

8 October 2014

George Ling
Projects Manager
City of Gosnells
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Re: Black Cockatoo Assessment – Garden Street Extension

Dear George

As requested, Terrestrial Ecosystems has inspected potential foraging habitat for Black-Cockatoos in the proposed Garden Street extension (i.e. project area; see Figure 1).

Methodology

Terrestrial Ecosystems’ assessment of Black-Cockatoo foraging and breeding habitat was based on the following methodology:

1. Identify any trees that:
 - contain a hollow where there is evidence of its use as a breeding site for Black-Cockatoos;
 - contain a hollow that may be suitable as a nesting site for Black-Cockatoos; and
 - have a diameter at breast height (DBH) greater than 50cm; and
2. Assess and map the availability and quality of foraging habitat based on the criteria shown in Table 1.

Trees were inspected from ground level. The DBH was measured to the nearest 10mm and the height was estimated to the nearest 1m. The project area was mapped based on the areas potential for providing foraging opportunities for Black-Cockatoos. Table 1 indicates the rating system used, and how this information should be interpreted as Black-Cockatoo foraging habitat.

Table 1. Criteria for assessing foraging habitat for Black-Cockatoos

Rating	Characteristics	Black-Cockatoo foraging
0	Contained no or very few plants that provide a food source for Black-Cockatoos.	Black-Cockatoos are almost never seen foraging in the area and if they are, it isn’t for very long.
1	Contained a few plants that would occasionally provide a food source for Black-Cockatoos.	Black-Cockatoos may infrequently be seen foraging in the area and they don’t stay very long.
2	Contained plants that are a preferred food source for Black-Cockatoos.	Black-Cockatoos could be seen foraging in the area and could return annually during flowering or seeding. There may be some evidence of past feeding in the area.
3	Contained an abundance of plants that are a preferred food source for Black-Cockatoos.	There is considerable evidence of Black-Cockatoos foraging in the area and these birds will return annually foraging during flowering or seeding.

Breeding and foraging habitats for Carnaby's Black-Cockatoo, Baudin's Black-Cockatoo and the Forest Red-tailed Black-Cockatoo are described in the Department of Sustainability, Environment, Water, Population and Communities (2012) EPBC Act referral guidelines for three threatened black-cockatoo species and the brief species information that follows.

Dr Graham Thompson assessed the project area on 30 September 2014.

Species ecology

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) – Endangered under the *EPBC Act 1999* and Schedule 1 under the *Wildlife Conservation Act 1950*

Carnaby's (or Short-billed) Black-Cockatoo (*Calyptorhynchus latirostris*) is a large, pied, cockatoo. Garnett et al. (2011) and the DSEWPac (2011) reported that Carnaby's Black-Cockatoo inhabits the south-west of Western Australia, from Kalbarri to as east on the south coast as Esperance.

Carnaby's Black-Cockatoos are partly migratory (Higgins 1999). In the drier regions of their geographic range where most of the native vegetation has been cleared (e.g. wheatbelt), Carnaby's Black-Cockatoos are postnuptial migrants (Saunders 1980; Saunders and Ingram 1995). After breeding, individuals in these areas migrate to feed in higher rainfall areas including the Swan Coastal Plain, and to a lesser extent, forests dominated by Jarrah (*E. marginata*), Marri (*C. calophylla*) and Karri (*E. diversicolor*; Saunders 1980). On the Swan Coastal Plain, Carnaby's Black-Cockatoos have been recorded foraging in most suburbs and in pine plantations within the greater Perth metropolitan area (Perry 1948). Vagrants have been recorded on Rottneest Island (Winnett 1989) and Garden Island (Wykes et al. 1999). These later two sightings clearly indicate that Carnaby's Black-Cockatoo will fly considerable distances over non-vegetated areas to forage.

