# CPS 11145/1 - Native Vegetation Clearing Permit Application - Mitigation and Avoidance measures and Offset Proposal

**Wellard Road and Henley Boulevard, Wellard – New Roundabout Construction**




14 October 2025

# 1. Background

On 19 June 2025 the City of Kwinana applied for a clearing permit under section 51E(1) of the *Environmental Protection Act 1986* (the EP Act) with the Department of Water and Environmental Regulation (DWER). The application is for the proposed clearing of 11 trees (of which 9 trees are native), within Lot 9500 on Deposited Plan 75385, Lot 3001 on Deposited Plan 58626 and Henley Boulevard-Wellard Road reserve (PIN 12263974), Wellard, for the purpose of construction of a roundabout and associated infrastructure. The application is referenced by the Department of Water and Environmental Regulation and application CPS 11145/1.

On 22 August 2025, DWER wrote to the City requesting additional information to inform the decision on the clearing permit application. This request for additional information sought further evidence of avoidance and mitigation measures employed by the City to prevent or reduce the clearing required for the construction of the Wellard Road-Henley Boulevard roundabout and, where the clearing impact could not be reduced or avoided, an offset proposal to mitigate and offset the loss of approximately 0.09ha of Tuart (*Eucalyptus gomphocephala*) woodland Threatened Ecological Community (TEC) and Black Cockatoo habitat required to be cleared for the roundabout construction. This document provides the City's offset proposal for DWER consideration.

# 2. Avoidance and Mitigation measures

The Wellard Road - Henley Boulevard connection is classified as a Distributor A hierarchy road under Main Roads Western Australia (MRWA) road classification, designed to accommodate significant traffic volumes, including 7.3% heavy vehicles (based on the City's traffic data), such as 19-meter semi-trailers, which are "as-of-right" vehicles for this road type.

In preparing a final detailed design for the upgrade of the intersection at Henley Boulevard and Wellard Road, Wellard, tree retention was considered as a high priority to retain the natural features of the area and significant trees. Where possible the City has worked to retain trees, reducing the required clearing amount to 11 individual trees (9 native) to the extent necessary for the works. Further reductions to the clearing impact area are possible, due to the following reasons:

1) Roundabout Design Requirements

The roundabout is designed in accordance with MRWA's Supplement to Austroads Guide to Road Design Part 4B: Roundabouts, which mandates accommodation of a 19-meter semi-trailer's swept path (minimum turning radius of 12.5 meters). The proposed roundabout has an absolute minimum central island radius of 12.5 meters, which ensures compliance with safety and operational standards for heavy vehicles while minimising the footprint.

Reducing the central island radius below 12.5 meters would compromise the roundabout's ability to safely accommodate a 19-meter semi-trailer, as confirmed by swept path analysis (conducted using software like AutoTURN). A smaller radius would:

a. Increase the risk of vehicles encroaching into adjacent lanes or kerbs, posing safety hazards.
b. Reduce the operational capacity of the intersection, leading to congestion on a high-traffic Distributor A road.
c. Fail to meet MRWA and Austroads design standards, rendering the roundabout non-compliant.

2) Minimum footprint for works provided

The proposed clearing within the Henley Boulevard- Wellard Road road reserve has been carefully limited to the minimum construction footprint necessary to deliver the roundabout, balancing road safety and operational needs with environmental protection. The design and location of the roundabout have been refined to avoid unnecessary disturbance to key habitat trees (Marri, Jarrah, and Tuart) and to retain as many mature trees as possible outside the construction area. The design maximises the use of the current intersection footprint. This approach avoids the need for additional pavement works that would otherwise have required further vegetation clearing.

Engineering solutions such as crash barriers cannot substitute for the structural requirements of the roundabout. A safe carriageway with appropriate geometry (including the circulating carriageway, central island, and approaches) is essential for accommodating heavy vehicle movements. As such, the clearing is confined strictly to the functional footprint of the roundabout. Importantly, no additional clearing is proposed for hazard-free zones such as sightlines; if required, barriers could further reduce these areas, but this would not alter the core construction footprint.

