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FURTHER INFORMATION ON CARNABY'S COCKATOO IN RELATION TO THE DEVELOPMENT OF LOT 4 UNDERWOOD AVENUE, SHENTON PARK, WESTERN AUSTRALIA (EPBC 2007/3386)

Prepared for:

The University of Western Australia
35 Stirling Highway
Nedlands WA 6009

Report Date: 19 December 2007
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SPECIALISTS IN LIVING AND WORKING PLACES

19 December 2007

WA and SA Section
Environment Assessment Branch
Department of Environment and Water Resources
GPO Box 787
Canberra ACT 2601

Attention: Ms Tessa Woollett

Dear Tessa,

RE: Further information required on Carnaby's Cockatoo in relation to Lot 4 Underwood Avenue, Shenton Park, Western Australia (EPBC 2007/3386)

As requested in your email of 12 December 2007 to Dr Paul van der Moezel, please find enclosed a report which consolidates the information we sent to the Department of Environment and Water (DEW) on two previous occasions (16 October and 29 November 2007).

Could you please review this report and indicate whether we are now able to advertise the Preliminary Information package.

For and on behalf of Coffey Environments Pty Ltd

Angela Lilley
Environmental Scientist

Paul van der Moezel
Principal

cc: University of Western Australia
Minter Ellison Lawyers

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1 INTRODUCTION

1.1 Background

The University of Western Australia (The University) proposes to develop the north eastern portion of Lot 4 Underwood Avenue, Shenton Park for residential purposes. The total development area of Lot 4 is 33.38 hectares (ha), of which approximately 11.88ha of bushland will be retained for conservation and passive recreation, 13ha will be cleared for a residential subdivision and a further 8.5ha will continue to be used for University purposes but is set aside for future development.

The *Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act)* sets out the way in which the Commonwealth Government is involved in the environmental impact assessment of certain projects that have the potential to impact on matters of national environmental significance.

An *EPBC Act* Referral of Proposed Action relating to the effect of the proposed residential subdivision on Carnaby's Cockatoo *(Calyptorhynchus latirostris)* was lodged with the federal Department of Environment and Water Resources (DEW) in March 2007. There was a public comment period of 10 business days. In late May 2007, Coffey Environments received advice from the DEW that the assessment will be through preliminary documentation and additional information is required, partly in response to the public submissions received.

Once Coffey Environments have provided DEW with the additional information requested, the referral and additional information will need to be published for public comment. Coffey Environments will then provide the Minister for Environment and Water Resources (the Minister) with revised information taking into account the public comments. The DEW will prepare a Recommendation Report and provide it to the Minister.

It is then up to the Minister to make a decision to approve, approve with conditions or not approve the proposed action. For assessment by preliminary documentation, a decision must be made within 40 business days of receiving finalised documentation from the proponent.

1.2 Purpose and Scope

This report was written by Coffey Environments on behalf of The University to respond to the DEW's request for further information on matters affecting Carnaby's Cockatoo in the Perth Region. It is a consolidation of Version 1 of this report and additional information sent to the DEW in December 2007. The following responses are provided to address questions and comments listed by the DEW in the letter to Dr Paul van der Moezel of Coffey Environments, dated 17 May 2007 (Appendix A) and a request for further information addressed to Dr van der Moezel, dated November 2007 (Appendix B). Questions and comments from 17 May 2007 are italicised in the general text while questions and comments from November 2007 are in bold.

2 GENERAL

2.1 Area of Banksia prionotes

What is the approximate area in hectares of the stand of Banksia prionotes on the northern part of the site, which will be cleared if the proposal is approved?

There are 2 areas of *Banksia prionotes* Thicket (with *B. menziesii* and *B. attenuata*) on the northern boundary of the subdivision area shown in Figure 1 which covers approximately 3.3ha and is included in the subdivision area to be cleared. Lower densities of *B. prionotes* occur along the southern boundary of Conservation Area A and along the eastern boundary of the subdivision area, and will be retained within the Conservation Area and landscape buffer.

In your report of October 2007 you claim that *B. prionotes* "...occur along the southern boundary of Conservation Area A and along the eastern boundary of the subdivision area...". What survey efforts were made to support this? Please comment on why this species is not recorded in the January 2007 report: In particular, *B. prionotes* is described as absent in both the Public Open Space (POS) and the Conservation Areas A and B, Table 2.

A targeted survey was conducted by Coffey Environments in November 2007. The survey counted and mapped the presence of *B. prionotes* in the Conservation Areas. Their height and reproductive status were also recorded. The survey revealed that there are 309 individual plants of *B. prionotes* occurring in conservation areas A and B. Please see Figure 5 for locations of *B. prionotes* in each of the conservation areas.

Table 1 (not Table 2 as suggested in the comment above) does not describe *B. prionotes* as being absent in the POS and Conservation Areas. Table 1 simply shows that the *Banksia prionotes* closed scrub vegetation type does not occur in these areas. This does not mean that the species is totally absent from elsewhere on the site. A species can occur in other vegetation types but not in such dominance that it defines the vegetation type. The November 2007 survey identified 309 individual plants of *Banksia prionotes* occurring in the *Jarrah/Banksia/Sheoak* low woodland vegetation type (Conservation Area A) and the *Banksia attenuata/B. menziesii* woodland (Conservation Area B).

What is the area and numbers of *B. prionotes* in the Conservation A area, and where are they located? Please describe their reproductive status and condition.

Table 3 below outlines the occurrence of *B. prionotes* in Conservation Areas A and B. Figure 5 maps the locations of *B. prionotes*. Plates 1 and 2 show populations BP3 (photo 284) and BP13 (photo 289). A total of 309 plants were recorded in Conservation Areas A and B. A total of 55 plants were recorded in Conservation Area B, most of which were not burnt in the 2002 fire and have flowered in recent seasons. A total of 254 plants were recorded in Conservation Area A. Most of these were post-fire seedlings and have not flowered previously. About 20% were burnt in 2002 and had flowered in recent seasons. All plants were considered healthy.

Table 1

Recordings *of Banksia prionotes* Locations.

Area	Name	GPS	Photo	Height (m)	# of plants	Health	Flowering status	Seedling presence
B	**BP3**	CTR 386391, 6464455 NE 386398, 6464461 SE 386397, 6464445 SW 386382, 6464450 NW 386377, 6464465	284	to 5	50	H	Flowered previously (some last season)	Seedlings
B	**BP4**	386368, 6464436		to 3.5	2	H	Few flowers last season	
B	**BP5**	386349, 6464454		to 3.5	2	H		Seedlings
B	**BP7**	386325, 6464450		to 3.5	1	H		Seedlings
A	**BP8**	386602, 6464237		to 2	12	H	No flowers previously	
A	**BP9**	386627, 6464230		to 7	20	H	Flowered previously (some last season)	Seedlings
A	**BP10**	386646, 6464234		to 2	6	H	No flowers previously	
A	**BP11**	386671, 6464229		to 1	1	H	No flowers previously	
A	**BP12**	Nth 386966, 6464336 Sth 386968, 6464295		to 3	56	H	Flowered previously 1/3 flowered for first time last season	Few seedlings
A	**BP13**	Sth 386967, 64643647 Nth 386964, 6464432	289	to 3	150	HD	¼ flowered before some last season	Few seedlings
A	**BP14**	386711, 6464433		to 0.5	4	H	No flowers previously	
A	**BP15**	386681, 6464425		to 1	3	H	No flowers previously	
A	**BP16**	386688, 6464401		1	1	H	No flowers previously	
A	**BP17**	386693, 6464246		1	1	H	No flowers previously	
A	**BP18**	386663, 6464244		to 1	1	H	No flowers previously	

2.2 *B. prionotes* as Food Source

Please respond to the comment in one of the submissions that the current proposal does not protect 'the significant stand of Banksia prionotes that is an important food source for the Carnaby's Black Cockatoo. The WA EPA has previously advised that "the bushland contains Banksia prionotes – only two other areas in the Perth Metropolitan Region have this species in comparable abundance". "Banksia prionotes is an important food source as they flower at different times from Banksia attenuata. The food source is the blossom and the grubs which live inside the Banksia cones".

As mentioned in Section 2.1, some areas of *B. prionotes* will be retained on Lot 4, however due to competing objectives such as protection of vegetation in best condition, protection of east to west corridor linkage and protection of greatest diversity of vegetation types, to achieve all outcomes the main populations of *B. prionotes* will be cleared as part of the subdivision. Carnaby's Cockatoo eat a diverse range of food types (see Saunders 1980; Higgins 1999; Shah 2006). The evidence to suggest that *Banksia prionotes* is a particularly 'important' food source is not correct. For example, Saunders (1980) does not include *B. prionotes* in the list of species eaten, nor is it included in DEW's Carnaby's Cockatoo species profile information (see http://intranet.deh.gov.au/cgi-bin/sprat/intranet/showspcies.pl?taxon id=59523).

The main area of *B. prionotes* Thicket (mapped as Bp) along the northern boundary of the subdivision area was affected by fire in January 2002, with approximately 90% of *B. prionotes* trees being burnt. To date, no flowers have been observed on the new *B. prionotes* saplings. Hence, for the past 5 years Carnaby's Cockatoos have been able to survive without feeding on this population of *B. prionotes* and have found alternative food sources such as the flowers/seeds of *B. attenuata* and *B. menziesii* trees. This suggests that visiting Carnaby's Cockatoos are not dependent on this population of *B. prionotes*.

B. prionotes flowers from February to August which is a different time of year compared to *B. attenuata* which flowers from October to February. However, the other main *Banksia* species on Lot 4, *B. menziesii*, flowers from February to October and provides an alternative food source to *B. attenuata* (DEC, 2007).

You note that "to date, no flowers have been observed on the new *B. prionotes* saplings". Please describe the survey efforts, including the time of years this occurred particularly in relation to flowering.

Coffey Environments (formerly ATA Environmental) undertook two site visits of the subject land in October 2006 and May 2007 to re-assess the vegetation condition to determine if the condition had improved or declined due to the fire on the site in January 2002.

The surveys in October 2006 and May 2007 by botanist Dr Paul van der Moezel included a survey of the whole site to map the extent of weeds following the 2002 fire. During these surveys observations were made of the re-growth of *Banksia prionotes* and their reproductive status.

Separate visits of the area of *B. prionotes* were also undertaken by Paul van der Moezel in conjunction with the EPA Board members (5 September 2007) and the EPA Service Unit's botanist Bec Ryan and zoologist John Dell (21 September 2007). At no time were the regrown *B. prionotes* seedlings observed to have flowered since the fire.

In November 2007, Coffey Environments specifically surveyed Conservation Areas A and B for *Banksia prionotes*. *B. prionotes* were recorded in each Conservation Area as shown in Figure 5 and detailed in Table 3.

Please respond to the comment in one of the submissions that the current proposal does not protect 'the significant stand of *Banksia prionotes* that is an important food source for the Carnaby's Black Cockatoo. The WA EPA has previously advised that "the bushland contains Banksia prionotes – only two other areas in the Perth Metropolitan Region have this species in comparable abundance". "*Banksia prionotes* is an important food source as they flower at different times from *Banksia attenuata*. The food source is the blossom and the grubs which live inside the *Banksia* cones".

Given the published list of plant species that Carnaby's Cockatoo has been reported to feed on (see Appendix G), *Banksia prionotes* is clearly **not** of particular significance as a food source (see comments below in Section 4). In fact, *Banksia prionotes* was mentioned as one of numerous species in the list provided in Shah (2006), and was not specifically referred to in any of the other published lists (see Appendix G where Saunders [1980] Tables are replicated). There is no doubt that *Banksia prionotes* and *Banksia attenuata* flower at different times, but when *Banksia prionotes* is flowering (February to August, especially March to May, see Marchant *et al,* 1987) Carnaby's Cockatoo also have been reported feeding on a variety of other species (see list in Shah 2006 which is replicated below in Appendix G). It should also be noted that *Banksia menziesii* which is present at the Underwood Avenue site, flowers from February to October which overlaps with the flowering period for *Banksia prionotes*.

What is the evidence to support your claim that "Carnaby's Cockatoos have been able to survive without feeding on this population of *B. prionotes* and have found alternative food sources such as flowers/seeds of *B. attenuata* and *B. menziesii* trees"? The importance of the *B. prionotes* as a food source in the area should be clarified by obtaining expert advice.

The focus and significance of *B. prionotes* as a food source for Carnaby's Cockatoo is ill informed. As can be seen from the four Tables in Saunders (1980) which are replicated in Appendix G, and Table 4 in Shah (2006) which is also replicated in Appendix G, *B. prionotes* constitutes an insignificant component of the diet of Carnaby's Cockatoo. Removing *B. prionotes* from its diet would have little or no impact on this species as it could readily find alternative food sources. It should also be noted that a large fire occurred at the Shenton Park site approximately five years ago and burnt about 95% of the *B. prionotes* on the site. These regenerated plants have yet to flower. The small number of *B. prionotes* that survived the fire have continued to flower. Most of these plants are in the designated conservation areas. Coffey Environments conducted a targeted *B. prionotes* search on 13 November 2007 which revealed that the few saplings that occur in conservation area B are yet to flower. The large population of *Banksia prionotes* occurring on the eastern edge of conservation area A contains a large number of saplings some of which flowered last season (refer to Table 1).

Surveys by Shah in 2006 observed Carnaby's Cockatoo in the vicinity of Lot 4 at Perry Lakes Reserve. Their continued presence in the area in the absence of flowers on 95% of *B. prionotes* on Lot 4 suggests that *B. prionotes* is not an important food source in the region.

2.3 Total area of the Site

What is the total site area 36 ha or 33 ha? The referral states 33 ha whilst the ATA Environmental Report Number 2005/067 mentions 36 ha.

The current subdivision proposal covers a total area of 33.38ha.

2.4 Use of the University's Bushland for feeding

Please comment on the claim in one of the submissions that a large flock (>100) of Carnaby's Black Cockatoos roosts at nearby Perry Lakes and uses the UWA bushland for feeding. Do these cockatoos do this on a daily basis when they are in the district or infrequently?

Carnaby's Cockatoo are known to forage in the western suburbs, utilising remnant vegetation as well as other introduced species. Carnaby's Cockatoos have been recorded foraging in most suburbs including Shenton Park bushland, Bold Park, Kings Park and road side verges (Saunders, 1974).

Coffey Environments is unable to say if a particular flock roosting at Perry Lakes regularly visits the UWA bushland for feeding. A zoologist who has assisted with preparing the fauna assessments lives near Bold Park and takes a keen interest in the presence and movement of Carnaby's Cockatoo in the area. Bold Park adjoins Perry Lakes and is near The University's bushland at Shenton Park. He has observed flocks of Carnaby's Cockatoo containing 30-120 birds visiting the Bold Park area from time-to-time (see Plate 1). They normally do so for a period of 4-5 days, then move onto other areas. We have some examples of this behaviour for a cleared housing block of land in Yanchep where for a short period (approximately five days) a flock of Carnaby's Cockatoo foraged (Plate 2) and then moved on. Similarly, Carnaby's Cockatoo are seen most years foraging in the *Banksia prionotes* and *B. ashbyi* on the verge at Underwood Avenue, Floreat, and on the *B. menziesii* and *B. attenuata* in 'Banksia Farm' in Mt Claremont for a couple of days, depleting the resource then moving to other areas. This is expected normal behaviour, where a flock 'learn' of the presence of a feeding resource, utilise it for a period and then move on to other areas (see Charnov, 1976).

2.5 Shah Report

The Department is concerned that the Birds Australia (WA) report on this species' use of the Swan Coastal Plain (Shah, B. Conservation of Carnaby's Black-Cockatoo on the Swan Coastal Plain, Western Australia (2006) was not referred to nor referenced in the referral information. This has been publicly available since 14 December 2006.

Writing of the ATA Environmental (2005) Report commenced in March 2005, before the Shah (2006) report was made publicly available. It is Coffey Environments' opinion that the Shah (2006) report has some limitations, these being that the data have not been published in the scientific literature, nor has the report been independently peer reviewed. The Shah (2006) report has to be weighted accordingly when compared with other information that is published in the scientific literature. A search of the scientific literature in Zoological Records and Current Contents did not detect its presence.

In an email received by Coffey Environments from Cheryl Gole and John Blyth, Co-Chairs, Conservation and Research Committee, Birds Australia WA on 2 April 2006 about the potential to share data on Carnaby's Cockatoo for a proposed research project, it was made clear that Birds Australia (WA) was not interested in sharing their data – quote:

> *'Your response makes it clear that you see collaboration as primarily sharing information and data. The problem with this from Birds Australia's perspective is that our information and data, in an incomplete form and possibly even in final form, will be available significantly before results coming from your proposed project. We do not wish to release our data until we have had the opportunity to analyse it, be well on the way to publication and have had the opportunity to carefully consider the implications of our results for future work'*).

If Coffey Environments had access to the primary data or the Shah (2006) report, then this information would have been considered when preparing their report. Coffey Environments has since had access

to the report and in light of this we believe that the ATA Environmental (2005) report is still valid and current.

Throughout the report of October 2007 it is noted that data, such as the Shah (2006) report, 'was not available at the time of writing the ATA Environmental (2005) report'. However, any relevant new information should be taken into account in responding to the Department's request for further information. In addition, you should note that providing the required information for environmental assessment may require further research to be undertaken.

Coffey Environments has taken any relevant new information into account in responding to the DEW's requests for further information, including further research where necessary. This has been included in the responses below.

2.6 Study Area

Please comment on the claim in the submissions that the ATA Environmental study covered only a small area of the western suburbs rather than the Swan Coastal Plain.

The ATA Environmental (2005) report included most of the area that is generally accepted as the 'western suburbs', however, this area represents only a very small fraction of the Swan Coastal Plain (see Figure 2). It was not Coffey Environments' intention to cover all of the Swan Coastal Plain, a task that would have taken many person-years and incurred a huge and unnecessary expense. The total area assessed was approximately 10,666ha. The Underwood Avenue subdivision plan encompasses 33.38ha and is centrally located within the region assessed. The subdivision area of Lot 4 equates to 0.313% of the total area assessed, and represents 4% of available very good habitat in the Western Suburbs and less than 3% of the available habitat assessed as having feed plants available and in good condition. The area of *B. prionotes* on Lot 4 to be cleared (3.3ha) equates to 0.031% of the total area assessed. If similar data to that which was reported by ATA Environmental (2005) were available for the rest of the Swan Coastal Plain, it would be apparent that the potential impact of clearing a section of the UWA owned Underwood Avenue site would be significantly less than is shown in the ATA report.

3 DISTRIBUTION AND POPULATION

3.1 Recent assessments of Carnaby's Cockatoo numbers

Please comment on the following: ATA Environmental claims 'we could find no recent assessment based on actual survey data for the number of Carnaby's Cockatoo'. However, we understand that Birds Australia's Swan Coastal Plain Project (Shah, 2006) undertook an extensive survey across the Swan Coastal Plain. An analysis of this should be included as part of the preliminary documentation.

