Appendix E – *Technical Assessment against MNES Significant Impact Guidelines Part Lot 963 Estuary Drive, Vittoria* (Emerge Associates, 2022)

TECHNICAL MEMORANDUM

Technical Assessment against MNES Significant Impact Guidelines
Part Lot 963 Estuary Drive, Vittoria

PROJECT NUMBER	EP22-080(03)	**DOC. NO.**	EP22-080(03)—004 RAW
PROJECT NAME	Bunbury Ports Environmental Support	**CLIENT**	Quantem
AUTHOR	RAW	**REVIEWER**	JDH
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1. INTRODUCTION

Quantem are proposing to develop a bulk liquid storage facility at the Bunbury Ports facility in the locality of Vittoria, referred to as the 'proposed action'. The location of the 'proposed action' is hereafter referred to as the 'site', as shown in **Figure 1**.

The Department of Agriculture, Water and the Environment's (DAWE) *Significant Impact Guidelines 1.1* outline the criteria for what constitutes a significant impact on a Matter of National Environmental Significant (MNES). An action is considered likely to have a significant impact on a MNES if it triggers any of the criteria outlined in the guidelines.

Emerge Associates (Emerge) were engaged by Aurecon, on behalf of Quantem, to prepare an assessment of potential impacts on three MNES by the proposed action. Specifically, the three MNES assessed were:

- *Zanda*[1] *latirostris* (Carnaby's black cockatoo) (endangered)
- *Zanda*[1] *baudinii* (Baudin's black cockatoo) (endangered)
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) (vulnerable).

These three taxa are collectively referred to as 'black cockatoos'.

2. BACKGROUND

Emerge undertook a *Flora, Vegetation and Fauna Assessment* of a larger area including the site in 2022 (Emerge Associates 2022). The site lies on reclaimed land that has been subject to intensive historical disturbance. The site extends over 4.34 ha and includes native vegetation in 'degraded' condition (0.79 ha), non-native vegetation (3.50 ha) and cleared areas (0.05 ha). All vegetation within the site will be cleared to facilitate development of the facility.

An assessment of the likelihood of occurrence of conservation significant flora, fauna and communities, including MNES, was undertaken previously by Emerge Associates (2022). Black cockatoos were the only MNES considered to have potential to occur in the site, due to the presence of small areas of foraging, breeding and roosting habitat.

[1] Previously *Calyptorhynchus.*

3. ASSESSMENT AGAINST THE SIGNIFICANT IMPACT CRITERIA

This assessment is supported by the Emerge Associates (2022) technical survey report, which provides key contextual information for understanding the habitat values for the black cockatoos within the site.

The DotE (2013) *Significant Impact Guidelines 1.1* have guided this assessment. Note that DotE (2013) refers to 'populations' and 'important populations' of an MNES. However, the DAWE (2022) referral guidelines for black cockatoos states that these terms have not been defined for black cockatoos and that it is more appropriate to 'consider the likelihood of a significant impact from impacts on habitat and individuals rather than a population'.

3.1. BLACK COCKATOO HABITAT

Generally speaking, black cockatoo habitat comprises breeding, foraging and night roosting habitat. Breeding and night roosting habitat is the same for all three species of black cockatoo, but foraging habitat differs between species based on plant foraging preferences.

DAWE (2022) defines the types of black cockatoo habitat as below:

- Breeding habitat comprises nesting trees, which are large, old (c. 120-130 years) *Eucalyptus* trees which have a diameter at breast height (DBH) of 500 mm or greater (or a DBH of ≥300 mm for salmon gum) (DAWE 2022). Nesting trees are classified into the following categories (DAWE 2022):
  - 'Known nesting trees' which contains a suitable nest hollow[2] with evidence of black cockatoo breeding.
  - 'Suitable nesting trees' which contains a suitable nest hollow[2] but do not have evidence of black cockatoo breeding.
  - 'Potential nesting trees' which do not contain a suitable nest hollow[2].
- Foraging habitat comprises plants within the range of the black cockatoo species that black cockatoos feed on or that support foraging. Black cockatoos may consume a wide range of plants and associated material (refer **Appendix A**). However, in acknowledgment that some plants are more regularly relied upon by black cockatoos than others, Emerge further classifies foraging habitat into 'primary' or 'secondary' food plants. Primary foraging plants are defined as plants or vegetation that are known from historical and contemporary records to be regularly consumed by black cockatoos and includes native and non-native species. Secondary foraging plants are defined as plants that black cockatoos have occasionally been recorded consuming, or that based on their limited extent or agricultural origin, should not be considered a sustaining resource.
- Night roosting habitat refers to trees or groups of 'known roosting trees' or 'potential roosting trees' (DAWE 2022), as defined below:
  - 'Known roosting tree' is a tree with evidence of roosting by black cockatoos. These trees are usually close to an important water source and within an area of high-quality foraging habitat.
  - 'Potential roosting tree' is a tall tree of any species within close proximity to water.

[2] Defined as any hollow with dimensions suitable for use for nesting by black cockatoos.

3.2. CARNABY'S COCKATOO

The following policy/guidance has been consulted as part of this assessment:

- *Referral guideline for 3 WA threatened black cockatoo species* (DAWE 2022)
- *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan* (DPaW 2013)
- *SPRAT Profile: Zandaanda latirostris — Carnaby's Black Cockatoo, Short-billed Black-cockatoo* (DCCEEW 2022c)
- *Potential Habitat Black Cockatoo Habitat Spatial Dataset*, (Emerge Associates 2021b)
- *Black Cockatoo Foraging Plants (***Appendix A***)*
- *Great Cocky Count – Black Cockatoo Roost Dataset* (Peck *et al.* 2019).

An assessment against the DotE (2013) *Significant Impact Guidelines 1.1* for Carnaby's cockatoo has been provided in **Table 1**, based on the 'Endangered' status of the species. The assessment detailed in **Table 1** below indicates that the Proposed Action **is not likely to** result in a significant impact on Carnaby's cockatoo (CC).

Table 1: Significant impact criteria for Carnaby's cockatoo in relation to the Proposed Action

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
Lead to a long-term decrease in the size of a population	Very unlikely	The Proposed Action in unlikely to lead to a long-term decrease in the size of a CC population. To lead to a long-term decrease in the size of a population, the Proposed Action would need to bring about a sustained reduction in birth rates through the removal of breeding habitat and/or a sustained increased in mortality rates for the species. In terms of breeding habitat, one 'potential nesting tree' occurs within the site (**Figure 2**). However, this tree does not support a suitable nest hollow and so would not currently provide breeding habitat for CC. It is likely to be many years until the potential nesting tree within the site contains a suitable nest hollow. Given that no breeding can currently occur within the site, CC birth rates in the short to medium term will not be affected as part of the Proposed Action. There is a chance that the potential nesting tree within the site may develop a suitable nest hollow in the long-term. If this did occur, removal of this one nesting tree is unlikely to lead to a long-term decrease in the CC birth rates or population as it would likely only comprise removal of one hollow. The Proposed Action is unlikely to increase CC mortality rates, which for the Proposed Action would be indirectly through a significant reduction of available foraging resources in the region, or directly through activities that could lead to bird deaths as a result of vehicle strikes, destruction of nests etc. Foraging habitat for CC is described as 'native shrubland, kwongan heathland and woodland…of native proteaceous plant species (*Banksia* spp., *Hakea* spp. and *Grevillea* spp.), as well as *Callistemon* spp. and marri' (DAWE 2022). Introduced species such as *Pinus* spp. and a variety of crops and orchard species are also listed as being foraged on by CC (DAWE 2022). The Proposed Action will indirectly impact on CC through the removal of 0.24 ha of native foraging habitat and 0.05 ha of non-native foraging habitat. The native foraging habitat vegetation within the site comprises species such as *Eucalyptus gomphocephala* (tuart) and *Acacia saligna.* These species are considered secondary foraging habitat, defined as plants that black cockatoo species have been recorded consuming occasionally or that, based on their limited extent or agricultural origin, should not be considered a sustaining resource. The non-native foraging habitat in the site comprises *Pinus radiata*,

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		which is considered primary foraging habitat as it is a preferred food source of CC. The total size of CC foraging habitat in the site is very small (0.29 ha). It is also noted that the site is not within an area identified as containing known foraging resources (based on state government foraging habitat mapping by Glossop *et al.* (2011)). Therefore, it is likely that CCs only use the site opportunistically for foraging (if at all) and rely on the broader local area for more substantial foraging resources. While not mapped as potential foraging habitat, given the presence of a known secondary foraging species, Emerge Associates have considered the removal 0.29 ha of foraging habitat in the context of the regional area. The removal of 0.29 ha potential CC foraging habitat represents only 0.02% of the 1,383 ha foraging habitat within 6 km of the site and 0.01% of the 4,720 ha foraging habitat within 12 km. In addition, the Proposed Action is unlikely to increase mortality rates through direct bird deaths or injuries via vehicle strikes, destruction of active nests and eggs etc during the clearing, construction and operation phases of the Proposed Action. No habitat currently suitable for breeding is present within the site, so no nests or eggs will be impacted. Mitigation measures will be implemented during initial clearing and construction works, to ensure no CC death or injury occurs. A pre-disturbance fauna inspection will be undertaken 1-2 days before clearing. Clearing will be undertaken in a manner that supports dispersal of individuals (if present) from the area and to other areas of existing vegetation immediately adjacent and nearby. Based on the above, the Proposed Action is unlikely to cause lead to a long-term decrease in the size of a CC population through a sustained reduction in birth rates and/or a sustained increased in mortality rates for the species.
Reduce the area of occupancy of the species	Very unlikely	The Proposed Action is unlikely to reduce the area of occupancy of CCs through the removal of 0.29 ha of foraging habitat, one potential nesting tree and potential roosting habitat within the site. In order to reduce the area of occupancy of CCs, the Proposed Action would need to lead to the permanent loss of vegetation within the species range that currently or potentially provides breeding trees with nesting hollows, or important foraging and night roosting habitat in proximity to watering points during the non-breeding season. As previously discussed above, the site contains one nesting tree which does not currently provide breeding habitat for CC. The site contains limited roosting habitat, with the **EgA** and **Pr** plant communities being the only vegetation that meets the definition of roosting habitat. These communities extend over a very small area (0.18 ha) and no evidence of black cockatoo roosting was observed during the field survey. BirdLife Australia have developed the Great Cocky Count which maps black cockatoo roosting sites. The Great Cocky Count dataset do not include any roosts within the site, with the closest known roost to the site located 2 km to the south (refer to **Figure 3** and the location labelled BUNGLER001) (Peck *et al.* 2019). Given these considerations, the Proposed Action is not considered to impact upon any roosting habitat of local or regional importance to the species. As discussed further above, CC's feed primarily in native shrubland, kwongan heathland and woodland on seeds, flowers and nectar of native proteaceous plant species, as indicated in (DAWE 2022) and **Appendix A**.

