GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

PERMIT DETAILS
Area Permit Number: 9018/1
File Number: DWERVT6339
Duration of Permit: From 26 November 2020 to 26 November 2022

PERMIT HOLDER
City of Cockburn

LAND ON WHICH CLEARING IS TO BE DONE
Lot 500 on Deposited Plan 416546, Jandakot
Lot 501 on Deposited Plan 416549, Jandakot
Lot 502 on Deposited Plan 416550, Jandakot
Lot 504 on Deposited Plan 416552, Jandakot
Lot 505 on Deposited Plan 416551, Jandakot
Lot 508 on Deposited Plan 416548, Jandakot
Lot 509 on Deposited Plan 416547, Jandakot
Boeing Way road reserve (PIN 1184357), Jandakot
Jandakot Road reserve (PINs 1187135, 11871425 and 11871426), Jandakot
Solomon Road reserve (PIN 1184356), Jandakot
Un-named Road reserves (PINs 11861474, 12251168, 12278473, 12354710, and 12354709), Jandakot

AUTHORISED ACTIVITY
The Permit Holder shall not clear more than 2.10 hectares of native vegetation within the area cross-hatched yellow on attached Plan 9018/1a and Plan 9018/1b.

CONDITIONS

1. **Avoid, minimise and reduce the impacts and extent of clearing**
   In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:
   (a) avoid the clearing of native vegetation;
   (b) minimise the amount of native vegetation to be cleared; and
   (c) reduce the impact of clearing on any environmental value.

2. **Dieback and weed control**
   When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:
   (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
   (b) ensure that no known *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
   (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

3. **Fauna management (directional clearing)**
   Clearing shall be conducted in a slow, progressive manner from east to west to allow fauna to move out of the clearing area and into adjacent remnant vegetation.

4. Offset – Land acquisition

Prior to 1 August 2021, the Permit Holder shall provide to the *CEO* a copy of the executed change in purpose of Lot 500 on Plan 413034 (being Crown Reserve 1820) from 'Recreation' to 'Conservation' on Plan 9018/1c.

5. Offset - Vegetation management - fencing

(a) Within six months of clearing, the Permit Holder shall construct a fence enclosing the area coloured orange on Plan 9018/1c.
(b) By 17 April 2022, the Permit Holder shall construct a fence enclosing the area coloured grey on Plan 9018/1c.
(c) Fences should allow for the movement of wildlife by being raised 15cm from the ground.
(d) Within one month of installing the above fences, the Permit Holder shall notify the *CEO* in writing that the fence has been completed.

6. Records must be kept

The Permit Holder must maintain the following records for activities done pursuant to this Permit, in relation to the clearing of native vegetation authorised under this Permit:

(a) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
(b) the date that the area was cleared;
(c) the size of the area cleared (in hectares);
(d) the direction that clearing was undertaken;
(e) actions taken to avoid, minimise and reduce the impacts and extent of clearing in accordance with condition 1 of this Permit;
(f) actions taken to minimise the risk of the introduction and spread of dieback and weeds in accordance with condition 2 of this Permit; and
(g) evidence supporting compliance with conditions 4 and 5 of this Permit.

7. Reporting

(a) The permit holder must provide to the *CEO*, on or before 30 June of each calendar year, a written report containing:
    (i) the records required to be kept under condition 8; and
    (ii) records of activities done by the permit holder under this permit between 1 January and 31 December of the preceding calendar year.
(b) If no clearing authorised under this permit has been undertaken, a written report confirming that no clearing under this permit has been undertaken, must be provided to the *CEO* on or before 30 June of each calendar year.
(c) The permit holder must provide to the *CEO*, no later than 90 calendar days prior to the expiry date of the permit, a written report of records required under condition 6, where these records have not already been provided under condition 7(a).

DEFINITIONS

The following meanings are given to terms used in this Permit:

black cockatoo habitat tree/s: means trees that have a diameter, measured at 1.5 metres from the base of the tree, of 50 centimetres or greater;

CEO: means the Chief Executive Officer of the Department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*;

dieback means the effect of *Phytophthora* species on native vegetation;

fill means material used to increase the ground level, or fill a hollow;

land degradation includes salinity, erosion, soil acidity and waterlogging;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

weed/s means any plant -

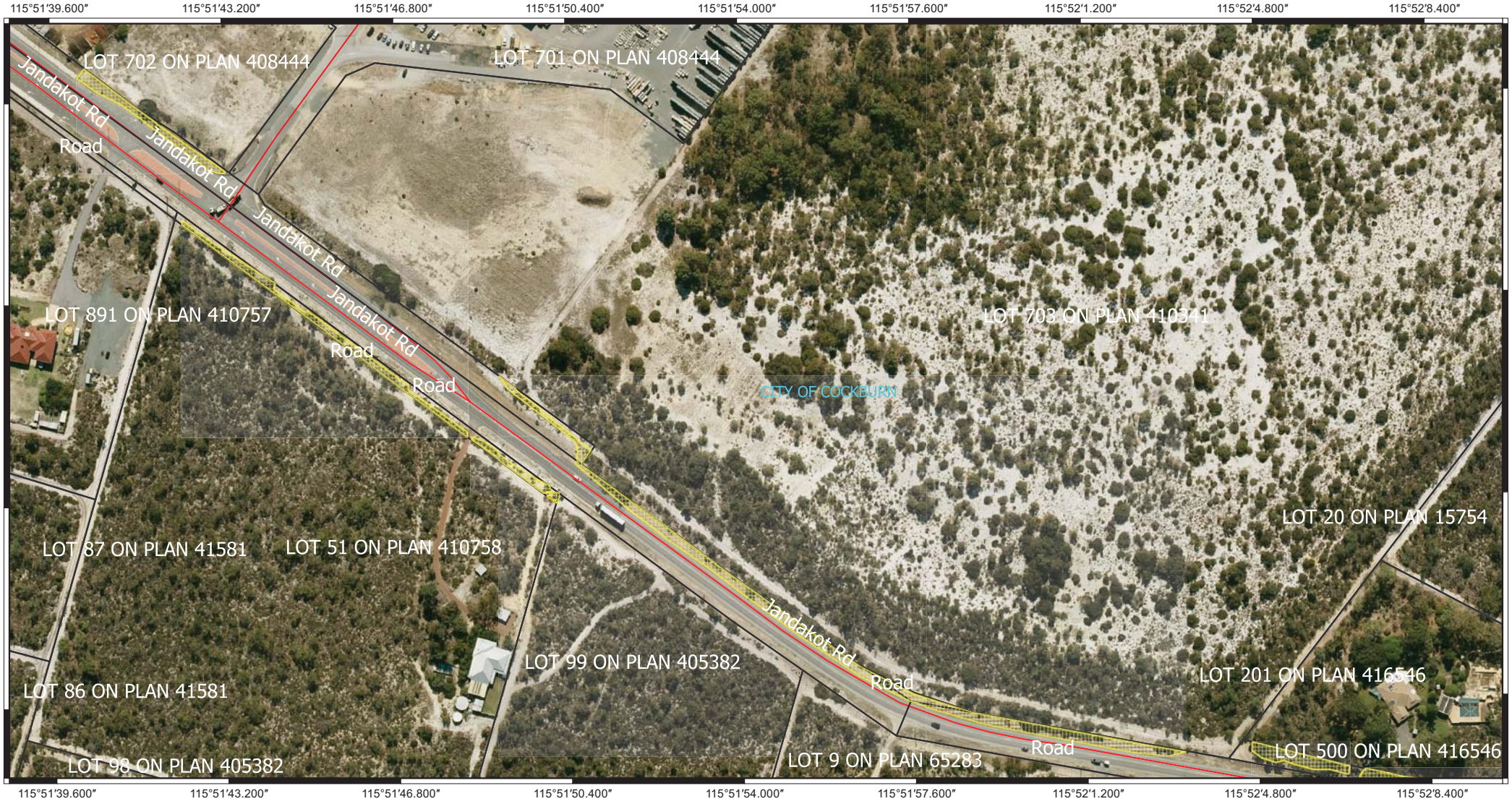
(a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
(b) published in a Department of Biodiversity, Conservation and Attractions Regional Weed Rankings Summary, regardless of ranking; or
(c) not indigenous to the area concerned.

Mathew Gannaway
MANAGER
NATIVE VEGETATION REGULATION

Officer delegated under Section 20
of the Environmental Protection Act 1986

3 November 2020

Plan 9018/1a



Legend

- CPS areas approved to clear base layers
- Local Government Authorities
- Cadastre - LGATE 218
- Roads - Landgate 012

Mathew Gannaway
2020.11.03 11:14:31 +08'00'

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

N

0 75 150 m

MGA 94
Geocentric Datum of Australia 1994

GOVERNMENT OF WESTERN AUSTRALIA

Plan 9018/1b

Legend

- CPS areas approved to clear
- base layers
- Local Government Authorities
- Cadastre - LGATE 218
- Roads - Landgate 012

Mathew Gannaway
2020.11.03 11:15:06 +08'00'

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

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0 75 150 m

MGA 94
Geocentric Datum of Australia 1994

GOVERNMENT OF WESTERN AUSTRALIA

Plan 9018/1c

Legend

- CPS subject to conditions

base layers

- Local Government Authorities
- Cadastre - LGATE 218
- Roads - Landgate 012

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Officer with delegated authority under Section 20
of the Environmental Protection Act 1986

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Geocentric Datum of Australia 1994

GOVERNMENT OF WESTERN AUSTRALIA

Clearing Permit Decision Report

1. Application details and outcome

1.1. Permit application details

Permit number:	CPS 9018/1
Permit type:	Area permit
Applicant name:	City of Cockburn (the City)
Application received:	19 August 2020
Application area:	2.10 hectares (ha) of native vegetation
Purpose of clearing:	Road widening
Method of clearing:	Mechanical
Property:	Lot 500 on Deposited Plan 416546 Lot 501 on Deposited Plan 416549 Lot 502 on Deposited Plan 416550 Lot 504 on Deposited Plan 416552 Lot 505 on Deposited Plan 416551 Lot 508 on Deposited Plan 416548 Lot 509 on Deposited Plan 416547 Boeing Way road reserve (PIN 1184357) Jandakot Road reserve (PINs 1187135, 11871425 and 11871426) Solomon Road reserve (PIN 1184356) Un-named Road reserves (PINs 11861474, 12251168, 12278473, 12354710, and 12354709)
Location (LGA area/s):	City of Cockburn
Localities (suburb/s):	Jandakot

1.2. Description of clearing activities

The application is to clear 2.10 ha of native vegetation scattered along a 1.7 kilometre (km) portion of Jandakot Road between Berrigan Drive and Fraser Road to upgrade Jandakot Road to a dual carriageway. Intersections between Jandakot Road and Solomon Road and Jandakot Road and Falcon Place will also be upgraded (see Figure 1, Section 1.5). The clearing of native vegetation within private properties adjoining Jandakot Road were considered necessary as the proposed upgrades were not deemed viable to occur within the existing 20 metre (m) road reserve.

