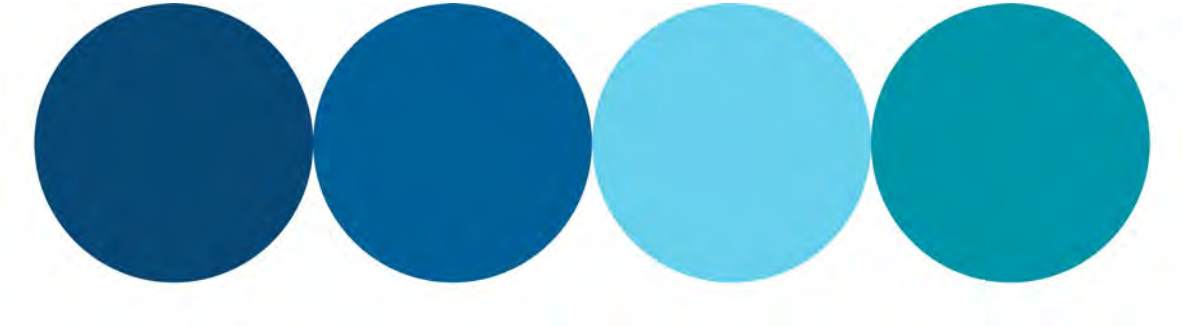


Alkimos Seawater Desalination Plant

Offset Strategy

November 2023





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1 Introduction

Water Corporation has updated this Offset Strategy following the publishing of EPA Report 1739 for the Alkimos Seawater Desalination Plant (ASDP) in May 2023, and subsequent Ministerial Statement 1207 (August 2023).

The ASDP ERD indicates a significant residual impact may result through the implementation of the Alkimos 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), as shown in Figure 1-1.

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 6 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

Condition B8 and C1-1(4) of Ministerial Statement 1207 requires an Offset Strategy be provided to the CEO for approval prior to ground disturbing activities occurring.

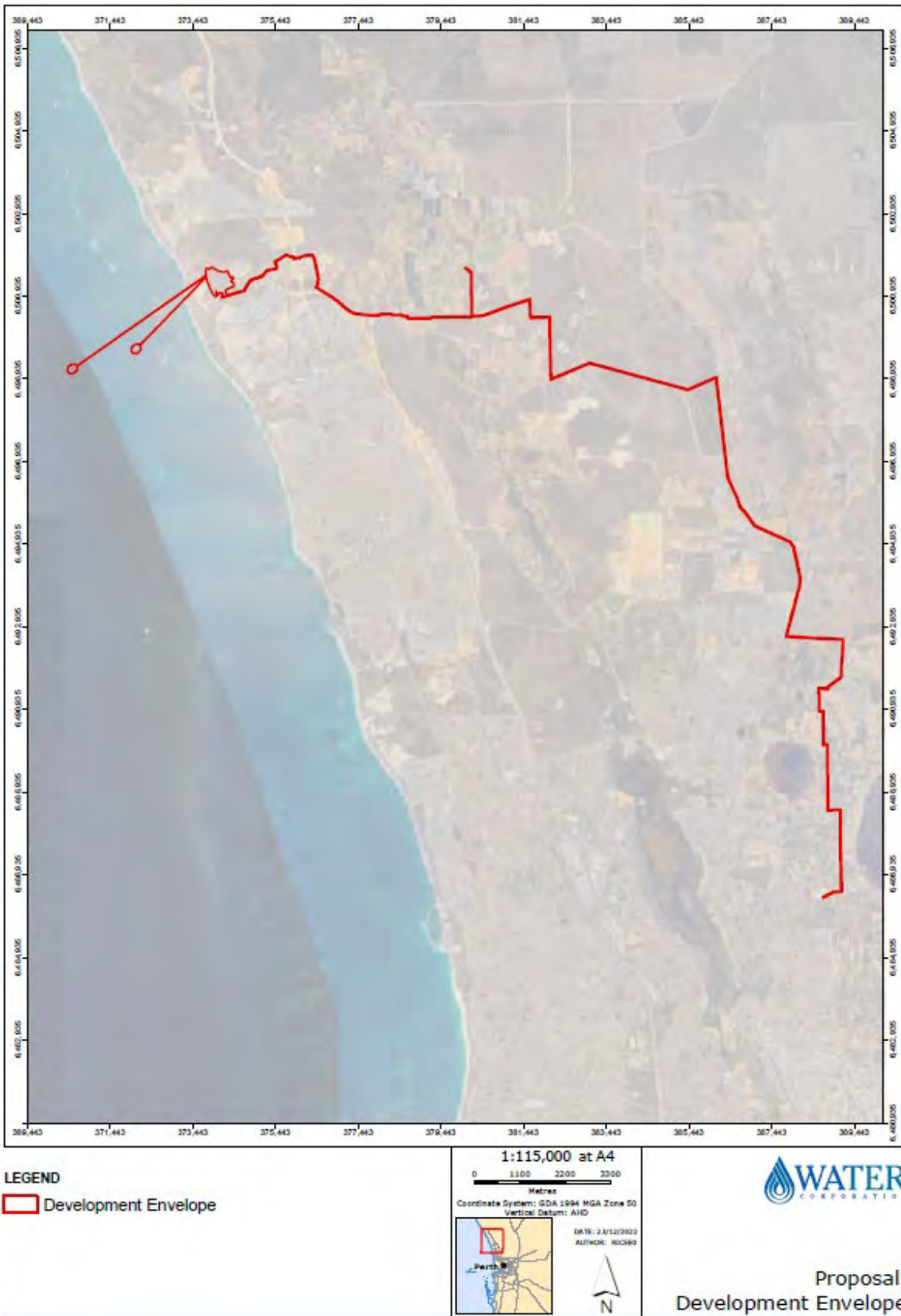


Figure 1-1: Proposal Overview



Table 1-1 details the Ministerial Statement requirements and relevant sections of the Offset Strategy.

Table 1-1: Ministerial Statement 1207 requirements

Ministerial Condition	Section
B8 Offsets	
B8-1 The proponent must implement offsets to counterbalance the significant residual impacts of the proposal on the following environmental values:	
(a) Banksia woodlands of the Swan Coastal Plain ecological community;	Section 2.1
(b) Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forest of the Swan Coastal Plain ecological community;	Section 2.2
(c) <i>Melaleuca huegelii</i> - <i>Melaleuca systema</i> shrublands on limestone ridge (Gibson et al. 1994 type 26a);	Section 2.3
(d) regionally significant bushland;	Section 2.4
(e) foraging habitat for Carnaby's black cockatoo (<i>Zanda latirostris</i>)	Section 2.5
(f) foraging habitat for forest red-tailed black cockatoo (<i>Calyptorhynchus banksii naso</i>); and	Section 2.5
(g) potential nesting trees and suitable nesting trees	Section 2.5
B8-2 In order to meet the requirements of condition B8-1 the proponent must ensure the implementation of the offsets achieves the following environmental outcomes and objectives:	
(1) ensure implementation of offsets provides an environmental benefit for the environmental values listed in condition B8-1;	Section 3
(2) ensure land acquisition offsets for the value identified in condition B8-1(d):	Section 3.1.1 and 3.1.3
(a) contain at least two (2) times the extent impacted;	
(b) contain the same vegetation communities and/or vegetation complexes to the environmental value being impacted; and	Section 3.1.1 and 3.1.3
(c) contain, or can be enhanced to achieve, a vegetation condition that is commensurate to the environmental value being impacted;	Section 2.4, 3.1.1 and 3.1.3
(3) revegetate at least seventy (70) ha within 37 km of the terrestrial development envelope to provide self-sustaining foraging habitat for black cockatoos;	Section 3.1.4
(4) install at least three (3) artificial nesting hollows for every suitable nesting tree authorised to be cleared in accordance with condition B2-1;	Section 3.3



Ministerial Condition	Section
(5) ensure land acquisition offsets contain at least three (3) times the number of potential and suitable nesting trees cleared by the proposal;	Section 3.1.4
B8-3 The proponent shall revise the Draft Alkimos Seawater Desalination Plant Offset Strategy (April 2023) (Environmental Management Plan) and submit it to the CEO. The revised Alkimos Seawater Desalination Offset Strategy (Environmental Management Plan) must:	
(1) demonstrate that the objectives and outcomes in condition B8-1 and condition B8-2 will be met;	As above
(2) be prepared in consultation with DBCA;	Section 3 introduction
(3) spatially identify the Proposed Offset Conservation Areas proposed as: (a) land acquisition offset area(s) and/or other lands to receive onground management; and	Section 3
(b) revegetation offset area(s) to receive on-ground management;	Section 3
(4) for the land acquisition offset area(s): (a) demonstrate that the Proposed Offset Conservation Areas contain the minimum extents of the environmental values needed to meet the objectives and outcomes of condition B8-1 and condition B8-2;	Section 3
(b) identify how the Proposed Offset Conservation Areas will be protected, being either the sites are ceded to the Crown for the purpose of management for conservation, or the sites are managed under other suitable mechanism for the purpose of conservation as agreed by the CEO by notice in writing;	Section 3
(c) specify the quantum of works associated with establishing the Proposed Offset Conservation Areas, including a contribution for maintaining the offset for at least twenty (20) years after completion of purchase; and	Section 3
(d) identify the relevant management body for the on-going management of the Proposed Offset Conservation Areas, including its role, and the role of the proponent, and confirmation in writing that the relevant management body accepts responsibility for its role;	Section 3
(5) identify the proportion of resources allocated for each specific offset addressed by the Alkimos Seawater Desalination Offset Strategy (Environmental Management Plan);	Section 3
(6) demonstrate how the environmental values within the Proposed Offset Conservation Areas will be maintained and/or improved in order to meet the objectives and outcomes in condition B8-1 and condition B8-2 through application	Section 3



Ministerial Condition	Section
of the principles of the WA Environmental Offsets Policy and completion of the WA Offsets Template as described in the WA Environmental Offsets Guidelines, and the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy, or any subsequent revisions or replacements of these documents;	
(7) demonstrate the artificial nesting hollows required by condition B8-2(4) will: (a) be installed at suitable locations determined in consultation with DBCA, and in accordance with Fauna Notes – Artificial hollows for black cockatoos (DBCA 2023) or any subsequent DBCA revision of this guideline;	Section 3.3
(b) be designed and placed in accordance with the specifications detailed within the Fauna Notes – Artificial hollows for black cockatoos (DBCA 2023) or any subsequent DBCA revision of this guideline; and	Section 3.3
(c) be monitored and maintained in accordance with the specifications detailed in Fauna Notes – Artificial hollows for black cockatoos (DBCA 2023) or any subsequent DBCA revision of this guideline, for a period of at least twenty (20) years;	Section 3.3
(8) where a research offset is proposed, prepare a draft research program that: (a) identifies the objectives and intended outcomes;	Section 3.2
(b) identifies how the research will result in a positive conservation outcome, and will either improve management and protection or address priority knowledge gaps that have been identified as a research priority needed to improve management and protection, for the environmental values identified in condition B8-1;	Section 3.2
(c) demonstrates the consistency of the objectives and outcomes in condition B8-3(8)(a) with any relevant guidance, including but not limited to, recovery plans or area management plans, the principles of the WA Environmental Offsets Policy, the WA Environmental Offsets Guidelines, or any subsequent revisions of these documents;	Section 3.2
(d) identifies and justifies how the research will support land acquisition and/or on-ground management in achieving a positive conservation outcome;	Section 3.2
(9) identify how the ongoing performance of the offset measures, and whether they are achieving the objectives and intended outcomes in condition B8-1 and condition B8-2 will periodically be made publicly available.	Section 3.4



2 Significant Residual Environmental Impacts

The clearing of vegetation will be required to facilitate the construction of the Alkimos SDP and Pipeline. This activity has the potential to result in significant residual impacts on certain environmental values.

Following the application of avoidance, minimisation and mitigation measures, the Alkimos Project identified significant residual environmental impacts to:

- 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),
- Regionally Significant Bushland within Bush Forever sites,
- Foraging habitat for Carnaby's black cockatoo species (*Zanda latirostris*),
- Foraging habitat for forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), and
- Potential nesting trees and suitable nesting trees both black cockatoo species.

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)	1.7 ha
<i>Tuart (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
Regionally Significant Bushland (Bush Forever)	-	-	5.7 ha
Carnaby's Cockatoo Foraging habitat	Endangered	Endangered	52.1 ha
Forest Red Tailed Black Cockatoo Foraging habitat	Vulnerable	Vulnerable	49.8 ha
Black Cockatoo – Potential nesting trees	-	-	96 trees
Black Cockatoo - Suitable nesting trees	-	-	8 hollows

* it should be noted that a small portion of non-native vegetation is included in the calculation of Carnaby's Black Cockatoo foraging habitat (pine plantation regrowth) (approximately 0.9 ha)



In order to inform the Alkimos offsets strategy, a number of calculations were used to quantify values of State and Commonwealth impacts. These are detailed in Appendix A.

- Appendix A1 – Eglinton Site Offset Calculator (Commonwealth and State).
- Appendix A2 – Carabooda Tank Site Offset Calculator (Commonwealth and State).
- Appendix A3 – Alkimos Site Offset Calculator (Commonwealth and State).
- Appendix A4 – Neergabby Site Offset Calculator (Commonwealth and State).
- Appendix A5 – Regionally Significant Vegetation (State)



2.1 Banksia Woodlands of the Swan Coastal Plain

The Alkimos SDP Proposal will result in the clearing of no more than 1.7 ha of Banksia Woodlands of the Swan Coastal Plain ecological community' Threatened Ecological Community (TEC) as shown in Figure 2-1.

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 1.7 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)	1.7 ha	The Proposal will result in the clearing of no more than 1.7 ha of Banksia Woodland TEC / PEC within the impact footprint.
Quality (scale 0 – 10)	5	A value of 5 has been determined by using the Banksia TEC Habitat Quality Score (DCCEEWA, 2023) and reflects the average score across the nine smaller TEC patches impacted across the project envelope. See Appendix D.
Total Quantum of Offsets required	0.85 ha	Adjusted based on assessment of quality.

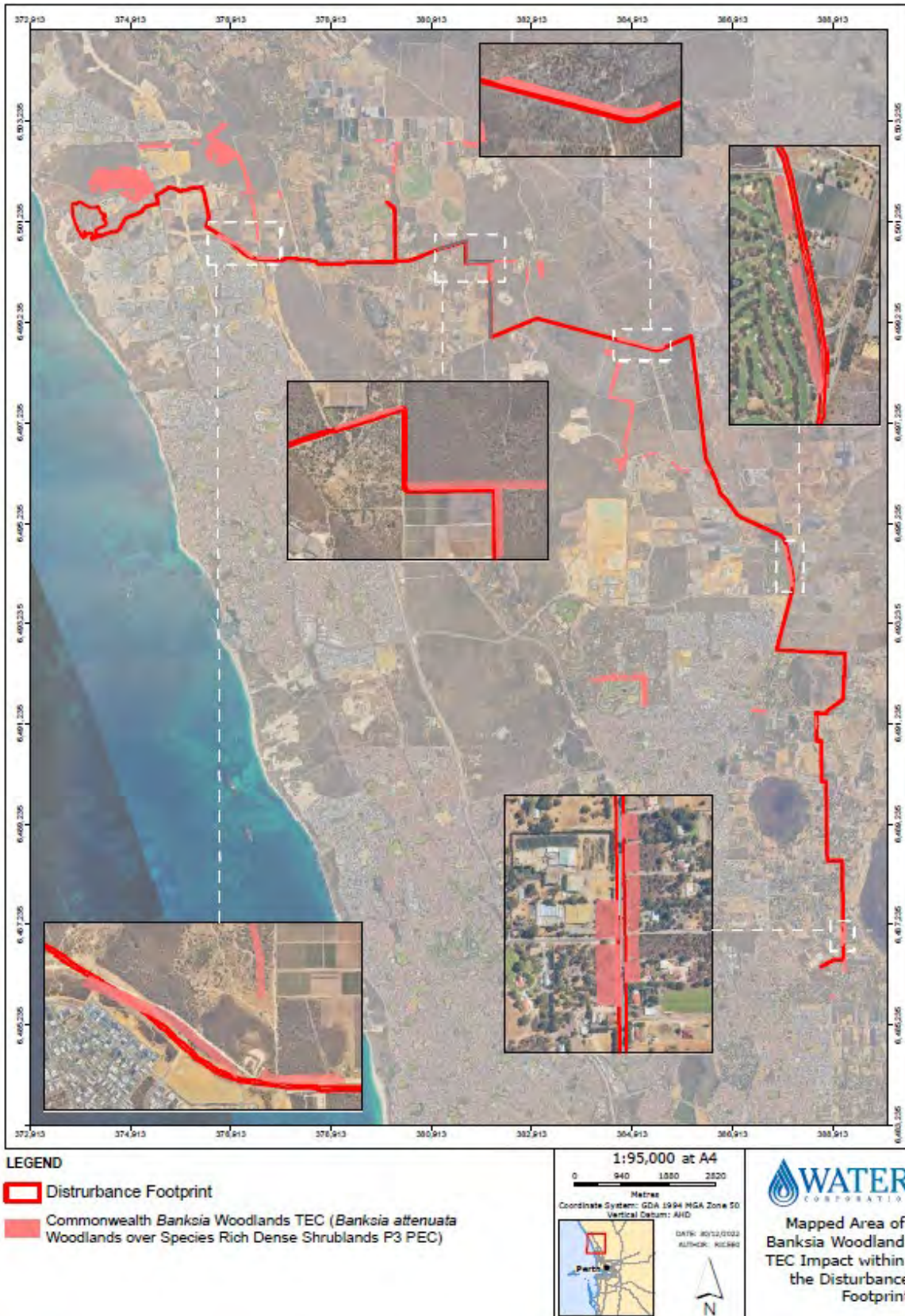


Figure 2-1 – Banksia Woodland TEC within footprint



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 2-2**.

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*. The main difference between the State PEC and the Commonwealth TEC is that there is no condition criteria are published for the state listed PEC.

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. The values used to inform the quality of each site has been determined using the Commonwealth Habitat Quality Scoring Tool for Tuart Woodland TEC. See Appendix D for further detail on the Habitat Quality Scoring Tool.

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)	5	A value of 5 has been determined by using the Tuart TEC Habitat Quality Score (DCCEEWb, 2023) and reflects the average score across the three smaller TEC patches impacted across the project envelope See Appendix D.
Total Quantum of Offsets required	0.58 ha	Adjusted based on assessment of quality.

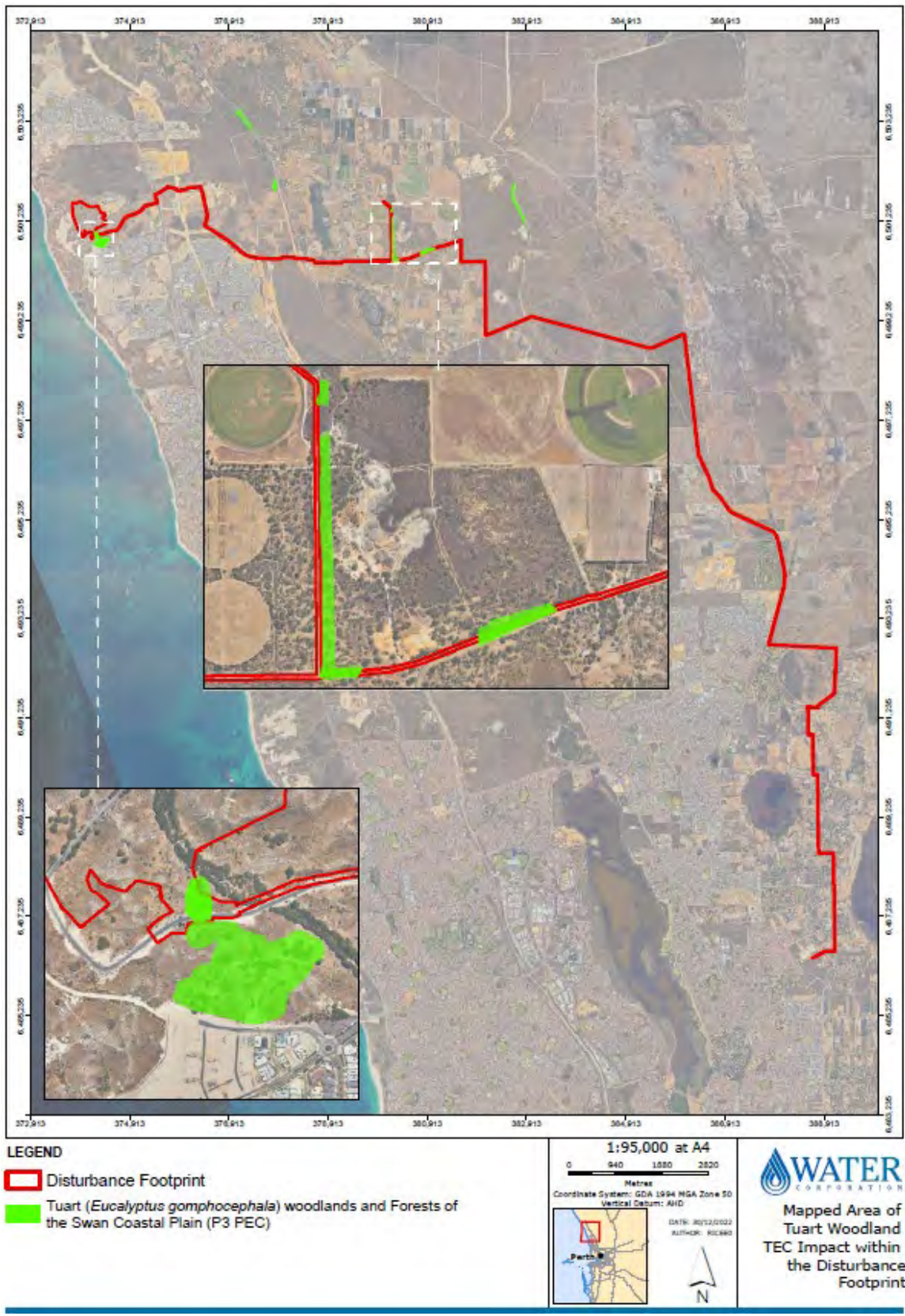


Figure 2-2 – Tuart TEC within footprint



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 2-3.

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.

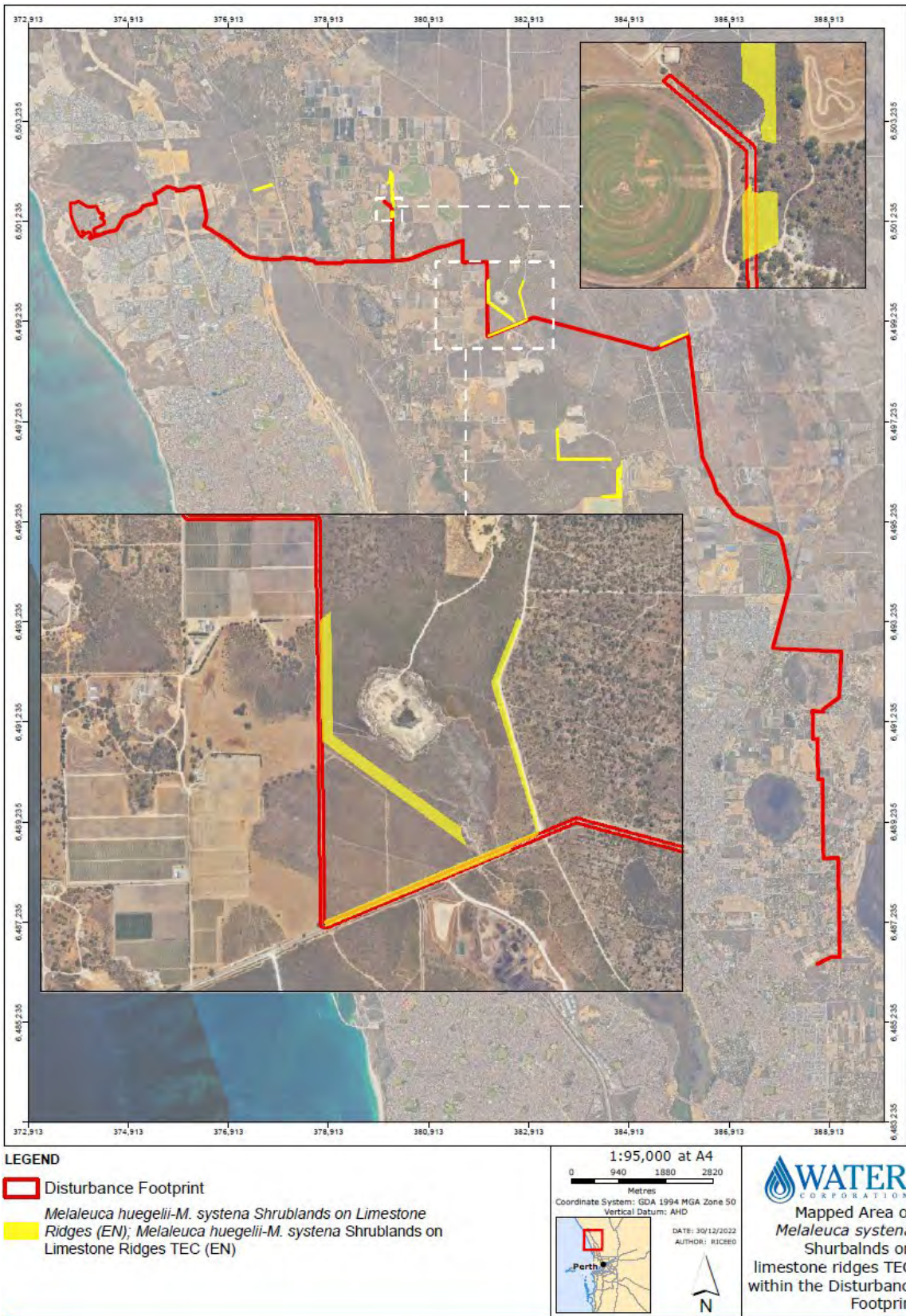


Figure 2-3 – Melaleuca TEC within footprint



2.4 Regionally Significant Bushland (Bush Forever)

The Alkimos SDP Proposal will result in the impact to 9.42 ha of Bush Forever sites, of which 5.7 ha is considered regionally significant bushland as shown in Figure 2-4.

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.

Significant Residual Impact

Ministerial Statement 1207 requires the provision of land acquisitions to offset the significant residual impact to regionally significant bushland (Bush Forever). This offset is required to:

- contain at least two (2) times the extent impacted;
- contain the same vegetation communities and/or vegetation complexes to the environmental value being impacted; and
- contain, or can be enhanced to achieve, a vegetation condition that is commensurate to the environmental value being impacted.

The regionally significant bushland within Bush Forever sites impacted by the project will occur along the pipeline route between the Alkimos SDP and the Wanneroo reservoir as shown in Figure 2-4. These sites and values impacted by the project include:

- Bush Forever Site 136

Bush Forever Site 136 is detailed as numerous sites in State Forest 65 – Pinjar Plantation South Bushland Nowergup/Yanchep/Neerabup (Government of Western Australia 2000). There is limited information available over the greater Bush Forever Site, however surveys undertaken for the Alkimos Project (Stantec 2021) mapped the area along Wesco Road as containing the 'degraded' vegetation type *Eucalyptus marginata*, *Corymbia calophylla*, low open woodland to woodland over *Xanthorrhoea preissii* open shrubland to shrubland over mixed species low shrubland. This vegetation was not considered a TEC or PEC.

- Bush Forever Site 290,

Bush Forever Site 290 is detailed as Hopkins Road Bushland, Nowergup, which is a 400ha site that features limestone ridges in the landscape features that could support floristic communities such as Spearwood *Banksia attenuata* or *Banksia attenuata* – *Eucalyptus* woodland (FCT 28), and contain significant flora such as *Eucalyptus argutifolia* or *Melaleuca huegelii* (Government of Western Australia 2000). Surveys undertaken for the Alkimos Project (Stantec 2021) mapped the area impacted along Wesco Road as



consistent with the WA TEC '*Melaleuca huegelii-Melaleuca systema* shrublands on limestone ridges' (FCT26a), however, the majority of the impact is completely degraded road verge.

- Bush Forever Site 293

Bush Forever Site 293 is detailed as Shire View Hill and Adjacent Bushland, Nowergup/Neerabup, which is a 268 ha site that is currently bisected by Wesco Road (Government of Western Australia 2000). Surveys undertaken for the Alkimos Project (Stantec 2021) mapped the area along Wesco Road as containing Banksia Woodlands of the Swan Coastal Plain TEC (Commonwealth), and Banksia Woodlands of the Swan Coastal Plain PEC (State) in good to very good condition.

- Bush Forever Site 471.

Bush Forever Site 471 is detailed as High Road Bushland, Wanneroo, which is a 41 ha site, likely to contain vegetation consistent with Spearwood *Banksia attenuata* or *Banksia attenuata - Eucalyptus* woodland (FCT 28) (Government of Western Australia 2000). Surveys undertaken for the Alkimos Project (SLR 2023b) mapped the area impacted by the project as *Banksia attenuata*, *Banksia ilicifolia* and *Banksia menziesii* as part of a broader Banksia Woodland TEC site.

The value of each Bush Forever site has also been considered in the Black cockatoo foraging habitat assessment. Given the affinity of foraging value and vegetation consistent with Banksia Woodland communities, the foraging value is high for black cockatoo species, in particular Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo.

2.4.1 Total Quantum of Impacts

Although the Alkimos project intersects 9.42 ha of Bush Forever sites, it was considered in the assessment that the significant residual impact for the project is the 5.7 ha of impact to regionally significant bushland. This is detailed in Table 2-5.

Table 2-5: Regionally Significant Bushland (Bush Forever) impact calculations

Criteria	Value	Explanation
Regionally Significant Bushland (Bush Forever) impact area	5.7 ha	The Proposal will result in the impact to no more than 5.7 ha within the pipeline impact footprint, predominantly within road reserves, tracks and cleared areas.

