We're working for Western Australia.

Great Eastern Highway Bypass Interchanges

CPS 9448/1

Offset Strategy

October 2025

Document Control

Revision	Date	Author	Reviewed
B	December 2024	Focused Vision Consulting	Main Roads
C	March 2025	Focused Vision Consulting	Main Roads
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F	August 2025	FVC	Main Roads
G	August 2025	FVC	Main Roads
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Main Roads Western Australia (Main Roads) submitted an application to the Department of Water and Environmental Regulation (DWER) to clear native vegetation for the Great Eastern Highway Bypass Interchanges (GEHBI) project in 2021 (CPS 9448/1) (the Proposal).

The Great Eastern Highway Bypass (GEH Bypass) provides a critical connection between Roe Highway and Tonkin Highway, particularly for vehicles travelling to and from the Hazelmere, Forrestfield and High Wycombe industrial areas. The intersections of the GEH Bypass with Roe Highway, Stirling Crescent and Abernethy Road have become increasingly congested due to the presence of large volumes of heavy vehicles moving in a north-south direction between the Forrestfield, High Wycombe and Hazelmere industrial areas, and light and heavy vehicles seeking to avoid traffic through Midland and Guildford. In addition to traffic congestion issues, future expansion of the southern part of Midland around the former railway workshops precinct is constrained by the lack of direct access to and from the south.

The significant residual impacts on the environmental values from the Proposal are 23.31 ha of native vegetation including:

- 5.78 ha of the *Banksia attenuata* woodlands over species rich dense shrublands Threatened Ecological Community (SCP20a) (Critically Endangered) Threatened Ecological Community (TEC)
- 2.53 ha of Low Lying *Banksia attenuata* woodlands or shrublands (SCP21c) Priority Ecological Community (PEC) (P3)
- 14.94 ha of Banksia Woodlands of the Swan Coastal Plain TEC/PEC (P3)
- 1.43 ha of *Conospermum undulatum* habitat
- 23.24 ha of Black Cockatoo foraging habitat
- 3.15 ha of vegetation growing in association with a Conservation Category wetland
- 12.75 ha of Bush Forever.

Table E1 presents a summary of the proposed offset sites and their contribution to offsetting the significant residual impacts of the Proposal.

Table E1 Summary of offset package for CPS 9448/1

Offset	Distance to Offset	Offset Area (ha)	SCP20a TEC 5.78 ha x Quality 6	P3 PEC FCT 21c 2.53 ha x Quality 6	BWSCP TEC/P3 PEC 14.94 ha x Quality 6	*Conospermum undulatum* 1.43 ha x Quality 7	BBC foraging habitat 23.24 ha x Quality 3	CBC foraging habitat 23.24 ha x Quality 6	FRTBC foraging habitat 23.24 ha x Quality 6	CCW 3.15 ha x Quality 4.2	Bush Forever 12.75 ha @ 2:1
			ha (%)	ha (%)	ha (%)	ha (%)	ha (%)	ha (%)	ha (%)	ha (%)	ha (%)
Cowalla	95 km	137.65		18.99 (100.0%)	113.40 (100.0%)					6.50 (34.4%)	
Crossman	103 km	86.60					47.45 (100.0%)	86.60 (97.4%)	86.10 (95.6%)		
Hartfield Park	6.9 km	5.28	2.92 (9.0%)			5.28 (108.3%)					0.50 (2.0%)
Mirrabooka Bushland	14.4 km	42.80	42.80 (91.0%)								25.00 ha (98.0%)
Neaves Road	26.8 km	6.57						1.06 (2.6%)	1.65 (4.4%)	4.92 (66.8%)	
Total			**45.72 (100.0%)**	**18.99 (100.0%)**	**113.40 (100.0%)**	**5.28 (108.3%)**	**47.45 (100.0%)**	**87.66 (100.0%)**	**87.75 (100.0%)**	**11.42 (101.2%)**	**25.50 (100.0%)**

1. Introduction

1.1 Proposal Background

Main Roads Western Australia (Main Roads) submitted an application to the Department of Water and Environmental Regulation (DWER) to clear native vegetation for the Great Eastern Highway Bypass Interchanges (GEHBI) project in 2021 (CPS 9448/1) (the Proposal). The proposed clearing area is shown in **Figure 1.** GEHBI has been approved under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) (EPBC 2020/8784).

The Great Eastern Highway Bypass (GEH Bypass) provides a critical connection between Roe Highway and Tonkin Highway, particularly for vehicles travelling to and from the Hazelmere, Forrestfield and High Wycombe industrial areas. The intersections of the GEH Bypass with Roe Highway, Stirling Crescent and Abernethy Road have become increasingly congested due to the presence of large volumes of heavy vehicles moving in a north-south direction between these industrial areas, and light and heavy vehicles seeking to avoid traffic through Midland and Guildford. In addition to traffic congestion issues, future expansion of the southern part of Midland around the former railway workshops precinct is constrained by the lack of direct access to and from the south.

GEHBI is proposing to clear 23.31 ha of native vegetation including 5.78 ha of the Critically Endangered *Banksia attenuata* woodlands over species rich dense shrublands (SCP20a) Threatened Ecological Community (TEC), 14.94 ha of Banksia Woodlands of the Swan Coastal Plain (BWSCP) Threatened and Priority Ecological Community (TEC/PEC), 2.53 ha of Low Lying *Banksia attenuata* woodlands or shrublands (SCP21c) PEC, 23.24 ha of Black Cockatoo foraging habitat, 2.47 ha of vegetation growing in association with a conservation category wetland (CCW) and 12.75 ha of Bush Forever. Due to the conservation significance of the vegetation proposed to be cleared, an environmental offset is required to mitigate the significant residual impacts of the proposal.

Main Roads has been able to identify and secure an appropriate like-for-like offset through a combination of land acquisition and revegetation of various offset sites for each of the significant residual impacts resulting from the proposed clearing.

1.2 Purpose of this Strategy

The purpose of this document is to outline the offsets proposed for CPS 9448/1, in accordance with the Western Australia (WA) Environmental Offsets Guidelines (GoWA 2011) and to mitigate the significant residual impacts remaining from GEHBI after the application of the mitigation hierarchy, as detailed in the CPS 9448/1 supporting document (GCA 2022).

The objective of the strategy is to, where practicable, avoid duplication in offsets required by DCCEEW in accordance with the EPBC Act approval for the GEHBI project. This objective is consistent with the Western Australia (WA) Environmental Offsets Guidelines.

0 150 300 450 600 m

GDA2020 MGA Zone 50

Legend

NVCP Clearing Area

State Road

Figure 1 - CPS 9448/1 Location

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2. Significant Residual Impacts

Table 1 provides a summary of the significant residual impacts and the habitat quality for each environmental value impacted by GEHBI. The rationale for each score is provided in the offset calculators for each offset site.

Table 1 Summary of Significant Residual impacts

Environmental Value	Type of Environmental Value	Conservation Significance of Environmental Value	Significant Impact (ha)	Start Quality
SCP20a – *Banksia attenuata* woodlands over species rich dense shrublands	Ecological community	Threatened Ecological Community (Critically Endangered)	5.78	6
SCP21c – Low lying *Banksia attenuata* woodlands or shrublands	Ecological Community	Priority Ecological Community (P3)	2.53	6
Banksia Woodlands of the Swan Coastal Plain (EPBC TEC)	Ecological Community	EPBC Threatened Ecological Community (Endangered) Priority Ecological Community (P3)	14.94	6
Conospermum undulatum	Flora	Threatened Species (Vulnerable)	1.42	6
Baudin's Black Cockatoo foraging habitat	Fauna	Threatened Species (Endangered)	23.24	3
Carnaby's Black Cockatoo foraging habitat	Fauna	Threatened Species (Endangered)	23.24	6
Forest Red-tailed Black Cockatoo foraging habitat	Fauna	Threatened species (Vulnerable)	23.24	6
Conservation Category Wetland UFI 15540	Wetland / watercourse	Vegetation growing in association of a wetland or watercourse	3.15	4.2
Bush Forever Site 481	Bush Forever	Bush Forever	12.75	NA

2.1 *Banksia attenuata* woodlands over species rich dense shrublands (SCP20a) TEC

GEHBI is proposing to clear 5.78 ha of the Critically Endangered *Banksia attenuata* woodlands over species rich dense shrublands TEC, also referred to as SCP20a (a component of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed BWSCP TEC and State-listed BWSCP PEC) (**Figure 2**). SCP20a occurs on sands near Koondoola and Banksia Grove and at the base of the Darling Scarp from Chittering to Gosnells (DPaW 2016). SCP20a is typically very species rich (average of 67 spp./100 m^2) and is dominated with *Banksia attenuata* (Slender Banksia) and/or *Eucalyptus marginata* (Jarrah) overstorey with *Bossiaea eriocarpa* (Common Brown Pea), *Conostephium pendulum* (Pearl Flower), *Hibbertia huegelii, Hibbertia hypericoides* (Yellow Buttercups), *Petrophile linearis* (Pixie Mops), *Scaevola repens, Stirlingia latifolia* (Blueboy), *Mesomelaena pseudostygia* and *Alexgeorgea nitens* being common in the understorey (DPaW 2016).

Five quadrats and one releve across the GEHBI survey area were considered representative of SCP20a (Biota 2021). These surveyed patches have an average species richness of 48.8 spp./100 m^2 which is lower than the average species richness of 50 spp./100 m^2 recorded for Banksia Woodland in Perth. The dominant trees recorded within the Development Envelope (DE) include *Banksia attenuata*, *B. menziesii*, *Eucalyptus todtiana*, *E. marginata* subsp. *marginata*, *Corymbia calophylla* and *Allocasuarina fraseriana*.

2.2 Low lying *Banksia attenuata* woodlands or shrublands (SCP21c) P3 PEC

Low lying *Banksia attenuata* woodlands or shrublands (SCP21c) (a component of the EPBC listed BWSCP TEC and State-listed BWSCP PEC) Priority 3 (P3) PEC occurs sporadically between Gingin and Bunbury and is largely restricted to the Bassendean system. SCP21c tends to occupy lower lying wetter sites and is variously dominated by *Melaleuca preissiana, Banksia attenuata, B. menziesii, Regelia ciliata, Eucalyptus marginata* or *Corymbia calophylla*. Structurally, this community type may be either a woodland or occasionally shrubland (DBCA 2024).

Up to 2.53 ha of SCP21c PEC will be cleared as part of the GEHBI clearing (**Figure 3**).

2.3 Banksia Woodlands of the Swan Coastal Plain TEC/P3 PEC

GEHBI will impact 14.94 ha of the State-listed BWSCP PEC, which is synonymous with the EPBC Act listed BWSCP TEC (Endangered) (Biota 2021) (**Figure 4**). At a State level, all Banksia woodlands that meet the diagnostic criteria of the EPBC Act-listed BWSCP TEC are considered to be part of the BWSCP P3 PEC.

The BWSCP TEC/PEC typically occurs on well drained, low nutrient soils on sandplain landforms, particularly the deep Bassendean and Spearwood sands and occasionally on Quindalup sands (DoEE 2016). The BWSCP TEC/PEC is described in the EPBC Act Approved Conservation Advice (DoEE 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 BWSCP TEC/PEC is restricted to the Perth (SWA02) and Dandaragan (SWA01) subregions of the Swan Coastal Plain Interim Biogeographic Regionalisation for Australia (IBRA) bioregion (DoEE 2016). The range of the BWSCP TEC/PEC extends from around Jurien Bay in the north, to Dunsborough in the south, and extending northwest on the Whicher and Darling escarpments (which lie within the JFA01 and JFA02 subregions of the Jarrah Forests IBRA bioregion).

2.4 *Conospermum undulatum* – Vulnerable

Conospermum undulatum is a Threatened species listed as Vulnerable under the BC Act. DBCA data indicates the species is currently restricted to about 35 populations and 135 subpopulations, occurring within over 135 land parcels on the eastern edge of the Swan Coastal Plain within the Perth Metropolitan area (GHD 2024).

Main Roads commissioned a population survey (GHD 2024) for the species which gained access to 70 of the 104 identified subpopulations. *C. undulatum* was unable to be located in 27 locations and these subpopulations were presumed extinct. From the remaining 43 subpopulations surveyed, 11,919 individuals were recorded. This total comprised 10,503 adults, 639 juveniles and 777 seedlings. Of the 11,919 plants recorded 9,821 were considered healthy, 1,814 moderate and 284 were poor in health.

A total population estimate for *C. undulatum* of 16,780 individuals was determined based on the GHD 2024 survey and the latest desktop results for each non-accessible population. This estimate is 3,720 higher than was estimated prior to the population survey (GHD 2024). The largest subpopulation recorded was 2,754 within Maida Vale Reserve (subpopulations 1a and 1e). The next largest was subpopulation 18g at the Department of Fire and Emergency Services training school, with 2,729 individuals recorded.

The majority of individuals and populations occur within the City of Gosnells and City of Kalamunda. The security and land tenure of the overall population of *C. undulatum* is:

- 7% on private land
- 2% on Commonwealth land
- 38% within the conservation estate or other secure tenure
- 47% on other State Government owned land.

A patch of 1.43 ha containing five (5) individuals of *Conospermum undulatum* occurs within the clearing area.

2.5 Baudin's Black Cockatoo (*Zanda baudinii*) - Endangered

The Baudin's Black Cockatoo (BBC) (*Zanda baudinii*) is listed as Endangered under the *Biodiversity Conservation Act 2016* (BC Act). BBC are endemic to the south-west of Western Australia. They occur in south-western humid and subhumid zones, north to Gidgegannup, east to Clackline, Wandering, Quindanning, the Perup River, Lake Muir and King River, and west to the eastern strip of the Swan Coastal Plain, including West Midland, Gosnells, Byford, North Dandalup, Yarloop, Wokalup and Bunbury, as well as the Stirling and Porongurup Ranges and along the south coast to Waychinicup National Park (Johnstone and Kirby 2008).

BBC feed on seeds of Eucalypts, Banksia, Hakea and fruiting apples and pears. Also, nectar, buds and lowers and strips bark from dead trees in search of beetle larvae. The species forages at all levels from canopy to ground.

No evidence of BBC was recorded indirectly or directly within the clearing area. GEHBI is situated at the edge of the known distribution range for BBC, and therefore, may not be commonly utilised by the species.

Within the clearing area, the habitat quality score for BBC is considered to be relatively low at '3'. A total of 23.24 ha of potential BBC foraging habitat with a habitat quality of '3' will be impacted (**Figure 5**).

2.6 Carnaby's Black Cockatoo (*Zanda latirostris*) – Endangered

Carnaby's Black Cockatoo (CBC) (*Zanda latirostris*) is listed as Endangered under the BC Act. CBC are long-lived, slow-breeding birds, endemic to south-western Australia. CBC are post-nuptial nomads as they generally migrate into coastal areas post-breeding season to forage (Johnstone and Kirkby 2011).

During the breeding season, CBC forage in native vegetation that surrounds the woodlands used for breeding. Breeding broadly occurs within Eucalypt woodland in the wheatbelt. 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 (Johnstone *et al.* 2006), including the Yanchep area and near Bunbury (Johnstone *et al.* 2006, Lee *et al.* 2013).

Common CBC foraging habitat in the Perth Metropolitan Area includes:

- Banksia woodlands or proteaceous understorey of eucalypt woodlands
- Marri and Jarrah woodlands and forest
- Pine plantations
- Planted native and non-native species around the Perth Metropolitan Area.

CBC were observed during surveys foraging in the Banksia woodland habitat within the proposed clearing area (Biota 2021). GEHBI will clear 23.24 ha of CBC foraging habitat with an overall habitat quality score of '6' (**Figure 5**).

2.7 Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable

The Forest Red-tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksii naso*) is listed as Vulnerable under the BC Act. FRTBC are endemic to the humid and sub-humid zones of the south-west of Western Australia (Mawson and Johnstone 1997), generally inhabiting the dense Jarrah, Marri and Karri forests receiving more than 600 mm average rainfall annually.

FRTBC distribution is from north of Perth to Augusta and Albany and to Mount Helena, Christmas Tree Well, North Bannister, Mt Saddleback, Rocky Gully and the upper King River in the east. Family groups and small flocks are now also observed on the Swan Coastal Plain throughout the year (Garnett *et al*. 2011).

Approximately 90% of the FRTBC diet is made up of Marri seeds and Jarrah fruit, but they will also feed on other species on the Swan Coastal Plain including the following:

- Blackbutt (*Eucalyptus patens*)
- Karri (*Eucalyptus diversicolor*)
- Sheoak (*Allocasuarina fraseriana*)
- Snottygobble (*Persoonia longifolia*)
- Hakea species
- Spotted Gum (*Eucalyptus maculata*)
- Cape Lilac (*Melia azedarach*).

GEHBI will clear up to 23.24 ha of foraging habitat with an average habitat quality score of '6' for FRTBC (**Figure 5**).

2.8 Wetlands

The Geomorphic Wetlands of the Swan Coastal Plain dataset displays the location, boundary, geomorphic classification (wetland type) and management category of wetlands on the Swan Coastal Plain. Wetland management categories are based on their ecological, hydrological, and geomorphological significance, and the degree of disturbance that has occurred. Conservation Category (CCW) wetlands are those that support a high level of ecological attributes and functions (generally having intact vegetation and natural hydrological processes), or that have a reasonable level of functionality and are representative of wetland types that are rare or poorly protected (DPaW 2017). Multiple Use Wetland (MUW) are considered to contain few remaining important attributes and functions (DBCA 2025a). While such wetlands can still play an important role in regional or landscape ecosystem management, they are considered to have low intrinsic value (AECOM 2020).

DWER has quantified the SRI on CCW as 3.15 ha based on updated DBCA wetland classification mapping taken from an unpublished dataset. The Proposal will clear 3.38 ha of native vegetation associated with wetlands, including 3.15 ha of CCW, Unique Feature Identifier (UFI) 15440 and UFI 15266 and 0.24 ha MUW UFI 15266 (**Figure 6**).

The HQS for the SRI to CCW is based on the condition as presented in **Table 2**.

Table 2 Summary of CCW Habitat Quality

Vegetation Condition	Quality Score	Area (ha)
Excellent – Very Good	7	0.93
Very Good	6	0.27
Good	4	0.65

Vegetation Condition	Quality Score	Area (ha)
Degraded	2	1.30
Average/Total	**4.2**	**3.15**

2.9 Bush Forever

The Proposal will clear 12.75 ha of vegetation within Bush Forever 481. State Planning Policy 2.8 (SPP 2.8) 'Bushland Policy for the Perth Metropolitan Area', otherwise known as Bush Forever, protects regionally significant bushland within the metropolitan area. Its aim is to ensure that bushland protection and management issues are appropriately addressed and integrated with broader land-use planning in order to secure long-term protection of biodiversity. SPP 2.8 does not prevent development where it is consistent with the policy and other planning and environmental considerations.

Generally, proposals should seek to protect Bush Forever sites, however there are exceptions, including for the construction of road infrastructure. GEHBI is consistent with the provisions of SPP 2.8 as it is a proposal that is consistent with the overall purpose and intent of the existing road reserves and can be reasonably justified in regard to wider environmental, social and economic considerations, including that all reasonable alternatives have been considered to avoid or minimise clearing.

Even though the clearing for GEHBI is consistent with the planning provisions of SPP 2.8, an offset for the loss of regionally significant bushland within Bush Forever site 481 is still required by SPP 2.8. For the purposes of offsetting in accordance with SPP 2.8, all 12.75 ha of vegetation to be cleared within Bush Forever site 481 is rated as having 'Very High' conservation significance (**Figure 7**).

2.10 Avoidance and Mitigation

All strategies to avoid and mitigate environmental impacts have been explored and implemented. Main Roads implemented design changes in February 2022, which reduced impacts as per **Table 3** below.

Table 3 Avoidance and Reduction of Impact on Environmental Values

Environmental values with reduced impacts following redesign	NVCP Application October 2021	Revised NVCP Application February 2022	% Reduction
Native vegetation clearing	31.03 ha	23.31 ha	24.9
SCP20a TEC	9.49 ha	5.78 ha	39.1
BWSCP TEC/PEC	21.77	14.94	31.4
Black Cockatoo foraging habitat	31.02 ha	23.24 ha	25.1
Vegetated Wetlands (CCW and MUW)	4.45	3.38 ha	24.1
Bush Forever	15.95 ha	12.75 ha	20.1

For further information on the measures taken to avoid and minimise its clearing impact, please refer to the Proposal's Native Vegetation Clearing Permit – Supporting Document (GCA 2022) which was submitted with the clearing permit application in 2021.

0 150 300 450 600 m

GDA2020 MGA Zone 50

Legend

- NVCP Clearing Area
- FCT SCP 20a TEC
- State Road

Figure 2 - SCP 20a TEC Impacts

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0 150 300 450 600 m

GDA2020 MGA Zone 50

Legend

- NVCP Clearing Area
- FCT SCP 21c PEC
- State Road

Figure 3 - SCP 21c PEC Impacts

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0 150 300 450 600 m

GDA2020 MGA Zone 50

Legend

- NVCP Clearing Area
- BWSCP PEC
- State Road

Figure 4 - BWSCP TEC/PEC Impacts

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0 150 300 450 600 m

GDA2020 MGA Zone 50

Legend

- NVCP Clearing Area
- Black Cockatoo Foraging Habitat
- State Road

Figure 5 - Black Cockatoo Foraging Habitat Impacts

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0 150 300 450 600 m

GDA2020 MGA Zone 50

Legend

NVCP Clearing Area

Wetlands Category:

Conservation

State Road

Figure 6 - Conservation Category Wetland Impacts

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MRWA24002 29 July 2025

Figure 7 - Bush Forever Impacts

3. Threatening Processes

3.1 Banksia Woodlands

Across the Perth Metropolitan Area, less than a quarter of the original BWSCP PEC remains (Brundrett *et al* 2017), with around 60% of the original extent of the ecological community having been cleared across its range (DoEE 2016). The remaining patches of the ecological community now exist in a highly fragmented landscape. BWSCP PEC patches once totalled around 132, but now as a result of clearing and fragmentation, it is divided into over 12,000 patches (DoEE 2016).

The key, ongoing threat to the remainder of the BWSCP PEC is clearing and fragmentation, particularly in the urban centres of Perth, Bunbury and Busselton. Associated with these urban areas are related threatening processes for BWSCP PEC including:

- The general degradation of the vegetation by disturbance through rubbish dumping
- Uncontrolled vehicle access
- Wildflower and seed collecting
- Altered fire regimes
- Dieback diseases (e.g. *Phytophthora*)
- Invasive species/weeds
- Water table drawdown
- Climate change
- Kangaroo overgrazing.

Altered fire regimes, mostly from the increase in frequency and inappropriate timing of controlled burns (when plants and animals are in active growth during autumn to spring) is also a contributor. Climate change is also considered a threat, where declining rainfall and altered timing of rainfall combined with increasing temperatures is expected (DoEE 2016). All these threats combined are likely to lead to the loss of species and ecosystem function.

