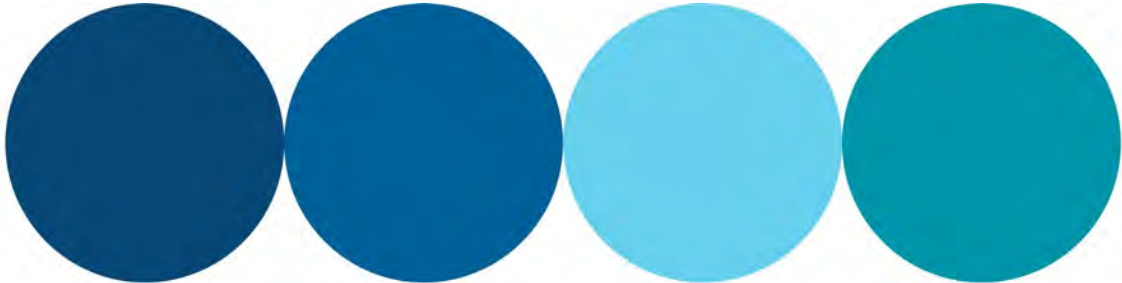


Alkimos Seawater Desalination Plant

Draft Offset Strategy

April 2023





Document information

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1 Introduction

Water Corporation has updated this Offset Strategy following the public comment period for the Alkimos Seawater Desalination Plant (ASDP) Environmental Review Document (ERD), Revision 6 (Water Corporation, August 2022).

The ASDP ERD indicates a significant residual impact may result through the implementation of the Proposal on the Landforms, Flora and Vegetation and Terrestrial Fauna Environmental Factors.

The purpose of this Offsets Strategy is to identify and quantify the potential significant residual impacts to the Landforms, Flora and Vegetation and Terrestrial Fauna Environmental Factors and outline the preliminary approach to counterbalance these impacts consistent with the Western Australian (WA) Environmental Offsets Policy (Government of Western Australia, 2011) and Commonwealth EPBC Act environmental offsets policy (Australian Government, 2012).

This Offset Strategy is limited to the consideration of Landforms, Flora and Vegetation and Terrestrial Fauna Environmental Factors.

The objectives of this strategy are to:

- Describe the potential significant residual environmental impacts to State listed environmental values and Matters of National Environmental Significance (MNES) through an assessment of the environmental factor guidelines Flora and Vegetation and Terrestrial Fauna.
- Estimate the quantity of offsets that may be required to meet regulatory guidelines using the WA Environmental Offsets Template (Government of Western Australia 2014b) and/or the Commonwealth Offsets Assessment Guides (Australian Government 2012b).
- Identify the proposed strategy to counterbalance the Proposal's significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

This strategy has been developed to meet the offset requirements prescribed under the Commonwealth and WA associated policies and guidelines as listed in Section 1.2.

The proposed offset options have been selected to be permanent, achievable and provide a long-term strategic outcome that benefits both the environment and the land manager. The Offset Strategy will be updated to meet the conditions and other associated requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and WA *Environmental Protection Act 1986* (EP Act).



1.1 Proposal Description

The Water Corporation plans to build and operate the Alkimos Seawater Desalination Plant Project (ASDP) (the Proposal).

The Proposal comprises the Seawater Desalination Plant (SDP) including marine works and infrastructure, Groundwater Treatment Plant (GWTP) and an associated 32.93 km long pipeline connecting the desalination plant to the Wanneroo Reservoir with a spur pipeline to the Carabooda Tank.

The construction and operation of a 100 GL per annum seawater desalination plant (SDP) and a 4.9 GL per annum groundwater treatment plant (GWTP) at the Alkimos water precinct.

The source water for the desalination process will be delivered through the construction of a pipeline directly west of the proposed SDP. By-products of the desalination process will be returned further offshore to the marine environment through a separate pipeline.

In order to distribute the drinking water into Perth's Integrated Water Supply Scheme (IWSS), the project includes a 32.93 km pipeline from the Alkimos site to the Wanneroo Reservoir, and other significant distribution points along the pipe route.

1.2 Regulatory Requirements

1.2.1 Legislative and Policy Context

The significant residual environmental impacts of the Proposal and appropriate offsets to counterbalance these impacts were identified and assessed in accordance with the following legislation, policies and guidelines:

- *Environmental Protection Act 1986* (EP Act).
- WA Environmental Offsets Policy (Government of Western Australia 2011).
- WA Environmental Offsets Guidelines (Government of Western Australia 2014a).
- EPBC Act Environmental Offsets Policy (Australian Government 2012a), and
- Commonwealth Offsets Assessment Guide (Australian Government 2012b).

1.2.2 Environment Protection and Biodiversity Conservation Act 1999

The Water Corporation referred the Proposal to the Commonwealth's Department of Environment and Energy (DoEE – now Department of Climate Change, Energy, the Environment and Water (DCCEEW) - formerly Department of Agriculture, Water and Environment; EPBC referral no. 2019/8453) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in July 2019. The Proposal was determined to be a 'Controlled Action' by a delegate of the Commonwealth Minister for the EPBC Act as it will, or is likely to have, a significant impact on the following Matters of National Environmental Significance (MNES):

- Listed threatened species and communities (section 18 and 18A); and
- Listed migratory species (sections 20 & 20A).



On 4 March 2020, it was also determined that the Proposal could be assessed by accredited assessment under the State and Commonwealth's Bilateral Agreement.

1.2.3 Environmental Protection Act 1986

The Water Corporation referred the Proposal to the WA Environmental Protection Authority (EPA) in accordance with Section 38 of the EP Act in May 2019 (EPA Assessment 2210). The EPA set the level of assessment as Public Environmental Review with four weeks public comment, with the following were preliminary environmental factors:

- Sea
 - Marine Environmental Quality
 - Benthic Communities and Habitats
 - Marine Fauna
- Land
 - Landforms
 - Flora and Vegetation
 - Terrestrial Fauna
- Air
 - Greenhouse Gas Emissions
- People
 - Social Surroundings

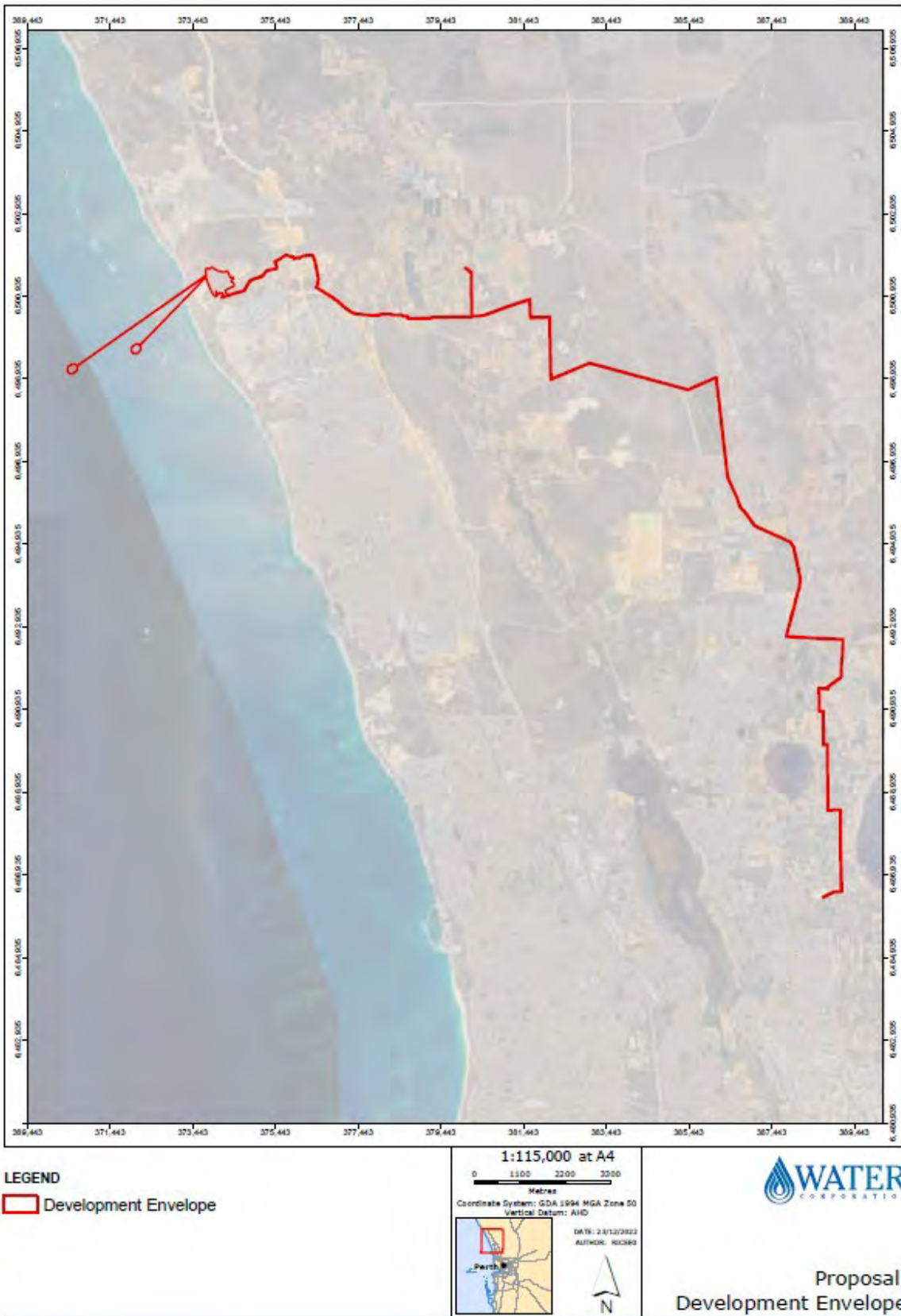


Figure 1-1: Proposal Overview



2 Significant Residual Environmental Impacts

Clearing of vegetation will be required to facilitate the construction of the SDP and Pipeline. Following the application of avoidance, minimisation and mitigation measures, there are several activities associated with the Proposal that have the potential to impact the environment, including impacts to EPBC Act and BC Act listed species and communities including:

- Banksia Woodland Threatened Ecological Community (TEC),
- Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain TEC (Cr),
- *Melaleuca huegelii-Melaleuca systema* shrublands on limestone ridges SCP26a (En), and
- Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*).

In addition, the project also results in significant residual impacts to:

- Bush Forever, and
- Landforms within Public Purposes Reserve in the Alkimos Water Precinct (reserved for conservation).

These impacts to terrestrial conservation values as a result of construction of the Proposal are summarised in Table 2-1.

Table 2-1: Area of Terrestrial Conservation Values Impacted by the Proposal

Vegetation / Habitat / Conservation Area	Listing		Proposal Total Impact
	EPBC Act	BC Act	
<i>Banksia</i> Woodlands of the Swan Coastal Plain	TEC (Endangered)	PEC (P3)	1.60 ha
Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forest of the Swan Coastal Plain	TEC (Critically Endangered)	PEC (P3)	1.16 ha
<i>Melaleuca huegelii-Melaleuca systema</i> shrublands on limestone ridges	-	TEC (En)	1.03 ha
Bush Forever	-	-	9.38 ha
Public Purposes reserve (for conservation) areas within Alkimos Water Precinct. (Area 10b)	-	-	5.17 ha
Carnaby's Cockatoo Foraging habitat	Endangered	Endangered	52.04 ha
Forest Red Tailed Black Cockatoo Foraging habitat	Vulnerable	Vulnerable	49.73 ha
Black Cockatoo species - Significant trees			104 trees



2.1 Banksia Woodlands of the Swan Coastal Plain

The Alkimos SDP Proposal will result in the clearing of no more than 1.60 ha of Banksia Woodlands of the Swan Coastal Plain ecological community' Threatened Ecological Community (TEC) as shown in Figure 2.

Banksia Woodlands of the Swan Coastal Plain was listed in September 2016 as an Endangered TEC under the EPBC Act. The Banksia Woodlands TEC is described in the EPBC Act Approved Conservation Advice (TSSC 2016) as:

A Woodland associated with the Swan Coastal Plain of southwest Western Australia. A key diagnostic feature is a prominent tree layer of Banksia, with scattered eucalypts and other tree species often present among or emerging above the Banksia canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range.

The 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' PEC is listed as Priority 3 by the WA Department of Biodiversity, Conservation and Attractions (DBCA). The PEC differs from the TEC in that it has no minimum condition and patch size thresholds. For this plan, there are no areas of the PEC within the development envelope that extend beyond the boundary of the Banksia Woodlands TEC.

The Proposal involves the clearing of 1.60 ha of Banksia Woodland TEC / PEC vegetation within the development envelope. The composition and condition of the Banksia Woodland in the development envelope is considered to be 'Very Good to Good' condition.

2.1.1 Significant residual impact

Following consideration of avoidance and mitigation measures to reduce impacts on flora and vegetation, Water Corporation has considered that clearing of the Banksia Woodlands TEC requires provision of an environmental offset to compensate for the significant residual impacts from the Proposal.

2.1.2 Total quantum of impact

Although this TEC is a Commonwealth and State listed community, Water Corporation has used Commonwealth Offset Calculator to quantify the impact of the proposal based on the quality of the vegetation impacted by the Proposal, as shown in Table 2-2.

Table 2-2: Banksia Woodland TEC/PEC area impact calculations

Criteria	Value	Explanation
Impact area (ha)	1.60 ha	The Proposal will result in the clearing of no more than 1.60 ha of Banksia Woodland TEC / PEC within the impact footprint.
Quality (scale 0 – 10)	7	A value of 7 has been applied in the calculator to reflect the majority of the Banksia Woodland TEC / PEC being in Very Good to Good condition.
Total Quantum of Offsets required	1.12 ha	Adjusted based on assessment of quality.

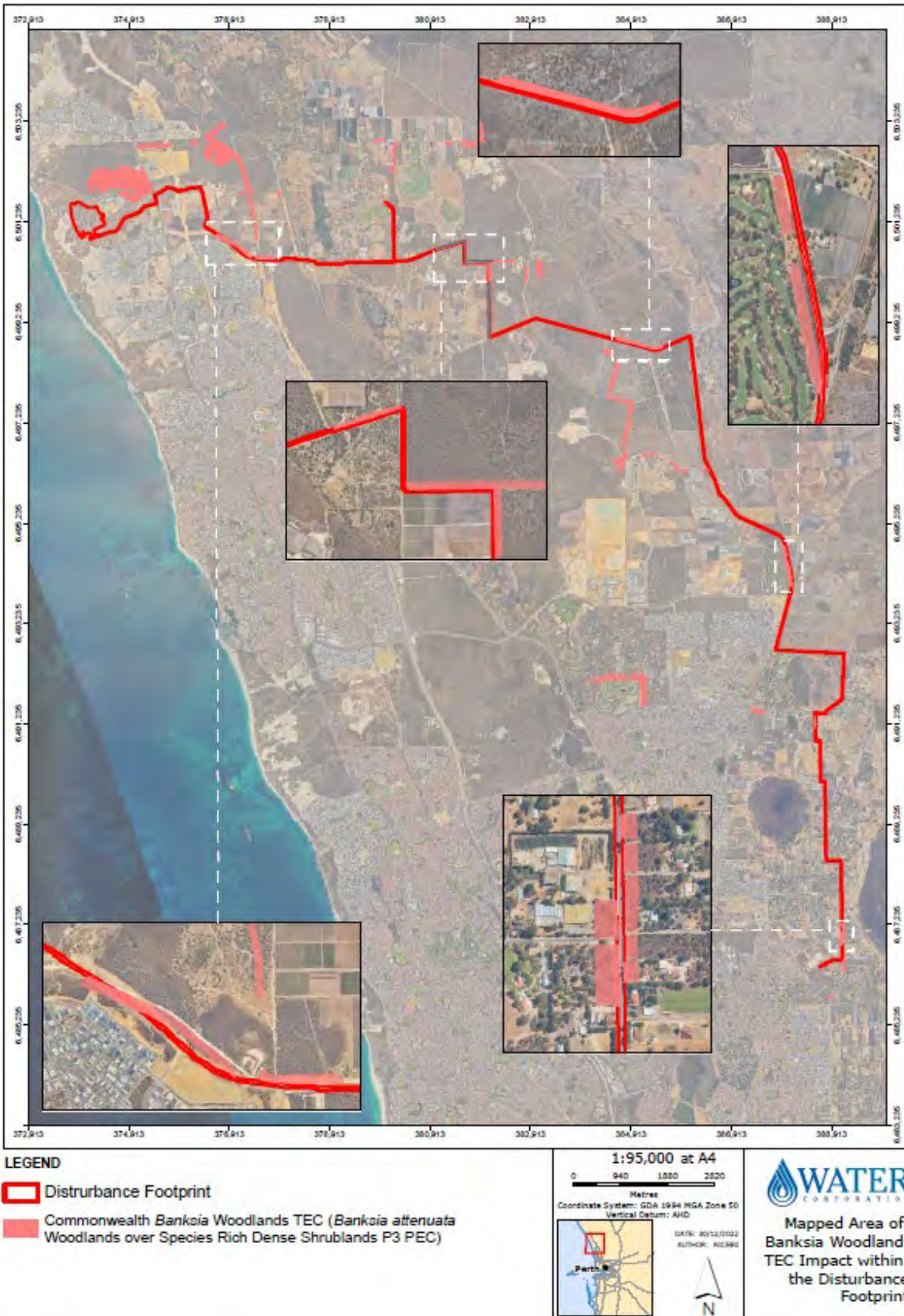


Figure 2-1 – Banksia Woodland TEC within footprint



2.2 Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain

The Alkimos SDP Proposal will result in the clearing of no more than 1.16 ha of Tuart Woodlands and Forests of the Swan Coastal Plain ecological community' Threatened Ecological Community (TEC) as shown in Figure 3.

The Tuart woodlands and forest of the Swan Coastal Plain is a nationally protected ecological community. It is comprised of woodlands or forests within which the presence of Tuart (*Eucalyptus gomphocephala*) trees in the uppermost canopy are the primary defining feature. The community also often contains other native trees such as Peppermint, Bull Banksia, Candlestick Banksia or Jarrah, with a substantial diversity of understorey plants.

The 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community' was listed as a TEC under the EPBC Act in 2019 at the level of 'Critically Endangered' as assessed using the criteria of the IUCN (2015) and guidance of TSSC (2019). This community is also listed as Priority 3 PEC under the WA *Biodiversity Conservation Act 2016*.

2.2.1 Significant Residual Impact

Following consideration of avoidance and mitigation measures to reduce impacts on flora and vegetation, Water Corporation has considered that clearing of the Tuart Woodlands TEC / PEC requires provision of an environmental offset to compensate for the significant residual impacts.

2.2.2 Total Quantum of Impacts

The composition and condition of the Tuart TEC impacted by the proposal is detailed as 'Very good to Good'.

Although this TEC is a Commonwealth and State listed community, Water Corporation has used Commonwealth Offset Calculator to quantify the impact of the proposal based on the quality of the vegetation impacted by the Proposal, as shown in Table 2-3.

Table 2-3: Tuart Woodlands TEC/PEC area impact calculations

Criteria	Value	Explanation
Impact area (ha)	1.16 ha	The Proposal will result in the clearing of no more than 1.16 ha of Tuart Woodlands TEC / PEC within the impact footprint
Quality (scale 0 – 10)	7	A value of 7 has been applied in the calculator to reflect the majority of the Tuart Woodlands being predominantly in Very Good condition.
Total Quantum of Offsets required	0.81 ha	Adjusted based on assessment of quality.

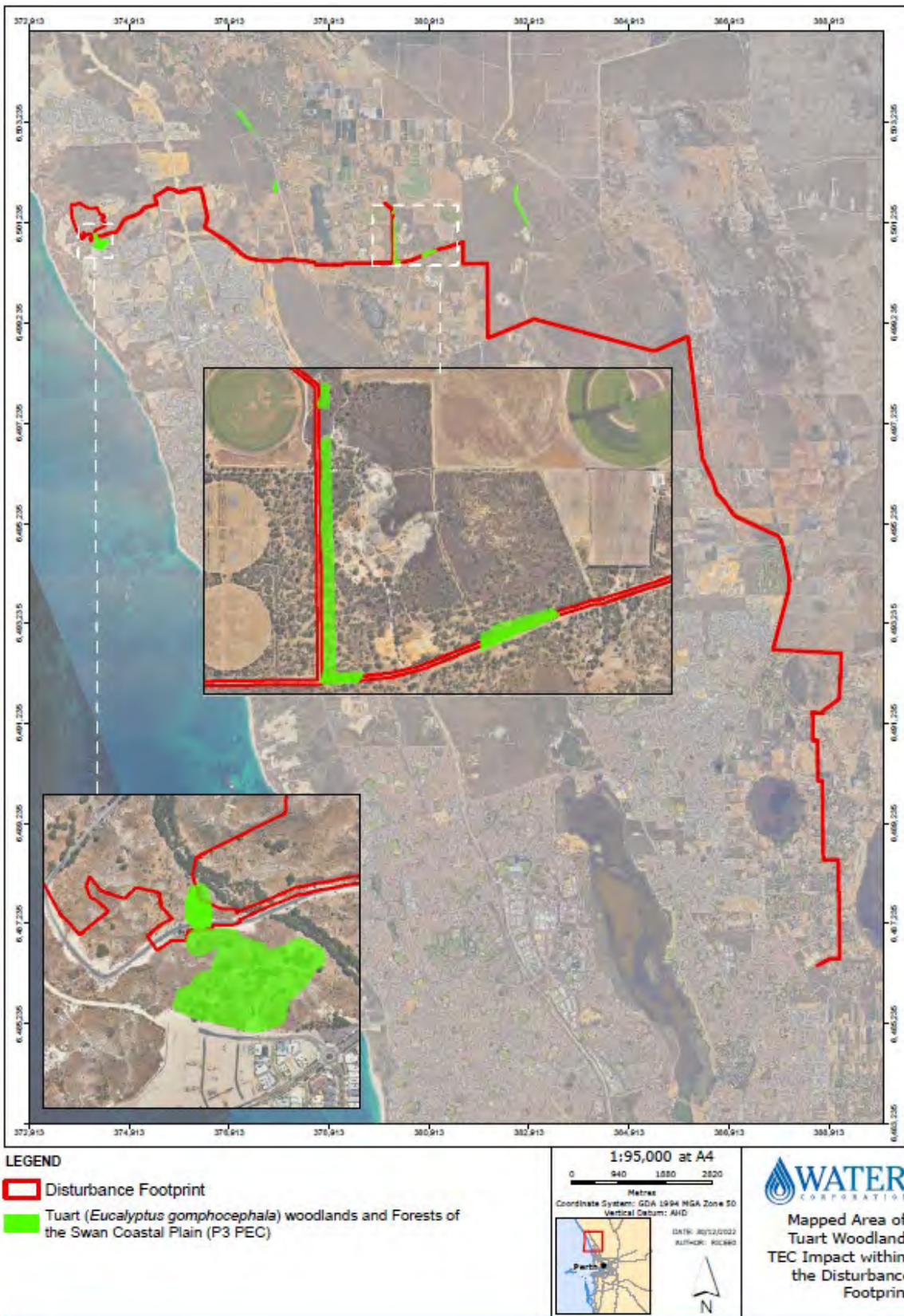


Figure 2-2 – Tuart TEC within footprint



2.3 *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges

The Alkimos SDP Proposal will result in the clearing of no more than 1.03 ha of *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges Threatened Ecological Community (TEC) as shown in Figure 4.

The *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges community occurs on skeletal soil on limestone ridge slopes and ridge tops north and south of Perth within the Alkimos SDP development envelope.

The community comprises species-rich thickets, heaths and scrubs dominated by *Melaleuca huegelii* (chenille honeymyrtle), *Melaleuca systema* (coastal honeymyrtle) and *Banksia sessilis* (parrot bush) commonly over *Grevillea preissii* (spider net grevillea) and *Acacia lasiocarpa* (pajang). A suite of herbs commonly occurs under the shrub layer. The community is also known as “floristic community type 26a”.

This community is listed as endangered under WA Minister Environmentally Sensitive Areas list in policy. It is highly restricted and known from massive limestone ridges around Yanchep north of Perth, and south of Perth near Lake Clifton.

2.3.1 Significant Residual Impact

Following consideration of avoidance and mitigation measures to reduce impacts on flora and vegetation, Water Corporation has considered that clearing of the *Melaleuca* TEC requires provision of an environmental offset to compensate for the significant residual impacts on floristic community type 26a.

2.3.2 Total Quantum of Impacts

As this TEC is a state listed community, Water Corporation has used the WA Government Offset Calculator to quantify the impact of the proposal based on the quality of the vegetation impacted by the Proposal, as shown in Table 2-4.

Table 2-4: Floristic community type 26a area impact calculations

Criteria	Value	Explanation
Impact area (ha)	1.03 ha	The Proposal will result in the clearing of no more than 1.03 ha of floristic community type 26a within the impact footprint
Quality (scale 0 – 10)	7	A value of 7 has been applied in the calculator to reflect the majority of the floristic community type 26a being in Very Good condition.
Total Quantum of Offsets required	0.72 ha	Adjusted based on assessment of quality.

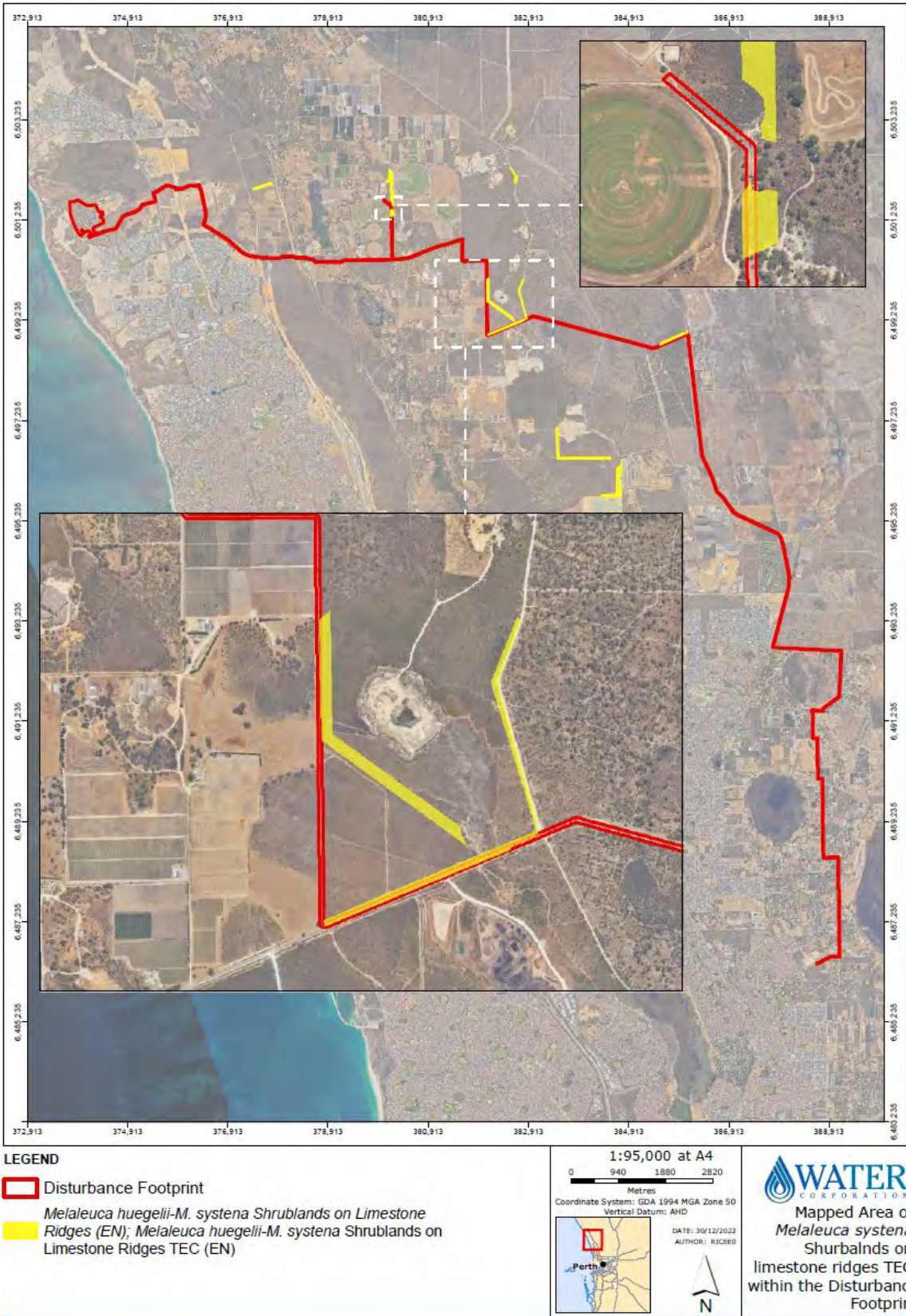


Figure 2-3 – Melaleuca TEC within footprint



2.4 Bush Forever and Public Purposes Areas (Reserved for Conservation)

The Alkimos SDP Proposal will result in the clearing of no more than 9.38 ha of Bush Forever and 5.17 ha of land zoned Public Purposes Reserve (for conservation), as shown in Figure 5 and Figure 6.

Bush Forever

Bush Forever is a Western Australian Government strategic plan to protect regionally significant bushland in a number of sites around the Swan Coastal Plain portion of the Perth Metropolitan with an aim to achieve a sustainable balance between conservation of our bushland and development in metropolitan Perth. The Bush Forever Policy was to be implemented as a whole of government initiative designed to identify, protect and manage regionally significant bushland.

Of the 26 vegetation complexes in the Perth Metropolitan Region, seven currently fall below the minimum 10 per cent target retention aimed at by Bush Forever. Bush Forever is the primary mechanism for implementing the Government's commitment to conserve regionally significant bushland in Perth.

Landforms

Metropolitan Regional Scheme (MRS) amendment 1029/33 delineated an area in the Alkimos precinct as Public Purposes Reserve. This is now referred to as the Alkimos Water Precinct, and currently contains the Alkimos wastewater treatment plant, with the remainder of the precinct preserved as an odour buffer.

The EPA assessment of the MRS amendment recommended that areas 9a and 10a be protected for conservation purposes to protect the integrity, function and environmental value of the bushland, including the landforms. Area 10b was subsequently added into Ministerial Statement 722 through the appeals determination process, containing significant landforms of the Alkimos Dune Complex (within the Quindalup South Dune System).

2.4.1 Significant Residual Impact

Following consideration of avoidance and mitigation measures to reduce impacts on landforms and flora and vegetation, Water Corporation has considered that the impacts to Bush Forever and Public Purposes Reserve (Area 10b) require the provision of an environmental offset to compensate for the significant residual impacts.

Bush Forever

The Bush Forever sites impacted by the project only occur along the pipeline route between the Alkimos SDP and the Wanneroo reservoir. Where the pipeline does intersect Bush Forever sites, this occurs predominantly within road reserves, tracks and Degraded to Completely Degraded areas. With this consideration, the total vegetated area within Bush Forever sites within the Disturbance Footprint would reduce from 9.38 ha to 6.18 ha.

Landforms

Although no significant residual impact to landforms is expected as a result of the Proposal (Landforms independently), Water Corporation acknowledges that the proposal does impact 5.17



ha of the Quindalup South Dune System within Area 10b. Given Area 10b was protected in Ministerial Statement 722 (through the appeals process), Water Corporation commits to the provision of an offset to counterbalance the significant residual impact to landforms within Area 10b.

2.4.2 Total Quantum of Impacts

Consideration of offsets for Bush Forever have been considered in accordance with State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (June 2010) as detailed in Table 2-5.

In the absence of specific guidance on offsets for landforms within Public Purposes Reserve (Area 10b), the areas are simply quantified on a hectare basis and detailed in Table 2-5.

Table 2-5: Bush Forever and Public Purposes Reserve (Area 10b) impact calculations

Criteria	Value	Explanation
Bush Forever impact area (ha)	9.38 ha	The Proposal will result in the impact to no more than 9.38 ha within the pipeline impact footprint predominantly within road reserves, tracks and cleared areas (likely to reduce to 6.18 ha when considered with condition).
Public Purposes Reserve (Area 10b)	5.17 ha	The Proposal will result in the impact to no more than 5.17 ha Public Purposes Reserve (Area 10b) within the ASDP development envelope. This includes impacts to: - 4.646 ha of Quindalup South Third dune phase (Q3), - 0.52ha of Quindalup South deep sand flat Phase, and - 0.002ha of Quindalup South shallow sand flat Phase



Figure 2-4 – Bush forever within Development Envelope



LEGEND

Development Envelope

MRS amendment areas

Public Purposes Reserve - Area 10b

Public Purposes Reserve - Area 9a and 10a

East-west parabolic dune linkage - Area 9c

East-west parabolic dune linkage - Area 9d

Soils Subsystems V5

Landforms

Quindalup South deep sand flat Phase

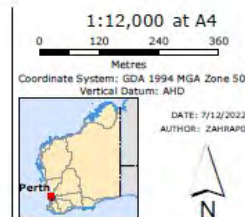
Quindalup South oldest dune Phase

Quindalup South second dune Phase

Quindalup South shallow sand flat Phase

Quindalup South third dune Phase

Quindalup South unstable sand Phase



WATER
CORPORATION
Metropolitan
Regional Scheme -
Public Purposes
Reserve -
Landforms

Figure 2-5 – Impacted Public Purposes Reserve (Area 10b)



2.5 Black Cockatoos

Two species of threatened black cockatoo were identified as occurring (foraging evidence) within the Development Envelope during detailed fauna assessments for the Alkimos SDP proposal. These species include Carnaby's Cockatoo (*Zanda latirostris*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*).

The Alkimos SDP Proposal will result in the clearing of no more than 52.04 ha of Carnaby's Cockatoo and 49.72 ha of Forest Red-Tailed Black Cockatoo foraging habitat within the Development Envelope including up to 104 Potential Black Cockatoo breeding trees, as shown in the Fauna Habitat map series in Appendix B.

Carnaby's Cockatoo

During the breeding season, Carnaby's Cockatoo forage in native vegetation that surrounds woodlands used for breeding. Breeding habitats (or sites) encompass those areas that contain suitable breeding trees within the range of the species, and associated foraging habitat. Carnaby's Cockatoos nest in the large hollows of tall living or dead Eucalypts. Formerly breeding activity was typically restricted to Eucalypt woodlands mainly in the Wheatbelt, but recent breeding activity records indicate the species has expanded its breeding range west and southward into the Jarrah-Marri forests of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain, including the Yanchep area, Lake Clifton and near Bunbury (Australian Government 2016a).

During the non-breeding season, Carnaby's Cockatoo forage extensively on the Swan Coastal Plain on Banksia woodlands, Seeding Marri and Jarrah, Pine plantations and Native and non-native plants around the Perth metropolitan area (Australian Government 2016a).

Forest Red-tailed Black Cockatoo

Forest Red-tailed Black Cockatoo are endemic to the humid and sub-humid zones of the south-west of Western Australia, generally inhabiting the Jarrah, Marri and Karri forests within the 600mm average rainfall isohyet.

Family groups and small flocks are now also observed on the Swan Coastal Plain throughout the year. The critical breeding habitat for this species is within remnant patches of old Marri (*Corymbia calophylla*) trees within the Northern and Southern Jarrah Forest IBRA sub-regions (Government of Western Australia 2017).

Roost sites are in Jarrah-Marri-Blackbutt habitat generally situated within 4 km of potential feeding sites. They are most often observed in small flocks at dawn or dusk as they leave or return to a roost site. Approximately 90% of the Forest Red-tailed Black Cockatoo diet is made up of Marri (*Corymbia calophylla*) seeds and Jarrah (*Eucalyptus marginata*) fruit, but they will also feed on Blackbutt (*Eucalyptus patens*), Karri (*Eucalyptus diversicolor*), Sheoak (*Allocasuarina fraseriana*), and other non-native species such as the Cape Lilac (*Melia azedarach*) on the Swan Coastal Plain (Government of Western Australia 2017).

Both the Forest Red-tailed and Carnaby's Cockatoos may occur on the site. However, the Forest Red-tailed is only thought to be an irregular visitor as it is understood that there is less potential foraging habitat present.



2.5.1 Significant Residual Impact

Following consideration of avoidance and mitigation measures to reduce impacts to Black Cockatoo foraging habitat and breeding trees, Water Corporation has considered that impacts to Black Cockatoos from the proposal requires provision of an environmental offset to compensate for the significant residual impacts.

2.5.2 Total Quantum of Impacts

The Proposal will also result in the clearing of up to 104 potential breeding trees as defined by the commonwealth guidance (DAWE, 2022).

Although both Black Cockatoo species are Commonwealth and State listed matters, Water Corporation has only used the Commonwealth Offset Calculator to quantify the impact of the proposal based on the quality of the vegetation impacted by the Proposal as shown in Table 2-6.

Table 2-6: Black Cockatoo area impact calculations

Criteria	Value	Explanation
Carnaby's Cockatoo habitat Impact area (ha)	52.04 ha	The Proposal will result in the clearing of no more than 52.04 ha of CBC foraging habitat within the impact footprint
Quality (scale 0 – 10)	10	The Value of 10 has been applied in the calculator to reflect the majority of the habitat being in high value condition.
Total Quantum of Offsets required	52.04 ha	Adjusted area of offset required, based on assessment of quality
Forest Red-tailed Black Cockatoo habitat Impact area (ha)		
Forest Red-tailed Black Cockatoo habitat Impact area (ha)	49.72 ha	The Proposal will result in the clearing of no more than 49.72 ha of FRTBC foraging habitat within the impact footprint.
Quality (scale 0 – 10)	10	The Value of 10 has been applied in the calculator to reflect the majority of the habitat being in high value condition.
Total Quantum of Offsets required	49.72 ha	Adjusted area of offset required, based on assessment of quality
Potential Black Cockatoo breeding trees (both species)		
Potential Black Cockatoo breeding trees (both species)	104 trees	The Proposal will result in the clearing of no more than 104 potential breeding trees within the impact footprint 8 of the 104 trees contain hollows.



3 Proposed Offset Strategy

The Proposal is currently being assessed under the State and Commonwealth Government's Bilateral Agreement as an accredited assessment, led by the WA EPA.

In accordance with the Bilateral Agreement, Water Corporation understand that the submission of the Environmental Review Document to the WA EPA will initiate inter-departmental consultation between both agencies to determine the requirements for, and quantum of the offset package for the Proposal.

The Water Corporation supports being engaged early in the process to ensure an appropriate offset package is developed that is proportionate to the residual impacts and achieves real on-ground environmental benefits and improved environmental values of the region.

Water Corporation has pursued a number of options in developing a package of offsets to counterbalance the significant residual impacts quantified in Section 2. These options are detailed in Section 3.1 and 3.1.4.

3.1 Land Acquisition

3.1.1 Eglinton Site

A parcel of Water Corporation owned freehold land within the suburb of Eglinton (adjacent to Alkimos) has been identified in the investigation of potential offset sites for the Alkimos SDP project as shown in Figure 7.

The Flora and Vegetation Consolidation Report (Stantec, 2021) mapped the majority of the Eglinton site as containing Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC). This vegetation comprises of an upper stratum dominated or co-dominated by one or more Banksia species was assessed against the criteria detailed within the Approved Conservation Advice (DotE 2016), to establish affinity with the Banksia Woodlands of the Swan Coastal Plain TEC. The Eglinton site was considered to be in 'excellent' vegetation condition.

The Eglinton site was surveyed as part of the Proposal and is located approximately 2.5 km East of the Alkimos SDP site. The Eglinton site abuts an existing land zoned parks and recreation, that was set reserved in the Metropolitan Region Scheme (MRS) Amendment 1029/33 for conservation purposes to protect the integrity, function, and environmental value of the bushland. Figure 8 details the proposed Eglinton offset site which would result in a contribution to adjacent land zoned parks and recreation. This provides an ecological linkage to other land reserved for conservation.

The Eglinton site also secures valuable foraging habitat for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo species.

Figure 7 demonstrates that there is sufficient TEC present within the Eglinton site (approximately 16.5ha) to meet the project offset requirements. However, it is preferred to utilise a 7 ha portion on the western side of the site.

Water Corporation proposes to use the **7 ha** (total area) Eglinton site, of which contains **5.98 ha** of Banksia Woodlands of the Swan Coastal Plain' TEC to primarily offset the impacts to that TEC from the project. The remaining 1.02 ha contains Northern Spearwood Shrublands and Woodlands PEC, which was included to reduce irregular boundary alignments (instead of following the TEC



mapping). The quantification of offset from the Eglinton site is detailed in Table 3-1. The Alkimos offset site provides equal value vegetation from across the pipeline route, however given the pipeline is 33km and impacts to the Banksia Woodland TEC are spread out across that entire length the offset is centrally located to the impacts.

It is also proposed to offset the impacts to Bush Forever from the project. As detailed in Section 2.4 the pipeline predominantly intersects Bush Forever sites within road reserves, tracks and cleared areas. Given its location within the MRS and connectivity to other land zone parks and recreation, the Eglinton site makes an ideal offset for Bush Forever.

With consideration to state conservation values, specifically Floristic Community Types (FCT), the Eglinton site is understood to mapped to contain FCT28. Given the Alkimos SDP proposal has now committed to avoiding FCT20a, the Eglinton site meets the offset requirements for the State and Commonwealth.

Timing: As the proposed offset site is currently owned by Water Corporation, the site will be secured, through a conservation covenant, within 1 year of the impact occurring. However, improvements (listed below) made to the site will be finalised within a 5-year period.

Table 3-1: Eglinton site offset

Environmental value (listing)	Proposed offset
Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community	5.98 ha
Carnaby's Cockatoo foraging habitat and Forest Red Tailed Black Cockatoo foraging habitat	7 ha
Bush Forever	7 ha

Actions prior to formalisation as offset:

- Survey site to confirm presence of TEC and FCT in proposed areas.
- Construct fencing within the Eglinton site (if required).
- Develop site management strategy into future, (as site will remain in Water Corporation's control)

Site management includes, but not limited to:

- Weed management,
- Rehabilitation of degraded areas,
- Installation of nesting boxes for Black Cockatoos (if appropriate)
- Revegetation,
- Fire management, and
- Routine monitoring of offset health (annual).

An Offset Management Plan for the Eglinton Offset Site has been prepared and is attached in Appendix E.

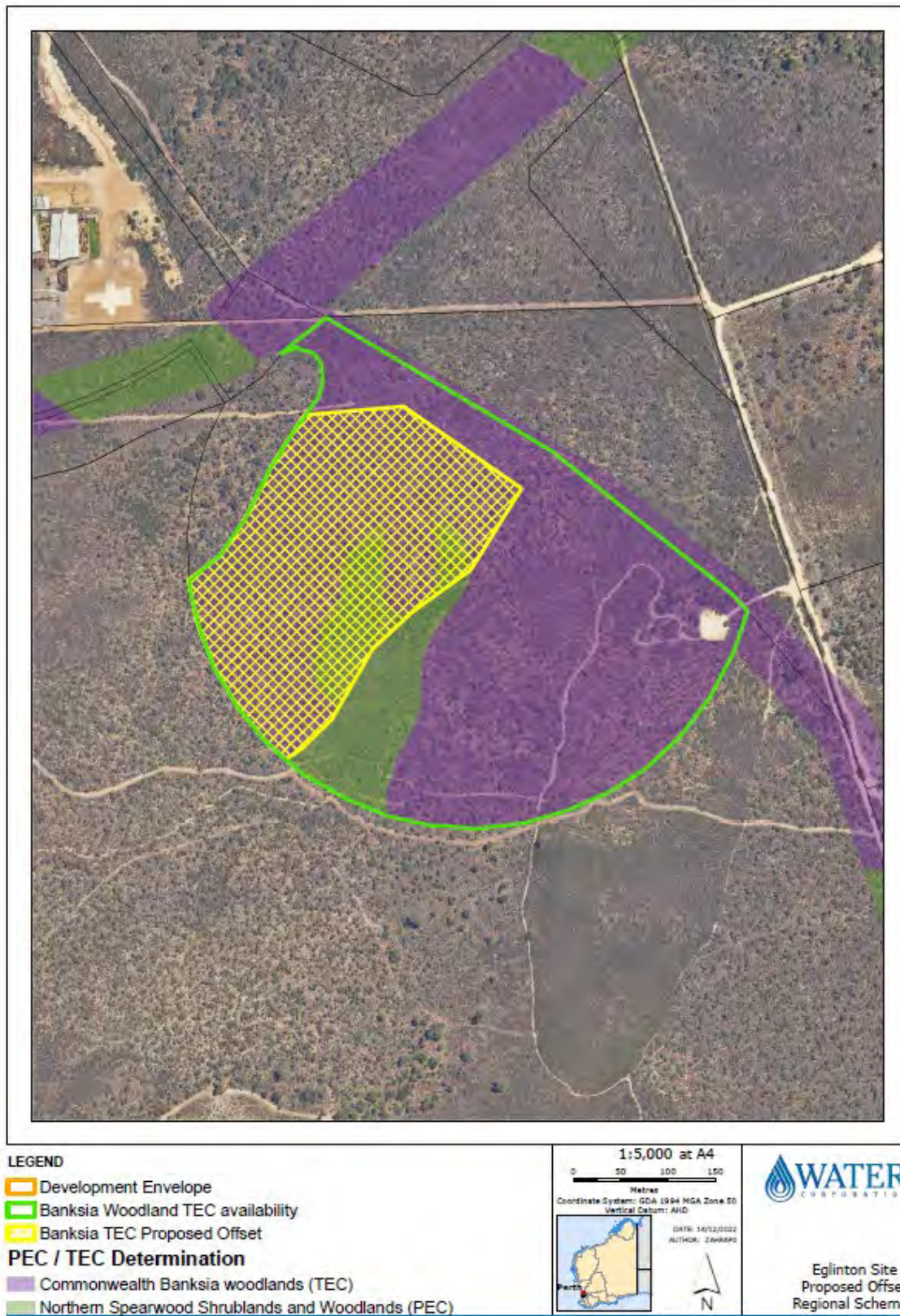


Figure 3-1 – Eglinton Site – TEC / PEC mapping



Figure 3-2 – Eglinton site – Offset site in relation to the Metropolitan Regional Scheme zoning

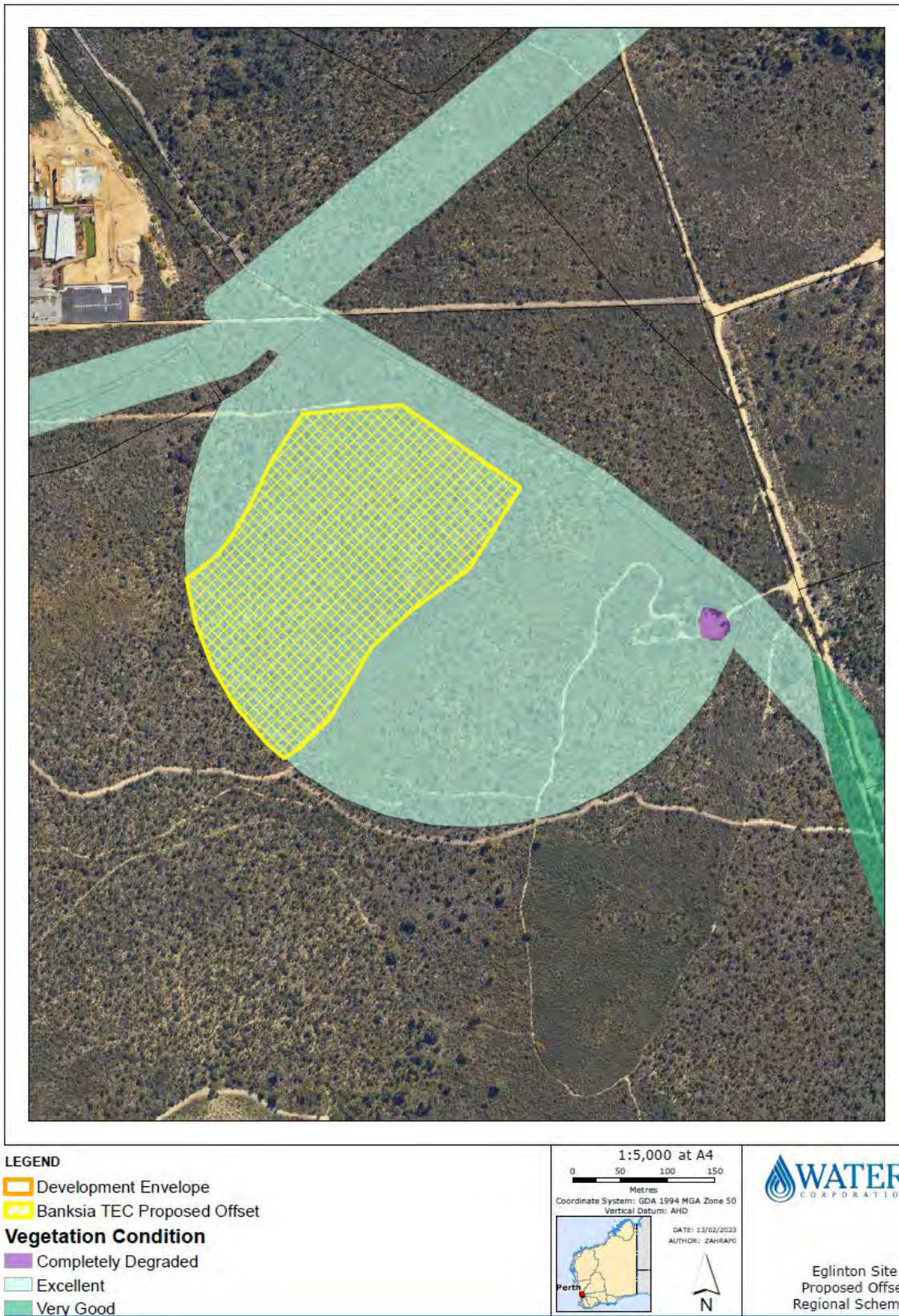


Figure 3-3 – Eglinton site – Vegetation Condition



3.1.2 Carabooda Tank Site

A parcel of land within the Carabooda Tank Site has been identified as a potential offset site for the Alkimos SDP project. This particular site is shown in Figure 10.

The Flora and Vegetation Consolidation Report (Stantec, 2021) mapped the Carabooda Tank site as containing the State-listed *Melaleuca huegelii-Melaleuca systema shrublands on limestone ridges* Threatened Ecological Community. The confirmation of these vegetation types to represent the TEC was verified by its description, outlined in Luu (2005); the presence of outcropping limestone and its affinity with FCT 26a.

This vegetation community comprises species-rich thickets, heaths and scrubs dominated by *Melaleuca huegelii*, *Melaleuca systema* and *Banksia sessilis* commonly over *Grevillea preissii* and *Acacia lasiocarpa*.

The Flora and Vegetation Consolidation Report (Stantec, 2021) identifies two vegetation units to be representative of the TEC:

- (BsXpCqMsHh) *Banksia sessilis* and *Xanthorrhoea preissii* tall open shrubland to closed heath over *Calothamnus quadrifidus*, *Melaleuca systema* and *Hibbertia hypericoides* low shrubland to low open heath, and
- (MhMsDaAfGp) *Melaleuca huegelii* and *Melaleuca systema* open heath to closed heath over *Grevillea preissii* subsp. *preissii* low shrubland over *Desmocladius asper* sedgeland and *Austrostipa flavescens* grassland.

The MhMsDaAfGp vegetation unit was identified at the Carabooda tank site and was shown to be in 'Excellent' vegetation condition.

The Carabooda Tank offset site is located within the Water Corporation owned Carabooda Tank cadastral boundary. The Alkimos SDP project will connect to the Carabooda Tank via a spur off the main pipeline. As shown in Figure 4 this offset site provides equal value vegetation immediately adjacent to, or within 5km, of where impacts to the Melaleuca TEC occur from the project.

Figure 10 demonstrates that there is sufficient TEC present within the site (approximately 3.5ha) to meet the project offset requirements. However, it is preferred to utilise the North-East corner of the site, noting that the preferred area has not been adequately surveyed to confirm the presence of the Melaleuca TEC. Prior to finalisation of the offset, an additional survey will confirm the presence of the TEC in the preferred location.

It is noted that the Carabooda Tank Site is a current Water Corporation operational asset and given the imminent change to the proposal, further confirmation the quarantining of the land as offset will need to be confirmed prior to finalisation of the offset.

The proposed offset will not only protect the Melaleuca TEC but is also proposed to additionally offset foraging habitat for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo species.

Table 3-2 and Figure 10 details the proposed quantity of Carabooda Tank Eglinton offset.

Timing: As the proposed offset site is currently owned by Water Corporation, the site will be secured, through a conservation covenant, within 1 year of the impact occurring. However, improvements (listed below) made to the site will be finalised within a 5 year period.



Table 3-2: Carabooda Tank site offset

Environmental value (listing)	Proposed offset
<i>Melaleuca huegelii</i> - <i>Melaleuca systena</i> shrublands on limestone ridges Threatened Ecological Community	3.1 ha
Carnaby's Cockatoo foraging habitat and Forest Red Tailed Black Cockatoo foraging habitat	3.1 ha

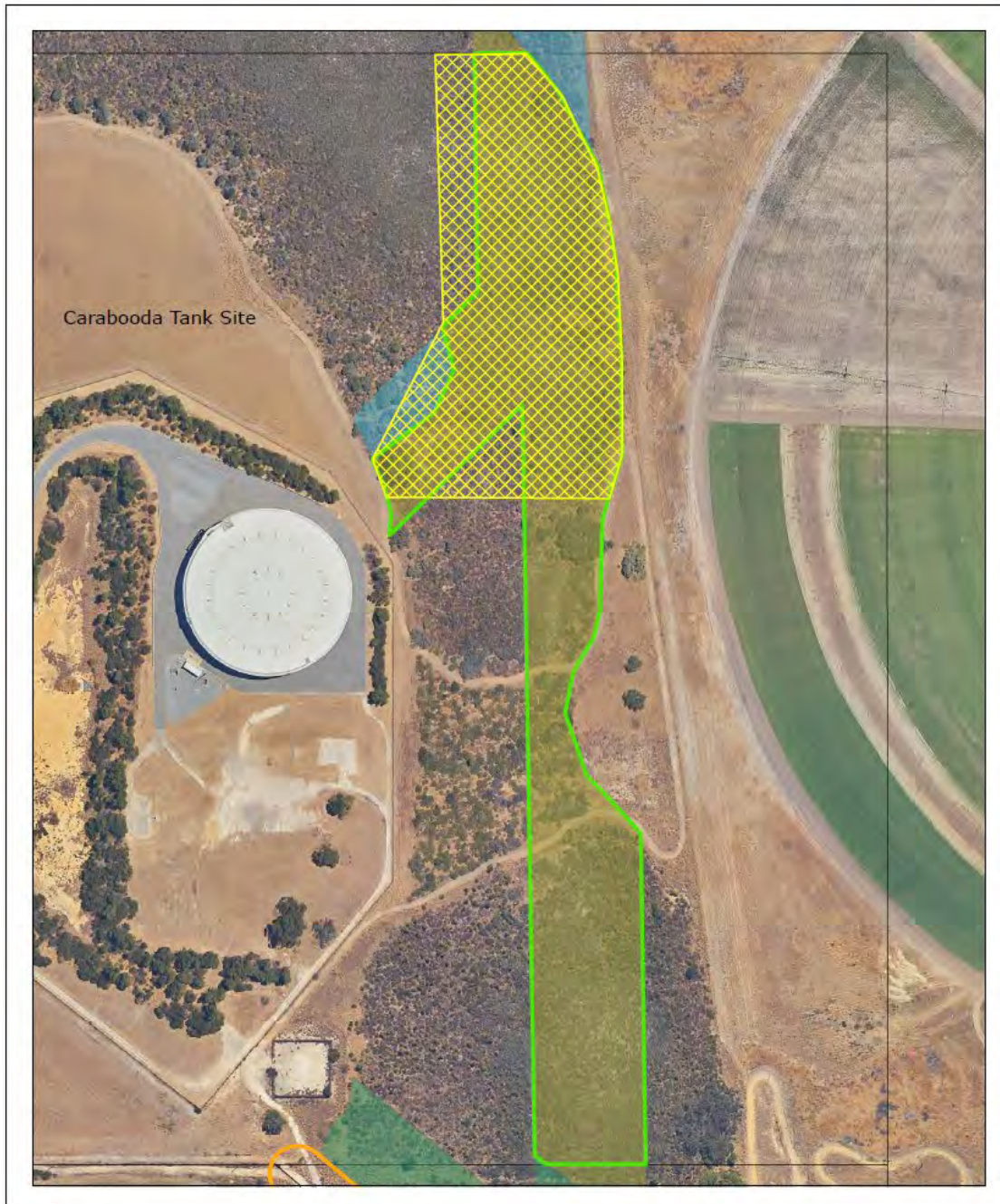
Actions prior to formalisation as offset:

- Survey site to confirm presence of TEC and FCT in proposed areas.
- Construct fencing within the Carabooda Tank site.
- Develop site management strategy into future, (as site will remain in Water Corporation's control)

Site management includes, but not limited to:

- Weed management,
- Revegetation,
- Rehabilitation of degraded areas,
- Fire management, and
- Routine monitoring of offset health (annual).

An Offset Management Plan for the Carabooda Tank Offset Site has been prepared and is attached in Appendix E.

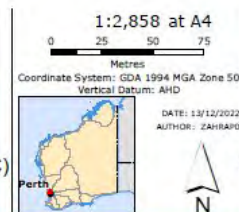


LEGEND

- Cadastral Boundary
- ▨ Proposed offset - Melaleuca TEC
- ▭ surveyed as Melaleuca TEC
- ASDP Development Envelope

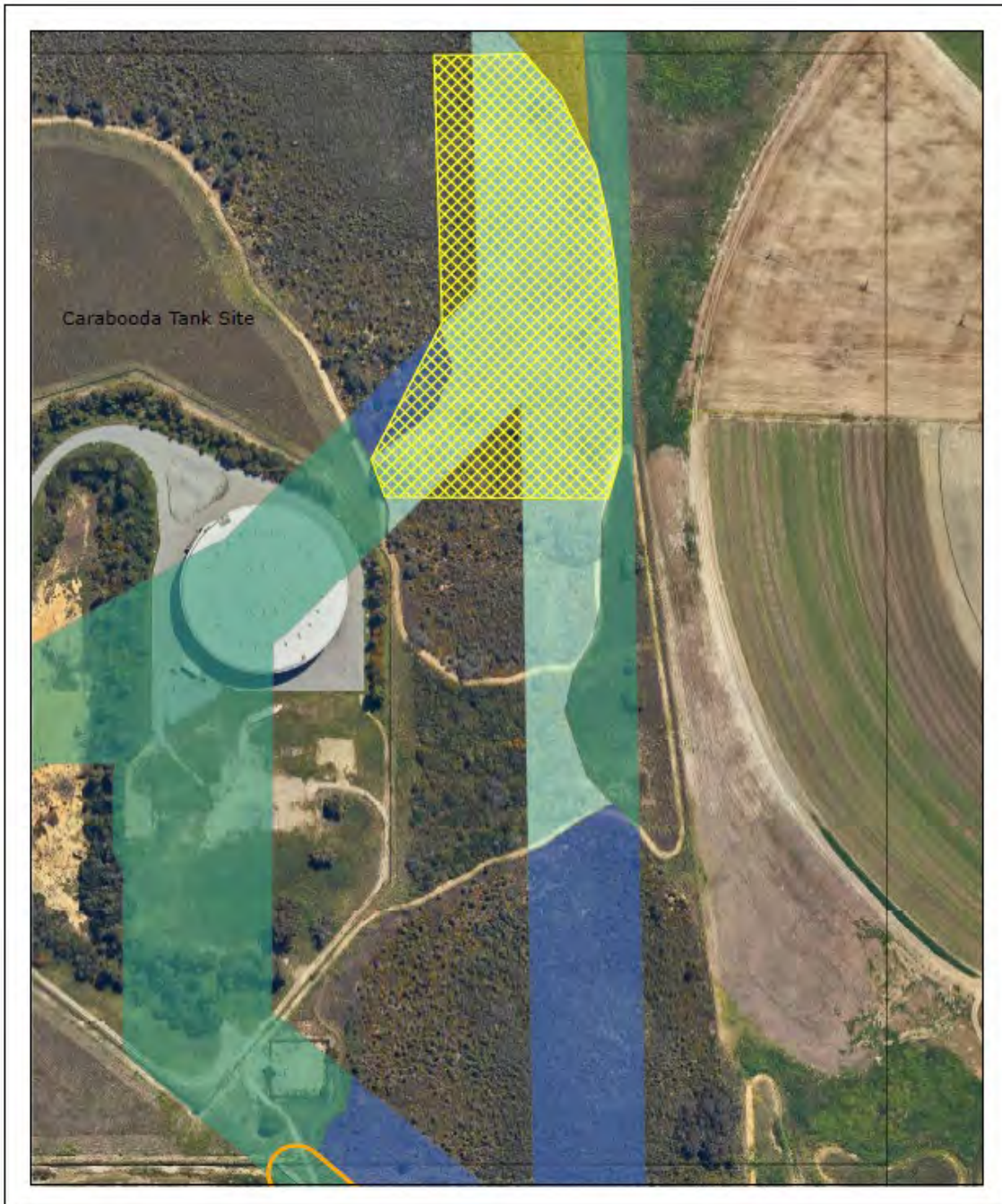
PEC / TEC Determination

- ▭ Commonwealth Banksia woodlands (TEC)
- ▭ Melaleuca huegelii-M. systema Shrublands on Limestone Ridges (TEC)
- ▭ Northern Spearwood Shrublands and Woodlands (PEC)










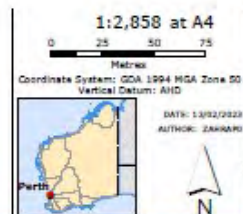

WATER CORPORATION
Proposed Offset
Melaleuca huegelii-
Melaleuca systema
shrublands on limestone
ridges TEC

Figure 3-4 – Carabooda Tank site



LEGEND

-  Cadastral Boundary
-  Proposed offset - Melaleuca TEC
- Vegetation Condition**
-  Completely Degraded
-  Excellent
-  Good
-  Very Good
-  ASDP Development Envelope

Proposed Offset
Melaleuca huegelii-
Melaleuca systena
shrublands on limestone
ridges TEC

Figure 3-5 – Carabooda Tank site – Vegetation condition



3.1.3 Alkimos Site

A parcel of Water Corporation owned freehold land within the Alkimos water precinct, adjacent to the Alkimos SDP project has been identified as an offset site for the Alkimos SDP project as shown in Figure 12. A large portion of the land is currently zoned urban deferred in the Metropolitan Region Scheme. This would indicate that it could potentially be used as future residential land.