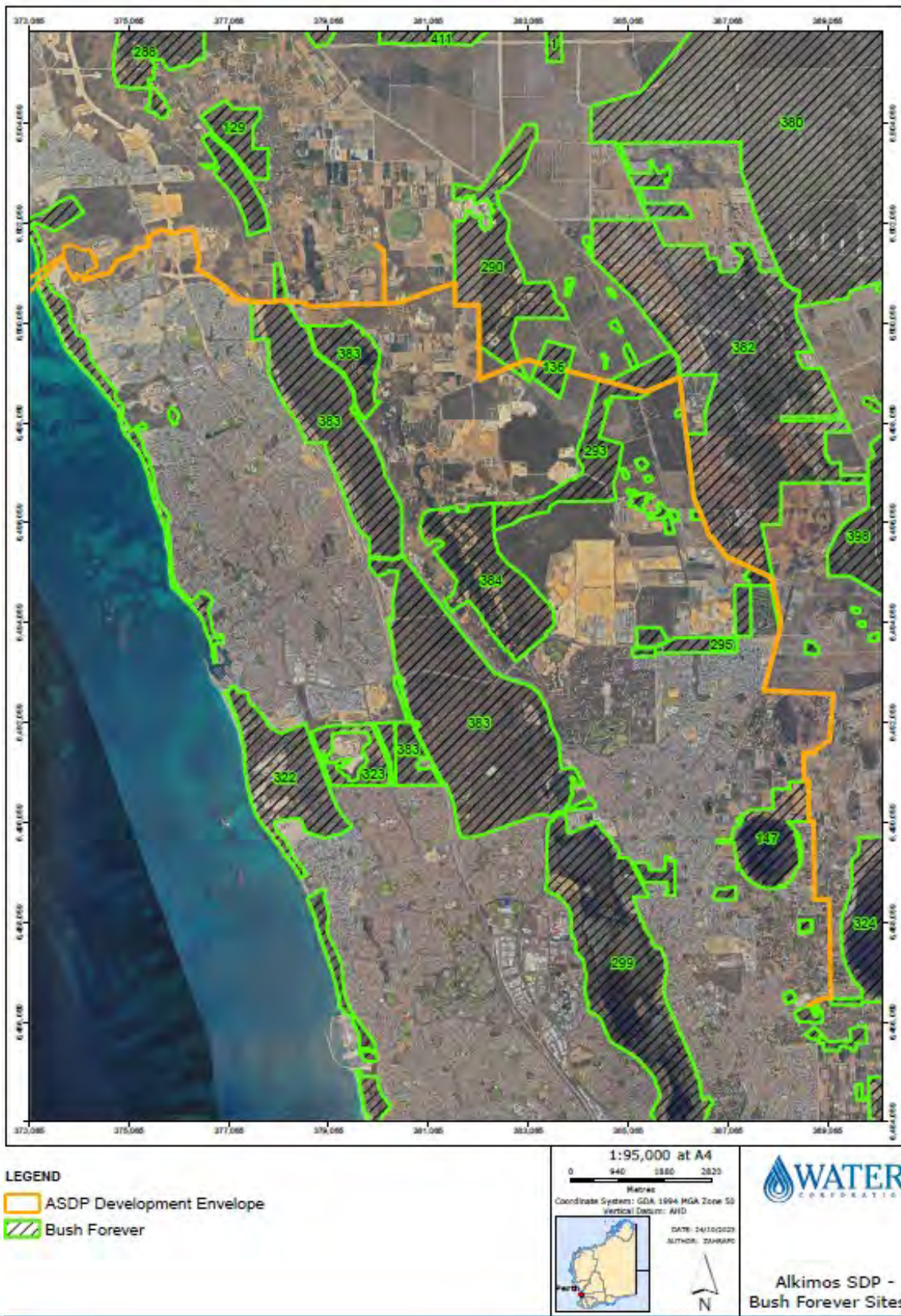


Figure 2-4 – Bush forever within Development Envelope



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 52.1 ha of Carnaby's Cockatoo and 49.8 ha of Forest Red-Tailed Black Cockatoo foraging habitat within the Development Envelope including up to 104 Potential Black Cockatoo breeding trees (8 with hollows), 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.

The Proposal will also result in the clearing of up to 96 potential breeding trees, and 8 suitable breeding trees as defined by the commonwealth guidance (DAWE, 2022).

2.5.2 Total Quantum of Impacts

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.

The values used to inform the quality of each site has been determined using the Habitat Scoring System for WA black cockatoo foraging habitat (DCCEEW 2023c). See Appendix D.

Table 2-6: Black Cockatoo area impact calculations

Criteria	Value	Explanation
Carnaby's Cockatoo habitat Impact area (ha)	52.1 ha	The Proposal will result in the clearing of no more than 52.1 ha of CBC foraging habitat within the impact footprint
Quality (scale 0 – 10)	7	The Value of 7 has been applied in the calculator to reflect the Habitat Scoring System for WA black cockatoo foraging habitat (DCCEEW 2023). (See Appendix D)
Total Quantum of Offsets required	36.47 ha	Adjusted area of offset required, based on assessment of quality
Forest Red-tailed Black Cockatoo habitat Impact area (ha)	49.8 ha	The Proposal will result in the clearing of no more than 49.8 ha of FRTBC foraging habitat within the impact footprint.
Quality (scale 0 – 10)	7	The Value of 7 has been applied in the calculator to reflect the Habitat Scoring System for WA black cockatoo foraging habitat (DCCEEW 2023). (See Appendix D)
Total Quantum of Offsets required	34.86 ha	Adjusted area of offset required, based on assessment of quality
Potential Black Cockatoo breeding trees (both species)	104 trees	The Proposal will result in the clearing of: <ul style="list-style-type: none"> - 96 potential breeding trees, and - 8 suitable breeding trees (with hollows).



3 Proposed Offset Strategy

The proposed Offset Strategy has prepared to address the requirements of Ministerial Statement 1207 and Commonwealth approval.

Water Corporation has undertaken considerable consultation in the preparation of the plan 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. The consultation included collaboration with Department of Biodiversity, Conservation and Attractions (DBCA), to identify and secure land suitable for both inclusion in the conservation estate and suitable for offsetting the impacts of the Alkimos project.

Water Corporation has pursued a number of options in developing a package of offsets to counterbalance the significant residual impacts quantified in Section 2.

3.1 Land Acquisitions



3.1.1 Eglinton Offset Site

A parcel of Water Corporation owned freehold land within the suburb of Eglinton has been identified in the investigation of potential offset sites for the Alkimos SDP project as shown in Figure 3-1, 3-2 and 3-3.

The Flora and Vegetation Consolidation Report (Stantec, 2021) mapped the majority of the Eglinton site as containing the following values:

- Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (Commonwealth TEC).
- FCT28 Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands (WA PEC)
- 'Excellent' condition vegetation.

The Commonwealth Banksia Woodland TEC vegetation comprises of an upper stratum dominated or co-dominated by one or more Banksia species and was assessed against the criteria detailed within the Approved Conservation Advice (DotE 2016).

The Eglinton site is located approximately 2.5 km East of the Alkimos SDP site and is zoned public purposes. The site abuts existing land zoned parks and recreation that was set reserved in the Metropolitan Region Scheme (MRS) Amendment 1029/33. The Eglinton offset site therefore results in an extension of this ecological linkage as shown in Figure 3-2.

An additional layer of benefit provided by the Eglinton site is that it also secures high value foraging habitat for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo species within close proximity to the project impact sites.

As detailed in Table 3-1, Water Corporation proposes to use the **7 ha** Eglinton site, which contains the following values:

- 5.98 ha of Banksia Woodlands of the Swan Coastal Plain TEC (Commonwealth TEC),
- 5.98 ha Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands PEC (FCT 28), and
- 7 ha of foraging habitat for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo species.

The remaining 1.02 ha of the offset site is mapped as Northern Spearwood Shrublands and Woodlands PEC (FCT24), which was included to reduce irregular boundary alignments (instead of following the TEC mapping).

The 7ha Eglinton site will also be provided to offset part of the impacts to Bush Forever from the project. Although the project impacts predominantly intersect Bush Forever sites within road reserves, tracks and cleared areas, there is still an impact to 5.7 ha of regionally significant bushland within the Bush forever sites. Although the Eglinton site may not contain regionally significant values (in the form of FCT28), it was identified as an ideal offset for Bush Forever, given the site location within the planning framework proposed for the Alkimos/Eglinton locality, enhancing the connectivity to other land zoned parks and recreation. As detailed above, the Eglinton Offset Site contains ecological values similar to those impacted by the proposal (detailed in Section 2.4).



With consideration to state conservation values, specifically Floristic Community Types (FCT), the Eglinton site is mapped predominantly containing FCT28 which aligns with the Commonwealth Banksia Woodland TEC and the state PEC.

Table 3-1 Eglinton offset site quantification

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
Regionally significant bushland (Bush Forever)	7 ha

An Offset Management Plan for the Eglinton Offset Site has been prepared and is attached in Appendix E1.

Legal protection mechanism:

The Eglinton site will be protected through the use of a biodiversity conservation covenant under the Biodiversity Conservation Act 2016. This mechanism enables the landowner (Water Corporation) to enter into a biodiversity conservation covenant with the CEO of DBCA to set aside the land for the purposes of protecting a threatened ecological community, in this case the Banksia Woodland TEC.

Where a biodiversity conservation covenant is not a suitable mechanism under the current zoning, Water Corporation will propose to enter into an agreement (covenant) with the Commissioner of Soil and Land Conservation under section 30 of the *Soil and Land Conservation Act 1945*.

Actions to improve the value of the offset site:

Water Corporation is confident that the implementation of the completion criteria provided in the Eglinton Offset Management Plan (Appendix E1) will improve the existing values within the offset site, and ultimately increase the habitat quality score (providing habitat quality gain). It is noted that this Offset Management Plan will be submitted formally to DWER following endorsement of the Offset Strategy.

A baseline quadrat-based habitat quality survey will be undertaken to enable Water Corporation to verify the improvements made throughout the implementation of the Offset Management Plan have met each predicted target value in the Habitat Quality Scoring (HQS) assessment.

Where the target value is not met, Water Corporation will implement contingency measures in the Offset Management Plan until the target is met and a stable, self-sustaining site is confirmed.

The measures proposed that will increase the habitat quality score are detailed in Table 3-2.



Table 3-2 Eglinton offset HQS improvement.

Value	Parameter	Current level	Current score in HQS (score)	Proposed improvement	Proposed score in HQS (score)
Banksia Woodland TEC	Site condition -Native understorey cover -Vegetation condition	Existing survey indicates vegetation is in Excellent condition	Excellent condition (80)	The site currently has no protection from external impacts and has been subject to unauthorised access and illegal dumping. The combination of site management activities: - weed control, - fencing, - rubbish removal, - dieback management, - pest management, and - habitat protection and rehabilitation will achieve an overall improvement to the quality of vegetation.	Excellent, but with greater protection and habitat improvement to near pristine level (100)
Banksia Woodland TEC	Site condition Presence of Dieback	No record of dieback, however fencing requires attention to prevent unauthorised access. risk significantly higher that dieback may be introduced.	Patch is partly dieback free (5)	The site currently has no protection from external impacts, is adjacent to 'uninterpretable' areas and has been subject to unauthorised access and illegal dumping. These activities have the potential to bring dieback into the site, of which Banksia is highly susceptible. The proposed site management activities such as fencing, and dieback management will prevent dieback from entering the site via authorised and unauthorised access.	Patch is dieback free (10)
Black Cockatoo foraging habitat. (Woodland habitat) *	Vegetation condition and structure - Site condition	'Moderate' Carnaby's Black Cockatoo habitat as detailed in HQS. 'Low to Moderate' Forest Red Tailed Black Cockatoo habitat as detailed in HQS.	4 Carnaby's (CBC) 3 Forest Red-tailed (FRT)	Proposed site management such as: - weed control, - fencing, - rubbish removal, - dieback management, - infill planting, and - pest management Will result in an improvement to the quality of vegetation for CBC habitat, with the reduction in potential tree deaths due to dieback management and increase in foliage cover due to less weed competition.	'moderate to high' Score 5 for CBC 'moderate' Score 4 for FRT

Timing:

Water Corporation is proposing to initiate the biodiversity conservation covenant (or equivalent) process within 1 year of the impact occurring.

Active improvements to the Eglinton site are projected to be finalised within a 5-year period. Where completion criteria are not met, improvements will continue until the criteria are met.

As the Eglinton site will remain Water Corporation land, with a conservation covenant on the title, passive management will continue until such time as the land is transferred to another authority. This period post completion criteria will ensure the site remains as intended for at least 20 years.

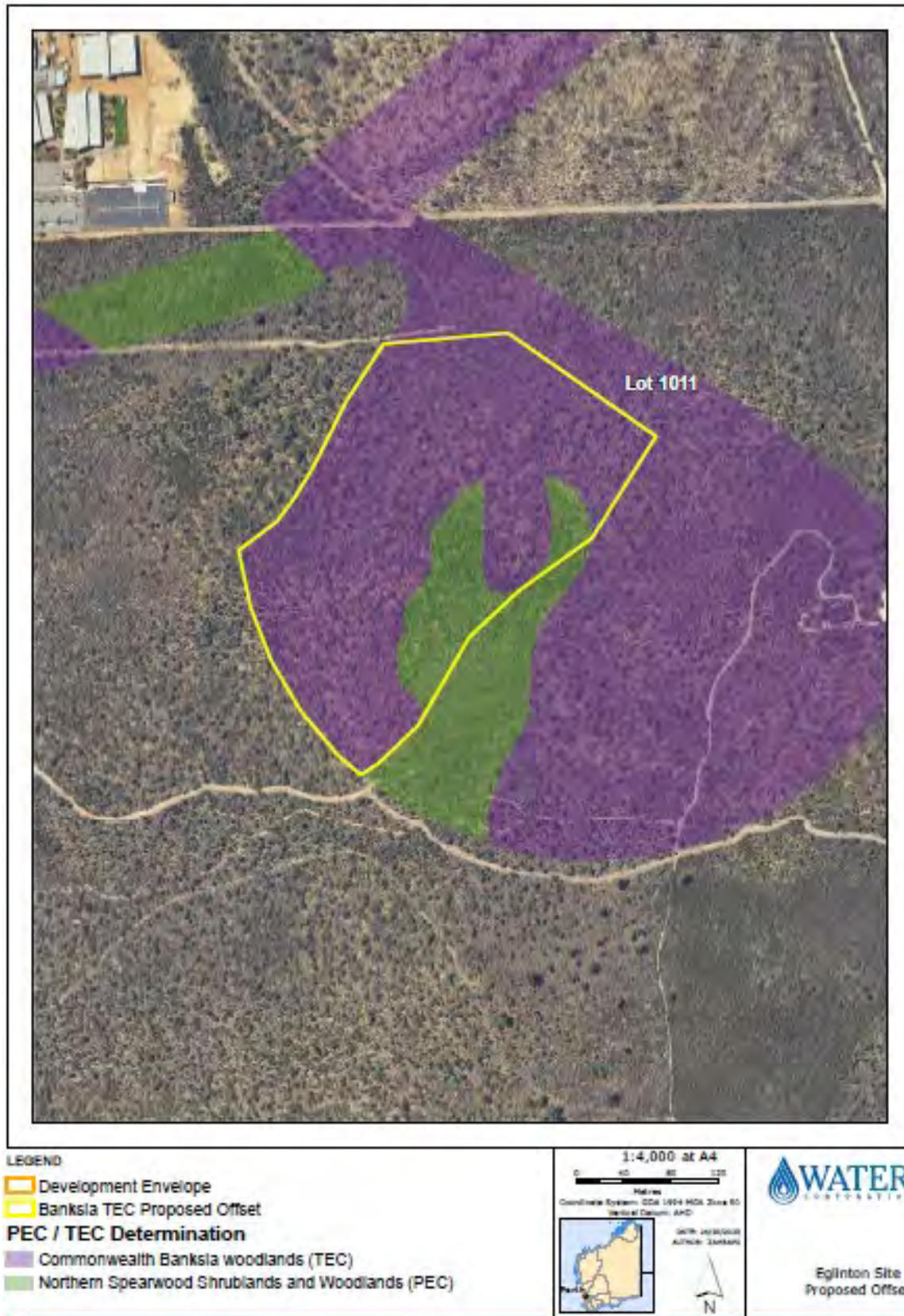


Figure 3-1 – Eglinton Site – TEC / PEC mapping



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

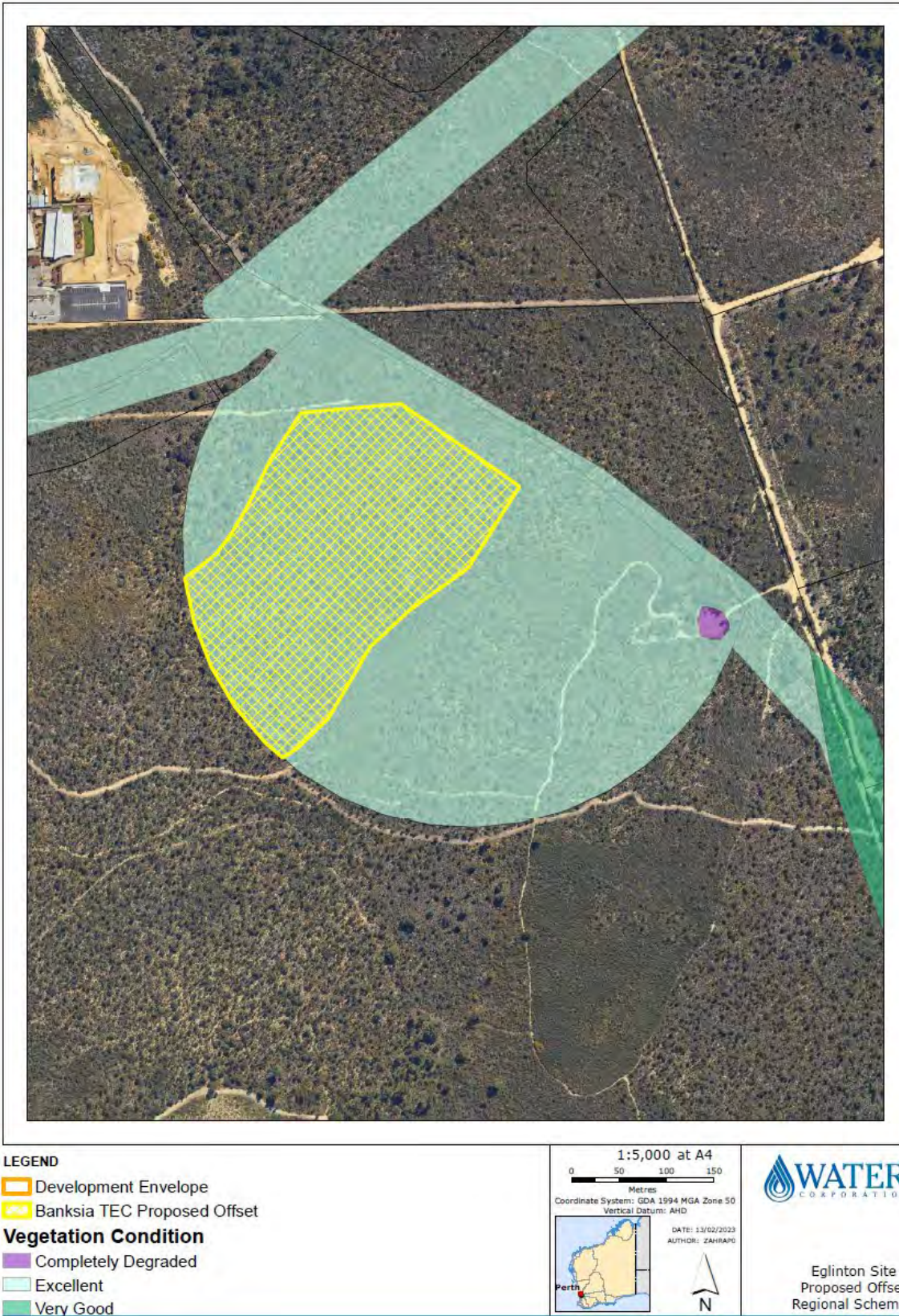


Figure 3-3 – Eglinton site – Vegetation Condition



3.1.2 Carabooda Tank Offset 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 3-4**.

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 3-4** this offset site provides equal value vegetation immediately adjacent to, or within 5km, of where impacts to the Melaleuca TEC occur from the project.

A further targeted survey has been undertaken by consultants (SLR) on 19 Oct 2023 to confirm the presence of the Melaleuca TEC (FCT26a) in the Offset site and map the entire TEC occurrence within the proposed offset area. Preliminary information has been provided confirming the Melaleuca TEC at the site, however consultant timing constraints have prevented the delivery of the report until 29 Feb 2024. Water Corporation has received confirmation from the consultants that there is at least 3.1 ha of Melaleuca TEC present within the 5.4 ha site, as represented in **Figure 3-4**. As a contingency, if for some reason the 3.1 ha is somehow not achievable, additional surveys will be undertaken on the southern portion of the Carabooda Tank Site, previously identified as containing the Melaleuca TEC in Stantec 2021 vegetation report, to meet the minimum requirement. The future Offset Management Plan will document the relevant survey data.

The 5.4 ha Carabooda Tank Offset site will also be provided to offset part of the impacts to Bush Forever from the project. Although the project impacts predominantly intersect Bush Forever sites within road reserves, tracks and cleared areas, there is still an impact to 5.7 ha of regionally significant bushland within the Bush forever sites. The Carabooda Tank Offset site was identified as the second area required to offset impacts to Bush Forever. Given the offset site is located adjacent to the Alkimos Project footprint, contains a regionally significant vegetation community,



and contains ecological values similar to those impacted by the proposal the Carabooda Tank Offset site is considered an appropriate site for inclusion as a Bush Forever site.

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 3-3, **Figure 3-4** and **Figure 3-5** details the proposed quantity of Carabooda Tank Eglinton offset.

Table 3-3 Carabooda Tank site offset quantification.

Environmental value (listing)	Proposed offset
<i>Melaleuca huegelii</i> - <i>Melaleuca systema</i> shrublands on limestone ridges Threatened Ecological Community	3.1 ha
Carnaby’s Cockatoo foraging habitat and Forest Red Tailed Black Cockatoo foraging habitat	5.4 ha
Regionally significant bushland (Bush Forever)	5.4 ha

Legal protection mechanism:

The Carabooda Tank site will be protected through the use of a biodiversity conservation covenant under the Biodiversity Conservation Act 2016. This mechanism enables the landowner (Water Corporation) to enter into a biodiversity conservation covenant with the CEO of DBCA to set aside the land for the purposes of protecting a threatened ecological community, in this case the Melaleuca TEC.

Where a biodiversity conservation covenant is not a suitable mechanism under the current zoning, Water Corporation will propose to enter into an agreement (covenant) with the Commissioner of Soil and Land Conservation under section 30 of the *Soil and Land Conservation Act 1945*.

Actions to improve the value of the offset site:

Water Corporation is confident that the implementation of the completion criteria provided in the Carabooda Tank Offset Management Plan (Appendix E2) will improve the existing values within the offset site, and ultimately increase the habitat quality score (providing habitat quality gain).

A baseline quadrat-based habitat quality survey will be undertaken to enable Water Corporation to verify the improvements made throughout the implementation of the Offset Management Plan have met each predicted target value in the Habitat Quality Scoring (HQS) assessment.

Where the target value is not met, Water Corporation will implement contingency measures in the Offset Management Plan until the target is met and a stable, self-sustaining site is confirmed. The measures proposed that will increase the habitat quality score are detailed in Table 3-4.

As noted by DBCA, careful consideration of management measures will need to be confirmed prior to implementation as certain actions may have an adverse impact on the State TEC value.



Table 3-4 Carabooda Tank offset HQS improvement

Value	Parameter	Current level	Current score (HQS or score)	Proposed improvement	Proposed score (HQS or score)
Melaleuca TEC	Site quality	Existing survey indicates vegetation is in Excellent condition	8 (As determined in State Offset Calculator)	The site currently has no protection from external impacts and is adjacent to active agricultural practices. The combination of site management activities: - weed control, - fencing, - rubbish removal, - dieback management, - pest management, and - habitat protection and rehabilitation will achieve an overall improvement to the value of assigned to the offset site vegetation.	9 (As determined in State Offset Calculator)
Black Cockatoo foraging habitat. (Shrubland habitat)	Vegetation condition and structure - Site condition	Low to Moderate Carnaby's Black Cockatoo habitat as detailed in HQS. Negligible Forest Red Tailed Black Cockatoo habitat as detailed in HQS.	3 Carnaby's (CBC) 1 Forest Red-tailed (FRT)	Proposed site management, such as: - infill planting, - weed control, - fencing, - rubbish removal, - dieback management and - pest management Will result in an improvement to the quality of vegetation for CBC habitat, with the reduction in potential tree deaths due to dieback management and increase in foliage cover due to less weed competition.	Increase - CBC habitat to 'moderate to high' (score 5) condition, And - FRT to a 'low to moderate' (score 3).

Timing:

Water Corporation is proposing to initiate the biodiversity conservation covenant (or equivalent) process within 1 year of the impact occurring. Improvement to the site will be finalised within a 5-year period.

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 E2. It is noted that this Offset Management Plan will be submitted formally to DWER following endorsement of the Offset Strategy.

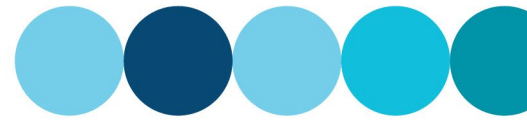


Figure 3-4 – Carabooda Tank site*

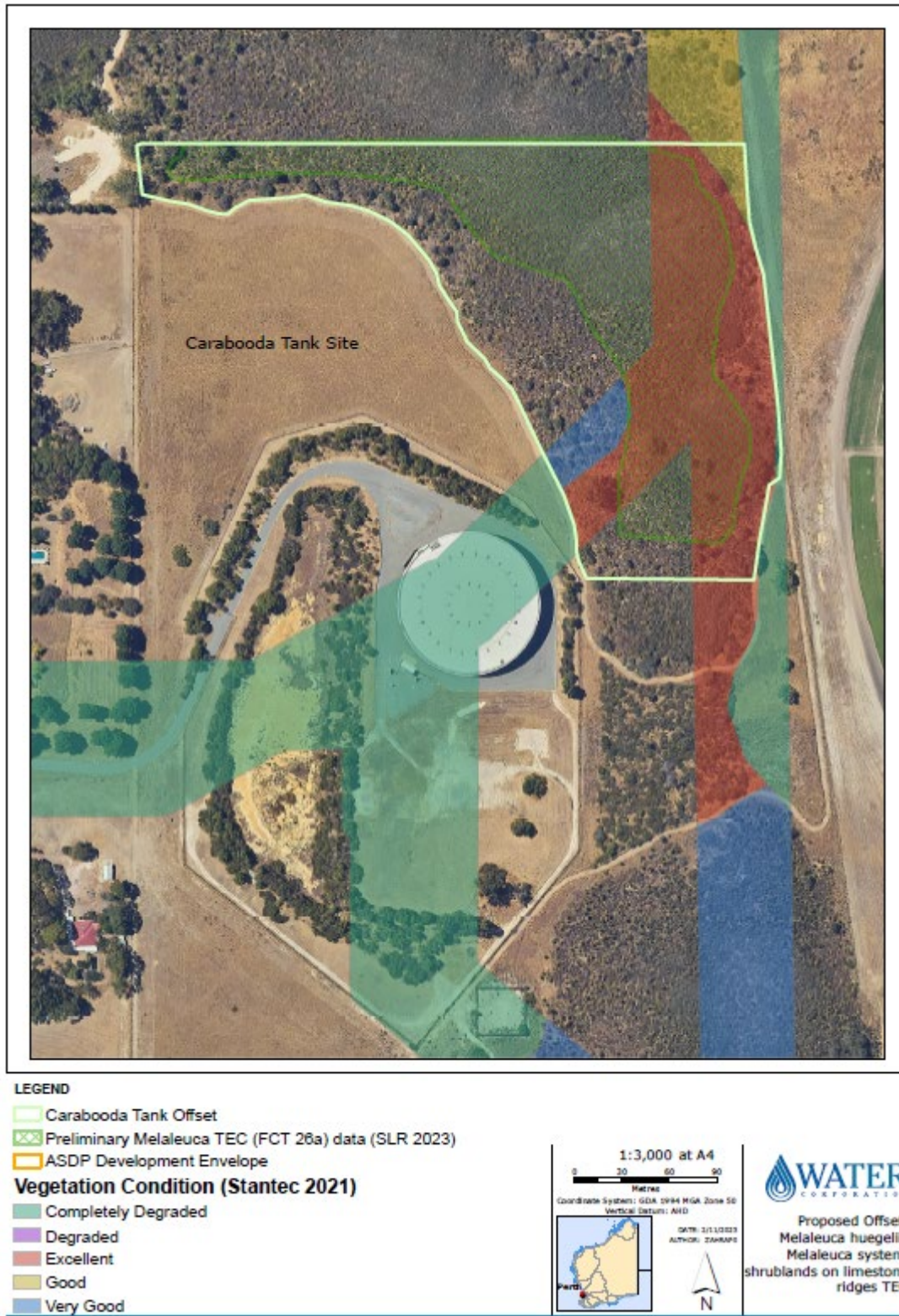


Figure 3-5 – Carabooda Tank site – Vegetation condition*

*a detailed survey at the Carabooda offset site has been undertaken, however the Report will not be available until early 2024.



3.1.3 Alkimos Offset 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 3-6. 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 quantified in Table 3-5 and shown in Figure 3-6.

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 2-2).

A secondary benefit from this offset site will be the **9 ha** of heath and shrubland and scattered trees which have some value for fauna as lower quality Black Cockatoo habitat as outlined in the habitat quality scoring framework (see Appendix D) and is shown in Figure 3-7.

The offset site will contribute to ecological linkages between other land reserved for conservation within the Alkimos Water Precinct and provide valuable foraging habitat linkages for both impacted Black Cockatoo species.

Table 3-5 Alkimos Water Precinct offset quantification.

Environmental value (listing)	Proposed offset
Tuart Woodlands TEC	4.91 ha
Carnaby's Cockatoo foraging habitat and Forest Red Tailed Black Cockatoo foraging habitat	9 ha

Legal protection mechanism:

The Alkimos site will be protected through the use of a biodiversity conservation covenant under the Biodiversity Conservation Act 2016. This mechanism enables the landowner (Water Corporation) to enter into a biodiversity conservation covenant with the CEO of DBCA to set aside the land for the purposes of protecting a threatened ecological community, in this case the Tuart Woodland TEC.

Where a biodiversity conservation covenant is not a suitable mechanism under the current zoning, Water Corporation will propose to enter into an agreement (covenant) with the Commissioner of Soil and Land Conservation under section 30 of the *Soil and Land Conservation Act 1945*.



Actions to improve the value of the offset site:

Water Corporation is confident that the implementation of the completion criteria provided in the Alkimos Offset Management Plan (Appendix E3) will improve the existing values within the offset site, and ultimately increase the habitat quality score (providing habitat quality gain).

A baseline quadrat-based habitat quality survey will be undertaken to enable Water Corporation to verify the improvements made throughout the implementation of the Offset Management Plan have met each predicted target value in the Habitat Quality Scoring (HQS) assessment.

Where the target value is not met, Water Corporation will implement contingency measures in the Offset Management Plan until the target is met and a stable, self-sustaining site is confirmed.

The measures proposed that will increase the habitat quality score are detailed in Table 3-6.

Table 3-6 Alkimos offset HQS improvement.

Value	Parameter	Current level	Current score in HQS (score)	Proposed improvement	Proposed score in HQS (score)
Tuart Woodland TEC	Site condition – Native understorey cover	Existing survey indicates 30% very good condition, 70% good. Site contains significant cleared areas, particularly within 30m TEC buffer.	≥50% and <60% OR ≥4 native species per plot (20)	The combination of site management activities: - weed control, - fencing, - rubbish removal, - dieback management, - pest management, - infill planting habitat protection and rehabilitation will achieve an overall improvement to quality of TEC understorey cover and also add vegetation consistent with Tuart TEC into degraded areas.	≥12 native species per plot (60)
Tuart Woodland TEC	Site context – Patch size	Existing patch 4.91 ha.	≥2 hectares and <5 hectares (50)	Proposed revegetation will improve values within TEC to include additional species in order to increase the TEC patch size to over 5 ha	≥5 hectares (100)
Black Cockatoo foraging habitat (both 'heath and shrubland' & 'scattered trees')	Vegetation condition and structure - Site condition	Low (10% foliage cover) Heath and shrubland (very good condition), Scattered trees (good condition)	2 Carnaby's (CBC) 1 Forest Red-tailed (FRT)	Proposed site management such as: - weed control, - fencing, - rubbish removal, - dieback management, - infill planting, and - pest management Will result in an improvement to the quality of vegetation for CBC & FRT habitat with increase foliage cover and foraging species for black cockatoos.	'moderate' Score 4 for CBC Native kwongan heath and shrubland, banksia or eucalypt woodlands with 20-30% projected foliage cover. Moderate percentage of tree deaths (30-40%). 'low to moderate' Score 3 for FRT Marri-Jarra-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with 5-20% projected foliage cover.