3) Alternative Location Analysis outcome

To address environmental concerns, the City considered several alternative locations and alignments for the roundabout. Each option would result in greater impacts compared to the current proposal, for example:

a. North/West Shift: Would increase canopy loss in the northwest corner, impacting additional black cockatoo foraging habitat and potentially encroaching into the Tuart Woodlands TEC.
b. East Shift: Would not reduce clearing and may require acquisition of land from the adjacent school, introducing social, logistical, and safety constraints.
c. South Shift: Would require additional clearing within Henley Reserve and Tuart woodland TEC, directly impacting high-quality black cockatoo habitat and potential roosting sites.

The current roundabout location represents the least-impact, technically viable option for the intersection upgrade. It achieves compliance with MRWA design standards for a 19-metre semi-trailer while minimizing environmental disturbance to the extent necessary.
Key design features include a minimum central island radius of 12.5 metres, an ICD of approximately 34 metres, and a mountable apron to reduce the overall footprint.

# 3. Offset Proposal

As the City has undertaken the necessary steps to minimize the required clearing for the intersection upgrade and further reductions to the clearing impact area cannot be achieved, an offset proposal is required. The details of this offset are provided herein to address the residual environmental impact of the clearing works.

## *3.1. Offset proposal location and size*

In DWER's Request for Further Information dated 22 August 2025, DWER provided a preliminary offset calculation to the City using the WA offsets calculator, should further clearing avoidance and mitigation measures not be applicable. This preliminary calculation indicated that an offset of 0.64ha was required to mitigate the residual impacts of the clearing of the 0.09ha of habitat required for the roundabout construction.

The trees proposed to be cleared as part of the City's clearing permit application are located adjacent to Henley Reserve in Wellard (refer to Figure 1). This reserve is approximately 28ha in size and provides important foraging and roosting habitat for local Black Cockatoo populations (both Carnaby's and Forest Red Tailed), as well as important ecological linkage in a north-south direction to the larger Leda Nature Reserve area. The reserve comprises areas of Tuart (*Eucalyptus gomphocephala*) woodland and wetland vegetation, with a Conservation Category Wetland (CCW) occupying much of the central portion of the site.

To offset the required clearing, the City has identified an area of 0.7ha (7,000m$^2$) within the northern portion of Henley Reserve that is currently in a completely degraded to degraded condition[1] and requires on-ground management (weed management) and revegetation to restore it to a good vegetation condition[1]. This area (shown in blue in Figure 2 over the page and in further detail in Figure 4 in Attachment 1) is located within Reserve 50531 and has been chosen for offset works as it is:

- currently in a completely degraded to degraded condition, with high weed infestation and poor overall habitat value;
- suitable for tree planting, having some large open areas devoid of canopy cover;
- connected to adjoining Tuart canopy within the Henley Reserve and adjacent to the area where clearing is required;
- away from high vehicle traffic areas, ensuring any habitat planted does not put foraging birds at risk of vehicle strike;
- located near the City's recorded Carnaby's Black Cockatoo (*Zanda latirostris*) and Forest Red Tailed Black Cockatoo (*Calyptorrhynchus banksii naso*) roosting locations within the larger Henley Reserve (KWIWELR001 and KWIWELR002); and
- in an area of the reserve that allows for ease of maintenance and monitoring.

[1] Vegetation Condition Scale (Keighery, 1994)




Figure 1: The area of the proposed clearing (shown in red) in context to Henley Reserve, Wellard (shown in green)



Figure 2: The proposed offset area shown in blue.

### *3.2. Current offset area condition and species diversity*

The area identified for revegetation and rehabilitation for the clearing permit offset comprises 0.7ha of Tuart (*Eucalyptus gomphocephala*) woodland in a degraded to completely degraded condition[1]. The vegetation is best described as Open to closed woodland of *Eucalyptus gomphocephala, Eucalyptus marginata* and *Corymbia calophylla* over *Banksia grandis*, *Banksia menziesii* and *Jacksonia furcellata* over *Acacia* spp. and *Rhagodia baccata* shrubland over herbs.