As indicated above, the Shah (2006) data/report was not available at the time of writing the ATA Environmental (2005) report. With reference to the DEW quote above, Coffey Environments was commenting on one of the reasons for the earlier Department for Environment and Heritage (DEH) decision to impose a controlled action on the development, where the DEH claimed that '*the breeding population is estimated at 60,000 breeding birds, with three to five sub-populations, the largest being about 20,000 birds, and that the population is continuing to decline*'. Coffey Environments has found no data to support this claim. The Shah (2006) report indicated that there was no previous estimate of the number of Carnaby's Cockatoo (pp. 8). Shah (2006) used three surveys (12 February, 26 March, 14 May 2006) to estimate the population of Carnaby's Cockatoo on the Swan Coastal Plain utilising volunteers stationed at 239, 153 and 121 sites spread over an area from Gingin to Bunbury. The minimum population estimates from these three surveys varied from 722 for the survey on 12 February, to 2,633 for the survey on 26 March to 855 for the survey on 14 May 2006. Shah then used the maximum number of birds counted (e.g. 4,510) at 13 roosts on the Swan Coastal Plain as the minimum population estimate. Due to the limitations of the study, Coffey Environments believes this is likely to be a considerable under-estimate of the number of Carnaby's Cockatoo utilising the Swan Coastal Plain.

In June 2005, Coffey Environments wrote to Mr M Flanigan of DEW (see Appendix C). In response to this request for information and clarification, Mr S. Mercer (14 June 2005) indicated the DEW would not be revisiting the decision, and did not provide any further information.

Land developers were concerned about the impact that Carnaby's Cockatoos were having on their potential developments in the Perth area and had indicated to a Coffey Environments staff member that they would consider supporting a study with the following broad objectives, if DEW (previously DEH) would support the study:

a) describe the spatial and temporal (day-to-day and seasonal) ecology of Carnaby's Cockatoo on the Swan Coastal Plain around the Perth metropolitan area;

b) describe preferred foraging sites and vegetation utilised by Carnaby's Cockatoo on the Swan Coastal Plain around the Perth metropolitan area; and

c) estimate the population size of Carnaby's Cockatoo on the Swan Coastal Plain around the Perth metropolitan area.

In December 2005, Dr Graham Thompson wrote to the DEH on behalf of Coffey Environments seeking its support for an extensive survey of the Carnaby's Cockatoo population in the greater Perth metropolitan area, as outlined in Appendix D. The response from DEH (Ms Walkington, Director, NES Wildlife Strategies Section, 21/2/2006) was non-committal. The Urban Development Institute of Australia (UDIA), which would have become a partner in this study, wrote to the DEH seeking its strong support for this investigation. This correspondence went unanswered.

More recently, a land developer operating in the south-west of WA in discussions with DEH offered to partially fund a very similar investigation as an environmental offset because its development may have impacted on Carnaby's Cockatoo. The DEW would not support the undertaking of a large scale, rigorous scientific investigation that was industry funded to provide basic data on the population and spatial ecology of Carnaby's Cockatoo in the Perth metropolitan area.

The DEC (formerly CALM) in its Recovery Plan for Carnaby's Cockatoo (Cale, 2003) draws attention to the need to regularly monitor the population size, but to date, no large scale project has been funded by the State Government that will achieve this stated objective. This task would require the strong support of the DEW or DEC.

Due to limited survey work, there is no accurate population estimate for Carnaby's Cockatoo.

Please comment on the following: ATA Environmental claims 'we could find no recent assessment based on actual survey data for the number of Carnaby's Cockatoo'. However, we understand that Birds Australia's Swan Coastal Plain Project (Shah, 2006) undertook an extensive survey across the Swan Coastal Plan. An analysis of this should be included as part of your preliminary documentation.

As Coffey Environments advised in its correspondence of 16 October 2007, the Shah (2006) data/report were not available at the time of writing the ATA Environmental report (2005/067). The phrase in quotes above has been taken out of context. What was actually said was:

We could find no recent assessment based on any actual survey data for the current number of Carnaby's Cockatoos. We note the determination for the controlled action by DEH reported that there were 60,000 breeding Carnaby's Cockatoos. This most probably came from Saunders et al. (1985). A review of the Saunders et al. (1985) article suggests that this assessment was at best an educated guess as there was no indication of how the number was determined. Because of the lack of recent published population data, Carnaby's Cockatoo's wide distribution, high level of movement between seasons and morphological and behavioural similarities with Baudin's Cockatoo, it is difficult to provide an accurate estimate of the population size of Carnaby's Black Cockatoo. It is surprising that given its status with DEC and the DEH, attempts have not been made by government agencies to estimate the population and monitor changes in recent years.

Even the Shah (2006) report indicated that there was no previous estimate of the number of Carnaby's Cockatoo (pp. 8). Coffey Environments stands by the statement it made, as it is a reasonable representation of the available information. Clearly, this statement referred to all Carnaby's Cockatoo in Western Australia, and Coffey Environments would doubt that Shah (2006) or Birds Australia WA would claim its survey which was only across the Swan Coastal Plain estimated the current number of Carnaby's Cockatoo in WA.

In addition, Coffey Environments has serious concerns about the quality of the 'research' undertaken by Birds Australia WA and reported by Shah (2006). Firstly, it should be pointed out that the Shah (2006) data have not been published in the scientific literature, nor has the report been independently peer reviewed (standard practice for quality research reports). The Shah (2006) report therefore has to be weighted accordingly when compared with other information that is published in the scientific literature.

Coffey Environments found numerous unsubstantiated claims and statements in the report, and believe the methodology used is not sufficiently rigorous to provided a valid and reliable estimate of the number of Carnaby's Cockatoo. The findings and recommendations should therefore be considered with due caution. We illustrate this with the following examples from the introduction, methods and results.

a) Unsupported assumptions in the introduction

There are numerous important assumptions made in the report that are not supported by fact or cited literature. For example page 5 'the last 45 years has seen a 50% decrease in the species' range and abundance'; page 5 'Recently confirmed breeding on the Swan Coastal Plain emphasises the region's potential significance if, as appears likely, the species is increasingly being forced to find new habitats and is moving coastwards'; page 5 'the accelerated rate of clearing of feeding habitat on the Swan Coastal Plain for urban development poses a significant threat to the long term survival of Carnaby's Cockatoo'. These type of comments would not be supported in a scientific publication of repute and only perpetuate existing myths that are not based on scientifically tested data and analysis.

b) Non-rigorous study design

Area counts

Three surveys undertaken by volunteer members of the public for 130 minutes pre-sunset and 20 minutes post-sunset at 239 sites on 12 February, 153 sites on 26 March and 121 sites on 14 May 2006, with all sites selected by the volunteers including parks, reserves, national parks, pine plantation and rural properties and stretching from as far north as Gingin and south as Bunbury.

Coffey Environments Comment - It would be unlikely that this census method would be acceptable in the scientific literature as valid and reliable for estimating the relative abundance of Carnaby's Cockatoo and a minimum population size, given that more than 95% of the area was not surveyed and volunteers selected their survey sites.

Roost counts

Potential overnight roost sites on the Swan Coastal Plain were initially identified by anecdotal reports and during the area counts. Sixteen sites were observed from 18 minutes before sunset and 57 minutes after sunset.

Coffey Environments Comment – The report clearly indicates a lack of roost site fidelity (p. 21), therefore these data could only indicate a small fraction of the actual Carnaby's Cockatoo population in the area, and bird counts at roosting site represented the highest number of Carnaby's Cockatoo recorded.

c) Variability of the results

The estimated number of Carnaby's Cockatoo counted varied appreciably between surveys with the minimum population estimated based on data from 12 February being 722, 26 March being 2633 and 14 May being 855, and the total number of birds counted roosting on 9 April was 4510.

Coffey Environments Comment - Such huge variation either suggests that Carnaby's Cockatoo are moving in and out of the surveyed area, or the method is inappropriate to census this species. Either way the data can only represent a significant under estimation of the real number of Carnaby's Cockatoo.

Coffey Environments acknowledges the presence of the Shah (2006) data, but it stands by its original statement, that there is *no recent assessment based on any actual survey data for the current number of Carnaby's Cockatoos.*

Your comments on the decision that the action is a controlled action are not relevant at this stage of the EPBC process. Comments on requests for DEW to provide support for surveys of the Carnaby's Black Cockatoo population are also not appropriate in the provision of further information for the assessment action. Please provide further information and analysis to the request for comment on the Shah (2006) report, as it relates to the proposal.

Coffey Environments believes that high quality, rigorously collected data on the current population of Carnaby's Cockatoo, and a rigorous testing of statements like 'the last 45 years has seen a 50% decrease in the species' range and abundance' (Shah 2006, pp. 5; Cale 2003, pp. 12) and 'the accelerated rate of clearing of feeding habitat on the Swan Coastal Plain for urban development poses a significant threat to the long term survival of Carnaby's Cockatoo' (Shah 2006, pp. 5) are required.

Coffey Environments have commented on the reliability and validity of the Shah (2006) report above. The information provided on feeding trees, roosting sites and numbers is useful, however, Coffey Environments has concern about the validity and reliability of the estimates of abundance, movement pattens and spatial distribution in the Shah (2006) report.

4 BREEDING HABITAT

4.1 Breeding Sites in Perth Metropolitan Area

ATA Environmental report No 2005/067 states that there are "no published data of any breeding taking place in the greater Perth metropolitan area" p7 and 'there are no records that indicate the species has bred in the Perth metropolitan area (p29) and 'We could find no evidence to support Birds Australia's claim that there is an increasing trend for Carnaby's Cockatoo to breed in the coastal areas south of Perth". However, the Department has been advised that there are a number of established breeding sites for this species within the Perth metropolitan region. (Evidently, this information is published in Johnstone, R. Kirkby, T., Stone, P. Minton, C. (2005). White-tailed Black-Cockatoos: Identification challenges and changes in distribution and status, and links with a community program – Cockatoo Care. In Gole, C. (Ed). Carnaby's Black-Cockatoo Future Directions Symposium, Birds Australia, Western Australia, Perth and is available for download from the Carnaby's Cockatoo website of Birds Australia WA. Given the above, further information is therefore sought on Carnaby's Cockatoo breeding records in the Perth metropolitan area.

A search of Zoological Records and Current Contents bibliographic databases in 2006 did not indicate the presence of the proceedings of the symposium on conserving Carnaby's Cockatoo. When Bansi Shah (Birds Australia WA) was asked by Coffey Environments for any breeding records that Birds Australia WA held for Carnaby's Cockatoo in the greater Perth metropolitan area no information was provided nor was Coffey Environments' attention drawn to the existence of the report referred to above. Coffey Environments understands that the proceedings from the *Carnaby's Black-Cockatoo Future Directions Symposium, Birds Australia, Western Australia, Perth* were not publicly available at the time this report was being written.

Johnstone *et al.* (2005) reported 'There are also unconfirmed reports [*of breeding* author's insert] from Baldivis and Northcliffe, and birds have been observed prospecting hollows in Tuarts *Eucalyptus gomphocephala* at Shenton Park in the Metropolitan area'. We understand that 'Northcliffe' referred to here is in the south-west of WA and not the metropolitan area. A large section of Baldivis is still native bush and is on the fringe of the urban area. Carnaby's Cockatoo are inquisitive birds, and 'prospecting' behaviour does not necessarily lead to breeding in a particular tree. Subsequent discussions with R. Johnstone (Western Australian Museum) indicated that he has reports of Carnaby's Cockatoo breeding at Bedfordale, most of which is outside of the built-up urban area to the east of the Armadale town centre. Johnstone *et al.* (2005) also reported breeding records for Carnaby's Cockatoo south of Mandurah and near Bunbury. Coffey Environments is unable to locate any publicly available data to verify these statements.

More recently, Johnstone *et al.* (2006) reported the presence of Carnaby's Cockatoo nesting sites in the southern section of the Perth-Bunbury Highway mostly south of Doman Road to the end of the highway corridor near Lake Clifton; SLK 100000-111600.

To demonstrate that Carnaby's Cockatoo have recently bred in new areas (e.g. Yanchep and south of Mandurah) would require these areas to have been surveyed previously and compared to current observations. Reporting birds breeding in certain areas now, does not provide evidence that they have not bred in these areas in the past unless there are previous records for comparison. Members of the scientific and public communities may now report the presence of Carnaby's Cockatoo in areas where they had not previously been recorded, as there is a heightened awareness of these birds due to:

- Media promotions by the Western Australian Museum and Birds Australia WA;
- An increased number of fauna assessments focussing on Carnaby's Cockatoo;
- Listing of Carnaby's Cockatoo under the *EPBC Act (1999)*;
- Listing as a Schedule 1 species under the *Wildlife Conservation (Specially Protected Fauna) Notice 2006;*
- Expanding developments and land clearing in areas outside of the wheatbelt and Perth metropolitan area.

Other than the comprehensive work of Saunders *et al.* (see summary Saunders 2005) over a period of about 30 years, records of breeding observations available are scarce.

ATA Environmental report No. 2005/067 states that there are "no published data of any breeding taking place in the greater Perth metropolitan area" (p7) and "there are no records that indicate the species has bred in the Perth metropolitan are" (p29) and "We could find no evidence to support Birds Australia's claim that there is an increasing trend for Carnaby's Cockatoo to breed in the coastal areas south of Perth". However, the Department has been advised that there are a number of established breeding sites for this species within the Perth metropolitan area. (Evidently, this information is published in Johnstone, R. Kirkby, T.,Stone, P. Minton, C. (2005). White-tailed Black-Cockatoos: Identification challenges and changes in distribution and status, and links with a community program – Cockatoo Care. In Glae, C. (Ed). Carnaby's Black-Cockatoo Future Directions Symposium, Birds Australia, Western Australia, Perth and is available for download from the Carnaby's Cockatoo website of Birds Australia, WA). Given the above, further information is therefore sought on Carnaby's Cockatoo breeding records in the Perth Metropolitan area.

Prior to the last response to DEW on 16 October 2007, Coffey Environments made an effort to contact those people and agencies likely to know about Carnaby's Cockatoo breeding sites in the Perth metropolitan area.

Coffey Environments previously advised as follows:

> *Johnstone et al. (2005) reported 'There are also unconfirmed reports [of breeding author's insert] from Baldivis and Northcliffe, and birds have been observed prospecting hollows in Tuarts* Eucalyptus gomphocephala *at Shenton Park in the Metropolitan area'. We understand the 'Northcliffe' referred to here is in the south-west of WA and not the metropolitan area. A large section of Baldivis is still native bush and is on the fringe of the urban area. Carnaby's Cockatoo are inquisitive birds, and 'prospecting' behaviour does not necessarily lead to breeding in a particular tree. Subsequent discussions with R. Johnstone (Western Australian Museum) indicated that he has reports of Carnaby's Cockatoo breeding at Bedfordale, most of which is outside of the built-up urban area to the east of the Armadale town centre. Johnstone et al. (2005) also reported breeding records for Carnaby's Cockatoo south of Mandurah and near Bunbury. No data are publicly available to verify any of these claims.*
>
> *More recently, Johnstone et al. (2006) reported the presence of Carnaby's Cockatoo nesting sites in the southern section of the Perth-Bunbury Highway mostly south of Doman Road to the end of the highway corridor near Lake Clifton; SLK 100000-111600.*
>
> *To demonstrate that Carnaby's Cockatoo have recently bred in new areas (e.g. Yanchep, south of Mandurah) as is being suggested, it is necessary that these areas had been surveyed at some*

time in the past and again more recently. Simply reporting birds breeding in these areas now, does not provide evidence that they have not bred in these areas in the past. A heightened awareness of the status of Carnaby's Cockatoo (e.g. media promotions by the Western Australian Museum, Birds Australia WA), an increased number of fauna assessments focussing on Carnaby's Cockatoo, listing of Carnaby's Cockatoo under the EPBC Act (1999) and as a Schedule 1 species under the Wildlife Conservation (Specially Protected Fauna) Notice 2006, and expanding developments and land clearing in areas outside of the wheatbelt and Perth metropolitan area is likely to result in the presence of Carnaby's Cockatoo being detected in areas where they had not previously been recorded.

Other than the comprehensive work of Saunders et al. (see summary Saunders 2005) over a period of about 30 years, the record of breeding observations available to environment consultants is scant (it is acknowledged that these data need to be withheld from potential poachers), but these data should be compiled and made available to environmental consultants when required. This is perhaps a responsibility of the Department of Environment and Conservation or Department of Environment and Water Resources.

Coffey Environments has no additional information on Carnaby's Cockatoo breeding sites in the Perth metropolitan area, however, Coffey Environments has written to the Western Australian Museum (Ron Johnstone) asking for more definitive information on Carnaby's Cockatoo breeding sites within the greater Perth metropolitan area, including specific information on known breeding locations such that they can be plotted to a map to demonstrate the distance these sites are from the Shenton Park site.

Coffey Environments has also written to Birds Australia WA seeking similar information. When responses to these letters become available this information will be forwarded to DEW.

There is a reasonable amount of information, anecdotal and published, to suggest that breeding is likely to occur on areas nearby to your proposal site. Just prior to, and during the breeding season, Carnaby's Black-Cockatoos feed primarily on native vegetation. Native foraging habitat is therefore most important during this time to ensure breeding success. Your proposal site is therefore likely to provide an important foraging habitat during breeding season. In light of this you are invited to provide information to clarify the risk associated with any proposed development on the site to the Carnaby's Black-Cockatoo.

Coffey Environments know of no data that would support the conclusion that Carnaby's Cockatoo are likely to breed in areas nearby to the UWA Shenton Park site. Carnaby's Cockatoo have been visiting the Perth metropolitan area to feed on pine plantations in large numbers for at least 60 years (Perry 1948, Serventy and Whittell 1962). There are no breeding records for Carnaby's Cockatoo at the Shenton Park site, at the adjacent Bold Park, or any other site in the built up residential Perth area during the last 60 years. Coffey Environments could find no data to indicate that Carnaby's Cockatoo shift their breeding areas. Coffey Environments acknowledges that breeding sites have recently been located at Baldivis, Bedfordale, south of Mandurah and near Yanchep. However, these locations had not previously been searched for Carnaby's Cockatoo nests, therefore it cannot be assumed that Carnaby's Cockatoo have recently moved into these areas to breed. Consequently, Coffey Environments conclude that the risk associated with Carnaby's Cockatoo breeding near the proposed site is negligible.

5 POTENTIAL OF SITES EXAMINED TO BE USED AS A FOOD RESOURCE BY CARNABY'S COCKATOO

5.1 Food Plants

Please comment on the following; Table 5 in ATA Environmental Report 2005/067 presents data on the potential of areas examined to offer a food resource, but no information appears to have been compiled on food plants at the proposed development site. It is unclear how assessment of food plants was undertaken, why no data is presented, why no species are listed and why foraging observations were not undertaken.