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		Of the plant species identified within the site as part of the *Flora, Vegetation and Fauna Assessment* (Emerge Associates 2021a), small areas of native and non-native foraging habitat for CC occur within the site. The native foraging habitat comprises 0.24 ha of plant communities **As** and **EgA**, which contain plants known to be a secondary foraging resource for CC. The non-native foraging habitat comprises 0.05 ha or plant community **Pr**, which contains *Pinus radiata* which is known to be a primary foraging resource for CC. Although foraging habitat is present, it comprises mainly secondary foraging species and extends over 7% of the site. Given the low cover of foraging plant species, the 0.29 ha of foraging habitat within the site is not considered to be an important food resource for CCs. On the above basis the Proposed Action will not reduce the area of occupancy of the species as the site does not currently provide breeding habitat for CCs and contains limited foraging and roosting habitat.
Fragment an existing population into two or more populations	Very unlikely	The Proposed Action is unlikely to fragment two or more populations of CCs given CCs are a highly mobile species known to routinely cover large distances and do not require continuous habitat coverage. CCs have a large home range, occurring from Kalbarri in the north to Esperance in the south-east (DPaW 2013). Notwithstanding, the site is not considered to support a resident population of CCs capable of being fragmented. A 'resident population' is any group of black cockatoos that are known to be based in a defined spatial location and are unlikely to leave this area for any significant amount of time DotE (2013). According to the *Carnaby's Cockatoo* (*Calyptorhynchus latirostris*) *Recovery Plan* (DPaW 2013), when not breeding, CCs tend to aggregate in large flocks and move through the landscape in search of food. These flocks base themselves at roost sites, which are usually the tallest trees in an area and often located in or near riparian environments or permanent water. The site contains some trees that would provide roosting habitat and is located adjacent to Vittoria Bay, which supports permanent (though likely saline) water. However, the roosting habitat in the site is limited, being only 0.18 ha in size. Larger areas of more suitable roosting habitat occur within the local area. Given the site contains limited CC roosting and foraging habitat and does not contain and trees currently suitable for breeding, it is likely CCs would only visit the site opportunistically for foraging (if at all) and return to suitable areas (further east) for roosting. The site is therefore unlikely to support a resident population of CCs. The site is not located in an area identified in state government developed mapping as containing known CC breeding, roosting or foraging habitat. The site comprises mainly non-native vegetation, with scattered native and non-native trees and shrubs. Larger areas of suitable CC habitat occur in the surrounding area. On this basis, the Proposed Action is unlikely to lead to increase in gaps between known patches of habitat, nor fragment an existing population of CC into two or more populations.
Adversely affect habitat critical to the survival of the species	Very unlikely	The Proposed Action is unlikely to adversely affect habitat critical to the survival of the CCs given the Disturbance Footprint does not support critical habitat as defined in the Recovery Plan (DPaW 2013). DPaW (2013) state that habitat critical to survival for the CC comprises the following:

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		• Eucalypt woodlands that provide nest hollows used for breeding, together with nearby vegetation that provides feeding, roosting and watering habitat that supports successful breeding. • Woodland sites known to have supported breeding in the past and which could be used in the future, provided adequate nearby food and/or water resources are available or are re-established. • In the non-breeding season, vegetation that provides food resources as well as the sites for nearby watering and night roosting that enable the cockatoos to effectively utilise the available food resources. As discussed above, the site does not include habitat critical to the survival of CC. The site does not currently provide breeding habitat for CC, with the single potential nesting tree not currently supporting hollows for breeding. The vegetation within the site comprises a small area of native and non-native foraging habitat for CC. In terms of roosting, small areas of native and non-native vegetation meet the definition of roosting habitat but are limited in size and no evidence of roosting was observed during the field survey. Whilst permanent water sources occur close to the site, they are likely saline and unsuitable for black cockatoo watering. Based on the above, the vegetation within the site is not considered to be habitat critical to the survival of CC.
Disrupt the breeding cycle of a population	Very unlikely	As previously described, CC breeding habitat is defined as suitable tree species (generally *Eucalypt* spp.) which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow DAWE (2022). For most tree species, suitable DBH is 500 mm. For salmon gum and wandoo, suitable DBH is 300 mm. The site supports one potential nesting tree, which is defined as a tree with DBH of 500 mm or greater but which does not contain suitable nesting hollows. It is likely many years until this tree develops hollows, if at all. Given there is only one potential nesting tree in the site that does not currently provide breeding habitat for CC, the Proposed Action will not disrupt the breeding cycle of a CC population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Very unlikely	Decline in this sense has been interpreted to mean a decline in the distribution and abundance of CCs through the removal/fragmentation of key habitat. Key habitat has been described previously and above with regard to breeding, roosting and foraging. The Proposed Action is unlikely to significantly decrease the availability of habitat for CCs. As discussed in detail above, no habitat currently able to be used for breeding by CC occurs within the site and foraging and roosting habitat is of a small size. A total of 0.29 ha of CC foraging habitat occurs within the site, of which 0.24 ha is native and 0.05 ha is non-native. The removal of this vegetation represents a small amount of foraging habitat available at the local and regional scale, specifically: • 0.02% of foraging habitat within 6 km of the Proposed Action area and 0.01% within 12 km. As part of the Proposed Action, clearing, construction and ongoing operation will be managed to prevent the potential spread of weeds, dieback and feral animals into the site.

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		The Proposed Action is very unlikely to decrease the availability of CC habitat to the point at which it would cause the species to decline given the small amount of CC habitat removal in the context of the broader protected areas of vegetation.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	Unlikely	The key consideration for this criterion would be the introduction of species that are known to compete with CCs for nesting hollows or foraging resources. These species include the native and introduced corellas (*Cacatua* species), galahs (*Cacatua roseicapilla*), Australian shelducks (*Tadorna tadornoides*), Australian wood ducks (*Chenonetta jubata*) and feral European honeybees (*Apis mellifera*). The one potential nesting tree within the site does not contain hollows and so is not a consideration. The site is located on reclaimed land that has been subject to long-term historical and ongoing disturbance. The site is bounded by similar, predominantly non-native vegetation and industrial buildings. The surrounding land uses have modified/altered the landscape and as a result, a range of introduced species are known or likely to already exist within the site. No invasive fauna species harmful to CC were identified in the site during the survey but may occur. The Proposed Action is unlikely to either introduce other species or further establish any existing species known to compete with CC within the site or in immediate surrounding areas.
Introduce disease that may cause the species to decline	Unlikely	CC can be susceptible to diseases such as beak and feather disease virus (BFDV), avian polyomavirus (APV) and chlamydophilosis. Insects, *Phytophthora cinnamomi* (dieback) and other soil-borne, foliar and canker pathogens can also affect the health of CC habitat. The Proposed Action is unlikely to be responsible for the introduction of these diseases, or increase the susceptibility of birds to these diseases, as the site is located within an area already exposed to a high degree of human interaction and disturbance, as discussed above. The site has been subject to significant historical disturbance and is surrounded by infrastructure and disturbed, primarily non-native vegetation. If insects, *Phytophthora cinnamomi* (dieback) and other soil-borne, foliar and canker pathogens were to occur, they would likely have already been introduced as part of previous human disturbances and existing ongoing land uses. Notwithstanding this, as part of initial clearing and construction activities, construction environmental management measures will be implemented to avoid the introduction of soil borne pathogens and weeds, including ensuring clean machinery is used within the site and clearing is restricted to permitted areas only. Any soil or vegetation required as part of the construction and operation activities will be from certified sources free of pathogens and disease. Based on the above, the Proposed Action is unlikely to introduce disease/s that may cause the species to decline.
Interfere with the recovery of the species	Very unlikely	The recovery objective for the CC is "*to stop further decline in the breeding populations of threatened black cockatoo species and to ensure their persistence throughout their current range in the south-west of Western Australia for the duration of this plan*" (DPaW 2013). As discussed above, the Proposed Action will not interfere or disrupt the breeding cycle of CC populations or individuals as no hollows suitable for breeding currently occur.

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		The Proposed Action will also not result in a reduction in the species range due to the extensive habitat availability across the local and regional area. As such, the Proposed Action is very unlikely to interfere with the recovery of the species.