A rapid site assessment of the offset area was undertaken on 3 October 2025 by the City's staff. Species identified within the offset area are listed in Table 1 in Attachment 2. Photographs of the offset area are provided in Attachment 3.

### *3.3. Offset reference site*

To inform rehabilitation and revegetation actions for the offset proposal a reference site within Henley Reserve has been used. The reference site comprises of Tuart woodland over *Banksia grandis* (Bull Banksia) and *Banksia menziesii* (Firewood Banksia) over *Acacia* spp. and is in good to very good condition. A 10m x 10m quadrat was used to assess vegetation condition and composition. The approximate location of this quadrat is shown in Figure 3. The species composition recorded within the reference quadrat is provided in Attachment 4, with photos provided in Attachment 5.

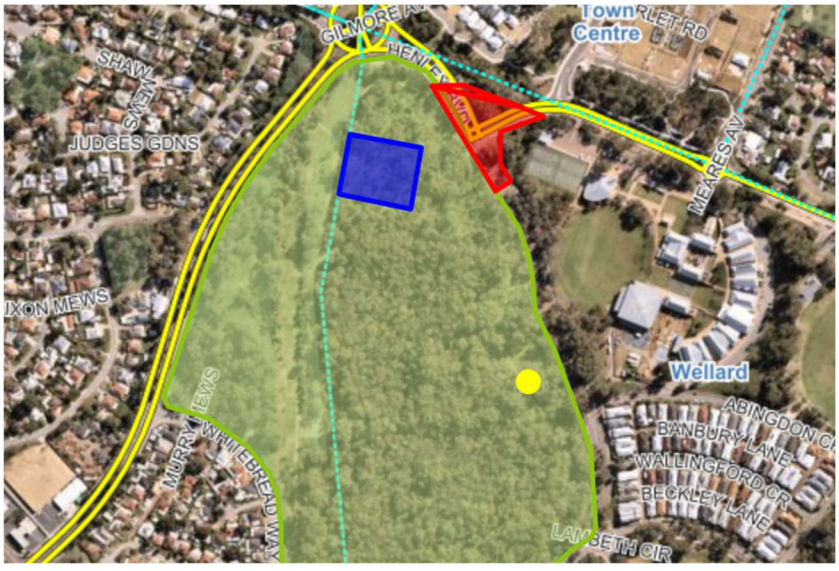



Figure 3: Offset reference site (yellow) shown in relation to the works area (red) and offset area (blue)

*3.4. Offset works detail*

The City of Kwinana's clearing offset will comprise a combination of rehabilitation and revegetation (infill planting) within the area identified to improve vegetation condition and local habitat value, increase foraging and roosting habitat for local Black Cockatoo populations and increase Tuart representation within Henley Reserve. Rehabilitation and revegetation works will comprise ground and site preparation, revegetation, ongoing weed management and tubestock monitoring and maintenance.

2.3.3. Site preparation

Prior to the commencement of revegetation and restoration works, the site will be prepared by:

- Removing any litter from the offset proposal area;
- Removing deadwood and fallen branches from the ground to increase access to planting surface areas; and
- Applying a widescale herbicide treatment to the area to treat weed infestations and allow for their removal from the offset area prior to the commencement of revegetation.

Site preparation is proposed to commence in early 2026, with at least 6 weeks between herbicide application and the commencement of revegetation works.

2.3.4. Revegetation works

Revegetation works have been guided by a rapid site survey of a reference site within the Henley Reserve within an area of Tuart woodland in good to very good condition.

Revegetation will comprise infill planting of 4,140 tubestock specimens over a period of 4 years, commencing July 2026. The species selected for revegetation and the quantity to be planted are provided in Table 1 over the page.

Calculations for the proposed revegetation works are provided in Attachment 6.