Appendix 3 in the ATA Environmental (2005) report listed some of the plant species that Carnaby's Cockatoo are known to feed on. This list is similar to the one provided by Saunders (1980), Higgins (1999), Johnstone *et al.* (2005) and the DEW's species profile information (http://intranet.deh.gov.au/cgi-bin/sprat/intranet/showspcies.pl?taxon id=59523). As outlined in Section 4.2.4 of the ATA Environmental (2005) report each of the 526 sites in the western suburbs were inspected for the presence of potential feed plants, their abundance and size. Five categories were used to assess the availability of potential food resource for three individual cockatoos (2 parents and one young) at each site. These categories were:

1. vegetation that was devoid of all available food resource potential;
2. vegetation where there were enough food resources on site to feed three Carnaby's Cockatoos for about one week;
3. vegetation where there were enough food resources on site to feed three Carnaby's Cockatoos for about one month, but the plants were degraded or fire affected;
4. vegetation where there were enough food resources to feed three Carnaby's Cockatoos for about one month and plants were in reasonable condition; and
5. vegetation where there are enough food resources to feed three Carnaby's Cockatoos for greater than one month.

A summary of these results is presented in Table 5 in the ATA Environmental (2005) report. No attempt was made to undertake comprehensive vegetation surveys at any of these sites to quantify the presence and abundance of each of the plant species.

Anecdotal foraging records during a site inspection are unlikely to provide useful data in the context of the survey's objectives. It was not the purpose or intention of this survey to record foraging behaviour of Carnaby's Cockatoo, therefore any foraging observations recorded during these inspections were not included in the ATA Environmental (2005) report. An assessment of plant species eaten by Carnaby's Cockatoo would require a much more systematic and comprehensive survey.

Please comment on the following; Table 5 in ATA Environmental Report 2005/067 presents data on the potential of areas examined to offer a food resource, but no information appears to have been compiled on food plants at the proposed development site. It is unclear how assessment of food plants was undertaken, why no data is present and why no species are listed and why foraging observations were not undertaken.

As is indicated in Tables 1, 2, 3 and 4 in Saunders (1980) as replicated in Appendix G, Table 4 in Shah (2006), which is also replicated in Appendix G and the other references cited below, Carnaby's Cockatoo feed on a variety of Banksias, Dryandras, Eucalypts, Hakeas, Grevilleas, *Pinus* species and *Erodium* species as well as numerous species that are now grown in urban gardens (e.g. sunflowers, jacarandas, hibiscus, macadamia and almond trees). These plant species are readily available throughout the Swan Coastal Plain and as there are no data to suggest that food is a limiting resource for non-breeding Carnaby's Cockatoo in the greater Perth metropolitan area, it seemed unnecessary to detail the specific plant species found at the Shenton Park site and other alternative feeding sites in the greater Perth metropolitan area.

5.2 Food as a limiting resource

No details are given by ATA Environmental in Table 5, on where, when or under what circumstances the data were compiled. This renders it difficult for the reader to gain an understanding of the potential food plants in the site, and it does not provide any information of the seasonality of this food source.

Coffey Environments could find no data to indicate that food is a limiting resource to sustain Carnaby's Cockatoo while they are in the greater Perth metropolitan area.

The ATA Environmental (2005) report indicated that 526 sites were visited by Dr Alexander Watson between December 2004 and March 2005. As the report indicated, during each visit all sites were assessed for a number of characteristics:

1. habitat type;
2. habitat quality;
3. food resource potential;
4. traffic volumes and ethnographic interference; and
5. potential breeding sites.

No attempt was made to assess seasonal variations in the availability of food resources in the western suburbs, as such a task would be extremely time consuming and expensive. Carnaby's Cockatoo are a highly mobile species that are known to have flown large uninterrupted distances. Therefore they are capable of overcoming the limitations associated with seasonality of some food resources. As there are no data to indicate that food is a limiting resource to sustain Carnaby's Cockatoo while they are in the greater Perth metropolitan area, such investigations would have little value.

No details are given by ATA Environmental in Table 5, on where, when or under what circumstances the data were compiled. This renders it difficult for the reader to gain an understanding of the potential food plants in the site, and it does not provide any information of the seasonality of this food source.

ATA Environmental provided detailed information in its report 2005/067 to explain when and under what circumstances the data in Table 5 were compiled. Sections 4.2.1 of the ATA Environmental report indicates the survey was undertaken between **December 2004 and March 2005**, a period when Carnaby's Cockatoo are in the Perth metropolitan area. Section 4.4 of the ATA Environmental report indicates the circumstances under which the data were compiled, indicating that Dr Alexander Watson **physically visited** each site and undertook an on-site assessment.

Appendix 2 of the ATA Environmental report outlines where the data were compiled. This appendix is reproduced in Appendix H, and the last two columns provide the coordinates (MGA) for all 525 sites referred to in Table 5.

No information was provided on specific plants that were available at each site, nor on the seasonality of this food resource. Given that there is no evidence to suggest that food is a limiting resource for Carnaby's Cockatoo during their non-breeding period in the Perth metropolitan area information on exact species found at any of the survey sites is unnecessary and meaningless in this context. In addition, given that there is no evidence to suggest that Carnaby's Cockatoo have bred or are likely to breed in the near future in the Perth western suburbs, the availability of a food source to support Carnaby's Cockatoo feeding chicks is not relevant.

5.3 Significance of the site for Carnaby's Cockatoo

There does not appear to be any evidence that research has been undertaken to demonstrate the significance of the site for Carnaby's Cockatoos. A good deal of information has been compiled in the report on food plants generally in the introduction, but the feed plants listed by ATA Environmental in the literature review are not extensive and reference should have been made to Shah (2006).

If some foraging areas were to be lost, then there are no data to suggest that this would significantly impact Carnaby's Cockatoo, as they will almost certain shift their foraging to other areas. There are no data to indicate that food is a limiting resource for Carnaby's Cockatoo in the greater Perth metropolitan area. The development area of Lot 4 Underwood Avenue is 4% of the available very good habitat of the Western Suburbs, and less than 3% of the available habitat assessed as having feed plants available and in good condition. Of the 33.38ha development area, 11.88ha will be retained in Conservation Areas and Public Open Space (POS).

The ATA Environmental (2005) report provided the following information on the site:

The retention of approximately 11.88ha for conservation and passive recreational purposes represents more than 35% of the total developable area of 33.38ha, which includes the areas shown to be cleared and earthworked as part of the subdivision works (previously labeled for future development) in Figures 1 and 3.

The current conservation and development proposal for Lot 4 Underwood Avenue, Shenton Park retains two conservation areas (Conservation Areas A and B) that are connected by a vegetated POS corridor. This proposal (Figure 3) retains approximately 11.88ha of suitable feeding habitat for Carnaby's Cockatoo. The vegetation in the conservation and POS areas are summarised Table 2.

Table 2

Vegetation types protected in Conservation and POS areas.

Vegetation Type	Current Proposal	
	Conservation Areas (hectares)	POS Area (hectares)
Jarrah/Banksia/Sheoak low woodland	8.0	1.0
Jarrah/Tuart open woodland	0.0	0.9
Banksia attenuata/B. menziesii woodland	1.6	0.0
Banksia prionotes closed scrub	0.0	0.0
Eucalyptus decipiens low woodland	0.1	0.0
Jarrah over *Banksia menziesii* low woodland	0.3	0.0
Cleared	0.005	0.204

The current conservation and development proposal (including the POS area) protects 10.2ha of vegetation with a condition rating of Good or better. Excluding the POS area, the current proposal protects 9.7ha of vegetation classed as Good or better.

The ATA Environmental (2005) report subjected the Shenton Park site to the same assessment as it did for the other sites it assessed in the western suburbs, thus enabling a comparison. These comparative data are presented in Tables 3, 4, 5, 7 and 8 of the ATA Environmental (2005) report. Appendix 3 in the ATA Environmental (2005) report lists 52 species as being a potential feeding resource for Carnaby's Cockatoo, but does not declare this list to be complete. Johnstone and Storr (1998) listed *Banksia*, *Dryandra*, *Hakea*, *Eucalyptus*, *Grevillea*, *Pinus* and *Allocasuarina* spp. Flowering *Dryandra sessilis*, *D. quercifolia*, *Lambertia inermis*, *Banksia grandis*, *Eucalyptus* spp., *Grevillea* sp., and *Callistemon* spp. and also the fruiting almonds and the seeds of corkscrew grass *Erodium* sp. as the feeding plants for Carnaby's Cockatoo. Most of the Johnstone and Storr (1998) species are included in the Appendix 3 list. This list is not very different from DEW's list (see http://intranet.deh.gov.au/cgi-bin/sprat/intranet/showspcies.pl?taxon id=59523).

Shah (2006) has recently added to the feeding species lists presented by Saunders (1980), Johnstone and Storr (1998) and Higgins (1999). No doubt further work, such as that proposed by Coffey Environments in Appendix D would also add to the list. The Shah (2006) report was not available when the survey was undertaken between December 2004 and March 2005.

Based on the above information, Coffey Environments' believes the site is not significant to Carnaby's Cockatoo.

There does not appear to be any evidence that research has been undertaken to demonstrate the significance of the site for Carnaby's Cockatoo. A good deal of information has been compiled in the report on food plants generally in the introduction, but the feed plants listed by ATA Environmental in the literature review are not extensive and reference should have been made to Shah (2006).

In section 6.1 of the original Carnaby's Cockatoo report (ATA Environmental, 2005), using the DEW significant impact guidelines (DEH, 2006), ATA Environmental discussed the data and information laid out in the preceding sections of the report to demonstrate a non-significant impact on Carnaby's Cockatoo by the proposed development. This issue is discussed further below.

As was pointed out in the earlier report to DEW (Coffey Environments, 2007), the Shah (2006) report was not available at the time the 2005/067 report was written. Included in this submission is a list of the known plants that Carnaby's Cockatoo are likely to feed on (see below). Coffey Environments anticipates that Carnaby's Cockatoo will also feed on other plants that are not listed, and this information will progressively become available.

The response to these requests does not appear to address the issues raised. Further information is required that clarifies the significance of the site for the Carnaby's Black-Cockatoo in terms of seasonality of food sources and the potential food plants at the site, and in relation to other sites in the area[r]. This should include details of the plant species. The removal of foraging habitat has been identified as one of the factors impacting on the population of Carnaby's Black-Cockatoo, and so the availability of food as a limiting factor has been established and does not need to be discussed further.

The DEW Significant Impact Guidelines (DEH, 2006) indicate a development is likely to have a significant impact on endangered species if it will:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; or
- interfere substantially with the recovery of the species.

Carnaby's Cockatoo occasionally forage in the UWA Shenton Park site. There are no data to indicate that food is a limiting resource for Carnaby's Cockatoo in the greater Perth metropolitan area. Given the list of native and introduced plant species that Carnaby's Cockatoo has been reported to feed on (see lists above) and the presence and abundance of many of these species on the Swan Coastal Plain, the clearing of a portion of the vegetation at the UWA Shenton Park site will not affect the survival of this species. Therefore, there is no evidence to suggest that the proposed development at the UWA Shenton Park site will have a significant impact on Carnaby's Cockatoo as defined by the DEW guidelines above, as there is no evidence to suggest it will lead to a long-term decrease in the population, reduce the area of occupancy, fragment an existing population, adversely affect habitat that is critical to the species survival, disrupt the breeding cycle, remove habitat to the extent that the species is likely to decline, result in invasive species becoming established in the habitat, introduce disease or interfere with the recovery of the species.

The availability of food as a limiting resource in the greater Perth metropolitan area has **not** been established, in fact, the statement above is incorrect. Saunders in his many papers (1974, 1977, 1980, 1990) identified the lack of suitable foraging areas for **breeding** Carnaby's Cockatoo as a possible limiting resource. It should not be inferred from this that food is a limiting resource during the non-breeding period. Saunders (1980) reported at Manmanning the average distance birds have been seen from their nests while feeding was 2.5km (range 0.6 – 12.1; 153 observations) and at Coomallo Creek it was 1.4 km (range 0 – 7.1 147 observations). Taking the greatest distance that Carnaby's Cockatoo were seen foraging while nesting was 12.1km, and given that there is no known breeding site for Carnaby's Cockatoo with 12km of the Shenton Park land, the availability of food is **not** a limiting factor. In addition, Saunders (1974) pointed out that the large flocks of White-tailed Black Cockatoos move to the Perth metropolitan area after breeding elsewhere, and mostly feed in the pine plantations. These data have been confirmed by Shah (2006).

Pinus spp. have been shown to be an important food source for Carnaby's Cockatoo in the Perth region. Large areas of pine plantation around the Perth metropolitan area are currently being cleared and there are plans to continue with this clearing. The Gnangara, Pinjar and Yanchep pine plantations are under the direct control of the Western Australian government.

Saunders (1990) reported the following significant impacts on Carnaby's Cockatoo:

- Available feeding resources near to nests
- Disjunct food resources near nests
- Collisions with vehicles
- Competition with Galahs for nesting hollows

Saunders and Ingram (1987) reported the factors affecting the survival of breeding populations of Carnaby's Cockatoo in remnants of native vegetation in agricultural areas as:

- Lack of nesting sites
- Galahs utilising nesting hollows
- Habitat fragmentation near breeding sites

Cale (2003), in the Carnaby's Black-Cockatoo Recovery Plan, lists the following reasons for listing the species as endangered:

- Much of its habitat in the wheatbelt region has been cleared
- Clearing of land surrounding known breeding sites reducing the availability of food
- Lack of eucalypt regeneration in remnant woodlands and a deterioration of hollows reducing nesting sites
- On the Swan Coastal Plain its original food resources have been largely replaced by the introduced pine plantations which are to be significantly reduced in area in the future
- It is a highly prized cage bird and is taken illegally from the wild.

Other than the clearing of vegetation on the Swan Coastal Plain, none of these impacts will be made worst by developing the Shenton Park site. As has been clearly demonstrated above, food is not a limiting resource in the greater Perth metropolitan area, and as breeding has not been recorded within 12km of Shenton Park a limiting resource in the western suburbs. It is therefore reasonable to conclude that **the development of the Shenton Park site will not have a significant impact on Carnaby's Cockatoo**.

5.4 Volume and significance of different food plants

There also appears to be no data on the volume and significance of different food plants and whether these food resources would be reserved by the areas proposed for retention. Since no actual data from surveys is presented in the referral information it is difficult to verify the accuracy of these claims.

No attempt was made by Coffey Environments to quantify the 'volume and significance of food plants' at the 526 sites visited. Coffey Environments has found no evidence to suggest that such a task has ever been undertaken by any developer for such a large area. The cost of such a survey would be prohibitive, and if it were required by DEW for this development, it would set a precedent for such a requirement for all other similar developments that may impact on Carnaby's Cockatoo.

Coffey Environments has not found any evidence to suggest that food is a limiting factor for Carnaby's Cockatoo.

There also appears to be no data on the volume and significance of different food plants and whether these food resources would be reserved by the areas proposed for retention. Since no actual data from surveys is presented in the referral information it is difficult to verify the accuracy of these claims.

Coffey Environments knows of no data to indicate the volume of different plant food eaten. However, Saunders (1980) has indicated the number of Carnaby's Cockatoo seen eating various plant species at Coomallo Creek, Manmanning, between Hill and Arrowsmith Rivers and Perth and the Moore River. These tables are replicated in Appendix G. In addition, the number of birds seen feeding at various sites reported by Shah (2006) is shown in Appendix G.

What is apparent from these data is that *B. prionotes* makes an **insignificant contribution** to the diet of Carnaby's Cockatoo. Carnaby's Cockatoo feed on a wide variety of Banksias, Dryandras, Hakeas, Grevilleas and Eucalypts in the native species group and on *Pinus* spp. and *Erodium* spp. in the introduced species group.

In addition, Perry (1948) reported Black Cockatoos feeding on *Pinus pinaster* seed. Saunders (1974) reported *Calyptorhynchus baudinii* (which in some areas was probably *Calyptorhynchus latirostris*) feeding on marri nuts and the fruits of *Hakea undulata*, *Dryandra nivea*, *D. sessilis* and *Banksia attenuata*, *B. grandis, Eucalyptus calophylla* and the seeds from *Pinus pinaster*. Saunders (1977) reported Carnaby's Cockatoo feed on the seeds of Hakeas, Grevilleas, Dryandras, Banksias and *Erodium* sp.. Scott and Black (1981) reported Carnaby's Cockatoo excavating the seed-eating *Alphitopis nivea* from the fruit of *Banksia attenuata* but discarding the immature seed. Saunders (1990) reported Carnaby's Cockatoo predominantly feed on the seeds and flowers of Proteaceae (*Banksia*, *Dryandra*, *Grevillea* and *Hakea*), insect larvae and *Erodium* spp. in agricultural areas. Mawson (1995) reported Carnaby's Cockatoo feeding on the nectar from flowering *Callistemon viminalis*.

Johnstone *et al.* (2003) indicated that Carnaby's Cockatoo had been observed feeding on a wide range of foods including the seeds of *Banksia*, *Dryandra*, *Hakea*, *Eucalyptus*, *Corymbia*, *Grevillea*, *Mesomelaea*, *Pinus* and *Allocasuarina* spp., the flowers of *Dryandra sessilis*, *D. lindleyana*, *D. quercifolia*, *D. squarrosa*, *Lambertia inermis*, *Banksia grandis*, *Eucalyptus* spp., *Corymbia*, *Grevillea* and *Calistemon* spp., fruiting nut trees, fruiting apples, soft fruits (e.g. persimmons), Plane trees (Liuidambar), and the seeds of Corkscrew *Erodium* spp. and Wild Radish *Raphanus raphanistrum*. Carnaby's Cockatoo will also extract insect larvae from both live and dead trees.

6 TREES CONTAINING POTENTIAL NEST HOLLOWS

6.1 Sighting of breeding pair

Please comment on the following: The published sighting (Johnstone et al. 2005) of a pair of Carnaby's Cockatoos inspecting potential nesting hollows at the site is an important consideration and should be included in the preliminary documentation.

The Johnstone *et al.* (2005) information was not available to the authors of the ATA Environmental (2005) report when it was being written. Johnstone *et al.* (2005) reported 'and birds have been observed prospecting hollows in Tuarts *Eucalyptus gomphocephala* at Shenton Park in the Metropolitan area'. This was not a specific reference to Lot 4 Underwood Avenue, but to the suburb of Shenton Park. Other areas of bushland (e.g. Shenton Bushland) in addition to Lot 4 are located within this suburb. Carnaby's Cockatoo are inquisitive, and will search hollows presumably for water, grubs and potential nesting sites. Because some birds were seen prospecting hollows, it can not be assumed that these sites were deemed suitable, or that they would be used as nesting sites as some stage in the future.

6.2 Tree Hollows

The referral states that many of the hollows are created by fire and subsequently are shallow and unsuitable for nesting, yet in section 4.5, it is stated that the trees were not climbed to examine hollows. Is it possible to know if hollows were too shallow for nesting if they were not inspected?

ATA Environmental (2007) conducted a search of the trees at Part Lot 4 Underwood Avenue and identified that there were 42 trees that could contain hollows that may potentially be used as a nest site by Carnaby's Cockatoo (*Calyptorhynchus latirostris*) at some stage in the future. The assessor for this survey adopted an ultra-cautious approach and included any tree that may have had a hollow, even if the entrance was appreciably smaller than the 23-30 cm size suggested by Johnstone and Storr (1998). Therefore, trees could have been included in those results because they looked like they contained a suitable hollow from an inspection at ground level, but may be excluded if the hollows were subject to closer examination.

