Main Roads

Tonkin Grade Separated Interchanges, Hale Road and Welshpool Road, EPBC 2019/8529

Draft Offset Strategy

March 2021

GHD scope and limitations

Main Roads Western Australia (Main Roads) commissioned GHD Pty Ltd (GHD) to prepare an offset strategy to support Preliminary Documentation for EPBC 2019/8529 Tonkin Grade Separated Interchanges, Hale Road and Welshpool Road for submission to Department of Agriculture, Water, and the Environment.

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Executive summary

Main Roads Western Australia (Main Roads) proposes to upgrade Tonkin Highway from the south of Roe Highway to approximately 1 km north of Kelvin Road (the Proposed Action) within the City of Kalamunda.

The Proposed Action consists of a single fly-over and grade-separated interchange at the existing intersections of Tonkin Highway and Hale Road in Forrestfield, and Tonkin Highway and Welshpool Road in Wattle Grove, respectively. The Proposed Action will also involve the reconstruction of approximately 4.5 km of Tonkin Highway into a six-lane dual carriageway. The Proposed Action will improve accessibility, travel times and road safety as well as sustaining jobs and enabling regional development in Perth's south eastern suburbs.

As the Proposed Action may have a significant impact on Matters of National Environmental Significance (MNES), Main Roads was required to prepare Preliminary Documentation to inform the assessment of the relevant impacts of the Proposed Action. This Preliminary Documentation was prepared in response to a request by Department of Agriculture, Water, and Environment (DAWE) on 5 December 2019 for additional information to support assessment of impacts for the Proposed Action (EPBC 2019/8529) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Proposed Action will result in significant residual impacts to Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (BWSCP TEC), Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Forest Red-tailed Black Cockatoo (FRTBC, *Calyptorhynchus banksii naso*), Baudin's Cockatoo (*Calyptorhynchus baudini*i), Wavy-Leaved Smokebush (*Conospermum undulatum*), Slender Andersonia (*Andersonia gracilis*), and Summer Honeypot (*Banksia mimica*), due to the following impacts:

- Clearing of up to 3.99 ha of BWSCP TEC
- Clearing of up to 141 potential breeding trees (> 500 mm Diameter at Breast Height) for Black Cockatoo species, none of which contain hollows suitable for Black Cockatoo nesting
- Clearing of up to 18.7 ha of moderate to low quality foraging habitat for Carnaby's Cockatoo
- Clearing of up to 7.9 ha of high to moderate quality foraging habitat and 11.3 ha of moderate to low quality foraging habitat for FRTBC and Baudin's Cockatoo (total 19.1 ha of foraging habitat)
- Loss of up to 62 individuals of Wavy-Leaved Smokebush and 7.45 ha of suitable habitat
- Loss of up to 11 individuals of Slender Andersonia
- Loss of three individuals of Summer Honeypot.

This draft Offset Strategy has been prepared to support the Preliminary Documentation (GHD 2021a), to demonstrate Main Roads' commitment to offset the Proposed Action's significant residual impacts to BWSCP TEC, Black Cockatoos and threatened flora.

The draft Offset Strategy comprises Main Roads pursuing a number of offset packages, in the form of land acquisition of third party freehold land or transfer of Main Roads owned land to the conservation estate, to counterbalance the potential significant impacts of the Proposed Action.

Identification and acquisition of land to counterbalance significant residual environmental impacts associated with Main Roads infrastructure projects is now being managed through a

Memorandum of Understanding (MoU) between Main Roads and Department of Biodiversity, Conservation and Attractions (DBCA). The MoU commits Main Roads funding to assist DBCA in identifying and acquiring suitable land offsets to be added to the conservation estate. Once suitable offset land in acquired, Main Roads will reimburse DBCA the land acquisition costs. Acquisition of suitable offset land aims to satisfy Commonwealth and State environmental compliance requirements.

Details of Offsets 1-5 (including locality) remain commercial in confidence at this time and will be provided upon the outcome of commercial negotiations.

Overview of offset package under consideration

The table below provides a summary of the potential for the offset package to counterbalance the potential significant residual impacts to BWSCP TEC, Carnaby's Cockatoo FTBC, Baudin's Cockatoo, *Conospermum undulatum, Andersonia gracilis,* and *Banskia mimica.*

The draft Offset Strategy will be refined subject to commercial negotiations with property owners, and consultation with the WA Department of Biodiversity, Conservation and Attractions (DBCA). Once the strategy is agreed with DBCA, Main Roads will develop a detailed Offset Proposal for submission and approval under the EPBC Act.

No.	Offset type	Offset summary	Property Location	Existing tenure
1. Gingin offset	Direct	Land transfer to DBCA 21 ha BWSCP TEC 96 ha Carnaby's Cockatoo 90 ha FRTBC	Confidential pending survey and negotiation with property owners	Freehold owned by third parties
2. Lake Clifton offset	Direct	Land transfer to DBCA 98 ha Baudin's Cockatoo		
3. Slender Andersonia offset	Direct	Land transfer to DBCA 75 individuals Slender Andersonia		
4. Mogumber offset	Direct	Land transfer to DBCA 21 individuals Summer Honeypot		
5. Maddington offset	Direct	Land transfer to DBCA 125 individuals and 16 ha of suitable habitat for Wavy-Leaved Smokebush		

Summary of preliminary offset calculations

Preliminary offset calculations were completed using the EPBC Act Offset Assessment Guide to determine the counterbalance of the offset packages being considered. As presented in the below table, the offset package is expected to provide adequate compensation for significant residual impacts to the MNES from this Proposed Action.

Residual impacts to MNES	Offset 1 Gingin offset	Offset 2 Lake Clifton offset	Offset 3 Slender Andersonia offset	Offset 4 Mogumber offset	Offset 5 Maddington offset
MNES values confirmed	Inferred, to be surveyed	Inferred, to be surveyed	Inferred, to be surveyed	Inferred, to be surveyed	Inferred, to be surveyed
BWSCP TEC 3.99 ha x quality 6 = 2.39 ha total	21 ha = 104% of impact offset	May contain TEC, not accounted for in this offset	Site unlikely to be suitable	May contain TEC, not accounted for in this offset	May contain TEC, not accounted for in this offset
Carnaby's Cockatoo 18.74 ha x quality 6 = 11.24 ha total	96 ha = 100% of impact offset	May contain habitat, not accounted for in this offset	Site unlikely to be suitable	May contain habitat, not accounted for in this offset	May contain habitat, not accounted for in this offset
FRTBC 19.14 ha x quality 6 = 11.48 ha total	90 ha = 100% of impact offset	May contain habitat, not accounted for in this offset	Site unlikely to be suitable	May contain habitat, not accounted for in this offset	May contain habitat, not accounted for in this offset
Baudin's Cockatoo 19.14 ha x quality 6 = 11.48 ha total	May contain habitat, not accounted for in this offset	98 ha = 100% of impact offset	Site unlikely to be suitable	Site unlikely to be suitable	May contain habitat, not accounted for in this offset
Slender Andersonia 11 individuals	Site unlikely to be suitable	Site unlikely to be suitable	75 individuals = 101% of impact offset	Site unlikely to be suitable	Site unlikely to be suitable
Summer Honeypot Three individuals	May contain populations, not accounted for in this offset	Site unlikely to be suitable	Site unlikely to be suitable	21 individuals = 104% of impact offset	Site unlikely to be suitable
Wavy-Leaved Smokebush 62 individuals 7.45 ha critical habitat x quality 6 = 4.47 ha total	Site unlikely to be suitable	Site unlikely to be suitable	Site unlikely to be suitable	Site unlikely to be suitable	125 individuals = 101% of impact offset 16 ha = 100% of impact offset

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1. Introduction

1.1 Proposed Action background

Main Roads Western Australia (Main Roads) proposes to upgrade Tonkin Highway from south of Roe Highway to approximately 1 km north of Kelvin Road, within the City of Kalamunda (the Proposed Action). Figure 1 presents the Proposed Action location and Development Envelope (DE). The DE comprises an area of approximately 51.5 ha and represents the preliminary impact footprint.

Tonkin Highway is a major arterial highway in the Perth metropolitan area that links Perth Airport and Kewdale with south-eastern and north-eastern suburbs. Welshpool Road is a major arterial road intersecting Tonkin Highway in Wattle Grove. Hale Road is a minor arterial road that currently provides alternative access to Tonkin Highway from Forrestfield.

The Proposed Action consists of construction and operation of a dual carriageway (three lanes in each direction, with provision for four lanes in the future), a fly-over at the intersection with Hale Road and a grade separated interchange at the intersection with Welshpool Road.

The Proposed Action aims to improve the efficiency of Tonkin Highway by grade separating Hale and Welshpool Roads allowing a continuous flow of traffic. The Proposed Action will alleviate the pressure on the existing transport network, as both the intersections of Welshpool Road and Hale Road experience significant volumes of heavy freight traffic. The Proposed Action also aims to improve pedestrian safety, and reduce congestion and potential vehicular conflict.

As the Proposed Action may have a significant impact on Matters of National Environmental Significance (MNES), Main Roads was required to prepare Preliminary Documentation to inform the assessment of the relevant impacts of the Proposed Action. This Preliminary Documentation was prepared in response to a request by Department of Agriculture, Water, and Environment (DAWE) on 5 December 2019 for additional information to support assessment of impacts for the Proposed Action (EPBC 2019/8529) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Proposed Action description

The Proposed Action includes:

- Construction and operation of a 4.2 km six lane dual carriageway from south of Roe Highway to approximately 1 km north of Kelvin Road
- Single fly-over (half diamond with North facing ramps) at the intersection with Hale Road
- Grade separated (egg-about) interchange at Welshpool Road
- Principal Shared Path (PSP) on the eastern side of the Tonkin Highway for the full length and grade separation at interchanges
- Concrete footpath on side roads with link to the PSP
- Single span bridges for grade separation interchanges
- Installation of associated road infrastructure, such as lighting, noise and retaining walls, safety barriers, stopping bays and traffic monitoring devices, signs and landscaping
- Drainage basins, drains and other associated infrastructure.

1.3 Purpose of this strategy

This draft Offset Strategy has been prepared to support the Preliminary Documentation for the Proposed Action, to demonstrate Main Roads' commitment to offset the Proposed Action's significant residual impacts to MNES.

This draft Offset Strategy will be refined subject to commercial negotiations with property owners, and consultation with the WA Department of Biodiversity, Conservation and Attractions (DBCA). Once land has been adequately assessed and/or acquired, Main Roads will develop a detailed Offset Proposal for submission and approval under the EPBC Act. Acquisition of suitable offset land aims to satisfy Commonwealth and State environmental compliance requirements.

Paper Size ISO A3

0 200 400 600 800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

0

Main Roads
Tonkin Grade Separated Interchanges

Proposal location and Development Envelope

Project No. 12523571
Revision No. 0
Date 28/10/2020

FIGURE 1

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Print date: 28 Oct 2020 - 15:11

Data source: Landgate_Subscription_Imagery\WANow Landgate / SLIP. Created by: bmorgan

2. Predicted impacts of Proposed Action

2.1 Controlling provisions

The Proposed Action has been determined a controlled action under the EPBC Act due to the likelihood of significant impacts on listed threatened species and communities (Sections 18 and 18A of the Act). The Preliminary Documentation (GHD 2021b) concludes that the Proposed Action will result in significant residual impacts to the following listed threatened species and communities:

- Banksia Woodlands of the Swan Coastal Plain ecological community (Endangered) (BWSCP TEC)
- Forest Red-tailed Black Cockatoo (FRTBC, *Calyptorhynchus banksii naso*) (Vulnerable)
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (Endangered)
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) (Endangered)
- Wavy-Leaved Smokebush (*Conospermum undulatum*) (Vulnerable)
- Slender Andersonia (*Andersonia gracilis*) (Endangered)
- Summer Honeypot (*Banksia mimica)* (Vulnerable).

The Preliminary Documentation (GHD 2021b) provides details of the predicted impacts of the Proposed Action to the above MNES. This information is summarised below.

2.2 Existing environment

2.2.1 Survey

The MNES within the DE has been determined through biological surveys as follows:

1. Woodman Environmental Consulting (Woodman) (2021) biological survey over a 193.64 ha Survey Area comprising the DE and surrounding land, including:
   - Detailed flora and vegetation survey in accordance with WA Environmental Protection Authority (EPA) guidance (EPA 2016a)
   - Level 1 terrestrial fauna survey in accordance with WA EPA guidance (EPA 2016b)
   - Targeted Black Cockatoo habitat assessment in accordance with EPBC Act referral guidelines (DSEWPaC 2012).
2. GHD (2020a) in-fill survey of 0.73 ha to address gaps in flora, vegetation and Black Cockatoo habitat mapping in three small areas in the vicinity of the Tonkin Highway/Hale Road intersection. This provided complete coverage of the DE.
3. GHD (2021a) targeted flora survey and black cockatoo hollow assessment. The survey targeted threatened orchids and investigated two trees with hollows that were identified by Woodmand (2021) as potentially suitable for nesting.
4. Glevan Consulting (2020) Phytophthora dieback occurrence assessment over the DE.

2.2.2 Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC)

The biological survey (Woodman 2021) mapped approximately 27.93 ha of BWSCP TEC over seven patches within the 193.64 ha Survey Area. Patch 1 lies approximately 1 km to the north of the DE. Patches 2 to 5 lie within the Hartfield Park Bush Forever site, within or adjacent to the DE. Patches 6 and 7 lie approximately 0.5 km to the south of the DE, adjacent to Kelvin Road. Half of the TEC area (13.8 ha) is contained within Patch 2, which is located within Hartfield Park. The remaining patches are smaller in size, ranging from approximately 1 to 4 ha.

The DE covers approximately 3.99 ha of TEC over four patches (Patches 2 to 5), which have been fragmented by the previous development of Tonkin Highway. Table 1 presents the condition of the TEC in the Survey Area and in the DE, which indicates the TEC within the DE is relatively degraded compared to that of surrounding vegetation.

Table 1 Banksia Woodlands of the Swan Coastal Plain TEC within the DE

Vegetation condition	Area within Survey Area (ha)	Area within DE (ha)
Excellent	17.63	0.97
Very Good	8.54	1.34
Good	1.22	1.21
Degraded	0.55	0.47
Total	**27.9**	**3.99**

2.2.3 Black Cockatoo habitat

Breeding habitat

The Preliminary Documentation identified a total of 141 trees (> 500 mm DBH) that comprise native species known to support Black Cockatoo breeding, as summarised in Table 2. None of the trees within the DE contain potentially suitable hollows.

Table 2 Potential Black Cockatoo breeding trees within the DE

Tree species	Number of potential breeding trees within DE (DBH > 500)	Number of trees with suitable hollows	Number of suitable hollows
Marri	91	-	-
Jarrah	5	-	-
Flooded Gum	31	-	-
Coastal Blackbutt	6	-	-
Stag	8	-	-
Total	**141**	**0**	**0**

The DE is unlikely to be current breeding habitat for Carnaby's Cockatoo and FRTBC, given the lack of breeding recorded in the DE or in the eastern Perth Metropolitan Region on the Swan Coastal Plain (SCP). The DE may potentially provide breeding habitat at some point in the future if Carnaby's Cockatoo and FRTBC breeding patterns change and move from the Jarrah forest onto woodland remnants in the eastern SCP, however this is considered unlikely.