The proposed works are part of a larger 'Jandakot Solomon Public Works Project' (referred to the Project hereafter in this report) which includes upgrades to a number of roads and intersections within the Jandakot Road traffic network. The City (2020a) advised that the Project has been developed in order to address safety and congestion issues along Jandakot Road.

1.3. Decision on application and key considerations

Decision:	Granted
Decision date:	3 November 2020
Decision area:	2.10 ha of native vegetation, as depicted in Section 1.5.

1.4. Reasons for decision

This clearing permit application was made in accordance with section 51E of the *Environmental Protection Act 1986* (EP Act) and was received by the Department of Water and Environmental Regulation (DWER) on 19 August 2020. DWER advertised the application for public comment and no submissions were received.

In undertaking their assessment and in accordance with section 51O of the EP Act, the Delegated Officer has given consideration to the site characteristics (see Appendix B), the Clearing Principles in Schedule 5 of the EP Act (see Appendix C), relevant planning instruments and any other pertinent matters they deemed relevant to the assessment (see Sections 3 and 4), information provided by the City (2020a; 2020b and 2020c) (see Appendix A), the findings of biological surveys (GHD Pty Ltd (GHD), 2019) (see Appendix F), as well as relevant datasets available at the time of the assessment (see Appendix G).

The Delegated Officer also took into consideration that the purpose of the clearing is to improve road safety of Jandakot road through:

- Safer opportunities for turning (both at roundabouts, at rural roads intersecting with Jandakot Road and Solomon Road and at the driveways of landowners adjoining Jandakot Road).
- Safer opportunities for cycling and walking – with footpaths and street lighting.
- A reduced likelihood for serious accidents as there will be a significantly reduced potential for head on or right angle traffic accidents that generally cause the greatest amount of injury and fatalities.
- Management of congestion.

The flora and fauna surveys (GHD, 2019) identified that the application area comprises 2.10 ha of significant foraging habitat for Carnaby's cockatoo and native vegetation commensurate with the ecological community 'Banksia Dominated Woodlands of the Swan Coastal Plain (SCP) Interim Biogeographic Regionalisation for Australia (IBRA) region' listed as 'Priority 3(iii)' priority ecological community (PEC) by Department of Biodiversity, Conservation and Attractions (DBCA) and as an 'Endangered' threatened ecological community (TEC) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (referred to as Banksia Woodland TEC herein this report).

To counterbalance these significant residual impacts caused by the proposed clearing, the City has submitted an offset proposal that involves protection and ongoing management of vegetation within Rose Shanks Reserve. Taking into consideration the City's avoidance, minimisation and mitigation measures and based on a calculation using EPBC Act Offsets calculator, the Delegated Officer determined that the protection and ongoing management of 10.01 hectares of vegetation in at least very good condition that includes Banksia Woodland TEC and black cockatoo foraging habitat will adequately proportionate to the significance of the environmental values being impacted.

It was also determined that a number of conservation significant fauna may be utilising the application area at the time of clearing. Slow, directional clearing that enables fauna to move into adjacent habitat will mitigate impacts to individuals that may be present at the time of clearing.

The application area is adjacent to native vegetation that contains suitable habitat for fauna. Weed and dieback management practices will assist in mitigating impacts to adjacent vegetation.

The Delegated Officer considered that the impacts of the proposed clearing are unlikely to have any long-term adverse impacts on the environmental values in the local area and that offset, fauna management and weed and dieback management practices will mitigate any potential impacts.

1.5. Site maps

Plan 9018/1a

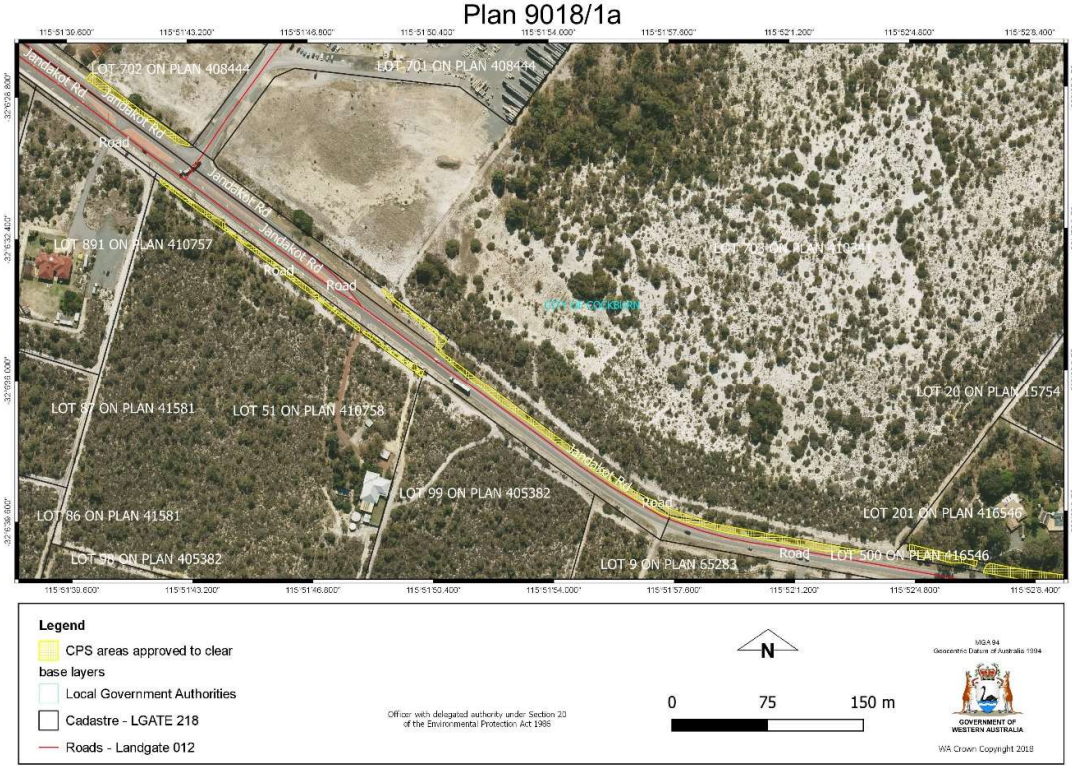

Figure 1a

Plan 9018/1b

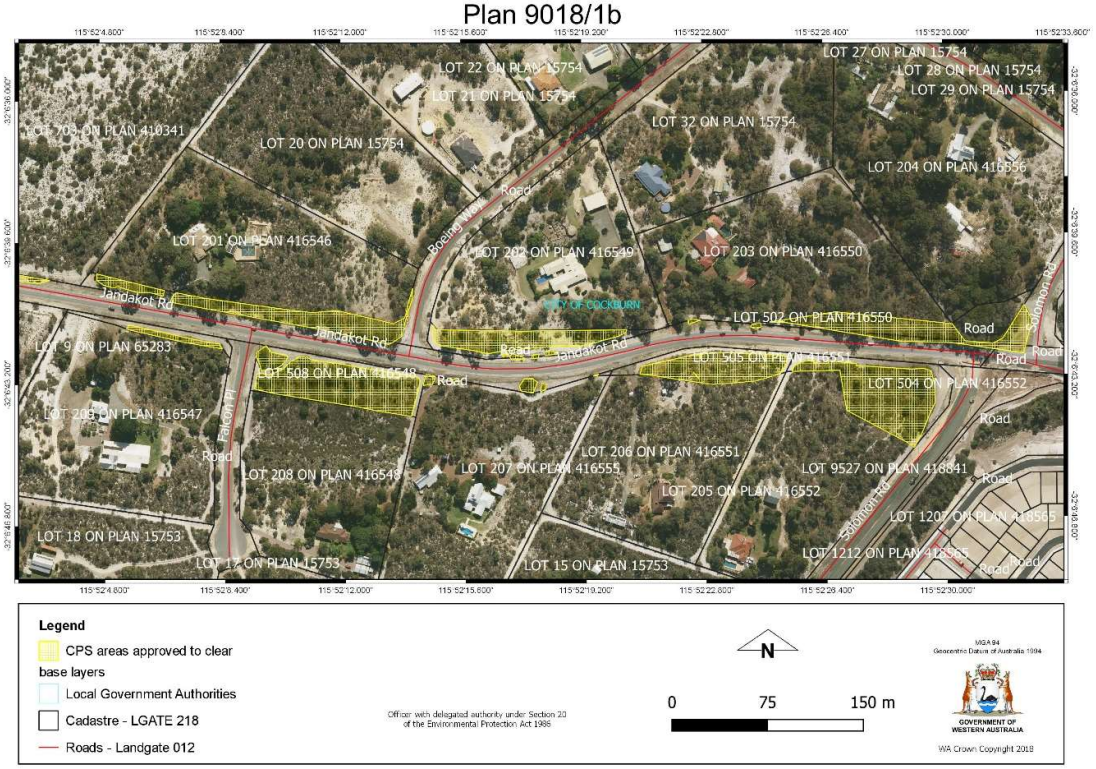

Figure 1b

Figure 1a and 1b. Maps of the application area. The areas cross-hatched yellow indicate the areas authorised to be cleared under the granted clearing permit.

2. Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.3), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

1. the precautionary principle;
2. the principle of intergenerational equity; and
3. the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act);
- *Biosecurity and Agriculture Management Act 2007;*
- *Land Administration Act 1997;* and
- EPBC Act

Relevant policies considered during the assessment were:

- *Environmental Offsets Policy* (2011)

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (December 2013);
- *Procedure: Native vegetation clearing permits* (DWER, October 2019);
- *Environmental Offsets Guidelines* (August 2014);
- Technical guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment* (Environmental Protection Authority (EPA), 2016); and
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016).

3. Detailed assessment of application

3.1. Avoidance and mitigation measures

Avoidance

Alternatives that would avoid the need for clearing have been considered. The City considered relocating traffic from Jandakot Road to the surrounding roads of Armadale Road, Warton Road, Nicholson Road and Beeliar Drive. As these roads are already congested this alternative was not viable. Other alternative local routes were also considered but were not deemed viable either. The City has noted that Jandakot Road is used by a mix of local, subregional and regional traffic much of which emanates from local communities that use Jandakot Road to travel to the regional road network of the freeway and to access regional employment centres such as Jandakot Airport. Taking this into consideration, the City has concluded that no logical alternatives that would avoid the need for clearing were identified (City of Cockburn, 2020c).

Minimise

Measures that would minimise the need for clearing have also been considered. The City has considered three different design option for the intersection between Jandakot Road and Solomon Road:

a) Option 1 – a central roundabout
b) Option 2 – an offset roundabout, with the roundabout offset towards the southeast
c) Option 3 – a traffic lights option

While Option 3 required the least amount of native vegetation to be cleared, a multi-criteria analysis which took into account a range of factors such as impacts on landowners, environment, noise, design safety or congestion management, revealed that this option is the worst performing due to higher localised impacts on surrounding landowners and the worst safety indicators. Additionally, this design was not supported by Main Roads Western Australia as they considered it to be less safe than the two other designs. The City also took into account that 49 people who contributed to the City's survey were oppose or strongly oppose to this option, compared to 10 people who support or strongly support this option (City of Cockburn, 2020c).