3.2 Black Cockatoos

The key threat to Black Cockatoos (BBC, FRTBC and CBC) is habitat loss, which includes habitat used for breeding, foraging (including non-native species) and roosting. Habitat fragmentation, degradation and the loss of breeding hollows and nest availability are all factors of the habitat loss for Black Cockatoos (DAWE 2022).

Key threats, and contributing actions to those threats, impacting Black Cockatoos include (EPA 2019):

- Habitat loss
    - Ongoing land clearing for development
    - Historical clearing
    - Harvesting of pine plantations
- Habitat fragmentation and degradation
    - Altered fire regimes
    - Climate change and drought
    - *Phytophthora* dieback and other plant disease
- Loss of breeding hollows and nest availability
    - Aging hollows
    - Nest competition with invasive species
    - Roost competition
- Mortality of individuals
    - Vehicle strike (particularly from grain spills and water pooling on roads)
    - Illegal shooting
    - Disease.

3.3 Conservation Category Wetlands

Up to 70% of wetlands on the Swan Coastal Plain have been lost since British settlement in 1829, primarily as a result of infilling or drainage to create land for agricultural use or urban development (Davis and Froend 1999). Ongoing threats to existing wetlands include:

- Clearing or filling of wetlands
- Nutrient enrichment
- Salinisation
- Pollution with pesticides and heavy metals
- Invasion of exotic flora and flora
- Loss of fringing vegetation
- Altered hydrological regimes occurring as a result of urbanisation and agricultural practices.

4. Summary of Offset Package

Five offset sites are proposed for the offset package, and these are summarised below in **Table 4**.

This Offset Strategy has determined the starting and predicted quality score for each of these offsets for each environmental value through referencing surveys to quantify the significant residual impacts and offset gains, and ongoing measurable management.

The location of each offset site in relation to GEHBI is shown in **Figure 8**.

Each site is described in more detail in **Section 6**.

Table 4 Summary of Offset Package for CPS 9448/1

Offset	Distance to Offset	Offset Area (ha)	SCP20a TEC 5.78 ha x Quality 6	P3 PEC FCT 21c 2.53 ha x Quality 6	BWSCP TEC/P3 PEC 14.94 ha x Quality 6	*Conospermum undulatum* 1.43 ha x Quality 7	BBC foraging habitat 23.24 ha x Quality 3	CBC foraging habitat 23.24 ha x Quality 6	FRTBC foraging habitat 23.24 ha x Quality 6	CCW 3.15 ha x Quality 4.2	Bush Forever 12.75 ha @ 2:1
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Hartfield Park	6.9 km	5.28	2.92 (9.0%)			5.28 (108.3%)					0.50 (2.0%)
Mirrabooka Bushland	14.4 km	42.80	42.80 (91.0%)								25.00 ha (98.0%)
Neaves Road	26.8 km	6.57						1.06 (2.6%)	1.65 (4.4%)	4.92 (66.8%)	
Total			**45.72 (100.0%)**	**18.99 (100.0%)**	**113.40 (100.0%)**	**5.28 (108.3%)**	**47.45 (100.0%)**	**87.66 (100.0%)**	**87.75 (100.0%)**	**11.42 (101.2%)**	**25.50 (100.0%)**

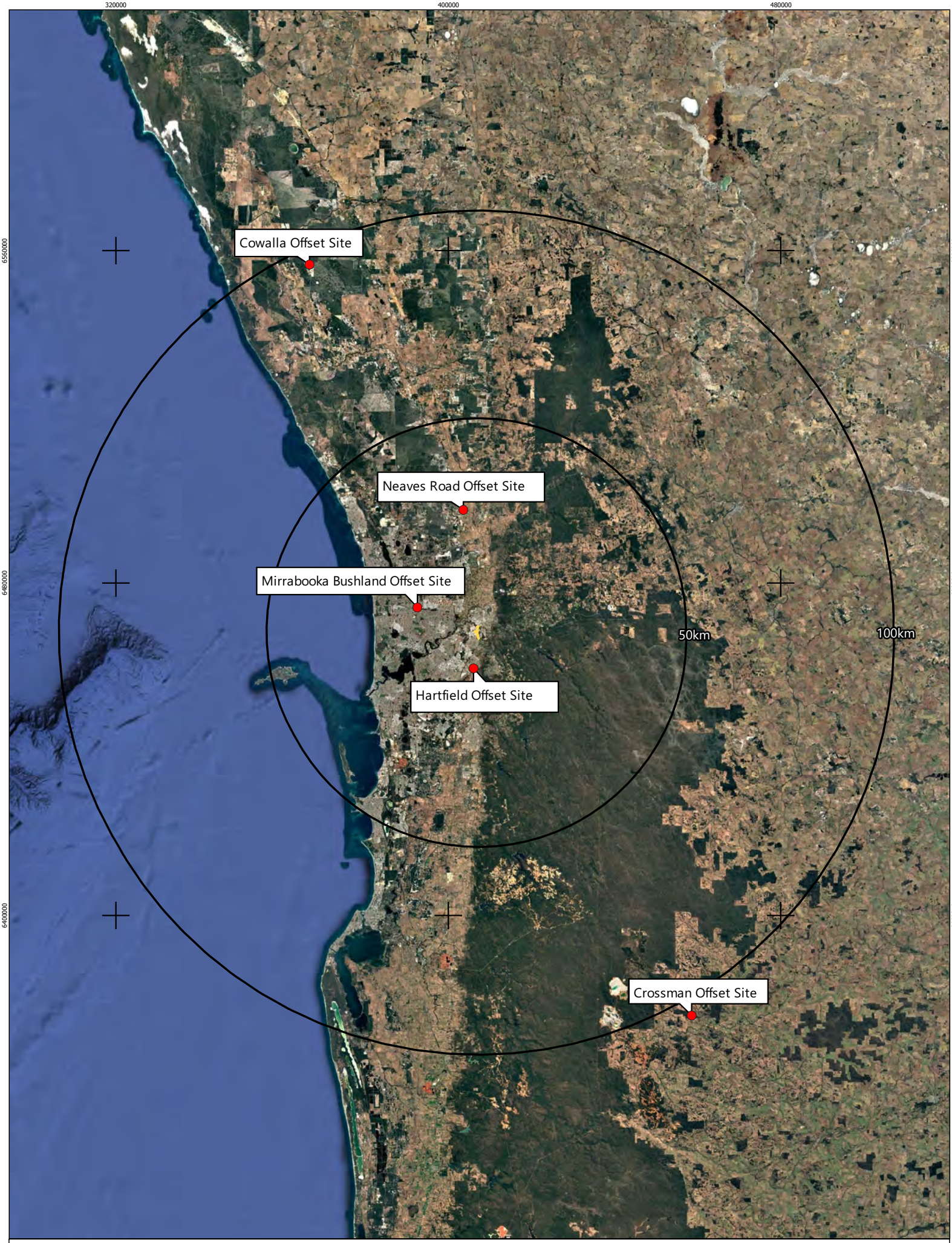

Figure 8 - Location of Offset Properties in Relation to the Proposal

5. Offset Rationale

Main Roads has developed this offset package to counterbalance the significant residual impacts of the clearing of native vegetation for GEHBI. Five offset sites have been acquired or proposed by Main Roads.

The determination of offsets, either through land acquisition or revegetation/rehabilitation, is increasingly challenging for proponents. This section provides some rationale for the selection of the offsets proposed in this document, highlighting some of the challenges Main Roads has faced in attempting to identify offset sites in close proximity to GEHBI, in an urban environment abutting the Darling Scarp.

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) has recently approved GEHBI under the EPBC Act (EPBC 2020/8784). In approving EPBC 2020/8784, DCCEEW have also approved an offset strategy for Matters of National Environmental Significance for GEHBI. The WA Offsets Policy states that there will be minimal duplication of between State and Commonwealth requirements for offsets. Therefore, where a relevant environmental factor under CPS 9448/1 has already been assessed under the EPBC Act, Main Roads has proposed the same offset for that factor in line with the WA Offset Policy.

5.1 SCP20a TEC

The interim recovery plan for SCP20a states that the known extent of SCP20a in 2016 was about 585 ha, with approximately 62% in secure conservation tenure (DPaW 2016). Through additional survey effort, it is likely that the extent of the TEC would be determined to be higher than this. Since 2016, Main Roads has found additional patches of SCP20a not previously mapped by the Department of Biodiversity, Conservation and Attractions (DBCA) in Hartfield Park, Forrestfield and near Bindoon.

One of the difficulties in identifying patches of SCP20a is the requirement for a quadrat-based, spring (i.e. detailed) survey and floristic analysis. There are no key indicator species to readily identify patches from casual observation for many FCTs, including 20a. New patches are often identified following standard floristic analysis of data obtained during a flora and vegetation survey.

The difficulty in easily identifying patches of SCP20a is a significant constraint in attempting to identify a potential offset site for the ecological community. It is not appropriate or cost effective to conduct floristic analysis on every patch of Banksia woodland in order to identify patches of SCP20a.

After five years of searching for a potential offset for SCP20a for CPS 9448/1, Main Roads has identified sufficient 'like-for-like' offsets for SCP20a. Whilst it is likely that there are more areas of SCP20a on the Swan Coastal Plain that have not yet been identified or protected, for this Proposal, Main Roads considers that that all reasonable and available options to offset SCP20a have been undertaken to achieve this offset requirement.

5.2 Black Cockatoo Foraging Habitat

GEHBI is located close to the Darling Scarp, with significant amounts of State Forest and National Park immediately to the east. A buffer with a 30 km radius from GEHBI was chosen to assess the extent of Black Cockatoo foraging habitat in the surrounding area. The majority of Black Cockatoo foraging habitat within 30 km of GEHBI is located to the east, within the Northern Jarrah Forest.

To identify the estimated available foraging habitat for Black Cockatoos, pre-European vegetation complexes were used to classify habitat values within the 30 km buffer. Using GIS, these complexes were then compared with the modelled distribution for each species and the current mapped extent of remnant vegetation (DPIRD 2020), to determine the available foraging habitat excluding cleared and developed areas.

The estimated available foraging habitat within 30 km of the Proposal has been calculated using this method for all three species of Black Cockatoo.

Baudin's Black Cockatoo

Within 30 km of GEHBI there is approximately 100,004 ha of remnant vegetation that is likely to contain BBC foraging habitat (**Figure 9**). Of this, approximately 78,297 ha (78%) has a level of protection through DBCA legislated lands and water, State Forest and/or Bush Forever sites.

Carnaby's Black Cockatoo

There is approximately 118,165 ha of remnant vegetation within 30 km of GEHBI that is likely to contain CBC foraging habitat (**Figure 10)**. Of this, approximately 91,616 ha (78%) has a level of protection through DBCA legislated lands and water, State Forest and/or Bush Forever sites.

Forest Red-tailed Black Cockatoo

There is approximately 117,406 ha of remnant vegetation within 30 km of GEHBI that is likely to contain FRTBC foraging habitat (**Figure 11**). Of this, approximately 91,162 ha (78%) has a level of protection through DBCA legislated lands and water, State Forest and/or Bush Forever sites.

This assessment determined that within 30 km of GEHBI, 78% of potential Black Cockatoo foraging habitat is already protected. This demonstrates that there is limited availability of properties containing suitable Black Cockatoo foraging habitat in the vicinity of GEHBI that could be acquired as an offset. As can be seen in **Figures 9-11**, much of the available area is a piecemeal patchwork of potential foraging habitat.

The suite of offsets proposed to counter-balance impacts to Black Cockatoos includes a combination of land acquisition and rehabilitation. Land acquisition offsets combined with land rehabilitation (that involves foraging habitat improvement) have been shown to be effective in producing a measurable environmental benefit (May *et al.* 2017).

In addition to foraging habitat improvement gains, the conservation gain of land acquisition and management is represented by a reduction in, or mitigation of, the threats to Black Cockatoos, in particular foraging habitat loss, further fragmentation and degradation. The overall result will be an environmental conservation gain to Black Cockatoos, in comparison to the absence of offset protection and management.

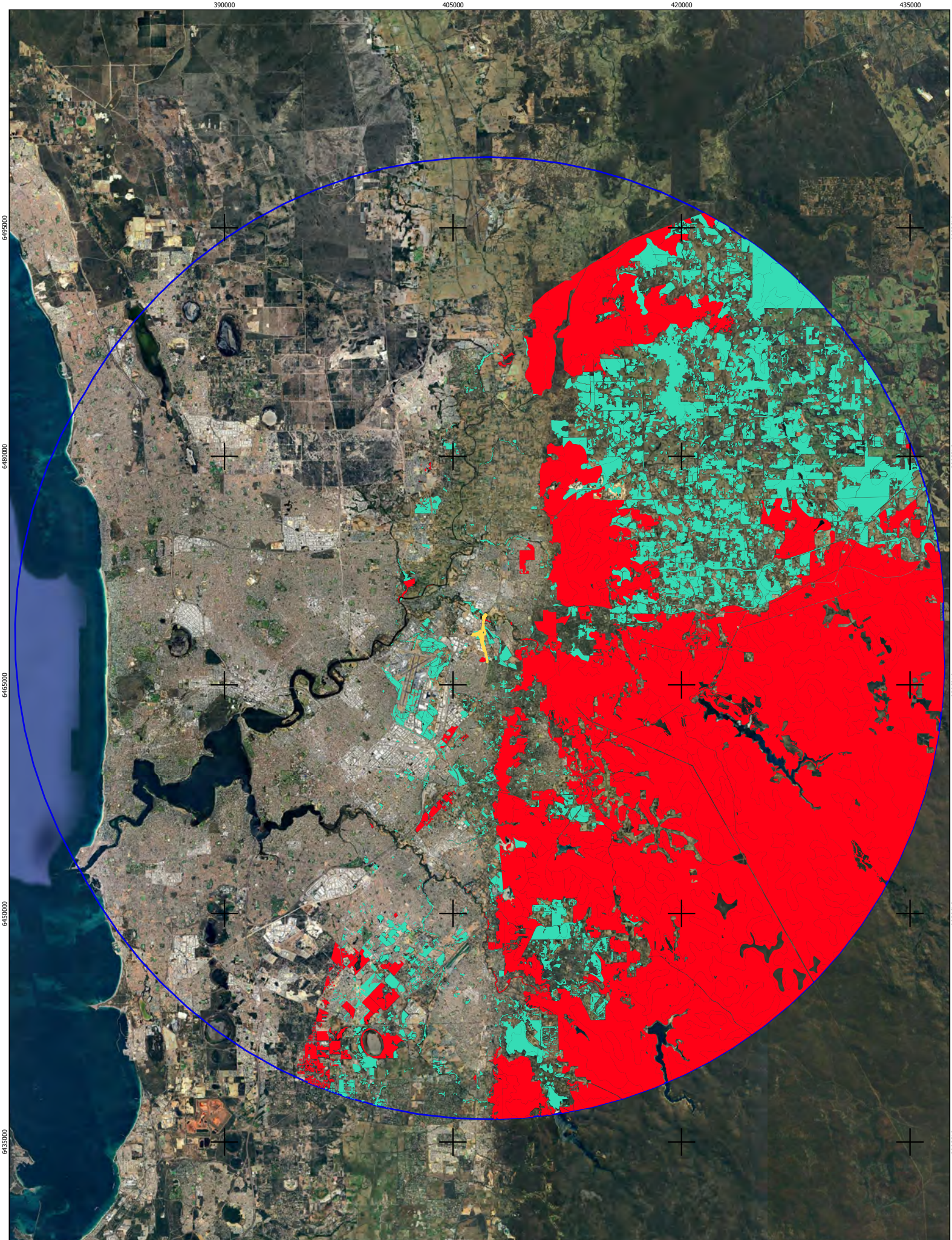

Figure 9 - Baudin's Black Cockatoo Foraging Habitat Availability

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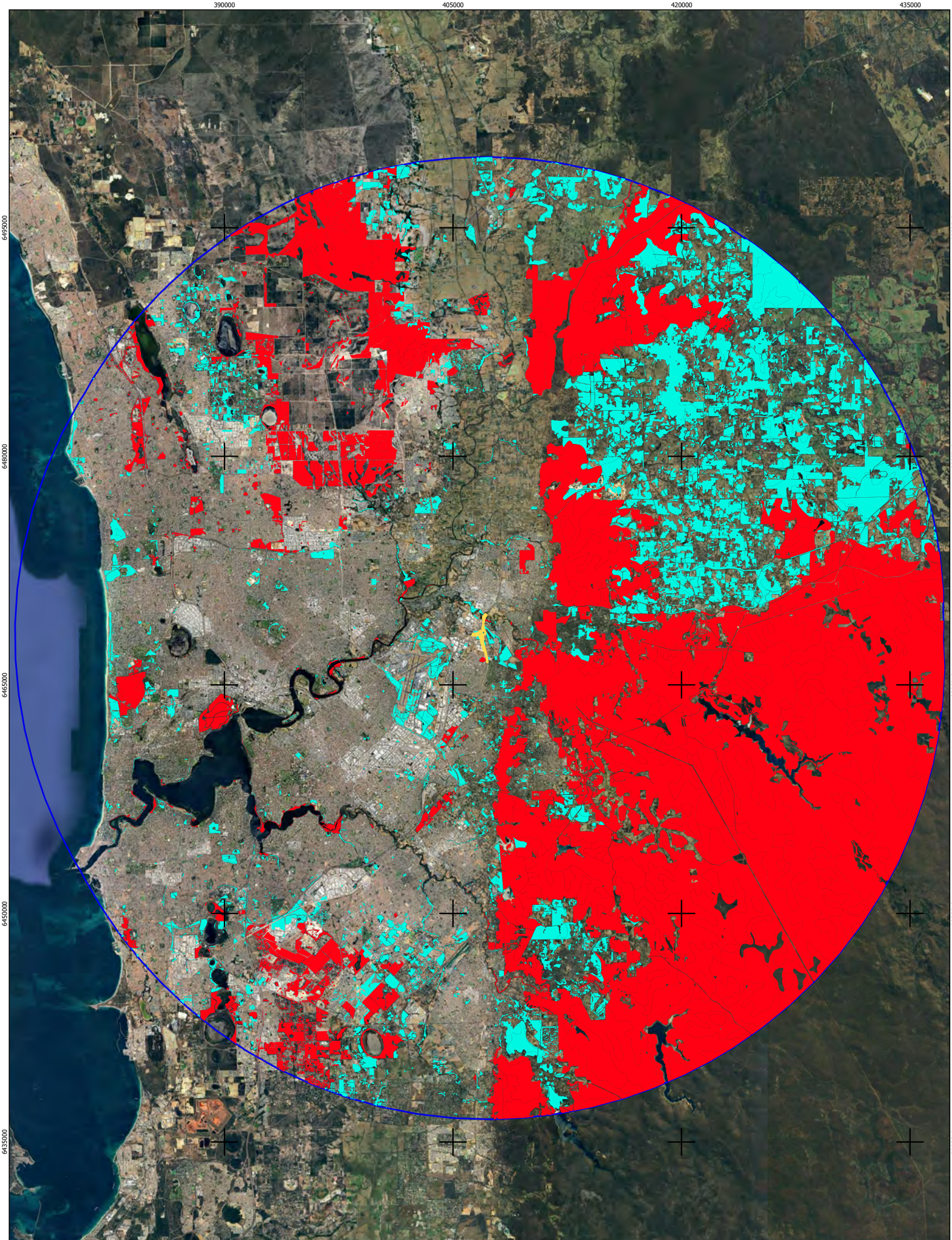

Figure 10 - Carnaby's Black Cockatoo Foraging Habitat Availability

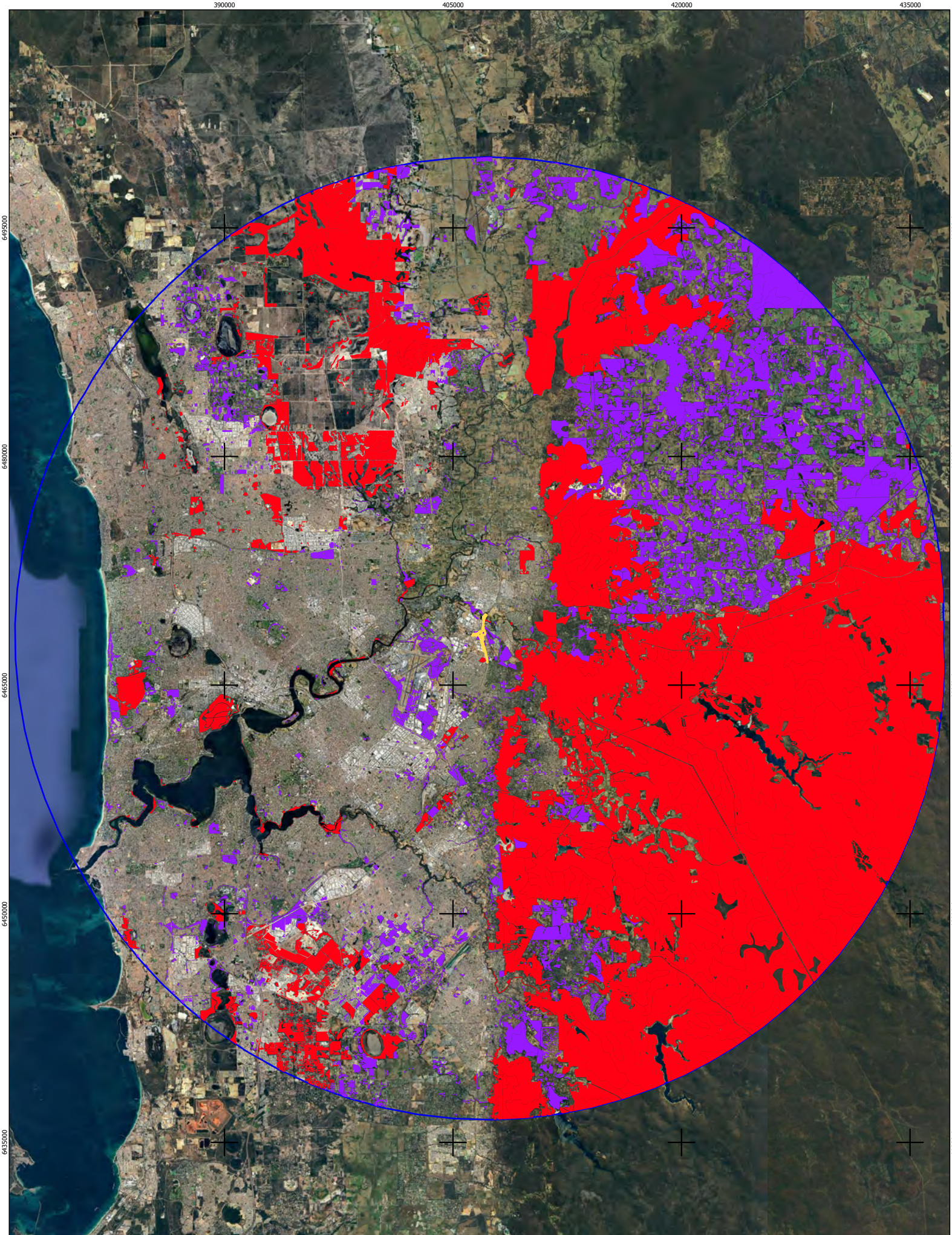

Figure 11 - Forest Red-tailed Black Cockatoo Foraging Habitat Availability

5.3 Conservation Category Wetlands

Main Roads is proposing to offset the impact on vegetation growing in association with a CCW with one revegetation offset and the protection and maintenance of wetlands occurring at the Cowalla offset site.