3.3. BAUDIN'S COCKATOO

The following policy/guidance has been consulted as part of this assessment:

- *Referral guideline for 3 WA threatened black cockatoo species* (DAWE 2022)
- *Conservation Advice Calyptorhynchus baudinii Baudin's cockatoo* (TSSC 2018)
- *SPRAT Profile: Calyptorhynchus baudinii – Baudin's black cockatoo, Long-billed Black-cockatoo, (DCCEEW 2022b)*
- *Potential Habitat Black Cockatoo Habitat Spatial Dataset*, (Emerge Associates 2021b)
- *Black Cockatoo Foraging Plants (***Appendix A***)*
- *Great Cocky Count – Black Cockatoo Roost Dataset* (Peck *et al.* 2019).

An assessment against the DotE (2013) *Significant Impact Guidelines 1.1* for Baudin's cockatoo has been provided in **Table 1**, based on the 'Endangered' status of the species. The assessment detailed in **Table 1** below indicates that the Proposed Action **is not likely to** result in a significant impact on Baudin's cockatoo (BC).

Table 2: Significant impact criteria for Baudin's cockatoo in relation to the Proposed Action

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
Lead to a long-term decrease in the size of a population	Very unlikely	The Proposed Action in unlikely to lead to a long-term decrease in the size of a BC population. To lead to a long-term decrease in the size of a population, the Proposed Action would need to bring about a sustained reduction in birth rates through the removal of breeding habitat and/or a sustained increased in mortality rates for the species. Note that BC occurs as a single population (TSSC 2018). In terms of breeding habitat, one 'potential nesting tree' occurs within the site (**Figure 2**). However, this tree does not support a suitable nest hollow and so would not currently provide breeding habitat for BC. It is likely to be many years until the potential nesting tree within the site contains a suitable nest hollow. Given that no breeding can occur within the site, BC birth rates in the short to medium term will not be affected as part of the Proposed Action. There is a chance that the potential nesting tree within the site may develop a suitable nest hollow in the long-term. If this did occur, removal of this one nesting tree is unlikely to lead to a long-term decrease in the BC birth rates or population as it would likely only comprise removal of one hollow. The Proposed Action is unlikely to increase BC mortality rates, which for the Proposed Action would be indirectly through a significant reduction of available foraging resources in the region, or directly through activities that could lead to bird deaths as a result of vehicle strikes, destruction of nests etc. Foraging habitat for BC is described as 'primarily seeds of marri, rarely jarrah…and the seeds of native proteaceous plant species (for example, *Banksia* spp. and *Hakea* spp.) (DAWE 2022). Introduced species such as *Pinus* spp. are also listed as being foraged on by BC (DAWE 2022).

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		The Proposed Action will indirectly impact on BC through the removal of 0.05 ha of non-native foraging habitat, comprising *Pinus radiata* trees, which is considered a secondary foraging resource for BC. The total size of BC foraging habitat in the site is very small (0.05 ha) and comprises 1% of the total site. It is also noted that the Proposed Action is not in an area identified as containing known foraging resources (based on foraging habitat mapping by Emerge Associates (2021b)). Therefore, it is likely that BC only use the site opportunistically for foraging (if at all) and rely on the broader local area for more substantial foraging resources. While not mapped as potential foraging habitat by Emerge Associates (2021b), given the presence of a known secondary foraging species, Emerge Associates have considered the removal 0.05 ha of foraging habitat in the context of the regional area. The removal of 0.05 ha potential BC foraging habitat represents only 0.004% of the 1,383 ha foraging habitat within 6 km of the site and 0.001% of the 3,917 ha foraging habitat within 12 km. In addition, the Proposed Action is unlikely to increase mortality rates through direct bird deaths or injuries via vehicle strikes, destruction of active nests and eggs etc during the clearing, construction and operation phases of the Proposed Action. No habitat currently suitable for breeding is present within the site, so no nests or eggs will be impacted. Mitigation measures will be implemented during initial clearing and construction works, to ensure no CC death or injury occurs. A pre-disturbance fauna inspection will be undertaken 1-2 days before clearing. Clearing will be undertaken in a manner that supports dispersal of individuals (if present) from the area and to other areas of existing vegetation immediately adjacent and nearby. Based on the above, the Proposed Action is unlikely to cause lead to a long-term decrease in the size of the BC population through a sustained reduction in birth rates and/or a sustained increased in mortality rates for the species.
Reduce the area of occupancy of the species	Very unlikely	The Proposed Action is unlikely to reduce the area of occupancy of BC through the removal of 0.05 ha of foraging habitat, one potential nesting tree and potential roosting habitat within the site. In order to reduce the area of occupancy of BC, the Proposed Action would need to lead to the permanent loss of vegetation within the species range that currently or potentially provides breeding trees with nesting hollows, or important foraging and night roosting habitat in proximity to watering points during the non-breeding season. As previously discussed above, the site contains one nesting tree which does not currently provide breeding habitat for BC. The site contains limited roosting habitat, with the **EgA** and **Pr** plant communities being the only vegetation that meets the definition of roosting habitat. These communities extend over a very small area (0.18 ha) and no evidence of black cockatoo roosting was observed during the field survey. BirdLife Australia have developed the Great Cocky Count which maps black cockatoo roosting sites. The Great Cocky Count dataset do not include any roosts within the site, with the closest known roost to the site located 2 km to the south (refer to **Figure 3** and the location labelled BUNGLER001) (Peck *et al.* 2019). Given these considerations, the Proposed Action is not considered to impact upon any roosting habitat of local or regional importance to the species.

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		As discussed above, BC feeds primarily on marri and proteaceous plant species (*Banksia* spp. and *Hakea* spp.) and also on some non-native species such as *Pinus* spp. Of the plant species identified within the site as part of the *Flora, Vegetation and Fauna Assessment* (Emerge Associates 2021a), small areas of non-native foraging habitat for BC occur within the site. The non-native foraging habitat comprises 0.05 ha of plant community **Pr**, which contains *Pinus radiata* which is known to be a secondary foraging resource for BC. Although foraging habitat is present, it comprises secondary foraging. Given the low cover of foraging plant species, the 0.05 ha of foraging habitat within the site is not considered to be an important food resource for BC. On the above basis the Proposed Action will not reduce the area of occupancy of the species as the site does not currently provide breeding habitat for BC and contains limited foraging and roosting habitat.
Fragment an existing population into two or more populations	Very unlikely	BC occurs as a single population (TSSC 2018).The Proposed Action is unlikely to fragment the population of BC given BCs are a highly mobile species known to routinely cover large distances and do not require continuous habitat coverage. BCs have a large home range, occurring from Gidgegannup in the north to Albany in the south-east (TSSC 2018). Notwithstanding, the site is not considered to support a resident group of BCs capable of being fragmented. A 'resident population' is any group of black cockatoos that are known to be based in a defined spatial location and are unlikely to leave this area for any significant amount of time (DotE 2013). When not breeding, BCs tend to aggregate in groups of three or in small parties but will occasionally gather in large flocks of up to 300 birds, usually where food is abundant (TSSC 2018). Given the site contains limited BC foraging habitat and no evidence of foraging by black cockatoos was recorded within the site. It is likely BCs would only visit the site opportunistically for foraging (if at all) and return to more suitable areas further east for roosting, breeding and foraging. The site is therefore unlikely to support a resident group of BCs. The site is not located in an area identified as containing known BC breeding, roosting or foraging habitat. The site comprises mainly non-native vegetation, with scattered native and non-native trees and shrubs. Larger areas of suitable BC habitat occur in the surrounding area. On this basis, the Proposed Action is unlikely to lead to increase in gaps between known patches of habitat, nor fragment the existing population of BC into two or more populations.
Adversely affect habitat critical to the survival of the species	Very unlikely	Critical habitat' is not defined for BC but is likely to be similar to the definition for CC, as above. The Proposed Action is unlikely to adversely affect habitat critical to the survival of BCs given the site does not support critical habitat as defined in the CC Recovery Plan (DPaW 2013). As discussed above, the site does not include habitat critical to the survival of BC. The site does not currently provide breeding habitat for BC, with the single potential nesting tree not currently supporting hollows for breeding. The vegetation within the site comprises a small area of non-native foraging habitat for BC. In terms of roosting, small areas of native and non-native vegetation meet the definition of roosting habitat but are limited in size and no evidence of roosting was observed during the field survey. Whilst permanent water sources occur close to the site, they are likely saline and unsuitable for black cockatoo watering.

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		Based on the above, the vegetation within the site is not considered to be habitat critical to the survival of BC.
Disrupt the breeding cycle of a population	Very unlikely	As previously described, BC breeding habitat is defined as suitable tree species (generally *Eucalypt* spp.) which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow (DoEE 2012). For most tree species, suitable DBH is 500 mm. For salmon gum and wandoo, suitable DBH is 300 mm. The site supports one potential nesting tree, which is defined as a tree with DBH of 500 mm or greater but which does not contain suitable nesting hollows. It is likely many years until this tree develops hollows, if at all. Given there is only one potential nesting tree in the site that does not currently provide breeding habitat for BC, the Proposed Action will not disrupt the breeding cycle of the BC population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Very unlikely	Decline in this sense has been interpreted to mean a decline in the distribution and abundance of BCs through the removal/fragmentation of key habitat. Key habitat has been described previously and above with regard to breeding, roosting and foraging. The Proposed Action is unlikely to significantly decrease the availability of habitat for BCs. As discussed in detail above, no habitat currently able to be used for breeding by BC occurs within the site and foraging and roosting habitat is of a small size. A total of 0.05 ha of non-native foraging habitat occurs within the site. The removal of this vegetation represents a small amount of foraging habitat available at the local and regional scale, specifically: • 0.004% of foraging habitat within 6 km of the site and 0.001% within 12 km. As part of the Proposed Action, clearing, construction and ongoing operation will be managed to prevent the potential spread of weeds, dieback and feral animals into the site. The Proposed Action is very unlikely to decrease the availability of BC habitat to the point at which it would cause the species to decline given the small amount of BC habitat removal in the context of the broader protected areas of vegetation.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	Unlikely	The key consideration for this criterion would be the introduction of species that are known to compete with BCs for nesting hollows or foraging resources. These species include the native and introduced corellas (*Cacatua* species), galahs (*Cacatua roseicapilla*), Australian shelducks (*Tadorna tadornoides*), Australian wood ducks (*Chenonetta jubata*) and feral European honeybees (*Apis mellifera*). The one potential nesting tree within the Proposed Action does not contain hollows and so is not a consideration. The site is located on reclaimed land that has been subject to long-term historical and ongoing disturbance. The site is bounded by similar, predominantly non-native vegetation and industrial buildings. The surrounding land uses have modified/altered the landscape and as a result, a range of introduced species are known or likely to already exist within the site. No invasive fauna species harmful to BC were identified in the site during the survey but may occur.