Water Corporation is proposing to protect and rehabilitate this land primarily as an offset for the impacts to Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community' (referred to as the Tuart Woodland TEC). The presence of the Tuart Woodland TEC within the proposed Alkimos offset site was confirmed in the Flora and Vegetation Consolidation Report (Stantec, 2021). The proposed offset includes a mapped area of **4.91 ha** Tuart Woodland TEC within the total **9.01 ha** offset site as shown in Figure 12.

The Flora and Vegetation Consolidation Report (Stantec, 2021) also confirms the condition within the offset site as 1.55 ha in very good condition, 3.21 ha in good condition, and 0.15 ha completely degraded in accordance with EPA Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment, 2016. The offset site provides equal value vegetation immediately adjacent to, or within 5km, of where impacts to the Tuart Woodland TECs occur (presented in Figure 3).

A secondary benefit of this offset site would be to offset the impact to the Public Purposes Reserve (Area 10b) within the development envelope of the ASDP plant site as outlined in Section 2.4. This offset site contains the same landform values as Area 10b, approximately **7.5 ha** of the Alkimos Dune Complex within the Quindalup South Dune System (5.5 ha of Q3, 2 ha of the deep sand flat phase (Qp)), as shown in Figure 14.

A third benefit from this offset site will be the approximate **3.63 ha** of heath and shrubland vegetation, which was mapped as high-quality Black Cockatoo habitat in the Terrestrial Fauna Consolidation Report (Stantec, 2021b) and is shown in Figure 13. A further portion of proposed offset site was also mapped in the report as 4.58 ha of 'scattered trees', however this only represents low quality foraging habitat and is not included.

The offset site will contribute to ecological linkages between other land reserved for conservation within the Alkimos Water Precinct and provide valuable foraging habitat through securing known foraging habitat for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo species. The quantification of the proposed offset site from the Alkimos site is detailed in Table 3-3.

Timing: As the proposed offset site is currently owned by Water Corporation, the site will be secured, through a conservation covenant, within 1 year of the impact occurring. However, improvements (listed below) made to the site will be finalised within a 5-year period.

Table 3-3: Alkimos Water Precinct offset

Environmental value (listing)	Proposed offset
Tuart Woodlands TEC	4.91 ha
Quindalup South Dune System – Alkimos Dune Complex	7.5 ha (5.5 ha of Q3, 2 ha of Qp)
Carnaby's Cockatoo foraging habitat and Forest Red Tailed Black Cockatoo foraging habitat	3.63 ha



Actions prior to formalisation as offset:

- Construct fencing within the Alkimos site.
- Develop site management strategy into future, (as site will remain in Water Corporation's control)

Site management includes, but not limited to:

- Weed management,
- Rehabilitation of degraded areas,
- Revegetation,
- Fire management, and
- Routine monitoring of offset health (annual).

An Offset Management Plan for the Alkimos Offset Site has been prepared and is attached in Appendix E.



LEGEND

- Public Purposes (reserved for conservation)
- Proposed Offset
- ASDP Development Envelope
- Stantec_Assessment**
- Tuart Woodlands of Swan Coastal Plain TEC
- WA PEC 'Acacia shrublands on taller dunes, Southern Swan Coastal Plain'

1:7,000 at A4

0 70 140 210
Metres

Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD

DATE: 13/02/2023
AUTHOR: ZAHIRAO



Proposed Offset -
Tuart Woodlands
of the Swan Coastal
Plain TEC

Figure 3-6 – Proposed Alkimos Offset site



LEGEND

FaunaHab

- Cleared
- Pine Plantation Regrowth
- Public Purposes (reserved for conservation)
- Heath and Shrubland
- Scattered Trees
- Wetlands and Riparian Vegetation
- Parkland, Planted Vegetation and Gardens
- Pine Plantation
- Woodland

1:7,000 at A4

0 70 140 210

Metres

Coordinate System: GDA 1994 MGA Zone 59
Vertical Datum: AHD

DATE: 11/08/2021

AUTHOR: ZW/MAP

N



Proposed Offset -
Tuart Woodlands
of the Swan Coastal
Plain TEC

Figure 3-7 – Proposed Alkimos Offset Site – Black Cockatoo habitat

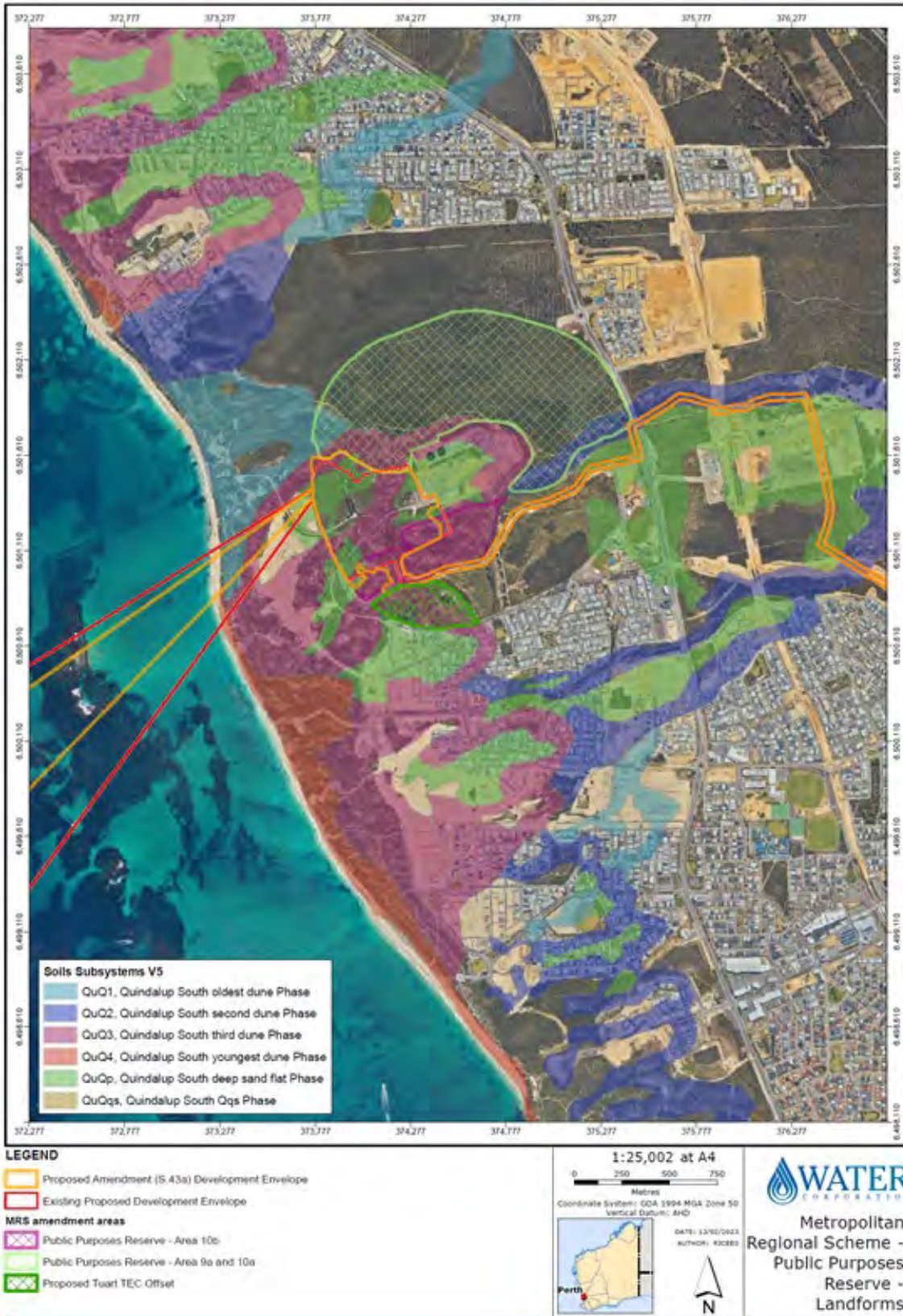


Figure 3-8 – Proposed Alkimos Offset Site – Landforms

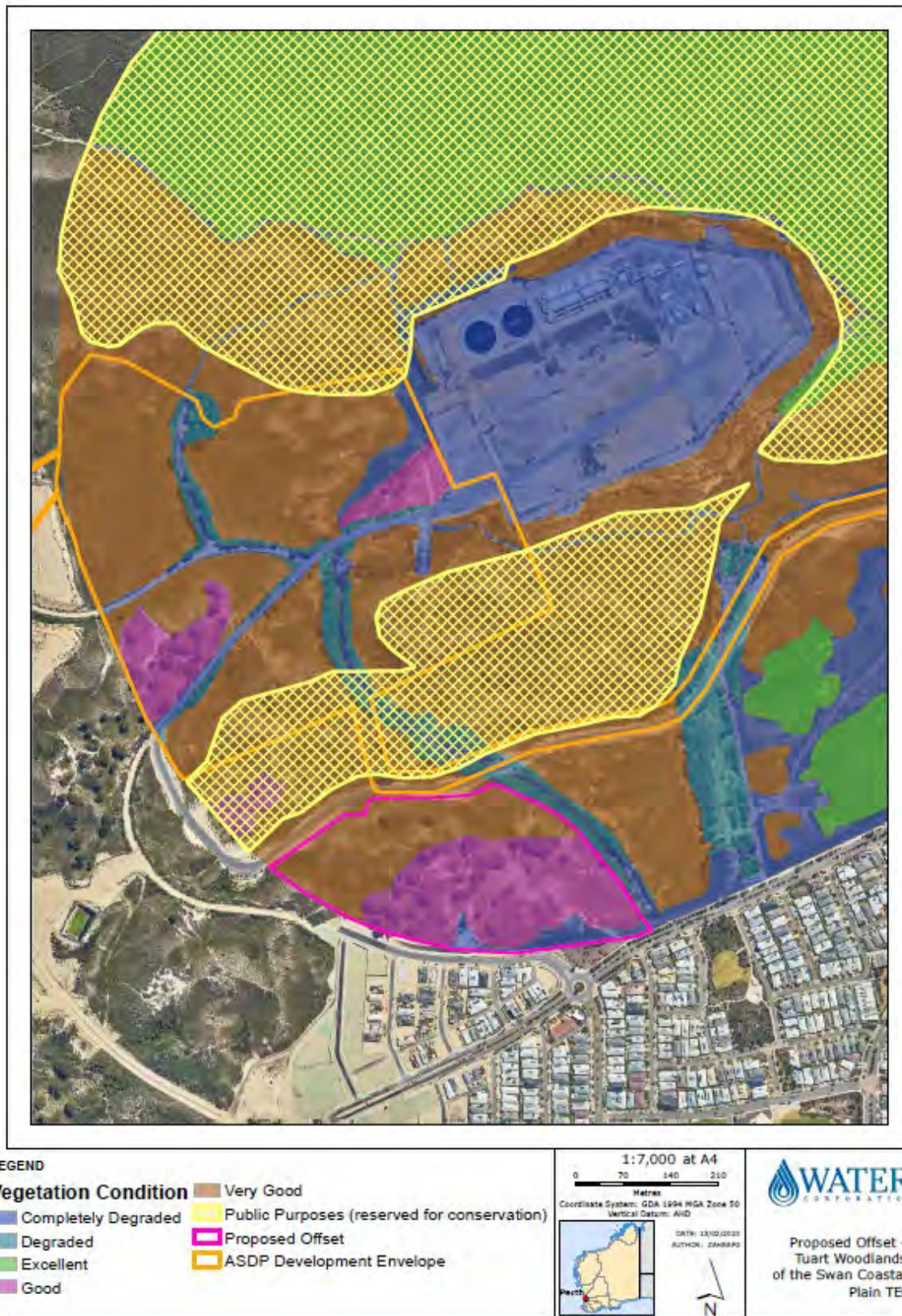


Figure 3-9 – Proposed Alkimos Offset Site – Vegetation condition



3.1.4 Neergabby site

Water Corporation has been collaborating with DBCA to contribute to funding the purchase two properties for eventual inclusion in the DBCA Conservation Estate.

The proposed sites are:

- Lot 1934 Gingin Brook Road, Neergabby, and
- Lot 58 Gingin Brook Road, Neergabby.

Both sites are located 32 km northeast of the ASDP site, 15 km east of Guilderton, as shown in Figure 3-10.

These properties contain values required to offset impacts from the Alkimos SDP project, in particular:

- Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC),
- Carnaby's Black Cockatoo foraging habitat,
- Forest Red-tail Black Cockatoo foraging habitat, and
- Significant breeding trees for Black Cockatoo species.

Both properties are currently in private ownership, but are well progressed in the negotiation and settlement process with DBCA.

Lot 1934 Gingin Brook Road, Neergabby is a 371-hectare rural property, predominantly vegetated with only 74 ha of cleared or partially cleared land (with trees retained). See Figure 3-11 and Figure 3-12.

Reconnaissance surveys undertaken by the Department of Biodiversity, Conservation and Attractions (DBCA) in 2021 identified that Lot 1934 contained approximately:

- 289 ha of excellent condition Banksia Woodland (meets criteria for the *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC).
- 1.3 ha of good to very good Banksia Woodland,
- 7 ha of Marri (*Corymbia calophylla*) / Banksia Woodland,
- 0.2 ha of wetland vegetation, and
- 74 ha of cleared areas in Completely Degraded or Degraded condition (trees retained in some sections)

There are some areas of weed infestation within the property, particularly the degraded areas and land adjacent to road verges and vehicle tracks. Weed species include *Hyparrhenia Hirta* (Tambookie grass), *Cirsium vulgare* (Spear thistle), *Citrullus amarus* (Pie melon) and *Erharta calycina* (Veldt grass).



Water Corporation has also undertaken an initial fauna survey by 360 Environmental to quantify the presence of potential breeding trees within Lot 1934. This survey found that the site occurs within the modelled breeding distribution of the Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo and contains trees that meet the criteria for potential black cockatoo breeding habitat. A total of ten hollows considered suitable for black cockatoo breeding were recorded from five trees.

The key findings from the survey are summarized below:

- 420 trees were assessed as potential nesting habitat for the three threatened black cockatoo species,
- A total of 58 hollows (contained within 29 trees) were identified,
- Of the 58 total hollows, ten hollows (contained within five trees) were assessed as potentially suitable for black cockatoo breeding, and
- Sixteen hollows (contained within 11 trees) were occupied by bees.

Figure 3-12 identifies the significant trees on Lot 1934, and the report is provided in Appendix C.

Lot 58 Gingin Brook Road, Neergabby is a 204.5 hectare property, currently zoned rural, predominantly vegetated with approximately 2.2 ha of partially cleared land.

Reconnaissance surveys undertaken by DBCA in 2021 identified that the lot contained approximately:

- 160 ha of excellent condition Banksia Woodland (meets criteria for the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC)).
- 25 ha of transitional *Banksia / Melaleuca* Woodland in Very Good condition,
- 17.3 ha of a wetland basin dampland vegetation community, consisting of *Melaleuca preissiana* and *Banksia littoralis* (Swamp Banksia) in good to excellent condition (mapped as a Conservation Category Wetland in the Wetland Evaluation Swan Coastal Plain 2020, Map 3), and
- 2.2 ha of cleared or Degraded land.

The condition of the Banksia woodland is Excellent with few weeds observed. The Transitional Banksia/Melaleuca community is more disturbed and well used by kangaroos and is recorded as Very Good condition.

The Banksia Woodland and Transitional Banksia/Melaleuca Woodland are both suitable foraging vegetation for Black Cockatoos. Occasional *Corymbia calophylla* (Marri) trees occur on the property, which are suitable for foraging and potential roosting.

There are some areas of weed infestation within the property, particularly the degraded areas and land adjacent to road verges and vehicle tracks. Weed species include *Hyparrhenia Hirta* (Tambookie grass), *Cirsium vulgare* (Spear thistle), *Citrullus amarus* (Pie melon) and *Erharta calycina* (Veldt grass).



Firebreaks are well established and maintained. Fences surrounding the property are in suitable condition with some maintenance required.

These properties has been quantified using the Commonwealth Offset Calculator to provide the entire offset requirements for significant residual impacts to the Banksia Woodland TEC and both Black Cockatoo species foraging habitat, including significant trees.

Timing: As the proposed offset site is not currently owned by Water Corporation, the site will be purchased by DBCA and transferred to the conservation estate within 1 year of the impact occurring.

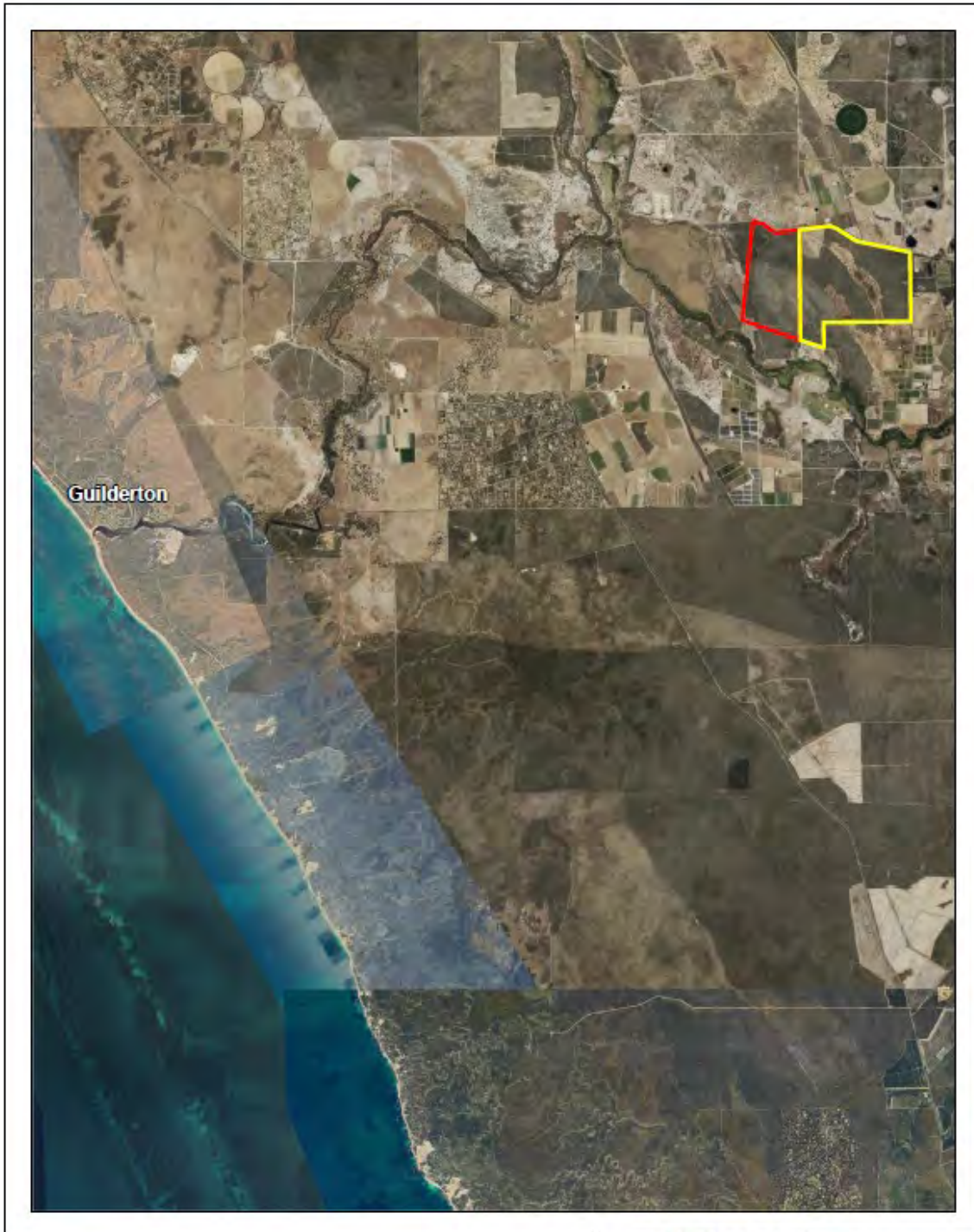
Table 3-4: Neergabby offset

Environmental value (listing)	Available for use as offset
Carnaby's Cockatoo foraging habitat	Neergabby sites (Lot 58 and 1934) (449 ha of existing BC foraging habitat) (Lot 1934 only) (70 ha of BC foraging habitat - revegetation)
Forest Red Tailed Black Cockatoo foraging habitat	Neergabby sites (Lot 58 and 1934) (449 ha of existing BC foraging habitat) (Lot 1934 only) (70 ha of BC foraging habitat - revegetation)
Significant trees	Neergabby sites (Lot 1934) (420 significant trees, with 10 hollows suitable for BC breeding) (Including 25 artificial nesting boxes)



Actions prior to formalisation as offset:

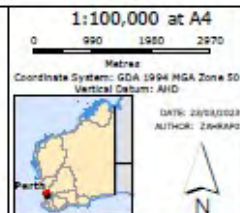
- Property transaction with DBCA (including Water Corporations agreement to funding)
- Finalise site management strategy (in consultation with DBCA), including:
 - Seed collection,
 - Site preparation and revegetation,
 - Weed management,
 - Dieback control,
 - Fencing,
 - Pest Control,
 - Habitat enhancement / Installation of nesting boxes for Black Cockatoos.

An Offset Management Plan for the Neergabby Offset Sites has been prepared and is attached in Appendix E.



LEGEND

-  Lot 58 Gingin Brook Road
-  Lot 1934 Gingin Brook Road



Neergabby Offset Site

Figure 3-10 – Neergabby Offset Sites



Figure 3-11 – Lot 1934 Gingin Brook Road, Neergabby (Environmental Values)

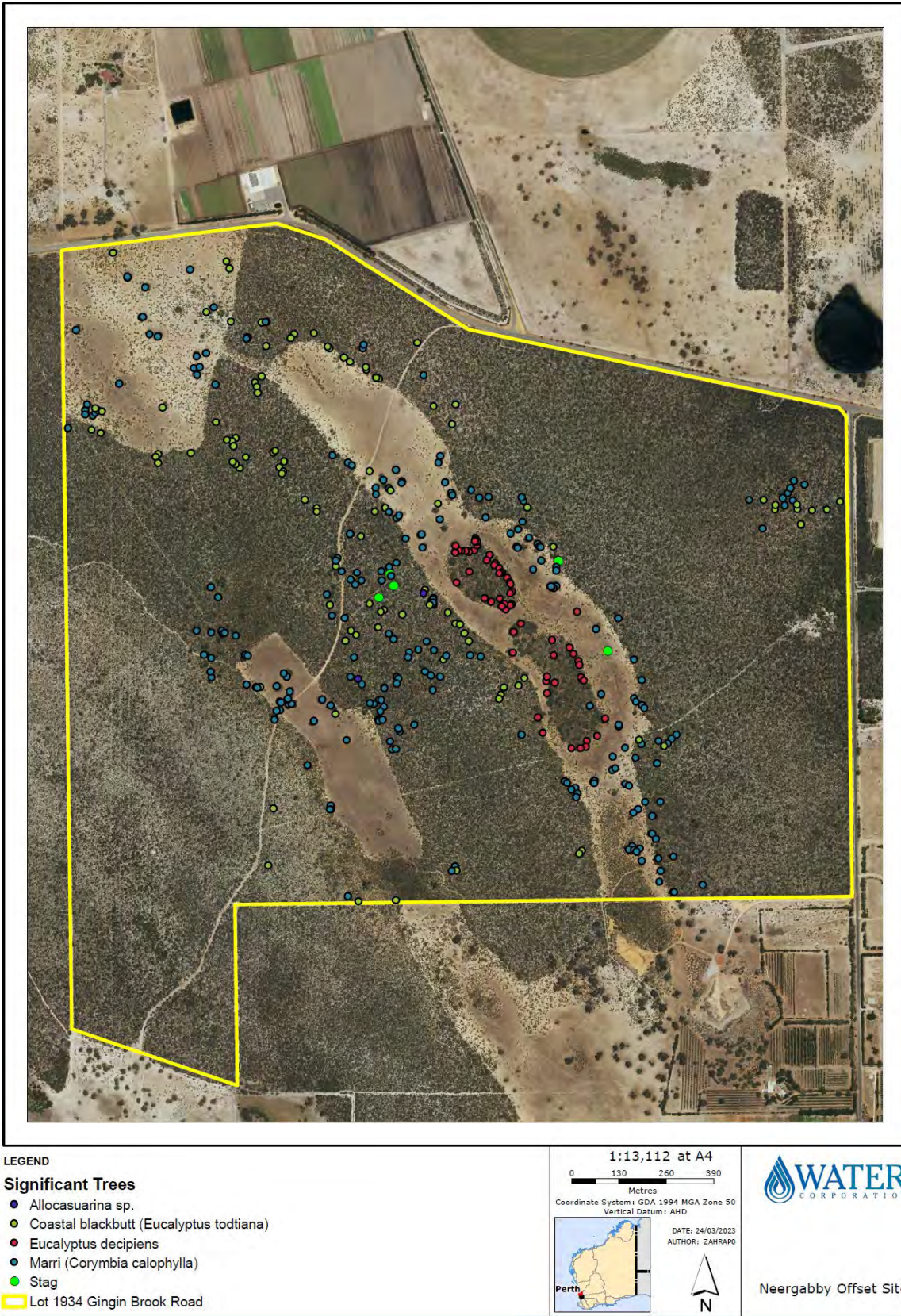


Figure 3-12 - Lot 1934 Gingin Brook Road, Neergabby (significant trees)



Figure 3-13 - Lot 58 Gingin Brook Road, Neergabby (Environmental Values)



3.2 Research

Water Corporation is providing funding to Edith Cowan University to finance Black Cockatoo research. The provision of research funding is often accepted by the Commonwealth as an 'other compensatory measure' that can lead to benefits for the impacted protected matter, such as Black Cockatoo species.

Problem statement

A commonly agreed offset strategy for Carnaby's Black-Cockatoo involves the restoration of degraded land with appropriate food plants. Areas vary in size and degree of connectedness as well as the degree of habitat quality. Although the preferred forage species for Carnaby's Black-Cockatoo are well known, the long-term success of food plant restoration in attracting CBC and meeting their foraging requirements is unknown. A critical question in the framework for no net loss, is whether restoration offsets are providing a net gain in food resources in comparison to the amount of native habitat lost due to development. The novel role of water provisioning is also investigated here.

Proposed research

1. Evaluate the success of restoration from previous Black-Cockatoo offset projects in the Perth metropolitan region in providing foraging habitat for Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo. Evaluate against the corresponding loss of native habitat and consider whether there has been no net loss in terms of feeding habitat.
2. Understand how landscape composition affects the utilisation of restored sites for feeding. Specifically:
3. Provide an integrated understanding of the best practice approach to restoration as an offset for CBC and RTBC.

Budget

The total value of the research proposal will equate to 10% of the offset value.



3.3 Additional Offsets Available (Options)

At this stage, Water Corporation is not proposing to use the following, but has included them in the strategy, to enable them to be considered if required.

3.3.1 Land Acquisition - Gobby Road Site

Water Corporation is in possession of a freehold land parcel at Lot 1375 Gobby Road, Keysbrook. The site is a rectangular area of 37.12 ha that is naturally vegetated northern jarrah forest, deeply sloped, and incised with Dirk Brook. Gobby Road is approximately 96km South-East from the ASDP site.

The land parcel has substantial landscape and environmental values to offset the significant residual impacts from the Proposal on both Black Cockatoo species.

The values outlined in the Black Cockatoo habitat assessment survey report, provided in Appendix D (360 Environmental, 2021) indicate that the site:

- is within the modelled breeding distribution of the Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Black Cockatoo,
- contains **611 potential breeding trees** with a DBH of greater than 500 mm,
- of the **611 potential breeding trees**, 157 contain hollows that were of suitable size (>12 cm) for black cockatoo breeding and were further investigated. (55 trees were identified to contain potentially suitable hollows for use by black cockatoo breeding, 12 hollows exhibited evidence of black cockatoo breeding such as chew marks around the hollow entrance,
- **36.47 ha** of very high-quality black cockatoo foraging habitat, comprising predominantly Jarrah and Marri, and
- Is adjacent to a known black cockatoo roosting site that occurs 18 m to the south of the Survey Area in a patch of vegetation that continues into the Survey Area, therefore it is likely that the Survey Area constitutes part of this roosting site.

The Gobby Road site is within the Shire of Serpentine-Jarrahdale and therefore within the Perth Metropolitan Region.

Although the Gobby Road site comprises different habitat and vegetation to the ASDP site and is on the outer extent of consideration as an offset, Water Corporation believes that the significance of the site overrides the geographical separation. Particularly as the site would provide security to a high-quality foraging, roosting and breeding habitat for both black cockatoo species impacted by the proposal (T Kirkby, pers coms. 13/12/2022).

Water Corporation proposes to use the Gobby Road land parcel to offset a portion of the impacts to both Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo foraging habitat, but in particular offsetting significantly more than the project's impact to potential breeding trees from the Proposal. The Gobby Road site meets the habitat needs and breeding tree requirements of both species, therefore is considered to be suitable to be used as an offset for both species.



Discussions are evolving with the Department of Biodiversity Conservation and Attractions (DBCA) in relation to the transfer of land tenure to the State, and subsequent transfer into the Conservation Estate.

Water Corporation is aware that Alcoa’s Mineral Lease 1SA (ML1SA) covers the site, however advice from the Department of Jobs, Tourism, Science and Innovation in 2022 confirmed that this Mineral Lease does not impact private or freehold land (of which this site is freehold land owned by Water Corporation).

If necessary, a conservation covenant could be used to secure the asset in perpetuity, prior to transfer to the State.

details a summary of the values to be offset, and details the location in relation to other State environmental assets (State Forest and National Park).

Timing: As the proposed offset site is currently owned by Water Corporation, the site will be secured, through transfer to the conservation estate (or a conservation covenant), within 1 year of the impact occurring.

Table 3-5: Gobby Road offset

Environmental value (listing)	Proposed Offset
Carnaby’s Cockatoo foraging habitat and Forest Red Tailed Black Cockatoo foraging habitat	36.47 ha
Carnaby’s Cockatoo breeding trees and Forest Red Tailed Black Cockatoo breeding trees	611 trees

Actions prior to formalisation as offset:

- Construct fencing within the Gobby Road site (if required).
- Undertake site management in conjunction with DBCA requirements (as site is planned to be transferred to the conservation estate).

Site management includes, but not limited to:

- Weed management,
- Rehabilitation of degraded areas,
- Installation of nesting boxes for Black Cockatoos,
- Revegetation, and
- Fire management.

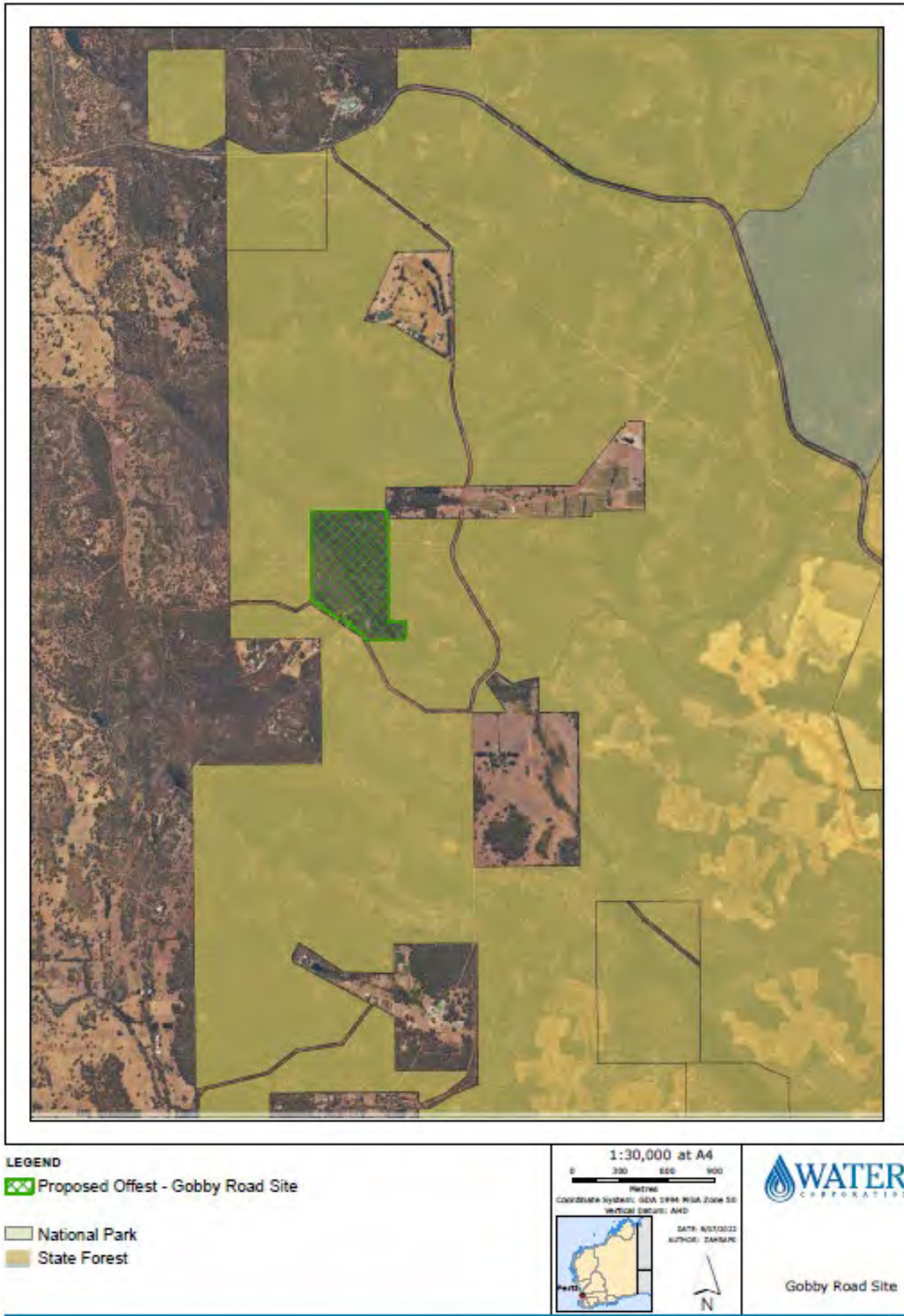


Figure 3-14 - Lot 1375 Gobby Road, Keysbrook



3.4 Offset summary

A summary of the proposed offset strategy is detailed in Table 3-6.

Table 3-6: Offset Summary

Environmental value (listing)	Total Quantum of Impact (Adjusted area in brackets)	Offset site (Primary offset value in brackets)	Percentage of offset met
<i>Banksia</i> Woodlands of the Swan Coastal Plain (TEC - Cth)	1.60 ha (1.12 ha)	7 ha Eglinton Site (5.98 ha Banksia TEC)	50%
		371 ha Neergabby site (Lot 1934) (289 ha of Banksia Woodland)	Greater than 50%
<i>Tuart (Eucalyptus gomphocephala)</i> woodlands and forest of the Swan Coastal Plain (TEC - Cth)	1.16 ha (0.81 ha)	9.01 ha Alkimos Site (4.91 ha Tuart TEC)	104%
<i>Melaleuca huegelii-Melaleuca systema</i> shrublands on limestone ridges (TEC - WA)	1.03 ha (0.72 ha)	3.1 ha Carabooda Tank Site (3.1 ha Melaleuca TEC)	113%
Bush Forever (WA)	9.38 ha (6.18 ha)	7 ha Eglinton Site (7 ha of Bush Forever)	113%
Public Purposes Reserve - Area 10b (Alkimos Dune Complex - WA)	5.17 ha	9.01 ha Alkimos Site (7.5 ha of Alkimos Dune Complex)	145%
Carnaby's Cockatoo Foraging habitat (Endangered - Cth)	52.04 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	81%
			23%
		ECU Research Project (Black Cockatoo Research)	5%
Forest Red Tailed Black Cockatoo Foraging habitat (Vulnerable - Cth)	49.72 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	89%
			23%
		ECU Research Project (Black Cockatoo Research)	5%



Black Cockatoo species - Significant trees	104 trees (8 Hollows)	Neergabby sites (Lot 1934) (420 significant trees, with 10 hollows suitable for BC breeding) (Including 25 artificial nesting boxes)	200%
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4 Consistency with principles of WA Environmental Offset Policy

This Draft Offsets Strategy has been prepared considering the six principles of the WA Environmental Offset Policy as shown in Table 4-1

Table 4-1: Principles of the WA Offset Policy

Principle	Consideration within the Proposal
Environmental offsets will only be considered after avoidance and mitigation options have been pursued.	<ul style="list-style-type: none"> The existing conservation areas immediately surrounding the SDP Development Envelope will remain largely intact. SDP Development Envelope will avoid Banksia woodland habitat, which was identified as high-quality foraging habitat for Black Cockatoos. The requirement for clearing of habitat has been avoided along large sections of the pipeline by using existing linear infrastructure, following road reserves and already cleared areas and tracks. The amount of fragmentation of vegetation has also been reduced as a result. The pipeline Development Envelope is 30 m, with only a 16 m clearing width required within this footprint, allowing key species and habitat to be avoided during final alignment. Identified breeding trees to be retained where possible, and will be clearly marked to avoid unauthorised clearing Clearing within authorised areas only - demarcate boundaries for approved clearing of TECs/PECs, ESAs and Bush Forever Sites.
Environmental offsets are not appropriate for all Proposals.	<p>Water Corporation has given significant consideration to reducing the environmental impacts of this Proposal. This consideration is provided in detail with the Environmental Review Document.</p> <p>The location and infrastructure corridors available for Water Corporation to implement such significant public infrastructure are limited, particularly within an ever-expanding residential landscape in the northern corridor.</p> <p>Water Corporation has documented the environmental impacts of the proposal, and following that assessment consider that environmental offsets are appropriate for this Proposal.</p>
Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted.	<p>The Water Corporation has proposed a number of direct and indirect offsets to counterbalance the significant residual impacts to:</p> <ul style="list-style-type: none"> Banksia Woodland Threatened Ecological Community (TEC) / Priority Ecological Community (PEC) (Banksia Woodlands TEC / PEC). Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forest of the Swan Coastal Plain TEC (Cr). <i>Melaleuca huegelii</i>-<i>Melaleuca systema</i> shrublands on limestone ridges SCP26a (En). and Black Cockatoo species (i.e. Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo). <p>These offsets have utilised the State and Commonwealth Offsets Calculators to quantify the impact and proposed offset to ensure they are proportionate to the significance of the environmental value being impacted.</p>



<p>Environmental offsets will be based on sound environmental information and knowledge.</p>	<p>Water Corporation has used suitably qualified environmental consultants to investigate and accurately document the environmental impacts of the Proposal.</p> <p>These investigations have been prepared in accordance with all relevant EPA guidance to ensure the report has sufficient credibility.</p>
<p>Environmental offsets will be applied within a framework of adaptive management.</p>	<p>Water Corporation operates all projects withing an adaptive management framework. Through such activities such as construction environmental management plans and regular audits to assess compliance against these management plans.</p> <p>This offset strategy therefore provides suitable flexibility in a challenging and complex environment to account for risks and other unintended consequences.</p>
<p>Environmental offsets will be focused on longer-term strategic outcomes</p>	<p>The proposed land acquisition offsets present a long-term strategic outcome through, the State ownership of offset sites and transfer into the Conservation Estate.</p> <p>On-ground management will result in improving degraded land, therefore increasing habitat, rather than protecting existing habitat.</p>



5 References

Australian Government, 2012a, EPBC Act Environmental Offsets Policy

Australian Government, 2012b, Commonwealth Offsets Assessment Guide.

Australian Government (DSEWPaC), 2012, *Referral Guidelines for three threatened Black Cockatoo species; Carnaby's Cockatoo, Baudin's Cockatoo and Forest Red-tailed Black Cockatoo*

Australian Government, 2016a, Species Profile and Threats Database - *Calyptorhynchus latirostris* — Carnaby's Cockatoo, Short-billed Black-Cockatoo. 2016. Australian Government.

Australian Government (DoEE), 2017, *Revised draft referral guideline for three threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo.*

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Australian Government (DAWE), 2022, Referral guideline for 3 WA threatened black cockatoo species Carnaby's Cockatoo (*Zanda latirostris*), Baudin's Cockatoo (*Zanda baudinii*) and the Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*).

Department of the Environment, 2016, Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s 266B) Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community. Commonwealth of Australia. Available online at <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/131-conservationadvice.pdf>.

Department of Biodiversity, Conservation and Attractions, 2020, Recovery plans and interim recovery plans <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatenedecological-communities>

Government of Western Australia, 2010, State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region.

Government of Western Australia, 2019, Environmental Protection Act 1986 (EP Act).

Government of Western Australia, 2011, WA Environmental Offsets Policy.

Government of Western Australia, 2014, WA Environmental Offsets Guidelines

Government of Western Australia, 2017, Critical breeding habitat for this species is within remnant patches of old Marri (*Corymbia calophylla*) trees within the Northern and Southern Jarrah Forest IBRA sub-regions

Kirkby, 2022, Pers comms, discussion with T. Kirkby on suitability of the Gobby Road offset site.

Stantec, 2021, ASDP - Flora and Vegetation Consolidation Report

Stantec, 2021b, ASDP – Terrestrial Fauna Consolidation Report

Threatened Species Scientific Committee, 2016, EPBC Act Approved Conservation Advice, Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community.

Threatened Species Scientific Committee, 2019, EPBC Act Approved Conservation Advice, Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community,



APPENDIX A: COMMONWEALTH OFFSET ASSESSMENT CALCULATIONS

Step 3: Calculating offsets

Key:

	Data to be entered
	Drop-down selection
	Automatically-generated scores

Environmental value (step 1)	Bush Forever site	Significant impact (step 2, part A)	6.18
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	4.33

Area (offset site)

Offset calculation Area							
Offsets calculation	Description	Proposed offset (area in hectares)	7.00	Duration of offset implementation (maximum 20 years)	20.00		
	Eglington	Current quality of offset site (scale)	7.00	Time until offset site secured (years)	1.00		
		Future quality WITHOUT offset (scale)	7.00	Risk of future loss WITHOUT offset (%)	25.0%	Offset value Conservation area (applied to step 2, part A)	1
		Future quality WITH offset (scale)	9.00	Risk of future loss WITH offset (%)	0.0%		113.3%
		Time until ecological benefit (years)	5.00				
	Confidence in offset result (%)	50.0%				OFFSET ADEQUATE?	YES

Step 3: Calculating offsets

Key:

	Data to be entered
	Drop-down selection
	Automatically-generated scores

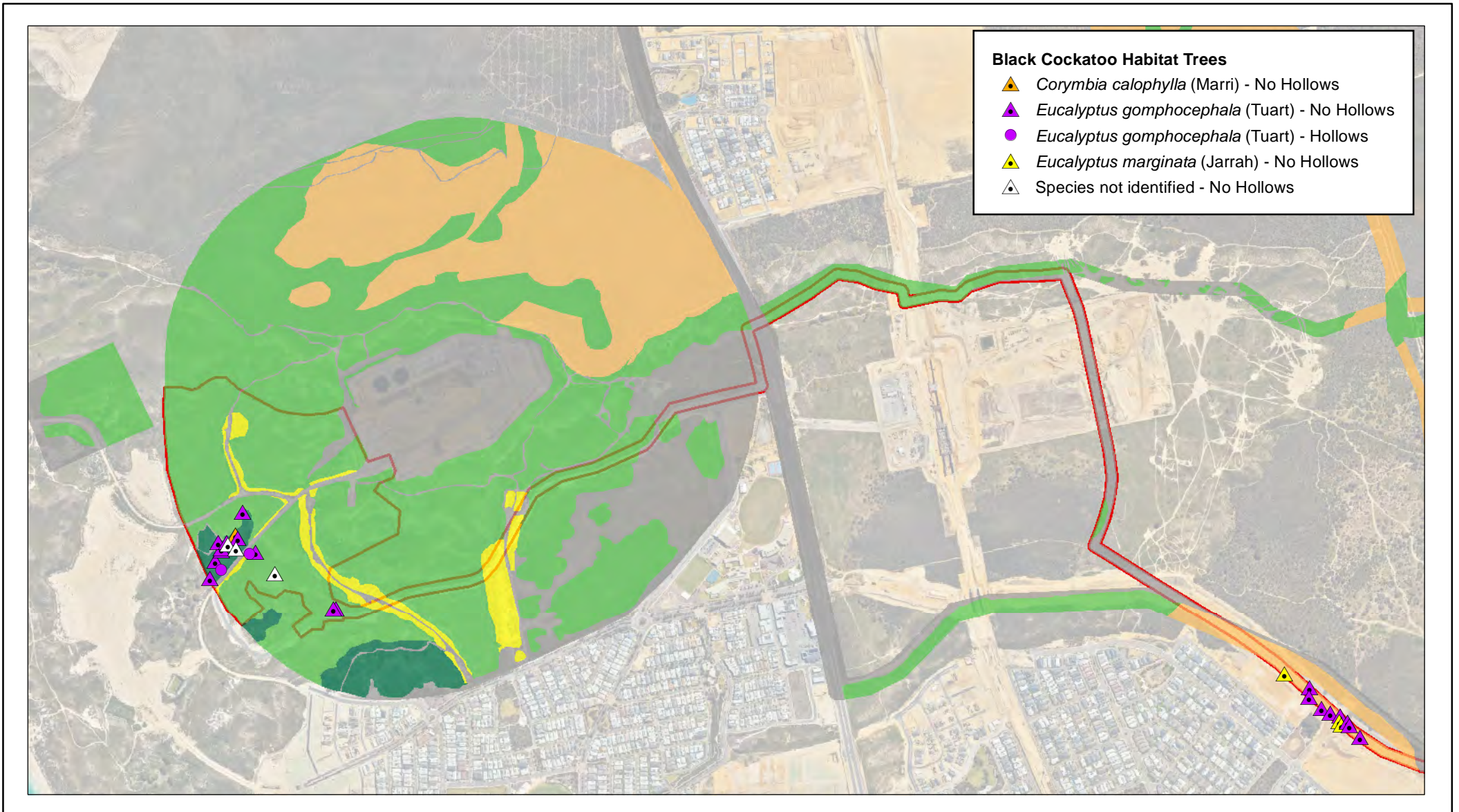
Environmental value (step 1)	Melaleuca huegelii- Melaleuca systena shrublands on limestone ridges	Significant impact (step 2, part A)	1.03
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	0.72

Area (offset site)

Offset calculation Area							
Offsets calculation	Description	Proposed offset (area in hectares)	3.10	Duration of offset implementation (maximum 20 years)	20.00	Offset value	0.82
	Land acquisition - Carabooda Tank Site	Current quality of offset site (scale)	8.00	Time until offset site secured (years)	1.00		113.8%
		Future quality WITHOUT offset (scale)	8.00	Risk of future loss WITHOUT offset (%)	25.0%		
		Future quality WITH offset (scale)	9.00	Risk of future loss WITH offset (%)	0.0%		
	Time until ecological benefit (years)	5.00					
	Confidence in offset result (%)	60.0%				OFFSET ADEQUATE?	YES



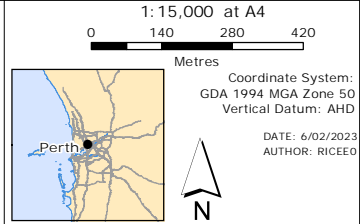
APPENDIX B: BLACK COCKATOO HABITAT IMPACTS



- Black Cockatoo Habitat Trees**
- ▲ *Corymbia calophylla* (Marri) - No Hollows
 - ▲ *Eucalyptus gomphocephala* (Tuart) - No Hollows
 - *Eucalyptus gomphocephala* (Tuart) - Hollows
 - ▲ *Eucalyptus marginata* (Jarrah) - No Hollows
 - △ Species not identified - No Hollows

- LEGEND**
- Development Envelope
 - Fauna Habitat**
(Stantec 2022; Biologic 2022; 360 2022)
 - Cleared
 - Heath and Shrubland (CBC, FRTBC)

- Parkland, Planted Vegetation and Gardens (CBC, FRTBC)
- Scattered Trees (CBC, FRTBC)
- Woodland (CBC, FRTBC)

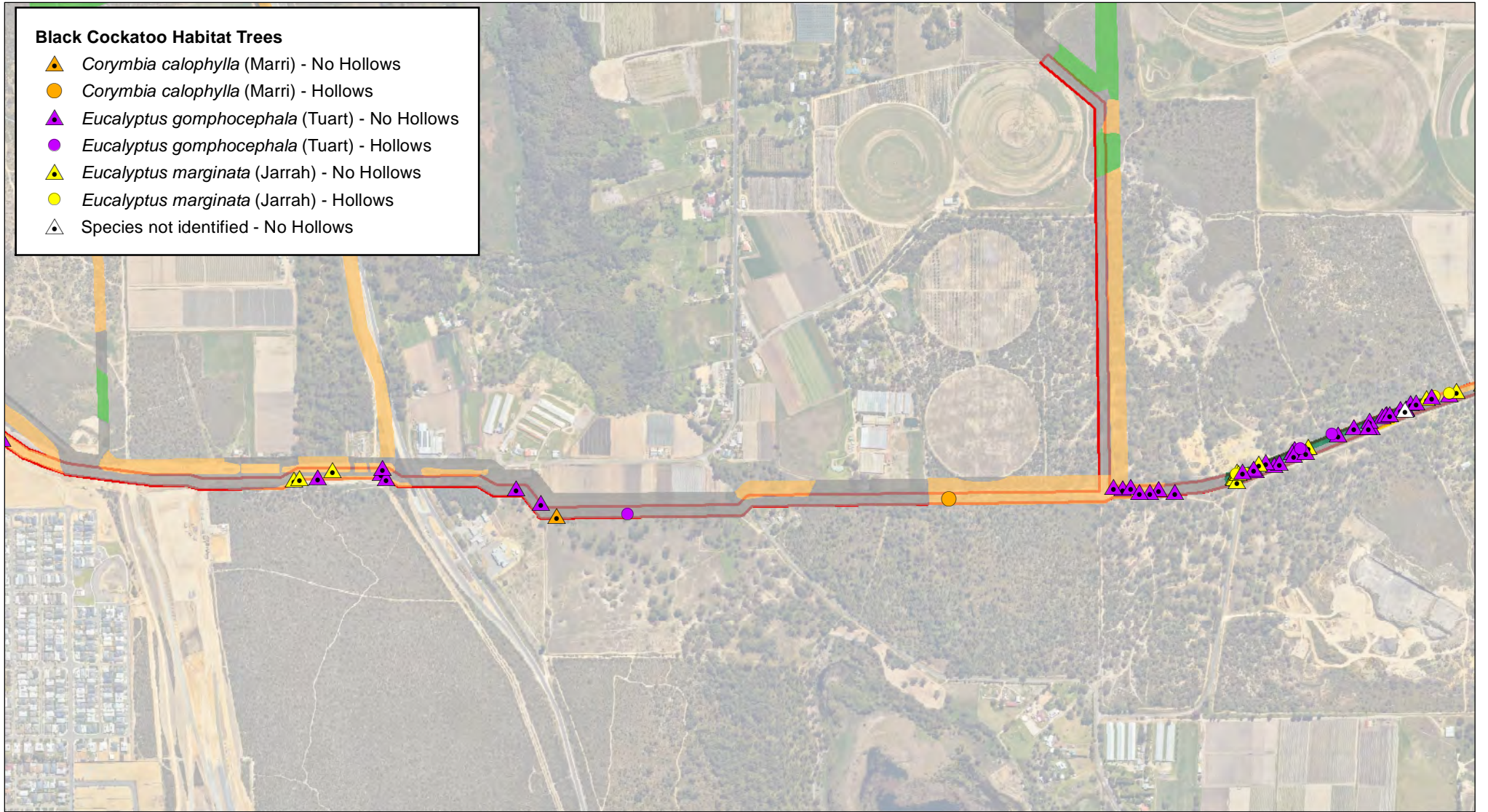


WATER CORPORATION

Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE

Black Cockatoo Habitat Trees

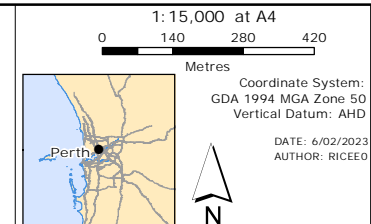
- ▲ *Corymbia calophylla* (Marri) - No Hollows
- *Corymbia calophylla* (Marri) - Hollows
- ▲ *Eucalyptus gomphocephala* (Tuart) - No Hollows
- *Eucalyptus gomphocephala* (Tuart) - Hollows
- ▲ *Eucalyptus marginata* (Jarrah) - No Hollows
- *Eucalyptus marginata* (Jarrah) - Hollows
- ▲ Species not identified - No Hollows



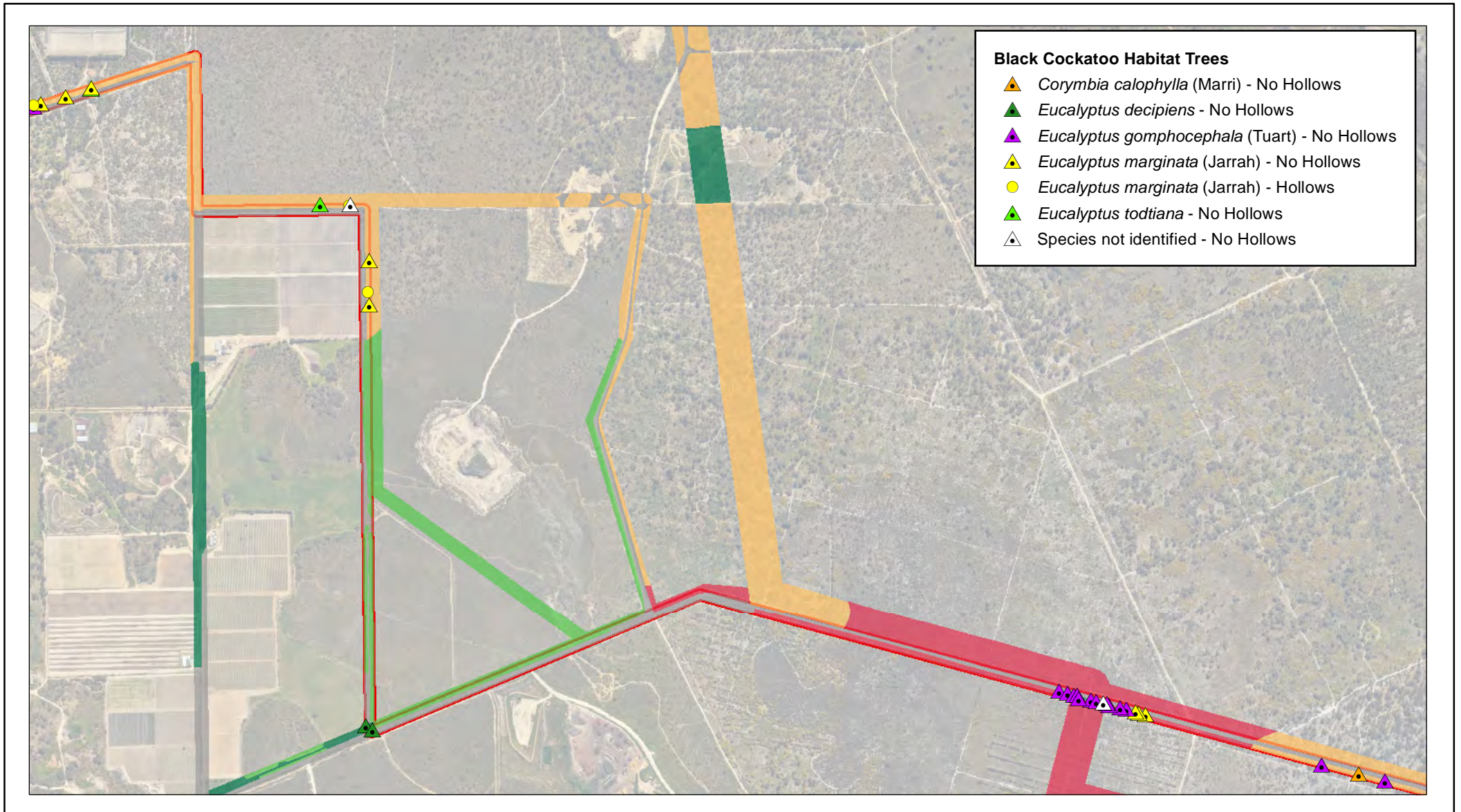
LEGEND

- Development Envelope
- Fauna Habitat (Stantec 2022; Biologic 2022; 360 2022)**
- Cleared
- Heath and Shrubland (CBC, FRTBC)

- Parkland, Planted Vegetation and Gardens (CBC, FRTBC)
- Scattered Trees (CBC, FRTBC)
- Woodland (CBC, FRTBC)

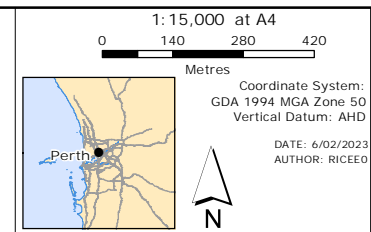


Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE



- Black Cockatoo Habitat Trees**
- ▲ *Corymbia calophylla* (Marri) - No Hollows
 - ▲ *Eucalyptus decipiens* - No Hollows
 - ▲ *Eucalyptus gomphocephala* (Tuart) - No Hollows
 - ▲ *Eucalyptus marginata* (Jarrah) - No Hollows
 - *Eucalyptus marginata* (Jarrah) - Hollows
 - ▲ *Eucalyptus tottiana* - No Hollows
 - ▲ Species not identified - No Hollows

- LEGEND**
- | | | |
|---|---|---|
| Development Envelope | Fauna Habitat
(Stantec 2022; Biologic 2022; 360 2022) | Pine Plantation Regrowth (CBC) |
| Cleared | Scattered Trees (CBC, FRTBC) | Woodland (CBC, FRTBC) |
| Heath and Shrubland (CBC, FRTBC) | | |



WATER CORPORATION

Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE



Black Cockatoo Habitat Trees
 ▲ Species not identified - No Hollows

LEGEND

- Development Envelope
- Fauna Habitat**
(Stantec 2022; Biologic 2022; 360 2022)
- Cleared
- Heath and Shrubland (CBC, FRTBC)
- Parkland, Planted Vegetation and Gardens (CBC, FRTBC)
- Pine Plantation Regrowth (CBC)
- Scattered Trees (CBC, FRTBC)
- Wetlands and Riparian Vegetation (CBC, FRTBC)
- Woodland (CBC, FRTBC)

1:15,000 at A4

0 150 300 450
Metres

Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD

DATE: 6/02/2023
AUTHOR: RICEEO



Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE

Figure 9-4d

386,087

388,087

6,494,716


6,494,716

386,087

388,087

6,492,716


LEGEND


 Development Envelope

Fauna Habitat

(Stantec 2022; Biologic 2022; 360 2022)

 Cleared


 Heath and Shrubland (CBC, FRTBC)

 Parkland, Planted Vegetation and Gardens (CBC, FRTBC)

 Pine Plantation Regrowth (CBC)

 Scattered Trees (CBC, FRTBC)

 Wetlands and Riparian Vegetation (CBC, FRTBC)

 Woodland (CBC, FRTBC)

1:15,000 at A4

0 150 300 450
Metres

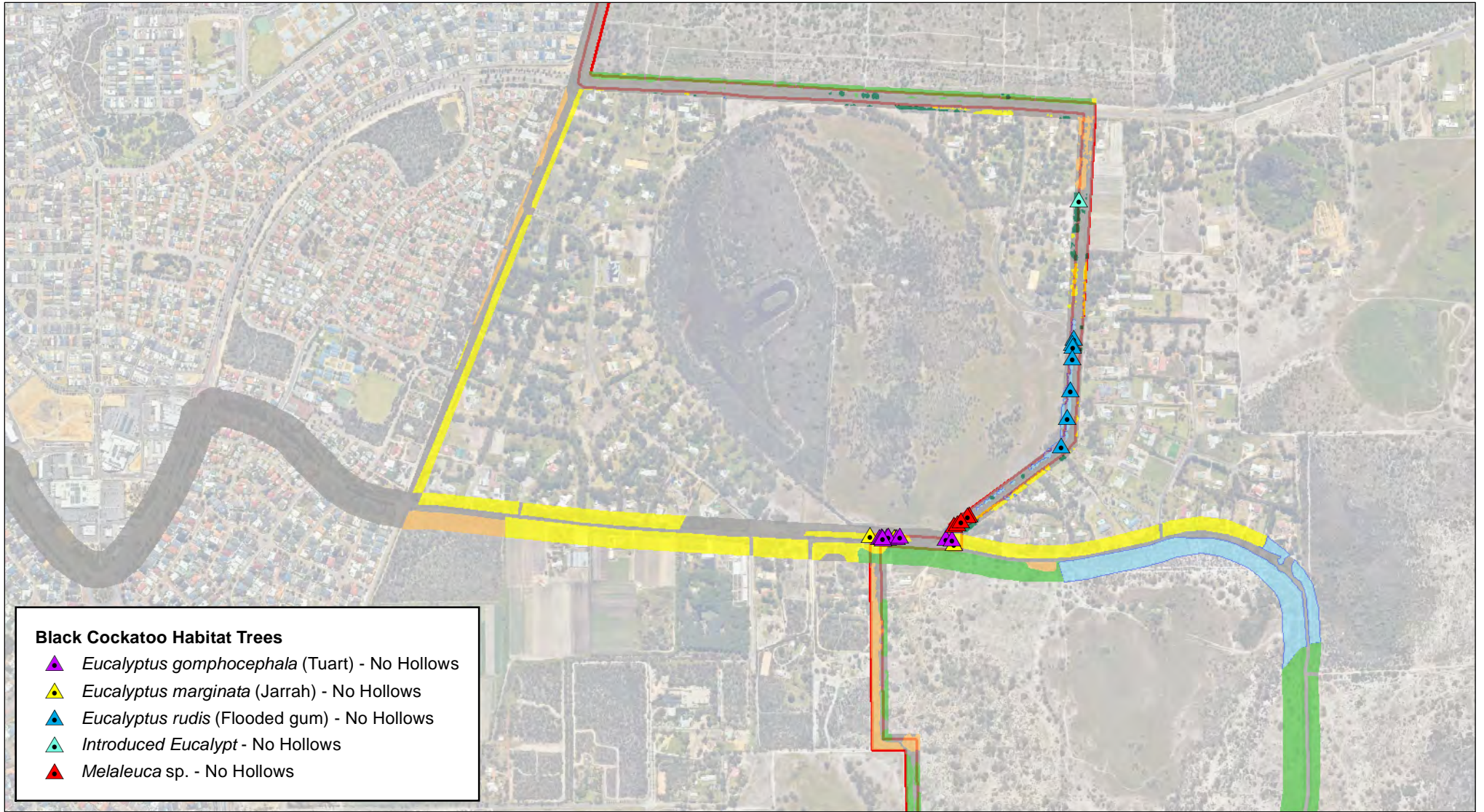
Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD



DATE: 6/02/2023
AUTHOR: RICEEO



Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE



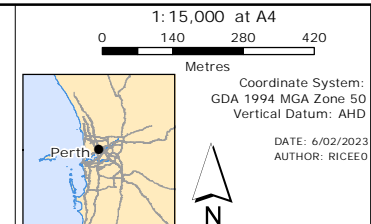
Black Cockatoo Habitat Trees

- ▲ *Eucalyptus gomphocephala* (Tuart) - No Hollows
- ▲ *Eucalyptus marginata* (Jarrah) - No Hollows
- ▲ *Eucalyptus rudis* (Flooded gum) - No Hollows
- ▲ *Introduced Eucalypt* - No Hollows
- ▲ *Melaleuca* sp. - No Hollows

LEGEND

- Development Envelope
- Fauna Habitat (Stantec 2022; Biologic 2022; 360 2022)**
- Cleared
- Heath and Shrubland (CBC, FRTBC)

- Parkland, Planted Vegetation and Gardens (CBC, FRTBC)
- Wetlands and Riparian Vegetation (CBC, FRTBC)
- Woodland (CBC, FRTBC)



Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE

388,389

390,389

6,489,537

6,489,537

388,389

390,389

6,489,537

LEGEND

Development Envelope

Fauna Habitat

(Stantec 2022; Biologic 2022; 360 2022)

Cleared

Heath and Shrubland (CBC, FRTBC)

Parkland, Planted Vegetation and Gardens (CBC, FRTBC)

Pine Plantation Regrowth (CBC)

Scattered Trees (CBC, FRTBC)

Wetlands and Riparian Vegetation (CBC, FRTBC)

Woodland (CBC, FRTBC)

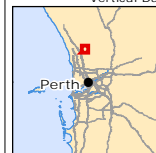
Black Cockatoo Habitat Trees

- Corymbia calophylla* (Marri) - No Hollows
- Eucalyptus gomphocephala* (Tuart) - No Hollows
- Eucalyptus gomphocephala* (Tuart) - Hollows
- Eucalyptus marginata* (Jarrah) - Hollows

1:15,000 at A4

0 150 300 450
Metres

Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD



DATE: 6/02/2023

AUTHOR: RICEEO



Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE

387,583

389,583

6,486,898

6,486,898

387,583

389,583

6,486,898



Black Cockatoo Habitat Trees

- *Corymbia calophylla* (Marri) - Hollows
- ▲ *Eucalyptus gomphocephala* (Tuart) - No Hollows
- *Eucalyptus marginata* (Jarrah) - Hollows

LEGEND

- Development Envelope
- Fauna Habitat**
- (Stantec 2022; Biologic 2022; 360 2022)**
- Cleared
- Heath and Shrubland (CBC, FRTBC)
- Parkland, Planted Vegetation and Gardens (CBC, FRTBC)
- Pine Plantation Regrowth (CBC)
- Scattered Trees (CBC, FRTBC)
- Wetlands and Riparian Vegetation (CBC, FRTBC)
- Woodland (CBC, FRTBC)

1:15,000 at A4

0 150 300 450
Metres

Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD

DATE: 6/02/2023
AUTHOR: RICEEO



Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE

Figure 9-4h



APPENDIX C: SURVEYS OF NERRGABBY PROPERTY

16 March 2023

Paul Zahra
Specialist - Environment
Water Corporation
629 Newcastle Street
LEEDERVILLE WA 6007
Via Email: Paul.zahra@watercorporation.com.au

Dear Paul

Lot 1934 Gingin Brook Road - Black Cockatoo Nesting Tree Survey

1 Introduction

360 Environmental Pty Ltd (360 Environmental) part of SLR Consulting (SLR) was commissioned by Water Corporation to undertake a black cockatoo nesting tree survey to identify suitable offset habitat for nesting trees. Lot 1934 Gingin Brook Rd (the Survey Area) is located approximately 75 km north of Perth in Neergabby (Figure 1). Water Corporation required ecologists to survey the site to identify 400 potential black cockatoo nesting trees and to provide a broad description of the vegetation present.