Tubestock will be planted evenly spaced between existing vegetation to endeavour to meet the following criteria:

Trees: 0.2 per square metre

Large shrubs/small trees (Banksia): 1 per square metre

Shrubs (1-3m): 1.5 per square metre

Small shrubs and groundcovers: 2 per square metre

Stakes and guards will be used to prevent grazing by fauna and additional ringlock fencing will be used on the boundary of the revegetation site to protect the area from park users. A

summer watering program will be provided for the first summer after planting to assist in the success of the planted specimens. Monitoring of tubestock will occur for the first two years post installation to monitor plant health and identify any losses that require replacement.

#### 2.3.5. Weed management

To ensure the success of revegetation efforts and improve overall vegetation condition within the offset area, weed management will be undertaken on an annual basis for a period of three years from the commencement of planting to help tubestock establish within the offset site. This work will be completed by the City's Natural Areas operational staff, or a suitably qualified contractor with experience in managing weeds within natural bushland areas.

Table 2 provides a list of the weeds identified in the offset area during the rapid site assessment, their preferred treatment method and key treatment timing.

Table 1: Offset planting species and quantities

| Species name (Common name) | Plant form | Quantity to be planted | | | |
|---|---|---|---|---|---|
| | | Year 1 | Year 2 | Year 3 | Year 4 |
| *Acacia pulchella* (Prickly Moses) | Shrub | 80 | 80 | 60 | 50 |
| Acacia rostellifera (Summer-scented Wattle) | Shrub or tree | 20 | 200 | 100 | 70 |
| *Banksia attenuata* (Candlestick Banksia) | Tree or tall shrub | - | 100 | 100 | - |
| *Banksia grandis* (Bull Banksia) | Tree or tall shrub | 20 | 100 | 100 | - |
| *Banksia menziesii* (Firewood Banksia) | Tree or tall shrub | - | 100 | 100 | - |
| *Banksia sessilis* | Tree or shrub | 40 | 120 | 100 | - |
| *Conostylis aculeata* (Prickly Conostylis) | Herb | - | 200 | 200 | - |
| *Corymbia calophylla* (Marri) | Tree | 20 | 40 | 40 | 30 |
| *Dianella revoluta* (Blueberry Lily) | Herb | 40 | 100 | 100 | - |
| *Eucalyptus gomphocephala* (Tuart) | Tree | 40 | 50 | 40 | 20 |
| *Hakea prostrata* (Harsh Hakea) | Shrub | 80 | 100 | 50 | 30 |
| *Kunzea glabrescens* (Spearwood) | Shrub | 80 | 50 | 50 | - |
| *Lepidosperma longitudinale* (Pithy Sword-sedge) | Sedge | 40 | 20 | 50 | - |
| *Lobelia anceps* (Angled Lobelia) | Herb | 80 | 100 | 100 | - |
| *Myoporum caprarioides* (Slender Myoporium) | Shrub | - | 100 | 50 | - |
| *Patersonia occidentalis* (Purple Flag) | Herb | 80 | 100 | 100 | - |
| *Rhagodia baccata* (Berry Saltbush) | Shrub | 40 | 50 | 50 | 50 |
| *Spyridium globulosum* (Basket Bush) | Shrub | 80 | 50 | 50 | 50 |
| Total | | 740 | 1,660 | 1,440 | 300 |

Table 2: Identified weed species within the offset proposal area and their treatment

| Weed type/species | Preferred treatment method | Treatment timing |
|---|---|---|
| Geophytes<br>- Arum Lily (*Zantedeschia aethiopica)*<br>- Pink Gladiolus *(Gladiulus caryophyllaceus)*<br>- Soursob (*Oxalis pes-caprae*)<br>- Violet wood sorrel (*Oxalis violacea*)<br>- Watsonia (*Watsonia bulbillifera*) | Chemical, spot spraying<br>Metsulfuron methyl/ Glyphosate + Pulse | June - September |
| Broad leaf Herbs<br>- Capeweed (*Arctotheca calendula*)<br>- Clover (*Trifolium* sp)<br>- Flatweed (*Hypochaeris* sp)<br>- Geraldton Carnation Weed (*Euphorbia terracina*)<br>- *Geranium molle*<br>- Prickly Lettuce (*Lactuca* sp)<br>- White Fumitory (*Fumaria capreolata*) | Chemical, spot spraying<br>Glyphosate/ Logran® / Metsulfuron methyl | July - November |
| Grasses, sedges and rushes<br>- Perennial Veldt Grass (*Ehrharta calycina*)<br>- Quaker Grass (*Briza maxima*) | Chemical, spot spraying<br>Fusilade® | June - August |
| Lupins<br>*Lupinus cosentinii* (Blue)<br>*Lupinus luteus* (Yellow) | Chemical, spot spraying<br>Metsulfuron methyl, Lontrel, Logran® | Jun - September |
| Pimpernel (*Lysimachia arvensis*) | Manual/chemical, TBC | TBC |
| Rose Pelargonium (*Pelargonium capitatum*) | Chemical, spot spraying<br>Metsulfuron methyl | June - October |

