) Pty Ltd (Holcim) operates a basalt quarry (Bunbury Quarry) in Gelorup, approximately 8 kilometres (km) south of the Bunbury city centre, Western Australia (Figure 1). The Bunbury Quarry has been in operation since the 1950s at Lots 348 and 2644 Jules Road, Gelorup. The Extractive Industry Licence was recently renewed for a period of 10 years on 30 November 2022 to enable Holcim to continue to extract aggregate within the approved extraction limit (the Study Area; Figure 1).

1.2 Project Location

The Bunbury Quarry is located on Lots 2644 and 348 Jules Road, Gelorup, approximately 7 kilometres (km) south of the Bunbury city centre (Figure 1) in the Shire of Capel. The proposed project footprint comprises an area of 21.2 hectares (ha) within Lot 348, encompassing 6.6 ha of native vegetation, and 0.8 ha of planted/non-native vegetation.

1.3 Approval History

The Bunbury Quarry is currently operated in accordance with a Development Approval and Extractive Industry Licence issued by the Shire of Capel on 30 November 2022 for a period of 10 ten years for the extraction of aggregate and a DWER Category 12 Licence valid until 30 September 2026 for the crushing and screening of aggregate. Holcim seeks a Clearing Permit to clear native vegetation within the approved extraction limit within Lot 348.

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LEGEND
- Proposed clearing area
- Lots 348 & 2644

Proposed Clearing Area

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BUNBURY QUARRY NATIVE VEGETATION CLEARING PERMIT

Figure
1

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2.0 Biological Surveys

A Rapid Biodiversity Assessment was undertaken in 2015 which encompassed the entire survey area. This assessment included a desktop study, identification of key features including vegetation and habitats, and identify flora and fauna associated with these vegetation and habitat types (MWH, 2016).

A detailed flora and vegetation assessment and Level 1 Fauna Assessment was undertaken by AECOM in 2021 (AECOM, 2022) for the Project. This survey covered an area of 39.5 ha. In addition, a Targeted Black Cockatoo survey was completed by AECOM for the Project.

3.0 Environmental Values

3.1 Vegetation

3.1.1 Pre-European Vegetation

Beard (1981) mapping is used to determine the current extent of remnant vegetation remaining compared to pre-European vegetation extent. The Environment Protection Authority's (EPA) objective is to retain at least 30% of all pre-European ecological communities (EPA, 2000).

Two pre-European vegetation associations are mapped within the project footprint, including Association 6 and 1000. Table 1 describes the two vegetation associations and the percentage remaining across different local government and state boundaries.

Table 1 Pre-European Beard Vegetation Associations and Percent Remaining (Government of Western Australia, 2019)

Association	Description	% Remaining Statewide	% Remaining Swan Coastal Plain	% Remaining Shire of Capel
6	Medium woodland; tuart & jarrah	23.72	23.72	43.87
1000	Mosaic: Medium forest; jarrah-marri / Low woodland; banksia / Low forest; teatree (Melaleuca spp.)	27.81	26.41	21.02

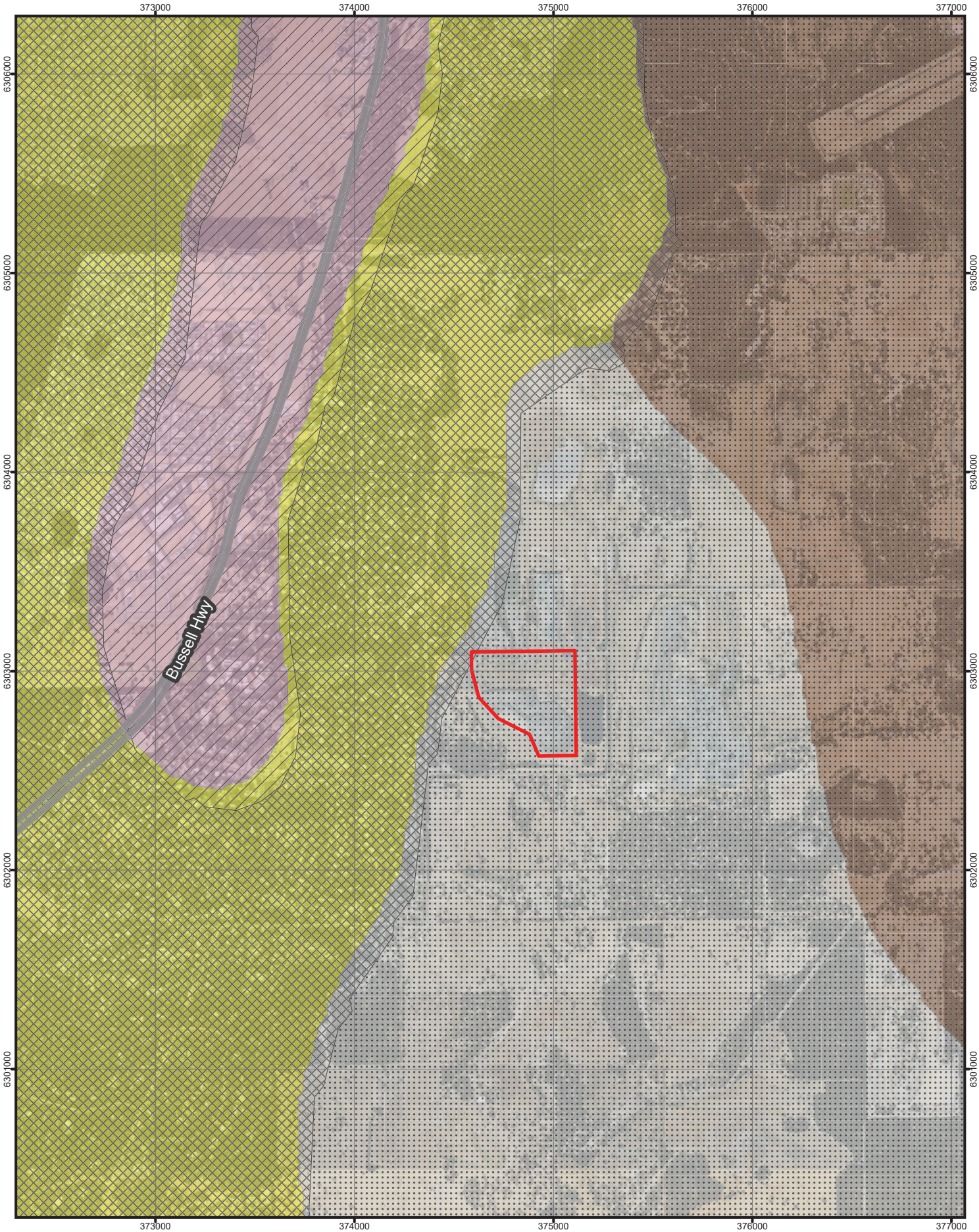
For projects on the Swan Coastal Plain and Southwest (Perth, Peel and Warren), vegetation complexes have been mapped at a finer scale than Beard (1981) by Mattiske & Havel (1998).

The Bassendean Complex-Central and South (44) and Karrakatta Complex-Central and South (49) intersect the project area and are described in Table 2.

Table 2 Pre-European Vegetation Complexes and Percent Remaining (Government of Western Australia, 2019)

Association	Description	% Remaining Swan Coastal Plain	% Remaining Shire of Capel
44 - Bassendean Complex-Central and South	Varies from Jarrah woodlands, sheoak/Banksia woodland to low Melaleuca species, and sedgelands on the moister sites	26.87	23.49
49 - Karrakatta Complex-Central and South	Predominantly open forest Tuart, Jarrah and Marri, Jarrah woodland and Banksia species.	23.49	49.27

The pre-European vegetation associations and complexes are shown on Figure 2.



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LEGEND

Proposed clearing area

Vegetation Complexes - Swan Coastal Plain (DBCA-046)
- Southern River Complex
- Bassendean Complex-Central and South
- Karrakatta Complex-Central and South
- Yoongarillup Complex

Pre-European Vegetation (DPIRD-006)
Veg Association #
- 6
- 998
- 1000

Pre-European Vegetation

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Figure 2

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3.1.2 Vegetation Communities

The project footprint includes 6.6 ha of native vegetation, 0.8 ha of planted/non-native vegetation and 13.8 ha of hardstand or cleared areas (Figure 3).

AECOM (2022) mapped two native vegetation types:

- 0.2 ha Eucalyptus (Marri) Woodland (CcXbLs) – *Corymbia calophylla* medium to large trees over *Xanthorrhoea brunonis* and *Lepidosperma squamatum* tall to low open shrubland over common pasture weeds including **Briza maxima* and **Cenchrus clandestinus*.
- 6.4 ha *Eucalyptus rudis* Wetland/Riparian Vegetation (ErBj) – *Eucalyptus rudis* medium isolated to clustered trees over *Machaerina juncea* and *Mesomelaena tetragona* low open sedgeland over **Avena barbata*, **Ehrharta calycina* and **Briza maxima* tall to low grassland. The regenerated area also includes *Viminaria juncea* and other native sedge species.

3.1.3 Vegetation Condition

The project footprint represents a fragmented disturbed landscape that includes paddocks, planted trees and shrubs, hardscape, native vegetation and the existing quarry pit area. The majority of the project footprint is Completely Degraded (14.3 ha, 67.7%).

Of the 6.6 ha of native vegetation, approximately 95% was in a Degraded condition, and the remaining 5% was in Good condition. The AECOM (2022) vegetation condition mapping is shown in Figure 4.

3.1.4 Threatened and Priority Ecological Communities

The AECOM (2022) biological survey included a desktop assessment, which identified 17 significant communities within 12 km of the project footprint. Of these, none were considered likely to occur.

No Threatened or Priority Ecological Communities were recorded during the biological survey (AECOM, 2022).

3.1.5 Threatened and Priority Flora

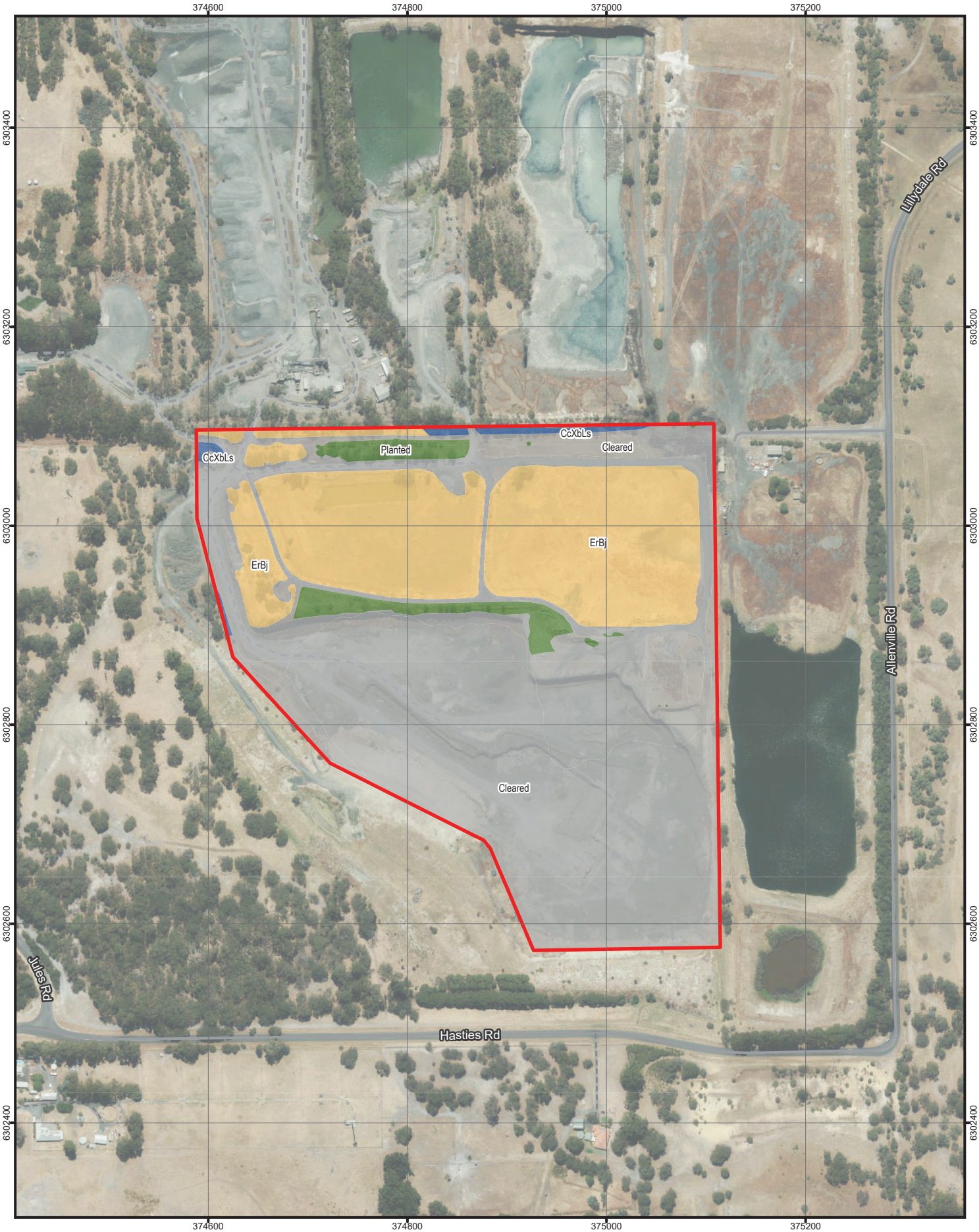
Forty-six (46) significant flora species were identified in the desktop study within 12 km of the project footprint. Of these, none were considered likely to occur.

No Threatened or Priority flora taxa were recorded during the biological survey (AECOM, 2022).

3.1.6 Flora Diversity

AECOM (2022) recorded 13 native flora species during the biological survey, representing 11 genera and five families.

Twenty (26) introduced species were also recorded, and none were listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* or a Weed of National Environmental Significance.



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LEGEND

Proposed clearing area

Vegetation Community
- CcXbLs
- Cleared
- ErBj
- Planted

Vegetation Communities

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BUNBURY QUARRY NATIVE VEGETATION CLEARING PERMIT

Figure 3

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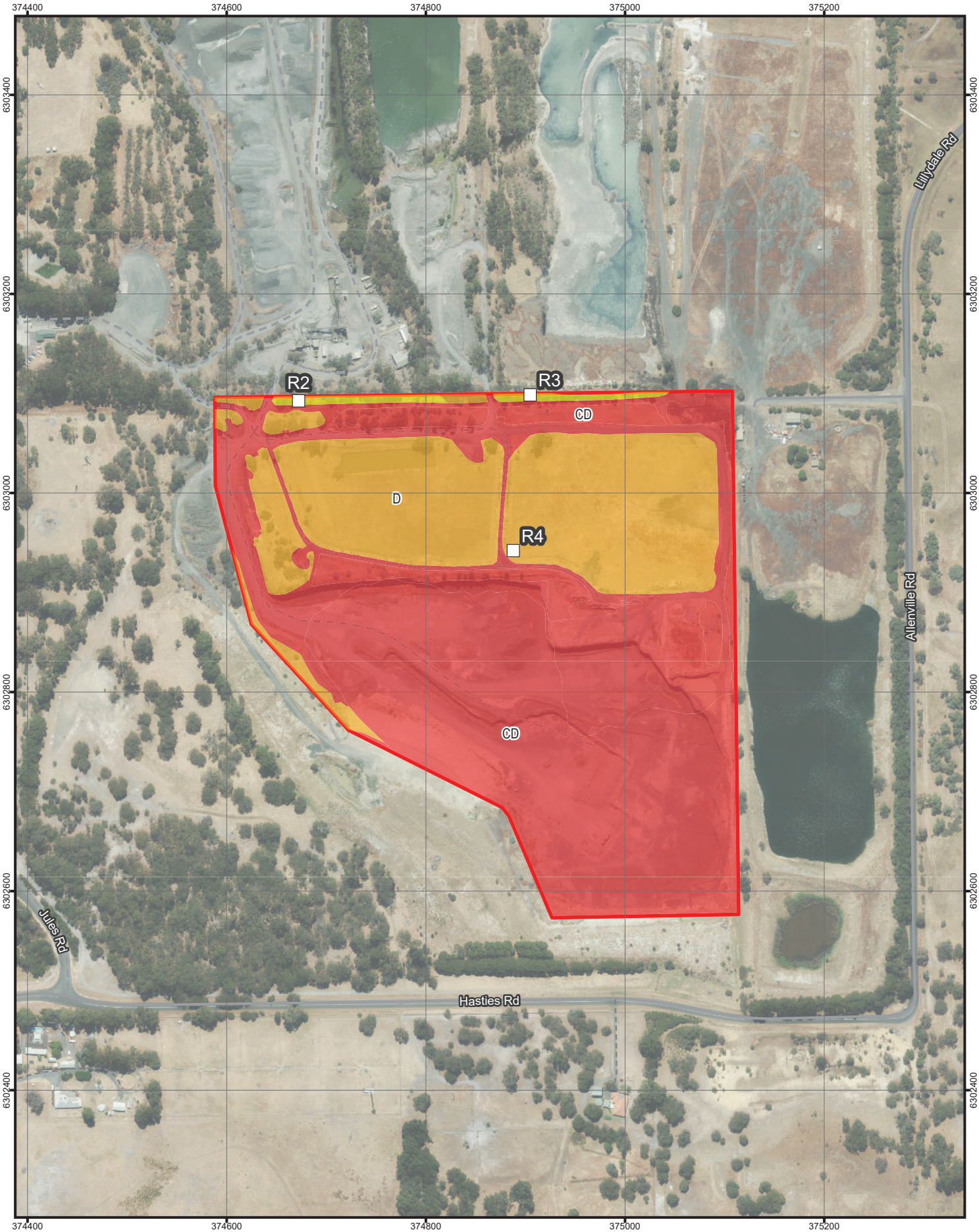

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Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010)
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LEGEND

- Proposed clearing area
- Flora Samples

Vegetation Condition

- Good
- Degraded
- Completely Degraded

Vegetation Condition

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Figure 4

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3.2 Fauna

3.2.1 Threatened and Priority Fauna

AECOM (2022) identified 37 significant fauna species within 12 km of the project footprint. The five considered likely to occur are listed below.

- Forest Red-tailed Black Cockatoo (FRTBC) *Calyptorhynchus banksii naso* (EPBC Act and BC Act: Vulnerable)
- Baudin's Cockatoo *Calyptorhynchus baudinii* (EPBC Act and BC Act: Endangered)
- Carnaby's Cockatoo *Calyptorhynchus latirostris* (EPBC Act and BC Act: Endangered)
- Western Ringtail Possum *Pseudocheirus occidentalis* (EPBC Act and BC Act: Critically Endangered)
- Quenda *Isoodon fusciventer* (WA: Priority 4)

No direct observations of significant fauna were recorded during the biological survey. Indirect observations of the FRTBC (chewed marri nuts) and the Western Ringtail Possum (scats) were recorded.

3.2.2 Native Fauna

Eighteen (18) vertebrate fauna species were recorded within the project footprint (direct and indirect observation). This comprised 15 bird, two mammal and one reptile species.

3.2.3 Fauna Habitats

The project footprint is a highly modified landscape of paddocks, historically cleared areas, planted areas, pockets of native vegetation comprising Wetland and Eucalypt Woodland and the existing quarry pit area. Four (including Cleared) fauna habitats were mapped (Figure 5). These included:

- 1.0 ha Trees and Shrubs over Grass.
- 6.2 ha Wetland/Drainage/Riparian Vegetation.
- 0.2 ha Open Eucalypt Woodland.
- 13.8 ha Cleared.