2 Methods

2.1 Field Surveys

The field survey was conducted over the 9 and 10 March, 2023 by Senior Ecologists Lukas Geidans, Poppy Walker, and Candice Le Roux, along with Ecologist Lewis Berry. The surveys were conducted in accordance with the EPBC Act Referral Guidelines for three WA threatened Black Cockatoo Species (Department of Agriculture Water and the Environment, 2022). Survey effort is displayed in Figure 2.

2.2 Black Cockatoo Breeding Tree Assessment

2.2.1 Nesting habitat

The field survey required the assessment of 400 trees that met the following criteria for potential nesting or future nesting, described in the EPBC Act Referral Guidelines for three WA threatened Black Cockatoo Species (Department of Agriculture Water and the Environment, 2022). These trees were recorded using the Fulcrum mobile data-collection application with the following information:

- Tree species with the potential to form suitable hollows, particularly endemic eucalypt species (e.g. Jarrah, Tuart, Marri, Wandoo, and Salmon Gum)
- Diameter at breast height (DBH) of greater than 500 mm (greater than 300 mm for Wandoo and Salmon Gum) regardless of the presence or absence of hollows (DBH is measured approximately 1.3 metres from the ground)
- Any trees containing hollows (observed from the ground), which were then categorized as:
 - Hollows that are unsuitable for black cockatoo nesting e.g. hollows with an estimated opening diameter of less than 100 mm, downwards-facing hollows.
 - Hollows that are potentially suitable for black cockatoo nesting e.g. upwards or sideways-facing hollows with an estimated opening diameter of greater than 100 mm (Saunders, Mawson and Dawson, 2014). Trees with multiple stems, swellings or forking/branching at breast height were measured separately. In these instances, the diameter was measured just above breast height to gain a more accurate measurement of diameter.

2.3 Limitations

Limitations and constraints of the black cockatoo survey are detailed below in Table 1.

Table 1: Limitations and Constraints Associated with the Survey

Variable	Degree of Limitation	Potential Constraints on Survey Outcomes
Availability of Data	Not a limitation	All data required to complete the scope of works including regional and local contextual information was available
Access and Survey Intensity	Not a limitation	The site was accessed by gate on Gingin Brook Rd and surveyed on foot. It was not a limitation for this field survey.
Experience	Not a limitation	The black cockatoo survey was undertaken by suitably qualified Senior Ecologists Lukas Geidans, Poppy Walker, and Candice Le Roux, along with Ecologist Lewis Berry. The team is adequately experienced in conducting black cockatoo surveys. This was not deemed a limitation.

Variable	Degree of Limitation	Potential Constraints on Survey Outcomes
Timing, weather, season	Not a limitation	The field survey was undertaken during the recommended timing for black cockatoo surveys as outlined in the EPBC Referral Guidelines (Department of Agriculture Water and the Environment, 2022). Timing was not a limitation for the black cockatoo survey.
Life forms sampled	Not a limitation	There were no constraints relating to black cockatoo sampling during the field survey.
Completeness	Not a limitation	A total of 420 trees were recorded and the survey was considered complete for this scope of works.

3 Results

3.1 Nesting Habitat

A total of 420 potential nesting trees with a DBH of greater than 500 mm were recorded within the Survey Area. These trees comprised:

- 248 Marri (*Corymbia calophylla*)
- 106 Coastal Blackbutt (*Eucalyptus todtiana*)
- 59 Redheart (*Eucalyptus decipiens*)
- Five Stags
- Two *Allocasuarina sp.*

Fifty-eight hollows were identified from 29 trees within the Survey Area. Ten hollows (recorded on five trees) were classified as potentially suitable for use by black cockatoos. Sixteen hollows (recorded on 11 trees) were found to be occupied by bees. One tree contained a hollow that is currently in use by nesting Galahs (*Eolophus roseicapilla*).

The locations of these trees and the presence of hollows are displayed in Figure 3. Raw survey data is shown in Appendix A.

3.2 Broad Vegetation

In keeping with the scope of works, the Survey Area was not formally assessed using the Foraging Quality Scoring Tool outlined within the Referral Guideline for 3 WA Threatened black cockatoo species (Department of Agriculture Water and the Environment, 2022). Instead, the broad vegetation surrounding the identified nesting trees was qualitatively evaluated. This vegetation may be suitable for foraging for the Forest Red-tailed Black Cockatoo and the Carnaby's Cockatoo. This area is dominated by an overstorey of Marri (*Corymbia calophylla*), Coastal Blackbutt (*Eucalyptus todtiana*), and Redheart (*Eucalyptus decipiens*) over mixed *Banksia attenuata* and *Banksia menziesii* over an understorey of *Zamia sp.*, *Kunzea sp.*, and *Xanthorrhoea sp.* The areas of site comprised of intact vegetation were in good condition with minimal weeds and minor interference by infrastructure. Previously cleared areas were in

relatively poor condition with a higher weed load and disturbance from infrastructure and tracks.

4 Discussion and Conclusion

The site occurs within the modelled breeding distribution of the Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo and contains trees that meet the criteria for potential black cockatoo breeding habitat. A total of ten hollows considered suitable for black cockatoo breeding were recorded from five trees.

The key findings from the survey are summarized below:

- Potential black cockatoo tree inspections were undertaken by Senior Ecologists Poppy Walker and Candice Le Roux on the 9 March 2023 and by Senior Ecologists Lukas Geidans, Candice Le Roux, and Ecologist Lewis Berry on the 10 March 2023
- 420 trees were assessed as potential nesting habitat for the three threatened black cockatoo species
- A total of 58 hollows (contained within 29 trees) were identified
- Of the 58 total hollows, ten hollows (contained within five trees) were assessed as potentially suitable for black cockatoo breeding
- Sixteen hollows (contained within 11 trees) were occupied by bees
- One hollow was occupied by nesting Galahs (*Eolophus roseicapilla*)
- No evidence of black cockatoos (sightings, calls, or foraging evidence) was observed during the field assessment.

5 Closing

We trust this meets your requirements at this time. Should you have any questions or require further action please do not hesitate to contact Lukas Geidans or the undersigned on (08) 9388 8360. We look forward to hearing from you.

For and on behalf of 360 Environmental/Part of SLR Pty Ltd



Dr. Michael Lohr – Fauna Ecology Team Leader

Enc:

Figure 1: Survey Area

Figure 2: Survey Effort

Figure 3: Potential Nesting Trees

Attachment A Black Cockatoo Raw Data

6 References

Department of Agriculture Water and the Environment (2022) *Referral guideline for 3 WA threatened black cockatoo species*. Canberra, Australia. Available at: <https://doi.org/978-176003-330-9>.

Saunders, D.A., Mawson, P.R. and Dawson, R. (2014) 'Use of tree hollows by Carnaby's Cockatoo and the fate of large hollow-bearing trees at Coomallo Creek, Western Australia 1969-2013', *Biological Conservation* [Preprint]. Available at: <https://doi.org/10.1016/j.biocon.2014.07.002>.

7 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data, and analyses ('client's information') provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive, or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness, and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive, and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions, and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions, and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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Figures

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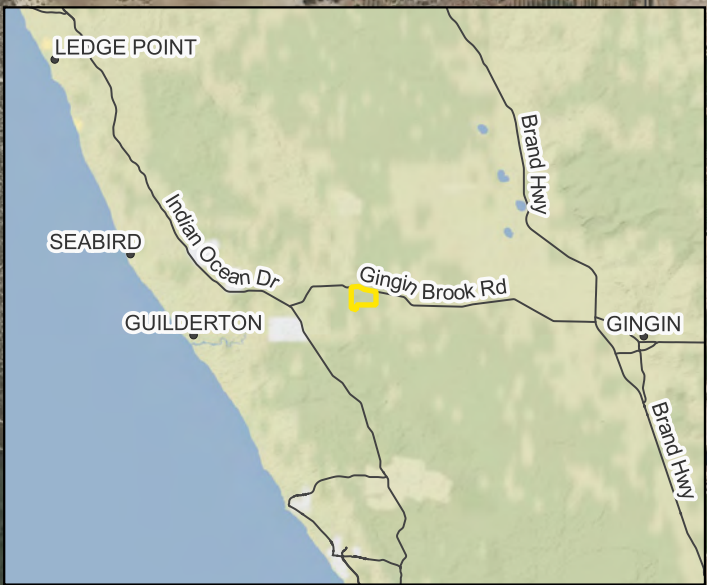
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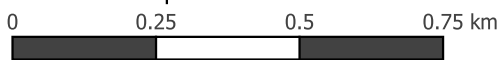
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 Survey Area

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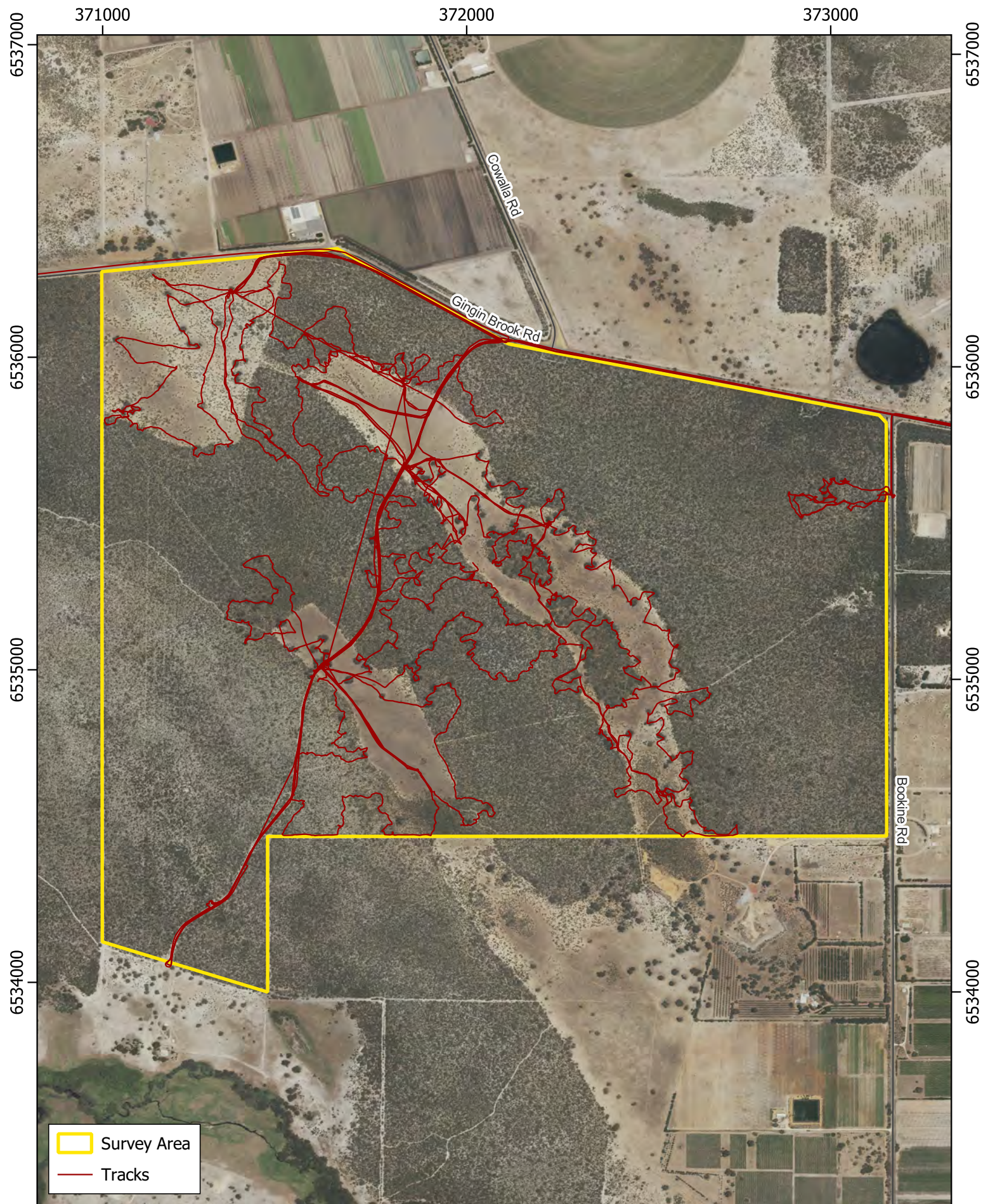
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 Drawn By: PW
 Reviewed By: LG

Service Layer Credits:
Landgate / SLIP

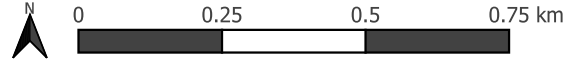
Water Corporation
Ginggin Brook Road Offset

**Survey Area
FIGURE 1**

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Survey Area
 Tracks



Coordinate System: GDA94
 Scale: 1:10,000 at A4
 Project Number: 5842
 Date Drawn: 14-Mar-2023
 Drawn By: PW
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Water Corporation
 Gingin Brook Road Offset

Survey Effort
 FIGURE 2

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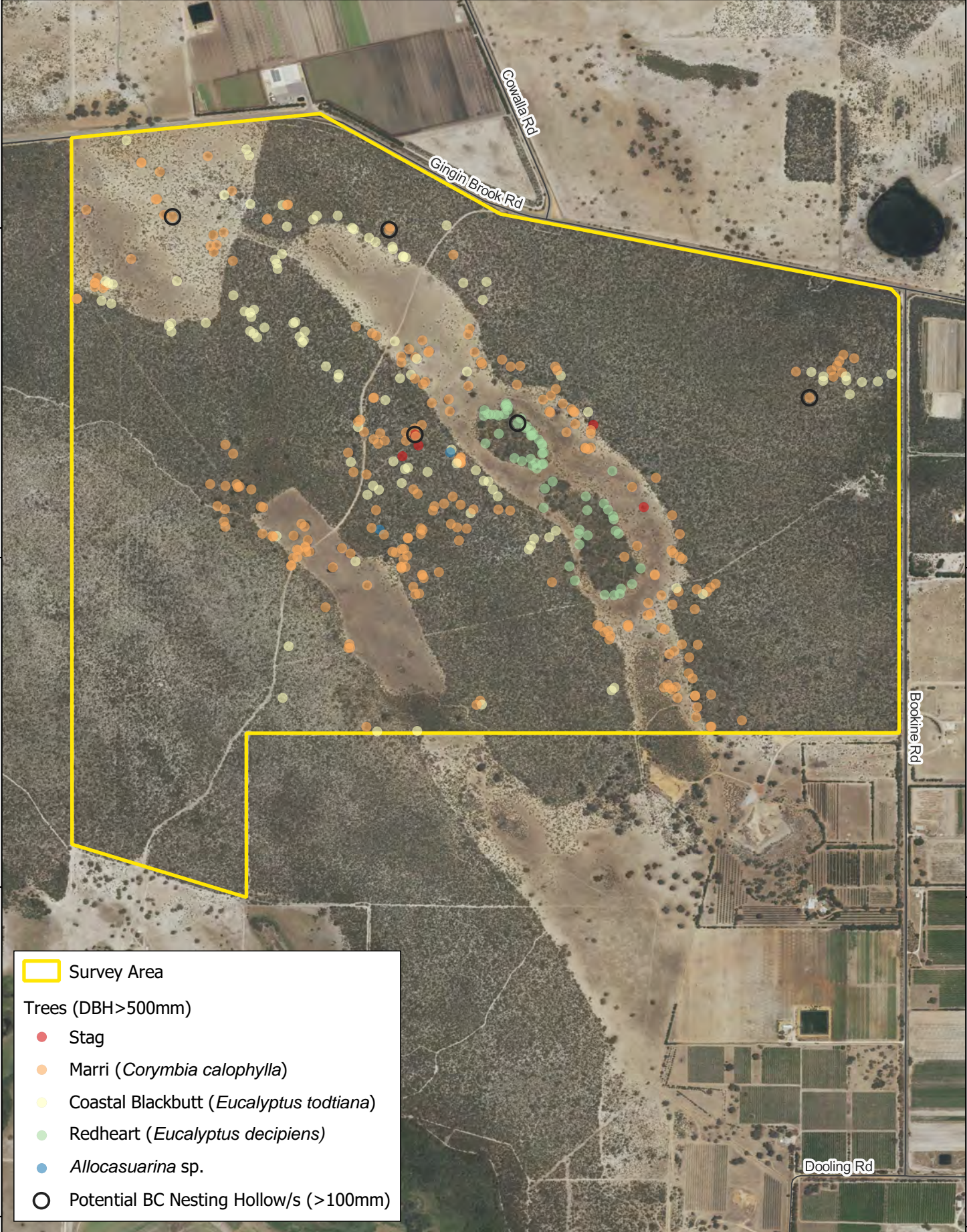
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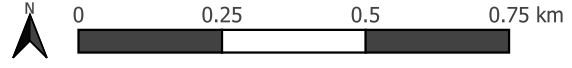


Survey Area

Trees (DBH>500mm)

- Stag
- Marri (*Corymbia calophylla*)
- Coastal Blackbutt (*Eucalyptus todtiana*)
- Redheart (*Eucalyptus decipiens*)
- *Allocasuarina* sp.

○ Potential BC Nesting Hollow/s (>100mm)



Coordinate System: GDA94
 Scale: 1:10,000 at A4
 Project Number: 5842
 Date Drawn: 15-Mar-2023
 Drawn By: PW
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Water Corporation
 Gingin Brook Road Offset
 Potential BC Nesting
 Trees
 FIGURE 3

Attachments

Attachment A

Black Cockatoo Raw Data

Latitude	Longitude	Taxon	DBH (mm)	Height (m)	No. Hollows	No. Hollows >100 mm	No. Hollows with Bees	Hollows Displaying Evidence	Comments	Photos
-31.3071923	115.6519176	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	500	5	0	0			Nil	44b1692d-f3b1-43cd-b627-c7fb28667595
-31.3039654	115.6536733	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	500	6.5	0	0			Nil	0fc134c0-26da-48ec-a773-62740d2e1675
-31.310804	115.6545398	Marri (<i>Corymbia calophylla</i>)	500	9	0	0			Nil	ea39dcc6-367a-40b7-a4aa-d77dcde43d4a
-31.3013887	115.6465152	Marri (<i>Corymbia calophylla</i>)	500	13	0	0			Nil	384baa59-2cbf-4cae-b8a2-e650db8ae103
-31.3116832	115.6538121	Marri (<i>Corymbia calophylla</i>)	540	13	0	0			Nil	fbdc83ec-7ece-4cb9-b7d4-5d54a0bed7e9
-31.3031487	115.6504995	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	550	6	0	0			Nil	6aa579b3-64a2-4239-a234-34c8339e484b
-31.3041602	115.6502184	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	550	6	0	0			Nil	90ecd054-e1af-4231-bb69-868c04012432
-31.3086734	115.6539977	Marri (<i>Corymbia calophylla</i>)	550	17	0	0			Nil	c8c4c9b8-a53a-43c0-9074-0b1fc2e2d867
-31.3085312	115.6568167	Redheart (<i>Eucalyptus decipiens</i>)	560	8	0	1			Nil	e9985eb8-02f7-4bbf-b4be-b0ae2315a934,0f33cc0d-537e-4f74-a133-7bc6422432b7
-31.3119799	115.6536442	Marri (<i>Corymbia calophylla</i>)	580	15	0	0			Nil	4197aa04-a27c-4292-bd4d-cd27772b9d3c
-31.3057978	115.6473378	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	780	11	0	0			Nil	df80dfaf-e01c-4835-b980-93ba0ccac298
-31.3108918	115.655606	Marri (<i>Corymbia calophylla</i>)	780	19	0	0			Nil	83aaf2de-d20d-4e9f-9f82-52e861d00e3f
-31.3107351	115.6548011	Marri (<i>Corymbia calophylla</i>)	830	16	0	0			Nil	517a15c4-f288-4812-9403-7f4ae300b253
-31.3118872	115.6571791	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	1090	9	0	0			Nil	49b21731-ed4e-4ddc-a46f-ec6dacc42d87
-31.3016494	115.6470206	Marri (<i>Corymbia calophylla</i>)	1190	20	0	0			Nil	205b0261-964c-4993-866d-10dbe18aa49b
-31.3129713	115.6526949	Marri (<i>Corymbia calophylla</i>)	1390	18	0	0			Nil	69e6b2b6-3acb-4c17-98da-060a69aa5a26

-31.30740495	115.6662425	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	500	8	0	0			Nil	9fdb9aed-81c3-43a6-a749-4b82a65c42d6
-31.30718638	115.6670502	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	500	6	0	0			Nil	90536114-d433-49ca-9852-8bd8a0a59d69
-31.311987	115.6571204	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	500	8	0	0			Nil	38f656d9-85d1-4dee-bc44-347117ba33e2
-31.3072828	115.651909	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	500	6	0	0			Nil	0566a843-a0a7-4bbd-9070-2b6e17d8f070
-31.3025337	115.6495002	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	500	6	0	0			Nil	93168b38-a7f6-4793-8fce-7c2c83b8992e
-31.3058664	115.647269	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	500	8	0	0			Nil	97fb5a87-5c67-4639-86a6-cffadffe5d0
-31.30832189	115.6562972	Redheart (<i>Eucalyptus decipiens</i>)	500	10	0	0			Nil	21a7ecfa-554a-4302-950f-45ca6824a37a
-31.3082957	115.6560825	Redheart (<i>Eucalyptus decipiens</i>)	500	10	0	0			Nil	b27a3629-f4b4-4224-b856-6f4c5695f3b8
-31.3098412	115.6594109	Redheart (<i>Eucalyptus decipiens</i>)	500	10	0	0			Nil	41676134-72c7-4b2d-876f-9afd0d362524
-31.3124527	115.6582325	Redheart (<i>Eucalyptus decipiens</i>)	500	10	0	0			Nil	77674dd8-a040-4cdf-9a6d-f48605735a2a
-31.31155906	115.6584869	Redheart (<i>Eucalyptus decipiens</i>)	500	12	0	0			Nil	2ce51a5d-e2d7-4817-9300-942b8997109b
-31.31145107	115.6585103	Redheart (<i>Eucalyptus decipiens</i>)	500	12	0	0			Nil	96bddeb4-d0bd-434f-8b5e-548d2fd349da
-31.3108479	115.6575282	Redheart (<i>Eucalyptus decipiens</i>)	500	10	0	0			Nil	1c8a5a86-3e77-45e6-9afb-5e25c77be90d
-31.30696036	115.6655538	Marri (<i>Corymbia calophylla</i>)	500	8	0	0			Nil	73b845a8-7b77-4e42-ba11-3faa785547da
-31.3070853	115.6579016	Marri (<i>Corymbia calophylla</i>)	500	10	0	0			Nil	d8af23de-7835-4e16-9179-26f8df2e8a49

-31.3082133	115.6583404	Marri (<i>Corymbia calophylla</i>)	500	14	0	0			Nil	11b50b3d-1201-40d5-b4b4-cde41273b389
-31.30822908	115.6583722	Marri (<i>Corymbia calophylla</i>)	500	14	0	0			Nil	417cc44e-6c1c-43ed-aa62-85d344a73dae
-31.31314996	115.6619939	Marri (<i>Corymbia calophylla</i>)	500	8	0	0			Nil	43abd0ef-3022-4898-80e3-bd5a785a8aa5
-31.31345673	115.6603916	Marri (<i>Corymbia calophylla</i>)	500	12	0	0			Nil	3d995ed2-b421-4eeb-98d3-d6c15b18c205
-31.3137931	115.6603674	Marri (<i>Corymbia calophylla</i>)	500	12	0	0			Nil	84732b2d-486c-4df7-ac5d-892076ff1ed4
-31.314181	115.6608467	Marri (<i>Corymbia calophylla</i>)	500	14	0	0			Nil	bfb4b787-c690-475e-8f7a-4cd64785bbb2
-31.31485626	115.6609669	Marri (<i>Corymbia calophylla</i>)	500	10	0	0			Nil	75ee0383-e8bb-44f8-8d7f-49a78d73fce3
-31.3145968	115.661747	Marri (<i>Corymbia calophylla</i>)	500	10	0	0			Nil	d4eb8c6b-1500-46d4-858d-91cbac4bbf8e
-31.31551792	115.6616069	Marri (<i>Corymbia calophylla</i>)	500	10	0	0			Nil	e46ae3a1-1387-42bd-8f96-401008a26a27
-31.3160525	115.6611914	Marri (<i>Corymbia calophylla</i>)	500	12	0	0			Nil	dfa915d4-b283-4044-894e-56b2f1f8de8c
-31.309491	115.6552567	Marri (<i>Corymbia calophylla</i>)	500	14	0	0			Nil	182c6412-f58f-41d8-a85b-c4e1e6dd90ae
-31.3096166	115.6552586	Marri (<i>Corymbia calophylla</i>)	500	11	0	0			Nil	13edfcff-1b35-410b-8556-34e17aea5fdf
-31.3089694	115.6528754	Marri (<i>Corymbia calophylla</i>)	500	13	0	0			Nil	fc4f49ba-7d08-450e-a104-dac9965c64c7
-31.3114183	115.6554213	Marri (<i>Corymbia calophylla</i>)	500	18	0	0			Nil	67cdc27a-2f4b-4151-b0e1-888c4654af5f
-31.311385	115.6551594	Marri (<i>Corymbia calophylla</i>)	500	16	0	0			Nil	6ae214ee-32bd-473b-9eba-a35b8d3384b5
-31.3112895	115.6549887	Marri (<i>Corymbia calophylla</i>)	500	13	0	0			Nil	8cfa86bc-9171-4ef8-a2a4-ce1b7284f6ca
-31.3061388	115.652948	Marri (<i>Corymbia calophylla</i>)	500	18	0	0			Nil	49b82acc-7a0b-4771-98bc-0c813c39a6f2
-31.3105427	115.6550402	Marri (<i>Corymbia calophylla</i>)	500	10	0	0			Nil	3438984d-f7c1-40fb-8215-bc99a297f73b
-31.3124613	115.6536244	Marri (<i>Corymbia calophylla</i>)	500	14	0	0			Nil	b82c4857-626f-49a6-916e-7b278ecc53e0
-31.3125066	115.6536395	Marri (<i>Corymbia calophylla</i>)	500	12	0	0			Nil	3df5d2df-7ea8-4fb5-bbb1-a522d227075c
-31.3120509	115.6533887	Marri (<i>Corymbia calophylla</i>)	500	11	0	0			Nil	c863f8ee-eed5-463f-a449-73a55fac665c
-31.31025	115.6488176	Marri (<i>Corymbia calophylla</i>)	500	12	0	0			Nil	34dc80cb-56b4-450f-9b48-14eb2fa7646f

-31.3012232	115.6483317	Marri (<i>Corymbia calophylla</i>)	500	14	0	0			Nil	d3921ea2-7677-4c59-8224-298cbf3d2c8c
-31.3026916	115.645005	Marri (<i>Corymbia calophylla</i>)	500	10	0	0			Nil	bcf89a49-ff2a-4b0f-b08a-60f2cd53c68f
-31.3046962	115.6452427	Marri (<i>Corymbia calophylla</i>)	500	10	0	0			Nil	1f541e64-3097-40c9-935e-5e60b4e4cddb
-31.3051293	115.6447473	Marri (<i>Corymbia calophylla</i>)	500	18	0	0			Nil	40a4b5b2-7bef-4a88-a044-3e25150e97d2
-31.3031534	115.6533313	Marri (<i>Corymbia calophylla</i>)	500	15	0	0			Nil	005886a6-5728-4db6-b3d8-283f28b7f985
-31.30963041	115.6551485	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	10	0	0			Nil	8ecc7706-d084-42b0-84b9-065752f0a304
-31.31049262	115.6527017	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	8	0	0			Nil	dccfdc43-1850-41db-866c-4c58a1a3ddb6
-31.31463943	115.6505485	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	7	0	0			Nil	af0efeb9-7777-4e8f-93b4-52aedfd1c15
-31.31605527	115.6503832	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	8	0	0			Nil	b61210ee-e5ba-4d82-a1e7-72edbc148a30
-31.3028549	115.6513202	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	10	0	0			Nil	03e75438-1ef8-43ac-ba52-391c772ae8a9
-31.3057937	115.6506771	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	5	0	0			Nil	757df088-f2fd-4245-a979-2d0799967d90
-31.3061647	115.6508466	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	6	0	0			Nil	a5995c3b-a66f-4db6-8914-8ad4f646cc7d
-31.3063226	115.6509187	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	6	0	0			Nil	fac27a12-1721-46d5-893c-837886b776e1
-31.30284816	115.6518913	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	510	8	0	0			Nil	f8297882-cd79-4d32-a3ff-73314d7b1bc5
-31.30799104	115.6565017	Redheart (<i>Eucalyptus decipiens</i>)	510	10	0	0			Nil	f4ee52db-81ed-4a8c-a578-52d46d1c97ce
-31.30861751	115.6570646	Redheart (<i>Eucalyptus decipiens</i>)	510	8	0	0			Nil	56863de3-c600-45af-ba0c-d59b48b3f628

-31.30886644	115.6572091	Redheart (<i>Eucalyptus decipiens</i>)	510	8	0	0			Nil	be87ac09-1361-4600-8a53-5480c872123f
-31.31053816	115.6586837	Redheart (<i>Eucalyptus decipiens</i>)	510	8	0	0			Nil	6933a0d3-b526-43df-8a80-ca3a386fc386
-31.31185352	115.6585083	Redheart (<i>Eucalyptus decipiens</i>)	510	10	0	0			Nil	22043d7c-829a-4c88-81b8-85eccaba498c
-31.31156937	115.6612552	Marri (<i>Corymbia calophylla</i>)	510	14	0	0			Nil	1e150d2d-b639-4a1b-8bab-5b4eb30026e8
-31.31405825	115.6589968	Marri (<i>Corymbia calophylla</i>)	510	18	0	0			Nil	986217f4-3fb2-42d5-992f-2276a1e0fcc8
-31.31406914	115.6598209	Marri (<i>Corymbia calophylla</i>)	510	20	0	0			Nil	bd74c7c3-bfdd-4c54-81be-c88ef8c0202b
-31.30945968	115.6552615	Marri (<i>Corymbia calophylla</i>)	510	18	0	0			Nil	1d19ffd9-8bce-4ac9-bacc-18befd508e02
-31.3096181	115.6552659	Marri (<i>Corymbia calophylla</i>)	510	15	0	0			Nil	e3c427ae-9dcc-441c-8413-720bb395b3c7
-31.30958887	115.6552514	Marri (<i>Corymbia calophylla</i>)	510	15	0	0			Nil	33db2b58-4ff8-4c8e-b349-dc01e9697c61
-31.31158541	115.6531576	Marri (<i>Corymbia calophylla</i>)	510	18	0	0			Nil	fcf48a34-f938-4bda-a63a-515c63379c47
-31.31139779	115.6528183	Marri (<i>Corymbia calophylla</i>)	510	20	0	0			Nil	a9c7e1fa-ea93-4cf5-8469-f5e5eae9dd59
-31.3116697	115.6538113	Marri (<i>Corymbia calophylla</i>)	510	11	0	0			Nil	3447c4a3-26dd-4ea8-a75a-b60c20ffb067
-31.31458042	115.6522102	Marri (<i>Corymbia calophylla</i>)	510	25	0	0			Nil	8b0bab30-daa7-4bca-94b5-2de441dbe3c3
-31.30217266	115.6489982	Marri (<i>Corymbia calophylla</i>)	510	10	0	0			Nil	ac43f577-f058-4ddc-82b1-42338090ba91
-31.3046891	115.6452492	Marri (<i>Corymbia calophylla</i>)	510	12	0	0			Nil	b551e740-411a-4eb4-90e4-151da85465eb
-31.30736198	115.665819	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	520	6	0	0			Nil	5e08d793-ce91-43f6-b88e-fdb59dfd0de6
-31.30723078	115.6579974	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	520	8	0	0			Nil	45ed4f64-f92c-499e-a4dd-196b005fd2c6
-31.3073021	115.6535977	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	520	7	0	0			Nil	c73357ec-c5cd-4b66-91f7-e78720b7c458

-31.3095971	115.6522519	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	520	3	0	0			Nil	e4f477ef-bbca-44fa-9600-2ccd5bac4c7f
-31.3040509	115.6501761	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	520	6	0	0			Nil	3ddf01a3-4f58-4a2c-9bcb-a8cab38aa7d8
-31.3062665	115.650963	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	520	7	0	0			Nil	0e5b6ba5-7ebb-4151-8cc3-e35ed5497074
-31.3060752	115.649588	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	520	12	0	0			Nil	88bfe412-5374-47a3-a65c-fe4d3ffe5ce5
-31.30817666	115.6559089	Redheart (<i>Eucalyptus decipiens</i>)	520	10	0	0			Nil	e994dc6c-74a4-4cf9-8cda-5cc887da5cf8
-31.3088389	115.6572489	Redheart (<i>Eucalyptus decipiens</i>)	520	8	0	0			Nil	009c2d5f-8d96-4728-a1b8-d7d1a9e3f0a4
-31.31148114	115.6594981	Redheart (<i>Eucalyptus decipiens</i>)	520	10	0	0			Nil	128c88cb-7c4e-4487-8315-beccf61824be
-31.3132424	115.6594579	Redheart (<i>Eucalyptus decipiens</i>)	520	10	0	0			Nil	b9f175a3-94e5-40fd-b885-e3771ef6bc55
-31.30698213	115.6578468	Marri (<i>Corymbia calophylla</i>)	520	10	0	0			Nil	b7b57291-448b-4a94-b8f8-27f48c2ef442
-31.30878165	115.6581513	Marri (<i>Corymbia calophylla</i>)	520	12	0	0			Nil	6afe1a27-c1d5-4b88-a2a8-737e21c0f2b4
-31.31477119	115.6611074	Marri (<i>Corymbia calophylla</i>)	520	12	0	0			Nil	67908214-3d8a-437f-96c0-07aca48ca991
-31.31410093	115.6590645	Marri (<i>Corymbia calophylla</i>)	520	18	0	0			Nil	5f4712f4-3c68-40e0-a07c-b779eb99a18c
-31.31458787	115.6613132	Marri (<i>Corymbia calophylla</i>)	520	8	0	0			Nil	466e28a4-bf3a-4a42-ad73-4cac840ba887
-31.30957082	115.6552514	Marri (<i>Corymbia calophylla</i>)	520	15	0	0			Nil	878a02d3-a887-44e9-a061-0e039476cde3
-31.3114104	115.6541639	Marri (<i>Corymbia calophylla</i>)	520	15	0	0			Nil	c3262dd8-77c3-453f-afc3-8bb6c93fc1ec
-31.3115578	115.6498279	Marri (<i>Corymbia calophylla</i>)	520	8	0	0			Nil	3f63de6b-dd5b-4a9f-96b8-5de1c0f90d3e
-31.3146857	115.6521833	Marri (<i>Corymbia calophylla</i>)	520	20	0	0			Nil	44887d82-d72c-41de-9d7f-c1e5ba1e3211
-31.31684696	115.6526755	Marri (<i>Corymbia calophylla</i>)	520	15	0	0			Nil	22f17157-3975-4b4e-918b-8ad7dded60ac

-31.30367835	115.6484071	Marri (<i>Corymbia calophylla</i>)	520	15	0	0			Nil	944c3c7c-ba44-48e6-8195-71a5186ffa0e
-31.3029576	115.6499502	Marri (<i>Corymbia calophylla</i>)	520	13	0	0			Nil	f4d15a07-843c-4772-b471-c632f8827c7a
-31.309824	115.6556727	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	530	14	0	0			Nil	69c69b2f-4cb9-4ef7-9bbe-966f95b1f326
-31.3037681	115.6534044	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	530	6	0	0			Nil	34251d15-6333-44b4-8460-9feb29da38a9
-31.31320237	115.6596124	Redheart (<i>Eucalyptus decipiens</i>)	530	8	0	0			Nil	468256e3-d307-4b15-a067-4c1a707f5eca
-31.3121918	115.6597379	Marri (<i>Corymbia calophylla</i>)	530	15	0	0			Nil	2125da7e-9952-4a46-bf3c-cbab9283e1dd
-31.3116201	115.6500952	Marri (<i>Corymbia calophylla</i>)	530	7	0	0			Nil	0b58f8e7-0776-44f2-835c-17ebdf2c435b
-31.3116394	115.6501271	Marri (<i>Corymbia calophylla</i>)	530	9	0	0			Nil	bfdcee5-99c5-4966-b869-57f3582ff32e
-31.3130126	115.6539586	Marri (<i>Corymbia calophylla</i>)	530	12	0	0			Nil	26f08981-2f0c-447d-b072-efad065c2063
-31.30974814	115.6538175	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	540	7	0	0			Nil	4e7e74c8-778d-4a21-98e9-db33ba05e227
-31.3025597	115.6503799	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	540	13	0	0			Nil	d0c86b80-9c9d-4c7b-ae38-375b3d88ba2b
-31.3029534	115.6512201	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	540	9	0	0			Nil	c3a768f7-4fdd-4a1e-b710-29da12e96f74
-31.30618091	115.6496859	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	540	6	0	0			Nil	40a085f8-a94b-4676-b705-d7913ccff887
-31.308058	115.656479	Redheart (<i>Eucalyptus decipiens</i>)	540	10	0	0			Nil	2ccd1ab2-f7af-46da-be9d-c76a1172f309
-31.3088221	115.6563013	Redheart (<i>Eucalyptus decipiens</i>)	540	10	0	0			Nil	154f4e37-14d1-43bf-8a3a-77ffff217ab
-31.3095036	115.6571763	Redheart (<i>Eucalyptus decipiens</i>)	540	8	0	0			Nil	5db68d6f-10a0-4f35-bafd-f2758b46677e
-31.31362774	115.6616653	Marri (<i>Corymbia calophylla</i>)	540	16	0	0			Nil	f2e8cd31-3ac8-4520-9adc-85caf19a0ac7

-31.3149441	115.6615152	Marri (<i>Corymbia calophylla</i>)	540	14	0	0		Nil	54899384-1418-4613-b9a4-24358df2aa58
-31.3115686	115.6541627	Marri (<i>Corymbia calophylla</i>)	540	14	0	0		Nil	ea71c140-d9fc-4162-9fd6-e5544daedf1f
-31.3051219	115.6447538	Marri (<i>Corymbia calophylla</i>)	540	18	0	0		Nil	2ec9df76-613c-4522-b2fd-ecfdcaaa5bd
-31.30255424	115.6505036	Marri (<i>Corymbia calophylla</i>)	540	20	0	0		Nil	3ace321a-7520-4ff8-993b-2a64bdf73cd8
-31.30737143	115.6651796	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	550	6	0	0		Nil	25e1d122-0c86-407d-a5a0-a4544a6734b9
-31.30712966	115.6648551	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	550	6	0	0		Nil	bd9c3da9-9849-4c97-a1bc-9d63f0ac9e5d
-31.3046905	115.6553287	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	550	10	0	0		Nil	a0ec092a-0ec0-432c-b59c-cf19c014b753
-31.3046595	115.6559626	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	550	7	0	0		Nil	b3187483-50ad-4499-babb-03d20d87ecb3
-31.3082952	115.6562188	Redheart (<i>Eucalyptus decipiens</i>)	550	10	0	0		Nil	7af77472-38da-42a5-98aa-b553bba2e5e3
-31.30828293	115.6560095	Redheart (<i>Eucalyptus decipiens</i>)	550	10	0	0		Nil	966fef82-172d-4cb4-9947-5270e0c7b701
-31.30908672	115.6559347	Redheart (<i>Eucalyptus decipiens</i>)	550	12	0	0		Nil	03a796a0-a55e-4fa0-9a76-fea30d70204c,a804962c-b12f-435d-b71d-faebb6a681ac,34af347a-7e24-445f-845c-ab9ff0bad26c,fcf94807-480e-449e-98f6-7c373e7432fb
-31.3086639	115.6570285	Redheart (<i>Eucalyptus decipiens</i>)	550	8	3	0	2	Nil	f5a09766-12ab-4d88-a72a-96ad80b9e7c2
-31.3091368	115.6574942	Redheart (<i>Eucalyptus decipiens</i>)	550	10	0	0		Nil	c565848b-cd29-44cb-bc79-bba93a02f926
-31.3093616	115.657488	Redheart (<i>Eucalyptus decipiens</i>)	550	10	0	0		Nil	5ced0f43-52a5-45c3-a650-40376bde5341

-31.30962754	115.6573184	Redheart (<i>Eucalyptus decipiens</i>)	550	8	0	0			Nil	069a2586-7242-4432-ba0b-b0b75c23b6ae
-31.3109157	115.6587212	Redheart (<i>Eucalyptus decipiens</i>)	550	15	1	0		1	Nil	
-31.30783578	115.6648048	Marri (<i>Corymbia calophylla</i>)	550	8	4	1		2	Nil	b23cb2d4-a3a0-4245-ac1a-ba9574647d79
-31.30683117	115.6656219	Marri (<i>Corymbia calophylla</i>)	550	8	0	0			Nil	ff06f405-e8f4-48e5-a91f-8166ac09b5ae
-31.31599426	115.6616703	Marri (<i>Corymbia calophylla</i>)	550	10	0	0			Nil	831d63d7-e42f-4579-937d-bba3b502aa33
-31.31034195	115.6539626	Marri (<i>Corymbia calophylla</i>)	550	20	0	0			Nil	054b7d83-788b-426e-bc30-4a23d5675da3
-31.3109114	115.6529401	Marri (<i>Corymbia calophylla</i>)	550	18	0	0			Nil	cdaaa4aa-ada6-4f24-a48f-e802a839d29e
-31.3060706	115.6528312	Marri (<i>Corymbia calophylla</i>)	550	18	0	0			Nil	966d74b4-e5de-4b9c-8e32-d0528751dccb
-31.3122555	115.6536913	Marri (<i>Corymbia calophylla</i>)	550	14	0	0			Nil	d86e551d-e13b-490a-8e2d-8ec9f6723a90
-31.3127004	115.6542104	Marri (<i>Corymbia calophylla</i>)	550	15	0	0			Nil	b73939e9-d608-4515-af9b-e608fd04f08d
-31.3124391	115.6506099	Marri (<i>Corymbia calophylla</i>)	550	10	0	0			Nil	acc4b070-c1d1-4aad-86a2-e73e30b0cb97
-31.3116558	115.657681	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	560	7	0	0			Nil	0dc2be6b-92b2-4816-a981-c7e29e038def
-31.31219038	115.6612536	Marri (<i>Corymbia calophylla</i>)	560	16	0	0			Nil	803ce024-1d25-4982-8967-556b0dd11f47
-31.3127699	115.6542409	Marri (<i>Corymbia calophylla</i>)	560	16	0	0			Nil	d7dca518-776f-4a83-9019-6e1d5f231b23
-31.3025444	115.6505292	Marri (<i>Corymbia calophylla</i>)	560	14	0	0			Nil	b645436d-467f-4cb0-abf5-8752cdc813c4
-31.3048008	115.6452429	Marri (<i>Corymbia calophylla</i>)	560	16	0	0			Nil	0c834523-8c8a-4c91-a597-8308af4045ec
-31.311699	115.6572653	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	570	9	0	0			Nil	110b3a01-f369-4bd2-bf88-d37be4fc0def
-31.3128841	115.6577559	Marri (<i>Corymbia calophylla</i>)	570	20	0	0			Nil	18b0f8c2-4833-481b-81c3-13ca44d82e82
-31.3088074	115.6530566	Marri (<i>Corymbia calophylla</i>)	570	15	0	0			Nil	c2d59d07-188a-4145-adb5-0106c95ff07f
-31.3098716	115.6523222	Marri (<i>Corymbia calophylla</i>)	570	13	0	0			Nil	d2f035e3-5864-4be8-a9ce-02b9ca12e678

-31.3108351	115.6498526	Marri (<i>Corymbia calophylla</i>)	570	14	0	0			Nil	59068bbc-829c-4dce-a999-1d529e58bbce
-31.316244	115.6556916	Marri (<i>Corymbia calophylla</i>)	570	15	0	0			Nil	eda1336b-8b69-45ea-93b8-eef9762179f9
-31.3086351	115.6524453	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	580	8	0	0			Nil	b994dfcc-4fbd-45e2-97c4-3a3480bfd10
-31.3088695	115.6571803	Redheart (<i>Eucalyptus decipiens</i>)	580	12	0	0			Nil	c33e738f-75e6-4e37-9e34-fa4368ab5794
-31.31012883	115.6577744	Redheart (<i>Eucalyptus decipiens</i>)	580	15	0	0			Nil	0cb1ed20-bc59-437a-928c-ca977f1b2053
-31.31350056	115.6610557	Marri (<i>Corymbia calophylla</i>)	580	12	0	0			Nil	d5064961-83b5-4caa-9e06-5e2e54e880fb
-31.3141097	115.6598457	Marri (<i>Corymbia calophylla</i>)	580	20	0	0			Nil	b46f313a-d4f1-4676-a793-eb5681737695
-31.3087716	115.6526121	Marri (<i>Corymbia calophylla</i>)	580	14	0	0			Nil	1bf4a493-24a7-43ab-9978-47c7900858ef
-31.30986529	115.6543492	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	590	7	1	0			Nil	7362f0ae-0d75-4f24-8faf-f9c5e49f53db
-31.3114797	115.6578624	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	590	9	0	0			Nil	c141dc07-ee17-4824-9ce3-57f1aa16b808
-31.3163091	115.6617348	Marri (<i>Corymbia calophylla</i>)	590	14	0	0			Nil	548489ab-8e7a-4594-969e-936b93193141
-31.3093317	115.65497	<i>Allocasuarina sp.</i>	600	10	0	0			Nil	464c92dd-d039-46d2-926e-d71989133570
-31.30738862	115.666678	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	600	8	1	0			Nil	556b5f56-1a18-449f-95ea-fe63aee8be9f
-31.3072517	115.6651876	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	600	10	0	0			Nil	ab13560a-9fb3-4782-887a-06741750f77c
-31.31304942	115.6611644	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	600	8	0	0			Nil	5686c897-f958-4984-aa59-b06de3757a6d
-31.3057607	115.6507319	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	600	6	0	0			Nil	39c57f07-4f4e-42e0-a5db-4af355f3bdca
-31.30802455	115.6565047	Redheart (<i>Eucalyptus decipiens</i>)	600	10	0	0			Nil	1f80133d-0125-4190-8c52-6e80087d97d7

-31.30806895	115.6565496	Redheart (<i>Eucalyptus decipiens</i>)	600	8	0	0			Nil	eb24c609-6cf7-43f9-b282-b6997326bd7c
-31.31073381	115.6591782	Redheart (<i>Eucalyptus decipiens</i>)	600	8	1	0	1		Nil	167db151-7078-468f-994f-b3c5d99495bf
-31.31155762	115.6595785	Redheart (<i>Eucalyptus decipiens</i>)	600	8	0	0			Nil	4eae5340-6dd8-407c-96f5-869b02ebf8bb
-31.3125072	115.6601853	Redheart (<i>Eucalyptus decipiens</i>)	600	15	0	0			Nil	4c800fc6-a020-4a9e-afee-e2223c64b05b
-31.31306431	115.6596503	Redheart (<i>Eucalyptus decipiens</i>)	600	12	0	0			Nil	5b03c480-a583-4fb0-9cd7-88374daad235
-31.31323474	115.6592	Redheart (<i>Eucalyptus decipiens</i>)	600	15	0	0			Nil	77a5006d-28c1-4eb1-9371-2b5b2b130d5a
-31.31160403	115.6587353	Redheart (<i>Eucalyptus decipiens</i>)	600	8	0	0			Nil	bdf73b8f-2a20-4f9e-9edf-41c0e250125e
-31.31201307	115.6610246	Marri (<i>Corymbia calophylla</i>)	600	10	0	0			Nil	3b7eb884-e828-422c-aec3-649800f5ed2f
-31.31292796	115.6622359	Marri (<i>Corymbia calophylla</i>)	600	10	0	0			Nil	233050ae-2bf6-4082-8fdc-151bb0d2db51
-31.3130309	115.6620939	Marri (<i>Corymbia calophylla</i>)	600	10	0	0			Nil	c07d8b54-26f9-45ab-8547-e994f9537085
-31.31421407	115.6592972	Marri (<i>Corymbia calophylla</i>)	600	18	0	0			Nil	1c30831a-35c2-4057-afaf-9f033600e918
-31.31577628	115.6609676	Marri (<i>Corymbia calophylla</i>)	600	14	0	0			Nil	619ce9ee-ca32-46b1-b8a8-b5152dd3afe7
-31.3107651	115.6552562	Marri (<i>Corymbia calophylla</i>)	600	15	0	0			Nil	85e6dfdb-b13a-449d-808d-d9e4fcd206da
-31.3102652	115.6492039	Marri (<i>Corymbia calophylla</i>)	600	14	0	0			Nil	331ed354-53e0-4862-bb68-240707538931
-31.3119906	115.6507752	Marri (<i>Corymbia calophylla</i>)	600	10	0	0			Nil	2f405939-9b65-4708-ad54-a1fc3307a818
-31.3040364	115.6462386	Marri (<i>Corymbia calophylla</i>)	600	12	1	0			Nil	0173bcbe-4743-4d14-b4fc-bb53e8149438
-31.30774	115.6659133	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	610	5	0	0			Nil	6ca1640e-2527-4012-85be-bb10fe6513e1

-31.3060119	115.6494931	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	610	12	0	0			Nil	4ebc4230-2f72-42d8-8acd-7ac168d42b85
-31.303114	115.6548724	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	610	5	0	0			Nil	87a41c45-34af-4fc8-bad4-14db57e3b3a6
-31.3119142	115.6510031	Marri (<i>Corymbia calophylla</i>)	610	20	0	0			Nil	38f3ff6d-555b-447d-907a-8a78e89a89b8
-31.31017065	115.6536445	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	620	8	0	0			Nil	d8aca099-e9aa-4337-a0a0-e7229bdc2f07
-31.306975	115.6515694	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	620	6	0	0			Nil	16988808-3f70-4769-833e-c9dcc940e7c
-31.3052589	115.6456946	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	620	9	0	0			Nil	c2efb8f2-8cf0-442a-be7d-90831538c8ee
-31.31107697	115.659428	Redheart (<i>Eucalyptus decipiens</i>)	620	8	1	0	1		Nil	4a47c776-1e06-4c1b-b17d-019367ca377c
-31.30696523	115.6568859	Marri (<i>Corymbia calophylla</i>)	620	12	2	0			Nil	b66b898e-b40e-4947-8caf-32b3bf3f3be6
-31.31596361	115.6621139	Marri (<i>Corymbia calophylla</i>)	620	16	0	0			Nil	
-31.3108164	115.6497861	Marri (<i>Corymbia calophylla</i>)	620	15	0	0			Nil	0d70570b-d3fc-449a-af6e-9e78ff4ce7e1
-31.3126805	115.6541971	Marri (<i>Corymbia calophylla</i>)	620	18	0	0			Nil	73727fad-14f2-488f-acef-1063b8545de9
-31.3091186	115.6488158	Marri (<i>Corymbia calophylla</i>)	620	11	0	0			Nil	d726d6ef-9356-40cd-b328-56cf9e93cb1d
-31.31144849	115.653041	<i>Allocasuarina sp.</i>	630	20	0	0			Nil	c28c1031-cd33-46c4-aaa5-a73fb8e52010
-31.3101102	115.6558881	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	630	13	0	0			Nil	016f59e5-1131-4934-904b-2c41053d601b
-31.30503133	115.6490338	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	630	12	0	0			Nil	3b81389b-0f19-4b0c-be1d-b019f5e2c58f
-31.306026	115.6473382	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	630	9	0	0			Nil	7acad4ce-48f3-4dc5-af48-f344a1fef005

-31.3111627	115.6594473	Redheart (<i>Eucalyptus decipiens</i>)	630	12	1	0		1	Nil	341fea08-7afd-46af-b375-a2d0e7614508,d583575f-22c7-4361-a63f-88cf5d1b7299
-31.31425389	115.6591899	Marri (<i>Corymbia calophylla</i>)	630	20	0	0			Nil	2c0b743c-4ed9-4649-81bc-c91a7e904bee
-31.31435815	115.6593579	Marri (<i>Corymbia calophylla</i>)	630	18	0	0			Nil	057cda5f-a9c9-4ea2-bdaf-44d2abb3f4c9
-31.3085799	115.6541944	Marri (<i>Corymbia calophylla</i>)	630	18	0	0			Nil	626aeab9-33f3-46f3-96c8-216bc3d1b52e
-31.3119532	115.65201	Marri (<i>Corymbia calophylla</i>)	630	25	0	0			Nil	eb182317-60f2-4571-9499-96151a06d230,08c19d77-f36f-4549-aef2-8f0653d8d87d
-31.3120731	115.6534875	Marri (<i>Corymbia calophylla</i>)	630	16	0	0			Nil	80363326-9592-4300-ad59-f670ac985cc7
-31.31024312	115.6528596	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	640	6	0	0			Nil	abdDCF7e-7bff-480e-82a5-665073bb88c0
-31.3051813	115.6454273	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	640	6	0	0			Nil	7e951fea-1b04-4b9b-a752-f5c92271d566
-31.31324534	115.6607506	Marri (<i>Corymbia calophylla</i>)	640	14	0	0			Nil	347b75a0-ac59-4b72-acfb-99de514e8d59
-31.3168431	115.6621209	Marri (<i>Corymbia calophylla</i>)	640	10	0	0			Nil	dfdbb236-567f-44da-a6de-90216e7a9f8b
-31.3109244	115.6566105	Marri (<i>Corymbia calophylla</i>)	640	15	0	0			Nil	a7d36222-d7f8-4c46-bf9d-7eef2a931ab8
-31.3102028	115.6491252	Marri (<i>Corymbia calophylla</i>)	640	13	0	0			Nil	
-31.3161315	115.6557909	Marri (<i>Corymbia calophylla</i>)	640	12	0	0			Nil	7586f9e1-f3f3-4351-b259-e145e0fa4037
-31.30711935	115.6554298	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	650	8	0	0			Nil	c8ac7c57-ff82-4231-be30-9387f2372f60
-31.3082252	115.658746	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	650	6	0	0			Nil	ebb9060a-2ce6-4444-9467-2e9a3500da63
-31.31578001	115.6594629	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	650	8	0	0			Nil	9b30152c-a6ab-4898-a610-cda34890e708
-31.3043076	115.6502453	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	650	6	0	0			Nil	9ff30786-f234-4555-be96-7159d608f7b2

-31.3057842	115.6482818	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	650	7	0	0			Nil	a7530735-a2d1-423d-af39-e581e0d9fcf2
-31.30318391	115.6522859	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	650	8	0	0			Nil	4b2e068f-a76f-4404-9467-da522b3cf300
-31.30816892	115.6565423	Redheart (<i>Eucalyptus decipiens</i>)	650	10	0	0			Nil	b6c9ef70-2f17-4275-afa0-36c9607bb61b
-31.30874155	115.6571753	Redheart (<i>Eucalyptus decipiens</i>)	650	12	1	0		1	Nil	ba10777b-6adf-43ae-8490-644592ca3ee8
-31.30909274	115.6574727	Redheart (<i>Eucalyptus decipiens</i>)	650	8	0	0			Nil	0f302b3a-9964-4341-9702-063c9cdb3f67
-31.30933794	115.657526	Redheart (<i>Eucalyptus decipiens</i>)	650	10	0	0			Nil	4181757f-3e9f-47bc-bcdb-6dda100b7d65
-31.309694	115.6572279	Redheart (<i>Eucalyptus decipiens</i>)	650	7	0	0			Nil	ff7d4435-ddbe-4ff1-8210-070e4a81345e
-31.31089851	115.6592912	Redheart (<i>Eucalyptus decipiens</i>)	650	18	0	0			Nil	2a05755c-8893-4d37-8f85-956cb100fe00
-31.30691138	115.6558459	Marri (<i>Corymbia calophylla</i>)	650	14	0	0			Nil	c7d7860f-7eba-404e-b225-abae3a702434
-31.30751065	115.655467	Marri (<i>Corymbia calophylla</i>)	650	12	0	0			Nil	a5b378b3-54bd-4c5b-b1b0-8ad95ecb6035
-31.30725799	115.6654593	Marri (<i>Corymbia calophylla</i>)	650	20	0	0			Nil	366cc4b7-86ab-45d0-979e-ea89a8c1b2f5
-31.30881746	115.6588164	Marri (<i>Corymbia calophylla</i>)	650	12	0	0			Nil	4c7bb8e9-438e-4054-877e-815904261481
-31.31209184	115.6610782	Marri (<i>Corymbia calophylla</i>)	650	12	0	0			Nil	8af813aa-ebe9-462a-b17f-453c6db409af
-31.31314451	115.6612237	Marri (<i>Corymbia calophylla</i>)	650	12	0	0			Nil	a941f6cb-abbb-4e4a-b77e-5b0583fa7c3c
-31.31405481	115.6598504	Marri (<i>Corymbia calophylla</i>)	650	20	0	0			Nil	848f1002-aab8-47f6-b75c-47be9d7b5b0b
-31.31575308	115.6611449	Marri (<i>Corymbia calophylla</i>)	650	14	0	0			Nil	36a32619-eb8f-41dd-ba2b-1bfb46500ae8
-31.31577027	115.6608237	Marri (<i>Corymbia calophylla</i>)	650	14	3	0		1	Nil	05c9e410-c18f-425d-a0c8-749bb0bc760a
-31.3058878	115.6523872	Marri (<i>Corymbia calophylla</i>)	650	22	0	0			Nil	7aa282db-c5a8-4640-b39f-fdaf984d8cd8