Carnaby's Black-Cockatoo breed between July and November mostly in eucalypt woodland (Saunders 1980; Saunders 1986). Carnaby's Black-Cockatoo nest in tree hollows that are created by fire, fungi, termites or old age, with hollows between 2.5 and 12m above the ground (Higgins 1999; Saunders 1979). Hollows are large, and up to 2.5m in depth (Higgins 1999). These hollows are usually in live or dead smooth-barked Salmon Gum (*Eucalyptus salmonophloia*) or Wandoo (*Eucalyptus wandoo*). However, Carnaby's Black-Cockatoo will also nest in Red Morrell (*E. longicornis*), York Gum (*E. loxophleba*), Tuart (*E. gomphocephala*), Flooded Gum (*E. rudis*), Gimlet (*E. salubris*), Swamp Yate (*E. occidentalis*) and Marri (*C. calophylla*) (Cale 2003; Higgins 1999). When breeding, they most often forage in the surrounding shrubland and kwongan heath (Higgins 1999). On the Swan Coastal Plain, breeding could occur in Tuart, Flooded Gum, Swamp Yate and Marri. Adults return to the same breeding area each year (Saunders 1977) and some use the same tree hollow for many years in succession to raise their chicks, others shift their nests among a number of trees in the same area (Saunders and Ingram 1998).

Although flocks of Carnaby's Black-Cockatoo are seen foraging in the Perth metropolitan area during summer and autumn there are no published data of any breeding taking place in the greater Perth metropolitan area. It is also interesting that Carnaby's Black-Cockatoo will nest in the Moora town site (Davies 2005) but have not nested in the Perth metropolitan area. It is not known if they bred in the Perth area before European settlement.

Saunders (1980) reported that Carnaby's Black-Cockatoo at Coomallo Creek (breeding area) foraged mostly on native plants, with the only exception being *Erodium* sp.. Higgins (1999) reported the habitat of Carnaby's Black-Cockatoo was uncleared or remnant woodlands dominated by *Eucalyptus*, particularly Wandoo and Salmon Gum and often in shrubland or kwongan heathland dominated by *Hakea*, *Dryandra*, *Banksia* and *Grevillea* and seasonally in *Pinus* plantations and less often in Marri, Karri or Jarrah.

Since the 1930s, pine plantations have become an important feeding resource during the summer months (Perry 1948; Saunders 1974; Saunders 1980). The utilisation of pine plantations by cockatoos is likely to reflect the high energetic return of pine seeds, the concentrated food source and the loss of native habitat that has occurred on the Swan Coastal Plain since the 1930s. Based on this information, Carnaby's Black-Cockatoos are likely to foraging within the project area.

The Department of Parks and Wildlife have made available shape files to indicate areas within which Carnaby's Black-Cockatoos are known to breed. These are circular shapes around known breeding sites. The

project area falls within the western section of a known breeding area that is centred on the Eucalypt woodland on the Darling Scarp. Carnaby's Black-Cockatoos are likely to forage in the vicinity of the project area.

Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable under the *EPBC Act 1999* and Schedule 1 under the *Wildlife Conservation Act 1950*

The Forest Red-tailed Black-Cockatoo is one of three large black-cockatoos found in Western Australia. *Calyptorhynchus banksii naso* frequents the humid to sub-humid south-west of Western Australia from Gingin in the north, to Albany in the south and west to Cape Leeuwin and Bunbury (Department of Sustainability Environment Water Population and Communities 2011). It was mostly seen in the hilly interior, but small numbers of birds were seen at Mundijong, Baldyvis, Karnup, Stakehill, Pinjarra, Coolup and in the Lake Clifton area (Johnstone and Kirkby 2011). In 2011, there was an increase in the number of Forest Red-tailed Black-Cockatoo on the coastal strip north from Rockingham to the northern metropolitan suburbs. The reason for the recent increase in abundance is unknown.

The Forest Red-tailed Black-Cockatoo nests in tree hollows with a depth of 1-5m that are predominately Marri, Jarrah and Karri. The nest entrance is 12-41 cm, and similar to other black-cockatoos, it lays two eggs on wood chips in October and November, but most often only one survives.

Johnstone and Kirkby (2011) reported the Forest Red-tailed Black-Cockatoos feed mostly on seeds from Marri, Jarrah, but also on Sheoak (*Allocasuarina fraseriana*), Snottygobble (*Persoonia longifolia*), Blackbutt (*Eucalyptus patens*) and introduced species such as *M. azedarach* and Lemon-scented Gum (*Corymbia citriodora*).