The DE is unlikely to provide breeding habitat for Baudin's Cockatoo. Although the species uses the northern Jarrah forest and eastern fringes of the Perth Metropolitan Region for foraging during the winter, the species' known breeding areas and predicted breeding range predominantly lie within the southern Jarrah and Karri forests in the South-West region of WA.

Foraging habitat

Foraging residues from all three species of Black Cockatoo were recorded (Woodman 2021), with mapped foraging habitat over the DE summarised in Table 3. The DE comprises approximately 18.7 ha of moderate to low value foraging habitat (score 2-4) for Carnaby's Cockatoo, and 7.9 ha of high to moderate value foraging habitat (score 5) and 11.3 ha of moderate to low value foraging habitat (score 2-4) for Baudin's Cockatoo and FRTBC, respectively. The nil to negligible value foraging habitat (score 0-1) within the DE is not considered significant and is not accounted for in impact or offset calculations.

Table 3 Black Cockatoo foraging habitat within the DE

Habitat score / value	Carnaby's Cockatoo		Forest Red-tailed Black Cockatoo		Baudin's Cockatoo	
	(ha)	Proportion	(ha)	Proportion	(ha)	Proportion
5: High to moderate	0.0	0.0%	7.9	15.3%	7.9	15.3%
4: Moderate	15.0	29.2%	6.4	12.5%	6.4	12.5%
3: Moderate to low	1.9	3.8%	2.7	5.3%	2.7	5.2%
2: Low	1.8	3.4%	2.1	4.1%	2.2	4.2%
1: Negligible	2.8	5.4%	2.4	4.6%	2.4	4.6%
0: Nil	30.0	58.2%	30.0	58.2%	30.0	58.2%
Total	**51.5**	**100%**	**51.5**	**100%**	**51.5**	**100%**

Roosting habitat

No known roosting sites were recorded within the DE (Woodman 2021), despite observations of FRTBC throughout the day and evidence of recent foraging. One potential roost site was identified within the Survey Area in the vicinity of the Hartfield Golf Club.

2.2.4 Threatened Flora

Woodman (2021) recorded populations of three listed threatened flora species within the Survey Area and DE, as summarised in as Table 4.

Table 4 Threatened flora within the DE

Species	Individuals within Survey Area	Individuals within DE
Wavy-Leaved Smokebush	1114	62
Slender Andersonia	34	11
Summer Honeypot	30	3

Woodman (2021) recorded 7.45 ha of suitable habitat for Wavy-Leaved Smokebush within the DE as presented in Table 5, The habitat surrounds the important population located within the Hartfield Park Bush Forever site 320 and accordingly is considered to be critical to the survival of the species. Much of the mapped habitat is not populated by the species, which instead is found in dense, clumped populations.

Table 5 Wavy-leaved Smokebush habitat within the DE

Vegetation type	Condition	Area within the DE (ha)
VT1	Excellent	0.97
	Very Good	1.34
	Good	1.20
	Degraded	0.73
VT2	Excellent	1.27
	Very Good	0.14
	Good	0.36
	Degraded	1.42
Total		**7.45**

2.2.5 Threatening processes

Significant weeds

Woodman (2021) recorded 68 introduced taxa in the biological survey, of which 32 were found within the DE. Four of the introduced taxa within the DE are Declared Pest weed species under the Western *Australian Biosecurity and Management Act 2007* and two are a Weed of National Significance (WoNS):

- **Asparagus asparagoides* (Bridal Creeper) – Declared Pest and WoNS
- **Echium plantagineum* (Paterson's Curse) – Declared Pest
- **Moraea flaccida* (One-leaf Cape tulip) – Declared Pest
- **Opuntia stricta* (Common Prickly Pear) – Declared Pest and WoNS.

Phytophthora dieback

Glevan Consulting (2020) identified areas of *Phytophthora* dieback infestation within the DE between Hale Road and Welshpool Road intersections. Adjacent land to the West and East of the DE, within Hartfield Park, was identified as likely infested and associated with wetland areas. Areas of uninfested land were identified within the DE, south of the Hale Road intersection.

Phytophthora dieback is identified as a threatening process to BWSCP TEC, Slender Andersonia and Summer Honeypot, as well as impacting on key Black Cockatoo habitat species such as Jarrah and Banksia.

2.2.6 Predicted impacts

The Proposed Action will result in significant residual impacts to BWSCP TEC, Black Cockatoos, Wavy-Leaved Smokebush, Slender Andersonia and Summer Honeypot due the following direct impacts:

- Clearing of up to 3.99 ha of BWSCP TEC
- Loss of Black Cockatoo habitat including:
  - Clearing of up to 142 potential breeding trees for Black Cockatoos, none of which contain hollows suitable for Black Cockatoo nesting
  - Clearing of up to 18.7 ha moderate to low value foraging habitat for Carnaby's Cockatoo

  - Clearing of up to 7.9 ha of high to moderate value foraging habitat and 11.3 ha of moderate to low value foraging habitat for Baudin's Cockatoo and FRTBC
- Loss of known conservation significant flora, including:
  - Loss of up to 62 individuals of Wavy-Leaved Smokebush and 7.45 ha of suitable habitat
  - Loss of up to 11 individuals of Slender Andersonia
  - Loss of three individuals of Summer Honeypot.

The Proposed Action will not result in impacts to known or potential nesting hollows or roosting sites for Carnaby's Cockatoo, FRTBC or Baudin's Cockatoo.

The above estimates are conservative, representing the full extent of MNES values within the 51.5 ha DE. The actual clearing footprint is expected to be less and will be refined through the detailed design and construction planning process.

The Proposed Action is not expected to result in significant indirect impacts to BWSCP TEC, Carnaby's Cockatoo, FRTBC, Baudin's Cockatoo, Wavy-Leaved Smokebush, Slender Andersonia or Summer Honeypot. The Proposed Action will not fragment BWSCP TEC, Black Cockatoo or Threatened flora habitat, with clearing being limited to the edges of existing disturbed corridors.

3. Proposed environmental offsets

3.1 Overview of offset package

Main Roads are investigating a number of options to develop a package of offsets to counterbalance the significant residual impacts of the Proposed Action to BWSCP TEC, Carnaby's Cockatoo, FRTBC, Baudin's Cockatoo, Wavy-Leaved Smokebush, Slender Andersonia and Summer Honeypot. The options under investigation comprise acquisition of land and funding of land management. Table 6 provides an overview of the offset package under investigation.

The direct offsets involve acquisition of land by the Crown and land transfer to the conservation estate, which will enable land management by DBCA. DBCA is the WA State Government agency responsible for the management of conservation land throughout the state. DBCA manages conservation land through the implementation of the *Conservation and Land Management Act 1984* (CALM Act). Land vested with DBCA, either through a reserve vesting or a management order on freehold estate, is their responsibility to manage for the purposes of conservation. Land vested with DBCA in the conservation estate therefore provides a high level of security to maintain the offset ecological values and DBCA manages the land in perpetuity.

DBCA has developed a *Corporate Guideline No. 14 – Environmental Offsets – Proponent Land Management Contributions* that outlines how proponents are to contribute management funding to DBCA for a land offset. This guideline specifies that DBCA seek payment from proponents for reasonable management expenses to establish and maintain offset properties for the first five to seven years (procedure 6.1 (e)). The purpose of this procedure is that after the initial set-up costs for active management, regular routine maintenance becomes the responsibility for DBCA (i.e. after seven years). DBCA will then continue to manage the site in perpetuity in accordance with the CALM Act. This ensures the land offset is of an appropriate quality to be handed over for ongoing management by DBCA after seven years. Where the proposed offset is solely for the acquisition and protection of land with MNES values, and no improvement of the quality of the offset is proposed, Main Roads considers that funding seven years of management costs in line with the DBCA Corporate Guideline 14 is adequate to set up the property for ongoing management by DBCA. Where an improvement to the offset property is proposed, it is likely that more than seven years of funding will be required in order to achieve the outcome.

For each of the land offsets acquired, Main Roads will fund seven years of DBCA land management activities. These land management costs are negotiated on a site by site basis, and costs are formalised through a separate Memorandum of Understanding.

Main Roads is liaising with DBCA regarding acquisition of suitable land in order to meet offset requirements and intends to have all required offsets in place within 24 months of commencement of construction. Main Roads has provided a separate confidential package of information on the five offsets under consideration to DAWE. Information on these offset properties is confidential due to ongoing negotiations with landowners and DBCA.

Table 6 Overview of offset package under consideration

No.	Offset type	Offset summary	Property Location	Existing tenure
1. Gingin offset	Direct	Land transfer to DBCA	Confidential pending survey and negotiation with property owners Dandaragan Plateau	Freehold owned by third parties

2. Lake Clifton offset	Direct	Land transfer to DBCA	Confidential pending survey and negotiation with property owners Southern Swan Coastal Plain	Freehold owned by third parties
3. Slender Andersonia offset	Direct	Land transfer to DBCA	Confidential pending survey and negotiation with property owners Dandaragan Plateau	Freehold owned by third parties
4. Mogumber offset	Direct	Land transfer to DBCA	Confidential pending survey and negotiation with property owners Dandaragan Plateau	Freehold owned by third parties
5. Maddington offset	Direct	Land transfer to DBCA	Confidential pending survey and negotiation with property owners Swan Coastal Plain	Freehold owned by third parties

3.2 Description of offsets

The components of the offset package are described below. The values of Offset 1 are inferred through desktop review and site inspection (GHD 2020b). Offsets 2 to 4 are based on freehold, rural properties currently under investigation by DBCA. Offset 5 is based on a freehold, development zoned property. Main Roads will confirm the values of Offsets 1 to 5 through detailed survey and consultation with DBCA.

3.2.1 Offset 1 – Confidential property acquisition (Gingin offset)

Offset 1 comprises a cluster of eight properties located on the Dandaragan Plateau, within the Shires of Gingin and Chittering, north of the Perth Metropolitan Region. The land is yet to be negotiated with land owners or subject to surveys. The properties comprise freehold land that is predominantly zoned for rural or agricultural development. The total area of this property cluster is approximately 3517 ha, of which approximately 2340 ha is native vegetation.

Based on desktop review and site inspection (GHD 2020b), the eight properties are expected to contain areas of BWSCP TEC and habitat for Carnaby's Cockatoo and FRTBC. The site inspection was undertaken by a qualified ecologist and comprised visual inspections of ecological values from the property boundaries along public roads (GHD 2020b). Appendix A presents a preliminary review of the ecological values of the eight properties (GHD 2020b).

Main Roads propose to acquire and transfer a portion of the properties that, in aggregate, comprise the following:

- Approximately 21 ha of BWSCP TEC
- Approximately 96 ha of foraging and potentially breeding habitat for Carnaby's Cockatoo
- Approximately 90 ha of foraging and potentially habitat for FRTBC.

The properties may potentially contain populations of Summer Honeypot but are unlikely to contain populations of Wavy-Leaved Smokebush or Slender Andersonia. The properties do not lie in the distribution of Baudin's Cockatoo and are unlikely to provide habitat for the species.

Main Roads are consulting with DBCA to confirm the availability and commercial terms to acquire the properties. Should the properties be suitable for acquisition, Main Roads will arrange for surveys to confirm the ecological values present, including extent and condition of BWSCP TEC, the habitat extent and quality for Carnaby's Cockatoo and FRTBC, and to locate populations (if present) of Summer Honeypot.

3.2.2 Offsets 2, 3, 4 and 5 – Confidential property acquisition (Lake Clifton, Slender Andersonia, Mogumber, and Maddington offsets)

Offsets 2, 3, 4 and 5 comprise a number of properties currently under investigation by DBCA, and have yet to be negotiated with land owners or subject to surveys. Based on consultation with DBCA, the location and vegetation expected to be present, the properties are expected to comprise the following:

- Offset 2: approximately 98 ha of habitat for Baudin's Cockatoos
- Offset 3: land containing at least 75 individuals of Slender Andersonia and a suitable buffer
- Offset 4: land containing at least 21 individuals of Summer Honeypot and a suitable buffer
- Offset 5: land containing at least 125 individuals of Wavy-Leaved Smokebush and at least 16 ha of suitable habitat

Offset 2 lies on the Swan Coastal Plain south of the Perth Metropolitan Region. Offsets 3 and 4 lie on the Dandaragan Plateau north of the Perth Metropolitan Region. Offset 5 lies on the Swan Coastal Plain and comprises land zoned for urban development.

Offsets 2, 3, 4 and 5 may potentially contain BWSCP TEC and habitat for Carnaby's Cockatoo and FRTBC, depending on their location. At present the ecological values of the properties remains to be confirmed. Accordingly, offset of the TEC, Carnaby's Cockatoo and FRTBC is not accounted for in the preliminary offset calculations.

The land area of Offsets 3 and 4 will depend on the presence and distribution of Slender Andersonia and Summer Honeypot populations on the properties, with a suitable buffer to protect the threatened flora populations from edge effects on the offset boundaries. The buffer will be determined in consultation with DBCA, but is expected to be at least 50 m, subject to land availability.

Main Roads are consulting with DBCA to confirm the availability and commercial terms to acquire the properties. Should the properties be suitable for acquisition, Main Roads will arrange for surveys to confirm the ecological values present, including habitat for the BWSCP TEC, Black Cockatoos and populations of threatened flora.

4. Offset guide inputs and justification

4.1 Assumptions

The preliminary offset calculations undertaken for Offsets 1-5 have been based on the available information for the properties. Offset 1 has been subject to preliminary assessment through desktop review and site inspection. Offsets 2 to 4 have been characterised based on rural freehold properties located outside the Perth Metropolitan Region, with ecological values relating to MNES equivalent or better than those in the DE. Offset 5 has been based on development zoned land on the Swan Coastal Plain with sufficient quality habitat and population of Wavy-Leaved Smokebush.

The suitability of each Offset site for the MNES is detailed in Section 3.2 and summarised in Table 21. Offset 1 is suitable for BWSCP TEC, Carnaby's Cockatoo and FRTBC. Offset 2 is suitable for Baudin's Cockatoo and potentially suitable for BWSCP TEC, Carnaby's Cockatoo and FRTBC. Offset 3 is suitable for Slender Andersonia. Offset 4 is suitable to Summer Honeypot and potentially suitable for Carnaby's Cockatoo and BWSCP TEC. Offset 5 is suitable for Wavy-Leaved Smokebush and potentially suitable for BWSCP TEC and Black Cockatoos.

The suitability of Offsets 1 to 5 will be confirmed through survey and/or consultation with DBCA.

4.1 Banksia Woodland of the Swan Coastal Plain TEC

Table 7 and Table 8 provide the inputs used in the EPBC Offset Assessment Guide in relation to BWSCP TEC.