With regards for the two roundabout options, Option 1 required less native vegetation clearing than Option 2. Also, having used the multicriteria analysis tool, Option 1 was found to be the best alternative. Given this, the City has decided to proceed with Option 1 (City of Cockburn, 2020c).

To minimise the need for clearing within resource enhancement wetlands mapped within the application area, a drainage design was tested using the median island and road reserve as drainage storage to reduce the area of land

required for the proposed retention basins. The test has revealed an option to address the drainage in a more environmentally sensitive way by minimising the area of the drainage sump. Subsequently, the City has committed building block wall sections along the edge of Jandakot Road as oppose to an earthworks batter into the wetland which would require more native vegetation to be cleared (City of Cockburn, 2020c).

Mitigation

To mitigate potential impacts on the environment, the City has committed to prepare an Environmental Management Plan which includes (but is not limited to) the following measures (City of Cockburn, 2020a and 2020b):

- Dieback controls in accordance with the City Dieback Management Procedure.
- All heavy plant and machinery will be inspected at entry and exit of the work site and be confirmed to be clean and free of vegetation and soil material to prevent the spread of weeds and dieback.
- Clearly visible flagging of the clearing area, and inspection of clearing footprint prior to clearing.
- Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in areas cleared for permanent works.
- Speed limits between 40-80 km p/hr will be applied throughout the construction site which will consequently reduce the risk of fauna strikes during construction.
- Transfer of any injured fauna found on site to an appropriate fauna rescue organisation or individual. A list of local fauna rescue organisations and individuals will be maintained on site.
- Water carts and/or surface stabilization measures (e.g. hydro mulch) will be used to minimise dust generated from cleared areas.
- Surface water runoff from additional road pavement will be discharged into infiltration basins and/or swales within the Project area for treatment and infiltration to groundwater.

In addition to the above measures, the City advised that:

- A zoologist will be on site during the time of clearing activities who, if required, will relocate fauna to an appropriate location.
- Any grasstrees and/or macrozamia palms will be translocated to one of the City's conservation areas and maintained until self-sufficient.

After consideration of avoidance, minimise and mitigation measures, it was determined that an offset to counterbalance the significant residual impacts to significant foraging habitat for Carnaby's cockatoo and Banksia Woodland TEC was necessary. In accordance with the WA State Government's *Environmental Offsets Policy* and *Environmental Offsets Guidelines*, these significant residual impacts have been addressed through the conditioning of environmental offset requirements on the permit. The nature and suitability of the offset provided are summarised in Section 4.

3.2. Assessment of environmental impacts

In assessing the application in accordance with section 51O of the EP Act, the Delegated Officer has examined the application and site characteristics (Appendix B), as well as the findings of the biological surveys (GHD, 2019) (Appendix F) and considered whether the clearing poses a risk to environmental values. The assessment against the Clearing Principles is contained in Appendix C.

This assessment identified that the clearing may pose a risk to the environmental values of biological values (ecological communities and fauna), significant remnant vegetation and water resources and that these required further consideration. The detailed consideration and assessment of the clearing impacts against the specific environmental values is provided below. Where the assessment found that the clearing presents a risk to environmental values, conditions aimed at controlling and/or ameliorating the impacts have been imposed under sections 51H and 51I of the EP Act. These are also identified below.

3.2.1. Environmental value: biological values (fauna) – Clearing Principle (b)

Assessment:

The Delegated Officer determined that the proposed clearing will impact on significant foraging habitat for Carnaby's cockatoo and suitable habitat for forest red-tailed black cockatoo (FRTBC), Quenda, Perth Slider, western brush wallaby, black-striped snake, southern death adder and Stylet bush cricket.

According to available databases, 64 conservation significant fauna species have been recorded within the local area (DBCA, 2007). Given the boundary of the local area overlaps ocean, a number of the recorded species are exclusively associated with marine, estuarine or freshwater habitats that do not occur within the application area. Noting the habitat requirements, distribution of the recorded species, the mapped vegetation type, the condition of the vegetation

within the application area, as well as the findings of the fauna survey (GHD, 2019), it was considered that the application area is likely to comprise suitable habitat for:

- Carnaby's cockatoo (*Calyptorhynchus latirostris*)
- Forest red-tailed black cockatoo (*Calyptorhynchus banksia* subsp. *naso*)
- Quenda, southwestern brown bandicoot (*Isoodon fusciventer*)
- Perth slider, lined skink (*Lerista lineata*)
- Western brush wallaby (*Notamacropus irma*)
- Black-striped snake, black-striped burrowing snake (*Neelaps calonotos*)
- Southern death adder (*Acanthophis antarcticus*)
- Peregrine falcon (*Falco peregrinus*)
- A short-tongued bee (*Leioproctus contrarius*)
- Stylet bush cricket, stylet Throsco (Jandakot) (*Throscodectes xiphos*)

Carnaby's cockatoo and forest red-tailed black cockatoo

The application area falls within the know distribution of Carnaby's cockatoo and FRTBC. The assessment of the proposed clearing has identified that the application area is not likely to provide suitable breeding habitat for these species. Suitable breeding habitat for these species includes trees which either have a suitable nest hollow or are of a suitable dimeter at breast height (DBH) to develop a nest hollow. For most tree species a suitable DBH is 500 millimetres (Commonwealth of Australia, 2012). A targeted black cockatoo survey (GHD, 2019) identified a total of seven potential breeding trees (*Eucalyptus rudis)* within the north-eastern portion of the application area. No hollows suitable for black cockatoo nesting were observed (GHD, 2019).

Foraging habitat for Carnaby's cockatoo and FRTBC vary (Commonwealth of Australia, 2012). Noting the mapped vegetation within the application area (GHD, 2019), the proposed clearing will have different levels of impacts on these species. Therefore, the impacts of the proposed clearing on foraging habitat for Carnaby's cockatoo and FRTBC will be addressed separately.

Carnaby's cockatoo

The assessment has identified that the application area contains significant foraging habitat for Carnaby's cockatoo. Significant habitat refers to the resources (breeding, resting and feeding), connectivity or habitat area for a species or community that is critical for its survival. Carnaby's cockatoo forages on the seeds, nuts and flowers of a large variety of plants including *Proteaceous* species (*Banksia*, *Hakea* and *Grevillea*), as well as *Allocasuarina* and *Eucalyptus species*, *Corymbia calophylla* and a range of introduced species (Valentine and Stock, 2008). The records of foraging activity for Carnaby's cockatoo on the SCP show that Banksia species account for nearly 50 percent of the diet for this species (Shah, 2006). Similarly, EPA technical advice for Carnaby's cockatoo notes that *Banksia* species (predominantly *Banksia attenuata*, *Banksia menziesii* and *Banksia sessilis*) provide the most important natural food resource on SCP (EPA, 2019). The significance of Banksia woodland habitat has been confirmed through foraging studies, which determined that Carnaby's cockatoo exploit all areas of available Banksia food resources on the SCP (EPA, 2019). The fauna survey (GHD, 2019) identified that the application area comprises approximately 1.19 ha of vegetation that provide high quality foraging habitat for Carnaby's cockatoo in form of Banksia woodland and 0.91 ha low quality foraging habitat in form of *Melaleuca* dampland with shrubland and *Eucalyptus rudis* open woodland over *Melaleuca* dampland.

Foraging habitat for black cockatoos within seven km of a breeding site is important to adequately support breeding pairs (EPA, 2019). The application area is not located within the mapped confirmed breeding area for Carnaby's cockatoo. The closest confirmed natural breeding site is approximately 17.5 km north east the application area. There is 20 artificial nesting boxes installed approximately 4.6 km northeast of the application area, some of which have previously been used by black cockatoos for hatching (Murdoch University, 2018). Therefore, the proposed clearing will reduce the amount of food available to breeding birds.

The application area provides significant foraging habitat that supports black cockatoo night roosting. Individual night roosting sites need suitable foraging habitat and water within six km (EPA, 2019). Overlapping foraging ranges within 12 km also support roosting sites and maintain habitat connectivity and movement across the landscape (EPA, 2019). A review of the available databases noted that there is 79 roosting sites within the local area, of which 28 occur within six km from the application area.

In addition, according to the 'Threat abatement plan for disease in natural ecosystem' (Commonwealth of Australia, 2018), Carnaby's cockatoo habitat is listed as under threat from Phytophthora dieback. The proposed clearing may introduce additional weed species and dieback into surrounding habitat.

Forest red-tailed black cockatoo

The assessment has concluded that although the application area provides suitable habitat for FRTBC, this habitat is not considered significant. FRTBC commonly inhabits dense jarrah, karri, and marri forests receiving more than 600 millimetres annual average rainfall but also occurs in a range of other forest and woodland types, including blackbutt (*E. patens*), wandoo (*E. wandoo*), tuart (*E. gomphocephala*), Albany blackbutt (*E. staeri*), yate (*E. cornuta*), and flooded gum (*E. rudis*) (Commonwealth of Australia, 2012). The species predominantly feeds on the seeds of marri and jarrah which comprise around 90 percent of its diet (Commonwealth of Australia, 2012).

The application area provides up to 2.10 hectares of suitable foraging habitat for this species. However, preferred foraging habitat for this species is limited to the *E. rudis* open woodland over Melaleuca dampland (0.257 hectares) vegetation types, which are largely in a degraded (Keighery, 1994) and completely degraded (Keighery, 1994) condition.

Quenda

The assessment has identified that the application area provides habitat for quenda, however, the habitat is not considered significant. This species prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. It also occurs in woodlands and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. On the SCP, quenda are often associated with wetlands. The species often feeds in adjacent Jarrah and Wandoo forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck and Strahan 2008).

Suspected quenda diggings were observed during the fauna survey. Based on the findings of the survey it was concluded that the application area provides suitable habitat for this species. However, preferred habitat for quenda is limited to *E. rudis* open woodland over Melaleuca dampland (0.66 ha) and Melaleuca dampland (0.28 ha). Noting this and the linear, fragmented shape of the proposed clearing along an existing road, the application area does not comprise significant habitat for Quenda.

Quenda may be subject to individual harm should they be present at the time of clearing.

Perth Slider, western brush wallaby, black-striped snake and southern death adder

Perth slider, western brush wallaby, black-striped snake and southern death adder are known to occur on areas of deep sands with Banksia woodland, which is considered to be preferred habitat for these species (Wilson & Swan, 2017; Australian Reptiles Online Database (AROD), 2014). Although the fauna survey confirmed that the vegetation within the application provides suitable habitat for these species, no records of these species were identified within the application area (GHD, 2019). Taking this into consideration, the application area is unlikely to provide a significant habitat for Perth slider, western brush wallaby, black-striped snake and southern death adder.

These species may be subject to individual harm should they be present at the time of clearing.