Based on this information, the Forest Red-tailed Black-Cockatoo is likely to forage in the vicinity of the project area.

Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) – Vulnerable under the *EPBC Act 1999* and Schedule 1 under the *Wildlife Conservation Act 1950*

Baudin's Black-Cockatoo occurs in the humid and sub-humid forests of Western Australia; an area within the 750mm isohyet (Chapman 2007). Its range extends from Gidgegannup and Clackline in the north to about 50km east of Albany and all the forest to the south-west coast (Chapman 2007).

Baudin's Black-Cockatoo is typically found in vagrant flocks and utilises the taller, more open Jarrah, Marri and Karri forests, where it feeds mainly on Marri seeds and various Proteaceous species. Johnstone and Kirkby (2008) reported Baudin's Black-Cockatoo feeding on the seeds of Marri, Jarrah, Sheoak, *Banksia grandis*, *B. quercifolia*, *B. littoralis*, *B. ilicifolia*, *Hakea erinacea*, *H. prostrata*, *H. stenocarpa*, *H. trifurcata*, *H. lasianthoides*, *H. ruscifolia*, *H. lissocarpha*, *H. varia*, *H. cristata*, *H. marginata*, *Dryandra sessilis*, *D. squarrosa*, *D. praemorsa*, *Grevillea wilsonii*, *Xanthorrhoea preissii*, *Kingia australis*, *Reedia spathacea*, *Pinus radiata*, *Erodium* spp., *Jacaranda* spp., *Macadamia* spp., *Carya illinoensis*, *Malus* spp., *Pyrus* spp., *Diospyros* spp. and *Quercus* spp.; and the nectar, buds and flowers of Marri, Jarrah, Wando, *C. citriodora*, *B. grandis*, *D. sessilis*, *D. lindleyana*, *D. squarrosa*, *Darwinia citriodora* and *Callistemon* spp. They also eat insect larvae and insects from under the bark.

Large flocks arrive in the non-breeding central and northern parts of the Darling Scarp in early February and March. This postnuptial nomad is seen in Collie, Bannister, North Dandalup, Serpentine, Jarrahdale, Wungong, Mundaring and Chidlow, and sometimes venture on to the adjacent coastal plain at Maida Vale, Kelmscott, Armadale, Byford, Mundijong, Lake Clifton, Bunbury, Capel, Busselton and Dunsborough (Johnstone and Kirkby 2008; Johnstone and Kirkby 2011). During the non-breeding period, Baudin's Black-Cockatoo utilises a number of roosts on a regular basis. Johnstone and Kirkby (2008) have recorded some of the larger roosts at Gidgegannup, Piesse Brook, Nganguring, Mundaring, Araluen, Wungong, North Dandalup and Serpentine. Other roosts are at Chidlow, Parkerville, Kalamunda, Kelmscott, Roleystone, Bedfordale, Gleneagle, Mundijong, Jarrahdale, Bannister and Crossman. Most of these roost sites are tall emergent eucalypts or Blackbutt and they are often near watercourses and in sheltered gullies.

It is known to breed in the southern forests north to Collie and east to near Kojonup in large vertical hollows of Karri, Marri and Wando (Johnstone and Kirkby 2008). Johnstone and Storr (1998) reported eggs are laid in August to December, with a clutch of 1-2, but normally only a single chick is fledged. Only the female incubates and broods.

Based on this information, Baudin's Black-Cockatoo could forage in the project area.

Results

Habitat

There are four major fauna habitat types in the project area (~ 6.81ha), one of which would be foraged regularly by Black-Cockatoos:

- Predominantly Banksia woodland (~ 2.89ha) that contains Sheoak and Jarrah trees. This habitat is in three sections in the northern part of the project area. It is the most southerly portion that supports most of the Allocasuarina and Jarrah trees. This habitat type provides foraging opportunities for Carnaby's and Baudin's Black-Cockatoos and the Forest Red-tailed Black-Cockatoo (Plates 1-4);
- Wetland and fringing vegetation (~ 0.71ha) which is in two sections in the project area (Plate 5);
- Grass land (~ 0.52ha) which is in two sections in the northern part of the project area (Plate 6); and
- Disturbed areas, including a drainage channel, pasture, car park, cleared areas and playing fields (Plates 7-10). This area has isolated trees that may infrequently be foraged by Black-Cockatoos.