To clarify whether trees actually contained a hollow a more detailed assessment was conducted. Where feasible, each of the trees were climbed, inspected and where applicable the dimensions of the hollows were measured.

On 9, 10 and 14 August 2007 tree climbers from Classic Tree Services, under supervision by Coffey Environments, climbed those trees previously identified as potentially containing a hollow (see Figure 4). Safely climbing tall trees requires an anchor point for the climbing rope above the hollow or near the hollow such that the climber can manoeuvre on the tree to inspect the hollow. The presence of bees in a tree in a position that could result in the tree climber being severely stung meant the tree was not climbed or the climb was abandoned when it became obvious that bees had become agitated. Many of the trees identified as containing a suitable hollow were old dead stags, and some of these contained substantial linear cracks in the trunk and branches making them potentially unsafe to climb.

For hollows that could be inspected, the height and width of the entrance was measured along with the depth. The presence of other birds or eggs in the hollow was recorded. If it was apparent that the hollow had been used as a nest (e.g. smell, feathers, nesting materials) then this was also recorded.

Saunders (1979) indicated that Carnaby's Cockatoo invariably 'reverse' into the entrance of the hollow when entering the nest. Therefore entrances should have a minimum diameter of 15cm and be at least 10cm deep. Saunders (1979) reported a mean hollow depth of 106cm (range 10-250cm) at Coomallo Creek and 122cm at Manmanning (range 50-250cm plus). At Coomallo Creek about 43% of the hollows opened upwards, but this reflected the availability of hollows rather than Carnaby's Cockatoo selecting for hollows that opened upwards. Mean height of hollow entrances above the ground was 543cm (range 200-1000cm) at Coomallo Creek and 738cm (range 400-1000cm) at Manmanning. Johnstone and Storr (1998) suggested that Carnaby's Cockatoo nest hollows range from 250-1200cm above the ground with an entrance from 23-30cm and a depth of 100-250cm. Johnstone and Storr (1998) reported nesting sites occurring mainly in smooth-barked eucalypts (Salmon Gum *E. salmonophloia* and Wandoo *E. wandoo*) but they are also found in Red Morrell (*E. longicornis*), York gum (*E. loxophleba*), marri (*E. calophylla*) and tuart (*E. gomphocephala*). The Underwood Ave site contains a few Tuart and Marri trees but no smooth-barked eucalypts, Red Morrell or York Gums.

Based on these published data, two metric criteria were used when assessing the potential of a tree hollow to be used by Carnaby's Cockatoo as a nesting site. Saunders' criteria of an entrance of at least 15x15cm and minimum depth of 10cm (holes that were less than this were considered unsuitable) and hollows with dimensions in the vicinity of Johnstone and Storr's assessment (e.g. entrance 23-30cm and a depth of 100-250cm), were considered more suitable. In addition, some hollows contained bees and others were being used or visited by Rainbow Lorikeets (*Trichoglossus haematodus*) and Little Corellas (*Cacatua sanguinea*), both of which are known to be aggressive toward Carnaby's Black Cockatoos. Therefore, hollows containing bees, Rainbow Lorikeets and Little Corella are unlikely to be used as a nesting site by Carnaby's Cockatoo. Trees containing a bee hive in one hollow are also prone to having bees establish themselves in other hollows in that tree as the hive increases in size. A few of the hollows contained water which had been there for some time (e.g. putrid smell and contained mosquito larvae). Of the preferred Carnaby's Cockatoo nesting tree types, only Tuart and Marri were present. Based on these factors, hollows were rated as 'not suitable' (mostly because they were too small, contained bees or water), 'unlikely' to be suitable, 'possibly' providing a suitable site, and as potentially providing a 'likely' nest site. Several trees containing hollows were positioned less than 5m from the ground. This was thought to increase the potential for disturbance and hence lowered the rating for these trees.

All trees previously identified as containing a suitable nesting hollow were revisited. Twelve trees were either not able to be climbed or were too dangerous to climb. In addition, not all of the hollows in a further five trees could be inspected because of the danger associated with climbing higher up the tree.

Thirty one of the original 42 trees had a hollow that could have potentially been used as a nesting site (Appendix F), but not necessarily be suitable for Carnaby's Cockatoo. Of these, six were rated as 'not suitable', mostly because the entrance was too small, eight were rated as 'unlikely' to be suitable, 12 were rated as 'possibly' suitable, but this group contained most of the trees that were too dangerous climb. Five trees were rated as potentially providing a 'likely' nesting site. One of these five trees was a live Eucalypt, the other four were dead stags.

There were a large number of Rainbow Lorikeets on site courting, inspecting tree hollows presumably for potential nest sites or sitting on nests. In addition, there were a number of pairs of Little Corella inspecting potential nesting hollows or sitting in the entrance of tree hollows, presumably indicating that they had claimed those sites. Bees were evident in many of the trees that had hollows, some were relatively small hives, others were well established and in some cases bees were entering and leaving multiple hollows in the same tree suggesting that they contained multiple hives.

Rainbow Lorikeets, Little Corellas and bees can potentially use almost all of the hollows identified as possible nesting sites for Carnaby's Cockatoo, rendering these tree hollows unsuitable as nesting sites for *C. latirostris*.

6.3 Nesting Sites

The referral information also states "some of the trees were dead stags which are seldom used by Carnaby's Cockatoo as nesting sites (p26). No supporting reference is given for this information. The Department understands that long term work in the WA agricultural region shows this statement to be incorrect with many hollows occurring in dead trees. There are a number of references to support this including the species recovery plan (Cale, 2002). Saunders (1979) also describes nesting in "live or dead standing trees".

The sentence 'Some of the trees were dead stags which are seldom used by Carnaby's Cockatoo as nesting sites' was not well written, and requires further clarification. It is acknowledged that Saunders (1979) reported that Carnaby's Cockatoo had no preference for living or dead trees. Cale's (2002) information came from other reports and is not based on primary data reported in the Recovery Plan.

Twelve of the 31 trees that contain hollows were dead or contained dead stags. Two of these trees contain a hollow that have potential to likely be used by Carnaby's Cockatoos, six were categorised as possibly being suitable and four were considered not suitable for Carnaby's Cockatoos (Appendix F).

6.4 Number of Tree Hollows on site

The referral also states that that it was difficult to estimate the number of suitable hollows but that it is likely to be very few if any. However, a list of 42 trees containing potential hollows is provided in Table 9. The Department is yet to be convinced that the breeding potential of the site has been adequately assessed if nest hollows have not been inspected using appropriate methods.

Thirty one of the original 42 trees had a hollow that could have potentially been used as a nesting site (Appendix F), but not necessarily be suitable for Carnaby's Cockatoo. Of these, six were rated as 'not suitable', mostly because the entrance was too small, eight were rated as 'unlikely' to be suitable, 12 were rated as 'possibly' suitable, but this group contained most of the trees that were too dangerous climb. Five trees were rated as potentially providing a 'likely' nesting site. One of these five trees was a live eucalypt, the other four were dead stags.

7 DISCUSSION SECTION IN ATA ENVIRONMENTAL REPORT 2005/067

7.1 Use of exotic species as a food source

Please comment on the following: Point 15, page 28-29. The Appeals committee (quoted in the ATA Environmental document) apparently stated that Carnaby's Black-Cockatoo has adapted to exotic species and is therefore not dependent for its survival on small bushland remnants. The Department notes that Birds Australia WA disputes this statement and claims no supporting evidence is provided to support it.

The EPA Appeals Committee (2004) in its report to the WA Minister for Environment stated the following in specific reference to the Carnaby's Cockatoo, 'the EPA contended that the species has already learnt to adapt to exotic plant species, such as pine plantations, as a result of clearing of native vegetation and is now further utilising exotic trees in parks and gardens. It is therefore considered that this species is not dependent for its survival on small bushland remnants as a food source'.

Coffey Environments is not aware of any data that indicates food is a limiting resource for Carnaby's Cockatoo in the greater Perth metropolitan area. Shah (2006), a Birds Australia published report, lists numerous non-native species as being eaten by Carnaby's Cockatoo during their survey as shown in Table 3 below.

Table 3

Non-native plant species listed in Shah (2006, pp. 33) as being eaten by Carnaby's Cockatoo.

Scientific name	Common name
Helianthus annuus	Sunflower plants
Hibiscus spp.	Hibiscus garden variety
Jacaranda mimosifolia	Jacaranda tree
Macadamia integrifolia	Macadamia nut tree
Pinus spp.	Pine tree
Prunus amygdalus	Almond tree

In addition, in Shah's (2006) Table 2, 15 feeding observations are reported. Fourteen of these observations are for Carnaby's Cockatoo feeding on *Pinus* spp. trees. The *Pinus* spp. referred to are not native to the areas in which Carnaby's Cockatoo were seen feeding. Therefore, the data presented by Birds Australia WA indicate that Carnaby's Cockatoo do feed on non-native species.

7.2 Importance of Banksia as Food Source

The report claims that Banksias are not key feed species, but provides no data or reference to support this. Evidence presented by Shah (2006) and Ron Johnstone (pers. comm.) suggest otherwise. Please address this issue.

As previously indicated, the Shah (2006) report was not available at the time of writing the ATA Environment (2005) report. The cited reference for the plant species fed on by Carnaby's Cockatoo

actually came from the Birds Australia WA website (http://www.birdswa.iinet.net.au/) and was downloaded on 7 July 2005.

The report did not suggest that *Banksia* were not a key feeding resource for Carnaby's Cockatoo. The report stated that 'Saunders (1980) reported Carnaby's Cockatoo at Coomallo Creek (breeding area) foraging mostly on native plants, with the only exception being *Erodium* sp. Plant species foraged included *Banksia attenuata, B. menziesii, Dryandra fraseri, D. sessilis, D. speciosa, Hakea auriculate, H. conchifolia, H. gilbertii, H. incrassate, H. lissocarpha, H. obliqua, H. prostrata, H. scoparia, H. undulata* and *Lambertia multiflora.* At Manmanning (another breeding area), Carnaby's Cockatoo foraged on *Hakea.* spp. as well as *Grevillea apiciloba, G. armigera, G. paniculate, G. paradoxa, G. petrophiloides, Dryandra affincirciodes* and *Isopogon scarbrusculus*'. Appendix E shows a detailed summary of plants foraged by Carnaby's Cockatoo as provided in Higgins (1999) and Appendix 3 of ATA Environmental (2005).

8 PINE PLANTATIONS

8.1 Implications for clearing pine plantations

Please comment on the following; ATA Environmental mentions the use of several pine plantations in the metropolitan region by Carnaby's Black-Cockatoo. Some of these plantations have now been cleared and the ongoing loss of pine plantations is a grave issue. Pine plantations have no certain tenure and are not protected under the EPBC Act. Plantations should therefore not be considered in these discussions as they are mostly likely to be felled in the near future. In Shah (2006) the second largest roost site recorded on the Swan Coastal Plain (Karnup Plantation in Baldivis) has been completely cleared since the roost survey. The largest (Gnangara Pine Plantation) is scheduled for removal in the future. As a result of the above claims it may not be appropriate to mention pine plantations as an alternative feeding habitat in an attempt to justify loss of native feeding habitats. This needs to be addressed as part of the preliminary documentation.

Coffey Environments would concur that the potential loss of some of the very large pine plantations from around Perth may have some impact on Carnaby's Cockatoo. Studies by Saunders *et al.* (summarised in 2005) suggested the potential limiting resource for Carnaby's Cockatoo was breeding hollows and available food resources near to breeding sites. There are no data to indicate or suggest that foraging resources in the greater Perth metropolitan area have been or are a limiting resource for Carnaby's Cockatoo, and thus a factor that might contribute to the decline of this species.

The clearing of pine plantations is under the control of the Western Australian Government as they directly manage the Gnangara, Pinjar and Yanchep pine plantations. If it is decided that these pine plantations are a valuable and necessary resource for Carnaby's Cockatoo, then it is within the State Government's power to address this issue. If the planting of an equivalent foraging resource for Carnaby's Cockatoo is deemed necessary, the Commonwealth Government could play a role in funding such an initiative. Additionally, the State Government will rehabilitate some areas of the cleared pine plantations with native vegetation such as that planned for the Gnangara Pine Plantation. As the pines are progressively harvested over the next 20 years, the predominant land use will change to conservation and recreation activities (WAPC and WRC, 2001).

Pine plantations have been recognised as an important foraging and roosting resource for Carnaby's Cockatoo (Perry, 1948; Saunders 1974; Shah 2006). The long term future of the pine plantations is a matter to be resolved by the WA Government and if necessary in consultation with the Federal DEW. It is not appropriate to speculate about what might happen to land that is removed from the Underwood Avenue site, in the long term.

9 REFERENCES

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10 DISCLAIMER

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Figures

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

PRINTED: Wed 19 Dec 07

UNDERWOOD AVENUE

SELBY STREET

EmAf

Bp

Bp

BmBa

Cleared

EmBaBm

Public Open Space

Ed

Conservation Area B

EmEg

EmBm

Conservation Area A

EmBaBm

Cleared

metres

0 25 50 75 100 125

SCALE 1 : 2 500 @ A3

LEGEND

- Boundary of Subdivision Area
- Subdivision Detail
- Conservation/POS Area Boundary
- Vegetation Association Boundary
- Interlocking Jarrah trees
- Approximate location of *Jacksonia sericea* (Priority 3) populations

VEGETATION ASSOCIATIONS

- BmBa — Banksia Low Woodland, including *Banksia menziesii* and *B. attenuata* over *Allocasuarina fraseriana* and *Hakea prostrata*
- EmEg — Jarrah *(Eucalyptus marginata)* and Tuart *(E. gomphocephala)* Open Woodland over *Acacia saligna*, *A. rostellifera* and *Hakea prostrata*
- EmBm — Jarrah Open Woodland over *Banksia menziesii* Low Woodland
- EmBaBm — Jarrah Low Woodland over *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Woodland
- EmAf — Jarrah Woodland over *Allocasuarina fraseriana*
- Bp — *Banksia prionotes* Thicket with *B. menziesii* and *B. attenuata*
- Ed — *Eucalyptus decipiens* Very Open Tree Mallee
- Cleared — Cleared

BASE SOURCE: Chappell, Lambert & Everett
Photo 2002; Subdivision 07-06-07 (778 143g)

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

VEGETATION ASSOCIATIONS
FIGURE 1

UWA-2003-001/27_175f1.dgn DATUM: MGA DRAWN: 29-08-07 CHECKED: AL 17-10-07

PRINTED: Wed 19 Dec 07

UWA-2003-001/27_175f2.dgn DATUM: MGA DRAWN: 29-08-07 CHECKED: AL 17-10-07

LEGEND

- Study Area Boundary
- 302 Site Number
- Heath
- Parkland
- Woodland

SOURCE: IMAGERY - DLI, April 2005

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

STUDY AREA SHOWING SWAN COASTAL PLAIN

FIGURE 2

PRINTED: Wed 19 Dec 07

UNDERWOOD AVENUE

5m Landscape Buffer 1090m²

5m Landscape Buffer 647m²

R60

Public Open Space & Drainage

STREET

16m Reserve

14m Reserve

6.01m Laneway

5m Laneway

Public Open Space

3m Landscape Buffer 167m²

Full 'T' Junction

3m Landscape Buffer 151m²

Left Out only

SELBY

CONSERVATION AREA B LOT 2

CONSERVATION AREA A LOT 1

Eastern limit of odour affected land as of June 07

Royal Perth Rehabilitation Hospital

metres

0 25 50 75 100 125

SCALE 1 : 2 500 @ A3

LEGEND

- Boundary of Subdivision Area
- Subdivision Detail
- R60 Zoned Lots
- University Purposes/Future Development
- Public Open Space/Drainage
- Conservation Area

BASE SOURCE: Chappell, Lambert & Everett
Photo 2002; Subdivision 07-06-07 (778 143g)

UWA-2003-001/27_175f3.dgn DATUM: MGA DRAWN: 17-10-07 CHECKED: AL 17-10-07

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SPECIALISTS IN LIVING AND WORKING PLACES

CONSERVATION AND DEVELOPMENT PROPOSAL

FIGURE 3

PRINTED: Wed 19 Dec 07

UNDERWOOD AVENUE

SELBY STREET

Public Open Space

Conservation Area B

Conservation Area A

26 25 16 23 24 15 14 22 27 21 19 17 13 20 18 28 12 29 30 10 11 08 09 31 06 05 07 02 01 03 04

metres

0 25 50 75 100 125

SCALE 1 : 2 500 @ A3

LEGEND

- Boundary of Subdivision Area
- Subdivision Detail
- Conservation/POS Area Boundary
- 01 Tree Number

TREES CONTAINING A HOLLOW

- Possibly
- Likely
- Unlikely
- Not suitable

BASE SOURCE: Chappell, Lambert & Everett
Photo 2002; Subdivision 07-06-07 (778 143g)

UWA-2003-001/27_1754.dgn DATUM: MGA DRAWN: 21-08-07 CHECKED: ST/AL 17-10-07

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LOCATION OF TREES CONTAINING A HOLLOW

FIGURE 4

PRINTED: Wed 19 Dec 07

CHECKED: AL 18-12-07

DRAWN: GLM 18-12-07

DATUM: MGA50

UWA-2003-001/27_175f5.dgn

UNDERWOOD AVENUE

SELBY STREET

EmAf

Bp

BmBa

Cleared

EmBaBm

Public Open Space

BP7

BP3

BP5

BP4

Ed

Conservation Area B

EmEg

EmBm

BP15

BP16

BP14

BP13

Conservation Area A

EmBaBm

BP12

BP8

BP18

BP17

BP9

BP10

BP11

Cleared

metres

0 25 50 75 100 125

SCALE 1 : 2 500 @ A3

LEGEND

- Boundary of Subdivision Area
- Subdivision Detail
- Conservation/POS Area Boundary
- Vegetation Association Boundary
- Interlocking Jarrah trees
- Approximate location of *Jacksonia sericea* (Priority 4) populations
- Location of *Banksia Prionotes*
  - Individual
  - Population, small
  - Population, showing extent
- BP18 ID

VEGETATION ASSOCIATIONS

- BmBa: Banksia Low Woodland, including *Banksia menziesii* and *B. attenuata* over *Allocasuarina fraseriana* and *Hakea prostrata*
- EmEg: Jarrah *(Eucalyptus marginata)* and Tuart *(E. gomphocephala)* Open Woodland over *Acacia saligna*, *A. rostellifera* and *Hakea prostrata*
- EmBm: Jarrah Open Woodland over *Banksia menziesii* Low Woodland
- EmBaBm: Jarrah Low Woodland over *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Woodland
- EmAf: Jarrah Woodland over *Allocasuarina fraseriana*
- Bp: *Banksia prionotes* Thicket with *B. menziesii* and *B. attenuata*
- Ed: *Eucalyptus decipiens* Very Open Tree Mallee
- Cleared: Cleared

BASE SOURCE: Chappell, Lambert & Everett; Photo 2002; Subdivision 07-06-07 (778 143g)

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

VEGETATION ASSOCIATIONS AND LOCATION OF *Banksia prionotes*

FIGURE 5

Plates

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

Plate 1. Carnaby's Cockatoo at Bold Park.

