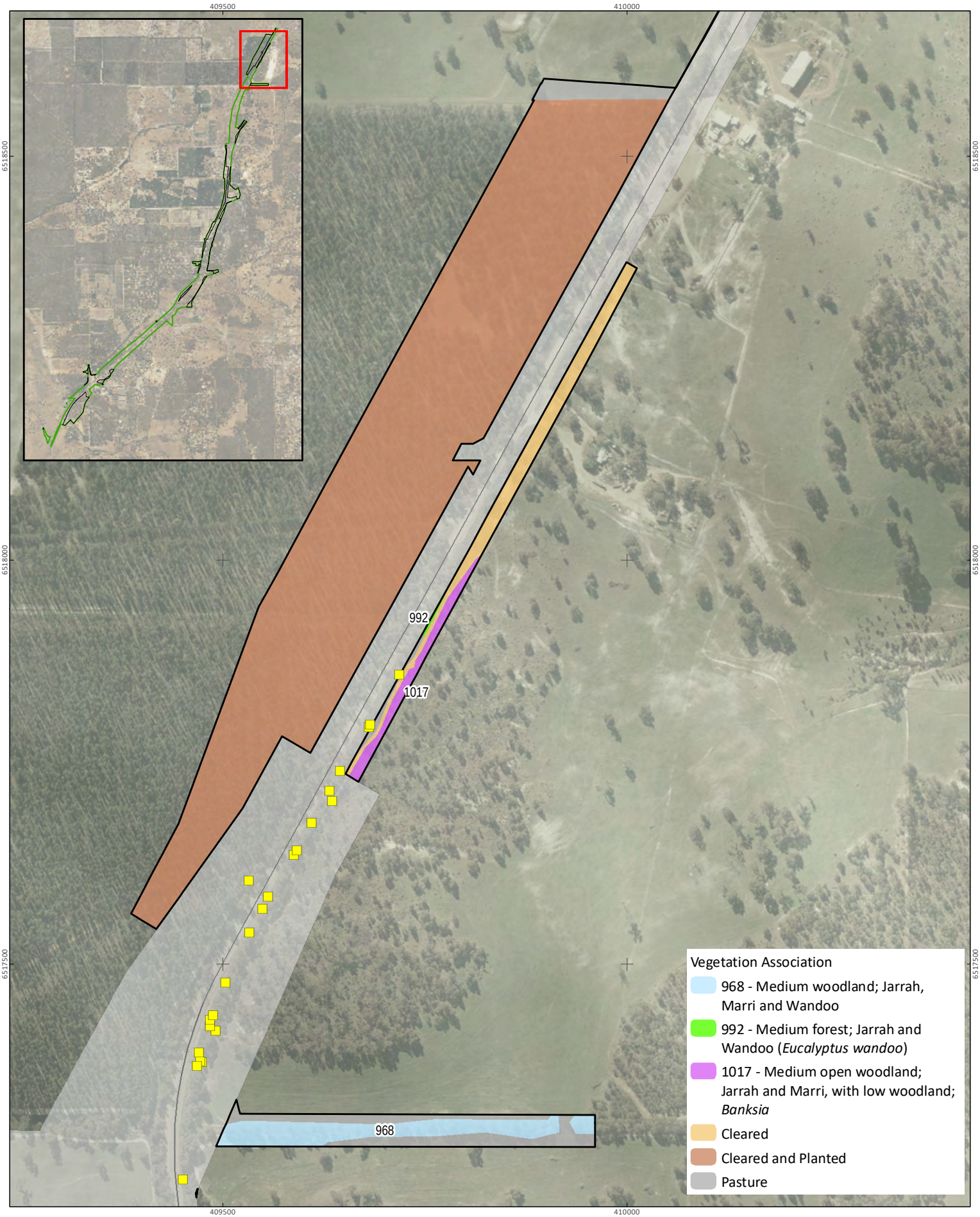

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Flora and fauna assessment for the Muchea North study area – Report Addendum.

Project No	1121
Date	24-Jan-17
Drawn by	KW
Map author	KC

0 25 50 100 150 200
Metres

1:6,000 (at A4) GDA 1994 MGA Zone 50

Gaps study area

Initial study area

Conservation significant flora

P3, *Acacia drummondii* subsp. *affinis*

Figure 3-1d

Vegetation associations, conservation significant flora and declared pests

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A single *Thelymira stellata* plant was located at the known DPaW population on Blue Plains Road adjacent to the study area on 4 November 2016 (Figure 2-2; Figure 3-2). No *T. stellata* plants were recorded in the initial study area or gaps study area during the transect searches.

Figure 3-2 *Thelymitra stellata* recorded at known population on Blue Plains Road, 4 November 2016

Habitat defined for *T. stellata* at the Blue Plains Road population is characterised by *Eucalyptus wandoo, E. marginata* and *Corymbia calophylla* woodland with a diverse understory consisting of *Xanthorrhoea preissii*, *Hakea lissocarpha*, *Leschenaultia biloba*, *Dampiera alata*, *Isopogon dubius* and *Daviesia preissii* in laterite sandy clay loam soils. The extent of mapped habitat for the Blue Plains Road population does not intersect the Muchea North EPBC Act approval boundary (Figure 2-2).

Approximately 13.9 ha of habitat considered to have the potential to support *T. stellata* (i.e. areas consistent with the habitat characteristics of the Blue Plains Road population) was mapped in the initial and gaps study areas (Figure 2-2). The condition of potential habitat for *T. stellata* in the study area ranged from excellent to good.

Habitat in the study area that was considered suitable for *T. stellata* also contained at least two other species of *Thelymitra*; *T. crinita* and *T. macrophylla*. Both these species can be easily distinguished from *T. stellata* as they have blueish flowers which appear up to four weeks before *T. stellata* flowers (Figure 3-3). *Thelymitra macrophylla* has a longer linear leaf than the target species but *T. crinita* has a similar leaf morphology to *T. stellata*.

Figure 3-3 Flowering individuals of *Thelymitra crinita* (left) and *Thelymitra stellata* (right) (DPaW 2017a)

No *Drakaea elastica* plants were located at the known DPaW record in the vicinity of the study area (Figure 2-3). The species was also not detected in the initial or gaps study areas during the transect searches.

Habitat defined for *D. elastica* at the known DPaW record was characterised by *Banksia menziesii* and *B. attenuata* woodland over low shrubs consisting of *Dasypogon bromeliifolius*, *Calytrix flavescens*, *Melaleuca thymoides*, *Hibbertia hypericoides*, *Eriostemon spicatus and Leporella fimbriata* in white sand lenses. Approximately 18.4 ha of habitat considered to have the potential to support *D. elastica* was mapped in the study area (Figure 2-3). The condition of potential habitat for *D. elastica* in the study area ranged from excellent to good.

3.2.2 Introduced flora

A total of 21 introduced flora species were recorded in the gaps study area (Appendix 3). All species recorded have wide distributions in WA. Six of the species (*Chamaecytisus palmensis*, *Cyperus polystachyos*, *Lupinus cosentinii*, *Moraea flaccida*, *Pinus radiata* and *Zantedeschia aethiopica*) were not previously recorded in the surveys of the initial study area (Phoenix 2015).

Three declared pests, **Asparagus asparagoides*, **Moraea flaccida* and **Zantedeschia aethiopica*, were recorded in the gaps study area (Figure 3-1; Table 3-4). Two declared species recorded in the gaps study area were not previously recorded in the initial study area, **M. flaccida* and **Z. aethiopica* (Phoenix 2015).

One WoNS, **Asparagus asparagoides*, was recorded at two locations in the gaps study area (Figure 3-1). Only a single individual was recorded at both locations.

Table 3-4 Declared pests recorded in the gaps study area

Species	No. locations	Location/s		No. plants
**Asparagus asparagoides*	2	MN16001 MN16007		2
**Moraea flaccida*	1	MN16003		100
**Zantedeschia aethiopica*	1	MN16007		1

3.2.3 Range extensions

No flora records from the gaps study area represented a range extension for any species.

3.2.4 Vegetation associations

The four sampled quadrats in the gaps study area were confirmed as four separate vegetation associations (Table 3-5). One of these represents a new vegetation association to those recorded in Phoenix (2015): Medium woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla* (association 1182).

A total of 13 vegetation associations were mapped in the gaps study area, based on the new survey data and previous adjacent mapping (Figure 3-1; Table 3-6). Broadly, the vegetation associations recorded represent low to medium woodlands and forest, and shrublands; these collectively covered 31.71% of the gaps study area (Figure 3-1; Table 3-6). Areas described as the road (GNH), cleared (e.g. townships, driveways, side roads), cleared and planted (re-vegetated), pasture (agricultural areas), pasture and cleared (mosaic of agricultural areas and cleared areas for other agricultural purposes) which dominated the gaps study area accounted for the remaining 68.29% (Figure 3-1; Table 3-6). Overall, the most dominant native remnant vegetation association within the gaps study area was Medium woodland; Jarrah, Marri and Wandoo (association 4) which accounted for 16.75% of the study area (Table 3-6).

Table 3-5 Vegetation associations recorded in sampled quadrats

Code	Vegetation description as per Shepherd *et al.* 2002	Quadrat	Vegetation description (current survey)
4	Medium woodland; Marri and Wandoo	MN16001	Mid *Corymbia calophylla* and *Eucalyptus marginata* woodland over mid open *Xanthorrhoea preissii* shrubland over low open **Avena barbata*, **Ehrharta calycina* and **Lolium rigidum* tussock grassland over low open **Trifolium campestre* forbland.
949	Low woodland; *Banksia*	MN16005	Low open *Banksia attenuata*, *B. menziesii* and *Eucalyptus marginata* forest over low open *Xanthorrhoea preissii* shrubland over low sparse *Mesomelaena pseudostygia* sedgeland.
999	Medium woodland; Marri	MN16003	Low open *Eucalyptus marginata*, *E. rudis* and *Melaleuca rhaphiophylla* forest over isolated low *Acacia pulchella* shrubs over mid open **Avena barbata*, **Briza minor* and **Eragrostis curvula* tussock grassland.
1182	Medium woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla*	MN16008	Mid open *Corymbia calophylla* woodland over low *Melaleuca rhaphiophylla* forest over over mid *Taxandria linearfiolia* shrubland over isolated low *Dielsia stenostachya* sedgeland.

Table 3-6 Vegetation associations mapped within the gaps study area

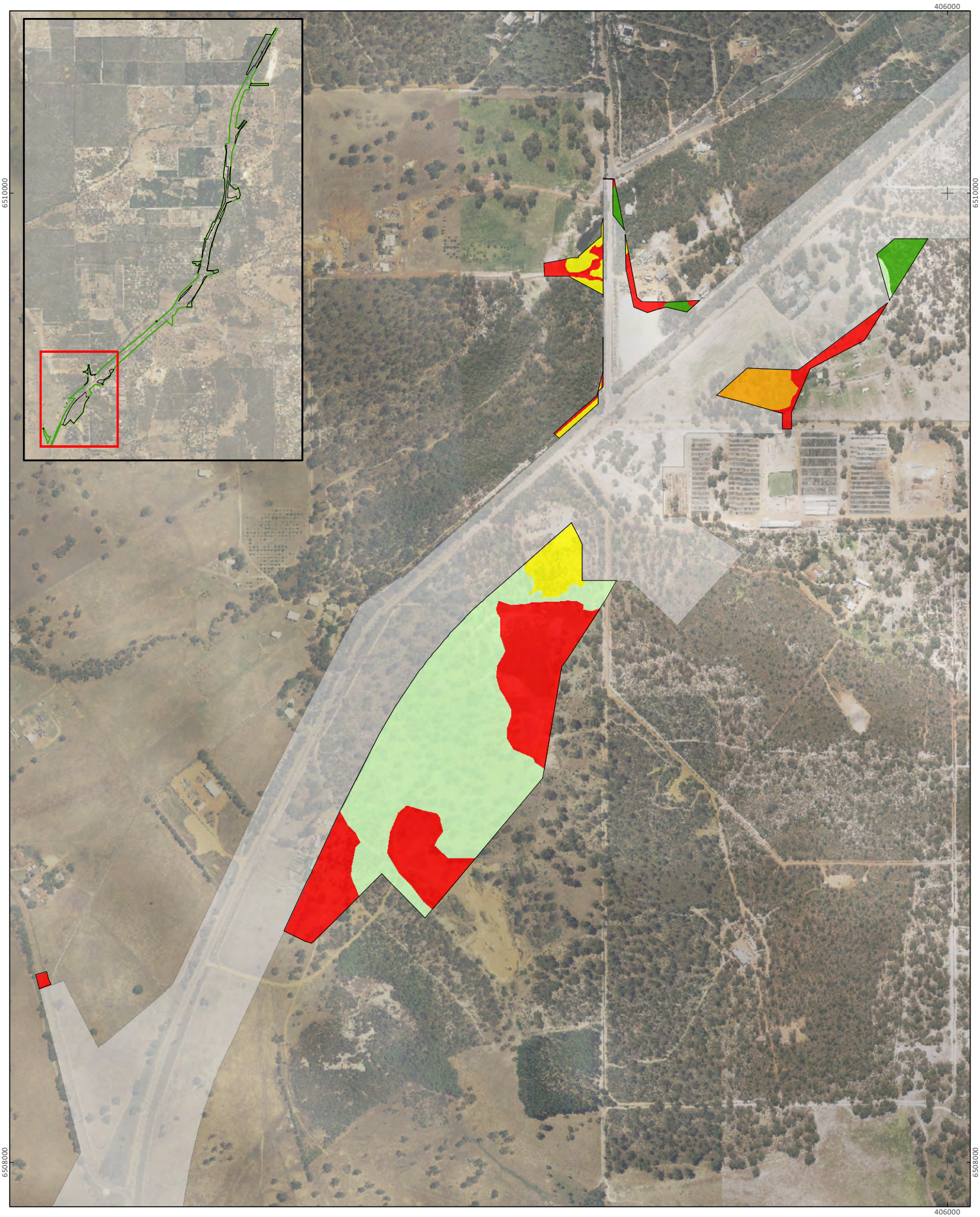
Code	Vegetation association description as per Shepherd *et al.* (2002)	Area (ha)	% of gaps study area
4	Medium woodland; Marri and Wandoo	12.72	16.57%
23	Low woodland; Jarrah and *Banksia*	3.38	4.41%
949	Low woodland; *Banksia*	1.92	2.50%
965	Medium woodland; Jarrah and Marri	1.29	1.68%
968	Medium woodland; Jarrah, Marri and Wandoo	2.03	2.64%
975	Low woodland; Jarrah	0.36	0.46%
992	Medium forest; Jarrah and Wandoo	0.01	0.02%
999	Medium woodland; Marri	0.08	0.11%
1003	Medium forest; Jarrah, Marri and Wandoo	0.59	0.76%
1006	Medium woodland; Jarrah, Wandoo and Powderbark	0.42	0.54%
1008	Medium open woodland; Marri	0.03	0.05%
1017	Medium open woodland; Jarrah and Marri, with low woodland; *Banksia*	1.02	1.33%
1182	Medium woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla*	0.49	0.64%
Cleared	Mostly cleared. Townships, driveways, side roads. Small pockets of vegetation may be present	10.48	13.65%
Cleared and Planted	Historically cleared. May be replanted with non-native vegetation	19.10	24.87%
Pasture	Agricultural areas. Small pockets of vegetation may be present	5.07	6.61%
Pasture and Cleared	Agricultural areas. Small pockets of vegetation may be present, includes infrastructure eg. sheds, houses	17.79	23.16%
Total		**76.78**	**100%**

3.2.5 Vegetation condition

The condition of remnant native vegetation across the gaps study area ranged from Degraded to Pristine (Table 3-7; Figure 3-4). The areas mapped as Completely Degraded (68.29%) represented areas devoid of native vegetation, i.e. agricultural areas, roads, townships, driveways and other cleared areas.