Table 7 Impact Calculator, BWSCP TEC

Attribute	Value	Justification
Area of impact	3.99 ha	3.99 ha of TEC mapped within DE during ecological survey (Woodman 2021).
Quality	6	Moderate score based on an area-weighted scoring of TEC vegetation condition across the DE, as follows: • Pristine – score 10 x 0% of TEC area • Excellent – score 9 x 24% of TEC area • Very Good – score 7 x 34% of TEC area • Good – score 5 x 30% of TEC area • Degraded – score 3 x 12% of TEC area • Completely Degraded – score 1 x 0% of TEC area. The area-weighted score is 6.4. The DE is subject to threatening processes including *Phytophthora* dieback and weeds. The DE contains four TEC patches that have been previously fragmented upon development of Tonkin Highway.

Table 8 Offset Calculator, BWSCP TEC – Offset 1 (Gingin offset)

Attribute	Value	Justification
Offset area	~ 21	An approximate 21 ha portion of the properties will be allocated to the offset, primarily to counterbalance impacts to BWSCP TEC, but may also contain Carnaby's Cockatoo and FRTBC habitat.
Start quality	6	Desktop review and site inspection (GHD 2020b) indicates that the site has good potential to contain areas of the TEC. Expect vegetation condition will be equivalent or better than the TEC condition within the DE.
Future quality without offset	5	Rural freehold land. Vegetation may deteriorate without management and site will benefit from transfer to the conservation estate.
Future quality with offset	6	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Land will be acquired and immediately transferred to conservation estate.
Risk of loss without offset	15%	Low risk as land is rural zoned and unlikely to be developed in the near future.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence, land will be surveyed to confirm habitat values and then purchased for transfer to the conservation estate.

4.2 Carnaby's Cockatoo

Table 9 and Table 10 provide the inputs used in the EPBC Offset Assessment Guide in relation to Carnaby's Cockatoo.

Table 9 Impact Calculator, Carnaby's Cockatoo

Attribute	Value	Justification
Area of impact	18.7 ha	18.7 ha of species habitat mapped within DE during ecological survey (Woodman 2021). This excludes areas mapped as nil to negligible habitat value (score 0-1, see Table 3).
Quality	6	Moderate score based on an area-weighted scoring of habitat quality across the DE ranging from score 4 to 6 out of 10 as a summation of foraging condition (score 2-4 out of 6), site context (score 1 out of 3) and species density (score 1 out of 1) (Woodman 2021), as follows: • Score 6 x 80% of habitat area • Score 5 x 10% of habitat area • Score 4 x 9% of habitat area The area-weighted score is 5.7. Foraging score ranged from 2 to 4 (low to medium value, see Table 3), excluding areas mapped as nil to negligible value. Site context was scored 1 out of 3 as the DE provided limited habitat for breedin g birds (Woodman 2021). Species density was scored 1 out of 1 due evidence of occupation and foraging within the DE (Woodman 2021). The DE contains 141 potential breeding trees, none of which contain hollows suitable for nesting by Carnaby's Cockatoos. The DE does not contain any known nesting or roosting trees for Carnaby's Cockatoos.

Attribute	Value	Justification
		The DE is subject to threatening processes including *Phytophthora* dieback and weeds. The DE contains Carnaby's Cockatoo habitat that has been previously fragmented upon development of Tonkin Highway.

Table 10 Offset Calculator, Carnaby's Cockatoo – Offset 1 (Gingin offset)

Attribute	Value	Justification
Offset area	~ 96	An approximate 96 ha portion of the properties will be allocated to the offset, primarily to counterbalance impacts to Carnaby's Cockatoo, but may also contain FRTBC habitat and BWSCP TEC.
Start quality	6	Desktop review and site inspection (GHD 2020b) indicates that the site is expected to contain areas of foraging habitat and potential breeding habitat for Carnaby's Cockatoo. Expect habitat quality will be equivalent or better than the habitat within the DE.
Future quality without offset	5	Rural freehold land. Vegetation may deteriorate without management and site will benefit from transfer to the conservation estate.
Future quality with offset	6	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Land will be acquired and immediately transferred to conservation estate.
Risk of loss without offset	15%	Low risk as property is rural zoned and unlikely to be developed in the near future.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence, land will be surveyed to confirm habitat values and then purchased for transfer to the conservation estate.

4.3 Forest Red-tailed Black Cockatoo

Table 11 and Table 12 provide the inputs used in the EPBC Offset Assessment Guide in relation to FRTBC.

Table 11 Impact Calculator, FRTBC

Attribute	Value	Justification
Area of impact	19.1 ha	19.1 ha of species habitat mapped within DE during ecological survey (Woodman 2021). This excludes areas mapped as nil to negligible habitat value (score 0-1, see Table 3).
Quality	6	Moderate score based on an area-weighted scoring of habitat quality across the DE ranging from score 4 to 7 out of 10 as a summation of foraging condition (score 2-5 out of 6), site context (score 1 out of 3) and species density (score 1 out of 1) (Woodman 2021), as follows: • Score 7 x 41% of habitat area • Score 6 x 34% of habitat area • Score 5 x 14% of habitat area • Score 4 x 11% of habitat area The area-weighted score is 6.0. Foraging score ranged from 2 to 5 (low to high value, see Table 3), excluding areas mapped as nil to negligible value. Site context was scored 1 out of 3 as the DE provided limited habitat for breeding birds (Woodman 2021). Species density was scored 1 out of 1 due evidence of occupation and foraging within the DE (Woodman 2021). The DE contains 141 potential breeding trees, none of which contain hollows suitable for nesting by FRTBC. The DE does not contain any known nesting or roosting trees for FRTBC. The DE is subject to threatening processes including *Phytophthora* dieback and weeds. The DE contains FRTBC habitat that has been previously fragmented upon development of Tonkin Highway.

Table 12 Offset Calculator, FRTBC – Offset 1 (Gingin offset)

Attribute	Value	Justification
Offset area	~ 90	An approximate 90 ha portion of the properties will be allocated to the offset, primarily to counterbalance impacts to FRTBC, but will also contain Carnaby's Cockatoo habitat and may also contain BWSCP TEC.
Start quality	6	Desktop review and site inspection (GHD 2020b) indicates that the site is expected to contain areas of foraging habitat and potential breeding habitat for FRTBC. Expect habitat quality will be equivalent or better than the habitat within the DE.
Future quality without offset	5	Rural freehold land. Vegetation may deteriorate without management and site will benefit from transfer to the conservation estate.
Future quality with offset	6	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Land will be acquired and immediately transferred to conservation estate.
Risk of loss without offset	15%	Low risk as property is rural zoned and unlikely to be developed in the near future.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.

Attribute	Value	Justification
Confidence in result	90%	High degree of confidence, land will be surveyed to confirm habitat values and then purchased for transfer to the conservation estate.

4.1 Baudin's Cockatoo

Table 13 and Table 14 provide the inputs used in the EPBC Offset Assessment Guide in relation to Baudin's Cockatoo.

Table 13 Impact Calculator, Baudin's Cockatoo

Attribute	Value	Justification
Area of impact	19.1 ha	19.1 ha of species habitat mapped within DE during ecological survey (Woodman 2021). This excludes areas mapped as nil to negligible habitat value (score 0-1, see Table 3).
Quality	6	Moderate score based on an area-weighted scoring of habitat quality across the DE ranging from score 4 to 7 out of 10 as a summation of foraging condition (score 2-5 out of 6), site context (score 1 out of 3) and species density (score 1 out of 1) (Woodman 2021), as follows: • Score 7 x 41% of habitat area • Score 6 x 34% of habitat area • Score 5 x 14% of habitat area • Score 4 x 11% of habitat area The area-weighted score is 6.0. Foraging score ranged from 2 to 5 (low to high value, see Table 3), excluding areas mapped as nil to negligible value. Site context was scored 1 out of 3 as the DE provided limited habitat for breeding birds (Woodman 2021). Species density was scored 1 out of 1 due evidence of occupation and foraging within the DE (Woodman 2021). The DE is unlikely to provide breeding habitat for Baudin's Cockatoo, and none of the 141 potential breeding trees contain hollows suitable for nesting. The DE does not contain any known roosting trees for Baudin's Cockatoos. The DE is subject to threatening processes including *Phytophthora* dieback and weeds. The DE contains Baudin's Cockatoo habitat that has been previously fragmented upon development of Tonkin Highway.

Table 14 Offset Calculator, Baudin's Cockatoo – Offset 2 (Lake Clifton offset)

Attribute	Value	Justification
Offset area	~ 98	An approximate 98 ha portion of land will be allocated to the offset, primarily to counterbalance impacts to Baudin's Cockatoo, but will also contain BWSCP TEC and other Black Cockatoo habitat.
Start quality	6	Expect habitat quality will be equivalent or better than the habitat within the DE.
Future quality without offset	5	Rural freehold land. Vegetation may deteriorate without management and site will benefit from transfer to the conservation estate.
Future quality with offset	6	No rehabilitation proposed. Land will be managed for conservation of existing values.

Attribute	Value	Justification
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Land will be acquired and immediately transferred to conservation estate.
Risk of loss without offset	15%	Low risk as property is rural zoned and unlikely to be developed in the near future.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence, land will be surveyed to confirm habitat values and then purchased for transfer to the conservation estate.

4.1 Slender Andersonia

Table 15 and Table 16 provide the inputs used in the EPBC Offset Assessment Guide in relation to Slender Andersonia.

Table 15 Impact Calculator, Slender Andersonia

Attribute	Value	Justification
Count	11	11 individuals recorded within DE during ecological survey (Woodman 2021).

Table 16 Offset Calculator, Slender Andersonia – Offset 3 (Slender Andersonia offset)

Attribute	Value	Justification
Time horizon	1 year	Land will be transferred to conservation estate so long term protection is afforded.
Start value	75	The portion of land to be allocated to the offset will contain at least 75 Slender Andersonia plants.
Future value without offset	0	Rural freehold land. Plants are expected to be lost in the event that the portion of land is developed and may also be lost due to indirect impacts from adjacent agricultural land. Site will benefit from transfer to the conservation estate.
Future value with offset	75	No rehabilitation / planting proposed. Land will be managed for conservation of existing values.
Confidence in result	15%	Low confidence (risk) of loss without offset as land is rural zoned and unlikely to be developed in the near future. High confidence in protection with offset, as land will be surveyed to confirm flora population and then purchased for transfer to the conservation estate.

4.1 Summer Honeypot

Table 17 and Table 18 provide the inputs used in the EPBC Offset Assessment Guide in relation to Summer Honeypot.

Table 17 Impact Calculator, Summer Honeypot

Attribute	Value	Justification
Count	three	Three individuals recorded within DE during ecological survey (Woodman 2021).

Table 18 Offset Calculator, Summer Honeypot – Offset 4 (Mogumber offset)

Attribute	Value	Justification
Time horizon	1 year	Land will be transferred to conservation estate so long term protection is afforded.
Start value	21	The portion of land to be allocated to the offset will contain at least 21 Summer Honeypot plants.
Future value without offset	0	Rural freehold land. Plants are expected to be lost in the event that the portion of land is developed and may also be lost due to indirect impacts from adjacent agricultural land. Site will benefit from transfer to the conservation estate.
Future value with offset	21	No rehabilitation / planting proposed. Land will be managed for conservation of existing values.
Confidence in result	15%	Low confidence (risk) of loss without offset as land is rural zoned and unlikely to be developed in the near future. High confidence in protection with offset, as land will be surveyed to confirm flora population and then purchased for transfer to the conservation estate.

4.1 Wavy-Leaved Smokebush

Table 19 and Table 20 provide the inputs used in the EPBC Offset Assessment Guide in relation to Wavy-Leaved Smokebush.

Table 19 Impact Calculator, Wavy-Leaved Smokebush

Attribute	Value	Justification
Count	62	62 individuals recorded within DE during ecological survey (Woodman 2021).
Area of impact	7.45 ha	7.45 ha of species habitat (VT1 and VT4) mapped within DE during ecological survey (Woodman 2021).
Quality	6	Moderate score based on an area-weighted scoring of habitat (VT1 and VT4) vegetation condition across the DE, as follows: • Pristine – score 10 x 0% of habitat area • Excellent – score 9 x 30% of habitat area • Very Good – score 7 x 20% of habitat area • Good – score 5 x 21% of habitat area • Degraded – score 3 x 29% of habitat area • Completely Degraded – score 1 x 0% of habitat area. The area-weighted score is 6.0. Much of the habitat is not populated by Wavy-Leaved Smokebush, which instead is found in dense, clumped populations.

Attribute	Value	Justification
		The DE is subject to threatening processes including *Phytophthora* dieback and weeds. The DE has been previously fragmented upon development of Tonkin Highway.

Table 20 Offset Calculator, Wavy-Leaved Smokebush – Offset 5 (Maddington offset)

Attribute	Value	Justification
Numbers of individuals		
Time horizon	1 year	Land will be transferred to conservation estate so long term protection is afforded.
Start value	125	The portion of land to be allocated to the offset will contain at least 125 Wavy-Leaved Smokebush plants.
Future value without offset	0	Land located within the Swan Coastal Plain that is zoned for urban development (e.g. industrial, residential, commercial, road reserve). Plants expected to be lost due to urban development and site will benefit from transfer to the conservation estate.
Future value with offset	125	No rehabilitation / planting proposed. Land will be managed for conservation of existing values.
Confidence in result	50%	Moderate confidence (risk) of loss without offset as land is zoned for urban development and likely to be developed in the near future. High confidence in protection with offset, as land will be surveyed to confirm flora population and then purchased for transfer to the conservation estate.
Habitat		
Offset area	~ 16	An approximate 16 ha portion of land will be allocated to the offset, primarily to counterbalance impacts to Wavy-Leaved Smokebush, but may also contain Black Cockatoo habitat and/or BWSCP TEC.
Start quality	6	Expect habitat quality will be equivalent or better than the habitat within the DE.
Future quality without offset	5	Freehold land located within the Swan Coastal Plain that is zoned for urban development. Vegetation may deteriorate without management and site will benefit from transfer to the conservation estate.
Future quality with offset	6	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Land will be acquired and immediately transferred to conservation estate.
Risk of loss without offset	50%	Moderate risk as land located within the Swan Coastal Plain and zoned for urban development, and therefore likely to be developed in the near future.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence, land will be surveyed to confirm habitat values and then purchased for transfer to the conservation estate.

5. Counterbalance of significant residual impacts

Table 21 provides a summary of the offset package counterbalance of the significant residual impacts to BWSCP TEC, Black Cockatoos, Wavy-Leaved Smokebush, Slender Andersonia and Summer Honeypot. Table 21 is based on preliminary offset calculations using the EPBC Act Offset Assessment Guide, as presented in Section 4 and Appendix B.

As presented in Table 21, the offset package is expected to provide adequate compensation for significant residual impacts to BWSCP TEC, Black Cockatoos, Wavy-Leaved Smokebush, Slender Andersonia and Summer Honeypot.