Plate 2. Carnaby's Cockatoo foraging in large numbers for several consecutive days on a cleared housing block in Yanchep.

Plate 3. Photo 284. *Banksia prionotes* in Conservation Area B.

Plate 4: Photo 289. *Banksia prionotes* in Conservation Area A.

Appendix A
Letter from Con Voutas of DEW

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

Australian Government
Department of the Environment and Water Resources

Dr Paul van der Moezel
ATA Environmental
Dilhorn House
2 Bulwer Street
PERTH WA 6000

Date
17 May 2007
EPBC Ref
2007/3386
EPBC contact
Mr Mark Jenkins
02 6274 1558
Mark.Jenkins@environment.gov.au

Dear Dr van der Moezel

Further information required
Lot 4 Underwood Avenue, Shenton Park, Western Australia

On 3 May 2007 we decided that the proposed action to develop a residential estate on the eastern portion of Lot 4, Underwood Avenue, Shenton Park, WA will need to be assessed through preliminary documentation. We note that the University of Western Australia is the designated proponent for this action.

Assessment by preliminary documentation means that we will be assessing the project using:

- the information contained in your original referral;
- the further information you have provided on the impacts of the action and the strategies to mitigate and/or offset that impact;
- any other relevant information on the matters protected by the EPBC Act; and
- the additional information requested by the Department in this letter.

The proposed action is likely to have a significant impact on the listed endangered Carnaby's Black-Cockatoo *(Calyptorhynchus latirostris)* in particular its foraging habitat and potential breeding habitat. In order for us to consider all the relevant issues and make an informed decision on whether to approve the action, we are writing to ask you to provide further information as detailed in Attachment A to this letter.

The information being sought has been determined to some degree by comments made in the 7 public submissions on the referral information. I would therefore appreciate it if you could respond at your earliest convenience to the questions and comments listed at Attachment A to this letter.

I have also written to the following party to advise them that further information is required.

Person responsible for the action Mr Bruce Thompson, The University of Western Australia

If you have any questions please contact the assessment officer and quote the EPBC reference number shown at the beginning of this letter.

Yours sincerely

C. Voutas

Con Voutas
A/g Director
Urban Development, Tourism and Recreation Section
Environment Assessment Branch

ATTACHMENT A

ADDITIONAL INFORMATION REQUIRED ON UWA PROPOSAL TO DEVELOP LOT 4 UNDERWOOD AVENUE, SHENTON PARK, WESTERN AUSTRALIA

General

- What is the approximate area in hectares of the stand of *Banksia prionotes* on the northern part of the site, which will be cleared if the proposal is approved?
- Please respond to the comment in one of the submissions that the current proposal does not protect "the significant stand of *Banksia prionotes* that is an important food source for the Carnaby's Black Cockatoo". The WA EPA has previously advised that " the bushland contains *Banksia prionotes* – only two other areas in the Perth Metropolitan Region have this species in comparable abundance". "*Banksia prionotes* is an important food source as they flower at different times from *Banksia attenuata*. The food source is the blossoms and the grubs which live inside the banksia cones".
- What is the total site area 36 ha or 33 ha? The referral states 33 ha whilst ATA report Number 2005/067 mentions 36 ha.
- Please comment on the claim in one of the submissions that a large flock (>100) of Carnaby's Black Cockatoos roosts at nearby Perry Lakes and uses the UWA bushland for feeding. Do these cockatoos do this on a daily basis when they are in the district or infrequently?
- The Department is concerned that the Birds Australia (WA) report on this species' use of the Swan Coastal Plain (Shah, B. *Conservation of Carnaby's Black-Cockatoo on the Swan Coastal Plain, Western Australia (2006)* was not referred to nor referenced in the referral information. This has been publicly available since 14 December 2006.
- Please comment on the claim in the submissions that the ATA study covered only a small area of the western suburbs rather than the Swan Coastal Plain.

Distribution and Population

Please comment on the following;

- ATA claims "we could find no recent assessment based on any actual survey data for the number of Carnaby's Cockatoos" (p5). However, we understand that s Birds Australia's Swan Coastal Plain Project (Shah, 2006) undertook an extensive survey across the Swan Coastal Plain. An analysis of this should be included as part of the preliminary documentation.

Breeding habitat

- ATA report No 2005/067 states that there are "no published data of any breeding taking place in the greater Perth metropolitan area" p7 and "there are no records that indicate the species has bred in the Perth metropolitan area (p29)" and "we could find no evidence to support Birds Australia's claim that there is an increasing trend for Carnaby's Cockatoo to breed in the coastal areas south of Perth" (p29). However, the Department has been advised that there are a number of established breeding sites for this species within the

Perth metropolitan region. (Evidently, this information this data is published in **Johnstone, R., Kirkby, T., Stone, P., Minton, C. (2005). White-tailed Black-Cockatoos: Identification challenges and changes in distribution and status, and links with a community program – Cockatoo Care.** ***In*** **Gole, C. (Ed.).** ***Carnaby's Black-Cockatoo Future Directions Symposium*****, Birds Australia Western Australia, Perth** and is available for download from the Carnaby's Cockatoo website of Birds Australia WA. Given the above, further information is therefore sought on Carnaby's Cockatoo breeding records in the Perth metropolitan area.

Potential of sites examined to be used as a food resource by Carnaby's Cockatoo
Please comment on the following;

- Table 5 in ATA Report 2005/067 presents data on the potential of areas examined to offer a food resource, but no information appears to have been compiled on food plants at the proposed development site. It is unclear how assessment of food plants was undertaken, why no data is presented, why no species are listed and why foraging observations were not undertaken.

- No details are given by ATA in Table 5, on where, when or under what circumstances the data were compiled. This renders it difficult for the reader to gain an understanding of the potential food plants in the site, and it does not provide any information of the seasonality of this food source.

- There does not appear to be any evidence that research has been undertaken to demonstrate the significance of the site for foraging Carnaby's Cockatoos. A good deal of information has been compiled in the report on food plants generally in the introduction, but the feed plants listed by ATA in the literature review are not extensive and reference should have been made to Shah (2006).

- There also appears to be no data on the volume and significance of different food plants and whether these food resources would be reserved by the areas proposed for retention. Since no actual data from surveys is presented in the referral information it is difficult to verify the accuracy of these claims.

Trees containing potential nest hollows
Please comment on the following;

- The published sighting (Johnstone *et al.*, 2005) of a pair of CBCs inspecting potential nesting hollows at the site is an important consideration and should be included in the preliminary documentation.

- The referral states that many of the hollows were created by fire and subsequently are shallow and unsuitable for nesting, yet in section 4.5, it is stated that the trees were not climbed to examine hollows. Is it possible to know if hollows were too shallow for nesting if they were not inspected?

- The referral information also states "some of the trees were dead stags which are seldom used by Carnaby's Cockatoo as nesting sites" (p26). No supporting reference is given for this information. The Department understands that long term work in the WA agricultural region shows this

statement to be incorrect with many nest hollows occurring in dead trees. There are a number of references to support this including the species recovery plan (Cale, 2002). Saunders (1979) also describes nesting in "live or dead standing trees".

- The referral also states that it was difficult to estimate the number of suitable hollows but that it is likely to be very few if any. However, a list of 42 trees containing potential hollows is provided in Table 9. The Department is yet to be convinced that the breeding potential of the site has been adequately assessed if nest hollows have not been inspected using appropriate methods.

Discussion section in ATA Report 2005/067

Please comment on the following;

Point 15 page 28-29

- The Appeals committee (quoted in the ATA document) apparently stated that Carnaby's Black-Cockatoo has adapted to exotic plant species and is therefore not dependent for its survival on small bushland remnants. The Department notes that Birds Australia WA disputes this statement and claims no supporting evidence is provided to support it.

- The report claims that Banksias are not key feed species, but provides no data or reference to support this. Evidence presented by Shah (2006) and Ron Johnstone (pers. comm.) suggest otherwise. Please address this issue.

Pine plantations

Please comment on the following;

ATA mentions the use of several pine plantations in the metropolitan region by Carnaby's Black-Cockatoo. Some of these plantations have now been cleared and the ongoing loss of pine plantations is a grave issue. Pine plantations have no certain tenure and are not protected under the EPBC Act.

Plantations should therefore not be considered in these discussions as they are mostly likely to be felled in the near future. In Shah (2006) the second largest roost site recorded on the Swan Coastal Plain (Karnup Plantation in Baldivis) has been completely cleared since the roost survey. The largest (Gnangara Pine Plantation) is scheduled for removal in the future. As a result of the above claims it may not be appropriate to mention pine plantations as alternative feeding habitat in an attempt to justify loss of native feeding habitats. This needs to be addressed as part of the preliminary documentation.

Appendix B
Letter from Lesley Donohoe of DEW

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

Australian Government
Department of the Environment and Water Resources

Dr Paul van der Moezel
Principal
Coffey Environments Pty Ltd
Dilhorn House
2 Bulwer Street
PERTH WA 6000

Date November 2007
EPBC Ref 2007/3386
EPBC contact
Ms Tessa Woollett
02 6275 9030
tessa.woollett@environment.gov.au

Dear Mr van der Moezel

Further information
Lot 4 Underwood Avenue, Shenton Park, Western Australia (EPBC 2007/3386)

Thank you for your letter of 16 October 2007 to Mr Con Voutas, to which you attached information requested by this Department on 17 May 2007. The information is required for assessing the impacts of the action on matters protected under the Environment Protection and Biodiversity Act (1999).

I have read this information and am of the view that it does not adequately address the issues raised by the Department. Attachment A to this letter outlines the areas that require further information in this regard.

I have also written to the following party to advise them that further information is required.

Person responsible for the action	Mr Bruce Thompson, The University of Western Australia

If you have any questions please contact the assessment officer and quote the EPBC reference number shown at the beginning of this letter.

Yours sincerely

Lesley Donohoe
A/g Director
WA and SA Section
Environment Assessment Branch

Attachment A

Comment on further information required on UWA Proposal to develop Lot 4 Underwood Avenue, Shenton Park, Western Australia provided on 16 October 2007.

General

Throughout your report of October 2007 it is noted that data, such as the Shah (2006) report, 'was not available at the time of writing the ATA Environmental (2005) report'. However, any relevant new information should be taken into account in responding to the Department's request for further information. In addition, you should note that providing the required information for environmental assessment may require further research to be undertaken.

Response to Specific Requests

1. General

Please respond to the comment in one of the submissions that the current proposal does not protect 'the significant stand of Banksia prionotes that is an important food source for the Carnaby's Black Cockatoo. The WA EPA has previously advised that "the bushland contains Banksia prionotes – only two other areas in the Perth Metropolitan Region have this species in comparable abundance". "Banksia prionotes is an important food source as they flower at different times from Banksia attentuata. The food source is the blossom and the grubs which live inside the Banksia cones".

- You note that "to date, no flowers have been observed on the new *B. prionotes* saplings". Please describe the survey efforts, including the time of year this occurred particularly in relation to flowering.
- What is the evidence to support your claim that "Carnaby's Cockatoos have been able to survive without feeding on this population of *B. prionotes* and have found alternative food sources such as flowers/seeds of *B attenuata* and *B. menziesii* trees"? The importance of *B. prionotes* as a food source in the area should be clarified by obtaining expert advice.
- In your report of October 2007 you claim that *B. prionotes* "...occur along the southern boundary of Conservation Area A and along the eastern boundary of the subdivision area..". What survey efforts were made in support of this? Please comment on why this species is not recorded as such in your January 2007 report: In particular, *B. prionotes* is described as absent in both the Public Open Space (POS) and the Conservations Areas A and B, Table 2.
- What is the area and numbers of *B. prionotes* in the Conservation A area, and where are they located? Please describe their reproductive status and condition.

2. Distribution and Population

Please comment on the following: ATA Environmental claims 'we could find no recent assessment based on actual survey data for the number of Carnaby's Cockatoo'. However, we

understand that Birds Australia's Swan Coastal Plain Project (Shah, 2006) undertook an extensive survey across the Swan Coastal Plain. An analysis of this should be included as part of the preliminary documentation.

- Your comments on the decision that the action is a controlled action are not relevant at this stage of the EPBC process. Comments on requests for DEW to provide support for surveys of the Carnaby's Black-Cockatoo population are also not appropriate in the provision of further information for the assessment of the action. Please provide further information and analysis in response to the request for comment on the Shah (2006) report, as it relates to this proposal.

3. *Breeding Habitat*

ATA Environmental report No 20065/067 states that there are "no published data of any breeding taking place in the greater Perth metropolitan area" p7 and "there are no records that indicate the species has bred in the Perth metropolitan area" (p29) and "We could find no evidence to support Birds Australia's claim that there is an increasing trend for Carnaby's Cockatoo to breed in the coastal areas south of Perth". However, the Department has been advised that there are a number of established breeding sites for this species within the Perth metropolitan region. (Evidently, this information is published in Johnstone, R. Kirkby, T., Stone, P. Minton, C. (2005). White-tailed Black-Cockatoos: Identification challenges and changes in distribution and status, and links with a community program – Cockatoo Care. In Glae, C. (Ed). Carnaby's Black-Cockatoo Future Directions Symposium, Birds Australia, Western Australia, Perth and is available for download from the Carnaby's Cockatoo website of Birds Australia WA). Given the above, further information is therefore sought on Carnaby's Cockatoo breeding records in the Perth metropolitan area.

- There is a reasonable amount of information, anecdotal and published, to suggest that breeding is likely to occur on areas nearby to your proposal site. Just prior to, and during the breeding season, Carnaby's Black-Cockatoos feed primarily on native vegetation. Native foraging habitat is therefore most important during this time to ensure breeding success. Your proposal site is therefore likely to provide an important foraging habitat during breeding season. In light of this you are invited to provide information to further clarify the risk associated with any proposed development on the site to the Carnaby's Black-Cockatoo.

4. *Potential of sites examined to be used as a food resource by Carnaby's Black-Cockatoo*

Please comment on the following; Table 5 in ATA Environmental Report 2005/067 presents data on the potential of areas examined to offer a food resource, but no information appears to have been compiled on food plants at the proposed development site. It is unclear how assessment of food plants was undertaken, why no data is presented, why no species are listed and why foraging observations were not taken.

No details are given by ATA Environmental in Table 5, on where, when or under what circumstances the data were compiled. This renders it difficult for the reader to gain an

understanding of the potential food plants in the site, and it does not provide any information of the seasonality of this food source.

There does not appear to be any evidence that research has been undertaken to demonstrate the significance of the site for Carnaby's Cockatoos. A good deal of information has been compiled in the report on food plants generally in the introduction, but the feed plants listed by ATA Environmental in the literature review are not extensive and reference should have been made to Shah (2006).

There also appears to be no data on the volume and significance of different food plants and whether these food resources would be reserved by the areas proposed for retention. Since no actual data from surveys is presented in the referral information it is difficult to verify the accuracy of these claims.

- The response to these requests does not appear to address the issues raised. Further information is required that clarifies the significance of the site for the Carnaby's Black-Cockatoo in terms of seasonality of food sources and the potential food plants at the site, and in relation to other sites in the area. This should include details of the plant species. The removal of foraging habitat has been identified as one of the factors impacting on the population of Carnaby's Black-Cockatoo, and so the availability of food as a limiting factor has been established and does not need to be discussed further.

Appendix C
Letter to Mr M Flanigan of DEW

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

1 June 2005 UWA-2003-001_FAAS_004_st

Mr Mark Flanigan
Assistant Secretary
Policy and Compliance Branch
Department of the Environment and Heritage

RE: LOTS 4 AND 105 UNDERWOOD AVENUE, SHENTON PARK

Dear Mr Flanigan,

The University of Western Australia is finalising its report on Carnaby's Cockatoos in response to the determination of 'Controlled Action' in relation to the proposal for its Underwood Avenue site and requests access to any information the DEH may have in order to complete this report. We believe that there may be some information which we have not been able to obtain which you may have used to determine your reasons for declaring the Controlled Action for Lots 4 and 105, Underwood Avenue, Shenton Park, Western Australia (EPBC 2004/1479).

In clause 13 you indicated that 'I found that the Carnaby's Black Cockatoo (CBC) has been listed as endangered under the EPBC Act due to its abundance having at least halved over the last three generations, together with a decline in both the area occupied and the quality of the available habitat for breeding and feeding. I found that the breeding population is estimated at 60,000 breeding birds, with three to five subpopulations, the largest being about 20,000 birds, and that the population is continuing to decline.' We are aware of Saunders' data (*Biological Conservation* 54 (1990), 277-290) wherein he uses information collected by government school observers (school children?). We are also aware that Cale's Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan suggested a population decline of 50% over the past three generations or 45 years but does not cite any evidence to support this claim. We are not aware of any survey data that estimates the breeding population of Carnaby's Cockatoos to be 60,000 birds. Your advice is therefore sought on the data that you used to substantiate:

a) a decline in Carnaby's Cockatoo numbers by 50% in three generations, and

b) the existence of 60,000 breeding Carnaby's Cockatoos.

In clause 16 you found 'based on information provided by Birds Australia, that ongoing loss of traditional nesting sites could mean that metropolitan areas on the Perth coastal plain may be used for breeding in the future.' You went on to say that potential nest sites had been identified by Birds Australia nearby in Bold Park. Given we could find no evidence from Birds Australia or any other published or anecdotal sources that Carnaby's Black Cockatoo has ever nested in the Perth metropolitan (urban) area or its reserves, can you:

a) provide the data from Birds Australia to indicate why you believe this may occur in the future, and
b) why Carnaby's Black Cockatoo might nest in Bold Park given that they have not done so to date and have utilised this site regularly during summer for many years.

In clause 17 you indicated that partial clearing of the Underwood Avenue site is likely to represent a *significant* loss of available habitat for Carnaby's Black Cockatoo in the Perth metropolitan area. I seek information on the analysis that was supplied to you and criteria that you applied to determine that this partial clearing of the Underwood Avenue site would likely be a significant loss in the context of the other available foraging habitats in the Perth metropolitan area.

In clause 17 you also indicated that you found the loss of habitat on the Underwood Avenue site could adversely affect the movement of Cockatoos between extensive areas of bushland to the west (Bold Park) and the east (Kings Park). Were you supplied with any information which would be useful for us to include or review in our report?

Yours sincerely

DR PAUL VAN DER MOEZEL
Partner

Appendix D
Further work suggested for Carnaby's Cockatoo

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

Dr Chris Murphy
Director
Urban Development, Tourism and Recreation
Department of Environment and Heritage
GPO 787
Canberra
Australian Capital Territory
Australia 2601

Re: Carnaby's Cockatoo

Dear Dr Murphy

I refer to our brief telephone conversation on 9 December 2005 about Carnaby's Cockatoo.