2.3.6. Land tenure and vesting

Henley Reserve comprises two different land tenures and Reserve identification numbers – Reserve 43072 and Reserve 50531. Both reserves are owned by the State Government and managed by the City of Kwinana under a management order.

The offset works are proposed within a portion of Reserve 50531. The reserve is owned by the Department of Planning, Lands and Heritage (DPLH) and is vested with the City of Kwinana via a Management Order for the purpose of 'Public Recreation'.

To secure the offset area for conservation, a change of vesting is required 'Public recreation' to 'Conservation'. The City of Kwinana is currently in the process of seeking support from DPLH to change the vesting of the reserve for this purpose.

3.5. *Monitoring Program*

To monitor and evaluate the success of the revegetation and rehabilitation works required for the offset, two 10m x 10m quadrats will be installed within the offset area along with 4 additional photo monitoring locations. The locations for these monitoring points are to be confirmed with DWER on their advice and will be marked by wooden stakes and recorded GPS points. Monitoring will comprise visual, photographic and survey data and be collected biannually for a period of two years after the final tubestock planting, or until 31 December 2031.

Monitoring will assess plant survival and revegetation success, weed treatment and management success and vegetation condition within the offset area.

3.6. *Completion criteria and offset outcome success*

In undertaking the proposed offset works, the City aims to provide a net gain and improvement to the size, density and diversity of local Black Cockatoo (Carnaby's and Forest Red Tailed) foraging and roosting habitat and a net gain and improvement to the Tuart Woodland TEC located within Henley Reserve. Further detail on the net gain expected is shown in Table 3. Completion Criteria are also provided in Table 4.

3.7. *Contingency measures*

Contingency measures will be implemented as required to ensure completion criteria can be met. These include additional planting (revegetation) events to replace tubestock losses, weed management programs, summer watering, fence repairs and replacements and monitoring.

Table 3: Offset proposal outcomes

| Environmental values to offset | Clearing impact | Improved offset outcome |
|---|---|---|
| Black Cockatoo foraging habitat | Size: 0.09ha<br>Composition: 11 trees (9 native) comprising 5 species.<br>Condition: Completely degraded, high weed infestation (cover currently over 80%)<br>Location: road reserve | Size: 0.7ha<br>Composition: Rehabilitated Tuart-Marri woodland, comprising middle and understorey specimens. Weeds <5% cover.<br>Addition of 1,160 stems of Black Cockatoo (Carnaby's Black Cockatoo and Forest Red Tailed Black Cockatoo) foraging specimens to Henley Reserve.<br>Condition: Good condition<br>Location: Henley Reserve, northern portion.<br>Vesting gain: Reserve 50531 vesting changed from 'Public Recreation' to 'Conservation'. |
| Black Cockatoo roosting habitat | | |
| Tuart woodland TEC | | Composition: Introduction of an additional 150 *Eucalyptus gomphocephala* (Tuart) specimens to Henley Reserve.<br>Condition: Rehabilitation of 0.7ha of Tuart woodland TEC within the Henley Reserve, to a good or better condition.<br>Vesting gain: Reserve 50531 vesting changed from 'Public Recreation' to 'Conservation'. |