Table 3-7 Vegetation condition in the gaps study area (ha/%)

Condition rating	Area (ha)	% of gaps study area
Completely Degraded	52.44	68.29%
Degraded	1.53	1.99%
Good	3.39	4.41%
Very Good	16.53	21.53%
Excellent	2.88	3.75%
Pristine	0.02	0.03%
Total	**76.79**	**100.00%**



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Project No	1121
Date	24-Jan-17
Drawn by	KW
Map author	KC

0 50 100 200 300
Metres

1:10,000 (at A4) GDA 1994 MGA Zone 50

Gaps study area
Initial study area

Vegetation condition
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Figure 3-4a

Vegetation condition

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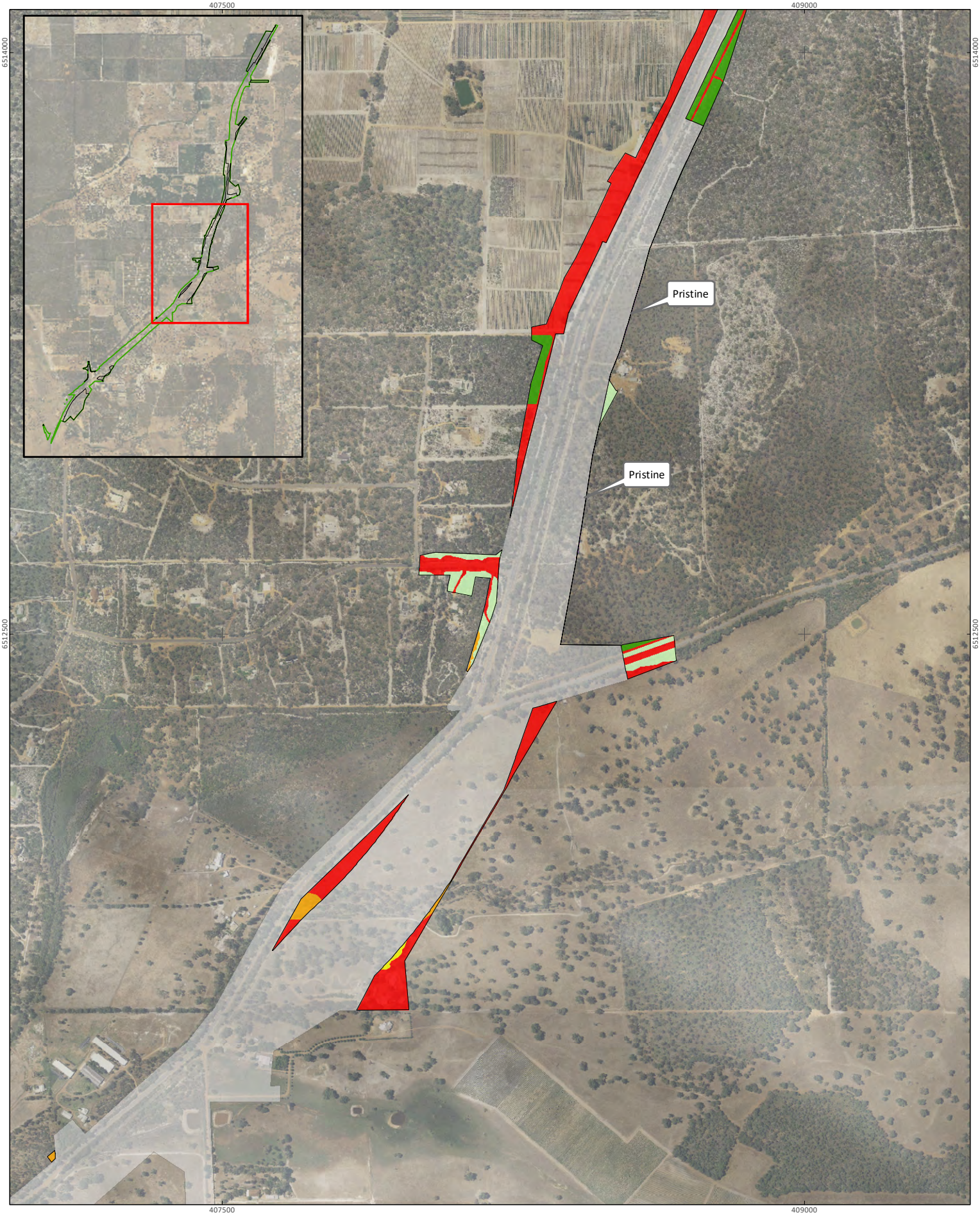

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0 50 100 200 300 400

Metres

1:12,500 (at A4) GDA 1994 MGA Zone 50

Gaps study area

Initial study area

Vegetation condition

- Pristine
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Figure 3-4b

Vegetation condition

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Map author	KC

0 50 100 200 300 400

Metres

1:12,500 (at A4) GDA 1994 MGA Zone 50

Gaps study area

Initial study area

Vegetation condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Figure 3-4c

Vegetation condition

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Map author	KC

0 25 50 100 150 200

Metres

1:6,000 (at A4) GDA 1994 MGA Zone 50

Gaps study area

Initial study area

Vegetation condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Figure 3-4d

Vegetation condition

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3.2.6 *Banksia* Woodlands of the Swan Coastal Plain TEC

Of a total of 10 sites were assessed in the study area, seven of which were determined to be the *Banksia* Woodlands of the Swan Coastal Plain TEC (Figure 3-5). TEC assessment site data is presented in Appendix 4.

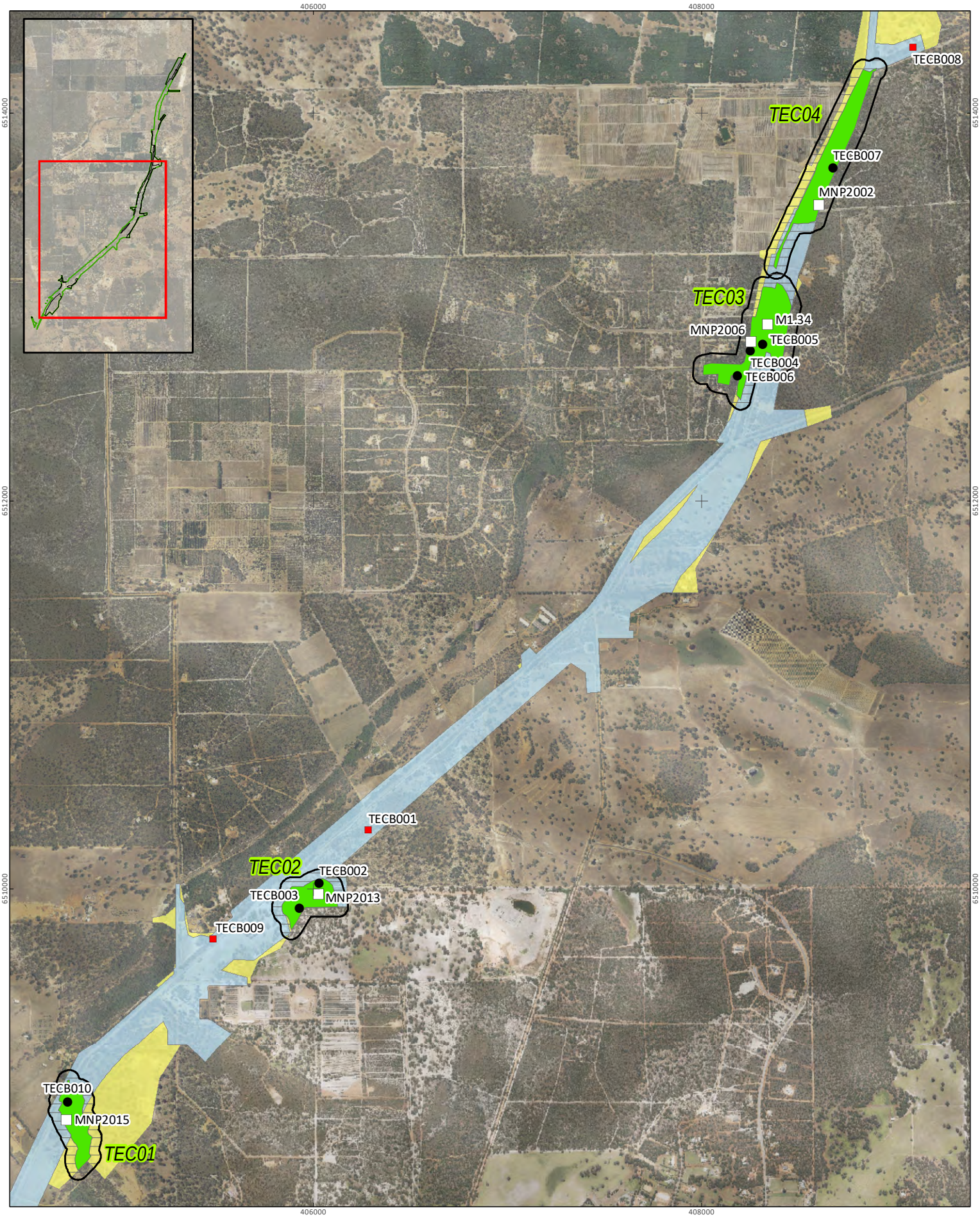
Based on the TEC patch criteria (see section 2.3), four TEC patches occur in the study area (Figure 3-5). Site TECB010 became patch TEC01, sites TECB002 and TECB003 combine to form patch TEC02. Sites TECB004, TECB005 and TECB006 combine to form patch TEC03 and site TECB007 became patch TEC04.

Three of these patches (TEC01, TEC03 and TEC04) extend beyond the Muchea North EPBC Act approval boundary.

Two of the TEC patches (TEC03 and TEC04) extend over bitumised roads. Conservation advice criteria (Threatened Species Scientific Committee 2015) specifies that a patch is continuous if gaps or variations are less than 30 m, so the road surface is included in the patch area calculations. TEC03 crosses over a side road to GNH (gap of 15 m) and TEC04 extends over GNH (gap of 23 m). Buffers (50 m) were applied around each TEC patch. The total area of each patch and associated buffer are summarised in Table 3-8.

Table 3-8 Summary of patch and associated buffer areas (ha)

Name	Area of TEC patch (ha)	Buffer area (ha)	Total area (ha)
TEC01	4.02	6.27	10.30
TEC02	3.71	5.34	9.05
TEC03	8.82	10.56	19.38
TEC04	8.03	12.94	20.98



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Map author	KC

0 250 500 1,000

Metres

1:25,000 (at A4) GDA 1994 MGA Zone 50

- Gaps study area
- Initial study area
- Vegetation assessment site
- TEC assessment site
  - Not TEC
  - TEC
- TEC patch
- TEC patch (50 m buffer)

Figure 3-5

***Banksia* Woodlands of the Swan Coastal Plain TEC, distribution in study area**

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3.2.7 Local and regional significance of vegetation

Local context

Eight of the vegetation associations defined in the gaps study area may be considered locally significant as they represent habitat for Threatened, Protected or Priority Flora, contain one or more quadrats that align with a TEC, were recorded to be in excellent or pristine condition and therefore are considered to represent patches of comparatively high native species diversity surrounded by highly impacted vegetation (Table 3-9).

Table 3-9 Vegetation associations in the gaps study area considered locally conservation significant

Vegetation code	Vegetation association description as per Shepherd *et al.* (2002)	Reason for local significance
4	Medium woodland; Marri and Wandoo	Provides habitat for *Acacia drummondii* subsp. *affinis* (P4)
23	Low woodland; Jarrah and *Banksia*	Contains vegetation in excellent condition Contains the *Banksia* Woodlands of the Swan Coastal Plain TEC
949	Low woodland; *Banksia*	Contains vegetation in excellent condition Contains the *Banksia* Woodlands of the Swan Coastal Plain TEC
968	Medium woodland; Jarrah, Marri and Wandoo	Provides habitat for *Acacia drummondii* subsp. *affinis* (P4) Contains vegetation in excellent condition
999	Medium woodland; Marri	Contains vegetation in excellent condition
1003	Medium forest; Jarrah, Marri and Wandoo	Contains vegetation in excellent condition
1182	Medium woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla*	Contains vegetation in excellent condition

Regional context

A review of the proportion of pre-European extent remaining for each vegetation association recorded in the gaps study area identified five as vulnerable, three as depleted and five of least concern (Table 3-10). The vulnerable vegetation associations (4, 992, 999, 1008 and 1182) may be considered regionally conservation significant as less than 30% of the pre-European extent remains.

Table 3-10 Regional status of vegetation associations in the gaps study area

Vegetation Code	Vegetation association description as per Shepherd *et al.* (2002)	Extent in gaps study area (ha)	Pre-European extent (ha)[1]	Current extent (ha)[1]	% remaining[1]	Status[2]
4	Medium woodland; Marri and Wandoo	12.75	1,054,279.89	293,916.91	27.88	VU
23	Low woodland; Jarrah and *Banksia*	3.38	41,062.83	30,082.16	73.26	LC
949	Low woodland; *Banksia*	1.92	218,193.94	123,096.71	56.42	LC
965	Medium woodland; Jarrah and Marri	1.29	9,356.43	5,182.33	55.39	LC
968	Medium woodland; Jarrah, Marri and Wandoo	2.03	296,877.84	95,732.25	32.25	D
975	Low woodland; Jarrah	0.36	17,275.64	15,570.11	90.13	LC
992	Medium forest; Jarrah and Wandoo	0.01	122,048.81	31,779.57	26.04	VU
999	Medium woodland; Marri	0.08	115,706.59	13,034.84	11.27	VU
1003	Medium forest; Jarrah, Marri and Wandoo	0.59	20,108.58	8,974.77	44.63	D
1006	Medium woodland; Jarrah, Wandoo and Powderbark	0.42	44,908.30	21,814.68	48.58	D
1008	Medium open woodland; Marri	0.03	4,592.09	1,144.71	24.93	VU
1017	Medium open woodland; Jarrah and Marri, with low woodland; *Banksia*	1.02	17,528.01	11,534.31	65.81	LC
1182	Medium woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla*	0.49	23,437.06	6,154.07	26.26	VU

[1]Source – Government of Western Australia (2015) [2] VU – Vulnerable, D – Depleted, LC – Least Concern.

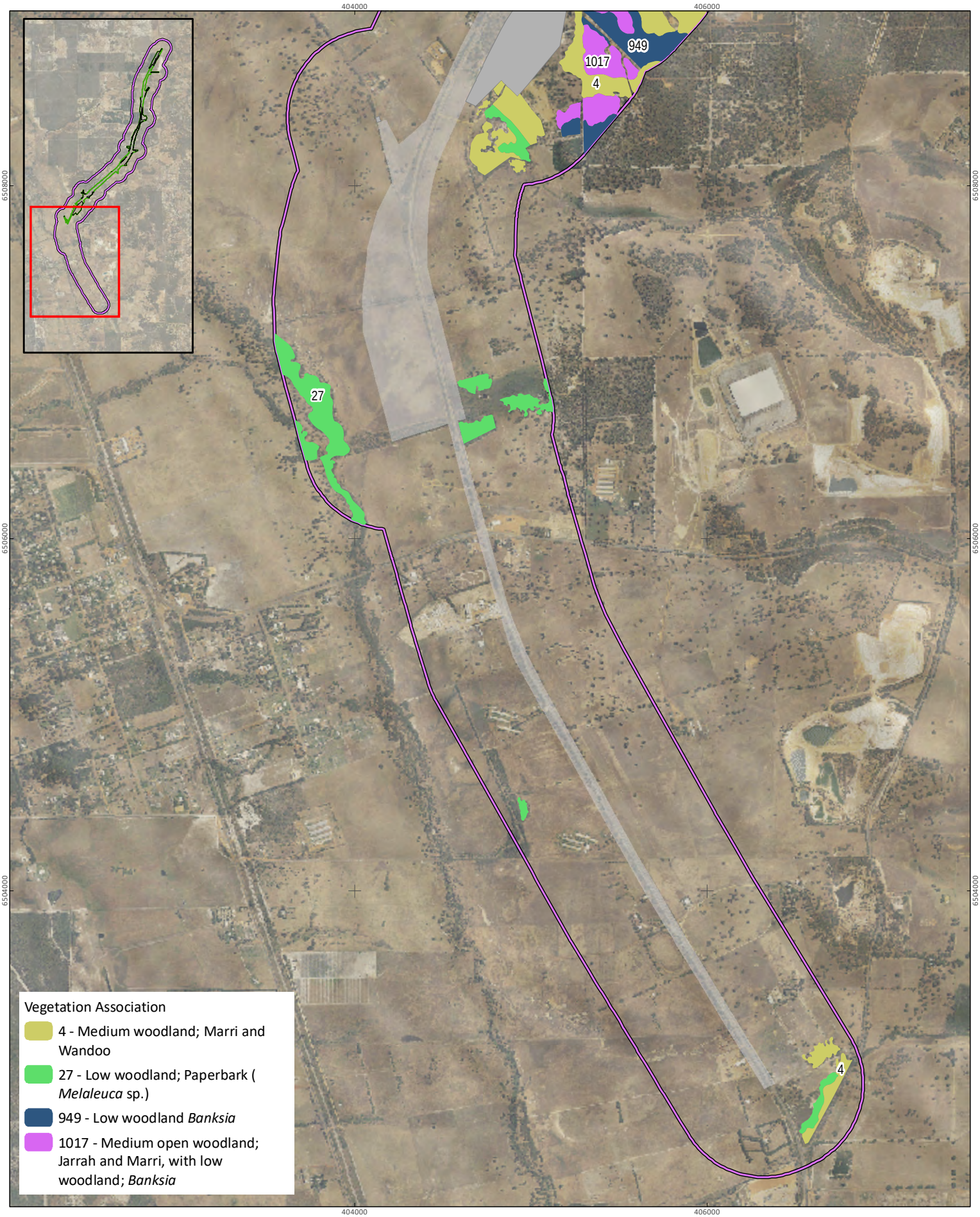
3.2.8 Extrapolation of remnant native vegetation

Extrapolation of the vegetation mapping identified 17 vegetation associations covering an area of 474.88 ha within the extrapolation study area (Table 3-11; Figure 3-6). Extrapolated remnant native vegetation was dominated by vegetation associations 23, 949, 965, 968 and 1017, all covering an area greater than 45 ha and covering approximately 62.9% of remnant vegetation in the extrapolation study area. The remaining 37.15% of remnant vegetation in the extrapolation study area was made up of the remaining 12 vegetation associations, all covering less than 33 ha each.