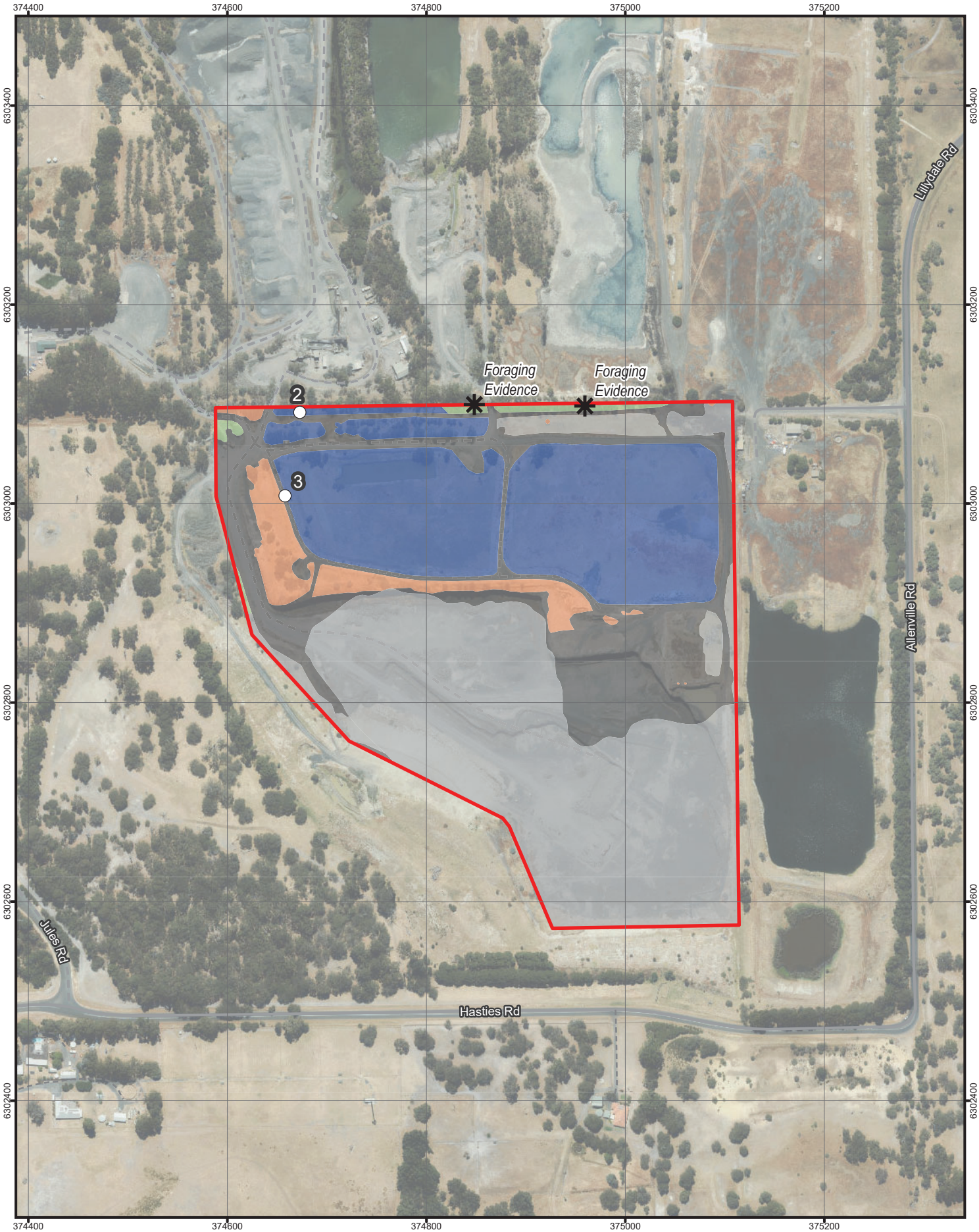
The vegetation was considered suitable foraging habitat for Black Cockatoo species, marginal habitat for Quenda, migratory birds and potential hunting habitat for the Peregrine Falcon (AECOM, 2022). The Black Cockatoo foraging habitat in planted areas was assessed as low-quality due to the lack of understorey species and small-fruited planted eucalypts. The area is also mapped as Supporting Habitat for the Western Ringtail Possum (DEWHA, 2009).

3.2.4 Black Cockatoo Survey

A Targeted Black Cockatoo survey was undertaken as part of the AECOM (2022) biological survey. The key findings included:

- Foraging evidence for the FRTBC was recorded within the project footprint (within the Open Eucalyptus Woodland habitat).
- A total of 118 potential breeding trees were recorded, and none had suitable hollows.
- A total of 7.4 ha of suitable foraging habitat was recorded for all three species, rated from Negligible to Moderate Quality. The majority (over 90%) was Negligible-Low quality foraging habitat.
- No roosting sites were identified.

The potential breeding trees and suitable foraging habitat recorded for each Black Cockatoo species is shown in Figure 6.



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LEGEND

- Proposed clearing area
- Fauna Habitat Assessment Locations selection

TaxonName

- Forest Red-tailed Black Cockatoo
- Western Ringtail Possum

Fauna Habitat

- Hardstand
- Open Eucalyptus Woodland
- Trees and Shrubs over Grass
- Wetland/Drainage/Riparian
- Cleared

Fauna Habitats

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Figure 5

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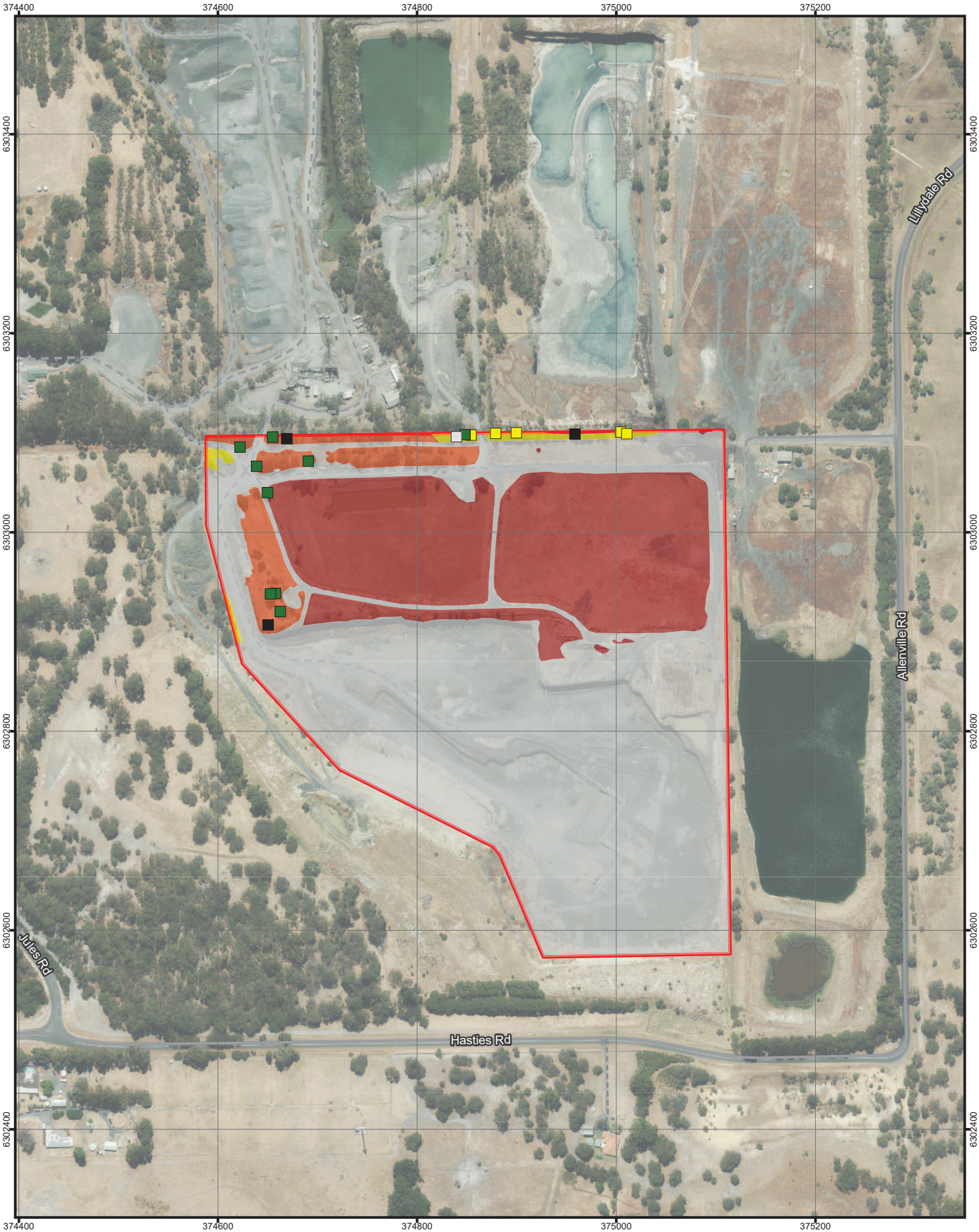

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LEGEND

Proposed clearing area

Species
- Marri (*Corymbia calophylla*)
- Flooded Gum (*Eucalyptus rudis*)
- York Gum (*Eucalyptus loxophleba*)
- Stag (old dead tree, unknown species)

Carnaby's Black Cockatoo Foraging Quality
- None
- Negligible
- Low
- Moderate

Black Cockatoo Breeding and Foraging Habitat

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Figure
6.1

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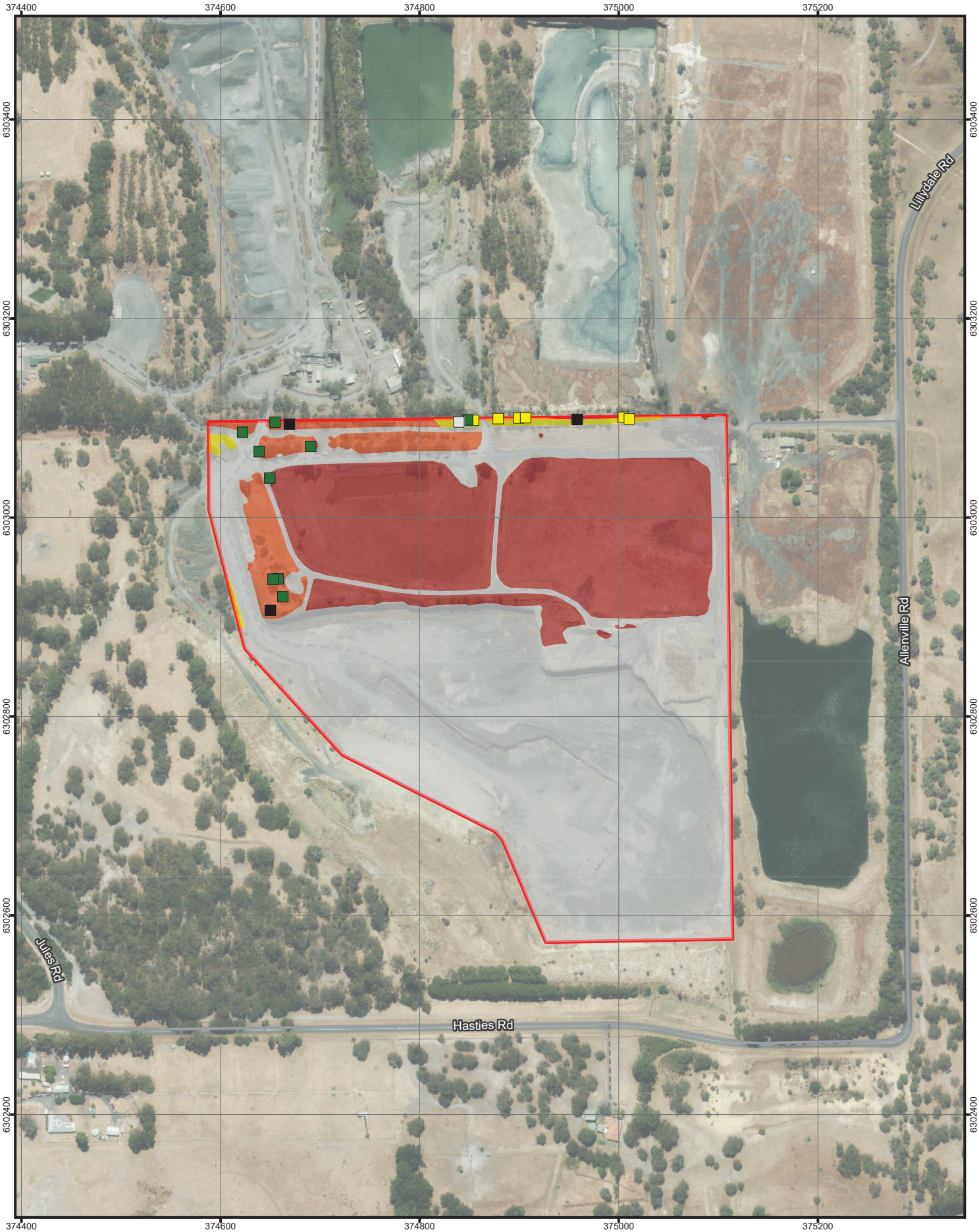

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LEGEND

Proposed clearing area

Species
- Marri (*Corymbia calophylla*)
- Flooded Gum (*Eucalyptus rudis*)
- York Gum (*Eucalyptus loxophleba*)
- Stag (old dead tree, unknown species)

Forest Red-Tailed Black Cockatoo Foraging Quality
- None
- Negligible
- Low
- Moderate

Black Cockatoo Breeding and Foraging Habitat

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Figure
6.2

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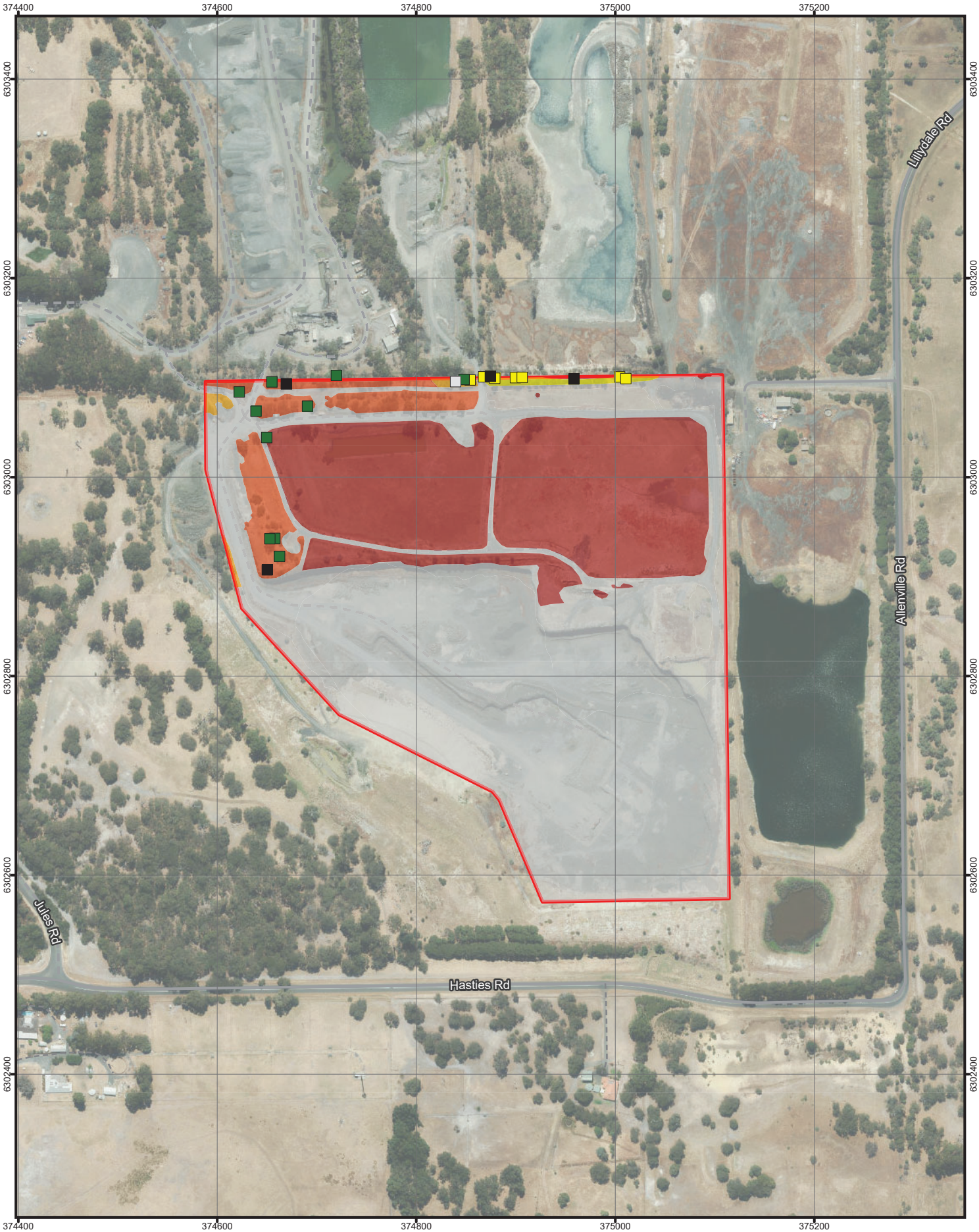

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LEGEND

Proposed clearing area

Species
- Marri (*Corymbia calophylla*)
- Flooded Gum (*Eucalyptus rudis*)
- York Gum (*Eucalyptus loxophleba*)
- Stag (old dead tree, unknown species)

Baudin's Black Cockatoo Foraging Quality
- None
- Negligible
- Low
- Low to Moderate
- Moderate

Black Cockatoo Breeding and Foraging Habitat

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BUNBURY QUARRY NATIVE VEGETATION CLEARING PERMIT

Figure
6.3

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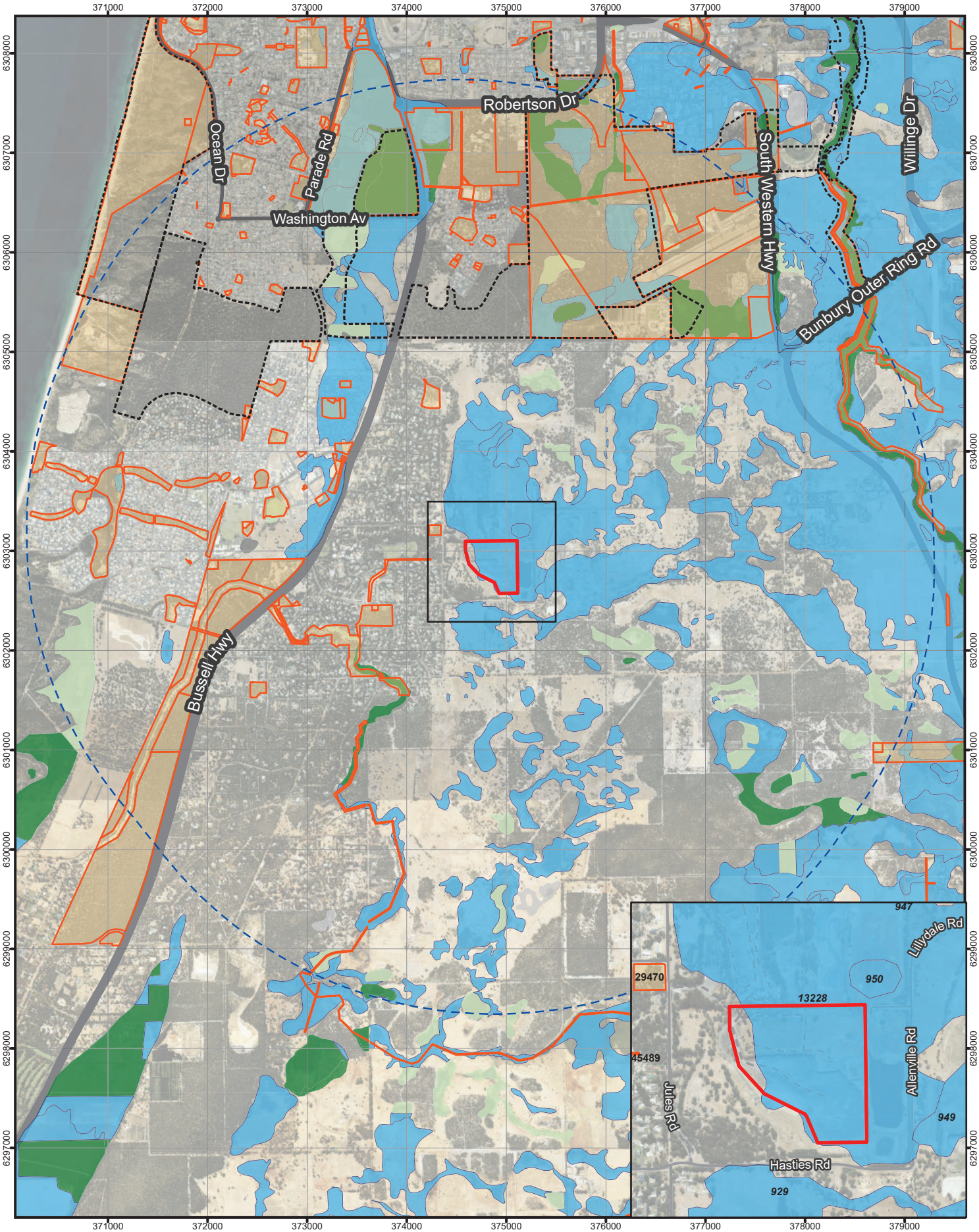
3.3 Reserves and Conservation Areas

The Department of Biodiversity, Conservation and Attractions (DBCA) (2021) Geomorphic Wetlands, Swan Coastal Plain dataset shows one Multiple Use Wetland (MUW) intersects the project footprint, ID 13,228.

No environmentally sensitive areas, reserves or conservation areas mapped by the State Government occur within the project footprint.

Several DBCA wetlands and conservation reserved are mapped within a 5 km radius of the project footprint, shown in Figure 7.