Significant impact criteria for CC ('Endangered')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		The Proposed Action is unlikely to either introduce other species or further establish any existing species known to compete with BC within the site or in immediate surrounding areas.
Introduce disease that may cause the species to decline	Unlikely	BCs can be susceptible to diseases such as beak and feather disease virus (BFDV), avian polyomavirus (APV) and chlamydophilosis. Insects, *Phytophthora cinnamomi* (dieback) and other soil-borne, foliar and canker pathogens can also affect the health of BC habitat. The Proposed Action is unlikely to be responsible for the introduction of these diseases, or increase the susceptibility of birds to these diseases, as the site is located within an area already exposed to a high degree of human interaction and disturbance, as discussed above. The site has been subject to significant historical disturbance and is surrounded by infrastructure and disturbed, primarily non-native vegetation. If insects, *Phytophthora cinnamomi* (dieback) and other soil-borne, foliar and canker pathogens were to occur, they would likely have already been introduced as part of previous human disturbances and existing ongoing land uses. Notwithstanding this, as part of initial clearing and construction activities, construction environmental management measures will be implemented to avoid the introduction of soil borne pathogens and weeds, including ensuring clean machinery is used within the Proposed Action area, and clearing is restricted to permitted areas only. Any soil or vegetation required as part of the construction and operation activities will be from certified sources free of pathogens and disease. Based on the above, the Proposed Action is unlikely to introduce disease/s that may cause the species to decline.
Interfere with the recovery of the species	Very unlikely	No recovery plan exists for BC but the recovery objective for the species is likely similar to that of CC: "*to stop further decline in the breeding populations of threatened black cockatoo species and to ensure their persistence throughout their current range in the south-west of Western Australia for the duration of this plan*" (DPAW 2013). As discussed above, the Proposed Action will not interfere or disrupt the breeding cycle of the BC population or individuals as no hollows suitable for breeding currently occur. The Proposed Action will also not result in a reduction in the species range due to the extensive habitat availability across the local and regional area. As such, the Proposed Action is very unlikely to interfere with the recovery of the species.

3.4. FOREST RED-TAILED BLACK COCKATOO

The following policy/guidance has been consulted as part of this assessment:

- *Referral guideline for 3 WA threatened black cockatoo species* (DAWE 2022)
- *Approved Conservation Advice for Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo)* (DEWHA 2009)
- *Commonwealth Listing Advice on Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo)* (TSSC 2009)
- *SPRAT Profile: Calyptorhynchus banksii naso — Forest Red-tailed Black-Cockatoo, Karrak* (DCCEEW 2022a)

- *Potential Habitat Black Cockatoo Habitat Spatial Dataset*, (Emerge Associates 2021b)
- *Black Cockatoo Foraging Plants (***Appendix A***)*
- *Great Cocky Count – Black Cockatoo Roost Dataset* (Peck *et al.* 2019).

An assessment against the DotE (2013) *Significant Impact Guidelines 1.1* for forest red-tailed black cockatoo has been provided in **Table 1**, based on the 'Vulnerable' status of the species. The assessment detailed in **Table 1** below indicates that the Proposed Action **is unlikely to** result in a significant impact on forest red-tailed black cockatoo (FRTBC).

Table 3: Significant impact criteria for forest red-tailed black cockatoo in relation to the Proposed Action

Significant impact criteria for FRTBC ('Vulnerable')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
Lead to a long-term decrease in the size of an important population of a species	Very unlikely	Forest red-tailed black cockatoo occurs as one population (DEWHA 2009) and so the term 'important population' is not a relevant consideration. The Proposed Action in unlikely to lead to a long-term decrease in the size of the population of FRTBC. To lead to a long-term decrease in the size of a population, the Proposed Action would need to bring about a sustained reduction in birth rates through the removal of breeding habitat and/or a sustained increased in mortality rates for the species. In terms of breeding habitat, one 'potential nesting tree' occurs within the site (**Figure 2**). However, this tree does not support a suitable nest hollow and so would not currently provide breeding habitat for FRTBC. It is likely to be many years until the potential nesting tree within the site contains a suitable nest hollow. Given that no breeding can occur within the site, FRTBC birth rates in the short to medium term will not be affected as part of the Proposed Action. There is a chance that the potential nesting tree within the site may develop a suitable nest hollow in the long-term. If this did occur, removal of this one nesting tree is unlikely to lead to a long-term decrease in the FRTBC birth rates or population as it would likely only comprise removal of one hollow. The Proposed Action is unlikely to increase FRTBC mortality rates, which for the Proposed Action would be indirectly through a significant reduction of available foraging resources in the region, or directly through activities that could lead to bird deaths as a result of vehicle strikes, destruction of nests etc. Foraging habitat for FRTBC is described as 'primarily seeds of jarrah and marri in woodlands and forest…including wandoo and blackbutt, *Allocasuarina* cones, snottygobble (*Persoonia longifolia*) and mountain marri (C. haematoxylon)' (DAWE 2022). Introduced species such as river red gum (*E. camaldulensis*) and rose gum (*E. grandis*) and cape lilac (*Melia azedarach*) are also listed as being foraged on by FRTBC (DAWE 2022). The Proposed Action will indirectly impact on FRTBC through the removal of 0.14 ha of native foraging habitat. The native foraging habitat vegetation within the site comprises species such as *Eucalyptus gomphocephala* (tuart). This species is considered secondary foraging habitat, defined as plants that black cockatoo species have been recorded consuming occasionally or that, based on their limited extent or agricultural origin, should not be considered a sustaining resource. The 0.14 ha of FRTBC foraging habitat in the site comprises 3% of the total site. Based on foraging habitat mapping by Emerge Associates (2021b), the site is not in an area identified as containing known FRTBC foraging resources. Therefore, it is likely that FRTBCs only use the site opportunistically for foraging (if at all) and rely on the broader local area for more substantial foraging resources.

Significant impact criteria for FRTBC ('Vulnerable')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		While not mapped as potential foraging habitat by Emerge Associates (2021b), given the presence of a known secondary foraging species, Emerge Associates have considered the removal 0.14 ha of foraging habitat in the context of the regional area. The removal of 0.14 ha potential FRTBC foraging habitat represents only 0.01% of the 1,383 ha foraging habitat within 6 km of the site and 0.003% of the 4,720 ha foraging habitat within 12 km. In addition, the Proposed Action is unlikely to increase mortality rates through direct bird deaths or injuries via vehicle strikes, destruction of active nests and eggs etc during the clearing, construction and operation phases of the Proposed Action. No habitat currently suitable for breeding is present within the site, so no nests or eggs will be impacted. Mitigation measures will be implemented during initial clearing and construction works, to ensure no FRTBC death or injury occurs. A pre-disturbance fauna inspection will be undertaken 1-2 days before clearing. Clearing will be undertaken in a manner that supports dispersal of individuals (if present) from the area and to other areas of existing vegetation immediately adjacent and nearby. Based on the above, the Proposed Action is unlikely to cause lead to a long-term decrease in the size of a FRTBC population through a sustained reduction in birth rates and/or a sustained increased in mortality rates for the species.
Reduce the area of occupancy of an important population	Very unlikely	Forest red-tailed black cockatoo occurs as one population (DEWHA 2009) and so the term 'important population' is irrelevant. The Proposed Action is unlikely to reduce the area of occupancy of FRTBCs through the removal of 0.14 ha of foraging habitat, one potential nesting tree and potential roosting habitat within the site. In order to reduce the area of occupancy of CCs, the Proposed Action would need to lead to the permanent loss of vegetation within the species range that currently or potentially provides breeding trees with nesting hollows, or important foraging and night roosting habitat in proximity to watering points during the non-breeding season. As previously discussed above, the Disturbance Footprint contains one FRTBC nesting tree which does not currently provide breeding habitat for FRTBC. The site contains limited roosting habitat, with the **EgA** and **Pr** plant communities being the only vegetation that meets the definition of roosting habitat. These communities extend over a very small area (0.18 ha) and no evidence of black cockatoo roosting was observed during the field survey. BirdLife Australia have developed the Great Cocky Count which maps black cockatoo roosting sites. The Great Cocky Count dataset do not include any roosts within the site, with the closest known roost to the site located 4 km to the north-east (refer to **Figure 3** and the location labelled DAREATR002) (Birdlife 2020). Given these considerations, the Proposed Action is not considered to impact upon any roosting habitat of local or regional importance to the species. As discussed further above, FRTBCs feed primarily on jarrah and marri, neither of which occur in the site. Of the plant species identified within the site as part of the *Flora, Vegetation and Fauna Assessment* (Emerge Associates 2021a), only *Eucalyptus gomphocephala* (tuart) comprises foraging habitat for FRTBC. Whilst native, tuarts are considered a secondary foraging resource for FRTBCs. A total of 0.14 ha of tuart foraging habitat occurs within the site. Given the low cover of FRTBC foraging plant species, the 0.14 ha of FRTBC foraging habitat vegetation within the site is not considered to be an important food resource for FRTBCs.