Peregrine falcon

The species is found in most habitats, from rainforests to the arid zone and at most altitudes, from the coast to alpine areas. It requires abundant prey and secure nest sites and prefers coastal and inland cliffs or open woodlands near water and may even be found nesting on high city buildings (Australian Museum, 2020). This species is widespread, highly mobile and is found in various habitats. The application area may comprise suitable habitat for this species, however, noting habitat preferences and the small extent of the proposed clearing, the application area is unlikely to comprise a significant habitat for this species.

A short-tongued bee

The specimens of *Leioproctus douglasiellus* have been collected on two plant species, both of which are on the DBCA Priority Flora list: *Goodenia filiformis* (Priority 3) and *Anthotium junciforme* (Priority 4) (Department of the Environment, 2020). The closest individual of a short-tongued bee was recorded approximately 4.7 km from the application area. The two foraging species are not likely to occur within the application area. Bees, in general, are highly mobile and known to have quite variable foraging distance characteristics that are largely driven by the function of the landscape, context and size of the individual. Noting this, the application area is unlikely to be significant habitat for a short-tongued bee.

Stylet bush cricket

Throscodectes xiphos is known from only two specimens and is listed as Priority 1 by DBCA on the basis that there is little known about the species (DBCA, 2007-). Any conclusions regarding its distribution, biology and habitat are based on generalisations about the subfamily Tettigoniinae that it belongs to. As other katydids favour heath habitats, Stylet bush cricket may potentially occur within the application area in areas of Banksia woodland with a heath understorey. However, noting the linear, fragmented extent of the application area, the proposed clearing is unlikely impact on significant habitat for this species.

Ecological linkage

According to available databases, the application area is not mapped in any ecological linkage. However, noting the extent of urban development in the local area, the vegetation in the application area may function as an ecological linkage enabling fauna to move between areas of remnant vegetation.

Aerial imagery and spatial datasets further indicate that larger patches of remnant vegetation occur adjacent to the northern and southern portions of the application area which are more likely to be used by fauna for movement across the landscape. Considering this, the proposed clearing will create a wider barrier for fauna movement but will not fragment the ecological linkage.

Outcome:

Based on the findings of the assessment, the Delegated Officer determined that the proposed clearing will impact on significant foraging habitat for Carnaby's cockatoo and suitable habitat for FRTBC, Quenda, Perth Slider, western brush wallaby, black-striped snake, southern death adder and Stylet bush cricket.

Taking into account the City's avoidance, minimisation and mitigation measures, the Delegated Officer determined that the loss of 2.10 ha of Carnaby's cockatoo foraging habitat can be addressed through a suitable offset (as conditioned on the clearing permit). Section 4 of this report provides further information on the offset provided.

The mitigate the impacts of Phytophthora dieback on Carnaby's cockatoo habitat the City will be required to adhere to weed and dieback management measures (as conditioned on the clearing permit) to minimise this risk.

The Delegated Officer has also determined that whilst not considered significant habitat for Quenda, Perth Slider, western brush wallaby, black-striped snake and southern death adder, impacts to individuals of these species may occur at the time of clearing. To minimise the potential impacts, the applicant will be required to undertake slow, progressive one directional clearing to allow terrestrial fauna to disperse ahead of the clearing activity should they occur on site at the time of clearing.

3.2.2. Environmental value: biological values (ecological communities) – Clearing Principles (a)

Assessment:

Priority flora

The assessment of the proposed clearing determined that the application area is not likely to provide habitat for priority flora species.

According to available databases, 40 Priority listed flora by DBCA have been recorded within the local area. Based on the similarities shared between the soil and vegetation types in habitats for these flora taxa and within the application area, it was determined that several flora species as detailed in Appendix B may occur within the application area. To confirm the presence/absence of conservation significant flora species within the application area, the City commissioned a targeted flora survey of the application area. The flora survey did not identify any priority flora species (GHD, 2019).

A post-field survey likelihood of occurrence assessment confirmed that all species that had the potential to occur within the application are considered highly unlikely or unlikely to occur in it (GHD, 2019). The assessment took into account previous records, habitat requirements, efficacy and intensity of the survey, flowering times and the cryptic nature of species (GHD, 2019).

Ecological communities

According to available databases, four federally listed TEC's and two state listed PEC's have been mapped within the local area. Based on the vegetation mapped within the application area, the known distribution of these TEC/PECs and the findings of the flora survey (GHD, 2019), the assessment concluded that the proposed clearing will impact on the federally listed Banksia Woodland TEC.

Conservation advice for this TEC notes that Banksia Woodland TEC comprises a dominant tree layer of *Banksia*, including at least one of four key species; *Banksia attenuata*, *Banksia menziesii*, *Banksia prionotes* and/or *Banksia*

ilicifolia (Threatened Species Scientific Community (TSSC), 2016). The tree layer often includes scattered eucalypts and other tree species within or above the *Banksia* canopy. The understorey is species rich, including sclerophyllous shrubs, sedges and herbs (TSSC, 2016).

An assessment using the key diagnostic characteristics, which include minimum patch size and condition thresholds, identified that approximately 1.19 hectares of vegetation in the application area is representative of Banksia Woodland TEC (GHD, 2019).

Weeds and dieback

The flora survey recorded 49 introduced flora species within a larger survey area which encompasses the application area. No introduced flora species recorded are listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* or listed as Weeds of National Significance.

There is a risk of weeds and dieback spreading into remnants of native vegetation adjacent to the proposed clearing and the applicant will be required to adhere to weed and dieback management measures (as conditioned on the clearing permit) to minimise this risk.

Outcome:

Noting that the application area comprises vegetation representative of Banksia Woodland TEC, the Delegated Officer determined that the proposed clearing will impact on native vegetation comprising a high level of biodiversity. Taking into account the City's avoidance, minimisation and mitigation measures, the Delegated Officer determined that the loss of 1.19 ha of Banksia Woodland TEC can be addressed through a suitable offset (as conditioned on the clearing permit). Section 4 of this report provides further information on the offset provided.

The application area occurs adjacent to remnants of native vegetation. Adhering to weed and dieback management measures (as conditioned on the clearing permit) will minimise the risk of weeds and dieback being spread.

3.2.3. Environmental value: significant remnant vegetation– Clearing Principles (e)

Assessment:

The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001). Within constrained areas (areas of urban development in cities and major towns) on the SCP, the threshold for representation of the pre-clearing extent of a particular native vegetation complex is 10 percent (EPA, 2008). The application is classified as a constrained area.

The application area is located within the SCP IBRA region which retains approximately 32.5 per cent of its pre-European vegetation extent (Government of Western Australia, 2019).

The local area retains approximately 17.5 per cent native vegetation cover (approximately 6,062.42 ha). The application area represents approximately 0.035 per cent of the remaining vegetation within the local area and the proposed clearing will reduce the extent of native vegetation within the local area to 6,060.32 ha.

While the remnant vegetation extents for the local area and mapped vegetation complex are above the 10 and 30 per cent vegetation thresholds outlined above, the application area is surrounded by urban development and is generally considered to occur within an area that has undergone extensive clearing.

The application area is within a highly cleared landscape, provides significant habitat for conservation significant fauna species and includes occurrence of a federally listed TEC and a state listed PEC. Therefore, the application area is considered to be a significant remnant within an extensively cleared landscape.

Outcome:

Based on the above assessment and subject to management conditions, the Delegated Officer has determined that although the application area forms part of a significant remnant in an area that has been extensively cleared, an offset is not required due to being in a highly constrained area as part of the Metropolitan Regional Scheme (MRS).

There is a risk of weeds and dieback spreading into remnants of native vegetation adjacent to the proposed clearing. The applicant will be required to adhere to weed and dieback management measures (as conditioned on the clearing permit) to minimise this risk.

3.2.4. Environmental value: water resources – Clearing Principles (f)

Assessment:

According to available databases, the application area is mapped within two resource enhancement wetlands. Resource enhancement wetlands are considered to be wetlands that have been partially modified but still support

substantial ecological attributes and functions. The EPA's Guidance Statement 33 (2008) recommends that all reasonable measures should be taken to minimise the potential impacts on resource enhancement wetlands and appropriate buffers as these wetlands have the potential to be restored to Conservation category.

To minimise the need for clearing within resource enhancement wetlands, a drainage design was tested using the median island and road reserve as drainage storage to reduce the area of land required for the proposed retention basins. The test has revealed an option to address the drainage in a more environmentally sensitive way by minimising the area of the drainage sump. Subsequently, the City has committed building block wall sections along the edge of Jandakot Road as oppose to an earthworks batter into the wetland which would require more native vegetation to be cleared (City of Cockburn, 2020c).

Considering the City's minimisation actions and that the clearing within the mapped wetlands will be limited to approximately 0.62 hectares scattered along three different portions of the application area, it has been concluded that the clearing is not likely to have a significant impact upon riparian vegetation or the environmental values of the wetland.

Outcome:

Based on the above assessment, the Delegated Officer has determined that the proposed clearing will not significantly impact on this environmental value.

It is considered the impacts of the proposed clearing are unlikely to have any long-term adverse impacts on the hydrological and ecological values of the wetland. No clearing permit conditions are necessary in relation to this matter.

3.3. Relevant planning instruments and other matters

Project background

The City (2020c) advised that the Project is required to address safety and congestion concerns raised by members of the community. The City provided statistics showing the number and locations of crashes along Jandakot Road over a four-year period. Overall, there were 105 crashes which resulted in medical treatment, hospitalisation, major or minor property damage and two fatalities. This has made Jandakot Road one of the most dangerous sections of road in the district of Cockburn (City of Cockburn, 2020c). In addition, the City advised that Jandakot Road is used by 15,000 vehicle every day. This is a traffic threshold when single lane roads need to expand their operating capacity to ensure traffic movement in a safe way. Therefore, upgrades to Jandakot Road to a dual carriageway was considered necessary (City of Cockburn, 2020c).

Regarding the concerns related to congestion issues, the City claimed that the Project is needed to facilitate the future development of it. The City explained that at the time of the Project planning, i.e. 2017, Jandakot Road was used by approximately 15,000 vehicle every day. According to its forecasts, by 2031 it will be approximately 26,000 vehicles. Furthermore, it is predicted that there will be additional 20,000 to 30,000 people living in the nearby localities of Jandakot, Treeby, Piara Waters, Harrisdale and Haynes. A significant number of these residents are likely to utilise Jandakot Road as it provides direct access to the Kwinana Freeway (City of Cockburn, 2020c).

Prior to the development of the Project, several workshops with affected landowners along Jandakot road and Solomon Road, as well as landowners taking access from road coming off Jandakot Road and Solomon Road were undertaken. This has resulted in a significant amount of information being provided to the community, and feedback received from the community. This feedback helped the City shape consideration of three different design options of the Project, with the design difference being the treatment of the Solomon Road and Jandakot Road intersection.

Following the workshops and design refinements, a report was presented to the Ordinary Council Meeting, seeking the City's determination on the Project, its level of support, and simultaneously, a consideration of a preferred design option for the intersection between Jandakot Road and Solomon Road. This triggered another set of discussions and negotiations with those specific landowners who had a portion of their land required to be used for the Project. The objective of the discussions was to reach a negotiated position that would ensure that the landowners, who had land needing to be taken for the Project, are fairly compensated, i.e. in accordance with the *Land Administration Act 1997 (*City of Cockburn, 2020c).