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Service Layer Credits: WMS:

LEGEND

- Proposed clearing area
- 5km buffer

Regional Parks (DBCA-026)

- Kalgulup Regional Park
- Reserves (LGATE-227)

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation
- Multiple Use
- Not Applicable
- Not Assessed
- Resource Enhancement

Reserves and Conservation Areas

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Figure 7

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4.0 Potential Impact of the Project

4.1 Scale of Proposed Clearing

The project footprint is 21.2 ha total within Lot 348 Jules Road, Gelorup. The project anticipates clearing up to 6.6 ha of native vegetation and 0.8 ha planted/non-native vegetation. The remaining 13.8 ha is already cleared or hardstand areas.

4.2 Clearing Principles

The proposed clearing works were assessed against the 10 Clearing Principles for native vegetation as listed in Schedule 5 of the *Environmental Protection Act* (Table 3).

The proposed clearing may be at variance with one or more of the 10 Clearing Principles.

Table 3 Clearing Principles Evaluation

Assessment	Source & Tools for Assessment	Outcome
Principle (a) - Native vegetation should not be cleared if it comprises a high level of biological diversity		
AECOM conducted a biological survey in spring 2021 (report completed May 2022). Twelve (12) native flora species from 10 genera and 5 families and 26 introduced species were recorded within the project footprint. No Threatened flora listed under the EPBC Act or the BC Act, and no Priority species listed by DBCA were recorded during the survey. Two native vegetation types were recorded within the project footprint (CcXbLs and ErBj) comprising 6.6 ha total as listed below. The remaining 14.6ha was significantly altered vegetation (planted / non-native or cleared). • 0.2 ha – Eucalyptus (Marri) Woodland (CcXbLs), three native and six weed species • 6.4 ha – *Eucalyptus rudis* Wetland/Riparian Vegetation (ErBj), eight native and 12 weeds species • 0.8 ha – Planted (includes gardens/landscaping, rehabilitated areas and paddock) • 13.8 ha – Cleared Approximately 95% of native vegetation was mapped in a Degraded condition and remaining 5% was in a Good condition. Given the low species diversity and Degraded condition of native vegetation, the proposed clearing of 6.6 ha of native vegetation is not likely to be at variance with this Principle.	AECOM biological survey (2022)	***The proposal is not likely to be at variance with this clearing principle***
Principle (b) - Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia		
The desktop fauna assessment identified five conservation significant fauna species that could potentially occur within the project footprint. This included the FRTBC (EPBC Act and BC Act: VU), Baudin's Cockatoo (EPBC Act and BC Act: EN),	AECOM biological survey (2022)	***The proposal is not likely to be at variance with this clearing principle***

<table>
<tr><th>Assessment</th><th>Source & Tools for Assessment</th><th>Outcome</th></tr>
<tr><td>
Carnaby's Cockatoo (EPBC Act and BC Act: EN), Western Ringtail Possum (WRP) (EPBC Act and BC Act: CR) and Quenda (WA: P4).

No direct observations of significant species were recorded during the biological survey. One significant species, the FRTBC, was recorded from indirect observations.

Four fauna habitats were mapped, including Trees and Shrubs over Grass (1.0 ha), Wetlands/Drainage/Riparian vegetation (6.2 ha), Open Eucalypt Woodland (0.2 ha), and Cleared (13.8 ha).

The vegetation was considered suitable for all three Threatened Black Cockatoo species, marginal habitat for Quenda, Western Ringtail Possum and migratory birds and potential hunting habitat for the Peregrine Falcon.

A total of 19 potential Black Cockatoo breeding trees were recorded within the project footprint, none had suitable hollows, and no roosting sites were identified.

A total of 7.4 ha of suitable foraging habitat was recorded, of which more than 90% was considered Negligible to Low quality. This includes Black Cockatoo foraging habitat in planted areas, which due to the lack of understorey species and small-fruited planted eucalypts, is generally low-quality habitat type. The Black Cockatoo foraging habitat is detailed below.

<table>
<tr><th>Foraging Quality</th><th>Carnaby’s</th><th>FRTBC</th><th>Baudin’s</th></tr>
<tr><td>Negligible (1)</td><td>6.1 ha</td><td>6.1 ha</td><td>6.1 ha</td></tr>
<tr><td>Low (2)</td><td>1.1 ha</td><td>1.1 ha</td><td>1.1 ha</td></tr>
<tr><td>Low to Moderate (3)</td><td>-</td><td>-</td><td>0.1 ha</td></tr>
<tr><td>Moderate Quality (4-6)</td><td>0.2ha</td><td>0.2ha</td><td>0.1 ha</td></tr>
<tr><td>Total</td><td>7.4 ha</td><td>7.4 ha</td><td>7.4 ha</td></tr>
</table>
One significant fauna species, the FRTBC, was recorded in the project footprint, as well as vegetation that provides marginal to suitable habitat for FRTBC.

WRP scats were recorded in areas adjacent to the project footprint, and the project area is mapped as Supporting Habitat for the WRP. However, the canopy cover is not well connected or continuous, there is a significant lack of understorey and midstory species for browse and an absence of other native canopy species (including its preferred feeding and nesting tree Agonis flexuosa/peppermint tree), it was dominated by weeds, isolated on all sides by internal roads and there were almost no suitable refuges available. It was largely assessed as Degraded in condition, with one small area of Good condition, because of these issues.
</td><td></td><td></td></tr>
</table>

Assessment	Source & Tools for Assessment	Outcome
The vegetation within the cleating footprint is unlikely to be necessary for the survival of any native or significant fauna species. Given the lack of suitable hollows and roosting sites in the small number of potential breeding trees and the lack of suitable WRP habitat, the proposal is not likely to be at variance to this Principle.		
Principle (c) - Native vegetation should not be cleared if it includes or is necessary for the continued existence of, rare flora		
No species listed as Threatened under the EPBC Act or the BC Act were recorded during the biological survey. Ten (10) Threatened flora species were identified in the desktop assessment. None were considered likely to occur. No Declared Rare Flora occurs within or adjacent to the project footprint, hence the project is not at variance to this Principle.	AECOM biological survey (2022)	***The proposal is not likely to be at variance with this clearing principle***
Principle (d) - Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a Threatened Ecological Community		
No Threatened Ecological Communities were anticipated to occur, and none were recorded in the biological survey. Two native vegetation communities were recorded and mapped. Neither were considered regionally significant. No TEC occurs within or adjacent to the project footprint, hence the project is not at variance to this Principle.	AECOM biological survey (2022)	***The proposal is not likely to be at variance with this clearing principle***
Principle (e) - Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been significantly cleared		
The National Objectives and Targets for Biodiversity Conservation 2001-2005 recognises that the retention of 30% or more of the pre-clearing extent of each ecological community is necessary if Australia's biodiversity is to be protected. This is consistent with the EPA Position Statement No. 2 on Environmental Protection of Native Vegetation in Western Australia (EPA, 2000). The project area intersects with two pre-European vegetation associations mapped by Beard (1981), Association 6 and 1000. Association 6 has greater than 30% remaining at the LGA level but less than 30% at all other scales. Association 1000 has less than 30% remaining at all scales.	AECOM biological survey (2022) Govt. of WA, 2019a Govt. of WA, 2019b	***The proposal is not likely to be at variance with this clearing principle***

<table>
<tr><th>Assessment</th><th>Source & Tools for Assessment</th><th>Outcome</th></tr>
<tr><td>

Beard Assoc.	Scale	Original Extent	Extent Remaining	% Remaining
6	Statewide	56343 ha	13362 ha	23.72
	SCP IBRA	56343 ha	13362 ha	23.72
	SWA02 Subregion	56343 ha	13362 ha	23.72
	Shire of Capel (LGA)	5245 ha	2301 ha	43.87
1000	Statewide	99836 ha	27769 ha	27.81
	SCP IBRA	94175 ha	24869 ha	26.41
	SWA02 Subregion	94175 ha	24869 ha	26.41
	Shire of Capel (LGA)	151734 ha	3190 ha	21.02

Two vegetation complexes (Mattiske & Havel 1998) intersect the project area, complex 44 and 49. Both complexes have less than 30% remaining on the Swan Coastal Plain.

Complex	Scale	Original Extent	Extent Remaining	% Remaining
44	SCP IBRA	87476 ha	23509 ha	26.87
	Shire of Capel (LGA)	4947 ha	1162 ha	23.49
49	SCP IBRA	53081 ha	12467 ha	23.49
	Shire of Capel (LGA)	6902 ha	3401 ha	49.27

AECOM (2022) mapped 6.6 ha of native vegetation and the remaining 14.6 ha as planted, non-native or cleared. Native vegetation types included Eucalyptus (Marri) Woodland (CcXbLs) and *Eucalyptus rudis* Wetland/Riparian Vegetation (ErBj), in a mostly Degraded condition.

</td><td></td><td></td></tr>
</table>

Assessment	Source & Tools for Assessment	Outcome
Beard Association 6 is described as medium Tuart and Jarrah woodland. Approximately 0.2 ha of native vegetation is mapped within Association 6 (primarily CcXbLs). Beard Association 1000 is described as a mosaic of medium Jarrah or Marri forest, low Banksia woodland and low teatree forest. Approximately 6.4 ha of native vegetation is mapped within this association (primarily ErBj). All native vegetation (6.6 ha) recorded by AECOM (2022) is mapped within Complex 44 (Bassendean Complex-Central and South). Complex 44 is described as Jarrah woodlands, sheoak/Banksia woodland to low Melaleuca species, and sedgelands on the moister sites. The majority of vegetation within the project footprint is highly modified and remnant native vegetation not entirely representative of the pre-European vegetation units. The proposed clearing is not likely to significantly reduce the remaining extent of pre-European vegetation, but these units have less than the 30% threshold remaining. However, given the habitat quality for Black cockatoo threatened species is greater than 95% negligible to low quality, the project is not likely to be at variance with this Principle.		
Principle (f) - Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or a wetland		
Multiple Use Wetland (MUW) (ID 13,228) intersects a large portion of the project footprint, corresponding with the *Eucalyptus rudis* Wetland/Riparian Vegetation units mapped by AECOM (2022). AECOM (2022) described the vegetation type as low-lying dampland/wetland with some areas of standing water. With variable habitat complexity from closed sedgeland to open pasture and sporadic mature *Eucalyptus rudis* trees. Given the project footprint intersects DBCA MUW (ID 13,228) and more than 95% of wetland habitats condition was recorded as either degraded or completely degraded in the biological survey (AECOM, 2022) the proposal not likely be at variance with this Principle.	AECOM biological survey (2022) DBCA-019 Geomorphic Wetlands, SCP (2021)	***The proposal is not likely to be at variance with this clearing principle***
Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation		
The existing Bunbury Quarry is located on Lots 348 and 2644 Jules Road, Gelorup, encompassing approximately 95 ha total. The project footprint is 21.2 ha and will require clearing of up to 6.6 ha of native vegetation and 0.8 ha of non-native vegetation. The Bunbury Quarry landscape is highly modified and includes areas of open pits, cleared, hardstand and planted vegetation. Clearing of patches of vegetation (native and non-native) is unlikely to cause appreciable land degradation. Therefore, the project is not at variance to this Principle.	AECOM biological survey (2022)	***The proposal is not likely to be at variance with this clearing principle***

Assessment	Source & Tools for Assessment	Outcome
Principle (h) - Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area		
The Project Area does not occur within or immediately adjacent to a conservation area. The closest conservation area to the Project Area is the Kalgulup Regional Park located approximately 1.5 km north. The nearest ESA to the project footprint is a Conservation Category Wetland (ID 931) located approximately 1 km south-west. As there are no conservation areas or environmentally sensitive areas within or adjacent the project footprint, the project is not at variance to this Principle.	AECOM biological survey (2022) DBCA-019 Geomorphic Wetlands, SCP (2021) DWER-046 Clearing Regulations ESAs (2021)	***The proposal is not likely to be at variance with this clearing principle***
Principle (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water		
A total of 6.2 ha of Wetland/Drainage/Riparian Vegetation habitat was recorded within the project footprint. The habitat is described as low-lying dampland/wetland with some areas of standing water. No dewatering will occur during clearing or extraction. Quarrying is restricted to 8 m AHD to prevent Holcim's operations affecting the underlying Yarragadee aquifer. Groundwater and surface water generated on-site is retained for use on-site and Holcim aims for zero discharge of excess water into the environment. Surface water quality monitoring is undertaken for any discharge of water from the premises in accordance with the discharge criteria set out in the DWER Category 12 licence. Given the presence of wetland habitat and standing water, the project may be at variance to this Principle.	AECOM biological survey (2022)	***The proposal may be at variance with this clearing principle***
Principle (j) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause or exacerbate the incidence or intensity of flooding		
The project area intersects DBCA MUW 13,228 and several wetland habitats recorded by AECOM (2022). The proposed clearing extends the existing Bunbury Quarry, which is already a largely modified landscape, with open pits, cleared and re-vegetated areas. Clearing up to 6.6 ha of native vegetation (6.2 wetland habitat) and 0.8 ha of non-native vegetation on Lot 348 is not likely to exacerbate the incidence or intensity of flooding, given the largely modified landscape. If appropriate management actions are implemented (TME, 2006), the proposed clearing is unlikely to be at variance with this Principle.	AECOM biological survey (2022)	***The proposal is not likely to be at variance with this clearing principle***

5.0 Environmental Management

5.1 Vegetation Clearing Management

Vegetation clearing will be closely managed and monitored to ensure the adjacent very good condition vegetation is protected and not impacted by the clearing activities as outlined in Table 4.

Table 4 Vegetation Clearing Management

Vegetation Clearing			
Key Standards / References			
• *Biodiversity Conservation Act 2016* • *Environment Protection and Biodiversity Conservation Act 2012* (EPBC Act) • *Environmental Protection Act 1986* (EP Act) • Clearing Permit conditions • Holcim Australia, Boundary Compliance, SHE Guideline 6.18. • Holcim Australia, Quarry Development, SHE Guideline 6.15			
Objectives and Targets			
• Clearing of native vegetation will not exceed the total area proposed on the Clearing Permit Application • Clearing of native vegetation will not occur in areas outside of the proposed clearing permit area			
1. Key Performance Indicators			
Ref	**Details**		
1.1	No damage to native vegetation outside approved disturbance boundary		
1.2	No unauthorised clearing of native vegetation within the approved disturbance boundary.		
2. Management Actions			
Ref	**Description**	**Responsibility**	**Timing**
1.1	Demarcate approved clearing area/ extraction boundary using GPS coordinates and blue markers with 100 m spacing. Adjacent posts on either side to be visible from each post.	Holcim	Prior to clearing
1.2	Demarcate any native vegetation within the site boundary that will be retained.	Holcim	Prior to clearing
1.3	Demarcate topsoil, weed and dieback management boundaries.	Holcim	Prior to clearing
1.4	Restrict access by personnel, vehicles and plant into vegetated areas adjacent to project boundary.	Holcim	At all times

Vegetation Clearing			
1.5	Excavated vegetation shall be stockpiled for habitat provision or mulched. Clearing of vegetation is kept to the minimum required for efficient operations.	Clearing Contractor	During clearing
1.6	Topsoil shall be stockpiled separately from overburden in windrows less than two (2) metres high or reused directly for the rehabilitation of worked areas.	Clearing Contractor	Immediately after clearing
1.7	Ensure no new informal tracks arise and all vehicle and personnel movements are limited to the approved project boundary.	Clearing Contractor	At all times
1.8	Report all incidents relating to these Vegetation Clearing Management actions to Holcim within 24 hours of incident.	Clearing Contractor	Within 24 hours of incident

3. Monitoring				
Ref	**Description and Location**	**Parameter**	**Responsibility**	**Frequency**
1.1	Inspect clearing area to ensure flagging is intact and no boundary breach has occurred.	Clearing boundary	Holcim	Daily during clearing.
1.2	Inspect felled and cleared vegetation and identify those suitable for use in rehabilitation and revegetation works.	Rehabilitation timber	Holcim	Weekly during clearing

Contingency and Corrective Actions		
Incident or Consequence	**Corrective Action**	**Responsibility**
Unauthorised Clearing	Report immediately to Holcim.	Clearing Contractor
	Investigate as an Incident.	Holcim
	Halt activities on site until site investigation is completed	Holcim
	Report clearing to Regulator if required	Holcim
	Re-establish the approved boundary demarcation.	Holcim
	Rehabilitate impacted area.	Holcim

5.2 Weeds

Strong hygiene management practises will be implemented to prevent the introduction of new weeds and limit the spread of existing weeds. The hygiene management actions are presented in Table 5.

Table 5 Weed Hygiene Management

Weed Management			
Key Standards/References			
• *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) • *Environmental Protection Act 1986* (EP Act) • *Biosecurity and Agriculture Management Act 2007* (BAM Act) • Weeds in Australia (DotE 2012) • Holcim Australia, Management of Weeds, Pathogens and Pest Animals, SHE Guideline 6.16			
Objectives and Targets			
Construction within the Development Area will aim to prevent the: • Spread of weeds from the site to new locations. • Introduction of new weeds into Project area.			
1. Key Performance Indicators			
Ref	**Details**		
2.1	No introduction of new weed species into Bunbury Quarry.		
2.2	No evidence of weeds being spread to adjacent sites within 5 years of clearing.		
2. Management Actions			
Ref	**Description**	**Responsibility**	**Timing**
2.1	Conduct weed control if weeds are noted.	Holcim	Where noted
2.2	Ensure all vehicles, equipment and plant undergo a complete quarantine inspection prior to access to site.	Clearing Contractor	At all times
2.3	Ensure fill, if used is uncontaminated, and free of weeds and disease as specified in the Landfill Waste Classification and Waste Definitions (DWER 2019).	Holcim	At all times
2.4	Control, with the aim to eradicate, any infestation of High to Very High priority weeds.	Holcim	As required
2.6	Locate topsoil and cleared vegetation stockpiles away from areas where runoff from rainfall may occur.	Clearing Contractor	During clearing

Weed Management			
2.7	Avoid the movement of people and machinery through infested areas particularly at the high risk time of seeding.	Clearing Contractor	At all times
2.8	Remove weeds from soil before stockpiling	Clearing Contractor	During clearing

3. Monitoring				
Ref	**Description and Location**	**Parameter**	**Responsibility**	**Frequency**
2.1	Visual inspection of site.	Weed infestations • No Declared Pests • No High to Very High priority weeds	Holcim	Every 3 months

Contingency and Corrective Actions		
Incident or Consequence	**Corrective Action**	**Responsibility**
Vehicle or equipment does not meet quarantine inspection requirement (i.e. not free of plant material or soil).	Report and investigate as an incident.	Holcim
	Arrange for vehicle/equipment to be cleaned or washed down at an external facility.	Clearing Contractor
	Re-inspect vehicle/equipment.	Holcim
New weed or Declared Pest or High to Very High priority infestation occurring onsite.	Report and investigate as an incident.	Holcim
	Arrange for weed control by a suitably trained contractor.	Holcim
	Increase monitoring frequency to weekly until no weed occurrence for 1 month.	Holcim
	Review hygiene measures and conduct additional toolbox meetings as required.	Holcim

6.0 Offset Proposal

Clearing permits may be granted subject to conditions which aim to prevent, control, abate or mitigate environmental harm or conditions which require offsetting the loss of the cleared vegetation. The management strategy for native vegetation within the development site is to: avoid impacts; minimise impacts and offset significant residual impacts.

As per the Clearing of Native Vegetation Offsets procedure (2014), offsets are required when clearing is at variance with one or more of the biodiversity related clearing principles (Principles a – f, h) and a significant residual impact remains. An assessment against the ten Clearing Principles (Section 4.2) has indicated that the proposed clearing is not at variance with the ten Clearing Principles therefore an offset is not required.

7.0 References

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5 September 2022

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Dear Jenny,

Flora and Fauna Assessment for Bunbury Quarry

1.0 Introduction

Holcim (Australia) Pty Ltd commissioned AECOM Australia Pty Ltd to complete a flora and fauna survey in order to support a clearing permit for the Bunbury Quarry (the survey area) (Figure 1).

The survey was undertaken in accordance with the relevant published guidance for flora and vegetation, terrestrial fauna and Black Cockatoo surveys.

PROJECT ID	60670845
CREATED BY	WYATTK2
APPROVED BY	C. HOUSE
LAST MODIFIED	04 MAR 2022

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Datum: GDA 1994 MGA Zone 50

0 50 100 150 200
metres

Data sources:
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010)
Service Layer Credits: World Street Map: Esri, HERE, Garmin, FAO, METI/NASA, USGS
WMS:

LEGEND

Survey Area

Survey Area

HOLCIM

BUNBURY QUARRY FLORA, FAUNA AND VEGETATION SURVEY

Figure
1

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2.0 Existing Environment

2.1.1 Climate

The survey area is situated in the Shire of Capel, approximately 7 km south of Bunbury. The climate is Mediterranean which experiences warm to hot dry summers and mild to cool wet winters.