Table 4: Completion Criteria for the City's offset proposal at Henley Reserve

| Environmental value | Completion criteria | Monitoring method |
|---|---|---|
| Revegetation tubestock survival rate | 80% survival rate of total revegetation specimens | Counted annually up until 31 December 2031 |
| Species diversity | Maintain diversity of revegetation to achieve a minimum of 17 local native species within the offset area. | Annually in spring by an environmental specialist until completion criterion has been met and maintained for two years (i.e. three successive monitoring events). |
| Percentage of weeds present | Weed coverage less than 5% within the offset area | Monitor the offset site for weeds by quadrats annually in spring for a minimum of three years after the last planted tubestock are established. |
| Declared weeds | No Declared Weeds under the *Biosecurity and Agricultural Management Act 2007* present | Monitor the revegetation site for Declared weeds by quadrats annually in spring for a minimum of three years after the last planted tubestock are established |

# 4. Conclusion

The City of Kwinana has reviewed the required clearing works and is unable to further restrict clearing for the roundabout construction due to Main Roads traffic and service requirements. The City has therefore presented an offset proposal for the revegetation and rehabilitation of 0.7ha of Tuart woodlands within the Henley Reserve. The offset works will mitigate the required clearing impact and provide a net gain to local Black Cockatoo foraging and roosting habitat and Tuart woodlands Threatened Ecological Community within the Henley Reserve.