Five vegetation associations not occurring within the gaps study area (141, 354, 973, 999 and 1132) were identified in the extrapolation study area based on adjacent vegetation mapping conducted for other work packages for the Project. With the exception of one vegetation association (1182), all associations in the gaps study area were also identified in the initial study area (Phoenix 2015).

Table 3-11 Distribution of extrapolated remnant vegetation

Vegetation code	Vegetation association description as per Shepherd *et al.* (2002)	Area (ha)
4	Medium woodland; Marri and Wandoo	32.77
23	Low woodland; Jarrah and *Banksia*	47.49
27	Low woodland; paperbark (*Melaleuca* sp.)	29.79
946	Medium woodland; Wandoo	12.38
949	Low woodland; *Banksia*	54.42
965	Medium woodland; Jarrah and Marri	82.01
968	Medium woodland; Jarrah, Marri and Wandoo	47.92
975	Low woodland; Jarrah	3.21
992	Medium forest; Jarrah and Wandoo	12.82
999	Medium woodland; Marri	0.81
1003	Medium forest; Jarrah, Marri and Wandoo	9.80
1006	Medium woodland; Jarrah, Wandoo and Powderbark	3.26
1008	Medium open woodland; Marri	18.36
1017	Medium open woodland; Jarrah and Marri, with low woodland; *Banksia*	66.99
1019	Medium sparse woodland Jarrah and Marri	9.78
1027	Mosaic Medium open woodland; Jarrah-Marri with low woodland; *Banksia*/medium sparse woodland; Jarrah-Marri	27.79
1182	Medium woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla*	15.29
TOTAL		**474.89**



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Project No	1121
Date	24-Jan-17
Drawn by	KW
Map author	KC

0 250 500 1,000
Metres

1:27,500 (at A4) GDA 1994 MGA Zone 50

Extrapolation study area
Gaps study area
Initial study area

Figure 3-6a

Vegetation extrapolated to 500 m

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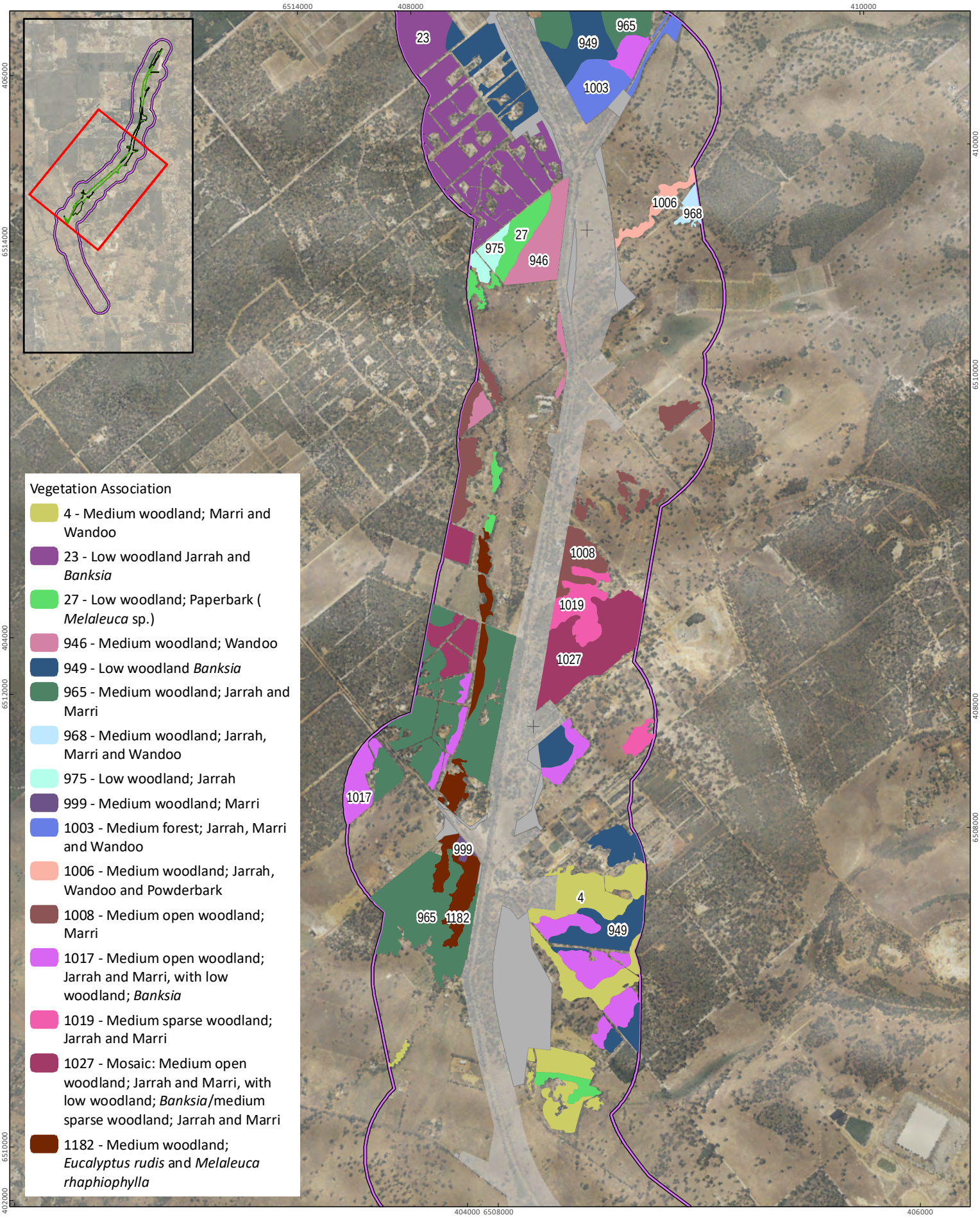

Vegetation Association

- 4 - Medium woodland; Marri and Wandoo
- 23 - Low woodland Jarrah and *Banksia*
- 27 - Low woodland; Paperbark (*Melaleuca* sp.)
- 946 - Medium woodland; Wandoo
- 949 - Low woodland *Banksia*
- 965 - Medium woodland; Jarrah and Marri
- 968 - Medium woodland; Jarrah, Marri and Wandoo
- 975 - Low woodland; Jarrah
- 999 - Medium woodland; Marri
- 1003 - Medium forest; Jarrah, Marri and Wandoo
- 1006 - Medium woodland; Jarrah, Wandoo and Powderbark
- 1008 - Medium open woodland; Marri
- 1017 - Medium open woodland; Jarrah and Marri, with low woodland; *Banksia*
- 1019 - Medium sparse woodland; Jarrah and Marri
- 1027 - Mosaic: Medium open woodland; Jarrah and Marri, with low woodland; *Banksia*/medium sparse woodland; Jarrah and Marri
- 1182 - Medium woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla*

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0 250 500 1,000
Metres

1:27,500 (at A4) GDA 1994 MGA Zone 50

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- Extrapolation study area
- Gaps study area
- Initial study area

Figure 3-6b

Vegetation extrapolated to 500 m

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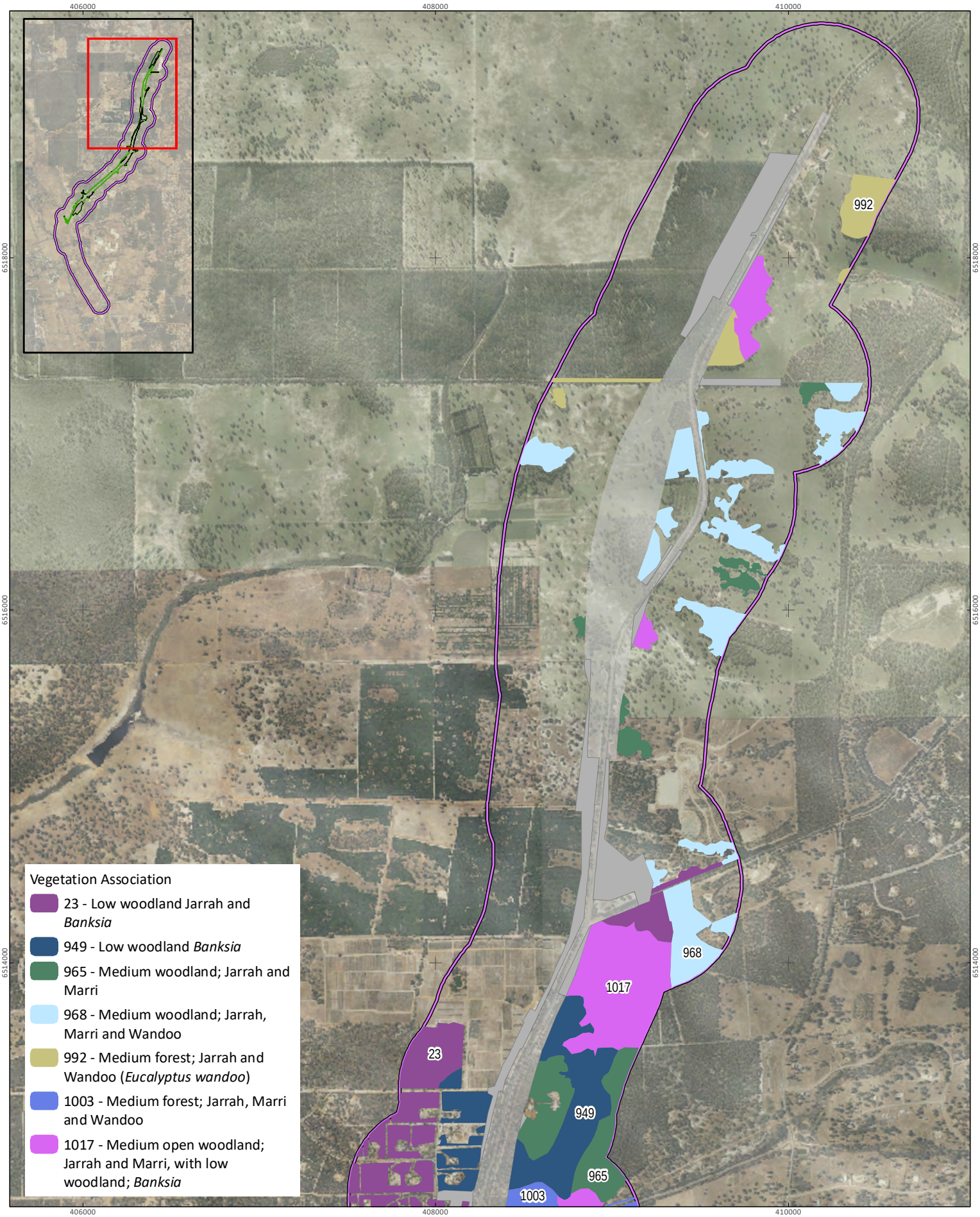

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Map author	KC

0 250 500 1,000
Metres

1:27,500 (at A4) GDA 1994 MGA Zone 50

Extrapolation study area
Gaps study area
Initial study area

Figure 3-6c

Vegetation extrapolated to 500 m

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3.3 FAUNA AND FAUNA HABITAT

3.3.1 Fauna habitats

Three fauna habitat types were defined in the gaps study area, including one habitat comprising remnant native vegetation (Figure 3-7):

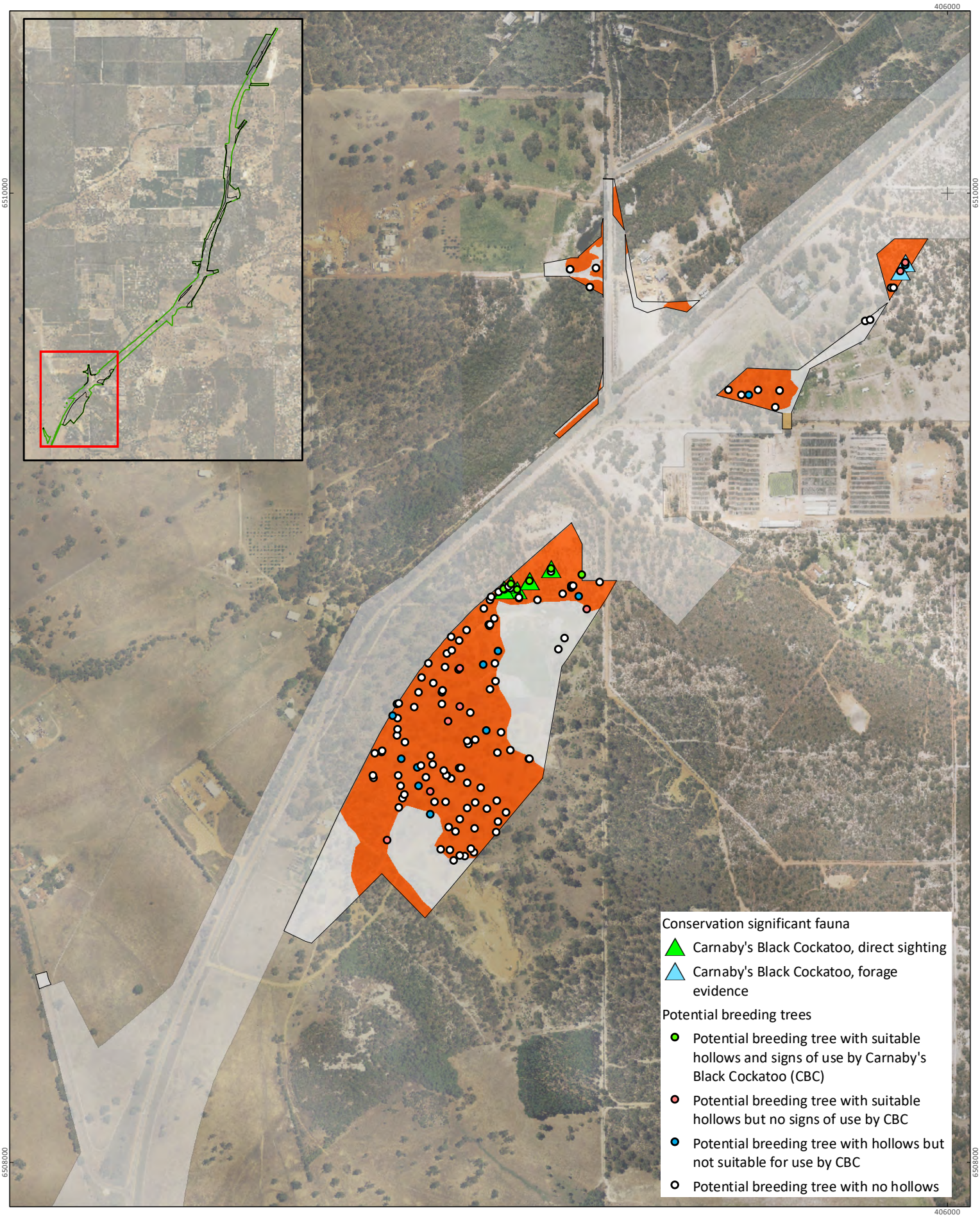
- cleared (agriculture, road, infrastructure) (33.34 ha, 43.42%)
- woodland (Jarrah, Marri, Wandoo and/or *Banksia*) (24.35 ha, 31.71%)
- cleared and revegetated non-native woodland mosaic (19.10 ha, 24.87%).