Timing:

Water Corporation is proposing to initiate the biodiversity conservation covenant (or equivalent) process within 1 year of the impact occurring. Improvement to the site will be finalised within a 5-year period.

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:

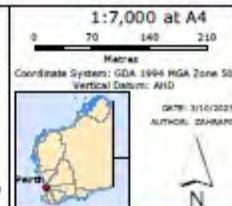
- Weed management,
- Rehabilitation of degraded areas,
- Revegetation,
- Fire management, and
- Routine monitoring of offset health (annual).

An Offset Management Plan for the Alkimos Offset Site has been prepared and is attached in Appendix E3. It is noted that this Offset Management Plan will be submitted formally to DWER following endorsement of the Offset Strategy.



LEGEND

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



Proposed Offset -
Tuart Woodlands
of the Swan Coastal
Plain TEC

Figure 3-6 – Proposed Alkimos Offset site



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



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 3-9.

These properties contain values required to offset impacts from the Alkimos SDP project, as quantified in Table 3-7, 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 freehold land, however, DBCA is in the process of finalising the purchase.

DBCA will be responsible for the on-going management of both sites, which will be funded by Water Corporation. However, initially Water Corporation will be responsible for the management of a 74-ha portion of degraded land within Lot 1934 Gingin Brook Road. This land will be subject to a significant revegetation program that will be implemented until such time as completion criteria are met and the land can be returned to DBCA management.

Lot 1934 Gingin Brook Road, Neergabby is a 371-hectare rural property, predominantly vegetated with 74 ha of cleared or partially cleared land (with trees retained). See Figure 3-9 and Figure 3-10.

Reconnaissance surveys undertaken by the Department of Biodiversity, Conservation and Attractions (DBCA) in 2022 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 habitat survey by SLR in 2023 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.

As part of the development of the Offset Management Plan, Water Corporation has committed to a quadrat based baseline vegetation mapping to determine the extent of weed cover and confirm that 70 ha within the 74 ha of mapped degraded land is available.

Figure 3-10 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 as detailed in Figure 3-11.

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.

The foraging habitat value of these properties has been quantified using the habitat quality scoring framework and is detailed in Appendix D. These habitat scores have been applied to the Commonwealth Offset Calculator to quantify the offset requirements for significant residual impacts to the Banksia Woodland TEC and both Black Cockatoo species foraging habitat, including significant trees.

Site selection justification:

The Neergabby Offset site is approximately 32 km from the ASDP site (and large component of the impact). Although not located within the immediate proximity of the impact sites, the location was identified as particularly valuable for the following reasons:

- The property contains foraging habitat for both Black Cockatoo species impacted by the proposal (Banksia Woodland for Carnaby's and Scattered Marri trees for Forest Red-tailed) as detailed in the DBCA site assessment (DBCA, 2022),
- The property is located immediately adjacent to a 6 km buffer surrounding a confirmed Carnaby's Black Cockatoo roost,
- There is observational evidence of increased Forest Red-tailed occurrence on the Swan Coastal Plain, and distribution spreading further north.
- There are actual observations of Carnaby's using the Neergabby area,
- This offset will secure and protect a considerable portion existing high value foraging vegetation that was previously in private ownership, for transfer into the conservation estate, and
- The site offered the ability to create additional foraging habitat, as outlined in the Offset Management Plan for the Neergabby Offset Site which will create an additional 70ha of foraging vegetation specifically selected for both Carnaby's and Forest Red-tailed Black Cockatoos.
- Should additional land be required to meet the 70 ha revegetation requirement in Ministerial Statement 1207, there is an additional 2.2 ha of degraded land within Lot 58.

Further justification for the selection of the Neergabby site is provided in context with other offset sites in Section 3.4.



Table 3-7 Neergabby offset quantification.

Environmental value (listing)	Available for use as offset
Carnaby's Cockatoo foraging habitat	Neergabby sites Lot 1934 - 289 ha of existing BC foraging habitat Lot 58 – 185 ha of existing BC foraging habitat available Lot 1934 only - 70 ha of BC foraging habitat – revegetation
Forest Red Tailed Black Cockatoo foraging habitat	Neergabby sites Lot 1934 - 289 ha of existing BC foraging habitat Lot 58 – 185 ha of existing BC foraging habitat Lot 1934 only - 70 ha of BC foraging habitat - revegetation
Significant trees	Neergabby site (Lot 1934 only) (420 significant trees, with 10 hollows suitable for BC breeding)

Legal protection mechanism:

The Neergabby site has been purchased in conjunction with DBCA. The site is currently freehold land, under the management of the State (DBCA). The intention is to provide further protection to the site by entering it into the conservation estate. The site would be listed as a nature reserve, protected for conservation purposes and formally managed by DBCA. By entering into the conservation estate, the site would have greater protection under the *Conservation and Land Management Act 1984* (WA).

Actions to improve the value of the offset site:

Water Corporation is confident that the implementation of the completion criteria provided in the Neergabby Offset Management Plan (Appendix E4) will improve the existing values within the offset site, and ultimately increase the habitat quality score (providing habitat quality gain).

A baseline quadrat-based habitat quality survey will be undertaken to enable Water Corporation to verify the improvements made throughout the implementation of the Offset Management Plan have met each predicted target value in the Habitat Quality Scoring (HQS) assessment.



Where the target value is not met, Water Corporation will implement contingency measures in the Offset Management Plan until the target is met and a stable, self-sustaining site is confirmed.

The measures proposed that will increase the habitat quality score are detailed in Table 3-8.

Table 3-8 Neergabby offset HQS improvement.

Value	Parameter	Current level	Current score in HQS (score)	Proposed improvement	Proposed score in HQS (score)
Banksia Woodland TEC	Site condition -Native understorey cover -Vegetation condition	Existing DBCA survey indicates vegetation is in Excellent condition	Excellent condition (80)	The site currently has limited protection from external impacts such as unauthorised access and illegal dumping. The combination of site management activities: - weed control, - fencing, - rubbish removal, - dieback management, - pest management, and - habitat protection and rehabilitation will achieve an overall improvement to the quality of vegetation.	Pristine (100)
Banksia Woodland TEC	Site condition Presence of Dieback	No record of dieback, however fencing requires attention to prevent unauthorised access. risk significantly higher that dieback may be introduced.	Patch is partly dieback free (5)	The site currently has limited protection from external impacts such as unauthorised access and illegal dumping. These activities have the potential to bring dieback into the site, of which Banksia is highly susceptible. The proposed site management activities such as fencing, and dieback management will prevent dieback from entering the site.	Patch is dieback free (10)



Value	Parameter	Current level	Current score in HQS (score)	Proposed improvement	Proposed score in HQS (score)
Black Cockatoo foraging habitat. (Existing Woodland habitat)	Vegetation condition and structure - Site condition	Moderate to high Banksia and eucalypt woodlands with 30-40% projected foliage cover	Moderate to high (Score 5) Carnaby's (CBC) <i>Native kwongan heath and shrubland (>20% projected foliage cover), banksia and eucalypt woodlands with 30-40% projected foliage cover; OR > 60% projected foliage cover but veg. condition reduced due to tree deaths (up to 20%).</i> Low (score 2) Forest Red-tailed (FRT) <i>Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with 1-5% projected foliage cover; OR Paddocks and/or urban areas with scattered food plants such as Cape Lilac, Eucalyptus caesia and E. erythrocorys.</i>	Proposed site management, The site currently has limited protection from external impacts such as unauthorised access and illegal dumping. The combination of site management activities: - weed control, - fencing, - rubbish removal, - dieback management, - pest management, and - habitat protection and rehabilitation will achieve an overall improvement to the quality of vegetation.	High (score 6) CBC <i>Native kwongan heath and shrubland (>25% projected foliage cover), banksia and eucalypt woodlands with >40% projected foliage cover. Low percentage (< 10%) of tree deaths.</i> Low to moderate (score 3) FRT <i>Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with 5-20% projected foliage cover.</i>
Black Cockatoo foraging habitat. (revegetation)	Vegetation condition and structure - Site condition	Negligible to low foraging habitat.	Negligible to low (Score 1) CBC (site condition) <i>Scattered specimens of known food plants but projected foliage cover of these is <2%. May include: paddocks or urban areas with scattered foraging trees.</i> Negligible to low (Score 1) FRT <i>Scattered specimens of known food plants but projected foliage cover of these is <2%. May include: paddocks or urban areas with scattered foraging trees.</i>	Proposed site management such as: - weed control, - fencing, - rubbish removal, - dieback management, - infill planting, and - pest management Will result in an improvement to the quality of vegetation for CBC & FRT habitat with increase foliage cover and foraging species for black cockatoos.	Moderate to high (Score 5) CBC <i>Native kwongan heath and shrubland (>20% projected foliage cover), banksia and eucalypt woodlands with 30-40% projected foliage cover; OR > 60% projected foliage cover but veg. condition reduced due to tree deaths (up to 20%).</i> Moderate (Score 4) FRT <i>Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with: 20-30% projected foliage cover; OR 40-60% projected foliage cover but veg. condition reduced due to tree deaths (up to 30-40%).</i>

Timing:

Water Corporation is committed to working with DBCA to finance the property acquisition and confirm ongoing management actions of the Neergabby sites. A Memorandum of Understanding between the Water Corporation and DBCA is being developed that will confirm the management and financial arrangements.

Water Corporation will assist DBCA in the transfer into the conservation estate. It is acknowledged that timeframes for delivery of this transfer into the conservation estate are likely to take a number of years, however with the management proposed should provide some protection until the transfer process is completed.



Actions prior to formalisation as offset:

- Finalisation of property transaction with DBCA (including Water Corporations agreement to funding),
- Confirmation of area available to provide minimum 70 ha of revegetation within Lot 1934. This will be through a site survey by a suitably qualified ecologist, to determine vegetation condition and area available. (Including survey of contingency areas within Lot 58)
- Finalise site management strategy (in consultation with DBCA), including:
 - Seed collection,
 - Site preparation and revegetation,
 - Weed management,
 - Dieback control,
 - Fencing,
 - Pest Control,

An Offset Management Plan for the Neergabby Offset Site has been prepared and is attached in Appendix E4.



Figure 3-8 – Neergabby Offset Sites



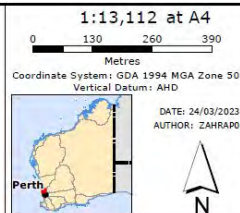
Figure 3-9 – Lot 1934 Gingin Brook Road, Neergabby (Environmental Values)



LEGEND

Significant Trees

- Allocasuarina sp.
- Coastal blackbutt (*Eucalyptus tottiana*)
- *Eucalyptus decipiens*
- Marri (*Corymbia calophylla*)
- Stag
- Lot 1934 Gingin Brook Road



Neergabby Offset Site

Figure 3-10 - Lot 1934 Gingin Brook Road, Neergabby (significant trees)

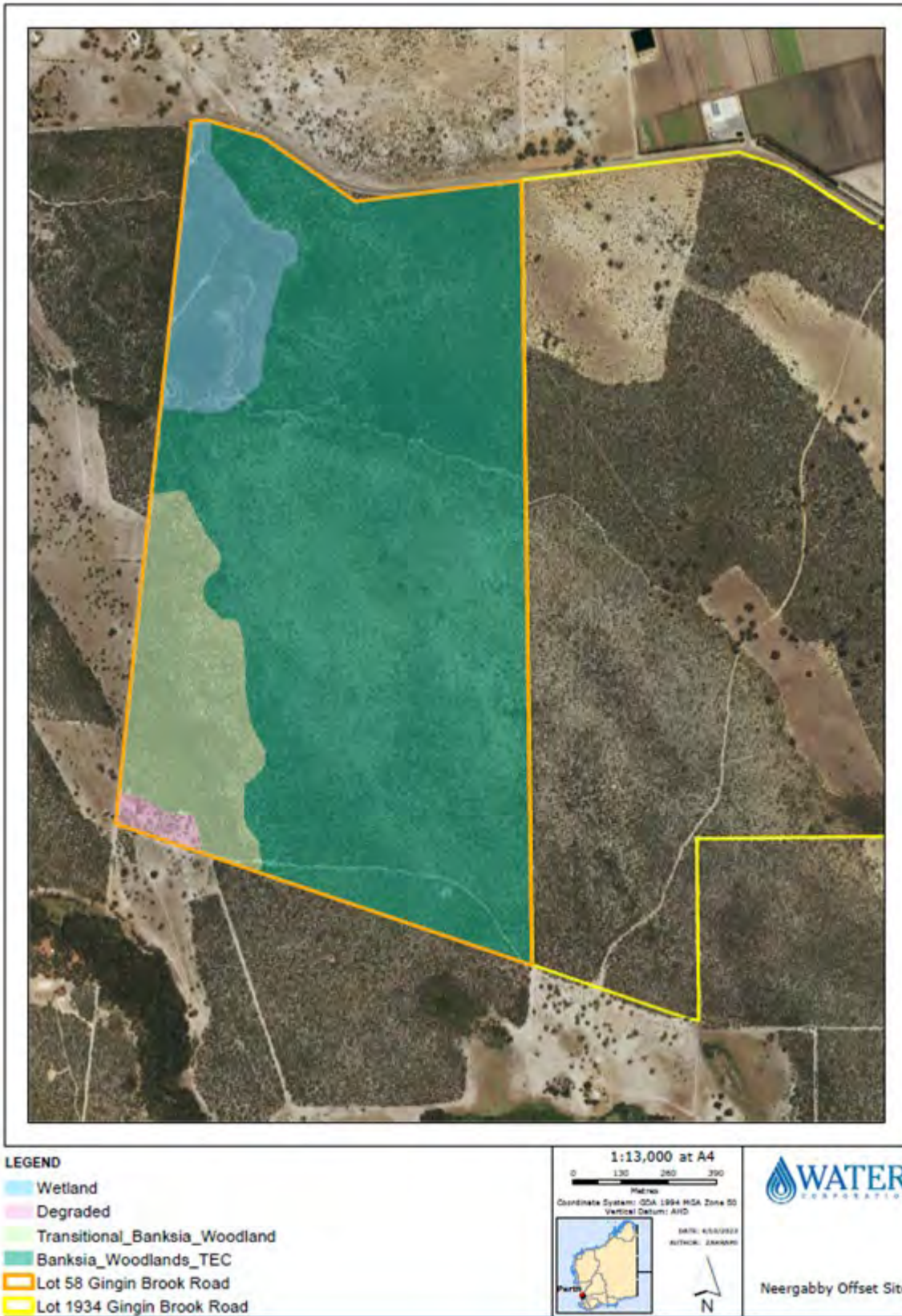


Figure 3-11 - Lot 58 Gingin Brook Road, Neergabby (Environmental Values)



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 objectives:

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.

- a. Utilise intensive standardised foraging observations and flock following over several focal study areas,
 - b. Surveys in restoration of similar species composition but differing seral stages alongside control sites of native vegetation,
2. Understand how landscape composition affects the utilisation of restored sites for feeding. Specifically:
 - a. In relation to distance from roost sites,
 - b. Distance from known nest sites,
 - c. Spatial availability of drinking water – this will provide a novel experimental component looking at how the provision of water affects feeding, roosting and breeding success.
 3. Provide an integrated understanding of the best practice approach to restoration as an offset for CBC and RTBC.

Benefits

The proposed research is intended to:

- support the identification of future offset sites that are required to provide additional black cockatoo foraging habitat from projects on the Swan Coastal Plain.



- Demonstrate the varying levels of success of on-ground management offsets, to guide site selection, habitat species selection and quantify time taken to be used as a foraging resource.
- Provide a greater understanding of the impact of drinking water availability to foraging habitat, and whether this should be a consideration to offset requirements (in similar manner to artificial nesting boxes)
- Inform guidance on best practice measures to ensure success of land acquisition and on-ground management offsets.

Budget

Given the complexity of the study issues, Water Corporation will be funding a 3-year project to be driven by a postdoctoral research associate.

3 years: \$354,132 plus oncosts of \$121,982 = \$476,114.

Plus, project operational funds of \$100,000 = \$576,114 Total

Alignment to the WA guidelines

The above research program is consistent with the following guidance:

- Carnaby’s cockatoo Recovery Plan (DPAW, 2013),
- Forest red-tailed black cockatoo Recovery Plan (DEC, 2008)
- WA Environmental Offsets Policy (Government of WA, 2011), and
- WA Environmental Offsets Guidelines (Government of WA, 2014).

Table 3-9 outlines how the proposed research will contribute to this guidance.

Table 3-9 Research program alignment to policy

Policy / Requirement / Objective	How the research meets requirement
Carnaby’s cockatoo Recovery Plan - To stop further decline in the distribution and abundance of Carnaby’s Cockatoo by protecting the birds throughout their life stages and enhancing habitat critical for survival throughout the breeding range, ensuring that the reproductive capacity of the species remains stable or increases. - Action 3: Conduct research to inform management (Undertake research into the biology, ecology, and conservation management of Carnaby’s cockatoo.	- Research will better inform future offset site selection and even better understand the value of impacts to specific areas of foraging habitat for Carnaby’s cockatoo. - Research will also assist in establishing guidelines for foraging habitat creation (including water requirements).
Forest red-tailed black cockatoo Recovery Plan - Determine and implement ways to minimise the effects of mining and urban development on habitat loss	- Research will better inform future offset site selection and even better understand the value of impacts to specific areas of foraging habitat for forest red-tailed black cockatoo.



	<ul style="list-style-type: none"> - Research will also assist in establishing guidelines for foraging habitat creation (including water requirements).
<p>WA Environmental Offsets Policy</p> <ul style="list-style-type: none"> - Environmental offsets will be focused on longer-term strategic outcomes 	<ul style="list-style-type: none"> - The research is aimed to investigate a long-term strategic outcome of whether restoration offsets are providing a net gain in food resources in comparison to the amount of native habitat lost due to development.
<p>WA Environmental Offsets Guidelines</p> <ul style="list-style-type: none"> - Research that may include field surveys should be designed to address priority knowledge gaps with the outcomes publicly available to improve management of the environment generally, and provide information that will improve environmental assessment of future projects 	<ul style="list-style-type: none"> - the long-term success of food plant restoration in attracting CBC and FRT and meeting their foraging requirements is unknown, (also water requirements)



3.3 Artificial Nesting Hollows

Artificial Nesting Hollows are proposed to be installed to offset specific impacts to potential Black Cockatoo nesting trees within the project impact footprint.

The location of this offset is not necessarily linked to the above offset sites, particularly as breeding for both species is more likely to occur inland of the impact and offset sites. Table 3-10 details a summary of the Artificial Nest Hollow Offset Management Plan.

The Offset Management Plan is provided in Appendix E5.

Table 3-10 Artificial nest hollow plan summary

Detail	Requirement
Offset location	To be determined on the advice of suitable Black Cockatoo experts and in consultation with Department of Biodiversity Conservation and Attractions and Department of Climate Change, Energy, the Environment and Water.
Offset characteristics	Install at least three (3) artificial nesting hollows for every suitable nesting tree authorised to be cleared by the proposal.
Additional value added	Provision of 25 artificial nesting boxes for potential Black Cockatoo breeding within land identified as optimal breeding areas.
Mechanism to protect	Water Corporation will be responsible for the management of the hollows, under guidance of DBCA and relevant landowner. Hollows will be maintained for at least a period of 20 years

The provision and maintenance of large numbers of artificial hollows in association with restoration/replanting of woodlands in breeding areas is seen as the one of the only long-term solutions to loss of breeding habitat, if artificial nest hollows are monitored and repaired on a regular basis, and that adequate funds are provided to ensure that those nest hollows remain serviceable. If maintained, artificial nest hollows are noted to also have the added benefit of extending the working life of natural nest hollows in the vicinity.

Each artificial hollow site will be selected on advice of suitably qualified expert, and DBCA. Trees selected for installation of artificial hollows should be located to best benefit the local sub population of Black Cockatoos impacted by the Alkimos Proposal.

The artificial nest hollow design criteria are outlined in Table 3-11. These criteria have been developed to align with *Fauna Notes – Artificial hollows for black cockatoos* (DBCA 2023) with consideration of recent research published by Saunders et al. (2023) *Artificial nesting hollows for the conservation of Carnaby’s cockatoo *Calyptorhynchus latirostris**.



Table 3-11 Artificial Nesting Hollow design criteria.

Species	Parameter	Value
Carnaby's Black Cockatoo and Forest Red Tailed Black Cockatoo	Location	<ul style="list-style-type: none"> - Within proximity to known breeding location for each Black Cockatoo species. - GPS located, and photographic point set up for monitoring and maintenance.
	Height in tree	<ul style="list-style-type: none"> - height of nest hollows is influenced by the dominant tree species. - in a Wandoo dominated site (Between 2 and 10m). - in a Salmon Gum dominated site (Between 3 and 10m). - where possible, a min of 4 m above ground in private land, and 8m in public land.
	Aspect	<ul style="list-style-type: none"> - nest hollow fixed with 6mm galvanised chain to a live tree affording the hollow shade during the middle of the day. (fixed at 4 points)
	Material	<ul style="list-style-type: none"> - durable enough to withstand exposure to elements for an extended period of time. - similar insulative properties of natural hollow.
	Access	<ul style="list-style-type: none"> - a galvanised steel access ladder reaching to the bottom of the nest hollow. (50x50mm squares, 4 mm thick)
	Nest depth	<ul style="list-style-type: none"> - minimum 1000 mm deep.
	Floor	<ul style="list-style-type: none"> - internal diameter of at least 375 mm. - a base that cannot be destroyed by nesting birds. - Floor lined with min 200mm depth woodchips. - woodchips to at least access ladder height. - Free draining.
	Location to food source	<ul style="list-style-type: none"> - Tree located within a 2 km from patch of foraging habitat.
	Other items	<ul style="list-style-type: none"> - Sacrificial chewing post (50x100mm). - Made from untreated Jarrah, Marri or Wandoo species.
	Working life	<ul style="list-style-type: none"> - 30 -50 years



3.4 Offset implementation

There are five Offset Management Plans proposed, including the:

- Eglinton Offset Site (Appendix E1),
- Carabooda Tank Offset Site (Appendix E2),
- Alkimos Offset Site (Appendix E3),
- Neergabby Offset Site (Appendix E4), and
- Artificial Nesting Hollows (Appendix E5).

Each offset site includes an audit table that will be completed and provided as per Condition B8-3(9) of Ministerial Statement 1207 in accordance with the compliance audit report required under condition D2-1.

It is noted that this Offset Management Plan will be submitted formally to DWER following endorsement of the Offset Strategy.



3.5 Offset summary and conclusion.

This offset strategy:

- Describes the potential significant residual environmental impacts to State listed environmental values and Matters of National Environmental Significance (MNES),
- Estimates 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), and
- Identifies the proposed strategy to counterbalance the Proposal's significant residual environmental impacts in accordance with State and Commonwealth environmental offsets policy and guidance.

A summary of the proposed offset strategy is detailed in Table 3-11.

Water Corporation has successfully secured over 19 ha of offset land within 500 m of the project development envelope, notably the Alkimos, Eglinton and Carabooda Tank sites. These sites provide sufficient offset requirements for the majority of the significant residual impacts of the proposal.

However, a larger land parcel was required to offset the residual impact to black cockatoo foraging habitat. Due to the location of project within the rapidly expanding urban areas of the Perth Metropolitan Region, significant land holdings in the immediate vicinity to the project are uncommon or are earmarked for urban development and other infrastructure requirements. The Neergabby site was identified as the nearest substantial land parcel that contained values to offset impacts to both the Black Cockatoo foraging habitat and Banksia Woodland TEC values.

In addition to the justification for selecting the Neergabby offset site outlined in Section 3.1.4, the Alkimos, Eglinton and Carabooda Tank sites have also been identified to provide multiple layers of offset requirements. For example, the 9ha Alkimos offset site specifically identified for Tuart TEC values, also contains a small percentage of value to offset black cockatoo foraging habitat requirements. The Alkimos offset site, once the Offset Management Plan has been implemented will provide additional foraging and roosting resources to the actual resident black cockatoo population being affected by the proposal. These overlapping values are detailed in Table 3-11.

Table 3-12 Offset Summary

Environmental value (listing)	Total Quantum of Impact (Adjusted area in brackets)	Offset site (Primary offset value in brackets)	Distance from impact site	Percentage of offset met
<i>Banksia</i> Woodlands of the Swan Coastal Plain (TEC - Cth)	1.7 ha (0.85 ha)	7 ha Eglinton Site (5.98 ha Banksia TEC)	0.5km from DE	35 %
		371 ha Neergabby site (Lot 1934) (289 ha of Banksia Woodland)	32km from ASDP site	Greater than 100%
<i>Tuart (Eucalyptus gomphocephala)</i> woodlands and forest of the Swan	1.16 ha (0.58 ha)	9.01 ha Alkimos Site (4.91 ha Tuart TEC)	Immediately adjacent	121%



Coastal Plain (TEC - Cth)				
<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)	Immediately adjacent	113%
Regionally significant Bushland (Bush Forever WA)	5.7 ha	7 ha Eglinton Site and 5.4 ha Carabooda Tank Site (12.4 ha of Bush Forever)	Within 0.5km from DE	108%
Carnaby's Cockatoo Foraging habitat (Endangered - Cth)	52.1 ha (36.47 ha)	7 ha Eglinton Site (7 ha of BC foraging habitat)	0.5km from DE	1 %
		5.4 ha Carabooda Tank Site (5.4 ha of BC foraging habitat)	Immediately adjacent	1 %
		9.01 ha Alkimos Site (9.01 ha of BC foraging habitat)	Immediately adjacent	1 %
		Neergabby sites (Lot 1934) 289 ha of BC foraging habitat (L58) 185 ha of BC foraging habitat (L 1934) 70 ha of BC foraging habitat - revegetation	32km from ASDP site	37% (L1934) 24% (L58) 29% (L1934)
		ECU Research Project (Black Cockatoo Research)	n/a	7%
Forest Red Tailed Black Cockatoo Foraging habitat (Vulnerable – Cth)	49.8 ha (34.86 ha)	7 ha Eglinton Site (7 ha of BC foraging habitat)	0.5km from DE	1%
		3.1 ha Carabooda Tank Site (5.4 ha of BC foraging habitat)	Immediately adjacent	1%
		9.01 ha Alkimos Site (9.01 ha of BC foraging habitat)	Immediately adjacent	1%
		Neergabby sites (Lot 1934) 289 ha of BC foraging habitat (L58) 185 ha of BC foraging habitat (L 1934) 70 ha of BC foraging habitat – revegetation	32km from ASDP site	41%(L1934) 26% (L58) 24% (L1934)
		ECU Research Project (Black Cockatoo Research)	n/a	7%
Black Cockatoo species – Significant trees	104 trees	Neergabby site (Lot 1934) (420 significant trees, with 10 hollows suitable for BC breeding)	32km from ASDP site	241%
	Includes 8 hollows	Hollow site to be determined. - provision of 25 artificial nesting boxes* *Location of nesting boxes to be determined in consultation with DBCA and relevant experts and may not be located at the Neergabby Offset site given the site may not be recognised as a breeding site.	TBA	100%



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 (outside those included in impact calculation) 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</p>



	<p>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.*

Australian Government 2019, Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

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*).

DCCEEW 2023a, Banksia TEC Habitat Quality Score

DCCEEW 2023b, Tuart TEC Habitat Quality Score

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>

Department of Environment and Conservation DEC 2008, Forest Black Cockatoo (Baudin's Cockatoo *Calyptorhynchus baudinii* and Forest Redtailed Black Cockatoo *Calyptorhynchus banksii naso*) Recovery Plan

DBCA 2021 Site assessment by DBCA of Lot 58 Gingin Brook Road, Neergabby (December 2021)

DBCA 2022 Site assessment by DBCA of Lot 1934 Gingin Brook Road, Neergabby (January 2022)

DPAW 2013, Carnaby's cockatoo Recovery Plan,

DBCA 2023, Fauna Notes – *Artificial hollows for black cockatoos*

Government of Western Australia 2000, Bush Forever Volume 2, Department of Environmental Protection, Perth, Western Australia.

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

SLR, 2023, Lot 1934 Gingin Brook Road - Black Cockatoo Nesting Tree Survey

SLR 2023b, Alkimos Seawater Desalination Plant Project Pipeline Survey – Vegetation Community Type Assessment, submitted during response to submission period.