The CCW revegetation offset, Neaves Road, is located approximately 26 km north of the Proposal and involves the restoration of a linear CCW.

5.4 Bush Forever

Offsets for Bush Forever have been calculated using the ratio of 2:1 provided in SPP 2.8 for areas of 'Very High' Conservation Significance. Bush Forever offsets have only been included in this Offset Strategy where the offset is protecting, managing or enhancing areas that have been designated as Bush Forever under SPP 2.8.

6. Description of Offsets

6.1 Cowalla

6.1.1 Site Description

The Cowalla offset property is located approximately 95 km north of the Perth CBD. The offset property occurs on Lot 87 (722 ha) and Lot 88 (310.4 ha) Duringen Road, Cowalla, Shire of Gingin. The land tenure was TYP-01 (freehold or crown grant), and the entire site was zoned as 'Rural (general)' prior to being purchased as an offset. A total of 137.55 ha of the Cowalla offset property is proposed for use as an offset site (Cowalla offset site) for GEHBI (**Figure 12**).

Broad scale vegetation mapping identified two Beard (1990) pre-European vegetation associations (Bassendean 949, associated with low woodland banksia and 37, associated with shrublands; teatree thicket) and two Heddle *et al*. (1980) vegetation complexes (Bassendean – North and Karrakatta – North) occur within the Cowalla offset property. All are associated with the BWSCP TEC/PEC.

A detailed flora and vegetation survey was conducted within the entire offset property in 2021 (FVC 2023). A total of six vegetation units were defined, comprising of *Banksia* Woodlands, *Melaleuca* and *Banksia* Woodlands, *Melaleuca* and *Callitris* Shrublands, *Melaleuca* Shrublands and scattered *Xanthorrhoea*. Of these vegetation units, FVC (2023) mapped 890 ha of the vegetation as being representative of EPBC Act BWSCP TEC. This constitutes 64.37% of the total survey area, of which 80% was mapped as being in Excellent condition. All of the EPBC BWSCP TEC is listed as a P3 PEC at State level. Three vegetation units were mapped within the TEC which comprise three other State-listed P3 PECs: Low lying *Banksia attenuata* woodlands or shrublands (SCP21c), *Banksia ilicifolia* woodlands (SCP22) and Northern *Banksia attenuata – Banksia menziesii* woodlands (SCP23b).

Nine CCWs occur within the survey area, totalling 216.5 ha, with the largest being 179 ha (UFI 13412). The wetlands continue to the south-east, eventually draining into the ephemeral Ellen Brook, a tributary of the Swan River (FVC 2023).

6.1.2 Suitability of Site as an Offset

The 137.55 ha Cowalla offset site is situated 95 km north of GEHBI.

The Cowalla offset site has been accepted as an offset by DCCEEW for GEHBI under EPBC 2020/8784 (**Figure 12**). Other parts of the offset property have been accepted as an offset by DCCEEW for Mitchell Freeway Extension (EPBC 2018/8367) and by DWER for Brand Highway (CPS 7533/2). Given that the WA Offset Policy and guidance are closely aligned with the DCCEEW Offset Policy and guidelines, and that DCCEEW has accepted this site as an offset, it is considered that the site also meets the requirements of the State Offsets Policy.

The boundary of a mining proposal (Bidaminna Project) intersects the northern boundary of the Cowalla property and the Cowalla offset site. The mining proposal has been referred to the State Environmental Protection Authority and DCCEEW (EPBC 2022/09360) for assessment. If the mining proposal goes ahead, it may contribute to edge effect threats and reduction in habitat quality within the Cowalla offset site, and potentially, loss of habitat if these impacts are not adequately managed.

6.1.3 Offset Security

The Cowalla offset property has been acquired as freehold title by DBCA with funding from Main Roads for the purpose of being used as an offset for State critical projects and is consistent with other DBCA lands purchased with Main Roads funding. The property was privately owned prior to acquisition by DBCA. The property has the values required and these have not been allocated to other projects at this point in time. The property is now part of the conservation estate and will be managed by DBCA in perpetuity, with Main Roads funding the first 20 years of management and enhancement of the Cowalla offset site.

The offset site will be added to the DWER offsets register once it is approved to formalise its status as an offset site.

6.1.4 Environmental Values

The environmental values within the Cowalla offset site pertaining to this Offset Strategy include:

- 18.99 ha of SCP21c P3 PEC
- 113.40 ha of the BWSCP TEC/PEC
- 6.50 ha CCW.

In addition to the environmental values being used as an offset, the offset site and the entire offset property contains high quality foraging habitat for Carnaby's Black Cockatoo.

6.1.5 Net Gain

Land management will include fencing and access control, weed control, *Phytophthora* dieback management and fire management as described below. This will reduce the potential spread of weeds, dieback and other diseases, invasive species, feral and native animal grazing, and uncontrolled vehicle access, leading to a conservation gain for the protected matters. These management actions will have a positive impact on the site and maintain BWSCP TEC/PEC and SCP21c PEC quality as '8' and CCW quality as '7'.

6.1.6 Management Actions

To achieve the net gain stated above, Main Roads proposes to undertake the following activities in conjunction with DBCA:

- Installation of fencing along the property boundary to deter unauthorised access
- Pest and/or feral animal control (rabbits, foxes, kangaroos, cats and feral bees) where required based on site observations of impacts to vegetation condition, habitat quality or fauna values
- Selective weed control to improve vegetation condition and habitat quality
- Fire management
- *Phytophthora* dieback management
- Rubbish removal.

These activities are described in further detail in **Section 7**.

Main Roads is currently in negotiation with DBCA regarding the management of the Cowalla offset site.

6.1.7 Targets

The monitoring and management schedule, including targets, for the Cowalla offset site are summarised in **Table 5**.

Table 5 Schedule of Monitoring and Management Activities and Targets for Cowalla

Action/Aspect	Description of Methodology	Timing	Target
Finalise land management agreement with DBCA	Develop MoU with DBCA that describes actions to be implemented and funding by Main Roads	Complete by end of 2025	Complete by end of 2025
Offset site inspection	Inspection for impacts from weeds, pest or feral animals, and other impacts that require active management	Annually for duration of approval	Averaged across the Cowalla offset site, BWSCP PEC and SCP21c PEC quality '8' or better and Wetlands overall habitat quality of '7' or better
Access management	Install fencing to control access to the offset area	No later than end of 2027	Fencing completed by end 2027
	Maintain fencing by visual inspection. Repair where necessary	As required.	Maintain integrity of fencing
Feral and pest animal control	Control program for rabbits, cats, foxes and feral bees	Commencing 2028 for the duration of the approval: if required, based on site observations of feral/pest animal activity impacting vegetation or habitat	Feral and pest animal controls undertaken, if required based on site observations
Fire management	Develop and implement a fire management plan for the offset site	No later than end of 2027	DBCA to implement fire management plan
Dieback management	Develop and implement a dieback management plan for the offset site including: • Initial dieback mapping • Ongoing dieback monitoring every 3 years • Other management actions as required	No later than end of 2027	No introduction of dieback into 'Protectable Areas' as a result of management actions
Weed management	Weed mapping to identify priority areas for weed control	Every four years commencing in 2026	Weed cover does not negatively impact vegetation condition or habitat quality
	Implement weed control	Annually for years 1-3 then every five years or more frequently as required based on site observation of weed impacts to vegetation or habitat	Weed cover does not negatively impact vegetation condition or habitat quality
BWSCP PEC and SCP21c PEC vegetation condition	Vegetation condition monitoring by installation and assessment of 10 x 10 m quadrats in accordance with EPA (2016) survey requirements	Every five years commencing 2026 for duration of approval	Averaged across the Cowalla offset site, BWSCP PEC and SCP21c PEC quality '8' or better
CCWs	Vegetation condition monitoring by installation and assessment of 10 x 10 m quadrats in accordance with EPA (2016) survey requirements	Every five years commencing 2026 for duration of approval	Averaged across the Cowalla offset site, CCW overall habitat quality of '7' or better

6.1.8 Offset Calculator Values

Offset calculators for the Cowalla offset site are provided in **Appendix A** and the values summarised in **Table 6** below.

Table 6 Offset Calculator Values for Cowalla

Environmental Value	Offset Size (ha)	Start Quality	Future Quality without Offset	Future Quality with Offset	Offset Value (%)
SCP21c PEC	18.99	8	8	8	100.00
BWSCP TEC/PEC	113.40	8	8	8	100.00
CCW	6.50	7	7	7	34.40

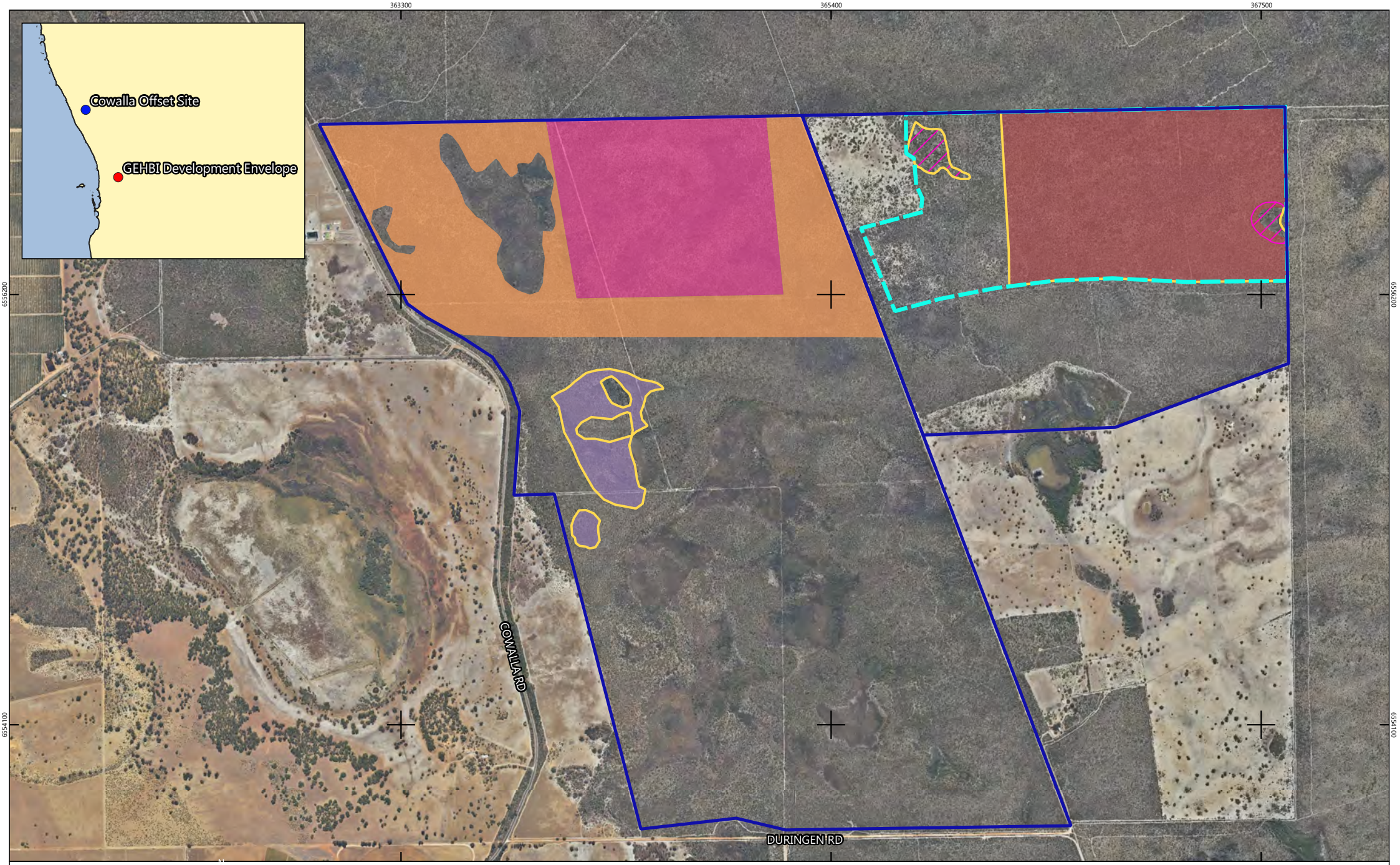

Figure 12 - Cowalla Offset Site

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6.2 Crossman

6.2.1 Site Description

The Crossman offset property is a 300 ha property located on Lot 2 Albany Highway, Crossman. It is in the Peel region within the Shire of Boddington, approximately 100 km south-east of the Proposal. An 86.60 ha portion of the Crossman offset property is proposed to offset GEHBI's impacts on CBC, 86.10 ha portion for FRTBC and a 47.45 ha portion is proposed to offset impacts to BBC foraging habitat (**Figure 13**).

The Crossman offset site is located within the Jarrah Forest IBRA region and has been broadly characterised into the following two vegetation associations by Beard (1990):

- Vegetation association 3 – Medium forests, mainly Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*)
- Vegetation association 4 – Medium woodland, Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*) and wandoo (*Eucalyptus wandoo*).

Two vegetation complexes; the Michibin Complex and the Yalanbee Complex occur within the offset site. The Michibin Complex is described as: Open woodland of *Eucalyptus wandoo* over *Acacia acuminata* with some *Eucalyptus loxophleba* on valley slopes, whilst the Yalanbee Complex is described as Woodland of *Eucalyptus wandoo-Eucalyptus accedens*, less consistently open forest of *Eucalyptus marginata* subsp. *thalassica-Corymbia calophylla* on lateritic uplands and breakaway landscapes (Heddle *et al.* 1980).

The Crossman offset site is located within the known range of all three Black Cockatoo species. A reconnaissance flora and vegetation survey and Black Cockatoo habitat assessment was undertaken in 2023 (AECOM 2023). Approximately 60% of the property contains vegetation communities that represent Black Cockatoo foraging habitat. Vegetation communities that do not contain Black Cockatoo foraging habitat have been excluded from the Crossman offset site allocation.

Within the Black Cockatoo foraging habitat, the upper storey vegetation is dominated by Jarrah (*Eucalyptus marginata*) and Wandoo (*Eucalyptus wandoo*), with some Marri (*Corymbia calophylla*). Dominant understorey and midstorey species used by Black Cockatoos for foraging include Rock Sheoak (*Allocasuarina huegeliana*), *Hakea lissocarpha, Banksia sessilis, B. dallanneyi, B. fraseri* and *B. squarrosa* (AECOM 2023). These flora species are known to be used by Black Cockatoos as food resources (Johnstone and Kirkby 2011).

There are no known breeding sites for Black Cockatoos within the Crossman offset site, however, there is a confirmed CBC breeding site within 6 km of the Crossman offset site to the west (AECOM 2023). There are no known roosts within the offset site, however, due to the large number of tall trees present, the habitat is suitable for roosting and it is likely that Black Cockatoos utilise the area to roost.

Feral species such as pigs, foxes and feral cats are known within the Crossman region. Foraging evidence of feral pigs via ground disturbance and the presence of European Red Fox dens were observed during the field assessment (AECOM 2023). Pigs are known to cause habitat degradation through wallowing and rooting and their selective feeding. They are also a vector for the introduction of disease to native fauna and the spread of weeds. The presence of these feral species will have an impact on the fauna composition of the offset site, such that native fauna may be unable to perform their ecosystem functions including pollination and seed dispersal.

6.2.2 Suitability of Site as an Offset

The Crossman offset site contains 47.45 ha of high-quality foraging habitat for BBC, 86.60 ha of high-quality foraging habitat for CBC and 86.10 ha of high-quality for FRTBC. Foraging evidence was recorded for CBC at six locations by AECOM (2023). Evidence of foraging was also recorded at 21 locations and 10 locations for BBC and FRTBC, respectively, within the offset site. There is a known CBC breeding site within 6 km of Crossman (AECOM 2023), while the nearest known breeding site for BBC is approximately 40 km west (GCA 2024). There was no evidence of FRTBC breeding within 15 km of the site (GCA 2024).

The Crossman offset site has been accepted as an offset by DCCEEW for GEHBI under EPBC 2020/8784 (**Figure 13**). Given that the WA Offset Policy and guidance are closely aligned with the DCCEEW Offset Policy and guidelines, and that DCCEEW has accepted this site as an offset, it is considered that the site also meets the requirements of the State Offsets Policy.

6.2.3 Offset Security

Crossman has been acquired as freehold title by DBCA with funding from Main Roads for the purpose of being used as an offset for State critical projects and is consistent with other DBCA lands purchased with Main Roads funding. The property was privately owned prior to acquisition by DBCA. The property has the values required and these have not been allocated to other projects at this point in time. The property is now part of the conservation estate and will be managed by DBCA in perpetuity, with Main Roads funding the first 20 years of management and enhancement of the Crossman offset site.

The offset site will be added to the DWER offsets register once it is approved to formalise its status as an offset site.

6.2.4 Environmental Values

The environmental values within the Crossman offset site pertaining to this Offset Strategy include:

- 47.45 ha of high-quality BBC, 86.60 ha of high-quality CBC and 86.10 ha of high quality FRTBC foraging habitat.
- Known breeding site for CBC within 6 km (AECOM 2023) and a known breeding site for BBC approximately 40 km west (GCA 2024). No known FRTBC breeding sites within 15 km (AECOM 2023).

Although only 47.45 ha of high quality BBC foraging habitat is required to satisfy the offsets required for the GEHBI project, the foraging habitat put forward for the other two Black Cockatoo species within the Crossman offset site is also considered BBC foraging habitat.

6.2.5 Net Gain

Land management at the Crossman offset site will include fencing and access control, weed control, *Phytophthora* dieback management and fire management as described below. These management actions will reduce the potential spread of weeds, dieback and other diseases, invasive species, feral and native animal grazing, and uncontrolled vehicle access, leading to a conservation gain for Black Cockatoos. Evidence of introduced fauna species was noted during field assessments within the site. Management actions will address threatening processes which are anticipated to improve natural regeneration, leading to a greater overall cover of native species utilised as food by Black Cockatoos increasing the habitat quality score by one point each for CBC, BBC and FRTBC.

6.2.6 Management Actions

To achieve the net gain stated above Main Roads proposes to undertake the following activities in conjunction with DBCA:

- Installation of fencing along property boundary to deter unauthorised vehicular access
- Pest and/or feral animal control (pigs, rabbits, foxes, kangaroos, cats and feral bees) where required based on site observations of impacts to habitat quality or fauna values
- Selective weed control where required to improve vegetation condition and habitat quality
- Fire management
- *Phytophthora* dieback management
- Rubbish removal.

These activities are described in further detail in **Section 7**.

6.2.7 Targets

Main Roads has developed a set of monitoring and management activities and targets for the Crossman offset site and these are outlined in **Table 7**.

Table 7 Schedule of Monitoring and Management Activities and Targets for Crossman

Action/Aspect	Description of Methodology	Timing	Target
Finalise land management agreement with DBCA	Develop MoU with DBCA that describes actions to be implemented and funded by Main Roads	Complete by end of 2025	Complete by end of 2025
Access management	Install fencing to control access to the offset area	No later than end of 2026	Fencing completed by end of 2026
	Monitor fencing by visual inspection and repair where necessary	Annually for duration of approval	Maintain integrity of fencing
Offset site inspection	Inspection for impacts from weeds, pest or feral animals, and other impacts that require active management	Annually for duration of approval	Averaged across the Crossman offset site BBC and FRTBC overall habitat quality '8' or better and CBC overall habitat quality '9' or better
Feral or pest animal control	Control program for pigs, rabbits, cats, foxes and feral bees	Commencing 2026 for the duration of the approval: if required based on site observations of feral or pest animal activity impacting vegetation or habitat	Feral or pest animal control undertaken if required based on site observations
Fire management	Develop and implement a fire management plan for the offset site	No later than end of 2026	Implement fire management plan
Dieback management	Develop and implement a Dieback Management Plan for the offset site including: • Initial dieback mapping • Ongoing dieback monitoring every 3 years • Other management actions as required	No later than end of 2026	No introduction of dieback into 'Protectable Areas' as a result of management actions
Weed management	Weed mapping to identify priority areas for weed control	Every four years commencing in 2026	Weed cover does not negatively impact Black Cockatoo habitat quality
	Implement weed control	Annually for years 1-3 then every five years or more frequently as required based on site observation of weed impacts to vegetation or habitat	Weed cover not negatively impacting Black Cockatoo habitat quality
BBC foraging habitat condition	Undertake Black Cockatoo foraging habitat assessment	Every five years commencing 2026 for duration of approval	Averaged across the Crossman offset site BBC overall habitat quality '8' or better
CBC foraging habitat condition	Undertake Black Cockatoo foraging habitat assessment	Every five years commencing 2026 for duration of approval	Averaged across the Crossman offset site CBC overall habitat quality '9' or better
FRTBC foraging habitat condition	Undertake Black Cockatoo foraging habitat assessment	Every five years commencing 2026 for duration of approval	Averaged across the Crossman offset site FRTBC overall habitat quality '8' or better

6.2.8 Offset Calculator Values

Offset calculators for Crossman are provided in **Appendix B** and the values summarised in **Table 8** below.