Negotiations at that time have been successful which enabled the Project to occur (City of Cockburn, 2020c).

To proceed with the Project, the City was required to acquire portions of several private properties within the application area. In response, the City has provided copies of Taking Orders issued on 30 September 2020 in accordance with Sections 177 and 178 of the *Land Administration Act 1997*.

Aboriginal sites

No registered Aboriginal sites of significance have been mapped within the application area. The nearest Aboriginal Heritage Place is Registered Site 'Yangebup Lake' located approximately 1.5 km southwest of the application area. It is the permit holder's responsibility to comply with the *Aboriginal Heritage Act 1972* (WA) and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

The City has committed that if suspected Aboriginal heritage sites or objects are found during construction, works within 20 m will cease immediately and the City Representative consulted. If necessary, a qualified heritage specialist will be engaged to survey and manage Aboriginal heritage sites/materials prior to work recommencing. The location and details of any newly discovered Aboriginal heritage objects or remains will be reported to DPLH (City of Cockburn, 2020a).

Referral under the EPBC Act

The proposal was referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) under the EPBC Act in relation to impacts to Carnaby's cockatoo and the Commonwealth-listed Banksia Woodland TEC (reference EPBC 2020/8728). DAWE determined that the proposed action is not a controlled action on 17 August 2020.

4. Suitability of offsets

Through the detailed assessment outlined in Section 3.2 above, the Delegated Officer has determined that the following significant residual impacts remain after the application of the avoidance, minimisation and mitigation measures summarised in Section 3.1:

- Loss of 2.10 ha of foraging habitat for Carnaby's cockatoo
- Loss of 1.19 ha of vegetation representative of Bankia Woodland TEC

To counterbalance the above impacts, the City has submitted an offset proposal that involves protection and ongoing management of vegetation within Rose Shanks Reserve, which is located within Bush Forever Site No. 390 (Fraser Road Bushland) approximately 2.6 kilometres southeast of the application area.

Acquisition and Long Term Protection:

The purpose of the offset site is currently 'Recreation'. A change in purpose to 'Conservation' will be initiated. The benefit of the change in purpose is two-fold whereby:

- Long-term security of the land holding is elevated. Whereby any proposed land-use must be consistent with the conservation purpose, as opposed to the former recreation purpose.
- Releasing funds to enable the City of Cockburn to actively manage the land for the conservation purpose.

The change of purpose of Rose Shanks Reserve has been determined in consultation with Department of Planning, Lands and Heritage (DPLH) who have provided in principle support. Rose Shanks Reserve is intended to be used as a banked offset site by the City of Cockburn, with Rose Shanks Reserve also providing offsets for clearing permit CPS 8471/2 (Frankland Park - Recreational ovals, club house and car park) and CPS 8983/1 (Bibra Lake Aboriginal Cultural Centre). The proposed offset site for CPS 9018/1 will therefore be included in a broader area of Rose Shanks Reserve located within Bush Forever Site No. 390 (Figure 2).

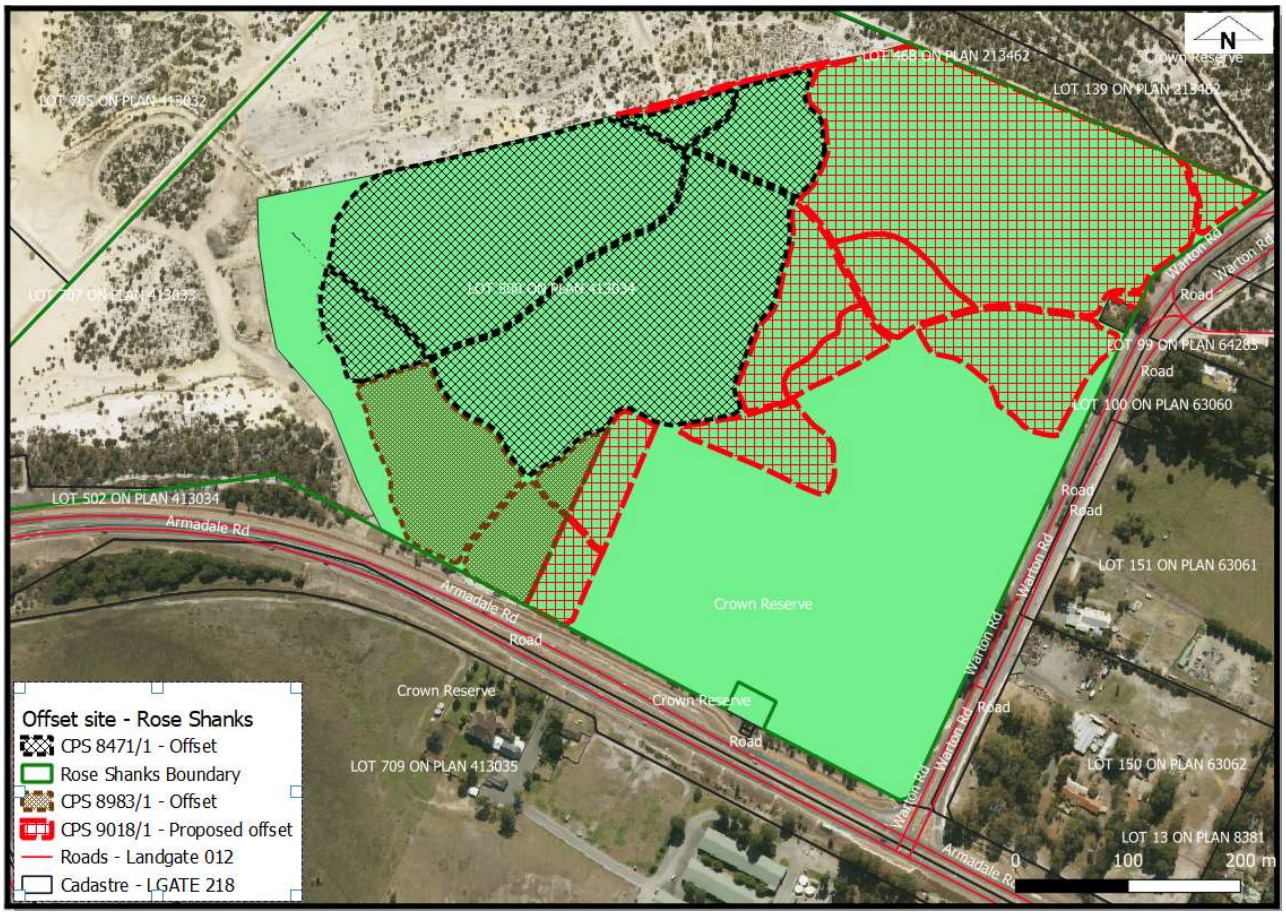

Figure 2. Locations of the offset sites for Clearing Permits CPS 8471/2, CPS 8983/1 and CPS 9018/1 in Rose Shank Reserve.

Management Actions:

The change of purpose of Rose Shanks Reserve initiating long-term protection for conservation purposes will permit funding to be allocated through the City of Cockburn management responsibilities in accordance with the conservation purpose. Ongoing management of the vegetation within the proposed offset site will be undertaken by the City of Cockburn in accordance with the City of Cockburn's Natural Area Management Strategy (2012-2022). This will include:

- Fencing the area to control inappropriate access;
- Control and management of environmental weeds;
- Control of feral animals;
- Fire management; and
- Mitigating the impact of plant diseases such as dieback, which the vegetation community is very susceptible to.

The City of Cockburn has identified Rose Shanks Reserve as a 'high' priority reserve for on-going management within their Natural Area Management Strategy (2012-2022), ensuring that the reserve is a high priority for management into the future and enabling appropriate funding arrangements.

In assessing whether the proposed offset is adequately proportionate to the significance of the environmental values being impacted, a calculation using the EPBC Act Offsets calculator was undertaken. The calculation indicates that the acquisition offset of the following areas as described on Figure 3 may be sufficient to adequately address the impacts of the proposed clearing:

- Approximately 7.17 hectares of vegetation representative of Banksia Woodland in excellent condition; and
- Approximately 2.84 hectares of vegetation representative of Banksia Woodland in very good condition.

The protection of 10.01 hectares of vegetation in at least very good condition that includes Banksia Woodland TEC and black cockatoo foraging habitat that will be fenced and managed on an ongoing basis through a 'Conservation' purpose in accordance with the City of Cockburn's Natural Area Management Strategy (2012–2022) will ensure that the current vegetation condition is retained and improved.

The Delegated Officer considers that this adequately counterbalances the significant residual impacts listed above.

The justification for the values used in the offset calculation is provided in Appendix E.

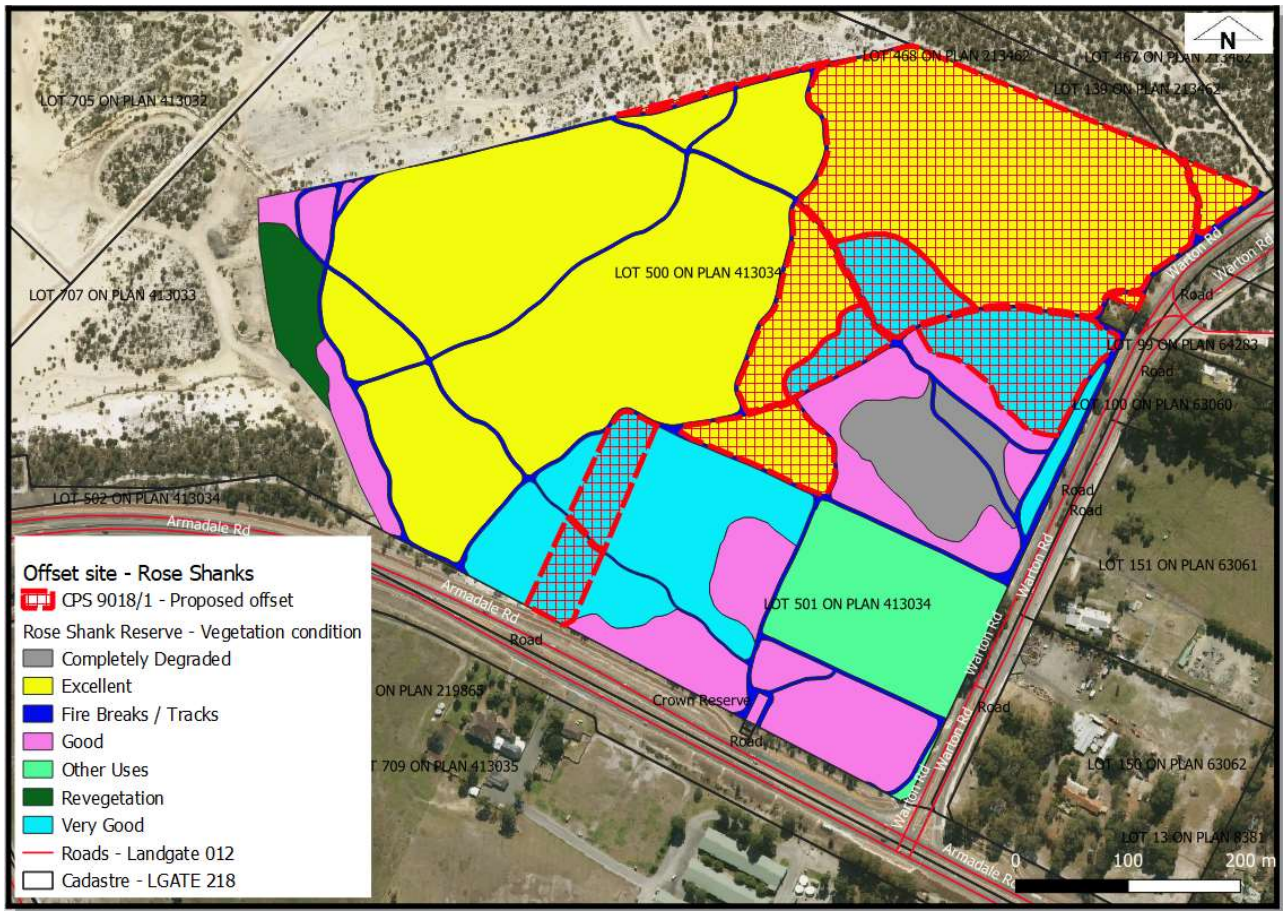

Figure 3. Vegetation condition within Rose Shand Reserve and offset area for the application CPS 9018/1.