Bush Forever sites

Within a 2km radius of the proposed Garden Street extension there are multiple Bush Forever sites (Figure 1) that contain habitat suitable for Black-Cockatoo foraging. The project area transects Bush Forever site 125 – Holmes Street Bushland.

Bush Forever 125 Holmes Street Bushland. This Bush Forever site contains 121.3ha of bushland with the uplands vegetated with *B. attenuata*, *B. menziesii*, *B. ilicifolia* and *Allocasuarina fraseriana*, and *M. preissiana*, *Eucalyptus todtiana*, *B. menziesii*, *A. fraseriana* and *Nuytsia floribunda* in the wetland areas.

Bush Forever 253 Harrisdale Swamp and adjacent bushland. This Bush Forever site contains 298.4ha of bushland and open water with the uplands vegetated with *B. attenuata* and *B. menziesii*, and scattered *A. fraseriana*, *M. raphiophylla* and *N. floribunda*, and *M. preissiana* and *M. raphiophylla* with scattered *B. littoralis*, *E. rudis* and *M. raphiophylla* in the wetland areas.

Bush Forever 413 Balannup Lake and adjacent bushland. This Bush Forever site is 76.6ha of bushland and open water with the uplands vegetated with *E. todtiana*, *B. attenuata*, *B. menziesii* and *N. floribunda*, and *M. raphiophylla*, *E. rudis*, *M. preissiana*, *A. fraseriana*, *M. raphiophylla* and *E. todtiana* in the wetlands.

Bush Forever 342 Anstey / Keane Dampland and adjacent bushland. This Bush Forever site is 311.6ha of bushland with the uplands vegetated with *B. menziesii*, *B. attenuata* and *A. fraseriana*, and the wetland is vegetated with *B. attenuata* and *M. preissiana*.

Bush Forever 465 Passmore Street bushland. This Bush Forever site is 13.7ha of bushland with the uplands vegetated with *C. calophylla* over *E. decipiens* and *B. littoralis*, and *M. preissiana*, *A. fraseriana*, *N. floribunda* and *B. grandis* in the wetland areas.

Bush Forever 464 Matison Street bushland. This Bush Forever site is 28.9ha of bushland with the uplands vegetated with *A. fraseriana*, *B. menziesii*, *B. ilicifolia*, *N. floribunda* and *E. todtiana*, and *C. calophylla* over *M. preissiana* in the wetland.

Bush Forever 340 Phobe Street bushland. This Bush Forever site is 7.37ha of bushland with the uplands vegetated with *B. menziesii*, *B. attenuata*, *B. ilicifolia* and *A. fraseriana* with scattered *E. todtiana*, and *N. floribunda*, *X. preissii*, *M. preissiana* and *N. floribunda* in the wetland areas.

Bush Forever 436 Canning and Southern Rivers. This Bush Forever site is 181.1ha of bushland with the uplands vegetated with *A. fraseriana*, *B. menziesii*, *B. ilicifolia*, *N. floribunda* and *E. todtiana*, and *E. rudis*, and *M. raphiophylla* in the wetland areas.

Significant Black-Cockatoo Trees

The Commonwealth referral guidelines require all Eucalypt trees with DBH of 500mm or greater be recorded. This has been done and there is a single Jarrah (*E. marginata*; DBH 1.56m, 25m high) that fits this criterion that is located at (UTM WGS 84; 50 401 735E 6448778S). This tree does not contain a hollow that would provide a suitable nesting site for any species of Black-Cockatoo.

Black-Cockatoo habitat assessment

In Figure 2, potential Black-Cockatoo foraging habitat is that shown as Banksia woodland (2.89ha) and it would be rated as 2 on the Table 1. There was evidence of Forest Red-tailed Black-Cockatoos foraging on two Jarrah trees (Plate 13).