The closest meteorological station to the survey area with comprehensive data is Bunbury (station number 009965), which is located approximately 5 km from the survey area. Bunbury meteorological station is maintained by the Bureau of Meteorology (BoM) and commenced recording in 1995 (BoM, 2022). The long-term data against the rainfall and mean temperatures received in the 12 months preceding the survey is shown in Figure 2 (BoM, 2022).

The survey was undertaken on the 25 November and 29 November 2021 following a winter experiencing above average rainfall. Total annual rainfall for the 12 months preceding the survey is higher than average, with 945.6 mm recorded compared to the annual mean of 728.6 mm.

Minimum temperatures were relatively stable across the 12-month period, with a warmer than average July. Maximum temperatures deviated slightly with February, October and November experiencing cooler than average temperatures, and a warmer January and December.

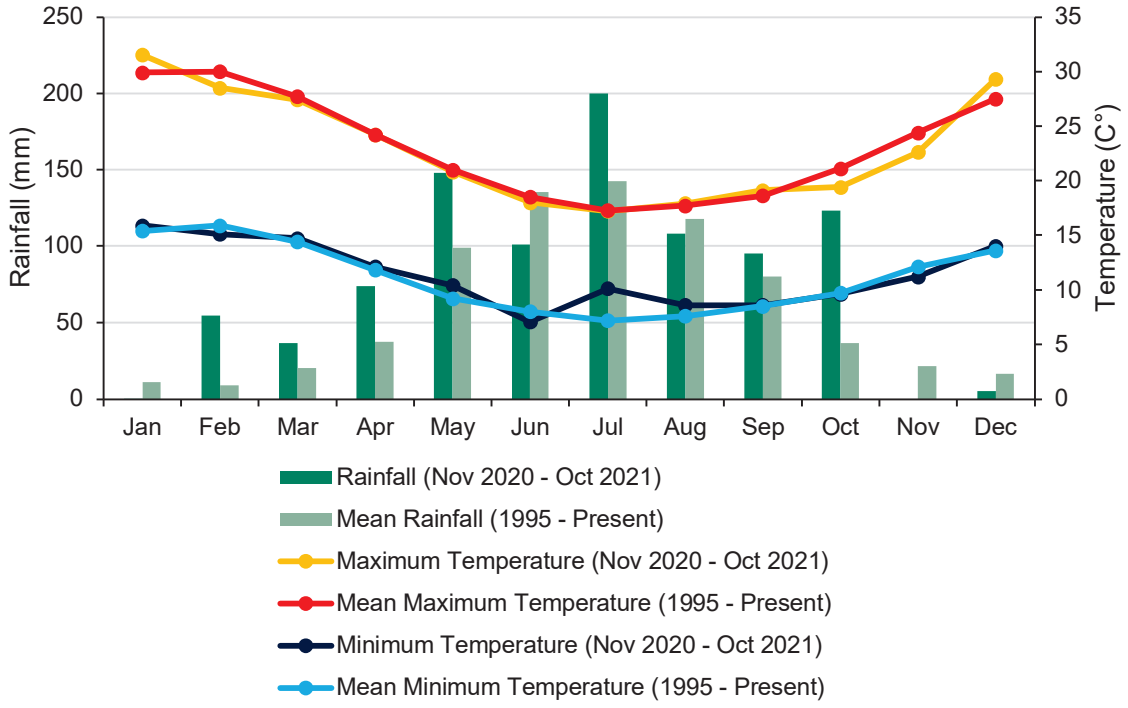


Figure 2 Climate data from Bunbury (Station 009965) (BoM, 2022)

2.1.2 Interim Biogeographical Region of Australia Regions

The largest regional vegetation classification scheme recognised by Environmental Protection Authority (EPA) is the Interim Biogeographical Region of Australia (IBRA). The IBRA regions provide the planning framework for the systematic development of a comprehensive, adequate and representative (CAR) national reserve system. There are 89 recognised IBRA regions across Australia that have been defined based on climate, geology, landforms and characteristic vegetation and fauna (IBRA7, 2012).

The survey area lies on the Swan Coastal Plain IBRA Region. The Swan Coastal Plain bioregion, described in CALM (2002), includes Perth and the outer suburbs (excluding the Hills suburbs). The Swan Coastal Plain consists of the Dandaragan Plateau and the Perth Coastal Plain and is comprised of a narrow belt less than 30 km wide of Aeolian, alluvial and colluvial deposits of Holocene or Pleistocene age (Gibson *et al* 1994). A complex series of seasonal freshwater wetlands, alluvial river

flats, coastal limestone and several offshore islands are included in the bioregion. Younger sandy areas and limestone are dominated by heath and/or tuart woodlands, while *Banksia* and jarrah-*Banksia* woodlands are found on the older dune systems. The outwash plains at the foot of the Darling Escarpment were once dominated by *Casuarina obesa*-marri woodlands and *Melaleuca* shrublands. Extensive clearing has occurred on the Swan Coastal Plain for urban and agricultural development.

2.1.3 Vegetation

Two pre-European vegetation associations are mapped within the survey area, including Association 6 and 1000. Table 1 describes the two vegetation associations and the percentage remaining across different local government and state boundaries.

Table 1 Pre-European vegetation mapping and percent remaining (Government of Western Australia, 2019)

Association	Description	% Remaining Statewide	% Remaining Swan Coastal Plain (SCP)	% Remaining in the Shire of Capel
6	Medium woodland; tuart & jarrah	23.72	23.72	43.87
1000	Mosaic: Medium forest; jarrah-marri / Low woodland; banksia / Low forest; teatree (Melaleuca spp.)	27.81	26.41	21.02

2.1.4 Previous Surveys

A Rapid Biodiversity Assessment was undertaken in 2015 which encompassed the entire survey area. This assessment included a desktop study, identification of key features including vegetation and habitats, and identify flora and fauna associated with these vegetation and habitat types (MWH, 2016). This assessment defined the majority of the survey area as Paddock and was considered mostly Completely Degraded with a small area as Good to Degraded (MWH, 2016).

3.0 Methodology

3.1 Desktop Assessment

A desktop assessment was conducted prior to the field survey to identify significant environmental values likely to be present in the survey area including flora, fauna, and vegetation communities. Desktop database searches were requested from the following government databases:

- Department of Biodiversity, Conservation, and Attractions Threatened Species and Communities database including Threatened and Priority flora and fauna (10 km buffer from survey area), and communities (20 km buffer from the survey area)
- Western Australian Herbarium (WAH, 1998) records
- Index of Biodiversity Assessments (IBSA) website
- Previous ecological surveys completed for Holcim Bunbury
- EPBC Act Protected Matters Search Tool (PMST).

All flora and communities of conservation significance identified in the desktop assessment were assessed for their likelihood of occurrence within the survey area using the categories outlined below (Table 2).

Table 2 Categories of likelihood of occurrence for species and communities

Likelihood	Flora	Fauna	Communities
Likely to Occur	Habitat is present in the survey area and the species has been recorded in close	Survey area is within the known distribution of the species, habitat is present in the survey area and the species has	Known occurrences of the community in close proximity to the survey area. Vegetation looks the same within the

Likelihood	Flora	Fauna	Communities
	proximity to the survey area.	been recorded in close proximity to the survey area.	known occurrence and survey area based on aerial imagery. Geographic location is similar to the survey area.
May Occur	Habitat may be present and/or the species has been recorded in close proximity to the survey area.	Survey area is within the known distribution of the species, marginal habitat may be present and/or the species has been recorded in close proximity to the survey area.	Known occurrence of the community in the local area, and/or vegetation looks the same within known occurrence and survey area based on aerial imagery. Geographic location is similar to the survey area.
Unlikely to Occur	No suitable habitat is present and the species has not been recorded in close proximity to the survey area.	Survey area is outside the known distribution for the species, or no suitable habitat is present and the species has not been recorded in close proximity to the survey area.	Known occurrence of the community in close proximity to the survey area however geographic location does not occur in survey area.

3.2 Field Assessments

The field surveys were undertaken by Ecologists Cassandra House (collection permit FB62000118) and Shannon de Melo on 25th and 29th November 2021.

3.2.1 Flora and Vegetation

A reconnaissance flora and vegetation survey was undertaken utilising methods outlined in the *Flora and Vegetation Surveys for Environmental Impact Assessment Technical Guide* (EPA, 2016).

Data was collected from four unbounded relevés and observation points. Data collected included the presence of plant species, their cover abundance, structural composition of vegetation, physical environment and presence/absence of disturbance.

Vegetation communities were described and mapped based on changes in dominant species composition and landform. Vegetation community descriptions were based on the National Vegetation Information System (NVIS) framework at level V Association (DEE, 2017a). Vegetation mapping was informed by aerial imagery analysis.

Vegetation condition was determined using the EPA (2016) scale adapted from Keighery (1994) condition scale (Table 3). The scale is based on disturbance (e.g. grazing, erosion), degree of alteration to community and habitat structure and site ecology. Areas devoid of native vegetation were mapped as cleared (e.g. roads, infrastructure).

Table 3 Bushland condition ratings (EPA, 2016; adapted from Keighery, 1994)

Rating	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Rating	Description
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance of vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

3.2.2 Fauna

A basic fauna habitat assessment was completed in conjunction with the flora and vegetation assessment to assess fauna habitats in accordance with basic fauna survey methods outlined in EPA (2020) Technical Guidance for Terrestrial Fauna Surveys. This included collecting data from five sample point locations. Sample point locations were selected in areas considered representative of the vegetation types and fauna habitat types present. This data was then used to determine the potential for fauna habitats to be utilised by conservation significant fauna species known to occur within the surrounding area.

Black cockatoo foraging and breeding habitat were assessed in accordance with DSEWPaC (2012) and the draft Department of the Environment and Energy Referral Guidelines (DEE, 2017). The breeding habitat survey focused on assessing and quantifying eucalypts within the survey area with hollows potentially suitable for breeding black cockatoos or with a Diameter at Breast Height (DBH) >500 mm (or >300 mm *Eucalyptus wandoo* and *Eucalyptus salmonophloia*). Suitability and utilisation by black cockatoos cannot always be assessed adequately at ground level, and hence the Precautionary Principle is used where appropriate. The quality of foraging habitat for black cockatoo species was determined through assessing the vegetation and calculating a foraging score using Bamford Consulting Ecologists Black Cockatoo Scoring System (Bamford, 2020). The foraging value score provides a numerical value that reflects the significance of vegetation as foraging habitat for black cockatoos, and this numerical value is designed to provide the information needed by the Commonwealth Department of Agriculture, Water and the Environment (DAWE) to assess impact significance and offset requirements. The Bamford Consulting Ecologists Black Cockatoo Scoring System is described in Appendix A (Bamford, 2020).

4.0 Limitations

Limitations of the flora, vegetation and fauna assessment are discussed in Table 4.

Table 4 Limitations of the Ecological Surveys

Limitation	Flora and Vegetation Survey	Fauna survey
Availability of contextual information on the region	**Nil** Sufficient resources for the Swan Coastal Plain (SCP) were available to provide contextual information.	**Nil** Sufficient contextual information is available on the SCP and survey area. Some of the resources utilised to inform the fauna survey include the DBCA database, EPBC Act PMST, AoLA, as well as several field guides and other publications.
Competency/experience of consultant conducting survey	**Nil** The flora and vegetation assessment was led by Cassandra House who has	**Nil** Cassandra is an ecologist with over 5 years' experience in the environmental

Limitation	Flora and Vegetation Survey	Fauna survey
	more than 5 years' experience conducting surveys of similar scope.	industry who has conducted multiple basic fauna surveys on the SCP.
Proportion of flora/fauna identified, recorded and/or collected (based on sampling, timing and intensity)	**Nil** Native vegetation was the focus of the survey. No effort was made to identify planted varieties of shrubs and trees. The sampling effort and intensity is considered adequate for the survey.	**Minor** Information gained for a basic fauna survey was sufficient for those areas surveyed. Fauna were observed (through direct or indirect evidence) during daylight hours (0700 and 1600hrs) and all habitats were assessed. Nocturnal species were observed through indirect evidence.
Completion (is further work needed)	**Nil** No further work is required.	
Remoteness and/or access problems	**Nil** The objectives of the assessments were met.	
Timing, weather, season, cycle	**Nil** The survey was undertaken during 25 and 29 November 2021 in Spring which is considered the ideal survey season for the Swan Coastal Plain (EPA, 2016). Rainfall was higher than average in the months preceding the survey. No significant limitations were identified relating to timing, weather, season or cycle.	
Disturbances (e.g. fire flood, accidental human intervention) which affected results of the survey	**Nil** The survey was not disrupted or impacted.	

5.0 Results

5.1 Desktop

5.1.1 Vegetation

The database searches identified 17 conservation significant communities that may occur in the survey area. These results include ten TECs listed under the EPBC Act, nine communities listed under the BC Act, and eight communities listed as PECs by DBCA.

Of these communities, none are considered likely to occur as the majority of the site lacks native vegetation in Good or better condition. The communities identified within the desktop assessment are included in Table 5 below.

Table 5 Threatened and Priority Ecological Communities that were identified in the desktop study

Community Name and Description	Cons. Status	
	State	EPBC
Banksia Woodlands of the Swan Coastal Plain The Banksia Woodlands TEC incorporates woodland of *Banksia* species with scattered Eucalypts and other tree species over a species rich mix of sclerophyllous shrubs, graminoids, and forbs. The community is associated with several State-listed TECs and PECs. Those relevant for this project include: • Banksia dominated woodlands of the Swan Coastal Plain (P3) • SCP21b Southern Banksia attenuata woodlands • SCP21c Low lying Banksia attenuata woodlands or shrublands	P3	E
SCP30b Quindalup Eucalyptus gomphocephala and/or Agonis flexuosa woodlands	P3	-
Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain.	P3	CE
SCP3c Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands, Swan Coastal Plain (floristic community type 3c as originally described in in Gibson et al. (1994))	CR	E
SCP29a Coastal shrublands on shallow sands	P3	-
SCP25 Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands	P3	-
Coastal Saltmarsh Subtropical and Temperate Coastal Saltmarsh	P3	V
SCP07 Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson et al. (1994))	V	CE
SCP08 Herb rich shrublands in clay pans (floristic community type 8 as originally described in Gibson et al. (1994))	V	CE
SCP09 Dense shrublands on clay flats (floristic community type 9 as originally described in Gibson et al. (1994))	V	CE

Community Name and Description	Cons. Status	
	State	EPBC
SCP10a Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson et al. (1994))	E	CE
SCP18 Shrublands on calcareous silts of the Swan Coastal Plain (floristic community type 18 as originally described in in Gibson et al. (1994))	V	-
SCP19a Sedgelands in Holocene dune swales of the southern Swan Coastal Plain (floristic community type 19 as originally described in in Gibson et al. (1994))	CR	E
SCP19b Woodlands over sedgelands in Holocene dune swales of the southern Swan Coastal Plain (original description; Gibson et al. (1994).	CR	E
SCP1b Corymbia calophylla woodlands on heavy soils of the southern Swan Coastal Plain (floristic community type 1b as originally described in Gibson et al. (1994))	V	-

1. EPBC Conservation status codes: E Endangered, CE Critically Endangered, V Vulnerable

2. BC Conservation status codes: E Endangered, V Vulnerable, CR Critically Endangered, P3 Priority 3

5.1.2 Flora

The desktop study identified 46 significant flora species that may occur in the survey area. This included ten species listed as Threatened under the EPBC Act and BC Act and 36 species listed as Priority by DBCA.

The likelihood assessment determined that:

- none were considered likely to occur
- six Threatened and eleven Priority flora species may occur
- four Threatened and 25 Priority flora species are unlikely to occur.

Species which may occur are described in Table 6. The comprehensive species list is presented in Appendix B.

Table 6 Conservation significant flora species identified in the desktop study which may occur

Taxon	Cons. Code (EPBC[1])	Cons. Code (State[2])	Habitat[3]
Aponogeton hexatepalus		P4	Mud. Freshwater: ponds, rivers, claypans
Austrostipa bronwenae	E	EN	Grows in non-saline but seasonally wet grey-brown sandy loam soil containing nodules of Muchea Limestone, at the edge of a *Gahnia trifida* sedgeland with *Eucalyptus decipiens*
Austrostipa jacobsiana	CE	CR	Bunbury specimens grow in winter-wet grey sandy clay soil in melaleuca mixed tall shrubland
Caladenia huegelii	E	EN	Grey or brown sand, clay loam

Taxon	Cons. Code (EPBC[1])	Cons. Code (State[2])	Habitat[3]
Caladenia speciosa		P4	White, grey or black sand
Carex tereticaulis		P3	Black peaty sand
Diuris drummondii	V	VU	Low-lying depressions in peaty and sandy clay swamps.
Drakaea micrantha	V	EN	Usually found on cleared firebreaks or open sandy patches that have been disturbed. Occurs in infertile grey sands, in jarrah and common sheoak woodland or forest associated with banksia species
Isopogon formosus subsp. dasylepis		P3	Sand, sandy clay, gravelly sandy soils over laterite. Often swampy areas
Lasiopetalum membranaceum		P3	Sand over limestone
Schoenus benthamii		P3	White, grey sand, sandy clay. Winter-wet flats, swamps
Schoenus loliaceus		P2	Sandy soils. Winter-wet depressions
Stylidium longitubum		P4	Sandy clay, clay. Seasonal wetlands
Synaphea hians		P3	Sandy soils. Rises
Synaphea odocoileops		P1	Brown-orange loam, sandy clay, granite. Swamps, winter-wet areas
Synaphea polypodioides		P3	Light brown loam, red-brown sandy loam, gravelly, brown sandy clay over laterite. In undulating areas
Synaphea stenoloba	E	CR	Loamy soils in low lying areas that are occasionally inundated

1. E: Endangered, V: Vulnerable; CE; Critically Endangered
2. P Priority; VU: Vulnerable; EN: Endangered; CR: Critically Endangered
3. Habitat derived from WAH, 1998-

5.1.3 Fauna

The desktop fauna assessment identified 37 conservation significant fauna species that have the potential to occur within the survey area. The likelihood of occurrence of fauna species was determined by assessing the likely presence of suitable habitat in the survey area and reviewing the recent records and distribution of the species. Species which are marine were removed from the data and did not undergo assessment as they are highly unlikely to occur within the survey area. This assessment determined that:

- five species are likely to occur, including three bird and two mammal species
- seven species may occur, including four birds, one invertebrate and two mammals
- twenty-five species are unlikely to occur.

Species likely to occur are described in Table 7. The comprehensive desktop species list is presented in Appendix C.

Table 7 Conservation significant fauna species identified in the desktop study as likely to occur

Taxon	Cons. Code (State[1])	Habitat
Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*	VU	The Forest Red-tailed Black Cockatoo requires tree hollows to nest and breed, occurs in forests of Karri (Eucalyptus diversicolor), Jarrah (E. marginata) and Marri (Corymbia calophylla), with flocks moving out onto the Swan Coastal Plain in search of food from exotic trees such as White Cedar (Johnstone et al., 2010). Foraging habitat for the species consists of Jarrah and Marri woodlands and forest throughout its range.
Baudin's Cockatoo *Calyptorhynchus baudinii*	EN	The Baudin's Cockatoo mainly occurs in eucalypt forests, especially jarrah, marri, and karri forest. Species forages primarily in Eucalypt forest, feeding on Marri nuts, flowers, nectar and seeds. Nesting trees are karri, marri, wandoo and tuart.
Carnaby's Cockatoo *Calyptorhynchus latirostris*	EN	Carnaby's Cockatoo nests in hollows in eucalypts, particularly Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*E. Wandoo*), but nests have been found in other eucalypts including York Gum (*E. loxophleba*), Flooded Gum (*E. rudis*), Tuart (*E. gomphocephala*) and Marri (*Corymbia calophylla*) (Johnstone et al., 2010). Breeding success is largely dependent on suitable feeding habitat adjacent to the nest site to provide the necessary food for the survival of the chick (Johnstone et al., 2010). Diet consists of an array of Proteaceous and Eucalyptus species. Foraging habitat, including Banksia woodlands, is considered to be habitat critical to the survival of the species (Johnstone et al., 2010).
Western Ringtail Possum *Pseudocheirus occidentalis*	CR	It is a medium sized nocturnal, arboreal, folivorous marsupial endemic to south-western Australia. The species weighs up to 1.3 kg, with a body length of approximately 40 cm. Its fur is dark brown above with cream to grey fur underneath, short rounded ears and a strong prehensile tail with a terminal white tip, and (Van Dyck & Strahan, 2008).
Quenda, southwestern brown bandicoot *Isoodon fusciventer*	P4	The Quenda or Southern Brown Bandicoot is found in forest, woodland, heath and shrub communities in these regions. Preferred habitat usually consists of a combination of sandy soils and dense heathy vegetation (Van Dyck & Strahan, 2008).