Significant impact criteria for FRTBC ('Vulnerable')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		On the above basis the Proposed Action will not reduce the area of occupancy of the species as the site does not currently provide breeding habitat for FRTBCs and contains limited foraging and roosting habitat.
Fragment an existing important population into two or more populations	Very unlikely	Forest red-tailed black cockatoo occurs as one population (DEWHA 2009) and so the term 'important population' is irrelevant. The Proposed Action is unlikely to fragment the FRTBC population given FRTBCs are a highly mobile species known to routinely cover large distances and do not require continuous habitat coverage. FRTBCs have a large home range, occurring from Gingin in the north to east of Albany in the south-east (DEWHA 2009). The site contains some trees that would provide roosting habitat and is located adjacent to Vittoria Bay, which supports permanent (though likely saline) water. However, the roosting habitat in the site is limited, being only 0.18 ha in size. Larger areas of more suitable roosting habitat occur within the local area. Given the site contains limited FRTBC roosting and foraging habitat and does not contain trees currently suitable for breeding, it is likely FRTBCs would only visit the site opportunistically for foraging (if at all) and return to suitable areas (further east) for roosting. The site is therefore unlikely to support resident FRTBC individuals. On this basis, the Proposed Action is unlikely to lead to increase in gaps between known patches of habitat, nor fragment the existing population of FRTBC into two or more populations.
Adversely affect habitat critical to the survival of a species	Very unlikely	'Critical habitat' is not defined for FRTBC but is likely to be similar to the definition for CC, as above. The Proposed Action is unlikely to adversely affect habitat critical to the survival of the FRTBCs given the site does not support critical habitat as defined in the CC Recovery Plan (DPaW 2013). As discussed above, the Proposed Action area includes no habitat critical to the survival of FRTCB. The Proposed Action does not currently provide breeding habitat for FRTBC, with the single potential nesting tree not currently supporting hollows for breeding. The vegetation within the site comprises a small area of native secondary foraging habitat for FRTBC. In terms of roosting, small areas of native and non-native vegetation meet the definition of roosting habitat but are limited in size and no evidence of roosting was observed during the field survey. Whilst permanent water sources occur close to the site, they are likely saline and unsuitable for black cockatoo watering. Based on the above, the native vegetation within the site is not considered to be habitat critical to the survival of FRTBC.
Disrupt the breeding cycle of an important population	Very unlikely	Forest red-tailed black cockatoo occurs as one population (DEWHA 2009) and so the term 'important population' is not a relevant consideration. As previously described, FRTBC breeding habitat is defined as suitable tree species (generally *Eucalypt* spp.) which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow (DoEE 2012). For most tree species, suitable DBH is 500 mm. For salmon gum and wandoo, suitable DBH is 300 mm. The Disturbance Footprint supports one potential nesting tree, which is defined as a tree with DBH of 500 mm or greater but which does not contain suitable nesting hollows. It is likely many years until this tree develops hollows, if at all.

Significant impact criteria for FRTBC ('Vulnerable')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		Given there is only one potential nesting tree in the site that does not currently provide breeding habitat for FRTBC, the Proposed Action will not disrupt the breeding cycle of FRTBCs.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Very unlikely	Decline in this sense has been interpreted to mean a decline in the distribution and abundance of FRTBCs through the removal/fragmentation of key habitat. Key habitat has been described previously and above with regard to breeding, roosting and foraging. The Proposed Action is unlikely to significantly decrease the availability of habitat for FRTBCs. As discussed in detail above, no habitat currently able to be used for breeding by FRTBCs occurs within the site and foraging and roosting habitat is of a small size. A total of 0.14 ha of native foraging habitat occurs within the site. The removal of this vegetation represents a small amount of foraging habitat available at the local and regional scale, specifically: • 0.01% of foraging habitat within 6 km of the site and 0.003% within 12 km. As part of the Proposed Action, clearing, construction and ongoing operation will be managed to prevent the potential spread of weeds, dieback and feral animals into the site. The Proposed Action is very unlikely to decrease the availability of FRTBC habitat to the point at which it would cause the species to decline given the small amount of FRTBC habitat removal in the context of the broader protected areas of vegetation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The key consideration for this criterion would be the introduction of species that are known to compete with FRTBCs for nesting hollows or foraging resources. These species include the native and introduced corellas (*Cacatua* species), galahs (*Cacatua roseicapilla*), Australian shelducks (*Tadorna tadornoides*), Australian wood ducks (*Chenonetta jubata*) and feral European honeybees (*Apis mellifera*). The one potential nesting tree within the Proposed Action does not contain hollows and so is not a consideration. The site is located on reclaimed land that has been subject to long-term historical and ongoing disturbance. The site is bounded by similar, predominantly non-native vegetation and industrial buildings. The surrounding land uses have modified/altered the landscape and as a result, a range of introduced species are known or likely to already exist within the site. No invasive fauna species harmful to FRTBC were identified in the site during the survey but may occur. The Proposed Action is unlikely to either introduce other species or further establish any existing species known to compete with FRTBC within the site or in immediate surrounding areas.
Introduce disease that may cause the species to decline	Unlikely	Like CC, FRTBC can be susceptible to diseases such as beak and feather disease virus (BFDV), avian polyomavirus (APV) and chlamydophilosis. Insects, *Phytophthora cinnamomi* (dieback) and other soil-borne, foliar and canker pathogens can also affect the health of FRTBC habitat. The Proposed Action is unlikely to be responsible for the introduction of these diseases, or increase the susceptibility of birds to these diseases, as the Proposed Action area is located within an area already exposed to a high degree of human interaction and disturbance, as discussed above. The Disturbance Footprint has

Significant impact criteria for FRTBC ('Vulnerable')	Will a significant impact result from the proposed development?	
	Likelihood	Comment
		been subject to significant historical disturbance and is surrounded by infrastructure and disturbed, primarily non-native vegetation. If insects, *Phytophthora cinnamomi* (dieback) and other soil-borne, foliar and canker pathogens were to occur, they would likely have already been introduced as part of previous human disturbances and existing ongoing land uses. Notwithstanding this, as part of initial clearing and construction activities, construction environmental management measures will be implemented to avoid the introduction of soil borne pathogens and weeds, including ensuring clean machinery is used within the site and clearing is restricted to permitted areas only. Any soil or vegetation required as part of the construction and operation activities will be from certified sources free of pathogens and disease. Based on the above, the Proposed Action is unlikely to introduce disease/s that may cause the species to decline.
Interfere substantially with the recovery of the species.	Very unlikely	No recovery plan exists for FRTBC but the recovery objective for the species is likely similar to that of CC: "*to stop further decline in the breeding populations of threatened black cockatoo species and to ensure their persistence throughout their current range in the south-west of Western Australia for the duration of this plan*" (DPAW 2013). As discussed above, the Proposed Action will not interfere or disrupt the breeding cycle of the FRTBC population or individuals as no hollows suitable for breeding currently occur. The Proposed Action will also not result in a reduction in the species range due to the extensive habitat availability across the local and regional area. As such, the Proposed Action is very unlikely to interfere with the recovery of the species.

4. CONCLUSIONS

Based on the above assessment the impacts from the Proposed Action are not considered likely to represent 'significant impacts' to Carnaby's cockatoo, Baudin's cockatoo or forest red-tailed black cockatoo. This is based on the following reasons:

- Carnaby's cockatoo:
  - One 'potential nesting tree' occurs within the site but this tree does not support a suitable nest hollow and so would not currently provide breeding habitat for CC.
  - A total of 0.29 ha of CC foraging habitat occurs in the site, comprised of 0.24 ha of native foraging vegetation and 0.05 ha of non-native vegetation. The native foraging habitat consists of secondary foraging plant species and the non-native foraging habitat consists of primary foraging plant species. The total size of CC foraging habitat in the site is very small (0.29 ha).
  - The site lies on reclaimed land and is not within an area identified as containing known foraging resources, based on existing datasets. The removal of 0.29 ha of potential CC foraging habitat represents only 0.02% of the 1,383 ha of CC foraging habitat within 6 km of the site and 0.01% of the CC 4,720 ha foraging habitat within 12 km.
  - The site contains a small area of roosting habitat (0.18 ha) and no evidence of black cockatoo roosting was observed during the field survey. No known roosting records occur within the site.

- Baudin's cockatoo:
  - One 'potential nesting tree' occurs within the site but this tree does not support a suitable nest hollow and so would not currently provide breeding habitat for BC.
  - A total of 0.05 ha of BC foraging habitat occurs in the site. This comprises non-native species which are a secondary foraging plant species for BC. The total size of BC foraging habitat in the site is very small (0.05 ha).
  - The site lies on reclaimed land and is not within an area identified as containing known foraging resources, based on existing datasets. The removal of 0.05 ha of potential BC foraging habitat represents only 0.004% of the 1,383 ha of BC foraging habitat within 6 km of the site and 0.001% of the 3,917 ha of BC foraging habitat within 12 km.
  - The site contains a small area of roosting habitat (0.18 ha) and no evidence of black cockatoo roosting was observed during the field survey. No known roosting records occur within the site.