-31.31194	115.6510012	Marri (<i>Corymbia calophylla</i>)	650	21	0	0			Nil	28e04fc4-633e-4f9e-a9a6-79224b97269a
-31.3112855	115.6508973	Marri (<i>Corymbia calophylla</i>)	650	20	0	0			Nil	c7e4c10d-622c-4979-a3fc-8e9a1258afc8
-31.3032204	115.6523314	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	660	7	0	0			Nil	14ab483b-d312-4bda-aca7-528932fc3134
-31.3159962	115.6616764	Marri (<i>Corymbia calophylla</i>)	660	12	0	0			Nil	bf9949f8-70d9-431c-b7e8-2aa72def37f8
-31.31209958	115.652242	Marri (<i>Corymbia calophylla</i>)	660	20	0	0			Nil	c9a566b1-0947-461d-b317-1b35924d301b
-31.3122197	115.6506729	Marri (<i>Corymbia calophylla</i>)	660	10	0	0			Nil	aafd4e3a-86e7-4200-9e8d-847ed807463c
-31.3046434	115.6455357	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	670	8	0	0			Nil	6fadf98b-af62-442b-8d10-6889e5a6d255
-31.30872293	115.6588174	Marri (<i>Corymbia calophylla</i>)	670	12	0	0			Nil	585410b4-75da-4ae2-86e4-23087ddc4f55
-31.30330909	115.6487675	Marri (<i>Corymbia calophylla</i>)	670	12	0	0			Nil	1c11277a-cea7-42e7-8ff3-c8393b72c56c
-31.30978623	115.653731	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	680	7	0	0			Nil	5b25b8c6-d99a-4a4f-b2b2-f5626749991b
-31.304695	115.6456129	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	680	6	0	0			Nil	5e85f070-6e72-41b4-b224-46c86f80a5b6
-31.3039932	115.6537566	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	680	11	0	0			Nil	56e7a7a9-ce4e-460d-aed6-27646169330e
-31.3094882	115.6567291	Redheart (<i>Eucalyptus decipiens</i>)	680	18	0	0			Nil	ab79dcdb-f7ee-433e-9434-dd886a4a178a
-31.31375434	115.6604623	Marri (<i>Corymbia calophylla</i>)	680	12	0	0			Nil	c82a55e1-d6a8-4810-9237-99b3ceab4327
-31.31657371	115.6617001	Marri (<i>Corymbia calophylla</i>)	680	14	0	0			Nil	287c1688-691a-4bae-9e64-a8bdc6f2eab0
-31.3088925	115.6540314	Marri (<i>Corymbia calophylla</i>)	680	18	0	0			Nil	a8aa10f9-4398-4369-9e24-dd1dff6468ef
-31.3087859	115.6537627	Marri (<i>Corymbia calophylla</i>)	680	15	0	0			Nil	be8cac00-58eb-4f62-bce0-3a48600b9c3a
-31.3121522	115.6537941	Marri (<i>Corymbia calophylla</i>)	680	17	0	0			Nil	86a53f65-3367-4d4a-a096-2291148eb9c2
-31.3120602	115.6510246	Marri (<i>Corymbia calophylla</i>)	680	18	0	0			Nil	acf0c4c6-133c-4822-94a4-81171c9ae815

-31.3029262	115.649972	Marri (<i>Corymbia calophylla</i>)	680	12	0	0			Nil	0d94731b-8849-4410-b71d-7bdad064a8d4
-31.3014045	115.6465168	Marri (<i>Corymbia calophylla</i>)	680	15	0	0			Nil	981597cb-0a70-4cc0-b90f-146db9e483a9
-31.3094369	115.6536623	Stag	680	10	3	0			Nil	552c3616-8355-496a-aec5-11c6cf571dd3
-31.3047273	115.6457311	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	690	8	0	0			Nil	d8262dcb-a2d8-472b-af9c-d67685751073
-31.3108973	115.6562891	Marri (<i>Corymbia calophylla</i>)	690	10	1	0			Nil	102a5958-546c-4709-bc93-0ef549ef94d7
-31.3090967	115.6529977	Marri (<i>Corymbia calophylla</i>)	690	13	0	0			Nil	d90619a6-d89e-4b1f-a4e8-11c55d6addb1
-31.307204	115.6538956	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	700	5	0	0			Nil	dce880ed-a853-42c4-bf4c-49395a2d3287
-31.31320896	115.6618859	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	700	8	0	0			Nil	bf16e2ec-b01a-4347-bddf-02a82cb17f46
-31.31035655	115.6530185	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	700	10	0	0			Nil	9b4f80dc-9aaa-4e00-a09e-fe201c615aa2
-31.30228181	115.6487863	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	700	8	0	0			Nil	b026bfa4-825e-4f88-8954-4da9982ce096
-31.30591307	115.649886	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	700	8	0	0			Nil	3455e19c-cf57-4cb2-ab4f-2ef618b5d63e
-31.3060221	115.6509895	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	700	8	0	0			Nil	6f80abe6-32fe-4816-9818-a0532dd506ee
-31.3051546	115.655863	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	700	5	0	0			Nil	3f9cf675-ad8a-4a06-82f2-a6106f6f672a
-31.3074757	115.6567941	Marri (<i>Corymbia calophylla</i>)	700	12	0	0			Nil	1ec884e1-4244-483c-bf9a-900b17a85b5c
-31.30746596	115.6542218	Marri (<i>Corymbia calophylla</i>)	700	12	0	0			Nil	9427e100-268a-4ad8-a85a-b101ccf90942
-31.30759515	115.6578632	Marri (<i>Corymbia calophylla</i>)	700	12	0	0			Nil	ea0768b3-6af8-4f13-81e9-a12748c7da46
-31.31582326	115.66104	Marri (<i>Corymbia calophylla</i>)	700	14	0	0			Nil	9ccd9d76-4c4e-4b7d-84d1-24735cd6bffd
-31.30993691	115.6526799	Marri (<i>Corymbia calophylla</i>)	700	28	0	0			Nil	6e7fe555-f2a8-4c7e-8765-8dbbe34c1e5c

-31.3113656	115.6488152	Marri (<i>Corymbia calophylla</i>)	700	10	0	0			Nil	d3dc45ac-a432-4bac-ae26-fc4b029e7422
-31.30408771	115.6490207	Marri (<i>Corymbia calophylla</i>)	700	12	0	0			Nil	d85d92bb-0836-4a9f-990f-e9a0c946b8b6
-31.31697327	115.6529716	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	710	6	0	0			Nil	819d56c0-6258-4f86-82cf-81458e987d7e
-31.3036998	115.6533881	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	710	9	0	0			Nil	1373b5d4-cf56-4c95-a2ff-df06e5074bea
-31.3078413	115.6528634	Marri (<i>Corymbia calophylla</i>)	710	22	0	0			Nil	c13dcd92-1c6c-4cf4-ae65-1c73933e2815
-31.31357245	115.6515567	Marri (<i>Corymbia calophylla</i>)	710	25	0	0			Nil	90723100-a132-4d6d-8c39-6d8fce8c4788
-31.3120082	115.6508073	Marri (<i>Corymbia calophylla</i>)	710	12	0	0			Nil	09879d0a-a92f-4635-850a-e82d1771033a
-31.3078322	115.6528846	Marri (<i>Corymbia calophylla</i>)	720	23	0	0			Nil	523b559b-ddd8-455b-aa54-79d6793e96ef
-31.3114553	115.6542138	Marri (<i>Corymbia calophylla</i>)	720	9	0	0			Nil	4295f0ab-3e9c-4d39-838b-9126fa580615
-31.3124695	115.6537465	Marri (<i>Corymbia calophylla</i>)	720	14	0	0			Nil	aacde7b9-f88a-4357-97f5-0a80b4926625
-31.30957684	115.6534148	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	730	8	0	0			Nil	d0c733ae-fae3-4521-80ef-eb28f70fccf7
-31.3090127	115.653763	Marri (<i>Corymbia calophylla</i>)	730	13	3	0			Nil	14f49059-d7c8-46b9-9183-c758ee438182
-31.31046655	115.6540807	Marri (<i>Corymbia calophylla</i>)	730	18	0	0			Nil	6ce0d861-f68f-4f13-b6b1-855219581215
-31.3093378	115.6521766	Marri (<i>Corymbia calophylla</i>)	730	18	0	0			Nil	1ced6e5a-ed64-4af0-81a2-92258633d274
-31.3120499	115.6511152	Marri (<i>Corymbia calophylla</i>)	730	18	2	0			Nil	d1450520-14cb-4695-9821-81b51e5ea000
-31.30550314	115.6494881	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	740	12	0	0			Nil	5c147c20-b04f-4e84-8e2a-a58c15ff83d2
-31.30464231	115.6474888	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	740	12	0	0			Nil	24176aff-d71f-4a5e-a77a-6f1a5d74f6c6
-31.3093694	115.6490302	Marri (<i>Corymbia calophylla</i>)	740	13	1	0			Nil	49b0ce7f-fdc5-4407-8ba5-8115268233ca
-31.3023949	115.6469442	Marri (<i>Corymbia calophylla</i>)	740	15	0	0			Nil	a38fa0e8-bad1-4552-9211-b36b25d0ca38

-31.30629005	115.653453	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	750	5	0	0			Nil	f1c6fa44-946b-4a4b-965d-47fd679bacc9
-31.3079012	115.6531923	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	750	9	0	0			Nil	e06f7618-1ec9-4151-b7bb-13a82b4bdd07
-31.3162361	115.6558363	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	750	7	0	0			Nil	89bdda2a-a5ea-437c-a2aa-86d1f312ca8c
-31.30833077	115.6558965	Redheart (<i>Eucalyptus decipiens</i>)	750	10	0	0			Nil	c846dbaf-152c-4454-9a54-c37471bc492b
-31.30957168	115.6569342	Redheart (<i>Eucalyptus decipiens</i>)	750	20	0	0			Nil	da0735cc-b26d-4542-93d3-ecf719399e16
-31.30788505	115.6575126	Marri (<i>Corymbia calophylla</i>)	750	18	0	0			Nil	a3fc732f-0eb7-4efb-9522-d4d7796ca578
-31.30824054	115.6577127	Marri (<i>Corymbia calophylla</i>)	750	16	0	0			Nil	2bf5123f-ad97-4dda-a4a1-ab39582c5391
-31.3130819	115.6617192	Marri (<i>Corymbia calophylla</i>)	750	12	0	0			Nil	4994e3e5-d86d-441d-94bb-52b8d496d125
-31.30953931	115.6551965	Marri (<i>Corymbia calophylla</i>)	750	18	0	0			Nil	93f66ff0-0aa4-4a8e-9719-d77352edebbc
-31.30383849	115.648494	Marri (<i>Corymbia calophylla</i>)	750	25	0	0			Nil	2dad3a1e-7da0-4f90-99f8-57f2cc214b0e
-31.3048292	115.6454658	Marri (<i>Corymbia calophylla</i>)	750	20	0	0			Nil	472c3009-0e99-4925-a503-834348ab88ad
-31.3101269	115.6560144	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	760	8	0	0			Nil	8bfd0f2e-a086-49e0-b195-5057ae997129
-31.31032361	115.6575618	Redheart (<i>Eucalyptus decipiens</i>)	760	18	0	0			Nil	4cc77f7d-dcf1-4899-bf8f-bb5f6a4d2259
-31.3141396	115.6607563	Marri (<i>Corymbia calophylla</i>)	760	17	0	0			Nil	4cf7939d-c9c6-4b49-8b05-9aa918ec68e9
-31.3124188	115.6506284	Marri (<i>Corymbia calophylla</i>)	760	11	1	0			Nil	0b232e03-8106-4c23-b9e6-723d9228f1c5
-31.30855764	115.658393	Marri (<i>Corymbia calophylla</i>)	770	16	0	0			Nil	832c1f5f-6e9f-4f0d-bfce-9e45fba94cd0
-31.3131989	115.65412	Marri (<i>Corymbia calophylla</i>)	770	20	0	0			Nil	a7d47aeb-9dc4-4d27-b81f-7fd6f3962cd0
-31.3156852	115.6609201	Marri (<i>Corymbia calophylla</i>)	780	14	0	0			Nil	2d24ea22-8ca8-46e6-81b0-c29787422dc3

-31.3119778	115.653708	Marri (<i>Corymbia calophylla</i>)	780	18	1	0			Nil	4ff42425-59fc-4187-9d1e-b861e5091ac5
-31.3103448	115.6495256	Marri (<i>Corymbia calophylla</i>)	780	16	0	0			Nil	bcbebd11-329f-42f7-9d02-0e0e1b9e10d3
-31.3047594	115.6455377	Marri (<i>Corymbia calophylla</i>)	780	9	0	0			Nil	3ca5d4f2-8d45-4869-b8ea-1ed7d80c7542
-31.311619	115.6502149	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	790	9	0	0			Nil	2f8239af-f62f-4db5-a074-a066de55f6ea
-31.30345147	115.6527483	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	790	10	0	0			Nil	b6729fed-de60-461f-a057-0e4f7bb70c4d
-31.3095917	115.6551883	Marri (<i>Corymbia calophylla</i>)	790	17	0	0			Nil	d46399e7-061d-4626-b2b8-6768c2043b37
-31.3103479	115.6561394	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	800	10	0	0			Nil	0b3ec59b-37ca-4b63-9a18-612ef4a4be45
-31.30542522	115.649599	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	800	12	0	0			Nil	9d74e144-5eaf-41f5-838a-bb38df121e94
-31.3089793	115.6573905	Redheart (<i>Eucalyptus decipiens</i>)	800	12	0	0			Nil	90edb06d-ded0-40c5-9db8-ab7d6df7bb17
-31.30966192	115.6574804	Redheart (<i>Eucalyptus decipiens</i>)	800	12	0	0			Nil	0165a145-4b3b-4210-b6bd-04fc7b771a0e
-31.31284232	115.6583833	Redheart (<i>Eucalyptus decipiens</i>)	800	15	0	0			Nil	94e9cc58-3ecd-4ec0-87e4-5e8922d037b9
-31.30714398	115.6656956	Marri (<i>Corymbia calophylla</i>)	800	12	2	0			Nil	603c55b7-6de3-49bc-8a34-3da2a877e3eb
-31.30698271	115.6566231	Marri (<i>Corymbia calophylla</i>)	800	12	0	0			Nil	511bce13-81cd-473f-bac2-0574b561c7f3
-31.30815403	115.6582961	Marri (<i>Corymbia calophylla</i>)	800	16	0	0			Nil	106c3b5a-ab87-4f6f-abb2-e70044d74cb8
-31.30924198	115.6587501	Marri (<i>Corymbia calophylla</i>)	800	14	0	0			Nil	b550aa33-3017-4771-a89e-b519201fef00,6808564d-1f5c-4146-9c47-5c9a0354012f
-31.3092071	115.6586612	Marri (<i>Corymbia calophylla</i>)	800	14	0	0			Nil	20234025-e4c0-4c20-8585-744d3c4dd628
-31.31225254	115.661329	Marri (<i>Corymbia calophylla</i>)	800	14	0	0			Nil	7e584583-24c7-44fc-87fb-7c7c92a6a240

-31.31445353	115.659322	Marri (<i>Corymbia calophylla</i>)	800	20	0	0			Nil	1bd0bf7c-1bc9-4d92-a202-a30153ef893a
-31.3090091	115.6531796	Marri (<i>Corymbia calophylla</i>)	800	20	4	0			Nil	1758ca70-e2fe-41bf-af7f-e9d2323675ba
-31.3124745	115.6536318	Marri (<i>Corymbia calophylla</i>)	800	18	0	0			Nil	86b8bc97-b183-41e0-aa0e-ddd454aa476c
-31.3108312	115.6602689	Stag	800	12	0	0			Nil	a449bbd2-3a5b-4f80-bb8d-30e452429e5d
-31.30547048	115.6493425	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	810	10	0	0			Nil	0546c6f8-dfb6-47c4-b096-51cd51730282,b45b3d4a-5b70-4ec1-aabf-ef06803d515c
-31.3007867	115.6461097	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	810	9	2	0			Nil	2ba93a5e-6935-4659-9828-e9142f48f33d
-31.3084026	115.6569069	Redheart (<i>Eucalyptus decipiens</i>)	820	10	0	0			Nil	e5357fa4-462b-4a71-b124-31f3e3a8bfa2
-31.31293656	115.65995	Redheart (<i>Eucalyptus decipiens</i>)	820	10	0	0			Nil	2e20032f-8f52-477d-b2a0-834d681ada73
-31.3092223	115.6586762	Marri (<i>Corymbia calophylla</i>)	820	14	0	0			Nil	5efb666f-1125-4b01-a4c8-93a4c0dc0410
-31.3039197	115.6550558	Marri (<i>Corymbia calophylla</i>)	820	12	0	0			Nil	a82f8f0f-894a-49ff-9c4f-8904589dd724
-31.31684381	115.6620954	Marri (<i>Corymbia calophylla</i>)	840	12	0	0			Nil	4579a8ea-b639-4bd2-8358-ef307bf010f7
-31.30828809	115.6564517	Redheart (<i>Eucalyptus decipiens</i>)	850	15	0	0			Nil	101ec887-efa3-49bc-944f-81e939d67994
-31.30799648	115.6580547	Marri (<i>Corymbia calophylla</i>)	850	14	0	0			Nil	122bbc2e-c682-4216-8c76-af406b984e5a
-31.31267189	115.6605719	Marri (<i>Corymbia calophylla</i>)	850	18	0	0			Nil	07ba8abc-f129-4424-b11a-c06cde3795cc
-31.3108864	115.6488041	Marri (<i>Corymbia calophylla</i>)	850	11	0	0			Nil	5f411696-d64f-47d7-83e3-a23ad71lead08
-31.302826	115.6471392	Marri (<i>Corymbia calophylla</i>)	850	18	0	0			Nil	aaa0fed9-74cf-4629-adee-f6ab0f5d66e6
-31.30857941	115.6588879	Stag	850	14	1	0			Nil	ad9e4310-e340-4fe5-be3e-c0c0d7e5637b
-31.31231613	115.6523785	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	860	6	0	0			Nil	e537dca5-1dc0-4dca-9bb4-b0382b7fcb8a

-31.3117437	115.6552105	Marri (<i>Corymbia calophylla</i>)	860	17	0	0			Nil	e8fa8738-d319-45a0-8e80-f57c9d109857
-31.3126085	115.6546627	Marri (<i>Corymbia calophylla</i>)	860	14	0	0			Nil	4872d377-2d69-4f89-888d-cfeb71a87451
-31.30338329	115.6484886	Marri (<i>Corymbia calophylla</i>)	860	20	0	0			Nil	ae0b58dd-2b91-410b-908b-a6ac4501427c
-31.30365228	115.6485758	Marri (<i>Corymbia calophylla</i>)	860	20	0	0			Nil	706e5944-175a-4f42-8aad-2d2f5df60ef2
-31.304548	115.6453028	Marri (<i>Corymbia calophylla</i>)	860	22	0	0			Nil	004313cf-75b8-4ac1-b011-9e9a7e831c60
-31.3109947	115.6555281	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	870	7	0	0			Nil	7b483307-c027-4003-80a6-a5d6687a6e62
-31.31002714	115.6606014	Marri (<i>Corymbia calophylla</i>)	870	14	0	0			Nil	04eaa856-c936-4077-a44f-5c48fe036039
-31.30925802	115.6550074	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	880	8	0	0			Nil	563f337b-7a40-48b6-8d26-710cda1e6553
-31.31188961	115.6600865	Marri (<i>Corymbia calophylla</i>)	880	22	0	0			Nil	a8da071a-5933-45e7-b9c9-33ccf0b2a6b9
-31.3072489	115.6658035	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	900	6	0	0			Nil	f2b05489-6819-40ac-9e9b-81f13f25f5c7
-31.3158499	115.6593884	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	900	10	0	0			Nil	8c95b167-9803-4f51-b467-e53920c73f76
-31.3010349	115.6493875	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	900	5	0	0			Nil	b9fd2aab-a6ff-48dc-b703-1d014f6ab5ee
-31.30562259	115.6495256	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	900	10	0	0			Nil	35b5f521-1e56-4165-975e-e638b1841816
-31.30977449	115.6573436	Redheart (<i>Eucalyptus decipiens</i>)	900	10	0	0			Nil	f32b3b10-c469-4c9c-83a8-c789ee7d6a11
-31.30594143	115.6555009	Marri (<i>Corymbia calophylla</i>)	900	14	0	0			Nil	d02fd3d2-d9fc-4543-b527-c68397dcb24c
-31.30609955	115.6554563	Marri (<i>Corymbia calophylla</i>)	900	14	0	0			Nil	c988edc6-52ff-4c5c-bc8f-65b14fe2f0a3
-31.30672719	115.6540129	Marri (<i>Corymbia calophylla</i>)	900	18	0	0			Nil	817587ee-4b2c-4f98-b54a-7fcc0305ff73
-31.30659312	115.6543713	Marri (<i>Corymbia calophylla</i>)	900	15	0	0			Nil	980f00c5-07e4-4fd3-bf0b-711862c5964b

-31.30777963	115.6577228	Marri (<i>Corymbia calophylla</i>)	900	14	0	0			Nil	071b8953-9394-4b63-a3bb-a582a77ec15e
-31.30821218	115.6576839	Marri (<i>Corymbia calophylla</i>)	900	16	0	0			Nil	27df0ffa-a1d4-48a1-821f-355f3f39f303
-31.3117345	115.6510699	Marri (<i>Corymbia calophylla</i>)	910	16	0	0			Nil	f11fd88a-965a-41c6-ab44-1420e7848b87
-31.3116087	115.6506815	Marri (<i>Corymbia calophylla</i>)	910	20	0	0			Nil	ddf7de7b-d45f-4493-ac7c-87efb98af80c
-31.3039015	115.6503661	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	920	10	0	0			Nil	4462ed50-40da-452c-ba74-7ef45fb3ff5c
-31.31269881	115.660573	Marri (<i>Corymbia calophylla</i>)	920	10	0	0			Nil	6937e30f-dac2-48cd-ab6a-491c1aba1f68
-31.3132121	115.6540145	Marri (<i>Corymbia calophylla</i>)	920	22	0	0			Nil	cbb3265f-f83b-4f91-9a92-80a3aff47671
-31.3102005	115.6484005	Marri (<i>Corymbia calophylla</i>)	930	15	0	0			Nil	1844e151-be5d-4eb8-b0ca-2f4950bc4ba0,a4a5e43b-e7ea-43a7-8468-f8d0a72a7fd7
-31.3039713	115.6536872	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	940	7	0	0			Nil	821cb027-64d8-417c-9eb8-5e5c97e8ff85
-31.3067693	115.6540579	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	950	5	0	0			Nil	2b85bec2-c81f-4c37-a657-5d2e6054b61b
-31.30650862	115.6538466	Marri (<i>Corymbia calophylla</i>)	950	15	0	0			Nil	47ec79f3-d6a4-485e-b8a9-f5d6d81082a6
-31.30731156	115.6540032	Marri (<i>Corymbia calophylla</i>)	950	10	0	0			Nil	a2466f5f-6383-4e5d-9e7d-be6664c2effa
-31.31468125	115.652233	Marri (<i>Corymbia calophylla</i>)	950	20	0	0			Nil	9a842900-1c1a-4577-bdd1-56b1de4db81c
-31.3088426	115.6540029	Stag	950	13	4	2	4		Nil	6539f971-baf9-45b9-a693-52e6f18c0788
-31.30964731	115.6575146	Redheart (<i>Eucalyptus decipiens</i>)	1000	15	0	0			Nil	456bf912-fbd5-4f46-947c-7045d6e19a20
-31.3068683	115.653635	Marri (<i>Corymbia calophylla</i>)	1000	8	0	0			Nil	a37617ee-5b79-405a-8891-e6e50345d822
-31.3092043	115.6588179	Marri (<i>Corymbia calophylla</i>)	1000	14	0	0			Nil	21549f45-0799-4868-925f-315538387d2c
-31.31667109	115.6629561	Marri (<i>Corymbia calophylla</i>)	1000	14	0	0			Nil	46ab8ef9-917a-44a3-9e5b-388b47dda42a

-31.31696039	115.6540673	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	1005	15	0	0			Nil	e49a1334-70cf-487a-b894-4f4d9e49c72f
-31.30626283	115.6542108	Marri (<i>Corymbia calophylla</i>)	1005	12	0	0			Nil	e9fb9461-c593-40de-b508-8eb2953955c7
-31.30787559	115.6549333	Marri (<i>Corymbia calophylla</i>)	1005	12	0	0			Nil	bdfc8820-eb15-4357-8fe4-edbcdb3bbcd6
-31.3084947	115.6524473	Marri (<i>Corymbia calophylla</i>)	1030	20	0	0			Nil	6c2caa2c-c036-48e4-9a3e-537b48ec9791
-31.3121976	115.6507878	Marri (<i>Corymbia calophylla</i>)	1070	11	0	0			Nil	0d11567a-4316-449f-b04d-74b44a61400c
-31.30357093	115.652928	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	1100	10	0	0			Nil	0d2f0dfd-6f13-4018-9356-fb209a12ca07
-31.30658768	115.6556384	Marri (<i>Corymbia calophylla</i>)	1100	12	0	0			Nil	bf2b61e0-ce37-4cd9-a948-f920dc9d17ac
-31.30679135	115.6563897	Marri (<i>Corymbia calophylla</i>)	1100	14	0	0			Nil	5dda2d3f-5741-4a70-af55-fed5e6c5fc57
-31.30712049	115.6644353	Marri (<i>Corymbia calophylla</i>)	1100	17	0	0			Nil	f842650c-5f69-4256-9eb8-1bcb1975e7ce
-31.31105205	115.6610457	Marri (<i>Corymbia calophylla</i>)	1100	14	0	0			Nil	d509d9f7-dce3-45c1-b2e3-98a77110ccee,766d59ae-ec9b-459f-b6e5-69521aef4178
-31.31247682	115.6517582	Marri (<i>Corymbia calophylla</i>)	1100	28	0	0			Nil	bc1e0d44-e3b1-4682-b158-c07ddcac5af5
-31.3024015	115.6469076	Marri (<i>Corymbia calophylla</i>)	1120	17	0	0			Nil	fa65d2bc-19c2-484a-9a4c-263d72c81272
-31.3032331	115.6532974	Marri (<i>Corymbia calophylla</i>)	1140	20	4	4		Nesting Galah (<i>Eolophus roseicapilla</i>)	Nil	9715a5cf-13f4-419d-9fc7-f310608da34e
-31.30655875	115.6543908	Marri (<i>Corymbia calophylla</i>)	1150	18	0	0			Nil	85d6ac2f-c6d2-491a-93de-4ba61d11e7c4
-31.3073997	115.6542866	Marri (<i>Corymbia calophylla</i>)	1150	17	0	0			Nil	9f2fc214-effa-4562-8bdf-1ed850bd5633
-31.3113655	115.6509854	Marri (<i>Corymbia calophylla</i>)	1170	22	1	0	1		Nil	7488586a-cf87-46ac-886d-f82b2a6abb36
-31.3112274	115.6487758	Marri (<i>Corymbia calophylla</i>)	1180	16	0	0			Nil	645e3931-0450-4926-b390-c676718699e0
-31.30685667	115.655813	Marri (<i>Corymbia calophylla</i>)	1200	16	0	0			Nil	5f6bf734-4d0f-4a28-8db4-f6c3f98c2971
-31.307081	115.6654042	Marri (<i>Corymbia calophylla</i>)	1200	20	0	0			Nil	7f9f65c4-060a-48e4-9c95-36fe8adaa592

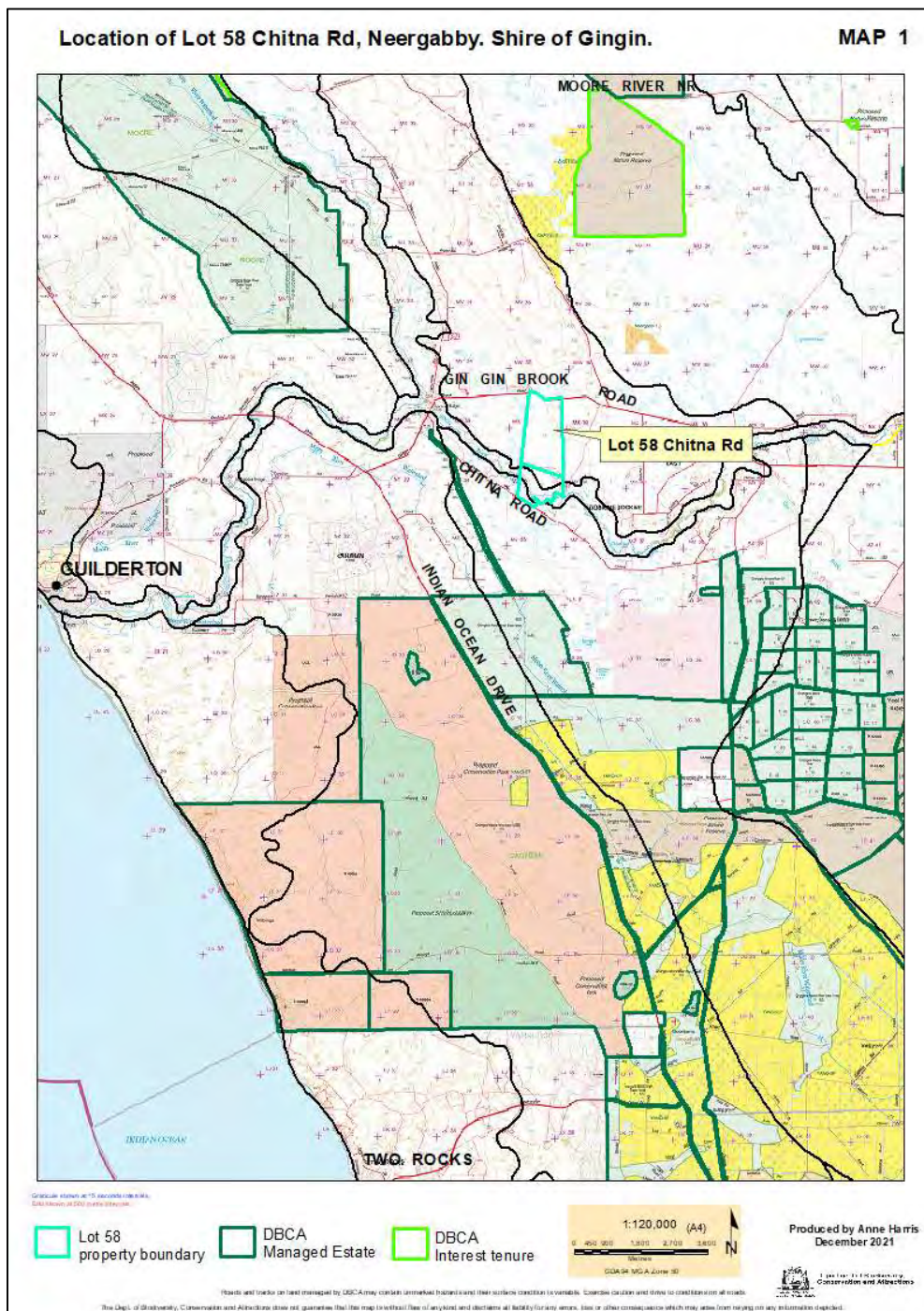
-31.30670685	115.6536244	Marri (<i>Corymbia calophylla</i>)	1200	10	0	0			Nil	f40c2311-e6e3-42c0-a879-ac5aae63adaa
-31.30797471	115.6544679	Marri (<i>Corymbia calophylla</i>)	1200	10	0	0			Nil	fd655c63-fbbd-47e8-a2fd-47a7848cd78a
-31.31538072	115.661498	Marri (<i>Corymbia calophylla</i>)	1200	18	0	0			Nil	3d00ea28-ef35-48da-9753-33820c78c83a
-31.3109249	115.6544985	Marri (<i>Corymbia calophylla</i>)	1220	15	0	0			Nil	7f59e8ce-de31-4147-8ddb-5919d4655e56
-31.3091395	115.6541021	Stag	1250	10	2	0			Nil	098319f2-62f7-4c74-ab12-176db0da4bd3
-31.310537	115.6562705	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	1270	8	0	0			Nil	2cd84857-7d08-4d8d-b72b-5b9369c13208
-31.30820674	115.6549551	Marri (<i>Corymbia calophylla</i>)	1300	22	0	0			Nil	6dcf4343-6bf9-4f52-9aad-31ccaf2b4079
-31.3012035	115.6494671	Coastal blackbutt (<i>Eucalyptus todtiana</i>)	1380	9	0	0			Nil	ec6b184a-d7a1-41bb-b744-130d26364420
-31.31027778	115.659951	Marri (<i>Corymbia calophylla</i>)	1400	16	0	0			Nil	214fc5ea-681f-4603-9871-d2a8cbc0c0e1
-31.3108012	115.6485977	Marri (<i>Corymbia calophylla</i>)	1400	16	0	0			Nil	fd761a48-25bc-4fb8-9da9-09ffdd919145
-31.3084372	115.6525078	Marri (<i>Corymbia calophylla</i>)	1530	21	0	0			Nil	066ee560-9ae2-4ade-bbbc-f387c7625661
-31.3028808	115.6473693	Marri (<i>Corymbia calophylla</i>)	1850	22	5	2	1		Nil	42f5ff36-82e4-4660-be74-2f639cfa836
-31.30665786	115.6657335	Marri (<i>Corymbia calophylla</i>)	2100	16	0	0			Nil	c1011b69-1506-4da8-896c-9e5634808243
-31.3067545	115.6660295	Marri (<i>Corymbia calophylla</i>)	2400	12	0	0			Nil	cf17c211-029a-4315-a0b9-ef0cc9ff4976
-31.3102844	115.6491569	Marri (<i>Corymbia calophylla</i>)	500	9	0	0			Nil	cbee7003-9292-4fc4-8c37-680f1e1abd76

FILENOTE

31 December 2021

Assessment of Lot 58 Chitna Road, Neergabby

Lot 58 Chitna Road was visited on 21 December 2021, by Anne Harris and Melissa Okely of Swan Coastal District, to undertake a general assessment of the property's environmental values for potential offset. Permission was obtained from the landowner, Vance Brewer, via Lei Zhang (DBCA Land Unit Officer). The location of Lot 58 is highlighted on Map 1 below.



The property consists of two blocks separated by an unmade gazetted road running east-west in the southern section. The northern block is 204.5 hectares, and the southern block is 99.5 hectares and contains a section of the Gingin Brook. Infrastructure on the property includes a large shed with a connected water tank, a shade house used for vehicle parking, and a second shade structure housing two shipping containers (Figures 1 and 2). There is also a water bore installed in the same area (Figure 3) and sundry building items laying around near these structures.



Figure 1. Shed with water tank and shade structure for vehicles behind.



Figure 2. Shade structure over two shipping containers.



Figure 3. Water bore installation.

Parallel lines seen on aerial photography indicate that vegetation on parts of the property may have been chained at some time in the past. Areas around the Gingin Brook were cleared prior to 1985 and have been heavily grazed by cows before Mr. Brewer purchased the property. There is a burn scar in the centre of the Lot that appeared on imagery at sometime between July and November of 2014 (7 years ago). Vegetation is resprouting, but the reduced cover and density of *Banksia* trees within the burn scar is still noticeable on aerial photography and on the ground.

There is also evidence of a fire in the north-west corner. Although, less conspicuous on an aerial photo, there are numerous dead *Melaleuca preissiana* and *Banksia littoralis* (swamp *Banksia*) trees with burn scars high up the trunks. Some of the mortality may be due to water stress and/or a combination of fire and reduced water recharge.

Vegetation mapping

Assessment of Lot 58 focused on describing the vegetation and recording the dominant flora species at sites where changes were seen, mostly from the firebreaks. No survey for Threatened species was undertaken. Site descriptions and corresponding photographs are shown at the end of this Filenote.

Lot 58 lies within the Vegetation Complexes No. 47, '*Karrakatta Complex North*', and No. 41, '*Moore River*' (Hedde et al.). There is 45.12% and 34.36% respectively remaining, with 28.24% and 1.33% currently within DBCA managed land (Vegetation Statistics SouthWest Report 2018).

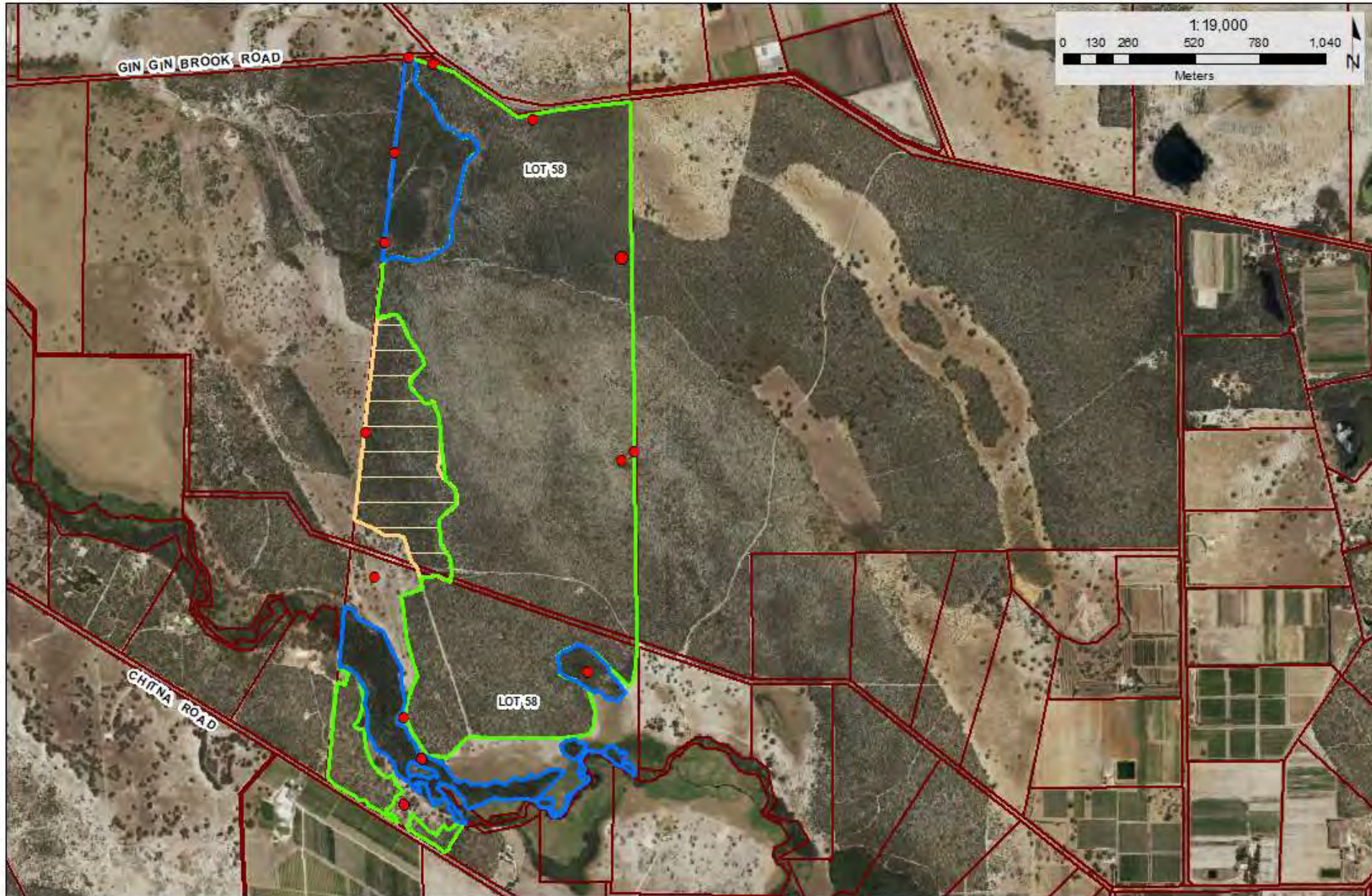
During the site assessment, the complexes have been mapped into three broad vegetation communities and are shown on Map 2:

- Banksia Woodland – 210.2 hectares. This community meets the criteria for the Commonwealth listed Threatened Ecological Community (TEC), '*Banksia Woodlands of the Swan Coastal Plain*'.
- Wetland communities – 35.7 hectares. Comprises the vegetation of the Gingin Brook and two Basin Damplands (one in the north-west corner and the other north of the Brook on the south-east side of the Lot).
- Transitional Banksia/Melaleuca Woodland – 24.9 hectares on the western side between the Brook and the Basin Dampland in the north-west corner.

Lot 58 Chitna Road, Neergabby, Shire of Gingin.
Vegetation mapping and assessment sites - 21 December 2021.

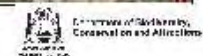
- Assessment and photo sites
- Banksia Woodland
- Transitional Banksia/Melaleuca
- Wetland
- Tenure boundary

MAP 2



Roads and tracks on land managed by DSCA may contain unmarked hazards and their surface condition is variable. Exercise caution and drive to conditions on all roads.
 The Dept. of Biodiversity, Conservation and Attractions does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequences which may arise from relying on any information depicted.

Produced by Anne Harris
 December 2021



It is important to note that no analysis has been undertaken to determine the assessment sites with known WA floristic communities. However, there are similarities with the Priority Ecological Communities, 'Swan Coastal Plain *Banksia attenuata* – *Banksia menziesii* woodlands' (type 23b; PEC 3) and '*Banksia dominated woodlands of the Swan Coastal Plain IBRA region*' (PEC 3). Both of these communities are included within the Commonwealth Listed TEC, '*Banksia Woodlands of the Swan Coastal Plain*'.

The condition of assessment sites in the Banksia woodland is Excellent with few weeds observed. The Transitional Banksia/Melaleuca community is more disturbed and well used by kangaroos and is recorded as Very Good.

The condition of the vegetated portion of the Gingin Brook is Good. With targeted weed control, there is potential for the native sedges and ferns to spread. The surrounding low-lying areas on the Brook edges have been heavily grazed and invaded by weedy grasses and are therefore, Degraded. The Basin Damplands have been disturbed by fire, grazing and weed invasion. Condition is Good to Excellent.

Flora

No Threatened or Priority flora were found at the assessment sites or are known from the area around Lot 58. However, the Transition Banksia/Melaleuca community is similar to the habitat known for the Threatened species, *Drakaea elastica* and some areas of Banksia Woodland are also suitable habitat for the Priority 2 species, *Calectasia elegans* (nomination for Threatened status is pending). All species recorded per site are presented in Table 1 at the end of this Filenote.

Wetlands

Sections of the Brook and the Basin Damplands have been mapped as Conservation Category Wetlands (Wetland Evaluation Swan Coastal Plain 2020, Map 3). Approximately 11.8 hectares is mapped for Lot 58. At the time of the site visit, the Gingin Brook was still flowing through cement pipes under a short bridge where the Brook narrows (Figure 4). Further away from this point to the east and west, the Brook widens out with diverging minor drainage lines and higher impacts of grazing and weed invasion.



Figure 4. Gingin Brook at the bridge on Lot 58.

Lot 58 Chitna Road, Neergabby, Shire of Gingin. Conservation Category Wetland mapping.

CCW polygons

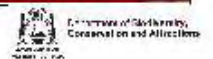
Tenure boundary

MAP 3



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Produced by Anne Harris
December 2021



Fauna

The Banksia Woodland and Transitional *Banksia/Melaleuca* Woodland are both suitable foraging vegetation for Black Cockatoos. Occasional *Corymbia calophylla* (Marri) trees occur on the property, which are suitable for foraging and potential roosting.

The flora species, *Goodenia pulchella* occurs in the Basin Dampland at Site 7. This plant has been linked to occurrences of Threatened native bee species.

General fauna recorded at the time of the visit were Dacelo novaeguineae (Kookaburra), *Dromaius novaehollandiae* (Emu), *Rhipidura leucophrys* (Willy Wagtail) and *Eolophus roseicapilla* (Pink and grey galah).

Management items

- Firebreaks have been maintained and the eastern boundary fence is in good condition. The western boundary fence requires some repairs to be undertaken and the northern boundary fence along Gingin Brook Rd is tangled with vegetation in places. Replacement should not be needed at this stage, but approximately 3.7 km of fencing will require checking and some mending.
- The invasive weed *Hyparrhenia hirta* (Tambookie grass) is dense along the road verge of Gingin Brook Rd, and on the northern fenceline of Lot 58.
- Species of weeds within the Gingin Brook that should be controlled include, *Zantedeschia aethiopica* (Arum Lily), *Cirsium vulgare* (Spear Thistle), *Conyza* sp. (Fleabane), *Rumex crispus* (Ruby Dock), *Rumex pulcher* (Fiddle Dock) and *Rubus ulmifolia* (Blackberry). The grass weeds, *Paspalum distichum* (Water Couch) and *Cynodon dactylon* (Couch) may be too difficult after many years of growth to be successfully removed.
- Removal of rubbish and building materials within the cleared areas of the Lot including a car chassis on the north-west corner.

Values

- 210.2 hectares of Banksia Woodland considered to be TEC.
- Over 235 hectares of vegetation containing species suitable for Black Cockatoo foraging.
- 11.8 hectares of Conservation Category Wetland.
- Suitable habitat for a range of native fauna.
- Potential for year round available water from the Gingin Brook for a range of native fauna.
- Established firebreaks.
- Constructed perimeter fences and gates.
- Water bore for potential fire-fighting activities.

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Swan Coastal District

Banksia Woodland communities – Sites 1, 5 and 6 shown in Figures 5, 6 and 7.

Relevés were undertaken at three sites. The vegetation composition and structure at all sites was very similar. Slight changes in species diversity in the mid-storey were recorded, which indicate slight changes in elevation, soil characteristics, water availability, time since fire, grazing pressure and other historical impacts. A community description that encompasses all the Banksia Woodlands sites is:

Low Woodland of *Banksia menziesii*, *B. attenuata*, *Nuytsia floribunda* and/or *Eucalyptus todtiana*, *Banksia ilicifolia* over Tall Open Shrubland to Tall Open Scrub of *Adenanthos cygnorum* and *Kunzea glabrescens* over Open Shrubland of *Jacksonia sternbergiana* and *Xanthorrhoea preissii* over Open Low Heath of *Eremaea pauciflora*, *Melaleuca trichophylla*, *Scholtzia involucreta*, *Hibbertia hypericoides*, *H. huegelii*, *Calytrix angulata*, *C. flavescens*, *Conostephium ?pendulum*, *Petrophile linearis*, *Acacia huegelii*, *Stirlingia latifolia* over Open Sedgeland of *Mesomelaena pseudostygia*, *Hypolaena exsulca*, *Alexgeorgea nitens* and *Chordifex sinuous* on pale yellow to yellow sand. Weeds recorded are, **Ursinia anthemoides* and isolated occurrences of **Ehrharta calycina*.



Figure 5. Site 1 on the north-east boundary.



Figure 6. Site 5 is on the northern boundary and is drying with numerous dead Banksia trees.



Figure 7. Site 6 is on the eastern boundary and is drying with numerous dead Banksia trees.

Transitional Banksia Woodland community – Site 4 shown in Figure 8.

This community is on the slightly elevated eastern edge of a wide flat wetland that continues onto the adjacent property to the west.

Low Woodland of *Banksia attenuata*, *B. menziesii*, *Melaleuca preissiana* and *Kunzea glabrescens* over Open Shrubland of *Calytrix angulata*, *Melaleuca trichophylla*, *Hibbertia huegelii*, *Gompholobium tomentosum*, *Styphelia conostephioides*, *Philotheca spicata*, *Conostephium ?preissii*, *Hypocalymma angustifolium* and *Xanthorrhoea preissii* over Very Open Sedgeland of *Hypolaena exsulca*, *Schoenus caespitosa*, *Lyginia barbata* and Very Open Herbland of *Patersonia occidentalis*, *Lomandra caespitosa* and *Lomandra hermaphrodita* on grey sand.



Figure 8. Site 4 is on the western boundary. Occasional *Melaleuca preissiana* trees occur with *Banksia attenuata* and tall *Kunzea glabrescens*.

Wetland communities – Sites 2, 3 and 7 shown in Figures 9 – 12.

The vegetation description within the Gingin Brook is described as Open Forest of *Eucalyptus rudis* and *Melaleuca raphiophylla* over a dense cover of annual and perennial weeds with a few native species including, *Lepidosperma longitudinale*, *Juncus pallidus*, *Pteridium esculentum*, *Liparophyllum capitatum*, *Cychnogeton lineare*, ?*Lemna* sp., and *Lobelia anceps* on black silty loam.

Weed species recorded include, *Paspalum distichum* (Water Couch), *Cynodon dactylon* (Couch), *Cotula coronopifolia* (Waterbuttons), *Rumex crispus* (Dock), *Rumex pulcher* (Fiddle Dock), *Cyperus tenuiflorus* (Scaly Sedge), *Conyza* sp. (Fleabane), *Cirsium vulgare*, *Zantedeschia aethiopica* (Arum Lily), *Fumaria capreolata* (Whiteflower Fumitory), *Colocasia esculenta* (Taro), and *Sonchus oleraceus* (Common Sowthistle).



Figure 9. Site 2 is on the Gingin Brook at the narrow bridge crossing just north of the sheds.



Figure 10. Site 3 is within a wider section of the Gingin Brook, on a slightly elevated area between drainage lines.

Vegetation description within the Basin Dampland on the south-east side of Lot 58 just north of the Brook is a Forest of *Melaleuca preissiana* and occasional *Banksia littoralis* over Closed Sedgeland of *Lepidosperma striatum* and *Lepidosperma longitudinale* with occasional *Melaleuca lateritia*, *Xanthorrhoea preissii*, *Leucopogon parviflorus*, *L. australis*, *Astartea scoparia* and *Hypocalymma angustifolium* on black sandy silt.



Figure 11. Site 7 located in the centre of the Basin Dampland in the south-eastern section of Lot 58, north of the Brook.

The Basin Dampland on the north-west corner was viewed from the edge and is shown in Figure 12 below. No relevé was undertaken within this Dampland. Many of the dead trees showed high burn marks from a hot fire.



Figure 12. Photo site at the north-west corner of Lot 58.

Table 1. Species recorded at each relevé and within Lot 58.

Taxa	Transitional Banksia / Melaleuca Site 4	Wetlands		Banksia Woodland		
		Gingin Brook Sites 2 & 3	Basin Damplands NW cnr & Site 7	Site 1	Site 5	Site 6
<i>Acacia cyclops</i>	1					
<i>Acacia huegelii</i>					1	1
<i>Acacia pulchella</i>						1
<i>Adenanthos cygnorum</i>					1	1
<i>Alexgeorgea nitens</i>					1	1
<i>Allocasuarina humilis</i>						1
<i>Alternanthera nodiflora</i>			1			
<i>Arnocrinum preissii</i>					1	1
<i>Astartea scoparia</i>			1			
<i>Banksia attenuata</i>	1			1	1	1
<i>Banksia ilicifolia</i>						1
<i>Banksia menziesii</i>	1			1	1	1
<i>Banksia littoralis</i>			1			
<i>Blancoa canescens</i>					1	
<i>Bossiaea eriocarpa</i>						1
<i>Burchardia congesta</i>					1	
<i>Calectasia narragarra</i>					1	
<i>Calothamnus sanguineus</i>				1		
<i>Calytrix angulata</i>	1				1	
<i>Calytrix flavescens</i>					1	1
<i>Calytrix fraseri</i>						1
<i>Centella asiatica</i>			1			
<i>Chordifex sinuosus</i>				1		1
* <i>Cirsium vulgare</i>		1				
* <i>Colocasia esculenta</i>		1				
<i>Conospermum stoechadis</i>				1		
<i>Conostephium ?pendulum</i>	1				1	1
<i>Conostephium ?preissii</i>	1					
* <i>Conyza sp.</i>		1				
<i>Corynotheca micrantha</i>					1	1
* <i>Cotula coronopifolia</i>		1				
<i>Cyanothamnus ramosus</i> subsp. <i>anethifolius</i>					1	
<i>Cycnogeton lineare</i>		1				
* <i>Cynodon dactylon</i>		1				
* <i>Cyperus tenuiflorus</i>		1				
<i>Desmocladius asper</i>				1		
* <i>Ehrharta calycina</i>				1		
<i>Eremaea pauciflora</i>				1	1	1
<i>Eucalyptus rudis</i>		1				
<i>Eucalyptus todtiana</i>					1	
* <i>Fumaria capreolata</i>		1				
<i>Gastrolobium capitatum</i>						1

Taxa	Transitional Banksia / Melaleuca Site 4	Wetlands		Banksia Woodland		
		Gingin Brook Sites 2 & 3	Basin Damplands NW cnr & Site 7	Site 1	Site 5	Site 6
<i>Gompholobium tomentosum</i>	1				1	1
<i>Goodenia pulchella</i>			1			
<i>Hibbertia crassifolia</i>						1
<i>Hibbertia huegelii</i>	1			1	1	1
<i>Hibbertia hypericoides</i>				1	1	
<i>Hibbertia subvaginata</i>						1
* <i>Hyparrhenia hirta</i>			1			
<i>Hypocalymma angustifolium</i>	1		1			
* <i>Hypochaeris glabra</i>			1			
<i>Hypolaena exsulca</i>	1				1	1
<i>Jacksonia furcellata</i>					1	
<i>Jacksonia sternbergiana</i>				1	1	
<i>Juncus pallidus</i>		1				
<i>Kunzea glabrescens</i>	1		1		1	1
? <i>Lemna disperma</i>		1				
<i>Lepidosperma longitudinale</i>		1	1			
<i>Lepidosperma striatum</i>			1			
<i>Leucopogon australis</i>			1			
<i>Leucopogon parviflorus</i>			1			
<i>Liparophyllum capitatum</i>		1				
<i>Labelia anceps</i>		1	1			
<i>Labelia tenuior</i>			1			
<i>Lomandra caespitosa</i>	1					
<i>Lomandra hermaphrodita</i>	1					1
<i>Lyginia barbata</i>	1				1	
<i>Melaleuca lateritia</i>			1			
<i>Melaleuca preissiana</i>	1	1	1			
<i>Melaleuca raphiophylla</i>		1	1			
<i>Melaleuca teretifolia</i>			1			
<i>Melaleuca trichophylla</i>	1			1	1	1
<i>Mesomelaena pseudostygia</i>				1	1	1
<i>Nuytsia floribunda</i>				1		1
* <i>Paspalum distichum</i>		1				
<i>Patersonia occidentalis</i>	1					1
<i>Persoonia comata</i>					1	
<i>Petrophile brevifolia</i>					1	
<i>Petrophile linearis</i>					1	1
<i>Philothea spicata</i>	1					
<i>Phlebocarya ciliata</i>					1	1
<i>Pimelea sulphurea</i>					1	
<i>Pteridium esculentum</i>		1				
* <i>Rubus ulmifolius</i>			1			
* <i>Rumex crispus</i>		1				
* <i>Rumex pulcher</i>		1				
<i>Schoenus caespitosa</i>	1					

Taxa	Transitional Banksia / Melaleuca Site 4	Wetlands		Banksia Woodland		
		Gingin Brook Sites 2 & 3	Basin Damplands NW cnr & Site 7	Site 1	Site 5	Site 6
<i>Scholtzia involucrata</i>				1	1	1
<i>Sonchus oleraceus</i>		1				
<i>Stirlingia latifolia</i>					1	1
<i>Styphelia conostephioides</i>	1					1
* <i>Ursinia anthemoides</i>				1		
<i>Xanthorrhoea preissii</i>	1		1	1	1	1
* <i>Zantedeschia aethiopica</i>		1				

Taxa not in relevés

Corymbia calophylla

Podotheca gnaphalioides

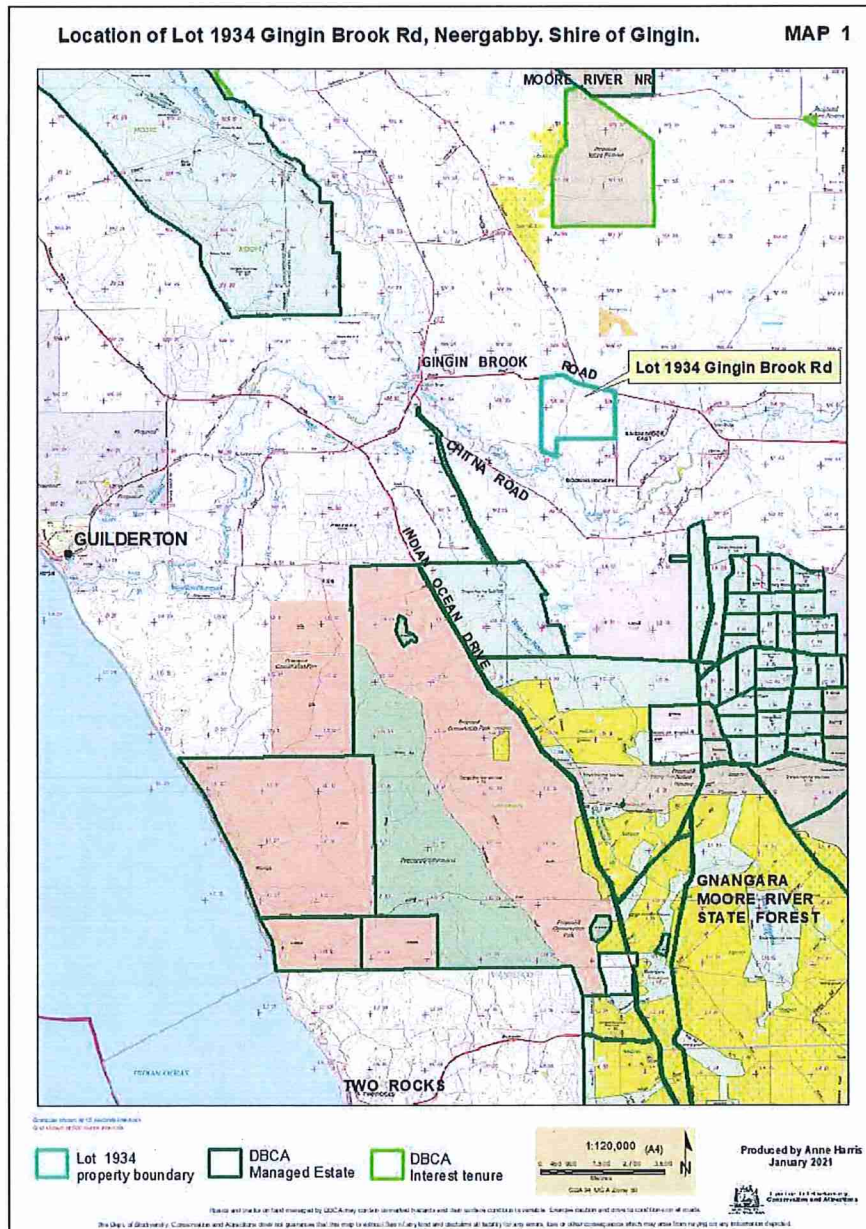
Ptilotus polystachyus

FILENOTE

10 January 2022

Assessment of Lot 1934 Gingin Brook Road Neergabby

Lot 1934 is a 371 hectare property on the southern side of Gingin Brook Road in Neergabby, approximately 15 km east of Guilderton (Map 1). Discussions have been held between the DBCA and the landowner, Mr. Lindsay Gordon, regarding the possibility of purchasing the property for conservation. Permission was obtained for access and on the 14 December 2021, Anne Harris and Melissa Okely of Swan Coastal District, carried out a brief assessment of vegetation and potential management requirements.



Historical activities

Visible parallel lines seen on aerial photography indicates that vegetation on the western side of Lot 1934 may have been partially cleared by chaining prior to 1985 (limit of historical imagery, Google Earth). This may have occurred on other parts of the property, but the evidence is not as clear.

Substantial areas were cleared in the north-western corner and through the centre of the property sometime between 1985 and 2002. The south-western third of the property was burnt in a fire during Spring of 2014 and the vegetation is more open, with less cover observed in all layers.

The remains of a rural-type residence is located in a small clearing on the eastern boundary close to Bookine Rd (Map 2). Cows, and potentially horses have been kept on the property at various times.

The Water Corporation monitors a bore (labelled GB1) on the western boundary (Vance Brewer pers. comm.) (Map 2).

Vegetation mapping

Only a few sites were fully described using relevés, due to the vegetation being predominantly Banksia Woodland. Photo sites and recording of limited dominant overstorey species occurred in other areas. Site descriptions and corresponding photographs are shown on pages 7 to 12.

Lot 1934 lies within the Vegetation Complex No. 47, '*Karrakatta Complex North*'. There is 45.12% of this complex remaining, with 28.24% currently within DBCA managed land (Vegetation Statistics SouthWest Report 2018).

Using the relevé descriptions from the site visit and aerial imagery, vegetation on Lot 1934 was separated into three broad communities (Map 2).