The profile of Carnaby's Cockatoo in respect to urban developments on the Swan Coastal Plain and in particular in the greater Perth Metropolitan area has increased in the last 12 months. Many of the proposed urban developments are likely to be in areas of Banksia or Tuart woodlands, areas perceived to be of importance to Carnaby's Cockatoo. Based on recent decisions by the Department of Environment and Heritage, a good number of these developments could result in a 'controlled action', which for a developer, can be difficult to address or deal with in the absence of data on the species biology and the spatial ecology.

During a recent extensive review of the literature on Carnaby's Cockatoo it became apparent that almost nothing is known of its spatial ecology, foraging behaviour and migratory movements on the Swan Coastal Plain in the vicinity of the Perth metropolitan area. Almost all of what is known comes from the research undertaken by Saunders and his colleagues, for birds in two areas – the kwongan heath at Coomallo Creek and at Manmanning in the wheatbelt.

In recent times there appears to be an acceptance of a number of propositions about Carnaby's Cockatoo as fact when there are no data in the scientific literature to support these claims (e.g. Carnaby's Cockatoo prefer to fly over vegetated corridors, Carnaby's Cockatoo are shifting their breeding areas and will breed in Bold Park, Carnaby's Cockatoo have recently started breeding near Yanchep north of Perth and areas south of Perth on the Swan Coastal Plain, Carnaby's Cockatoo move out of the Perth metropolitan area in June and return again in December, Carnaby's Cockatoo have a preference for feeding on *Banksia prionotes*, *B. menziesii* and *B. attenuata*, its abundance has halved over the last three generations, there is a population of about 60000 breeding birds, and that the population is continuing to decline, etc). The consequence is that decisions relating to the impact that a proposed development might have on Carnaby's Cockatoo is often not based on published data or knowledge of the species spatial ecology or biology, but on

speculation and anecdotal information that may be coloured by the recorders/presenters personal objectives.

Much of the Swan Coastal Plain that is earmarked for development in the next 20 years is Banksia or Tuart woodland, areas that have been suggested as preferred habitat for Carnaby's Cockatoo. It seems evident if these developments are to proceed and not impact on the viability of Carnaby's Cockatoo then there is an urgent need for more information on the species spatial and temporal ecology and foraging areas on the Swan Coastal Plain.

I have asked the Urban Development Institute of Australia (UDIA) in Western Australia to become partners in an application to the Australian Research Council (ARC) for a Linkage Grant that will have the following outcomes:

a) describe the spatial and temporal (day-to-day and seasonal) ecology of Carnaby's Cockatoo on the Swan Coastal Plain around the Perth metropolitan area;
b) describe preferred foraging sites and vegetation utilised by Carnaby's Cockatoo on the Swan Coastal Plain around the Perth metropolitan area; and
c) estimate the population size of Carnaby's Cockatoo on the Swan Coastal Plain around the Perth metropolitan area.

The primary methodology to be employed will be to fit radio-transmitters to a number of Carnaby's Cockatoo and to monitor their movements, roosts, feeding sites, etc. Locating birds will be done initially using light aircraft, and then vehicles using knowledge of their roosts and patterns of movement. As our knowledge of their roosts, patterns of movement and foraging sites increases, greater attention will be paid to recording foraging sites and vegetation.

The primary outcome of this research will be a detailed description of the spatial and temporal ecology and foraging sites of Carnaby's Cockatoo in the Perth metropolitan area and beyond. These data can then be translated on to maps of the Swan Coastal Plain in the vicinity of the Perth metropolitan area to indicate which land developments would and would not impact on Carnaby's Cockatoo.

The investment requested of members of the UDIA for this project is substantial. Before the UDIA and its members are prepared to commit to this project they are seeking comfort from the Department of Environment and Heritage that this information would be useful, and the Department of Environment and Heritage would, in principle, be supportive of this research project.

If this project proceeds, I would welcome the involvement of your Department in the project. It would be my intention to publish the results in the appropriate scientific literature.

Yours faithfully

Dr Graham Thompson
11 December 2005

Appendix E
Plant Species foraged by Carnaby's Cockatoo

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

PLANT SPECIES FORAGED BY CARNABY'S COCKATOO

From Higgins (1999; Appendix 3).

Family	Genus	Species	Part eaten
Proteaceae	*Banksia*	*ashbyi*	flowers, seeds
		attenuata	flowers, seeds
		grandis	flowers, seeds
		littoralis	flowers, seeds
		menziesii	flowers, seeds
		verticillata	flowers, seeds
		tricuspis	flowers, seeds
	Dryandra	*affincircioides*	seeds
		fraseri	flowers, seeds
		nivea	flowers, seeds
		nobilis	seeds
		praemorsa	flowers, seeds
		sessilis	flowers, seeds
		speciosa	flowers, seeds
	Grevillea	*apiciloba*	flowers, seeds
		armigera	flowers, seeds
		paniculata	seeds
		petrophiloides	seeds
	Hakea	*auriculata*	seeds
		circumalata	seeds
		conchifolia	Seeds
		crassifolia	seeds
		cyclocarpa	seeds
		falcata	seeds
		gilberti	seeds
		incrassata	seeds
		lissocarpha	seeds
		multilineata	seeds
		obliqua	seeds
		prostrata	seeds
		ruscifolia	seeds
		scoparia	seeds
		sulcata	seeds
		trifurcata	seeds
		undulata	seeds
		varia	seeds
	Isopogon	*scabriuscula*	seeds
	Lambertia	*multiflora*	flowers, seeds
Myrtaceae	*Eucalyptus*	*marginata*	Seeds
		todtiana	Seeds
		wandoo	Flowers
	Corymbia	*calophylla*	flowers, seeds, nectar
	Callistomon	*viminalis*	Nectar

Family	Genus	Species	Part eaten
Pinaceae	*Pinus*	*pinaster*	Seeds
		pinea	Seeds
		radiata	Seeds
Araliaceae	*Brassia*	*actinophylla*	Fruit
Casuarinaceae	*Casuarina*		Seeds
Fabaceae	*Lupinus*		Seeds
Geraniaceae	*Erodium*	*botrys*	Seeds
Polygonaceae	*Emex*	*australis*	Seeds
Rosaceae	*Prunus*	*dulices*	seeds

List of plant species taken from http://www.birdswa.iinet.net.au/ on 7 July 2005.

Appendix F
Coordinates, comments on hollows and a photograph of trees on the Underwood Ave site that potentially contain hollows that could be used as a nest site for Carnaby's Cockatoo

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

UTM coordinates, comments on hollows and a photograph of trees on the Underwood Ave site that potentially contain hollows that could be used as a nest site for Carnaby's Cockatoo.

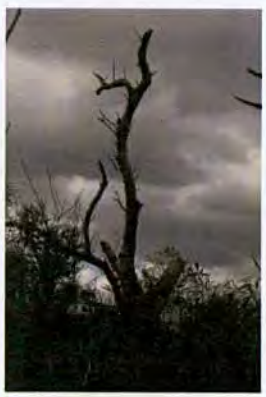
ID	Coordinates (MGA 94, Zone 50)		Comments and hollow dimensions (entrance height x width x hollow depth in mm).	Meets Saunders' (1979) criteria	Meets Johnstone and Storr's (1998) criteria	Comments on the potential to be used by Carnaby's Cockatoo as a nest site		Rating
T101	**386265**	**6464298**	**Dead, height ≈ 15m, upward facing hollow, 44x50x30.**	**Yes**	**No**	**Hollow is very exposed with a wide entrance. It is unlikely to be used as a Carnaby's Cockatoo nest site.**		**Unlikely**
T102	**386247**	**6464295**	**Dead stag, height ≈ 5m, hollows 20x20x25; 10x10x70 and second entrance 10x10x50; 25x25x100.**	**Yes**	**Yes**	**This stag is small and exposed and in one of the animal pens. It is unlikely to be used by Carnaby's Cockatoo as a nest site.**		**Unlikely**

T103	386254	6464223	Dead stag, height ≈ 4m, 10x20x1100.	Yes	No	This small stag is in the animal pens. The entrance is probably too small but it is deep enough. It is unlikely to be used.		Unlikely
T104	386422	6464173	Large live eucalypt, height ≈ 22m, 20x20x3000+.	Yes	Yes	This tree offers a good Carnaby's Cockatoo nesting site.		Likely
T105	386250	6464331	Live eucalypt, height ≈ 12m, 30x30x40, upward facing.	Yes	No	This hollow is a bit too shallow and facing upwards is exposed to the weather.		Possibly

T106	386250	6464338	Live eucalypt, height ≈ 8m, 10x10x40.	No	No	This hollow is too small, but it has been used as a nest in the past by some unknown bird species.		Not suitable
T107	386293	6464336	Dead stag, height ≈ 13m, 10x10x60; 25x25x3000; 20x15x60, 4th hole not measured.	Yes	Yes	Rainbow Lorikeet seen on a nest in one hollow.		Likely
T108	386325	6464361	Live tree, height ≈ 12m, 13x13x47.	No	No	Upward facing shallow hole that is probably unsuitable to be used as a Carnaby's Cockatoo nest as it is too small.		Not suitable

T109	386358	6464351	Dead stag, height ≈ 10m. Not climbed because it contained a bee hive.	Hollows at the top are in branches that are cracked. Rainbow Lorikeet seen coming from hollow in the trunk. Upward facing branch may contain a suitable hollow.		Unlikely
T110	386528	6464447	Dead tree, height ≈ 15m, lots of hollows. Not climbed because it contained at least 3 bee hives.	Probably not suitable as a number of hollows contain bees.		Unlikely
T111	386563	6464383	Live eucalypt, height ≈ 18m. Too dangerous to climb. Hollow in side branch possibly contained a Rainbow Lorikeet nest.	Hollow provides little opportunity for landing and entry so it may not suitable.		Unlikely

*T112	386850	6464514	Live eucalypt, ≈ 20m, 15x15x55; 40x40x40.	Yes	No	One hollow contained a egg and the other had been a nest.		Possibly
T113	386786	6464586	Live eucalypt, height ≈ 18m, 10x10x40.	No	No	Entrance holes too small for a Carnaby's Cockatoo nest.		Not suitable
T114	386644	6464618	Live eucalypt, height ≈ 20m. Tree contained a bee hive and was too dangerous to climb. Has 4 possible hollows.			Possibly contained hollows suitable for a Carnaby's Cockatoo nest.		Possibly

T115	386640	6464631	Dead stag, height ≈ 18m. Too dangerous to climb, bees in one hollow.			Possibly contained hollows suitable for a Carnaby's Cockatoo nest.		Possibly
T116	386626	6464667	Dead stag, height ≈ 18m. Too dangerous to climb, bees in one hollow.			Possibly contained a hollow suitable for a Carnaby's Cockatoo nest. Rainbow Lorikeet seen inspecting the hollows.		Possibly
T117	386594	6464585	Dead stag, height ≈ 20m, 16x12x2000+; 15x15x700; 20x50x1400; one hollow too high to reach. Contains a bee hive in the trunk.	Yes	Yes	Tree contains hollows that are likely to be suitable for a Carnaby's Cockatoo nest.		Likely

T118	386580	6464556	Live eucalypt, height ≈ 22m, 13x13x60.	No	No	A Galah used this hollow as a nest site last spring. Hollow probably too small for a Carnaby's Cockatoo nest.		Not suitable
T119	386564	6464578	Live eucalypt, height ≈ 15m. Too difficult to climb.			Very wide entrance to hollows facing upwards that could lead to a good nest site.		Possibly
T120	386536	6464552	Live eucalypt, height ≈ 18m, 9x7x45; other hollows too dangerous to inspect.			Hollows probably too small.		Unlikely

T121	386505	6464584	Live eucalypt, height ≈ 22m, 22x20x30; 20x20x65; 20x20x1300+.	Yes	Yes	Hollows suitable for a Carnaby's Cockatoo nest.		Likely
T122	386518	6464603	Live eucualypt, height ≈ 18m. Too dangerous to climb as holes are at the end of branches.			Has at least 5 potential hollows.		Likely
T123	386528	6464652	Live eucalypt, height ≈ 20m, 20x20x65, contained a bee hive and other hollows not inspected.	Yes	Yes	Possibly contained hollows suitable for a Carnaby's Cockatoo nest.		Possibly

T124	386481	6464629	Dead stag, height ≈ 12m. Too dangerous to climb. Trunk hollow contains a bee hive.			Holes at end of branches may be suitable for Carnaby's Cockatoo nest site.		Possibly
T125	386435	6464674	Live eucalypt, height ≈ 20m, 38x40x1200. Other holes contained bees and were not searched.	Yes	Yes	Tree hollow contained water in the bottom. A pair of Little Corellas came out of one hole.		Possibly
T126	386422	6464674	Dead stag, height ≈ 20m. Too dangerous to climb high sections. No hole above the branch stub off the trunk.			Hollows at end of branches may be suitable for Carnaby's Cockatoo nest sites.		Possibly

T127	386471	6464591	Dead stag, height ≈ 20m. Too dangerous to climb, one hole contained bees.			Holes at end of upper branches possibly contain hollows suitable for Carnaby's Cockatoo nest sites.		Possibly
T128	386515	6464522	Live eucalypt, height ≈ 20m. Holes on end of branches and too dangerous to climb.			Holes are probably too small for a Carnaby's Cockatoo next site.		Unlikely
T129	386465	6464502	Live eucalypt, height ≈ 22m, 12x7x35; 10x10x20.	No	No	Holes too small and both had water in the bottom.		Not suitable

T130	386347	6464478	Dead stag, height ≈ 22m. Too dangerous to climb and contained bees.			Nest hollow in trunk contained a pair of Little Corellas. Possibly a Carnaby's Cockatoo nest site if not used by Corellas.		Possibly
T131	386240	6464349	Live eucalypt, height ≈ 15m, 12x12x65; 8x12x65, entrances joined in the trunk.	No	No	Holes too small for a Carnaby's Cockatoo nest site.		Not suitable

Appendix G
Tables from Saunders (1980) and Shah (2006)

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

APPENDIX G – TABLES FROM SAUNDERS (1980) AND SHAH (2006)

Table 2 from Saunders (1980) – Coomallo Creek

Plant species	Part of plant attacked	No of groups feeding	No of birds in groups	Percentage of all birds observed	Crop contents
Banksia attentuata	F, S	1	25	1.7	
B. menziesii	F, S	1	25	1.7	
Dryandra fraseri	F, S	3	98	6.8	
D. sessilis	F, S	2	18	1.3	1
D. speciosa	F, S	1	6	0.4	
Erodium spp.	S	6	156	10.9	1
Hakea auriculata	S	1	46	3.2	
H. conchifolia	S	1	6	0.4	
H. gilbertii	S				7
H. incrassata	S	1	12	0.8	8
H. lissocarpha	S	50	846	58.8	
H. obliqua	S	1	22	1.5	
H. prostrata	S				4
H. scoparia	S	1	8	0.6	
H. sulcata	S	3	61	4.3	
H. undulata	S	5	47	3.3	4
Lamertia multiflora	F, S	4	62	4.3	
Insect larvae					2

F= flowers, S = seed

Table 3 from Saunders (1980) - Manmanning

Plant species	Part of plant attacked	No of groups feeding	No of birds in groups	Percentage of all birds observed	Crop contents
Casuarina spp.	S	3	31	2.6	
Dryandra affincircioides	F, S	2	8	0.7	
Erodium spp.	S	48	600	50.1	4
Grevillea apiciloba	F, S	53	269	22.5	
G. armigera	F, S	4	23	1.9	
G. paniculata	S	2	27	2.3	7
G. paradoxa	S	1	3	0.2	
G. petrophiloides	S	1	4	0.3	
Hakea circumalata	S	1	10	0.8	
H. falcata	S	3	25	2.1	
H. incrassata	S				3
H. multilineata	S	2	22	1.8	2
H. scoparia	S	17	115	9.6	
H. sulcata	S	8	59	4.9	
Isopogon scabrusculus	S	1	2	0.2	
Insect larvae					2

F= flowers, S = seed.

Table 4 from Saunders (1980) – between Hill and Arrowsmith Rivers

Plant species	Part of plant attacked	No of groups feeding	No of birds in groups	Percentage of all birds observed
Banksia ashbyi	F,S	1	250	1.8
B. attenuatta	F, S	8	870	6.4
B. grandis	F, S	3	500	3.7
B. menziesii	F, S	4	500	3.7
Dryanadra nivea	F, S	1	250	1.9
D. sessillis	F, S	3	710	5.2
Eucalyptus calophylla	S	41	7454	54.8
E. todtiana	S	3	600	4.4
Hakea lissocarpha	S	3	246	1.9
H. obliqua	S	2	40	0.3
H. prostrata	S	1	250	1.8
H. ruscifolia	S	1	200	1.5
H. trifurcata	S	5	861	6.3
H. varia	S	1	250	1.8
Lambertia multiflora	F, S	1	22	0.2
Emex austalis	s	1	300	2.2
Lupin seed		1	300	2.2

F= flowers, S = seed.

Table 5 from Saunders (1980) – between Perth and Moore River

Plant species	Part of plant attacked	No of groups	No of birds in groups	Percentage of all birds observed	Gnangara-Somerville	Dale Forest
Banksia attenuata	F, S	7	1603	9.4	31	3
B, grandis	F, S	1	50	0.3		3
B. littoralis	F, S	1	32	0.2		
B. menziesii	F, S	4	950	5.6		
B. verticillata	F, S	1	25	0.1		
Dryandra nivea	F, S	18	658	3.9		10
D. nobilis	F, S					3
D. praemorsa	F, S	3	136	0.8		
D. sessilis	F, S	1	3	<0.02		5
Eucalyptus calophylla	F, S	21	3367	19.9	1	10
E. marginata	S	12	1166	6.9		2
E. totdiana	S	1	500	3.0		
E. wandoo	F	1	60	0.4		
Hakea auriculata	S	1	27	0.1		
H. cyclocarpa	S	1	80	0.5		1
H. gilberti	S					1
H. lissocarpha	S	1	50	0.3		
H. obliqua	S	1	200	1.2		
H. prostrata	S	6	166	1.0		4
H. undulata	S	2	156	0.9	1	14
H. varia	S	4	95	0.6		
H. trifurcata	S	2	211	1.2		7
Pinus spp.	S	42	7409	43.7	165	52
Insect larvae						

F= flowers, S = seed.