Table 8 Offset Calculator Values for Crossman

Environmental Value	Offset Size (ha)	Start Quality	Future Quality without Offset	Future Quality with Offset	Offset Value (%)
BBC foraging habitat	47.45	7	7	8	100.00
CBC foraging habitat	86.60	8	8	9	97.40
FRTBC foraging habitat	86.10	7	7	8	95.60

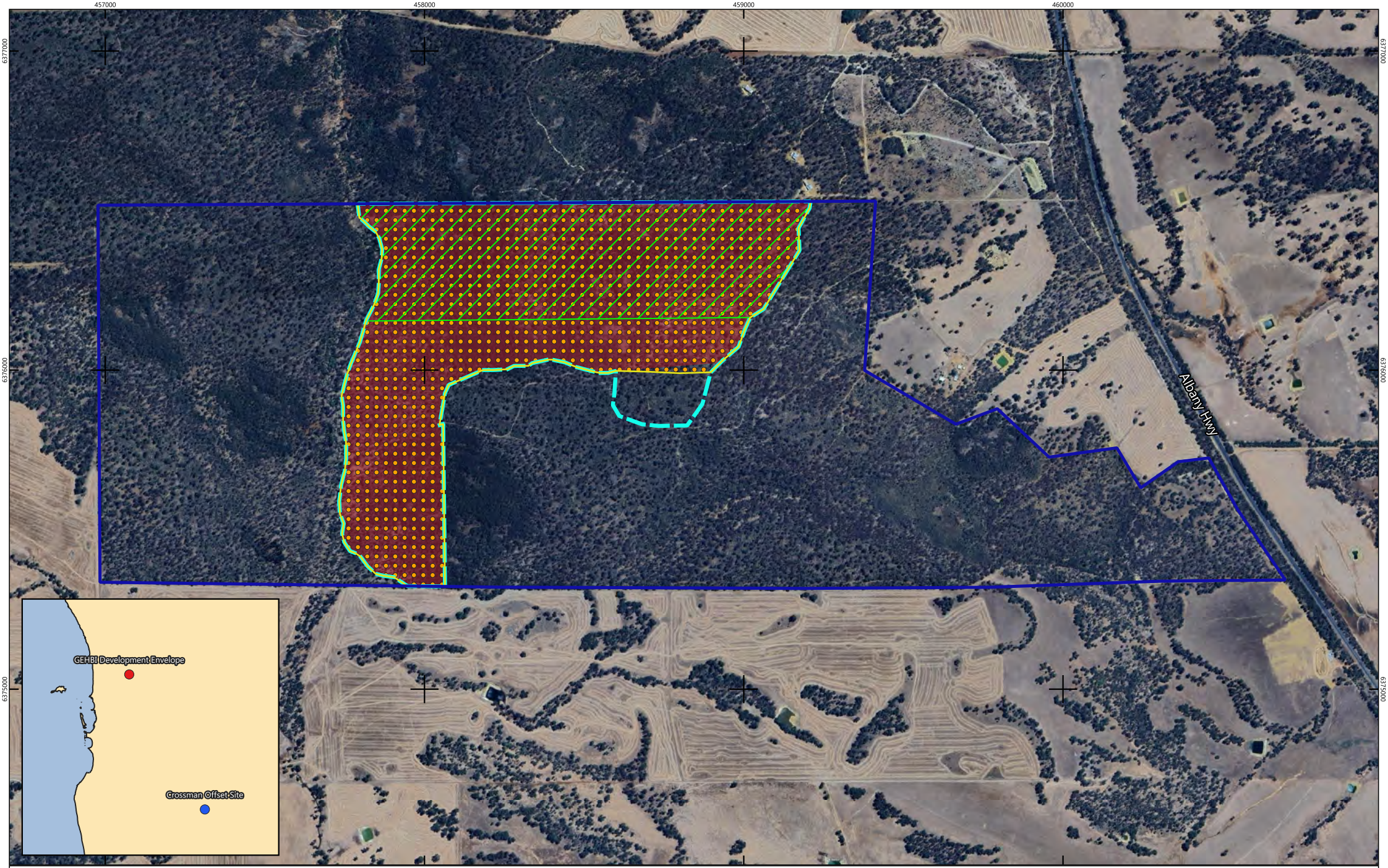

Figure 13 - Crossman Offset Site

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Project Code DDMonthYYYY

6.3 Hartfield Park

6.3.1 Site Description

Hartfield Park is a 'Class A' reserve for the purpose of recreation, zoned 'Parks and Recreation' and a Bush Forever site (no. 320) managed by the City of Kalamunda in the suburb of Forrestfield, 6.5 km south-west of GEHBI. Main Roads is developing an offset management plan for Hartfield Park in consultation with the City of Kalamunda, as an offset for several road projects including GEHBI. Two parcels of land (a 2.92 ha parcel and a 2.36 ha parcel designated in this strategy as 'the Hartfield Park offset site') are proposed as an offset for GEHBI (**Figure 14**). The portion of Hartfield Park allocated to GEHBI contains SCP20a TEC and *Conospermum undulatum* habitat (Umwelt 2025).

Hartfield Park contains one Beard (1990) vegetation association (Pinjarra 968). Pinjarra 968 is described as *Eucalyptus calophylla* and *E. marginata* Low Forest; *Eucalyptus calophylla* Low Woodland; Low Woodlands dominated by *Eucalyptus marginata*, *Banksia attenuata*, *B. menziesii* and *Allocasuarina fraseriana* and combinations of these: *Banksia attenuata* and *B. menziesii* Low Woodland Wetlands; *Eucalyptus rudis* and *E. calophylla* Low Woodland; *Melaleuca preissiana* Open Low Woodland. Vegetation condition is >75% Excellent to Very Good, <25% Good to Degraded, with areas of severe localised disturbance (Shire of Kalamunda 1996).

Hartfield Park lies within one Heddle *et al.* (1980) vegetation complex, the Southern River Complex. This is described as open woodland of Marri and Jarrah with Banksia species with fringing woodland of Flooded Gum and Swamp Paperbark along creek beds (GoWA 2021).

Hartfield Park contains a large population of *Conospermum undulatum* and the species is known to occur within the Hartfield Park offset site.

Dieback infestation is present within Hartfield Park, including within the offset site (GS Biological 2023) and vegetation defined by the DBCA as SCP 20a. Recent observations have noted occasional Banksia species deaths in the south-western corner of Reid Oval (GS Biological 2023).

Due to the large area that is currently infested, Dieback is considered to be a threat to SCP20a. Without appropriate management and treatment as part of the offset strategy, it is considered likely the vegetation will continue to degrade over time. This degradation would result from the combined effects of Dieback, edge effects and the close proximity to existing land uses such as the golf course.

Phosphite treatment has been shown to enhance resistance of susceptible plant species. It is suggested that a phosphite treatment will be effective for the protection of the majority of midstory Banksia species and should be incorporated into the site's ongoing management strategy (GS Biological 2023).

Evidence of dogs, red fox, cats and rabbits were observed during site inspections of Hartfield Park (Strategen 2012). Feral species, particularly rabbits, are considered to be a threat to vegetation as grazing by feral species may impact seedling recruitment and growth. The implementation of management actions such as fencing will minimise the impact of herbivore grazing.

Main Roads, in collaboration with the City of Kalamunda, is proposing to undertake rehabilitation and enhanced management within Hartfield Park to offset significant residual impacts on SCP20a from a number of road projects including GEHBI.

There are currently no routine management operations being implemented by the City of Kalamunda within Hartfield Park. Management actions are conducted on an ad hoc basis and the most recent actions include targeted control of the weed, *Gladiolus caryophyllaceus,* and minor Dieback control.

Existing environmental issues requiring additional management are: removal of rubbish from illegal dumping, unauthorised access, Dieback management, weed control, bushfire management, firebreak maintenance and management of feral animals.

Flora, vegetation and fauna assessments have been undertaken for Main Roads at Hartfield Park in 2019, 2020 and 2024, including assessments of Swan Coastal Plain (SCP) Floristic Community Types (FCTs) (Umwelt, 2023, 2024; Woodman Environmental, 2021). In 2025 Umwelt prepared a report which consolidated the results of the surveys undertaken within the Hartfield Park Reporting area. Umwelt (2025) identified a total of 16.3 ha of SCP20a within the Hartfield Park reporting area boundary.

6.3.2 Suitability of Site as an Offset

Hartfield Park is located in close proximity to the GEHBI impact site, 6.5 km to the south-west, and contains similar vegetation types and fauna habitat to those being impacted by the Proposal, making it a suitable offset site for GEHBI. By managing threatening processes and pressures at the offset site, tangible conservation benefits will be realised thereby achieving a conservation gain for the environmental values being impacted and offset. Other parts of Hartfield Park have been proposed as offset sites for the Tonkin Grade Separations (Hale Road and Welshpool Road) project (Ministerial Statement 1249 and EPBC 2019/8529) and the Tonkin Grade Separations (Kelvin Road) project (currently under assessment for Part IV EP Act and EPBC 2022/09325).

6.3.3 Offset Security

The Hartfield Park offset site is currently a Class A reserve for the purpose of 'Recreation' and is zoned as 'Parks and Recreation' under the MRS, with a management order to the City of Kalamunda. This management arrangement will continue during and post-implementation of the offset. Main Roads will work with the City of Kalamunda to change the purpose of part of this Class A reserve to 'Conservation' in order to reflect the intent of managing native vegetation within the Class A reserve.

In Western Australia, a 'Class A reserve' represents the highest level of protection for Crown land. This classification is designated for areas of high conservation or community value, ensuring their preservation for specific purposes such as conservation, recreation or cultural heritage. Once land is classified as a Class A reserve, any changes to its purpose, boundary, or status require the approval of both Houses of Parliament, providing a robust safeguard against unauthorised alterations.

The Hartfield Park offset site forms part of Bush Forever site 320 (Hartfield Park Bushland) and is afforded protection under SPP 2.8, which provides a policy and implementation framework to ensure bushland protection and management is properly addressed the Perth Metropolitan Area.

The offset site will be added to the DWER offsets register once it is approved to formalise its status as an offset site.

6.3.4 Environmental Values

The environmental values within the Hartfield Park offset site pertaining to this Offset Strategy include:

- 5.28 ha of *Conospermum undulatum* habitat
- 2.92 ha of SCP20a TEC
- 0.5 ha of Bush Forever.

In addition to the environmental values being used as an offset, the offset site contains foraging habitat and potential breeding habitat for Black Cockatoos.

6.3.5 Net Gain

The Hartfield Park offset site contains a number of significant environmental values that can be protected and enhanced with active on-ground management actions. Land management will include fencing and access control, weed control, *Phytophthora* dieback management and fire management as described below. This will reduce the potential spread of weeds, dieback and other diseases, invasive species, feral and native animal grazing, and uncontrolled vehicle access, leading to a conservation gain for the protected matters. These management actions will have a positive impact on the site by maintaining the quality of SCP20a and part of the Bush Forever site.

Figure 14 - Hartfield Park Offset Site

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6.3.6 Management Actions

Main Roads is currently in consultation with the City of Kalamunda to develop the 'Hartfield Park Offset Management Plan', which encompasses this offset site for GEHBI. Main Roads will develop the offset management plan for the entirety of Hartfield Park in order to achieve the net gain stated above. Main Roads proposes to undertake the following activities in conjunction with the City of Kalamunda:

- Develop and fund an offset management plan for Hartfield Park
- Installation and/or replacement of fencing along the offset boundary, adjacent to golf course and hockey field to deter unauthorised access. Conservation style fencing will be installed consisting of 1200 mm ring lock or hinge joint with timber strainers
- Pest and/or feral animal control (rabbits, foxes, kangaroos, cats and feral bees) where required based on site observations of impacts to habitat quality or fauna values. Pest species such as rabbits are known to occur within the wider Hartfield Park, however with suitable management and fencing it is not considered to be a significant threat to SCP 20a
- Selective weed control to improve vegetation condition and habitat quality
- Fire management
- Implement *Phytophthora* dieback management, to minimise the spread of *Phytophthora* from infested areas south-east of the hockey field to uninfested areas south-west of the hockey field
- Rubbish removal
- Infill planning with species commensurate with SCP 20a in the degraded area to the north east of the patch (**Figure 14**).
- Any additional bare or degraded areas identified during weed control inspections in the remainder of the offset will also be infill planted.

These activities will be described in further detail in the Hartfield Park Offset Management Plan (Main Roads, in preparation).

6.3.7 Targets

Main Roads has developed a set of monitoring and management activities and targets for the Hartfield Park offset site, and these are outlined in **Table 9**.

Table 9 Schedule of Monitoring and Management Activities and Targets

Action/Aspect	Description of Methodology	Timing	Target
Finalise land management agreement with City of Kalamunda	Develop MoU with City of Kalamunda that describes actions to be implemented and funding by Main Roads	Complete Q1 2026	Complete Q1 2026
Develop and implement the Hartfield Park Offset Management Plan (OMP)	An OMP is currently in development in consultation with the City of Kalamunda and will be implemented to meet the completion criteria	OMP approved by end of 2026	OMP approved by end of 2026
SCP20a monitoring	Vegetation condition monitoring in accordance with OMP	Every five years commencing 2026 for duration of approval	Averaged across the Hartfield Park offset site SCP20a overall habitat quality '7' or better
Conospermum undulatum monitoring	Monitor vegetation condition of *Conospermum undulatum* habitat in accordance with OMP	Every five years commencing 2026 for duration of approval	Averaged across the Hartfield Park offset site *Conospermum undulatum* habitat

Action/Aspect	Description of Methodology	Timing	Target
			overall habitat quality '7' or better

6.3.8 Offset Calculator Values

Offset calculators for the Hartfield Park offset site are provided in **Appendix C** and the values summarised **Table 10** below.

Table 10 Offset Calculator Values for Hartfield Park

Environmental Value	Offset Size (ha)	Start Quality	Future Quality without Offset	Future Quality with Offset	Offset Value (%)
SCP20a TEC	2.92	6	5	7	9.00
Bush Forever	0.50	NA	NA	NA	2.00
Conospermum undulatum habitat	5.28	6	5	7	108.3

6.4 Mirrabooka Bushland Offset Site

6.4.1 Site Description

Mirrabooka Bushland encompasses an area of 56.99 ha and is part of Bush Forever site 385 (Reid Highway Bushland). The Bushland has high conservation value and contains one of the largest known patches of SCP20a (Madden 2002). The Bushland is located adjacent to Reid Highway approximately 14.5 km west north-west of the Proposal within the City of Stirling (**Figure 15**). A 42.80 ha portion of Mirrabooka Bushland is proposed as an offset (the Mirrabooka Bushland offset site) for GEHBI to offset impacts to SCP20a TEC and 25 ha for impacts to Bush Forever.

Mirrabooka Bushland is situated within the Swan Coastal Plain IBRA Region and has been broadly characterised into two vegetation associations by Beard (1990):

- Vegetation association 6 – Medium woodlands, Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*) and Wandoo (*Eucalyptus wandoo*)
- Vegetation association 1001 – Medium very sparse woodland, Jarrah (*Eucalyptus marginata*) with Low woodland *Banksia* spp. and Casuarina (*Allocasuarina* spp.).

Mirrabooka Bushland contains one Heddle *et al*. (1980) vegetation complex: Karrakatta Complex – Central and South. This is described as open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) and woodland of *Eucalyptus marginata* (Jarrah) - *Banksia* species (GoWA 2021).

The presence of Dieback within Mirrabooka Bushland has been confirmed through field observations and analysis of soil and plant tissue samples (Bark Environmental 2021). Evidence of scattered Banksia deaths, including recent deaths, occurs within vegetation defined as SCP20a. Dieback is having a high impact on the vulnerable vegetation community and this could continue to spread over time autonomously through root-root contact and via human soil-moving activities (Bark Environmental 2021). Dieback is considered to be a threat to the structure of SCP20a if not suitably managed. Without suitable management and treatment, it is considered likely that the vegetation will degrade over time. Dieback is known to be present within the central portion of the western block.

More than 30 species of weeds have been identified within the Mirrabooka Bushland (Cullity *et al.* 2013). Most of these species are typical of urban bushland remnants in the region, but there are several species that have potential to cause significant degradation. These include Victorian Teatree, Watsonia and Bridal Creeper (Cullity *et al.* 2013).

Introduced fauna most likely present in the area, include the House Mouse (*Mus musculus*), feral, stray, and domestic Cats (*Felis catus*), European Rabbit (*Oryctolagus cuniculus*) and Fox (*Vulpes vulpes*). These pest species pose a threat to native wildlife by preying on, or outcompeting them for resources. The likely presence of foxes and cats within the site is considered to be a threat to the native fauna within the site, given the limited remnant vegetation within the surrounding area. Loss of native fauna within the site may reduce the capacity for faunal species to undertake key ecological functions (e.g. pollination and seed dispersal) within Mirrabooka Bushland (DoEE 2017).

The 42.80 ha Mirrabooka Bushland offset site contains SCP20a TEC (*Banksia attenuata* woodlands over species rich dense shrublands) (Madden 2002, FVC 2024).

6.4.2 Suitability of Site as an Offset

Mirrabooka Bushland is located approximately 14.5 km west-northwest of GEHBI and supports the SCP20a TEC. The site is of high conservation value as it contains the Karrakatta Complex – Central and South, which is poorly represented within the Bush Forever network. It is also floristically diverse, contributes to a significant bushland linkage, and includes SCP20a (Madden, 2002).

Bush Forever site 385 contains one of the largest remaining patches of SCP20a; however, it lacks secure tenure and an active conservation manager. The site consists of multiple freehold titles owned and managed by the Western Australian Planning Commission (WAPC). As with many Bush Forever sites under WAPC ownership, land management is minimal and limited to meeting statutory requirements. Historically there has been very little active management of this site to protect the values in the Bush Forever site. Management actions have primarily comprised *Phytophthora* dieback treatment and the installation of exclusion zones to control the spread of dieback.

The City of Stirling has expressed willingness to actively manage the site for conservation but requires additional resources to be able to implement the required management. Financial support from Main Roads for the management of this offset site would enable the City of Stirling to undertake conservation management and ensure the long-term protection of the bushland.

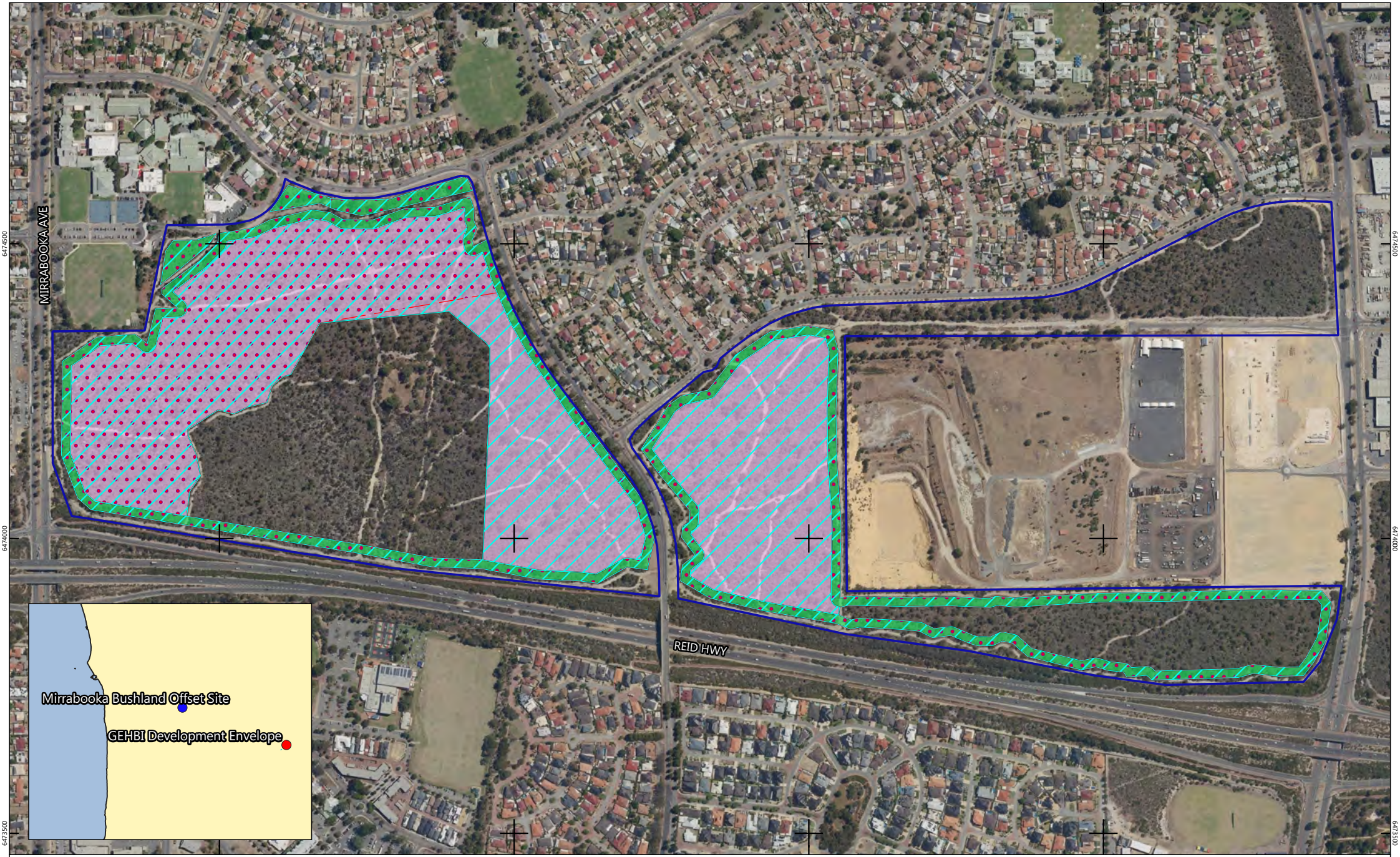

Figure 15 - Mirrabooka Bushland Offset Site

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6.4.3 Offset Security

Mirrabooka Bushland forms part of Bush Forever site 385 (Reid Highway Bushland) and is afforded some protection under SPP 2.8, which provides a policy and implementation framework to ensure bushland protection and management is properly addressed the Perth Metropolitan Area.

WAPC intends to amalgamate the freehold properties and roads across the site into a single lot with the land tenure to change from freehold land to a Crown Reserve, for the purpose of conservation and passive recreation. The City of Stirling will be allocated as the responsible entity through a land management order.

The offset site will be added to the DWER offsets register once it is approved to formalise its status as an offset site.

6.4.4 Environmental Values

The environmental values within the Mirrabooka Bushland offset site pertaining to this Offset Strategy are:

- 42.80 ha of SCP20a TEC
- 25.0 ha of Bush Forever.

In addition to the environmental values being used as an offset, the offset site contains Black-Cockatoo foraging habitat and Banksia Woodlands of the Swan Coastal Plain TEC/PEC.

6.4.5 Net Gain

The Mirrabooka Bushland offset site contains 42.80 ha of SCP20a and 25.0 ha of Bush Forever. The proposed management of the offset site will ensure that the values are protected in perpetuity from existing threatening processes and are enhanced by active management. Land management will include fencing and access control, weed control, *Phytophthora* dieback management and fire management as described below. This will reduce the potential spread of weeds, dieback and other diseases, invasive species, feral animal grazing, and uncontrolled vehicle access, leading to a conservation gain for the offset values. These management actions will have a positive impact on the site and will improve the vegetation condition for SCP20a and Bush Forever.

6.4.6 Management Actions

Main Roads is currently in consultation with the City of Stirling to develop a 'Mirrabooka Bushland Offset Management Plan'. The offset management plan will be implemented across the entirety of Mirrabooka Bushland, including the areas allocated as an offset to GEHBI, see **Figure 15**.

To achieve the net gain stated above, Main Roads proposes to undertake the following activities in conjunction with the City of Stirling:

- Develop and fund an offset management plan to be implemented by a land manager (likely to be the City of Stirling), that will include the following management actions:
    - Maintain and upgrade fencing along property boundary and tracks to deter unauthorised access
    - Rationalisation of tracks. Closed tracks to be revegetated or allowed to regenerate naturally
    - Weed control – hand weeding, spraying of herbicide and cutting of woody weeds
    - Fire management
    - *Phytophthora* dieback management.

A summary of the proposed rehabilitation and maintenance actions, along with their implementation schedule is provided in **Table 11**.