Table 21 Summary of preliminary offset calculations

Residual impacts to MNES	Offset 1 Gingin offset	Offset 2 Lake Clifton offset	Offset 3 Slender Andersonia offset	Offset 4 Mogumber offset	Offset 5 Maddington offset
MNES values confirmed	Inferred, to be surveyed	Inferred, to be surveyed	Inferred, to be surveyed	Inferred, to be surveyed	Inferred, to be surveyed
BWSCP TEC 3.99 ha x quality 6 = 2.39 ha total	21 ha = 104% of impact offset	May contain TEC, not accounted for in this offset	Site unlikely to be suitable	May contain TEC, not accounted for in this offset	May contain TEC, not accounted for in this offset
Carnaby's Cockatoo 18.74 ha x quality 6 = 11.24 ha total	96 ha = 100% of impact offset	May contain habitat, not accounted for in this offset	Site unlikely to be suitable	May contain habitat, not accounted for in this offset	May contain habitat, not accounted for in this offset
FRTBC 19.14 ha x quality 6 = 11.48 ha total	90 ha = 100% of impact offset	May contain habitat, not accounted for in this offset	Site unlikely to be suitable	May contain habitat, not accounted for in this offset	May contain habitat, not accounted for in this offset
Baudin's Cockatoo 19.14 ha x quality 6 = 11.48 ha total	May contain habitat, not accounted for in this offset	98 ha = 100% of impact offset	Site unlikely to be suitable	Site unlikely to be suitable	May contain habitat, not accounted for in this offset
Slender Andersonia 11 individuals	Site unlikely to be suitable	Site unlikely to be suitable	75 individuals = 101% of impact offset	Site unlikely to be suitable	Site unlikely to be suitable
Summer Honeypot Three individuals	May contain populations, not accounted for in this offset	Site unlikely to be suitable	Site unlikely to be suitable	21 individuals = 104% of impact offset	Site not suitable
Wavy-Leaved Smokebush 62 individuals 7.45 ha critical habitat x quality 6 = 4.47 ha total	Site unlikely to be suitable	Site unlikely to be suitable	Site unlikely to be suitable	Site unlikely to be suitable	125 individuals = 101% of impact offset 16 ha = 100% of impact offset

6. Application of EPBC Act environmental offsets policy

The proposed offset strategy is consistent with the principles of the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) as presented in Table 22.

Table 22 Consistency with EPBC Act Environmental Offsets Policy

Policy overarching principles	Comment
Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter	The offsets will provide a conservation outcome that maintains or improves the viability of the BWSCP TEC, Carnaby's Cockatoo, FRTBC, Baudin's Cockatoo, Wavy-Leaved Smokebush, Slender Andersonia and Summer Honeypot. The offset strategy provides at least 100% offset for all seven protected matters. The conservation outcome will be achieved through protecting the protected matters through transfer of land containing BWSCP TEC; Black Cockatoo habitat; and populations of Wavy-Leaved Smokebush, Slender Andersonia and Summer Honeypot to DBCA. Allowing 24 months from commencement of construction to have required offsets in place will result in better outcome for each species as the extra time allows Main Roads to acquire the best available offset property, rather than the first property that becomes available. There is a long length of time required to acquire properties as an offset. This process includes arranging a biological survey of the offset property to determine the presence and extent of environmental values. With this biological survey Main Roads and DBCA are able to assess the property for its value holistically to being added to the conservation estate, not solely whether the property contains the particular MNES or habitat requiring offset. For example, properties located adjacent to existing conservation reserves or those connecting areas of land already in the conservation estate are considered of higher value to the DBCA. By comparison, if Main Roads was to select the first offset property identified through a desktop review for acquisition, then there is the potential that this property may not provide the best conservation outcome. Therefore, through having more time and going through a more comprehensive and comparative process of identifying suitable offset properties (in consultation with DBCA), Main Roads is ensuring the best available offset property is acquired resulting in the best conservation outcome.
Suitable offsets must be built around direct offsets but may include other compensatory measures	The offset strategy is built around direct offsets, involving a package of suitable offset properties to provide at least 100% direct offsets for BWSCP TEC, Carnaby's Cockatoo, FRTBC, Baudin's Cockatoo, Wavy-Leaved Smokebush, Slender Andersonia and Summer Honeypot.
Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter	All offsets will be transferred to DBCA. DBCA and the Conservation and Parks Commission are then responsible for the management of the land and creation of the conservation reserve, providing in perpetuity protection and management. The quantum of offsets proposed are in proportion to the level of statutory protection applied to the BWSCP TEC

Policy overarching principles	Comment
	(Endangered), Carnaby's Cockatoo (Endangered), FRTBC (Vulnerable), Baudin's Cockatoo (Endangered), Wavy-Leaved Smokebush (Vulnerable), Slender Andersonia (Endangered), and Summer Honeypot (Endangered) as presented in the preliminary offset calculations.
Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter	The offsets will be of a size and scale proportional to the residual impacts on BWSCP TEC, Carnaby's Cockatoo, FRTBC, Baudin's Cockatoo, Wavy-Leaved Smokebush, Slender Andersonia and Summer Honeypot. The offset strategy provides at least 100% offset for all three protected matters. The provision of direct offsets is based on completed offset assessment guide calculations, incorporating evidence based justification for all inputs.
Suitable offsets must effectively account for and manage the risks of the offset not succeeding	The estimation of direct offsets is based on completed offset assessment guide calculations, incorporating a conservative assessment of risk of the offset not succeeding. Main Roads has a history of offset management, including provision of land to DBCA for ongoing management and conservation. The transfer of land to DBCA is expected to have a high chance (90%) of successfully delivering the required conservation outcomes. Management actions proposed to be undertaken on the offset sites include: • Access control – fencing and gates • Fire breaks • Weed control • Dieback assessment and management • Feral bee control • Rubbish removal. These management actions will prevent the decline or deterioration of the protected matters within the offset sites. In most cases, none of these management actions are currently being undertaken on the offset sites, with the exception of fire breaks in some cases. Therefore, the current risk of the loss of protected matters on these sites prior to becoming an offset site is greater (15%) than it will be once these management actions are implemented to prevent the decline or deterioration of the protected matters (5%).
Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs	The proposed offsets are additional to any other requirements.
Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offsets identified in the offset strategy will be acquired and implemented in consultation and agreement with DBCA as the State agency with lead responsibility for conservation. The offsets will involve an efficient and timely transfer of land to DBCA. Main Roads, working with DBCA, is experienced in and has the resources to fund acquisition and transfer of properties to DBCA for ongoing management and conservation.

Policy overarching principles	Comment
	Main Roads is liaising with DBCA regarding acquisition of suitable land in order to meet offset requirements and intends to have all required offsets in place within 24 months of commencement of construction. The offsets will be scientifically robust, based on surveys of the Proposed Action DE and offset properties. The Offset Proposal will be a transparent document developed in consultation with DBCA and relevant local stakeholders. Main Roads cannot provide offsets prior to commencement of the action due to the large number of road projects currently being implemented by the State and Federal governments and the long length of time is takes to acquire properties as an offset. The long length of time associated with acquiring a private property is due to the process involved and challenges that arise. In addition, as Main Roads projects typically commence shortly after receiving State and Federal environmental approval, there is not sufficient time to acquire an offset property prior to commencement of the action. The level of risk that Main Roads will not be able to secure an appropriate offset is low. Main Roads has a long history of providing suitable offsets and is working on alternative methods to improve the quality and timeliness of offsets for project. This includes the Memorandum of Understanding (MoU) that Main Roads has with DBCA, which commits Main Roads funding to assist DBCA in identifying and acquiring suitable land offsets to be added to the conservation estate. The purpose of this MoU is to assist DBCA in acquiring suitable land offsets and placing them in an 'offset bank' which can then be utilised for future projects. With this MoU in place, this reduces the risk of Main Roads not being able to secure an appropriate offset as there are currently DBCA resources allocated to identifying and acquiring suitable offsets to satisfy Commonwealth and State environmental compliance requirements. Main Roads will mitigate the risk of not securing offsets within 24 months of commencement of the action through regularly meeting with DBCA to discuss the potential offset properties available, and actively investigating these properties to determine the presence and extent of environmental values. Main Roads also works with DBCA to provide continual updates on the priorities of sites to be acquired and particular MNES values that Main Roads are seeking to meet project offset requirements. If Main Roads are unable to secure offsets within the 24 month timeframe, then Main Roads will continue to seek suitable offsets through actively consulting with DBCA and seeking alternative methods for the delivery of offsets.
Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced	All offset sites will be managed by DBCA through conservation tenure. The Offset Proposal will be based on a Memorandum of Understanding between Main Roads and DBCA, including requirements for land management and monitoring.

7. References

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, Australian Government October 2012.

EPA 2016a, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth, Environmental Protection Authority.

EPA 2016b, *Technical Guidance – Sampling methods for terrestrial vertebrate fauna*, Perth, Environmental Protection Authority.

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GHD 2020b, *Gingin Offset Properties*, memorandum prepared for Main Roads Western Australia.

Glevan Consulting 2020, *Tonkin Highway Corridor Upgrade Hale Road to Kelvin Road, Phytophthora Dieback occurrence assessment*. Unpublished report prepared for Main Roads Western Australia.

Woodman Environmental Consulting Pty Ltd (Woodman) 2021, *Tonkin Grade Separated Interchanges, Biological Survey and Targeted Black Cockatoo Habitat Assessment*, Unpublished report prepared for Main Roads Western Australia.

Appendices

Appendix A – Gingin Offset Properties (GHD 2020b)

Memorandum

04 September 2020

To	Main Roads		
Copy to			
From	Heath Morgan	Tel	+61 8 62228384
Subject	Gingin Offset Properties	Job no.	12523571

1 Background

Main Roads Western Australia (Main Roads) proposes to upgrade Tonkin Highway from the south of Roe Highway to approximately 1 km north of Kelvin Road (the Proposed Action, EPBC 2019/8529) within the City of Kalamunda. The Proposed Action consists of a single fly-over and grade-separated interchange at the existing intersections of Tonkin Highway and Hale Road in Forrestfield, and Tonkin Highway and Welshpool Road in Wattle Grove, respectively. The Proposed Action will also involve the reconstruction of approximately 4.5 km of Tonkin Highway into a six-lane dual carriageway.

On 19 November 2019, a delegate of the Minister for the Environment determined the Proposed Action was a controlled action under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), to be assessed by Preliminary Documentation.

The Proposed Action will result in significant residual impacts to Matters of National Environmental Significance (MNES), comprising the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (BWSCP TEC), Carnaby's Black Cockatoo (*Calyptorhynchus latirostris)*, Forest Red Tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksia naso)*, Baudin's Cockatoo (*Calyptorhynchus baudinii)*, Wavy-Leaved Smokebush (*Conospermum undulatum*), Slender Andersonia (*Andersonia gracilis*), and Summer Honeypot (*Banksia mimica)*; due to the following impacts:

- Clearing of up to 3.99 ha of BWSCP TEC
- Clearing of up to 142 potential breeding trees (> 500 mm Diameter at Breast Height) for Black Cockatoo species, including two trees that contain hollows suitable for nesting by Black Cockatoos
- Clearing of up to 18.4 ha of moderate to low quality foraging habitat for Carnaby's Cockatoo
- Clearing of up to 7.9 ha of high to moderate quality foraging habitat and 11.0 ha of moderate to low quality foraging habitat for FRTBC and Baudin's Cockatoo (total 18.9 ha of foraging habitat)
- Loss of up to 62 individuals of *Conospermum undulatum* and up to 7.45 ha of habitat
- Loss of up to 11 individuals of *Andersonia gracilis* and 1.58 ha of habitat

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- Loss of three individuals of *Banksia mimica* and 3.20 ha of habitat.

The Preliminary Documentation includes an Offset Strategy to counterbalance the significant residual impacts of the Proposed Action to the MNES.

As part of the Offset Strategy, Main Roads is investigating the potential to use a cluster of properties north east of Gingin for offsets (the Gingin offset properties). This memorandum provides a preliminary review of the ecological values of the Gingin offset properties with respect to the significant residual impacts of the Proposed Action. The memorandum incorporates a desktop review of publicly available data and a site visit by a GHD ecologist. Attachment A presents figures and Attachment B presents the site visit notes and photographs.

2 Location and property description

The Gingin offset properties comprises a cluster of eight freehold areas located approximately 6.5 km south east of Gingin, within the Shires of Gingin and Chittering, as presented in Table 1 and Figure 1. The total area of the property cluster is approximately 3517 ha, of which approximately 2340 ha is native vegetation.

3 Geology and hydrology

The Gingin offset properties are located on the Dandaragan Plateau, comprising quaternary colluvium and sand (Qpo) and pockets of laterite (Czl) over Cretaceous greensand and chalk (Kup, Kug) (Urban Geology 1:50,000 Gingin sheet) . The Dandaragan Plateau is gently undulating and bordered by the Darling Scarp/Plateau to the east and the Gingin Scarp and Swan Coastal Plain to the west.

The Gingin offset properties occur at an elevation between approximately 100 to 200 mAHD, comprising a series of broad east-west hills dissected by three waterways: Lennard Brook in the north, Nullila Brook in the centre and Breera Brook in the south (Figure 2). The three waterways drain to the west across the Gingin Scarp and discharge into swamp deposits on the eastern fringe of the Swan Coastal Plain, in the vicinity of Brand Highway (Urban Geology 1:50,000 Gingin sheet).

Waterways across the Dandaragan Plateau are typically seasonal. However in the southern portion, a number are perennial being groundwater fed, including Lennard Brook (Rutherford *et al.* 2005). Portions of Lennard Brook and Breera Brook are mapped as conservation category wetlands (Figure 2). The swamp deposits west of the Gingin offset properties are highly cleared for agriculture and mapped predominantly as multiple use wetlands, though pockets are mapped as conservation category wetlands (Figure 2).

Areas of shallow groundwater (0-5 m) are identified in the vicinity of Lennard Brook, Mullila Brook and Breera Brook, which may support groundwater dependent ecosystems (GDEs) (Rutherford *et al.* 2005). Lennard Brook is known to be fed by groundwater flow from the underlying Mirrabooka Aquifer (Rutherford *et al.* 2005)

Table 1 Overview of Gingin offset properties

Property location	Local government	Property area (ha)	Approximate area of native vegetation (ha)	Land tenure	Zoning under local planning scheme
Lot 14, 679 Gray Road Bindoon	Chittering	188.6	175	Freehold	Agricultural resource
Lot 15, 902 Teatree Road Bindoon	Chittering	215.9	73	Freehold	Agricultural resource
Lot 17, 891 Gray Road Bindoon	Chittering	192.5	167	Freehold	Agricultural resource
Lot 18, 534 Teatree Road Bindoon	Chittering	304.1	131	Freehold	Agricultural resource, rural conservation, rural residential. Special Control area (Water and Wastewater Treatment Plant)
Lot 101 777 Teatree Road Bindoon	Chittering	474.7	469	Freehold	Environmental conservation Special use (military considerations, tourist development)
Lot M 2119, 359 Creighton Road Lennard Brook	Gingin	652.9	457	Freehold	General rural
Lot M 2120, Creighton Road Lennard Brook	Gingin	725.4	434	Freehold	General rural
Lot M 2121, 441 Breera Road, Breera	Gingin	763.6	433	Freehold owned by third party	General rural
Total		**3517.6**	**2340**		

4 Database records - Vegetation and flora

Regional vegetation complex mapping (Heddle *et al.* 1980) indicates the Gingin offset properties are covered by three complexes associated with the Dandaragan Plateau (Figure 3):

- Karamal Complex South: dominated by an open forest of *Eucalyptus marginata-Corymbia calophylla* (Jarrah-Marri) with a definite second storey of *Banksia grandis* (Bull Banksia) on the gravelly soils and *B. attenuata* and *B. menziesii* on the sandier soils
- Mogumber Complex-South: dominated by open woodland of *C. calophylla* and well-defined second storey of *Eucalyptus todtiana-B. attenuata- menziesii, B. ilicifolia*
- Moondah Complex: Low closed to low open forest of *B. attenuata*, *B. menziesii*, *E. todtiana*, *B. prionotes* on slopes, open woodland of *C. calophylla*. *Banksia* species in valleys.