All of the habitat types were previously documented in the initial study area (Phoenix 2015). Most of the gaps study area (68.29%) comprised cleared areas, represented by agriculture, roads and other infrastructure, and cleared and revegetated woodlands. The remaining 31.71% of the gaps study area comprised woodland habitat dominated by Jarrah, Marri, Wandoo and/or *Banksia* tree species.

Fauna habitats within the gaps study area varied in quality and suitability for species of conservation significance. The native vegetation habitats (e.g. woodland, forest and shrubland) offer higher habitat value for fauna in patches that are contiguous with larger areas of remnant native vegetation in the initial study area and outside the study areas. These habitats also have a higher value as linkages for native fauna moving across the landscape.

Elsewhere, the native vegetation remnants within the gaps study area are of low value as fauna habitat due to degradation, including poor or absent native understory, presence of weeds, presence of feral animals, narrowness of the existing habitat, fragmentation and isolation from other areas of native vegetation by cleared or highly degraded areas and the lack of native vegetation in the surrounding agricultural landscape.

The cleared areas, pasture, and non-native revegetation woodlands that are widespread within the gaps study area offer little habitat value to fauna due to their lack of suitable vegetation cover or foraging habitat or flora species.



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Project No	1121
Date	25-Jan-17
Drawn by	KW
Map author	KC

0 50 100 200 300
Metres

1:10,000 (at A4) GDA 1994 MGA Zone 50

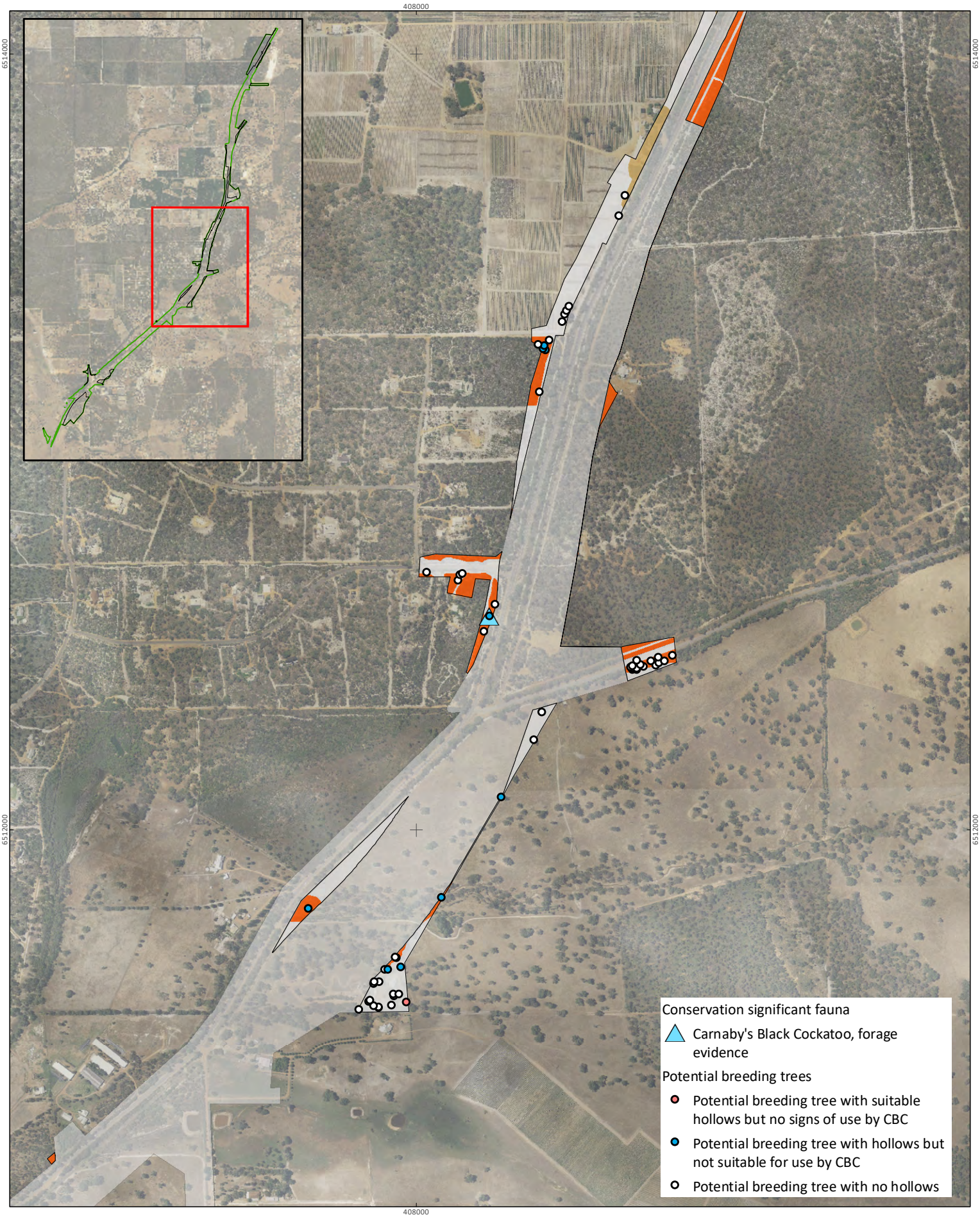
Gaps study area
Initial study area

Fauna habitat
Cleared (agriculture, road, infrastructure)
Cleared and revegetated non-native woodland mosaic
Woodland (Jarrah, Marri, Wandoo and/or banksia)

Figure 3-7a

Fauna habitats, conservation significant fauna and Carnaby's Black Cockatoo potential breeding trees

PHOENIX ENVIRONMENTAL SCIENCES



Jacobs

Flora and fauna assessment for the Muchea North study area – Report Addendum.

Project No	1121
Date	25-Jan-17
Drawn by	KW
Map author	KC

0 50 100 200 300 400
Metres

1:12,500 (at A4) GDA 1994 MGA Zone 50

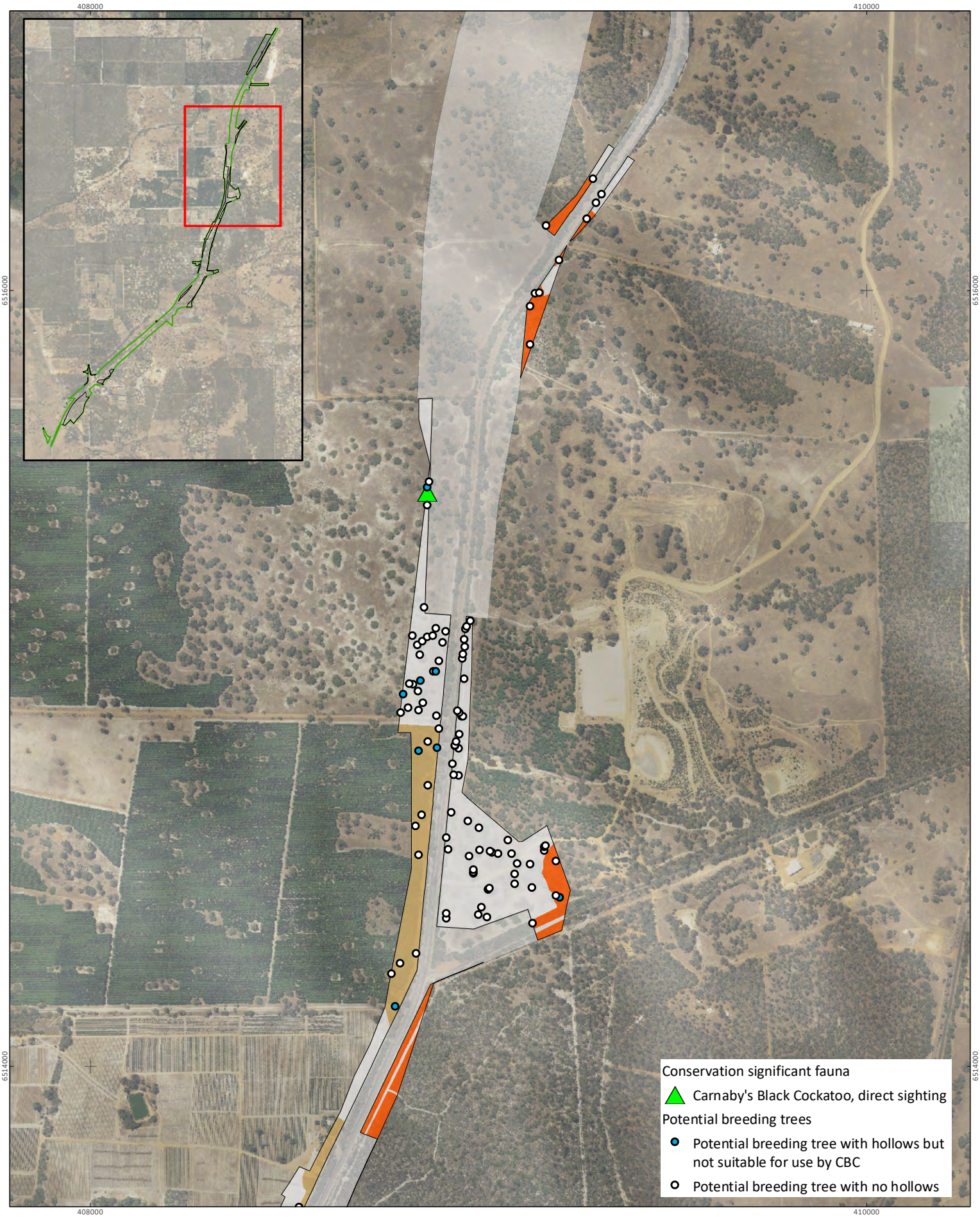
Gaps study area
Initial study area

Fauna habitat
Cleared (agriculture, road, infrastructure)
Cleared and revegetated non-native woodland mosaic
Woodland (Jarrah, Marri, Wandoo and/or banksia)

Figure 3-7b

Fauna habitats, conservation significant fauna and Carnaby's Black Cockatoo potential breeding trees

PHOENIX ENVIRONMENTAL SCIENCES



Jacobs

Flora and fauna assessment for the Muchea North study area – Report Addendum.

Project No	1121
Date	25-Jan-17
Drawn by	KW
Map author	KC

0 50 100 200 300 400
Metres

1:12,500 (at A4) GDA 1994 MGA Zone 50

P:\GIS Data\Projects\GNH\1121-GNH-JA-ECO\ARCGIS MXDs\MINAddendum\1121_Fauna_C_KW_20170110.mxd

Gaps study area

Initial study area

Fauna habitat

Cleared (agriculture, road, infrastructure)

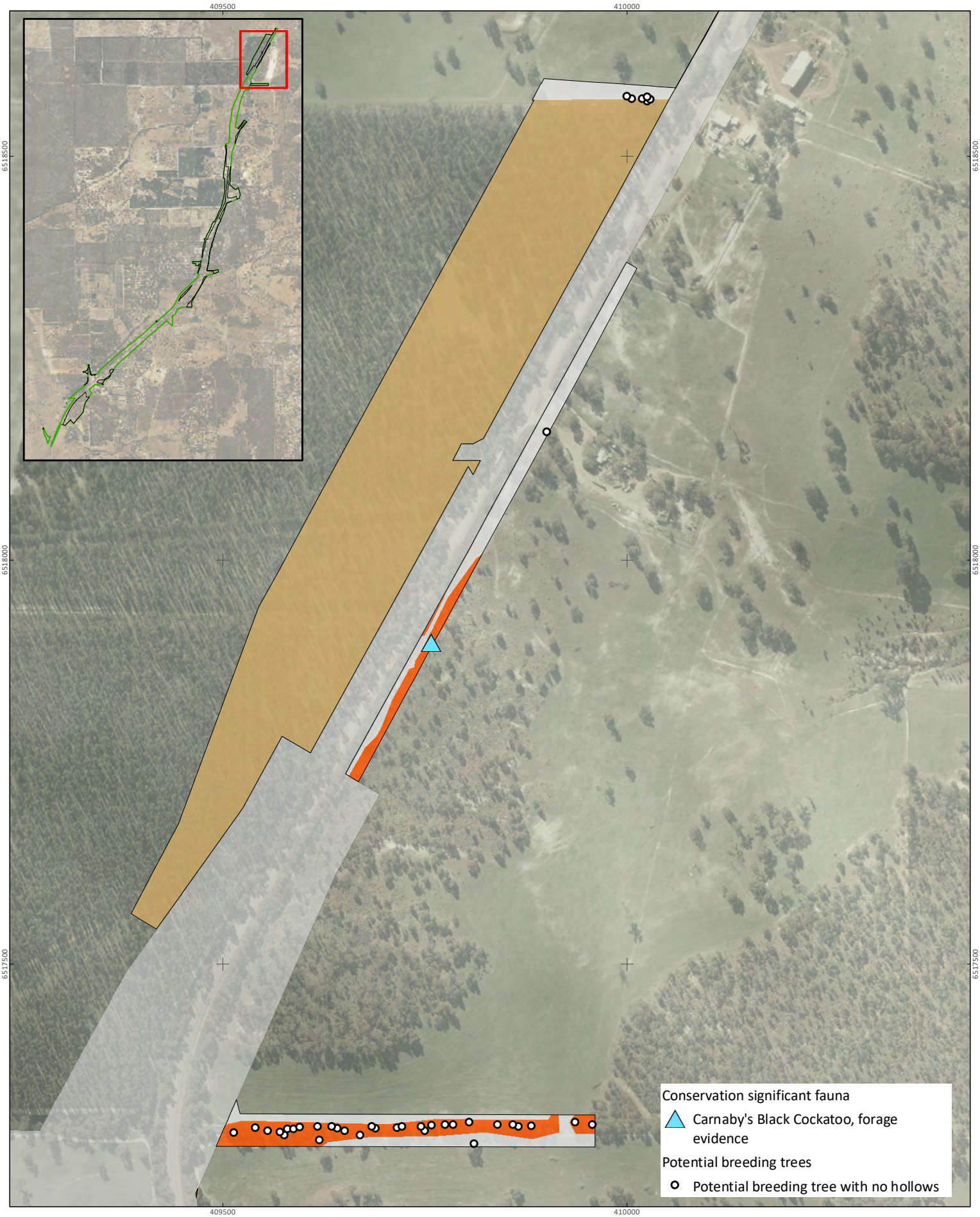
Cleared and revegetated non-native woodland mosaic

Woodland (Jarrah, Marri, Wandoo and/or banksia)

Figure 3-7c

Fauna habitats, conservation significant fauna and Carnaby's Black Cockatoo potential breeding trees

PHOENIX ENVIRONMENTAL SCIENCES



Jacobs

Flora and fauna assessment for the Muchea North study area – Report Addendum.

Project No	1121
Date	25-Jan-17
Drawn by	KW
Map author	KC

0 25 50 100 150 200
Metres

1:6,000 (at A4) GDA 1994 MGA Zone 50

Gaps study area
Initial study area

Fauna habitat
Cleared (agriculture, road, infrastructure)
Cleared and revegetated non-native woodland mosaic
Woodland (Jarrah, Marri, Wandoo and/or banksia)

Figure 3-7d

Fauna habitats, conservation significant fauna and Carnaby's Black Cockatoo potential breeding trees

PHOENIX ENVIRONMENTAL SCIENCES

3.3.2 Conservation significant fauna

One conservation significant species was recorded within the gaps study area during the survey, Carnaby's Black Cockatoo. The species was recorded on numerous occasions from direct observation and secondary evidence (foraging evidence; Figure 3-7). Carnaby's Black Cockatoos were seen during the surveys as single birds, in pairs and in groups of up to 22 (Table 3-12). Not all observations of feeding residues and birds were documented, therefore the records here are an underestimate of Carnaby's Black Cockatoo observations during the surveys.

Table 3-12 Conservation significant fauna recorded in the gaps study area

Species	Number of individuals	Latitude	Longitude	Record type[1]	Comments
Calyptorhynchus latirostris (Carnaby's Black Cockatoo) Endangered (EPBC and WC Act)		-31.470179	116.050045	Forage evidence	*Banksia* sp. chewings
	2	-31.548282	116.000598	Direct observation	Pair roosting in tree
	2	-31.548441	116.000325	Direct observation	Pair nesting in tree
	2	-31.548337	116.000196	Direct observation	Pair prospecting hollow
	2	-31.548420	116.000022	Direct observation	Pair at hollow, chick heard inside hollow
		-31.518300	116.033027	Forage evidence	*Banksia attenuata* chewings
	22	-31.548284	116.000597	Direct observation	Perched in tree
	1	-31.491931	116.040458	Direct observation	*Banksia menziesii* chewings
	2	-31.548432	116.000037	Direct observation	Pair roosting in tree
		-31.54242	116.008813	Forage evidence	*Banksia attenuata* chewings
		-31.542582	116.008706	Forage evidence	*Banksia attenuata* chewings
	1	-31.548052	116.001063	Direct observation	Pair at nest hollow

An assessment of the likelihood of occurrence of all potential conservation significant species identified in the desktop review as part of earlier surveys by Phoenix (2015) was undertaken based on current known distribution, habitat preferences, proximity of previous records to the study area identified in the desktop review and habitats present. Distribution and habitat preferences for each of these species are provided in Table 5-17 of Phoenix (2015).