- Forest red-tailed black cockatoo:
  - One 'potential nesting tree' occurs within the site but this tree does not support a suitable nest hollow and so would not currently provide breeding habitat for FRTBC.
  - A total of 0.14 ha of FRTBC foraging habitat occurs in the site. This comprises native species which are a secondary foraging plant species for FRTBC. The total size of FRTBC foraging habitat in the site is very small (0.14 ha) and comprises 3% of the total site.
  - The site lies on reclaimed land and is not within an area identified as containing known foraging resources, based on existing datasets. The removal of 0.14 ha potential FRTBC foraging habitat represents only 0.01% of the 1,383 ha of FRTBC foraging habitat within 6 km of the site and 0.003% of the 4,720 ha of FRTBC foraging habitat within 12 km.
  - The site contains a small area of roosting habitat (0.18 ha) and no evidence of black cockatoo roosting was observed during the field survey. No known roosting records occur within the site.

5. REFERENCES

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FIGURES

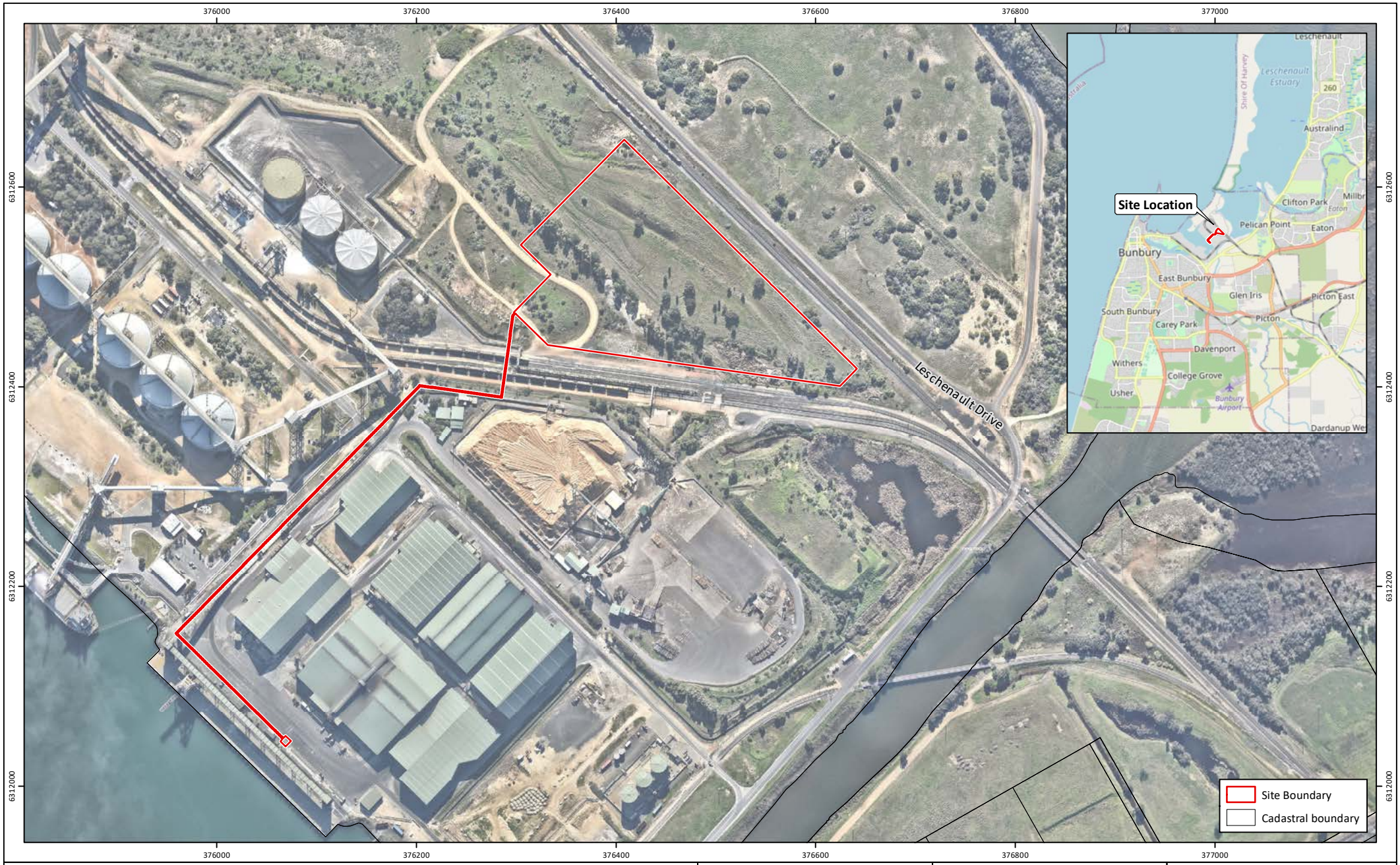

Figure 1: Site Location

Project: MNES Assessment
Part Lot 963 Estuary Drive, Vittoria
Client: Quantem

Plan Number:
EP22-080(03)--F07
Drawn: GAR
Date: 11/10/2022
Checked: TAA
Approved: TAA
Date: 27/10/2022

N

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Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

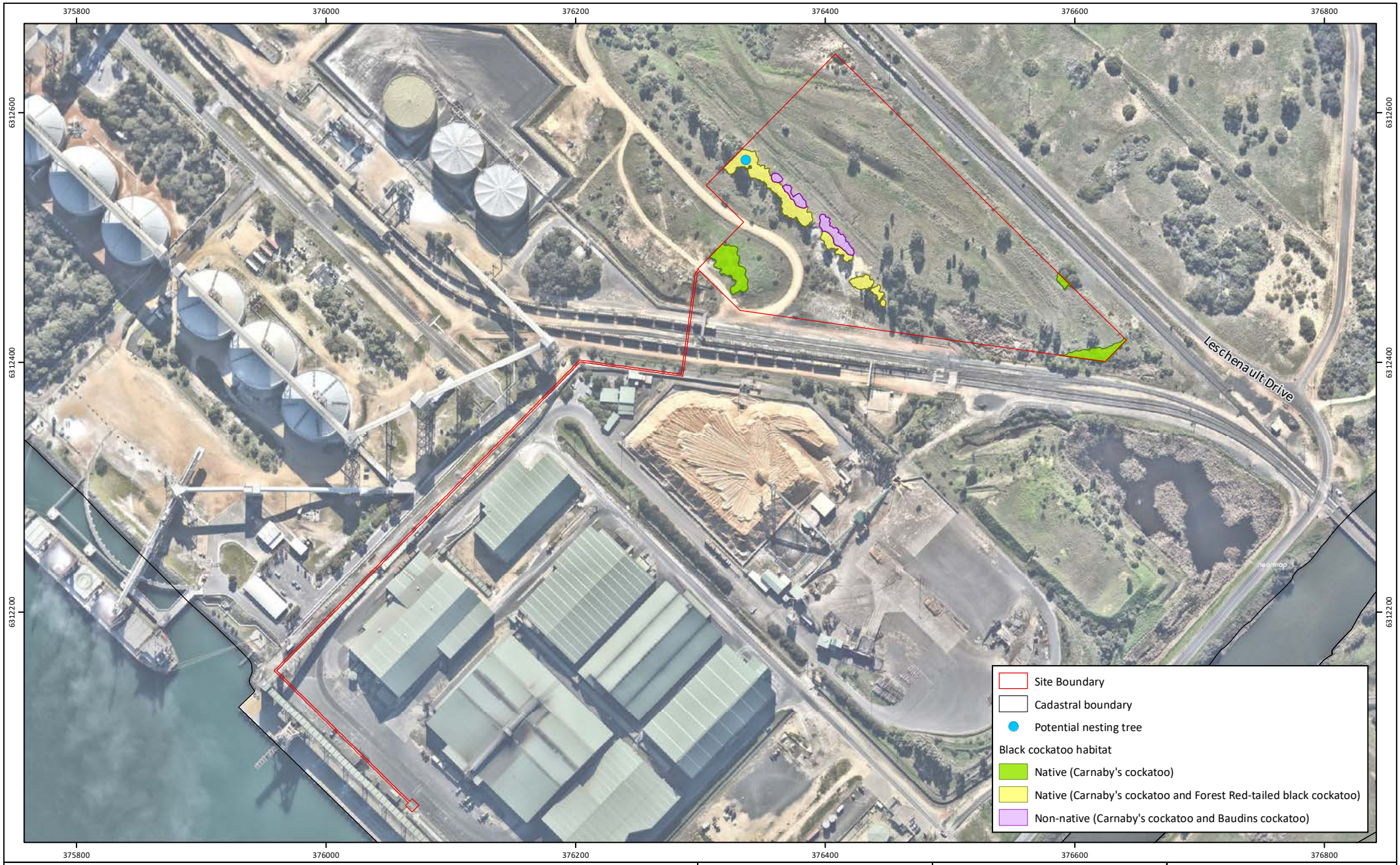

Figure 2: Black Cockatoo Habitat

Project: MNES Assessment
Part Lot 963 Estuary Drive, Vittoria
Client: Quantem

Plan Number:
EP22-080(03)--F08
Drawn: GAR
Date: 11/10/2022
Checked: TAA
Approved: TAA
Date: 27/10/2022

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Metres
Scale: 1:4,000@A4
GDA 1994 MGA Zone 50