Appendix A – Additional information provided by applicant

During the assessment of the application, DWER wrote to the City to advise that the proposed clearing has the potential to impact on forest red-tailed black cockatoo (*Calyptorhynchus banksii* subsp. *naso*), Baudin's cockatoo (*Calyptorhynchus baudinii*), Carnaby's cockatoo (*Calyptorhynchus latirostris*), Banksia Woodland TEC and two resource enhancement wetlands mapped within the application area. The City was invited to provide further information regarding appropriate onsite impact mitigation strategies, such as a modification to the application area and additional avoidance and mitigation methods (Item 1), and/or satisfactory environmental offsets (Item 2). The City was advised that prior to DWER's consideration of an offset, further information regarding avoidance and minimisation measures were required. In addition, the copies of the executed taking order were required to demonstrate that the City has legal access to all properties in the application area (Item 3).

The applicant's response and DWER's consideration of these are summarised below.

Item	Summary of comments (City of Cockburn, 2020b)	Consideration of comment
1	The City reiterated a number of mitigation measures that were listed in the application form. In addition to these, the City has committed: • to engage a zoologist who would identify and, if required, relocate any fauna observed during the clearing; and • translocate any grasstrees and/or macrozamia palms to one of the City's conservation areas and maintained until self-sufficient	DWER reviewed the comments and considered that the information provided did not sufficiently demonstrate that all reasonable avoidance and mitigation measures had been implemented. Evidence of further measures was required, particularly, how the avoidance principle was considered in the design of the roundabout at the intersection between Jandakot Road and Solomon Road and the drainage within the area which overlaps mapped resource enhancement wetlands. In response, the City (2020b) submitted a document describing what other alternatives to the Project were considered and how the need for clearing of native vegetation was minimised (see Section 3.1). Based on the review of additional information obtained, the Delegated Officer considered that the City had taken all reasonable actions to avoid and minimise the need for clearing.
2	The City submitted an offset proposal which included the protection and ongoing management of vegetation within Rose Shanks Reserve, located within Bush Forever Site No. 390 (Fraser Road Bushland). The City also provided flora and fauna surveys of the proposed offset site.	The Delegated Officer noted that the proposed offset site contains vegetation that provides foraging habitat for Carnaby's cockatoo and is commensurate with Banksia Woodland TEC in varying condition. In assessing whether the proposed offset is adequately proportionate to the significance of the environmental values being impacted, a calculation using the EPBC Act Offsets calculator was undertaken. The offset calculation indicated that the proposed offset area had enough vegetation to adequately address the significant residual impacts of the proposed clearing (see Section 4).
3	The City advised that taking orders were already submitted to DWER together with associated documentation.	The Delegated Officer considered that the supplied taking orders and associated documentation sufficiently demonstrated that the City has legal access to all properties within the application area.

Appendix B – Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best information available to DWER at the time of this assessment. This information was used to inform the assessment of the clearing against the Clearing Principles, contained in Appendix C.

1. Site characteristics

Site characteristic	Details
Local context	Spatial data indicate the local area (10 km radius of the application area, which is equal to approximately 34,911 ha) (excluding ocean) retains approximately 17.49 per cent (6,062 ha). Approximately 5.92 per cent of the vegetation within the local area (approximately 2052 ha) occurs within DBCA managed estate.
Vegetation description	Vegetation survey (GHD, 2020) indicate the vegetation within the proposed clearing area consists of three vegetation types: • VT01 (approximately 55 per cent of the application area), which is described as *Banksia attenuata, Banksia menziesii* and *Eucalyptus marginata* subsp. *marginata* open woodland; • VT02 (approximately 32 per cent of the application area), which is described as *Melaleuca preissiana* and *Banksia ilicifolia* isolated trees to open woodland; and • VT03 (approximately 13 per cent of the application area), which is described as *Eucalyptus rudis* open woodland over *Melaleuca preissiana* low woodland. Representative photos and the full survey descriptions and mapping are available in Appendix F. This is consistent with the SCP mapped vegetation Bassendean Complex – Central and South, which is described as vegetation ranging from woodland of *Eucalyptus marginata* (Jarrah) - *Allocasuarina fraseriana* (Sheoak) - Banksia species to low woodland of Melaleuca species, and sedgelands on the moister sites. This area includes the transition of *Eucalyptus marginata* (Jarrah) to *Eucalyptus todtiana* (Pricklybark) in the vicinity of Perth (Heddle et al., 1980).
Vegetation condition	Vegetation survey (GHD, 2019) indicate the vegetation within the proposed clearing area is in: • Very good (Keighery, 1994) condition - approximately 24.6 per cent of the application area; • Good (Keighery, 1994) condition - approximately 45.8 per cent of the application area; • Degraded (Keighery, 1994) condition - approximately 23.1 per cent of the application area; and • Completely degraded (Keighery, 1994) condition - approximately 6.5 per cent of the application area. The full Keighery condition rating scale is provided in Appendix D. Representative photos and the full survey descriptions and mapping are available in Appendix F.
Soil description	The soil within the application area is mapped as the following subsystems (Department of Primary Industries and Regional Development (DPIRD), 2020): • Bassendean B1 Phase (approximately 80 per cent of the application area), which is described as extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 meter; banksia dominant (Schoknecht et al., 2004); • Bassendean B2 Phase (approximately 10 per cent of the application area), which is described as flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan to 1-2 meters (Schoknecht et al., 2004); and

Site characteristic	Details
	• Bassendean B4 Phase (approximately 10 per cent of the application area), which is described as broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 meters by clay or less frequently a strong iron-organic hardpan (Schoknecht et al., 2004).
Land degradation risk	The mapped soils within the application area have a high risk of acidification and microbial purification. In addition to this, Bassendean B1 an B2 Phase have also an increased risk of water repel and water storage.
Waterbodies	The desktop assessment indicates that two unknown sumpland type resource enhancement wetlands (IDs 6877 and 6881) are mapped within the application area. No watercourses are mapped within the application area.
Conservation areas	The closest conservation area is located approximately 2.1 km northeast of the application area.
Climate and landform	*Rainfall: 9*00 millimetres *Evapotranspiration: 8*00 millimetres *Groundwater Salinity (Total Dissolved Soilds):* <500 milligrams per litre total dissolved solids

2. Flora, fauna and ecosystem analysis

With consideration for the site characteristics set out above, relevant datasets (see Appendix G) and biological survey information, the following conservation significant flora and fauna species, and ecological communities may be impacted by the clearing.

Species / Ecological Community	Conservation status	Distance of closest record [km]	Suitable soil type?	Suitable vegetation type?	Suitable habitat features?	Are surveys adequate to identify?
Flora						
Acacia benthamii	Priority (P)2	6185	No	No	N/A	Yes
Acacia lasiocarpa var. *bracteolata long peduncle variant* (G.J. Keighery 5026)	P1	3852	Yes	Yes	N/A	Yes
Amanita carneiphylla	P3	4149	Yes	No	N/A	Yes
Amanita drummondii	P3	3741	Yes	No	N/A	Yes
Amanita fibrillopes	P3	3750	Yes	No	N/A	Yes
Amanita preissii	P3	4149	Yes	Yes	N/A	Yes
Amanita quenda	P1	4668	Yes	No	N/A	Yes
Amanita wadjukiorum	P3	4210	Yes	Yes	N/A	Yes
Amanita wadulawitu	P2	4308	Yes	Yes	N/A	Yes
Angianthus micropodioides	P3	8792	Yes	No	N/A	Yes
Aponogeton hexatepalus	P4	5797	No	No	N/A	Yes
Austrostipa jacobsiana	Threatened (T)	6875	Yes	Yes	N/A	Yes
Byblis gigantea	P3	4350	Yes	Yes	N/A	Yes
Caladenia huegelii	T	1453	Yes	Yes	N/A	Yes
Cyathochaeta teretifolia	P3	2348	Yes	Yes	N/A	Yes
Dampiera triloba	P3	3643	Yes	Yes	N/A	Yes

Species / Ecological Community	Conservation status	Distance of closest record [km]	Suitable soil type?	Suitable vegetation type?	Suitable habitat features?	Are surveys adequate to identify?
Diuris drummondii	T	1004	Yes	Yes	N/A	Yes
Diuris purdiei	T	4168	Yes	Yes	N/A	Yes
Dodonaea hackettiana	P4	2743	No	No	N/A	Yes
Drakaea elastica	T	2770	Yes	No	N/A	Yes
Drakaea micrantha	T	4982	Yes	No	N/A	Yes
Drosera occidentalis	P4	6718	Yes	Yes	N/A	Yes
Eremophila glabra subsp. *chlorella*	T	6252	No	No	N/A	Yes
Hydrocotyle lemnoides	P4	8618	No	No	N/A	Yes
Hydrocotyle striata	P1	6375	No	No	N/A	Yes
Jacksonia gracillima	P3	3495	No	No	N/A	Yes
Jacksonia sericea	P4	6111	No	No	N/A	Yes
Kennedia beckxiana	P4	4619	No	No	N/A	Yes
Lepidosperma rostratum	T	8646	No	No	N/A	Yes
Levenhookia preissii	P1	3702	Yes	Yes	N/A	Yes
Meionectes tenuifolia	P3	8896	No	No	N/A	Yes
Microtis quadrata	P4	2768	Yes	Yes	N/A	Yes
Ornduffia submersa	P4	6933	No	No	N/A	Yes
Phlebocarya pilosissima subsp. *pilosissima*	P3	989	Yes	Yes	N/A	Yes
Pimelea calcicola	P3	6876	No	No	N/A	Yes
Schoenus benthamii	P3	7028	No	No	N/A	Yes
Schoenus capillifolius	P3	5797	No	No	N/A	Yes
Schoenus pennisetis	P3	5777	Yes	Yes	N/A	Yes
Stenanthemum sublineare	P2	8037	Yes	Yes	N/A	Yes
Stylidium aceratum	P3	5777	Yes	Yes	N/A	Yes
Stylidium longitubum	P4	2768	Yes	Yes	N/A	Yes
Stylidium paludicola	P3	1004	Yes	Yes	N/A	Yes
Styphelia filifolia	P3	1886	Yes	Yes	N/A	Yes
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T	5431	No	No	N/A	Yes
Thelymitra variegata	P2	2768	Yes	Yes	N/A	Yes
Thysanotus glaucus	P4	8746	Yes	Yes	N/A	Yes
Thysanotus sp. Badgingarra (E.A. Griffin 2511)	P2	8582	No	No	N/A	Yes
Tripterococcus sp. Brachylobus (A.S. George 14234)	P4	4137	Yes	Yes	N/A	Yes
Verticordia lindleyi subsp. *lindleyi*	P4	5777	Yes	Yes	N/A	Yes
Fauna						
A short-tongued bee	Endangered (EN)	4708	N/A	N/A	Yes	Yes
Australasian bittern	EN	5101	N/A	N/A	No	Yes
Australian little bittern	P4	4080	N/A	N/A	No	Yes
Barking owl (southwest subpop.)	P3	2207	N/A	N/A	No	Yes
Bar-tailed godwit	Migratory birds protected under an	5101	N/A	N/A	No	Yes