Up to 14 conservation significant species may occur, within the gaps study area (Table 3-13) based on habitats present and current known species distributions, as indicated by NatureMap records (DPaW 2016b). Some species may occur in the larger areas of remnant vegetation adjacent to the gaps study area where suitable habitat is present, particularly where connectivity to larger areas of native vegetation is available, or where species have ability to migrate across larger areas of sub-optimal habitat.

Table 3-13 Conservation significant fauna likelihood of occurrence assessment in gaps study area

Species	Likelihood of occurrence *
Invertebrates	
Leioproctus contrarius (Bee) Priority 3 (DPaW)	Possible – species of Goodeniaceae the species is associated with have been recorded in the gaps study area and previously in the initial study area (Phoenix 2015). Previously recorded approximately 10 km south of the gaps study area (DPaW 2017b).
Idiosoma nigrum (Shield-back Trapdoor Spider) Vulnerable (EPBC and WC Act)	Unlikely – study area south of known distribution.
Throscodectes xederoides (Mogumber Bush Cricket) Priority 3 (DPaW)	Unlikely – suitable habitat not present (white sands).
Reptiles	
Pseudemydura umbrina (Western Swamp Tortoise) Critially Endangered (EPBC and WC Act)	Unlikely – study area north of known distribution; habitat not present (freshwater wetlands).
Egernia stokesii badia (Western Spiny-tailed Skink) Endangered (EPBC Act), Vulnerable (WC Act)	Unlikely – study area outside of current known distribution; habitat unsuitable (too degraded and fragmented).
Aspidites ramsayi (Woma Python) Priority 1 (DPaW)	Unlikely – study area outside of the known distributon of the species.
Neelaps calonotus (Black-striped Snake) Priority 3 (DPaW)	Possible – may occur in shrubland habitat where suitable sandy substrates are present. Previously recorded approximately 4 km southwest of the gaps study area (DPaW 2017b).
Birds	
Leipoa ocellata (Malleefowl) Vulnerable (EPBC and WC Act)	Unlikely – habitat unsuitable (too degraded and fragmented).
Oxyura australis (Blue-billed Duck) Priority 4 (DPaW)	Unlikely – suitable habitat not present (wetlands).
Apus pacificus (Fork-tailed Swift) Migratory (EPBC and WC Act)	Possible – may forage in the airspace above the gaps study area but unlikely to land or nest. Previously recorded approximately 25 km west-southwest of the gaps study area (DPaW 2017b).
Botaurus poiciloptilus (Australasian Bittern) Endangered (EPBC and WC Act)	Unlikely – suitable habitat present (wetlands).
Ardea modesta (Eastern Great Egret) Migratory (EPBC and WC Act)	Unlikely – suitable habitat not present (streams and waterbodies).
Ardea ibis (Cattle Egret) Migratory (EPBC and WC Act)	Possible – may occur in low lying areas following suitable rainfall. Previously recorded approximately 35 km southwest of the gaps study area (DPaW 2017b).
Plegadis falcinellus (Glossy Ibis) Migratory (EPBC and WC Act)	Possible – may occur in low lying areas following suitable rainfall. Previously recorded approximately 7 km west of the gaps study area (DPaW 2017b).
Falco peregrinus (Peregrine Falcon)	Likely – may forage in all habitats and nest in woodland habitats where suitable large eucalypts or tall infrastructure present

Species	Likelihood of occurrence *
Specially protected (WC Act)	throughout the gaps study area study area. Previously recorded approximately 2.5 km west of the gaps study area (DPaW 2017b).
Rostratula australis (Australian Painted Snipe) Endangered (EPBC and WC Act)	Unlikely – suitable habitat not present (shallow wetlands).
Tringa hypoleucos (Common Sandpiper) Migratory (EPBC and WC Act)	Unlikely – suitable habitat not present (shallow wetlands).
Gelochelidon nilotica (Gull-billed Tern) Migratory (EPBC and WC Act)	Unlikely – suitable habitat not present (coastal or wetlands).
Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo) Vulnerable (EPBC and WC Act)	Likely – may forage and roost in various most habitats but unlikely to breed within the gaps study area. Records exist in the vicinity of the gaps study area (DPaW 2017b) and DoEE have recently updated the species known distribution to northward through the study area.
Calyptorhynchus latirostris (Carnaby's Black Cockatoo) Endangered (EPBC and WC Act)	Recorded – recorded from multiple direct observations and secondary evidence records within the gaps study area (Table 3-12; Figure 3-7) and in adjacent areas during previous surveys. Likely to occur throughout most of the gaps study area to forage and/or roost where suitable hollow bearing trees and foraging species present. Breeding may occur where suitable hollow bearing trees are present. Previously recorded within and multiple times within 1 km of the gaps study area (DPaW 2017b).
Calyptorhynchus baudinii (Baudin's Black Cockatoo) Vulnerable (EPBC Act) and Endangered (WC Act)	Possible – gaps study area north of modelled distribution (DSEWPaC 2012); however, a few (potentially unreliable) NatureMap records occur as far north as New Norcia (DPaW 2017b). May occasionally forage but unlikely to breed or roost in the southern portion of the gaps study area, unlikely to occur in the northern portion. Previously recorded approximately 6 km north of the gaps study area (DPaW 2017b).
Ninox connivens connivens (Barking Owl) Priority 2 (DPaW)	Possible – may occur in woodland habitat throught the gaps study area to forage and may nest in habitat where suitable hollows present. Previously recorded approximately 20 km southeast of the gaps study area (DPaW 2017b).
Merops ornatus (Rainbow Bee-eater) Migratory (EPBC and WC Act)	Likely – May occur in, or fly over, most habitats, including shrubland and woodland habitats as well as disturbed areas throughout the gaps study area to forage and may nest where suitable sandy substrates present. Previously recorded within 1 km of the gaps study area (DPaW 2017b).
Mammals	
Dasyurus geoffroii (Western Quoll) Vulnerable (EPBC and WC Act)	Possible – may occur in woodland and forest habitat where suitable cover present but limited and patchy, often heavily degraded and/or fragmented in most areas. Previously recorded within 3 km west of the gaps study area and near Bindoon (DPaW 2017b).
Parantechinus apicalis (Dibbler) Endangered (EPBC and WC Act)	Unlikely – gaps study area north of known current distribution; habitat unsuitable (too degraded and fragmented).
Isoodon obesulus fusciventer (Southern Brown Bandicoot) Priority 4 (DPaW)	Possible – may to occur in woodland and shrubland habitats of the gaps study area where suitable understory present. Previously recorded within 1 km of the gaps study area (DPaW

Species	Likelihood of occurrence *
	2017b).
Macropus irma (Western Brush Wallaby) Priority 4 (DPaW)	Possible – may occur in woodland or shrubland habitats. A single individual was observed in woodland habitat approximately 2 km east of the study area during the spring targeted orchid surveys. It has also previously been recorded approximately 12 km east of the gaps study area (DPaW 2017b).
Petrogale lateralis lateralis (Black-flanked Rock-wallaby) Vulnerable (EPBC Act) and Endangered (WC Act)	Unlikely – suitable habitat not present (rocky outcrops).
Leporillus conditor (Greater Stick-nest Rat) Vulnerable (EPBC Act) and Conservation Dependent (WC Act)	Unlikely – confined to a few localities all well outside the gaps study area; suitable habitat not present (arid semi-arid shrubland).

* See Phoenix (2015)Table 5-17 for full description of species distribution and habitat preferences.

3.3.3 Survey of black cockatoo species

A total of 338 potential Carnaby's Black Cockatoo breeding trees were recorded in the gaps study area (Table 3-14; Figure 3-7; Appendix 5). Potential breeding tree records were dominated by *Corymbia calophylla* (48.5%), followed by *Eucalyptus marginata* (25.1%) and *E. wandoo* (18.3%) with the remaining 8.1% consisted of *E. accedens*, *E. rudis* and trees where species identification could not be confirmed (*Eucalyptus* sp.).

Table 3-14 Summary of potential Carnaby's Black Cockatoo breeding trees recorded in gaps study area, by work package

Total number of trees	Total number of trees	With hollows	Potential hollows	Suitable hollows	Evidence of use	Hollow usage not assessed	Bees present in holows
Corymbia calophylla	164	7	0	2	0	0	0
Eucalyptus accedens	8	0	0	0	0	0	0
Eucalyptus marginata	85	18	0	2	0	0	1
Eucalyptus rudis	4	0	0	0	0	0	0
Eucalyptus wandoo	62	21	0	12	7	0	0
Eucalyptus sp. (dead, introduced or unknown)	15	2	0	1	0	0	0
Total	**338**	**48**	**0**	**17**	**7**	**0**	**1**

Of the potential breeding trees recorded, 48 had visible hollows, and 17 of these were confirmed by Tony Kirkby as having hollows suitable for current breeding by Carnaby's Black Cockatoo, including seven which showed signs of current or recent use by the species (Table 3-14; Appendix 5):

- HT06348 (-31.5482, 116.0017), *Eucalyptus wandoo*, hollow with well chewed entrance.
- HT12761 (-31.5480, 116.0010), *Eucalyptus wandoo,* pair of Carnaby's Black Cockatoo at nest hollow.
- HT12762 (-31.5483, 116.0006), *Eucalyptus wandoo*, hollow at 10 m, pair of Carnaby's Black Cockatoo above nest hollow.

- HT12763 (-31.5484, 116.0003), *Eucalyptus wandoo*, hollow at 10 m, pair of Carnaby's Black Cockatoo at hollow.
- HT12765 (-31.5483, 116.0002), *Eucalyptus wandoo*, hollow at 7 m, pair of Carnaby's Black Cockatoo prospecting hollow.
- HT12767 (-31.5484, 116.0000), *Eucalyptus wandoo*, pair of Carnaby's Black Cockatoo at hollow and chick heard.
- HT14749 (-31.5484, 116.0000), *Eucalyptus wandoo*, Carnaby's Black Cockatoo pair at hollow and chick heard.

Breeding and roosting tree species were recorded in some of the sampled vegetation quadrats in the gaps study area (Table 3-15).

Approximately 64.25 ha of breeding habitat for Carnaby's Black Cockatoo was mapped in the gaps study area, of which 21.76 ha was located within remnant native vegetation. The remainder consisted of trees recorded in cleared pastures and revegetated areas. In total, 204 (60.4%) of the 338 potential breeding trees were present within the mapped areas with the remainder recorded in cleared pastures and revegetated areas.

Foraging habitat for Carnaby's Black Cockatoo was recorded in the gaps study area. Known food species were recorded in all four of the sampled vegetation quadrats (Table 3-15) as well as quadrats in the vicinity of the gaps study area previously sampled in the initial study area (Phoenix 2015). Abundant foraging evidence was recorded within the gaps study area (not all observations were recorded on GPS), particularly in areas of remnant vegetation containing *Banksia attenuata*, *B. menziesii* and Marri. This finding was supported by the spatial analysis of foraging habitat which classified 19.33 ha as quality value foraging habitat and a further 24.39 ha of low value foraging habitat.

Forest Red-tailed Black Cockatoos are seldom recorded near the gaps study area; however, as there are some desktop records from the area, potential foraging habitat was identified in areas where their main food preference (Jarrah and Marri seed) was present in the existing remnant vegetation. Spatial analysis identified 47.9 ha of potential foraging habitat for Forest Red-tailed Black Cockatoo throughout the gaps study area.

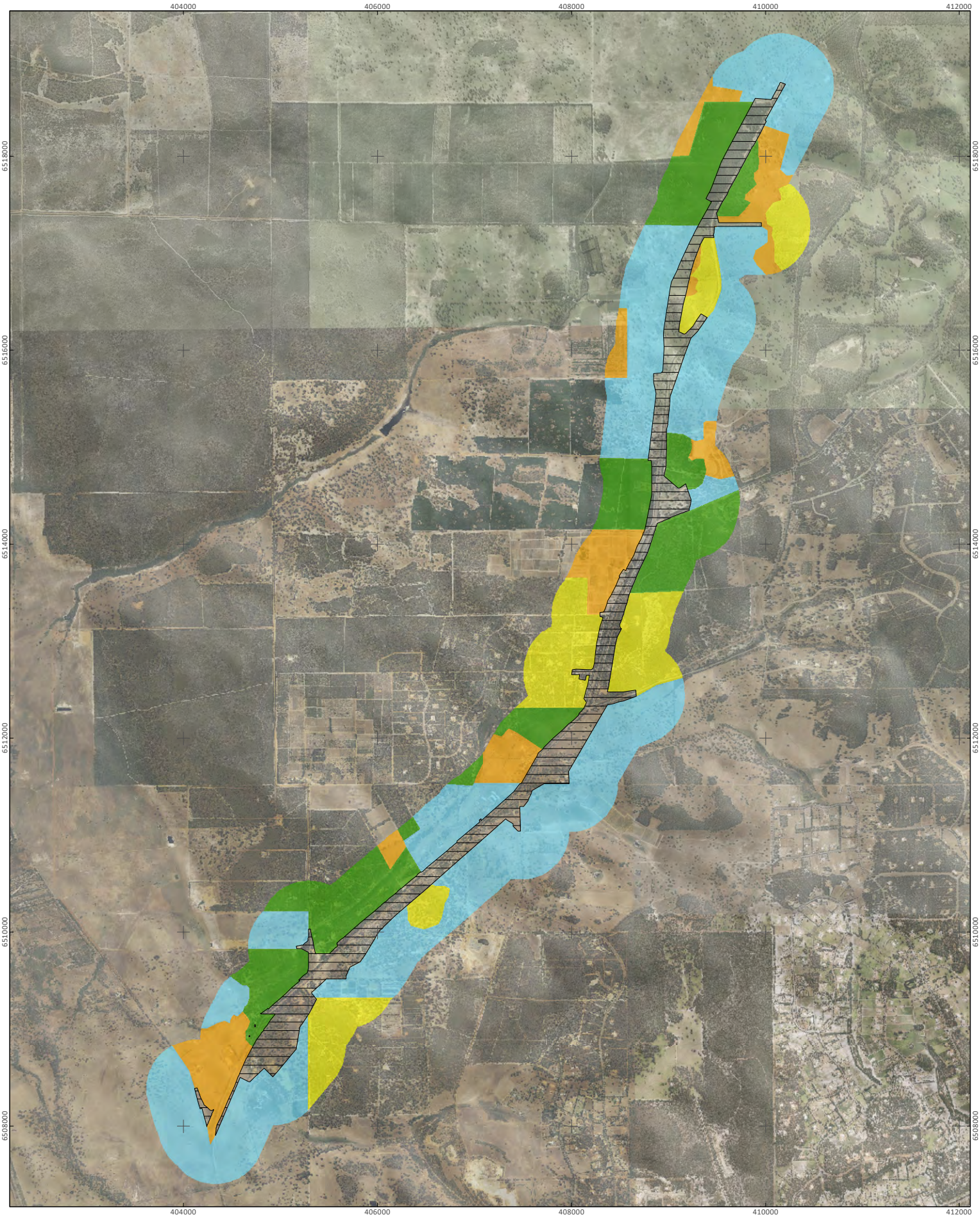
Table 3-15 Plant species of relevance to Carnaby's Black Cockatoo recorded in quadrats in the gaps study area (based on DEC 2011)

Taxon	Food plant	Nesting	Roosting	MN16001	MN16003	MN16005	MN16008
Banksia attenuata	•					✓ 20%	
Banksia menziesii	•					✓ 25%	
Corymbia calophylla	•	•	•	✓ 30%			✓ 5%
Eucalyptus marginata	•	•?		✓ 1%	✓ 5%	✓ 10%	
Eucalyptus rudis	•	•	•		✓ 5%		
Hakea lissocarpha	•			✓ 0.10%			
**Pinus radiata*	•		•				✓ 1%
Xanthorrhoea preissii	•			✓ 10%		✓ 15%	
Total species				**4**	**1**	**4**	**2**

3.3.1 Extrapolation of Carnaby's Black Cockatoo habitat

Extrapolation of Carnaby's Black Cockatoo habitat identified that up to 1,345 ha of potential foraging and/or breeding habitat may be present in the Carnaby's habitat extrapolation study area (Figure 3-8). This includes up to 575 ha of potential foraging habitat and up to 1,010 ha of potential breeding habitat. Up to 429.28 ha was identified as potentially containing quality foraging habitat due to the presence and abundance of high value foraging species including Marri, Jarrah, *Banksia* and *Pinus* species. The remaining 146.10 ha was classified as low value foraging habitat.