Table 2 presents the estimated vegetation complex extent over the Gingin offset properties properties, based on the mapped vegetation complexes and mapped native vegetation extent.

Table 2 Native vegetation and vegetation complexes within the Gingin offset properties

Property location	Approx. native veg. (ha)	Vegetation complex	Approx. area within complex (ha)
Lot 14, 679 Gray Road Bindoon	175	Karamal Complex-South	69
		Mogumber Complex-South	50
		Moondah Complex	57
Lot 15, 902 Teatree Road Bindoon	73	Karamal Complex-South	18
		Mogumber Complex-South	40
		Moondah Complex	15
Lot 17, 891 Gray Road Bindoon	167	Karamal Complex-South	73
		Moondah Complex	94
Lot 18, 534 Teatree Road Bindoon	131	Mogumber Complex-South	101
		Moondah Complex	30
Lot 101, 777 Teatree Road Bindoon	469	Karamal Complex-South	338
		Mogumber Complex-South	129
		Moondah Complex	2
Lot M 2119, 359 Creighton Road Lennard Brook	457	Karamal Complex-South	325
		Moondah Complex	132
Lot M 2120, Creighton Road Lennard Brook	434	Karamal Complex-South	434
Lot M 2121, 441 Breera Road, Breera	433	Karamal Complex-South	338
		Moondah Complex	96
Total	**2340**		**2340**

A desktop review of publically available databases (*NatureMap*, WA Herbarium) and the DBCA Threatened and Priority Flora database indicated five Threatened flora species within 5 km of the Gingin offset properties. These flora are listed below and their spatial location, as provided by the DBCA database, are presented in Figure 3:

- *Chamelaucium sp.* Gingin (N.G. Marchant 6) – Endangered
- *Chamelaucium lullfitzii* – Vulnerable
- *Grevillea corrugata* – Vulnerable
- *Grevillea curviloba* – Vulnerable
- *Ptychosema pusillum* – Vulnerable

All of these species have observations records restricted to the Dandaragan Plateau, Gingin or Chittering areas (WA Herbarium 1998-2020), and as such an increase in conservation areas in the region may aid in the conservation of these species.

No records of *Conospermum undulatum, Andersonia gracilis* or *Banksia mimica* have been recorded within 5 km of the Gingin offset properties.

5 Site inspection

A GHD ecologist conducted a site visit to the Gingin offset properties on 8 September 2020, to inspect the ecological values relevant to the MNES impacted by the Proposed Action. As permission to access the private freehold properties and internal private roads and tracks had not been given, the site visit was limited to the west, north and east boundaries of the Gingin offset properties, which were accessible from public roads. The site photos and notes are provided in Attachment 2, with Figure 4 presenting the photo locations.

6 Potential for Banksia Woodlands of the Swan Coastal Plain TEC

The BWSCP TEC is associated with regional vegetation complexes to a varying degree, as presented in Figure 5 and Table 3 (TSSC 2016). The Gingin offset properties comprises approximately 746 ha mapped in strong association with the TEC and approximately 1594 mapped in minor association with the TEC.

The site inspection identified Banskia woodland with potential to represent the BWSCP TEC at photograph locations 03, 04 on the north side of the Gingin offset properties and locations 14 and 15 on the east side of the Gingin offset properties. Based on the mapped association of regional vegetation complexes and the identification of site vegetation, the Gingin offset properties are considered to have good potential to contain areas of BWSCP TEC.

Table 3 Vegetation complexes associated with the BWSCP TEC

Complex	Association with TEC (TSSC 2016)	Approximate extent within Gingin offset properties (ha)	Current extent remaining on SCP[1] (ha)	Proportion of pre-European extent remaining
Karamal Complex-South	Minor	1594	15,385	64.1%
Mogumber Complex-South	Strong	320	5720	38.6%
Moondah Complex	Strong	426	7233	40.8%

7 Potential for Black Cockatoo habitat

The Gingin offset properties are located within the mapped range of Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and FRTBC (*Calyptorhynchus banksii naso*), however are outside of the mapped range of Baudin's Cockatoo (*Calyptorhynchus baudinii*) (Attachment 3). The regional vegetation mapped over the Gingin offset properties contains flora species that provide foraging resources (e.g. Marri, Banksia) and breeding habitat (e.g. Marri, Jarrah), with an inferred high value for foraging and breeding habitat (Table 4).

Table 4 Vegetation complex Black Cockatoo foraging and breeding habitat value

Vegetation complex	Foraging and breeding habitat value	
	FRTBC	Carnaby's Cockatoo
Karamal complex-South	High	High
Mogumber Complex-South	High	High
Moondah Complex	Medium to High	High

Figure 6 presents the Black Cockatoo foraging habitat, breeding sites and potential roost sites mapped over the Gingin offset properties and its vicinity. There are known breeding sites and roost sites identified along the Darling Scarp running east of the Gingin offset properties. The nearest Carnaby's Cockatoo breeding sites are 5.5 km to the east, but the species would likely breed closer to the Gingin offset properties given suitable habitat within the area (T. Kirkby, pers. comm.). The closest confirmed breeding of FRTBC is 32 km to the south of the Gingin offset properties, however, the species has been observed in a hollow in Muchea and breeding behaviour has been recorded in Bindoon (T. Kirkby, pers. comm.).

The site visit observed foraging habitat including Marri, Jarrah, *E. patens*, *Banksia* spp and *Pinus* spp, and observed Carnaby's Cockatoos in the property (Attachment B).

Based on the vegetation complex and habitat mapping, breeding records and the site visit observations, the approximately 2340 ha of native vegetation within the Gingin offset properties is expected to contain areas of foraging habitat and potential breeding habitat for Carnaby's Cockatoo and FRTBC.

[1] Vegetation Statistics South West 2018 Report https://catalogue.data.wa.gov.au/dataset/dbca

8 Potential for threatened flora

Plate 1 presents the nearest records of *C. undulatum*, *A gracilis* and *B. mimica* to the Gingin offset properties. This indicates that populations of *B. mimica* and an isolated population of *A. gracilis* are recorded within 40 km to the north of the Gingin offset properties, however *C. undulatum* is restricted to the Perth Metropolitan Area over 40 km to the south of the Gingin offset properties.

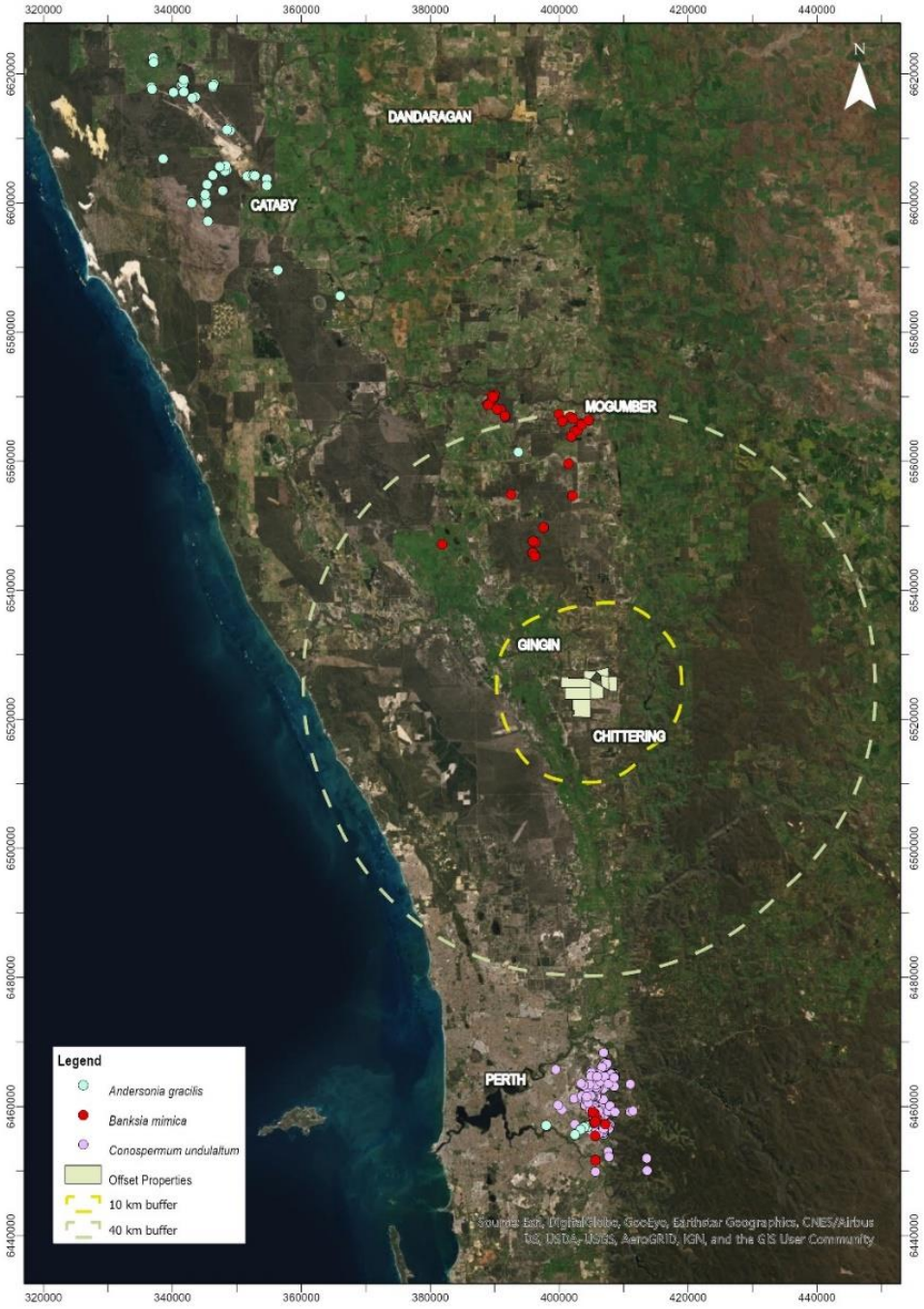

Plate 1 Records of *Andersonia gracilis*, *Banksia mimica* and *Conospermum undulatum* nearby Gingin offset properties (NatureMap, WA Herbarium 1998).

Table 5 outlines the likelihood of the three threatened flora species occurring in Gingin offset properties.

Table 5 Threatened flora likelihood

Threatened flora species	Habitat description	Nearby records[1]	Likelihood
Conospermum undulatum	Sandy clay soils over laterite, or on flat or gently sloping sites in association with *Banksia* or jarrah and marri woodland between the Swan and Canning Rivers. Some plants have been recorded within slightly swampy habitats (DEC 2009).	Approximately 50 km south of the Gingin offset properties	Unlikely No records within 40 km of the Gingin offset properties. Species known from a restrictive range on the eastern side of the Swan Coastal Plain in the Perth metropolitan region (DBCA 2007-2020). Some suitable habitat for species
Andersonia gracilis	Seasonally damp, black sandy clay flats near or on the margins of swamps, often on duplex soils supporting low open heath vegetation with species such as *Calothamnus hirsutus*, *Verticordia densiflora* and *Kunzea recurva* over sedges (DEC 2006).	Approximately 36 km north of the Gingin offset properties	Unlikely Lack of suitable habitat. Known to exist in the Dandaragan area north of Gingin
Banksia mimica	Flat to gentle slopes in grey and white sand in open woodlands. Associated vegetation includes *Andersonia* sp., *Stirlingia latifolia*, *Xanthorrhoea preissii*, *Leucopogon* sp., *Melaleuca thymoides*, *Conostylis juncea, Dampiera linearis, Jacksonia floribunda* and *Stirlingia latifolia* (DEWHA 2008).	Approximately 18 km north of Gingin offset properties	Possible Found in association with vegetation complex Karamal Complex-South, which intersects the Gingin offset properties

[1]Nearby records determined using NatureMap/ WA Herbarium data

9 Summary of offset values

The Gingin offset properties is expected to contain areas of potential BWSCP TEC, foraging habitat for Carnaby's Cockatoo and FRTBC, and potentially breeding habitat for Carnaby's Cockatoo and FRTBC. The Gingin offset properties lies outside the range of Baudin's Cockatoo and is not expected to provide habitat for this species.

The Gingin offset properties may also potentially have habitat and populations of *Banksia mimica*, however it is unlikely to have habitat or populations of *Andersonia gracilis* or *Conospermum undulatum*.

Regards

Heath Morgan
Senior Environmental Consultant

Attachment 1: Figures
Attachment 2: Site photographs
Attachment 3: Black Cockatoo ranges

References

Department of Environment and Conservation (DEC) 2006, Slender Andersonia (*Andersonia gracilis*) Interim Recovery Plan 2006-2011. Interim Recovery Plan No. 228. Department of Environment and Conservation, Western Australia.

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Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, Environment Protection and Biodiversity Act 1999 referral guidelines for three threatened black cockatoo species: Carnaby's Black Cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's Black Cockatoo (vulnerable) *Calyptorhynchus baudinii* and Forest Red-tailed Black Cockatoo (vulnerable) *Calyptorhynchus banksia naso*, Australian Government Canberra.

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Mory AJ, Haig, DW, Mcloughlin S, and Hocking RM, 2005, Geology of the northern Perth Basin, Western Australia — a field guide: Western Australia Geological Survey, Record 2005/9, 71p.