Species / Ecological Community	Conservation status	Distance of closest record [km]	Suitable soil type?	Suitable vegetation type?	Suitable habitat features?	Are surveys adequate to identify?
	international agreement (IA)					
Baudin's cockatoo	EN	6206	N/A	N/A	Yes	Yes
Black-striped snake, black-striped burrowing snake	P3	4155	N/A	N/A	Yes	Yes
Black-tailed godwit	IA	1693	N/A	N/A	No	Yes
Blue-billed duck	P4	2423	N/A	N/A	No	Yes
Carnaby's cockatoo	EN	530	N/A	N/A	Yes	Yes
Carter's freshwater mussel	Vulnerable (VU)	2744	N/A	N/A	No	Yes
Caspian Tern	IA	8448	N/A	N/A	No	Yes
Chuditch, western quoll	VU	6421	N/A	N/A	No	Yes
Common greenshank, greenshank	IA	1693	N/A	N/A	No	Yes
Crested tern	IA	5101	N/A	N/A	No	Yes
Curlew sandpiper	Critically endangered (CR)	1693	N/A	N/A	No	Yes
Dell's skink, Darling Range Southwest Ctenotus	P4	9734	N/A	N/A	No	Yes
Eastern curlew	CR	9940	N/A	N/A	No	Yes
Forest red-tailed black cockatoo	VU	1210	N/A	N/A	Yes	Yes
Fork-tailed swift	IA	7713	N/A	N/A	No	Yes
Glossy ibis	IA	3255	N/A	N/A	No	Yes
Graceful sunmoth	P4	708	N/A	N/A	No	Yes
Great knot	CR	5101	N/A	N/A	No	Yes
Great white shark	VU	9410	N/A	N/A	No	Yes
Greater sand plover, large sand plover	VU	5101	N/A	N/A	No	Yes
Grey plover	IA	3090	N/A	N/A	No	Yes
Hooded plover, hooded dotterel	P4	3720	N/A	N/A	No	Yes
Leatherback turtle	VU	9379	N/A	N/A	No	Yes
Letter-winged kite	P4	5101	N/A	N/A	No	Yes
Little ringed plover	IA	2932	N/A	N/A	No	Yes
Loggerhead turtle	EN	9232	N/A	N/A	No	Yes
Long-tailed jaeger, long-tailed skua	IA	8002	N/A	N/A	No	Yes
Long-toed Stint	IA	3277	N/A	N/A	No	Yes
Marsh sandpiper, little greenshank	IA	2800	N/A	N/A	No	Yes
Masked owl (southwest)	P3	6368	N/A	N/A	No	Yes
Numbat, walpurti	EN	1191	N/A	N/A	No	Yes
Oriental pratincole	IA	5101	N/A	N/A	No	Yes
Osprey, eastern osprey	IA	4383	N/A	N/A	No	Yes
Pacific golden plover	IA	3090	N/A	N/A	No	Yes
Pectoral sandpiper	IA	2974	N/A	N/A	No	Yes
Peregrine falcon	Other specially protected fauna (OS)	2565	N/A	N/A	Yes	Yes
Perth slider, lined skink	P3	453	N/A	N/A	Yes	Yes

Species / Ecological Community	Conservation status	Distance of closest record [km]	Suitable soil type?	Suitable vegetation type?	Suitable habitat features?	Are surveys adequate to identify?
Quenda, southwestern brown bandicoot	P4	0	N/A	N/A	Yes	Yes
Quokka	VU	4218	N/A	N/A	No	Yes
Red knot	EN	5101	N/A	N/A	No	Yes
Red-necked stint	IA	2631	N/A	N/A	No	Yes
Red-tailed tropicbird	IA	5575	N/A	N/A	No	Yes
Ruddy turnstone	IA	7713	N/A	N/A	No	Yes
Ruff (reeve)	IA	5101	N/A	N/A	No	Yes
Sanderling	IA	8263	N/A	N/A	No	Yes
Sharp-tailed sandpiper	IA	2800	N/A	N/A	No	Yes
Southern death adder	P3	9834	N/A	N/A	Yes	Yes
Stylet bush cricket, stylet Throsco (Jandakot)	P1	484	N/A	N/A	Yes	Yes
SCP shield-backed trapdoor spider	P3	1322	N/A	N/A	No	Yes
Tammar wallaby	P4	6689	N/A	N/A	No	Yes
Wandering albatross	VU	8902	N/A	N/A	No	Yes
Water-rat, rakali	P4	7704	N/A	N/A	No	Yes
Western brush wallaby	P4	627	N/A	N/A	Yes	Yes
Western false pipistrelle, western falsistrelle	P4	6892	N/A	N/A	No	Yes
Western ringtail possum, ngwayir	CR	9706	N/A	N/A	No	Yes
Whimbrel	IA	9800	N/A	N/A	No	Yes
White-tailed black cockatoo	EN	5101	N/A	N/A	Yes	Yes
White-winged black tern, white-winged tern	IA	3765	N/A	N/A	No	Yes
Wood sandpiper	IA	2924	N/A	N/A	No	Yes
Ecological communities						
Banksia Dominated Woodlands of the SCP IBRA Region	Priority 3	0	Yes	Yes	N/A	Yes
Callitris preissii (or *Melaleuca lanceolata*) forests and woodlands, SCP (floristic community type 30a as originally described in Gibson et al. (1994))	Vulnerable	8994	Yes	No	N/A	Yes
Communities of Tumulus Springs (Organic Mound Springs, SCP)	Critically Endangered	9941	No	No	N/A	Yes
Herb rich shrublands in clay pans (floristic community type 8 as originally described in Gibson et al. (1994))	Vulnerable	8166	No	No	N/A	Yes
Low lying *Banksia attenuata* woodlands or shrublands	Priority 3	8454	Yes	Yes	N/A	Yes
Northern Spearwood shrublands and woodlands	Priority 3	4248	No	No	N/A	Yes
Shrublands and woodlands on Muchea Limestone of the SCP	Endangered	7965	No	No	N/A	Yes
Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson et al. (1994))	Endangered	6563	No	No	N/A	Yes
Subtropical and Temperate Coastal Saltmarsh	Priority 3	6803	No	No	N/A	Yes

Species / Ecological Community	Conservation status	Distance of closest record [km]	Suitable soil type?	Suitable vegetation type?	Suitable habitat features?	Are surveys adequate to identify?
Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the SCP	Priority 3	4040	Yes	No	N/A	Yes
Wooded wetlands which support colonial waterbird nesting areas	Priority 2	6990	No	No	N/A	Yes

3. Vegetation extent

	Pre-European extent (ha)	Current extent (ha)	% remaining	Current extent in all DBCA managed land (ha)	% current extent in all DBCA managed land (proportion of pre-European extent)
IBRA bioregion					
SCP	850,785.09	276,461.42	32.49	153,017.73	17.99
Vegetation complex					
Bassendean Complex – Central and South	87,476.26	23,508.66	26.87	7,614.25	8.70
Local area					
10 km radius from the perimeter of the application area	34,911.09	6,062.42	17.37	2,051.57	5.88

Appendix C – Assessment against the Clearing Principles

Assessment against the Clearing Principles	Variance level	Is further consideration required?
Environmental value: biological values		
Principle (a): *"Native vegetation should not be cleared if it comprises a high level of biodiversity."* Assessment: The application area contains values which are considered to indicate a high level of biodiversity; namely, vegetation representative of federally listed TEC and significant habitat for conservation significant fauna. The application area does not provide habitat for threatened or priority flora species.	Is at variance	Yes Refer to Section 3.2.2 above.
Principle (b): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna."* Assessment: The proposed clearing area contains significant foraging habitat for Carnaby's cockatoo. Ground dwelling conservation significant fauna may also utilise the application area.	Is at variance	Yes Refer to Section 3.2.1 above.
Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."* Assessment: The proposed clearing area is unlikely to contain flora species listed under the BC Act.	Not likely to be at variance	No
Principle (d): *"Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community."* Assessment: The proposed clearing area does not contain species composition indicative of a TEC listed by the Western Australian Minister for Environment.	Not likely to be at variance	No
Environmental values: significant remnant vegetation and conservation areas		
Principle (e): *"Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared."* Assessment: The extent of the mapped vegetation type and native vegetation in the local area is inconsistent with the national objectives and targets for biodiversity conservation in Australia. Furthermore, the application area provides habitat for conservation significant fauna species and include occurrences of federally listed TEC. The application area is classified as a constrained area on the SCP, where the threshold for representation of the pre-clearing of native vegetation is 10 per cent.	Is at variance	Yes Refer to Section 3.2.3 above.
Principle (h): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area."* Assessment: Given the separation distance between the application area and the nearest conservation area, the proposed clearing is not likely to have an impact on the environmental values of nearby conservation areas.	Not likely to be at variance	No

Assessment against the Clearing Principles	Variance level	Is further consideration required?
Environmental values: land and water resources		
Principle (f): *"Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland."* Assessment: The application area is mapped within two resource enhancement wetlands, and therefore, the vegetation proposed to be cleared is growing in an environment associated with a wetland. Noting the small amount of clearing of vegetation within the mapped wetlands scattered across three portions of the application area, the clearing is unlikely to impact on an environment associated with wetlands.	Is at variance	Yes Refer to Section 3.2.4 above.
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: Due to the sandy soils type, the application area has an increased risk of wind erosion. However, noting the fragmented, liner extent of the application area, the proposed clearing is not likely to cause appreciable impact on land degradation.	Not likely to be at variance	No
Principle (i): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water."* Assessment: Noting the fragmented, liner extent of the proposed clearing and the condition of the vegetation scattered along the application area, the proposed clearing is not likely to cause deterioration in the quality of surface or underground water.	Not likely to be at variance	No
Principle (j): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding."* Assessment: The mapped soils and topographic contours in the surrounding area do not indicate the proposed clearing is likely to contribute to increased incidence or intensity of flooding.	Not likely to be at variance	No