Table 2 provides a summary of the assessed potential impact on Black-Cockatoos associated with the action of clearing the vegetation based on the criteria set out in the Department of Sustainability, Environment, Water, Population and Communities (2012) referral guidelines for Black-Cockatoos. This is followed by a more detailed assessment to support this summary table. Commonwealth referral guidelines (Department of Sustainability Environment Water Population and Communities 2011) are vague on what is quality foraging habitat for Black-Cockatoos, so the criteria of clearing or degrading more than 1ha of *quality foraging habitat* is difficult to assess.

Table 2. Summary assessment of whether an action will have a significant impact on the two species of Black-Cockatoos

High risk of significant impacts: referral recommended	Carnaby's Black-Cockatoo	Baudin's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
Clearing of any known nesting tree.	No nesting trees were recorded on the project area.	No nesting trees were recorded on the project area.	No nesting trees were recorded on the project area.
Clearing or degradation of any part of a vegetation community known to contain breeding habitat.	The project is inside the DPaW mapped potential breeding habitat.	The project area is outside known breeding habitat.	No known breeding habitats nearby.
Clearing of more than 1ha of quality foraging habitat.	Banksia woodland which provides potential foraging habitat was approximately 2.89ha.	Banksia woodland which provides potential foraging habitat was approximately 2.89ha.	There is less than 1ha of foraging habitat for Forest Red-tailed Black-Cockatoos and this was mostly confined to areas supporting <i>A. fraseriana</i> .
Clearing or degradation (including pruning the top canopy) of a known night roosting site.	Clearing will not impact on a known roosting site.	Clearing will not impact on a known roosting site.	Clearing will not impact on a known roosting site.
Creating a gap of greater than 4 km between patches of black cockatoo habitat (Breeding, foraging or roosting).	Clearing will not create a gap of greater than 4km between patches of Black-Cockatoo habitat.	Clearing will not create a gap of greater than 4km between patches of Black-Cockatoo habitat.	Clearing will not create a gap of greater than 4km between patches of Black-Cockatoo habitat.
Uncertainty: referral recommended or contact the department			
Degradation (such as through altered hydrology or fire regimes) of more than 1 ha of foraging habitat. Significance will depend on the level and extent of degradation and the quality of the habitat.	Clearing will impact on more than 1ha of foraging habitat.	Clearing will impact on more than 1ha of foraging habitat.	Clearing will impact on less than 1ha of foraging habitat.
Clearing or disturbance in areas surrounding black-cockatoo breeding, foraging or night roosting habitat that has the potential to degrade habitat through introduction of invasive species, edge effect, hydrological changes, increased human visitation or fire.	No known roosting site in the vicinity of the project area.	No known roosting site in the vicinity of the project area.	The Great Cocky Count for 2014 records a roosting site in the general vicinity of the project area.
Actions that do not directly affect the listed species but that have a potential for indirect impacts such as increasing competitors for nest hollows.	No known actions that would potentially indirectly affect this species.	No known actions that would potentially indirectly affect this species.	No known actions that would potentially indirectly affect this species.
Actions with the potential to introduce known plant disease such as <i>Phytophthora</i> spp. To an area where the pathogen was not previously known.	With the implementation of appropriate hygiene standards during vegetation clearing, diseases are unlikely to be introduced to the site.	With the implementation of appropriate hygiene standards during vegetation clearing, diseases are unlikely to be introduced to the site.	With the implementation of appropriate hygiene standards during vegetation clearing, diseases are unlikely to be introduced to the site.

Clearing of any known nesting tree (high risk)

The project area is within the circled area for known nesting sites for Carnaby's Black-Cockatoo as shown on the DPaW maps. However, there are no suitable trees with nesting hollows in the project area.

Clearing of any part or degradation of breeding habitat (high risk)

There is a single significant tree in the project area. However, this tree does not contain a hollow that would provide a suitable nesting site for Black-Cockatoos.