(https://www.epa.wa.gov.au/sites/default/files/Proponent_response_to_submissions/SLR%20360%20Env_AI_kimos%20Transmission%20Line%20Vegetation%20Assessment_Rev3%20%28May%202023%29.pdf)

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: OFFSET CALCULATIONS



APPENDIX A1 – EGLINTON SITE OFFSET CALCULATOR

WA Environmental Offsets calculator

Step 1: Determining conservation significance

Key:

	Data to be entered
	Drop-down selection
	Automatically-generated scores (Or, if appropriate, manual data entry permitted)

Area / feature (Impact site)

Conservation significance determination for the environmental value impacted									
Conservation significance	<table border="1"> <tr> <td>Description</td> <td>Banksia Woodlands of the Swan Coastal Plain</td> </tr> <tr> <td>Type of environmental value</td> <td>Ecological community</td> </tr> <tr> <td>Conservation significance of environmental value</td> <td>Priority ecological community</td> </tr> <tr> <td>Conservation significance score</td> <td>0.1%</td> </tr> </table>	Description	Banksia Woodlands of the Swan Coastal Plain	Type of environmental value	Ecological community	Conservation significance of environmental value	Priority ecological community	Conservation significance score	0.1%
Description	Banksia Woodlands of the Swan Coastal Plain								
Type of environmental value	Ecological community								
Conservation significance of environmental value	Priority ecological community								
Conservation significance score	0.1%								

Please select <i>area</i> or <i>feature</i> for the calculations	Area
------------------------------------------------------------------	------

Step 2: Calculating significant residual impact

Key:

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

Environmental value (step 1)	Banksia Woodlands of the Swan Coastal Plain
------------------------------	---------------------------------------------

Area (impact site)

Part A: Significant impact calculation Area			
Significant impact	Description	Quantum of impact	
	Banksia Woodland	Significant impact (hectares)	1.70
		Quality (scale)	5.00
		Total quantum of impact	0.85

Part B: Rehabilitation credit calculation Area (onsite)					
Rehabilitation Credit	Description	Proposed rehabilitation (area in hectares)		Time until ecological benefit (years)	
		Current quality of rehabilitation site (scale)		Confidence in rehabilitation result (%)	
		Future quality WITHOUT rehabilitation (scale)		Rehabilitation credit	0.00
		Future quality WITH rehabilitation (scale)			

Part C: Significant residual impact calculation Area		
Significant residual impact	Total quantum of impact	0.85
	Rehabilitation credit	0.00
	Significant residual impact	0.85

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Banksia Woodlands of the Swan Coastal Plain	Significant impact (step 2, part A)	1.70
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	0.85

Area (offset site)

Offset calculation Area							
Offsets calculation	Description	Proposed offset (area in hectares)	5.98	Duration of offset implementation (maximum 20 years)	20.00	Offset value	0.30
	Eglinton Offset site	Current quality of offset site (scale)	8.00	Time until offset site secured (years)	1.00		35.0%
		Future quality WITHOUT offset (scale)	8.00	Risk of future loss WITHOUT offset (%)	0.0%		
		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 (%)	50.0%				

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	Score (Area)		Rationale
Conservation significance			
Description	Banksia Woodlands of the Swan Coastal Plain		
Type of environmental value	Ecological community		
Conservation significance of environmental value	Priority ecological community		
Landscape-level value impacted	yes/no		
Significant impact			
Description	Banksia Woodland		
Significant impact (hectares) / Type of feature	1.70		area calculated in assessment
Quality (scale) / Number	5.00		using commonwealth habitat quality scoring assessment
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		no rehabilitation within impact site considered
Future quality WITHOUT rehabilitation (scale) / Future number WITHOUT rehabilitation	0.00		
Future quality WITH rehabilitation (scale) / Future number WITH rehabilitation	0.00		
Time until ecological benefit (years)	0.00		
Confidence in rehabilitation result (%)	0		
Offset			
Description	Eglinton Offset site		
Proposed offset (area in hectares)	5.98		5.98 ha within a total 7 ha site
Current quality of offset site / Start number (of type of feature)	8.00		Using commonwealth habitat quality scoring assessment The proposed land is understood to be of excellent quality, but heavily persistent weeds and is not protected from disturbance (trail bikes etc).
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	8.00		without offset, no action to improve or protect the land would occur
Future quality WITH offset (scale) / Future number WITH offset	9.00		Water Corporation will undertake significant improvement actions on the site to improve the quality of the TEC/PEC significantly (such as weed management, revegetation etc)
Time until ecological benefit (years)	5.00		following a period of 5 years to secure the offset in perpetuity, and improve the site to reach the full value of the offset
Confidence in offset result (%)	0.5		Water Corporation is very confident that it can achieve a result in relation to enhancing the condition of Tuart TEC/PEC through active management
Duration of offset implementation (maximum 20 years)	20.00		maximum. Proposed to remain in perpetuity
Time until offset site secured (years)	1.00		allowance for covenant to be secured.
Risk of future loss WITHOUT offset (%)	0.0%		The proposed eglinton site is zoned "Public Purposes" in the planning scheme. The site was purchased by Water Corporation for use as the Eglinton Groundwater Treatment Plant. Water Corporation had originally intended to use the site for the GWTP, which has since been relocated to the ASDP site. However, Water Corporation still considers the site a usable resource to provide water resources to the surrounding area, and is planned to be used for storage tanks, and other water infrastructure, within the next 10 years. However, a percentage of 0% is applied as if clearing was to occur it would require an offset.
Risk of future loss WITH offset (%)	0.0%		the land will be protected through a covenant and/or planning scheme change
Offset ratio (Conservation area only)	N/A		

Secondary offset (overlapping interest): Eglinton site - Black Cockatoos - Justification for scores

Item	Score	Justification
Impact area		
Area of significant residual impact	52.04 ha	as defined by Alkimos Proposal
habitat quality	4 CBC 3 FRT 7 as per DCCEEW advice	<p>Site condition : high to very high quality habitat (However, see Black Cockatoo Habitat Scoring Tool Calculator in Appendix D)</p> <p>Site context : low importance in relation to other available areas. 52.04 ha (49.8ha FRT) is spread across the ASDP plant site and pipeline corridor. On the plant site there is significantly more valuable foraging species to the north of the site, within the northern conservation area. As the pipeline route is only 16m wide, predominantly along cleared road corridors, Black cockatoos will favour adjacent bushland for foraging.</p> <p>Species stocking rate : The ASDP is predominantly shrubland, therefore unlikely to support significant usage by Black Cockatoos.</p>
Proposed offset area		
Time over which loss is averted	20	maximum. Proposed to remain in perpetuity
Time until ecological benefit	5	following a period of 1 year to secure the offset in perpetuity and apply some management to the site, it is expected to reach full offset value at 3 to 5 years.
Risk of loss (%) without offset	0%	<p>The proposed eglinton site is zoned "Public Purposes" in the planning scheme. The site was purchased by Water Corporation for use as the Eglinton Groundwater Treatment Plant. Water Corporation had originally intended to use the site for the GWTP, which has since been relocated to the ASDP site. However, Water Corporation still considers the site a usable resource to provide water resources to the surrounding area, and is planned to be used for storage tanks, and other water infrastructure, within the next 10 years.</p> <p>However, a percentage of 0% is applied as if clearing was to occur it would require an offset.</p>
Start Quality	7 CBC 5 FRT	See Black Cockatoo Habitat Scoring Tool Calculator in Appendix D)
future quality without offset	7 CBC 5 FRT	the quality will not change without an offset
Risk of loss (%) with offset	0%	it is expected that DBCA will manage the land following a period of intensive management by Water Corporation
future quality with offset	8 CBC 6 FRT	it is expected that it is achievable within a 5 year management timeframe to improve the site to acheive a score of 9,
Confidence in result (%)	50%	Water Corporation is very confident that it can achieve a result in relation to protecting and improving and understands that 50% is a reasonable expectation to have in confidence, especially as the improvements are more focussed on protections to the site, rather than improving veg quality.

Primary offset: Eglinton site Banksia Woodland TEC - Justification for scores

Item	Score	Justification
Impact area		
Area of significant residual impact	1.7	as defined by Alkimos Proposal
habitat quality	5	Site condition : predominantly good condition (see Banksia Habitat Scoring Tool Calculator in Appendix D)
		Site context : areas are scattered through impact footprint (ASDP plant site and pipeline corridor)and are on road reserves.
Proposed offset area		
Time over which loss is averted	20	maximum. Proposed to remain in perpetuity
Time until ecological benefit	5	It is expected to take a period of 5 years of improvements to reach the full value of the offset.
Risk of loss (%) without offset	0%	<p>The proposed eglinton site is zoned "Public Purposes" in the planning scheme.</p> <p>The site was purchased by Water Corporation for use as the Eglinton Groundwater Treatment Plant. Water Corporation had originally intended to use the site for the GWTP, which has since been relocated to the ASDP site.</p> <p>However, Water Corporation still considers the site a usable resource to provide water resources to the surrounding area, and is planned to be used for storage tanks, and other water infrastructure, within the next 10 years.</p> <p>However, a percentage of 0% is applied as if clearing was to occur it would require an offset.</p>
Start Quality	8	the proposed land is understood to be of excellent quality, but without protection (i.e from weed, dieback infestation).
future quality without offset	8	without offset, no action to improve or protect the land would occur
Risk of loss (%) with offset	0%	the land will be protected through a covenant and/or planning scheme change
future quality with offset	9	Water corporation will undertake a management program to improve and protect the offset land.
Confidence in result (%)	50%	Water Corporation is very confident that it can achieve a result in relation to protecting and improving and understands that 50% is a reasonable expectation to have in confidence, especially as the improvements are more focussed on protections to the site, rather than improving veg quality.



APPENDIX A2 – CARABOODA TANK SITE OFFSET CALCULATOR

WA Environmental Offsets calculator

Step 1: Determining conservation significance

Key:

- Data to be entered
- Drop-down selection
- Automatically-generated scores
(Or, if appropriate, manual data entry permitted)

Area / feature (Impact site)

Conservation significance determination for the environmental value impacted	
Conservation significance	Description Melaleuca huegelii-Melaleuca systema shrublands on limestone ridges
	Type of environmental value Ecological community
	Conservation significance of environmental value Threatened ecological community - endangered
	Conservation significance score 1.2%

Please select area or feature for the calculations	Area
----------------------------------------------------	------

Step 2: Calculating significant residual impact

Key:

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

Environmental value (step 1)	Melaleuca huegelii-Melaleuca systema shrublands on limestone ridges
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Area (impact site)

Part A: Significant impact calculation Area		
	Description	Quantum of impact
Significant impact	clearing for ASDP to Wanerroo pipeline	Significant impact (hectares) 1.03
		Quality (scale) 7.00
		Total quantum of impact 0.72

Part B: Rehabilitation credit calculation Area (onsite)				
	Description	Proposed rehabilitation (area in hectares)	Time until ecological benefit (years)	
Rehabilitation Credit	not applicable at this stage	Current quality of rehabilitation site (scale)	Confidence in rehabilitation result (%)	
		Future quality WITHOUT rehabilitation (scale)	Rehabilitation credit	0.00
		Future quality WITH rehabilitation (scale)		

Part C: Significant residual impact calculation Area	
Significant residual impact	Total quantum of impact 0.72
	Rehabilitation credit 0.00
	Significant residual impact 0.72

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Melaleuca huegelii- Melaleuca systema 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	

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	Score (Area)		Rationale
Conservation significance			
Description	Melaleuca huegelii-Melaleuca systema shrublands on limestone ridges		As defined by Flora and Vegetation Consolidation Report (Stantec, 2020a)
Type of environmental value	Ecological community		As detailed in guidance. https://www.dpaw.wa.gov.au/images/documents/plants-animals/tecs/SCP26a-Melaleuca-shrublands-on-limestone-ridges.pdf
Conservation significance of environmental value	Threatened ecological community - endangered		Endangered - as per guidance. https://www.dpaw.wa.gov.au/images/documents/plants-animals/tecs/SCP26a-Melaleuca-shrublands-on-limestone-ridges.pdf
Landscape-level value impacted	yes/no		
Significant impact			
Description	clearing for ASDP to Wanerroo pipeline		
Significant impact (hectares) / Type of feature	1.03		
Quality (scale) / Number	7.00		predominantly very good quality vegetation but with some weed presence
Rehabilitation credit			
Description	not applicable at this stage		n/a
Proposed rehabilitation (area in hectares)	0.00		n/a
Current quality of rehabilitation site / Start number (of type of feature)	0.00		n/a
Future quality WITHOUT rehabilitation (scale) / Future number WITHOUT rehabilitation	0.00		n/a
Future quality WITH rehabilitation (scale) / Future number WITH rehabilitation	0.00		n/a
Time until ecological benefit (years)	0.00		n/a
Confidence in rehabilitation result (%)	0		n/a
Offset			
Description	Land acquisition - Carabooda Tank Site		
Proposed offset (area in hectares)	3.10		
Current quality of offset site / Start number (of type of feature)	8.00		Stantec report identifies the condition of the Carabooda Tank Site to be excellent.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	8.00		likely to reduce slightly as the site is not actively managed and is surrounded by agricultural uses. Should be noted that some of the site could be cleared when future water assets are installed.
Future quality WITH offset (scale) / Future number WITH offset	9.00		quality of vegetation will be protected through transfer to the conservation estate, or secured with conservation covenant.
Time until ecological benefit (years)	5.00		immediate benefit, as land is already vegetated
Confidence in offset result (%)	0.6		high confidence in the result as land is already owned by Water Corporation.
Duration of offset implementation (maximum 20 years)	20.00		in perpetuity
Time until offset site secured (years)	1.00		allowance of 1 year for land transfer or covenant
Risk of future loss WITHOUT offset (%)	25.0%		Site is used to house the Carabooda Water Tank. It is planned to require additional clearing for another tank on the site, and the site has appropriate planning approvals (still subject to clearing permission). Used DWER Draft Guidance to inform percentage (25% is based on the category: "Road reserves and other infrastructure corridors - 20–40% moderate likelihood that the site could be cleared over the next 20 years, depending on the width of the infrastructure corridor, adjacent land uses and likelihood of being impacted by widening, realignment or maintenance activities.")
Risk of future loss WITH offset (%)	0.0%		protected in perpetuity
Offset ratio (Conservation area only)	N/A		

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012
This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	FRT BC
EPBC Act status	Vulnerable
Annual probability of extinction <small>Based on IUCN category definitions</small>	0.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Carabooda Tank Offset Site - Forest Red Tailed Black Cockatoo

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	No		Area			The TEC condition: Very Good - Good
			Quality			
			Total quantum of impact	0.00		
<i>Threatened species habitat</i>						
Area of habitat	Yes	Also component of Black Cockatoo foraging habitat	Area	49.8	Hectares	using HQS for FRTBC - See Appendix D (average score applied - 3 for pipeline and 1 for ASDP site)
			Quality	7	Scale 0-10	
			Total quantum of impact	34.86	Adjusted hectares	
<i>Threatened species</i>						
Protected matter attributes						
Number of features e.g. Nest hollows, habitat trees						
Condition of habitat Change in habitat condition, but no change in extent						
Birth rate e.g. Change in nest success						
Mortality rate e.g. Change in number of road kills per year						
Number of individuals e.g. Individual plants/animals						

Offset calculator																							
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source				
<i>Ecological Communities</i>																							
Area of community	Yes		Adjusted hectares	land acquisition - Carabooda Tank Site SEE STATE CALCULATOR	Risk-related time horizon (max. 20 years)	Start area (hectares)	Risk of loss (% without offset)	Future area without offset (adjusted hectares)	0.0	Risk of loss (% with offset)	Future area with offset (adjusted hectares)	0.0	0.00		0.00	0.00	#DIV/0!	#DIV/0!					
					Time until ecological benefit	Start quality (scale of 0-10)	Future quality without offset (scale of 0-10)	Future quality with offset (scale of 0-10)	0.00	50%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
					Time over which loss is averted (max. 20 years)	20	Start area (hectares)	5.4	Future area without offset (adjusted hectares)	5.4	Future area with offset (adjusted hectares)	5.4	0.00	50%	0.00	0.00	0.00	0.53	1.53%	No			
<i>Threatened species habitat</i>																							
Area of habitat	Yes	34.86	Adjusted hectares	land acquisition - Carabooda Tank Site	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	5.4	Future area without offset (adjusted hectares)	5.4	Future area with offset (adjusted hectares)	5.4	0.00	50%	0.00	0.00	0.00	0.53	1.53%	No			
					Time until ecological benefit	5	Start quality (scale of 0-10)	3	Future quality without offset (scale of 0-10)	3	Future quality with offset (scale of 0-10)	5	2.00	50%	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
					Time horizon (years)		Start value		Future value without offset		Future value with offset		Raw gain		Confidence in result (%)		Adjusted gain		Net present value		% of impact offset		Minimum (90%) direct offset requirement met?
<i>Threatened species</i>																							
Protected matter attributes																							
Number of features e.g. Nest hollows, habitat trees																							
Condition of habitat Change in habitat condition, but no change in extent																							
Birth rate e.g. Change in nest success																							
Mortality rate e.g. Change in number of road kills per year																							
Number of individuals e.g. Individual plants/animals																							

Secondary offset (overlapping interest):

Black Cockatoos - Justification for scores

Item	Score	Justification
Impact area		
Area of significant residual impact	52.1 ha	as defined by Alkimos Proposal
habitat quality	4 CBC 3 FRT 7 as per DCCEEW Advice	<p>Site condition :</p> <p>Site context : low importance in relation to other available areas. 52.1ha (49.8ha for FRT) is spread across the ASDP plant site and pipeline corridor. On the plant site there is significantly more valuable foraging species to the north of the site, within the northern conservation area. As the pipeline route is only 16m wide, predominantly along cleared road corridors, Black cockatoos will favour adjacent bushland for foraging. FRT habitat is more valuable on the pipeline route</p> <p>Species stocking rate: The ASDP is predominantly shrubland, therefore unlikely to support significant usage by Black Cockatoos .</p>
Proposed offset area		
Time over which loss is averted	20	maximum. Proposed to remain in perpetuity
Time until ecological benefit	5	following a period of 5 years to secure the offset in perpetuity, and improve the site to reach the full value of the offset
Risk of loss (%) without offset	0%	<p>Site is used to house the Carabooda Water Tank. It is planned to require additional clearing for another tank on the site, and the site has appropriate planning approvals (still subject to clearing permission).</p> <p>Used DWER Draft Guidance to inform percentage</p> <p>(25% could be used and would be based on the category: "Road reserves and other infrastructure corridors - 20–40% moderate likelihood that the site could be cleared over the next 20 years, depending on the width of the infrastructure corridor, adjacent land uses and likelihood of being impacted by widening, realignment or maintenance activities.")</p>
Start Quality	6 (3 FRT BC)	the proposed land has good value when using the habitat scoring system (DCCEEW 2023) lesser value for FRT
future quality without offset	6 (3 FRT BC)	the score will not change without an offset
Risk of loss (%) with offset	0%	WC will manage the site into the future
future quality with offset	8 (5 FRT BC)	The foraging quality score will improve slightly following improvements in vegetation for foraging
Confidence in result (%)	50%	Water Corporation is very confident that it can achieve a result in relation to securing a high quality foraging habitat



APPENDIX A3 – ALKIMOS SITE OFFSET CALCULATOR

WA Environmental Offsets calculator

Step 1: Determining conservation significance

Key:
 Data to be entered
 Drop-down selection
 Automatically-generated scores
 (Or, if appropriate, manual data entry permitted)

Area / feature (Impact site)

Conservation significance determination for the environmental value impacted									
Conservation significance	<table border="1"> <tr> <td>Description</td> <td>Tuart Woodlands of the Swan Coastal Plain PEC</td> </tr> <tr> <td>Type of environmental value</td> <td>Ecological community</td> </tr> <tr> <td>Conservation significance of environmental value</td> <td>Priority ecological community</td> </tr> <tr> <td>Conservation significance score</td> <td>0.1%</td> </tr> </table>	Description	Tuart Woodlands of the Swan Coastal Plain PEC	Type of environmental value	Ecological community	Conservation significance of environmental value	Priority ecological community	Conservation significance score	0.1%
Description	Tuart Woodlands of the Swan Coastal Plain PEC								
Type of environmental value	Ecological community								
Conservation significance of environmental value	Priority ecological community								
Conservation significance score	0.1%								

Please select <i>area</i> or <i>feature</i> for the calculations	Area
------------------------------------------------------------------	------

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Tuart Woodlands of the Swan Coastal Plain PEC
------------------------------	-----------------------------------------------

Area (impact site)

Part A: Significant impact calculation Area		
	Description	Quantum of impact
Significant impact	Tuart Woodlands	Significant impact (hectares) 1.16
		Quality (scale) 5.00
		Total quantum of impact 0.58

Part B: Rehabilitation credit calculation Area (onsite)				
	Description	Proposed rehabilitation (area in hectares)	Time until ecological benefit (years)	
Rehabilitation Credit				
		Current quality of rehabilitation site (scale)	Confidence in rehabilitation result (%)	
		Future quality WITHOUT rehabilitation (scale)	Rehabilitation credit	0.00
		Future quality WITH rehabilitation (scale)		

Part C: Significant residual impact calculation Area	
Significant residual impact	Total quantum of impact 0.58
	Rehabilitation credit 0.00
	Significant residual impact 0.58

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Tuart Woodlands of the Swan Coastal Plain PEC	Significant impact (step 2, part A)	1.16
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	0.58

Area (offset site)

Offset calculation Area							
Offsets calculation	Description	Proposed offset (area in hectares)	4.91	Duration of offset implementation (maximum 20 years)	20.00	Offset value	0.98
	Alkimos Offset Site	Current quality of offset site (scale)	5.00	Time until offset site secured (years)	1.00		168.5%
		Future quality WITHOUT offset (scale)	5.00	Risk of future loss WITHOUT offset (%)	0.0%		
		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 (%)	50.0%				OFFSET ADEQUATE?

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset		
Calculation	Score (Area)	Rationale
Conservation significance		
Description	Tuart Woodlands of the Swan Coastal Plain PEC	
Type of environmental value	Ecological community	
Conservation significance of environmental value	Priority ecological community	
Landscape-level value impacted	yes/no	
Significant impact		
Description	Tuart Woodlands	
Significant impact (hectares) / Type of feature	1.16	area calculated in assessment
Quality (scale) / Number	5.00	using commonwealth habitat quality scoring assessment
Rehabilitation credit		
Description	0	
Proposed rehabilitation (area in hectares)	0.00	
Current quality of rehabilitation site / Start number (of type of feature)	0.00	no rehabilitation within impact site considered
Future quality WITHOUT rehabilitation (scale) / Future number WITHOUT rehabilitation	0.00	
Future quality WITH rehabilitation (scale) / Future number WITH rehabilitation	0.00	
Time until ecological benefit (years)	0.00	
Confidence in rehabilitation result (%)	0	
Offset		
Description	Alkimos Offset Site	
Proposed offset (area in hectares)	4.91	4.91 ha within a total 9 ha site
Current quality of offset site / Start number (of type of feature)	5.00	Using commonwealth habitat quality scoring assessment The proposed land is understood to be of good quality, but heavily infested with persistent weeds and is not protected from disturbance (trail bikes etc).
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	5.00	without offset, no action to improve or protect the land would occur
Future quality WITH offset (scale) / Future number WITH offset	9.00	Water Corporation will undertake significant improvement actions on the site to improve the quality of the TEC/PEC significantly (such as weed management, revegetation etc)
Time until ecological benefit (years)	5.00	following a period of 5 years to secure the offset in perpetuity, and improve the site to reach the full value of the offset
Confidence in offset result (%)	0.5	Water Corporation is very confident that it can achieve a result in relation to enhancing the condition of Tuart TEC/PEC through active management
Duration of offset implementation (maximum 20 years)	20.00	Maximum used. Proposed to remain in perpetuity
Time until offset site secured (years)	1.00	allowance for covenant to be secured.
Risk of future loss WITHOUT offset (%)	0.0%	Although this land is zoned urban deferred in the planning scheme, if it was to be cleared it would likely require offsets. Although this zoning requires clearance from odour condition to develop, the Planning Scheme allows for future development. Water Corporation has investigated methods to develop this land and would likely be developed in the next 10 years, given the land development pressures on the Alkimos area in the future and the value of the land to recuperate costs of land purchase.
Risk of future loss WITH offset (%)	0.0%	the land will be protected through a covenant and/or planning scheme change
Offset ratio (Conservation area only)	N/A	

Primary offset: Tuart Woodland TEC - Justification for scores

Item	Score	Justification
Impact area		
Area of significant residual impact	1.16	as defined by Alkimos Proposal
habitat quality	5	Site condition : good condition on the plant site, but area south of Carabooda tank is predominantly completely degraded (see Tuart Habitat Scoring Tool Calculator in Appendix D)
		Site context : although areas are scattered through impact footprint (ASDP plant site and pipeline corridor) Tuart trees account for canopy connectivity across the area, despite being on road reserves.
Proposed offset area		
Time over which loss is averted	20	maximum. Proposed to remain in perpetuity
Time until ecological benefit	5	following a period of 5 years to secure the offset in perpetuity, and improve the site to reach the full value of the offset
Risk of loss (%) without offset	0%	Although this land is zoned urban deferred in the planning scheme, if it was to be cleared it would require offsets. Although this zoning requires clearance from odour condition to develop, the Planning Scheme allows for future development. Water Corporation has investigated methods to develop this land and would likely be developed in the next 10 years, given the land development pressures on the Alkimos area in the future and the value of the land to recouperate costs of land purchase.
Start Quality	5	The proposed land is understood to be of good quality, but heavily infested with persistent weeds and is not protected from disturbance (trail bikes etc).
future quality without offset	5	without offset, no action to improve or protect the land would occur
Risk of loss (%) with offset	0%	the land will be protected through a covenant and/or planning scheme change
future quality with offset	9	Water Corporation will undertake significant improvement actions on the site to improve the quality of the TEC signifcaintly (such as weed management, revegetation etc)
Confidence in result (%)	50%	Water Corporation is very confident that it can achieve a result in relation to enhancing the condition of Tuart TEC through active management

Secondary offset (overlapping interest): Tuart Woodland TEC - Black Cockatoos - Justification for scores

Item	Score	Justification
Impact area		
Area of significant residual impact	52.1 ha	as defined by Alkimos Proposal
habitat quality	4 CBC 3 FRT 7 as per DCCEEW comment	<p>Site condition : high to very high quality habitat (see Black Cockatoo Habitat Scoring Tool Calculator in Appendix D)</p> <p>Site context : low importance in relation to other available areas. 52.1ha (49.7ha for FRT) is spread across the ASDP plant site and pipeline corridor. On the plant site there is significantly more valuable foraging species to the north of the site, within the northern conservation area. As the pipeline route is only 16m wide, predominantly along cleared road corridors, Black cockatoos will favour adjacent bushland for foraging. FRT habitat is more valuable on the pipeline route</p> <p>Species stocking rate : The ASDP is predominantly shrubland, therefore unlikely to support significant usage by Black Cockatoos.</p>
Proposed offset area		
Time over which loss is averted	20	maximum. Proposed to remain in perpetuity
Time until ecological benefit	5	following a period of 5 years to secure the offset in perpetuity, and improve the site to reach the full value of the offset
Risk of loss (%) without offset	0%	<p>Although this land is zoned urban deferred in the planning scheme, if it was to be cleared it would require offsets.</p> <p>Although this zoning requires clearance from odour condition to develop, the Planning Scheme allows for future development. Water Corporation has investigated methods to develop this land and would likely be developed in the next 10 years, given the land development pressures on the Alkimos area in the future and the value of the land to recuperate costs of land purchase.</p>
Start Quality	5	the foraging quality score will not change without an offset (However, see Black Cockatoo Habitat Scoring Tool Calculator in Appendix D)
future quality without offset	5	without offset, no action to improve or protect the land would occur
Risk of loss (%) with offset	0%	it is expected that DBCA will manage the land following a period of intensive management by Water Corporation
future quality with offset	6	The foraging quality score will improve slightly following improvements in vegetation for foraging
Confidence in result (%)	50%	Water Corporation is very confident that it can achieve a result in relation to creating and establishing a high quality foraging habitat



APPENDIX A4 – NEERGABBY SITE OFFSET CALCULATOR

WA Environmental Offsets calculator

Step 1: Determining conservation significance

Key:
 Data to be entered
 Drop-down selection
 Automatically-generated scores
 (Or, if appropriate, manual data entry permitted)

Area / feature (Impact site)

Conservation significance determination for the environmental value impacted	
Conservation significance	Description Banksia Woodlands of the Swan Coastal Plain
	Type of environmental value Ecological community
	Conservation significance of environmental value Priority ecological community
	Conservation significance score 0.1%

Please select area or feature for the calculations	Area
----------------------------------------------------	------

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Banksia Woodlands of the Swan Coastal Plain
------------------------------	---------------------------------------------

Area (impact site)

Part A: Significant impact calculation Area		
	Description	Quantum of impact
Significant impact	1.7	Significant impact (hectares) 1.70
		Quality (scale) 5.00
		Total quantum of impact 0.85

Part B: Rehabilitation credit calculation Area (onsite)				
	Description	Proposed rehabilitation (area in hectares)	Time until ecological benefit (years)	
Rehabilitation Credit				
		Current quality of rehabilitation site (scale)	Confidence in rehabilitation result (%)	
		Future quality WITHOUT rehabilitation (scale)	Rehabilitation credit	0.00
		Future quality WITH rehabilitation (scale)		

Part C: Significant residual impact calculation Area	
Significant residual impact	Total quantum of impact 0.85
	Rehabilitation credit 0.00
	Significant residual impact 0.85

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Banksia Woodlands of the Swan Coastal Plain	Significant impact (step 2, part A)	1.70
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	0.85

Area (offset site)

Offset calculation Area							
Offsets calculation	Description	Proposed offset (area in hectares)	289.00	Duration of offset implementation (maximum 20 years)	20.00	Offset value	14.38
	Neergabby Offset site (Lot 1934 only)	Current quality of offset site (scale)	8.00	Time until offset site secured (years)	1.00		1691.5%
		Future quality WITHOUT offset (scale)	8.00	Risk of future loss WITHOUT offset (%)	0.0%		
		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 (%)	50.0%	OFFSET ADEQUATE?			YES

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset		
Calculation	Score (Area)	Rationale
Conservation significance		
Description	Banksia Woodlands of the Swan Coastal Plain	
Type of environmental value	Ecological community	
Conservation significance of environmental value	Priority ecological community	
Landscape-level value impacted	yes/no	
Significant impact		
Description	1.7	
Significant impact (hectares) / Type of feature	1.70	area calculated in assessment
Quality (scale) / Number	5.00	using commonwealth habitat quality scoring assessment
Rehabilitation credit		
Description	0	
Proposed rehabilitation (area in hectares)	0.00	
Current quality of rehabilitation site / Start number (of type of feature)	0.00	no rehabilitation within impact site considered
Future quality WITHOUT rehabilitation (scale) / Future number WITHOUT rehabilitation	0.00	
Future quality WITH rehabilitation (scale) / Future number WITH rehabilitation	0.00	
Time until ecological benefit (years)	0.00	
Confidence in rehabilitation result (%)	0	
Offset		
Description	Neergabby Offset site (Lot 1934 only)	
Proposed offset (area in hectares)	289.00	289 ha is only Lot 1934, there is still more on L58 not required
Current quality of offset site / Start number (of type of feature)	8.00	Using commonwealth habitat quality scoring assessment The proposed land is understood to be of excellent quality, but heavily persistent weeds and is not protected from disturbance (trail bikes etc).
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	8.00	without offset, no action to improve or protect the land would occur
Future quality WITH offset (scale) / Future number WITH offset	9.00	Water Corporation will undertake significant improvement actions on the site to improve the quality of the TEC/PEC significantly (such as weed management, revegetation etc)
Time until ecological benefit (years)	5.00	following a period of 5 years to secure the offset in perpetuity, and improve the site to reach the full value of the offset
Confidence in offset result (%)	0.5	Water Corporation is very confident that it can achieve a result in relation to enhancing the condition of Tuart TEC/PEC through active management. Particularly with DBCA providing assistance
Duration of offset implementation (maximum 20 years)	20.00	maximum. Proposed to remain in perpetuity
Time until offset site secured (years)	1.00	allowance for land to be secured.
Risk of future loss WITHOUT offset (%)	0.0%	The lot was privately owned. It is zoned general rural. It sits within an area earmarked as 'rural smallholding' under the town planning scheme, which indicates subdivision is possible, and therefore reduce the value of the habitat through clearing and fragmentation of the greater area. however, a percentage of 0% is applied based on an offset being required if it were to be cleared.
Risk of future loss WITH offset (%)	0.0%	the land will be protected through a transfer into the conservation estate.
Offset ratio (Conservation area only)	N/A	

Offset (overlapping interest):

Black Cockatoos - Justification for scores

Item	Score	Justification
Impact area		
Area of significant residual impact	52.1 ha (49.8 FRT)	as defined by Alkimos Proposal
habitat quality	4 CBC 3 FRT 7 as per DCCEEW Advice	Site condition : high to very high quality habitat (see Black Cockatoo Habitat Quality Scoring Tool Calculator in Appendix D Site context : a 4 for CBC and a 3 for FRT are an average across the entire project footprint amended to 7 as per DCCEEW advice the impact occurs to lower value habitat areas as detailed in the HQS tool and is of low importance in relation to other available areas. 52.1 ha (and 49.8ha FRT) is spread across the ASDP plant site and pipeline corridor. On the plant site there is significantly more valuable foraging species to the north of the site, within the northern conservation area. As the pipeline route is only 16m wide, predominantly along cleared road corridors, Black cockatoos will favour adjacent bushland for foraging. Species stocking rate :
Proposed offset area		
Time over which loss is averted	20	maximum. Proposed to remain in perpetuity
Time until ecological benefit	5	following a period of 5 years to secure and improve the offset
Risk of loss (%) without offset	0%	The lot is privately owned. It is zoned general rural. It sits within an area earmarked as 'rural smallholding' under the town planning scheme, which indicates subdivision is possible, and therefore reduce the value of the habitat through clearing and fragmentation of the greater area. however, a percentage of 0% is applied based on an offset being required if it were to be cleared.
Start Quality	8 CBC 5 FRT	the proposed land is listed as higher quality in a Black Cockatoo Habitat Scoring Tool Calculator in Appendix D for CBC over FRT
future quality without offset	8 CBC 5 FRT	this will not change without an offset
Risk of loss (%) with offset	0%	the conservation status and future land management of the land will prevent loss.
future quality with offset	9 CBC 6 FRT	with protection and some site cleanup prior to transfer to DBCA, the 9 and 6 would be achievable at the site.
Confidence in result (%)	50%	Water Corporation is very confident that it can achieve a result in relation to creating and establishing a high quality foraging habitat

Offset: Banksia Woodland TEC - Justification for scores

Item	Score	Justification
Impact area		
Area of significant residual impact	1.7	as defined by Alkimos Proposal
habitat quality	5	<p>Site condition : See Banksia Habitat Scoring Tool Calculator in Appendix D)</p> <p>Site context : areas are scattered through impact footprint (ASDP plant site and pipeline corridor) despite being on road reserves.</p>
Proposed offset area		
Time over which loss is averted	20	maximum. Proposed to remain in perpetuity
Time until ecological benefit	5	It is expected to take a period of 5 years of improvements to reach the full value of the offset.
Risk of loss (%) without offset	0%	<p>The lot is privately owned.</p> <p>It is zoned general rural.</p> <p>It sits within an area earmarked as 'rural smallholding' under the town planning scheme, which indicates subdivision is possible, and therefore reduce the value of the habitat through clearing and fragmentation of the greater area.</p> <p>however, a percentage of 0% is applied based on an offset being required if it were to be cleared.</p>
Start Quality	8	(see Banksia Habitat Scoring Tool Calculator in Appendix D)
future quality without offset	8	without offset, no action to improve or protect the land would occur
Risk of loss (%) with offset	0%	the land will be protected through a transfer into the conservation estate
future quality with offset	9	<p>Water corporation will undertake a management program to improve and protect the offset land.</p> <p>The land will also be protected through a transfer into the conservation estate.</p>
Confidence in result (%)	50%	Water Corporation is very confident that it can achieve a result in relation to protecting and improving and understands that 50% is a reasonable expectation to have in confidence, especially as the improvements are more focussed on protections to the site, rather than improving veg quality.