Appendix D – Vegetation condition rating scale

Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Measuring Vegetation Condition for the South West and Interzone Botanical Province (Keighery, 1994)

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, with disturbance affecting individual species; weeds are non-aggressive species.
Very Good	Vegetation structure altered, with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and/or grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and/or grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and/or grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Appendix E – Offset calculator value justification

Field Name	Description	Justification for value used
IUCN Criteria	The IUCN criteria for the value being impacted	**1.2%** - Afforded to Carnaby's cockatoo habitat as this species is listed as Endangered under the BC Act and the EPBC Act. **1.2%** - Afforded to Banksia Woodland TEC as this community is listed as Endangered under the EPBC Act.
Area of impact (habitat/community) or Quantum of impact (features/individuals)	The area of habitat/community impacted or number of features/individuals impacted	**2.10** - The application area comprises 2.10 hectares of Carnaby's cockatoo foraging habitat; and **1.19** - The application area includes 1.19 hectares of vegetation representative of Banksia Woodland TEC.
Quality of impacted area (habitat/community)	The quality score for area of habitat/community being impacted - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**5** - Native vegetation condition in very good (0.50ha), good (0.88ha), degraded (0.56ha) and completely degraded (0.16ha). The vegetation is black cockatoo foraging habitat (2.10ha) and representative of Banksia woodland TEC (1.19ha).
Time over which loss is averted (habitat/community)	This describes the timeframe over which changes in the level of risk to the proposed mitigation site can be considered and quantified	**20** - The offset site will be vested as 'conservation'. 20 years is the maximum value associated with this field.
Time until ecological benefit (habitat/community) or Time horizon (features/individuals)	This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) or value (features/individuals) improvement of the proposed mitigation to be realised	**1** - 1 year has been assigned, being the change to the security of purpose. That is, amending the purpose of the Rose Shanks Reserve offset site from 'Recreation' to 'Conservation' within Rose Shanks Reserve (Lot 500 on Plan 413034 - Crown Reserve R 1820).
Start area (habitat/community) or Start value (features/individuals)	The area of habitat/community or number of features/individuals proposed to mitigate the impacts	The required ha for each value post consideration of mitigation area shown below: **10.01** hectares required to address impacts to Carnaby's habitat; and **5.67** hectares required to address impacts to Banksia woodland
Start quality (habitat/community)	The quality score for the area of habitat/community proposed as mitigation - a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability	**7** - A quality score of (7) (Very Good to Excellent) has been assigned based upon the results of the Eco Logical (2019) vegetation mapping, concluding that vegetation condition over the delineated offset site is at least Very Good (Keighery 1994).
Future quality without offset (habitat/community) or Future value without offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed mitigation site without the mitigation	**6** - A quality score of (6) (Very Good) has been assigned due to an expected decline in vegetation condition of the majority of the site that is currently in excellent condition with the current Recreation purpose and no active

		management and protections (including fencing).
Future quality with offset (habitat/community) or Future value with offset (features/individuals)	The predicted future quality score (habitat/community) or value (features/individuals) of the proposed mitigation site with the mitigation	**7** - A quality score of (7) (Very Good to Excellent) has been assigned due to the expected retention, or exceedance, of vegetation condition values due to adequate management and protections being implemented.
Risk of loss (%) without offset (habitat/community)	This describes the chance that the habitat/community on the proposed mitigation site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without the mitigation	**10%** - A risk of loss percentage without offset of 10% has been assigned due to Rose Shanks Reserve (Lot 500 on Plan 413034 - Crown Reserve R 1820) currently being a Bush Forever site with a Parks and Recreation purpose under the MRS.
Risk of loss (%) with offset (habitat/community)	This describes the chance that the habitat/community on the proposed mitigation site will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with the mitigation	**5%** - A risk of loss percentage with an offset has been reduced to 5% due to the purpose of Rose Shanks Reserve (Lot 500 on Plan 413034 - Crown Reserve R 1820) being elevated to 'Conservation' within a Bush Forever site.
Confidence in result (%) – risk of loss (habitat/community)	The capacity of measures to mitigate risk of loss of the mitigation site	**90%** - A confidence in result (risk of loss) value of (90%) has been assigned due to the high level of certainty about the risk without the proposed offset due to the Recreation purpose, unmanaged access, and susceptibility to dieback, weeds and inappropriate fires.
Confidence in result (%) – Change in quality (habitat/community) or Change in value (features/individuals)	The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)	**90%** - A confidence in result (change in quality) value of (90%) has been assigned due to the high level of certainty about the successful achievement of the proposed offset due to the change to a 'Conservation' purpose and recognition of Rose Shanks Reserve as a 'high' priority reserve for on-going management by the City of Cockburn within their Natural Area Management Strategy (2012-2022).
Revegetation credit (net present value)	The net present value of the mitigation (area of habitat/community or number of individuals/features) that will be applied to the quantum of impact	**100%** - for Canaby's cockatoo obtained through the input of variables explained above. Calculation for 1.19 hectare impact of Banksia Woodland comes out as 176.40% for a 10.01 hectare offset. Therefore, no additional area is required for impacts to Banksia Woodland TEC.

Appendix F – Biological survey information excerpts / photographs of the vegetation

City of Cockburn commission GHD to undertake a detailed and targeted flora and vegetation survey and Level 1 fauna survey (including Black cockatoo assessment) and prepare a consolidated report which would include the findings of previous survey results conducted Eco Logical in 2016 and GHD in 2018 over the project footprint. The total size of the survey area was 12.09 ha which encompassed the application area (Figure 4).

Figure 4. Survey boundary

Three vegetation types were identified and described in the survey area, excluding revegetation and cleared areas (GHD, 2019):

- VT01 described as *Banksia attenuata, Banksia menziesii* and *Eucalyptus marginata* subsp. *marginata* open woodland over *Allocasuarina humilis* and *Acacia pulchella* var. *glaberrima* open shrubland over *Eremaea pauciflora* var. *pauciflora, Gompholobium tomentosum* and *Bossiaea eriocarpa* open low heath over *Mesomelaena pseudostygia* and *Desmocladus flexuosus* very open sedgeland and **Avena barbata* and **Ehrharta calycina* very open grassland over *Dasypogon bromeliifolius, *Ursinia anthemoides* subsp. *anthemoides* and **Gladiolus caryophyllaceus* very open herbland. Other common species include: *Eucalyptus todtiana*, *Nuytsia floribunda, Stirlingia latifolia, Hibbertia hypericoides* subsp. *hypericoides, Patersonia occidentalis, Laxmannia squarrosa* and *Scholtzia involucrate.*
- VT02 described as *Melaleuca preissiana* and *Banksia ilicifolia* isolated trees to open woodland over *Kunzea glabrescens* and *Astartea scoparia* shrubland to sparse shrubland over *Lechenaultia floribunda, Boronia crenulata* subsp. *viminea* and *Hypocalymma angustifolium* heathland over **Avena barbata, *Vulpia myuros* and **Ehrharta calycina* isolated grasses over *Dasypogon bromeliifolius, Phlebocarya ciliata* and **Gladiolus caryophyllaceus* open forbland
- VT03 described as *Eucalyptus rudis* open woodland over *Melaleuca preissiana* low woodland over **Acacia longifolia* subsp. *longifolia* and **Leptospermum laevigatum* open shrubland over **Ehrharta longiflora* and **Briza maxima* grassland.

Based on the results of the desktop searches, dominant species, landform features, field observations and coupled with the statistical analyses, one conservation significant ecological community was identified within the survey area (VT01) – Banksia Woodland TEC.

Key findings for vegetation and flora

A large proportion of the survey area was found to be in completely degraded condition, which included cleared areas (64 per cent). Other disturbance factors include weed invasion, grazing impacts (including rabbits) and proliferation of informal tracks/firebreaks. Vegetation in very good condition (11 per cent) was represented by VT01 and VT02, with intact native species structure, high diversity and low cover of introduced species.

Within the survey area 144 flora taxa (including subspecies and varieties) representing 43 families and 111 genera were recorded during the spring survey (GHD, 2019) and from GHD (2019) and Eco Logical (2017) field surveys. This total comprised 95 native taxa and 49 introduced flora taxa.

No EPBC Act or BC Act listed flora or Priority listed flora by the DBCA were recorded within the survey area during this current spring 2019 survey and from historical field surveys conducted by Eco Logical and GHD.

Key findings for fauna

Four broad fauna habitat types have been identified within the survey area, not including cleared areas such as roads, tracks and houses. These habitat types closely align with the vegetation types.

A total of 28 fauna species, including 22 birds and four mammals and two reptiles were recorded area during the spring survey (GHD, 2019) and from previous field surveys.

Three conservation significant fauna species were recorded within the survey area through presence of suitable habitat and/or signs of presence. These included:

- Carnaby's Cockatoo
- Forest Red-tailed Black-Cockatoo
- Southern Brown Bandicoot

The three conservation significant species considered likely to occur include:

- Western Brush Wallaby
- Perth Slider
- Black-striped Snake

Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo foraging habitats were recorded during the survey. High value foraging habitat was recorded for the Banksia/Eucalypt open woodland and revegetation fauna habitat types for both Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo. Low value foraging habitat was recorded for the Melaleuca dampland with shrubland and *Eucalyptus rudis* open woodland over Melaleuca dampland fauna habitat types.

A total of 14 (of which seven occurs within the application area) potential breeding habitat trees with DBH greater than 500 millimetres were recorded from the survey area. No hollows suitable for black cockatoo use were observed from the ground based assessment.

Limitations

A review of the survey limitations identified only a minor constrain related to the mapping reliability. GHD (2019) advised that certain atmospheric factors might have affected the accuracy of GPS receivers. GHD used GPS units which are accurate to within five metres on average, and therefore, it was not expected that the data points consisting of coordinates recorded from the CPS units may contain inaccuracies.

Other aspects of the GHD (2019) surveys, which include proportion of flora collected and identified, timing or intensity of the survey, had no limitations on the survey results.

Photographs of the vegetation

Figure 5. Banksia/Eucalypt open woodland

Figure 6. Melaleuca dampland with shrubland

Figure 7. *Eucalyptus rudis* open woodland over Melaleuca dampland

Appendix G – References and databases

1. GIS datasets

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- Cadastre Address (LGATE-002)
- Consanguineous Wetlands Suites (DBCA-020)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Groundwater Salinity Statewide (DWER-026)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Native Title (ILUA) (LGATE-067)
- Offsets Register – Offsets (DWER-078)
- Pre-European Vegetation Statistics
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- Remnant Vegetation, All Areas
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- South Coast Significant Wetlands (DBCA-018)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- RIWI Act, Groundwater Areas (DWER-034)

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities

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