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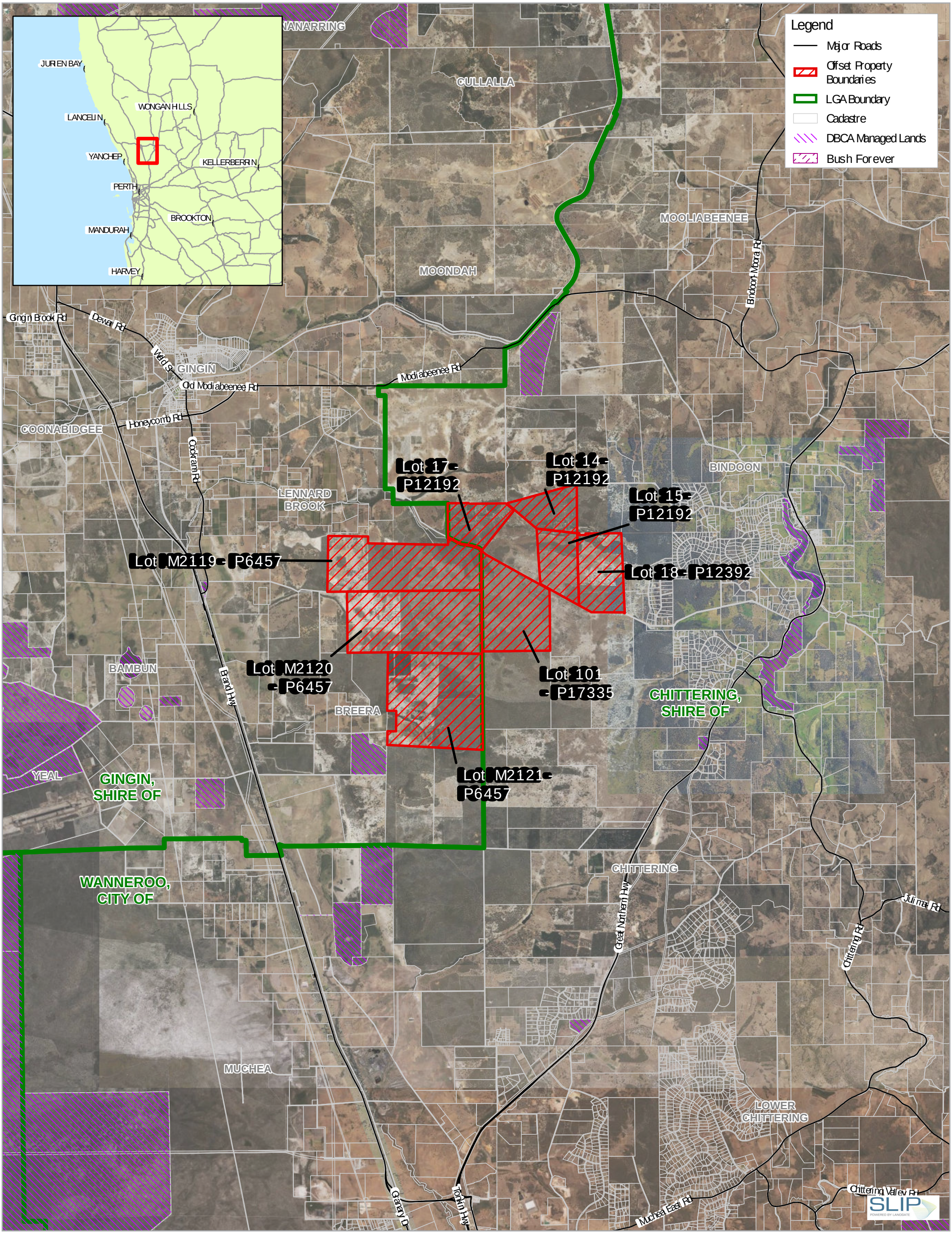
Western Australian (WA) Herbarium 1998–2020, FloraBase–the Western Australian Flora, Biodiversity, Conservation and Attractions, retrieved July 2020 from http://florabase.dpaw.wa.gov.au/.



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Kilometres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

Main Roads WA
SR282 Tonkin Grade Separated Interchanges

Offset property location

Project No. 12523571
Revision No. 0
Date 28/10/2020

FIGURE 1

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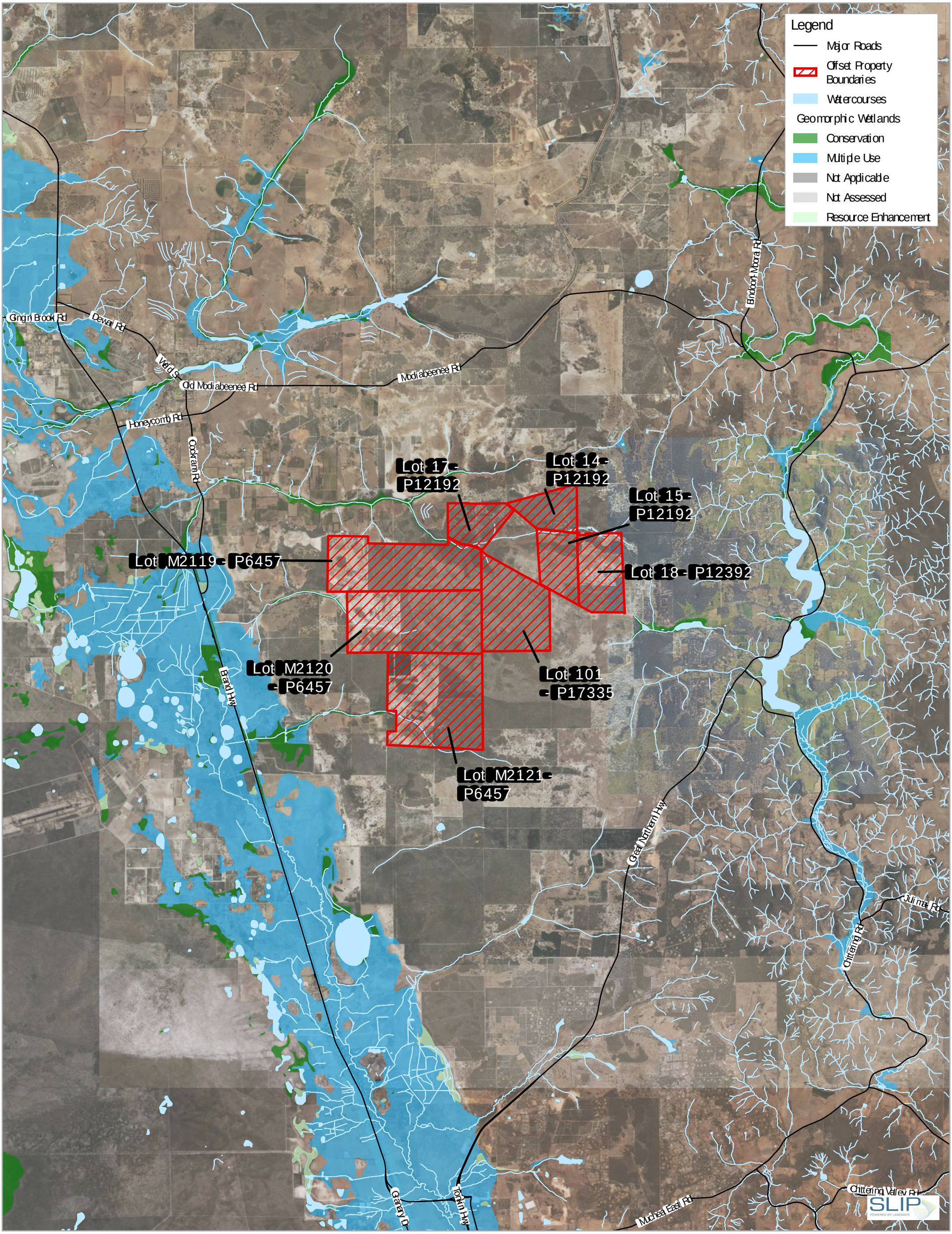

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Main Roads WA
SR282 Tonkin Grade Separated Interchanges

Regional wetlands

Project No. 12523571
Revision No. 0
Date 28/10/2020

FIGURE 2

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Legend

- *Chamelaucium lullfitzii*
- *Chamelaucium* sp. Gingin (N.G. Marchant 6)
- *Grevillea corrugata*
- *Grevillea curviloba*
- *Prychosema pusillum*
- Endangered (E)
- Vulnerable (VU)
- Major Roads
- Offset Property Boundaries

Vegetation Complexes

- Bassendean Complex-Central and South Transition
- Bassendean Complex-North
- Bassendean Complex-North Transition
- Coonambidgee Complex
- Cullula Complex
- Gingin Complex
- Karamal Complex-South
- Karrakatta Complex-North Transition
- Mogumber Complex-South
- Moondah Complex
- Reagan Complex
- Wannamal Complex
- Yanga Complex

Lot 14 - P12192
Lot 17 - P12192
Lot M2119 - P6457
Lot 18 - P12392
Lot M2120 - P6457
Lot 15 - P12192
Lot 101 - P17335
Lot M2121 - P6457

Brindoon-Moora Rd
Modiabeenee Rd
Old Modiabeenee Rd
Honeycomb Rd
Cockram Rd
Brand Hwy
Great Northern Hwy
Julimar Rd
Muchea East Rd
Tonkin Hwy
Chittering Valley Rd
Garatty Dr

Paper Size ISO A3

0 1 2 3 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

Main Roads WA
SR282 Tonkin Grade Separated Interchanges

Regional vegetation and flora records

Project No. 12523571
Revision No. 0
Date 28/10/2020

FIGURE 3

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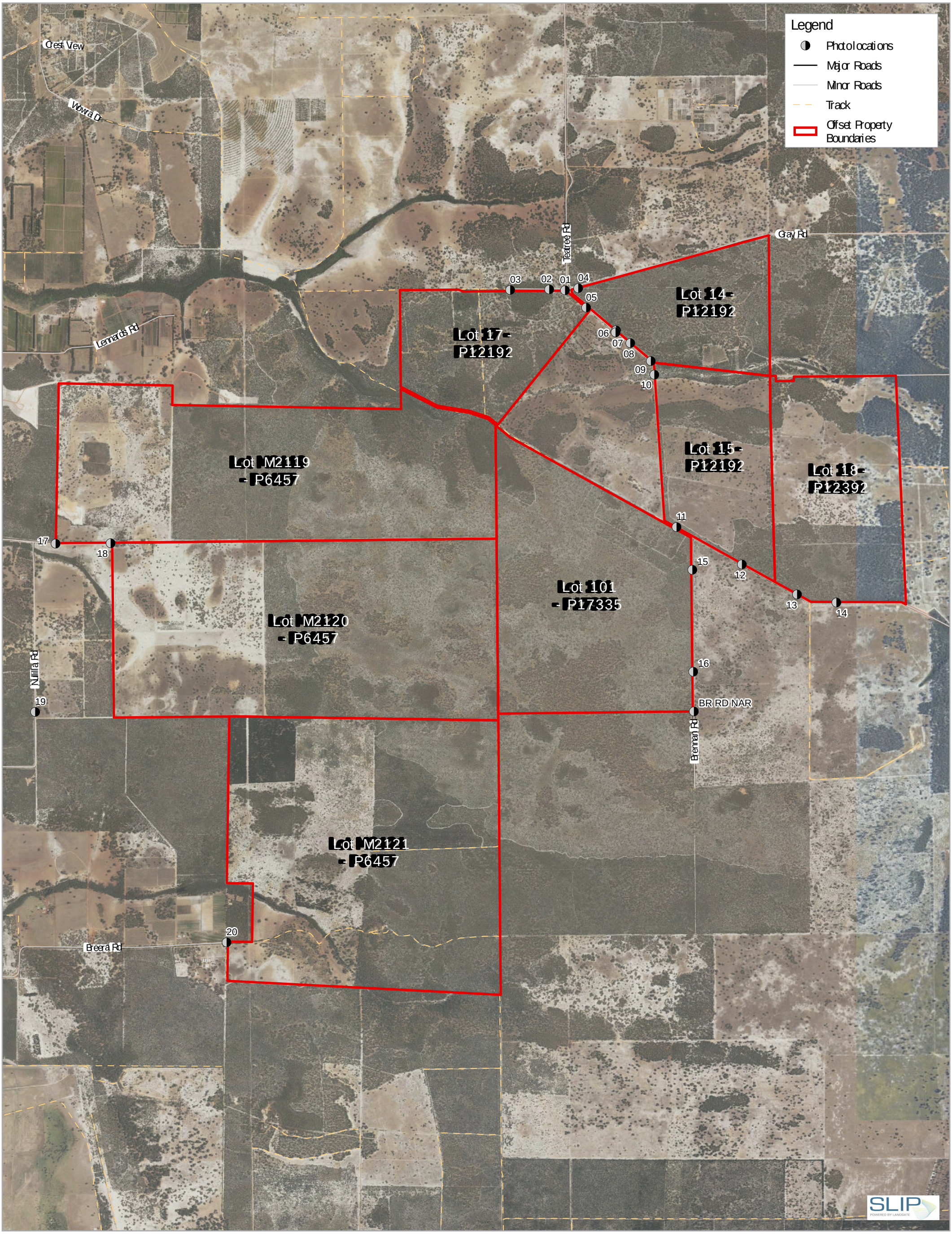

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Main Roads WA
SR282 Tonkin Grade Separated Interchanges

Site visit mapping

Project No. 12523571
Revision No. 0
Date 28/10/2020

FIGURE 4

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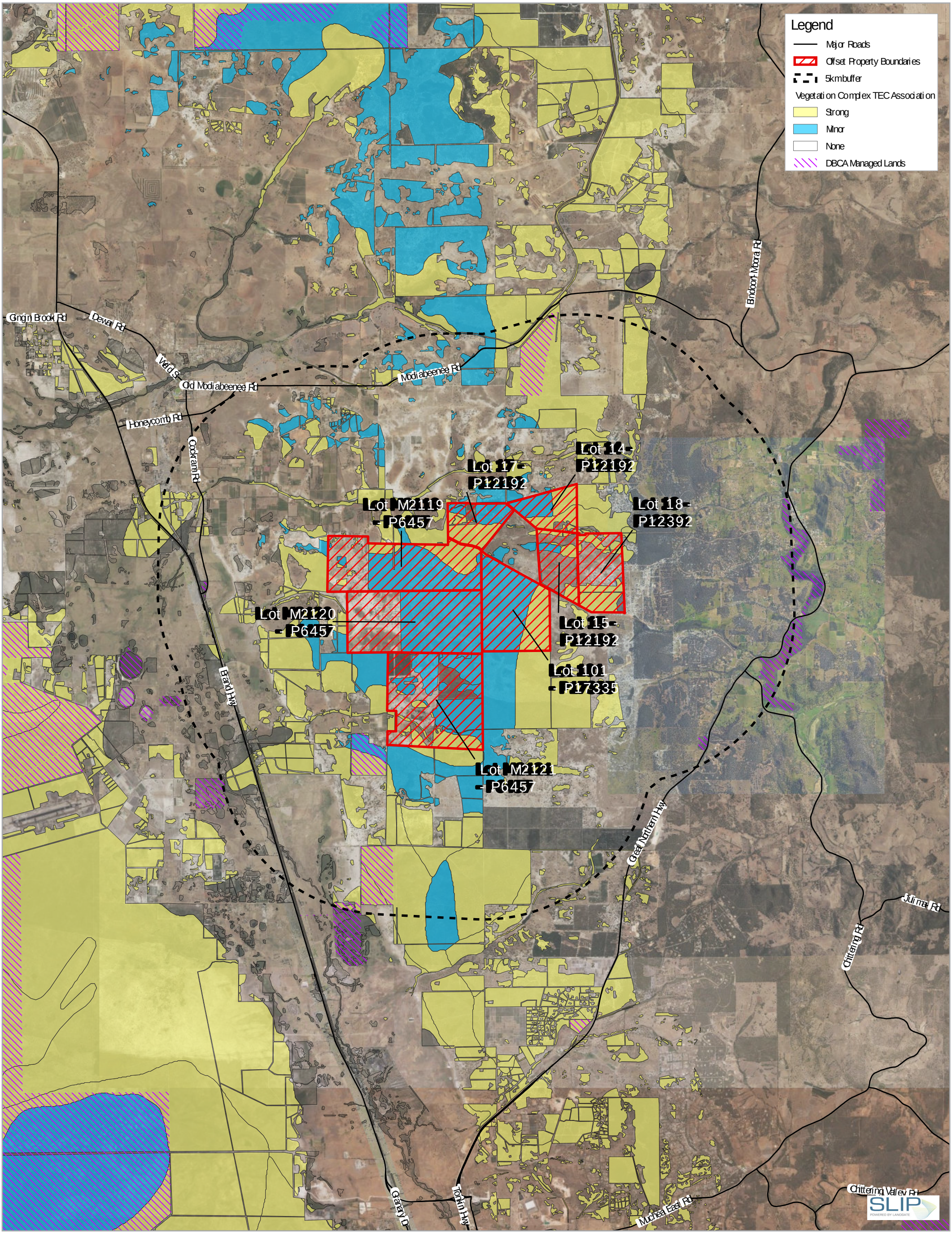