Offset (REHAB NEERGABBY):

Black Cockatoos - Justification for scores

Item	Score	Justification
Impact area		
Area of significant residual impact	52.1 ha (49.8ha FRT)	as defined by Alkimos Proposal
habitat quality	4 CBC 3 FRT 7 as per DCCEEW Advice	Site condition :see Black Cockatoo Habitat Scoring Tool Calculator in Appendix D
		Site context : low importance in relation to other available areas. 52.1 ha (49.8 ha FRT) is spread across the ASDP plant site and pipeline corridor. On the plant site there is significantly more valuable foraging species to the north of the site, within the northern conservation area. As the pipeline route is only 16m wide, predominantly along cleared road corridors, Black cockatoos will favour adjacent bushland for foraging.
		Species stocking rate :
Proposed offset area		
Time over which loss is averted	20	maximum. Proposed to remain in perpetuity
Time until ecological benefit	5	a period of 5 years is expected to recognise some benefit from habitat creation
Risk of loss (%) without offset	0%	The lot is privately owned. It is zoned general rural. It sits within an area earmarked as 'rural smallholding' under the town planning scheme, which indicates subdivision is possible, and therefore reduce the value of the habitat through clearing and fragmentation of the greater area. however, a percentage of 0% is applied based on an offset being required if it were to be cleared.
Start Quality	3	the proposed revegetation areas are mostly cleared, but with significant trees. Updated - within 12 km of known roost
future quality without offset	3	this will not change without an offset
Risk of loss (%) with offset	0%	the conservation status and future land management of the land will prevent loss.
future quality with offset	7 CBC and 6 FRT	with revegetation and some additional management prior to transfer to DBCA, a 6 would be achievable for CBC and for FRT given the area is surrounded by good habitat
Confidence in result (%)	40%	Water Corporation is very confident that it can achieve a result in relation to creating and establishing a high quality foraging habitat



**APPENDIX A5 – REGIONALLY SIGNIFICANT VEGETATION (BUSH FOREVER) - WA
OFFSET CALCULATOR**

WA Environmental Offsets calculator

Step 1: Determining conservation significance

Key:

	Data to be entered
	Drop-down selection
	Automatically-generated scores (Or, if appropriate, manual data entry permitted)

Area / feature (Impact site)

Conservation significance determination for the environmental value impacted	
Conservation significance	Description Bush Forever site
Conservation significance	Type of environmental value Conservation area
Conservation significance	Conservation significance of environmental value Bush Forever site
Conservation significance	Conservation significance score A conservation significance score does not apply in this case; an offset ratio may be appropriate (step 3)

Please select <i>area</i> or <i>feature</i> for the calculations	Area
------------------------------------------------------------------	------

Step 2: Calculating significant residual impact

Key:

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

Environmental value (step 1)	Bush Forever site
------------------------------	-------------------

Area (impact site)

Part A: Significant impact calculation Area		
Significant impact	Description	Quantum of impact
	clearing for ASDP to Wanerroo pipeline	Significant impact (hectares) 5.70
		Quality (scale) 7.00
		Total quantum of impact 3.99

Part B: Rehabilitation credit calculation Area (onsite)				
Rehabilitation Credit	Description	Proposed rehabilitation (area in hectares)	Time until ecological benefit (years)	
	not applicable at this stage	Current quality of rehabilitation site (scale)	Confidence in rehabilitation result (%)	
		Future quality WITHOUT rehabilitation (scale)	Rehabilitation credit	0.00
		Future quality WITH rehabilitation (scale)		

Part C: Significant residual impact calculation Area	
Significant residual impact	Total quantum of impact 3.99
Significant residual impact	Rehabilitation credit 0.00
Significant residual impact	Significant residual impact 3.99

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)	5.70
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	3.99

Area (offset site)

Offset calculation Area							
Offsets calculation	Description	Proposed offset (area in hectares)	12.40	Duration of offset implementation (maximum 20 years)	20.00		
		Current quality of offset site (scale)	7.00	Time until offset site secured (years)	1.00		
	Eglinton and Alkimos sites.	Future quality WITHOUT offset (scale)	7.00	Risk of future loss WITHOUT offset (%)	0.0%	Offset value Conservation area (applied to step 2, part A)	2
		Future quality WITH offset (scale)	8.00	Risk of future loss WITH offset (%)	0.0%		108.8%
		Time until ecological benefit (years)	5.00				
		Confidence in offset result (%)	50.0%				OFFSET ADEQUATE? YES

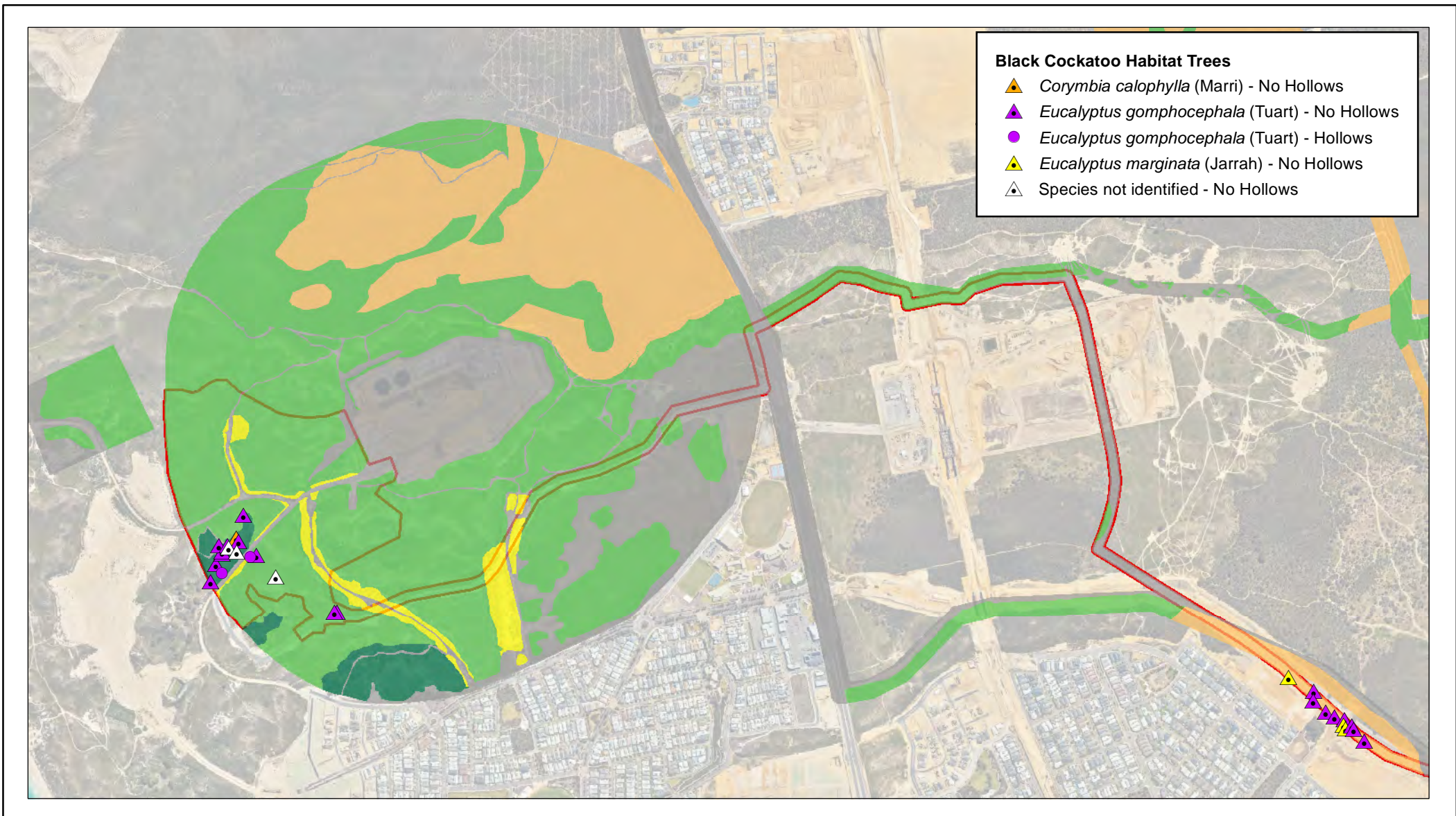
WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	Score (Area)		Rationale
Conservation significance			
Description	Bush Forever site		As defined by spatial data.
Type of environmental value	Conservation area		SPP 2.8
Conservation significance of environmental value	Bush Forever site		bush forever policy.
Landscape-level value impacted	yes/no		
Significant impact			
Description	clearing for ASDP to Wanerloo pipeline		
Significant impact (hectares) / Type of feature	5.70		excludes areas of road, or cleared land. total 9.42 ha
Quality (scale) / Number	7.00		predominantly very good quality vegetation but with significant weed presence given the occurrences are on road reserves.
Rehabilitation credit			
Description	not applicable at this stage		n/a
Proposed rehabilitation (area in hectares)	0.00		n/a
Current quality of rehabilitation site / Start number (of type of feature)	0.00		n/a
Future quality WITHOUT rehabilitation (scale) / Future number WITHOUT rehabilitation	0.00		n/a
Future quality WITH rehabilitation (scale) / Future number WITH rehabilitation	0.00		n/a
Time until ecological benefit (years)	0.00		n/a
Confidence in rehabilitation result (%)	0		n/a
Offset			
Description	Eglinton and Alkimos sites.		
Proposed offset (area in hectares)	11.40		includes 2 sites, Carabooda Tank and Eglinton offset sites to meet 2 x 5.7ha requirement
Current quality of offset site / Start number (of type of feature)	7.00		Using commonwealth habitat quality scoring assessment The Alkimos site is understood to be of good quality, but heavily infested with persistent weeds and is not protected from disturbance (trail bikes etc). The Eglinton site is excellent quality, but is also unprotected from external disturbance
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	7.00		no change without offset
Future quality WITH offset (scale) / Future number WITH offset	8.00		Water Corporation will undertake significant improvement actions on the site to improve the quality of the TEC/PEC significantly (such as weed management, revegetation etc)
Time until ecological benefit (years)	5.00		5 years for site management to occur
Confidence in offset result (%)	0.5		high confidence in the result as land is already owned by Water Corporation.
Duration of offset implementation (maximum 20 years)	20.00		in perpetuity
Time until offset site secured (years)	1.00		allowance of 1 year for covenant
Risk of future loss WITHOUT offset (%)	0.0%		Eglinton Site is zoned public purposes and was planned to accommodate the Eglinton Groundwater treatment plant. The site has appropriate planning approvals (still subject to clearing permission). Alkimos site is land is zoned urban deferred in the planning scheme, if it was to be cleared it would likely require offsets.
Risk of future loss WITH offset (%)	0.0%		the sites will be protected through a covenant and/or planning scheme change
Offset ratio (Conservation area only)	2		ratio as documented in MS1207



APPENDIX B: BLACK COCKATOO HABITAT IMPACT MAP SERIES



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)

1:15,000 at A4

0 140 280 420
Metres

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

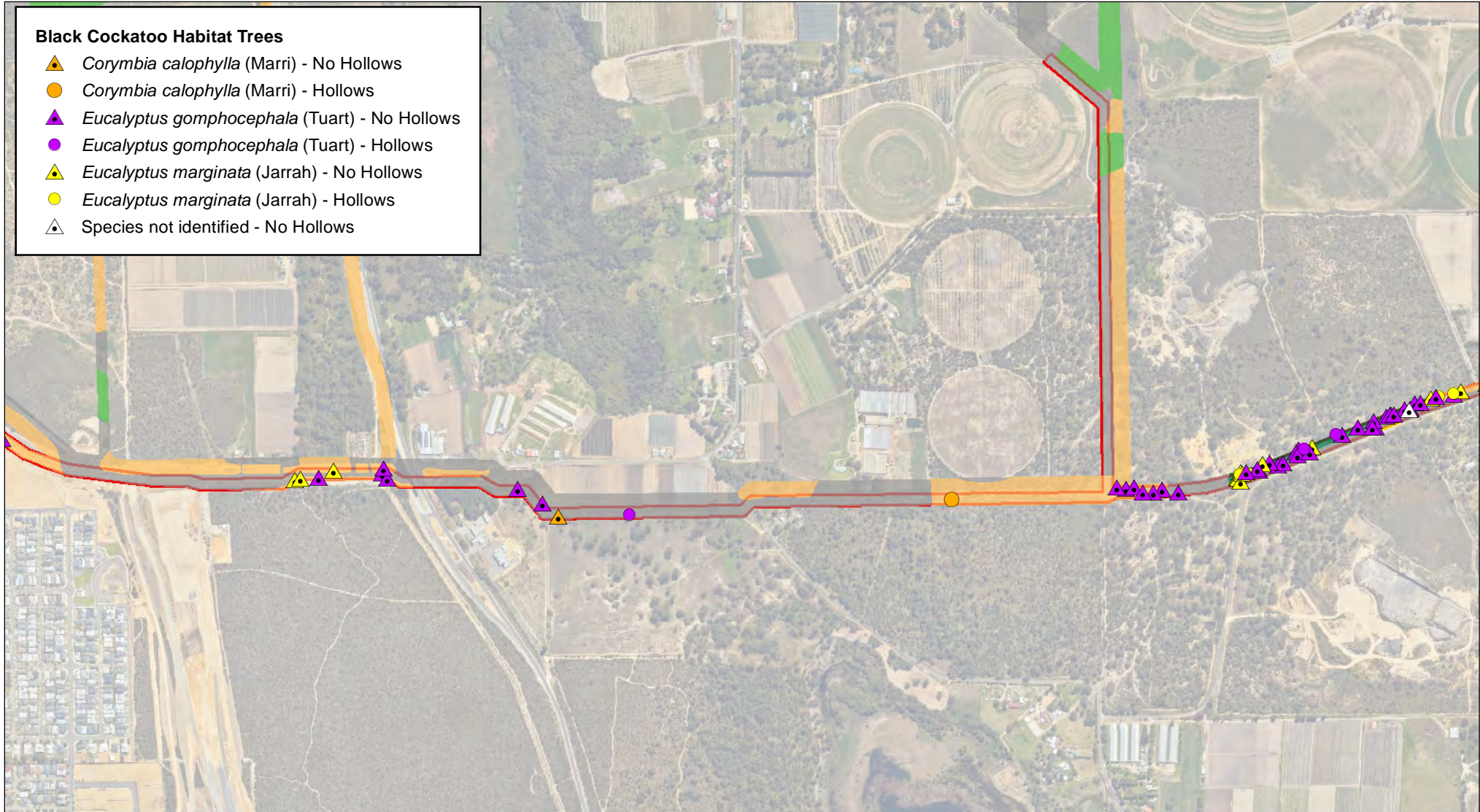
DATE: 6/02/2023
AUTHOR: RICEEO

WATER CORPORATION

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

Black Cockatoo Habitat Trees

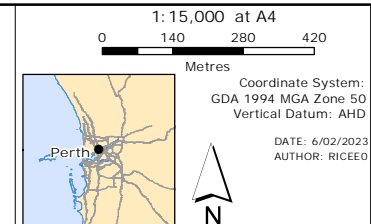
- ▲ *Corymbia calophylla* (Marri) - No Hollows
- *Corymbia calophylla* (Marri) - Hollows
- ▲ *Eucalyptus gomphocephala* (Tuart) - No Hollows
- *Eucalyptus gomphocephala* (Tuart) - Hollows
- ▲ *Eucalyptus marginata* (Jarrah) - No Hollows
- *Eucalyptus marginata* (Jarrah) - Hollows
- ▲ Species not identified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



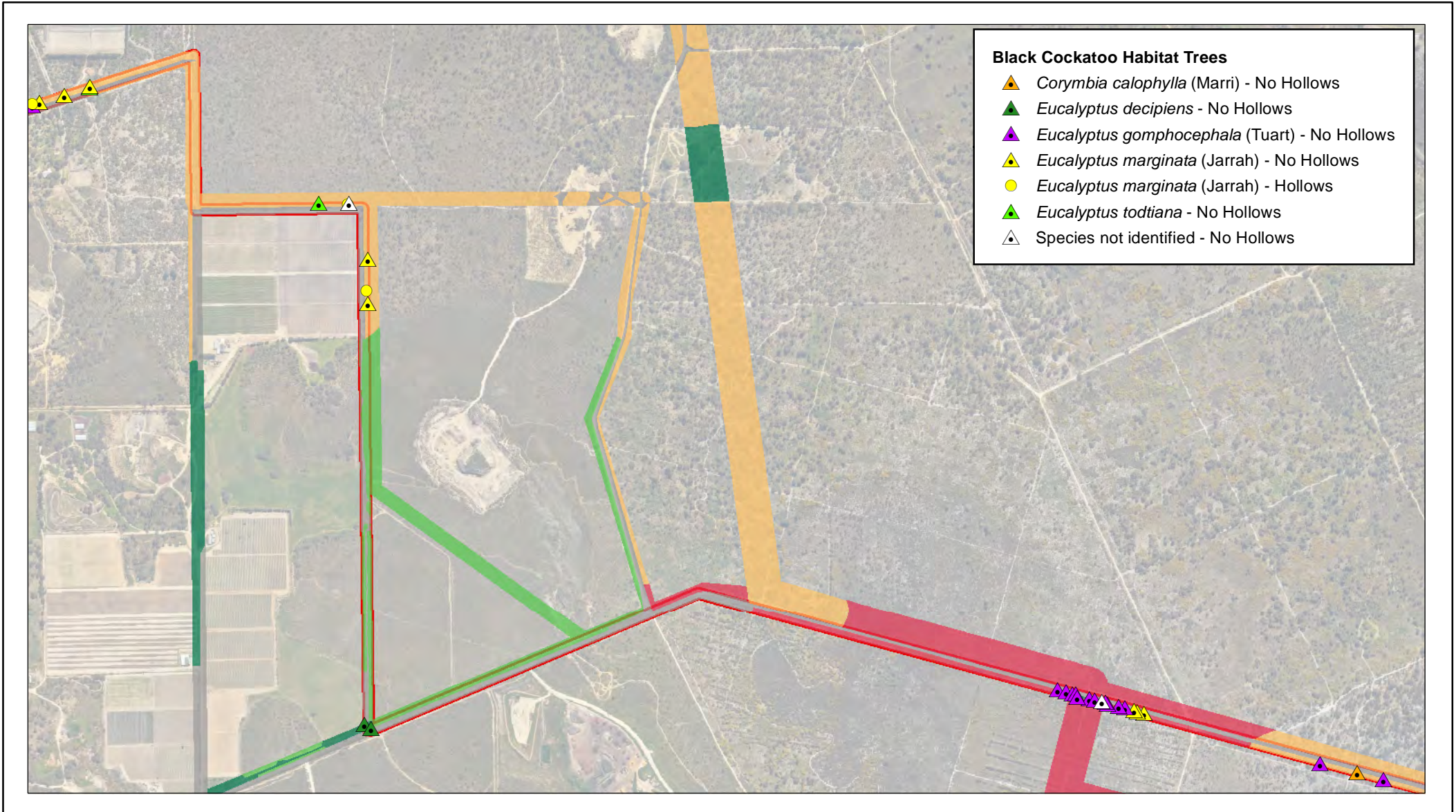
LEGEND

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

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



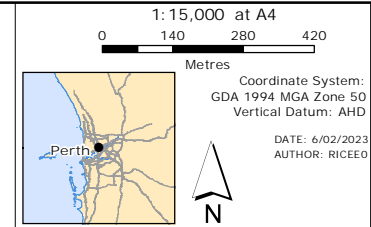
Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE



- 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

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> Development Envelope Cleared Heath and Shrubland (CBC, FRTBC) | <p>Fauna Habitat
(Stantec 2022; Biologic 2022; 360 2022)</p> <ul style="list-style-type: none"> Pine Plantation Regrowth (CBC) Scattered Trees (CBC, FRTBC) Woodland (CBC, FRTBC) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



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

385,037

387,037

6,498,005

6,498,005

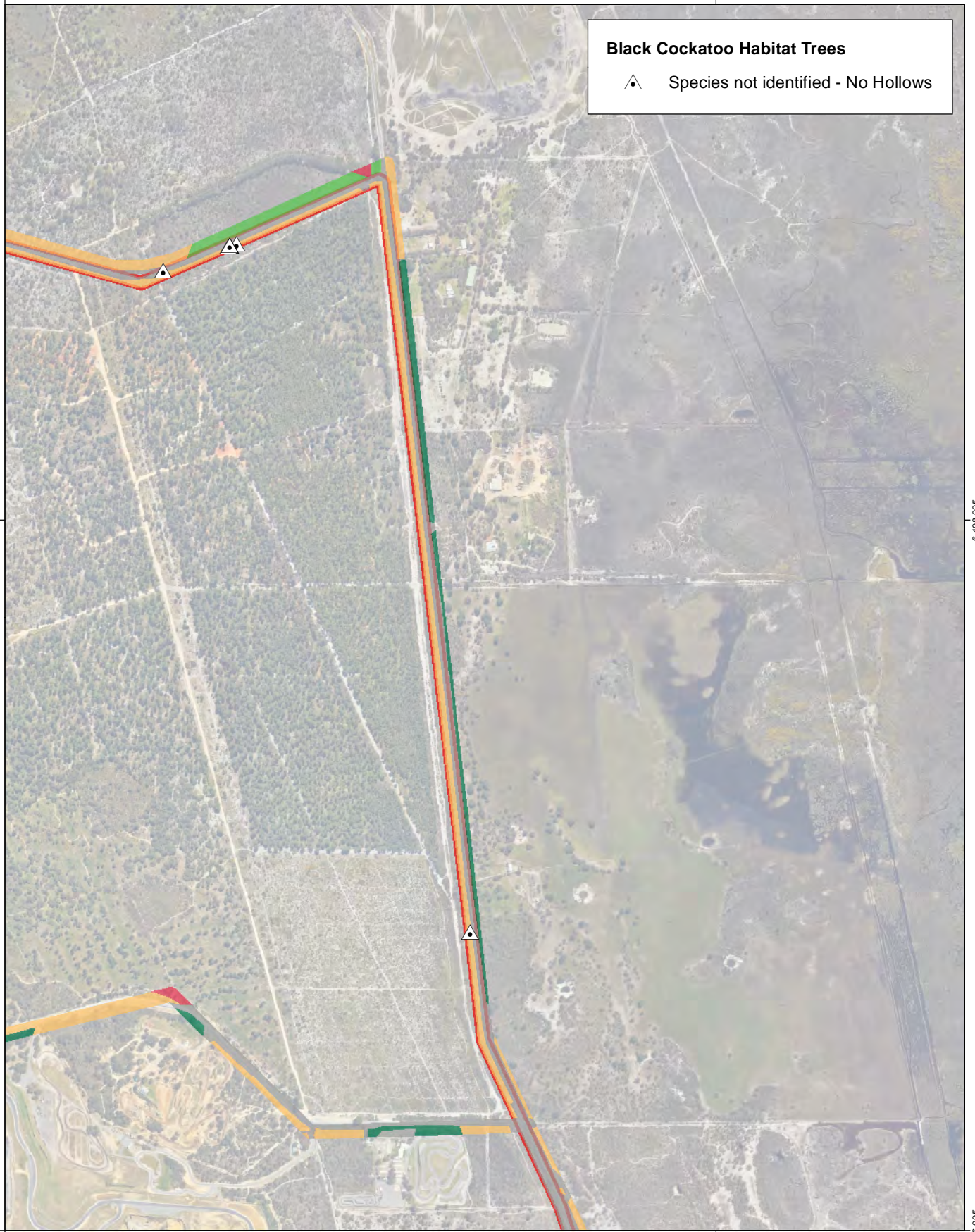
385,037

387,037

6,498,005

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

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)

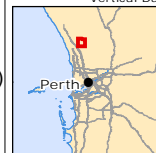
 Wetlands and Riparian Vegetation (CBC, FRTBC)

 Woodland (CBC, FRTBC)

1:15,000 at A4

0 150 300 450
Metres

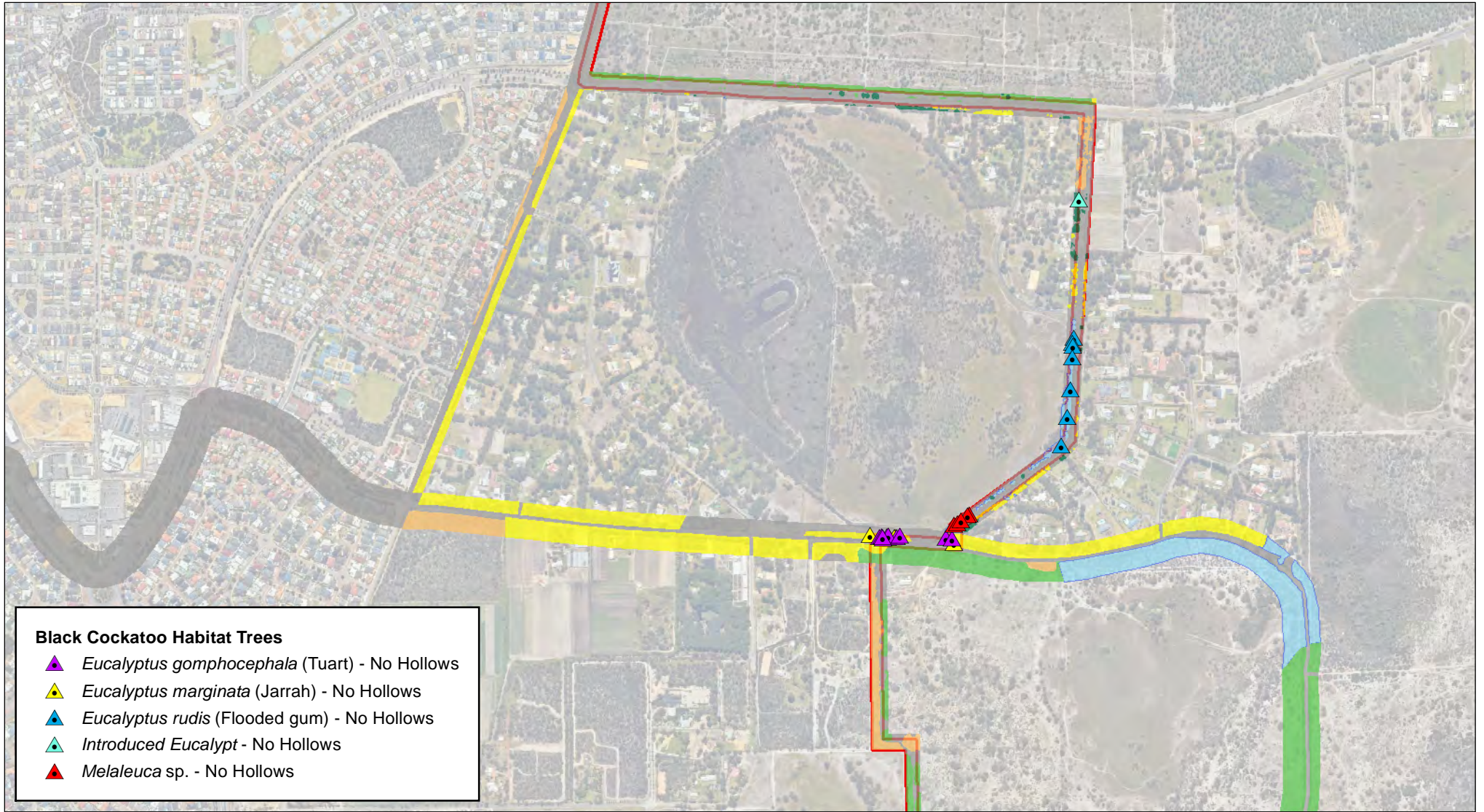
Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD



DATE: 6/02/2023
AUTHOR: RICEEO



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



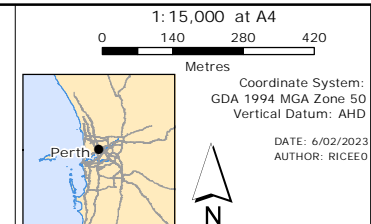
Black Cockatoo Habitat Trees

- ▲ *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

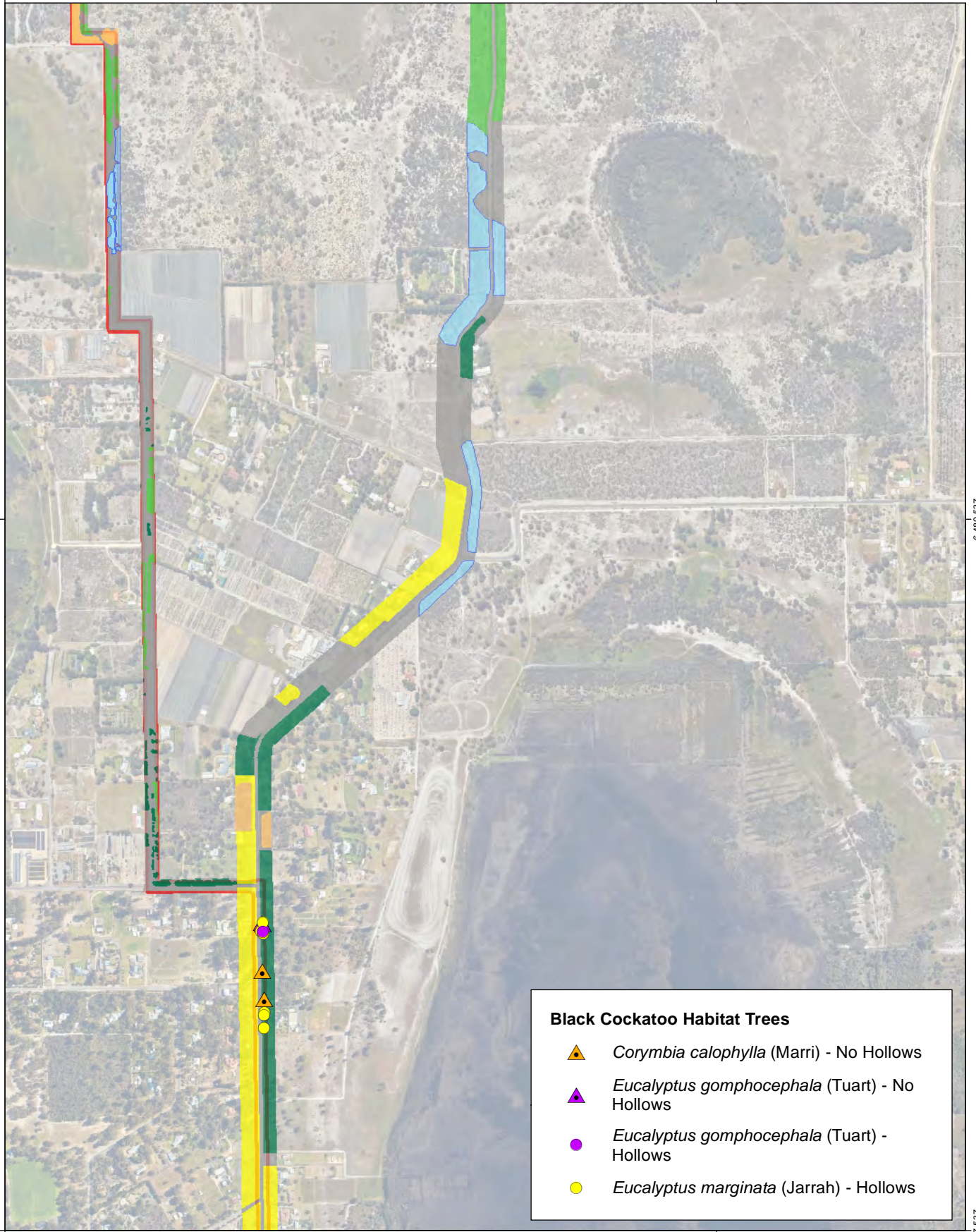
6,489,537

6,489,537





388,389

390,389


6,489,537



Black Cockatoo Habitat Trees

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


LEGEND


 Development Envelope


Fauna Habitat

(Stantec 2022; Biologic 2022; 360 2022)