1. P Priority, VU Vulnerable, EN Endangered, CR Critically Endangered

5.2 Field Survey

5.2.1 Flora and Vegetation

The survey area comprised 39.47 ha of which 28.75 ha represents planted and cleared areas and 10.72 ha represents native vegetation. Native vegetation is characterised by Marri Woodland (CcXbLs) and Flooded Gum Wetland/Riparian Vegetation (ErMj).

Vegetation communities are described in Table 8 and mapped in Figure 3. Floristic data supporting vegetation mapping is presented in Appendix D.

Table 8 Vegetation community descriptions including mapping code and photographs

Community Description	Additional Details	Photograph
CcXbLs Eucalyptus (Marri) Woodland *Corymbia calophylla* medium to large trees over *Xanthorrhoea brunonis* and *Lepidosperma squamatum* tall to low open shrubland over common pasture weeds including **Briza maxima* and **Cenchrus clandestinus*. Represents small pockets of remnant native vegetation. Weed invasion has displaced some native understorey species.	Survey effort: R3 Species richness: three native and six weed species Area: 1.13 ha	
ErMj Eucalyptus rudis Wetland/Riparian Vegetation *Eucalyptus rudis* medium isolated to clustered trees over *Machaerina juncea* and *Mesomelaena tetragona* low open sedgeland over **Avena barbata, *Ehrharta calycina* and **Briza maxima* tall to low grassland. The regenerated area also includes *Viminaria juncea* and other native sedge species. Represents wetland/riparian vegetation. Mapped as isolated occurrences. This vegetation represents both planted/modified and native vegetation depicted by the presence of native understorey species and regrowth of native species.	Survey effort: R2 and R4 Species richness: eight native and 12 weed species Area: 9.58 ha	

Community Description	Additional Details	Photograph
Significantly altered vegetation – non-native • Planted – mix of planted native and introduced species over grassland (non-native). Includes gardens/landscaping, rehabilitated areas and paddocks (9.98 ha) • Cleared (18.77 ha)	Survey effort: R1 Area: 28.75 ha	

Vegetation Condition

The survey area represents a fragmented disturbed landscape that includes paddocks, planted trees and shrubs, hardscape and native vegetation. The majority of the survey area is Completely Degraded (28.28 ha, 71.6%) (Table 9). Native vegetation represents 10.72 ha of the total survey area and is comprised of areas ranging in condition from Degraded to Good. Vegetation condition is mapped in Figure 4.

Table 9 Vegetation condition

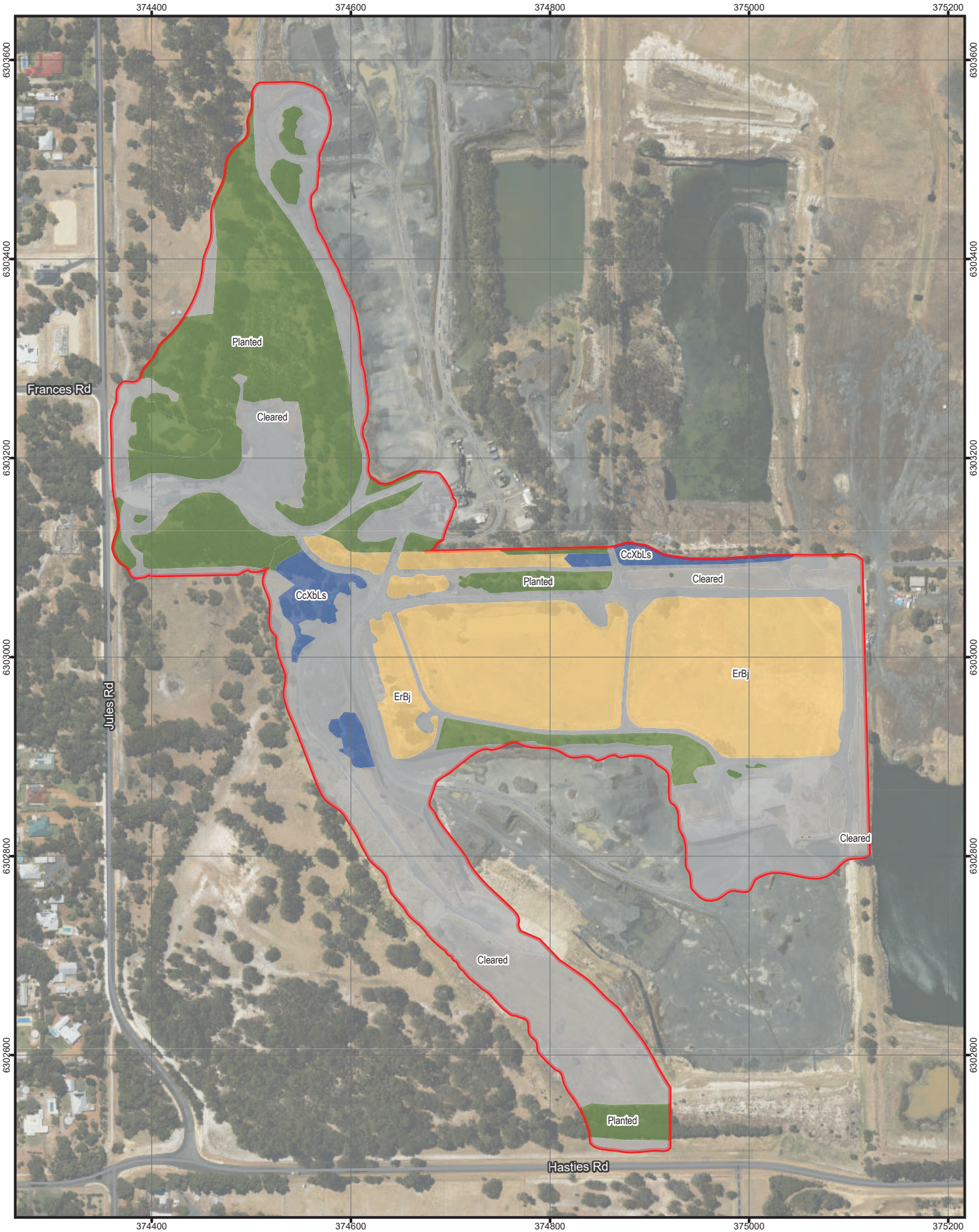
Condition Rating	Area (ha)	Proportion of Survey Area (%)
Good	0.62	1.6
Degraded	10.58	26.8
Completely Degraded	28.28	71.6
Total	**39.47**	**100**

Flora Species Diversity

A total of 13 native flora species were recorded during the field survey, representing 11 genera and five families. No species listed as Threatened under the EPBC Act or BC Act were recorded and none were considered likely to occur from the desktop study. No Priority flora were recorded and are also considered as unlikely to occur in the survey area.

Twenty-six introduced species were recorded. None of these species are listed as Declared Pests under the Biosecurity and Agriculture Management Act 2007 (BAM Act) or Weed of National Environmental Significance.

A comprehensive species list by family and community is presented in Appendix D.



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Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010)
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LEGEND

Survey Area

Vegetation Community
- CcXbLs
- ErBj
- Planted
- Cleared

Vegetation Communities

HOLCIM

BUNBURY QUARRY FLORA, FAUNA AND VEGETATION SURVEY

Figure
3

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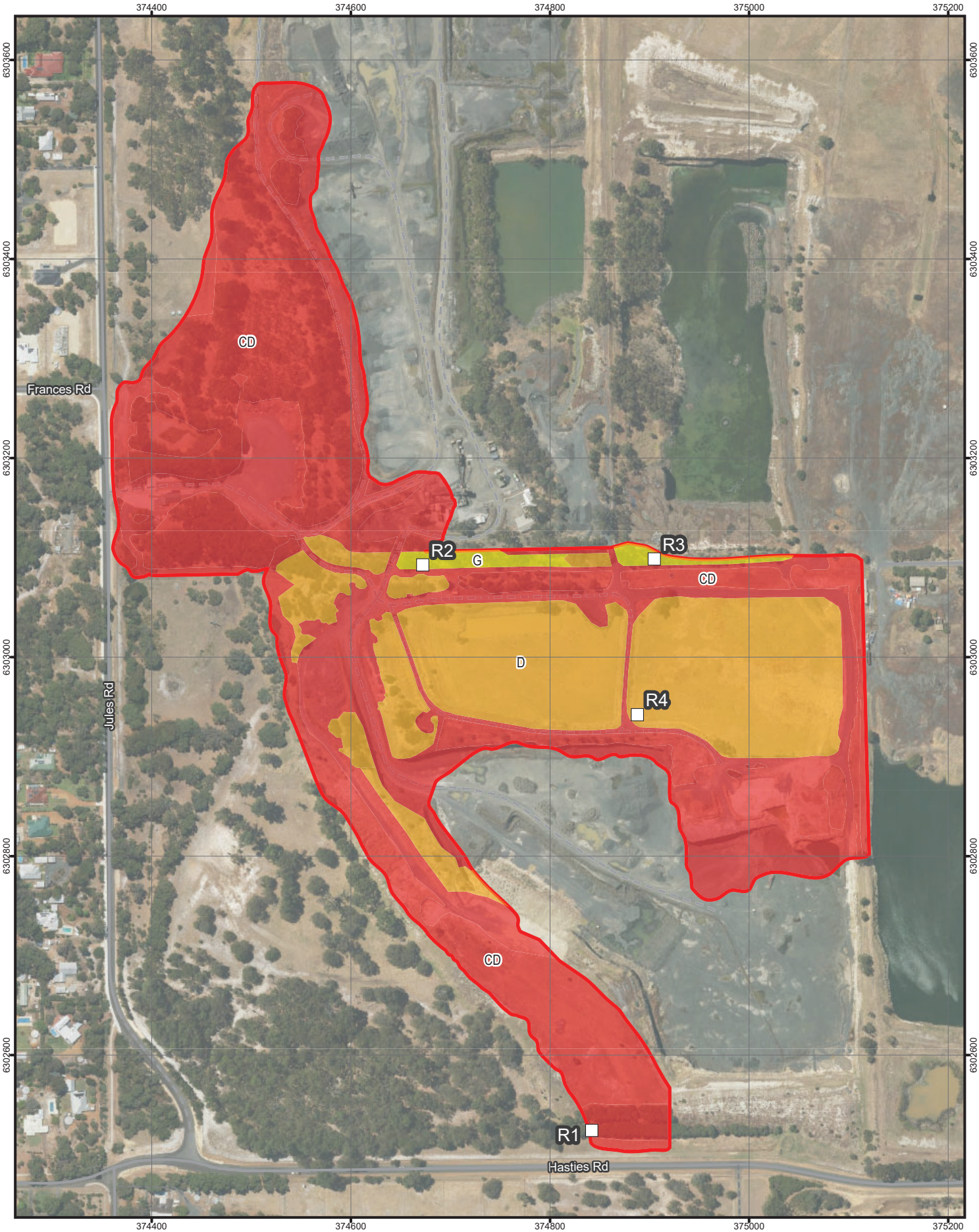

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LEGEND

- Survey Area
- Flora Samples

Vegetation Condition

- Good
- Degraded
- Completely Degraded

Vegetation Condition

HOLCIM

BUNBURY QUARRY FLORA, FAUNA AND VEGETATION SURVEY

Figure 4

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5.2.2 Fauna

Eighteen vertebrate fauna species were recorded during the field survey. This comprised 15 bird, two mammal and one reptile species. A complete inventory of fauna species recorded within the survey area is provided below.

The Laughing Kookaburra *Dacelo novaeguineae* and Spotted Dove *Spilopelia chinensis* were also observed in the survey area; these species are considered naturalised in Western Australia.

Species observed included:

- Western Grey Kangaroo *Macropus fuliginosus melanops*
- Western Ringtail Possum *Pseudocheirus occidentalis*
- Dugite *Pseudonaja affinis*
- Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*
- Black-faced Cuckooshrike *Coracina novaehollandiae*
- White-faced Heron *Egretta novaehollandiae*
- Spotted Dove *Spilopelia chinensis*
- Striated Pardalote *Pardalotus striatus*
- Rufous Whistler *Pachycephala rufiventris*
- Australian Ringneck *Platycercus zonarius*
- Willie Wagtail *Rhipidura leucophrys*
- Brown Honeyeater *Lichmera indistincta*
- Grey Fantail *Rhipidura albiscapa*
- Australian Magpie *Cracticus tibicen*
- Weebil *Smicrornis brevirostris*
- New Holland Honeyeater *Phylidonyris novaehollandiae*
- Red Wattlebird *Anthochaera carunculata*
- Laughing Kookaburra *Dacelo novaeguineae* (Naturalised).

Fauna Habitats

The survey area largely represents a mix of highly modified landscape of paddocks, historically cleared areas, planted areas, and pockets of native vegetation comprising Wetland and Eucalypt Woodland. Four (including Cleared) fauna habitats were mapped (Table 10 and Figure 5). Areas of hardstand were not counted as fauna habitat and comprised 13.14 ha. The most common fauna habitat is Trees and Shrubs over Grass (13.82 ha).

The Trees and Shrubs over Grass habitat includes many properties that contain planted introduced and native Eucalyptus trees, with no understory present. This habitat does provide some foraging roosting and breeding habitat for Carnaby's Cockatoo *Calyptorhynchus latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*. The Trees and Shrubs over Grass habitat provides important foraging and shelter opportunities for native fauna, including many reptile and bird species. However, due to the lack of understory species and microhabitat complexity, it is generally a low-quality habitat type.

Open Eucalyptus Woodland represents remnant native vegetation found in small pockets. This habitat supports a high density of understorey comprising native and introduced species and provides moderate cover suitable as refuge for local fauna species. This habitat is considered of moderate to high quality. This habitat also presents as good foraging and breeding habitat for the three Threatened black cockatoo species.

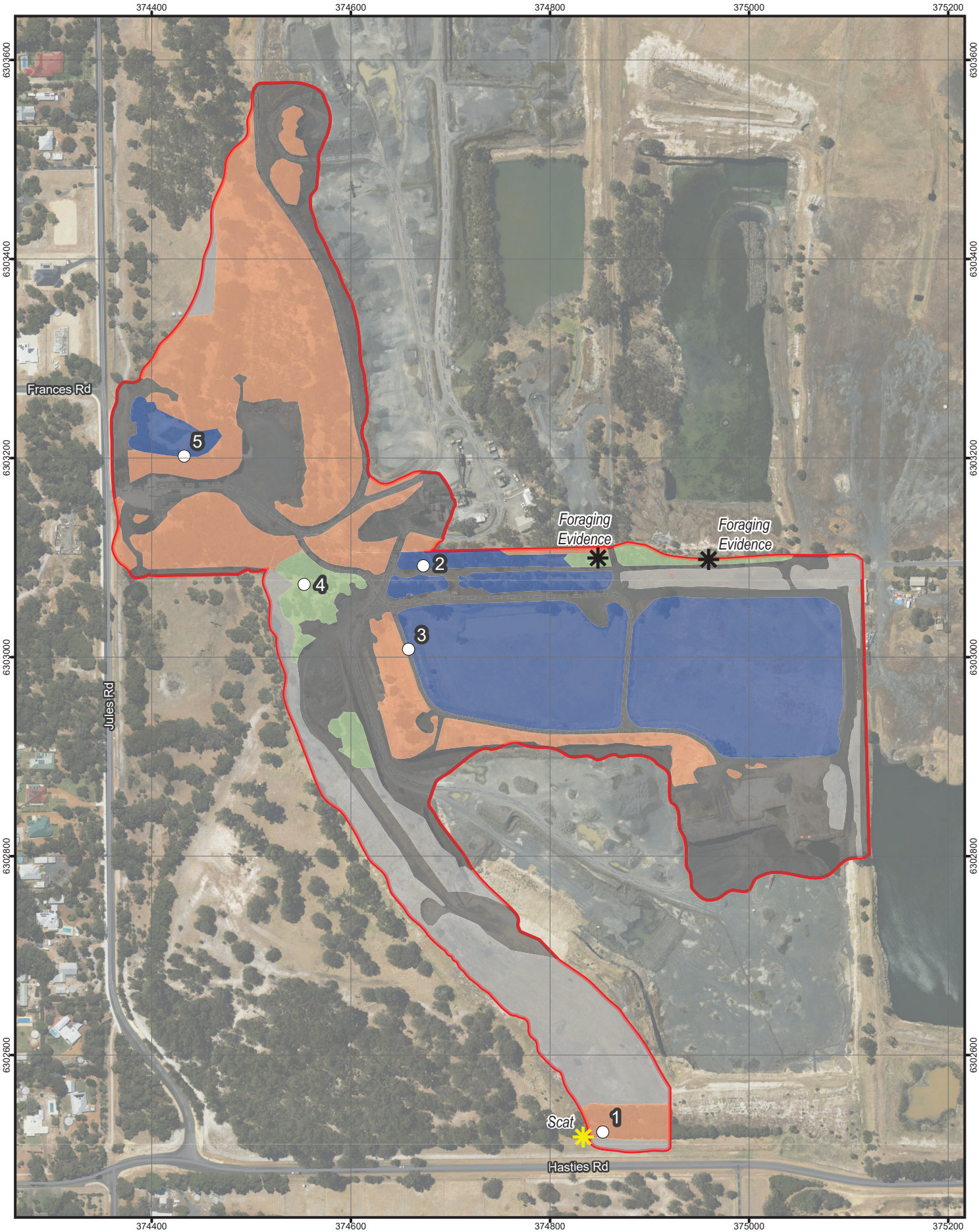
Areas of Wetland/Drainage/Riparian Vegetation was mapped for 9.53 ha. Understorey density varied from absent to dense sedgeland. Due to the lack of diversity in microhabitats, the habitat quality is considered low to moderate areas are limited in the quality of habitat that they provide. The habitat provides an important refuge for water-dependent species and may provide potentially suitable temporary habitat for migratory wetland species

The native vegetation in the survey area represents an important habitat linkage within a broader area of high fragmentation.

Table 10 Fauna habitats within the survey area

Description	Area (ha)	Conservation Significant Fauna Habitat	Photograph
Wetland/Drainage/Riparian Vegetation Low-lying dampland/wetland with some areas of standing water. Variable habitat complexity from closed sedgeland to open pasture. Sporadic mature *Eucalyptus rudis* trees present throughout.	9.53	Negligible to low foraging value for the Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Cockatoo. Marginal habitat for Quenda *Isoodon fusciventer.* May provide suitable habitat for migratory bird species.	
Open Eucalypt Woodland Remnant open Marri woodland, with a sparse understory. Habitat complexity varies, with some small to medium logs present. Grass is abundant, with rock piles observed in some locations. These features make this habitat type a moderate to high quality because of the variety in microhabitats available.	1.13	Moderate quality foraging value for the Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo. Low-moderate foraging for Baudin's Cockatoo. Marginal habitat for Quenda *Isoodon fusciventer* and Western Ringtail Possum *Pseudocheirus occidentalis.*	

Description	Area (ha)	Conservation Significant Fauna Habitat	Photograph
Trees and Shrubs over Grass Recorded on sandy to gravelly soil. Tree density varies from sparse to dense and includes a broad diversity of introduced and native species. Understorey composition varies from largely absent, to introduced grasses, and pasture. Logs of variable size, decorticating bark, and coarse litter provides some refuge. The habitat is considered to range from low to moderate quality with the presence and abundance of large mature eucalypts, limited by the disturbed understorey including weeds and amount of bare ground.	13.82	Negligible to low foraging value for the Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Cockatoo. Marginal habitat for Quenda *Isoodon fusciventer* and Western Ringtail Possum *Pseudocheirus occidentalis.*	
Cleared Devoid of any vegetation. Restricted to sandy tracks and low mowed grassland/pasture.	1.85	Potential hunting habitat for Peregrine Falcon.	



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LEGEND

- Survey Area
- Fauna Habitat Assessment Locations

Opportunistic Fauna Observations

- Forest Red-tailed Black Cockatoo
- Western Ringtail Possum

Fauna Habitat

- Hardstand
- Open Eucalyptus Woodland
- Trees and Shrubs over Grass
- Wetland/Drainage/Riparian
- Cleared

Fauna Habitats

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BUNBURY QUARRY FLORA, FAUNA AND VEGETATION SURVEY

Figure
5

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5.2.3 Black Cockatoo

Breeding Habitat

All areas of potential breeding habitat within the study area were assessed for potential breeding trees. Trees with DBH >= 50 cm are considered large enough to potentially develop hollows suitable for breeding cockatoos. The survey area contains 118 Potential Breeding Habitat trees. Of these 72 (61%) were Introduced species, 11 (9.3%) Corymbia calophylla, 23 (19.5%) Eucalyptus rudis, 2 (1.7%) Eucalyptus gomphocephala, 1 (0.8%) Eucalyptus loxophleba and 9 (7.6%) stags. These trees are mapped in Figure 6.

Suitable hollows were not observed in any of the trees within the survey area, although large trees recorded within the survey area do have the potential to develop suitable hollows for nesting. Details of trees captured in the survey area are presented in Appendix E.