It is emphasised that the extrapolated habitat mapping should be considered tentative and detailed field surveys are required to accurately confirm extent of each habitat type for Carnaby's Black Cockatoo in this broader area.



Jacobs

Flora and fauna assessment for the Muchea North study area – Report Addendum.

Project No	1121
Date	24-Jan-17
Drawn by	KW
Map author	KC

0 500 1,000 2,000

Metres

1:50,000 (at A4) GDA 1994 MGA Zone 50

Muchea North EPBC Act approval boundary

Extrapolated habitat

- Potential foraging
- Potential breeding and foraging
- Potential foraging and breeding
- Cleared

Figure 3-8

Extrapolated Carnaby's Black Cockatoo potential habitat

PHOENIX ENVIRONMENTAL SCIENCES

4 DISCUSSION

4.1 FLORA AND VEGETATION

The initial flora and vegetation assessment for Muchea North identified a number of significant records, including seven conservation significant flora (*Darwinia foetida* CE, *Stylidium squamellosum* P2, *Acacia drummondii* subsp. *affinis* P3, *Haemodorum loratum* P3, *Verticordia serrata* var. *linearis* P3, *Eucalyptus caesia* P4, and *Verticordia lindleyi* subsp*. lindleyi* P4) and locally significant vegetation (Phoenix 2015).

The current assessment identified additional values for Muchea North. This included new populations of the previously recorded Priority 3 species *Acacia drummondii* subsp. *affinis*, a single location of the Priority 4 species *Anigozanthos humilis* subsp. *chrysanthus* and patches of remnant vegetation representing the EPBC Act-listed TEC *Banksia* Woodlands of the Swan Coastal Plain.

The 260 individuals of *Acacia drummondii* subsp. *affinis* recorded from 75 locations in both the gaps study area and the initial study area supplement 99 previous records from the initial surveys (Phoenix 2015). The large number of records indicate that the species is relatively abundant in the area and it is likely that additional plants/populations of the species occur outside of the study area in adjacent vegetation.

Acacia drummondii subsp. *affinis* is known from 54 records extending from north of Perth to south of Bunbury (DPaW 2017b) within the Avon Wheatbelt, Jarrah Forest and Swan Coastal Plain bioregions (DPaW 2017a). The populations identified within the study area therefore likely represent a small proportion of the overall population of the species.

Anigozanthos humilis subsp. *chrysanthus* is known from 117 records (DPaW 2017b) within the Avon Wheatbelt, Geraldton Sandplain, Jarrah Forest and Swan Coastal Plain bioregions (DPaW 2017a). The closest of these records occur more than 25 km north and 20 km south of the population within the study area. The population in the study area may be considered locally significant as it represents a disjunct population of the species.

The two EPBC Act-listed orchid species subject to transect searches during the survey, *Thelymitra stellata* and *Drakaea elastica*, were not recorded in the initial study area or gaps study area. In the absence of an approved recovery plan for *T. stellata* there is no clear definition of habitat considered critical to survival of the species. Therefore, to determine the significance of the 13.9 ha of potential habitat mapped for *T. stellata* in the initial and gaps study areas, critical habitat definition from the approved recovery plan for *D. elastica* (DEC 2009) is adopted here for *T. stellata* and is defined as:

- the area of occupancy of important populations
- areas of similar habitat surrounding important populations as they provide potential habitat for natural range extensions and support viable populations of the associated mycorrhizal fungus and the pollinating wasp species crucial to the orchid's survival
- additional occurrences of similar habitat that may contain important populations of the species or be suitable sites for future translocations.

In relation to the above definition of critical habitat, key findings from the current survey for *Thelymitra stellata* are:

- the initial and gaps study areas do not intersect the area of occupancy of any known (therefore any important) populations of *T. stellata*
- no potential habitat mapped in the initial or gaps study areas is adjacent to, or surrounding, any important populations of *T. stellata*; the nearest mapped area of similar habitat

surrounding an important population (i.e. the Blue Plains Road population) is located 1.7 km south of this population

- similar habitat to that of the Blue Plains Road population was identified in the the initial study area and gaps study area; however, *T. stellata* was not detected in this habitat in the survey
- none of the mapped potential habitat is considered suitable for translocation due to the small and isolated nature of the habitat patches.

In relation to the above definition of critical habitat, key findings of this survey for *Drakaea elastica* are:

- the study area does not intersect the area of occupancy of any known (therefore any important) populations of *D. elastica*
- the 18.4 ha of potential habitat for *D. elastica* mapped within the study area is not adjacent to, or surrounding, any important populations of the species
- potential habitat was identified in the study area; however, *D. elastica* was not detected in this habitat in the survey
- none of the mapped potential habitat is considered suitable for translocation.

Taking the above findings into account, none of the potential habitat mapped for *Thelymitra stellata* or *Drakaea elastica* in the initial and gaps study areas was considered habitat critical to the species' survival.

At the request of the client, comment is provided here regarding likelihood of occurrence in the gaps study area of three Threatened Flora from the desktop review that were not recorded during targeted searches in the current survey: *Darwinia foetida* (CE under the EPBC Act), *Chamelaucium* sp*. Gingin* (EN under the EPBC Act) and *Grevillea corrugata* (EN under the EPBC Act).

Darwinia foetida is a tangled, domed shrub growing to 0.6 m high with green flowers and flowering period from October to November (DSEWPaC 2009). It is known from swampy, seasonally wet habitat in the Muchea area. The species was recorded at two locations in the initial surveys, one population in a degraded area heavily infested with weeds within the initial study area, and the other in a rehabilitated area south of the current study areas (Phoenix 2015). It is considered unlikely *Darwinia foetida* is present in the gaps study area as additional plants would have been readily detected in the targeted surveys due to its distinct form and because the targeted searches were conducted at an optimal sampling period for the species.

Chamelaucium sp*. Gingin* is an open straggly shrub 1–2 m tall with many slender, stiff branches that bear numerous 5–20 mm long axillary shoots, erect bright green leaves, clusters of up to 20 pale pinkish-white flowers at the end of main branches and flowering in September to December (TSSC 2016). The species is is confined to a range of only 3 km in the Gingin/Chittering area (Stack & English 2003) and occurs on white/yellow sand supporting open low woodland with *Eucalyptus todtiana*, *Banksia attenuata* and *Hibbertia* sp. (TSSC 2016). It is considered unlikely *Chamelaucium* sp*. Gingin* is present in the gaps study area as it would have been readily detected in the targeted surveys.

Grevillea corrugata is a shrub growing to 2.5 m tall and 2 m wide, with white flowers and flowering period in August to September (DPaW 2017a; DSEWPaC 2013). The species grows in gravelly loam on roadside in partially cleared *Eucalyptus* woodland and is known from only two locations, approximately 10 km south of Bindoon (DSEWPaC 2013). It is considered unlikely *Chamelaucium* sp*. Gingin* is present in the gaps study area as it would have been readily detected in the targeted surveys.

Remnant native vegetation covers 24.34 (31.71%) of the gaps study area and was generally similar to that of the initial study area, representing low to mid woodlands and forest, and shrublands. Of 13 vegetation associations mapped in the gaps study area, only one new association was recorded that was not mapped in the initial study area, vegetation association 1182 Medium woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla*. The most dominant association was Medium woodland; Jarrah, Marri and Wandoo (association 4) which accounted for 16.75% (12.72 ha) of the gaps study area, significantly increasing its representation within the combined initial and gaps study areas. The condition of remnant native vegetation across the gaps study area ranged from Degraded to Pristine.

Four patches of the EPBC Act-listed TEC *Banksia* Woodland of the Swan Coastal Plain were identified within *Banksia* woodland vegetation associations in the initial study and gaps study areas. Conservation advice for the species (Threatened Species Scientific Committee 2016) indicates that high conservation value, unmodified and older growth areas are particularly important for retention and management. One of the patches (TEC03) contains one conservation significant species and is the largest (8.82 ha) patch recorded. TEC04 is smaller by <1 ha (8.03 ha) and both are double the size of TEC01 (4.02 ha) and TEC02 (3.71 ha).

Patch size distribution indicates the TEC currently has a highly fragmented geographic distribution with most patches (about 82%) less than 10 ha in size and facing demonstrable threats (Threatened Species Scientific Committee 2016). The median patch size has reduced from an estimated pre-European average area of 146 ha to a current size of only 1.6 ha. In this context, the patches mapped in the study area are two to four times the size of the average current known patch size. Land use surrounding the smaller two patches (TEC01 and TEC02) is more disturbed and they are both less connected to extant vegetation making them more fragmented than TEC03 and TEC04. In the context of the conservation advice (Threatened Species Scientific Committee 2016) and extent of the study area, TEC03 and TEC04 are considered to be of greater value than the smaller more fragmented patches TEC01 and TEC02.

Five vegetation associations within the gaps study area (4, 992, 999, 1008 and 1182) may be considered regionally conservation significant as they represent vulnerable communities with less than 30% of pre- European extent remaining (**ha** and **%** in bold refer to combined values for the initial and gaps study area)(Phoenix 2015):

- total area of vegetation association 4 within the study area is 12.72 ha (**18.22 ha**) which represents 0.004% (**0.006%**) of the total area of vegetation type 4 remaining (293,917)
- total area of vegetation association 992 within the study area is 0.01 ha (**5.31 ha**) which represents 0.00003% (**0.017%**) of the total area of vegetation type 992 remaining (31,780 ha)
- total area of vegetation association 999 within the study area is 0.001 ha (**10.00 ha**) which represents 0.001% (**0.077%**) of the total area of vegetation type 999 remaining (13,035 ha)
- total area of vegetation association 1008 within the study area is 0.03 ha (**6.11 ha**) which represents 0.003% (**0.534%**) of the total area of vegetation type 1008 remaining (1,145 ha)
- total area of vegetation association 1182 within the study area is **0.49 ha** which represents 0.008% of the total area of vegetation type 1182 remaining (6,154 ha).

Eight vegetation associations within the gaps study area (4, 23, 949, 968, 999, 1003 and1182) may be considered locally significant as they represent habitat for Priority Flora, contain one or more quadrats that align with a TEC and/or were recorded to be in excellent or pristine condition and therefore are considered to represent patches of comparatively high native species diversity surrounded by highly impacted vegetation.

Of 61 plant taxa recorded in the survey, 19 represent new species collections for the Muchea North surveys. The most prominent families (Myrtaceae, Fabaceae, Proteaceae and Poaceae) also had the highest species representation in surveys of the initial study area (Phoenix 2015). A higher proportion of the recorded plant taxa from the current survey were introduced species (33% in the gaps study area compared with 19% in the initial study area). This is likely due to the smaller proportion of vegetation in Excellent to Pristine condition in the gaps study area (approximately 3.8%) compared to the initial study area (approximately 10.2%) with a subsequent higher proportion of vegetation in very good to degraded condition which invariably indicates the presence of more weed species.

The survey identified the presence of three declared pests in the gaps study area (**Asparagus asparagoides* (also a WoNS), **Moraea flaccida* and **Zantedeschia aethiopica*) that will require management, including two (**M. flaccida* and **Z. aethiopica*) which were not previously recorded in the initial study area.

4.1 FAUNA AND FAUNA HABITAT

No new fauna values were identified in the gaps study area in addition to those already identified in previous surveys of the initial study area (Phoenix 2015).

Records from the current survey extended the extent of breeding and foraging habitat for Carnaby's Black Cockatoo at Muchea North into parts of the gaps study area. This included records of seven nesting trees that were confirmed with evidence of current or recent use by the species, an additional 10 potential breeding trees with hollows suitable for breeding and 19.33 ha mapped as quality foraging habitat. The results reinforce the findings from the initial surveys that part of the Muchea North area is an important for the local breeding population of Carnaby's Black Cockatoo, particularly due to the high number of potential breeding trees and area of high quality foraging habitat within and in the vicinity of the Muchea North EPBC Act approval boundary. Of particular importance is habitat within Road Reserve 40350 as it contains an unusually high density of suitable Carnaby's Black Cockatoo breeding hollows and is likely to be of significant value to the species at present and into the future.

Although Forest Red-tailed Black Cockatoos have been sighted in the Muchea North area in the past few years it is unlikely, although possible, they are breeding there. If this is the case then the numbers would be extremely low. No Red-tailed Black Cockatoos were seen or heard and no feeding residues from this species were noted during the either the initial or current surveys for Muchea North. The survey methods employed for locating Carnaby's Black Cockatoo records also apply to Forest Red-tailed Black Cockatoo, therefore the survey results indicate the initial and gaps study areas are not currently an important area for Forest Red-tailed Black Cockatoos for either foraging or breeding.

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Appendix 1 Quadrat data

Site:	MN16001	**Type:**	Quadrat (10 m x 10 m)
Date(s):	18 October 2016	**Position:**	-31.550882, 115.998622
Total vegetation cover (%):	80	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	35	**Soil colour:**	brown
Shrub cover <2 m (%):	10	**Soil:**	sandy loam
Grass cover (%):	10	**Rock type:**	none
Herb cover (%):	30	**Fire age:**	not evident
Disturbance details:	historic clearing, vehicle tracks, weed infestation,		
Vegetation condition:	Good, Keighery (1994)		
Vegetation description:	Mid *Corymbia calophylla* and*Eucalyptus marginata* woodland over mid open *Xanthorrhoea preissii* shrubland over low open **Avena barbata*, **Ehrharta calycina* and **Lolium rigidum* tussock grassland over low open **Trifolium campestre* forbland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Corymbia calophylla	30.0	12.00		
Trifolium campestre	20.0	00.50	*	
Xanthorrhoea preissii	10.0	01.50		
Lupinus cosentinii	05.0	07.00	*	
Lolium rigidum	04.0	00.50	*	
Chamaecytisus palmensis	03.0	03.00	*	
Avena barbata	03.0	00.40	*	
Ehrharta calycina	02.0	00.70	*	
Eucalyptus marginata	01.0	14.00		
Briza maxima	01.0	00.30	*	
Arctotheca calendula	01.0	00.20	*	
Hakea lissocarpha	00.1	01.00		
Asparagus asparagoides	00.1	00.40	*	

Site:	MN16003	**Type:**	Quadrat (10 m x 10 m)
Date(s):	05 October 2016	**Position:**	-31.545357, 116.00148
Total vegetation cover (%):	80	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	40	**Soil colour:**	grey, whitish, black
Shrub cover <2 m (%):	1	**Soil:**	sand, peat
Grass cover (%):	40	**Rock type:**	none
Herb cover (%):	5	**Fire age:**	not evident
Disturbance details:	weed infestation		
Vegetation condition:	Good, Keighery (1994)		
Vegetation description:	Low open *Eucalyptus marginata*, *E. rudis* and *Melaleuca rhaphiophylla* forest over isolated low *Acacia pulchella* shrubs over mid open **Avena barbata*, **Briza minor* and **Eragrostis curvula* tussock grassland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Melaleuca rhaphiophylla	30.0	06.00		
Avena barbata	30.0	00.50	*	
Eragrostis curvula	10.0	00.60	*	
Eucalyptus rudis	05.0	08.00		
Eucalyptus marginata	05.0	06.00		
Cyperus polystachyos	05.0	00.30	*	
Arctotheca calendula	02.0	00.20	*	
Gladiolus caryophyllaceus	01.0	02.00	*	
Juncus pallidus	01.0	01.50		
Acacia pulchella	01.0	01.50		
Sonchus oleraceus	01.0	00.70	*	
Briza minor	01.0	00.40	*	
Moraea flaccida	01.0	00.40	*	

Site:	MN16005	**Type:**	Quadrat (10 m x 10 m)
Date(s):	05 October 2016	**Position:**	-31.542326, 116.00865
Total vegetation cover (%):	65	**Topography:**	undulating plain
Tree/shrub cover >2 m (%):	50	**Soil colour:**	grey, whitish
Shrub cover <2 m (%):	15	**Soil:**	sand
Grass cover (%):	5	**Rock type:**	none
Herb cover (%):	3	**Fire age:**	>5 years
Disturbance details:	grazing – low, weed infestation		
Vegetation condition:	Excellent, Keighery (1994)		
Vegetation description:	Low open *Banksia attenuata* , *B. menziesii* and *Eucalyptus marginata* forest over low open *Xanthorrhoea preissii* shrubland over low sparse *Mesomelaena pseudostygia* sedgeland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Banksia menziesii	25.0	05.00		
Banksia attenuata	20.0	05.00		
Xanthorrhoea preissii	15.0	00.90		
Eucalyptus marginata	10.0	07.00		
Mesomelaena pseudostygia	05.0	00.50		
Taxandria linearifolia	02.0	00.30		
Rhodanthe citrina	02.0	00.10		
Adenanthos cygnorum	01.0	02.20		
Anigozanthos humilis	01.0	00.20		
Macarthuria australis	01.0	00.10		
Caladenia flava	01.0	00.05		
Burchardia congesta	00.1	00.40		
Stylidium sp. Bindoon (K.F. Kenneally 11405)	00.1	00.20		
Briza maxima	00.1	00.20	*	
Hibbertia huegelii	00.1	00.20		
Drosera erythrorhiza	00.1	00.01		

Site:	MN16008	**Type:**	Quadrat (10 m x 10 m)
Date(s):	05 October 2016	**Position:**	-31.541252, 116.002561
Total vegetation cover (%):	100	**Topography:**	seasonally inundated
Tree/shrub cover >2 m (%):	90	**Soil colour:**	black
Shrub cover <2 m (%):	50	**Soil:**	sand, peat
Grass cover (%):	5	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	>5 years
Disturbance details:	historic clearing, weed infestation		
Vegetation condition:	Good, Keighery (1994)		
Vegetation description:	Mid open *Corymbia calophylla* woodland over low *Melaleuca rhaphiophylla* forest over over mid *Taxandria linearfiolia* shrubland over isolated low *Dielsia stenostachya* sedgeland.		