 Cleared


 Heath and Shrubland (CBC, FRTBC)

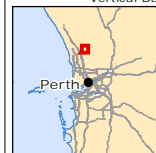
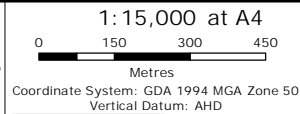
 Parkland, Planted Vegetation and Gardens (CBC, FRTBC)

 Pine Plantation Regrowth (CBC)

 Scattered Trees (CBC, FRTBC)

 Wetlands and Riparian Vegetation (CBC, FRTBC)

 Woodland (CBC, FRTBC)



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

6,484,898



Black Cockatoo Habitat Trees

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

LEGEND

- Development Envelope
- Parkland, Planted Vegetation and Gardens (CBC, FRTBC)
- Pine Plantation Regrowth (CBC)
- Heath and Shrubland (CBC, FRTBC)
- Scattered Trees (CBC, FRTBC)
- Wetlands and Riparian Vegetation (CBC, FRTBC)
- Cleared
- 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



APPENDIX C: SURVEYS OF NEERGABBY PROPERTY



APPENDIX D: HABITAT QUALITY SCORING FRAMEWORKS

APPENDIX D1 - BANKSIA WOODLAND TEC HABITAT SCORING,

*Areas labelled in each table referred to in the tables relate to the labels in Appendix D4 – map series across the project

Habitat Quality Scoring Framework											Eglington Offset site			Neergabby Offset site		
	BW1	BW2	BW3	BW4	BW5	BW6	BW7	BW8	BW9		quality without offset	quality with offset	quality without offset	quality with offset		
	Impact site quality	Impact site quality	Impact site quality	Impact site quality	Impact site quality	Impact site quality	Impact site quality	Impact site quality	Impact site quality	Impact site quality	Offset site quality	Offset site quality	Offset site quality	Offset site quality		
Native Understorey Cover	Vegetation condition (Keighery 1994) - Pristine (100) - Excellent (80) - Very good (60) - Good (40) - Degraded (20) - Completely Degraded (0)										80	80	100	80	80	100
	Justification										mapped as excellent condition in Stantec 2021.	mapped as excellent condition in Stantec 2021.	mapped as excellent, but will improve with additional management proposed.	listed as excellent condition in DBCA 2022	listed as excellent condition in DBCA 2022	mapped as excellent, but will improve with additional management proposed.
	Species Richness										0	0	10	0	0	10
	Average native species richness within the top half of recorded range for the TEC (10)										0	0	10	0	0	10
	Average native species richness within the bottom half of recorded range for the TEC (0)										0	0	10	0	0	10
	Justification										no evidence species richness is in top half	no evidence species richness is in top half	species richness is likely in top half based on condition	species richness is likely in top half based on condition	species richness is likely in top half based on condition	species richness is likely in top half based on condition
	Presence of Threatened taxa										0	0	0	0	0	0
	Patch is critical habitat for, and hosts Threatened taxa (10)										0	0	0	0	0	0
	Justification										no evidence of critical habitat	no evidence of critical habitat	no evidence of critical habitat	no evidence of critical habitat	no evidence of critical habitat	no evidence of critical habitat
	Contains State listed TEC/PEC										20	20	20	20	20	20
Patch contains WA FCT listed as State TEC (20)										20	20	20	20	20	20	
Patch contains WA FCT listed as State PEC (10)										20	20	20	20	20	20	
Patch does not contain WA FCT listed as either TEC or PEC (0)										20	20	20	20	20	20	
Presence of Dieback										10	10	10	10	10	10	
Patch is dieback free (10)										10	10	10	10	10	10	
Justification										no dieback identified in coastal areas	no dieback identified in coastal areas	no record of dieback	no record of dieback	no record of dieback	no record of dieback	
Patch is partly dieback free (5)										10	10	10	10	10	10	
Patch is dieback infested (0)										10	10	10	10	10	10	
Justification										no record of dieback but area open to unauthorised access.	no record of dieback but area open to unauthorised access.	fencing will protect from unauthorised access	no record of dieback but area open to unauthorised access.	no record of dieback but area open to unauthorised access.	fencing will protect from unauthorised access	
Condition total (out of 150)										70	70	10	90	70	90	
Context Score (Condition total / 150 * 70)										32.67	32.67	4.67	42.00	32.67	42.00	
Connectivity										30	30	30	20	20	30	
Patch is continuous with remnant vegetation and forms a corridor that links different landscape units (30)										30	30	30	20	20	30	
Patch is continuous with remnant vegetation that forms a medium to large local remnant (20)										30	30	30	20	20	30	
Patch is within 1km of other medium to large remnants (10)										30	30	30	20	20	30	
Patch is within 12km of other significant remnants and contributes to support of significant wildlife (i.e. known Black Cockatoo Breeding sites are located within 12km) (5)										30	30	30	20	20	30	
Patch does not meet any of the above criteria (0)										30	30	30	20	20	30	
Justification										adjacent to existing larger patch, however that patch is designated to be cleared for urban	adjacent to existing larger patch, however that patch is designated to be cleared for urban	adjacent to existing larger patch, but unmapped as TEC	adjacent to existing larger patch, but unmapped as TEC	adjacent to existing larger patch, but unmapped as TEC	adjacent to existing larger patch, but unmapped as TEC	
Patch size										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 3.6ha										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 1.5ha										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 0.7ha										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 0.259ha										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 0.13ha										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 3ha										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 1ha										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 0.5ha										20	20	20	10	10	20	
total patch not mapped. But patch mapped as 1.5ha										20	20	20	10	10	20	
patch around 12 ha										40	40	40	50	50	40	
patch around 12 ha										40	40	40	50	50	40	
over 20ha										40	40	40	50	50	40	
over 20ha										40	40	40	50	50	40	
over 20ha										40	40	40	50	50	40	
over 20ha										40	40	40	50	50	40	
Justification										SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	
Site location and risk										10	10	10	10	10	10	
Patch is located in an area where the TEC has been extensively cleared (10)										10	10	10	10	10	10	
Justification										SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	
Site location and risk										0	0	0	0	0	0	
Patch is located at the geographical edge of the recorded range (10)										0	0	0	0	0	0	
Justification										SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	SCP has been extensively cleared	
Context total (out of 100)										50	40	30	50	60	80	
Context Score (Context total / 100 * 30)										15.00	12.00	9.00	15.00	18.00	24.00	
Quality total (out of 100)										47.67	44.67	13.67	57.00	47.67	60.00	
Condition Score + Context Score										47.67	44.67	13.67	57.00	47.67	60.00	
Final Site Habitat Quality Score (out of 10)										4.8	4.5	1.4	5.7	4.8	6.0	
Quality total / 10										4.8	4.5	1.4	5.7	4.8	6.0	
Weighted Site Score										4.8	4.5	1.4	5.7	4.8	6.0	
Final Site Habitat Quality Score * area of site (hectares)										4.8	4.5	1.4	5.7	4.8	6.0	
Site Habitat Quality Score (out of 10)										4.8	4.5	1.4	5.7	4.8	6.0	
All Weighted Site Scores / total impact area										4.8	4.5	1.4	5.7	4.8	6.0	



APPENDIX D2 - TUART WOODLAND TEC HABITAT SCORING

*Areas labelled in each table referred to in the tables relate to the labels in Appendix D4 – map series across the project

Habitat Quality Scoring Framework		TW1 Impact site quality	TW2 Impact site quality	TW3 Impact site quality	TW1 - 4.91ha Offset site quality	quality without offset	quality with offset	
Site condition (70%)	Native Understorey Cover							
	-	≥80% OR ≥12 native species per plot3 (60)					60	
	-	≥60% and <80% OR ≥8 native species per plot (40)						
	-	≥50% and <60% OR ≥4 native species per plot (20)	20	20	20	20	20	
	-	<50% OR <4 native species per plot (0)						
	justification	although marked as very good condition in Stantec 2021 impact area also contains at least 50% access road (in 30m TEC buffer)	good condition in Stantec	sig trees to make it TEC	completely degraded condition in Stantec 2021, but holds some	30% very good condition, 70% good in Stantec 2021. contains significant cleared areas within 30m TEC buffer)	30% very good condition, 70% good in Stantec 2021. contains significant cleared areas within 30m TEC buffer)	with rehabilitation proposed to improve cleared areas around Tuart trees and in buffer.
	Contains a habitat role							
	-	Site has a habitat role (15)	15	15	15	15	15	
	justification	Site doesn't have a habitat role (0)	contains more than 2 per 0.5ha trees greater than DBH	contains more than 2 per 0.5ha trees greater than DBH	contains more than 2 per 0.5ha trees greater than DBH	contains more than 2 per 0.5ha trees greater than DBH	contains more than 2 per 0.5ha trees greater than DBH	
	Site shows regeneration							
-	Site shows regeneration (15)	0	0	0	0	0	15	
justification	Site doesn't show regeneration (0)	no evidence of regen or small trees etc. due to condition	no evidence of regen or small trees etc. due to condition	no evidence of regen or small trees etc. due to condition	no evidence of regen or small trees etc. due to condition	no evidence of regen or small trees etc. due to condition	new plants will infill areas (commitment to at least a mean of 15 individuals per half hectare)	
Presence of Key Fauna Species								
-	Entire site hosts key fauna (10)	10	10	10	10	10	10	
justification	Minor Presence (0)	BC habitat	BC habitat	BC habitat	BC habitat	BC habitat	BC Habitat	
Presence of Dieback								
-	Site has no evidence of dieback (15)	15	15	15	15	15	15	
justification	Site has signs of dieback (5)	no dieback identified in coastal areas	no dieback identified in coastal areas	no dieback identified in coastal areas	no dieback identified in coastal areas	no dieback identified in coastal areas	coastal zones (alkaline soils) less susceptible.	
-	dieback is widespread on site (0)							
Condition total (out of 115)		60	60	60	60	60	115	
Condition Score (Condition total / 115 * 70)		36.52	36.52	36.52	36.52	36.52	70.00	
Site context (30%)	Patch size							
	-	≥5 hectares (100)						
	-	≥2 hectares and <5 hectares (50)	50	50	50	50	50	100
	justification	≥0.5 hectares and <2 hectares (0)	patch around 5 ha	mapped only 1-2ha, but patch appears to be within greater area (2-5ha)	mapped only 1-2ha, but patch appears to be within greater area (2-5ha)	patch around 5 ha	patch around 5 ha	existing patch 4.91 ha. Revegetation will include TEC species, which will increase the area of TEC to ove 5ha
	Patches smaller than 0.5 ha will not be accepted.							
	Landscape Role							
	-	Site has a landscape role (15)	0	15	15	0	0	0
	justification	Site does not have a landscape role (0)	no patch within 100m	not mapped, but likely to not mapped, but likely to	no patch within 100m	no patch within 100m	no patch within 100m	no patch within 100m
	Buffer Zone							
	-	Site has an appropriate buffer zone (15)	0	0	0	10	10	10
justification	Site does not have an appropriate buffer zone (0)	impact occurs within access road. Buffer not maintained around TEC	impact occurs buffer of patch, therefore 30m would not be maintained around TEC	impact occurs buffer of patch, therefore 30m would not be maintained around TEC	majority of tuart TEC has adequate buffer. Estimate around 30% does not (Predominantly around access road)	majority of tuart TEC has adequate buffer. Estimate around 30% does not (Predominantly around access road)	majority of tuart TEC has adequate buffer. Estimate around 30% does not (Predominantly around access road)	
Context total (out of 130)		50	65	65	65	65	115	
Context Score (Context total / 130 * 30)		11.54	15.00	15.00	15.00	15.00	26.54	
Quality total (out of 100)		48.06	51.52	51.52	51.52	51.52	96.54	
Condition Score + Context Score								
Final Site Habitat Quality Score (out of 10)		4.8	5.2	5.2	5.2	5.2	9.7	
Quality total / 10		average across total impact: 5.04						
Weighted Site Score		not used as total patch size not known						
Final Site Habitat Quality Score * area of site (hectares)								
Site Habitat Quality Score (out of 10)		as above						
All Weighted Site Scores / total impact area								



APPENDIX D3 - BLACK COCKATOO SPECIES HABITAT SCORING

Impact Site – ASDP plant site

Location	Vegetation description	Vegetation Condition	TEC/PEC	Data Source	Fauna habitat description	Data source	Carnaby's Black-Cockatoo				Forest Red-tailed Black-Cockatoo			
							Site condition	Site context	Species density	Score	Site condition	Site context	Species density	Score
A Plant site (90% of the site)	<i>Melaleuca systema</i> (+/- <i>Spyridium globulosum</i>) open shrubland to open heath over <i>Lomandra maritima</i> and * <i>Euphorbia terracina</i> herbland over <i>Desmocladius asper</i> open sedgeland	Very good	<i>Acacia</i> Shrublands on taller dunes, Southern Swan Coastal Plain (PEC)	Stantec 2020a	Heath and shrubland	Stantec 2020b	2	2	0	4	1	2	0	3
B Plant site (7% of site)	<i>Eucalyptus gomphocephala</i> open woodland to closed forest over * <i>Avena barbata</i> , * <i>Ehrharta calycina</i> grassland to closed grassland with * <i>Euphorbia terracina</i> herbland	Good	<i>Acacia</i> Shrublands on taller dunes, Southern Swan Coastal Plain (PEC)	Stantec 2020a	Scattered trees	Stantec 2020b	2	2	1	5	2	2	1	5
C Plant site (2% of site) 1% cleared	Introduced Plantings	Degraded	n/a	Stantec 2020a	Parkland, Planted Vegetation, and gardens	Stantec 2020b	2	2	0	4	1	2	0	3

Impact Site – ASDP pipeline

Location	Vegetation description	Vegetation Condition	TEC/PEC	Data Source	Fauna habitat description	Data source	Carnaby's Black-Cockatoo				Forest Red-tailed Black-Cockatoo			
							Site condition	Site context	Species density	Score	Site condition	Site context	Species density	Score
D Pipeline (~35%)	<i>Eucalyptus gomphocephala</i> woodland to open forest over <i>Banksia attenuata</i> and <i>Allocasuarina fraseriana</i> low open woodland over * <i>Euphorbia terracina</i> low herbland with * <i>Briza maxima</i> and * <i>Eragrostis curvula</i> low open grassland to grassland.	Good	Northern Spearwood Shrublands and Woodlands (P3 PEC)	Stantec 2020a	Woodland	Stantec 2020b	3	2	1	6	2	2	1	5
E Pipeline (~5%)	cleared	Completely degraded	Commonwealth Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and Forests of the Swan Coastal Plain TEC (P3 PEC), Sourced from Statec - TEC / PEC Consolidated Survey 2020	Stantec 2020a	Woodland	Stantec 2020b	1	2	0	3	1	2	0	3
F Pipeline (~15%)	<i>Melaleuca huegelii</i> and <i>Melaleuca systema</i> open heath to closed heath over <i>Grevillea preissii</i> subsp. <i>preissii</i> low shrubland over <i>Desmocladius asper</i> sedgeland and <i>Austrostipa flavescens</i> grassland.	Very good	<i>Melaleuca huegelii</i> - <i>M. systema</i> Shrublands on Limestone Ridges TEC (EN)	Stantec 2020a	Heath and shrubland	Stantec 2020b	2	2	0	4	1	2	0	3
G Pipeline	SCP28: Spearwood <i>Banksia attenuata</i> / <i>Banksia attenuata</i> - <i>Eucalyptus</i> woodlands	Excellent	Commonwealth Banksia woodlands TEC	GHD 2022	Woodland	Stantec 2020b	5	2	1	8	2	2	1	5

(~10%)			(<i>Banksia</i> Dominated Woodlands of the Swan Coastal Plain P3 PEC)											
H Pipeline (~5%)	SCP24: Northern Spearwood shrublands and woodlands	Degraded	Northern Spearwood Shrublands and Woodlands (P3 PEC)	GHD 2022	Heath and shrubland	Stantec 2020b	2	2	1	5	1	2	1	4
I Pipeline (~2%)	<i>Eucalyptus marginata</i> (+/- <i>Corymbia calophylla</i>) low open woodland to woodland over <i>Xanthorrhoea preissii</i> open shrubland to shrubland over mixed species low shrubland.	Degraded	n/a	Stantec 2020a	Pine plantation regrowth	Stantec 2020b	3	3	1	7	4	3	1	8
J Pipeline (~1%)	Banksia woodland	Degraded	n/a	Anders 2022	Wetland and Riparian Vegetation	Stantec 2020b	4	3	1	8	2	3	1	6
K Pipeline (~5%)	<i>Banksia attenuata</i> and <i>Allocasuarina fraseriana</i> low open woodland to low woodland over <i>Xanthorrhoea preissii</i> , <i>Jacksonia sternbergiana</i> and <i>Allocasuarina humilis</i> shrubland over <i>Hibbertia hypericoides</i> , <i>Mesomelaena pseudostygia</i> and <i>Desmocladius flexuosus</i> low shrubland to low open heath.	Degraded	Commonwealth Banksia woodlands TEC (<i>Banksia</i> Dominated Woodlands of the Swan Coastal Plain P3 PEC)	Stantec 2020a	Woodland	Stantec 2020b	4	3	1	8	3	3	1	7
Not labelled (~30% other cleared and low scoring)	cleared			Stantec 2020a		Stantec 2020b								

Offset site – Alkimos site

Location	Vegetation description	Vegetation Condition	TEC/PEC	Data Source	Fauna habitat description	Data source	Carnaby's Black-Cockatoo				Forest Red-tailed Black-Cockatoo			
							Site condition	Site context	Species density	Score	Site condition	Site context	Species density	Score
L Alkimos offset site (heath and shrubland)	Melaleuca systema (+/- <i>Spyridium globulosum</i>) open shrubland to open heath over <i>Lomandra maritima</i> and * <i>Euphorbia terracina</i> herbland over <i>Desmocladius asper</i> open sedgeland.	Very good	Commonwealth Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and Forests of the Swan Coastal Plain TEC (P3 PEC),	Stantec 2020a Sourced from Stantec - TEC / PEC Consolidated Survey 2020	Heath and shrubland	Stantec 2020b	2 (Proposed 4)	2	0	4	1 (Proposed 3)	2	0	3
M Alkimos offset site	<i>Eucalyptus gomphocephala</i> open woodland to closed forest over * <i>Avena barbata</i> , * <i>Ehrharta calycina</i> grassland to closed	Good	Commonwealth Tuart (<i>Eucalyptus gomphocephala</i>) woodlands	Stantec 2020a Sourced from Stantec - TEC / PEC	Scattered trees	Stantec 2020b	2 (Proposed 4)	2	1	5	1 (Proposed 3)	2	1	4

(scattered trees)	grassland with *Euphorbia terracina herbland.		and Forests of the SCP TEC (P3 PEC),	Consolidated Survey 2020									
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Offset Site – Eglinton site

Location	Vegetation description	Vegetation Condition	TEC/PEC	Data Source	Fauna habitat description	Data source	Carnaby's Black-Cockatoo				Forest Red-tailed Black-Cockatoo			
							Site condition	Site context	Species density	Score	Site condition	Site context	Species density	Score
N Eglinton offset site (woodland)	Banksia attenuata and Allocasuarina fraseriana low open woodland to low woodland over Xanthorrhoea preissii, Jacksonia sternbergiana and Allocasuarina humilis shrubland over Hibbertia hypericoides low shrubland to low open heath over Mesomelaena pseu	Excellent	Commonwealth Banksia woodlands TEC (<i>Banksia</i> Dominated Woodlands of the Swan Coastal Plain P3 PEC)	Stantec 2020a	Woodland	Stantec 2020b	4 (Proposed 5)	2	1	7 (Proposed 8)	3 (Proposed 4)	2	1	6 (Proposed 7)
O Eglinton offset site (shrubland)	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.	Excellent	Northern Spearwood Shrublands and Woodlands (P3 PEC)	Stantec 2020a	Heath and shrubland	Stantec 2020b	3	2	1	6	1	2	0	3

Offset site – Carabooda tank site

Location	Vegetation description	Vegetation Condition	TEC/PEC	Data Source	Fauna habitat description	Data source	Carnaby's Black-Cockatoo				Forest Red-tailed Black-Cockatoo			
							Site condition	Site context	Species density	Score	Site condition	Site context	Species density	Score
P Carabooda tank offset site (woodland)	Banksia attenuata and Allocasuarina fraseriana low open woodland to low woodland over Xanthorrhoea preissii, Jacksonia sternbergiana and Allocasuarina humilis shrubland over Hibbertia hypericoides low shrubland to low open heath over Mesomelaena pseu	Good/very good	Commonwealth Banksia woodlands TEC (<i>Banksia</i> Dominated Woodlands of the Swan Coastal Plain P3 PEC)	Stantec 2020a	Woodland	Stantec 2020b	4	2	1	7	3	2	1	6
Q Carabooda tank offset site (shrubland)	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.	Excellent	<i>Melaleuca huegellii-M. systema</i> Shrublands on Limestone Ridges TEC (EN)	Stantec 2020a	Heath and shrubland	Stantec 2020b	3 (Proposed 5)	2	1	6 (Proposed 8)	1 (Proposed 3)	2	0	3 (Proposed 5)

Offset site – Neergabby site

Location	Vegetation description	Vegetation Condition	TEC/PEC	Data Source	Fauna habitat description	Data source	Carnaby's Black-Cockatoo				Forest Red-tailed Black-Cockatoo			
							Site condition	Site context	Species density	Score	Site condition	Site context	Species density	Score
R Neergabby offset site (woodland) L1934	Banksia Woodland 289 ha Low Woodland to Low Open Forest of Banksia attenuata, B. menziesii, B. ilicifolia, Nuytsia f/oribunda and occasional Eucalyptus todtiana over Open Shrubland of Xanthorrhoea preissii, Jacksonia sternbergiana and Macrozamia riedlei over Low Open Shrubland to Open Low Heath of Eremaea paucif/ora, Hibbertia hypericoides, H. subvaginata, H. huege/ii, Bossiaea eriocarpa, Petrophile linearis, Scholtzia involucreta, Calytrix angulata, C. flavescens, Stirlingia latifolia, Conospermum triplinervium, Conostephium ?pendulum, Melaleuca trichophyl/a 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.	Excellent	Commonwealth Banksia woodlands TEC	DBCA 2022a	Woodland	DBCA 2022a	5 (Proposed 6)	2	1	8 (Proposed 9)	2 (Proposed 3)	2	1	5 (Proposed 6)
S Neergabby offset site (Marri woodland) L1934	Two islands of Marri / Banksia Woodland (7ha islands within L1934)	Excellent	n/a	DBCA 2022a	Woodland	DBCA 2022a	3	2	1	6	4	2	1	7

T Neergabby offset site (scattered trees – rehab site) L1934	Cleared area – native annual species (<i>ptilotus polystachyus</i> and <i>Podotheca gnaphalioides</i>) 70ha within Lot 1934	Degraded	n/a	DBCA 2022a	Scattered Trees ?	DBCA 2022a	1 (Proposed 5)	2	0	3 (Proposed 7)	1 (Proposed 4)	2	0	3 (Proposed 6)
U Neergabby offset site (woodland) L58 Gingin Brook Road	Vegetation Complexes No. 47, 'Karrakatta Complex North', and No. 41, 'Moore River' (Heddle et al.). Banksia Woodland – 160 hectares. This community meets the criteria for the Commonwealth listed Threatened Ecological Community (TEC), 'Banksia Woodlands of the Swan Coastal Plain'.	Excellent	Commonwealth Banksia woodlands TEC	DBCA 2022b	Woodland	DBCA 2022b	5 (Proposed 6)	2	1	8 (Proposed 9)	3 (Proposed 3)	2	1	6 (Proposed 6)
V Neergabby offset site (transitional) L58 Gingin Brook Road	Transitional Banksia/Melaleuca Woodland – 24.9 hectares on the western side between the Brook and the Basin Dampland in the north-west corner	Excellent	Not defined	DBCA 2022b	Woodland	DBCA 2022b	3	2	1	6	2	2	0	4
W Neergabby offset site (wetland) L58 Gingin Brook Road	Wetland communities – 17 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).	Excellent	Not defined	DBCA 2022b	Wetland and Riparian	DBCA 2022b	2	2	0	4	2	2	0	4

Explanations for scores.

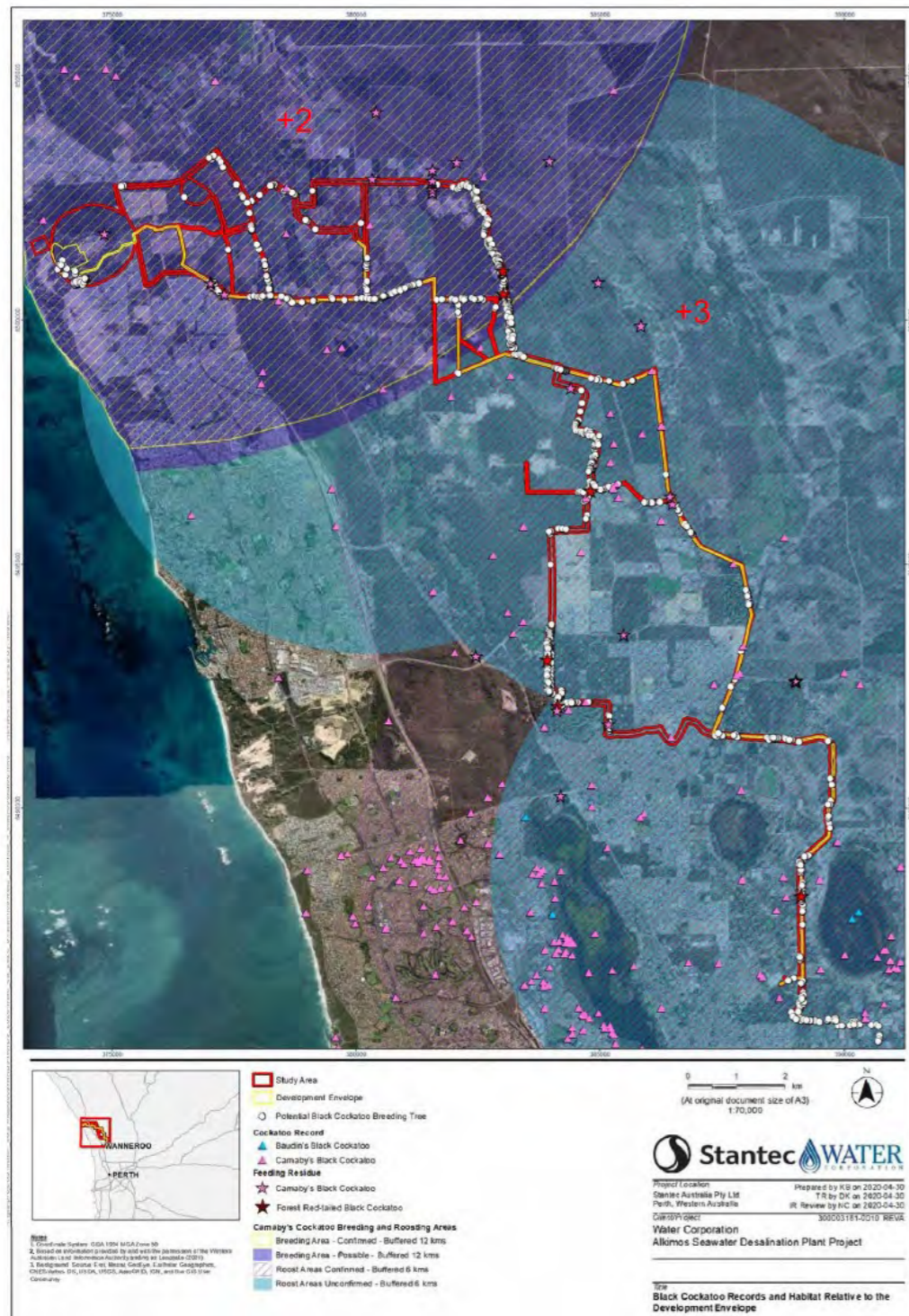
Site condition. Out of 6. Based upon vegetation type and suitability for foraging for each species, with some consideration given to condition (ie score downgraded if vegetation condition not at least good/very good). Some assumptions made as vegetation descriptions do not give estimates of pfc (projected foliage cover) of key food plants. Presence of banksias gives a high value for Carnaby's; presence of Allocasuarina and/or Marri give s ahigh value for Forest Red-tail. Carnaby's will also use Marri but it is less valuable than for Forest Red-tail.

Site context. Out of 3. Generally 0 if site condition only 1 or 2. A score of 1 given for all others but a score of 2 given if site condition is 5. This is because in the local context, a high scoring site on site condition is contextually very important. A score of 3 not given as there is moderately extensive alternative foraging habitat of similar quality within 12km, and nearby breeding either does not occur or is very limited.