Roosting Habitat

Black cockatoos typically roost in the tallest trees in the landscape in or near riparian environments or near other permanent water sources (DSEWPaC, 2012). Evidence of roosting usually involves large amounts of bird scat beneath a large, mature tree, with a significant number of broken branches on the ground.

Roosting sites were searched for throughout the survey area, but no clear black cockatoo roosting sites were identified.

Foraging Habitat

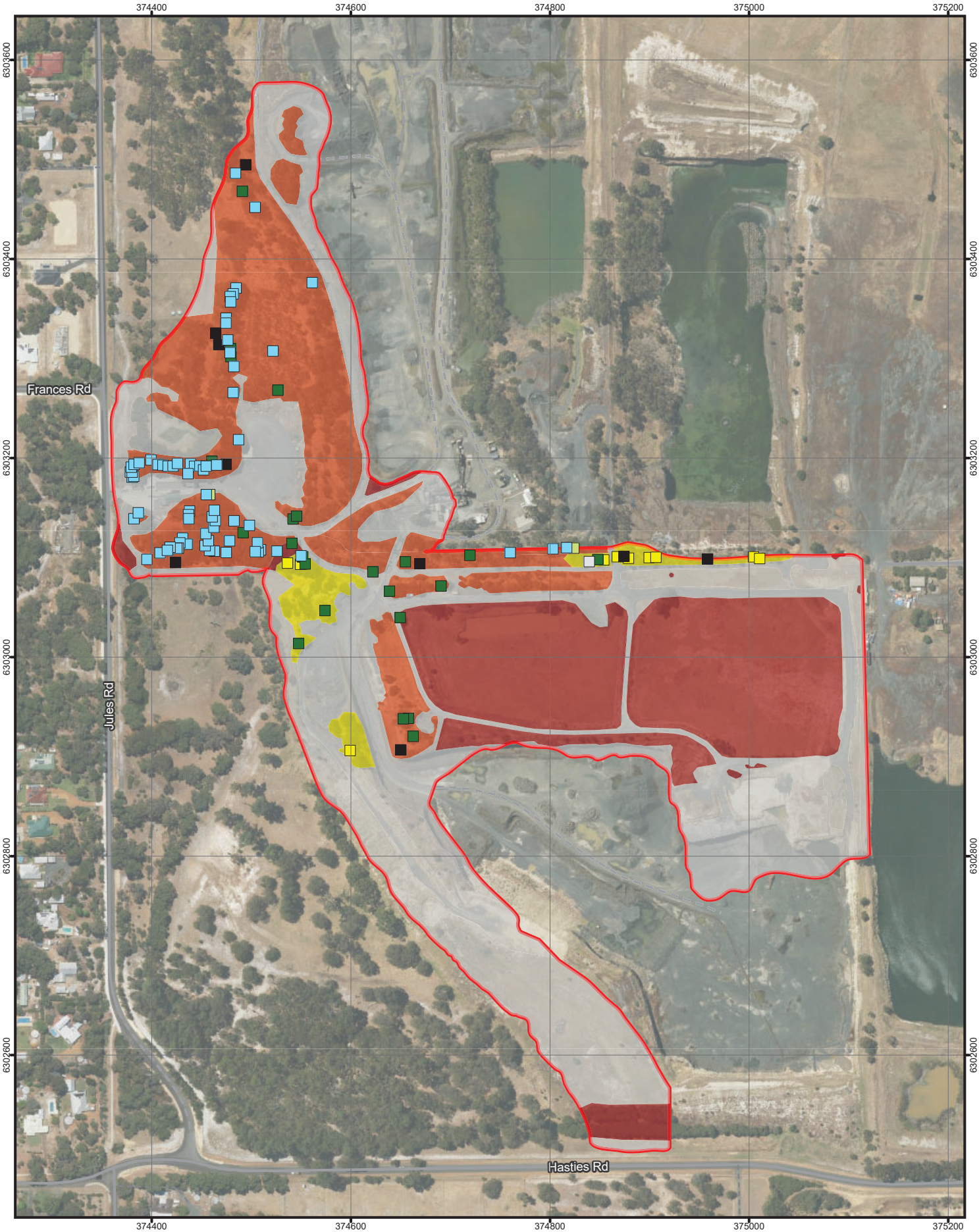
Foraging assessments were informed by fauna habitat and vegetation community and condition mapping, site context, and density scores. Figure 6 shows the extent of foraging habitat for each of the three species. Foraging evidence was recorded for Forest Red-tailed Black Cockatoos within the survey area (Figure 5).

Black cockatoo foraging value was assessed for all vegetation within the survey area. Foraging scores were based on the site condition, site context and species stocking rates. Site condition and stocking rates varied whilst site context was the same for the three cockatoos. Breeding for all three cockatoos is considered likely in native vegetation areas within 15 km of the site according to DBCA data. The survey area includes 10.72 ha of native vegetation which represents <1% of native vegetation present within 15 km. The trees largely comprise small-fruited planted eucalypts. These areas provide minimal foraging value for black cockatoo species. The primary foraging value provided by the small remnant areas of eucalypt Woodland. This vegetation community includes a highly preferred food source for all three species; Marri *Corymbia calophylla*.

Trees and Shrubs over Grass and the Wetland/Drainage/Riparian habitats represent negligible to low foraging quality habitat for the Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo. These same habitats are considered low to moderate foraging quality for Baudin's Cockatoo. Foraging habitat extent is summarised in Table 11.

Table 11 Black Cockatoo foraging habitat extent

Foraging Quality	Areas (ha)		
	Carnaby's	FRTBC	Baudin's
Negligible (1)	9.47	9.47	9.47
Low (2)	9.6	9.6	9.6
Low to Moderate (3)	-	-	0.89
Moderate Quality (4-6)	1.13	1.13	0.24
Moderate to High Quality (7)	-	-	-
High Quality (8)	-	-	-
TOTAL	**20.2**	**20.2**	**20.2**



PROJECT ID	60670845
CREATED BY	WYATTK2
APPROVED BY	C. HOUSE
LAST MODIFIED	23 MAY 2022

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Datum: GDA 1994 MGA Zone 50
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metres

Data sources:
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010)
Service Layer Credits: WMS:

LEGEND

Survey Area

Species
- Marri (*Corymbia calophylla*)
- Flooded Gum (*Eucalyptus rudis*)
- Tuart (*Eucalyptus gomphocephala*)
- York Gum (*Eucalyptus loxophleba*)
- Stag (old dead tree, unknown species)
- Introduced

Carnaby's Black Cockatoo Foraging Quality
- None
- Negligible
- Low
- Moderate

Black Cockatoo Breeding and Foraging Habitat

HOLCIM

BUNBURY QUARRY FLORA, FAUNA AND VEGETATION SURVEY

Figure 6.1

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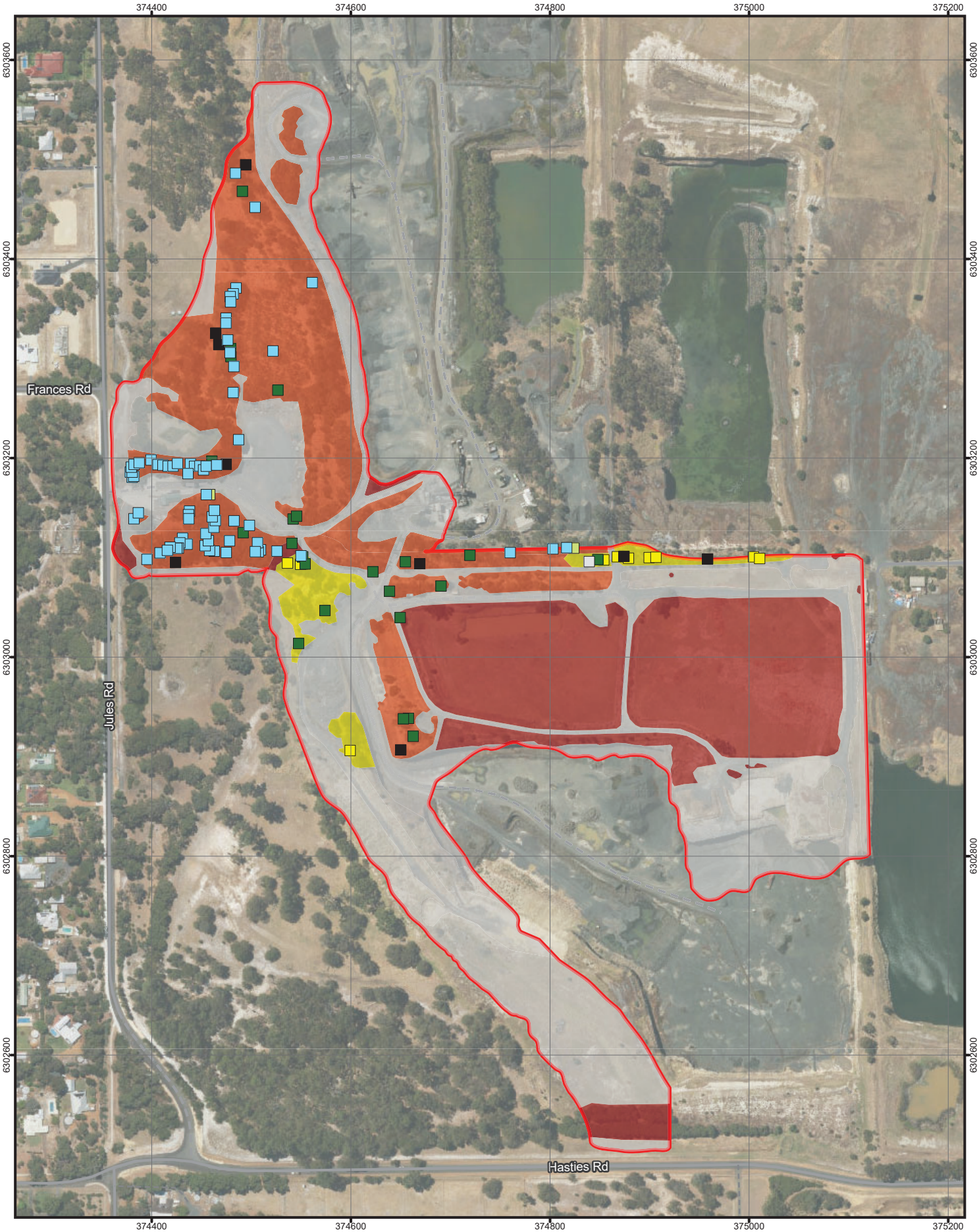

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APPROVED BY	C. HOUSE
LAST MODIFIED	23 MAY 2022

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Data sources:
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Service Layer Credits: WMS:

LEGEND

Survey Area

Species

- Marri (*Corymbia calophylla*)
- Flooded Gum (*Eucalyptus rudis*)
- Tuart (*Eucalyptus gomphocephala*)
- York Gum (*Eucalyptus loxophleba*)
- Stag (old dead tree, unknown species)
- Introduced

Forest Red-Tailed Black Cockatoo Foraging Quality

- None
- Negligible
- Low
- Moderate

Black Cockatoo Breeding and Foraging Habitat

HOLCIM

BUNBURY QUARRY FLORA, FAUNA AND VEGETATION SURVEY

Figure 6.2

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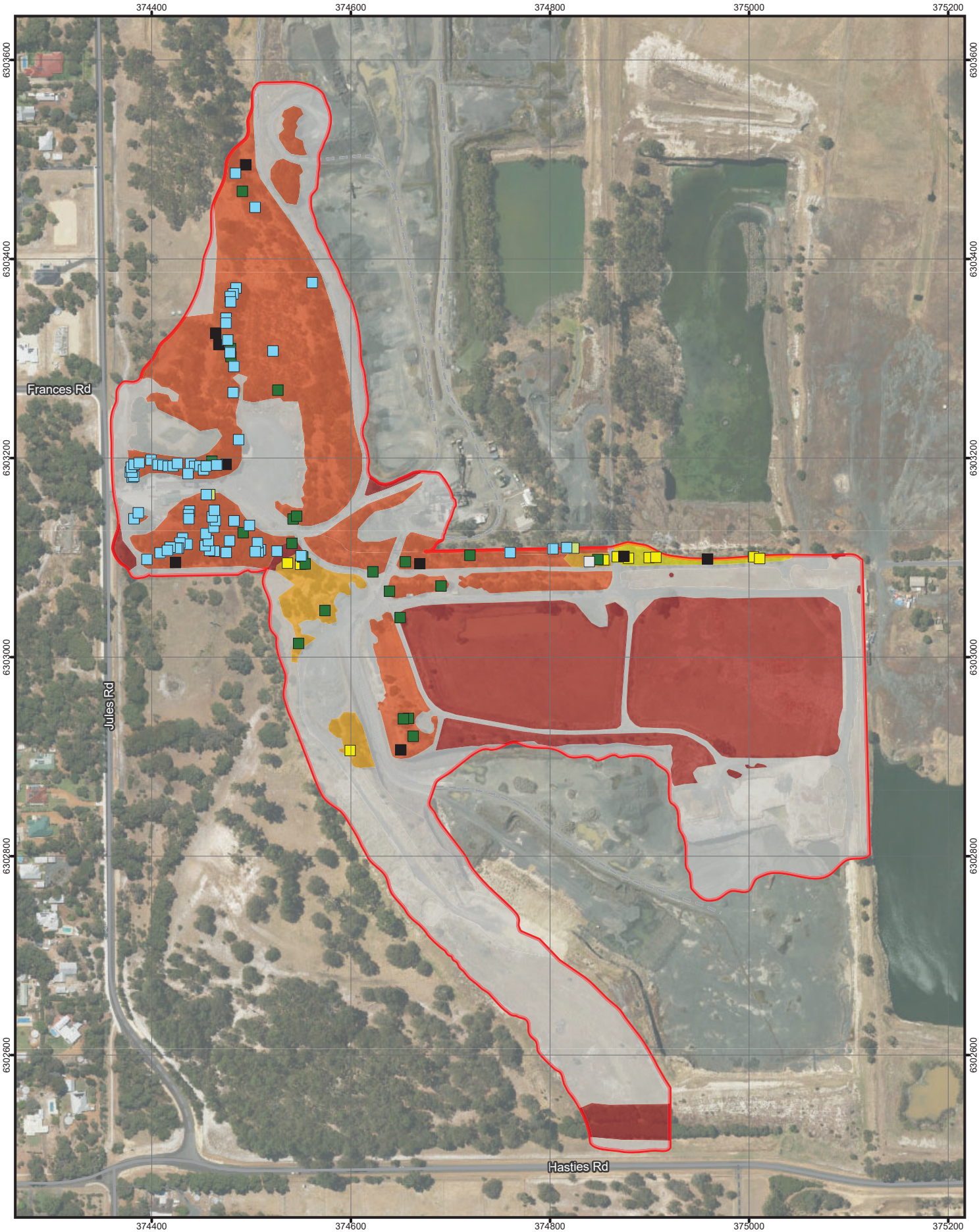

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APPROVED BY C. HOUSE
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Data sources:
Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2010)
Service Layer Credits: WMS:

LEGEND

Survey Area

Species
- Marri (*Corymbia calophylla*)
- Flooded Gum (*Eucalyptus rudis*)
- Tuart (*Eucalyptus gomphocephala*)
- York Gum (*Eucalyptus loxophleba*)
- Stag (old dead tree, unknown species)
- Introduced

Baudin's Black Cockatoo Foraging Quality
- None
- Negligible
- Low
- Low to Moderate
- Moderate

Black Cockatoo Breeding and Foraging Habitat

HOLCIM

BUNBURY QUARRY FLORA, FAUNA AND VEGETATION SURVEY

Figure 6.3

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6.0 Conclusion

A reconnaissance flora and vegetation assessment and basic fauna survey including black cockatoo assessment was undertaken in order to support a clearing permit for Holcim's Bunbury Quarry.

During the field survey, two significant fauna species were observed indirectly within or directly adjacent to the survey area; the Western Ringtail Possum *Pseudocheirus occidentalis* and the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*. Both species are listed as Threatened under the EPBC Act and BC Act. Areas of Open Eucalypt Woodland and large eucalyptus trees within revegetation areas provide suitable habitat for these species.

Potential black cockatoo breeding trees recorded within the survey area did not contain any suitable hollows and are therefore unlikely to be utilised for breeding. A total of 20.2 ha of foraging habitat was recorded for the three black cockatoo species. This included 1.13 ha of moderate quality habitat for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoos and 0.24 ha of moderate quality habitat for Baudin's Cockatoo.

Two native vegetation communities were mapped for 11.19 ha within the survey area defined as Marri Woodland (CcXbLs) and Flooded Gum Wetland/Riparian Vegetation (ErMj). The vegetation condition of these communities varied from Degraded to Good.

No flora species listed as Threatened under the EPBC Act or BC Act and no Priority flora listed by DBCA were recorded. No significant flora species identified in the desktop assessment were considered likely to occur due to the historical disturbance of the site and lack of suitable habitat.

The flora, vegetation and fauna assessment was completed successfully with no significant limitations.

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Yours faithfully,

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Appendix A Bamford Consulting Ecologists (BCE) Black Cockatoo Scoring System

Introduction

Application of the Offset Assessment Guide (offsets guide) developed by the federal environment department for assessing Black-Cockatoo foraging habitat requires the calculation of a score out of 10. The following system has been developed by Bamford Consulting Ecologists (BCE) with assistance from Quessentia Consulting to provide an objective scoring system that is practical and can be used by trained field zoologists with experience in the environments frequented by the species.

The foraging value score provides a numerical value that reflects the significance of vegetation as foraging habitat for Black-Cockatoos, and this numerical value is designed to provide the information needed by the Federal Department of Agriculture, Water, and the Environment (DAWE) to assess impact significance and offset requirements. The foraging value of the vegetation depends upon the type, density and condition of trees and shrubs in an area and can be influenced by the context such as the availability of foraging habitat nearby. The BCE scoring system for value of foraging habitat has three components as detailed above. These three components are drawn from the DAWE offsets guide but the scoring approach was developed by BCE and includes a fourth (moderation) component.

Note that the scoring system can only be applied within the range of the species or at least where the species could reasonably be expected to occur based upon existing information.

Calculating the total score (out of 10) requires the following steps:

a. Site condition. Determining a score out of six for the vegetation composition, condition, and structure; plus

b. Site context. Determining a score out of three for the context of the site; plus

c. Species stocking rate. Determining a score out of one for species density.

d. Determining the total score out of 10, which may require moderation for context and species density with respect to the site condition (vegetation) score. Moderation also includes consideration of pine plantations as a special case for foraging value.

The BCE scoring system places the greatest weight on site condition (scale of 0 to 6) because this has the highest influence on the foraging values of a site, which in turn is the fundamental driver in meeting ecological requirements for continued survival.

Site context has a lower weight (scale of 0 to 3) in recognition of the mobility of the species, which means they can access good foraging habitat even in fragmented landscapes but allowing for recognition of the extent of available habitat in a region and context in relation to activity (such as breeding and roosting). The application of scoring site context is further discussed below.

Species stocking rate is given a low weight (0 to 1) as it is a means only of recognising that a species may or may not be abundant at a site, but that abundance is dependent upon site condition and context and is thus not an independent variable. The abundance of a species is also sensitive to sampling effort, and to seasonal and annual variation, and is therefore an unreliable indicator of actual importance of a site to a species.

Calculation of scores and the moderation process are described in detail below.