- Banksia Woodland – 289.4 hectares. This community meets the criteria for the Commonwealth listed Threatened Ecological Community (TEC), '*Banksia Woodlands of the Swan Coastal Plain*'. All assessment sites were recorded as being in Excellent condition.
- 'Other' Banksia Woodland – 1.3 hectares on the southern boundary. This comprises two small areas that have been disturbed and have various amounts of regrowth including Banksia species within them (refer to Site Descriptions, page 7). Condition ranged from Good to Very Good.
- Marri (*Corymbia calophylla*) / Banksia Woodland – 7.0 hectares. This occupied the higher slopes and hill tops in the centre of the property lying in a north-west to south-east direction. Clearing has separated the community into two 'islands', measuring 4.4 and 2.6 hectares. No relevé was undertaken.
- Wetland – 0.2 hectare. A larger wetland was bisected by Bookine Rd on the eastern boundary, which left a very small area occurring on Lot 1934. The larger body of wetland occurs on Lot 23 Gingin Brook Rd. Vegetation structure is intact but is further disturbed by the firebreak.

Note that the hectare amounts given for each community are not exact. It is also important to note that no analysis has been undertaken to determine the assessment sites with known WA floristic communities. However, there are similarities with the Priority Ecological Communities, '*Swan Coastal Plain Banksia attenuata – Banksia menziesii woodlands*' (type 23b; PEC 3) and '*Banksia dominated woodlands of the Swan Coastal Plain IBRA region*' (PEC 3). Both of these communities are included within the Commonwealth Listed TEC, '*Banksia Woodlands of the Swan Coastal Plain*'.

There are also two locations where surface expressions of limestone were seen, and one location where a flora species known to prefer calcareous soil occurred. Further investigation is needed to determine if these sites are linked to Tamala limestone occurrences. Sites are shown on Map 2.

**Lot 1934 Gingin Brook Road, Neergabby, Shire of Gingin.
Vegetation mapping and assessment sites - 14 December 2021.**

MAP 2

- Assessment and photo sites
- Grevillea vestita Possible limestone
- Banksia Woodland
- Other Banksia sites
- Marri Banksia
- Wetland
- Tenure boundary



Produced by Anne Harris
January 2022

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Flora

One species of Priority 2 flora, *Acacia benthamii*, occurred along the edge of the central track (Map 2 and Figure 1). There was limestone rocks and pebbles on the surface, but not embedded. Coastal and calcareous soils are known preferences for this species, but it is not known if the limestone occurring at this location is natural, or has been brought in historically for track surfacing. If it has been brought in, seeds of this species may have been brought in with it. The population will be vouchered for the site at the WA Herbarium and reported in the Threatened Flora database.

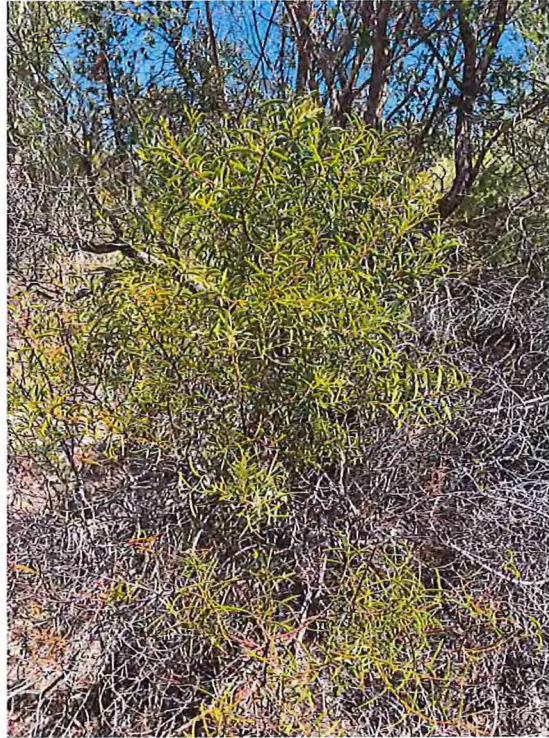


Figure 1. Priority 2 species, *Acacia benthamii* shrub.

Grevillea vestita is a shrub that also prefers to grow in soils with a limestone influence. This shrub was recorded along the northern boundary.

Some areas of the Banksia Woodland community were identified as potentially suitable habitat for the Priority 2 species, *Calectasia elegans* (nomination for Threatened status is pending). All flora recorded during the assessment are presented in Table 1 at the end of this Filenote.

Fauna

All vegetation communities mapped on Lot 1934, and where Marri trees have been retained in portions of cleared areas, are suitable for Black Cockatoo foraging and potentially roosting. The Banksia Woodland is also suitable habitat for a range of native fauna.

Management items

- Firebreaks have been maintained except for sections on the southern boundary, approximately 1 km in total that require maintenance or construction.
- Sections of fence totaling approximately 5.8 km on the northern, eastern and southern sides, need varying levels of repair or vegetation removed from them. Although these works would not need to be undertaken immediately upon acquisition of the property, the replacement of a 475 m section of fence on the south-west boundary, separating Lot 795, also owned by Mr. Gordon, would need to be. The eastern corner of this section is shown in Figure 2 below.



Figure 2. Photo taken looking south from the southern boundary at the breach in the shared fence with Lot 795.

- The invasive weed *Hypparrhenia hirta* (Tambookie grass) is dense along the road verge of Gingin Brook Rd, and parts of Bookine Rd. This can be seen in Figure 3. Discussions regarding the control and further spread of this species would need to be held with the local shire.
- There is approximately 74 hectares of cleared areas in Degraded to Completely Degraded condition, but few weed species have invaded away from the property boundaries. The native annual species, *Ptilotus polystachyus* and *Podotrochea gnaphalioides* (a daisy known as Golden Long-heads) are dominant. This indicates that restoration of these areas would not require significant works, if planting of overstorey species only is undertaken and no further weed species are introduced.

However, the cleared section in the north-west corner has a dense infestation of the weed *Cirsium vulgare* (Spear Thistle), occurrences of *Citrullus amarus* (Pie melon) and patches of *Ehrharta calycina* (Veldt grass) that require removal and control (Figure 3).



Figure 3. North-west corner of Lot 1934 showing dense weed cover. Dense Tambookie grass on the road verge is also invading.

- An historical house site on the eastern boundary of the property near Bookine Road, contains building debris and machine parts. There are also clumps of the prickly pear cactus, *Opuntia*, *Pennisetum* grass, and *Geranium* that require removal (Figures 4 and 5).



Figures 4 and 5. Building debris, machine parts and a clump of the prickly pear cactus at an old house site.

Values

- 289.4 hectares of Banksia Woodland considered to be TEC, and a further 8.3 hectares containing Banksia trees at a lower density.
- Nearly 300 hectares of vegetation containing species suitable for Black Cockatoo foraging, with the potential for roosting in seven of those hectares.
- Established firebreaks.
- Majority of boundaries have suitable perimeter fences and gates to limit illegal access.
- Cleared areas internal to the Lot have few invasive weed species.
- Occurrence of the Priority 2 flora species, *Acacia benthamii*.
- Adjoins Lot 58 Chitna Rd, that is also under discussion for potential acquisition. If both properties are acquired, it would create a nature reserve of over 675 hectares with 568 hectares of remnant vegetation (~84%).

Anne Harris
Swan Coastal District

Descriptions and photographs of assessment sites

Banksia Woodland communities – Sites 1, 4 and two photo sites, shown in Figures 6 to 9.

Relevés were undertaken at three sites. The vegetation composition and structure at all sites was very similar. Slight changes in species diversity in the mid-storey were recorded, which indicate slight changes in elevation, soil characteristics, water availability, time since fire, grazing pressure and other historical impacts. A community description that encompasses all the Banksia Woodland sites on Lot 1934 is:

Low Woodland to Low Open Forest of *Banksia attenuata*, *B. menziesii*, *B. ilicifolia*, *Nuytsia floribunda* and occasional *Eucalyptus tottiana* over Open Shrubland of *Xanthorrhoea preissii*, *Jacksonia sternbergiana* and *Macrozamia riedlei* over Low Open Shrubland to Open Low Heath of *Eremaea pauciflora*, *Hibbertia hypericoides*, *H. subvaginata*, *H. huegelii*, *Bossiaea eriocarpa*, *Petrophile linearis*, *Scholtzia involucreta*, *Calytrix angulata*, *C. flavescens*, *Stirlingia latifolia*, *Conospermum triplinervium*, *Conostephium ?pendulum*, *Melaleuca trichophylla* *Gompholobium tomentosum*, *Calothamnus sanguineus* and *Acacia sessilis* over Sedgeland of *Mesomelaena pseudostygia*, *Lyginia imberbis*, *Desmocladius asper* and *Hypolaena exsulca* and Very Open Herbland of *Patersonia occidentalis*, *Burchardia congesta*, *Ptilotus manglesii* and *Lomandra micrantha* on pale yellow to yellow sand.



Figure 6. Site 1 is in the centre north of Lot 1934.



Figure 7. Site 4 is on the edge of a cleared area where the Tall Shrubland layer of *Kunzea glabrescens* has increased in cover, indicating past disturbance.



Figure 8. This photo site is within the Banksia woodland burnt in Spring 6 years ago. Vegetation is more open.



Figure 9. A photo site on the eastern boundary showing dense cover of the shrub *Eremaea pauciflora*.

Other Banksia Woodland – Photo sites shown in Figures 10 – 12.

Vegetation in these small areas have been disturbed in the past and are comprised of different soil and dominant species, but both still contain Banksia trees but at lower density than the mapped Banksia Woodland. Figure 10 shows one site where Tall *Kunzea glabrescens* and *Jacksonia sternbergiana* occur with low *Banksia attenuata* on a steeper upper slope with yellow sand.



Figure 10. Dense tall shrub layer with low *Banksia attenuata* trees on a disturbed upper slope.

Figure 11 shows a site previously cleared with only *Xanthorrhoea preissii* left. This site now grades from occasional trees to dense stands of *Banksia prionotes* towards the lower elevation, and occasional *B. prionotes* and *Banksia menziesii* with tall *Hakea prostrata* where it was slightly elevated. Occasional limestone outcropping was seen in this area (Figure 12).



Figure 11. Dense *Xanthorrhoea preissii* with *Banksia prionotes* seen in the background.



Figure 12. Limestone rocks scattered along a narrow track and on the edge of the vegetation.

Marri / Banksia Woodland – Site 3 shown in Figure 13.

This community occurs on the higher slopes in the centre of the property. The description below has been taken from a relevé occurring on the very edge of the community, within the mapped Banksia Woodland, where Marri is occasional.

Tall Open Woodland to Forest of *Corymbia calophylla* over Open Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei*, *Kunzea glabrescens*, *Jacksonia sternbergiana* and *Hakea ruscifolia* over Low Open Shrubland of *Leucopogon racemulosus*, *Stirlingia latifolia*, *Calytrix angulata*, *Bossiaea eriocarpa*, *Scholtzia involucrata*, *Hibbertia huegelii*, *Petrophile linearis*, *Hovea trisperma* and *Verticordia nitens* over Open Sedgeland of *Mesomelaena pseudostygia*, *Desmocladus asper* and Open Herbland of *Conostylis setigera*, *Patersonia occidentalis*, *Tricoryne elatior* and *Tripterococcus brunonis* with the grass, *Neurachne alopecuroidea* on Yellow sand likely over laterite, on upper slopes and hill tops.



Figure 13. Site 3 showing an occasional Marri tree over Banksia Woodland.

Wetland – Photo site shown in Figure 14 .

Dominant species are described for the photo site in this community.

Low Open Shrubland of *Banksia menziesii*, *B. attenuata*, *B. ilicifolia* and *Melaleuca preissiana* over Open Shrubland of *Xanthorrhoea preissii*, *Kunzea glabrescens*, *Jacksonia furcellata* and *Hypocalymma angustifolium* over Sedgeland of *Lepidosperma striatum*. Flat, and low in the landscape with grey sandy loam. Water was observed just under the soil surface within the dense sedges.



Figure 14. Banksia trees, alive and dead, occur within this transitional wetland community near Bookine Rd.

Degraded – Photo sites shown in Figures 15 and 16.

Corymbia calophylla (Marri) trees or *Nuytsia floribunda* (WA Christmas tree or Moodjar) had been left in scattered patches within the cleared areas. In some places under the trees, there are patches of the weed species, *Erigeron sumatrensis* (Tall Fleabane) (formerly known as *Conyza sumatrensis*). These patches are likely to have come from resting kangaroos or other fauna, using the trees as shade. The weeds have not yet spread into the adjacent clearing.



Figure 15. Marri trees, mostly in scattered patches, are dominant within the degraded areas on Lot 1934. The ground cover is the native daisy *Podotheca gnaphalioides*.



Figure 16. *Nuytsia floribunda* trees and *Xanthorrhoea preissii* not cleared on the edge of a Degraded patch.

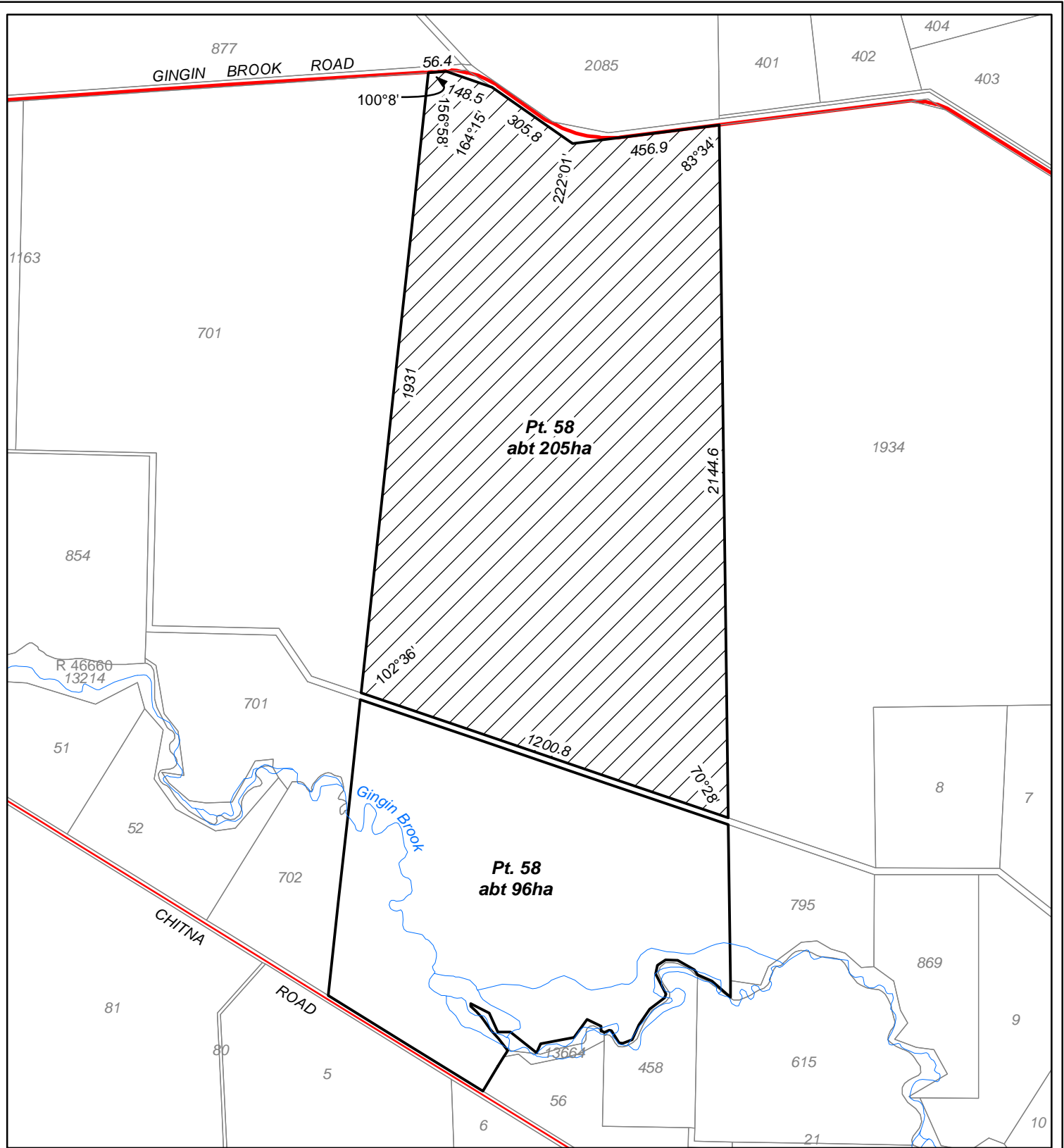
Table 1. Species recorded at each relevé and within Lot 1934.

Taxa	Banksia Woodland Sites 1 and 3		Marri / Banksia Site 4	Degraded Site 2	Wetland
<i>Acacia sessilis</i>	1				
<i>Banksia attenuata</i>	1	1	1		1
<i>Banksia ilicifolia</i>	1				1
<i>Banksia menziesii</i>	1		1		1
<i>Banksia prionotes</i>					
<i>Bossiaea eriocarpa</i>	1		1		
<i>Burchardia congesta</i>	1				
<i>Calothamnus sanguineus</i>	1				
<i>Calytrix angulata</i>	1		1		
<i>Calytrix flavescens</i>	1				
<i>Conospermum triplinervium</i>	1				
<i>Conostephium ?pendulum</i>	1				
<i>Conostylis setigera</i>			1		
<i>Corymbia calophylla</i>		1	1	1	
<i>Desmocladus asper</i>	1		1		
* <i>Erigeron sumatrensis</i>				1	
<i>Eucalyptus todtiana</i>	1				
<i>Gompholobium tomentosum</i>	1				
<i>Hakea ruscifolia</i>			1		
<i>Hibbertia huegelii</i>	1		1		
<i>Hibbertia hypericoides</i>	1	1			
<i>Hibbertia subvaginata</i>	1				

Taxa	Banksia Woodland Sites 1 and 3	Marri / Banksia Site 4	Degraded Site 2	Wetland
<i>Hovea trisperma</i>		1		
<i>Hypocalymma angustifolium</i>				1
<i>Hypolaena exsulca</i>	1			
<i>Jacksonia furcellata</i>				1
<i>Jacksonia sternbergiana</i>	1	1	1	
<i>Kunzea glabrescens</i>		1	1	1
<i>Lepidosperma striatum</i>				1
<i>Lomandra micrantha</i>	1			
<i>Lyginia imberbis</i>	1			
<i>Macrozamia riedlei</i>	1	1	1	
<i>Melaleuca preissiana</i>				1
<i>Melaleuca trichophylla</i>	1			
<i>Mesomelaena pseudostygia</i>	1	1	1	
<i>Neurachne alopecuroidea</i>			1	
<i>Nuytsia floribunda</i>	1	1	1	
<i>Patersonia occidentalis</i>	1	1		
<i>Petrophile linearis</i>	1	1		
<i>Podotheca gnaphalioides</i>				1
<i>Ptilotus manglesii</i>	1			
<i>Scholtzia involucrata</i>	1	1		
<i>Stirlingia latifolia</i>	1	1		
<i>Styphelia racemulosa</i>		1		
<i>Tricoryne elatior</i>		1		
<i>Tripterococcus brunonis</i>		1		
<i>Verticordia nitens</i>		1		
<i>Xanthorrhoea preissii</i>	1	1	1	1

Taxa not in relevés

**Cirsium vulgare*
**Citrullus amarus*
**Ehrharta calycina*
**Leptospermum laevigatum*
**Opuntia stricta*
Acacia benthamii (P2)
Acacia huegelii
Banksia littoralis
Beaufortia elegans
Daviesia nudiflora
Eremaea pauciflora
Hakea gilbertii
Hakea prostrata
Persoonia comata
Petrophile macrostachya
Xanthorrhoea brunonis



NOTE:
 All dimensions are approximate
 and are subject to survey.
 Total area of Lot 58 is abt 304ha

PROPOSED SUBDIVISION

Legend

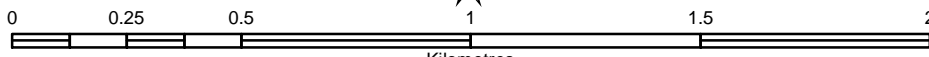


Land subject to SUBDIVISION - abt 205ha

Location(s): Portion of Lot 58 on Deposited Plan 23213
 as shown on Certificate of Title 2168/703

Owner(s): Vance Peter Brewer and Kaylene Maree Brewer

DRAFT ONLY



Kilometres
 SCALE: 1:16,500



APPENDIX D: SURVEY OF GOBBY ROAD - 360 ENVIRONMENTAL (2021)



**Alkimos Desalination Plant Offset Site,
Lot 1375 Gobby Road, Keysbrook**

Black Cockatoo Habitat Assessment and Hollow Inspection

Prepared for
Water Corporation

April 2021

● people ● planet ● professional

Document Reference	Revision	Prepared by	Reviewed by	Admin Review	Submitted to Client	
					Copies	Date
4323AA_Rev0	Internal Draft	L. Geidans	E. Webb S. Walker	-	-	08/04/2021
4323AA_Rev1	Client Draft	360 Environmental	Water Corporation	S. Hick	x1 electronic copy	28/04/2021
4323AA_Rev2	Client Final					

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Executive Summary

Water Corporation commissioned 360 Environmental Pty Ltd (360 Environmental) to undertake a black cockatoo habitat assessment of Lot 1375 Gobby Road, Keysbrook, in February 2021. The Survey Area covers 37 ha and is approximately 56 km south south-east of Perth, in the Jarrah Forest bioregion.

This biological assessment aims to provide information to assist in determining whether the Survey Area is an appropriate environmental offset for the proposed Alkimos Desalination Plant.

The Survey Area occurs within the modelled breeding distribution of the Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Black Cockatoo.

The black cockatoo habitat assessment identified 611 potential breeding trees with a DBH of greater than 500 mm, and three trees with a DBH of less than 500 mm but with a potentially suitable breeding hollow, comprising:

- 215 Jarrah (*Eucalyptus marginata*)
- 158 Marri (*Corymbia calophylla*)
- 38 Powderbark Wandoo (*Eucalyptus accedens*)
- 115 Wandoo (*Eucalyptus wandoo*)
- One Tuart (*Eucalyptus gomphocephala*)
- 84 stags.

157 trees contain hollows that were of suitable size (>12 cm) for black cockatoo breeding and were further investigated. A total of 55 trees were identified to contain potentially suitable hollows for use by black cockatoo breeding. Twelve hollows exhibited evidence of black cockatoo breeding such as chew marks around the hollow entrance.

A total of 36.47 ha of very high-quality black cockatoo foraging habitat, comprising predominantly Jarrah and Marri, was recorded within the Survey Area. Direct sightings of Forest Red-tailed Black Cockatoos and Baudin's Black Cockatoos were recorded within the Survey Area.

Table of Abbreviations

Abbreviation	Description
BC Act	WA Biodiversity Conservation Act 2016
EP Act	WA Environmental Protection Act 1986
EPA	Environmental Protection Authority
360 Environmental	360 Environmental Pty Ltd
DBCA	Department of Biodiversity, Conservation and Attractions
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation for Australia
IBSA	Index of Biodiversity Surveys for Assessments
EPBC Act	Environment Protection Biodiversity and Conservation Act 1999
PMST	Protected Matters Search Tool
WA	Western Australia
km	Kilometres
mm	millimetres

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Appendix C Foraging Habitat Scoring Tool Results

1 Introduction

1.1 The Project

Water Corporation commissioned 360 Environmental Pty Ltd (360 Environmental) to undertake a black cockatoo habitat assessment of Lot 1375 Gobby Road, Keysbrook, in February 2021. The Survey Area covers 37 ha and is approximately 56 km south south-east of Perth, in the Jarrah Forest bioregion (Figure 1).

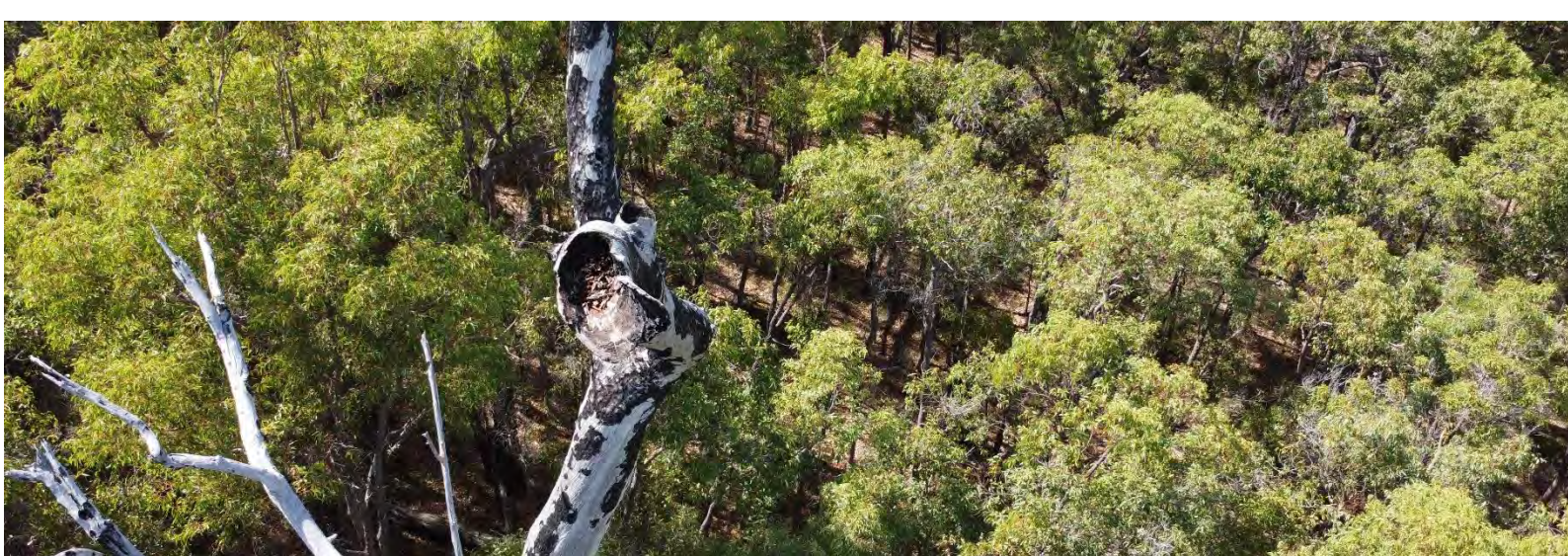
This biological assessment aims to provide information to assist in determining whether the Survey Area is an appropriate environmental offset for the proposed Alkimos Seawater Desalination Plant.

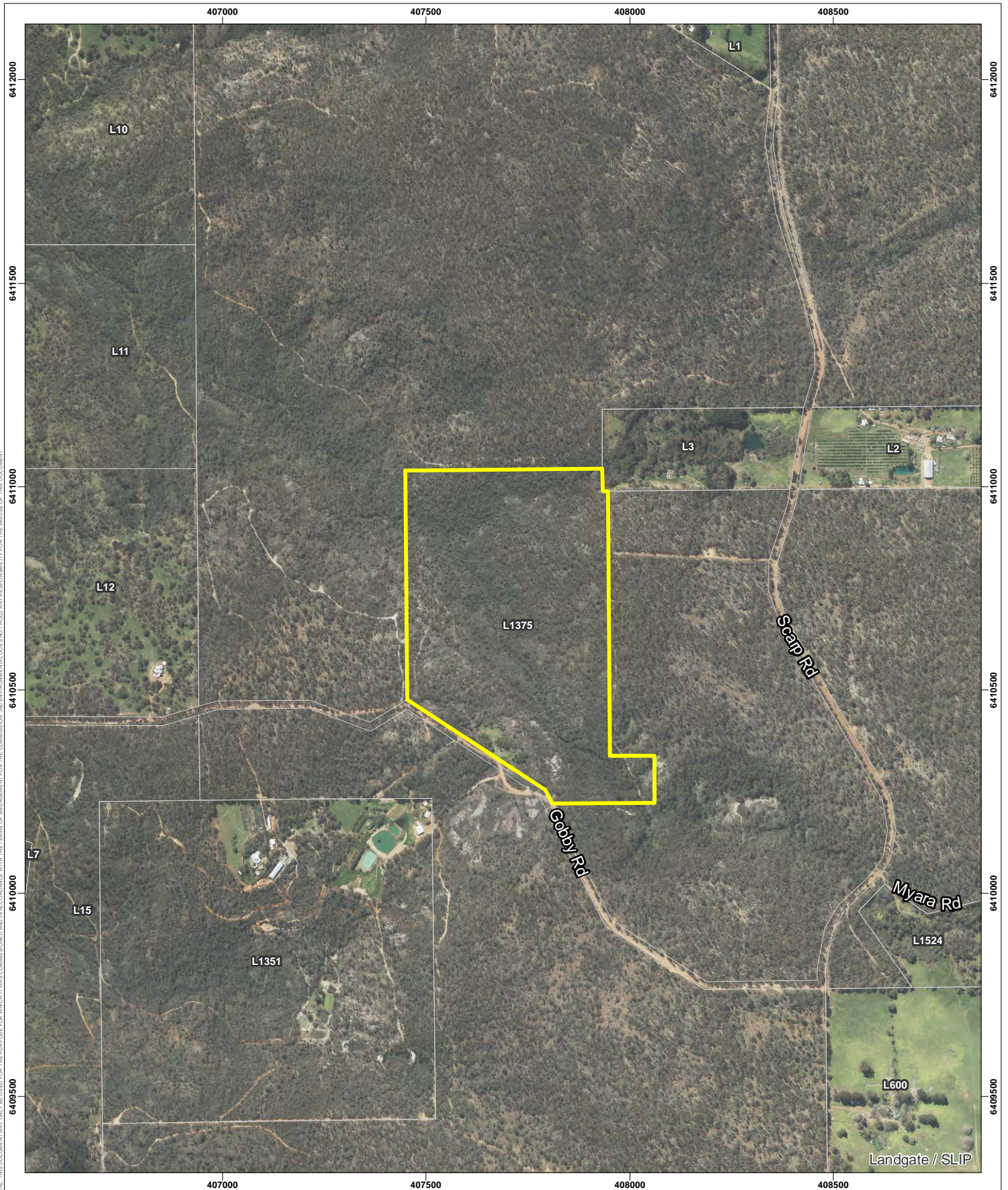
1.2 Objectives and Scope

The purpose of the survey is to delineate key black cockatoo values within the Survey Area.

The scope of works includes:

- Completing a desktop assessment using DBCA database searches for the proposed Offset Site to determine environmental values and conservation significant habitat
- Undertaking a field survey to assess the quality of black cockatoo habitat within the Survey Area
- Identifying evidence (if any) of black cockatoo foraging and assess the quality of foraging habitat within the Survey Area
- Conducting a visual inspection on any trees with hollows to identify evidence of use by black cockatoos and provide an indication on the size of the hollow.

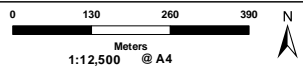




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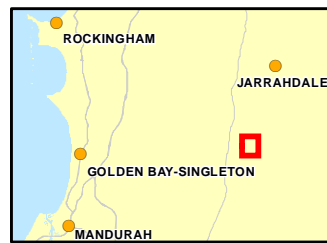
Legend

- Cadastral Lines
- Survey Area



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Water Corporation
 Gobby Road Offset Site, Keysbrook

Alkimos Seawater Desalination Plant
 Offset Black Cockatoo Assessment

Figure 1
Survey Area

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2 Methods

2.1 Desktop Assessment

2.1.1 Database Searches

Database searches were undertaken to identify known black cockatoo breeding areas within or surrounding the Survey Area (Table 1). The search area for each parameter was varied to reflect distances recommended by DBCA.

Table 1: Database Searches of the Survey Area

Database Name	Date Received	Search Target	Search Area
DBCA Threatened and Priority Fauna List and black cockatoo custom search (Department of Biodiversity Conservation and Attractions, 2021b)	26 February 2021	Threatened Priority Fauna and Black Cockatoo	20 km search buffer of the Survey Area
NatureMap area search (Department of Biodiversity Conservation and Attractions, 2021a)	17 February 2021	Threatened Priority Fauna and Black Cockatoo	20 km search buffer of the Survey Area
Protected Matters Search Tool area search (Department of Agriculture Water and the Environment, 2021)	17 February 2021	Commonwealth listed threatened flora and fauna, and TECs	20 km search buffer of the Survey Area

2.2 Black Cockatoo Habitat Assessment

2.2.1 Field Survey

The black cockatoo habitat assessment was undertaken by 360 Environmental ecologists Lukas Geidans, Louis Masarei and Poppy Walker over six non-consecutive days in February 2021. The Survey Area was traversed on foot to determine the presence of breeding, foraging and roosting habitat. The survey was conducted in accordance with the EPBC Act Referral Guidelines for three threatened Black Cockatoo Species (Department of Sustainability Environment Water Population and Communities, 2012) and with due regard for the revised draft referral guideline for three threatened black cockatoo species (Department of the Environment and Energy, 2017).

2.2.2 Breeding Habitat

Any trees meeting the following criteria for potential breeding or future breeding, based on the criteria described in the referral and revised draft referral guidelines (Department of Sustainability Environment Water Population and Communities, 2012; Department of the Environment and Energy, 2017), were recorded using the Fulcrum mobile data-collection application. The following information was collected:

- Tree species with the potential to form suitable hollows, particularly endemic eucalypt species (e.g. Wandoo, York Gum and Salmon Gum)

- Diameter at breast height (DBH) of greater than 500 mm (greater than 300 mm for Wandoo and Salmon Gum) regardless of the presence or absence of hollows (DBH was measured approximately 1.3 m from the ground)
- Any trees containing hollows (observed from the ground) were then categorised as:
 - Hollows that are obviously unsuitable for black cockatoo breeding (e.g. hollows with an estimated opening diameter of obviously less than 100 mm, downwards-facing hollows)
 - Hollows that are potentially suitable for black cockatoo breeding (e.g. upwards or sideways-facing hollows with an estimated opening diameter of possibly greater than 100 mm) (Saunders, Mawson and Dawson, 2014).

Trees with swellings or forking/branching at breast height were measured just above or below breast height to gain a more accurate measurement of diameter. In instances where trees had multiple stems, only the largest stem was measured.

2.2.2.1 Hollow Inspection

Hollows that were recorded as potentially suitable during the initial assessment from the ground were reinspected using a DJI Mini 2 drone. Each hollow was photographed and reassessed for its suitability for use by black cockatoos.

2.2.3 Foraging Habitat

Foraging habitat was assessed based on the presence of tree and shrub species known to be important dietary items for black cockatoos, such as Marri and *Banksia* species, as outlined in the referral and revised draft referral guidelines. It also included looking for:

- Evidence of feeding (chewed cones, seed and nut material)
- Opportunistic observations of black cockatoos foraging or using the Survey Area.

Foraging habitat was mapped and classified as low, medium, high, or very high quality using criteria based on the Foraging Habitat Scoring Tool in the Draft Revised EPBC Referral Guidelines (Department of the Environment and Energy, 2017).

2.2.4 Roosting Habitat

Areas suitable for black cockatoo roosting were identified and recorded. If observed, evidence of roosting such as scat at the base of trees was recorded. Note, absence of roosting evidence did not rule out the possibility of black cockatoo roosting, as dusk/dawn surveys were not undertaken.

2.3 Limitations

Limitations and constraints of the black cockatoo survey are detailed below in Table 2.

Table 2: Limitations and Constraints Associated with the Survey

Variable	Degree of Limitation	Potential Constraints on Survey Outcomes
Availability of Data	Not a limitation	All data required to complete the scope of works including regional and local contextual information was available

Variable	Degree of Limitation	Potential Constraints on Survey Outcomes
Access and Survey Intensity	Minor limitation	The site contained adequate tracks to allow for vehicle access. The remainder of the site was accessed on foot. Hollows were inspected using a DJI Mini 2 drone. Potential hollows occurring below the canopy or in amongst other foliage and strong and gusty winds experienced during the survey inhibited flying close to some hollows during the inspections. These weather conditions meant that photographs of hollows were taken from further away and finer details such as chew marks were difficult to observe.
Experience	Not a limitation	The black cockatoo habitat assessment was undertaken by suitably qualified ecologists Lukas Geidans, Poppy Walker and Louis Masarei with a combined total of eight years' experience conducting black cockatoo surveys. The team was supported by senior zoologist Evan Webb who has over 5 years' experience conducting black cockatoo surveys.
Timing, weather, season	Not a limitation	The field survey was undertaken during the recommended timing for black cockatoo surveys as outlined the Revised Draft Referral Guideline for Three Threatened Black Cockatoo Species (Department of the Environment and Energy, 2017). Timing was not a limitation for the black cockatoo survey.
Life forms sampled	Not a limitation	There were no constraints relating to black cockatoo sampling during the field survey.
Completeness	Not a limitation	The survey was considered complete for a black cockatoo assessment.

3 Results

3.1 Desktop Assessment

The Survey Area occurs within the modelled breeding distribution of the Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Black Cockatoo (Department of Sustainability Environment Water Population and Communities, 2012; Department of the Environment and Energy, 2017).

The DBCA black cockatoo database search identified three potential Forest Red-tailed breeding sites within 20 km of the Survey Area. The closest potential Forest Red-tailed breeding site was 5.25 km north east of the Survey Area. An additional eight potential White-tailed Black Cockatoo (where a positive species identification to Carnaby's Black Cockatoo or Baudin's Black Cockatoo was not made) breeding sites were recorded within 20 km of the Survey Area. One confirmed White-tailed Black Cockatoo breeding site was identified 10.7 km east north-east of the Survey Area. The three closest potential White-tailed Black Cockatoo breeding sites were within 1.3 km and 1.5 km west of the Survey Area. Figure 2 outlines the location of these sites.

The database search also identified 32 black cockatoo roosting sites within 20 km of the Survey Area, of which five roost sites were located within 5 km of the Survey Area (Figure 2). The nearest roost sites to the Survey Area are located approximately 18 m south and 380 m west. In 2019, both Forest Red-tailed and White-tailed Black Cockatoos were recorded at these two roost sites (Department of Biodiversity Conservation and Attractions, 2021c).

3.2 Breeding Habitat

A total of 611 potential breeding trees with a DBH of greater than 500 mm, and three trees with a DBH of less than 500 mm but with a potentially suitable breeding hollow, were recorded within the Survey Area (Figure 3; Appendix A), comprising:

- 215 Jarrah (*Eucalyptus marginata*)
- 158 Marri (*Corymbia calophylla*)
- 38 Powderbark Wandoo (*Eucalyptus accedens*)
- 115 Wandoo (*Eucalyptus wandoo*)
- One Tuart (*Eucalyptus gomphocephala*)
- 84 stags (dead trees).

200 trees were observed to contain hollows from the ground, of which 157 were considered potentially suitable for black cockatoo breeding and inspected by drone. Drone inspections found that:

- A total of 55 trees contain hollows are suitable for black cockatoo breeding, of which 12 show potential signs of previous use such as evidence of chewing around the entrance (Table 3).
- One tree contains hollows that may potentially be suitable for black cockatoo breeding in the future but are currently occupied by bees.

Table 3: Hollows Exhibiting Breeding Evidence

 <p>Tree ID: 5</p>	 <p>Tree ID: 106</p>	 <p>Tree ID: 48</p>	 <p>Tree ID: 82</p>
 <p>Tree ID: 116</p>	 <p>Tree ID: 117</p>	 <p>Tree ID: 124</p>	 <p>Tree ID: 40</p>
 <p>Tree ID: 58</p>	 <p>Tree ID: 98</p>	 <p>Tree ID: 224</p>	 <p>Tree ID: 223</p>

3.3 Black Cockatoo Observations

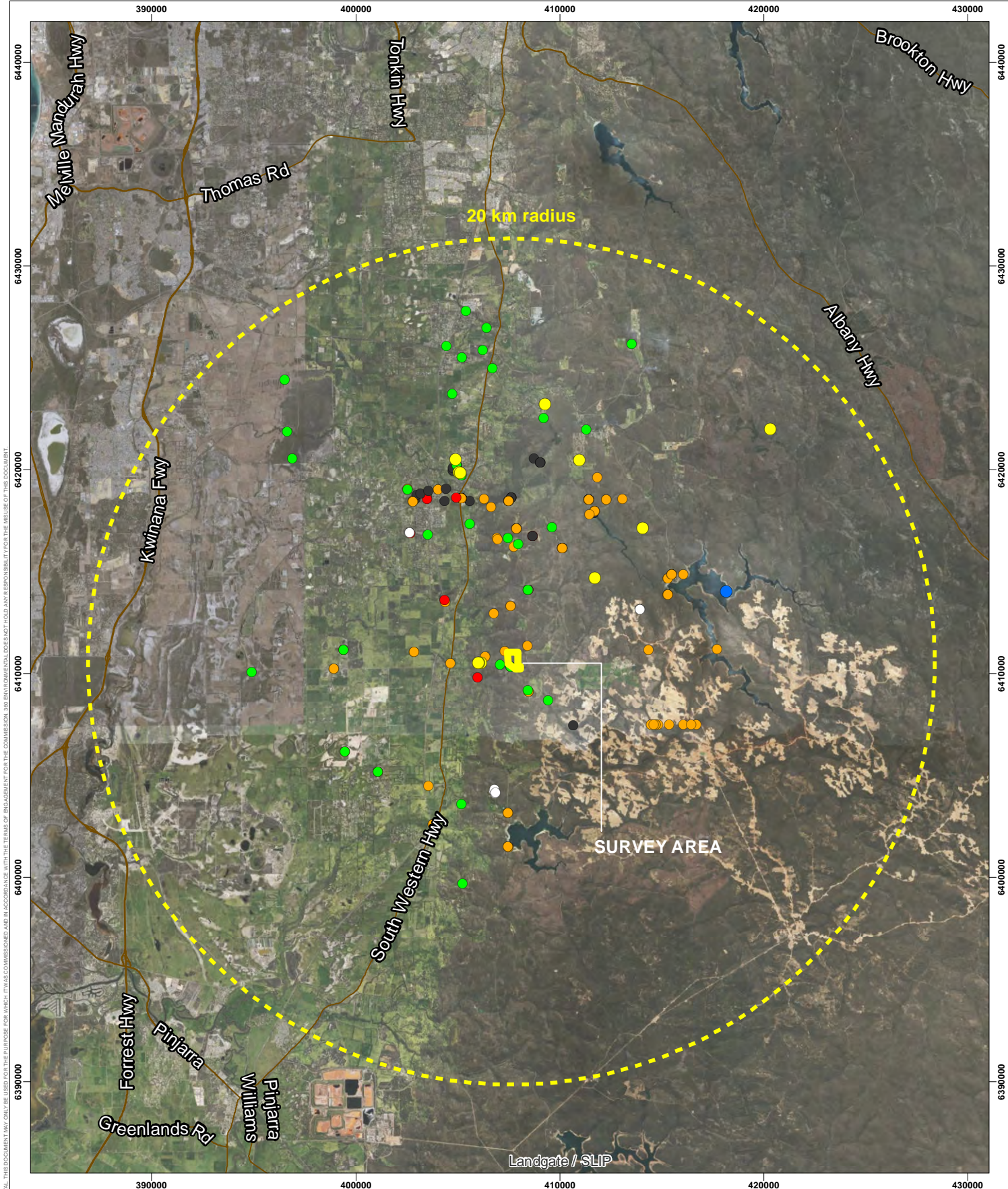
Black cockatoos were heard calling during the six day survey. Direct sightings of approximately ten Forest Red-tailed Black Cockatoos was made within the Survey Area. A sighting of a flock of approximately 15 Baudin’s Black Cockatoos was roughly approximately 25 outside the Survey Area. These locations are shown in Figure 4 and Appendix B.

3.4 Foraging Habitat

A total of 36.47 ha of very high quality black cockatoo foraging habitat was recorded within the Survey Area, consisting of vegetation dominated by Jarrah and Marri. Foraging habitat is mapped in Figure 4 and the results of the Foraging Habitat Scoring Tool are displayed in full in Appendix C.

3.5 Roosting Habitat

No direct sightings of roosting black cockatoos were made during the survey. The Survey Area contains approximately 36.47 ha of potential roosting habitat and all trees recorded as potential breeding trees may also be used for roosting.

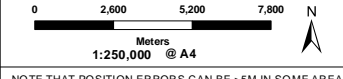


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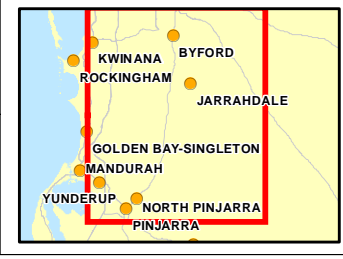
- Survey Area
- Baudin's cockatoo
- Carnaby's cockatoo
- Forest red-tailed black cockatoo
- White-tailed black cockatoo
- Black Cockatoo Breeding Area**
- Confirmed
- Potential
- Black Cockatoo Roosting Area**
- Confirmed

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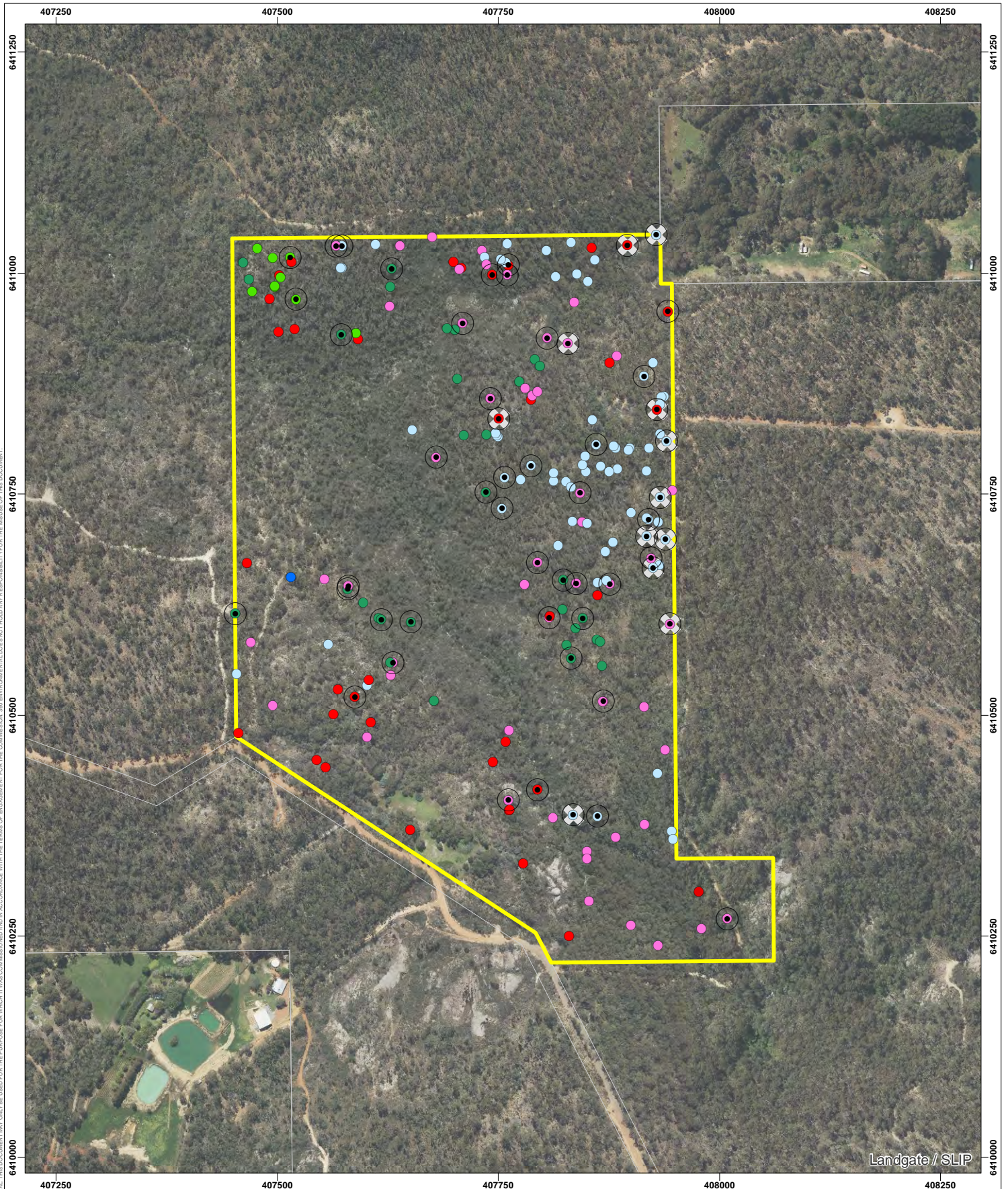
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 Offset Black Cockatoo Assessment

Figure 2
DBCA Black Cockatoo
Database Search

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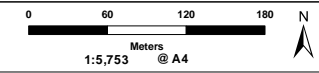


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Legend

- Survey Area
- Cadastral Lines
- Trees with Hollows Suitable for Breeding
- Trees with Breeding Evidence

- Potential Black Cockatoo Breeding Trees (with hollows)**
- Jarrah (*Eucalyptus marginata*)
 - Marri (*Corymbia calophylla*)
 - Powderbark Wandoo (*Eucalyptus accedens*)
 - Stag
 - Tuart (*Eucalyptus gomphocephala*)
 - Wandoo (*Eucalyptus wandoo*)



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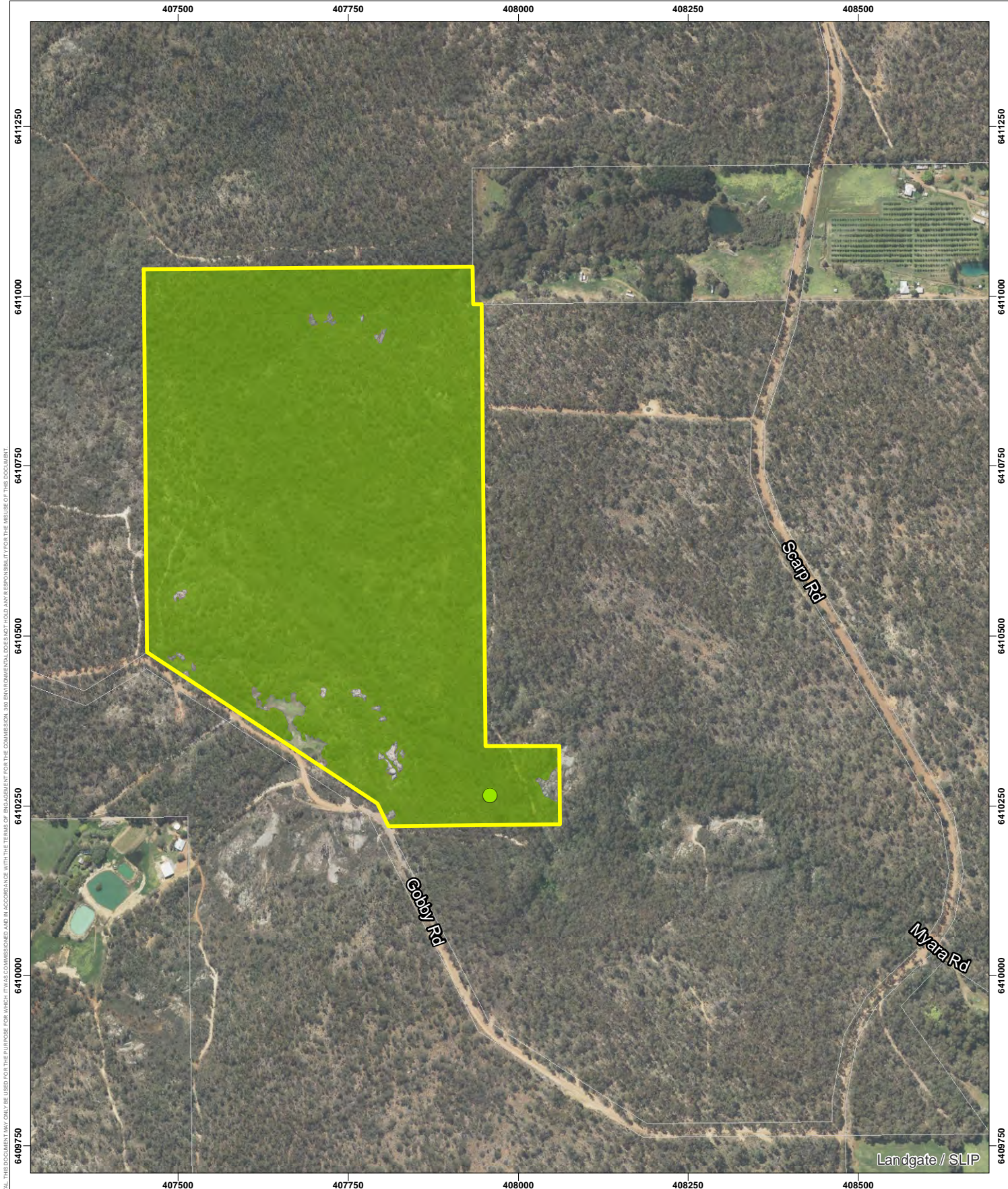
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Water Corporation
 Gobby Road Offset Site, Keysbrook
 Alkimos Seawater Desalination Plant
 Offset Black Cockatoo Assessment

Figure 3
Potential Black Cockatoo Breeding Trees

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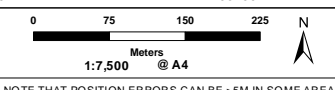
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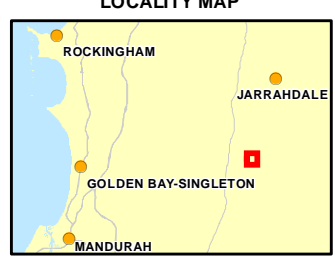
- Survey Area
- Cadastral Lines
- Very High Quality Foraging Habitat
- Black Cockatoo Evidence**
- Forest Red-tailed Black Cockatoo, Sighting

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LF	LG	SW	0

Water Corporation
Gobby Road Offset Site, Keysbrook

Alkimos Seawater Desalination Plant
Offset Black Cockatoo Assessment

Figure 4
Black Cockatoo Foraging Habitat

4 Discussion and Conclusion

The Survey Area occurs within the known breeding range of the Carnaby's Black Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Black Cockatoo and the survey was undertaken within the peak breeding season for black cockatoos (Department of Sustainability Environment Water Population and Communities, 2012; Department of the Environment and Energy, 2017). The results of the DBCA database search results identified nearby potential breeding sites for both Forest Red-tailed and White-tailed Black Cockatoos located within 20 km of the Survey Area and suitable breeding hollows were identified within the Survey Area. A number of these identified hollows showed evidence of previous use (such as chew marks at the entrance).

While foraging evidence was not found, the Survey Area contains very high quality foraging habitat for all three black cockatoo species consisting primarily of Jarrah, Marri and Wandoo (Groom, 2011; Department of the Environment and Energy, 2017). The presence of a small creekline dissecting the Survey Area increases the value of foraging habitat within the Survey Area as it provides a water source for black cockatoos.

The DBCA database search results indicate that a known black cockatoo roosting site occurs 18 m to the south of the Survey Area. Given that this roosting site occurs in a patch of vegetation that continues into the Survey Area, it is likely that the Survey Area constitutes part of this known roosting site. Both Forest Red-tailed and White-tailed Black Cockatoos were recorded at this roosting site in 2019.

The Survey Area is a proposed offset for the site of the Alkimos Seawater Desalination Plant, which falls within the Guilderton and Cottesloe (Central and South) Pre-European Vegetation Complexes as described by Beard (2013). The Guilderton Complex is described as Thickets of *Acacia rostellifera* (summer-scented acacia) and *Melaleuca cardiophylla* (tangling melaleuca), interspersed with *A. lasiocarpa* (panjang), and *Melaleuca systena* (coastal melaleuca heath) (Beard *et al.*, 2013). The Cottesloe Complex is described as a Low Woodland or Open Low Woodland, characterized by *Acacia* and *Banksia* species (Beard *et al.*, 2013). The Survey Area therefore comprises very different habitat and vegetation to the Alkimos Seawater Desalination Plant Survey Area, however both sites provide high quality foraging habitat for black cockatoos.

The key findings of the 2021 Black Cockatoo Habitat Assessment are summarised below:

- A total of 611 trees with a DBH of greater than 500 mm and three trees with a DBH of less than 500 mm but with a potentially suitable breeding hollow were recorded
- A total of 55 trees were found to contain potentially suitable hollows for use by black cockatoos, of which 12 hollows showed potential evidence of previous use, such as chew marks around the hollow entrance
- A total of 36.47 ha of very high quality foraging habitat was recorded, which also constitutes roosting habitat
- A known black cockatoo roosting site occurs 18 m to the south of the Survey Area in a patch of vegetation that continues into the Survey Area, therefore it is likely that the Survey Area constitutes part of this roosting site

- Baudin's Black Cockatoos and Forest Red-Tailed Black Cockatoos were seen and heard calling within the Survey Area.