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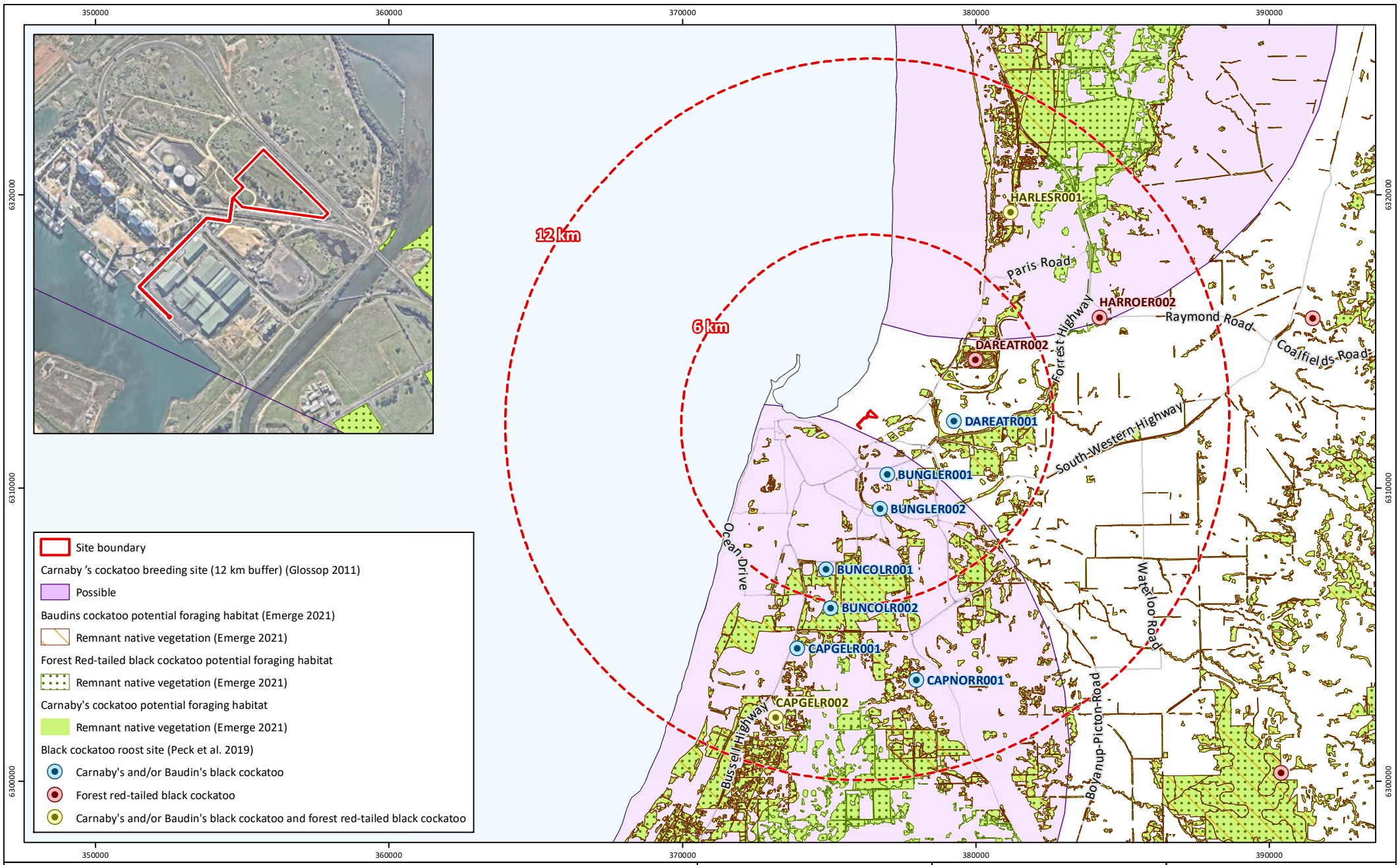

Figure 3: Black Cockatoo Habitat Context

Project:	MNES Assessment Part Lot 963 Estuary Drive, Vittoria
Client:	Quantem

Plan Number:
EP22-080(03)--F09

Drawn:	GAR
Date:	11/10/2022
Checked:	TAA
Approved:	TAA
Date:	27/10/2022

N

0 2 4 6
Kilometers

Scale: 1:170,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

APPENDIX A

BLACK COCKATOO FORAGING PLANTS

		Foraging category as assigned by Emerge			
Species name	**Common name**	**CBC**	**BBC**	**FRTBC**	**Literature references**
Acacia baileyana	Cootamundra wattle	Secondary	-	-	Groom 2011
Acacia pentadenia	Karri wattle	Secondary	-	-	Groom 2011
Acacia saligna	Orange wattle	Secondary	-	-	Groom 2011
Agonis flexuosa	Peppermint tree	Secondary	-	-	Groom 2011
Allocasuarina fraseriana	Sheoak	-	Secondary	Secondary	Johnstone & Storr 1998; Johnstone et al. 2010; Johnstone 2017; DoEE 2017
Allocasuarina spp.		Secondary	-	Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Anigozanthos flavidus	Tall kangaroo paw	-	Secondary	-	Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Araucaria heterophylla	Norfolk island pine	Secondary	-	-	Groom 2011; DoEE 2017
Banksia ashbyi	Ashby's banksia	Primary	Secondary	-	Saunders 1980; Groom 2011; DoEE 2017
Banksia attenuata	Slender banksia	Primary	Secondary	-	Saunders 1980; Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia baxteri	Baxter's banksia	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia carlinoides	Pink dryandra	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia coccinea	Scarlet banksia	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia dallanneyi	Couch honeypot dryandra	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia ericifolia	Heath-leaved banksia	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia fraseri		Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia gardneri	Prostrate banksia	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia grandis	Bull banksia	Primary	Secondary	-	Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia hookeriana	Hooker's banksia	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia ilicifolia	Holly banksia	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; Johnstone & Storr 1998; DoEE 2017
Banksia kippistiana		Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia leptophylla		Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia lindleyana	Porcupine banksia	Primary	Secondary	-	Johnstone et al. 2010; DoEE 2017

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Banksia littoralis	Swamp banksia	Primary	Secondary	-	Saunders 1980; Groom 2011Johnstone & Storr 1998; Johnstone et al. 2010; DoEE 2017
Banksia menziesii	Firewood banksia	Primary	Secondary	-	Saunders 1980; Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia mucronulata	Swordfish dryandra	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia nivea	Honeypot dryandra	Primary	Secondary	-	Saunders 1980; Groom 2011; DoEE 2017
Banksia nobilis	Golden dryandra	Primary	Secondary	-	Saunders 1980; Groom 2011; DoEE 2017
Banksia praemorsa	Cut-leaf banksia	Primary	Secondary	-	Saunders 1980; Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia prionotes	Acorn banksia	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia prolata		Primary	Secondary	-	Johnstone et al. 2010; DoEE 2017
Banksia quercifolia	Oak-leaved banksia	Primary	Secondary	-	Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia sessilis	Parrot bush	Primary	Secondary	-	Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia speciosa	Showy banksia	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia spp.		Primary	Secondary	-	Saunders 1979; DSEWPaC 2012; DoEE 2017
Banksia squarrosa	Pingle	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; DoEE 2017
Banksia tricuspis	Pine banksia	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia undata	Urchin dryandra	Primary	Secondary	-	Groom 2011; DoEE 2017
Banksia verticillata	Granite banksia	Primary	Secondary	-	Saunders 1980; Groom 2011; DoEE 2017
Brassica campestris	Canola	Secondary	-	-	Groom 2011; DoEE 2017
Callistemon spp.		Secondary	Secondary	-	Johnstone et al. 2010; DoEE 2017
Callistemon viminalis	Captain cook bottlebrush	Secondary	-	-	Groom 2011
Callitris sp.		Secondary	-	-	Johnstone et al. 2010; Groom 2011
Carya illnoinensis	Pecan	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011; Groom 2014; DoEE 2017
Casuarina cunninghamiana	River sheoak	Secondary	-	-	Groom 2011
Citrullus lanatus	Pie or afghan melon	Secondary	-	-	Johnstone et al. 2010; Groom 2011

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		CBC	BBC	FRTBC	
Corymbia calophylla	Marri	Primary	Primary	Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Saunders 1979; Johnstone & Kirkby 2008
Corymbia citriodora	Lemon scented gum	Secondary	Secondary	Secondary	Johnstone et al. 2010; DSEWPaC 2012; Groom 2011; Johnstone 2017
Corymbia ficifolia	Red flowering gum	Secondary	-	-	Groom 2011
Corymbia haematoxylon	Mountain marri	Secondary	-	Secondary	Groom 2011; DoEE 2012; DoEE 2017
Corymbia maculata	Spotted gum	-	-	-	-
Darwinia citriodora	Lemon-scented darwinia	Secondary	Secondary	-	Groom 2011; Johnstone et al. 2010
Diospryros sp.	Sweet persimmon	Secondary	Secondary	-	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eremophila glabra	Tarbush	Secondary	-	-	Groom 2011
Erodium aureum		Secondary	-	-	Groom 2011
Erodium botrys	Long storksbill	Secondary	Secondary	-	Groom 2011; Johnstone & Storr 1998; Johnstone et al. 2010
Erodium spp.		Secondary	Secondary	-	Johnstone et al. 2010; DoEE 2017
Eucalyptus caesia	Silver princess	Secondary	-	Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone 2017
Eucalyptus camaldulensis	River red gum	-	-	Secondary	DoEE 2012; DoEE 2017
Eucalyptus decipiens	Red heart/moit	-	-	Secondary	Johnstone 2017
Eucalyptus diversicolor	Karri	-	-	Primary	Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998
Eucalyptus erythrocorys	Illyarrie	Secondary	-	Secondary	DSEWPaC 2012; DoEE 2017; Johnstone 2017, Johnstone et al. 2010
Eucalyptus gomphocephala	Tuart	Secondary	-	Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eucalyptus grandis	Flooded gum, rose gum	-	-	Secondary	DoEE 2012; DoEE 2017
Eucalyptus lehmannii	Bushy yate	-	-	Secondary	Johnstone 2017
Eucalyptus leucoxylon	Yellow gum	Secondary	-	-	Groom 2014