1.1 Site Condition

Table 1 Site condition: vegetation composition, condition, and structure scoring

Site Score	Description of Vegetation Values		
	Carnaby's Cockatoo	Baudin's Cockatoo	Forest Red-tailed Black Cockatoo
0	No foraging value. No Proteaceae, eucalypts or other potential sources of food. Examples: • Water bodies (e.g., salt lakes, dams, rivers) • Bare ground • Developed sites devoid of vegetation (e.g., infrastructure, roads, gravel pits) or with vegetation of no food value, such as some suburban landscapes • Mown grass	No foraging value. No eucalypts or other potential sources of food. Examples: • Water bodies (e.g., dams, rivers). • Bare ground • Developed sites devoid of vegetation (e.g., infrastructure, roads, gravel pits)	No foraging value. No eucalypts or other potential sources of food. Examples: • Water bodies (e.g., dams, rivers) • Bare ground • Developed sites devoid of vegetation (e.g., infrastructure, roads, gravel pits)
1	Negligible to low foraging value. Examples: • Scattered specimens of known food plants but projected foliage cover of these is < 2%. This could include urban areas with scattered foraging trees • Paddocks that are lightly vegetated with melons or other known food-source weeds (e.g., Erodium spp.) that represent a short-term and/or seasonal food source • Blue Gum plantations (foraging by Carnaby's Black-Cockatoos has been reported but appears to be unusual)	Negligible to low foraging value. Scattered specimens of known food plants but projected foliage cover of these < 1%. This could include urban areas with scattered foraging trees	Negligible to low foraging value. Scattered specimens of known food plants but projected foliage cover of these < 1%. Could include urban areas with scattered foraging trees.
2	Low foraging value. Examples: • Shrubland in which species of foraging value, such as shrubby banksias, have <10% projected foliage cover • Woodland with tree banksias 2-5% projected foliage cover • Open eucalypt woodland/mallee of small- • fruited species	Low foraging value. Examples: • Woodland with scattered specimens of known food plants (e.g., Marri and Jarrah) 1-5% projected foliage cover • Urban areas with scattered foraging trees.	Low foraging value. Examples: • Woodland with scattered specimens of known food plants (e.g., Marri, Jarrah or Sheoak) 1-5% projected foliage cover • Urban areas with scattered food plants such as Cape Lilac, *Eucalyptus caesia* and *E. erythrocorys*

Site Score	Description of Vegetation Values		
	Carnaby's Cockatoo	Baudin's Cockatoo	Forest Red-tailed Black Cockatoo
	• Paddocks that are densely vegetated with melons or other known food-source weeds (e.g., Erodium spp.) that represent a short-term and/or seasonal food source		
3	Low to Moderate foraging value. Examples: • Shrubland in which species of foraging value, such as shrubby banksias, have 10-20% projected foliage cover • Woodland with tree banksias 5-20% projected foliage cover • Eucalypt Woodland/Mallee of small-fruited species • Eucalypt Woodland with Marri < 10% projected foliage cover	Low to Moderate foraging value. Examples: • Eucalypt Woodland with known food plants (especially Marri) 5-20% projected foliage cover • Parkland-cleared Eucalypt Woodland/Forest with known food plants 10-40% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants 10-40% projected foliage cover (establishing food sources with good long-term viability)	Low to Moderate foraging value. Examples: • Eucalypt Woodland with known food plants (especially Marri and Jarrah) 5-20% projected foliage cover • Parkland-cleared Eucalypt Woodland/Forest with known food plants 10-40% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants 10-40% projected foliage cover (establishing food sources with good long-term viability)
4	Moderate foraging value. Examples: • Woodland/low forest with tree banksias (of key species B. attenuata and B. menziesii) 20-40% projected foliage cover • Kwongan/ Shrubland in which species of foraging value, such as shrubby banksias, have 20-40% projected foliage cover • Eucalypt Woodland/Forest with Marri 20-40% projected foliage cover	Moderate foraging value. Examples: • Marri-Jarrah Woodland/Forest with 20-40% projected foliage cover • Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Eucalypt Woodland/Forest with diverse, healthy understorey and known food trees (especially Marri) 10-20% projected foliage cover • Orchards with highly desirable food sources (e.g., apples, pears, some stone fruits)	Moderate foraging value. Examples: • Marri-Jarrah Woodland/Forest with 20-40% projected foliage cover • Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Sheoak Forest with 40-60% projected foliage cover.
5	Moderate to High foraging value. Examples: • Banksia Low Forest (of key species B. attenuata and B. menziesii) with 40-60% projected foliage cover	Moderate to High foraging value. Examples: • Marri-Jarrah Forest with 40-60% projected foliage cover	Moderate to High foraging value. Examples: • Marri-Jarrah Forest with 40-60% projected foliage cover

Site Score	Description of Vegetation Values		
	Carnaby's Cockatoo	Baudin's Cockatoo	Forest Red-tailed Black Cockatoo
	• Banksia Low Forest (of key species B. attenuata and B. menziesii) with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Pine plantations with trees more than 10 years old (but see pine note below in moderation section)	• Marri-Jarrah Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths	• Marri-Jarrah Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Sheoak Forest with > 60% projected foliage cover.
6	High foraging value. Example: • Banksia Low Forest (of key species B. attenuata and B. menziesii) with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term)	High foraging value. Example: • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term)	High foraging value. Example: • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term)

Vegetation structural class terminology follows Keighery (1994).

1.2 Site Context

Site Context is a function of site size, availability of nearby habitat and the availability of nearby breeding areas. Site context includes consideration of connectivity, although Black-Cockatoos are very mobile and will fly across paddocks to access foraging sites. Based on BCE observations, Black-Cockatoos are unlikely to regularly go over open ground for a distance of more than a few kilometres and prefer to follow treelines.

The maximum score for site context is 3, and because it is effectively a function of presence/absence of nearby breeding and the distribution of foraging habitat across the landscape, the following table, developed by Bamford Consulting in conjunction with DEE, provides a guide to the assignation of site context scores. Note that 'local area' is defined as within a 15 km radius of the centre point of the study site. This is greater than the maximum distance of 12 km known to be flown by Carnaby's Black-Cockatoo when feeding chicks in the nest.

Table 2 Site context weighting

Site Context Score	Percentage of the existing native vegetation within the 'local' area that the study site represents	
	'Local' breeding known/likely	'Local' breeding unlikely
3	>5%	>10%
2	1-5%	5-10%
1	0.1-1%	1-5%
0	<0.1%	<1%

The table above provides weighting for where nearby breeding is known (or suspected) and for the proportion of foraging habitat within 15km represented by the site being assessed. Some adjustments may be needed based on the judgement of the assessor and in relation to the likely function of the site. For example, a small area of foraging habitat (e.g., 0.5% of such habitat within 15km) could be upgraded to a context of 2 if it formed part of a critical movement corridor. In contrast, the same sized area of habitat, of the same local proportion, could be downgraded if it were so isolated that birds could never access it.

1.3 Species Density (Stocking Rate)

Species stocking rate is described as "the usage and/or density of a species at a particular site" in the offsets guide. The description also implies that a site supports a discrete population, which is unlikely in the case of very mobile black cockatoos. Assignation of the species density score (0 or 1) is based upon the black-cockatoo species being either abundant or not abundant. A score of 1 is used where the species is seen or reported regularly and/or there is abundant foraging evidence.

Regularly is when the species is seen at intervals of every few days or weeks for at least several months of the year. A score of 0 is used when the species is recorded or reported very infrequently and there is little or no foraging evidence. Where information on actual presence of birds is lacking, a species density score can be assigned by interpreting the landscape and the site context. For example, a site with a moderate condition score that is part of a network of such habitat where a black-cockatoo species is known would get a species density score of 1 even without clear presence data, while a species density score of 0 can be assigned to a site where the level of usage can confidently be predicted to be low.

1.4 Moderation of scores for the calculation of a value out of 10

The calculation out of 10 requires the vegetation characteristics (out of 6) to be combined with the scores given for context and species density. It is considered that the context and density scores are not independent of vegetation characteristics, otherwise habitat of absolutely no value for black-

cockatoo foraging (such as concrete or a wetland) could get a foraging score out of 10 as high as 4 if it occurred in an area where the species breed (context score of 3) and are abundant (species density

score of 1). Similarly, vegetation of negligible or low characteristics which could not support black cockatoos could be assigned a score as high as 6 out of 10. In that case, the score of 6 would be more a reflection of nearby vegetation of high characteristics than of the foraging value of the negligible to low scoring vegetation. The Black-Cockatoos would only be present because of vegetation of high characteristics, so applying the context and species density scores to vegetation of low characteristics would not give a true reflection of their foraging value.

For this reason, the context and species density scores need to be moderated for the vegetation characteristic score to prevent vegetation of little or no foraging value receiving an excessive score out of 10. A simple approach is to assign a context and species density score of zero to sites with a Condition score of low (2), negligible (1) or none (0), on the basis that birds will not use such areas unless they are adjacent to at least low-moderate quality foraging habitat (>3). The approach to calculating a score out of 10 can be summarised as follows:

Table 3 Moderation of scores

Vegetation composition, condition, and structure score (out of 6)	Context score	Species density score
3-6 (low/moderate to high value)	Assessed as per Section 1.2 above	Assessed as per Section 1.3 above
0-2 (no to low value)	0	0

Note that this moderation approach may require interpretation depending on the context. For example, vegetation with a condition score of 2 could be given a context score of 1 under special circumstances. Such as when very close to a major breeding area or if strategically located along a movement corridor.

Overall scores are ranked in accordance with the numbers and descriptions included in Table 4 below.

Table 4 Quality scores

Description	Overall Score
None	0
Negligible	1
Low	2
Low to Moderate	3
Moderate	4
Moderate	5
Moderate	6
Moderate to High	7
High	8

Appendix B Flora Desktop Results

Species	EPBC	WA	Most recent record (DBCA/WA Herb)	Habitat	Likelihood of Occuring	Reasoning
Acacia flagelliformis		P4	1991	Sandy soils. Winter-wet areas. Located in semi-swampy area south of centre of Bunbury	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Acacia semitrullata		P4	1984	White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Adelphacme minima		P3	2007	White to grey sand on sand plains, ridges, and winter-wet swamps	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Angianthus drummondii		P3	2007	Grey or brown clay soils, ironstone. Seasonally wet flats	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Aponogeton hexatepalus		P4	2007	Mud. Freshwater: ponds, rivers, claypans	May	Suitable habitat may be present within study area
Austrostipa bronwenae	E	EN	2016	Grows in non-saline but seasonally wet grey-brown sandy loam soil containing nodules of Muchea Limestone, at the edge of a Gahnia trifida sedgeland with eucalyptus decipiens	May	Suitable habitat may be present within study area
Austrostipa jacobsiana	CE	CR	2016	Bunbury specimens grow in winter-wet grey sandy clay soil in melaleuca mixed tall shrubland	May	Suitable habitat may be present within study area. Known records within relatively close proximity to study area
Boronia tetragona		EN	2003	Black/white sand, laterite, brown sandy loam. Winter-wet flats, swamps, open woodland	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area

Species	EPBC	WA	Most recent record (DBCA/WA Herb)	Habitat	Likelihood of Occuring	Reasoning
Caladenia huegelii	E	CR	2010	Grey or brown sand, clay loam	May	Suitable habitat may be present within study area. Records in close proximity to study area
Caladenia speciosa		P4	2012	White, grey or black sand	May	Suitable habitat may be present within study area. Known records within close proximity to study area
Carex tereticaulis		P3	2012	Black peaty sand	May	Suitable habitat may be present within study area
Caustis sp. Boyanup (G.S. McCutcheon 1706)		P3	1988	White or grey sand	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Chamaescilla gibsonii		P3	2000	Clay to sandy clay. Winter-wet flats, shallow water-filled claypans	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Chamelaucium erythrochlorum		P4	1983	Lateritic soils, pale sandy clay, or loam soils	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Darwinia whicherensis	E	EN	2021	Known from three locations at the base of Whicher Range, in a winter-wet area of shrubland over shallow red clay over ironstone	Unlikely	Suitable habitat unlikely to be present within study area
Diuris drummondii	V	VU	2012	Low-lying depressions in peaty and sandy clay swamps.	May	Suitable habitat may be present within study area
Drakaea elastica	EN	CR	2008	White or grey sand. Low-lying situations adjoining winter-wet swamps	Unlikely	Suitable habitat unlikely to be present within study area
Drakaea micrantha	V	EN	2015	Usually found on cleared firebreaks or open sandy patches that have been disturbed. Occurs in infertile grey sands, in jarrah and common sheoak woodland or forest associated with banksia species	May	Suitable habitat may be present within study area

Species	EPBC	WA	Most recent record (DBCA/WA Herb)	Habitat	Likelihood of Occuring	Reasoning
Eleocharis keigheryi	V	VU	2015	Grows in small clumps in a substrate of clay or sandy loam. Emergent in freshwater creeks and claypans	Unlikely	Suitable habitat unlikely to be present within study area
Eucalyptus rudis subsp. cratyantha		P4	2000	Flats, hillsides	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Franklandia triaristata		P4	2003	White or grey sand.	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Gastrolobium whicherense		P2	2006	Red-grey sandy clay over quartzite. Steeop westerly slopes	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Isopogon formosus subsp. dasylepis		P3	2004	Sand, sandy clay, gravelly sandy soils over laterite. Often swampy areas	May	Suitable habitat may be present within study area
Jacksonia gracillima		P3	1996	Winter-wet flats	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Lasiopetalum membranaceum		P3	2007	Sand over limestone	May	Suitable habitat may be present within study area
Leptomeria furtiva		P2	2003	Grey or black peaty sand. Winter-wet flats	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area

Species	EPBC	WA	Most recent record (DBCA/WA Herb)	Habitat	Likelihood of Occuring	Reasoning
Leucopogon sp. Busselton (D. Cooper 243)		P2	1995	Wet shrubland, Marri-Jarrah woodland	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Microtis quadrata		P4	2002	Seasonally wet depressions and in swampy mounds in near coastal areas	Unlikely	Suitable habitat unlikely to be present within study area
Ornduffia submersa		P4	1988	Weltand	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Platysace ramosissima		P3	1987	Sandy soils	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Puccinellia vassica		P1	2016	Saline soils. On the outer margins of coastal saltmarshes	Unlikely	Suitable habitat unlikely to be present within study area
Pultenaea skinneri		P4	1997	Sandy or clayey soils. Winter-wet depressions	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Schoenus benthamii		P3	2005	White, grey sand, sandy clay. Winter-wet flats, swamps	May	Suitable habitat may be present within study area
Schoenus loliaceus		P2	2003	Sandy soils. Winter-wet depressions	May	Suitable habitat may be present within study area
Stylidium longitubum		P4	2017	Sandy clay, clay. Seasonal wetlands	May	Suitable habitat may be present within study area. Known records within relatively close proximity to study area

Species	EPBC	WA	Most recent record (DBCA/WA Herb)	Habitat	Likelihood of Occuring	Reasoning
Stylidium paludicola		P3	1985	Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Synaphea hians		P3	2005	Sandy soils. Rises	May	Suitable habitat unlikely to be present within study area
Synaphea odocoileops		P1	2003	Brown-orange loam, sandy clay, granite. Swamps, winter-wet areas	May	Suitable habitat unlikely to be present within study area
Synaphea petiolaris subsp. simplex		P3	1993	Sandy soils. Flats, winter-wet areas	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Synaphea polypodioides		P3	2016	Light brown loam, red-brown sandy loam, gravelly, brown sandy clay over laterite. In undulating areas	May	Suitable habitat may be present within study area
Synaphea sp. Pinjarra Plain (A.S. George 17182)		T	2003	Grey sandy loam or clay, grey-brown clayey sand, brown clayey loam, laterite. Flats, seasonally wet areas, railroad reserves often with wet depressions or drains	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Synaphea sp. Serpentine (G.R. Brand 103)	CE	CR	1983	Grey-brown sandy loams or clay in seasonally wet areas	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area
Synaphea stenoloba	CE	CR	2012	Loamy soils in low lying areas that are occasionally inundated	May	Suitable habitat may be present within study area
Thelymitra variegata		P2	2010	Sandy clay, sand, laterite	Unlikely	Suitable habitat unlikely to be present within study area
Trithuria australis		P4	1980	Associated with freshwater habitat	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area

Species	EPBC	WA	Most recent record (DBCA/WA Herb)	Habitat	Likelihood of Occuring	Reasoning
Verticordia attenuata		P3	1996	White or grey sand. Winter-wet depressions	Unlikely	Suitable habitat may be present within study area, however known records are old and are not within close proximity to study area

Appendix C Fauna Desktop Results

Scientific Name	Common Name	Conservation Status		DBCA		Ecology	Likelihood of Occurrence
		State	Federal	Last Record	Total Records		
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	VU	V	2017	57	Inhabits dense jarrah, karri and marri forest. Sometimes associates with Baudin's cockatoo at sites where food is abundant	Likely - study area is located within the distribution range. Suitable habitat present
Calyptorhynchus baudinii	Baudin's Cockatoo	EN	E	2017	33	Species mainly occurs in eucalypt forests, especially jarrah, marri, and karri forest. Species forages primarily in Eucalypt forest, feeding on Marri nuts, flowers, nectar and seeds. Nesting trees are karri, marri, wandoo and tuart	Likely - study area is located within the distribution range. Suitable habitat present
Calyptorhynchus latirostris	Carnaby's Cockatoo	EN	E	2018	178	Occurs in uncleared or remnant native eucalypt woodlands, especially those that contain salmon gum and wandoo, and in shrubland or kwongan heathland. Also occurs in remnant patches of native vegetation on land otherwise cleared for agriculture. Species forages seasonally in pine plantations in areas of high rainfall.	Likely - study area is located within the distribution range. Suitable habitat present
Isoodon fusciventer	Quenda, southwestern brown bandicoot	P4	-	2016	20	Species inhabits jarrah forest and banksi and swamp habitats, preferring dense vegetation around wetland fringes and heathland	Likley - suitable habitat present.
Notamacropus irma	Western brush wallaby	P4	-	2020	19	Species occupies a wide range of open forest and woodlands habitats, preferring areas with modest densities of ground cover. Generally avoids open pasture areas and is typically solitary or found in pairs	May occur. Suitable habitat present
Phascogale tapoatafa wambenger	South-western brush-tailed phascogale, wambenger	CD	-	2019	19	Found in dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse fround cover. Species creates nests in small tree hollows and cavities	May occur. Suitable habitat present
Pseudocheirus occidentalis	Western ringtail possum, ngwayjr	CR	CE	2020	1977	Species found in coastal Agonis flexuosa forest or eucalypt woodland or forest with a midstorey of Agonis flexuosa	Likely - suitable habitat present. Bunbury region considered northern edge of the core habitat
Galaxiella nigrostriata	Black-stripe minnow, black-striped dwarf galaxias	EN	E	2018	89	Endemic to seasonally dry coastal wetlands of south-west Western Australia. Inhabits permanent or ephemeral spring-fed headwater streams, ponds, roadside ditches and small creeks in sandy wetland areas with thick vegetation. Also occurs in the shallow areas of some freshwater lakes with thick vegetation.	Unlikely. No suitable habitat is likely to be present.
Idiosoma sigillatum	Swan Coastal Plain shield-backed trapdoor spider	P3	-	2002	8	Relatively widespread although strictly bioregion-and substrate-specific distribution along the Swan Coastal Plain of south-western Western Australia, from Dalyellup north to at least Ledge Point. Eastern limit of its range along the sandy foothills of the Darling Escarpment. western limits of the range of I. jarrah and I. mcclementsorum. Burrows usually occur in banksia woodland and heathland on sandy soils, and are adorned with a typical 'moustache-like' arrangement of twig-lines.	May occur. Potentially suitable habitat present
Setonix brachyurus	Quokka	VU	V	1975	2	In the north of its range it prefers dense understorey, less than 10 years since fire, adjacent vegetation age that is greater than 25 years and the absence of feral predators. In the south of its range the species is strongly linked to complex vegetation structure (minimum of three layers), low densities of woody debris and habitat patchiness. Keep close proximity to fresh water throughout the year. Species often present in riparian and swamp habitat	Unlikely. No recent records, no suitable habitat likely to be present.
Nannatherina balstoni	Balston's Pygmy Perch	VU	V	-	-	Inhabits acidic, tannin-stained freshwater pools, streams and lakes in peat flats within 30km of the coast of south-west Western Australia, preferring shallow water, and commonly associated with tall sedge thickets and inundated riparian vegetation. Adults are also found in open water, larvae tend to be confined to shallow water	Unlikely. No suitable habitat is likely to be present.
Westralunio carteri	Carter's Freshwater Mussel, Freshwater Mussel	VU	V	-	-	Shallow burrower in silty sand/mud in streams and rivers. Dioecious; larvae brooded in gills of females and become parasitic on fish gills and fins when released, where they undergo metamorphosis before dropping to the sediment as free-living juvenile mussels. Mainly live in freshwater rivers, streams, and water supply reservoirs.	Unlikely. No suitable habitat is likely to be present.
Dasyurus geoffroii	Chuditch, Western Quoll	VU	V	-	-	Present mostly in Jarrah *Eucalyptus marginata* forests and woodlands, mallee shrublands and heathlands. Largely restricted to the south-west of Western Australia	Unlikely. No suitable habitat is likely to be present.
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit	CR	CE	-	-	The Northern Siberian Bar-tailed Godwit is a large migratory shorebird that breeds in northern Siberia (Gill & Donsker, 2015). During the non-breeding period, the distribution of L. l. menzbieri is predominantly in the north and north-west of Western Australia and in south-eastern Asia (Bamford et al., 2008). This species occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins & Davies, 1996).	Unlikely. No suitable habitat is likely to be present.
Calidris ferruginea	Curlew Sandpiper	CR	CE	-	-	The Curlew Sandpiper is a small, slim waterbird, measuring 23 cm and weighing 57 g. In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. In Western Australia, they are widespread around coastal and sub coastal plains from Cape Arid to the south-west Kimberley. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas and less often recorded inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (Higgins & Davies, 1996).	May occur. Potentially suitable habitat present
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	CR	CE	-	-	The Eastern Curlew is Australia's largest shorebird and a long-haul flyer. It is easily recognisable, with its long, down-curved bill. The Eastern Curlew takes an annual migratory flight to Russia and north-eastern China to breed, arriving back home to Australia in August to feed on crabs and molluscs in intertidal mudflats. It is extremely shy and will take flight at the first sign of danger (DAWE, 2021). The southern most important international site in Western Australia is Eighty Mile Beach (Bamford et al., 2008).	Unlikely. No recent records, no suitable habitat likely to be present.