Table 11 Management Action Schedule

Action	Rehabilitation Objectives	How	Target
Revegetation	Aid natural rehabilitation, reduce weed cover, improve vegetation condition	• Identify areas for revegetation and develop a revegetation plan	Year 1
		• Undertake revegetation • Revegetation areas to be monitored for success • Infill planting as required	Annually for the first 3 years, then as required Monitoring ongoing
Seed Collection	Obtain local provenance seed for future direct seeding and seedling production	• Licensed seed collector to collect seed from the Offset Site and store appropriately	Annually for the first 3 years
Track Consolidation	Close and rehabilitate surplus walk and vehicular tracks	• Develop a track plan for the site-based on recreational and maintenance requirements • Prepare site for natural rehabilitation • Apply brushing • Install 'rehabilitation' signage	Year 1-3
Access Control	Manage uncontrolled access, aid natural rehabilitation, reduce the introduction and spread of dieback, weeds, and litter	• Install pedestrian and vehicle gates where required • Ongoing maintenance and repairs as required	Year 1 to 3 As required
Fire Management Plan	Formalise strategic fire and access tracks and fire preparedness, reduce weed incursions and dieback spread	• Develop a fire management plan • Install limestone sheeting to existing tracks (3-4 m wide) • Prune overhanging vegetation prior to installation	Year 1-3
Litter Removal	Reduce impact on bushland and fauna, reduce weed incursions	• Collect litter • Educate the community regarding the impacts of green waste dumping	As required
Weed Management Plan	Record weed species, density and type, to guide weed control, track progress, and identify new and emerging weeds	• Undertake weed mapping using the Natural Area Initial Assessment template to inform the Weed Management Plan • Develop a Weed Management Plan • Review Weed Management Plan every 3 years following mapping	Year 1 Repeat every 3 years
Weed Control	Reduce overall weed coverage, to reduce fire risk and encourage natural rehabilitation	• Undertake weed control with herbicides and/or manual removal as guided by the Weed Management Plan • Weed control to be performed by an experienced licensee operator	Year 1 to 3 - twice per annum (pa) (Jun/Jul & Sep) Year 4 to 5 – once pa Year 6 to 20 - once every second year or as required based on evidence of impact to vegetation or revegetation

Action	Rehabilitation Objectives	How	Target
Weed Control (cont.)	Reduce overall weed coverage, to reduce fire risk and encourage natural rehabilitation (cont.)	• Control with the aim to eradicate Bridal Creeper, a WoNS and DP	As required
		• Remove and treat woody weeds: Victorian Teatree, Acacia species and Geraldton Wax	Year 2
Dieback Management	Prevent the spread of dieback and protect uninfested areas to maintain vegetation condition and species richness	• Undertake dieback mapping in interpretable areas and implement recommendations	Year 1 Repeat every three years
		• Develop a dieback management plan (informed by mapping) including access management, signage, boot cleaning stations, treatment type and schedule	Year 2
		• Undertake phosphite treatments (foliar and stem injection) in accordance with the dieback management plan	Year 3 Repeat every three years
		• Educate the public to the presence of dieback and hygiene measures to prevent spread	Year 2 and 3
Feral Species Control	Encourage natural rehabilitation, aid revegetation success, and reduce impact on native animals	• Undertake baseline assessment of feral species • Develop a feral species control program	Year 1 - 2
		• Implement control program	Each year as required based on evidence of impact to vegetation or revegetation
Vegetation Monitoring	Measure rehabilitation progress against baseline data and completion criteria. Apply adaptive management if required	• Undertake vegetation condition mapping to determine baseline data	Year 1
		• Vegetation condition mapping	Every 5 years
Maintenance	Maintain integrity of infrastructure to protect rehabilitation, revegetation, and fauna habitat	• Repair / replace signs, fences and gates • Litter and green waste removal • Dieback boot cleaning stations	Inspect quarterly, maintain as required
Management Responsibility and Offset Security	Reduce impacts from surrounding land use, future developments, and other issues to secure land purpose	• Liaise with DPLH regarding the process • Transfer land management from DPLH to City of Stirling as a land management order	Years 3 and 4

6.4.7 Targets

Main Roads has developed as set of monitoring and management activities and targets for the Mirrabooka Bushland offset site. These are outlined in **Table 12**.

Table 12 Schedule of Monitoring and Management Activities and Targets

Action/Aspect	Description of Methodology	Timing	Target
Develop management agreement with City of Stirling	Develop MoU with City of Stirling to implement the OMP with funding from Main Roads	Complete by end of 2026	Complete by end of 2026
Develop and implement the Mirrabooka Bushland Offset Management Plan (OMP)	Develop an OMP to be implemented within the offset site to meet the completion criteria	OMP approved by end of 2026	OMP approved by end of 2026
SCP20a monitoring	Vegetation condition monitoring in accordance with OMP	Every five years commencing 2026 for duration of approval	Within the Mirrabooka Bushland offset site, SCP20a habitat quality • '8' or better 'internal' • '7' or better 'boundary'

6.4.8 Offset Calculator Values

Offset calculators for the Mirrabooka Bushland offset site are provided in **Appendix D** and the values summarised in **Table 13** below.

Table 13 Offset Calculator Values for Mirrabooka Bushland

Environmental Value	Offset Size (ha)	Start Quality	Future Quality without Offset	Future Quality with Offset	Offset Value (%)
SCP20a TEC	9.50 (boundary)	7	6	7	19.2
	33.30 (internal)	7	7	8	71.8
Bush Forever	25.0	NA	NA	NA	98.00

6.5 Neaves Road

6.5.1 Site Description

The Neaves Road offset property (Neaves Road) is a proposed revegetation site, located on Lot 156 on Plan P056488 on the corner of Neaves Road and Tonkin Highway in Bullsbrook, City of Swan (**Figure 16**). The property is situated approximately 35 km north of Perth CBD and approximately 25 km from GEHBI. Bush Forever Site 100 (Neaves Road Creek) traverses the south-western portion of the property, with the lot being freehold land owned by the Commissioner of Main Roads. Main Roads has allocated 6.57 ha of the Neaves Road offset property as a revegetation offset for GEHBI (the Neaves Road offset site).

Neaves Road is intersected by two Beard (1990) pre-European vegetation associations (Bassendean 1018 and Pinjarra 4) and one Heddle *et al.* (1980) vegetation complex (Yanga Complex). One Bush Forever site no. 100) intersects the Neaves Road offset site.

Neaves Road consists of mixed patches of remnant and revegetated vegetation. Native vegetation is most prominent in the centre and south-west corner of the site, with revegetated vegetation occurring mostly in the north-east corner (Coffey 2015). A more recent survey conducted in October 2024 (Astron 2025), defined six vegetation types, comprising of *Eucalyptus rudis* and *Melaleuca preissiana* forest, *Eucalyptus rudis* forest, *Corymbia calophylla* woodland, Mixed planted tree and/or shrub species and Parkland cleared areas.

Vegetation condition has been mapped, with the condition of the native vegetation in the Neaves Road offset site ranging from 'Very Good' (0.70 ha) to 'Completely Degraded' (0.88 ha), with most being in 'Degraded' (2.56 ha) or 'Good' (2.33 ha) condition (Astron 2025).

The offset site contains three CCWs (UFI 8773, UFI 8909 and 8910) with a total of 4.92 ha, with the largest being CCW UFI 8773. In addition to the CCWs, the Neaves Road offset property also contains approximately 18 ha of MUW UFI 15732 covering 73% of the property. MUW UFI 15732 represents the Ellen Brook Floodplain which extends over 40 km from Ellenbrook to Gingin.

No known Black Cockatoo breeding or roosting sites or their buffers occur within the offset site. The buffer of one confirmed breeding site occurs 8.5 km north of the property. Numerous confirmed roosting sites occur within 10 km of the property.

Evidence of CBC and FRTBC foraging was recorded throughout the property during the Targeted Black Cockatoo survey (Astron 2025).

6.5.2 Suitability of Site as an Offset

Revegetation works within the Neaves Road offset site (6.57 ha) will improve the quality of the existing Black Cockatoo foraging habitat and wetland vegetation. These works will build on revegetation works undertaken by volunteer groups on the site in the past (when the land was owned by the Department of Defence). Rehabilitation of this site will improve the foraging habitat and vegetation structure from low quality to moderate to high as supported by the revegetation plan (GCA 2023).

Figure 16 - Neaves Road Offset Site

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The Neaves Road offset site currently supports suitable foraging habitat for CBC and FRTBC, characterised by the presence of foraging species Marri, River Red Gum, Coastal Blackbutt and Flooded Gum (Astron 2025). Both FRTBC and CBC have been recorded within the offset site (Astron 2025). The offset site also contains CCW Geomorphic Wetlands of the Swan Coastal Plain.

The Neaves Road offset site has been accepted as an offset by DCCEEW for GEHBI under EPBC 2020/8784. Given that the WA Offset Policy and guidance are closely aligned with the DCCEEW Offset Policy and guidelines, and that DCCEEW has accepted this site as an offset, it is considered that the site also meets the requirements of the State Offsets Policy.

6.5.3 Offset Security

The Neaves Road property was purchased by Main Roads from the Commonwealth of Australia for the Northlink Project in 2017 for road construction purposes and is currently held as Freehold by the Commissioner of Main Roads. Lot 156 Neaves Road was not used for the project and was identified as being surplus to Main Roads operational requirements. Typically, Main Roads would sell such a property for rural purposes, however in this instance the site was identified as being suitable as a prospective offset site, given the opportunities for revegetation and restoration of the existing environmental values which are present on the property.

The restoration and creation of State and Commonwealth values at the site will offer further protection to the site, given it would be challenging to obtain future approvals for clearing within the site once it is established as an offset. On-ground management will deliver improvement in foraging and wetland vegetation quality and ensure that the risk of environmental values at the offset site being further impacted over the 20 year duration of the offset is reduced.

The site is currently managed for conservation by Main Roads and the land has been designated for revegetation purposes in Main Roads property management system to protect the site in perpetuity. Main Roads will continue to liaise with DBCA regarding future inclusion of the site in the conservation estate when the vegetation no longer requires proactive management.

Main Roads would be supportive of another government agency or department who manages these types of lands as their core business taking over management of the site, noting that DBCA has indicated it is not interested in managing restoration sites until certain vegetation condition criteria are achieved. The Neaves Road Offset Area will be added to the DWER offsets register once it is approved to formalise its status as an offset site.

6.5.4 Environmental Values

The environmental values within the Neaves Road offset site pertaining to this Offset Strategy include:

- 1.06 ha of CBC foraging habitat
- 1.65 ha FRTBC foraging habitat
- 4.92 ha of CCW

6.5.5 Net Gain

The 1.65 ha of foraging habitat to be created within the Neaves Road offset site will be revegetated to provide 1.06 ha of foraging habitat for CBC and 1.65 ha of foraging habitat for FRTBC.

The condition of the 4.92 ha of wetland vegetation will be improved with management, revegetation and weed control.

6.5.6 Management Actions

To achieve the net gain stated above, Main Roads proposes to undertake the following activities within the Neaves Roads offset site:

- Revegetation to protect and enhance Black Cockatoo habitat and CCW vegetation
- Installation of fencing along property boundary to deter unauthorised vehicular access
- Pest and/or feral animal control (rabbits, foxes, kangaroos, cats and feral bees) where required based on site observations of impacts to habitat quality or fauna values
- Selective weed control where required to improve vegetation condition and habitat quality
- Fire management
- *Phytophthora* dieback management
- Rubbish removal.

These activities are described in further detail in **Section 7**.

6.5.7 Targets

Main Roads completion criteria for the Neaves Road offset site revegetation works are listed in **Table 14**.

Table 14 Completion criteria for Neaves Road

Action/Aspect	Description of Methodology	Timing	Target
Implement revegetation plan	Undertake revegetation across the Neaves Road offset site	Commence 2026	Complete by end of 2045
CBC foraging habitat condition	Revegetate 1.06 ha of CBC habitat within the Neaves Road offset site	Commence 2026	Within the Neaves Road offset site CBC habitat quality '7' or better
FRTBC foraging habitat condition	Revegetate 1.65 ha of FTRBC habitat within the Neaves Road offset site	Commence 2026	Within the Neaves Road offset site FRTBC habitat quality '7' or better
CCW	Revegetate and rehabilitate 4.92 ha of CCW within the Neaves Road offset site	Commence 2026	Within the Neaves Road offset site CCW vegetation condition Very Good to Excellent (7) or better

6.5.8 Offset Calculator Values

Offset calculators for Neaves Road are provided in **Appendix E** and the values summarised in **Table 15** below.

Table 15 Offset Calculator Values for Neaves Road

Environmental Value	Offset Size (ha)	Start Quality	Future Quality without Offset	Future Quality with Offset	Offset Value (%)
CBC foraging habitat	1.06	2	2	7	2.60
FRTBC foraging habitat	1.65	2	2	7	4.40
CCW	4.92	4	4	7	66.8

7. Management Actions

The following management actions will be implemented at each offset site as a minimum (unless the site specific offset management plan states otherwise). All plans and actions will be developed and implemented in consultation with the ultimate land manager – DBCA, City of Kalamunda, City of Stirling or Main Roads.

7.1 Fencing

Access to offset sites will be controlled through installation, maintenance or upgrade of fences, as agreed with the land manager. Fencing will be erected within 24 months of clearing commencing under CPS 9448. The specification of fences will be determined prior to installation and will depend on the size, location and topography of the offset site. Fencing helps manage threats to values within the offset site from unauthorised human access, unauthorised vehicle entry, herbivore grazing and feral predators (Neave and Tanton 1989, Page and Beeton 2000).

7.2 Pest and/or Feral Animal Control

Pest animals such as rabbits, kangaroos, foxes and feral pigs are a serious threat to biodiversity within the offset areas through degradation of native vegetation. Pest management will be carried out using range of best practices in accordance with the National Pest Smart Guidelines (Invasive Animals Cooperative Research Centre 2016) issued by the DPIRD and governed by the *Biosecurity and Agricultural Management Act 2007*.

As specified for each offset site, where required based on observations of impacts to vegetation condition, habitat quality and/or fauna values, trapping and/or baiting for pigs, foxes and/or cats will be undertaken. Feral bee control will be undertaken where required, based on site observations, on any hives identified in potentially suitable breeding hollows. Control measures for rabbits will be implemented if they are observed to be adversely impacting the native vegetation condition.

7.3 Selective Weed Control

Weed mapping will be undertaken, where appropriate, within 24 months of clearing commencing, to identify locations of WoNS, Declared Pest plants and aggressive environmental weeds. A weed control program will be developed based on the weed mapping results to target significant outbreaks of these weeds within the offset site, to prevent them from spreading further and ideally eradicating them. Throughout the implementation of the Offset Strategy, weed control will be undertaken at offset sites as required based on site observations of impacts to vegetation condition and/or habitat quality.

7.4 Fire Management

Main Roads will develop and implement a fire management plan for each site in consultation with the land manager. The fire management plan will include location of firebreaks and vehicle access.

7.5 Phytophthora Dieback Management

Dieback surveys, where required, will be undertaken to inform a Dieback Management Plan for each offset site. The Dieback Management Plan may include measures such as ongoing dieback monitoring, hygiene stations, signage, Phosphite treatment or limestone sheeting of particular tracks. If developed, the Dieback Management Plans will be implemented for the duration of this Offset Strategy.

7.6 Rubbish Removal

On establishment of a site as an offset, any significant piles of rubbish will be removed. Monitoring of rubbish dumping and removal as required will continue as part of routine management of each site.

8. Corrective Actions

Where the management actions and/or targets at a particular offset site are not being met, corrective actions will be implemented to ensure the success of the offset.

Measures to detect the need to implement corrective actions will include monitoring as described for each offset. Where monitoring results detect issues, a decline in vegetation/habitat condition or revegetation failure or issues, the following will be carried out:

- Evaluate the cause of the decline, failures or issues
- Determine the appropriate contingency and corrective actions.

Corrective actions may include:

- Supplementary planting and/or seeding
- Changes to species lists for planting and/or seeding
- Altered weed control scheduling
- Altered herbicides or weed management techniques
- Altered pest and/or feral animal management
- Active dieback management, including Phosphite treatment
- Additional or alternative access control, including fencing
- Engaging additional resources to ensure works are undertaken within appropriate timeframes.

9. Adaptive Management and Review

Main Roads will review and revise this strategy as required and in accordance with any conditions in CPS 9448/1. The latest approved version of the strategy shall be implemented.

9.1 Adaptive management

This strategy adopts an 'adaptive management' approach which seeks to embed a cycle of monitoring, reporting and implementing change, where required. Accordingly, it is intended that this strategy is intended to be dynamic and may be updated (as required) to reflect changes in the monitoring and management practices, subject to the results of the monitoring to identify that the environmental objectives are being achieved. This strategy may also be revised to address learnings from the implementation of corrective actions, should this occur.

Corrective actions for each offset site in this strategy are detailed under the relevant subsections.

Adaptive management measures may also be applied where those measures are likely to provide a better environmental outcome or where the measures proposed within the strategy will provide little to no benefit. For example, if monitoring was required in year five and a fire swept through the area in year four, monitoring would not be undertaken until such time that the monitoring is likely to provide useful information, e.g. two years following the fire event.

Deviations from the Offset Strategy will be reported with the relevant annual report.

9.1.1 Unplanned Events

Where an unplanned event occurs that potentially impacts the progress of revegetation, such as flooding, fire, drought, etc, the timing of any management triggers and targets specified within the strategy, and subsequent plans, will be adjusted accordingly.

For example, if in year 12, a major fire impacted an offset site, it may be appropriate to consider the rehabilitation progress has been pushed back.

9.2 Environmental Review

Main Roads proposes to review this Offset Strategy every five years after its approval in order to consider:

- The management and monitoring actions
- Opportunities for an improvement in environmental performance (for example, changes to methodologies or timing)
- Identify a need to update this strategy to capture changes to the management and / or monitoring actions
- Identify any general need to update this strategy.

10. Consideration of WA Offsets Policy

This Offset Strategy has been developed to be consistent with the WA Offsets Policy. **Table 16** shows how each of the offset policy principles has been addressed in this Offset Strategy.

Table 16 Consideration of the WA Environmental Offsets Policy Principles

Offset Principle	Consideration
Environmental offsets will only be considered after avoidance and mitigation options have been pursued.	The potential impacts from GEHBI have been significantly reduced as a result of the efforts applied during the detailed design phase and during environmental assessment. This reduction has been largely achieved through the additional avoidance and mitigation measures that have been developed for GEHBI and this has resulted in a 40% reduction of impacts to SCP20a and total avoidance of impacts to SCP20c (**Section 2.9**).
Environmental offsets are not appropriate for all projects.	Roe Highway is a major arterial highway that links the southeast corridor with the northeast and northwest corridors of the Perth Metropolitan Area. Roe Highway services the Hazelmere and Forrestfield industrial areas, and is a strategic freight, tourist and inter town route. The Roe Highway and GEHB intersection is one of the last remaining signalised intersections on Roe Highway. Approximately 60,000 vehicles pass through the Roe Highway and GEHB intersection each day, with heavy vehicles making up to 14% of this figure. The current layout of Roe Highway at GEHB consists of four lanes (two in each direction) with a signalised intersection. In the past five years, 155 crashes have occurred at the intersection, with four requiring hospitalisations (Main Roads Western Australia, 2020). The proposed upgrades will improve road user safety and enhance transport efficiency through a significant economic corridor. The Proposed Action will also improve long-term access to and from Perth's International and Domestic airports. Main Roads operates on a hierarchy of avoid, minimise, reduce, rehabilitate and (if necessary, where significant residual impacts will result) offset environmental impacts. This hierarchy is achieved primarily through changes in scope and design, development, and implementation of management measures and finally, an offset proposal. Application of the management hierarchy has been summarised in this Offset Strategy. Main Roads has proposed offsets to counterbalance the significant residual impacts on BWSCP TEC/PEC, SCP20a TEC, SCP21c PEC, CBC, FRTBC, BBC, CCW and Bush Forever. The decision to offset these environmental values is based on the quantum of impacts, conservation status and context of the impacts of GEHBI.
Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted.	Main Roads has pursued a number of options in developing a package of offsets to counterbalance significant residual impacts that are relevant and appropriate for the locality and quantum of impact for each environmental value impacted. The options investigated have comprised restoration of land representative of BWSCP TEC/PEC, SCP20a TEC and SCP21c PEC, and providing Black Cockatoo foraging habitat, Bush Forever and wetland vegetation. The direct offsets proposed will protect and enhance the same (or similar) environmental values being impacted by the Proposal. The area and condition of BWSCP TEC/PEC, SCP20a TEC, SCP21c PEC, Black Cockatoo foraging habitat, Bush Forever sites, and CCWs within the proposed offset sites is proportionate to that impacted.

Offset Principle	Consideration
Environmental offsets will be based on sound environmental information and knowledge.	All offset sites have either been surveyed or will be surveyed prior to the implementation of the offset. The quantum of impact has been calculated using data from field surveys or the most current publicly available information in the absence of field survey data.
Environmental offsets will be applied within a framework of adaptive management.	Each offset will have a management plan to ensure offset objectives are met and each of these plans addresses monitoring, has contingencies and allows for adaptive management measures.
Environmental offsets will be focussed on longer term strategic outcomes.	All offsets will be implemented for at least 20 years by Main Roads prior to being handed over to the land manager of the site. On-ground management actions for each site will be formalised through a site specific management plan, where applicable.

11. Reporting and Accountability

11.1 Roles and Responsibilities

This Offset Strategy outlines the environmental management activities to be undertaken by Main Roads or its delegate, in association with the offset areas for the Proposal. The actions contained within this Offset Strategy are required to be implemented in accordance with the conditions of CPS 9448/1.

The Director Environment and Heritage at Main Roads will maintain responsibility for implementation of the management actions specified in this Offset Strategy on behalf of the Main Roads Managing Director.

11.2 Reporting

For each offset site, an annual monitoring report will be prepared that will follow the format in **Table 17**. Reports will be for the calendar year – 1 January to 31 December annually – and will be included in the CPS 9448/1 annual compliance report.