Table 4 from Shah (2006)

Plant scientific name	Plant common name	Part of plant being eaten	Date seen	# Birds
Acacia saligna	Orange Wattle	fresh bark	12/06/2006	7
Agonis flexuosa	Peppermint tree	bark/ grubs	11/05/2006	25
		bark	15/06/2006	6
		bark/ grubs	2/07/2006	18
Banksia attenuata	Candlestick Banksia	seeds, possibly grubs	2/02/2006	50
		seeds out of old fruits	2/03/2006	17
		nuts	5/06/2006	3
Banksia attenuata, B. ilicifolia	Candlestick Banksia Holly Banksia	fruit cones	30/05/2006	120+
Banksia attenuata, B. menziesii	Candlestick Banksia, Firewood Banksia	flowers & seeds	12/04/2006	20-30
Banksia ericifolia	Coastal Heath Banksia		16/07/2006	150-200
Banksia ilicifolia	Holly Banksia	fruit	23/11/2005	5
		mature cones	9/12/2005	5
		fruits	23/05/2006	40
Banksia longifolia	Tree Banksia	nuts	24/06/2006	12
Banksia menziesii	Firewood Banksia		22/04/2006	400
		flowers, seeds, nuts	5/05/2006	12
		flowers, seeds & nuts	17/05/2006	15
		flowers	11/06/2006	185
Banksia menziesii & *Banksia ilicifolia*	Firewood Banksia & Holly Banksia	seeds and cones	20/08/2006	15-20
Banksia prionotes	Acorn Banksia	mature cones (dry)	9/12/2005	5
		mature cones	20/12/2005	21
		mature cones	4/02/2006	7
Banksia spp., *maybe B. grandis*	Bull Banksia	seeds, maybe flowers	12/02/2006	250
Banksia spp.	Banksia		12/07/2006	6
			16/07/2006	5
Callistemon spp.	Bottle brush	old seeds	11/12/2005	16
Corymbia callophyla	Marri tree	nuts	27/12/2005	2
		nuts, under bark	24/06/2006	
		fruit	12/03/2006	39
Corymbia callophylla, Eucalyptus marginate	Marri & Jarrah trees	fruit	25/11/2005	15
		fruit	5/04/2006	190
Corymbia ficifolia	Red flowering gum	closed flowers	15/04/2006	6
		flowers	12/02/2006	62
Dryandra sessilis	Parrot Bush	late flowers/mature seed	24/12/2005	30+
Eucalyptus citriodora	Lemon scented gum	nuts, seeds, flowers	10/05/2006	20
Eucalyptus gomphocephalla, Banksia menziesii	Tuart tree, Firewood Banksia	tuart blossoms, developing flower spike	22/04/2006	50
Eucalyptus salmonophloia	Salmon gum	nuts, seeds	8/05/2006	15
Eucalyptus spp.	Eucalyptus tree	nuts and any new shoots	21/04/2006	65
Ficus spp.	Fig tree	Fruit	20/02/2006	20
Hakea laurina	Pin cushion Hakea		12/06/2006	6
		flowers & seeds	12/06/2006	6
		seeds	12/06/2006	6
Xanthorrhoea preissii, Eucalyptus salmonophloia	Grass tree, salmon gums	seeds, flowers	15/05/2006	25

Helianthus annuus	Sunflower plants	immature sunflower seeds	12/04/2006	45
Hibiscus spp.	Hibiscus garden variety	flowers or nectar	1/11/2005	8
Jacaranda mimosifolia	Jacaranda tree	seed pods (last year's)	23/12/2005	9
Macadamia integrifolia	Macadamia nut tree		30/07/2006	15
		nuts	10/06/2006	60
		nuts	30/7/2006	100-150
Pinus spp., *Eucalyptus* spp.	Pine & gum trees	nuts	3/04/2006	40-50
Pinus spp.	Pine tree		11/12/2005	16
		cones	14/12/2005	26
		nut/seed	20/12/2005	30
		nuts	31/12/2005	30
		feeding on small green pine cones	6/01/2006	60
		seed from cone	23/01/2006	50
		seed from cone	2/02/2006	50
		nuts, striping of pine needles	10/02/2006	4
		pine cones/ seeds	17/02/2006	8
		pine cones	21/02/2006	3
		pine cones	22/02/2006	3
		pine cones	23/02/2006	6
		pine nuts	25/02/2006	60
		fruit cones, still green and 4 - 6 cm wide	2/03/2006	100
		nuts/cones	26/03/2006	30+
		pine cones	28/03/2006	10
		nuts	2/04/2006	8
			16/07/2006	10
		seeds of cones		15
Prunus amygdalus	Almond tree	unripe almonds	1/01/2006	10

Appendix H
Summary of the 526 Sites Surveyed in the Western Suburbs of Perth as potentially suitable for foraging by Carnaby's Cockatoo

EPBC Referral Response - Carnaby's Cockatoo
Lot 4 Underwood Avenue, Shenton Park

APPENDIX H (APPENDIX 2 FROM ATA REPORT 2005/067)

SUMMARY OF THE 526 SITES SURVEYED IN THE WESTERN SUBURBS OF PERTH AS POTENTIALLY SUITABLE FOR FORAGING BY CARNABY'S COCKATOO

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
3	2	1	3	Parkland	N	0.36	382605	6471572
4	2	1	2	Parkland	N	0.192	382825	6471668
5	2	1	1	Parkland	N	0.424	383431	6471157
6	2	1	2	Parkland	N	1.359	383710	6471795
7	4	2	2	Parkland	N	2.035	383463	6471788
8	2	1	2	Parkland	N	1.274	383299	6472009
9	5	3	3	Heath	N	1.542	383245	6472089
10	2	1	2	Parkland	N	2.224	383306	6472443
11	2	1	2	Parkland	N	3.068	383337	6472400
12	2	2	2	Heath	N	0.693	383215	6472213
13	2	3	3	Heath	N	38.589	383778	6472523
14	5	3	1	Woodland	Y	3.117	384149	6472475
15	1	1	2	Parkland	N	0.284	384218	6472215
16	2	1	1	Parkland	N	0.292	384479	6472097
17	2	2	2	Heath	N	2.988	384087	6471829
18	3	1	2	Parkland	N	3.915	384663	6471883
19	2	1	2	Parkland	N	1.251	384605	6472090
20	1	3	3	Heath	N	3.191	382338	6471322
21	2	1	2	Parkland	N	1.323	385942	6471346
22	2	1	2	Parkland	N	0.932	386161	6471422
23	2	1	2	Parkland	N	0.477	386191	6471768
24	2	1	2	Parkland	N	0.243	386505	6471290
25	2	1	1	Parkland	N	4.619	386602	6471125
26	2	1	1	Parkland	N	0.462	386605	6470918
27	2	1	2	Parkland	N	1.524	385976	6470651
28	2	1	2	Parkland	N	1.143	385713	6470969
29	3	1	3	Parkland	N	0.360	385506	6470896
30	2	1	2	Parkland	N	0.870	385316	6471082
31	2	1	2	Parkland	N	0.128	385583	6471188
32	2	1	2	Parkland	N	0.520	385258	6471722
33	2	1	2	Parkland	Y	1.368	383246	6470339
34	2	1	2	Parkland	N	0.583	383875	6470259
35	2	1	2	Parkland	N	0.552	383875	6469713
36	2	1	1	Parkland	Y	0.244	383885	6469462
37	2	1	2	Parkland	Y	2.134	383320	6469193
38	2	3	3	Parkland	N	1.386	383343	6469050
39	2	1	2	Parkland	N	0.212	382762	6469278
40	3	1	2	Parkland	N	1.485	382865	6468834
41	2	4	3	Heath	N	25.598	382499	6468738
41	2	4	3	Heath	N	8.508	382499	6468738
42	3	3	2	Woodland	N	3.527	383337	6468735
43	2	1	2	Parkland	N	2.625	383714	6469542
44	1	1	2	Parkland	N	0.995	383382	6469531
45	2	1	1	Parkland	Y	2.648	384523	6470271
46	1	1	1	Parkland	N	0.496	384276	6469667
47	2	2	2	Parkland	Y	1.196	384815	6469041
48	4	4	4	Woodland	Y	4.605	384447	6469076
49	2	1	1	Parkland	N	2.468	384517	6468939
50	1	1	2	Parkland	N	0.373	384195	6468620
51	2	2	2	Parkland	N	2.310	383818	6468746
52	4	2	1	Parkland	N	1.232	385094	6469027
54	4	2	3	Parkland	N	2.086	385371	6468723
55	4	3	4	Woodland	Y	13.335	385214	6468723
56	2	1	2	Parkland	N	0.719	385452	6468427
57	2	1	2	Parkland	N	4.703	385724	6468838

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
58	2	1	3	Parkland	N	5.308	386165	6469196
59	2	1	4	Parkland	N	0.787	385751	6467837
60	3	3	3	Woodland	N	4.620	385691	6467886
61	1	1	1	Parkland	N	0.962	385531	6468225
61	1	1	1	Parkland	N	0.620	385531	6468225
61	1	1	1	Parkland	N	0.157	385531	6468225
62	3	3	3	Woodland	N	0.585	385497	6467899
63	3	3	2	Woodland	N	0.540	385426	6468009
64	4	1	3	Parkland	N	1.015	385611	6467251
64	4	1	3	Parkland	N	0.838	385611	6467251
65	4	3	3	Woodland	Y	3.825	385596	6467285
66	2	1	3	Parkland	N	16.041	385496	6467235
67	4	3	2	Woodland	Y	3.628	385330	6467034
68	4	1	2	Parkland	Y	71.805	384302	6467114
69	4	3	3	Woodland	N	11.058	385069	6467073
70	4	1	3	Parkland	N	1.819	382610	6468545
71	2	2	1	Parkland	N	1.124	382850	6468480
71	2	2	1	Parkland	N	0.455	382850	6468480
72	1	1	2	Parkland	N	0.161	383357	6468358
73	2	1	2	Parkland	N	1.215	383125	6468044
73	2	1	2	Parkland	N	0.311	383125	6468044
74	4	1	2	Parkland	N	0.199	383230	6468038
75	2	1	3	Parkland	N	1.032	383183	6468184
76	2	1	4	Parkland	N	0.524	382925	6467873
77	2	1	3	Parkland	N	0.361	382629	6468244
78	2	3	4	Woodland	N	0.973	388685	6468212
79	2	1	2	Parkland	N	0.262	384270	6468310
80	2	1	3	Parkland	N	0.741	384132	6468152
81	2	1	3	Parkland	N	0.809	384602	6467594
82	2	1	3	Parkland	N	2.370	385080	6467933
83	2	1	3	Parkland	N	1.138	384807	6468207
84	2	1	2	Parkland	N	0.799	385394	6467648
84	2	1	2	Parkland	N	0.187	385394	6467648
84	2	1	2	Parkland	N	0.059	385394	6467648
85	2	1	3	Parkland	N	1.097	385300	6467265
86	2	1	2	Parkland	N	1.148	387238	6467456
87	4	1	2	Parkland	N	1.641	383006	6467122
88	2	1	2	Parkland	N	2.407	383505	6467118
88	2	1	2	Parkland	N	0.584	383505	6467118
89	2	1	1	Parkland	N	1.095	382892	6467034
89	2	1	1	Parkland	N	0.917	382892	6467034
89	2	1	1	Parkland	N	0.718	382892	6467034
90	2	1	1	Parkland	N	0.139	383246	6466917
91	2	1	2	Parkland	N	1.472	383915	6466862
92	2	1	2	Parkland	N	1.401	382227	6465959
93	1	2	2	Parkland	N	0.662	383202	6466147
94	4	1	1	Parkland	N	9.749	382428	6465679
94	4	1	1	Parkland	N	1.564	382428	6465679
94	4	1	1	Parkland	N	1.310	382428	6465679
95	1	1	2	Parkland	N	0.650	382790	6464765
96	2	2	2	parkland	N	0.699	382556	6465141
97	2	3	3	Woodland	N	1.320	382880	6464778
98	2	2	4	Parkland	N	1.374	382725	6465221
99	4	1	1	Parkland	N	0.526	382881	6464776
99	4	1	1	Parkland	N	0.419	382881	6464776
100	4	1	1	Parkland	N	1.250	382822	6464279
100	4	1	1	Parkland	N	0.182	382822	6464279
101	1	1	2	Parkland	Y	0.609	383928	6461982
102	1	2	3	Parkland	N	3.284	383966	6461947
103	2	2	2	Parkland	N	5.285	383694	6461816

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
104	2	1	3	Parkland	N	3.104	383929	6463136
105	4	3	2	Woodland	N	5.690	384187	6463176
106	4	2	3	Woodland	N	2.174	384860	6462593
107	1	1	2	Parkland	N	0.252	384821	6462561
108	2	1	1	Parkland	N	0.279	384753	6462358
108	2	1	1	Parkland	N	0.117	384753	6462358
109	4	2	3	Woodland	N	0.987	384366	6463142
110	1	1	1	Parkland	N	0.904	386516	6470620
111	1	1	2	Parkland	N	2.200	386679	6470591
112	1	1	1	Parkland	N	4.652	386778	6470586
112	1	1	1	Parkland	N	1.610	386778	6470586
113	1	2	2	Woodland	N	0.721	386843	6470203
113	1	2	2	Woodland	N	0.464	386843	6470203
114	2	2	2	Parkland	N	3.680	386716	6469656
115	2	2	1	Parkland	N	1.167	386725	6469454
116	2	2	1	Parkland	N	0.918	386662	6469268
117	2	2	1	Parkland	N	2.042	386585	6469066
118	2	1	3	Parkland	N	1.073	386291	6470198
119	4	1	2	Parkland	N	0.177	385346	6470314
120	2	1	2	Parkland	N	1.353	385387	6470424
121	2	1	2	Parkland	N	21.985	388157	6467368
122	4	1	2	Parkland	N	7.775	388031	6467771
122	4	1	2	Parkland	N	2.943	388031	6467771
123	2	1	2	Parkland	N	2.643	388593	6467323
123	2	1	2	Parkland	N	1.486	388593	6467323
124	2	2	2	Parkland	N	0.846	388921	6467408
124	2	2	2	Parkland	N	0.731	388921	6467408
125	2	2	4	Parkland	N	1.921	387515	6466851
125	2	2	4	Parkland	N	0.977	387515	6466851
125	2	2	4	Parkland	N	0.096	387515	6466851
125	2	2	4	Parkland	N	0.081	387515	6466851
126	2	1	2	Parkland	N	2.171	387645	6466049
127	2	1	2	Parkland	N	0.816	386865	6466398
128	2	1	2	Parkland	N	1.218	386608	6466033
129	2	1	2	Parkland	N	0.778	386643	6465800
130	2	1	1	Parkland	N	0.129	386931	6465648
130	2	1	1	Parkland	N	0.084	386931	6465648
130	2	1	1	Parkland	N	0.037	386931	6465648
131	2	1	3	Parkland	N	2.966	387240	6464983
132	2	1	1	Parkland	N	1.522	387031	6464973
133	2	1	3	Parkland	N	1.864	388367	6460452
134	4	2	3	Parkland	N	2.073	388792	6460584
135	2	1	2	Parkland	N	5.517	388792	6460958
136	4	1	2	Parkland	N	0.493	388224	6460118
137	2	1	2	Parkland	N	1.301	387256	6458802
138	4	2	2	Woodland	N	19.352	387650	6459138
139	2	1	3	Parkland	N	1.188	386273	6458758
139	2	1	3	Parkland	N	0.280	386273	6458758
139	2	1	3	Parkland	N	0.214	386273	6458758
139	2	1	3	Parkland	N	0.146	386273	6458758
140	2	1	3	Parkland	Y	7.243	385941	6458628
141	2	1	2	Parkland	N	0.659	386462	6459423
142	2	1	2	Parkland	N	0.296	386278	6459543
143	4	3	3	Parkland	N	0.626	386538	6459986
144	2	1	2	Parkland	N	0.931	386309	6460165
144	2	1	2	Parkland	N	0.293	386309	6460165
144	2	1	2	Parkland	N	0.186	386309	6460165
144	2	1	2	Parkland	N	0.133	386309	6460165
144	2	1	2	Parkland	N	0.104	386309	6460165
144	2	1	2	Parkland	N	0.073	386309	6460165

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
145	2	1	3	Parkland	Y	2.522	385563	6460211
146	4	1	2	Parkland	N	1.801	385840	6460215
147	2	1	2	Parkland	N	0.860	385425	6460343
148	2	1	1	Parkland	N	0.623	386550	6461093
149	2	1	1	Parkland	N	4.248	384849	6460738
150	1	1	1	Parkland	N	0.761	384617	6460452
151	4	3	3	Parkland	Y	6.282	384024	6460045
152	2	1	3	Parkland	N	4.625	384039	6458733
153	2	1	4	Parkland	N	0.585	384025	6458625
154	1	1	2	Parkland	N	0.492	383969	6458135
155	4	1	2	Parkland	N	3.371	383877	6458007
156	2	3	3	Woodland	N	2.914	383886	6457901
157	2	1	3	Parkland	N	0.398	383490	6458036
158	2	1	3	Parkland	N	1.288	383490	6458036
159	1	1	2	Parkland	N	0.397	383360	6457823
160	4	1	2	Parkland	N	0.493	383234	6457691
160	4	1	2	Parkland	N	0.441	383234	6457691
161	1	1	2	Parkland	N	0.377	383324	6458219
162	4	1	2	Parkland	N	0.085	382466	6470018
163	4	1	1	Parkland	N	0.198	382599	6469877
164	2	3	2	Heath	N	6.805	382641	6467118
164	2	3	2	Heath	N	1.713	382641	6467118
164	2	3	2	Heath	N	0.418	382641	6467118
164	2	3	2	Heath	N	0.355	382641	6467118
164	2	3	2	Heath	N	0.114	382641	6467118
165	2	1	1	Parkland	N	0.312	382503	6467490
165	2	1	1	Parkland	N	0.158	382503	6467490
165	2	1	1	Parkland	N	0.145	382503	6467490
165	2	1	1	Parkland	N	0.132	382503	6467490
165	2	1	1	Parkland	N	0.064	382503	6467490
165	2	1	1	Parkland	N	0.048	382503	6467490
165	2	1	1	Parkland	N	0.042	382503	6467490
166	2	2	1	Heath	N	1.814	382437	6466982
167	4	1	1	Parkland	N	0.186	382425	6466526
167	4	1	1	Parkland	N	0.151	382425	6466526
167	4	1	1	Parkland	N	0.147	382425	6466526
167	4	1	1	Parkland	N	0.047	382425	6466526
168	2	3	2	Heath	N	0.684	382429	6466404
169	2	3	2	Heath	N	7.399	382425	6466188
169	2	3	2	Heath	N	2.159	382425	6466188
170	4	1	1	Parkland	N	2.024	382437	6466165
171	2	3	2	Heath	N	13.647	382841	6466810
172	2	3	2	Heath	N	0.978	382425	6465132
172	2	3	2	Heath	N	0.179	382425	6465132
173	2	3	1	Heath	N	91.902	382755	6464244
173	2	3	1	Heath	N	37.187	382755	6464244
174	2	2	3	Parkland	N	1.783	383249	6462258
174	2	2	3	Parkland	N	1.696	383249	6462258
174	2	2	3	Parkland	N	1.397	383249	6462258
174	2	2	3	Parkland	N	0.989	383249	6462258
174	2	2	3	Parkland	N	0.711	383249	6462258
174	2	2	3	Parkland	N	0.639	383249	6462258
174	2	2	3	Parkland	N	0.592	383249	6462258
174	2	2	3	Parkland	N	0.560	383249	6462258
174	2	2	3	Parkland	N	0.495	383249	6462258
174	2	2	3	Parkland	N	0.451	383249	6462258
174	2	2	3	Parkland	N	0.417	383249	6462258
174	2	2	3	Parkland	N	0.265	383249	6462258
175	4	1	2	Parkland	N	0.178	382913	6461483
175	4	1	2	Parkland	N	0.173	382913	6461483