# Attachment 1: Proposal impact and offset areas

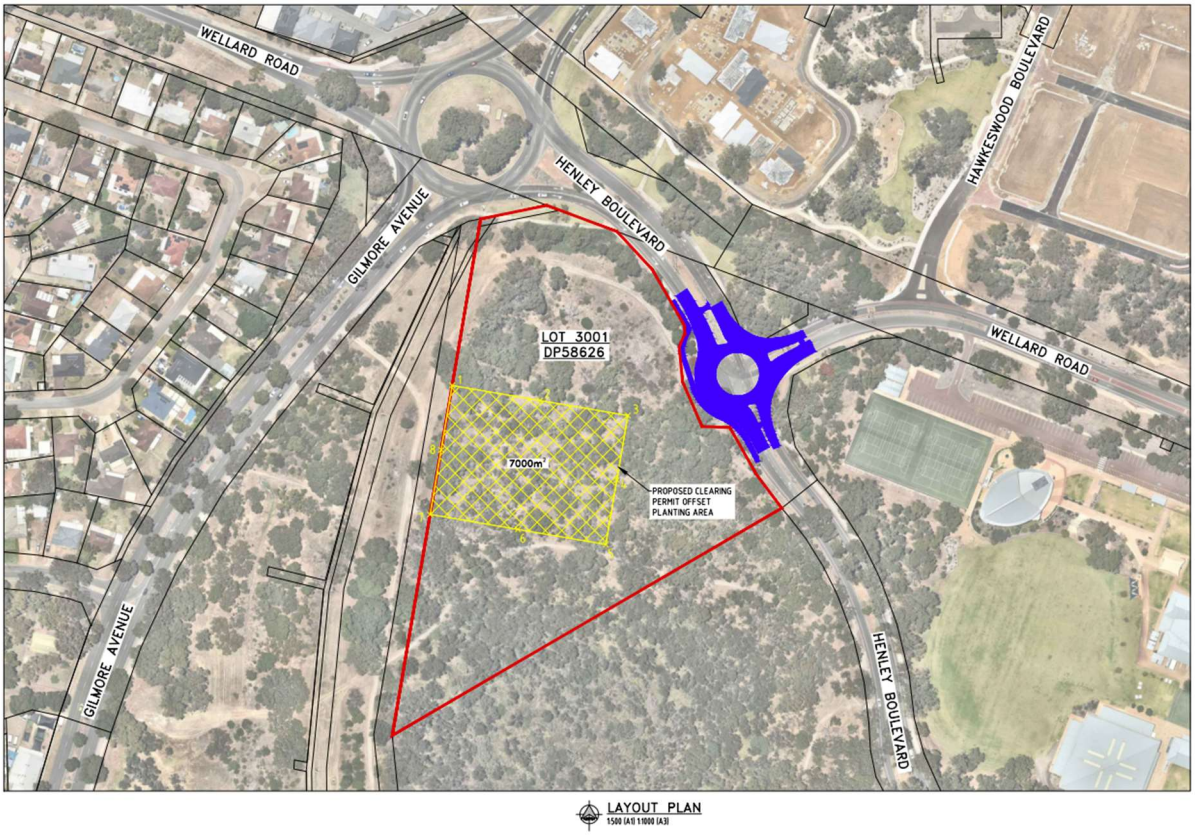



Figure 4: The roundabout construction footprint (shown in blue) and the location of the offset area (hatched yellow)

# Attachment 2: Species identified in the offset area

| Species | Common Name |
|---|---|
| **Tree canopy (approx. 40%)** | |
| *Corymbia calophylla* | Marri |
| *Eucalyptus gomphocephala* | Tuart |
| *Eucalyptus marginata* | Jarrah |
| **Upper storey (3-5m) (approx. 20%)** | |
| *Banksia grandis* | Swamp Banksia |
| *Banksia menziesii* | Firewood Banksia |
| *Hakea prostrata* | Harsh Hakea |
| | |
| **Mid-storey 1-3m (approx. 20%)** | |
| *Acacia pulchella* | Prickly Moses |
| *Acacia rostellifera* | Summer-scented Wattle |
| *Jacksonia furcellata* | Grey Stinkwood |
| *Kunzea glabrescens* | Spearwood |
| *Macrozamia reidlei* | Zamia Palm |
| *Rhagodia baccata* | Berry Saltbush |
| *Xanthorrhoea preissii* | Balga |
| **Small shrubs and groundcovers (approx. 10%)** | |
| *Acacia lasiocarpa* | Panjang |
| *Anigozanthos manglesii* | Mangles' Kangaroo Paw |
| *Conostylis aculeata* | Prickly Conostylis |
| *Dianella revoluta* | Flax Lily |
| *Hardenbergia comptoniana* | Native Wisteria |
| *Sowerbaea laxiflora* | Purple Tassels |

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| Weeds (Approx 95%) | |
|---|---|
| *Anagallis arvenis var. caerulea* | Blue Pimpernel |
| *Arctotheca calendula* | Capeweed |
| *Briza maxima* | Quaker Grass |
| *Ehrharta calycina* | Perennial Veldt Grass |
| *Euphorbia terracina* | Geraldton Carnation Weed |
| *Geranium molle* | Geranium |
| *Gladiolus caryophyllaceus* | Pink Gladiolus |
| *Hypochaeris sp.* | Flatweed |
| *Fumaria capreolata* | White Fumitory |
| *Lactuca sp.* | Lettuce weed |
| *Lupinus cosentinii* | Blue Lupin |
| *Lupinus luteus* | Yellow Lupin |
| *Oxalis pes-caprae* | Soursob |
| *Oxalis violacea* | Violet Wood Sorrel |
| *Pelargonium capitatum* | Rose Pelargonium |
| *Trifolium spp.* | Clover |
| *Watsonia sp. (bulbillifera?)* | Watsonia |
| *Zantedeschia aethiopica* | Arum Lily |

*Note: Red text denotes exotics and introduced weed species.*

# Attachment 3: Current offset area photos



Photo 1: Eastern portion of the offset area, facing south towards the walking track.



Photo 2: Eastern portion of the offset area, facing west southwest



Photo 3: Eastern portion of the offset area, facing north-northwest.



Photo 4: High weed presence in the understorey and groundcovers.