Table 17 Format of Annual Monitoring Report for each Offset Site

Section	Potential Inclusions
Introduction	• Background • Objective • Scope of works • Summary of management activities for the period • Assumptions/limitations
Environmental Setting	• Climatic/weather conditions over the reporting period (rainfall, storms, dry periods) • Changes to topography, drainage or hydrology (surface water runoff, flow direction) • Environmental events such as flooding or fires • Wetlands (if applicable)
Management Activities	• Details of on-ground management works or other works undertaken as per the agreed management actions • Identification and justification for deviations from on-ground management works or other works specified in the operational works plan for the period • Identification and justification of any corrective actions (if required) implemented during the period • Result of any surveys, including monitoring surveys, undertaken (e.g. dieback mapping, weed mapping, flora and vegetation surveys) • Any observed or anecdotal results noted from the implementation of on-ground management works (i.e. observable reduction in feral animals or reduction in weeds)
Financial Arrangements	• Details of expenditure incurred during the management period • Identification of and justification for deviations in anticipated expenditure during the management period • Proposed re-allocation of funds from one management activity to another • Any proposed re-allocation of funds from one management period to another • Risk assessment for proposed funding changes for the upcoming management period
Stakeholder Consultation	• DBCA • External consultants • Third parties • DWER • DCCEEW • LGA

Section	Potential Inclusions
Figures	• Site layout • Locations of on-ground management activities (e.g. fencing, signage, weed control, track maintenance) • Locations of work areas (e.g. weed control, track maintenance) • Locations of observations (e.g. areas showing reduced feral animal activity) • Indications of proposed works areas for the upcoming management period • Provision of spatial data
Photographs	• Evidence of works implemented (e.g. fencing, signage, rubbish removal) • Evidence justifying deviations from operational works plan • Visible changes to the site and/or surrounds • Visible changes (improvement or degradation) to environmental values (e.g. vegetation condition, flora, fauna habitat, wetlands)
Conclusions	• Management activities completed to date • Comment on the effectiveness of management activities that have been implemented this far
Recommendations	• Recommendations for management activities for the upcoming management period • Recommendations for deviations to any management activities for the upcoming management period • Recommendations for funding allocation for management activities for the upcoming management period • Any other recommendations

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13. Appendices

Appendix A – Cowalla Offset Calculators

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	FCT SCP 21c Priority Ecological Community
	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**

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	FCT SCP 21c Priority Ecological Community

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Clearing of 2.53 ha of Priority 3 FCT SCP 21c	Significant impact (hectares)	2.53
		Quality (scale)	6.00
		Total quantum of impact	1.52

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	1.52
	Rehabilitation credit	0.00
	Significant residual impact	1.52

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	FCT SCP 21c Priority Ecological Community	Significant impact (step 2, part A)	2.53
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	1.52

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	18.99	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**1.52**
	Lot 87 & 88 Duringen Road, Cowalla	**Current quality of offset site (scale)**	8.00	**Time until offset site secured (years)**	1.00		**100.0%**
		Future quality WITHOUT offset (scale)	8.00	**Risk of future loss WITHOUT offset (%)**	15.0%		
		Future quality WITH offset (scale)	8.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	1.00				
		Confidence in offset result (%)	90.0%			**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	FCT SCP 21c Priority Ecological Community		The proposed clearing will impact on 2.53 ha of P3 PEC SCP21c.
Type of environmental value	Ecological community		SCP 21c is listed as a P3 PEC by DBCA.
Conservation significance of environmental value	Priority ecological community		SCP 21c is a state listed P3 PEC listed by the DBCA and forms part of the Commonwealth BWSCP TEC under the EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 2.53 ha of Priority 3 FCT SCP 21c		Native vegetation that is representative of SCP 21c - Low Lying Banksia attenuata woodlands or shrublands PEC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	2.53		Clearing of 2.53 ha of native vegetation that is representative of DBCA P3 PEC SCP 21c.
Quality (scale) / Number	6.00		Habitat Quality Score for SCP 21c has been assigned as '6'.
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Lot 87 & 88 Duringen Road, Cowalla		Offset containing vegetation considered to be representative of SCP 21c.
Proposed offset (area in hectares)	18.99		A total of 18.99 ha of native vegetation within the site will be used to counterbalance impacts to SCP 21c as part of project works.
Current quality of offset site / Start number (of type of feature)	8.00		Within the proposed offset site the SCP 21c allocated as part of the offset package is in 'Excellent' condition (FVC 2023). A score of '8' has been assigned for current vegetation condition.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	8.00		A review of historical aerial imagery and consideration of site context, the majority of the offset is surrounded by excellent condition vegetation with no apparent edge effects. It is assumed that the site will not decline in quality without the offset. A score of '8' has been applied.
Future quality WITH offset (scale) / Future number WITH offset	8.00		Management actions will address potential threats and include weed management and installation of fencing along the boundary of the site, to prevent grazing, weed and dieback infestation. These actions are considered to be able to maintain the quality of the vegetation in its current condition and a score of '8' has been assigned.
Time until ecological benefit (years)	1.00		As the proposed offset relates to acquiring and conserving an existing area of native vegetation which is representative of the SCP 21c in 'Excellent' condition, the minimum of one year for this field is applied.
Confidence in offset result (%)	0.9		A high degree of confidence has been assigned as DBCA is an experienced land manager and will provide expertise regarding management.
Duration of offset implementation (maximum 20 years)	20.00		The site will be managed by DBCA for the long term conservation purposes. Main Roads will fund the offset implementation for 20 years.The maximum offset implementation time has been applied.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	15.0%		Risk of loss without offset has been set at 15% as the existing land use on the property prior to being purchased as an offset (Rural) and potential for further agricultural development in the future may lead to loss of the ecological value. There are existing mining proposals (sand mines) adjacent to the Cowalla site that could be expanded into this property.
Risk of future loss WITH offset (%)	5.0%		Risk of loss with the offset has been set at 5%, as it is considered that some inherent risk of loss will occur regardless of the level of protection. The site would be protected from further agricultural development and, being DBCA owned, will largely protected from further mining activities.
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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 Woodland of the Swan Coastal Plain Priority Ecological Community
	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)	Banksia Woodland of the Swan Coastal Plain Priority Ecological Community

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Clearing of 14.94 ha of Priority 3 Banksia Woodlands of the Swan Coastal Plain Ecological Community, which is also an EPBC Act listed TEC	Significant impact (hectares)	14.94
		Quality (scale)	6.00
		Total quantum of impact	8.96

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	8.96
	Rehabilitation credit	0.00
	Significant residual impact	8.96

WA Environmental Offsets Calculator

Step 3: Calculating offsets

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

Environmental value (step 1)	Banksia Woodland of the Swan Coastal Plain Priority Ecological Community	Significant impact (step 2, part A)	14.94
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	8.96

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	113.40	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**8.96**
	Lot 87 & 88 Duringen Road, Cowalla	**Current quality of offset site (scale)**	8.00	**Time until offset site secured (years)**	1.00		**100.0%**
		Future quality WITHOUT offset (scale)	8.00	**Risk of future loss WITHOUT offset (%)**	15.0%		
		Future quality WITH offset (scale)	8.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	1.00				
		Confidence in offset result (%)	90.0%			**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 Woodland of the Swan Coastal Plain Priority Ecological Community		The proposed clearing will impact on 14.94 ha of Priority 3 Ecological Community BWSCP.
Type of environmental value	Ecological community		BWSCP is listed as a Priority 3 Ecological Community by the DBCA and forms part of the Commonwealth-listed Endangered TEC under the EPBC Act.
Conservation significance of environmental value	Threatened ecological community - endangered		BWSCP is a state Priority 3 PEC listed by the DBCA and and a Commonwealth-listed Endangered TEC.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 14.94 ha of Priority 3 Banksia Woodlands of the Swan Coastal Plain Ecological Community, which is also an EPBC Act listed TEC		Native vegetation that is representative of the BWSCP TEC is proposed to be cleared for the Great Eastern Highway Bypass.
Significant impact (hectares) / Type of feature	14.94		Clearing of 14.94 ha of native vegetation that is representative of BWSCP TEC.
Quality (scale) / Number	6.00		Habitat Quality Score has been determined based on the proportional condition of the vegetation to be cleared. Proportionate scores are based as follows: •5.13 ha x Very Good - Excellent – 7 •4.31 ha x Very Good – 6 •1.35 ha x Good - Very Good – 5 •4.02 ha x Good – 4 •0.12 ha x Degraded – 0 The NVCP area is subject to other threatening processes such as Dieback and weeds. A portion of the NVCP clearing area has moderate confidence to be Dieback infested.
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Lot 87 & 88 Duringen Road, Cowalla		Offset containing vegetation considered to be representative of BWSCP TEC
Proposed offset (area in hectares)	113.40		A total of 113.40 ha of native vegetation within the site will be used to counterbalance impacts to BWSCP as part of project works.
Current quality of offset site / Start number (of type of feature)	8.00		Within the proposed offset site the BWSCP TEC allocated as part of the offset package is in 'Excellent' condition (FVC 2023). A score of '8' has been assigned for current vegetation condition.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	8.00		A review of historical aerial imagery and consideration of site context, the majority of the offset is surrounded by excellent condition vegetation with no apparent edge effects. It is assumed that the site will not decline in quality without the offset. A score of '8' has been applied.
Future quality WITH offset (scale) / Future number WITH offset	8.00		Management actions, will address potential threats and include weed management and installation of fencing along the boundary of the site, to prevent grazing, weed and dieback infestation. These actions are considered to be able to maintain the quality of the vegetation in its current condition and a score of '8' has been assigned.

Time until ecological benefit (years)	1.00		As the proposed offset relates to acquiring and conserving an existing area of native vegetation which is representative of the BWSCP TEC in 'Excellent' condition, the minimum of one year for this field is applied.
Confidence in offset result (%)	0.9		A high degree of confidence has been assigned as DBCA is an experienced land manager and will provide expertise regarding management.
Duration of offset implementation (maximum 20 years)	20.00		The site will be managed by DBCA for the long term conservation purposes. Main Roads will fund the offset implementation for 20 years.The maximum offset implementation time has been applied.
Time until offset site secured (years)	1.00		The site will be secured within 1 year.
Risk of future loss WITHOUT offset (%)	15.0%		Risk of loss without offset has been set at 15% as the existing land use on the property prior to being purchased as an offset (Rural) and potential for further agricultural development in the future may lead to loss of the ecological value. There are existing mining proposals (sand mines) adjacent to the Cowalla site that could be expanded into this property.
Risk of future loss WITH offset (%)	5.0%		Risk of loss with the offset has been set at 5%, as it is considered that some inherent risk of loss will occur regardless of the level of protection. The site will be protected from further agricultural development and being DBCA owned will largely be protectedfrom further mining activities.
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)
	Type of environmental value	Wetland/watercourse
	Conservation significance of environmental value	A category or type of wetland or watercourse for which an offset is required
	Conservation significance score	**0.1%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)	Significant impact (hectares)	3.15
		Quality (scale)	4.20
		Total quantum of impact	1.32

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	1.32
	Rehabilitation credit	0.00
	Significant residual impact	1.32

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)	Significant impact (step 2, part A)	3.15
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	1.32

***Area* (offset site)**

Offset calculation
Area

Offsets calculation	**Description**	**Proposed offset (area in hectares)**	6.50	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**0.45**
	Lot 87 & 88 Duringen Road, Cowalla	**Current quality of offset site (scale)**	7.00	**Time until offset site secured (years)**	1.00		**34.4%**
		Future quality WITHOUT offset (scale)	7.00	**Risk of future loss WITHOUT offset (%)**	15.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	1.00				
		Confidence in offset result (%)	90.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)		The proposed clearing will impact a total 3.15 ha of CCW.
Type of environmental value	Wetland/watercourse		CCW wetlands.
Conservation significance of environmental value	A category or type of wetland or watercourse for which an offset is required		Clearing of 3.15 ha of vegetation growing in association with a conservation category wetland defined under the Geomorphic Wetlands of the Swan Coastal Plain dataset.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)		The proposed clearing will impact a total of 3.15 ha of CCW.
Significant impact (hectares) / Type of feature	3.15		Clearing of 3.15 ha of vegetation growing in association with a CCW defined under the Geomorphic Wetlands of the Swan Coastal Plain dataset.
Quality (scale) / Number	4.20		Wetland vegetation proposed to be cleared comprises of Corymbia calophylla open woodland, Eucalyptus rudis subsp. rudis open forest, Allocasuarina fraseriana open woodland and Jacksonia floribunda scattered shrubland. Habitat Quality Score has been determined based on the proportional condition of the vegetation to be cleared. Proportionate scores are based as follows: - 0.93 ha x Excellent-Very Good – 7 - 0.27 ha x Very Good – 6 - 0.65 ha x Good – 4 - 1.30 ha x Degraded – 2
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Lot 87 & 88 Duringen Road, Cowalla		Offset containing vegetation growing in association with CCW.
Proposed offset (area in hectares)	6.50		A total of 6.50 ha of native vegetation growing in association with CCW. The offset site contains two CCWs (UFI 9450 and 9446) comprising a total areas of 6.50 ha.
Current quality of offset site / Start number (of type of feature)	7.00		Existing CCW quality 4.29 ha 'Excellent' (8), 2.23 ha 'Very Good' (6). Score of '7' assigned for existing quality.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	7.00		A review of historical aerial imagery and consideration of site context, the majority of the offset is surrounded by excellent condition vegetation with no apparent edge effects. It is assumed that the site will not decline in quality without the offset. A score of '7' has been applied.
Future quality WITH offset (scale) / Future number WITH offset	7.00		Management actions, will address potential threats and include weed management and installation of fencing along the boundary of the site, to prevent grazing, weed and dieback infestation. These actions are considered to be able to maintain the quality of the vegetation in its current condition and a score of '7' has been assigned.
Time until ecological benefit (years)	1.00		As the proposed offset relates to acquiring and conserving an existing area which contains high quality CCW, the minimum of one year for this field is applied.

Confidence in offset result (%)	0.9		A high degree of confidence has been assigned as DBCA is an experienced land manager and will provide expertise in managing the site
Duration of offset implementation (maximum 20 years)	20.00		The site will be managed by DBCA for the long term conservation purposes. The maximum offset implementation time has been applied.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	15.0%		Risk of loss without offset has been set at 15% as the existing land use on the property prior to being purchased as an offset (Rural) and potential for further agricultural development in the future may lead to loss of the ecological value. There are existing mining proposals (sand mines) adjacent to the Cowalla site that could be expanded into this property.
Risk of future loss WITH offset (%)	5.0%		Risk of loss with the offset has been set at 5%, as it is considered that some inherent risk of loss will occur regardless of the level of protection. The site will be protected from further agricultural development and being DBCA owned will largely be protected from further mining activities.
Offset ratio (Conservation area only)	N/A		

Appendix B – Crossman Offset Calculators

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Baudin's Black Cockatoo (Zanda baudinii)
	Type of environmental value	Species (flora/fauna)
	Conservation significance of environmental value	Rare/threatened species - 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)	Baudin's Black Cockatoo (Zanda baudinii)

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Clearing of 23.24 ha of Baudin's Black cockatoo foraging habitat	Significant impact (hectares)	23.24
		Quality (scale)	3.00
		Total quantum of impact	6.97

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	6.97
	Rehabilitation credit	0.00
	Significant residual impact	6.97

WA Environmental Offsets Calculator

Step 3: Calculating offsets

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

Environmental value (step 1)	Baudin's Black Cockatoo (Zanda baudinii)	Significant impact (step 2, part A)	23.24
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	6.97

Area **(offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	47.45	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**6.97**
	Lot 3 Crossman Road Crossman	**Current quality of offset site (scale)**	7.00	**Time until offset site secured (years)**	1.00		**100.0%**
		Future quality WITHOUT offset (scale)	7.00	**Risk of future loss WITHOUT offset (%)**	15.0%		
		Future quality WITH offset (scale)	8.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	90.0%			**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	Baudin's Black Cockatoo (Zanda baudinii)		The proposed clearing will impact on 23.24 ha of foraging habitat for BBC.
Type of environmental value	Species (flora/fauna)		BBC is listed as Endangered under the state BC Act.
Conservation significance of environmental value	Rare/threatened species - endangered		BBC is listed as Endangered under the state BC Act and the Commonwealth EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 23.24 ha of Baudin's Black cockatoo foraging habitat		Native vegetation comprising of suitable foraging habitat for BBC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	23.24		Clearing of 23.24 ha of native vegetation representative of potential BBC habitat.
Quality (scale) / Number	3.00		No known BBC presence, but potential foraging habitat will be impacted. Habitat Quality Score has been assessed based on the EPBC HQS assessment. The habitat contains wide range of vegetation types, but the dominant vegetation type is Banksia open woodland over Xanthorrhoea preissii open shrubland. The limited presence of Marri/Jarrah trees represent limited foraging habitat for BBC. The site has therefore been assessed to provide 'low to moderate' (5-10%) foraging habitat for Baudin's Cockatoo (score 3).
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Lot 3 Crossman Road Crossman		Offset containing vegetation that is suitable foraging habitat for BBC.
Proposed offset (area in hectares)	47.45		A total of 47.45 ha of native vegetation within the offset site will be used to counterbalance impacts to BBC foraging as part of project works.
Current quality of offset site / Start number (of type of feature)	7.00		The offset site is within the known range for BBC. The average foliage cover for suitable foraging species, within the offset site used by BBC as food resources is 28% (AECOM 2023) and therefore has moderate foraging value. Foraging evidence was noted for BBC at 21 locations during the Crossman survey (AECOM 2023). A score of '7' has been assigned for existing quality. Habitat Quality Score has been assessed based on the EPBC HQS assessment.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	7.00		It is unlikely that habitat quality for BBC will decline within the offset site without active management of the site for conservation as there are limited threats to the site that would cause habitat quality for BBC to decline. The site is within an established forest block without edge effects and has limited access.

Future quality WITH offset (scale) / Future number WITH offset	8.00		With active management and protection of this site, it is anticipated that the BBC habitat quality can be improved over time. Management of the site will include weed management and the installation of a fence around the site to prevent destructive herbivore grazing, unwarranted access to the area (reduces potential spread of dieback and weeds), and littering. Several studies have been conducted that demonstrate the ecological benefits of fencing to prevent destructive grazing, with natural regeneration, increased plant growth, and enhanced native species richness and cover commonly observed as positive outcomes. Weed management is frequently undertaken and endorsed for conservation significant areas to reduce competition for native seeds and seedlings and increase native cover (Main Roads, 2023). Fencing and weed management are anticipated to improve native regeneration, leading to a greater overall cover of native species utilised as food by BBC. Based on existing research and proposed management actions, the vegetation condition and structure is envisaged to shift from 'Moderate to High' to 'High'.
Time until ecological benefit (years)	10.00		It is estimated that it will take 10 years of management to achieve improvement in habitat quality.
Confidence in offset result (%)	0.9		The offset will be managed by DBCA. A high degree of confidence has been assigned as DBCA is an experienced land manager and will provide expertise regarding the required management.
Duration of offset implementation (maximum 20 years)	20.00		The maximum offset implementation time has been applied as Main Roads will fund management for 20 years.
Time until offset site secured (years)	1.00		The site will be secured within 1 year.
Risk of future loss WITHOUT offset (%)	15.0%		Risk of loss without the offset has been set at 15%, as the existing land use for the property prior to being purchased as an offset (rural) and potential for further agricultural and/or forestry activities exists without protection.
Risk of future loss WITH offset (%)	5.0%		Risk of loss with the offset has been set at 5%, as it is considered that some risk of loss will exist for the offset even with DBCA ownership and management.
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Carnaby's Black Cockatoo (Zanda latirostris)
	Type of environmental value	Species (flora/fauna)
	Conservation significance of environmental value	Rare/threatened species - endangered
	Conservation significance score	**1.2%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Carnaby's Black Cockatoo (Zanda latirostris)

***Area* (impact site)**

Part A: Significant impact calculation *Area*

	Description	Quantum of impact	
Significant impact	Clearing of 23.24 ha of Carnaby's Black Cockatoo (Zanda latirostris) foraging habitat, which is also an EPBC Act listed Endagered species.	Significant impact (hectares)	23.24
		Quality (scale)	6.00
		Total quantum of impact	13.94

Part B: Rehabilitation credit calculation *Area* (onsite)

	Description				
Rehabilitation Credit		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	13.94
	Rehabilitation credit	0.00
	Significant residual impact	13.94

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Carnaby's Black Cockatoo (Zanda latirostris)	Significant impact (step 2, part A)	23.24
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	13.94

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	86.60	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**13.58**
	Lot 3 Crossman Road Crossman	**Current quality of offset site (scale)**	8.00	**Time until offset site secured (years)**	1.00		**97.4%**
		Future quality WITHOUT offset (scale)	8.00	**Risk of future loss WITHOUT offset (%)**	15.0%		
		Future quality WITH offset (scale)	9.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	90.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	Carnaby's Black Cockatoo (Zanda latirostris)		The proposed clearing will impact on 23.24 ha of foraging habitat for CBC.
Type of environmental value	Species (flora/fauna)		CBC is listed as Endangered under the state BC Act.
Conservation significance of environmental value	Rare/threatened species - endangered		CBC is listed as Endangered under the state BC Act and the Commonwealth EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 23.24 ha of Carnaby's Black Cockatoo (Zanda latirostris) foraging habitat, which is also an EPBC Act listed Endagered species.		Native vegetation comprising of suitable foraging habitat for CBC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	23.24		Clearing of 23.24 ha of native vegetation representative of suitable CBC habitat.
Quality (scale) / Number	6.00		Habitat Quality Score has been assessed based on the EPBC HQS assessment and determined that CBC habitat quality was '6' (GCA 2024). The habitat contains a wide range of vegetation types, with the dominant vegetation type is Banksia open woodland over Xanthorrhoea preissii open shrubland.
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Lot 3 Crossman Road Crossman		Offset containing vegetation that is suitable foraging habitat for CBC.
Proposed offset (area in hectares)	86.60		A total of 86.60 ha of native vegetation within the site will be used to counterbalance impacts to CBC foraging as part of project works.
Current quality of offset site / Start number (of type of feature)	8.00		Evidence of foraging by CBC was observed within the offset site (AECOM 2023). The upper storey vegetation is dominated by Jarrah and Wandoo , with limited Marri. Foraging species used by CBC have an average projected foliage cover of 42% (AECOM 2023). There are no known breeding sites for CBC within the Crossman offset site, however there is a confirmed CBC breeding site to the west of the Crossman offset site within 6 km (AECOM 2023) and nearby (13 km) Bannister and Boddington areas (GCA 2024). There are no known roosts within the offset site, however it is likely that CBC utilise the area to roost. Habitat Quality Score has been assessed based on the EPBC HQS assessment.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	8.00		It is unlikely that habitat quality for CBC will decline within the offset site without active management of the site for conservation as there are limited threats to the site that would cause habitat quality for CBC to decline. The site is within an established forest block without edge effects and has limited access.