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
175	4	1	2	Parkland	N	0.148	382913	6461483
175	4	1	2	Parkland	N	0.055	382913	6461483
175	4	1	2	Parkland	Y	1.673	382913	6461483
175	4	1	2	Parkland	Y	0.801	382913	6461483
175	4	1	2	Parkland	Y	0.432	382913	6461483
176	4	1	2	Parkland	N	1.487	382892	6461020
177	2	2	1	Heath	Y	5.379	382916	6461283
178	2	3	3	Heath	N	0.681	382242	6459725
179	1	1	1	Parkland	N	1.482	382493	6459419
179	1	1	1	Parkland	N	1.073	382493	6459419
179	1	1	1	Parkland	N	1.037	382493	6459419
179	1	1	1	Parkland	N	0.987	382493	6459419
179	1	1	1	Parkland	N	0.932	382493	6459419
179	1	1	1	Parkland	N	0.762	382493	6459419
179	1	1	1	Parkland	N	0.754	382493	6459419
179	1	1	1	Parkland	N	0.603	382493	6459419
179	1	1	1	Parkland	N	0.580	382493	6459419
179	1	1	1	Parkland	N	0.531	382493	6459419
179	1	1	1	Parkland	N	0.525	382493	6459419
179	1	1	1	Parkland	N	0.490	382493	6459419
179	1	1	1	Parkland	N	0.482	382493	6459419
179	1	1	1	Parkland	N	0.443	382493	6459419
179	1	1	1	Parkland	N	0.440	382493	6459419
179	1	1	1	Parkland	N	0.414	382493	6459419
179	1	1	1	Parkland	N	0.382	382493	6459419
179	1	1	1	Parkland	N	0.380	382493	6459419
179	1	1	1	Parkland	N	0.377	382493	6459419
179	1	1	1	Parkland	N	0.346	382493	6459419
179	1	1	1	Parkland	N	0.342	382493	6459419
179	1	1	1	Parkland	N	0.331	382493	6459419
179	1	1	1	Parkland	N	0.327	382493	6459419
179	1	1	1	Parkland	N	0.323	382493	6459419
179	1	1	1	Parkland	N	0.303	382493	6459419
179	1	1	1	Parkland	N	0.303	382493	6459419
179	1	1	1	Parkland	N	0.294	382493	6459419
179	1	1	1	Parkland	N	0.266	382493	6459419
179	1	1	1	Parkland	N	0.257	382493	6459419
179	1	1	1	Parkland	N	0.229	382493	6459419
179	1	1	1	Parkland	N	0.191	382493	6459419
179	1	1	1	Parkland	N	0.153	382493	6459419
179	1	1	1	Parkland	N	0.150	382493	6459419
179	1	1	1	Parkland	N	0.135	382493	6459419
179	1	1	1	Parkland	N	0.127	382493	6459419
179	1	1	1	Parkland	N	0.106	382493	6459419
179	1	1	1	Parkland	N	0.101	382493	6459419
179	1	1	1	Parkland	N	0.081	382493	6459419
180	1	1	1	Parkland	N	2.297	383320	6460297
180	1	1	1	Parkland	N	0.873	383320	6460297
180	1	1	1	Parkland	N	0.604	383320	6460297
180	1	1	1	Parkland	N	0.408	383320	6460297
180	1	1	1	Parkland	N	0.284	383320	6460297
180	1	1	1	Parkland	N	0.265	383320	6460297
180	1	1	1	Parkland	N	0.210	383320	6460297
181	1	2	1	Heath	N	2.811	382353	6456605
182	1	3	2	Heath	N	0.512	382165	6457620
183	4	1	1	Parkland	N	0.127	382371	6457587
184	1	3	2	Heath	N	3.864	382353	6456605
184	1	3	2	Heath	N	2.890	382353	6456605
185	2	3	2	Heath	N	2.472	382598	6457099
186	4	1	1	Parkland	N	0.289	382470	6457147

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
187	2	1	2	Parkland	N	0.336	382722	6457053
188	2	1	2	Parkland	N	0.087	382712	6457450
189	4	1	2	Parkland	N	2.093	383037	6457103
190	1	1	1	Parkland	N	1.877	382914	6456947
190	1	1	1	Parkland	N	1.027	382914	6456947
191	2	2	2	Parkland	N	1.081	382981	6456394
192	1	1	2	Parkland	N	0.345	382455	6456010
193	2	2	3	Parkland	N	1.851	382763	6455490
194	2	1	2	Parkland	N	0.845	382990	6456631
194	2	1	2	Parkland	N	0.628	382990	6456631
195	2	1	2	Parkland	N	1.442	383294	6456697
195	2	1	2	Parkland	N	0.874	383294	6456697
196	2	1	2	Parkland	N	0.606	383296	6456925
196	2	1	2	Parkland	N	0.047	383296	6456925
197	2	1	2	Parkland	N	0.255	383433	6457253
198	2	3	3	Heath	N	1.059	383700	6456488
199	2	1	2	Parkland	N	1.515	383677	6456562
199	2	1	2	Parkland	Y	2.000	383677	6456562
200	2	1	2	Parkland	N	0.463	384132	6456589
201	2	1	2	Parkland	N	2.475	383938	6456400
201	2	1	2	Parkland	N	0.189	383938	6456400
202	1	2	1	Parkland	N	2.157	383874	6456258
203	2	2	2	Parkland	N	2.545	384491	6456490
204	4	1	2	Parkland	N	2.256	384557	6456771
205	4	3	2	Woodland	N	5.545	384592	6457060
205	4	3	2	Woodland	N	2.557	384592	6457060
205	4	3	2	Woodland	N	2.323	384592	6457060
205	4	3	2	Woodland	N	0.768	384592	6457060
205	4	3	2	Woodland	N	0.631	384592	6457060
205	4	3	2	Woodland	N	0.207	384592	6457060
205	4	3	2	Woodland	N	0.105	384592	6457060
206	2	1	2	Parkland	N	0.742	384618	6457039
207	2	2	3	Woodland	N	4.363	384814	6457114
208	2	1	2	Parkland	N	0.901	383351	6460246
208	2	1	2	Parkland	N	0.093	383351	6460246
209	1	1	2	Parkland	N	0.785	383595	6460408
210	2	1	3	Parkland	N	0.652	383474	6460552
211	2	1	2	Parkland	N	1.166	384110	6460859
212	2	1	3	Parkland	N	11.137	384502	6461248
212	2	1	3	Parkland	N	10.056	384502	6461248
212	2	1	3	Parkland	N	1.904	384502	6461248
212	2	1	3	Parkland	N	1.064	384502	6461248
212	2	1	3	Parkland	N	0.531	384502	6461248
212	2	1	3	Parkland	N	0.459	384502	6461248
212	2	1	3	Parkland	N	0.447	384502	6461248
212	2	1	3	Parkland	N	0.404	384502	6461248
212	2	1	3	Parkland	N	0.175	384502	6461248
212	2	1	3	Parkland	N	0.120	384502	6461248
213	2	1	2	Parkland	N	1.150	385078	6461142
213	2	1	2	Parkland	N	0.361	385078	6461142
213	2	1	2	Parkland	N	0.242	385078	6461142
213	2	1	2	Parkland	N	0.224	385078	6461142
214	2	1	2	Parkland	N	1.822	385230	6461111
215	2	1	3	Parkland	N	5.328	387883	6461646
215	2	1	3	Parkland	N	4.620	387883	6461646
216	4	2	2	Woodland	N	0.303	388241	6462235
217	4	3	3	Woodland	N	1.107	387992	6462290
218	4	1	2	Parkland	N	1.912	388601	6460075
219	4	1	2	Parkland	N	0.682	388555	6460804
219	4	1	2	Parkland	N	0.682	388555	6460804

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
219	4	1	2	Parkland	Y	3.831	388555	6460804
220	4	1	2	Parkland	N	1.430	388087	6463152
220	4	1	2	Parkland	Y	4.921	388087	6463152
221	4	1	2	Parkland	N	4.510	388014	6463555
221	4	1	2	Parkland	N	0.180	388014	6463555
222	2	1	3	Parkland	N	0.396	387330	6463656
223	2	1	2	Parkland	N	1.094	388935	6463769
224	4	3	4	Woodland	N	4.898	386984	6462220
225	4	3	4	Woodland	N	2.442	387044	6462355
226	4	1	4	Parkland	N	2.719	386623	6462366
226	4	1	4	Parkland	N	0.940	386623	6462366
226	4	1	4	Parkland	N	0.753	386623	6462366
226	4	1	4	Parkland	N	0.091	386623	6462366
226	4	1	4	Parkland	N	0.071	386623	6462366
226	4	1	4	Parkland	Y	37.057	386623	6462366
227	4	1	1	Parkland	N	1.770	384043	6465703
227	4	1	1	Parkland	N	0.722	384043	6465703
228	4	1	2	Parkland	N	0.711	384884	6465746
229	2	1	4	Parkland	Y	63.949	385377	6464953
230	2	3	3	Woodland	N	13.818	384557	6463667
230	2	3	3	Woodland	Y	8.693	384557	6463667
231	2	1	3	Parkland	N	16.710	385341	6464487
232	4	4	4	Woodland	N	2.020	385113	6464443
233	4	1	2	Parkland	N	2.569	385445	6463388
233	4	1	2	Parkland	N	0.305	385445	6463388
234	2	1	3	Parkland	N	11.803	385338	6463018
234	2	1	3	Parkland	N	0.266	385338	6463018
235	2	1	3	Parkland	N	1.719	384971	6462688
235	2	1	3	Parkland	N	0.273	384971	6462688
236	2	1	4	Parkland	N	5.273	386787	6463466
237	4	3	4	Woodland	Y	30.297	386758	6463098
238	4	3	2	Woodland	N	1.010	387027	6463683
239	3	3	2	Woodland	N	0.531	387104	6463629
240	4	1	2	Parkland	N	0.207	386991	6463323
240	4	1	2	Parkland	N	0.085	386991	6463323
241	2	3	4	Woodland	N	14.411	386525	6462881
241	2	3	4	Woodland	N	9.645	386525	6462881
241	2	3	4	Woodland	N	0.460	386525	6462881
242	4	1	1	Parkland	N	0.170	385858	6465565
243	2	1	3	Parkland	N	3.997	385506	6466069
243	2	1	3	Parkland	N	1.661	385506	6466069
243	2	1	3	Parkland	N	1.146	385506	6466069
243	2	1	3	Parkland	N	0.523	385506	6466069
244	2	2	4	Heath	N	2.407	385013	6466215
245	2	2	4	Heath	N	3.173	385013	6466215
246	2	1	1	Parkland	N	2.231	384391	6465884
247	2	1	2	Parkland	N	3.903	384693	6466533
248	1	4	2	Heath	N	10.532	383703	6465670
249	1	4	4	Heath	N	1.413	383781	6466056
250	4	4	2	Woodland	N	7.940	384627	6466585
251	2	3	3	Woodland	Y	33.580	384586	6466282
252	4	3	2	Woodland	N	0.609	384209	6466865
253	2	2	2	Woodland	Y	4.986	383992	6467104
253	2	2	2	Woodland	Y	0.810	383992	6467104
254	2	4	4	Woodland	Y	3.850	386583	6464607
255	4	4	4	Woodland	N	24.220	386652	6464472
256	2	2	2	Parkland	N	2.202	386165	6464638
257	4	4	3	Woodland	N	0.546	386882	6464225
258	2	2	2	Parkland	N	5.035	386362	6464244
259	2	2	2	Parkland	N	2.671	386369	6464196

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
260	2	2	2	Parkland	N	1.652	383680	6462179
261	2	1	1	Parkland	Y	4.177	383506	6462162
262	2	1	3	Parkland	N	22.765	383556	6462712
262	2	1	3	Parkland	N	0.736	383556	6462712
262	2	1	3	Parkland	N	0.619	383556	6462712
262	2	1	3	Parkland	N	0.502	383556	6462712
262	2	1	3	Parkland	N	0.374	383556	6462712
263	4	1	2	Parkland	N	1.878	386970	6460031
263	4	1	2	Parkland	N	0.648	386970	6460031
263	4	1	2	Parkland	N	0.498	386970	6460031
263	4	1	2	Parkland	Y	8.292	386970	6460031
264	2	1	1	Parkland	N	1.670	387413	6462709
265	2	1	1	Parkland	N	1.030	387354	6462709
265	2	1	1	Parkland	N	0.241	387354	6462709
266	1	1	1	Parkland	N	1.222	387677	6462188
266	1	1	1	Parkland	N	0.621	387677	6462188
267	2	1	2	Parkland	N	0.765	387039	6462994
268	2	1	1	Parkland	N	2.029	386805	6463139
268	2	1	1	Parkland	N	1.408	386805	6463139
268	2	1	1	Parkland	N	0.220	386805	6463139
268	2	1	1	Parkland	N	0.208	386805	6463139
269	2	1	3	Parkland	N	6.144	387378	6464156
270	2	1	2	Parkland	N	1.275	387496	6464640
271	2	1	2	Parkland	N	0.738	387695	6464513
272	2	1	3	Parkland	N	5.217	387041	6464513
273	2	1	3	Parkland	N	3.102	388245	6464538
274	2	1	3	Parkland	N	3.448	388424	6464361
275	2	1	2	Parkland	N	1.264	388868	6464558
276	2	1	3	Parkland	N	0.197	389253	6464558
277	2	1	1	Parkland	N	2.168	389395	6465301
277	2	1	1	Parkland	N	0.451	389395	6465301
278	2	1	3	Parkland	N	0.470	389841	6465844
279	4	1	1	Parkland	N	3.333	389700	6466709
279	4	1	1	Parkland	N	0.869	389700	6466709
279	4	1	1	Parkland	N	0.868	389700	6466709
280	2	1	2	Parkland	N	3.010	389617	6466378
281	2	1	3	Parkland	N	1.018	389217	6466004
281	2	1	3	Parkland	N	0.391	389217	6466004
282	2	1	2	Parkland	N	4.675	389972	6465103
283	1	1	3	Parkland	N	0.642	390210	6465240
284	2	1	2	Parkland	N	0.898	390532	6465147
285	2	1	2	Parkland	N	1.804	390807	6464927
300	4	2	2	Woodland	N	1.457	386050	6464647
301	2	1	1	Parkland	N	1.122	385871	6464664
302	4	2	1	Parkland	N	1.018	386418	6464728
302	4	2	1	Parkland	N	0.276	386418	6464728
302	4	2	1	Parkland	N	0.184	386418	6464728
303	2	2	3	Parkland	N	0.733	386077	6464475
304	2	1	2	Parkland	N	5.982	385887	6464173
305	4	1	1	Parkland	Y	0.954	385767	6463850
306	2	2	3	Parkland	N	4.846	386154	6463843
307	4	3	3	Woodland	Y	9.769	386491	6464007
308	4	2	2	Parkland	N	1.467	386713	6463691
309	4	1	1	Parkland	N	1.937	387029	6463817
310	4	1	2	Parkland	N	1.995	386960	6464097
1A	2	3	2	Heath	N	10.88	382106	6472398
1B	1	2	1	Heath	N	0.217	382140	6472019
1C	3	3	3	Heath	N	2.883	382584	6472625
1D	2	2	1	Heath	Y	7.185	382952	6472689
1E	1	3	1	Heath	N	0.440	382926	6472627

Site No	Food Potential	Habitat Quality	Ethno Influence	Habitat Type	Nesting Opport'y	Area (ha)	Easting	Northing
2A	2	2	2	Heath	N	22.286	382387	6471818
2B	2	3	3	Heath	N	26.113	383005	6472187
2C	1	3	2	Heath	N	1.428	383035	6472567
B1	1	4	3	Heath	N	7.059	384432	6465541
B1	1	4	3	Heath	N	2.860	384432	6465541
B1	1	4	3	Heath	N	1.182	384432	6465541
B1	1	4	3	Heath	N	1.077	384432	6465541
B1	1	4	3	Heath	N	1.024	384432	6465541
B1	1	4	3	Heath	N	0.865	384432	6465541
B1	1	4	3	Heath	N	0.514	384432	6465541
B2	3	4	2	Woodland	Y	12.962	384016	6465631
B3	2	4	2	Woodland	Y	1.508	382921	6465136
B4	2	4	2	Woodland	Y	12.950	383211	6463924
B5	4	1	4	Parkland	N	16.863	383887	6463980
B6	4	3	3	Woodland	Y	1.461	383721	6463767
B7	4	4	4	Woodland	Y	262.973	383654	6464766
K1	4	1	2	Parkland	N	2.736	390701	6463733
K10	2	1	2	Parkland	N	4.311	389264	6463440
K10	2	1	2	Parkland	N	3.679	389264	6463440
K10	2	1	2	Parkland	N	1.749	389264	6463440
K11	4	1	2	Parkland	N	6.225	388912	6463308
K11	4	1	2	Parkland	N	0.450	388912	6463308
K12	1	1	2	Parkland	N	0.687	389694	6463798
K13	1	1	1	Parkland	N	2.762	390667	6463038
K13	1	1	1	Parkland	N	1.596	390667	6463038
K13	1	1	1	Parkland	N	1.415	390667	6463038
K13	1	1	1	Parkland	N	0.365	390667	6463038
K13	1	1	1	Parkland	N	0.286	390667	6463038
K13	1	1	1	Parkland	N	0.241	390667	6463038
K13	1	1	1	Parkland	N	0.164	390667	6463038
K13	1	1	1	Parkland	N	0.159	390667	6463038
K14	2	1	1	Parkland	N	2.917	390491	6463370
K15	4	4	4	Woodland	N	22.102	389475	6463224
K15	4	4	4	Woodland	N	1.783	389475	6463224
K15	4	4	4	Woodland	Y	204.194	389475	6463224
K15	4	4	4	Woodland	Y	70.148	389475	6463224
K15	4	4	4	Woodland	Y	22.813	389475	6463224
K2	4	1	2	Parkland	N	0.153	389728	6463229
K3	4	2	2	Parkland	N	3.739	390164	6463040
K4	2	1	2	Parkland	N	2.161	390169	6462678
K5	2	1	2	Parkland	N	5.761	390702	6463499
K5	2	1	2	Parkland	N	1.625	390702	6463499
K5	2	1	2	Parkland	Y	11.078	390702	6463499
K6	1	1	2	Parkland	N	4.938	389510	6463134
K6	1	1	2	Parkland	N	4.185	389510	6463134
K6	1	1	2	Parkland	N	3.885	389510	6463134
K6	1	1	2	Parkland	N	0.552	389510	6463134
K6	1	1	2	Parkland	N	0.316	389510	6463134
K7	1	2	3	Woodland	N	1.119	388377	6461930
K8	4	1	3	Parkland	N	3.733	388590	6462736
K9	4	1	3	Parkland	N	1.462	388590	6462736