Species	Cover (%)	Height (m)	Weeds	Conservation status
Melaleuca rhaphiophylla	90.0	08.00		
Taxandria linearifolia	50.0	01.80		
Corymbia calophylla	05.0	12.00		
Dielsia stenostachya	05.0	00.30		
Pinus radiata	01.0	12.00	*	
Kunzea micrantha	01.0	01.50		
Asparagus asparagoides	01.0	00.20	*	

Appendix 2 Key to determining the presence of the EPBC Act lists TEC *Banksia* Woodlands of the Swan Coastal Plain

Summary of TEC: The *Banksia* Woodlands of the Swan Coastal Plain from the conservation advice, *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (s 266B) Approved Conservation Advice (incorporating listing advice) for the *Banksia* Woodlands of the Swan Coastal Plain ecological community. 26 August 2016

LISTING

EPBC list include the *Banksia* Woodlands of the Swan Coastal Plain ecological community in the **endangered category (Table 1)**. **Western Australia** recognises components of this ecological community as **threatened.** Other name: '*Banksia* Dominated Woodlands of the Swan Coastal Plain IBRA Region'

Table 1. Community listing at Australian Department of Environment and Energy (DEE) Species Profile and Threats Database (SPRAT)

SPRAT EPBC Act Listing Status	**Listed as Endangered**
Date Effective	16-Sep-16
Approved Conservation Advice	Threatened Species Scientific Committee (2016). Approved Conservation Advice (incorporating listing advice) for the *Banksia* Woodlands of the Swan Coastal Plain Ecological Community. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/131-conservation-advice.pdf. In effect under the EPBC Act from 16-Sep-2016.
Listing Advice	Listing assessment information may be available in the Approved Conservation Advice
Adopted/Made Recovery Plans	There is no adopted or made Recovery Plan for this ecological community
Adopted/Made Threat Abatement Plans	No Threat Abatement Plan has been identified as being relevant for this ecological community

DESCRIPTION OF THE ECOLOGICAL COMMUNITY

The ecological community is a woodland[1] associated with the Swan Coastal Plain of southwest Western Australia. **A key diagnostic feature is a prominent tree layer of *Banksia*, with scattered eucalypts and other tree species** often present among or emerging above the *Banksia* canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range.

National context. In Western Australia a number of floristic community types (FTP) are encompassed within the EPBC listed *Banksia* Woodlands TEC (**Table 2**). Some of the FTPs are highly restricted and listed as Threatened or Priority ecological communities. These should be provided

[1] The term 'woodland' has been chosen as the most typical structure, but the ecological community may also be considered to include examples of tall shrubland, open woodland or forest under some classification systems. The percentage canopy cover is more than 2% and typically less than 50%. The structure and appearance may also vary due to disturbance history. Similarly, component species of the dominant upper sclerophyllous layer may be variously considered 'tall or large shrubs' or 'small trees'.

specific or additional protection, particularly where assigned a higher threat rank than the *Banksia* Woodlands EPBC listing.

The EPBC listed endangered *Banksia* woodlands TEC includes three state listed TECs (**Table 2**), endorsed by the Western Australian Minister for the Environment.

Threaten Flora and Fauna. As at July 2016, 20 flora and 9 fauna species listed as threatened in Western Australia, are likely to occur in the ecological community. They include 16 nationally listed threatened plant species and 8 nationally listed threatened animal species (Appendix A).

Table 2: Floristic Community Types (FCT) with relationships to the *Banksia* Woodlands ecological community. *Source:* Gibson et al. (1994); Government of Western Australia, 2000; Keighery et al. (2008); Urban Bushland Council, 2011.

FCT	Floristic Community Type name	WA TEC	PEC
Supergroup 3 – Uplands centred on Bassendean Dunes and Dandaragan Plateau			
20a	*Banksia attenuata* woodlands over species rich dense shrublands	EN (WA)	
20b	Eastern *Banksia attenuata* and/or *Eucalyptus marginata woodlands*	EN (WA)	
*20c EN (EPBC)	Eastern shrublands and woodlands	CR (WA)	
21b	Southern *Banksia attenuata* woodlands		P3
21c	Low lying *Banksia attenuata* woodlands		P3
22	*Banksia ilicifolia* woodlands		P2
23a	Central *Banksia attenuata*		
23b	Northern *Banksia attenuata*		P3
23c	North-eastern *Banksia attenuata*		
S9	*Banksia attenuata* woodlands over dense low shrublands		
Supergroup 4 – Uplands centred on Spearwood and Quindalup Dunes			
24	Northern Spearwood shrublands and woodlands		P3
25	Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands		P3
28	Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands		
Whicher Scarp FCTs (Keighery et al., 2008)			
A1	Central Whicher Scarp Mountain Marri Woodland WHSFCT_A1 (Keighery et al., 2008 indicates *B. attenuata* is a dominant)		P1
A2	North Whicher Scarp Jarrah and Woody Pear woodland WHSFCT_A2 (Keighery et al., 2008 indicates *B. attenuata* is a dominant)		
A3	North Whicher Scarp *Banksia* and Woody Pear woodland WHSFCT_A3 (Keighery et al., 2008 indicates *B. attenuata* is a dominant)		
A4	Whicher Scarp *Banksia grandis*, Jarrah and Marri woodland WHSFCT_A4 (Keighery et al., 2008 indicates *B. attenuata* is a dominant)		
B1	Swan Coastal Plain /North Whicher Scarp *Banksia attenuata* woodland WHSFCT_B1 (Keighery et al., 2008 indicates *B. attenuata* is a dominant)		
B2	West Whicher Scarp *Banksia attenuata* woodland WHSFCT_B2 (Keighery et al., 2008 indicates *B. attenuata* is a dominant)		P1

C2	Whicher Scarp Jarrah woodland on deep coloured sands WHSFCT_C2 (Keighery et al., 2008, indicates *B. attenuata* is generally present and often dominant)		P1

LOCATION

The *Banksia* Woodlands ecological community is located in the southwest of Western Australia, largely restricted to the **Perth (SWA02)** and **Dandaragan (SWA01)** subregions **of the Swan Coastal Plain IBRA bioregion**, from around Jurien Bay in the north to Dunsborough in the south (**Figure 1**). The ecological community also extends into immediately adjacent areas on the Whicher and Darling escarpments (which lie within **JAF01 and JAF02 subregions of the Jarrah Forests IBRA bioregion**), to the south and east, where pockets of *Banksia* Woodlands may also occur (**Table 3**).

The *Banksia* Woodlands ecological community mainly occurs on deep Bassendean and Spearwood sands or occasionally on Quindalup sands, typically at the eastern edge. The community occurs within an annual rainfall band of approximately 535 to 900 mm on deep sands and 650 to 750 mm on lateritic sands. *Banksia* Woodlands typically occur on the tops and slopes of sand dunes, but do not occur on clay flats. Unusual examples of *Banksia* Woodlands occur on sandflats at some locations.

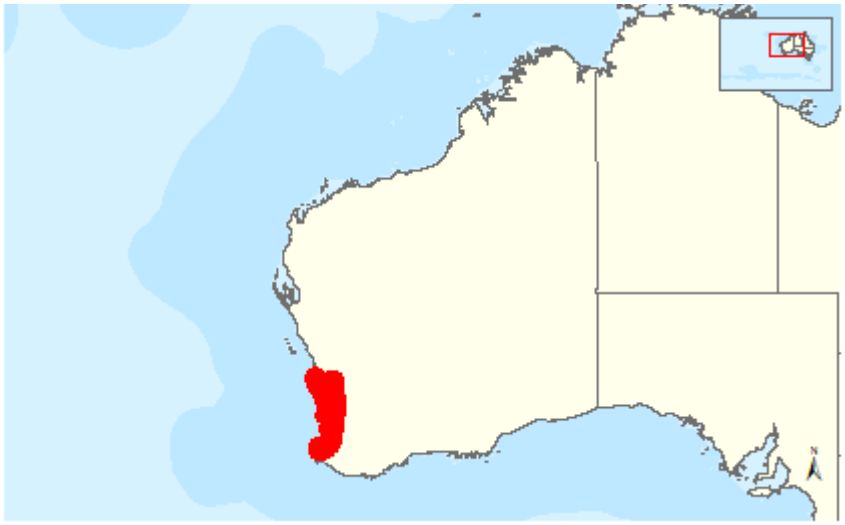

Figure 1. Extent of TEC

Table 3. Extent of *Banksia* Woodland TEC in WA

Subregion	Current extent (ha)	Extent in reserves (ha)	% protected
Dandaragan (SWA01)	81,067.80	24,671.20	30.43
Perth (SWA02)	253,540.60	57,054.90	22.5
Jarrah Forests (JAF01/02)	1,881.40	105.9	5.63
TOTAL	336,489.90	81,832.00	24.32

FLORA Structure

The **three** principal structural features of the ecological community are:

1. A distinctive upper sclerophyllous layer of low trees (occasionally large shrubs more than 2 m tall), typically **dominated or co-dominated** by one or more of the *Banksia* species **identified in Table 4**.

2. An emergent tree layer of medium or tall (>10 m height) *Eucalyptus* or *Allocasuarina* species may sometimes be present above the *Banksia* canopy.
3. An understory that consists of:

3.1 A layer of sclerophyllous shrubs of various heights often from the families Asteraceae, Dilleniaceae, Ericaceae, Fabaceae, Myrtaceae and Proteaceae (**Table 4**); and

3.2 A herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses often from the families Cyperaceae, Droseraceae, Haemodoraceae, Orchidaceae, Restionaceae and "lilies" from various families (**Table 4**). The development of a ground layer may vary depending on the density of the shrub layer and disturbance history.

Table 4: Species in the TEC.

TEC: Dominant or Co-dominant Species	**Co-dominant only (NOT TEC if dominant)**	**TEC: Emergent taller trees**	**Key species in shrub layer**	**Key species in herb layer**
Banksia attenuata (candlestick banksia, slender banksia)	*Banksia littoralis* (swamp banksia)	*Corymbia calophylla* (marri)	*Adenanthos cygnorum* (woolly bush), *Xanthorrhoea preissii* (balga)	*Amphipogon turbinatus* (tufted beard grass)
B. menziesii (firewood banksia)	*B. burdettii* (Burdett's banksia)	*Eucalyptus gomphocephala* (tuart)	*Allocasuarina humilis* (dwarf sheoak)	*Burchardia congesta* (milkmaids)
B. prionotes (acorn banksia)	*Eucalyptus todtiana* (blackbutt, pricklybark)	*E. marginata* (jarrah)	*Bossiaea eriocarpa* (common brown pea)	*Caladenia* spp. (spider orchids)
B. ilicifolia (holly-leaved banksia)	*Nuytsia floribunda* (Western Australian Christmas tree)		*Conostephium pendulum* (pearl flower)	*Dasypogon bromeliifolius* (pineapple bush)
	Allocasuarina fraseriana (western sheoak		*Daviesia* spp., *Eremaea pauciflora*,	*Desmocladus flexuosus*
	Callitris arenaria (sandplain cypress)		*Gompholobium tomentosum* (hairy yellow pea)	*Drosera erythrorhiza* (red ink sun dew)
	Callitris pyramidalis (swamp cypress)		*Hibbertia hypericoides* (yellow buttercups)	*Lepidosperma squamatum* (a tufted sedge) south coast of WA mainly
	Xylomelum occidentale (woody pear)		*Jacksonia* spp., *Kunzea glabrescens*	*Lomandra hermaphrodita*
			Petrophile linearis (pixie mops)	*Lyginia barbata* (southern rush)
			Philotheca spicata (pepper and salt)	*Lyginia imberbis*
			Stirlingia latifolia (blueboy),	*Mesomelaena pseudostygia* (semaphore sedge)
			Phlebocarya ciliata,	*Patersonia*

				occidentalis (purple flag)
			Hypolaena exsulca	*Podolepis* spp.
				Stylidium brunonianum (pink fountain trigger plant)
				Stylidium piliferum (common butterfly trigger plant)
				Trachymene pilosa (dwarf parsnip)
				Xanthosia huegelii (heath xanthosia).

DIAGNOSTICS FOR COMPLIANCE

For EPBC Act referral, assessment and compliance purposes, the national ecological community is limited to patches that meet the following key diagnostic characteristics, condition thresholds, and minimum patch sizes:

1. Use the key diagnostic characteristics to determine if the ecological community is present
2. Determine the condition of the patch using Keighery's Scale
3. Consider if the patch meets a minimum size threshold
4. Take into account the surrounding context of a patch (buffer zone).

A **patch** is a discrete and mostly continuous area of the ecological community. A patch may include small-scale (<30 m) variations, gaps and disturbances, such as tracks, paths or breaks (including exposed soil, leaf litter, cryptogams and watercourses/drainage lines), or localised **variations in vegetation** (types) that do not significantly alter the overall functionality of the ecological community. Such breaks are generally included in patch size calculations. Where there is a break in native vegetation cover, from the edge of the tree canopy of **30 m or more** (e.g. due to permanent artificial structures, wide roads or other barriers; or due to water bodies typically more than 30m wide) then the gap typically indicates that separate patches are present.

Changes in condition of vegetation across a patch should not be considered to be evidence of multiple patches. Patches can be spatially variable and are often characterised by one or more areas within a patch that meet the key diagnostic characteristics and condition threshold criteria amongst areas of lower condition. **Average canopy cover and condition across the broadest area that meets the general description of the ecological community should initially be used in determining overall canopy cover and vegetation condition**. However, if there are areas that are either significantly higher or lower in condition and where the average canopy cover or quality falls below the minimum thresholds, the next largest area or areas that meet key diagnostics (including minimum canopy cover requirements) and minimum condition thresholds should be specified. This may result in multiple patches being identified within the overall area first considered.

A **buffer zone** is a contiguous area immediately adjacent to a patch. As the area of the buffer lies to the outside, around a patch, **it is not part of the ecological community and is not formally protected** as a matter of national environmental significance. The recommended **minimum buffer zone for the ecological community is 20–50 metres** from the outer edge of a patch, and the appropriate size depends on the nature of the buffer and local context (e.g. slope). A larger buffer

zone should be applied to protect patches that are of particularly high conservation value, or if patches are down slope of drainage lines or a source of nutrient enrichment, or groundwater drawdown.

Restored (revegetated or replanted) sites are not excluded from the listed ecological community so long as the patch meets the description, key diagnostic characteristics and condition thresholds above, and there is evidence of post-regeneration recruitment that could contribute to longer-term maintenance of the patch.