Future quality WITH offset (scale) / Future number WITH offset	9.00		With active management and protection of this site, it is anticipated that the CBC habitat quality can be improved over time.Management of the site will include weed management and the installation of a fence around the site to prevent destructive herbivore grazing, unwarranted access to the area (reduces potential spread of dieback and weeds), and littering. Several studies have been conducted that demonstrate the ecological benefits of fencing to prevent destructive grazing, with natural regeneration, increased plant growth, and enhanced native species richness and cover commonly observed as positive outcomes. Weed management is frequently undertaken and endorsed for conservation significant areas to reduce competition for native seeds and seedlings and increase native cover (Main Roads, 2023). Fencing and weed management are anticipated to improve native regeneration, leading to a greater overall cover of native species utilised as food by CBC. Based on existing research and proposed management actions, the vegetation condition and structure is envisaged to shift from 'Moderate to High' to 'High'.
Time until ecological benefit (years)	10.00		It is estimated that it will take 10 years of management to achieve improvement in habitat quality
Confidence in offset result (%)	0.9		The offset will be managed by DBCA. A high degree of confidence has been assigned as DBCA is an experienced land manager and will provide expertise regarding the required management.
Duration of offset implementation (maximum 20 years)	20.00		The maximum offset implementation time has been applied as Main Roads will fund management for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	15.0%		Risk of loss without the offset has been set at 15%, as the existing land use for the property prior to being purchased as an offset (rural) and potential for further agricultural and/or forestry activities exists without protection.
Risk of future loss WITH offset (%)	5.0%		Risk of loss with the offset has been set at 5%, as it is considered that some risk of loss will exist for the offset even with DBCA ownership and management.
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Forest Red-tailed Black-Cockatoo (Calytorhynchus banksii naso)
	Type of environmental value	Species (flora/fauna)
	Conservation significance of environmental value	Rare/threatened Species - vulnerable
	Conservation significance score	**0.2%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Forest Red-tailed Black-Cockatoo (Calytorhynchus banksii naso)

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Clearing of 23.234 ha of Forest Red-tailed Black-Cockatoo foraging	Significant impact (hectares)	23.24
		Quality (scale)	6.00
		Total quantum of impact	13.94

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	13.94
	Rehabilitation credit	0.00
	Significant residual impact	13.94

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Forest Red-tailed Black-Cockatoo (Calytorhynchus banksii naso)	Significant impact (step 2, part A)	23.24
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	13.94

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	86.10	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**13.33**
	Lot 3 Crossman Road Crossman	**Current quality of offset site (scale)**	7.00	**Time until offset site secured (years)**	1.00		**95.6%**
		Future quality WITHOUT offset (scale)	7.00	**Risk of future loss WITHOUT offset (%)**	15.0%		
		Future quality WITH offset (scale)	8.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	90.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	Forest Red-tailed Black-Cockatoo (Calytorhynchus banksii naso)		The proposed clearing will impact on 23.24 ha of foraging habitat for FRTBC.
Type of environmental value	Species (flora/fauna)		FRTBC is listed as Vulnerable under the state BC Act.
Conservation significance of environmental value	Rare/threatened Species - vulnerable		FRTBC is listed as Vulnerable under the state BC Act and the Commonwealth EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 23.234 ha of Forest Red-tailed Black-Cockatoo foraging		Native vegetation comprising of suitable foraging habitat for FRTBC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	23.24		Clearing of 23.24 ha of native vegetation representative of suitable FRTBC habitat.
Quality (scale) / Number	6.00		Habitat Quality Score has been assessed based on the EPBC HQS assessment. The habitat contains a range of suitable FRTBC foraging habitat, including Jarrah woodland, Flooded Gum open and closed forest, Marri open woodland. There is foraging evidence for FRTBC and the presence of suitable foraging habitat and the impact site been assessed to provide 'low to moderate' foraging habitat for FRTBC and assigned a score of '6'.
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Lot 3 Crossman Road Crossman		Offset containing vegetation that is suitable foraging habitat for FRTBC.
Proposed offset (area in hectares)	86.10		A total of 86.1 ha of native vegetation within the site will be used to counterbalance impacts to FRTBC foraging as part of project works.
Current quality of offset site / Start number (of type of feature)	7.00		Evidence of foraging by FTRBC was observed within the offset site (AECOM 2023). The upper storey vegetation is dominated by Jarrah and Wandoo with limited Marri. All of these upper storey species are considered primary food source for FRTBC. FRTBC are also known to forage on Allocasuarina species, which is also present within the offset site. The average projected foliage cover of suitable FRTBC foraging species is approximately 29% and therefore has been determined to be of moderate foraging value, falling within the 20-30% foliage cover range. There is no known evidence of FRTBC breeding areas within a 15km radius (AECOM 2023). Habitat Quality Score has been assessed based on the EPBC HQS assessment.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	7.00		It is unlikely that habitat quality for FRTBC will decline within the offset site without active management of the site for conservation as there are limited threats to the site that would cause habitat quality for FRTBC to decline. The site is within an established forest block without edge effects and has limited access.

Future quality WITH offset (scale) / Future number WITH offset	8.00		With active management and protection of this site, it is anticipated that the FRTBC habitat quality can be improved over time. Management of the site will include weed management and the installation of a fence around the site to prevent destructive herbivore grazing, unwarranted access to the area (reduces potential spread of dieback and weeds), and littering. Several studies have been conducted that demonstrate the ecological benefits of fencing to prevent destructive grazing, with natural regeneration, increased plant growth, and enhanced native species richness and cover commonly observed as positive outcomes. Weed management is frequently undertaken and endorsed for conservation significant areas to reduce competition for native seeds and seedlings and increase native cover (Main Roads, 2023). Fencing and weed management are anticipated to improve native regeneration, leading to a greater overall cover of native species utilised as food by FRTBC. Based on existing research and proposed management actions, the vegetation condition and structure is envisaged to shift from 'Moderate to High' to 'High'.
Time until ecological benefit (years)	10.00		It is estimated that it will take 10 years of management to achieve improvement in habitat quality
Confidence in offset result (%)	0.9		The offset will be managed by DBCA. A high degree of confidence has been assigned as DBCA is an experienced land manager and will provide expertise regarding the required management.
Duration of offset implementation (maximum 20 years)	20.00		The maximum offset implementation time has been applied as Main Roads will fund management for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	15.0%		Risk of loss without the offset has been set at 15%, as the existing land use for the property prior to being purchased as an offset (rural) and potential for further agricultural and/or forestry activities exists without protection.
Risk of future loss WITH offset (%)	5.0%		Risk of loss with the offset has been set at 5%, as it is considered that some risk of loss will exist for the offset even with DBCA ownership and management.
Offset ratio (Conservation area only)	N/A		

Appendix C – Hartfield Park Offset Calculators

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands
	Type of environmental value	Ecological community
	Conservation significance of environmental value	Threatened ecological community - critically endangered
	Conservation significance score	**6.8%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands

***Area* (impact site)**

Part A: Significant impact calculation *Area*

	Description	Quantum of impact	
Significant impact	Clearing of 5.78 ha of Critically Endangered Ecological Community SCP 20a, which is also EPBC Act listed Banksia Woodland of Swan Coastal Plain TEC	Significant impact (hectares)	5.78
		Quality (scale)	6.00
		Total quantum of impact	3.47

Part B: Rehabilitation credit calculation *Area* (onsite)

	Description				
Rehabilitation Credit		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	3.47
	Rehabilitation credit	0.00
	Significant residual impact	3.47

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands	Significant impact (step 2, part A)	5.78
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	3.47

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	2.92	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**0.31**
	Hartfield Park	**Current quality of offset site (scale)**	6.00	**Time until offset site secured (years)**	1.00		**9.0%**
		Future quality WITHOUT offset (scale)	5.00	**Risk of future loss WITHOUT offset (%)**	10.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	80.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands		The proposed clearing will impact on 5.78 ha of Critically Endangered Ecological Community SCP 20a.
Type of environmental value	Ecological community		SCP 20a is listed as a Critically Endangered Threatened Ecological Community.
Conservation significance of environmental value	Threatened ecological community - critically endangered		SCP 20a is a state Critically Endangered TEC under the BC Act and forms part of the Commonwealth-listed Endangered TEC BWSCP under the EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 5.78 ha of Critically Endangered Ecological Community SCP 20a, which is also EPBC Act listed Banksia Woodland of Swan Coastal Plain TEC		Native vegetation that is representaive of SCP 20a - Banksia attenuata woodlands over species rich dense shrublands TEC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	5.78		Clearing of 5.78 ha of native vegetation that is representative of State listed Critically Endangered SCP 20a TEC.
Quality (scale) / Number	6.00		TEC quality has been determined based on the proportional condition of the vegetation to be cleared. Proportionate scores are based as follows: •4.51 ha x Very Good - Excellent – 7 •0.26 ha x Very Good – 6 •0.88 ha x Good – 4 •0.12 ha x Degraded - 2
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Hartfield Park		Offset containing vegetation considered to be SCP 20a.
Proposed offset (area in hectares)	2.92		A total of 2.92 ha of native vegetation within the site will be used to contribute to counterbalancing of impacts to SCP 20a as part of project works.
Current quality of offset site / Start number (of type of feature)	6.00		The vegetation condition within the offset site is 'Very Good' (6). A score of '6' has been assigned to the start quality.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	5.00		The offset site within Hartfield Park is adjacent to recreational uses and without additional active conservation management will decline in quality.
Future quality WITH offset (scale) / Future number WITH offset	7.00		Main Roads is proposing to implement the Hartfield Park Offset Management Plan across the entirety of vegetated areas within Hartfield Park including the offset area. Active conservation management within the offset site will enable the management of potential edge effects from adjacent recreational land uses.
Time until ecological benefit (years)	10.00		It is assumed that it will take approximately 10 years to achieve the desired species diversity, vegetation cover and weed density. Management measures proposed at the offset site will be funded for 20 years or until completion criteria however for the purposes of the calculation, it is assumed that ecological benefit will be achieved at 10 years.

Confidence in offset result (%)	0.8		The offset site will be actively managed by City of Kalamunda through funding by Main Roads. A high degree of confidence has been applied as adaptive management will allow ongoing and emerging threats to be dealt with as they occur.
Duration of offset implementation (maximum 20 years)	20.00		Main Roads will fund the active management of the site by the City of Kalamunda for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	10.0%		Although the site is an existing Class A reserve, there has been limited management to conserve environmental values at a site which has been the subject of recreational use.
Risk of future loss WITH offset (%)	5.0%		The site is an existing Class A reserve vested for the purpose of 'recreation'. Changing the vesting to 'conservation' will further reduce the risk of loss in combination with it currently being an A class reserve
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

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Purpose:

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Data currency:

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Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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 481, Stirling Cresent, Hazelmere
	Type of environmental value	Conservation area
	Conservation significance of environmental value	Bush Forever site
	Conservation significance score	**A conservation significance score does not apply in this case; an offset ratio may be appropriate (step 3)**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Bush Forever Site 481, Stirling Cresent, Hazelmere

***Area* (impact site)**

Part A: Significant impact calculation *Area*

	Description	Quantum of impact	
Significant impact	Clearing of 12.75 ha of Bush Forever Site 481	Significant impact (hectares)	12.75
		Quality (scale)	0.00
		Total quantum of impact	0.00

Part B: Rehabilitation credit calculation *Area* (onsite)

	Description				
Rehabilitation Credit		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	0.00
	Rehabilitation credit	0.00
	Significant residual impact	0.00

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Bush Forever Site 481, Stirling Cresent, Hazelmere	Significant impact (step 2, part A)	12.75
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	0.00

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	0.50	**Duration of offset implementation (maximum 20 years)**			
	Hartfield Park	**Current quality of offset site (scale)**		**Time until offset site secured (years)**			
		Future quality WITHOUT offset (scale)		**Risk of future loss WITHOUT offset (%)**		**Offset value Conservation area** (applied to step 2, part A)	**2**
		Future quality WITH offset (scale)		**Risk of future loss WITH offset (%)**			**2.0%**
		Time until ecological benefit (years)					
		Confidence in offset result (%)				**OFFSET ADEQUATE?**	**NO**

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 481, Stirling Cresent, Hazelmere		The proposed clearing will impact a total of 12.75 ha of vegetation associated with Bush Forever Site 481.
Type of environmental value	Conservation area		Bush Forever Site under SPP 2.8
Conservation significance of environmental value	Bush Forever site		Clearing of 12.75 ha of Bush Forever site 481.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 12.75 ha of Bush Forever Site 481		The proposed clearing will impact 12.75 ha of vegetation associated with Bush Forever Site 481.
Significant impact (hectares) / Type of feature	12.75		Clearing of 12.75 ha of native vegetation associated with Bush Forever Site 481 that contains TECs, CCW and is in condition: Degraded 0.55 ha Good 3.65 ha Very Good to Good 1.12 ha Very Good 3.91 ha Excellent to Very Good 3.51 ha
Quality (scale) / Number	0.00		NA
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Hartfield Park		Offset containing vegetation within a Bush Forever site
Proposed offset (area in hectares)	0.50		A total of 0.5 ha of native vegetation within Bush Forever site 320.
Current quality of offset site / Start number (of type of feature)	0.00		Not Applicable
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	0.00		Not Applicable
Future quality WITH offset (scale) / Future number WITH offset	0.00		Not Applicable
Time until ecological benefit (years)	0.00		Not Applicable
Confidence in offset result (%)	0		Not Applicable
Duration of offset implementation (maximum 20 years)	0.00		Not Applicable
Time until offset site secured (years)	0.00		Not Applicable
Risk of future loss WITHOUT offset (%)	0.0%		Not Applicable
Risk of future loss WITH offset (%)	0.0%		Not Applicable
Offset ratio (Conservation area only)	2		Maximum ratio under SPP 2.8 of 2 has been applied as the conservation significance of the vegetation to be impacted is 'Very High' due to the presence of TEC, CCW and vegetation in Good to 'Excellent to Very Good' condition.

WA Environmental Offsets calculator

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Data currency:

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Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Conospermum undulatum impacted by GEHBI
	Type of environmental value	Species (flora/fauna)
	Conservation significance of environmental value	Rare/threatened Species - vulnerable
	Conservation significance score	**0.2%**

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)	Conospermum undulatum impacted by GEHBI

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Patch of Conospermum undulatum	Significant impact (hectares)	1.43
		Quality (scale)	6.00
		Total quantum of impact	0.86

Part B: Rehabilitation credit calculation *Area* (onsite)

Rehabilitation Credit	Description			Time until ecological benefit (years)	
		Proposed rehabilitation (area in hectares)			
		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	0.86
	Rehabilitation credit	0.00
	Significant residual impact	0.86

WA Environmental Offsets Calculator

Step 3: Calculating offsets

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

Environmental value (step 1)	Conospermum undulatum impacted by GEHBI	Significant impact (step 2, part A)	1.43
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	0.86

Area **(offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	2.36	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**0.42**
	Hartfield Park	**Current quality of offset site (scale)**	6.00	**Time until offset site secured (years)**	1.00		**48.4%**
		Future quality WITHOUT offset (scale)	5.00	**Risk of future loss WITHOUT offset (%)**	10.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	80.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	Conospermum undulatum impacted by GEHBI		
Type of environmental value	Species (flora/fauna)		
Conservation significance of environmental value	Rare/threatened Species - vulnerable		
Landscape-level value impacted	yes/no		
Significant impact			
Description	Patch of Conospermum undulatum		
Significant impact (hectares) / Type of feature	1.43		
Quality (scale) / Number	6.00		
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Hartfield Park		Offset containing vegetation containing Conospermum undulatum
Proposed offset (area in hectares)	2.36		A total of 2.36 ha of native vegetation within the site will be used to contribute to counterbalancing of impacts to Conospermum undulatum as part of project works.
Current quality of offset site / Start number (of type of feature)	6.00		The vegetation condition within the offset site is 'Very Good' (6). A score of '6' has been assigned to the start quality.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	5.00		The offset site within Hartfield Park is adjacent to recreational uses and without additional active conservation management will decline in quality.
Future quality WITH offset (scale) / Future number WITH offset	7.00		Main Roads is proposing to implement the Hartfield Park Offset Management Plan across the entirety of vegetated areas within Hartfield Park including the offset area. Active conservation management within the offset site will enable the management of potential edge effects from adjacent recreational land uses.
Time until ecological benefit (years)	10.00		It is assumed that it will take approximately 10 years to achieve the desired species diversity, vegetation cover and weed density. Management measures proposed at the offset site will be funded for 20 years or until completion criteria however for the purposes of the calculation, it is assumed that ecological benefit will be achieved at 10 years.
Confidence in offset result (%)	0.8		The offset site will be actively managed by City of Kalamunda through funding by Main Roads. A high degree of confidence has been applied as adaptive management will allow ongoing and emerging threats to be dealt with as they occur.
Duration of offset implementation (maximum 20 years)	20.00		Main Roads will fund the active management of the site by the City of Kalamunda for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	10.0%		Although the site is an existing Class A reserve, there has been limited management to conserve environmental values at a site which has been the subject of recreational use.
Risk of future loss WITH offset (%)	5.0%		The site is an existing Class A reserve vested for the purpose of 'recreation'. Changing the vesting to 'conservation' will further reduce the risk of loss in combination with it currently being an A class reserve
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Conospermum undulatum impacted by GEHBI
	Type of environmental value	Species (flora/fauna)
	Conservation significance of environmental value	Rare/threatened Species - vulnerable
	Conservation significance score	**0.2%**

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)	Conospermum undulatum impacted by GEHBI

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Patch of Conospermum undulatum	Significant impact (hectares)	1.43
		Quality (scale)	6.00
		Total quantum of impact	0.86

Part B: Rehabilitation credit calculation *Area* (onsite)

Rehabilitation Credit	Description			Time until ecological benefit (years)	
		Proposed rehabilitation (area in hectares)			
		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	0.86
	Rehabilitation credit	0.00
	Significant residual impact	0.86

WA Environmental Offsets Calculator

Step 3: Calculating offsets

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

Environmental value (step 1)	Conospermum undulatum impacted by GEHBI	Significant impact (step 2, part A)	1.43
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	0.86

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	2.92	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**0.51**
	Hartfield Park	**Current quality of offset site (scale)**	6.00	**Time until offset site secured (years)**	1.00		**59.9%**
		Future quality WITHOUT offset (scale)	5.00	**Risk of future loss WITHOUT offset (%)**	10.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	80.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	Conospermum undulatum impacted by GEHBI		
Type of environmental value	Species (flora/fauna)		
Conservation significance of environmental value	Rare/threatened Species - vulnerable		
Landscape-level value impacted	yes/no		
Significant impact			
Description	Patch of Conospermum undulatum		
Significant impact (hectares) / Type of feature	1.43		
Quality (scale) / Number	6.00		
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Hartfield Park		Offset containing vegetation containing Conospermum undulatum
Proposed offset (area in hectares)	2.92		A total of 2.92 ha of native vegetation within the site will be used to contribute to counterbalancing of impacts to Conospermum undulatum as part of project works.
Current quality of offset site / Start number (of type of feature)	6.00		The vegetation condition within the offset site is 'Very Good' (6). A score of '6' has been assigned to the start quality.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	5.00		The offset site within Hartfield Park is adjacent to recreational uses and without additional active conservation management will decline in quality.
Future quality WITH offset (scale) / Future number WITH offset	7.00		Main Roads is proposing to implement the Hartfield Park Offset Management Plan across the entirety of vegetated areas within Hartfield Park including the offset area. Active conservation management within the offset site will enable the management of potential edge effects from adjacent recreational land uses.
Time until ecological benefit (years)	10.00		It is assumed that it will take approximately 10 years to achieve the desired species diversity, vegetation cover and weed density. Management measures proposed at the offset site will be funded for 20 years or until completion criteria however for the purposes of the calculation, it is assumed that ecological benefit will be achieved at 10 years.
Confidence in offset result (%)	0.8		The offset site will be actively managed by City of Kalamunda through funding by Main Roads. A high degree of confidence has been applied as adaptive management will allow ongoing and emerging threats to be dealt with as they occur.
Duration of offset implementation (maximum 20 years)	20.00		Main Roads will fund the active management of the site by the City of Kalamunda for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	10.0%		Although the site is an existing Class A reserve, there has been limited management to conserve environmental values at a site which has been the subject of recreational use.
Risk of future loss WITH offset (%)	5.0%		The site is an existing Class A reserve vested for the purpose of 'recreation'. Changing the vesting to 'conservation' will further reduce the risk of loss in combination with it currently being an A class reserve
Offset ratio (Conservation area only)	N/A		

Appendix D – Mirrabooka Bushland Offset Calculators

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands
	Type of environmental value	Ecological community
	Conservation significance of environmental value	Threatened ecological community - critically endangered
	Conservation significance score	**6.8%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands

***Area* (impact site)**

Part A: Significant impact calculation *Area*

	Description	Quantum of impact	
Significant impact	Clearing of 5.78 ha of Critically Endangered Ecological Community SCP 20a, which is also EPBC Act listed Banksia Woodland of Swan Coastal Plain TEC	Significant impact (hectares)	5.78
		Quality (scale)	6.00
		Total quantum of impact	3.47

Part B: Rehabilitation credit calculation *Area* (onsite)

	Description				
Rehabilitation Credit		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	3.47
	Rehabilitation credit	0.00
	Significant residual impact	3.47

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands	Significant impact (step 2, part A)	5.78
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	3.47

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	9.50	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**0.67**
	Mirrabooka Bushland boundary edge	**Current quality of offset site (scale)**	7.00	**Time until offset site secured (years)**	1.00		**19.2%**
		Future quality WITHOUT offset (scale)	6.00	**Risk of future loss WITHOUT offset (%)**	10.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	80.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands		The proposed clearing will impact on 5.78 ha of Critically Endangered Ecological Community SCP 20a.
Type of environmental value	Ecological community		SCP 20a is listed as a Critically Endangered Threatened Ecological Community.
Conservation significance of environmental value	Threatened ecological community - critically endangered		SCP 20a is a state Critically Endangered TEC under the BC Act and forms part of the Commonwealth-listed Endangered TEC BWSCP under the EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 5.78 ha of Critically Endangered Ecological Community SCP 20a, which is also EPBC Act listed Banksia Woodland of Swan Coastal Plain TEC		Native vegetation that is representaive of SCP 20a - Banksia attenuata woodlands over species rich dense shrublands TEC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	5.78		Clearing of 5.78 ha of native vegetation that is representative of State listed Critically Endangered SCP 20a TEC.
Quality (scale) / Number	6.00		TEC quality has been determined based on the proportional condition of the vegetation to be cleared. Proportionate scores are based as follows: •4.51 ha x Very Good - Excellent – 7 •0.26 ha x Very Good – 6 •0.88 ha x Good – 4 •0.12 ha x Degraded - 2
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Mirrabooka Bushland boundary edge		Offset containing SCP 20a.
Proposed offset (area in hectares)	9.50		A total of 9.50 ha of native vegetation within the site will be used to counterbalance impacts to SCP 20a as part of project works.
Current quality of offset site / Start number (of type of feature)	7.00		The boundary of Mirrabooka Bushland is subject to edge effects and is impacted by a higher weed load than the internal portions of the Bushland. Areas of SCP20a away from the edge of BF 385 are considered to be of higher quality than those on the edge. Therefore vegetation condition along the edge is 'Very Good' condition and assigned a start value of '7'.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	6.00		Without active management the vegetation condition will decline with ongoing urbanisation, edge effects and other threatening processes. DWER notes that based on the marginally higher weed load and proximity to cleared firebreaks, it is appropriate to consider a decline of '1' in the future quality without offset.
Future quality WITH offset (scale) / Future number WITH offset	7.00		Main Roads is proposing to implement the Mirrabooka Bushland Offset Management Plan across the entirety of vegetated areas within Mirrabooka Bushland including the offset area. Active conservation management within the offset site will enable the management of threatening processes to maintain the vegetation condition.