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Eucalyptus loxophleba	York gum	Secondary	-	-	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eucalyptus marginata	Jarrah	Primary	Secondary	Primary	Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone 2017
Eucalyptus patens	Blackbutt	Primary	-	Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Groom 2011
Eucalyptus pleurocarpa	Tallerack	Secondary	-	-	Groom 2011
Eucalyptus preissiana	Bell-fruited mallee	Secondary	-	-	Groom 2011
Eucalyptus robusta	Swamp mahogany	Secondary	-	-	Johnstone et al. 2010; Groom 2011
Eucalyptus salmonophloia	Salmon gum	Primary	-	-	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DSEWPaC 2012; DoEE 2017
Eucalyptus staeri	Albany blackbutt	-	-	Secondary	Johnstone & Storr 1998
Eucalyptus todtiana	Coastal blackbutt	Secondary	-	-	Saunders 1980; Johnstone et al. 2010; Groom 2011; Johnstone & Kirkby 2008
Eucalyptus wandoo	Wandoo	Primary	Secondary	Primary	Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Ficus sp.	Fig	Secondary	-	-	Groom 2011
Grevillea armigera	Prickly toothbrushes	Primary	-	-	Groom 2011
Grevillea bipinnatifida	Fuschia grevillea	Primary	-	-	Groom 2011
Grevillea hookeriana	Red toothbrushes	Primary	-	-	Groom 2011
Grevillea hookeriana subsp. api	Black toothbrushes	Primary	-	-	Groom 2011
Grevillea paniculata	Kerosene bush	Primary	-	-	Groom 2011
Grevillea paradoxa	Bottlebrush grevillea	Primary	-	-	Groom 2011
Grevillea petrophiloides	Pink poker	Primary	-	-	Groom 2011
Grevillea robusta	Silky oak	Primary	-	-	Johnstone et al. 2010; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Grevillea spp.		Primary	-	-	Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Grevillea wilsonii	Native fuchsia	-	Secondary	-	Johnstone et al. 2010
Hakea auriculata		Primary	-	-	Saunders 1980; Groom 2011
Hakea candolleana		Primary	-	-	Groom 2011
Hakea circumalata	Coastal hakea	Primary	-	-	Groom 2011
Hakea commutata		Primary	-	-	Groom 2011
Hakea conchifolia	Shell-leaved hakea	Primary	-	-	Groom 2011
Hakea costata	Ribbed hakea	Primary	-	-	Groom 2011
Hakea cristata	Snail hakea	Primary	Secondary	-	Groom 2011; Johnstone et al. 2010
Hakea cucullata	Snail hakea	Primary	-	-	Groom 2011
Hakea cyclocarpa	Ramshorn	Primary	-	-	Saunders 1980; Groom 2011
Hakea eneabba		Primary	-	-	Groom 2011
Hakea erinacea	Hedgehog hakea	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011
Hakea falcata	Sickle hakea	Primary	-	-	Groom 2011
Hakea flabellifolia	Fan-leaved hakea	Primary	-	-	Groom 2011
Hakea gilbertii		Primary	-	-	Saunders 1980; Groom 2011
Hakea incrassata	Golfball or marble hakea	Primary	-	-	Johnstone et al. 2010; Groom 2011
Hakea lasiantha	Woolly flowered hakea	Primary	-	-	Johnstone et al. 2010; Groom 2011
Hakea lasianthoides		Primary	Secondary	-	Johnstone et al. 2010; Groom 2011
Hakea laurina	Pin-cushion hakea	Primary	-	-	Johnstone et al. 2010; Groom 2011
Hakea lissocarpha	Honeybush	Primary	Secondary	-	Saunders 1980; Johnstone et al. 2010; Groom 2011
Hakea marginata		-	Secondary	-	Johnstone et al. 2010
Hakea megalosperma	Lesueur hakea	Primary	-	-	Groom 2011
Hakea multilineata	Grass leaf hakea	Primary	-	-	Groom 2011
Hakea neospathulata		Primary	-	-	Groom 2011
Hakea obliqua	Needles and corks	Primary	-	-	Saunders 1980; Groom 2011
Hakea oleifolia	Dungyn	Primary	-	-	Groom 2011

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Hakea pandanicarpa subsp. crassifolia	Thick-leaved hakea	Primary	-	-	Groom 2011
Hakea petiolaris	Sea urchin hakea	Primary	-	-	Groom 2011
Hakea polyanthema		Primary	-	-	Groom 2011
Hakea preissii	Needle tree	Primary	-	-	Groom 2011
Hakea prostrata	Harsh hakea	Primary	Secondary	-	Saunders 1980; Johnstone et al. 2010; Groom 2011
Hakea psilorrhyncha		Primary	-	-	Groom 2011
Hakea ruscifolia	Candle hakea	Primary	Secondary	-	Saunders 1980; Groom 2011; Johnstone et al. 2010
Hakea scoparia	Kangaroo bush	Primary	-	-	Groom 2011
Hakea smilacifolia		Primary	-	-	Groom 2011
Hakea spp.		Primary	Secondary	-	Saunders 1979; DSEWPaC 2012; DoEE 2017
Hakea stenocarpa	Narrow-fruited hakea	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011
Hakea sulcata	Furrowed hakea	Primary	-	-	Groom 2011
Hakea trifurcata	Two-leaved hakea	Primary	Secondary	-	Saunders 1980; Johnstone et al. 2010; Groom 2011
Hakea undulata	Wavy-leaved hakea	Primary	Secondary	-	Saunders 1980; Johnstone et al. 2010; Groom 2011
Hakea varia	Variable-leaved hakea	Primary	Secondary	-	Saunders 1980; Groom 2011
Harpephyllum caffrum	Kaffir plum	-	-	Secondary	Johnstone 2017
Helianthus annuus	Sunflower	Secondary	-	-	Johnstone et al. 2010; Groom 2011
Hibiscus sp.	Hibiscus	Secondary	-	-	Groom 2011
Isopogon scabriusculus		Secondary	-	-	Groom 2011
Jacaranda mimosifolia	Jacaranda	Secondary	Secondary	-	Johnstone et al. 2010; Groom 2011
Jacksonia furcellata	Grey stinkwood	Secondary	-	-	Groom 2011
Kingia australis	Kingia	-	Secondary	-	Johnstone et al. 2010
Lambertia inermis	Chittick	Secondary	-	-	Johnstone & Storr 1998; Groom 2011
Lambertia multiflora	Many-flowered honeysuckle	Secondary	-	-	Saunders 1980; Groom 2011

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Liquidamber styraciflua	Liquid amber	Primary	-	Secondary	Johnstone et al. 2010; Groom 2011; Groom 2014; Personal observation
Lupinus sp.	Lupin	Secondary	-	-	Saunders 1980; Groom 2011
Macadamia integrifolia	Macadamia	Primary	Secondary	-	Johnstone et al. 2010; Grooms 2011; Groom 2014
Malus domestica	Apple	Secondary	Secondary	-	Johnstone et al. 2010; Johnstone & Storr 1998; DSEWPaC 2012; DoEE 2017; Groom 2011
Melaleuca leuropoma		Secondary	-	-	Saunders 1980; Groom 2011
Melia azedarach	Cape lilac or white cedar	Secondary	-	Primary	Johnstone et al. 2010; Groom 2011
Mesomeleana spp.		Secondary	-	-	Johnstone et al. 2010; Groom 2011
Olea europea	Olive	-	-	Secondary	Johnstone 2017
Persoonia longifolia	Snottygobble	-	-	Secondary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Pinus canariensis	Canary island pine	Primary	-	-	Johnstone et al. 2010; Groom 2011
Pinus caribea	Caribbean pine	Primary	-	-	Johnstone et al. 2010; Groom 2011
Pinus pinaster	Pinaster or maritime pine	Primary	-	-	Groom 2011
Pinus radiata	Radiata pine	Primary	Secondary	-	Johnstone et al. 2010; Groom 2011
Pinus spp.		Primary	Secondary	-	Johnstone & Storr 1998; Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Protea 'Pink Ice'		Secondary	-	-	Groom 2011
Protea repens		Secondary	-	-	Groom 2011
Protea spp.		Secondary	-	-	Johnstone et al. 2010
Prunus amygdalus	Almond tree	Secondary	-	-	Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017
Pyrus communis	European pear	-	Secondary	-	Johnstone & Storr 1998; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Quercus spp.	Oak	-	Secondary	-	Johnstone et al. 2010

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Raphanus raphanistrum	Wild radish	Secondary	-	-	Groom 2011; DoEE 2017
Reedia spathacea		-	Secondary	-	Johnstone et al. 2010
Rumex hypogaeus	Doublegee	Secondary	-	-	Saunders 1980
Stenocarpus sinuatus		Secondary	-	-	Johnstone et al. 2010
Syzygium smithii	Lilly pilly	Secondary	-	-	Groom 2014
Tipuana tipu	Tipu or rosewood tree	Primary	-	-	Groom 2011, Groom 2014
Xanthorrhoea preissii	Grass tree	Secondary	Secondary	-	Groom 2011; Johnstone et al. 2010
Xylomelum occidentale	Woody pear	Secondary	-	-	Groom 2014

CBC=Carnaby's black cockatoo, BBC=Baudin's black cockatoo and FRTBC=Forest red-tailed black cockatoo

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