Species density. Out of 1. Both Carnaby's and Forest Red-tails can be expected across all sites (Red-tails less frequent in Neergabby area than further south, so species density of 0 used for vegetation types that are not likely to attract the sub-species). Mostly given as 0 for site condition of 1 or 2, but used to separate sites with a condition of 2 where the vegetation structure is different. For example, Tuart woodland and coastal shrublands both have low site condition scores but the woodland will be visited more often due to structure and might provide foraging opportunities with beetle larvae in narrow stems. To reflect this sort of subtle difference, Tuart woodland fets a species density score of 1

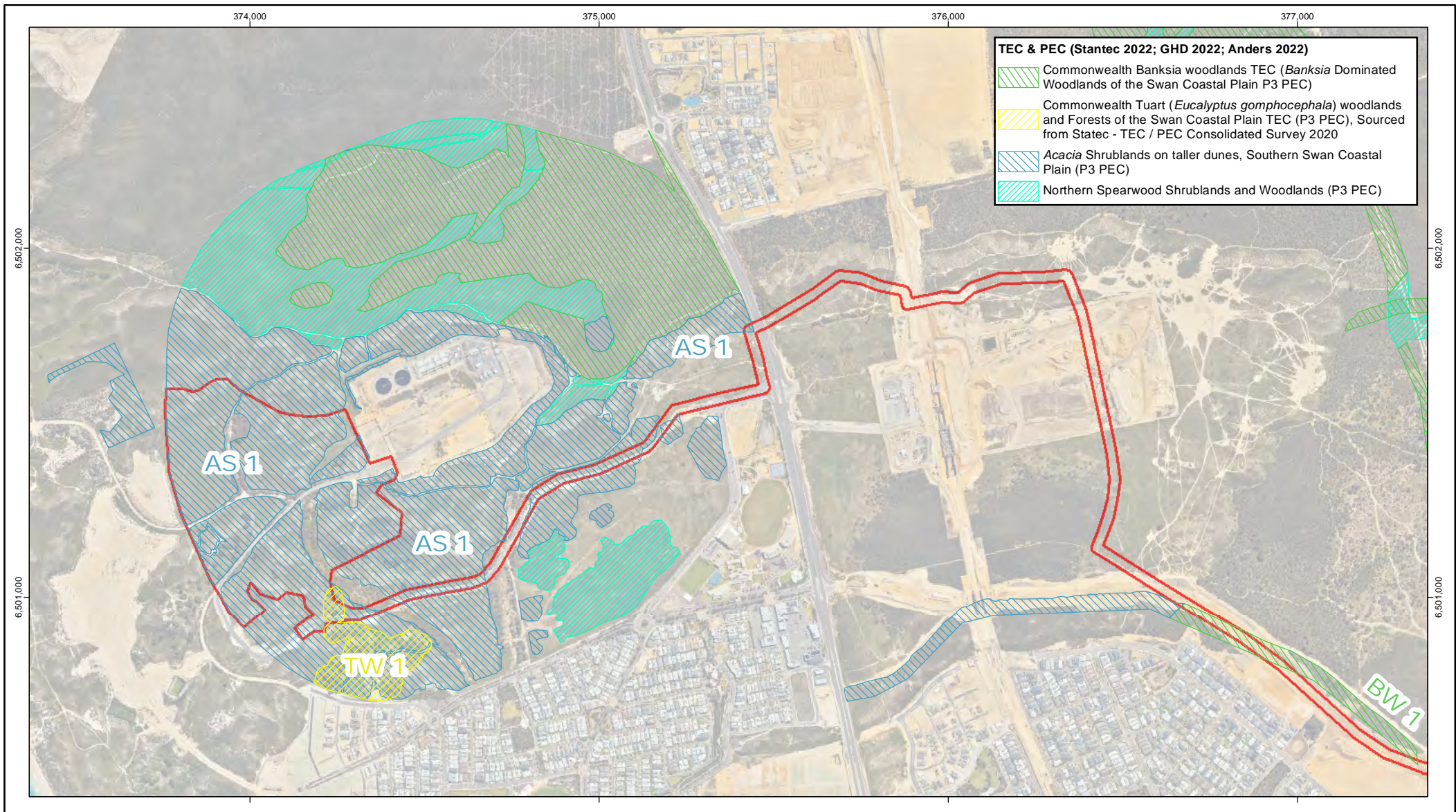
Amended 11/09/2023.





- Include location of HQS scoring tool within the impact sites and Offset sites (to align with Appendix D5)
- Updated site context score based on distance to possible (+2) and known (+3) roosts and breeding areas.




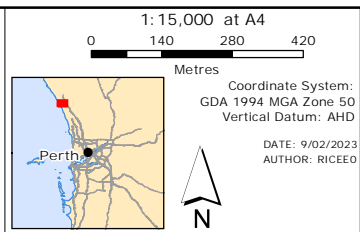


APPENDIX D4 – ASDP PROJECT TEC MAP SERIES

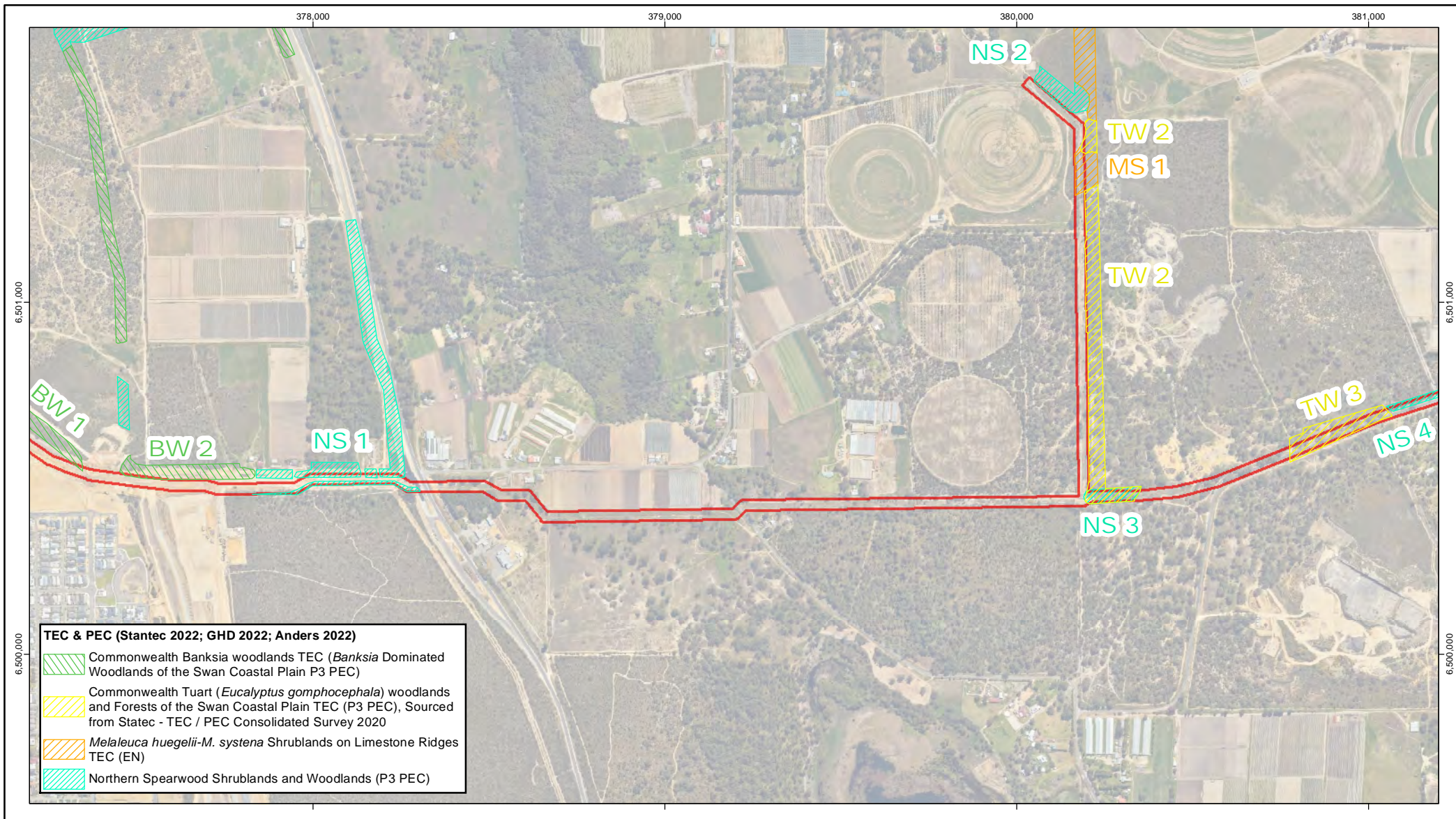


- TEC & PEC (Stantec 2022; GHD 2022; Anders 2022)**
-  Commonwealth Banksia woodlands TEC (*Banksia* Dominated Woodlands of the Swan Coastal Plain P3 PEC)
 -  Commonwealth Tuart (*Eucalyptus gomphocephala*) woodlands and Forests of the Swan Coastal Plain TEC (P3 PEC), Sourced from Stantec - TEC / PEC Consolidated Survey 2020
 -  Acacia Shrublands on taller dunes, Southern Swan Coastal Plain (P3 PEC)
 -  Northern Spearwood Shrublands and Woodlands (P3 PEC)

LEGEND
 Development Envelope

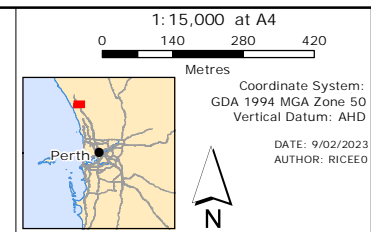


Alkimos Desalination Plant - TEC & PEC

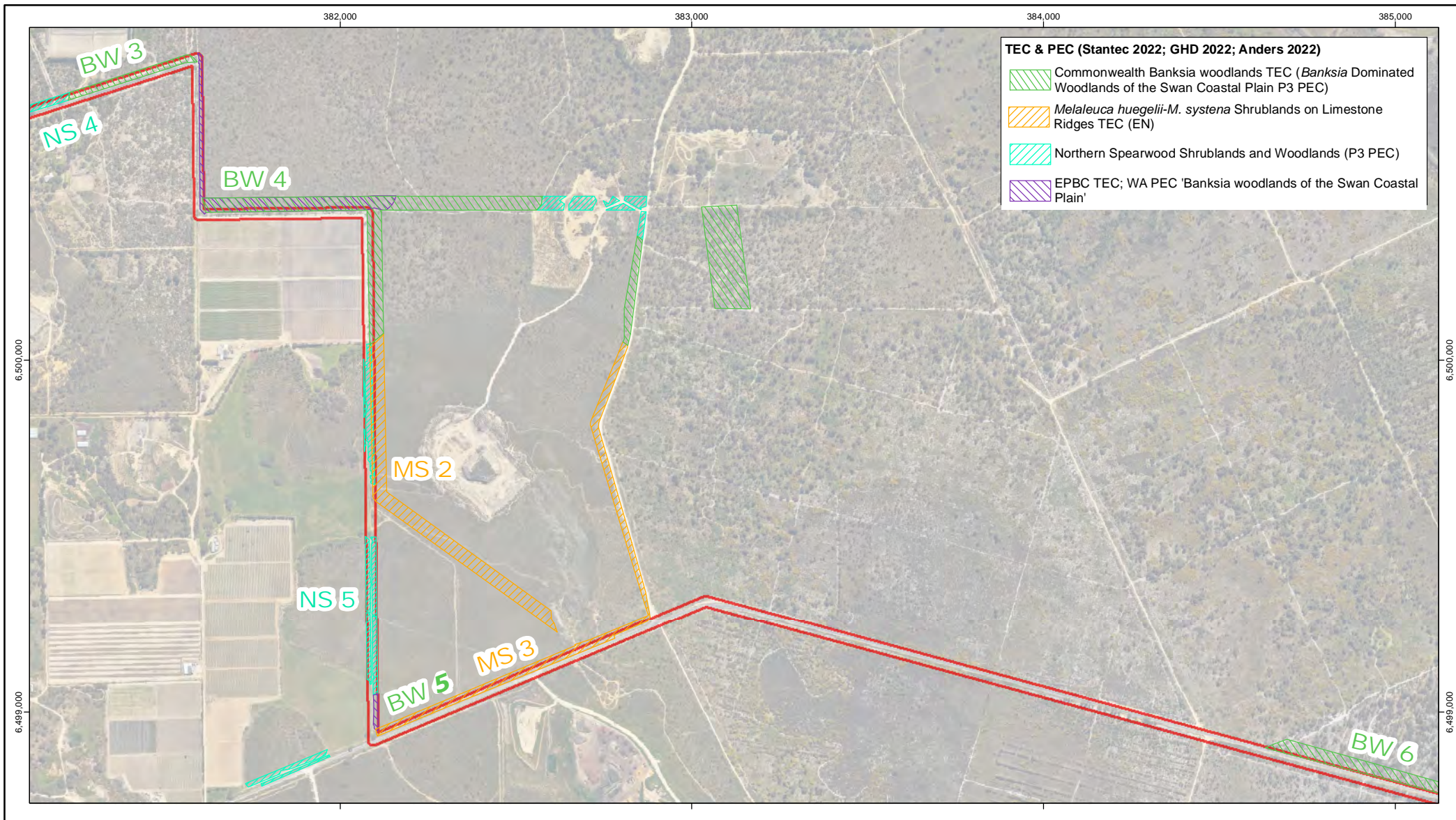


LEGEND


Development Envelope







Alkimos Desalination
Plant - TEC & PEC

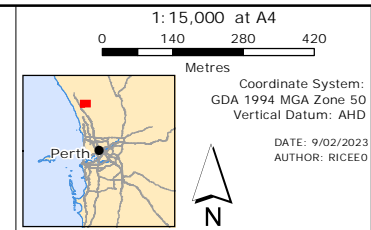


LEGEND

 Development Envelope

TEC & PEC (Stantec 2022; GHD 2022; Anders 2022)

-  Commonwealth Banksia woodlands TEC (*Banksia* Dominated Woodlands of the Swan Coastal Plain P3 PEC)
-  *Melaleuca huegelii-M. systema* Shrublands on Limestone Ridges TEC (EN)
-  Northern Spearwood Shrublands and Woodlands (P3 PEC)
-  EPBC TEC; WA PEC 'Banksia woodlands of the Swan Coastal Plain'



Alkimos Desalination
Plant - TEC & PEC



LEGEND

- Development Envelope
- TEC & PEC (Stantec 2022; GHD 2022; Anders 2022)**
- Commonwealth Banksia woodlands
TEC (*Banksia* Dominated Woodlands of the Swan Coastal Plain P3 PEC)
- Melaleuca huegelii*-*M. systena*
Shrublands on Limestone Ridges TEC (EN)

1:15,000 at A4

Metres

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

Perth

DATE: 9/02/2023
AUTHOR: RICEEO



Alkimos Desalination
Plant - TEC & PEC



LEGEND

 Development Envelope

TEC & PEC (Stantec 2022; GHD 2022; Anders 2022)

 Commonwealth Banksia woodlands
TEC (*Banksia* Dominated Woodlands of the Swan Coastal Plain P3 PEC)



1:15,000 at A4

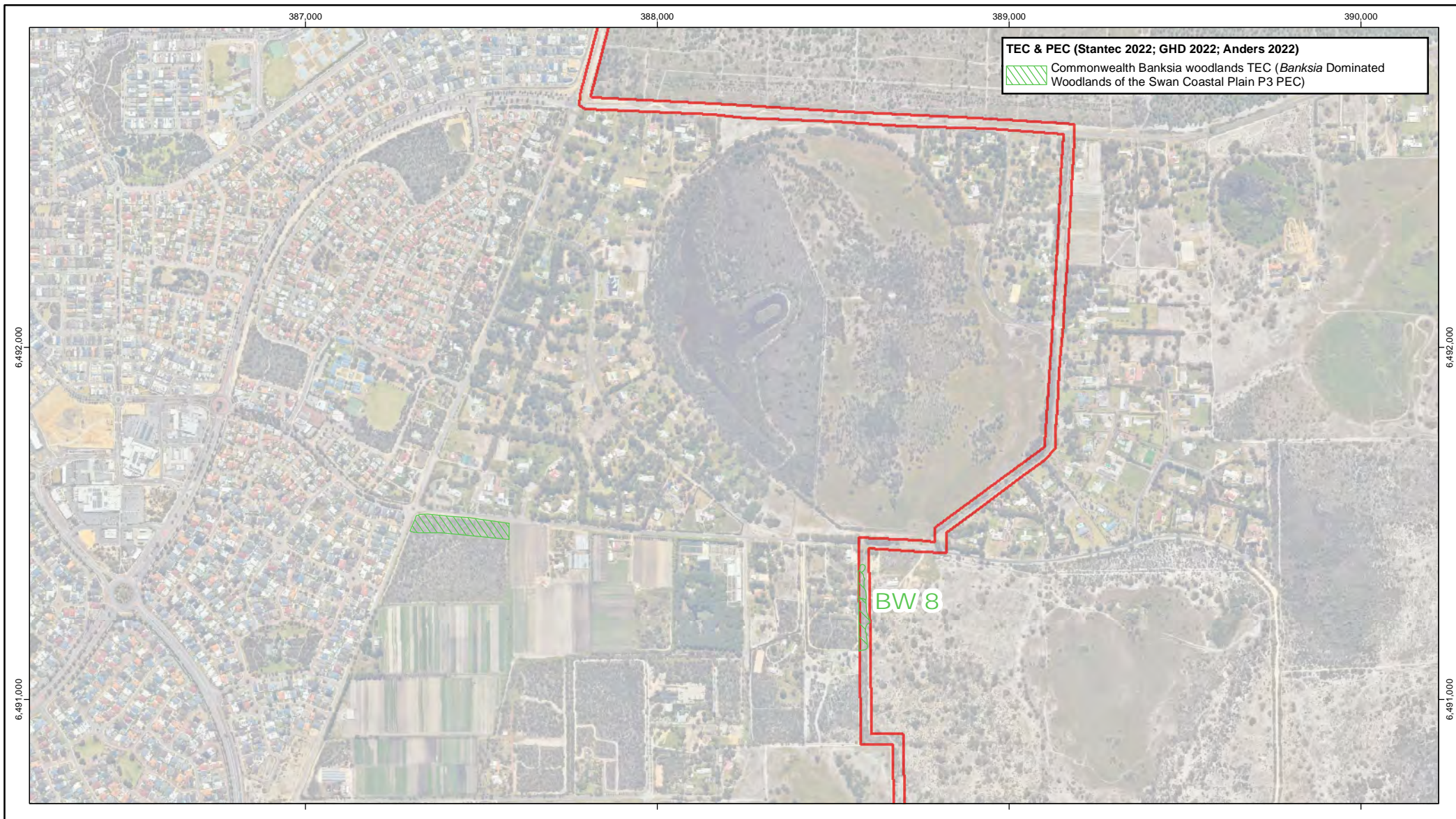
Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD



DATE: 9/02/2023
AUTHOR: RICEEO

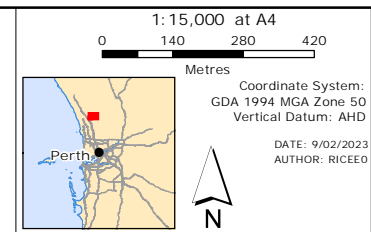


Alkimos Desalination Plant - TEC & PEC



TEC & PEC (Stantec 2022; GHD 2022; Anders 2022)
 Commonwealth Banksia woodlands TEC (*Banksia* Dominated Woodlands of the Swan Coastal Plain P3 PEC)

LEGEND
 Development Envelope



Alkimos Desalination Plant - TEC & PEC

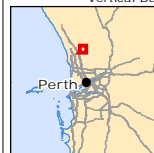


LEGEND

 Development Envelope

1:15,000 at A4
 0 150 300 450
 Metres

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



DATE: 9/02/2023
 AUTHOR: RICEEO



Alkimos Desalination
 Plant - TEC & PEC



LEGEND

- Development Envelope
- TEC & PEC (Stantec 2022; GHD 2022; Anders 2022)**
- Commonwealth Banksia Woodlands
TEC (Banksia attenuata Woodlands over Species Rich Dense Shrublands P3 PEC)
- Commonwealth Banksia woodlands
TEC (Banksia Dominated Woodlands of the Swan Coastal Plain P3 PEC)

1:15,000 at A4

Metres

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

Perth

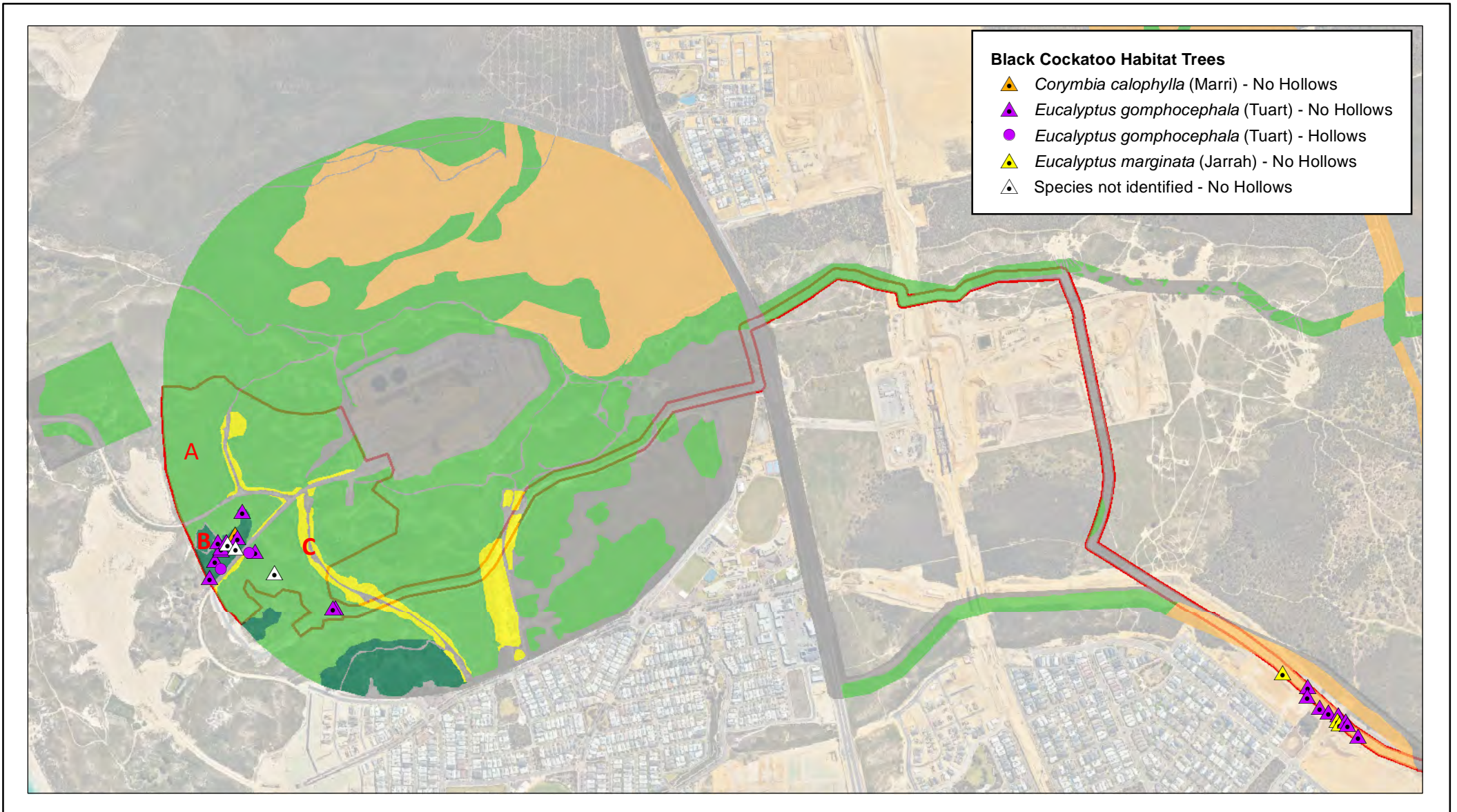
DATE: 9/02/2023
AUTHOR: RICEEO



Alkimos Desalination
Plant - TEC & PEC



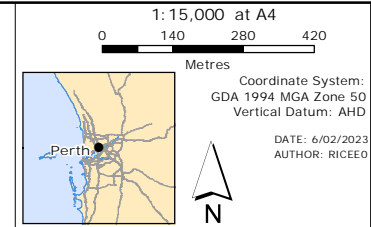
APPENDIX D5 – BLACK COCKATOO HABITAT QUALITY MAP SERIES (LOCATIONS OF HABITAT SCORED IN BLACK COCKATOO HQS TABLE)



- 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

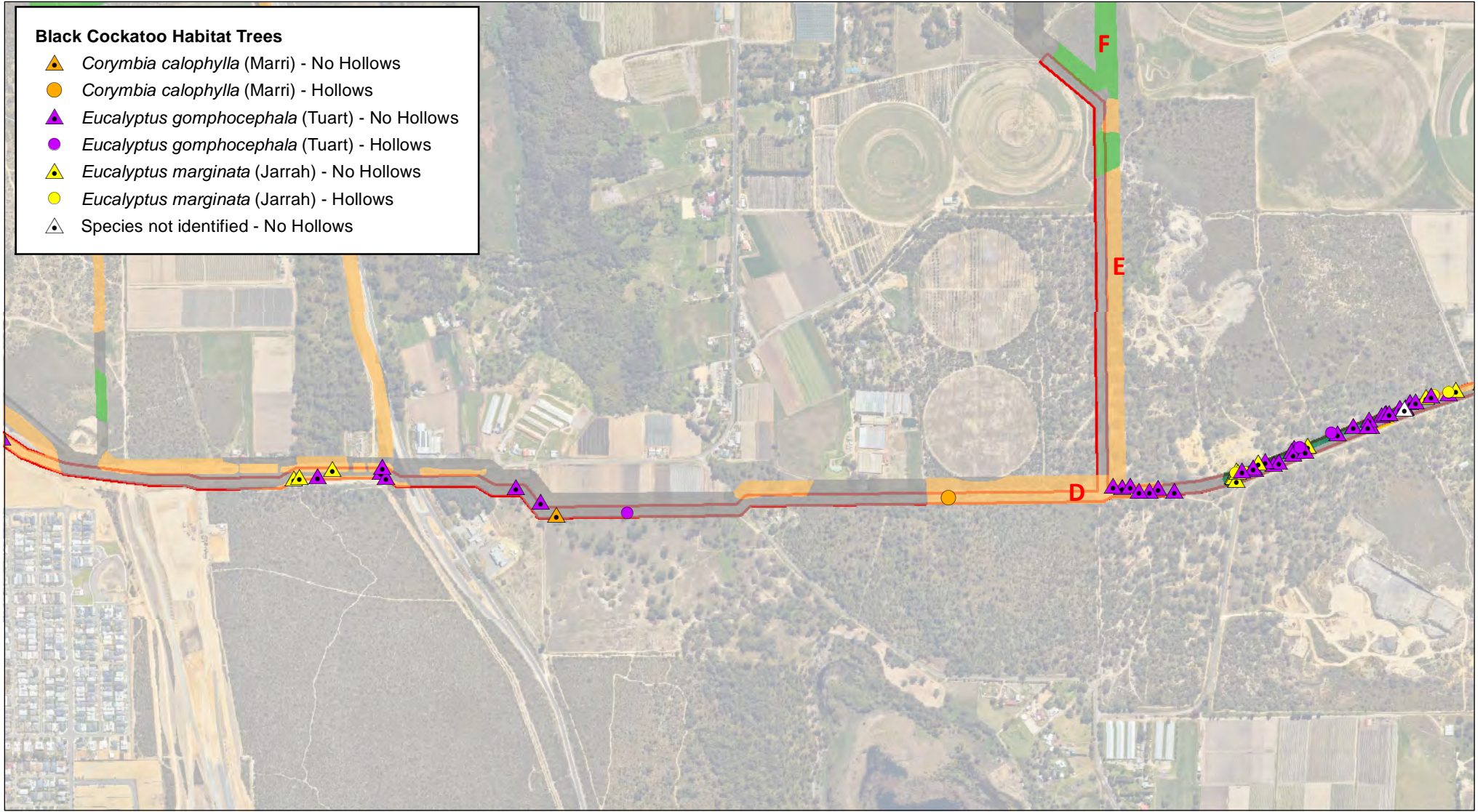
- Development Envelope
- Cleared
- Heath and Shrubland (CBC, FRTBC)
- Parkland, Planted Vegetation and Gardens (CBC, FRTBC)
- Scattered Trees (CBC, FRTBC)
- Woodland (CBC, FRTBC)



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

Black Cockatoo Habitat Trees

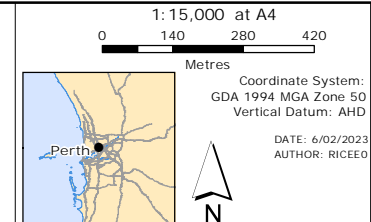
- ▲ *Corymbia calophylla* (Marri) - No Hollows
- *Corymbia calophylla* (Marri) - Hollows
- ▲ *Eucalyptus gomphocephala* (Tuart) - No Hollows
- *Eucalyptus gomphocephala* (Tuart) - Hollows
- ▲ *Eucalyptus marginata* (Jarrah) - No Hollows
- *Eucalyptus marginata* (Jarrah) - Hollows
- ▲ Species not identified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



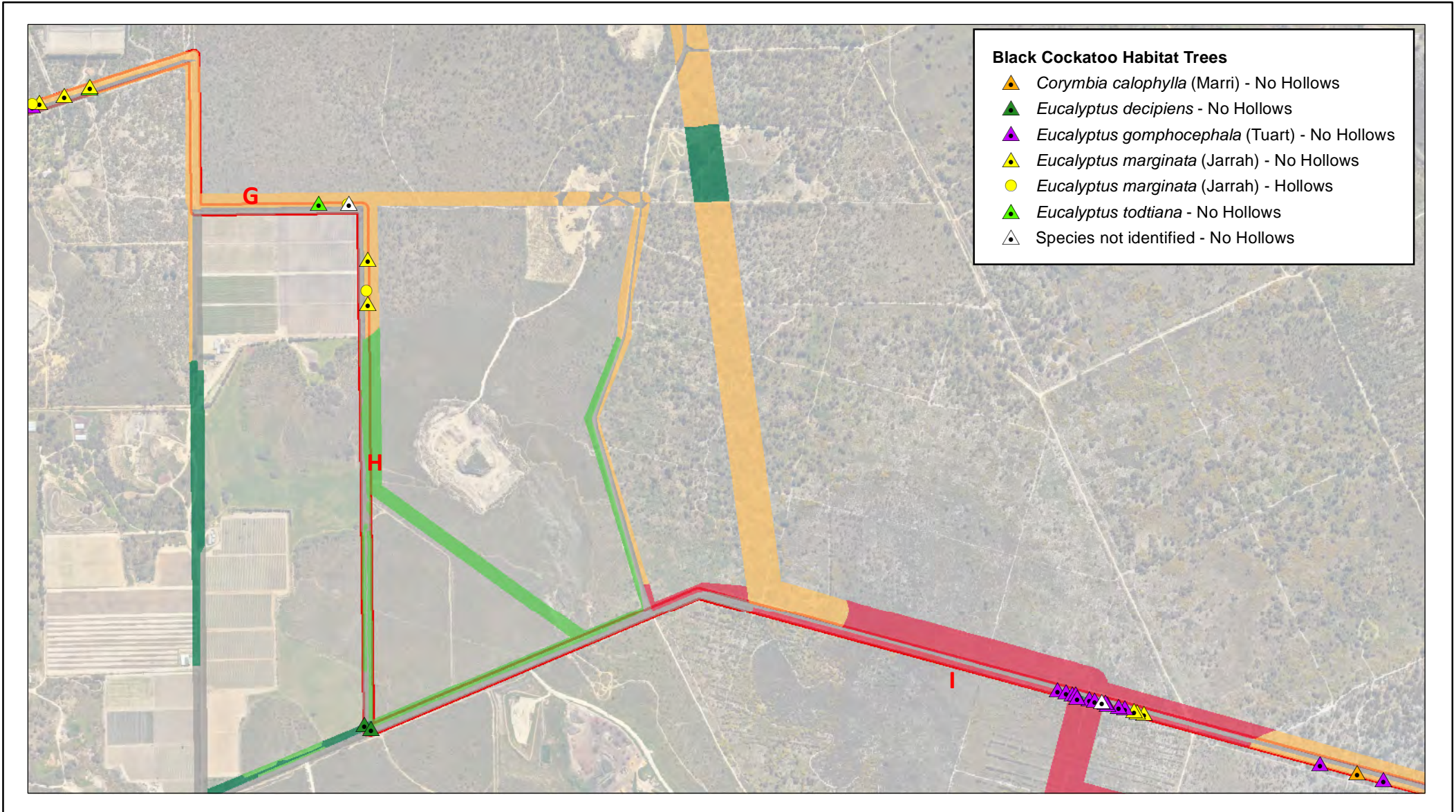
LEGEND

- 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)