5 References

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6 Limitations of this Report

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Appendices

Appendix A Raw Tree Data

Latitude	Longitude	Taxa	DBH (mm)	Approx height (m)	# of hollows	# of hollows > 120 mm	# of hollows with bees	Comments	Suitable for Black Cockatoo	Tree Photo Reference	Hollow Photo Reference
-32.44107640	116.01949350	Marrri (Corymbia calophylla)	520	6	1					178578fb-a47b-4598-b238-ace6ccfdb310	
-32.44109570	116.02013630	Marrri (Corymbia calophylla)	520	12						03116813-9799-407a-a36c-119ed8922a69	
-32.44096960	116.02024010	Stag	980	10	3	3			No	74a964f5-16aa-4b28-8a5c-e676cead1da7	52, 53, 54
-32.44119040	116.02032350	Marrri (Corymbia calophylla)	640	10						5295e7b0-f791-403b-8e1e-be3d2d0cf8e0	
-32.44135400	116.02027210	Marrri (Corymbia calophylla)	580	8						7d657593-2bb3-4111-a78d-0d47666fb0be	
-32.44117420	116.02056090	Stag	1020	8	1	1			No	f2d30e03-48dd-453c-ab04-22fa86ce3ae3	55, 56
-32.44116030	116.02062630	Marrri (Corymbia calophylla)	510	14						fc51237f-beac-43fc-8f3e-8d1de606f26f	
-32.44109260	116.02078440	Marrri (Corymbia calophylla)	500	16						43bf453f-c2c5-4593-a868-700d464df72	
-32.44102690	116.02050870	Marrri (Corymbia calophylla)	500	10						d96b10de-0135-48cb-82e1-3c5982466f4b	
-32.44052740	116.02048860	Jarrah (Eucalyptus marginata)	760	14						e0798939-0d3f-4f7d-8c77-3039804904ae	
-32.44051070	116.02021800	Marrri (Corymbia calophylla)	500	12						27d4d428-d148-4955-93ea4-97375cd7ce4f	
-32.44048510	116.01993760	Marrri (Corymbia calophylla)	500	12						d8bb406c-e6cb-41d1-8d1d-a21418c2e2bf	
-32.44029668	116.01971670	Stag	800	7	1	1			No		
-32.43985730	116.01931360	Stag	1010	3	1	1				3a134093-ae7-4295-bbbc-91d4ca208af2	57, 58, 59
-32.43977160	116.01947970	Marrri (Corymbia calophylla)	1160	17						1fc5b2ea-2737-4486-abae-b87fd3d3c97	
-32.43983459	116.01955280	Jarrah (Eucalyptus marginata)	990	18	3				Yes	513a63c0-4f99-40cb-93af-8574ce80868f	60, 61, 62, 63
-32.43986440	116.01879620	Stag	940	7	1	1			No	a326cb31-8a03-4a77-b234-703a52a1010e	65, 66
-32.43885240	116.01818990	Wandoo (Eucalyptus wandoo)	500	10						1f0cf2af-7b81-442d-86e9-5aff0286440	
-32.43875090	116.01786900	Wandoo (Eucalyptus wandoo)	510	8						6726d38e-7093-4a07-a47e-aa5d9e5636d9	
-32.43865590	116.01789640	Wandoo (Eucalyptus wandoo)	700	14	2	2			No	3636321d-600c-41fe-a3ff-bca9f03e3a0_e33f09f4-e008-4250-9547-54b24526b343	87, 88, 89, 90
-32.43874480	116.01750930	Jarrah (Eucalyptus marginata)	670	8						df1912ac-1f6f-41fc-b925-0b195868dc2f	
-32.43874450	116.01745300	Marrri (Corymbia calophylla)	780	6						9a451670-4167-4e56-9a7d-903335c15e56	
-32.43899710	116.01738800	Stag	870	17						c2fe50f1-3f12-4fa3-ad73-bf7036de972d	
-32.43908960	116.01725710	Marrri (Corymbia calophylla)	650	11						e47e9577-bd23-4e36-bc19-04d5864da3a2	
-32.43988590	116.01711880	Marrri (Corymbia calophylla)	940	14						332d88bd-7980-4801-bb13-7643dadbd496	
-32.43901790	116.01708700	Stag	500	16	1					f32913e2-6f39-413c-abcf-565988319c68	
-32.43899250	116.01699240	Marrri (Corymbia calophylla)	720	12						ed6c428a-b2d0-4bc5-a9bb-e3b49b0a9ea8	
-32.43891220	116.01695270	Marrri (Corymbia calophylla)	740	12						d7cc6826-d2a3-47b3-ac92-4f78409c19d8	
-32.43887020	116.01713510	Marrri (Corymbia calophylla)	690	12	1					54253f7b-90f4-4265-b1bc-a4ac1afc6f45	
-32.43877100	116.01714030	Marrri (Corymbia calophylla)	710	17						b758b505-7388-4360-b33a-6a3e794d741c	
-32.43873190	116.01731760	Jarrah (Eucalyptus marginata)	580	14						d152bee2-3f43-443e-8b36-e52a903c4a0e	
-32.43868410	116.01725780	Marrri (Corymbia calophylla)	610	12						5a7b78ca-0347-416e-b053-4405136639ee	
-32.43861010	116.01720250	Jarrah (Eucalyptus marginata)	540	10						e51263b9-b0f0-4e0f-e5d7-8d2d2c0d006a	
-32.43865880	116.01707290	Jarrah (Eucalyptus marginata)	620	10						7643a3ec-eb40-4fa2-bb57-642ec148f866	
-32.43860630	116.01693770	Marrri (Corymbia calophylla)	510	8	1	1			Yes	0c5017f1-bddd-46c6-92dc-4512a88b0392	75, 76
-32.43849790	116.01703650	Marrri (Corymbia calophylla)	840	8						65845a87-198d-4feb-88fd-f1d0eba50d81	
-32.43849400	116.01709360	Jarrah (Eucalyptus marginata)	700	12	1	1			No	254c6757-cf87-4f89-8cad-033eccca24345	73, 74
-32.43843720	116.01711640	Marrri (Corymbia calophylla)	820	8	1	1				5e16daf4-9d35-4f83-ae9c-0b84460e99f5	
-32.43839630	116.01737950	Stag	760	16	2	2				602aa5c7-0545-4cf9-8c83-366bca8562ea	
-32.43852770	116.01673600	Marrri (Corymbia calophylla)	1060	7	1					8986bc70-2634-44c1-9237-1db576e23ab4	
-32.43878540	116.01667930	Marrri (Corymbia calophylla)	510	6	1	1			No	754a9098-90ff-4a50-88ff-0a57983ad7b4	81, 82
-32.43901940	116.01650600	Marrri (Corymbia calophylla)	530	13						8e6cd522-1566-45bf-ac3-7b1d747f01ff	
-32.43925060	116.01647280	Marrri (Corymbia calophylla)	1240	18	1					0aee307f-34ee-4221-9b8c-c71f01fe196d	
-32.44021510	116.01852400	Marrri (Corymbia calophylla)	510	12						750cbf9a-d670-4428-b4b9-2ad19e1e8fbb	
-32.44023100	116.01852520	Marrri (Corymbia calophylla)	550	14						dfea8f07-671d-41e3-b92d-4beba8eb5ea4	
-32.44074300	116.01886260	Marrri (Corymbia calophylla)	500	8						2190e76b-b041-4952-a47a-0d944f976197	
-32.44077990	116.01884790	Jarrah (Eucalyptus marginata)	160	12						d9c91d2b-a3c1-4b15-a785-50370bfc2150	
-32.44078700	116.01884600	Jarrah (Eucalyptus marginata)	550	12						699fa901-88c6-4e16-bcea-9af4d9e0a74	
-32.44084160	116.01899440	Marrri (Corymbia calophylla)	500	10						67c7a236-f8de-4d70-a4f8-67bfa2c0b4f6	
-32.44082080	116.01975890	Marrri (Corymbia calophylla)	520	8						6c8d9f7a-a47c-4c03-b75f-6b1045c6bd92	
-32.44071070	116.01974030	Stag	600	10	3	1				65888ef8-a761-4335-813b-72e744866c7f	
-32.44065440	116.01985090	Marrri (Corymbia calophylla)	920	14						9d9d0e8b-520b-4b79-bb43-236ae9710700	
-32.44065960	116.02057230	Jarrah (Eucalyptus marginata)	850	14						3c4f666e-3abb-4fb1-b6f1-bbfb12c05186	
-32.44028950	116.02012660	Jarrah (Eucalyptus marginata)	490	12						1ab9f1d7-58ac-433b-b5a8-3f99c74f9c68	
-32.44037108	116.01987630	Jarrah (Eucalyptus marginata)	510	12						779ca1cf-bd91-4238-8142-f7b2f8ecf96c	
-32.44028750	116.01972300	Stag	760	10	3	2				170b1e6d-c1fe-4a11-b5d1-8153a0a13498	
-32.43957200	116.01912960	Marrri (Corymbia calophylla)	540	10	1	1			Yes	4df0b1ba-59e3-467d-86c0-0fe601de1164	64
-32.43908160	116.01875650	Marrri (Corymbia calophylla)	530	10	1					aef643e8-f8b9-4726-ad6a-d901f7466cd5_37958150-7499-47bc-94a6-1397d3df2185	
-32.43928650	116.01859940	Marrri (Corymbia calophylla)	810	10	2	1				bccd9a13-d276-4ec3-abef-2685f8e9f65c	
-32.43929150	116.01849830	Stag	490	10						69b7eced-69dc-4beb-8f38-ca9e470a2ecc	
-32.43929018	116.01817610	Marrri (Corymbia calophylla)	590	10						60d4bd49-1e65-45cf-89b4-f9a0bd5be449_48b4103c-ee3c-408f-8c1f-4eff86b96f76	
-32.43930574	116.01794040	Marrri (Corymbia calophylla)	480	10						b6c06ab8-84a8-4957-b7d4-0ad185187efc	
-32.43951120	116.01769200	Marrri (Corymbia calophylla)	560	10						9effefce-8fd9-42b0-b30f-019c2621487c	
-32.43946180	116.01741250	Wandoo (Eucalyptus wandoo)	590	12						a48a2b40-3acd-4af5-a3f6-54c89f196ee_7a6a8610-ef1c-4cc9-92d5-6eeec6816a8d1	
-32.43953352	116.01701200	Marrri (Corymbia calophylla)	800	12						27fe3acd-64f2-4ef1-9e2e-01d4ecbf0132	
-32.43969000	116.01759530	Marrri (Corymbia calophylla)	1020	12	1	1				c36b8420-a3cb-4b07-a619-3f8ba2edf04e_f944fb3a-e915-4473-b3b1-fb26cbf88605	
-32.43997120	116.01791550	Marrri (Corymbia calophylla)	720	10						34572d8a-7596-4638-afb1-bed1f0a2410e	
-32.44001144	116.01808760	Marrri (Corymbia calophylla)	890	14						0d528926-e362-499f-bf5b-14e980443237	
-32.43999503	116.01827370	Marrri (Corymbia calophylla)	840	12						c4929b2a-e5e7-4707-8884-75fcd48f7c22	
-32.44015179	116.01827400	Cape Lilac (Melia azeedarach)	760	10						6a59a7f6-9a35-4b34-8f94-b0af2083077e_e242e633-5a2b-4227-9466-278947a14d54	
-32.43959889	116.01838430	Marrri (Corymbia calophylla)	640	8						d8b177ec-77e8-4890-912a-8b77e452a887	
-32.43978390	116.01878640	Marrri (Corymbia calophylla)	530	8	2					23d7be38-b205-43aa-939a-2ea058fd7607_f8f518e4-a935-4a3a-a929-4e5ee777e2ab	
-32.43960992	116.01875550	Marrri (Corymbia calophylla)	600	10						57bf8d1-6ae7-4029-975c-095b0e7800dd	
-32.43967890	116.01877920	Stag	0	8	3	2			Yes	04598dbd-9bc4-45cd-b05f-75f70288d6e1	67, 68, 69
-32.43977870	116.01879350	Marrri (Corymbia calophylla)	510	10	1					68d4f962-d1e6-4a45-92c4-d027343e3d9d	
-32.44006605	116.01926840	Marrri (Corymbia calophylla)	890	13						9fa02157-02f3-4526-b633-ab6fbade39de	
-32.44032213	116.01895360	Marrri (Corymbia calophylla)	600	14	2	1				29fdbecc-d44c-4a2f-ac10-6e4db34b3857	
-32.44055472	116.01912600	Stag	540	8						3d5d46ec-ed55-42ec-9460-395562ceec8b2	
-32.43932413	116.01658250	Marrri (Corymbia calophylla)	1240	18	1					0aee307f-34ee-4221-9b8c-c71f01fe196d	
-32.43911400	116.01573240	Marrri (Corymbia calophylla)	550	12						bfa8f211-147e-4559-ad64-9c518a23feb0	
-32.43912400	116.01568800	Jarrah (Eucalyptus marginata)	820	12						b2e5f60d-a56a-4ec5-a26f-dcb756876270	
-32.43868770	116.01595450	Stag	670	12	1	1				b035866f-f7bb-466d-9d43-bf588d0925bf	
-32.43824890	116.01583360	Marrri (Corymbia calophylla)	630	14						1b59139c-48f6-47df-8cb1-2f94d316fcad	
-32.4380											

Latitude	Longitude	Taxa	DBH (mm)	Approx height (m)	# of hollows	# of hollows > 120 mm	# of hollows with bees	Comments	Suitable for Black Cockatoo	Tree Photo Reference	Hollow Photo Reference
-32.43736570	116.01619740	Marrri (Corymbia calophylla)	550	12						3cbd7384-ae3b-4f5d-9ad7-253a32f432c4	
-32.43723756	116.01565790	Marrri (Corymbia calophylla)	780	12	1	1			No	985af68d-544a-4b9f-bb87-bece6b4ea523	72
-32.43723830	116.01565880	Marrri (Corymbia calophylla)	550	8						e715c9f9-9f1c-417e-b0af-f9198b867a2b	
-32.43658460	116.01616630	Marrri (Corymbia calophylla)	500	7						efde04ff-0c55-49b1-a8d2-854b33139204	
-32.43628080	116.01565460	Wandoo (Eucalyptus wandoo)	560	5						f427c250-5a90-4544-a946-4586c7a8efu7	
-32.43609980	116.01561330	Wandoo (Eucalyptus wandoo)	650	10						1a2ec1b8-1dfe-408f-b4b7-67ceec0250bf	
-32.43780576	116.01723800	Wandoo (Eucalyptus wandoo)	640	7	1	1				a3847d5d-dfed-01da-83e1-110c9160869b	
-32.43824750	116.01652070	Marrri (Corymbia calophylla)	550	12						b7cd483b-abc3-40d9-9c9f-18395c689110	
-32.43948150	116.01634080	Marrri (Corymbia calophylla)	1090	14	1	1			No	f85c42f2-ed49-4add-86bb-16f5b734e3af	85, 86
-32.43868060	116.01619910	Marrri (Corymbia calophylla)	800	12						710cad8e-18df-4e03-9a94-352461066533	
-32.43822992	116.01650310	Marrri (Corymbia calophylla)	640	12						29e9df1a-79d0-404e-8133-4bb5c5d70fce	
-32.43807146	116.01662680	Jarrrah (Eucalyptus marginata)	510	8	2	1				8ac4d7d2-bc4e-4a9b-86d8-b7010a1d41cd	
-32.43809353	116.01665630	Marrri (Corymbia calophylla)	510	10						6bd4c1f8-941e-477ae-bf10-7d715da02be4	
-32.43738188	116.01618760	Tuart (Eucalyptus gomphocephala)	680	14		1		No access to hollow		0ca0dccc-3d17-4f27-8dce-fe0056e0e2cd	
-32.43694979	116.01637700	Wandoo (Eucalyptus wandoo)	950	12						b45d57a3-2ffe-490e-9415-568fadbf799b	
-32.43693762	116.01658250	Marrri (Corymbia calophylla)	510	10						1cb1d163-9e62-46c9-8990-b10b41dff01f	
-32.43692234	116.01624560	Marrri (Corymbia calophylla)	540	10						7900c992-ea16-441c-baaf-f47320dde16d	
-32.43655350	116.01626200	Marrri (Corymbia calophylla)	540	12						ac1c904a-7cd4-4e76-84f5-0122632f2ae7	
-32.43626331	116.01614270	Marrri (Corymbia calophylla)	560	12						aa010524-53db-4f49-82d6-5ebdd08a9134	
-32.43652130	116.01643020	Marrri (Corymbia calophylla)	460	12						d424cb03-2417-45e3-a22e-1bd34dbb362e	
-32.43729953	116.01710990	Wandoo (Eucalyptus wandoo)	320	10						e5f3f20d-b710-4adf-b34a-2321d298686a	
-32.43740565	116.01658590	Stag	510	12	1					3d60ca0b-25c9-475e-b591-acee77e20598	
-32.43740590	116.01677100	Wandoo (Eucalyptus wandoo)	410	10						bee733be-d78d-48dd-b353-e8a9e42a3776	
-32.43751006	116.01686920	Wandoo (Eucalyptus wandoo)	480	10	3	2			Yes	508fc141-c531-4537-ada3-87bdea3d3fdd	102, 103
-32.43747497	116.01687320	Stag	0	11	1	1			Yes	44dc4c7b-85fc-4918-960f-b78b57a18659	99, 100, 101
-32.43759790	116.01662030	Wandoo (Eucalyptus wandoo)	480	10						d336f822-563a-46c4-82e6-07acac1cad4	
-32.43760316	116.01656950	Wandoo (Eucalyptus wandoo)	490	13						19e83379-68fd-4ddc-9e67-3c6399e4be68	
-32.43759260	116.01654640	Wandoo (Eucalyptus wandoo)	510	12						90184d78-f3b9-4c44-81a3-9f4c48504e3c	
-32.43752817	116.01654940	Wandoo (Eucalyptus wandoo)	540	12						01c58377-c794-4857-b172-4b7fc597a7bb	
-32.43777463	116.01679240	Wandoo (Eucalyptus wandoo)	480	10						53de982-8021-485a-84e3-8bd888f9e172	
-32.43776954	116.01677130	Wandoo (Eucalyptus wandoo)	490	15						062e980c-d148-406c-a18f-061174b387a6	
-32.43776630	116.01680640	Wandoo (Eucalyptus wandoo)	310	16						a82db726-f5e9-40be-be53-1ed948419117	
-32.43781320	116.01680520	Wandoo (Eucalyptus wandoo)	480	12						b69f9b02-2045-46c4-973a-7d31d6df4142	
-32.43784368	116.01688160	Wandoo (Eucalyptus wandoo)	300	12						97ca2ecc-ca0f-4573-bf28-ee000b6d6242	
-32.43784962	116.01705060	Wandoo (Eucalyptus wandoo)	540	12						4f699c84-53fa-4793-ae9c-da252398f9e5	
-32.43781906	116.01726520	Wandoo (Eucalyptus wandoo)	540	12	5	2			Yes	accdf099-e273-43c3-9040-151048e3faef	95-98
-32.43776840	116.01715380	Wandoo (Eucalyptus wandoo)	510	14						f125713a-91e3-4d36-9a3b-23c6a8eecd721	
-32.43772059	116.01709220	Wandoo (Eucalyptus wandoo)	380	16						d6d698ca-fa2d-410e-b16e-d0f62ee0f3c9	
-32.43764702	116.01704860	Wandoo (Eucalyptus wandoo)	510	16	1	1			No	5a9909c7-bc52-49a7-ac32-3a9a57480a8b	108
-32.43785330	116.01762420	Wandoo (Eucalyptus wandoo)	640	14	1	1			Yes	3d2f38bd-4bd0-4453-b1b9-38ed8ee0f019	94
-32.43792240	116.01737680	Wandoo (Eucalyptus wandoo)	300	13						df8a8dc7-03a9-4de0-e64d-dba16a231fb1	
-32.43826390	116.01740360	Stag	890	12	3	2			Yes	b9106ef8-b6a8-4835-9b1e-b7d0d03655b,1a47cc5c-66e4-4337-af8a-7ad9d668d9c7	91, 92, 93
-32.43826530	116.01737380	Wandoo (Eucalyptus wandoo)	540	18	2	1				879a1f41-2c5d-4258-ad69-b55aad03a7d1	
-32.43477657	116.02071680	Jarrrah (Eucalyptus marginata)	720	16						69b76dba-90da-4f1d-847a-4b3ecb181ddb	
-32.43475875	116.02067490	Stag	600	18						9e2cb0df-f0b7-40e4-b6ff-ed73712fc9d9	
-32.43492429	116.02056730	Jarrrah (Eucalyptus marginata)	540	17						a065d185-b2f2-4f02-8b5d-ccc9c38ea89	
-32.43484477	116.02032260	Stag	700	10						fe299c19-373e-4fb0-96e1-4112f6fae8c5	
-32.43484392	116.02033430	Marrri (Corymbia calophylla)	640	18						7998f994-100f-499b-9754-fc84c13d805b	
-32.43475535	116.02028370	Jarrrah (Eucalyptus marginata)	570	19						f0fec55d-4e84-422d-a740-53f9f780a258	
-32.43471830	116.02032790	Marrri (Corymbia calophylla)	510	16						f1f4ab86-2f6b-4456-800b-c818dc13d197	
-32.43460226	116.02025850	Jarrrah (Eucalyptus marginata)	730	22						8f7b729b-bd66-4527-a2a8-911343078c51	
-32.43497240	116.02030020	Stag	540	16						ee8b73a7-d000-4173-a261-5279c1ad2e39	
-32.43492683	116.02016560	Stag	600	12						98009d2d-1ed6-4a9e-8f04-4aa1815374f6	
-32.43515220	116.02013010	Stag	670	15	2	2			No	7da8580a-6158-4bd2-81e4-fd9ff1f7b5d1	334, 335, 336
-32.43500833	116.01981430	Wandoo (Eucalyptus wandoo)	670	15						8bf81dbc-4030-4cd7-b2f5-c2d1085862a3	
-32.43501908	116.01954340	Stag	890	15	3	3			Yes	37525bea-e3a8-4e1e-8d87-f26e319d04b3	337-343
-32.43496730	116.01929760	Stag	510	15	1	1			Yes	15f842e8-b3ee-4f04-b456-482b5a5ecb3b4	350, 351
-32.43518220	116.01914430	Wandoo (Eucalyptus wandoo)	570	16	2					3221501b-34bc-43f0-a0f0-eb5486eef90b	
-32.43517359	116.01885810	Stag	510	17						f3a1bd59-c289-48f8-8d8a-df9938692b5a	
-32.43506606	116.01879970	Wandoo (Eucalyptus wandoo)	410	16						078020b9-fda0-4b3e-ae9f-6bd06c7c6f3d	
-32.43523895	116.01864990	Wandoo (Eucalyptus wandoo)	410	22						c5295967-39aa-4efc-a6b7-fbfb1ab97c6f	
-32.43513930	116.01854290	Wandoo (Eucalyptus wandoo)	320	10						a76a2b6e-16cc-49b1-b78b-9e8ee3d27bcc	
-32.43503578	116.01848620	Wandoo (Eucalyptus wandoo)	380	10						12692c21-d915-416d-8d3e-d9bc626b5561	
-32.43519226	116.01847220	Wandoo (Eucalyptus wandoo)	380	10						d3b388de-e18a-43bb-bbb7-1ecca9ca85d5	
-32.43500861	116.01836150	Wandoo (Eucalyptus wandoo)	320	10						7165b5f6-2b35-40af-b81e-0dd438793d85	
-32.43536770	116.01863750	Stag	950	8						5365dbab-54bf-4a9a-b944-90a802c9d587	
-32.43540610	116.01896030	Wandoo (Eucalyptus wandoo)	510	20	2	1	1			a793724f-1b6e-4295-af92-8c4556d4b70	
-32.43524590	116.01907260	Wandoo (Eucalyptus wandoo)	320	18						43dd21e7-4f51-482f-9375-3a64af18b34	
-32.43525678	116.01920780	Wandoo (Eucalyptus wandoo)	890	18	4	2			No	6af3aa44-0bc9-4d02-a551-d032808f0585	348, 349
-32.43522282	116.02004290	Marrri (Corymbia calophylla)	860	12	3	1				21a08d07-313a-4a19-32a9-6d169f2c046a	
-32.43535497	116.02010960	Jarrrah (Eucalyptus marginata)	570	14						6c3f3f03-47ab-48ff-8245-80e4412c98fa	
-32.43547382	116.02016330	Jarrrah (Eucalyptus marginata)	560	13						e2d1e0c3-a003-466d-9184-0710889f98c	
-32.43552023	116.02040370	Jarrrah (Eucalyptus marginata)	570	20						302fe441-4ef2-47f0-bf32-c9fe640a1d7a	
-32.43560059	116.02044430	Jarrrah (Eucalyptus marginata)	670	13						bdc5193a-d8de-4171-9497-b56992ba9177	
-32.43536035	116.02045770	Jarrrah (Eucalyptus marginata)	860	7	3	2			Yes	c2d9af17-14b4-44f1-82ca-7cc027e30545	120, 121
-32.43533035	116.02056760	Jarrrah (Eucalyptus marginata)	640	18						5bce88b8-99eb-4f66-8e21-3ad6b63eb386	
-32.43522707	116.02057000	Jarrrah (Eucalyptus marginata)	510	26	1	1			No	a37ba3be-b9c4-45ae-917a-3fd24a5a7954	122
-32.43515604	116.02039870	Jarrrah (Eucalyptus marginata)	510	27						bcb668e8-c6ea-42f1-ab2d-d639e6c321	
-32.43543732	116.02073860	Jarrrah (Eucalyptus marginata)	890	28						dc0233f7-509d-4897-b5f8-63f043e81f52	
-32.43545670	116.02068820	Jarrrah (Eucalyptus marginata)	560	14						0cd65744-aac1-460e-8d1a-60be9f9906b3	
-32.43546618	116.02068300	Jarrrah (Eucalyptus marginata)	570	18						f0057920-17ec-4916-e161-7d833940fd92	
-32.43556975	116.02069300	Jarrrah (Eucalyptus marginata)	670	22	2					502ed128-755a-449b-a5c7-559e26cab6d8	
-32.43557480	116.02066410	Jarrrah (Eucalyptus marginata)	730	18	2					3c21ede8-6ea1-4a58-bff5-d99fb3001026	
-32.43565605	116.02064740	Jarrrah (Eucalyptus marginata)	730	17	4	2			No	cf6ca1f-85ec-4948-9c55-c0921ab3367b	

Latitude	Longitude	Taxa	DBH (mm)	Approx height (m)	# of hollows	# of hollows > 120 mm	# of hollows with bees	Comments	Suitable for Black Cockatoo	Tree Photo Reference	Hollow Photo Reference
-32.43570699	116.02060920	Marrri (Corymbia calophylla)	760	15	3				No	ab135fc7-b800-4c66-b0a6-b3dae8c33b8d	116
-32.43573698	116.02043620	Jarraah (Eucalyptus marginata)	600	22						80c37bfb-ae04-400a-af28-2ab18cb18959	
-32.43575311	116.02040470	Jarraah (Eucalyptus marginata)	670	11						bfd8cdab-ebb8-4309-addd-267fc21d28d7	
-32.43470870	116.02075300	Marrri (Corymbia calophylla)	780	26	2				Yes	a224f2e6-111a-4bb3-98da-0f0e79d28bf	124, 125
-32.43446790	116.02036070	Jarraah (Eucalyptus marginata)	580	17						ee1b873c-5ffc-4854-b0b1-be2dd59716d1	
-32.43459230	116.02011220	Jarraah (Eucalyptus marginata)	550	17						12f88f68-cd12-4472-9d22-d19ee46287f4	
-32.43438550	116.01978850	Jarraah (Eucalyptus marginata)	540	16	1	1			No	000f06ad-d987-4a77-91c9-7f87e417d0b	431
-32.43446610	116.01959050	Jarraah (Eucalyptus marginata)	590	15						5333f572-5bc9-46ad-934e-2514db3c81ff	
-32.43450630	116.01954650	Jarraah (Eucalyptus marginata)	880	16						f4810be9-fba5-4533-8536-541abc457991	
-32.43460690	116.01962210	Stag	620	18	1	1			No	a8b1e204-6f89-45bc-beb4-8c7cb5cbb6e8	432
-32.43455750	116.01894920	Marrri (Corymbia calophylla)	750	24						83d7a218-0e42-407d-a69f-c20e17f87097	
-32.43480190	116.01828050	Stag	400	25	1	1			Yes	2989e9ee-b75a-408c-8857-64c067f15976	480, 481
-32.43486850	116.01818210	Wandoo (Eucalyptus wandoo)	600	28	1	1			No	8995c444-b6d0-4d48-8225-5df6d93996c7	482-484
-32.43485780	116.01809450	Wandoo (Eucalyptus wandoo)	580	12	1	1			No	542c0c4d-4965-4f60-9e30-53dcf727b30	485-488
-32.43510930	116.01792410	Powderbark Wandoo (Eucalyptus accedens)	450	24						5bdc99d-9f94-4e4e-8fd0-e38b181ffcc5	
-32.43547640	116.01797810	Stag	550	22						92cae67e-d6d5-428b-9d3f-a79d7f656410	
-32.43536850	116.01820930	Wandoo (Eucalyptus wandoo)	830	25	2	2				8d5966ab-1429-47e6-91ea-c91ac9e51371	
-32.43539080	116.01822030	Marrri (Corymbia calophylla)	500	22						24a1758f-2b61-4688-879c-627458d6c3ff	
-32.43542790	116.01833760	Powderbark Wandoo (Eucalyptus accedens)	690	20						66dd4d8c-474e-4fe5-9b2a-10de0be90dab	
-32.43569700	116.01828260	Marrri (Corymbia calophylla)	760	8						6a1d985c-883c-4818-a77f-da5f9f26df9e	
-32.43564250	116.01839840	Marrri (Corymbia calophylla)	500	12						518816e4-2b1d-45c0-b568-7f20f0e4c363	
-32.43557850	116.01860530	Stag	970	28	1	1			Yes	4e48dba-6d31-4694-84d2-3b390c1e1ca2	352, 353, 354, 355, 356, 357, 358
-32.43566622	116.01871090	Jarraah (Eucalyptus marginata)	500	22						5e540f53-32cf-4ed7-9cd2-4df19edbc3d5	
-32.43563440	116.01878570	Marrri (Corymbia calophylla)	680	20						272cb7fa-f3c5-4166-8b42-d606277ba2e	
-32.43569300	116.01873420	Wandoo (Eucalyptus wandoo)	500	20						d47764a4-cdec-466b-88a5-197df98c6c5c	
-32.43578590	116.01870100	Marrri (Corymbia calophylla)	750	20	1	1			Yes	4b24c99d-0e8c-4f59-b7be-dee18c05699e	359, 360, 361, 362
-32.43575340	116.01882440	Jarraah (Eucalyptus marginata)	520	20						587f5179-e6e2-44a9-bf88-c515761696d6	
-32.43569500	116.01902340	Jarraah (Eucalyptus marginata)	640	20						079a8d6f-4ac9-4d70-b8e5-b15852098d3f	
-32.43559640	116.01909800	Marrri (Corymbia calophylla)	740	20	1	1			No		150
-32.43554830	116.01910670	Stag	750	20	1	1			No		151, 152, 153
-32.43551202	116.01917660	Stag	600	20	1	1			No		154, 155
-32.43547948	116.01902270	Stag	950	20	1	1			Yes	39bd044f-c321-404a-bc22-3f9d257ad240	156, 157, 158, 159
-32.43580960	116.01927150	Jarraah (Eucalyptus marginata)	740	20						596b15ae-b7a5-4ea1-b92e-36bbf8e04da3	
-32.43580750	116.01983020	Jarraah (Eucalyptus marginata)	1280	20	3	3			No	61a8a92f-bd4d-4064-bf60-49c5c02b9792	
-32.43587960	116.02006100	Jarraah (Eucalyptus marginata)	700	20						e1841c8a-b7cf-4e9d-a95e-67e50164f121	186, 187, 188, 189, 190
-32.43591770	116.02008730	Jarraah (Eucalyptus marginata)	500	20						389da181-aa7f-4bb8-b750-2b5fca461a15	
-32.43589900	116.02014670	Jarraah (Eucalyptus marginata)	500	20						96815120-b7eb-45cb-ataad-1f6d5030d785	
-32.43590270	116.02032490	Jarraah (Eucalyptus marginata)	500	20						7825cda1-44af-4e2e-be61-251ad367d6c6	
-32.43587430	116.02033730	Jarraah (Eucalyptus marginata)	500	20						4aeb07c0-441c-4f48-b753-939042f5f101	
-32.43588280	116.02034860	Jarraah (Eucalyptus marginata)	500	20						d58b2599-f7f5-443c-9250-0a404ee77034	
-32.43583310	116.02059770	Jarraah (Eucalyptus marginata)	680	20						1bf7e4d7-8f2a-439b-5855-56b7dfa1a91	
-32.43586310	116.02072300	Jarraah (Eucalyptus marginata)	650	20						49c27534-0d14-4f18-a66a-4217f60aac55	
-32.43583310	116.02074010	Jarraah (Eucalyptus marginata)	680	20						0e48969e-06a0-449e-a0c4-86a2c4d2b6f6	
-32.43580490	116.02078050	Jarraah (Eucalyptus marginata)	620	20						88f447f3-1f72-4ce8-b384-1cba6579528b	
-32.43590000	116.02070450	Jarraah (Eucalyptus marginata)	670	20						03a852b3-d4c5-4103-91ff-6d725c1825de	
-32.43595330	116.02064070	Jarraah (Eucalyptus marginata)	1280	20	2	2				00f0dab2-f58b-4956-afd9-034f351ed038	
-32.43618610	116.02075270	Jarraah (Eucalyptus marginata)	510	20						e1f01c38-af21-460e-ac25-4a5e02e9d1fc	
-32.43632811	116.02048080	Jarraah (Eucalyptus marginata)	570	20	1	1			No	9dcb3544-40cb-45fc-9a75-90d101a5e4d1	242
-32.43640980	116.02062170	Jarraah (Eucalyptus marginata)	700	20						6315d9cc-5d67-48b4-b0cf-c36c8720c9cb	
-32.43630890	116.02013120	Jarraah (Eucalyptus marginata)	570	20	1	1			Yes	f3c313dc-b902-4a6e-93de-f1e0f18e6eae	
-32.43633310	116.02002670	Jarraah (Eucalyptus marginata)	590	20	1	1				e1391e7b-8f1b-454b-b0bc-c5265158e5a7	
-32.43641780	116.01999570	Jarraah (Eucalyptus marginata)	490	20						f53bb8e9-9699-4e59-8c4a-9a2a6425a4f1	
-32.43628290	116.01992760	Jarraah (Eucalyptus marginata)	890	20	1	1				f61ae421d92-437b-8e1f-f84f873364d0	
-32.43635300	116.01992810	Stag	600	20						7a32252b-ac9a-4324-b07f-58020485c872	
-32.43631650	116.01984730	Jarraah (Eucalyptus marginata)	730	20						7c7f7efc-234e-4ef8-a87c-66416591c4a5	
-32.43640870	116.01984360	Jarraah (Eucalyptus marginata)	510	20						829c3e3b-d416-4713-b13f-ea8cdeb18f6e	
-32.43632930	116.01974700	Jarraah (Eucalyptus marginata)	760	20	1	1				72658104-8786-4c3a-9d96-92de8ace2876	
-32.43626850	116.01970720	Jarraah (Eucalyptus marginata)	540	20	2	2				650d8b4b-5a53-41ca-bc7b-95679529161c	
-32.43628440	116.01961990	Jarraah (Eucalyptus marginata)	730	20						1ad77bba-9d48-4d45-b133-7844cd4cca56	
-32.43643730	116.01950840	Jarraah (Eucalyptus marginata)	950	20	5	4			No	7ae54eb1-1a4e-4496-a1cd-f09bae539653	
-32.43648740	116.01956660	Jarraah (Eucalyptus marginata)	1020	20	3	3			No	df6f1cd8-d4f1-4ee7-99f4-15c28f4cd6d1	200, 201, 202
-32.43642950	116.01936040	Jarraah (Eucalyptus marginata)	570	20	2	2			No	cf9a1800-e357-4426-bc5c-3d117c23540c	203, 204, 205
-32.43633930	116.01935990	Jarraah (Eucalyptus marginata)	540	20	1	1				79d14825-6c09-4806-ad25-91e8f58e708	
-32.43637310	116.01926730	Jarraah (Eucalyptus marginata)	510	20						5cbee848-abd5-495a-bc90-64962c3834e3	
-32.43639950	116.01926980	Jarraah (Eucalyptus marginata)	760	20						7fabd1eb-c68b-49a1-84df-dc1e58d81868	
-32.43642640	116.01925470	Jarraah (Eucalyptus marginata)	540	20						a47cc41e-7af4-4d4d-4788-3631f394d750	
-32.43642580	116.01924210	Jarraah (Eucalyptus marginata)	640	20						ebbfdd2c-a409-437c-9a88-19c12293ee4a	
-32.43636930	116.01912640	Jarraah (Eucalyptus marginata)	640	20						3cb0e2ed-9451-47d1-8f04-3e82e1a8dd63	
-32.43626960	116.01908730	Jarraah (Eucalyptus marginata)	700	20	3	3			Yes	87b5059c-c3dc-4238-80e4-d7103e20ecd2	
-32.43629060	116.01894510	Jarraah (Eucalyptus marginata)	510	20						82d292bd-0b53-4b38-ab89-773654de7a66	209, 210, 211, 212, 213, 214, 215, 216
-32.43640500	116.01890480	Jarraah (Eucalyptus marginata)	700	20	1	1				269706cb-507f-439d-b43c-9a159052a2b2	
-32.43638150	116.01877040	Jarraah (Eucalyptus marginata)	730	20	2	2			Yes	7a719b13-b685-48bc-9bc2-7836a5e45130	
-32.43635510	116.01865680	Jarraah (Eucalyptus marginata)	540	20						bb918d47-6309-4b45-9c9b-bc6de4fa2984	217, 218, 219
-32.43621300	116.01834750	Wandoo (Eucalyptus wandoo)	600	20						f2e8ef17-5480-47a0-a110-6b183c023c2f	
-32.43628679	116.01838830	Wandoo (Eucalyptus wandoo)	640	20						f50c801e-90bd-4f06-89ef-8d739b5b4d68	
-32.43632390	116.01838720	Wandoo (Eucalyptus wandoo)	450	20						349fb111-d295-424b-a282-5e330b579d8f	
-32.43631690	116.01820970	Wandoo (Eucalyptus wandoo)	380	20						a44e5414-9795-43f1-9a74-0f6b9e22400	
-32.43617049	116.01794280	Stag	1020	20	2	2			Yes	8a5920a-bd8f-418e-92af-271ab74c5e64	
-32.43629415	116.01776170	Marrri (Corymbia calophylla)	570	20						2c5999aa-525c-422b-b49e-25de4fca50a8	364, 365, 366
-32.43645063	116.01747470	Stag	540	20						8f67593b-fb29-4dda-bed9-bc287f16dbbf	
-32.43645657	116.01791730	Wandoo (Eucalyptus wandoo)	380	20						ee5f607c-0662-4024-b3dd-2ebbd0185a06	
-32.43653320	116.01854370	Wandoo (Eucalyptus wandoo)	600	20	1	1			Yes	3da8543a-c00b-4cf3-8c5c-2c0ce75541f3	220, 221
-32.43657650	116.01862790	Stag	800	20						b62dafa5-74d8-4455-a485-63c915d2f263	
-32.43655160	116.01867450	Stag	700	20						69a69d31-86de-41ab-b3ef-7586234e2087	

Latitude	Longitude	Taxa	DBH (mm)	Approx height (m)	# of hollows	# of hollows > 120 mm	# of hollows with bees	Comments	Suitable for Black Cockatoo	Tree Photo Reference	Hollow Photo Reference
-32.43649050	116.01923040	Jarrah (Eucalyptus marginata)	540							49aa0e27-0fd2-4f0f-a900-7fe794a7c8f0	
-32.43654911	116.01967310	Stag	950		5	4			Yes	710b7450-5fe0-4b1d-aecc-4c084b3ccac	206, 207, 208
-32.43661840	116.01974820	Marrri (Corymbia calophylla)	890							2cb7668e-4c92-45fe-b37e-e1ea2c4018fa	
-32.43648261	116.01995810	Jarrah (Eucalyptus marginata)	760							69fcb794-9c7d-4d4c-8ace-615ee0c89da5	
-32.43644540	116.01997850	Jarrah (Eucalyptus marginata)	700							2deeebb1-1cb9-4fe1-b960-bd47ed7289ec	
-32.43663660	116.02049540	Marrri (Corymbia calophylla)	510							8341c8b8-0178-444d-a5d0-969bb4d65f88	
-32.43660004	116.02063670	Jarrah (Eucalyptus marginata)	1110		6	4	1		Yes	c5564921-3ed2-43c9-ba3a-759ffcb18505	128, 129, 130, 131, 132, 133, 134, 135
-32.43653156	116.02078260	Stag	1020		2	2			No	fb55c08-47fa-401c-bec5-0f38a74fc31a	127
-32.43685020	116.02060910	Jarrah (Eucalyptus marginata)	570		2	2			No	d040b521-1835-49cc-99a2-07c94d3b2d3	142, 143, 144
-32.43682755	116.02049690	Jarrah (Eucalyptus marginata)	890		6	4			Yes	1a30a05e-fba4-42b7-b9a2-2981f55f665c	139, 140, 141
-32.44091322	116.02139480	Stag	950		4	3			Yes	a51d8b3e-1f55-4270-9f83-df98ee5f7cce	243, 244, 245, 246, 247
-32.44109530	116.02126240	Marrri (Corymbia calophylla)	570							f614e008-519d-450b-ba31-4a412f0fe259	
-32.44110520	116.02120120	Stag	640							23e28262-2f8f-4be2-8392-e8576ba2b78	
-32.44111497	116.02112760	Marrri (Corymbia calophylla)	510							1e837281-8b09-4c2a-873f-62ed4426aa88	
-32.44100920	116.02120220	Marrri (Corymbia calophylla)	600							f2850180-03cf-4590-82af-5a61787012df	
-32.44096896	116.02124960	Marrri (Corymbia calophylla)	570							62b2be64-5e91-4491-bd98-317f0b418-36	
-32.44097420	116.02114720	Marrri (Corymbia calophylla)	670							efe1b81f-1da5-4e8c-be42-af957e56ecdd	
-32.44102290	116.02111960	Marrri (Corymbia calophylla)	540							fb2a9e4-19e9-43c0-ad5c-88b29e3811df	
-32.44100971	116.02108500	Stag	700		2	2			No	5da2eba9-52de-4f8e-ad43-8eeea1ac1573	248
-32.44093970	116.02093150	Jarrah (Eucalyptus marginata)	1150							8fa2f4b3-101d-4732-9f7a-299084977001	
-32.44098620	116.02094260	Marrri (Corymbia calophylla)	700							1ed0f998-7aa2-40d7-bba3-1422cb839779	
-32.44092260	116.02085300	Marrri (Corymbia calophylla)	600							a5a861db-91fd-439f-83bc-b588aa4c28ad	
-32.44089650	116.02094900	Marrri (Corymbia calophylla)	700							f47fb3c-8df4-4c20-8068-9d068ae643b3	
-32.44083994	116.02098880	Marrri (Corymbia calophylla)	700							4b973caf-55da-40d4-8970-2d5ce215f942	
-32.44078700	116.02094370	Marrri (Corymbia calophylla)	540							fd0c468-5f6e-4b62-88dd-b152e1a98a88	
-32.44074571	116.02079030	Marrri (Corymbia calophylla)	570							5af34a3a-9d8e-4e2a-bc41-3c3a37580a06	
-32.44065262	116.02071150	Jarrah (Eucalyptus marginata)	640							e8b604b3-d36b-49ea-b2c4-da682b9d55c6	
-32.44063910	116.02075010	Marrri (Corymbia calophylla)	530							14b6b948-6dc2-4f3a-b5c0-4ca78e57c5e	
-32.44062347	116.02067960	Marrri (Corymbia calophylla)	570							c4bd3b6b-3369-496c-b196-45629c6b3d32	
-32.44054764	116.02064480	Marrri (Corymbia calophylla)	600							71ed4b9d-0706-48fc-bf94-927b60fd8740	
-32.44054350	116.02080710	Marrri (Corymbia calophylla)	730							6e8e5f95-283e-47a6-bbba-51bfed08603d	
-32.44060150	116.02085170	Marrri (Corymbia calophylla)	540							33245e0a-1d0f-4bda-b037-00e8039dab48	
-32.44059550	116.02109690	Marrri (Corymbia calophylla)	600							as25e3c6-fbc0-41b8-85af-f41109f5915f	
-32.44063320	116.02106180	Marrri (Corymbia calophylla)	490								
-32.44079381	116.02123920	Marrri (Corymbia calophylla)	510							b90a9ed8-260d-40c6-ade7-9a4b6d3662e3	
-32.44000776	116.02073860	Jarrah (Eucalyptus marginata)	920		1	1				b5b4ed7c-7c53-4099-a831-be151537ed23	
-32.44009490	116.02075520	Jarrah (Eucalyptus marginata)	890		1	1			No	0d5f7176-87a9-40fb-9684-9c9188fc979f	161
-32.43993800	116.02044570	Stag	890		3	3			No	328abc9c-3b7d-4312-9d19-bd7b81c708e6	249, 250, 251, 252
-32.43984490	116.02049940	Marrri (Corymbia calophylla)	540							76206559-44c2-4e93-abcf-867b5c723ef	
-32.43976753	116.02066550	Marrri (Corymbia calophylla)	540							eacefb2-e176-4f51-871b-6d0af1d2e7c9	
-32.43953130	116.02075580	Jarrah (Eucalyptus marginata)	800							96a5b557-9158-4bcf-bad6-6305a4b99ab8	
-32.43922360	116.02077240	Jarrah (Eucalyptus marginata)	890							900907be-8f53-49d6-a085-5297cafe6296	
-32.43917671	116.02067490	Stag	640		2	2			No	f7816ba8-b15a-4271-a3a8-02bc7e2195d3	163, 164, 165
-32.43922130	116.02060420	Stag	1110							6417eec3-f3dc-48f2-9716-a82fa59f6a54	
-32.43933350	116.02058950	Jarrah (Eucalyptus marginata)	640							95866422-ab77-46b6-834e-0aa0f3b2c33e	
-32.43942100	116.02057950	Jarrah (Eucalyptus marginata)	700		1	1			No	2369f5d4-b0f2-49a5-99d3-92c54f107c9a	162
-32.43943520	116.02050490	Jarrah (Eucalyptus marginata)	730							b2d24222-e41d-4205-b85a-20ebf6eb991c	
-32.43868011	116.01993060	Stag	570		2	2			Yes	01c5d343-d127-4329-b39a-8cbdd369353	267, 268
-32.43899222	116.02046600	Stag	570							1f2d490e-5913-4964-9f09-ee11754f85d9	
-32.43900524	116.02055460	Stag	600							1fba6b49-21f7-480a-ac49-6e6a61f88b8b	
-32.43901599	116.02082850	Marrri (Corymbia calophylla)	570							b480e421-9ef2-478f-9d1b-5ac36606a958	
-32.43885612	116.02082850	Stag	950		5	5			Yes	19d4c1c6-4b06-4f51-9c83-4b47f559d56	166, 167
-32.43789178	116.02073660	Stag	600		1	1			Yes	e31d986b-4a62-4d1c-b99a-e965b5bc7f5d	386
-32.43771663	116.02075300	Jarrah (Eucalyptus marginata)	540							030f5cbb-50d7-4181-9e61-78fc4af850b9	
-32.43770219	116.02040810	Marrri (Corymbia calophylla)	570							706e0f85-5772-48cf-b8b5-761cee766034	
-32.43785217	116.02046600	Marrri (Corymbia calophylla)	540							acc4f92-f3e5-4ada-8db6-64f16ce46683	
-32.43776480	116.02031100	Stag	700							faf642f7-2b09-44d3-acd4-b18da141308f	
-32.43760490	116.02007710	Marrri (Corymbia calophylla)	540							92b2060c5-aead-49d8-9ac0-2f916648733e	
-32.43748205	116.02002180	Stag	640		2	2			Yes	259b6bc5-099d-47e9-a8ca-9e9a5df188d7	280, 281
-32.43773550	116.01997120	Wandoo (Eucalyptus wandoo)	320							5fdd095b-c11b-47f0-aab0-088ach2a09ad	
-32.43773077	116.01987300	Wandoo (Eucalyptus wandoo)	320							a0f3f5b7-d3c8-40aa-88a1-f9c974625c49	
-32.43759890	116.01987460	Marrri (Corymbia calophylla)	540		1	1	1		No	d42363cc-92cc-4fd3-94fc-284317187fe7	287
-32.43746507	116.01987130	Jarrah (Eucalyptus marginata)	730		3	3				680673cf-96a7-4ea9-a3a3-a8084a2f1d95	
-32.43746790	116.01961580	Stag	730		2	2			Yes	01244222-396f-4268-a895-ff3e984ca6e	377, 378, 379
-32.43743220	116.01958160	Wandoo (Eucalyptus wandoo)	450							e49f2db7-c8bb-40bc-a8cd-97e2908984d2	
-32.43743860	116.01946340	Wandoo (Eucalyptus wandoo)	890		2	2			Yes	d8851cf4-0831-43ab-8d12-852bb17ab118	376
-32.43741533	116.01952160	Wandoo (Eucalyptus wandoo)	570							2376af9e-a8a5-49fa-952f-749d282a3851	
-32.43781538	116.01929160	Stag	1110		9	8			Yes	8976f7f6-8c77-4ca2-be85-c705613a022	273, 274, 275, 276, 277, 278
-32.43751210	116.01910400	Wandoo (Eucalyptus wandoo)	350							003000b2-80b5-4048-9c7a-fcac6892341c	
-32.43747752	116.01899550	Stag	600		2					433792cd-9f57-4cda-805a-f0ac979e484d	
-32.43725709	116.01915800	Stag	540		4	4			Yes	f81a29f9-8ea2-4a35-9eaa-71a6f7f78e87	226, 227, 228, 229, 230, 231, 232, 233
-32.43712630	116.01905810	Jarrah (Eucalyptus marginata)	600							e878d6aa-f617-432f-9fc8-c9a75cd9f14c	
-32.43717305	116.01890270	Stag	540							a7b9898a-c076-40e5-ac3a-051a02213493	
-32.43722596	116.01905450	Stag	570							c8b3f8f9-0f35-4c30-bd8e-568e261254e4	
-32.43712891	116.01928860	Jarrah (Eucalyptus marginata)	700							62786c12-e467-4e11-9d62-88d4fed2948	
-32.43712080	116.01928580	Marrri (Corymbia calophylla)	540							a6088015-f6ba-47cd-bf7c-75aed04d0f93	
-32.43716230	116.01938700	Jarrah (Eucalyptus marginata)	570							66545efb-53eb-4432-9913-6edc7c21688a	
-32.43602920	116.02072280	Jarrah (Eucalyptus marginata)	1250		4	2			Yes	0d6d1d90-fc29-4839-9492-c41753af6116	109, 110, 111, 112, 113, 114
-32.43609870	116.02050890	Jarrah (Eucalyptus marginata)	810		1	1			No	68f0f2ed-d32a-4091-9138-6fb59bf2f120	242
-32.43614530	116.02050070	Jarrah (Eucalyptus marginata)	640							625266d0-dba0-44d4-803d-8117727f124	
-32.43613910	116.02029280	Jarrah (Eucalyptus marginata)	1710								
-32.43609690	116.02028120	Jarrah (Eucalyptus marginata)	670		1						
-32.43609510	116.02026920	Jarrah (Eucalyptus marginata)	680								
-32.43611900	116.02026160	Jarrah (Eucalyptus marginata)	1130		2	1			No	486a1e92-c08f-455d-ade3-4f773122d663	367, 368

Latitude	Longitude	Taxa	DBH (mm)	Approx height (m)	# of hollows	# of hollows > 120 mm	# of hollows with bees	Comments	Suitable for Black Cockatoo	Tree Photo Reference	Hollow Photo Reference
-32.43804060	116.01928860	Wandoo (Eucalyptus wandoo)	560								
-32.43802530	116.01933580	Wandoo (Eucalyptus wandoo)	550								
-32.43794380	116.01929190	Wandoo (Eucalyptus wandoo)	460								
-32.43795320	116.01930380	Wandoo (Eucalyptus wandoo)	740								
-32.43791070	116.01935380	Wandoo (Eucalyptus wandoo)	600								
-32.43780240	116.01929750	Marri (Corymbia calophylla)	1550		10	4			No		273, 274, 275, 276, 277, 278
-32.43773730	116.01945550	Wandoo (Eucalyptus wandoo)	590								
-32.43789010	116.01949700	Marri (Corymbia calophylla)	540								
-32.43792340	116.01954460	Wandoo (Eucalyptus wandoo)	360								
-32.43793600	116.01960410	Wandoo (Eucalyptus wandoo)	600		1	1			No		272
-32.43782530	116.01969170	Wandoo (Eucalyptus wandoo)	790		3	1			Yes		279, 280, 281
-32.43803870	116.01974860	Wandoo (Eucalyptus wandoo)	490								
-32.43803340	116.01983810	Wandoo (Eucalyptus wandoo)	380								
-32.43804830	116.01985720	Wandoo (Eucalyptus wandoo)	310		1						
-32.43806580	116.01990250	Wandoo (Eucalyptus wandoo)	800		1						
-32.43813640	116.01988260	Wandoo (Eucalyptus wandoo)	480								
-32.43807760	116.02000500	Wandoo (Eucalyptus wandoo)	730								
-32.43805090	116.02004690	Wandoo (Eucalyptus wandoo)	630								
-32.43789857	116.02001140	Wandoo (Eucalyptus wandoo)	630								
-32.43799880	116.02014270	Wandoo (Eucalyptus wandoo)	460								
-32.43799820	116.02038570	Marri (Corymbia calophylla)	650								
-32.43806070	116.02054020	Marri (Corymbia calophylla)	510								
-32.43803390	116.02061560	Jarrah (Eucalyptus marginata)	720								
-32.43804600	116.02073550	Stag	980								
-32.43800070	116.02070200	Marri (Corymbia calophylla)	560								
-32.43727420	116.02079380	Jarrah (Eucalyptus marginata)	970								
-32.43724280	116.02074480	Jarrah (Eucalyptus marginata)	680								
-32.43724830	116.02069230	Jarrah (Eucalyptus marginata)	630								
-32.43730980	116.02064740	Jarrah (Eucalyptus marginata)	630								
-32.43729290	116.02062360	Jarrah (Eucalyptus marginata)	660		1						
-32.43732230	116.02054180	Jarrah (Eucalyptus marginata)	980		3	3			Yes		171, 172, 173
-32.43722340	116.02052420	Stag	1080		4	4			Yes		168, 169, 170
-32.43731770	116.02008920	Marri (Corymbia calophylla)	980								
-32.43725880	116.02002150	Marri (Corymbia calophylla)	780								
-32.43720590	116.02004570	Marri (Corymbia calophylla)	670								
-32.43744770	116.01997970	Jarrah (Eucalyptus marginata)	950		2						
-32.43708370	116.01940330	Jarrah (Eucalyptus marginata)	800		1	1			No		234, 235, 236
-32.43712270	116.01940280	Jarrah (Eucalyptus marginata)	610								
-32.43716610	116.01968790	Jarrah (Eucalyptus marginata)	880								
-32.43500833	116.01981430	Wandoo (Eucalyptus wandoo)	670								
-32.43416280	116.01564380	Wandoo (Eucalyptus wandoo)	590		2					8bfb1dbc-4030-4cd7-b2f5-c2d1085862a3	
-32.43439040	116.01562750	Wandoo (Eucalyptus wandoo)	410								
-32.43433990	116.01571350	Wandoo (Eucalyptus wandoo)	620		1						
-32.43447220	116.01575750	Wandoo (Eucalyptus wandoo)	900								
-32.43441520	116.01583080	Marri (Corymbia calophylla)	630								
-32.43454990	116.01576360	Marri (Corymbia calophylla)	610								
-32.43462550	116.01569360	Wandoo (Eucalyptus wandoo)	830								
-32.43466920	116.01562150	Wandoo (Eucalyptus wandoo)	830								
-32.43482760	116.01567530	Wandoo (Eucalyptus wandoo)	710								
-32.43514218	116.01559180	Wandoo (Eucalyptus wandoo)	500								
-32.43553353	116.01657450	Marri (Corymbia calophylla)	790								
-32.43555135	116.01642670	Marri (Corymbia calophylla)	700								
-32.43495370	116.01660190	Wandoo (Eucalyptus wandoo)	480								
-32.43494220	116.01675790	Jarrah (Eucalyptus marginata)	630								
-32.43491300	116.01681510	Jarrah (Eucalyptus marginata)	530								
-32.43492490	116.01683040	Wandoo (Eucalyptus wandoo)	480								
-32.43490950	116.01681750	Wandoo (Eucalyptus wandoo)	540		1	1			Yes		519, 520, 521
-32.43473260	116.01680380	Marri (Corymbia calophylla)	560								
-32.43465530	116.01675630	Marri (Corymbia calophylla)	500								
-32.43446450	116.01660950	Wandoo (Eucalyptus wandoo)	450								
-32.43443080	116.01655560	Marri (Corymbia calophylla)	620								
-32.43440720	116.01657860	Wandoo (Eucalyptus wandoo)	610								
-32.43421450	116.01673630	Wandoo (Eucalyptus wandoo)	490								
-32.43423120	116.01683050	Jarrah (Eucalyptus marginata)	750		1	1					
-32.43400130	116.01683540	Jarrah (Eucalyptus marginata)	690		2	1			Yes		514, 515, 516
-32.43400520	116.01676940	Stag	700		1	1			Yes		512, 513
-32.43397310	116.01673870	Wandoo (Eucalyptus wandoo)	400								
-32.43392950	116.01663220	Wandoo (Eucalyptus wandoo)	470								
-32.43393860	116.01659610	Wandoo (Eucalyptus wandoo)	730								
-32.43411696	116.01657620	Marri (Corymbia calophylla)	780								
-32.43409100	116.01752760	Wandoo (Eucalyptus wandoo)	470								
-32.43401028	116.01753240	Stag	800		1	1			No		489, 490
-32.43415660	116.01755800	Wandoo (Eucalyptus wandoo)	440								
-32.43424310	116.01743070	Wandoo (Eucalyptus wandoo)	730		1	1			Yes		494, 495
-32.43436590	116.01734030	Marri (Corymbia calophylla)	660								
-32.43442730	116.01741350	Wandoo (Eucalyptus wandoo)	580		1	1			No		496, 497, 498, 499
-32.43458755	116.01747270	Marri (Corymbia calophylla)	600								
-32.43462943	116.01740630	Stag	900		1	1			No		500, 501
-32.43392878	116.01792600	Stag	1000		3	1			No		433, 434, 435, 436, 437, 438
-32.43393501	116.01798770	Wandoo (Eucalyptus wandoo)	680								
-32.43405950	116.01852230	Stag	1000		2	1			No		443, 444, 445, 446
-32.43413500	116.01855190	Jarrah (Eucalyptus marginata)	850		3	1			No		447, 448, 449, 450
-32.43420460	116.01857340	Stag	800		2	1					
-32.43431190	116.01863960	Marri (Corymbia calophylla)	780		1	1			Yes		451, 452, 453

Latitude	Longitude	Taxa	DBH (mm)	Approx height (m)	# of hollows	# of hollows > 120 mm	# of hollows with bees	Comments	Suitable for Black Cockatoo	Tree Photo Reference	Hollow Photo Reference
-32.43431530	116.01882460	Stag	780		1	1			Yes		454, 455
-32.43421380	116.01883570	Marrri (Corymbia calophylla)	920		3	1			Yes		456, 457, 458, 459, 460
-32.43420949	116.01891940	Marrri (Corymbia calophylla)	690								
-32.43418850	116.01880840	Jarrah (Eucalyptus marginata)	850		4	2			No		461, 462, 463, 464, 465, 466
-32.43415820	116.01874520	Jarrah (Eucalyptus marginata)	990		4	2			No		467, 468, 469, 470, 471, 472
-32.43399880	116.01882740	Jarrah (Eucalyptus marginata)	920		3	1			No		402, 403, 404, 405, 406, 407, 408, 409, 410
-32.43399440	116.01959240	Jarrah (Eucalyptus marginata)	1350		4	2			No		413, 414, 415, 416, 417, 418, 419, 420
-32.43415150	116.01950290	Jarrah (Eucalyptus marginata)	900								
-32.43417460	116.01950280	Jarrah (Eucalyptus marginata)	800								
-32.43423220	116.01958100	Jarrah (Eucalyptus marginata)	510								
-32.43431690	116.01952760	Jarrah (Eucalyptus marginata)	590								
-32.43431690	116.01965750	Jarrah (Eucalyptus marginata)	900		4	1			No		425, 426, 427, 428, 429, 430
-32.43417110	116.01968100	Jarrah (Eucalyptus marginata)	750								
-32.43408390	116.01972600	Jarrah (Eucalyptus marginata)	700								
-32.43404740	116.01984270	Marrri (Corymbia calophylla)	890		2	1			No		411, 412
-32.43416931	116.01987830	Jarrah (Eucalyptus marginata)	780		1	1			No		396, 397, 398, 399, 400, 401
-32.43397070	116.01989740	Marrri (Corymbia calophylla)	860								
-32.43403600	116.02013510	Marrri (Corymbia calophylla)	890								
-32.43403990	116.02016300	Marrri (Corymbia calophylla)	830								
-32.43402120	116.02026920	Marrri (Corymbia calophylla)	900		1	1			Yes		391, 392, 393, 394, 395
-32.43412319	116.02058470	Jarrah (Eucalyptus marginata)	760								
-32.43412658	116.02054080	Jarrah (Eucalyptus marginata)	800								
-32.43395906	116.02058940	Jarrah (Eucalyptus marginata)	690								
-32.43392171	116.02061860	Jarrah (Eucalyptus marginata)	700		1	1			Yes		387, 388, 389, 390
-32.43392454	116.02062160	Jarrah (Eucalyptus marginata)	510								
-32.43406800	116.01930020	Jarrah (Eucalyptus marginata)	670		2	1			No		421, 422
-32.43410440	116.01932040	Marrri (Corymbia calophylla)	670								
-32.43422160	116.01939210	Jarrah (Eucalyptus marginata)	580								
-32.43433940	116.01940530	Jarrah (Eucalyptus marginata)	1200		3	1			No		423, 424
-32.43439994	116.01937410	Jarrah (Eucalyptus marginata)	670								
-32.43425280	116.01919380	Jarrah (Eucalyptus marginata)	540								
-32.43429439	116.01909510	Marrri (Corymbia calophylla)	530								
-32.43421100	116.01914660	Jarrah (Eucalyptus marginata)	550								
-32.43410890	116.01915060	Jarrah (Eucalyptus marginata)	680								
-32.43408430	116.01914620	Jarrah (Eucalyptus marginata)	600								
-32.43399410	116.01903760	Marrri (Corymbia calophylla)	530								
-32.43409290	116.01900500	Marrri (Corymbia calophylla)	510								
-32.43422421	116.01900060	Jarrah (Eucalyptus marginata)	680								
-32.43397140	116.01839050	Stag	600								
-32.43424034	116.01826760	Marrri (Corymbia calophylla)	800		1	1			No		474
-32.43413600	116.01828160	Marrri (Corymbia calophylla)	500								
-32.43833066	116.02037850	Jarrah (Eucalyptus marginata)	560								
-32.43822420	116.02033250	Marrri (Corymbia calophylla)	520								
-32.43831700	116.01991960	Wandoo (Eucalyptus wandoo)	430		1	1					
-32.43812190	116.01954450	Wandoo (Eucalyptus wandoo)	310								
-32.43810420	116.01949830	Wandoo (Eucalyptus wandoo)	660		1						
-32.43836740	116.01552010	Jarrah (Eucalyptus marginata)	1120		1	1			No		545, 546, 547, 548
-32.43818280	116.01553150	Jarrah (Eucalyptus marginata)	800								
-32.43774490	116.01551380	Wandoo (Eucalyptus wandoo)	490		2	2	2		Yes		549, 550, 551
-32.43688640	116.01571980	Wandoo (Eucalyptus wandoo)	540								
-32.43668760	116.01560290	Wandoo (Eucalyptus wandoo)	390								
-32.43773730	116.01945550	Wandoo (Eucalyptus wandoo)	590		1	1				e776b2af-cdb6-4d82-9b67-7fe26f494fa1	
-32.43402390	116.01581940	Powderbark Wandoo (Eucalyptus accedens)	450		1		1			1ef4aecd-2419-4492-abd4-45d6cc2a5f80	
-32.43412290	116.01584730	Powderbark Wandoo (Eucalyptus accedens)	570							a25eb9c2-bf87-47cb-92ed-f3f19d32fbd1	
-32.43414611	116.01588450	Powderbark Wandoo (Eucalyptus accedens)	330							4f2b963a-b16f-4703-943c-c6a8a00dba7f	
-32.43412150	116.01600370	Powderbark Wandoo (Eucalyptus accedens)	1220		2	1			No	dfdb05ce0-c5ee-4f95-976c-9838e20c15a4	527, 528, 529
-32.43415020	116.01608620	Powderbark Wandoo (Eucalyptus accedens)	540							0fa0c6ba-4e50-45e9-acd1-c78222a76639	
-32.43411540	116.01620960	Powderbark Wandoo (Eucalyptus accedens)	480		1	1			Yes	866b936b-672b-463d-94ed-2a94c474d4eb	522, 523, 524, 525, 526
-32.43407530	116.01620940	Marrri (Corymbia calophylla)	510							220a5948-2873-4c83-b258-51b46ce336f	
-32.43400730	116.01599390	Powderbark Wandoo (Eucalyptus accedens)	320							f947d761-3370-4373-90be-cdc59b35ee22	
-32.43436739	116.01575580	Powderbark Wandoo (Eucalyptus accedens)	320							1826d92a-f927-4d33-8c50-58003f7aa1	
-32.43433315	116.01594050	Powderbark Wandoo (Eucalyptus accedens)	410							6855a06b-0d54-4c28-9cc3-2e3322f539fe	
-32.43432806	116.01594180	Powderbark Wandoo (Eucalyptus accedens)	450							99d40fbb-f96-4c21-9d00-5941245d5f73	
-32.43430344	116.01607930	Marrri (Corymbia calophylla)	490		1	1				ad2e229c-0d14-41e0-a5a5-71dafdb52609	
-32.43431730	116.01609590	Powderbark Wandoo (Eucalyptus accedens)	540		1					8636e1f3-9abf-4681-9f57-2316ea081380	
-32.43416350	116.01622680	Marrri (Corymbia calophylla)	510		1					c2ed130d-acfe-4944-9ca4-9a4ac4a8226	
-32.43423990	116.01628910	Marrri (Corymbia calophylla)	510							17711646-fc97-46b3-a15c-787b7bba6827	
-32.43423400	116.01632270	Marrri (Corymbia calophylla)	730							3585bd12-737c-4f0b-9334-dde8b5c285fe	
-32.43420950	116.01642570	Powderbark Wandoo (Eucalyptus accedens)	450							b4e6b956-74fc-4232-98fd-4b49cfae80af	
-32.43402386	116.01644370	Marrri (Corymbia calophylla)	600							5752e5f3-16fa-4532-9963-5f1f786cf99e	
-32.43441300	116.01585730	Marrri (Corymbia calophylla)	490							44ebd1337-4c45-40ef-81ef-d1fc30e81735	
-32.43446060	116.01573360	Powderbark Wandoo (Eucalyptus accedens)	570		1	1			No	a906e995-a822-4b25-8aee-df6e02b0085	533
-32.43458330	116.01577370	Marrri (Corymbia calophylla)	540							df92ec13-74bd-44da-88ee-6fd9d32bce53	
-32.43471470	116.01585220	Stag	600							a5dc7807-5d9b-4cb4-99eb-20ee1ec5ea90	
-32.43487380	116.01606150	Marrri (Corymbia calophylla)	1020		1					56f63b11-b180-489e-99aa-542d155e7c85	
-32.43488950	116.01618950	Marrri (Corymbia calophylla)	510							576b0827-f96c-4137-8006-bd93ea2d089b	
-32.43485120	116.01626090	Marrri (Corymbia calophylla)	700		1	1			No	95e976ee-5634-4bd8-a5c3-d8d07555a9c2	536, 537, 538, 539, 540
-32.43454600	116.01627420	Powderbark Wandoo (Eucalyptus accedens)	640		1	1			Yes	167b1702-fe99-451e-841e-92ac0474bccd	541, 542, 543
-32.43453980	116.01638880	Powderbark Wandoo (Eucalyptus accedens)	570							26be3fac-fa67-459e-a034-70892572a7de	
-32.43445900	116.01625150	Powderbark Wandoo (Eucalyptus accedens)	370							9fb62de2-cfae-4f9b-93f7-8eabc2396ab4	
-32.43440440	116.01605310	Stag	600							b46af9f2-0552-41c3-9f28-1494158e9d31	
-32.43441560	116.01602300	Powderbark Wandoo (Eucalyptus accedens)	570		2	1			No	6afb139e-9629-43f2-95f5-ca1cfff640458	530
-32.43441230	116.01602240	Powderbark Wandoo (Eucalyptus accedens)	0								
-32.43453670	116.01596130	Marrri (Corymbia calophylla)	530		1					f44166bb-4035-4261-8a37-ad8815b240bd	