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Kilometres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

Main Roads WA
SR282 Tonkin Grade Separated Interchanges

BWSCP TEC context

Project No. 12523571
Revision No. 0
Date 28/10/2020

FIGURE 5

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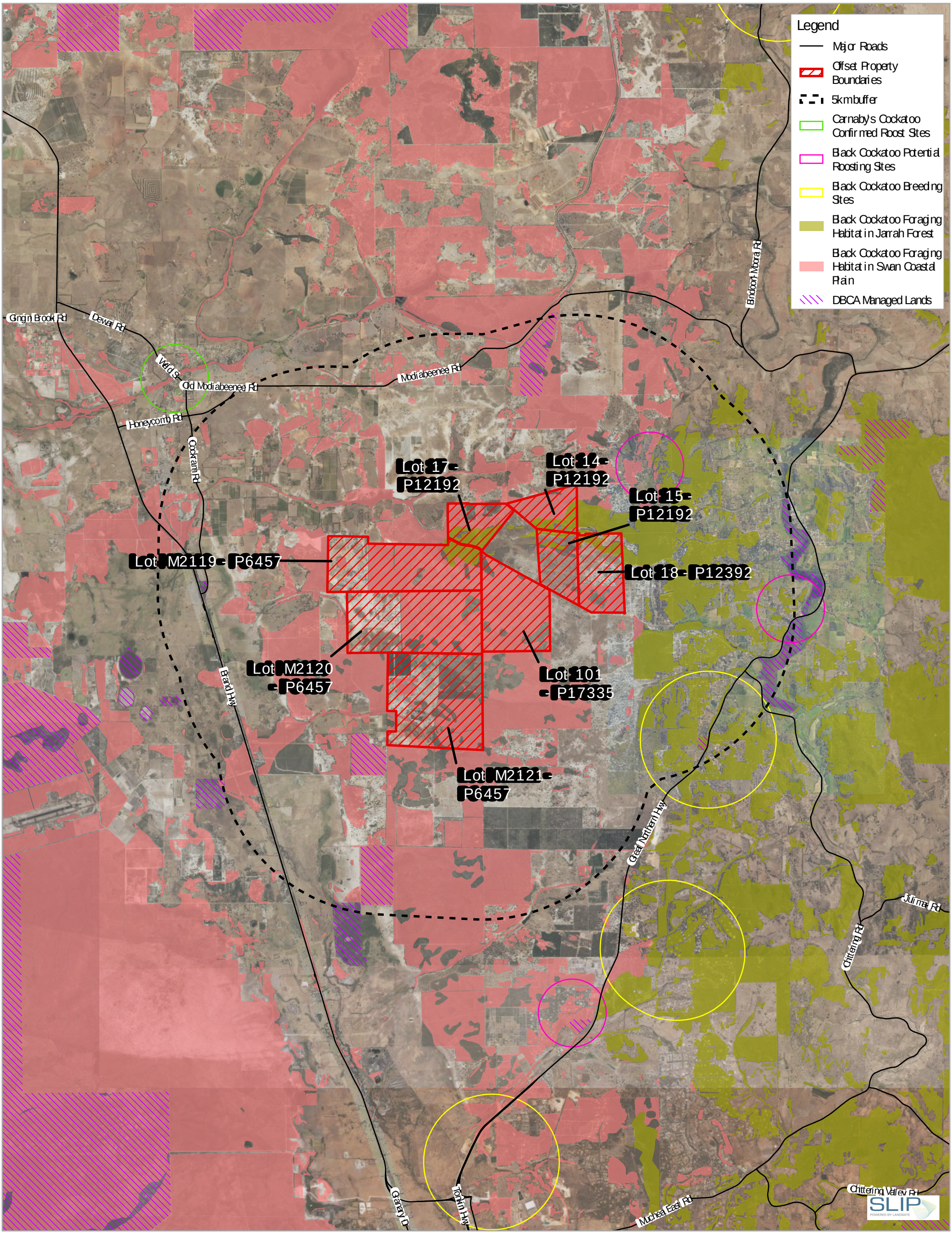

Paper Size ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

Main Roads WA
SR282 Tonkin Grade Separated Interchanges

Black cockatoo habitat context

Project No. 12523571
Revision No. 0
Date 28/10/2020

FIGURE 6

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Attachment 2: Site Information

Table 6 Site details from Gingin offset properties

Site aspects	*Description/ observations*
Site ID	01 (Lot 17)
Photographs	 
Description	Open woodland dominated by *Eucalyptus todtiana* and B*anksia attenuata* on white-grey sands. Understory contained weeds. Fragmented due to previous clearing and tracks. No evidence of recent burn. Very Good condition.
Banksia woodlands of the Swan Coastal Plain TEC	No, *E. todtiana* appears dominant.

Habitat for identified Threatened flora	Potentially suitable for *Banksia mimica* but vegetation is fragmented and weedy.
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	Carnaby's Cockatoo heard in distance

Site ID	**02 (Lot 17)**
Photographs	
Description	Open woodland containing thin stands of *Eucalyptus marginata* and scattered *Corymbia callophylla* over patches of *Banksia sessilis.* Grey-brown sands with litter layer. No evidence of recent burn, some weeds and cleared for track. This vegetation continues along the perimeter of the lot before and after private property (see below).
Banksia woodlands of the Swan Coastal Plain TEC	No, Eucalypts are dominant
Habitat for identified Threatened flora	Potentially suitable for *Conospermum undulatum*
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**03 (Lot 17)**
Photograph	
Description	Banksia woodland of *B. attenuata* and *B. menziesii* and scattered *Eucalyptus todtiana* dominant shrubs of *Adenanthos cygnorum* and Melalueca sp. White sands. Excellent condition, no visible weeds, no evidence of recent burn and mostly intact bushland.
Banksia woodlands of the Swan Coastal Plain TEC	Likely to be synonymous with the TEC
Habitat for identified Threatened flora	Potentially suitable for *Banksia mimica*
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**04 (Lot 14)**
Photography	 
Description	Banksia woodland of *B. attenuata* and *B. menziesii* and scattered *Eucalyptus todtiana* dominant shrubs of *Adenanthos cygnorum* and *Melalueca* sp. White sands. Excellent condition, no visible weeds, no evidence of recent burn and mostly intact bushland.
Banksia woodlands of the Swan Coastal Plain TEC	Likely to be synonymous with the TEC
Habitat for identified Threatened flora	Potentially suitable for *Banksia mimica*
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**05 (Lot 17)**
	
	
Description	Vegetation type similar to 01, but contains largely cleared areas and dense cover of weeds. Large Eucalyptus sp. in distance.
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**06 (Lot 14)**
	
	
Description	Open woodland of *Eucalyptus marginata* (young stands). Vegetation like 04. Mostly white-grey sands with some yellow influence. History of clearing and fragmentation but no weeds or fire influence. Very Good condition.
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	Potentially suitable for *Conospermum undulatum* but fragmented and previously cleared.

Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**07 (Lot 14)**
Photographs	
Description	Open previously cleared vegetation. Some large *Eucalyptus marginata* and *Corymbia callophylla* in uncleared patch.
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	Foraging and potential breeding
Notes	–

Site ID	**08 (Lot 14)**
Photographs	
Description	Roadside (east side) change in vegetation, white-grey sands containing *Banksia grandis* and some sedge-grasses. Disjunct by a sand track running between vegetation.
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**09 (Lot 14/15)**
Photographs	
Description	Vegetation (west) cleared and disjunct from vegetation in east. Addition of introduced species.
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	No
Notes	Carnaby's Cockatoo heard in west, likely utilising some of the large Eucalyptus surrounding the cleared paddock.

Site ID	**10 (Lot 15)**
Photographs	 

	
Description	*Banksia attenuata* and *B. sessilis* on laterite and white-grey sand. Addition of Acacia sp. Scattered tall *Pinus pinaster,* and tall *Corymbia callophylla* on west of roadside. Cleared paddock.
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**11 (Lot 15/101)**
Photographs	 
Description	Thin remnant patch of Eucalyptus todtiana, B. attenuata and Adenanthos cygnorum on white sands. Cleared paddock adjacent.
Banksia woodlands of the Swan Coastal Plain TEC	No, Banksia is not dominant
Habitat for identified Threatened flora	Potentially suitable for Conospermum undulatum
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**12 (Lot 15)**
Photographs	
Description	Open woodland of *Corymbia callophylla*, *Banksia menziesii* and *Adenanthos cygnorum* with dense understory on white-grey sands. Excellent condition. Further along roadside, some large trees of *Eucalyptus patens, E. marginata* and *Corymbia callophylla*
Banksia woodlands of the Swan Coastal Plain TEC	No, Banksia is not dominant
Habitat for identified Threatened flora	Potentially suitable for *Conospermum undulatum*
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**13 (Lot 18)**
Photographs	 
Description	Vegetation transitions to dominant *E. marginata* with some *Banksia grandis* over diverse understory. *Adenanthos cygnorum* still present in mid-layer.
Banksia woodlands of the Swan Coastal Plain TEC	No, none of the key Banksia species are present
Habitat for identified Threatened flora	Potentially suitable for *Conospermum undulatum*
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**14 (Lot 18)**
Photographs	
Description	Vegetation transitioned to contain Banksia woodland on white sands with Banksia as the dominant upper-strata species – *B. attenuata*, and B. *menziesii.*
Banksia woodlands of the Swan Coastal Plain TEC	Very Likely to be synonymous with the TEC
Habitat for identified Threatened flora	Potentially suitable for *Banksia mimica*
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	Estimate 20 Carnaby's Cockatoos flying over cleared paddock heading west.

Site ID	**15 (Lot 101)**
Photographs	
Description	Open shrubland with scattered *B. attenuata* and dominant *Adenanthos cygnorum* and addition of Allocasuarina.
Banksia woodlands of the Swan Coastal Plain TEC	Potential
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	–

Site ID	**16 (Lot 16)**
Photographs	 
Description	Roadside contained few large *Eucalyptus marginata* and *Corymbia callophylla.* *B. attenuata*, and *B. menziesii*. shrubland (younger fire age) and emergent Eucalyptus.

Banksia woodlands of the Swan Coastal Plain TEC	No, Eucalyptus
Habitat for identified Threatened flora	Potentially Banksia mimica and Conospermum undulatum (photo 2)
Foraging and/or Breeding trees for Black Cockatoo	Foraging, potential breeding
Notes	–

Site ID	**17 (Lot M 2119)**
Photographs	
Description	*Eucalyptus todtiana*, *E. marginata* woodland and scattered *B. attenuata*. Weedy understory, cleared paddock adjacent.
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	Too disturbed (weeds)
Foraging and/or Breeding trees for Black Cockatoo	Yes – minimal – *Eucalyptus todtiana.*
Notes	–

Site ID	**18 (Lot M 2119/Lot M 2120)**
Photographs	 
Description	Scattered remnant vegetation (mostly introduced species) surrounding cleared paddock (photo 1 north, photo 2 south)
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	No
Notes	Lot inaccessible due to private farming property

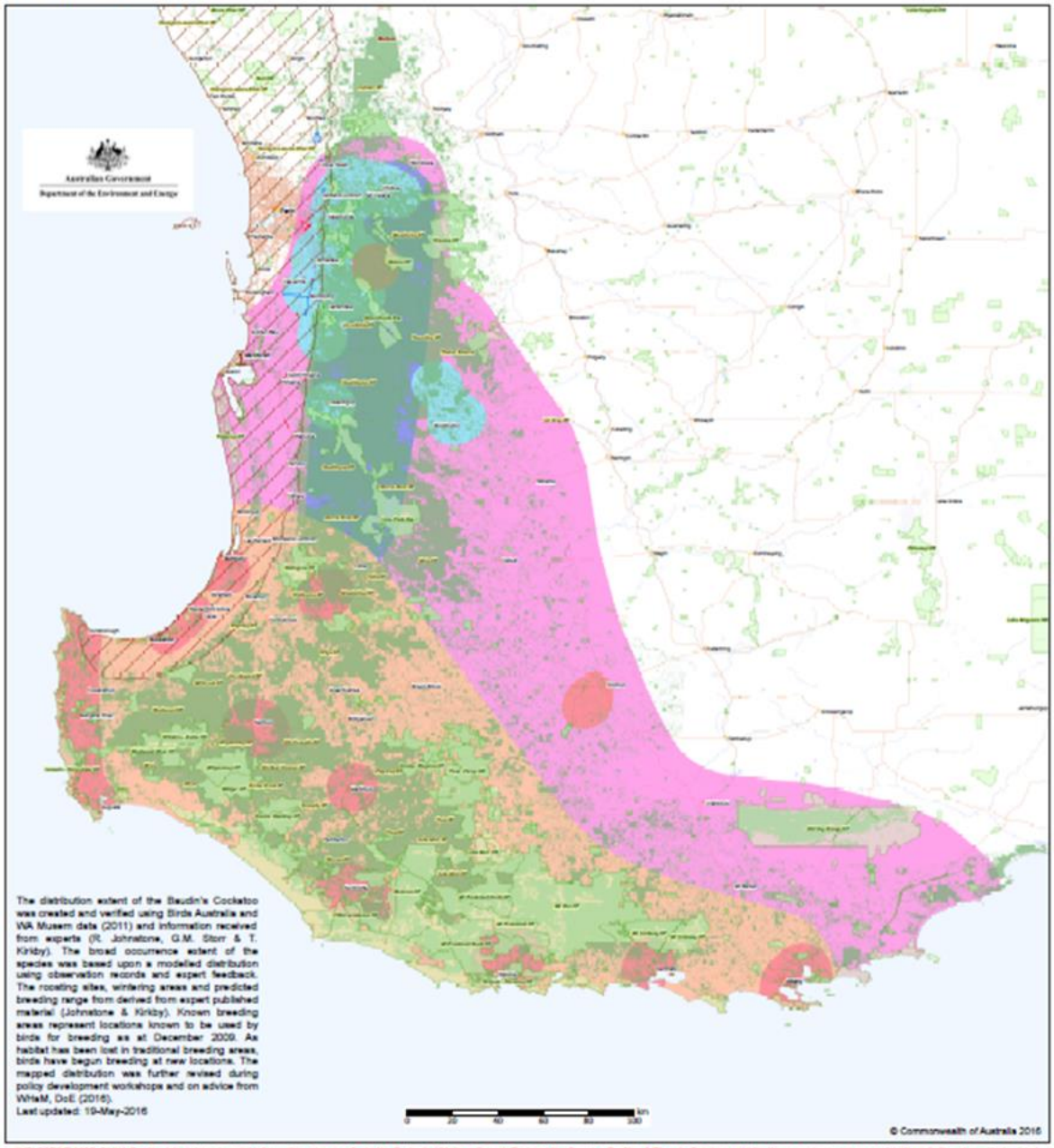
Site ID	**19 (Lot 2120)**
Photographs	 
Description	Remnant *Eucalyptus marginata* and distant patch of vegetation containing Eucalyptus sp. (photo 2).
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	Lot inaccessible due to private farming property