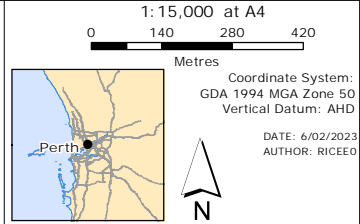
Alkimos Desalination Plant - Fauna Habitat and Black Cockatoo Trees within the DE



- 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)**
 - Cleared
 - Heath and Shrubland (CBC, FRTBC)

- Pine Plantation Regrowth (CBC)
- Scattered Trees (CBC, FRTBC)
- Woodland (CBC, FRTBC)



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

385,037

387,037

6,498,005

6,498,005

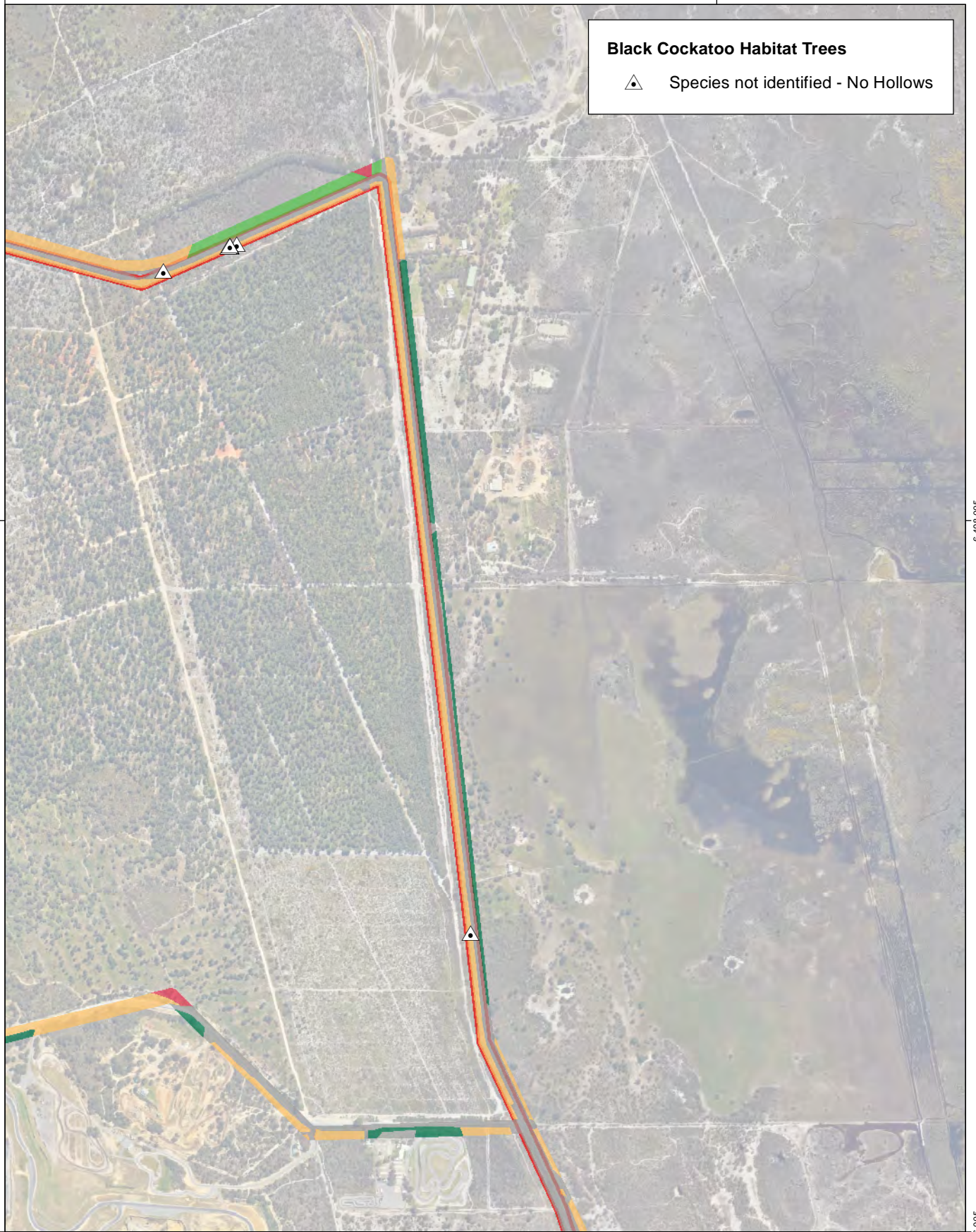
385,037

387,037

6,498,005

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

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)

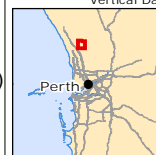
 Wetlands and Riparian Vegetation (CBC, FRTBC)

 Woodland (CBC, FRTBC)

1:15,000 at A4

0 150 300 450
Metres

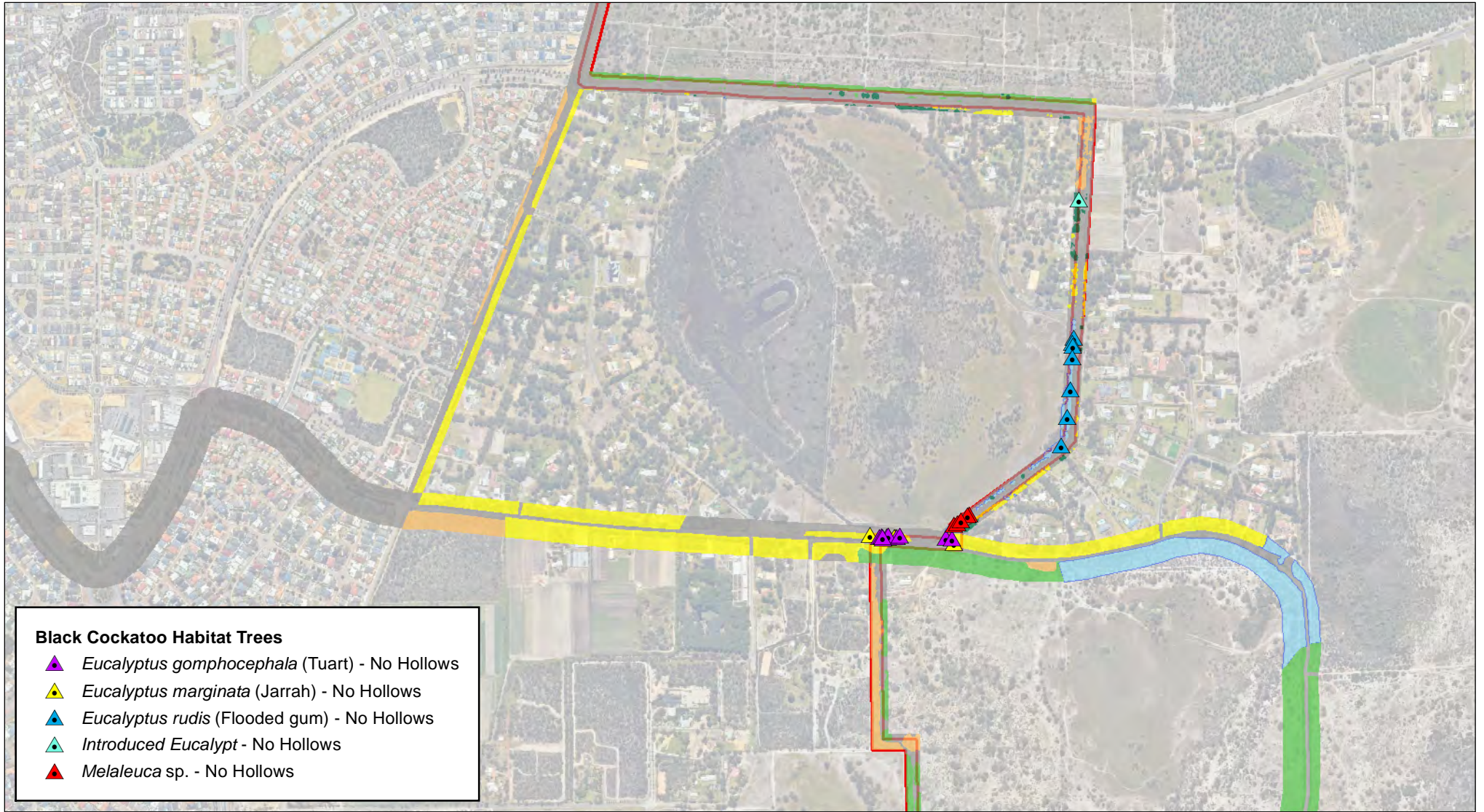
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Vertical Datum: AHD



DATE: 6/02/2023
AUTHOR: RICEEO



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



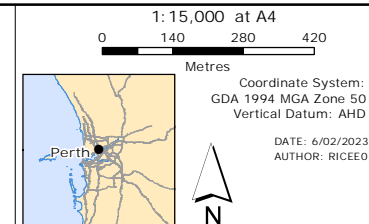
Black Cockatoo Habitat Trees

- ▲ *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

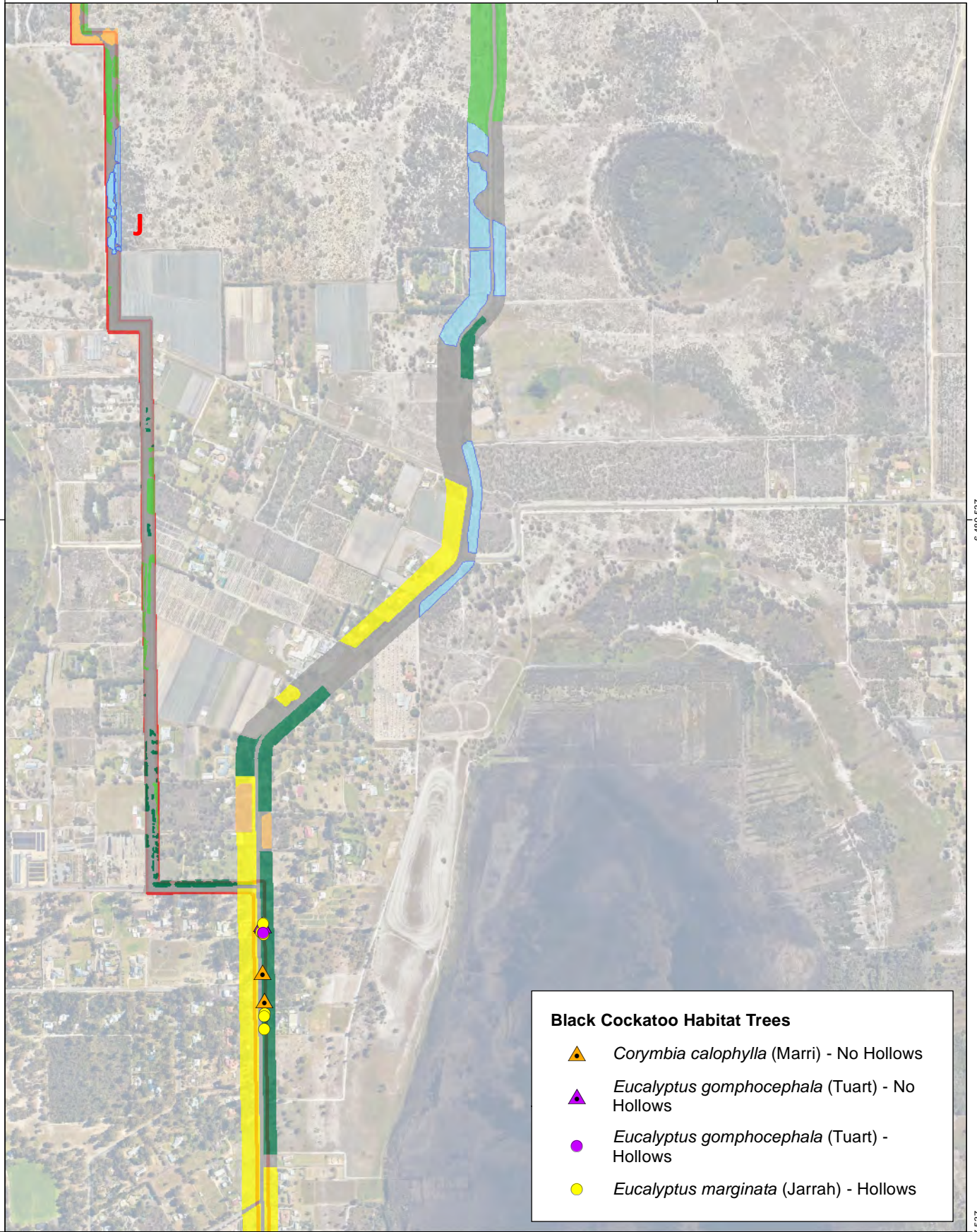
6,489,537

6,489,537

388,389

390,389

6,489,537



Black Cockatoo Habitat Trees

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

LEGEND

Development Envelope

Fauna Habitat

(Stantec 2022; Biologic 2022; 360 2022)

Cleared

Heath and Shrubland (CBC, FRTBC)

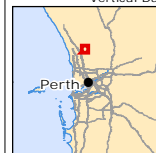
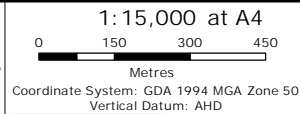
Parkland, Planted Vegetation and Gardens (CBC, FRTBC)

Pine Plantation Regrowth (CBC)

Scattered Trees (CBC, FRTBC)

Wetlands and Riparian Vegetation (CBC, FRTBC)

Woodland (CBC, FRTBC)



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

6,484,898



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

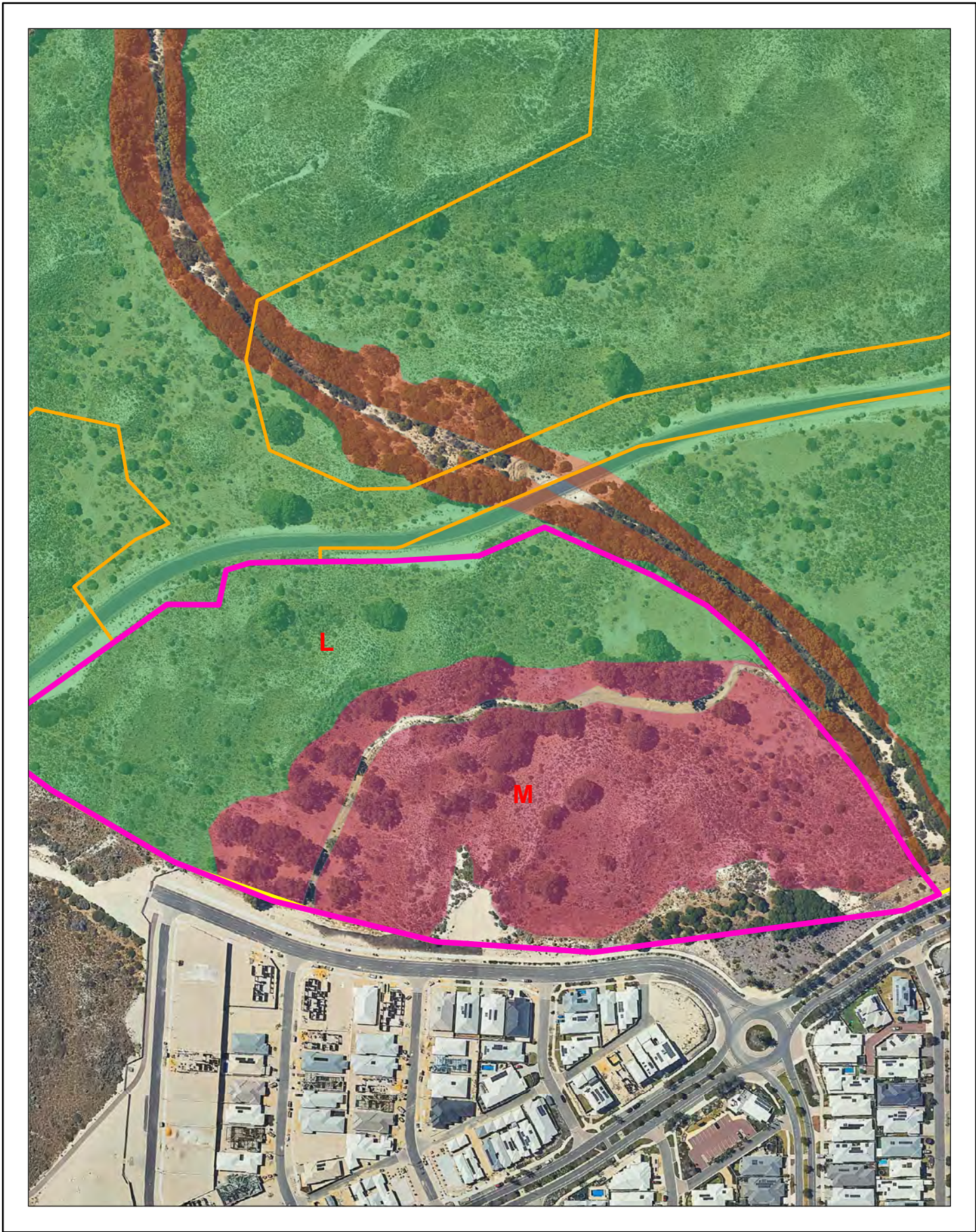
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Metres

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



LEGEND

- Alkimos_Water_Precinct
- Proposed Alkimos Seawater Desalination Plant - Development Envelope
- Proposed Offset

Fauna Habitat

- Cleared
- Heath and Shrubland
- Parkland, Planted Vegetation and Gardens
- Scattered Trees

1:3,000 at A4



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

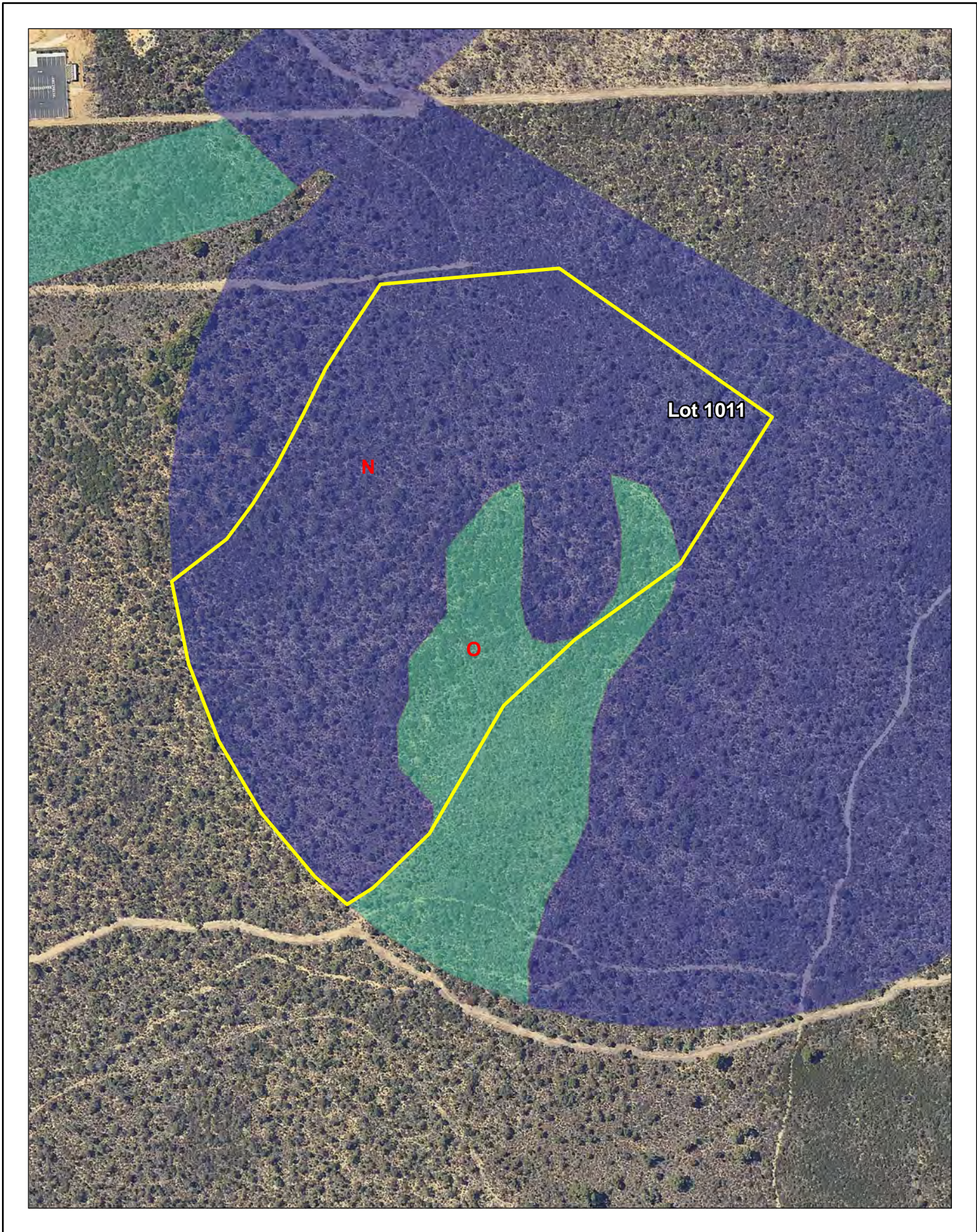


DATE: 7/09/2023
AUTHOR: ZAHRAPO





Alkimos Water Precinct
Fauna Habitat



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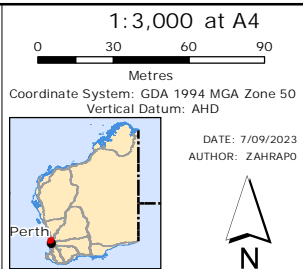


LEGEND

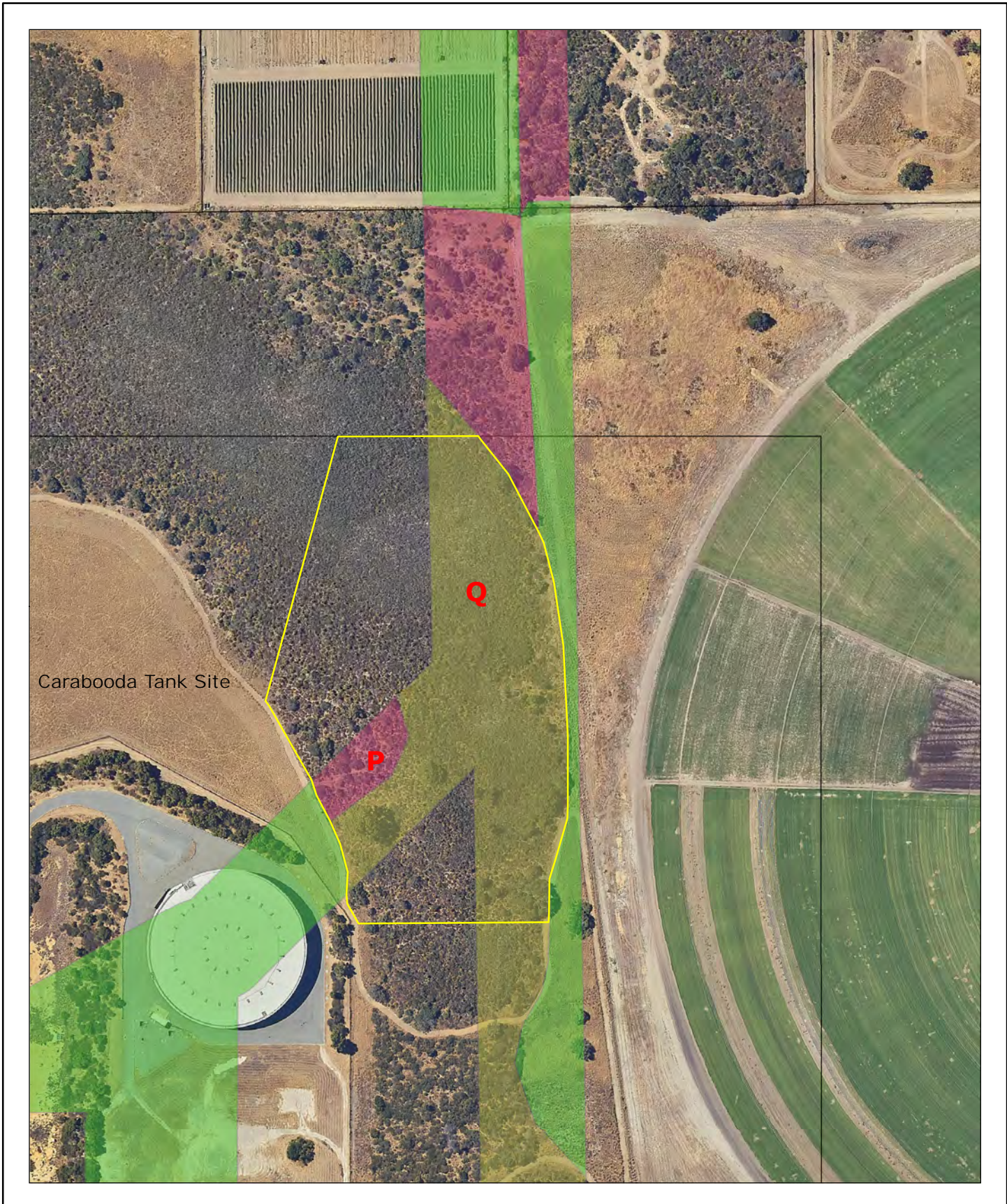
-  Development Envelope
-  Banksia TEC Proposed Offset

Fauna Habitat

-  Heath and Shrubland
-  Woodland



Eglinton Site -
Proposed Offset

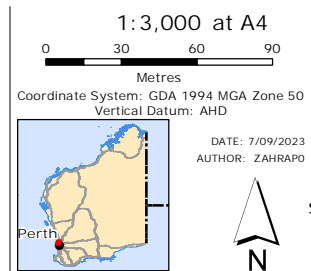


LEGEND

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

FaunaHab






- Cleared
- Heath and Shrubland
- Woodland

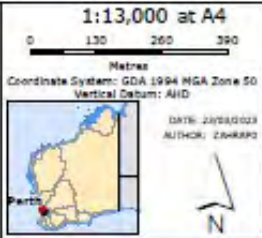


Proposed Offset
 Melaleuca huegelii-
 Melaleuca systena
 shrublands on limestone
 ridges TEC

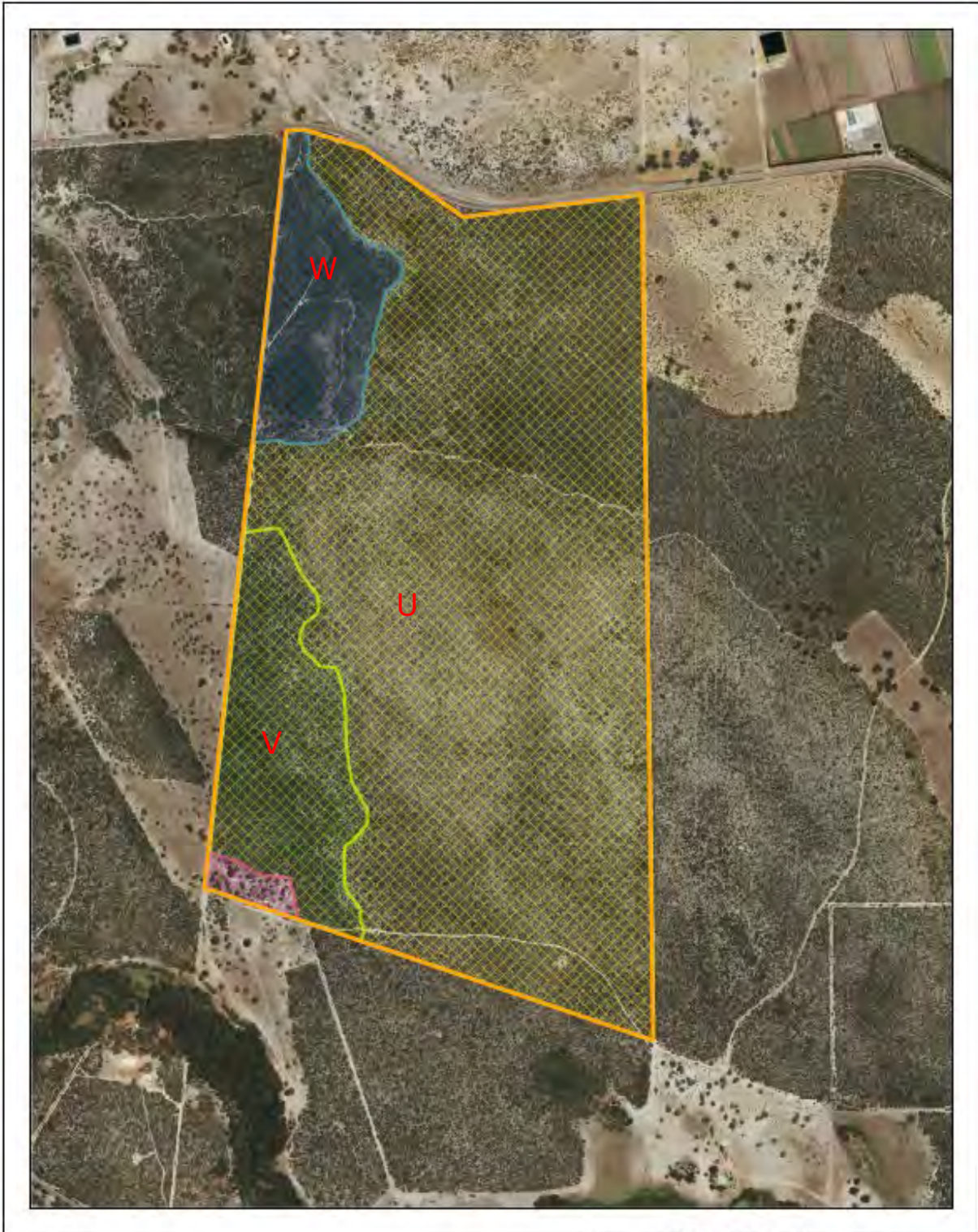


LEGEND

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



Neergabby Offset Site




LEGEND

-  Wetland
-  Degraded
-  Transitional_Banksia_Woodland
-  Banksia_Woodlands_TEC
-  Lot 58 Gingin Brook Road


1:13,000 at A4

0 130 260 390
Metres

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



DATE: 28/04/2022
AUTHOR: ZENKAP0





Neergabby Offset Site



APPENDIX E: OFFSET MANAGEMENT PLANS



APPENDIX E1 – EGLINTON SITE – OFFSET MANAGEMENT PLAN



APPENDIX E2 – CARABOODA TANK SITE – OFFSET MANAGEMENT PLAN



APPENDIX E3 – ALKIMOS SITE – OFFSET MANAGEMENT PLAN



APPENDIX E4 – NEERGABBY SITE – OFFSET MANAGEMENT PLAN



APPENDIX E5 – ARTIFICIAL NESTING HOLLOW – OFFSET MANAGEMENT PLAN