Photo 5: Northeastern portion of the offset area, approximately mid-way, facing west-northwest



Photo 6: Northen portion of the offset area, facing north



Photo 7: Northern portion of the offset area along the eastern boundary, facing northwest



Photo 8: Central eastern portion of the offset area, facing southwest



Photo 9: *Geranium molle*



Photo 10: Rose Pelargonium (*Pelargonium capitatum)*



Photo 11: Central southern area of the offset area, facing west



Photo 12: Arum Lily (*Zantedeschia aethiopica)*



Photo 13: Southwestern corner of the offset area, facing north



Photo 14: Western boundary of the offset area, facing east



Photo 15: Western boundary of the offset area, facing southeast



Photo 16: Western boundary of the offset area, facing northeast

# Attachment 4: Reference site species composition

Reference site information:
10m x 10m quadrat
Northwestern corner GPS reference:
WGS84, 115.813198 Longitude, -32.258425 Latitude
(near Abingdon Crescent, Wellard)

Vegetation Structure:
Canopy: 20m height, 80% canopy cover
Upper storey: 3-10m height, 40% cover
Mid storey: 1-3m height, 30% cover
Lower storey/groundcovers: 0-1m height, 10% cover

| Species | % cover | Stems counted |
|---|---|---|
| Canopy, 20m | 80 | |
| *Eucalyptus gomphocephala* (Tuart) | | 1 |
| Upper storey, 3-10m | 40 | |
| *Acacia rostellifera* (Summer-scented Wattle) | | 5 |
| *Banksia grandis (Bull Banksia)* | | 1 |
| *Banksia menziesii* (Firewood Banksia) | | 5 |
| *Calothamnus quadrifidus* (One-sided Bottlebrush) | | 1 |
| *Hakea prostrata* (Harsh Hakea) | | 1 |
| *Myoporum caprarioides* (Slender Myoporum) | | 1 |
| Mid storey, 1-3m | 30 | |
| *Acacia pulchella* (Prickly Moses) | | 9 |
| *Acacia rostellifera* (Summer-scented Wattle) | | 15 |
| *Banksia menziesii* (Firewood Banksia) | | 3 |
| *Calothamnus quadrifidus* (One-sided Bottlebrush) | | 1 |
| *Hardenbergia comptoniana* (Native Wisteria) | | 2 |
| *Myoporum caprarioides* (Slender Myoporum) | | 5 |
| *Rhagodia baccata* (Saltbush) | | 1 |
| Lower storey/ groundcovers, 0-3m | 20 | |
| Emerging *Acacia pulchella* (Prickly Moses) | | 10 |
| *Conostylis aculeata* (Prickly Conostylis) | | 3 |
| *Hardenbergia comptoniana* (Native Wisteria) | | 3 |
| Emerging Calothamnus quadrifidus (One-sided Bottlebrush) | | 4 |

Weeds present, approx. 70% cover

*Asparagus asparagoides* (Bridal Creeper)
*Ehrharta calycina* (Perennial Veldt Grass)
*Euphorbia terracina* (Carnation Weed)
*Fumaria capreolata* (White Fumitory)
*Geranium molle* (Geranium)
*Hypochaeris* sp. (Flatweed)
*Pelargonium capitatum* (Rose Pelargonium)
*Zantedeschia aethiopica* (Arum Lily)

# Attachment 5: Reference site photographs



Photo 1: NW corner reference site, facing east



Photo 2: SW portion of the reference area, facing NE

# Attachment 6: Revegetation quantity calculation

Calculation: Area infill % cover required x density planted

Tree canopy

Existing cover: 40%

Reference site cover: 80% (1 specimen)

Revegetation density: 0.2 trees per square metre

7,000 x 0.2 = 1,400$m^2$ x 0.2 stems/$m^2$ = 280 stems

Upper canopy

Existing cover: 20%

Reference site cover: 40%

Revegetation density: 1 tree per square metre

7,000 x 0.2 = 1,400$m^2$ x 1 stem/$m^2$ = 1,400 stems

Mid canopy

Existing cover: 20%

Reference site cover: 30%

Revegetation density: 1.5 shrubs per square metre

7,000 x 0.1 = 700$m^2$ x 1.5 stems/$m^2$ = 1,050 stems

Lower storey/groundcovers

Existing cover: 10%

Reference site cover: 20%

Revegetation density: 2 shrubs/groundcovers per square metre

7,000 x 0.1 = 700$m^2$ x 2 shrubs/groundcovers per square metre = 1,400 stems

Total stems = 4,130 stems required