Site ID	**20**
Photographs	 
Description	Commercial plantations and private property. Some remnant Eucalyptus woodland with Acacia sp (photo 2)
Banksia woodlands of the Swan Coastal Plain TEC	No
Habitat for identified Threatened flora	No
Foraging and/or Breeding trees for Black Cockatoo	Foraging
Notes	Lot inaccessible due to private farming property

Attachment 3: Black Cockatoo Species Distribution

Distribution maps published: https://www.environment.gov.au/epbc/comment/draft-revised-referral-guideline-black-cockatoo

Map 2: Modelled distribution for Baudin's Cockatoo
(*Calyptorhynchus baudinii*)



INDICATIVE MAP ONLY. For the latest departmental information, please refer to the Protected Matters Search Tool and the Species Profiles & Threats Database at http://www.environment.gov.au/biodiversity/threatened/index.html

Produced by:
Environmental Resources Information Network 2016

Contextual data source:
National Vegetation Information System (NVIS 4.2) 2016
Interim Biogeographic Regionalisation for Australia (IBRA) version 7 2012
Collaborative Australian Protected Area Database (CAPAD) 2014
Geoscience Australia GEODATA TOPO 250K Topographic Data Series 3 2006

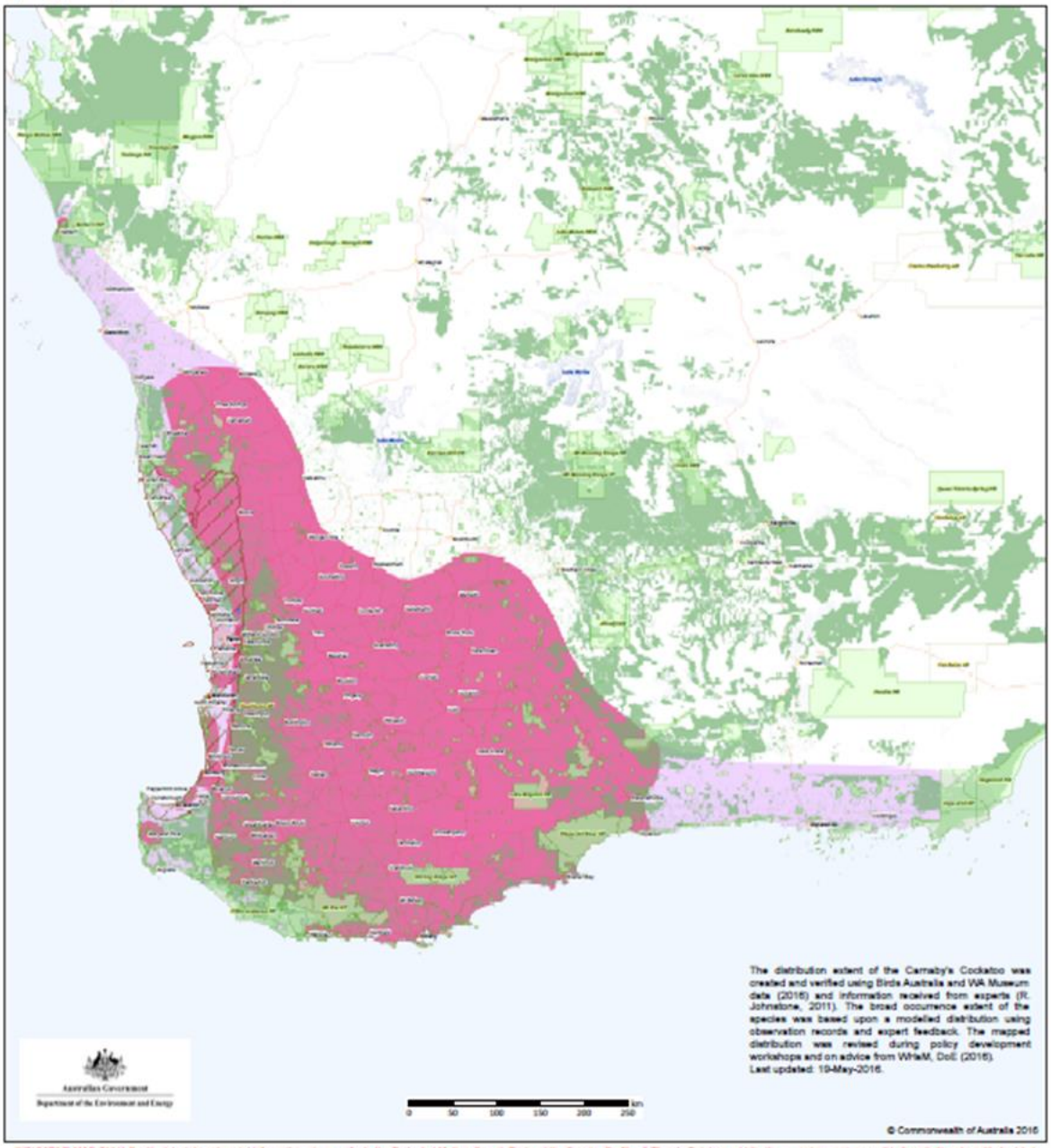
Projection: Geographic
Datum: GDA94

Ecological Communities
- Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain
- Banksia Woodlands of the Swan Coastal Plain
- Conservation Areas
- Jarrah, Karri and Marri (NVIS 4.2)

Species
- Known Breeding Areas
- Predicted Breeding Range
- Known Foraging Areas
- Main Wintering Area
- Species Likely to Occur

- Cities & Towns
- Roads (sealed)
- Roads (unsealed)
- Railways
- State Border
- Major Rivers
- Lakes/Reservoirs
- Non-perennial Lakes

Map 3: Modelled distribution for Carnaby's Cockatoo (*Calyptorhynchus latirostris*)



INDICATIVE MAP ONLY. For the latest departmental information, please refer to the Protected Matters Search Tool and the Species Profiles & Threats Database at http://www.environment.gov.au/biodiversity/threatened/index.html

Produced by:
Environmental Resources Information Network 2016

Contextual data source:
National Vegetation Information System (NVIS 4.2) 2016
Interim Biogeographic Regionalisation for Australia (IBRA) version 7 2012
Collaborative Australian Protected Area Database (CAPAD) 2014
Geoscience Australia GEODATA TOPO 250K Topographic Data Series 3 2006

Projection: Geographic
Datum: GDA94

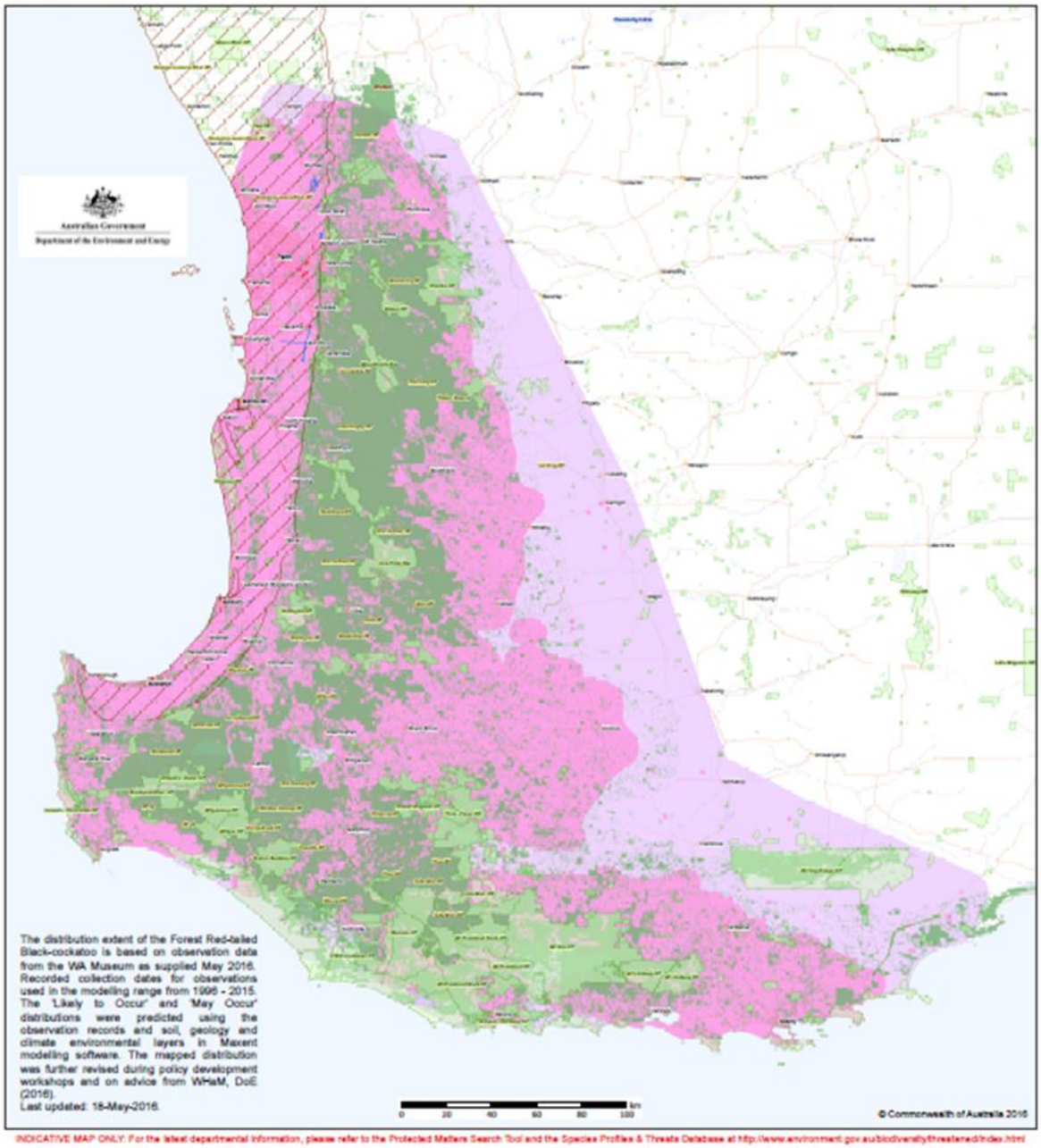
Conservation Areas
Jarrah, Karri, Marri, Salmon Gum, Wandoo, Banksia, Grevillea, Dryandra and Hakea (NVIS 4.2)

Species
Breeding Range
Non-breeding Range

Ecological Communities
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain
Banksia Woodlands of the Swan Coastal Plain

Cities & Towns
Roads (sealed)
Roads (unsealed)
State Border
Major Rivers
Lakes/Reservoirs
Non-perennial Lakes

Map 4: Modelled distribution for Forest Red-tailed Black-Cockatoo
(*Calyptorhynchus banksii naso*)



INDICATIVE MAP ONLY. For the latest departmental information, please refer to the Protected Matters Search Tool and the Species Profiles & Threats Database at http://www.environment.gov.au/biodiversity/threatened/index.html

Produced by:
Environmental Resources Information Network 2016

Contextual data source:
National Vegetation Information System (NVIS 4.2) 2016
Interim Biogeographic Regionalisation for Australia (IBRA) version 7 2012
Collaborative Australian Protected Area Database (CAPAD) 2014
Geoscience Australia GEODATA TOPO 250K Topographic Data Series 3 2006

Projection: Geographic
Datum: GDA94

Conservation Areas
Jarrah, Karri and Marri (NVIS 4.2)

Species
Likely to Occur
May Occur

Ecological Communities
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain
Banksia Woodlands of the Swan Coastal Plain

Cities & Towns
Roads (sealed)
Roads (unsealed)
Railways
State Border
Major Rivers
Lakes/Reservoirs
Non-perennial Lakes

Appendix B – Preliminary offset calculations

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Banksia TEC
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**	3.99	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	2.39	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes	2.39	Adjusted hectares		**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	21	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	2.10	90%	1.89	1.49	2.50	104.42%	Yes		
									Future area without offset (adjusted hectares)	17.9	**Future area with offset (adjusted hectares)**	20.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**6**	1.00	90%	0.90	0.90				
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	2.394	2.50	104.42%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Carnaby's Cockatoo
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	18.74	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	11.24	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	11.24	Adjusted hectares		**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	96	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	9.60	90%	8.64	6.81	11.34	100.86%	Yes	
									Future area without offset (adjusted hectares)	81.6	**Future area with offset (adjusted hectares)**	91.2								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**6**	1.00	90%	0.90	0.89				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	11.244	11.34	100.86%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Forest Red-tailed Black Cockatoo
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	19.14	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	11.48	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	11.48	Adjusted hectares		**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	90	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	9.00	90%	8.10	7.78	11.54	100.50%	Yes	
									Future area without offset (adjusted hectares)	76.5	**Future area with offset (adjusted hectares)**	85.5								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**6**	1.00	90%	0.90	0.90				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	11.484	11.54	100.50%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Baudin's Cockatoo
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	19.14	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	11.48	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	11.48	Adjusted hectares		**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	98	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	9.80	90%	8.82	6.95	11.58	100.81%	Yes	
									Future area without offset (adjusted hectares)	83.3	**Future area with offset (adjusted hectares)**	93.1								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**6**	1.00	90%	0.90	0.89				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	11.484	11.58	100.81%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Conospermum undulatum
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	C. undulatum	**Area**	7.45	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	4.47	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	Yes	C. undulatum	62		Count	

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	4.47	Adjusted hectares		**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	16	**Risk of loss (%) without offset**	50%	**Risk of loss (%) with offset**	5%	7.20	90%	6.48	6.23	4.45	99.65%	Yes	
									Future area without offset (adjusted hectares)	8.0	**Future area with offset (adjusted hectares)**	15.2								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**6**	1.00	90%	0.90	0.90				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	Yes	62	Count	125	1		125		0		125		125	50%	62.50	62.38	100.61%	Yes		

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	62	62.38	100.61%	**Yes**	$0.00	N/A	$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	4.47	4.45	99.65%	**Yes**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Andersonia gracilis
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	Yes	Andersonia gracilis	11		Count	

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	Yes	11	Count	75	1		75		0		75		75	15%	11.25	11.12	101.06%	Yes		

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	11	11.12	101.06%	**Yes**	$0.00	N/A	$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Banksia mimica
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

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

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	Yes	Banksia mimica	3		Count	

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	Yes	3	Count	21	1		21		0		21		21	15%	3.15	3.11	103.75%	Yes		

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	3	3.11	103.75%	**Yes**	$0.00	N/A	$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	H. Morgan, N. Lutz	D. Farrar		D. Farrar		29/09/2020
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