Latitude	Longitude	Taxa	DBH (mm)	Approx height (m)	# of hollows	# of hollows > 120 mm	# of hollows with bees	Comments	Suitable for Black Cockatoo	Tree Photo Reference	Hollow Photo Reference
-32.43441170	116.01636790	Powderbark Wandoo (Eucalyptus accedens)	350							5377804f-168e-406f-8113-4826e1c5ea22	
-32.43393070	116.01686730	Powderbark Wandoo (Eucalyptus accedens)	320							f3b05856-c69f-4c4b-bbb1-c5d6ab5ea4d0	
-32.43398730	116.01682160	Jarraah (Eucalyptus marginata)	490							fe2a6081-cc7f-4a8a-80dc-d3832e44d58c	
-32.43417170	116.01694930	Jarraah (Eucalyptus marginata)	570							e6d99542-1512-4d95-934c-dc7ee9c390fe	
-32.43420030	116.01694600	Powderbark Wandoo (Eucalyptus accedens)	490							f11863c8-3b74-4282-b02a-bf730b7d74a79	
-32.43423100	116.01681460	Jarraah (Eucalyptus marginata)	540		1	1			No	129590a6-d57b-4c6c-8f6e-59c355b025c6	517, 518
-32.43433140	116.01686660	Jarraah (Eucalyptus marginata)	510							4f11808d-fd04-4250-bd9b-3c602d4988d3	
-32.43444730	116.01687210	Marri (Corymbia calophylla)	540							6327a0c4-e3b3-42d9-b515-155305b449e0,f9c9cedb-2952-4a37-941d-0698b6afe560	
-32.43472550	116.01680470	Marri (Corymbia calophylla)	510							89f91491-856d-4bea-998c-b8943c7e75ce	
-32.43489840	116.01681220	Powderbark Wandoo (Eucalyptus accedens)	320							bc602961-adb3-455e-9a8f-2f05bf640cd2	
-32.43533177	116.01664420	Powderbark Wandoo (Eucalyptus accedens)	480							2af04cee-3770-4b59-92f5-900ab2238c87	
-32.43491693	116.01667980	Powderbark Wandoo (Eucalyptus accedens)	320							942ec712-b88e-4f91-b549-7702e91cb210	
-32.43494947	116.01676860	Stag	640							a809591f-4d61-4460-b605-8b57234f3158	
-32.43493650	116.01682740	Powderbark Wandoo (Eucalyptus accedens)	320							d465606a-2666-4016-8c11-d70b2be22e2b	
-32.43516793	116.01674880	Powderbark Wandoo (Eucalyptus accedens)	480							37840474-ee0d-4ef1-b8dd-251c428387b5	
-32.43496060	116.01702090	Marri (Corymbia calophylla)	510		2	1	1		No	72fbd9c-159b-4776-8b25-4e7d6bba7ee0	502, 503, 504, 505
-32.43490350	116.01699710	Powderbark Wandoo (Eucalyptus accedens)	570		1	1			No	fb5c4865-3ef1-40d7-b711-bac8d91063ba	506, 507, 508
-32.43473780	116.01722620	Powderbark Wandoo (Eucalyptus accedens)	320							071bc457-c1ee-4a2f-91cf-5b24b2f2cf7f	
-32.43444520	116.01723710	Jarraah (Eucalyptus marginata)	600							de40967d-443e-4c49-ac30-65e87c4bde4a,bf3ef2d9-4f31-4ab6-b135-5e402a3a53ab	
-32.43443983	116.01729770	Powderbark Wandoo (Eucalyptus accedens)	350							b25ea042-7d03-4ead-8cb5-45a0d1bc250b	
-32.43442455	116.01741670	Powderbark Wandoo (Eucalyptus accedens)	350							2e588d25-932e-4910-a24e-441d2a2e3991	
-32.43432042	116.01722090	Stag	510							abdbab315-decf-4f76-8fd4-5e2e25586a79	
-32.43421720	116.01715980	Powderbark Wandoo (Eucalyptus accedens)	350							2fc7c3e3-c1e2-43d8-af7c-022dc2d56690	
-32.43413480	116.01718830	Powderbark Wandoo (Eucalyptus accedens)	450							ede068d2-1367-4255-949d-e481b47bfc4c	
-32.43406310	116.01721700	Powderbark Wandoo (Eucalyptus accedens)	350							a2432ae6-6345-46ee-97d1-e1b0fe03ba49	
-32.43399180	116.01723940	Jarraah (Eucalyptus marginata)	920		1	1			No	cac31eaa-92dc-486f-962b-a93a2f1d89a9	491, 492, 493
-32.43392029	116.01792300	Stag	640							807a7a72-4dec-40b4-ae8a-18262b6c2105	
-32.43417978	116.01817950	Marri (Corymbia calophylla)	510		1	1			No	0dff1b0f0-dc62-46ab-9157-945a9889828a	439, 440
-32.43425788	116.01824450	Stag	510		1	1			No	b3fb1208-b009-4039-b0af-227b9943a5f4	441, 442
-32.43393274	116.01817880	Marri (Corymbia calophylla)	510							b5178f09-932d-4bc7-87ca-00f742398601	
-32.43387610	116.01830460	Marri (Corymbia calophylla)	640							c6690581-c009-4ff7-b299-d122f8f35d36	
-32.43470380	116.01992320	Jarraah (Eucalyptus marginata)	510							d9e8a219-078b-4958-92e9-c84aa0f1cf82	
-32.43459810	116.01967150	Jarraah (Eucalyptus marginata)	510							7017f537-d6a6-44f0-9ec9-40aae7d1da81	
-32.43454538	116.01931870	Stag	510								
-32.43814830	116.02035890	Stag	480							4ee6cfd88-6c8b-4ea2-a586-d69f419df151	
-32.43896845	116.01553680	Marri (Corymbia calophylla)	800		1	1			No	9a69e596-9686-467e-8cd9-6a89ab332e9b	544
-32.43806500	116.01552580	Powderbark Wandoo (Eucalyptus accedens)	380							52cedaa3-34bf-4130-8f32-69517cceddb1	
-32.43778920	116.01575380	Powderbark Wandoo (Eucalyptus accedens)	350							158fbc83-dbd7-4360-ab34-211a65ca3585	
-32.43724650	116.01598350	Powderbark Wandoo (Eucalyptus accedens)	350							b08f788b-ded4-48ef-bf31-af2851276ea9	
-32.43708278	116.01581010	Marri (Corymbia calophylla)	540							cfdcf42-497b-4bb3-a2d4-0ec705c72793	
-32.43668070	116.01557880	Powderbark Wandoo (Eucalyptus accedens)	330							d8ddb651-fe2b-4465-8102-53713207a9c4	

Appendix B

Sightings and Foraging Evidence

Latitude	Longitude	Species	Evidence type	Foraging material	Comments
-32.4409455	116.0208563	Forest Red-tailed Black Cockatoo	Sighting		Flock of Birds

Appendix C

Foraging Habitat Scoring Tool Results

Habitat	Area (ha)	Starting Score	Within Swan Coastal Plain	Suitable nest hollows	Primarily marri/jarrah	Contains trees DBH >500mm	Known roost	No feeding debris	No foraging habitat within 6km	>12km from known breeding site	>12km from known roosting site	>2km from water	Disease present e.g. dieback	Total	Quality
Predominantly Marri	36.47	7	3	3	2	2	0	0	0	0	0	0	0	17	Very High Quality

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APPENDIX E: OFFSET MANAGEMENT PLANS

Alkimos Offset Site

Offset Management Plan





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1. Summary

The Alkimos Offset Strategy was developed to identify the proposed strategy to counterbalance the Alkimos Seawater Desalination Plant Project’s significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

There are 4 offset sites proposed, including the:

- **Alkimos Offset Site,**
- Carabooda Tank Offset Site,
- Neergabby Offset Site, and
- Eglinton Offset Site.

This Offset Management Plan provides specific content in relation to Alkimos Offset Site.

A summary of the Alkimos Offset Site details is shown in Table 1.

Table 1: Summary of Alkimos Offset Site

EPBC referral number	2019/8543
Offset name	Alkimos Offset Site
Location	A 9.01 ha portion of the Alkimos Water Precinct, Lot 3000. See Figure 3-1.
Offset characteristics	<ul style="list-style-type: none"> • 4.91 ha of Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain ecological community (TEC) in very good to good condition. • 3.63 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby’s Black Cockatoo). • Approximately 7.5 ha of the Landform - Alkimos Dune Complex, which is a preserved parabolic dune within the Quindalup Dune System.
Additional value added	<ul style="list-style-type: none"> • Rehabilitation of the entire 9.01 ha of “Very good” to “Good” condition vegetation into “Excellent” condition.
Mechanism to protect	<ul style="list-style-type: none"> • Conservation covenant

A Declaration of the accuracy of this report is provided in Appendix A.



2. Project Overview

Water Corporation is proposing to build and operate the Alkimos Seawater Desalination Plant (ASDP) within a 220 ha Public Purpose Reserve, owned by the Water Corporation, (Lot 3000) adjacent to the existing Alkimos Wastewater Treatment Plant.

Alkimos is located approximately 40 km northwest of the Perth central business district (CBD) in the northwest corridor, north of Quinns Rock beach and south of Yanchep beach. The ASDP project also includes marine works and infrastructure, a groundwater treatment plant and the integration pipeline connecting the desalination plant to Wanneroo Reservoir.

Following the application of avoidance, minimisation and mitigation measures, there are several activities associated with the Proposal that have the potential to result in a significant residual impact to *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and *Biodiversity Conservation Act 2016* (WA) listed species and communities, including:

- *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC),
- Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain TEC,
- *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges TEC (SCP26a),
- Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*),
- Landforms within Public Purposes Reserve in the Alkimos Water Precinct (reserved for conservation), and
- Bush Forever.

The Alkimos Offset Strategy (Revision 4) was developed to identify the proposed strategy to counterbalance the Proposal's significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

The Alkimos Offset Strategy details that the Alkimos Offset site is proposed to offset the impacts to:

- Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain Threatened Ecological Community (TEC),
- Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*), and
- Landforms within Public Purposes Reserve in the Alkimos Water Precinct (reserved for conservation)

This Offset Management Plan provides specific content in relation to the Alkimos Offset Site.



3. Alkimos Offset Site

The Alkimos offset site is located within the Alkimos Water Precinct in Lot 3000, Alkimos as shown in Figure 3-1.



Figure 3-1 – Alkimos Offset Site - Location



3.1. Alkimos Offset Site - Setting

Lot 3000 is a 220 ha Public Purpose Reserve, owned by the Water Corporation. The site is already partially developed in the form of the existing Alkimos Wastewater Treatment Plant (WWTP). As the land is zoned for Public Purposes, the site was considered for the location of the proposed Alkimos Seawater Desalination Plant (ASDP).

The remainder of the site is predominantly vegetated with a large area north of the facilities retained for conservation. The Southern portion of the site was retained for potential urban development, provided odour from the WWTP is proven to not be an impact.

Flora Vegetation and Fauna Surveys were undertaken as part of the investigations into the ASDP project by numerous consultants, which confirmed that the proposed 9.01 ha offset site contained approximately:

- 4.91 ha of Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (TEC) in very good to good condition.
- 3.63 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby's Black Cockatoo).
- Approximately 7.5 ha of the Landform - Alkimos Dune Complex, which is a preserved parabolic dune within the Quindalup Dune System.

The Flora and Vegetation Surveys undertaken identified significant weed infestation within the site. Weed species include doublegee (*Rumex hypogaeus*), narrowleaf cottonbush (*Gomphocarpus fruticosus*), common prickly pear (*Opuntia stricta*), *Citrullus amarus* (Pie melon) and onion weed (*Trachyandra divaricata*).

Firebreaks are well established and maintained. However, fences surrounding the property are in average condition and are prone to unauthorised access.

Figure 3-2, Figure 3-3 and Figure 3-4 identifies the environmental values of the offset site.



LEGEND

Public Purposes (reserved for conservation)

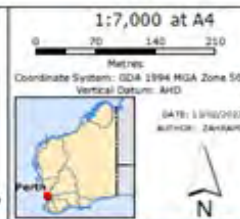
Proposed Offset

ASDP Development Envelope

Stantec_Assessment

Tuart Woodlands of Swan Coastal Plain TEC

WA PEC 'Acacia shrublands on taller dunes, Southern Swan Coastal Plain'



Proposed Offset -
Tuart Woodlands
of the Swan Coastal
Plain TEC

Figure 3-2 – Alkimos Offset Site - Environmental Values (Tuart TEC)



LEGEND

FaunaHab

- Cleared
- Heath and Shrubland
- Parkland, Planted Vegetation and Gardens
- Pine Plantation
- Pine Plantation Regrowth
- Scattered Trees
- Wetlands and Riparian Vegetation
- Woodland
- Public Purposes (reserved for conservation)

1:7,000 at A4

0 70 140 210

Metres

Coordinate System: GDA 1994 MGA Zone 59
Vertical Datum: AHD

DATE: 11/05/2023
AUTHOR: ZHW/MAC

N

Proposed Offset -
Tuart Woodlands
of the Swan Coastal
Plain TEC

Figure 3-3 - Alkimos Offset Site - Environmental Values (Black Cockatoo Habitat)

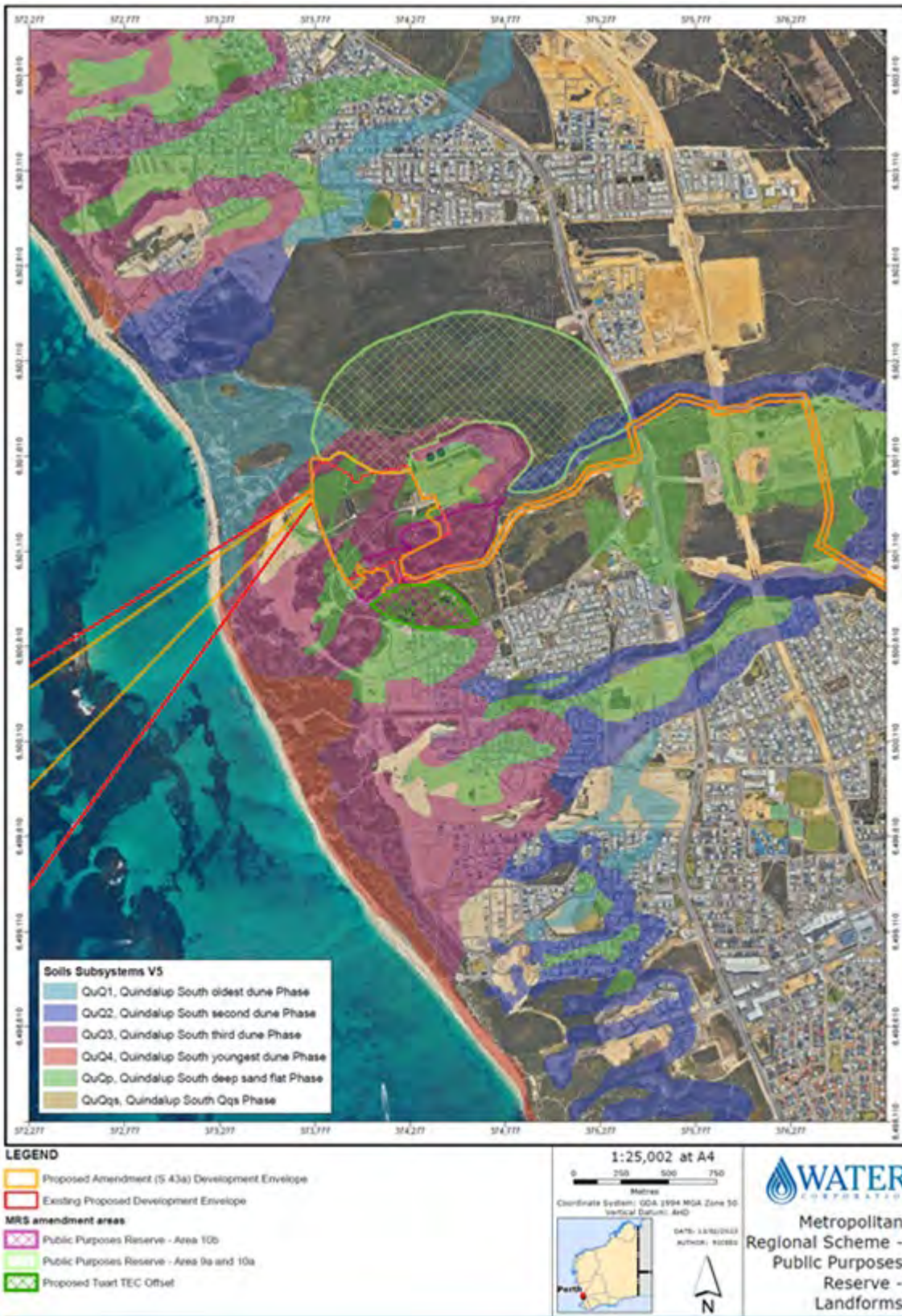


Figure 3-4 - Alkimos Offset Site - Environmental Values (Landforms)



4. Proposed Offset Quantification

Table 2: Alkimos Project Offset Strategy Summary Table

Environmental value (listing)	Total Quantum of Impact (Adjusted area in brackets)	Offset site (Primary offset value in brackets)	Percentage of offset met
<i>Banksia</i> Woodlands of the Swan Coastal Plain (TEC - Cth)	1.60 ha (1.12 ha)	7 ha Eglinton Site (5.98 ha Banksia TEC)	50%
		371 ha Neergabby site (Lot 1934) (289 ha of Banksia Woodland)	Greater than 50%
<i>Tuart</i> (<i>Eucalyptus gomphocephala</i>) woodlands and forest of the Swan Coastal Plain (TEC - Cth)	1.16 ha (0.81 ha)	9.01 ha Alkimos Site (4.91 ha Tuart TEC)	104%
<i>Melaleuca huegelii</i> - <i>Melaleuca systena</i> shrublands on limestone ridges (TEC - WA)	1.03 ha (0.72 ha)	3.1 ha Carabooda Tank Site (3.1 ha Melaleuca TEC)	113%
Bush Forever (WA)	9.38 ha (6.18 ha)	7 ha Eglinton Site (7 ha of Bush Forever)	113%
Public Purposes Reserve - Area 10b (Alkimos Dune Complex - WA)	5.17 ha	9.01 ha Alkimos Site (7.5 ha of Alkimos Dune Complex)	145%
Carnaby's Cockatoo Foraging habitat (Endangered - Cth)	52.04 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (449 ha of BC foraging habitat) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	81%
		Research Project (Black Cockatoo Research)	5%
Forest Red Tailed Black Cockatoo Foraging habitat (Vulnerable - Cth)	49.72 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (449 ha of BC foraging habitat) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	89%
		Research Project (Black Cockatoo Research)	5%
Black Cockatoo species - Significant trees	104 trees (8 Hollows)	Neergabby sites (Lot 1934) (420 significant trees, with 10 hollows suitable for BC breeding) (Including 25 artificial nesting boxes)	200%



5. Offset Management

Section 5 outlines the:

- Completion Criteria proposed for the Alkimos Offset Site (Section 5.1),
- Management Measures (Section 5.2),
- Monitoring program (Section 5.3),
- Management of uncertainty, including risk assessment (Section 5.4), and
- Reporting (Section 5.5).



5.1. Completion criteria

Table 3: Alkimos Offset Site completion criteria

Objective	Offset Site Value	Management measure	Item #	Completion Criteria	Completion target
Counterbalance the significant residual impact to 1.16 ha of Tuart Woodlands TEC.	To conserve, maintain and enhance 4.91 ha of Tuart Woodland TEC within a 9.01 ha portion of Alkimos Water Precinct (Lot 3000).	Weed control within existing Tuart Woodland TEC.	A1	Achieve ≤ 25% weed cover within the 9.1 ha site.	End of year 5
		Removal of any rubbish material	A2	100% removal of existing rubbish within the site	End of year 1
		Perimeter fencing of offset site	A3	Establishment of all perimeter fences for Offset site.	End of year 1
		Conservation covenant	A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1
Counterbalance the significant residual impact to - 52.04 ha of Carnaby's Black Cockatoo foraging habitat, AND - 49.72 ha of Forest Red Tailed Black Cockatoo foraging habitat	To conserve, maintain and enhance 3.63 ha of foraging habitat within Alkimos Water Precinct.	Pest control	B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years
		Firebreak management	B2	Maintenance of existing perimeter firebreaks	Annual for 5 years
	AND To rehabilitate areas of 9.01 ha site to provide additional Black Cockatoo foraging habitat (in addition to the 3.63ha of existing).	Weed control within offset site	B3	Achieve ≤ 25% weed cover within 9.01ha site.	End of year 5
		Seed Collection and Habitat creation	B4	Rehabilitation of 9.01 ha site. Rehabilitation will: - include key Black Cockatoo foraging species, collected from species naturally occurring on the site. - achieve at least 50% vegetation cover. - achieve 70% richness of species used, in and around each monitoring quadrat. and - achieve ≤ 25% weed cover , with no declared weed species present.	End of year 5
Counterbalance the significant residual impact to 5.14 ha of Alkimos Dune Complex within the Public Purposes Reserve (reserved for conservation)	To conserve, maintain and enhance 7.5 ha of Alkimos Dune Complex within the 9.01 ha site.	Landform management	C1	Maintain 7.5 ha of Alkimos Dune Complex to prevent further impacts on the landform.	End of year 1
		Perimeter fencing of offset site	C2	Establishment of all perimeter fences for Offset site to prevent damage to dune complex by unauthorised vehicle access.	Annual for 5 years



5.2. Management measures

Table 4: Alkimos Offset site management measures

Item #	Measure	Management actions
B4	Seed Collection	The revegetation contractor will collect seed from the site to develop a seed bank for use in restoration projects using provenance seed.
B4	Site preparation and revegetation	<p>If required, prior to initial rehabilitation works, based on advice from the revegetation contractor, the mechanical surface preparation will be implemented to facilitate revegetation.</p> <p>Where necessary, propagation of seedlings from the seed bank will occur in time for planting in the next available winter.</p> <p>Numbers and species for propagation and infill planting in subsequent years will be based on the results of spring monitoring.</p> <p>If possible direct seeding is to be carried out in autumn after the first significant seasonal rainfall.</p>
A1 & B3	Weed control	<p>Water Corporation will use authorised weed control operators (with experience in natural area weed control) to reduce weed coverage in the proposed rehabilitation sites and surrounding the offset site.</p> <p>Weed management techniques include:</p> <ul style="list-style-type: none"> • Physical removal, • Application of herbicide, • Smothering (mulch or other), and • Other less chemical methods (steam).
A3 & C2	Fencing	Perimeter fencing will be managed to prevent unauthorised site access. Individual tree guards may be used where appropriate.
A4	Conservation covenant	Water Corporation will establish a conservation covenant or equivalent to protect the site in perpetuity.
A2	Rubbish removal	Any existing rubbish found within the site boundary will be removed.
B1	Pest control	The site will be assessed for pest species, such as rabbits and foxes. Where such species are found to be present, control measures will be implemented, such as baiting and humane traps.
C1 & C2	Landform management	Water Corporation will ensure that as part of the rehabilitation works, care is taken to maintain the Alkimos Dune Complex in its current form. Site access will be managed to prevent potential wind erosion.
B2	Firebreaks	Firebreaks are to be maintained as per shire requirements to prevent unnecessary or frequent burning of the property.



5.3. Monitoring

Table 5: Alkimos Offset Site monitoring program

Item #	Completion Criteria	Completion target	Monitoring action	Responsibility	Frequency	Contingency Action
A1	Achieve ≤ 25% weed cover within the 9.1 ha site.	End of year 5	Weed survey	Water Corporation	- Baseline, - end of year 3, and - end of year 5	At year 3 survey, if target not met, implement additional intensive weed control methods.
A2	100% removal of existing rubbish within the site	End of year 1	Visual inspection	Water Corporation	- Annual	If additional rubbish identified during any surveys, rubbish removal contractor will be engaged.
A3	Establishment of all perimeter fences for Offset site.	End of year 1	Visual inspection	Water Corporation	- Annual	If damaged, maintain section where required.
A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1	Confirmation	Water Corporation	- end of year 1	Follow up until complete
B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years	Fauna monitoring program to establish baseline pest populations and control program.	Water Corporation	- Baseline, - end of year 3, and - end of year 5	If pest levels at year 3 above baseline, additional control program will be implemented (trapping, baiting etc)
B2	Maintenance of existing perimeter firebreaks	Annual for 5 years	Visual inspection	Water Corporation	- Annual	Annual firebreak maintenance as per shire requirements.
B3	Achieve ≤ 25% weed cover within 9.01ha site.	End of year 5	Weed survey	Water Corporation	- Baseline, - end of year 3, and - end of year 5	If monitoring in year 3 identifies that completion target is unlikely to be met at end of year 5, additional weed control is to be implemented. In case of fire or vandalism: <ul style="list-style-type: none"> Monitor the site closely after fire and adjust weed control schedule accordingly, Monitor weed and native species germination to establish site response to fire.
B4	Rehabilitation of 9.01 ha site. Rehabilitation will: - include key Black Cockatoo foraging species, collected from species naturally occurring on the site. - achieve at least 50% vegetation cover. - achieve 70% richness of species used, in and around each monitoring quadrat. and - achieve ≤ 25% weed cover , with no declared weed species present.	End of year 5	Vegetation survey	Water Corporation	Annually – End of spring	If annual monitoring in year 3 identifies that completion target is unlikely to be met at end of year 5, additional planting, weed control is to be implemented. In case of fire or vandalism: <ul style="list-style-type: none"> Monitor the site closely after fire and adjust weed control schedule accordingly, Monitor native species germination to establish site response to fire Additional infill planting if required.
C1	Maintain 7.5 ha of Alkimos Dune Complex to prevent further impacts on the landform.	End of year 1	Visual inspection	Water Corporation	- Annual	In the event of unauthorised access of vandalism, replace fencing section as required
C2	Establishment of all perimeter fences for Offset site to prevent damage to dune complex by unauthorised vehicle access.	End of year 1	Visual inspection	Water Corporation	- Annual	If damaged, maintain section where required.



5.4. Management of uncertainty

The Alkimos Offset Site is proposed to be offsetting the impacts on:

- 4.91 ha of Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (TEC) in very good to good condition.
- 3.63 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby's Black Cockatoo).
- Approximately 7.5 ha of the Landform – Alkimos Dune Complex, which is a preserved parabolic dune within the Quindalup Dune System.

The data used to quantify the values at the offset site was taken from surveys undertaken by multiple consultants, but consolidated in 2021 by Stantec (Stantec, 2021) who used suitably qualified ecologists with over 10 years of experience undertaking vegetation and fauna habitat assessments in a range of bioregions within Western Australia. These reports were appended to the Environmental Review Document (ERD) as Appendix J and K.

Additional flora, vegetation and fauna surveys will be undertaken using similarly qualified consultants within the recommended survey periods to ensure accuracy of data.

Risks

The key risks to the success of the offset site are:

- Fire,
- Low rainfall years,
- Pest species impacts to rehabilitation and revegetation.

The above management and contingency measures address these risks. In the case where Water Corporation does not meet the completion criteria at the end of the expected management period, contingency measures will be implemented until success can be demonstrated.

A risk assessment of the likely risk events and circumstances that could impact the success of the offset site have been addressed in Table 6. The risk rating is calculated using Appendix B.



Table 6: Risk assessment

Item #	Completion Criteria	Completion target	Management action	Risk Event / Circumstance	likelihood	Conseq.	Risk rating	Controls
A1	Achieve ≤ 25% weed cover within the 9.1 ha site.	End of year 5	Weed control within existing Tuart Woodland TEC.	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Additional weed management
				Fire	Possible	Minor	Low	Maintain firebreaks
A2	100% removal of existing rubbish within the site	End of year 1	Removal of any rubbish material	Illegal dumping	Unlikely	Minor	Low	Maintain fencing
A3	Establishment of all perimeter fences for Offset site.	End of year 1	Perimeter fencing of offset site	Unauthorised access	Unlikely	Moderate	Low	Maintain fencing
A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1	Conservation covenant	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Expedite process
B1	Management of all vertebrate pest species to protect rehabilitation.	Annual	Pest control	Rabbit/kangaroo population boom	Possible	Minor	Low	Using tree guards
				Insect plague	Unlikely	Minor	Low	Regular site inspections and pest management
B2	Maintenance of existing perimeter firebreaks	Annual	Firebreak management	Fire	Possible	Minor	Low	Maintain firebreaks
B3	Achieve ≤ 25% weed cover within 9.01ha site.	End of year 5	Weed control within offset site	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Additional weed management
				Fire	Possible	Minor	Low	Maintain firebreaks
B4	Rehabilitation of 9.01 ha site. Rehabilitation will: <ul style="list-style-type: none"> - include key Black Cockatoo foraging species, collected from species naturally occurring on the site. - achieve at least 50% vegetation cover. - achieve 70% richness of species used, in and around each monitoring quadrat. and - achieve ≤ 25% weed cover, with no declared weed species present. 	End of year 5	Seed Collection and Habitat creation	Failure to meet criteria in timeframe	Possible	Moderate	Medium	Additional revegetation
				Fire	Possible	Moderate	Medium	Maintain firebreaks
				Low rainfall	Possible	Moderate	Medium	Additional revegetation
				Vandalism / illegal access	Unlikely	Minor	Low	Maintain fencing
C1	Maintain 7.5 ha of Alkimos Dune Complex to prevent further impacts on the landform.	Annual	Landform management	Unauthorised access	Unlikely	Moderate	Low	Maintain fencing
C2	Establishment of all perimeter fences for Offset site to prevent damage to dune complex by unauthorised vehicle access.	Annual	Perimeter fencing of offset site	Unauthorised access	Unlikely	Moderate	Low	Maintain fencing



5.5. Reporting

An offset compliance report will be provided to the Department of Water and Environmental Regulation and the Department of Climate Change, Energy and Water at **Year 5** to demonstrate completion of the offset management plan, or any remaining actions.

The Report will use the template Audit Table provided in Appendix C.



6. References

DBCA 2020, Wetland Evaluation Swan Coastal Plain 2020, (reference to Map 3 for Conservation Category Wetlands)

DAWE 2022, Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo, Department of Agriculture, Water and the Environment, Canberra, February.

Stantec, 2021, ASDP - Flora and Vegetation Consolidation Report

Stantec, 2021b, ASDP – Terrestrial Fauna Consolidation Report



7. Appendices



Appendix A – Declaration of Accuracy

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Management Plan (*use correct title of signed document*) is complete, current and correct.
2. I am the designated proponent or the approval holder for this action.
3. I am aware that:
 - a. Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999*(Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
 - b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.
 - c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed

Full name (please print)

Organisation (please print)

Date / /



Appendix B – Risk Rating Assessment

Table 1: Risk Framework

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

Table 2: Likelihood and consequence

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical	The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.



Appendix C – Audit Table



APPENDIX C – COMPLIANCE AUDIT TABLE

Objective	Offset Site Value	Management measure	Item #	Completion Criteria	Completion target	Status	Evidence
Counterbalance the significant residual impact to 1.16 ha of Tuart Woodlands TEC.	To conserve, maintain and enhance 4.91 ha of Tuart Woodland TEC within a 9.01 ha portion of Alkimos Water Precinct (Lot 3000).	Weed control within existing Tuart Woodland TEC.	A1	Achieve 75% reduction in weed cover within the 9.1 ha site.	End of year 5		
		Removal of any rubbish material	A2	100% removal of existing rubbish within the site	End of year 1		
		Perimeter fencing of offset site	A3	Establishment of all perimeter fences for Offset site.	End of year 1		
		Conservation covenant	A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1		
Counterbalance the significant residual impact to - 52.04 ha of Carnaby's Black Cockatoo foraging habitat, AND - 49.72 ha of Forest Red Tailed Black Cockatoo foraging habitat	To conserve, maintain and enhance 3.63 ha of foraging habitat within Alkimos Water Precinct. AND	Pest control	B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years		
		Firebreak management	B2	maintenance of existing perimeter firebreaks	Annual for 5 years		
	To rehabilitate areas of 9.01 ha site to provide additional Black Cockatoo foraging habitat (in addition to the 3.63 ha of existing).	Weed control within offset site	B3	Achieve 75% reduction in weed cover within 9.01ha site.	End of year 5		
		Seed Collection and Habitat creation	B4	Rehabilitation of 9.01 ha site. Also, rehabilitation will: - include key Black Cockatoo foraging species, collected from species naturally occurring on the site. - achieve at least 50% vegetation cover. - achieve 70% richness of species used, in and around each monitoring quadrat. and - achieve ≤ 25% weed cover, with no declared weed species present.	End of year 5		
Counterbalance the significant residual impact to 5.14 ha of Alkimos Dune Complex within the Public Purposes Reserve (reserved for conservation)	To conserve, maintain and enhance 7.5 ha of Alkimos Dune Complex within the 9.01 ha site.	Landform management	C1	maintain 7.5 ha of Alkimos Dune Complex to prevent further impacts on the landform.	End of year 1		
		Perimeter fencing of offset site	C2	Establishment of all perimeter fences for Offset site to prevent damage to dune complex by unauthorised vehicle access.	Annual for 5 years		

Carabooda Tank Offset Site

Offset Management Plan





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1. Summary

The Alkimos Offset Strategy was developed to identify the proposed strategy to counterbalance the Alkimos Seawater Desalination Plant Project’s significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

There are 4 offset sites proposed, including the:

- Alkimos Offset Site,
- **Carabooda Tank Offset Site,**
- Neergabby Offset Site, and
- Eglinton Offset Site.

This Offset Management Plan provides specific content in relation to the Carabooda Tank Offset Site.

A summary of the Carabooda Tank Offset Site details is shown in Table 1.

Table 1: Summary of Carabooda Tank Offset Site

EPBC referral number	2019/8543
Offset name	Carabooda Tank Offset Site
Location	A 3.1 ha portion of Carabooda Tanks Site located at Lot 50, Greenlees Way Carabooda. See Figure 3-1.
Offset characteristics	<ul style="list-style-type: none"> • 3.1 ha of Melaleuca huegelii-Melaleuca systema shrublands on limestone ridges Threatened Ecological Community (TEC) in excellent condition, however with no current management. • 3.1 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby’s Black Cockatoo).
Additional value added	<ul style="list-style-type: none"> • management of the entire 3.1 ha site to improve vegetation and maintain “Excellent” condition.
Mechanism to protect	<ul style="list-style-type: none"> • Conservation covenant



2. Project Overview

Water Corporation is proposing to build and operate the Alkimos Seawater Desalination Plant (ASDP) within a 220 ha Public Purpose Reserve, owned by the Water Corporation, (Lot 3000) adjacent to the existing Alkimos Wastewater Treatment Plant.

Alkimos is located approximately 40 km northwest of the Perth central business district (CBD) in the northwest corridor, north of Quinns Rock beach and south of Yanchep beach. The ASDP project also includes marine works and infrastructure, a groundwater treatment plant and the integration pipeline connecting the desalination plant to Wanneroo Reservoir.

Following the application of avoidance, minimisation and mitigation measures, there are several activities associated with the Proposal that have the potential to result in a significant residual impact to *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and *Biodiversity Conservation Act 2016* (WA) listed species and communities, including:

- *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC),
- Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain TEC,
- *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges TEC (SCP26a),
- Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*),
- Landforms within Public Purposes Reserve in the Alkimos Water Precinct (reserved for conservation), and
- Bush forever.

The Alkimos Offset Strategy (Revision 4) was developed to identify the proposed strategy to counterbalance the Proposal's significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

The Alkimos Offset Strategy details that the Carabooda Tank Offset Site is proposed to counterbalance impacts to:

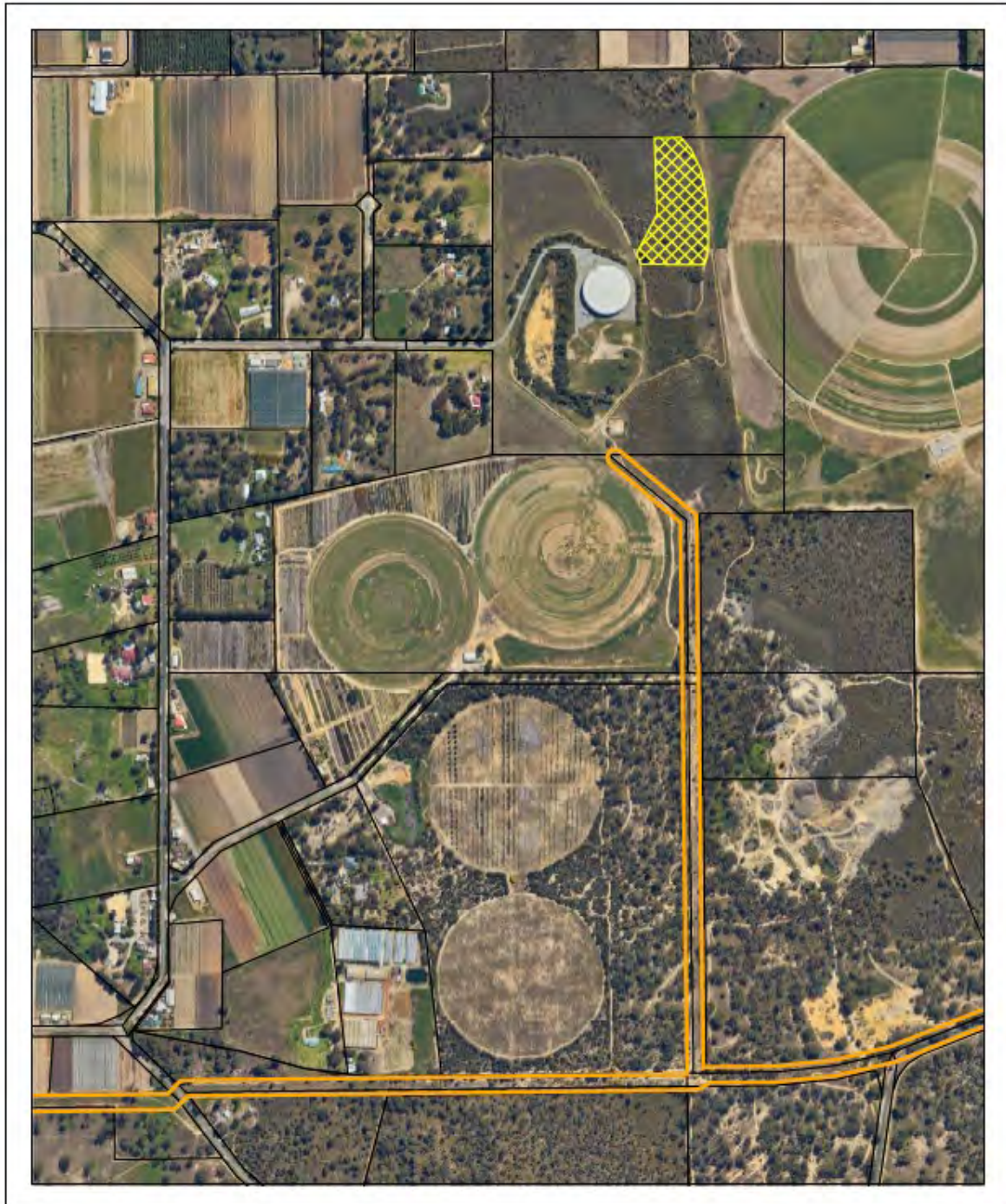
- *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges TEC (SCP26a), and
- Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*).

This Offset Management Plan provides specific content in relation to the Carabooda Tank Offset Site.



3. Carabooda Tank Offset Site

The Carabooda Tank Offset Site is located within 100m of the project pipeline development envelope, as shown in Figure 3-1.



LEGEND

- Cadastral Boundary
- Proposed offset - Melaleuca TEC
- ASDP Development Envelope

<p style="text-align: center;">1:10,000 at A4</p> <p style="text-align: center;">0 100 200 300 Metres</p> <p>Coordinate System: GDA 1994 MGA Zone 50 Vertical Datum: AHD</p> <p style="text-align: right;">DATE: 6/24/2023 AUTHOR: ZAKHARO</p>	 <p>Proposed Offset Melaleuca huegelii- Melaleuca systena shrublands on limestone ridges TEC</p>

Figure 3-1 – Carabooda Tank Offset Site - Location



3.1. Carabooda Tank Offset Site - Setting

The Carabooda Tank site is a 33 ha parcel of Water Corporation owned land.

The Carabooda Tank Offset Site is located in the northeast corner of the property within the cadastral boundary, in an area surrounding the existing infrastructure.

The Alkimos SDP project connects to the Carabooda Tank via a spur off the main pipeline. This offset site provides equal or better value vegetation immediately adjacent to, or within 5km, of where impacts to the Melaleuca TEC occur from the project.

The remainder of the site is predominantly vegetated and encroached upon by intensive agricultural activities as shown in Figure 3-2.

Flora Vegetation and Fauna Surveys were undertaken as part of the investigations into the ASDP project by numerous consultants, including Stantec 2021, which confirmed that the proposed offset site contained approximately:

- 3.1 ha of *Melaleuca huegelii-Melaleuca systema* shrublands on limestone ridges TEC (SCP26a) (Melaleuca TEC) in excellent condition, however with no current management, and
- 3.1 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby's Black Cockatoo).

The Flora and Vegetation Surveys undertaken identified some weed infestation within the site, predominantly in the areas adjacent to tracks.

Firebreaks are well established and maintained. However, there are no fences surrounding the vegetation on the property and therefore is prone to unauthorised access.

Figure 3-2 identifies the environmental values of the offset site.



LEGEND

- Cadastral Boundary
- ▨ Proposed offset - Melaleuca TEC
- ▭ surveyed as Melaleuca TEC
- ▭ ASDP Development Envelope

PEC / TEC Determination

- ▭ Commonwealth Banksia woodlands (TEC)
- ▭ Melaleuca huegeli-M. systema Shrublands on Limestone Ridges (TEC)
- ▭ Northern Spearwood Shrublands and Woodlands (PEC)

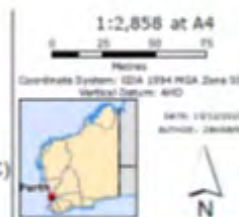


Figure 3-2 – Carabooda Tank Offset Site – Environmental Values (Melaleuca TEC)



4. Proposed Offset Quantification

Table 2: Alkimos Project Offset Strategy Summary Table

Environmental value (listing)	Total Quantum of Impact (Adjusted area in brackets)	Offset site (Primary offset value in brackets)	Percentage of offset met
<i>Banksia</i> Woodlands of the Swan Coastal Plain (TEC - Cth)	1.60 ha (1.12 ha)	7 ha Eglinton Site (5.98 ha Banksia TEC)	50%
		371 ha Neergabby site (Lot 1934) (289 ha of Banksia Woodland)	Greater than 50%
<i>Tuart</i> (<i>Eucalyptus gomphocephala</i>) woodlands and forest of the Swan Coastal Plain (TEC - Cth)	1.16 ha (0.81 ha)	9.01 ha Alkimos Site (4.91 ha Tuart TEC)	104%
<i>Melaleuca huegelii</i> - <i>Melaleuca systema</i> shrublands on limestone ridges (TEC - WA)	1.03 ha (0.72 ha)	3.1 ha Carabooda Tank Site (3.1 ha Melaleuca TEC)	113%
Bush Forever (WA)	9.38 ha (6.18 ha)	7 ha Eglinton Site (7 ha of Bush Forever)	113%
Public Purposes Reserve - Area 10b (Alkimos Dune Complex - WA)	5.17 ha	9.01 ha Alkimos Site (7.5 ha of Alkimos Dune Complex)	145%
Carnaby's Cockatoo Foraging habitat (Endangered - Cth)	52.04 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (449 ha of BC foraging habitat) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	81%
		Research Project (Black Cockatoo Research)	5%
Forest Red Tailed Black Cockatoo Foraging habitat (Vulnerable - Cth)	49.72 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (449 ha of BC foraging habitat) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	89%
		Research Project (Black Cockatoo Research)	5%
Black Cockatoo species - Significant trees	104 trees (8 Hollows)	Neergabby sites (Lot 1934) (420 significant trees, with 10 hollows suitable for BC breeding) (Including 25 artificial nesting boxes)	200%



5. Offset Management

Section 5 outlines the:

- Completion Criteria proposed for the Carabooda Tank Offset Site (Section 5.1),
- Management Measures (Section 5.2),
- Monitoring program (Section 5.3),
- Management of uncertainty, including risk assessment (Section 5.4), and
- Reporting (Section 5.5).



5.1. Completion criteria

Table 3: Carabooda Tank Offset Site completion criteria

Objective	Offset Site Value	Management measure	Item #	Completion Criteria	Completion target
Counterbalance the significant residual impact to 1.03 ha of Melaleuca TEC.	To conserve, maintain and enhance 3.1 ha of Melaleuca TEC within a portion of the Carabooda Tank Site.	Weed control within existing Melaleuca TEC.	A1	Achieve ≤ 20% weed cover within the 3.1 ha site.	End of year 5
		Removal of any rubbish material	A2	100% removal of existing rubbish within the site	End of year 1
		Perimeter fencing of offset site	A3	Establishment of all perimeter fences for Offset site (without restricting fauna movement) particularly in areas that abut non conservation areas.	End of year 1
		Conservation covenant	A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1
Counterbalance the significant residual impact to - 52.04 ha of Carnaby's Black Cockatoo foraging habitat, AND - 49.72 ha of Forest Red Tailed Black Cockatoo foraging habitat	To conserve, maintain and enhance 3.1 ha of foraging habitat within Carabooda Tank Offset Site for Black Cockatoo species.	Pest control	B1	Management of all vertebrate pest species to protect any rehabilitation activities.	Annual for 5 years
		Firebreak management	B2	Maintenance of existing perimeter firebreaks	Annual for 5 years
		Weed control within offset site	B3	Achieve ≤ 20% weed cover within total 3.1 ha site.	End of year 5
		Seed Collection and Habitat protection	B4	Conserve, maintain and enhance the 3.1 ha site, to improve and protect the currently "excellent" condition site. Conservation activities will include collection of provenance seed to ensure a seed bank is available in case of contingency measures, and ≤ 20% weed cover with no declared weed species present.	End of year 5



5.2. Management measures

Table 4: Carabooda Tank Offset site management measures

Item #	Measure	Management actions
B4	Seed Collection	The revegetation contractor will collect seed from the site to develop a seed bank for use in restoration projects using provenance seed.
B4	Site preparation and rehabilitation	<p>If required, prior to initial rehabilitation works, based on advice from the revegetation contractor, the mechanical surface preparation will be implemented to facilitate revegetation.</p> <p>Where necessary, propagation of seedlings from the seed bank will occur in time for planting in the next available winter.</p> <p>Numbers and species for propagation and infill planting in subsequent years will be based on the results of spring monitoring.</p> <p>If possible direct seeding is to be carried out in autumn after the first significant seasonal rainfall.</p>
A1 & B3	Weed control	<p>Water Corporation will use authorised weed control operators (with experience in natural area weed control) to reduce weed coverage across the Offset Site.</p> <p>Weed management techniques include:</p> <ul style="list-style-type: none"> • Physical removal, • Application of herbicide, • Smothering (mulch or other), and • Other less chemical methods (steam).
A3	Fencing	Perimeter fencing will be managed to prevent unauthorised site access.
A4	Conservation covenant	Water Corporation will establish a conservation covenant or equivalent to protect the site in perpetuity.
A2	Rubbish removal	Any existing rubbish found within the site boundary will be removed.
B1	Pest control	The site will be assessed for pest species, such as rabbits and foxes. Where such species are found to be present, control measures will be implemented, such as baiting and humane traps.
B2	Firebreaks	Firebreaks are to be maintained as per shire requirements to prevent unnecessary or frequent burning of the property.



5.3. Monitoring

Table 5: Carabooda Tank Offset Site monitoring program

Item #	Completion Criteria	Completion target	Monitoring action	Responsibility	Frequency	Contingency Action
A1	Achieve ≤ 20% weed cover within the 3.1 ha site.	End of year 5	Weed survey	Water Corporation	- Baseline, - end of year 3, and - end of year 5	At year 3 survey, if target not met, implement additional intensive weed control methods.
A2	100% removal of existing rubbish within the site	End of year 1	Visual inspection	Water Corporation	- Annual	If additional rubbish identified during any surveys, rubbish removal contractor will be engaged.
A3	Establishment of all perimeter fences for Offset site (without restricting fauna movement) particularly in areas that abut non conservation areas.	End of year 1	Visual inspection	Water Corporation	- Annual	If damaged, maintain section where required.
A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1	Confirmation	Water Corporation	- end of year 1	Follow up until complete
B1	Management of all vertebrate pest species to protect any rehabilitation activities.	Annual for 5 years	Fauna monitoring program to establish baseline pest populations and control program.	Water Corporation	- Baseline, - end of year 3, and - end of year 5	If pest levels at year 3 above baseline, additional control program will be implemented (trapping, baiting etc)
B2	Maintenance of existing perimeter firebreaks	Annual for 5 years	Visual inspection	Water Corporation	- Annual	Annual firebreak maintenance as per shire requirements.
B3	Achieve ≤ 20% weed cover within total 3.1 ha site.	End of year 5	Weed survey	Water Corporation	- Baseline, - end of year 3, and - end of year 5	If monitoring in year 3 identifies that completion target is unlikely to be met at end of year 5, additional weed control is to be implemented. In case of fire or vandalism: <ul style="list-style-type: none"> Monitor the site closely after fire and adjust weed control schedule accordingly, Monitor weed and native species germination to establish site response to fire.
B4	Conserve, maintain and enhance the 3.1-ha site, to improve and protect the currently “excellent” condition site. - Conservation activities will include collection of provenance seed to ensure a seed bank is available in case of contingency measures, and ≤ 20% weed cover with no declared weed species present.	End of year 5	Vegetation survey	Water Corporation	Annually - End of spring	If annual monitoring in year 3 identifies that completion target is unlikely to be met at end of year 5, additional planting, weed control is to be implemented. In case of fire or vandalism: <ul style="list-style-type: none"> Monitor the site closely after fire and adjust weed control schedule accordingly, Monitor native species germination to establish site response to fire Additional infill planting if required.



5.4. Management of uncertainty

The Carabooda Tank Offset Site is proposed to be offsetting the impacts on:

- 3.1 ha of *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges TEC (SCP26a) (Melaleuca TEC) in excellent condition, however with no current management, and
- 3.1 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby's Black Cockatoo), and

The data used to quantify the values at the offset site was taken from surveys undertaken by multiple consultants, but consolidated in 2021 by Stantec (Stantec, 2021) who used suitably qualified ecologists with over 10 years of experience undertaking vegetation and fauna habitat assessments in a range of bioregions within Western Australia. These reports were appended to the Environmental Review Document (ERD) as Appendix J and K.

Additional flora, vegetation and fauna surveys will be undertaken using similarly qualified consultants within the recommended survey periods to ensure accuracy of data.

Risks

The key risks to the success of the offset site are:

- Fire,
- Low rainfall years,
- Pest species impacts to rehabilitation and revegetation.

The above management and contingency measures address these risks. In the case where Water Corporation does not meet the completion criteria at the end of the expected management period, contingency measures will be implemented until success can be demonstrated.

A risk assessment of the likely risk events and circumstances that could impact the success of the offset site have been addressed in Table 6. The risk rating is calculated using Appendix A.



Table 6: Risk assessment

Item #	Completion Criteria	Completion target	Management action	Risk Event / Circumstance	likelihood	Conseq.	Risk rating	Controls
A1	Achieve ≤ 20% weed cover within the 3.1 ha site.	End of year 5	Weed control within existing Melaleuca TEC.	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Additional weed management
				Fire	Possible	Minor	Low	Maintain firebreaks
A2	100% removal of existing rubbish within the site	End of year 1	Removal of any rubbish material	Illegal dumping	Unlikely	Minor	Low	Maintain fencing
A3	Establishment of all perimeter fences for Offset site.	End of year 1	Perimeter fencing of offset site	Unauthorised access	Unlikely	Moderate	Low	Maintain fencing
A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1	Conservation covenant	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Expedite process
B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years	Pest control	Rabbit/kangaroo population boom	Possible	Minor	Low	Pest control and additional tree guards on new planting
				Insect plague	Unlikely	Minor	Low	Regular site inspections and pest management
B2	Maintenance of existing perimeter firebreaks	Annual for 5 years	Firebreak management	Fire	Possible	Minor	Low	Maintain firebreaks
B3	Achieve ≤ 20% weed cover within total 3.1 ha site.	End of year 5	Weed control within offset site	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Additional weed management
				Fire	Possible	Minor	Low	Maintain firebreaks
B4	Conserve, maintain and enhance the 3.1-ha site, to improve and protect the currently “excellent” condition site. - Conservation activities will include collection of provenance seed to ensure a seed bank is available in case of contingency measures, and ≤ 20% weed cover with no declared weed species present.	End of year 5	Seed Collection and Habitat protection	Failure to meet criteria in timeframe	Possible	Moderate	Medium	Additional revegetation
				Fire	Possible	Moderate	Medium	Maintain firebreaks
				Low rainfall	Possible	Moderate	Medium	Additional revegetation
				Vandalism / illegal access	Unlikely	Minor	Low	Maintain fencing



5.5. Reporting

An offset compliance report will be provided to the Department of Water and Environmental Regulation at **Year 5** to demonstrate completion of the offset management plan, or any remaining actions.

The Report will use the template Audit Table provided in Appendix B.



6. References

DBCA 2020, Wetland Evaluation Swan Coastal Plain 2020, (reference to Map 3 for Conservation Category Wetlands)

DAWE 2022, Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo, Department of Agriculture, Water and the Environment, Canberra, February.

Stantec, 2021, ASDP - Flora and Vegetation Consolidation Report

Stantec, 2021b, ASDP – Terrestrial Fauna Consolidation Report



7. Appendices



Appendix A – Risk Rating Assessment

Table 1: Risk Framework

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

Table 2: Likelihood and consequence

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical	The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.



Appendix B – Audit Table

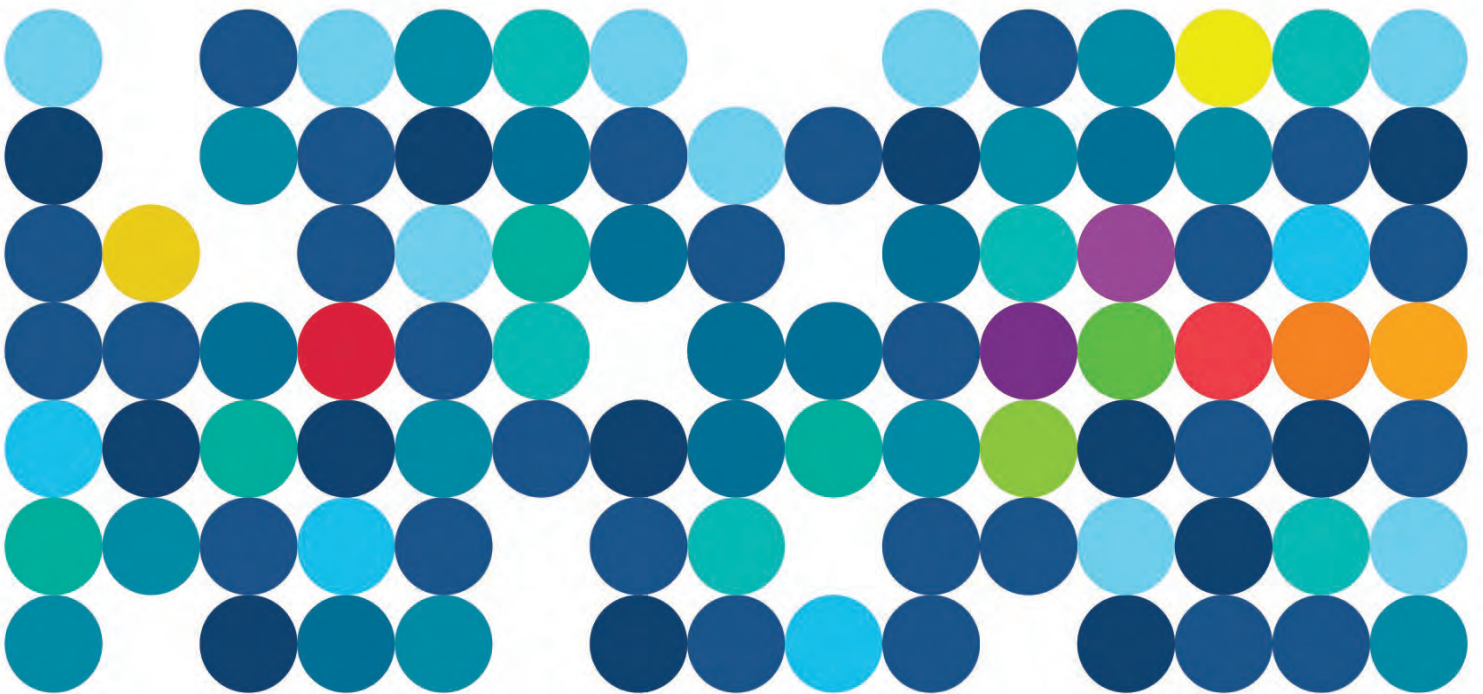


APPENDIX B – COMPLIANCE AUDIT TABLE

Objective	Offset Site Value	Management measure	Item #	Completion Criteria	Completion target	Status	Evidence
Counterbalance the significant residual impact to 1.03 ha of Melaleuca TEC.	To conserve, maintain and enhance 3.1 ha of Melaleuca TEC within a portion of the Carabooda Tank Site.	Weed control within existing Melaleuca TEC.	A1	Achieve ≤ 20% weed cover within the 3.1 ha site.	End of year 5		
		Removal of any rubbish material	A2	100% removal of existing rubbish within the site	End of year 1		
		Perimeter fencing of offset site	A3	Establishment of all perimeter fences for Offset site (without restricting fauna movement) particularly in areas that abut non conservation areas.	End of year 1		
		Conservation covenant	A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1		
Counterbalance the significant residual impact to - 52.04 ha of Carnaby's Black Cockatoo foraging habitat, AND - 49.72 ha of Forest Red Tailed Black Cockatoo foraging habitat	To conserve, maintain and enhance 3.1 ha of foraging habitat within Carabooda Tank Offset Site for Black Cockatoo species.	Pest control	B1	Management of all vertebrate pest species to protect any rehabilitation activities.	Annual for 5 years		
		Firebreak management	B2	Maintenance of existing perimeter firebreaks	Annual for 5 years		
		Weed control within offset site	B3	Achieve ≤ 20% weed cover within total 3.1 ha site.	End of year 5		
		Seed Collection and Habitat protection	B4	Conserve, maintain and enhance the 3.1-ha site, to improve and protect the currently "excellent" condition site. - Conservation activities will include collection of provenance seed to ensure a seed bank is available in case of contingency measures, and ≤ 20% weed cover with no declared weed species present.	End of year 5		

Eglinton Offset Site

Offset Management Plan





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1. Summary

The Alkimos Offset Strategy was developed to identify the proposed strategy to counterbalance the Alkimos Seawater Desalination Plant Project’s significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

There are 4 offset sites proposed, including the:

- Alkimos Offset Site,
- Carabooda Tank Offset Site,
- Neergabby Offset Site, and
- **Eglinton Offset Site.**

This Offset Management Plan provides specific content in relation to the Eglinton Offset Site.

A summary of the Eglinton Offset Site details is shown in Table 1.

Table 1: Summary of Eglinton Offset Site

EPBC referral number	2019/8543
Offset name	Eglinton Offset Site
Location	A 7-ha portion of Lot 1011, Eglinton. See Figure 3-1.
Offset characteristics	<ul style="list-style-type: none"> • 5.98 ha of Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC) in excellent condition, however with no current management. • 7 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby’s Black Cockatoo). • 7 ha of land for contribution to Bush Forever.
Additional value added	<ul style="list-style-type: none"> • management of the entire 7 ha site to improve vegetation and maintain “Excellent” condition.
Mechanism to protect	<ul style="list-style-type: none"> • Conservation covenant

A Declaration of the accuracy of this report is provided in Appendix A.



2. Project Overview

Water Corporation is proposing to build and operate the Alkimos Seawater Desalination Plant (ASDP) within a 220 ha Public Purpose Reserve, owned by the Water Corporation, (Lot 3000) adjacent to the existing Alkimos Wastewater Treatment Plant.