Appendix C Fauna Desktop Results

Scientific Name	Common Name	Conservation Status		DBCA		Ecology	Likelihood of Occurrence
		State	Federal	Last Record	Total Records		
Diomedea dabbenena	Tristan Albatross	EN	E	-	-	Species is a marine, pelagic seabird. Forages in open water in the Atlantic Ocean near the Cape of Good Hope, South Africa. Sleeps and rests on ocean waters when not breeding.	Unlikely. No recent records, no suitable habitat likely to be present.
Rostratula australis	Australian Painted Snipe	EN	E	-	-	The Australian Painted Snipe is a stocky wading bird (adult length: 240-300 mm) with a long pinkish bill (Fraser, 2020). This species is a very rare summer visitor to the south-west of Western Australia (Johnstone & Storr, 1998). The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Fraser, 2020). The species has a particular preference for breeding habitat, choosing ephemeral freshwater wetlands, especially after heavy rains or flooding. The preferred wetlands are characterised by complex shorelines with low fringing vegetation, areas of exposed mud and very shallow water (Purnell et al., 2014).	May occur. Potentially suitable habitat present
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	EN	E	-	-	Occurs in Antarctic to subtropical waters. Mainly occurs over Antarctic waters in summer, and is widespread south as far as the pack-ice and onto the Antarctic continent. Abundant over pack-ice near penguin colonies. May avoid crossing extensive ice sheets, which dampen sea swell and inhibit soaring	Unlikely. No recent records, no suitable habitat likely to be present.
Thalassarche cauta	Shy Albatross	EN	E	-	-	Inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea. Occassionally the species occurs in continental shelf waters, in bays and harbours. Known breeding locaions include Albatross Island off Tasmania, Auckland Island, Bounty Island and The Snares off New Zealand.	Unlikely. No recent records, no suitable habitat likely to be present.
Calidris canutus	Red Knot, Knot	EN	E	-	-	The Red Knot is a widely distributed marine and migratory species. It is common In the north-west of Western Australia with populations in the tens of thousands recorded at 80-mile Beach (Bamford et al., 2008). The species mainly inhabits intertidal mudflats, sand flats, in estuaries, bays and lagoons. They are occasionally seen on inland salt lakes and wetlands but hardly every use freshwater swamps.	Unlikely. No recent records, no suitable habitat likely to be present.
Diomedea amsterdamensis	Amsterdam Albatross	EN	E	-	-	Species is a marine, pelagic seabird. It nests in open patchy vegetation (among tussocks, ferns or shrubs) near exposed ridges or hillocks. Sleeps and rests on ocean waters when not breeding	Unlikely. No recent records, no suitable habitat likely to be present.
Botaurus poiciloptilus	Australasian Bittern	EN	E	-	-	The Australasian Bittern, is a large, stocky, thick–necked heron–like bird with mottled brown and dark brown to black plumage. It grows to a length of 66–76 cm and has a wingspan of 1050–1180 cm. It has a straw yellow bill and the legs and feet are pale green to olive (Marchant and Higgins, 1990; Pizzey and Knight, 1997). In Western Australia the species is now thought to only occur on the western coastal plain, southern coastal region and inland to some wetlands in the Jarrah forests (DSEWPaC, 2011). The Australasian Bittern's preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water (Marchant & Higgins, 1990).	May occur. Potentially suitable habitat present
Diomedea sanfordi	Northern Royal Albatross	EN	E	-	-	Species is marine, pelagic and aerial. Habitat includes subantarctic, subtropical, and occassionally Antarctic waters. Occurs where the surface temperature of the water is between 6-20°C. Nests on flat or gently sloping ground, on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets. Depressions, gullies, lee slopes and vegetation provide shelter for its nests, but exposed sites are also needed nearby so that it can take off and land	Unlikely. No recent records, no suitable habitat likely to be present.
Pachyptila turtur subantarctica	Fairy Prion (southern)	VU	V	-	-	The fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. There are 80 to 250 breeding pairs in Australia and a global population of 80 000. In Australia, breeding is recorded on two rock stacks off Macquarie Island and on the nearby Bishop and Clerk Island. The population may have been larger prior to the arrival of black rats on Macquarie Island. The subspecies digs burrows among rocks or low vegetation in which to nest. Burrows may be dug below mat forming herbs. Feeds by plucking food from the ocean surface. Some individuals may migrate towards New Zealand and southern Australia in winter	Unlikely. No recent records, no suitable habitat likely to be present.
Falco hypoleucos	Grey Falcon	VU	V	-	-	The Grey Falcon is a rare, pale grey inland falcon. In Western Australlia the species is mainly found where annual rainfall is less than 500 mm, except when wet years are followed by drought, when the species might become marginally more widespread, although it is essentially confined to the arid and semi-arid zones at all times (Schoenjahn, 2018). The Grey Falcon inhabits inland plains, gibber deserts, pastoral lands and timbered watercourses (Pizzey & Knight, 2007).	Unlikely. No recent records, no suitable habitat likely to be present.
Anous tenuirostris melanops	Australian Lesser Noddy	VU	V	-	-	The Australian Lesser Noddy is a small dark-plumaged Noddy, standing at approximately 34 cm and a wingspan of 60 cm (Pizzey & Knight, 2007). This species breeds on the Abrolhos Islands and is sedentary however sometimes beach washed south to Cape Naturaliste, where, where it nests in mangroves (Pizzey & Knight, 2007, Johnstone & Storr, 1998, Higgins & Davies, 1996). Individuals recorded on the mainland have typically been dying or dead after washing up from large storms (Johnstone & Storr, 1998).	Unlikely. No recent records, no suitable habitat likely to be present.

Appendix C Fauna Desktop Results

Scientific Name	Common Name	Conservation Status		DBCA		Ecology	Likelihood of Occurrence
		State	Federal	Last Record	Total Records		
Thalassarche melanophris	Black-browed Albatross	VU	V	-	-	Inhabits Antarctic, subantarctic and temperate waters and occasionally enters the tropics. Forages around the breaks of continental and island shelves and across nearby underwater banks, but also frequents other marine habitats, such as oceanic waters and the iceberg belt at the limit of the Antarctic pack ice. The species breeds on subantarctic and peri-antarctic islands (Marchant & Higgins 1990) in colonies located on terraces of coastal cliffs, slopes of nearby hills, summits of rocky islets or on flat or gently-sloping ground. The terrain in such areas is rocky, but usually supports a moderately-dense cover of tussock grasses	Unlikely. No recent records, no suitable habitat likely to be present.
Macronectes halli	Northern Giant Petrel	VU	V	-	-	Species is marine and oceanic. Mainly occurs in sub-Antarctic waters, but regularly occurs in Antarctic waters of the southwestern Indian Ocean, the Drake Passage and west of the Antarctic Peninsula. Its range extends into subtropical waters mainly between winter and spring. Frequents both oceanic and inshore waters near breeding islands and in the non-breeding range. It nests in coastal areas where vegetation or broken terrain offers shelter, on sea-facing slopes, headlands, in the lee of banks, under or against vegetation clumps, below cliffs or overhanging rocks, or in hollows.	Unlikely. No recent records, no suitable habitat likely to be present.
Thalassarche carteri	Indian Yellow-nosed Albatross	VU	V	-	-	Species is a marine bird, located in subtropical and warmer subantarctic waters. Observed over water of surface-temperature 10* to 23*C, but most abundant over warmer parts of the subtropical zone. The species nests on tussock-covered coastal cliffs and slopes, often in rocky situations	Unlikely. No recent records, no suitable habitat likely to be present.
Thalassarche steadi	White-capped Albatross	VU	V	-	-	Species is marine and occurs in subantarctic and subtropical waters. Has been noted in shelf-waters around breeding islands and over adjacent rises. Species occurs both inshore and offshore and enters harbours and bays. Scarce in pelagic waters. Nests on slopes vegetated with tussock and succulents on Auckland Island	Unlikely. No recent records, no suitable habitat likely to be present.
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	VU	V	-	-	The Greater Sand Plover is a medium-sized (length: 22–25 cm; mean adult mass weight 75–100 g) brown-and-white plover. Sexes differ when in breeding plumage, but are inseparable when in non-breeding plumage; juveniles are also separable from adults (Marchant et al., 2006; Stewart et al., 2007). In Western Australia, the Greater Sand Plover occurs in coastal areas with the greatest abundance observed in the north-west (Marchant et al., 2006; Minton et al., 2006). The species is a non-breeding visitor to Western Australia inhabiting, almost entirely, coastal sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons (Steward et al., 2007)	Unlikely. No recent records, no suitable habitat likely to be present.
Diomedea exulans	Wandering Albatross	VU	V	-	-	Species is marine, pelagic and aerial. In the Antarctic, it occurs in open water, rarely entering the belt of icebergs but may approach the edge of the pack-ice in late summer. In the Antarctic, it concentrates near submarine plateaux, banks and ridges (Johnstone & Kerry 1976). In the Australasian region, it occurs inshore, offshore and in pelagic waters (Barton 1979, 1980; Blaber 1986; Norris 1967). It nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground	Unlikely. No recent records, no suitable habitat likely to be present.
Diomedea epomophora	Southern Royal Albatross	VU	V	-	-	Species spends most of its life directly exposed to open oceans of the Southern Hemisphere. Remote tropical islands are sought out for nesting. The species typically nest on slopes with tussock grass providing some shelter, though exposed sites are also common as they ease the often difficult tasks of take-off and landing	Unlikely. No recent records, no suitable habitat likely to be present.
Sternula nereis nereis	Australian Fairy Tern	VU	V	-	-	The Fairy Tern is a small, bulky, round, grey-white bird (mean adult mass: 70 g) (Simpson & Trusler, 2010). The species is found along the southern and western coastal regions of Western Australia, occurring as far north as the Dampier Archipelago. The Fairy Tern inhabits coastal beaches, islands, sheltered inlets, estuaries, lagoons, and coastal wetlands, irrespective of salinity. The species nests on sheltered sandy beaches, spits, and banks (Higgins & Davies, 1996).	May occur. Potentially suitable habitat present
Phoebetria fusca	Sooty Albatross	VU	V	-	-	Species is marine and pelagic. Most abundant near the Subtropical Convergence. It ranges south of the Antarctic Convergence in the south-western Indian Ocean, but rarely elsewhere. The species breeds on subtropical and subantarctic islands in the Indian and Atlantic Oceans, on vegetated cliffs and steep slopes that are sheltered from prevailing winds, often amongst tussock grass.	Unlikely. No recent records, no suitable habitat likely to be present.
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross	VU	V	-	-	Species is a marine sea bird inhabiting sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats and occurs through the belt of icebergs to the edge of the consolidated pack-ice. The species are specialised shelf feeders, concentrating around breeding islands or over adjacent submarine banks. . In winter, they are commonly found in the coastal waters of continents, over up-wellings or boundaries of currents.	Unlikely. No recent records, no suitable habitat likely to be present.

Appendix D Flora by Family by Community Matrix

Family		Species	Planted	CcXbLs	ErMj
Asteraceae					
	*	*Sonchus asper*		x	
Cyperaceae					
		Ficia nodosa			x
		Isolepis marginata			x
		Lepidosperma squamatum		x	
		Machaerina articulata			x
		Machaerina juncea			x
		Mesomelaena tetragona			x
Fabaceae					
	*	*Acacia iteaphylla*	x		
	*	*Acacia longifolia subsp. longifolia*	x	x	
		Acacia pulchella var. glaberrima	x		
	*	*Lotus subbiflorus*			x
		Viminaria juncea			x
Lythraceae					
	*	*Lythrum hyssopifolia*			x
Myrtaceae					
		Corymbia calophylla		x	
	*	*Eucalyptus lehmannii*	x		
		Eucalyptus rudis			x
	*	*Melaleuca nesophila*	x		
Oleaceae					
	*	*Olea europaea*		x	
Phytolaccaceae					
	*	*Phytolacca octandra*			x
Plantaginaceae					
	*	*Plantago lanceolata*			x
Poaceae					
	*	*Avena barbata*	x		x
	*	*Briza maxima*		x	x
	*	*Bromus diandrus*	x		
	*	*Cenchrus clandestinus*		x	x
	*	*Cynodon dactylon*	x		
	*	*Ehrharta calycina*	x	x	
	*	*Eragrostis curvula*			x
	*	*Lolium rigidum*			x
		Rytidosperma sp.			x
Xanthorrhoeaceae					
		Xanthorrhoea brunonis		x	

*denotes weed species

Appendix E Potential Black Cockatoo Breeding Trees

ID	Species	Tree Height (m)	DBH (cm)	Comments	No. Potentially Suitable Hollows	Latitude	Longitude
1	Flooded Gum (Eucalyptus rudis)	12	52		0	-33.4041	115.65207
2	Stag	3	70	Multiple hollows, however tree is in poor condition	0	-33.4042	115.65223
3	Marri (Corymbia calophylla)	8	60		0	-33.4042	115.65421
4	Flooded Gum (Eucalyptus rudis)	10	100		0	-33.4042	115.65415
5	York Gum (Eucalyptus loxophleba)	8	65		0	-33.4042	115.65406
6	Marri (Corymbia calophylla)	15	60		0	-33.4041	115.65436
7	Marri (Corymbia calophylla)	18	90		0	-33.4041	115.65448
8	Marri (Corymbia calophylla)	18	100	Tree half dead	0	-33.4041	115.6547
9	Stag	15	60		0	-33.4042	115.65534
10	Marri (Corymbia calophylla)	12	60		0	-33.4041	115.65583
11	Marri (Corymbia calophylla)	12	52		0	-33.4042	115.6559
12	Flooded Gum (Eucalyptus rudis)	18	55		0	-33.4047	115.65201
13	Flooded Gum (Eucalyptus rudis)	10	70		0	-33.4056	115.65208
14	Flooded Gum (Eucalyptus rudis)	15	75		0	-33.4056	115.65203
15	Flooded Gum (Eucalyptus rudis)	18	100		0	-33.4057	115.65213
16	Stag	12	50		0	-33.4059	115.652
17	Flooded Gum (Eucalyptus rudis)	10	57		0	-33.4044	115.65245
18	Flooded Gum (Eucalyptus rudis)	12	90		0	-33.4044	115.6519
19	Flooded Gum (Eucalyptus rudis)	14	63		0	-33.4041	115.65277
20	Introduced	15	53		0	-33.4041	115.6532
21	Introduced	17	63		0	-33.404	115.65367
22	Introduced	17	100		0	-33.404	115.65382
23	Tuart (Eucalyptus gomphocephala)	15	90		0	-33.404	115.65389
24	Stag	10	120		0	-33.4041	115.65443
25	Marri (Corymbia calophylla)	15	100		0	-33.4041	115.65478
26	Marri (Corymbia calophylla)	12	50		0	-33.4059	115.65145
27	Flooded Gum (Eucalyptus rudis)	10	52		0	-33.4049	115.65091
28	Flooded Gum (Eucalyptus rudis)	12	50		0	-33.4042	115.65172
29	Flooded Gum (Eucalyptus rudis)	18	55		0	-33.4041	115.65096
30	Introduced	18	56		0	-33.4041	115.65095
31	Flooded Gum (Eucalyptus rudis)	12	52		0	-33.404	115.65085
32	Flooded Gum (Eucalyptus rudis)	18	52		0	-33.4037	115.65086
33	Flooded Gum (Eucalyptus rudis)	15	51	Multiple large trunks	0	-33.4037	115.6509
34	Introduced	18	50		0	-33.4016	115.6511
35	Stag	4	200		0	-33.4005	115.6504
36	Introduced	20	55		0	-33.4006	115.65029
37	Flooded Gum (Eucalyptus rudis)	20	80		0	-33.4008	115.65036
38	Introduced	20	80		0	-33.4009	115.6505
39	Flooded Gum (Eucalyptus rudis)	15	50		0	-33.4026	115.65072
40	Introduced	15	51		0	-33.4022	115.65067
41	Introduced	25	52		0	-33.4016	115.65028
42	Introduced	25	55		0	-33.4017	115.65025
43	Introduced	25	51		0	-33.4017	115.65022
44	Introduced	25	80		0	-33.4018	115.65022
45	Introduced	25	75		0	-33.4019	115.65017
46	Introduced	25	70		0	-33.402	115.65017
47	Stag	20	75		0	-33.4021	115.65006
48	Stag	12	51		0	-33.4022	115.65009
49	Introduced	25	50		0	-33.4021	115.65018
50	Flooded Gum (Eucalyptus rudis)	18	70		0	-33.4022	115.65021
51	Introduced	20	70		0	-33.4022	115.65021
52	Flooded Gum (Eucalyptus rudis)	20	55		0	-33.4023	115.65022
53	Introduced	15	55		0	-33.4024	115.65025
54	Introduced	25	75		0	-33.4026	115.65024
55	Introduced	25	50		0	-33.4034	115.64913
56	Introduced	25	55		0	-33.4033	115.64915
57	Introduced	28	60		0	-33.4033	115.64911
58	Introduced	28	60		0	-33.4033	115.64913
59	Introduced	28	80		0	-33.4033	115.64913
60	Introduced	25	75		0	-33.4032	115.64916
61	Introduced	25	52		0	-33.4032	115.64921
62	Introduced	25	70		0	-33.4032	115.64934
63	Introduced	25	90		0	-33.4032	115.64941
64	Introduced	28	53		0	-33.4032	115.64947
65	Introduced	30	75		0	-33.4033	115.64952
66	Introduced	25	53		0	-33.4033	115.64958
67	Introduced	30	70		0	-33.4032	115.64963
68	Introduced	20	75		0	-33.4032	115.64976
69	Introduced	30	55		0	-33.4033	115.64981
70	Introduced	25	80		0	-33.4033	115.64974
71	Introduced	25	75		0	-33.4033	115.64987
72	Introduced	28	52		0	-33.4033	115.64991
73	Introduced	30	60		0	-33.4033	115.64993
74	Flooded Gum (Eucalyptus rudis)	25	90		0	-33.4032	115.65

75	Introduced	18	100		0	-33.4033	115.65005
76	Stag	15	50		0	-33.4032	115.65015
77	Introduced	18	120		0	-33.403	115.65029
78	Flooded Gum (Eucalyptus rudis)	15	150		0	-33.4046	115.6512
79	Flooded Gum (Eucalyptus rudis)	17	90		0	-33.4042	115.65099
80	Marri (Corymbia calophylla)	14	58		0	-33.4042	115.65096
81	Marri (Corymbia calophylla)	12	53		0	-33.4042	115.65094
82	Marri (Corymbia calophylla)	12	70		0	-33.4041	115.6508
83	Introduced	16	67		0	-33.404	115.65069
84	Introduced	17	75		0	-33.404	115.65051
85	Introduced	13	70		0	-33.404	115.65048
86	Introduced	15	70		0	-33.404	115.65048
87	Introduced	14	70		0	-33.404	115.65045
88	Flooded Gum (Eucalyptus rudis)	13	56		0	-33.4039	115.65032
89	Introduced	14	56		0	-33.4038	115.65039
90	Introduced	14	80		0	-33.4038	115.65023
91	Introduced	15	82		0	-33.4039	115.65018
92	Introduced	14	57		0	-33.404	115.65014
93	Introduced	12	60		0	-33.404	115.65001
94	Introduced	15	58		0	-33.404	115.64996
95	Introduced	16	51		0	-33.404	115.64991
96	Introduced	15	65		0	-33.4039	115.64995
97	Introduced	16	57		0	-33.4039	115.64992
98	Introduced	14	55		0	-33.4038	115.65001
99	Introduced	15	71		0	-33.4038	115.65003
100	Introduced	14	65		0	-33.4037	115.64999
101	Introduced	16	100		0	-33.4037	115.65002
102	Tuart (Eucalyptus gomphocephala)	15	65		0	-33.4035	115.64997
103	Introduced	17	50		0	-33.4035	115.64993
104	Introduced	14	63		0	-33.4037	115.64975
105	Introduced	15	80		0	-33.4037	115.64974
106	Introduced	16	75		0	-33.4037	115.64974
107	Introduced	15	55		0	-33.4039	115.64967
108	Introduced	15	52		0	-33.404	115.64972
109	Introduced	25	55		0	-33.4037	115.64915
110	Introduced	25	55		0	-33.4037	115.64919
111	Introduced	20	80		0	-33.4041	115.64928
112	Stag	5	120		0	-33.4041	115.64959
113	Introduced	30	150		0	-33.404	115.64942
114	Introduced	16	80		0	-33.404	115.64964
115	Introduced	15	70		0	-33.404	115.64962
116	Introduced	15	60		0	-33.404	115.64961
117	Introduced	13	65		0	-33.404	115.64953
118	Introduced	15	53		0	-33.404	115.6495