Time until ecological benefit (years)	10.00		It is assumed that it will take approximately 10 years to achieve the desired species diversity, vegetation cover and weed density. The ecological benefit will be achieved at 10 years.
Confidence in offset result (%)	0.8		The offset site will be actively managed by City of Stirling through funding by Main Roads. A high degree of confidence has been applied as adaptive management will allow ongoing and emerging threats to be dealt with as they occur.
Duration of offset implementation (maximum 20 years)	20.00		Main Roads will fund the active management of the site by the City of Stirling for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	10.0%		Risk of loss without the offset has been set at 10%. While the offset site forms part of Bush Forever site 385, the land is not actively managed for conservation and includes land in freehold title. Consequently, the risk of environmental values being lost is greater than it would be for a BF site being actively managed.
Risk of future loss WITH offset (%)	5.0%		Risk of loss with the offset has been set at 5%, as it is considered that some risk of loss will remain for the offset. The risk will reduce when the site is actively managed with funding from Main Roads. WAPC intends to amalgamate the freehold properties and roads across the site into a single lot with the land tenure to change from freehold land to a Crown Reserve, for the purpose of conservation and passive recreation. The City of Stirling will be allocated as the responsible entity through a land management order.
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands
	Type of environmental value	Ecological community
	Conservation significance of environmental value	Threatened ecological community - critically endangered
	Conservation significance score	**6.8%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands

***Area* (impact site)**

Part A: Significant impact calculation *Area*

	Description	Quantum of impact	
Significant impact	Clearing of 5.78 ha of Critically Endangered Ecological Community SCP 20a, which is also EPBC Act listed Banksia Woodland of Swan Coastal Plain TEC	Significant impact (hectares)	5.78
		Quality (scale)	6.00
		Total quantum of impact	3.47

Part B: Rehabilitation credit calculation *Area* (onsite)

	Description				
Rehabilitation Credit		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	3.47
	Rehabilitation credit	0.00
	Significant residual impact	3.47

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands	Significant impact (step 2, part A)	5.78
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	3.47

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	33.30	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**2.49**
	Mirrabooka Bushland Internal area	**Current quality of offset site (scale)**	7.00	**Time until offset site secured (years)**	1.00		**71.8%**
		Future quality WITHOUT offset (scale)	7.00	**Risk of future loss WITHOUT offset (%)**	10.0%		
		Future quality WITH offset (scale)	8.00	**Risk of future loss WITH offset (%)**	5.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	80.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	SCP 20a - Banksia attenuata woodlands over species rich dense shrublands		The proposed clearing will impact on 5.78 ha of Critically Endangered Ecological Community SCP 20a.
Type of environmental value	Ecological community		SCP 20a is listed as a Critically Endangered Threatened Ecological Community.
Conservation significance of environmental value	Threatened ecological community - critically endangered		SCP 20a is a state Critically Endangered TEC under the BC Act and forms part of the Commonwealth-listed Endangered TEC BWSCP under the EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 5.78 ha of Critically Endangered Ecological Community SCP 20a, which is also EPBC Act listed Banksia Woodland of Swan Coastal Plain TEC		Native vegetation that is representaive of SCP 20a - Banksia attenuata woodlands over species rich dense shrublands TEC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	5.78		Clearing of 5.78 ha of native vegetation that is representative of State listed Critically Endangered SCP 20a TEC.
Quality (scale) / Number	6.00		TEC quality has been determined based on the proportional condition of the vegetation to be cleared. Proportionate scores are based as follows: •4.51 ha x Very Good - Excellent – 7 •0.26 ha x Very Good – 6 •0.88 ha x Good – 4 •0.12 ha x Degraded - 2
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Mirrabooka Bushland Internal area		Offset containing SCP 20a.
Proposed offset (area in hectares)	33.30		A total of 33.30 ha of native vegetation within the site will be used to counterbalance impacts to SCP 20a as part of project works.
Current quality of offset site / Start number (of type of feature)	7.00		Areas of SCP20a away from the edge of BF 385 are considered to be of higher quality than those on the edge. Vegetation condition is 'Very Good to Excellent' and assigned a start value of '7'.
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	7.00		The offset is well fenced from unauthorised access. Review of historic aerial imagery and the proportion of remenent vegetation remaining, it is not considered that the vegetation condition will decline due to ongoing urbanisation and other threatening processes such as edge effects from weeds.
Future quality WITH offset (scale) / Future number WITH offset	8.00		Main Roads is proposing to implement the Mirrabooka Bushland Offset Management Plan across the entirety of vegetated areas within Mirrabooka Bushland including the offset area. Active conservation management within the offset site will enable the management of threatening processes and improve the vegetation condition.
Time until ecological benefit (years)	10.00		It is assumed that it will take approximately 10 years to achieve the desired species diversity, vegetation cover and weed density. The ecological benefit will be achieved at 10 years

Confidence in offset result (%)	0.8		The offset site will be actively managed by City of Stirling through funding by Main Roads. A high degree of confidence has been applied as adaptive management will allow ongoing and emerging threats to be dealt with as they occur.
Duration of offset implementation (maximum 20 years)	20.00		Main Roads will fund the active management of the site by the City of Stirling for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	10.0%		Risk of loss without the offset has been set at 10%. While the offset site forms part of Bush Forever site 385, the land is not actively managed for conservation and includes land in freehold title. Consequently, the risk of environmental values being lost is greater than it would be for a BF site being actively managed.
Risk of future loss WITH offset (%)	5.0%		Risk of loss with the offset has been set at 5%, as it is considered that some risk of loss will remain for the offset. The risk will reduce when the site is actively managed with funding from Main Roads. WAPC intends to amalgamate the freehold properties and roads across the site into a single lot with the land tenure to change from freehold land to a Crown Reserve, for the purpose of conservation and passive recreation. The City of Stirling will be allocated as the responsible entity through a land management order.
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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 481, Stirling Cresent, Hazelmere
	Type of environmental value	Conservation area
	Conservation significance of environmental value	Bush Forever site
	Conservation significance score	**A conservation significance score does not apply in this case; an offset ratio may be appropriate (step 3)**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Bush Forever Site 481, Stirling Cresent, Hazelmere

***Area* (impact site)**

Part A: Significant impact calculation *Area*

	Description	Quantum of impact	
Significant impact	Clearing of 12.75 ha of Bush Forever Site 481	Significant impact (hectares)	12.75
		Quality (scale)	0.00
		Total quantum of impact	0.00

Part B: Rehabilitation credit calculation *Area* (onsite)

	Description				
Rehabilitation Credit		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	0.00
	Rehabilitation credit	0.00
	Significant residual impact	0.00

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Bush Forever Site 481, Stirling Cresent, Hazelmere	Significant impact (step 2, part A)	12.75
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	0.00

Area **(offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	25.00	**Duration of offset implementation (maximum 20 years)**			
	Mirrabooka Bushland - Bush Forever Site 385 Reid Highway Bushland	**Current quality of offset site (scale)**		**Time until offset site secured (years)**			
		Future quality WITHOUT offset (scale)		**Risk of future loss WITHOUT offset (%)**		**Offset value Conservation area** (applied to step 2, part A)	**2**
		Future quality WITH offset (scale)		**Risk of future loss WITH offset (%)**			**98.0%**
		Time until ecological benefit (years)					
		Confidence in offset result (%)				**OFFSET ADEQUATE?**	**NO**

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 481, Stirling Cresent, Hazelmere		The proposed clearing will impact a total of 12.75 ha of vegetation associated with Bush Forever Site 481.
Type of environmental value	Conservation area		Bush Forever Site under SPP 2.8
Conservation significance of environmental value	Bush Forever site		Clearing of 12.75 ha of Bush Forever site 481.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 12.75 ha of Bush Forever Site 481		The proposed clearing will impact 12.75 ha of vegetation associated with Bush Forever Site 481, known to contain Banksia Woodlands of the Swan Coastal Plain PEC.
Significant impact (hectares) / Type of feature	12.75		Clearing of 12.75 ha of native vegetation associated with Bush Forever Site 481 that contains TECs, CCW and is in condition: Degraded 0.55 ha Good 3.65 ha Very Good to Good 1.12 ha Very Good 3.91 ha Excellent to Very Good 3.51 ha
Quality (scale) / Number	0.00		NA
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Mirrabooka Bushland - Bush Forever Site 385 Reid Highway Bushland		Offset containing vegetation within a Bush Forever site
Proposed offset (area in hectares)	25.00		A total of 25.0 ha of native vegetation within Bush Forever site 385.
Current quality of offset site / Start number (of type of feature)	0.00		Not Applicable
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	0.00		Not Applicable
Future quality WITH offset (scale) / Future number WITH offset	0.00		Not Applicable
Time until ecological benefit (years)	0.00		Not Applicable
Confidence in offset result (%)	0		Not Applicable
Duration of offset implementation (maximum 20 years)	0.00		Not Applicable
Time until offset site secured (years)	0.00		Not Applicable
Risk of future loss WITHOUT offset (%)	0.0%		Not Applicable
Risk of future loss WITH offset (%)	0.0%		Not Applicable
Offset ratio (Conservation area only)	2		Maximum ratio under SPP 2.8 of 2 has been applied as the conservation significance of the vegetation to be impacted is 'Very High' due to the presence of TEC, CCW and vegetation in Good to 'Excellent to Very Good' condition.

Appendix E – Neaves Road Offset Calculators

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Carnaby's Black Cockatoo (Zanda latirostris)
	Type of environmental value	Species (flora/fauna)
	Conservation significance of environmental value	Rare/threatened species - endangered
	Conservation significance score	**1.2%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Carnaby's Black Cockatoo (Zanda latirostris)

***Area* (impact site)**

Part A: Significant impact calculation *Area*

	Description	Quantum of impact	
Significant impact	Clearing of 23.24 ha of Carnaby's Black Cockatoo (Zanda latirostris) foraging habitat, which is also an EPBC Act listed Endagered species.	Significant impact (hectares)	23.24
		Quality (scale)	6.00
		Total quantum of impact	13.94

Part B: Rehabilitation credit calculation *Area* (onsite)

	Description				
Rehabilitation Credit		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	13.94
	Rehabilitation credit	0.00
	Significant residual impact	13.94

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Carnaby's Black Cockatoo (Zanda latirostris)	Significant impact (step 2, part A)	23.24
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	13.94

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	1.06	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**0.36**
	Neaves Road, Bullsbrook	**Current quality of offset site (scale)**	2.00	**Time until offset site secured (years)**	1.00		**2.6%**
		Future quality WITHOUT offset (scale)	2.00	**Risk of future loss WITHOUT offset (%)**	15.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	10.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	80.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	Carnaby's Black Cockatoo (Zanda latirostris)		The proposed clearing will impact on 23.24 ha of foraging habitat for CBC.
Type of environmental value	Species (flora/fauna)		CBC is listed as Endangered under the state BC Act.
Conservation significance of environmental value	Rare/threatened species - endangered		CBC is listed as Endangered under the state BC Act and the Commonwealth EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 23.24 ha of Carnaby's Black Cockatoo (Zanda latirostris) foraging habitat, which is also an EPBC Act listed Endagered species.		Native vegetation comprising of suitable foraging habitat for CBC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	23.24		Clearing of 23.24 ha of native vegetation representative of suitable CBC habitat.
Quality (scale) / Number	6.00		Habitat Quality Score has been assessed based on the EPBC HQS assessment and determined that CBC habitat quality was '6' (GCA 2024). The habitat contains a wide range of vegetation types, with the dominant vegetation type is Banksia open woodland over Xanthorrhoea preissii open shrubland.
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Neaves Road, Bullsbrook		Revegetation offset for foraging habitat for CBC.
Proposed offset (area in hectares)	1.06		A total of 1.06 ha of the site will be revegetated to counterbalance impacts to CBC foraging as part of project works.
Current quality of offset site / Start number (of type of feature)	2.00		Astron (2025) mapped the foraging habitat as 'Mixed Planted Trees' with a habitat score of 2. This habitat type offers minimal foraging value for CBC (Astron 2025)
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	2.00		The site is degraded and will not naturally regenerate to provide CBC foraging habitat without human intervention.
Future quality WITH offset (scale) / Future number WITH offset	7.00		Main Roads will implement a revegetation plan (GCA 2023) across the entire Neaves Road site, including the offset site for CBC. Revegetation activities will improve CBC habitat to '7' quality.
Time until ecological benefit (years)	10.00		It is assumed that it will take approximately 10 years to achieve the desired species diversity, vegetation cover and weed density. The ecological benefit will be achieved at 10 years.
Confidence in offset result (%)	0.8		A high degree of confidence is assigned as CBC revegetation is well understood by Main Roads and an adaptive management approach will ensure issues arising can be adequately managed.
Duration of offset implementation (maximum 20 years)	20.00		The site will be managed by Main Roads as an offset for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	15.0%		The land is 'rural' zoned under the MRS and helld in freehold title by Main Roads. Risk of loss without the offset has been set at 15%

Risk of future loss WITH offset (%)	10.0%		Onground management will deliver improvement in foraging quality and ensure that the risk of environmental values at the offset site being further impacted over the 20 year duration of the offet is reduced. While the site will not be placed under secure tenure, it will be actively managed as an offset site and has been captured in Main Roads property management system for long-term protection
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Forest Red-tailed Black-Cockatoo (Calytorhynchus banksii naso)
	Type of environmental value	Species (flora/fauna)
	Conservation significance of environmental value	Rare/threatened Species - vulnerable
	Conservation significance score	**0.2%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Forest Red-tailed Black-Cockatoo (Calytorhynchus banksii naso)

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Clearing of 23.234 ha of Forest Red-tailed Black-Cockatoo foraging	Significant impact (hectares)	23.24
		Quality (scale)	6.00
		Total quantum of impact	13.94

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	13.94
	Rehabilitation credit	0.00
	Significant residual impact	13.94

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Forest Red-tailed Black-Cockatoo (Calytorhynchus banksii naso)	Significant impact (step 2, part A)	23.24
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	13.94

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	1.65	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**0.61**
	Neaves Road, Bullsbrook	**Current quality of offset site (scale)**	2.00	**Time until offset site secured (years)**	1.00		**4.4%**
		Future quality WITHOUT offset (scale)	2.00	**Risk of future loss WITHOUT offset (%)**	15.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	10.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	80.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	Forest Red-tailed Black-Cockatoo (Calytorhynchus banksii naso)		The proposed clearing will impact on 23.24 ha of foraging habitat for FRTBC.
Type of environmental value	Species (flora/fauna)		FRTBC is listed as Vulnerable under the state BC Act.
Conservation significance of environmental value	Rare/threatened Species - vulnerable		FRTBC is listed as Vulnerable under the state BC Act and the Commonwealth EPBC Act.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of 23.234 ha of Forest Red-tailed Black-Cockatoo foraging		Native vegetation comprising of suitable foraging habitat for FRTBC is proposed to be cleared for GEHBI.
Significant impact (hectares) / Type of feature	23.24		Clearing of 23.24 ha of native vegetation representative of suitable FRTBC habitat.
Quality (scale) / Number	6.00		Habitat Quality Score has been assessed based on the EPBC HQS assessment. The habitat contains a range of suitable FRTBC foraging habitat, including Jarrah woodland, Flooded Gum open and closed forest, Marri open woodland. There is foraging evidence for FRTBC and the presence of suitable foraging habitat and the impact site been assessed to provide 'low to moderate' foraging habitat for FRTBC and assigned a score of '6'.
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Neaves Road, Bullsbrook		Revegetation offset for foraging habitat for FRTBC.
Proposed offset (area in hectares)	1.65		A total of 1.65 ha of native vegetation within the site will be used to counterbalance impacts to FRTBC foraging as part of project works.
Current quality of offset site / Start number (of type of feature)	2.00		Astron (2025) mapped the foraging habitat as 'Mixed Planted Trees' with a habitat score of 2. This habitat type offers minimal foraging value for FRTBC (Astron 2025)
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	2.00		The site is degraded and will not naturally regenerate to provide FRTBC foraging habitat without human intervention.
Future quality WITH offset (scale) / Future number WITH offset	7.00		Main Roads will implement a revegetation plan (GCA 2023) across the entire Neaves Road site, including the offset site for FRTBC. Revegetation activities will improve FRTBC habitat to '7' quality.
Time until ecological benefit (years)	10.00		It is assumed that it will take approximately 10 years to achieve the desired species diversity, vegetation cover and weed density. The ecological benefit will be achieved at 10 years.
Confidence in offset result (%)	0.8		A high degree of confidence is assigned as FRTBC revegetation is well understood by Main Roads and an adaptive management approach will ensure issues arising can be adequately managed.
Duration of offset implementation (maximum 20 years)	20.00		The site will be managed by Main Roads as an offset for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	15.0%		The land is 'rural' zoned under the MRS and helld in freehold title by Main Roads. Risk of loss without the offset has been set at 15%

Risk of future loss WITH offset (%)	10.0%		Onground management will deliver improvement in foraging quality and ensure that the risk of environmental values at the offset site being further impacted over the 20 year duration of the offet is reduced. While the site will not be placed under secure tenure, it will be actively managed as an offset site and has been captured in Main Roads property management system for long-term protection
Offset ratio (Conservation area only)	N/A		

WA Environmental Offsets calculator

PLEASE ENABLE MACROS FOR THIS SPREADSHEET

Produced by:

The Department of Water and Environmental Regulation (DWER) in consultation with stakeholder working groups

Purpose:

Use the WA Envirionmental Offsets calculator in conjunction with the *Environmental offsets metric: Quantifying environmental offsets in Western Australia* guideline. Together, they form a supplement to section 4 of the *WA Environmental Offsets Guidelines* and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets.

Data currency:

The correct application of the WA Environmental Offsets Calculator relies on access to current datasets (such as vegetation extent and land tenure).

Process for using the WA Environmental Offsets Calculator		
Step	**Worksheet**	**Component**
Step 1: Determining conservation significance	**Step1_ConservationSignificance**	**Conservation significance determination**
		Combined *area* /*feature*
Step 2: Calculating significant residual impact	**Step2_SignificantResidualImpact**	**Part A: Significant impact calculation**
		Separate *area* or *feature* calculations
		Part B: Rehabilitation credit calculation
		Separate *area* or *feature* calculations
		Part C: Significant residual impact calculation
		Separate *area* or *feature* calculations
Step 3: Calculating offsets	**Step3_Offsets**	**Offsets calculation**
		Separate *area* or *feature* calculations
Rationale for scores used in the Offsets Calculator	**Rationale**	**All**

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**	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)
	Type of environmental value	Wetland/watercourse
	Conservation significance of environmental value	A category or type of wetland or watercourse for which an offset is required
	Conservation significance score	**0.1%**

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

WA Environmental Offsets Calculator

Step 2: Calculating significant residual impact

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

Environmental value (step 1)	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)

***Area* (impact site)**

Part A: Significant impact calculation *Area*

Significant impact	Description	Quantum of impact	
	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)	Significant impact (hectares)	3.15
		Quality (scale)	5.00
		Total quantum of impact	1.58

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	1.58
	Rehabilitation credit	0.00
	Significant residual impact	1.58

WA Environmental Offsets Calculator

Step 3: Calculating offsets

Key:

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

Environmental value (step 1)	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)	Significant impact (step 2, part A)	3.15
		Rehabilitation credit (step 2, part B)	0.00
		Significant residual impact (step 2, part C)	1.58

***Area* (offset site)**

Offset calculation *Area*							
Offsets calculation	**Description**	**Proposed offset (area in hectares)**	4.92	**Duration of offset implementation (maximum 20 years)**	20.00	**Offset value**	**1.05**
	Neaves Road, Bullsbrook	**Current quality of offset site (scale)**	4.00	**Time until offset site secured (years)**	1.00		**66.8%**
		Future quality WITHOUT offset (scale)	4.00	**Risk of future loss WITHOUT offset (%)**	10.0%		
		Future quality WITH offset (scale)	7.00	**Risk of future loss WITH offset (%)**	10.0%		
		Time until ecological benefit (years)	10.00				
		Confidence in offset result (%)	80.0%			**OFFSET ADEQUATE?**	**NO**

WA Environmental Offsets Calculator

Rationale for scores used in the offsets calculator

Environmental value to be offset			
Calculation	***Score (Area)***		***Rationale***
Conservation significance			
Description	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)		The proposed clearing will impact a total of 3.15 ha CCW.
Type of environmental value	Wetland/watercourse		CCW wetland.
Conservation significance of environmental value	A category or type of wetland or watercourse for which an offset is required		Clearing of 3.15 ha of vegetation growing in association with a CCW defined under the Geomorphic Wetlands of the Swan Coastal Plain dataset.
Landscape-level value impacted	yes/no		NA
Significant impact			
Description	Clearing of up to a total of 3.15 ha of native vegetation associated with CCW UFI 15540 (2.46 ha) and UFI 15266 (0.69 ha)		The proposed clearing will impact a total of 3.15 ha of CCW.
Significant impact (hectares) / Type of feature	3.15		Clearing of 3.15 ha of vegetation growing in association with a CCW defined under the Geomorphic Wetlands of the Swan Coastal Plain dataset.
Quality (scale) / Number	5.00		Wetland vegetation proposed to be cleared comprises of Corymbia calophylla open woodland, Eucalyptus rudis subsp. rudis open forest, Allocasuarina fraseriana open woodland and Jacksonia floribunda scattered shrubland. Habitat Quality Score has been determined based on the proportional condition of the vegetation to be cleared. Proportionate scores are based as follows: - 0.93 ha x Excellent-Very Good – 7 - 0.27 ha x Very Good – 6 - 0.65 ha x Good – 4 - 1.30 ha x Degraded – 2
Rehabilitation credit			
Description	0		
Proposed rehabilitation (area in hectares)	0.00		
Current quality of rehabilitation site / Start number (of type of feature)	0.00		
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	Neaves Road, Bullsbrook		Offset containing vegetation growing in association with CCW.
Proposed offset (area in hectares)	4.92		A total of 4.92 ha of native vegetation growing in association with a Conservation Category Wetlands of the Swan Coastal Plain
Current quality of offset site / Start number (of type of feature)	4.00		Wetland vegetation in 'Completely Degraded' to 'Very Good' condition, primarily in 'Good' condition and therefore a score of '4' has been assigned..
Future quality WITHOUT offset (scale) / Future number WITHOUT offset	4.00		Without revegetation and active management the site will not improve, but is unlikely to significantly decline in quality.
Future quality WITH offset (scale) / Future number WITH offset	7.00		Main Roads will implement a revegetation plan (GCA 2023) across the entire Neaves Road site, including the offset site for wetlands. Revegetation activities will improve overall wetland vegetation quality to '7'.
Time until ecological benefit (years)	10.00		It is assumed that it will take approximately 10 years to achieve the desired species diversity, vegetation cover and weed density. The ecological benefit and improvement in CCW quality will be achieved at 10 years.
Confidence in offset result (%)	0.8		A moderate degree of confidence is assigned as wetland revegetation is well understood by Main Roads and an adaptive management approach will ensure issues arising can be adequately managed.

Duration of offset implementation (maximum 20 years)	20.00		The site will be managed by Main Roads as an offset for 20 years.
Time until offset site secured (years)	1.00		The site will be secured as an offset within 1 year.
Risk of future loss WITHOUT offset (%)	10.0%		Risk of loss without offset has been set at 10% as the CCW offset location is within Bush Forever site 100, however, the site has not been actively managed for conservation purposes
Risk of future loss WITH offset (%)	10.0%		Risk of loss with the offset has been set at 5%. While the offset site is within BF site 100, is it located on freehold title and has not been subject to active onground management. Implementation of the offset will reduce the risk that onsite environmental values will be be lost in the future.
Offset ratio (Conservation area only)	N/A		