Alkimos is located approximately 40 km northwest of the Perth central business district (CBD) in the northwest corridor, north of Quinns Rock beach and south of Yanchep beach. The ASDP project also includes marine works and infrastructure, a groundwater treatment plant and the integration pipeline connecting the desalination plant to Wanneroo Reservoir.

Following the application of avoidance, minimisation and mitigation measures, there are several activities associated with the Proposal that have the potential to result in a significant residual impact to *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and *Biodiversity Conservation Act 2016* (WA) listed species and communities, including:

- *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC),
- Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain TEC,
- *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges TEC (SCP26a),
- Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*),
- Landforms within Public Purposes Reserve in the Alkimos Water Precinct (reserved for conservation), and
- Bush forever.

The Alkimos Offset Strategy (Revision 4) was developed to identify the proposed strategy to counterbalance the Proposal's significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

The Alkimos Offset Strategy details that the Eglinton Offset site is proposed to offset the impacts to:

- *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community,
- Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*), and
- Bush Forever.

This Offset Management Plan provides specific content in relation to the Eglinton Offset Site.



3. Eglinton Offset Site

The Eglinton Offset Site is located within 500m of the project pipeline development envelope, as shown in Figure 3-1.

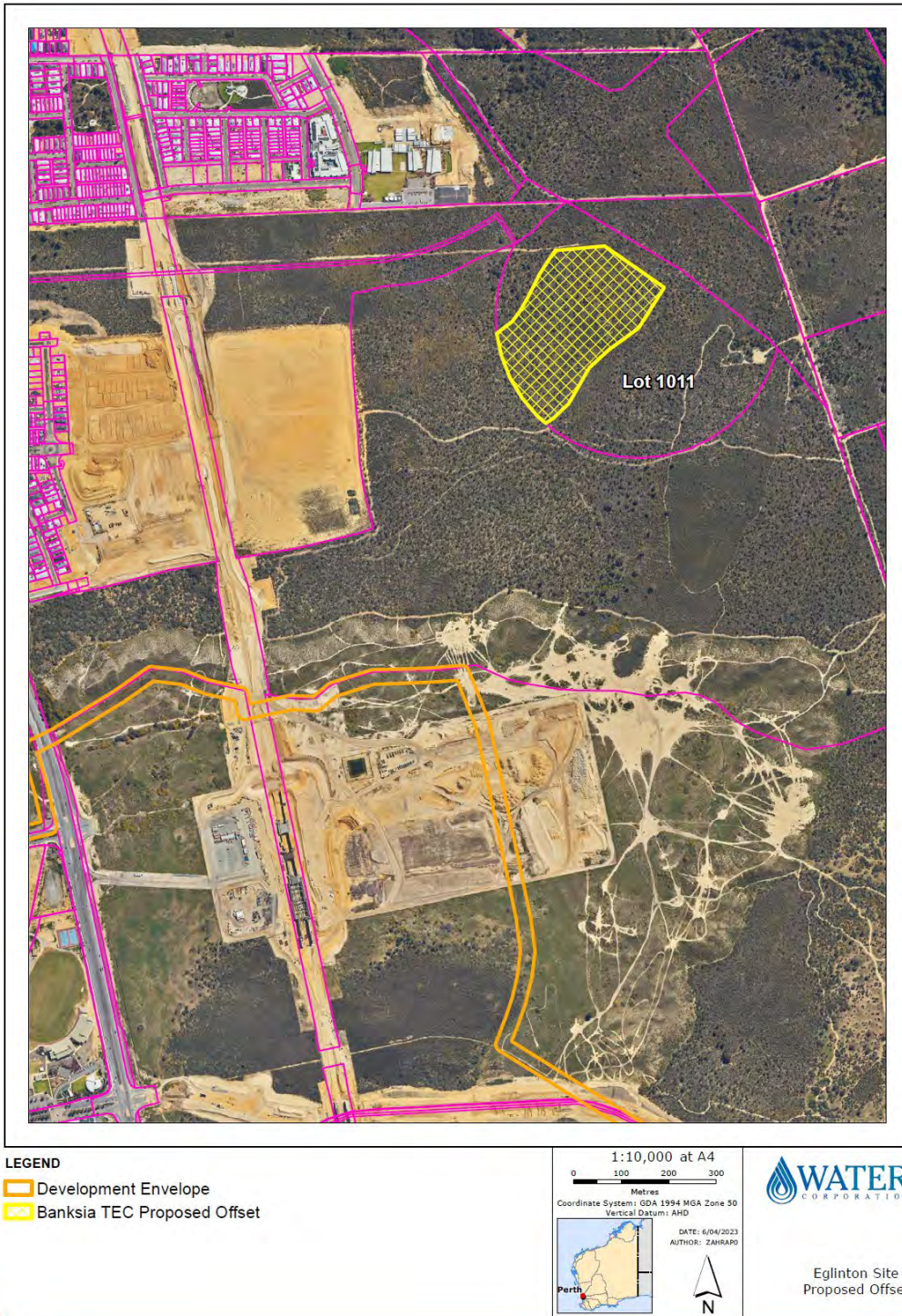


Figure 3-1 – Eglinton Offset Site - Location



3.1. Eglinton Offset Site - Setting

Lot 1011 is a 20 ha Public Purpose Reserve, owned by the Water Corporation. The site has some development in the form of a groundwater production bore, that can potentially be used to provide groundwater to the Eglinton Groundwater Scheme.

As the land is zoned for Public Purposes, the site was originally considered for the location of the Eglinton Groundwater Treatment Plant.

The remainder of the site is predominantly vegetated and is bordered with land reserved for parks and recreation in the Metropolitan Region Scheme as shown in Figure 3-2. This also demonstrates additional connectivity to other reservations in the area.

Flora Vegetation and Fauna Surveys were undertaken as part of the investigations into the ASDP project by numerous consultants, including Stantec 2021, which confirmed that the proposed offset site contained approximately:

- 5.98 ha of Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC) in excellent condition, however with no current management,
- 7 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby's Black Cockatoo), and
- 7 ha of land for contribution to Bush Forever that will provide additional ecological linkages.

The Flora and Vegetation Surveys undertaken identified some weed infestation within the site, predominantly in the areas adjacent to tracks.

Firebreaks are well established and maintained. However, there are no fences surrounding the property is prone to unauthorised access.

Figure 3-3 identifies the environmental values of the offset site.



<p>LEGEND</p> <p> Proposed Offset - Banksia TEC</p> <p> Development Envelope</p> <p>MRS ZONES</p> <p> Parks and Recreation</p> <p> Alkimos Central city area</p> <p> Major road reserve</p> <p> Road reserve</p>		<p>1:10,000 at A4</p> <p>0 100 200 300 Metres</p> <p>Coordinate System: GDA 1994 MGA Zone 50 Vertical Datum: AHD</p> <p></p> <p>DATE: 3/08/2022 AUTHOR: ZAHARA</p> <p></p>	<p></p> <p>Eglinton Site - Proposed Offset Regional Scheme</p>
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Figure 3-2 – Eglinton Offset Site – MRS land use planning

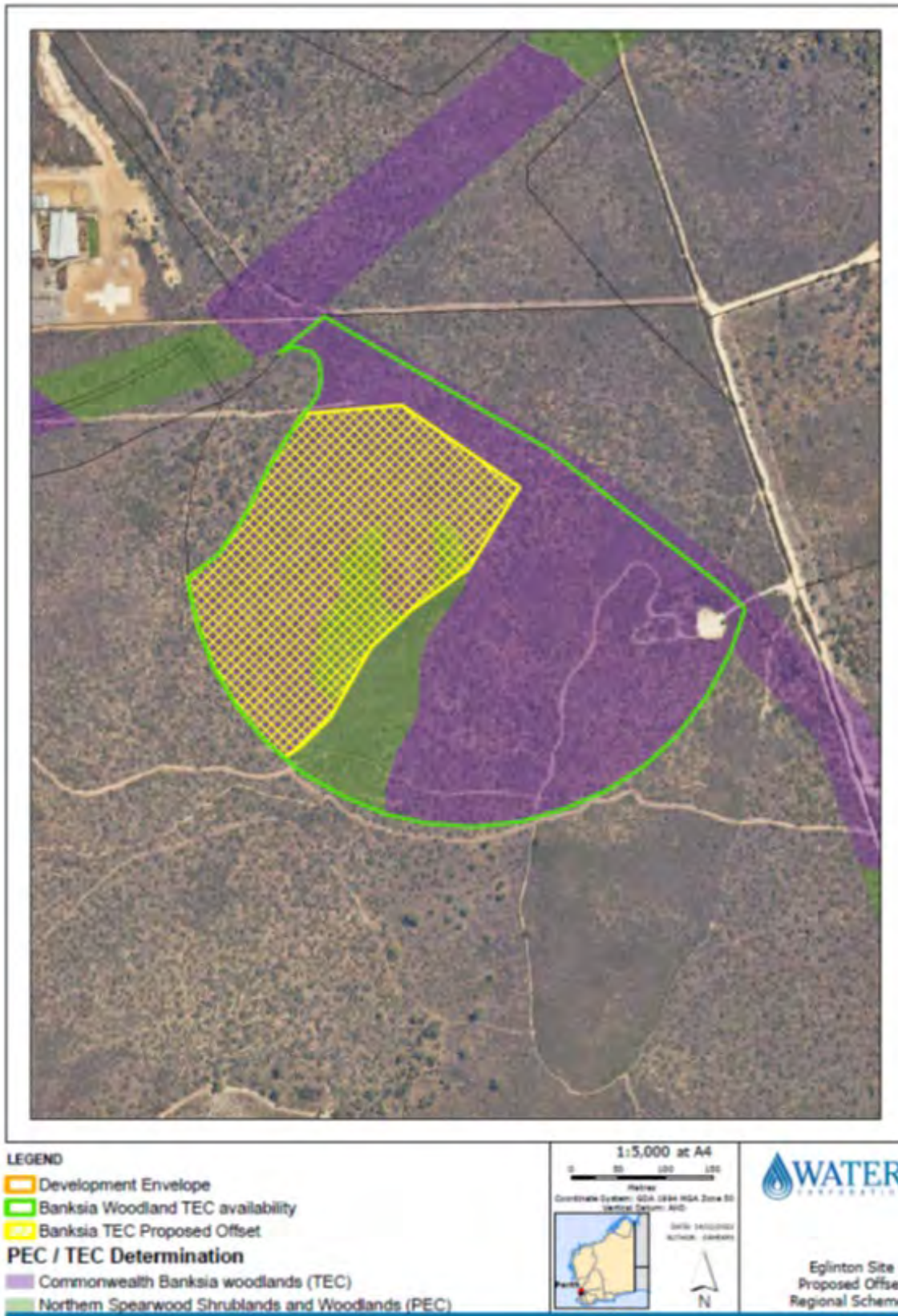


Figure 3-3 – Eglinton Offset Site - Environmental Values (Banksia Woodland TEC)



4. Proposed Offset Quantification

Table 2: Alkimos Project Offset Strategy Summary Table

Environmental value (listing)	Total Quantum of Impact (Adjusted area in brackets)	Offset site (Primary offset value in brackets)	Percentage of offset met
<i>Banksia</i> Woodlands of the Swan Coastal Plain (TEC - Cth)	1.60 ha (1.12 ha)	7 ha Eglinton Site (5.98 ha Banksia TEC)	50%
		371 ha Neergabby site (Lot 1934) (289 ha of Banksia Woodland)	Greater than 50%
<i>Tuart</i> (<i>Eucalyptus gomphocephala</i>) woodlands and forest of the Swan Coastal Plain (TEC - Cth)	1.16 ha (0.81 ha)	9.01 ha Alkimos Site (4.91 ha Tuart TEC)	104%
<i>Melaleuca huegelii</i> - <i>Melaleuca systena</i> shrublands on limestone ridges (TEC - WA)	1.03 ha (0.72 ha)	3.1 ha Carabooda Tank Site (3.1 ha Melaleuca TEC)	113%
Bush Forever (WA)	9.38 ha (6.18 ha)	7 ha Eglinton Site (7 ha of Bush Forever)	113%
Public Purposes Reserve - Area 10b (Alkimos Dune Complex - WA)	5.17 ha	9.01 ha Alkimos Site (7.5 ha of Alkimos Dune Complex)	145%
Carnaby's Cockatoo Foraging habitat (Endangered - Cth)	52.04 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (449 ha of BC foraging habitat) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	81%
			23%
		Research Project (Black Cockatoo Research)	5%
Forest Red Tailed Black Cockatoo Foraging habitat (Vulnerable - Cth)	49.72 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (449 ha of BC foraging habitat) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	89%
			27%
		Research Project (Black Cockatoo Research)	5%
Black Cockatoo species - Significant trees	104 trees (8 Hollows)	Neergabby sites (Lot 1934) (420 significant trees, with 10 hollows suitable for BC breeding) (Including 25 artificial nesting boxes)	200%



5. Offset Management

Section 5 outlines the:

- Completion Criteria proposed for the Eglinton Offset Site (Section 5.1),
- Management Measures (Section 5.2),
- Monitoring program (Section 5.3),
- Management of uncertainty, including risk assessment (Section 5.4), and
- Reporting (Section 5.5).



5.1. Completion criteria

Table 3: Eglinton Offset Site completion criteria

Objective	Offset Site Value	Management measure	Item #	Completion Criteria	Completion target
Counterbalance the significant residual impact to 1.60 ha of Banksia Woodlands TEC.	To conserve, maintain and enhance 5.98 ha of Banksia Woodland TEC within a 7-ha portion of the Eglinton Offset Site.	Weed control within existing Banksia Woodland TEC.	A1	Achieve ≤ 20% weed cover within the 5.98 ha site.	End of year 5
		Removal of any rubbish material	A2	100% removal of existing rubbish within the site	End of year 1
		Perimeter fencing of offset site	A3	Establishment of all perimeter fences for Offset site (without restricting fauna movement) particularly in areas that abut non conservation areas.	End of year 1
		Conservation covenant	A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1
Counterbalance the significant residual impact to - 52.04 ha of Carnaby's Black Cockatoo foraging habitat, AND - 49.72 ha of Forest Red Tailed Black Cockatoo foraging habitat	To conserve, maintain and enhance 7 ha of foraging habitat within Eglinton Offset Site for Black Cockatoo species.	Pest control	B1	Management of all vertebrate pest species to protect any rehabilitation activities.	Annual for 5 years
		Firebreak management	B2	Maintenance of existing perimeter firebreaks	Annual for 5 years
		Weed control within offset site	B3	Achieve ≤ 20% weed cover within total 7 ha site.	End of year 5
		Seed Collection and Habitat protection	B4	Conserve, maintain and enhance the 7-ha site, to improve and protect the currently "excellent" condition site. Conservation activities will include collection of provenance seed to ensure a seed bank is available in case of contingency measures, and ≤ 20% weed cover with no declared weed species present.	End of year 5
Counterbalance the significant residual impact to 9.38 ha of Bush Forever within the pipeline Development Envelope (only 6.18 ha of vegetation)	To conserve, maintain and enhance 7 ha of Bush Forever within the site.	Landform management	C1	maintain 7 ha of Bush Forever to ensure connectivity between adjacent conservation areas.	Annual for 5 years
		Perimeter fencing of offset site	C2	Establishment of all perimeter fences for Offset site to prevent damage to vegetation values by unauthorised vehicle access.	Annual for 5 years



5.2. Management measures

Table 4: Eglinton Offset site management measures

Item #	Measure	Management actions
B4	Seed Collection	The revegetation contractor will collect seed from the site to develop a seed bank for use in restoration projects using provenance seed.
B4	Site preparation and rehabilitation	<p>If required, prior to initial rehabilitation works, based on advice from the revegetation contractor, the mechanical surface preparation will be implemented to facilitate revegetation.</p> <p>Where necessary, propagation of seedlings from the seed bank will occur in time for planting in the next available winter.</p> <p>Numbers and species for propagation and infill planting in subsequent years will be based on the results of spring monitoring.</p> <p>If possible direct seeding is to be carried out in autumn after the first significant seasonal rainfall.</p>
A1 & B3	Weed control	<p>Water Corporation will use authorised weed control operators (with experience in natural area weed control) to reduce weed coverage across the Offset Site.</p> <p>Weed management techniques include:</p> <ul style="list-style-type: none"> • Physical removal, • Application of herbicide, • Smothering (mulch or other), and • Other less chemical methods (steam).
A3 & C2	Fencing	Perimeter fencing will be managed to prevent unauthorised site access.
A4	Conservation covenant	Water Corporation will establish a conservation covenant or equivalent to protect the site in perpetuity.
A2	Rubbish removal	Any existing rubbish found within the site boundary will be removed.
B1	Pest control	The site will be assessed for pest species, such as rabbits and foxes. Where such species are found to be present, control measures will be implemented, such as baiting and humane traps.
C1 & C2	Land management	Water Corporation will ensure that vegetation in the proposed Bush Forever site is maintained in its current form. Site access will be managed to prevent damage from unauthorised access.
B2	Firebreaks	Firebreaks are to be maintained as per shire requirements to prevent unnecessary or frequent burning of the property.



5.3. Monitoring

Table 5: Eglinton Offset Site monitoring program

Item #	Completion Criteria	Completion target	Monitoring action	Responsibility	Frequency	Contingency Action
A1	Achieve ≤ 20% weed cover within the 5.98 ha site.	End of year 5	Weed survey	Water Corporation	- Baseline, - end of year 3, and - end of year 5	At year 3 survey, if target not met, implement additional intensive weed control methods.
A2	100% removal of existing rubbish within the site	End of year 1	Visual inspection	Water Corporation	- Annual	If additional rubbish identified during any surveys, rubbish removal contractor will be engaged.
A3	Establishment of all perimeter fences for Offset site (without restricting fauna movement) particularly in areas that abut non conservation areas.	End of year 1	Visual inspection	Water Corporation	- Annual	If damaged, maintain section where required.
A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1	Confirmation	Water Corporation	- end of year 1	Follow up until complete
B1	Management of all vertebrate pest species to protect any rehabilitation activities.	Annual for 5 years	Fauna monitoring program to establish baseline pest populations and control program.	Water Corporation	- Baseline, - end of year 3, and - end of year 5	If pest levels at year 3 above baseline, additional control program will be implemented (trapping, baiting etc)
B2	Maintenance of existing perimeter firebreaks	Annual for 5 years	Visual inspection	Water Corporation	- Annual	Annual firebreak maintenance as per shire requirements.
B3	Achieve ≤ 20% weed cover within total 7 ha site.	End of year 5	Weed survey	Water Corporation	- Baseline, - end of year 3, and - end of year 5	If monitoring in year 3 identifies that completion target is unlikely to be met at end of year 5, additional weed control is to be implemented. In case of fire or vandalism: <ul style="list-style-type: none"> Monitor the site closely after fire and adjust weed control schedule accordingly, Monitor weed and native species germination to establish site response to fire.
B4	Conserve, maintain and enhance the 7-ha site, to improve and protect the currently “excellent” condition site. - Conservation activities will include collection of provenance seed to ensure a seed bank is available in case of contingency measures, and ≤ 20% weed cover with no declared weed species present.	End of year 5	Vegetation survey	Water Corporation	Annually - End of spring	If annual monitoring in year 3 identifies that completion target is unlikely to be met at end of year 5, additional planting, weed control is to be implemented. In case of fire or vandalism: <ul style="list-style-type: none"> Monitor the site closely after fire and adjust weed control schedule accordingly, Monitor native species germination to establish site response to fire Additional infill planting if required.
C1	maintain 7 ha of Bush Forever to ensure connectivity between adjacent conservation areas.	Annual for 5 years	Visual inspection	Water Corporation	- Annual	In the event of unauthorised access of vandalism, replace fencing section as required
C2	Establishment of all perimeter fences for Offset site to prevent damage to vegetation values by unauthorised vehicle access.	Annual for 5 years	Visual inspection	Water Corporation	- Annual	If damaged, maintain section where required.



5.4. Management of uncertainty

The Eglinton Offset Site is proposed to be offsetting the impacts on:

- 5.98 ha of Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC) in excellent condition, however with no current management,
- 7 ha of high-quality foraging habitat for Black Cockatoos (both Forest Red-tailed and Carnaby's Black Cockatoo), and
- 7 ha of land for contribution to Bush Forever that will provide additional ecological linkages.

The data used to quantify the values at the offset site was taken from surveys undertaken by multiple consultants, but consolidated in 2021 by Stantec (Stantec, 2021) who used suitably qualified ecologists with over 10 years of experience undertaking vegetation and fauna habitat assessments in a range of bioregions within Western Australia. These reports were appended to the Environmental Review Document (ERD) as Appendix J and K.

Additional flora, vegetation and fauna surveys will be undertaken using similarly qualified consultants within the recommended survey periods to ensure accuracy of data.

Risks

The key risks to the success of the offset site are:

- Fire,
- Low rainfall years,
- Pest species impacts to rehabilitation and revegetation.

The above management and contingency measures address these risks. In the case where Water Corporation does not meet the completion criteria at the end of the expected management period, contingency measures will be implemented until success can be demonstrated.

A risk assessment of the likely risk events and circumstances that could impact the success of the offset site have been addressed in Table 6. The risk rating is calculated using Appendix B.



Table 6: Risk assessment

Item #	Completion Criteria	Completion target	Management action	Risk Event / Circumstance	likelihood	Conseq.	Risk rating	Controls
A1	Achieve ≤ 20% weed cover within the 5.98 ha site.	End of year 5	Weed control within existing Banksia Woodland TEC.	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Additional weed management
				Fire	Possible	Minor	Low	Maintain firebreaks
A2	100% removal of existing rubbish within the site	End of year 1	Removal of any rubbish material	Illegal dumping	Unlikely	Minor	Low	Maintain fencing
A3	Establishment of all perimeter fences for Offset site.	End of year 1	Perimeter fencing of offset site	Unauthorised access	Unlikely	Moderate	Low	Maintain fencing
A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1	Conservation covenant	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Expedite process
B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years	Pest control	Rabbit/kangaroo population boom	Possible	Minor	Low	Pest control and additional tree guards on new planting
				Insect plague	Unlikely	Minor	Low	Regular site inspections and pest management
B2	Maintenance of existing perimeter firebreaks	Annual for 5 years	Firebreak management	Fire	Possible	Minor	Low	Maintain firebreaks
B3	Achieve ≤ 20% weed cover within total 7 ha site.	End of year 5	Weed control within offset site	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Additional weed management
				Fire	Possible	Minor	Low	Maintain firebreaks
B4	Conserve, maintain and enhance the 7-ha site, to improve and protect the currently “excellent” condition site. - Conservation activities will include collection of provenance seed to ensure a seed bank is available in case of contingency measures, and ≤ 20% weed cover with no declared weed species present.	End of year 5	Seed Collection and Habitat protection	Failure to meet criteria in timeframe	Possible	Moderate	Medium	Additional revegetation
				Fire	Possible	Moderate	Medium	Maintain firebreaks
				Low rainfall	Possible	Moderate	Medium	Additional revegetation
				Vandalism / illegal access	Unlikely	Minor	Low	Maintain fencing
C1	maintain 7 ha of Bush Forever to ensure connectivity between adjacent conservation areas.	Annual for 5 years	Land management	Unauthorised access	Unlikely	Moderate	Low	Maintain fencing
C2	Establishment of all perimeter fences for Offset site to prevent damage to vegetation values by unauthorised vehicle access.	Annual for 5 years	Perimeter fencing of offset site	Unauthorised access	Unlikely	Moderate	Low	Maintain fencing



5.5. Reporting

An offset compliance report will be provided to the Department of Water and Environmental Regulation and the Department of Climate Change, Energy and Water at **Year 5** to demonstrate completion of the offset management plan, or any remaining actions.

The Report will use the template Audit Table provided in Appendix C.



6. References

DBCA 2020, Wetland Evaluation Swan Coastal Plain 2020, (reference to Map 3 for Conservation Category Wetlands)

DAWE 2022, Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo, Department of Agriculture, Water and the Environment, Canberra, February.

Stantec, 2021, ASDP - Flora and Vegetation Consolidation Report

Stantec, 2021b, ASDP – Terrestrial Fauna Consolidation Report



7. Appendices



Appendix A – Declaration of Accuracy

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Management Plan (*use correct title of signed document*) is complete, current and correct.
2. I am the designated proponent or the approval holder for this action.
3. I am aware that:
 - a. Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999*(Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
 - b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.
 - c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed

Full name (please print)

Organisation (please print)

Date / /



Appendix B – Risk Rating Assessment

Table 1: Risk Framework

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

Table 2: Likelihood and consequence

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical	The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.



Appendix C – Audit Table



APPENDIX C – COMPLIANCE AUDIT TABLE

Objective	Offset Site Value	Management measure	Item #	Completion Criteria	Completion target	Status	Evidence
Counterbalance the significant residual impact to 1.60 ha of Banksia Woodlands TEC.	To conserve, maintain and enhance 5.98 ha of Banksia Woodland TEC within a 7-ha portion of the Eglinton Offset Site.	Weed control within existing Banksia Woodland TEC.	A1	Achieve ≤ 20% weed cover within the 5.98 ha site.	End of year 5		
		Removal of any rubbish material	A2	100% removal of existing rubbish within the site	End of year 1		
		Perimeter fencing of offset site	A3	Establishment of all perimeter fences for Offset site (without restricting fauna movement) particularly in areas that abut non conservation areas.	End of year 1		
		Conservation covenant	A4	Establishment of conservation covenant or equivalent to protect the site in perpetuity.	End of year 1		
Counterbalance the significant residual impact to - 52.04 ha of Carnaby's Black Cockatoo foraging habitat, AND - 49.72 ha of Forest Red Tailed Black Cockatoo foraging habitat	To conserve, maintain and enhance 7 ha of foraging habitat within Eglinton Offset Site for Black Cockatoo species.	Pest control	B1	Management of all vertebrate pest species to protect any rehabilitation activities.	Annual for 5 years		
		Firebreak management	B2	Maintenance of existing perimeter firebreaks	Annual for 5 years		
		Weed control within offset site	B3	Achieve ≤ 20% weed cover within total 7 ha site.	End of year 5		
		Seed Collection and Habitat protection	B4	Conserve, maintain and enhance the 7-ha site, to improve and protect the currently "excellent" condition site. - Conservation activities will include collection of provenance seed to ensure a seed bank is available in case of contingency measures, and ≤ 20% weed cover with no declared weed species present.	End of year 5		
Counterbalance the significant residual impact to 9.38 ha of Bush Forever within the pipeline Development Envelope (only 6.18 ha of vegetation)	To conserve, maintain and enhance 7 ha of Bush Forever within the site.	Landform management	C1	maintain 7 ha of Bush Forever to ensure connectivity between adjacent conservation areas.	Annual for 5 years		
		Perimeter fencing of offset site	C2	Establishment of all perimeter fences for Offset site to prevent damage to vegetation values by unauthorised vehicle access.	Annual for 5 years		

Neergabby Offset Site

Offset Management Plan





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1. Summary

The Alkimos Offset Strategy was developed to identify the proposed strategy to counterbalance the Alkimos Seawater Desalination Plant Project’s significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

There are 4 offset sites proposed, including the:

- Alkimos Offset Site,
- Carabooda Tank Offset Site,
- **Neergabby Offset Site**, and
- Eglinton Offset Site.

This Offset Management Plan provides specific content in relation to the Neergabby Offset Site.

A summary of the Neergabby Offset Site details is shown in Table 1.

Table 1: Summary of Project Details

EPBC referral number	2019/8543
Offset name	Neergabby Offset Site
Location	Lot 1934 Gingin Brook Road (331ha) and Lot 58 Gingin Brook Road (204ha), Neergabby
Offset characteristics	<ul style="list-style-type: none"> • 449 ha of high value foraging habitat for Black Cockatoos. Also valued as Excellent quality Banksia Woodland TEC. • 420 trees confirmed as potential nesting habitat for three threatened black cockatoo species (within Lot 1934). • 58 hollows were identified within 29 trees. • 10 hollows were potentially suitable for Black Cockatoos (contained within 5 trees) • 16 hollows (within 11 trees) were occupied by bees.
Additional value added	<ul style="list-style-type: none"> • Rehabilitation of 70 ha of Degraded to Completely degraded land.
Mechanism to protect	<ul style="list-style-type: none"> • Transfer to the conservation estate

A Declaration of the accuracy of this report is provided in Appendix A.



2. Project Overview

Water Corporation is proposing to build and operate the Alkimos Seawater Desalination Plant (ASDP) within a 220 ha Public Purpose Reserve, owned by the Water Corporation, (Lot 3000) adjacent to the existing Alkimos Wastewater Treatment Plant.

Alkimos is located approximately 40 km northwest of the Perth central business district (CBD) in the northwest corridor, north of Quinns Rock beach and south of Yanchep beach. The ASDP project also includes marine works and infrastructure, a groundwater treatment plant and the integration pipeline connecting the desalination plant to Wanneroo Reservoir.

Following the application of avoidance, minimisation and mitigation measures, there are several activities associated with the Proposal that have the potential to result in a significant residual impact to *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and *Biodiversity Conservation Act 2016* (WA) listed species and communities, including:

- *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC),
- Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain TEC,
- *Melaleuca huegelii*-*Melaleuca systema* shrublands on limestone ridges TEC (SCP26a),
- Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*),
- Landforms within Public Purposes Reserve in the Alkimos Water Precinct (reserved for conservation), and
- Bush Forever.

The Alkimos Offset Strategy (Revision 4) was developed to identify the proposed strategy to counterbalance the Proposal's significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

The Alkimos Offset Strategy details that the Neergabby Offset sites are proposed to offset the impacts to *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC) and Black Cockatoo species (Carnaby's Cockatoo *Zanda latirostris* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*).

This Offset Management Plan provides specific content in relation to the Neergabby Offset Sites.



3. Neergabby Offset Sites

The two Neergabby offset properties are located 15 km east of Guilderton as shown in Figure 3-1.



Figure 3-1 – Neergabby Offset Sites - Location



3.1. Lot 1934 Gingin Brook Road, Neergabby - Setting

Lot 1934 Gingin Brook Road is a 371 hectare is currently zoned rural and is predominantly vegetated with approximately 74 ha of cleared or partially cleared land (trees retained).

Reconnaissance surveys undertaken by the Department of Biodiversity, Conservation and Attractions (DBCA) in 2021 identified that the lot contained approximately:

- 289 ha of excellent condition Banksia Woodland (meets criteria for the *Banksia* Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC)).
- 1.3 ha of good to very good Banksia Woodland,
- 7 ha of Marri (*Corymbia calophylla*) / Banksia Woodland,
- 0.2 ha of wetland vegetation, and
- 74 ha of cleared areas in Completely Degraded or Degraded condition (trees retained in some sections)

Using the Black Cockatoo foraging habitat assessment in the DAWE, 2022 Guidance for Carnaby's and Forest Red-Tailed Black Cockatoo species, the Banksia Woodland areas would be considered high value. More intensive baseline assessments will be undertaken to calculate a more accurate value. However, Banksia Woodland is expected to remain high value foraging habitat.

There are some areas of weed infestation within the property, particularly the degraded areas and land adjacent to road verges and vehicle tracks. Weed species include *Hyparrhenia Hirta* (Tambookie grass), *Cirsium vulgare* (Spear thistle), *Citrullus amarus* (Pie melon) and *Erharta calycina* (Veldt grass).

Firebreaks are well established and maintained. Fences surrounding the property are in suitable condition with gates.

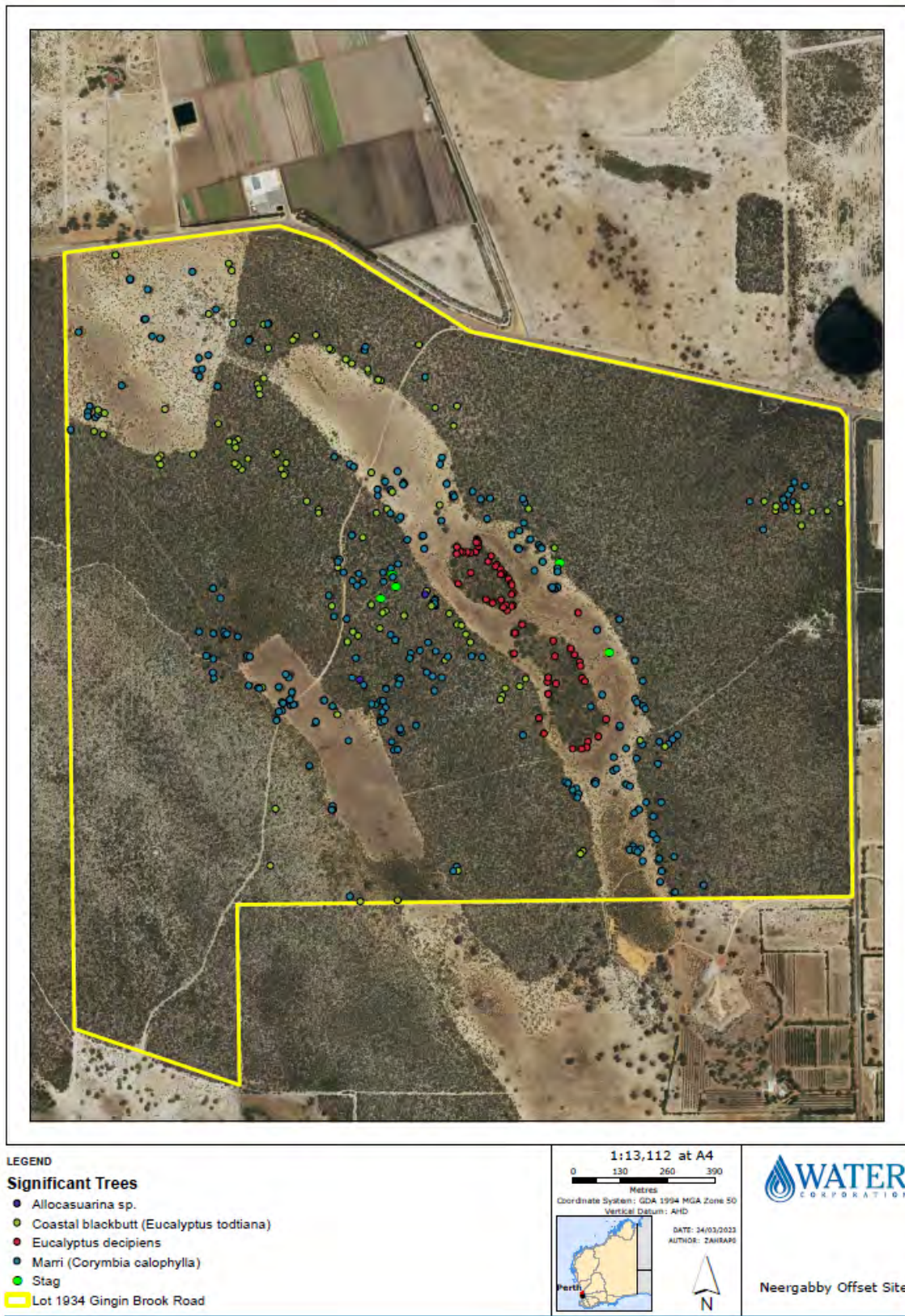


Figure 3-3 identifies the environmental values of the offset site.



LEGEND

- Banksia Woodland TEC
- Wetland
- Marri Banksia Woodland
- Degraded
- Lot 1934 Gingin Brook Road

1:13,000 at A4

Metres

Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD

DATE: 23/03/2023
AUTHOR: ZAHRAPO



Neergabby Offset Site

Figure 3-2 – Lot 1934 Gingin Brook Road, Neergabby - Environmental Values



Figure 3-3 - Lot 1934 Gingin Brook Road, Neergabby - Environmental Values (significant trees)



3.2. Lot 58 Gingin Brook Road, Neergabby - Setting

Lot 58 Gingin Brook Road is a 204.5 hectare property approximately 15 km east of Guilderton. The property is currently zoned rural and is predominantly vegetated with approximately 2.2 ha of partially cleared land.

Reconnaissance surveys undertaken in 2021 identified that the lot contained approximately:

- 160 ha of excellent condition Banksia Woodland (meets criteria for the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC)).
- 25 ha of transitional *Banksia / Melaleuca* Woodland in Very Good condition,
- 17.3 ha of a wetland basin dampland vegetation community, consisting of *Melaleuca preissiana* and *Banksia littoralis* (Swamp Banksia) in good to excellent condition (mapped as a Conservation Category Wetland in the Wetland Evaluation Swan Coastal Plain 2020, Map 3), and
- 2.2 ha of cleared or Degraded land.

The condition of the Banksia woodland is Excellent with few weeds observed. The Transitional Banksia/Melaleuca community is more disturbed and well used by kangaroos and is recorded as Very Good condition.

Using the Black Cockatoo foraging habitat assessment in the DAWE, 2022 Guidance for Carnaby's and Forest Red-Tailed Black Cockatoo species, the Banksia Woodland areas would be considered high value. More intensive baseline assessments will be undertaken to calculate a more accurate value. However, Banksia Woodland is expected to remain high value foraging habitat.

The Banksia Woodland and Transitional Banksia/Melaleuca Woodland are considered suitable foraging vegetation for both Black Cockatoos species. Occasional *Corymbia calophylla* (Marri) trees occur on the property, which are suitable for foraging and potential roosting.

There are some areas of weed infestation within the property, particularly the degraded areas and land adjacent to road verges and vehicle tracks. Weed species include *Hyparrhenia Hirta* (Tambookie grass), *Cirsium vulgare* (Spear thistle), *Citrullus amarus* (Pie melon) and *Erharta calycina* (Veldt grass).

Firebreaks are well established and maintained. Fences surrounding the property are in suitable condition with some maintenance required.

Figure 3-4 identifies the environmental values of the offset site.



Figure 3-4 - Lot 58 Gingin Brook Road, Neergabby - Environmental Values



4. Proposed Offset Quantification

Table 2: Alkimos Project Offset Strategy Summary Table

Environmental value (listing)	Total Quantum of Impact (Adjusted area in brackets)	Offset site (Primary offset value in brackets)	Percentage of offset met
<i>Banksia</i> Woodlands of the Swan Coastal Plain (TEC - Cth)	1.60 ha (1.12 ha)	7 ha Eglinton Site (5.98 ha Banksia TEC)	50%
		371 ha Neergabby site (Lot 1934) (289 ha of Banksia Woodland)	Greater than 50%
<i>Tuart</i> (<i>Eucalyptus gomphocephala</i>) woodlands and forest of the Swan Coastal Plain (TEC - Cth)	1.16 ha (0.81 ha)	9.01 ha Alkimos Site (4.91 ha Tuart TEC)	104%
<i>Melaleuca huegelii</i> - <i>Melaleuca systena</i> shrublands on limestone ridges (TEC - WA)	1.03 ha (0.72 ha)	3.1 ha Carabooda Tank Site (3.1 ha Melaleuca TEC)	113%
Bush Forever (WA)	9.38 ha (6.18 ha)	7 ha Eglinton Site (7 ha of Bush Forever)	113%
Public Purposes Reserve - Area 10b (Alkimos Dune Complex - WA)	5.17 ha	9.01 ha Alkimos Site (7.5 ha of Alkimos Dune Complex)	145%
Carnaby's Cockatoo Foraging habitat (Endangered - Cth)	52.04 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (449 ha of BC foraging habitat) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	81%
			23%
		Research Project (Black Cockatoo Research)	5%
Forest Red Tailed Black Cockatoo Foraging habitat (Vulnerable - Cth)	49.72 ha	7 ha Eglinton Site (7 ha of BC foraging habitat)	1.27%
		3.1 ha Carabooda Tank Site (3.1 ha of BC foraging habitat)	0.89%
		9.01 ha Alkimos Site (3.6 ha of BC foraging habitat)	0.3%
		Neergabby sites (Lot 58 and 1934) (449 ha of BC foraging habitat) (Lot 1934) (70 ha of BC foraging habitat - revegetation)	89%
			27%
		Research Project (Black Cockatoo Research)	5%
Black Cockatoo species - Significant trees	104 trees (8 Hollows)	Neergabby sites (Lot 1934) (420 significant trees, with 10 hollows suitable for BC breeding) (Including 25 artificial nesting boxes)	200%



5. Offset Management

Section 5 outlines the:

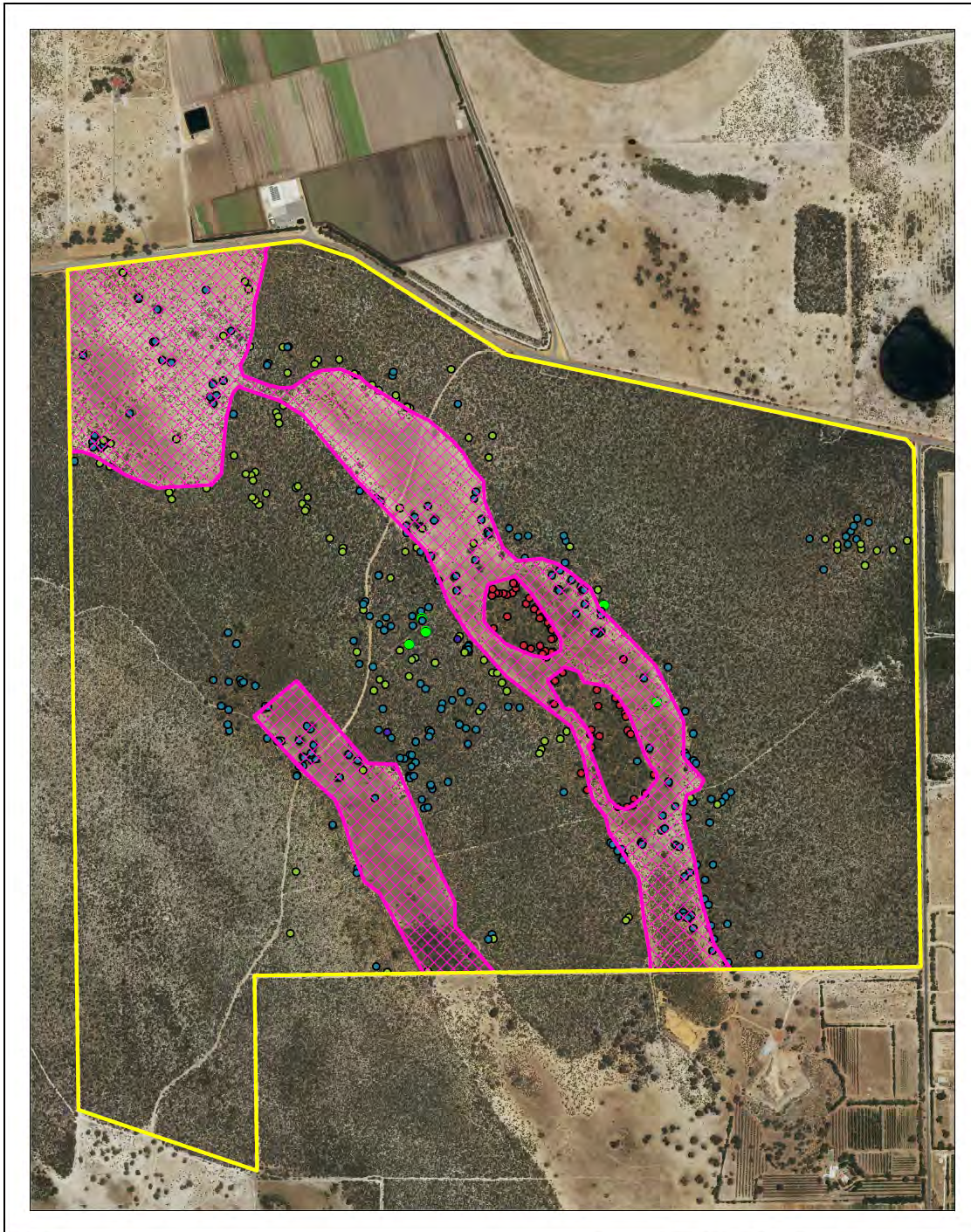
- Completion Criteria proposed for the Neergabby Offset Site (Section 5.1),
- Management Measures (Section 5.2),
- Monitoring program (Section 5.3),
- Management of uncertainty, including risk assessment (Section 5.4), and
- Reporting (Section 5.5).



5.1. Completion criteria

Table 3: Neergabby site completion criteria

Objective	Offset Site Value	Management measure	Item #	Completion Criteria	Completion target
Counterbalance the significant residual impact to 2.32 ha of Banksia Woodlands TEC.	To conserve, maintain and enhance 289 ha of Banksia Woodland TEC on Lot 1934.	Weed control within existing Banksia Woodland TEC.	A1	Achieve ≤ 20% weed cover in 10m perimeter of Banksia Woodland TEC. (5m either side of mapped boundary)	End of year 5
		Removal of any rubbish material	A2	100% removal of existing rubbish within the site	End of year 1
		Dieback control at site access points.	A3	Establishment and maintenance of dieback cleaning stations at key site entry points.	End of year 1
		Perimeter fencing of offset site	A4	Re-establishment of all perimeter fences for Lot 1934 and Lot 58.	End of year 1
Counterbalance the significant residual impact to - 52.04 ha of Carnaby's Black Cockatoo foraging habitat, AND - 49.72 ha of Forest Red Tailed Black Cockatoo foraging habitat	To conserve, maintain and enhance 449 ha of Banksia Woodland on both Lot 1934 and L58. AND To revegetate 70 ha of Black Cockatoo foraging habitat on Lot 1934 as shown in Figure 5-1.	Pest control	B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years
		Dieback control at site access points.	B2	Establishment and maintenance of dieback cleaning stations at key site entry points.	End of year 1
		Firebreak management	B3	maintenance of existing perimeter firebreaks	Annual for 5 years
		Weed control within planted Foraging habitat.	B4	Achieve ≤ 20% weed cover in weed cover within 70ha revegetation areas.	End of year 5
		Seed Collection and Habitat creation	B5	Revegetation of 70ha of degraded land to include key Black Cockatoo foraging species, collected from species naturally occurring on the site, to achieve at least 50% vegetation cover.	End of year 5
Counterbalance the significant residual impact to 104 significant trees for Black Cockatoo species (breeding)	To conserve, maintain and enhance breeding habitat in 400 significant trees within Lot 1934.	Habitat enhancement	C1	Provide 25 artificial nesting boxes for potential Black Cockatoo breeding	End of year 1
		Habitat enhancement	C2	Maintain 25 artificial nesting boxes for potential Black Cockatoo breeding for first 5 years.	Annual for 5 years
		Pest control	C3	Removal of feral beehives from existing hollows annually, 2 weeks prior to known breeding season.	Annual for 5 years



LEGEND

- Lot 1934 Gingin Brook Road
- Revegetation area (70ha)

Significant Trees

- Allocasuarina sp.
- Coastal blackbutt (*Eucalyptus todtiana*)
- Eucalyptus decipiens*
- Marri (*Corymbia calophylla*)
- Stag

1:13,112 at A4

Metres

Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD

DATE: 6/04/2023
AUTHOR: ZAHRAPO



Neergabby Offset Site

Figure 5-1 – Lot 1934 Gingin Brook Road, Neergabby - Revegetation areas



5.2. Management measures

Table 4: Neergabby site management measures

Item #	Measure	Management actions
B5	Seed Collection	Immediately following property acquisition the revegetation contractor will collect seed from the site to develop a seed bank for use in restoration projects using provenance seed.
B5	Site preparation and revegetation	<p>If required, prior to initial revegetation works, based on advice from the revegetation contractor, the mechanical surface preparation will be implemented to facilitate revegetation.</p> <p>Where necessary, propagation of seedlings from the seed bank will occur in time for planting in the next available winter.</p> <p>Numbers and species for propagation and infill planting in subsequent years will be based on the results of spring monitoring.</p> <p>If possible direct seeding is to be carried out in autumn after the first significant seasonal rainfall.</p>
A1 & B4	Weed control	<p>Immediately following property acquisition Water Corporation will use authorised weed control operators (with experience in natural area weed control) to reduce weed coverage in the proposed revegetation sites and surrounding the offset site.</p> <p>Weed management techniques include:</p> <ul style="list-style-type: none"> • Physical removal, • Application of herbicide, • Smothering (mulch or other), and • Other less chemical methods (steam).
A3 & B2	Dieback control	The site will be assessed for dieback, with management measures to be implemented in accordance with the future land manager (DBCA).
A4 & B5	Fencing	<p>In consultation with future land manager (DBCA), perimeter fencing will be managed to prevent unauthorised site access.</p> <p>Internal temporary fencing may be implemented to prevent fauna impacts to planted vegetation. (if individual tree guards not efficient)</p> <p>Where this applies, the revegetation contractor will install a 0.9 m high rabbit proof skirt with a 90° bend, with the upper 600 mm clipped to the fence at 300 mm centres and the bottom 300 mm pinned flat on the ground on the outside of the fence to exclude rabbits.</p>
B1 & C3	Pest control	<p>For the first 5 years of offset management, the site will be assessed for pest species, such as rabbits and foxes. Where such species are found to be present, control measures will be implemented, such as baiting and humane traps (to be implemented in accordance with the future land manager advice, DBCA).</p> <p>Where tree hollows were found to contain European Honeybees, a specialist apiarist will be engaged to confirm the species and relocate bees (to allow use by Black Cockatoos).</p>



Item #	Measure	Management actions
C1 & C2	Habitat enhancement	<p>Immediately following property acquisition, Water Corporation will contract the acquisition of additional Black Cockatoo breeding nesting hollows for installation within the site.</p> <p>Each artificial hollow site will be selected on advice of suitably qualified expert, on the advice of DBCA. Trees selected for artificial hollows should be within the Neergabby site, in mature trees, in shaded locations and adjacent to foraging habitat.</p>
B3	Firebreaks	<p>For the first 5 years of offset management, Firebreaks are to be maintained as per shire requirements to prevent unnecessary or frequent burning of the property on the advice of the future land manager advice (DBCA).</p>



5.3. Monitoring

Table 5: Neergabby site monitoring program

Item #	Completion Criteria	Completion target	Monitoring action	Responsibility	Frequency	Contingency Action
A1	Achieve ≤ 20% weed cover in in 10m perimeter of Banksia Woodland TEC areas, with no declared weed species present. (5m either side of mapped boundary)	End of year 5	Weed survey	Water Corporation	- Baseline, - end of year 3, and - end of year 5	At year 3 survey, if target not met, implement additional intensive weed control methods.
A2	100% removal of existing rubbish within the site	End of year 1	Visual inspection	Water Corporation	- Baseline, and - end of year 5	If additional rubbish identified during any surveys, rubbish removal contractor will be engaged.
A3	Establishment and maintenance of dieback cleaning stations at key site entry points.	End of year 1	Dieback survey To confirm dieback has not been introduced or spread within the site.	Water Corporation	- Baseline dieback survey, - end of year 5	If dieback is found in baseline, increase survey to map dieback occurrence and develop site specific management plan in accordance with DBCA guidance.
A4	Re-establishment of all perimeter fences for Lot 1934 and Lot 58.	End of year 1	Visual inspection	Water Corporation	- Annual	Maintain section if required.
B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years	Fauna monitoring program to establish baseline pest populations and control program.	Water Corporation	- Baseline, - end of year 3, and - end of year 5	If pest levels at year 3 above baseline, additional control program will be implemented (trapping, baiting etc)
B2	Establishment and maintenance of dieback cleaning stations at key site entry points.	End of year 1	Dieback survey To confirm dieback has not been introduced or spread within the site.	Water Corporation	- Baseline dieback survey, - end of year 5	If dieback is found in baseline, increase survey to map dieback occurrence and develop site specific management plan in accordance with DBCA guidance.
B3	maintenance of existing perimeter firebreaks	Annual for 5 years	Visual inspection	Water Corporation	- Annual	Annual firebreak maintenance as per shire requirements.
B4	Achieve ≤ 20% weed cover within 70ha revegetation areas, with no declared weed species present.	End of year 5	Weed survey	Water Corporation	- Baseline, - end of year 3, and - end of year 5	If monitoring in year 3 identifies that completion target is unlikely to be met at end of year 5, additional weed control is to be implemented. In case of fire or vandalism: <ul style="list-style-type: none"> • Monitor the site closely after fire and adjust weed control schedule accordingly, Monitor weed and native species germination to establish site response to fire.



Item #	Completion Criteria	Completion target	Monitoring action	Responsibility	Frequency	Contingency Action
B5	<p>Revegetation of 70ha of degraded land to include key Black Cockatoo foraging species, collected from species naturally occurring on the site, to achieve:</p> <ul style="list-style-type: none"> - at least 50% vegetation cover. - 70% richness of species used, in and around each monitoring quadrat. - ≤ 20% weed cover, with no declared weed species present. 	End of year 5	Vegetation survey	Water Corporation	Annually - End of spring	<p>If annual monitoring in year 3 identifies that completion target is unlikely to be met at end of year 5, additional planting, weed control is to be implemented.</p> <p>In case of fire or vandalism:</p> <ul style="list-style-type: none"> • Monitor the site closely after fire and adjust weed control schedule accordingly, • Monitor native species germination to establish site response to fire • Additional infill planting if required.
C1	Provide 25 artificial nesting boxes for potential Black Cockatoo breeding	End of year 1	n/a	n/a	n/a	<p>In the event of fire or vandalism:</p> <ul style="list-style-type: none"> • Replace damaged nesting boxes.
C2	Maintain 25 artificial nesting boxes for potential Black Cockatoo breeding for first 5 years.	Annual for 5 years	Visual inspection	Water Corporation	Annually – in month prior to breeding time	Annual monitoring of nesting boxes to ensure accessible for breeding accessible. (no bee hives, other nests, damage)
C3	Removal of feral beehives from existing hollows annually, 2 weeks prior to known breeding season.	Annual for 5 years	Visual inspection	Water Corporation	Annually – in month prior to breeding time	<p>Annual monitoring of identified existing hollows to ensure accessible for breeding accessible.</p> <p>If feral beehives are present at time of inspection, Water Corporation will engage a bee removal expert 2 weeks before breeding begins.</p>



5.4. Management of uncertainty

The Neergabby Site is proposed to be offsetting the impacts on:

- Carnaby's Black Cockatoo (Foraging habitat and breeding trees),
- Forrest Red Tailed Black Cockatoo (Foraging habitat and breeding trees), and
- Banksia Woodland of the Swan Coastal Plain TEC.

The data used to quantify the values at the offset site is taken from surveys undertaken by DBCA officers and a targeted tree survey by 360 Environmental, both suitably qualified ecologists with over 10 years of experience undertaking vegetation and fauna habitat assessments in a range of bioregions within Western Australia. These reports are provided in Appendix B.

Additional flora, vegetation and fauna surveys will be undertaken using similarly qualified consultants within the recommended survey periods to ensure accuracy of data.

Risks

The key risks to the success of the offset site are:

- Fire,
- Low rainfall years,
- Pest species impacts to revegetation and tree hollows.

The above management and contingency measures address these risks. In the case where Water Corporation does not meet the completion criteria at the end of the expected management period, contingency measures will be implemented until success can be demonstrated.

A risk assessment of the likely risk events and circumstances that could impact the success of the offset site have been addressed in Table 6. The risk rating is calculated using Appendix C.



Table 6: Risk assessment

Item #	Completion Criteria	Completion target	Management action	Risk Event / Circumstance	likelihood	Conseq.	Risk rating	Controls
A1	Achieve $\leq 20\%$ weed cover in in 10m perimeter of Banksia Woodland TEC areas, with no declared weed species present. (5m either side of mapped boundary)	End of year 5	Weed control within existing Banksia Woodland TEC.	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Additional weed management
				Fire	Possible	Minor	Low	Maintain firebreaks
A2	100% removal of existing rubbish within the site	End of year 1	Removal of any rubbish material	Illegal dumping	Unlikely	Minor	Low	Maintain fencing
A3	Establishment and maintenance of dieback cleaning stations at key site entry points.	End of year 1	Dieback control at site access points.	Introduction of dieback	Unlikely	Moderate	Low	Baseline surveys and access management (control points)
A4	Re-establishment of all perimeter fences for Lot 1934 and Lot 58.	End of year 1	Perimeter fencing of offset site	Fire	Possible	Minor	Low	Maintain firebreaks
				Vandalism	Unlikely	Minor	Low	Regular site inspections
B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years	Pest control	Rabbit population boom	Unlikely	Minor	Low	Fencing around revegetation
				Insect plague	Unlikely	Minor	Low	Regular site inspections and pest management
B2	Establishment and maintenance of dieback cleaning stations at key site entry points.	End of year 1	Dieback control at site access points.	Introduction of dieback	Unlikely	Moderate	Low	Baseline surveys and access management (control points)
B3	Maintenance of existing perimeter firebreaks	Annual for 5 years	Firebreak management	Weed growth in firebreak (reducing effectiveness of firebreak)	Unlikely	Moderate	Low	Regular site inspections
B4	Achieve $\leq 20\%$ weed cover in within 70ha revegetation areas, with no declared weed species present (from baseline).	End of year 5	Weed control within planted Foraging habitat.	Failure to meet criteria in timeframe	Unlikely	Minor	Low	Additional weed management
				Fire	Possible	Minor	Low	Maintain firebreaks
B5	Revegetation of 70ha of degraded land to include key Black Cockatoo foraging species, collected from species naturally occurring on the site, to achieve: <ul style="list-style-type: none"> - at least 50% vegetation cover. - 70% richness of species used, in and around each monitoring quadrat. - $\leq 20\%$ weed cover, with no declared weed species present. 	End of year 5	Seed Collection and Habitat creation	Failure to meet criteria in timeframe	Possible	Moderate	Medium	Additional revegetation
				Fire	Possible	Moderate	Medium	Maintain firebreaks
				Low rainfall	Possible	Moderate	Medium	Additional revegetation
				Vandalism / illegal access	Unlikely	Minor	Low	Maintain fencing
C1	Provide 25 artificial nesting boxes for potential Black Cockatoo breeding	End of year 1	Habitat enhancement	Fire	Possible	Moderate	Medium	Maintain firebreaks
				Pest usage (bees, other bird species)	Possible	Minor	Low	Regular site inspections
C2	Maintain 25 artificial nesting boxes for potential Black Cockatoo breeding for first 5 years.	Annual for 5 years	Habitat enhancement	Fire	Possible	Moderate	Medium	Maintain firebreaks
				Pest usage (bees, other bird species)	Possible	Minor	Low	Regular site inspections
C3	Removal of feral beehives from existing hollows annually, 2 weeks prior to known breeding season.	Annual for 5 years	Pest control	Availability of pest controllers prior to breeding season	Unlikely	Minor	Low	Ensure multiple contractors available



5.5. Reporting

An offset compliance report will be provided to the Department of Water and Environmental Regulation and the Department of Climate Change, Energy and Water at **Year 5** to demonstrate completion of the offset management plan, or any remaining actions.

The Report will use the template Audit Table provided in Appendix D.



6. References

DBCA 2020, Wetland Evaluation Swan Coastal Plain 2020, (reference to Map 3 for Conservation Category Wetlands)

DAWE 2022, Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo, Department of Agriculture, Water and the Environment, Canberra, February.



7. Appendices



Appendix A – Declaration of Accuracy

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Management Plan (*use correct title of signed document*) is complete, current and correct.
2. I am the designated proponent or the approval holder for this action.
3. I am aware that:
 - a. Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999*(Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
 - b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.
 - c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed

Full name (please print)

Organisation (please print)

Date / /



Appendix B – Neergabby Offset Sites Surveys



Appendix C – Risk Rating Assessment

Table 1: Risk Framework

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

Table 2: Likelihood and consequence

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical	The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.



Appendix D – Audit Table



APPENDIX D – COMPLIANCE AUDIT TABLE

Objective	Offset Site Value	Management measure	Item #	Completion Criteria	Completion target	Status	Evidence
Counterbalance the significant residual impact to 2.32 ha of Banksia Woodlands TEC.	To conserve, maintain and enhance 289 ha of Banksia Woodland TEC on Lot 1934.	Weed control within existing Banksia Woodland TEC.	A1	Achieve ≤ 20% weed cover in 10m perimeter of Banksia Woodland TEC from baseline. (5m either side of mapped boundary)	End of year 5		
		Removal of any rubbish material	A2	100% removal of existing rubbish within the site	End of year 1		
		Dieback control at site access points.	A3	Establishment and maintenance of dieback cleaning stations at key site entry points.	End of year 1		
		Perimeter fencing of offset site	A4	Re-establishment of all perimeter fences for Lot 1934 and Lot 58.	End of year 1		
Counterbalance the significant residual impact to - 52.04 ha of Carnaby's Black Cockatoo foraging habitat, AND - 49.72 ha of Forest Red Tailed Black Cockatoo foraging habitat	To conserve, maintain and enhance 449 ha of Banksia Woodland on both Lot 1934 and L58.	Pest control	B1	Management of all vertebrate pest species to protect rehabilitation.	Annual for 5 years		
		Dieback control at site access points.	B2	Establishment and maintenance of dieback cleaning stations at key site entry points.	End of year 1		
	AND	Firebreak management	B3	maintenance of existing perimeter firebreaks	Annual for 5 years		
	To revegetate 70 ha of Black Cockatoo foraging habitat on Lot 1934.	Weed control within planted Foraging habitat.	B4	Achieve ≤ 20% weed cover within 70ha revegetation areas (from baseline).	End of year 5		
		Seed Collection and Habitat creation	B5	Revegetation of 70ha of degraded land to include key Black Cockatoo foraging species, collected from species naturally occurring on the site, to achieve at least 50% vegetation cover.	End of year 5		
Counterbalance the significant residual impact to 104 significant trees for Black Cockatoo species (breeding)	To conserve, maintain and enhance breeding habitat in 400 significant trees within Lot 1934.	Habitat enhancement	C1	Provide 25 artificial nesting boxes for potential Black Cockatoo breeding	End of year 1		
		Habitat enhancement	C2	Maintain 25 artificial nesting boxes for potential Black Cockatoo breeding for first 5 years.	Annual for 5 years		
		Pest control	C3	Removal of feral beehives from existing hollows annually, 2 weeks prior to known breeding season.	Annual for 5 years		