Clearing of more than 1ha of quality foraging habitat (high risk)

The definition of what is 'quality habitat' is unknown, but some of the trees in the project area are on the Commonwealth governments' list of foraging species for Baudin's, Carnaby's and Forest Red-tailed Black-Cockatoos. There is evidence that Forest Red-tailed Black-Cockatoos have chewed Jarrah nuts in the project area (Plate 13). The project area contains in excess of 1ha of vegetation recorded as potential foraging habitat for Black-Cockatoos.

Clearing or degradation including pruning the top canopy of a known roosting site (high risk)

There is no evidence to indicate that Baudin's, Carnaby's or Forest Red-tailed Black-Cockatoos roost in the project area. However, Forest Red-tailed Black-Cockatoos regularly shift their roosting sites, and could periodically roost near the area. The recently released 2014 Great Cocky count (Finn *et al.* 2014) indicates significant roosting sites in the general area for Forest Red-tailed Black-Cockatoos. The lack of tall trees in the project area would strongly suggest that Black-Cockatoos are unlikely to roost in the project area.

Degradation (such as through altered hydrology or fire regimes) of more than 1ha of foraging habitat. Significance will depend on the level and extent of degradation and the quality of the habitat (uncertainty)

It is proposed that in excess of 1ha of Black-Cockatoo foraging habitat will be disturbed or cleared.

Clearing or disturbance in areas surrounding black cockatoo habitat that has the potential to degrade habitat through the introduction of invasive species, edge effects, hydrological changes, increased human visitation or fire (uncertainty)

The area to be cleared will be used for the development of a road and road verge. This development will increase human visitation to the area.

Actions that do not directly affect the listed species but that have the potential for indirect impacts such as increasing competitors for nest hollows (uncertainty)

There are no obvious indirect actions that will impact on Black-Cockatoos other than those already discussed.

Action with the potential to introduce know plant diseases such as Phytophthora spp. (uncertainty)

Clearing of the vegetation is only likely to spread diseases such as *Phytophthora* spp., if appropriate standards of hygiene are not maintained in the equipment used to clear the vegetation. This aspect is able to be effectively managed and controlled by the land developer.

Other observations and fauna management issues to be consider

There is an abundance of Southern Brown Bandicoots (*Isodon obesulus fusciventer*; Plate 11) throughout the northern sections of the project area particularly in the vicinity of dense vegetation. Rabbits are also present on the higher ground (Plate 12). A management strategy should be developed and implemented to avoid or minimise impacting on Southern Brown Bandicoots prior to and during the vegetation clearing program.

There is a drain that crosses the project area near the junction of Holmes and Balfour Street, which possibly flows east in to a small sump. The wetland area and drain are likely to support the normal range of small amphibians and other semi-aquatic vertebrates.

Referral under the EPBC Act

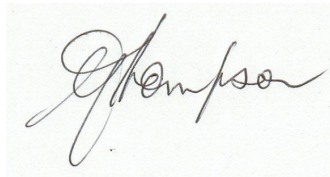
Clearing vegetation will trigger at least one of the criterion listed in the Commonwealth Government (Department of Sustainability Environment Water Population and Communities 2012) referral guidelines (e.g. clearing of in excess of 1ha of quality foraging habitat). It is suggested that the City of Gosnells has preliminary discussions with the Commonwealth Department of the Environment as a referral is recommended.

Recommendations

There are few large trees in the project area. If the large significant Jarrah shown in Figure 2 can be left, then this will provide habitat for Black-Cockatoos in future years.

The preparation and implementation of a vertebrate fauna management plan is recommended prior to vegetation clearing. This plan should specifically address the management and mitigation strategies of Southern Brown Bandicoots and other vertebrate fauna currently residing in the project area prior to and during construction.

Yours sincerely



Dr Graham Thompson
Partner and Principal Zoologist

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Plate 1. Banksia woodland



Plate 2. Banksia woodland



Plate 3. Banksia woodland



Plate 4. Banksia woodland



Plate 5. Wetland



Plate 6. Grass land



Plate 7. Community centre car park



Plate 8. Drain



Plate 9. Periphery of playing fields



Plate 10. Periphery of playing fields



Plate 11. Southern Brown Bandicoot diggings



Plate 12. Rabbit scats



Plate 13. Chewed Jarrah nuts