SAMPLING PROTOCOLS

The site should represent the range of variation in vegetation cover and species diversity, starting with the area of maximum apparent native plant species diversity. **Optimal timing is in early to mid spring and a second survey in late spring** may be required to detect the majority of species. **Plot sizes of at least 100 m² (10m x 10m).**

DIAGNOSTIC KEY

Diagnostic features are summarised in **Table 6** at the end.

1 LOCATION AND PHYSICAL ENVIRONMENT

- Primarily in the Swan Coastal Plain IBRA bioregion **AND/OR**
- Also extend into the adjacent Jarrah Forest IBRA bioregion..... **2**

2 SOILS AND LANDFORM

- *Banksia* community typically occurs on **well drained, low nutrient soils on sandplain landforms,** particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands **OR**
- Also common on **sandy colluvium and aeolian sands** of the Ridge Hill Shelf, Whicher Scarp and Dandaragan Plateau **OR**
- Sporadically **transitional substrates, sandflats**..... **3**
- do not occur on **clay flats**.....**NOT TEC**

3 STRUCTURE

Community of low woodland to forest with:

1. **A distinctive upper sclerophyllous layer of low trees** (occasionally large shrubs) **more than 2 m tall**, typically dominated (**Cover >2%)** or co-dominated by one or more of the *Banksia* species identified in **Table 4**; **AND**
2. **Emergent trees of medium or tall (>10 m) height** *Eucalyptus* or *Allocasuarina* species may sometimes be present above the *Banksia* canopy identified in **Table 4**; **AND**
3. **A species rich understory** that consists of:

   3.1 A layer of sclerophyllous shrubs of various heights often from the families Asteraceae, Dilleniaceae, Ericaceae, Fabaceae, Myrtaceae and Proteaceae; **AND**

3.2 A herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses often from the families Cyperaceae, Droseraceae, Haemodoraceae, Orchidaceae, Restionaceae and "lilies" from various families. The development of a ground layer may vary depending on the density of the shrub layer and disturbance history…….. **4**

4. Cover <2% of *Banksia* species.....**NOT TEC**

4 COMPOSITION

- The canopy is most commonly dominated or co-dominated by *Banksia* species from **Table 4, Changes in vegetation (types) across a patch should not be considered to be evidence of multiple patches.** Patches can be characterised by one or more areas within a patch that meet the key diagnostic characteristics. **Average canopy cover across the broadest area should be used in determining overall canopy cover**, **AND**
- The patch must include at least one of the following diagnostic species:
  - *Banksia attenuata* (candlestick banksia)
  - *Banksia menziesii* (firewood banksia)
  - *Banksia prionotes* (acorn banksia)
  - *Banksia ilicifolia* (holly-leaved banksia); **AND**
- If present, the emergent tree layer often includes *Eucalyptus* species from **Table 4**, **AND**
- Other trees of a medium height may be present, and may be **co-dominant** with the *Banksia* species across a patch listed in **Table 4**, **AND**
- The understorey typically contains a high to very high diversity of shrub and herb species that often vary from patch to patch. Examples[2] in **Table 4**…… **5**
- Patches clearly dominated by co-dominant species from **Table 4** ……..**NOT TEC**
- FCT 20c (Eastern shrublands and woodlands, **Table 2**) should be considered under separate EPBC listing……**SEPARATE TEC**

5 CONDITION THRESHOLDS

A patch should meet at least the Good Condition category (Table 5) with average canopy cover and condition across the broadest area……..6

Any single patch of a threatened ecological community may be degraded to some degree but contributes to the overall function of the ecological community. Very degraded/modified patches are not protected as the ecological community listed under the EPBC Act but may still be protected through State and local laws.

Changes in condition of vegetation across a patch should not be considered to be evidence of multiple patches. Average condition across the broadest area should be used in determining overall vegetation condition.

[2] The floristic diversity in *Banksia* Woodlands is primarily associated with the understorey surveys have recorded more than 600 native plant taxa, an average of 50 plant taxa have been recorded within 100 m^2 plots.

Restored (revegetated or replanted) sites are not excluded from the listed ecological community with evidence of post-regeneration recruitment that could contribute to longer-term maintenance of the patch.

6 MINIMUM PATCH SIZE

A **patch** is a discrete and mostly continuous area of the ecological community. A patch may include small-scale (<30 m) variations, gaps and disturbances, such as tracks, paths or breaks (including exposed soil, leaf litter, cryptogams and watercourses/drainage lines), or localised variations in vegetation. Where there is **a break in native vegetation cover, from the edge of the tree canopy of 30 m or more** (e.g. due to permanent artificial structures, wide roads or other barriers; or due to water bodies typically more than 30m wide) then the gap typically indicates that **separate patches are present**.

Condition Pristine, no minimum…… **TEC**

Condition Excellent, minimum 0.5 ha……**TEC**

Condition Excellent, minimum <0.5 ha…… **NOT TEC**

Condition Very Good, minimum 1 ha……**TEC**

Condition Very Good, minimum <1 ha…… **.NOT TEC**

Condition Good, minimum 2 ha……**TEC**

Condition Good, minimum <2 ha……**NOT TEC**

Table 5. Condition categories and indicative measures/thresholds

Keighery (1994) Vegetation Condition Scale (Government of WA, 2000)		**Indicative condition measures/thresholds**		**Minimum Patch Size**
Code	**Description**	**Typical native vegetation composition**	**Typical weed cover**	
Pristine	Pristine or nearly so. No obvious signs of disturbance.	Native plant species diversity fully retained or almost so	Zero or almost so weed cover/abundance	no minimum
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.	High native plant species diversity	Less than 10%.	0.5 ha
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Moderate native plant species diversity	5 – 20%	1 ha

Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.	Low native plant species diversity	5 – 50%	2 ha
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	Very Low native plant species diversity	20 – 70%	
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.	Very Low to NO native plant species diversity	Greater than 70%	

References are in the original document

Table 6. Summary of diagnostic features

Diagnostic features				
Location Located in (SWA01) or (SWA02) bioregion and/or adjacent JAF01 or JAF02 bioregion	**Soils and Landform** Sandplain landforms, sandy colluvium and aeolian sands on hills, rarely sandflats.	**Dominant tree canopy** >2m tall One or more key *Banksia* species in Table 4 are dominant or co-dominant, emergent trees >10m tall in Table 4	**Native understorey** Species rich native understorey present in Table 4	**Vegetation condition** Condition rating at least Good Pristine- no minimum patch size, excellent - minimum 0.5 ha, very good -1 ha, good 2 ha according to the scale of Keighery (1994)
Location:	Soil: Lanform:	Dominant species: Co-dominant species: Emergent tree canopy species:	Sclerophyllous shrub species: Herbaceous ground layer species:	Patch Size Condition:

Appendix A

Table A1: Listed threatened flora species that are likely to occur in the *Banksia* Woodlands of the Swan Coastal Plain ecological community.
CR = Critically endangered, EN = Endangered, VU = Vulnerable.
WA Status = status under the *Wildlife Conservation Act 1950*.
Scientific Name Common Name EPBC Status WA Status
Anthocercis gracilis slender tailflower VU VU
Banksia aurantia orange dryandra CR VU
Banksia mimica summer honeypot EN VU
Caladenia huegelii king spider-orchid EN CR
Calytrix breviseta subsp. *breviseta* swamp starflower EN CR
Chamelaucium sp. *Gingin* (N.G. Marchant 6) Gingin wax EN VU
Conospermum undulatum wavy-leaved Smokebush VU VU
Diplolaena andrewsii Not listed VU
Drakaea elastica glossy-leafed hammer orchid EN CR
Drakaea micrantha dwarf hammer orchid VU EN
Eucalyptus x *balanites* Cadda Road mallee EN CR
Grevillea althoferorum subsp. *fragilis* Not listed CR
Grevillea bracteosa subsp. *bracteosa* Not listed EN
Grevillea christineae Christine's grevillea EN EN
Grevillea corrugata EN VU
Grevillea curviloba subsp. *incurve* narrow curved-leaf grevillea EN EN
Leucopogon sp. Flynn (F.Hort, J.Hort & A.Lowrie 859) Not listed CR
Macarthuria keigheryi Keighery's macarthuria EN EN
Ptychosema pusillum dwarf pea VU VU
Verticordia densiflora var. *pedunculata* long-stalked feather flower EN EN
Acacia benthamii P2
Acacia semitrullata P4
Actinotus whicheranus P2
Amperea micrantha P2
Anigozanthos humilis subsp. Badgingarra (S.D.Hopper 7114) P2
Anigozanthos humilis subsp. *chrysanthus* golden catspaw P4
Boronia capitata subsp. *gracilis* P3
Caladenia speciosa sandplain white spider orchid P4
Calectasia elegans elegant tinsel lily P2
Caustis sp. Boyanup (G.S.McCutcheon 1706) P3
Dillwynia sp. Capel (P.A.Jurjevich 1771) P1
Franklandia triaristata lanoline bush P4
Grevillea evanescens P1
Isopogon drummondii P3
Johnsonia inconspicua P3
Lasiopetalum membranaceum P3
Laxmannia jamesii James paper lily P4
Persoonia rudis P3
Schoenus griffinianus P4
Thelymitra variegata Queen of Sheba P2
Verticordia lindleyi subsp. *lindleyi* P4
Table A3: Listed threatened fauna species that are likely to occur in the Banksia Woodlands of the Swan Coastal Plain ecological community.

CR = Critically endangered, EN = Endangered, VU = Vulnerable.
WA Status = status under the *Wildlife Conservation Act 1950*.

Scientific name Common name EPBC Act status WA status

Mammals

Dasyurus geoffroii chuditch, western quoll VU VU
Phascogale tapoatafa wambenger Southwestern brushtailed phascogale, wambenger, wambenga Not listed VU
Pseudocheirus occidentalis western ringtail possum VU VU
Setonix brachyurus quokka VU VU

Birds

Calyptorhynchus baudinii Baudin's cockatoo VU EN
Calyptorhynchus latirostris Carnaby's cockatoo EN EN
Calyptorhynchus banksii naso forest red-tailed black cockatoo VU VU

Insects

Leioproctus douglasiellus A short- tongued bee CR EN
Neopasiphae simplicior A native bee CR EN

Table A4: WA priority fauna species that are likely to occur in the Banksia Woodlands of the Swan Coastal Plain ecological community.

Species are not listed under the WA *Wildlife Conservation Act 1950*, but are assigned a priority status: P1 = Priority 1: Poorly-known species (on threatened lands); P2 = Priority 2: Poorly-known species (some on conservation lands); P3 = Priority 3: Poorly-known species (some on conservation lands); P4 = Priority 4: Rare, Near Threatened and other species in need of monitoring.

Scientific name Common name WA status

Mammals

Falsistrellus mackenziei western false pipistrelle P4
Isoodon obesulus fusciventer quenda P4
Macropus irma western brush wallaby P4

Birds

Ninox connivens connivens barking owl (southwest pop.) P2
Tyto novaehollandiae novaehollandiae masked owl (southwest ssp.) P3

Reptiles

Ctenotus gemmula (SCP pop.) jewelled southwest skink P3
Ctenotus ora coastal plains skink P1
Lerista lineata lined skink P3
Neelaps calonotus black-striped snake P3

Invertebrates

Austroconops mcmillani a biting midge P2
Austrosaga spinifer cricket P3
Hylaeus globuliferus bee P3
Glossurocolletes bilobatus (syn. *Leioproctus bilobatus*) bee P2
Leioproctus contrarius bee P3
Synemon gratiosa graceful sunmoth P4
Throscodectes xiphos cricket P1
Cataxia maculate (syn. *Arbanitis inornatus*) trapdoor spider P1

Appendix 3 Flora species inventory for the gaps study area

Family	Species
Araceae	**Zantedeschia aethiopica*
Asparagaceae	**Asparagus asparagoides* (WoNS)
Asteraceae	**Arctotheca calendula*
Asteraceae	**Cotula coronopifolia*
Asteraceae	*Rhodanthe citrina*
Asteraceae	**Sonchus oleraceus*
Colchicaceae	*Burchardia congesta*
Cyperaceae	**Cyperus polystachyos*
Cyperaceae	*Lepidosperma longitudinale*
Cyperaceae	*Lepidosperma* sp.
Cyperaceae	*Mesomelaena pseudostygia*
Cyperaceae	*Tetraria octandra*
Dilleniaceae	*Hibbertia huegelii*
Dilleniaceae	*Hibbertia hypericoides*
Dilleniaceae	*Hibbertia lasiopus*
Droseraceae	*Drosera callistos*
Droseraceae	*Drosera erythrorhiza*
Ericaceae	*Styphelia tenuiflora*
Fabaceae	*Acacia drummondii* subsp. *affinis* (P3)
Fabaceae	*Acacia pulchella*
Fabaceae	*Acacia pulchella* var. *reflexa*
Fabaceae	**Chamaecytisus palmensis*
Fabaceae	**Lotus subbiflorus*
Fabaceae	**Lupinus cosentinii*
Fabaceae	**Trifolium campestre*
Goodeniaceae	*Lechenaultia biloba*
Haemodoraceae	*Anigozanthos humilis*
Haemodoraceae	*Anigozanthos humilis* subsp. *chrysanthus* (P4)
Haemodoraceae	*Haemodorum discolor*
Iridaceae	**Chasmanthe floribunda*
Iridaceae	**Gladiolus caryophyllaceus*
Iridaceae	**Moraea flaccida*
Juncaceae	*Juncus pallidus*
Loranthaceae	*Nuytsia floribunda*
Molluginaceae	*Macarthuria australis*
Myrtaceae	*Corymbia calophylla*
Myrtaceae	*Darwinia* sp. *Bindoon* (S. Patrick 281)

Family	Species
Myrtaceae	*Eucalyptus marginata*
Myrtaceae	*Eucalyptus rudis*
Myrtaceae	*Eucalyptus wandoo*
Myrtaceae	*Kunzea micrantha*
Myrtaceae	*Melaleuca rhaphiophylla*
Myrtaceae	*Taxandria linearifolia*
Orchidaceae	*Caladenia flava*
Orchidaceae	*Microtis media*
Pinaceae	**Pinus radiata*
Poaceae	**Avena barbata*
Poaceae	**Briza maxima*
Poaceae	**Briza minor*
Poaceae	**Ehrharta calycina*
Poaceae	**Eragrostis curvula*
Poaceae	**Lolium rigidum*
Proteaceae	*Adenanthos cygnorum*
Proteaceae	*Banksia attenuata*
Proteaceae	*Banksia dallanneyi* ? var. *sylvestris*
Proteaceae	*Banksia menziesii*
Proteaceae	*Hakea lissocarpha*
Proteaceae	*Synaphea spinulosa* subsp. *spinulosa*
Restionaceae	*Dielsia stenostachya*
Stylidiaceae	*Stylidium* sp. *Bindoon* (K.F. Kenneally 11405)
Xanthorrhoeaceae	*Xanthorrhoea preissii*

Appendix 4 *Banksia* Woodlands of the Swan Coastal Plain TEC – site assessment

Location and assessment sites	Soils and landform	Dominant tree canopy >2 m tall	Native understorey		Vegetation condition and area (ha)	Result
			Sclerophyllus shrub species	Herbaceous ground layer species		
Location SWA02 **TEC site** TECB010 **Vegetation sites** MNP2015	**Soils** White sand **Landform** Undulating plain	**Dominant species** *Banksia attenuata* *Banksia menziesii* **Co-dominant species** *Eucalyptus todtiana* *Nuytsia floribunda* *Adenanthos cygnorum* **Emergent species** *Eucalyptus marginata*	*Acacia pulchella* *Astroloma xerophyllum* *Banksia nivea* *Bossiaea eriocarpa* *Calytrix flavescens* *Dampiera* sp. *Daviesia trifloral* *Eremaea pauciflora* *Gompholobium tomentosum* *Hemigenia* sp. *Hibbertia hypericoides* *Hibbertia* sp. *Hovea trisperma* *Hypolaena exsulca* *Jacksonia floribunda* *Petrophile linearis* *Philotheca spicata* *Stirlingia latifolia* *Synaphea* sp. *Xanthorrhoea preissii*	*Alexgeorgea nitens* *Amphipogon turbinatus* *Anigozanthos humilis* *Burchardia congesta* *Caladenia flava* *Conostylis aculeata* *Conostylis teretifolia* *Dasypogon bromeliifolius* *Diuris magnifica* *Drosera erythrorhiza* *Haemodorum* sp. *Laxmannia* sp. *Lepidosperma pubisquameum* *Lomandra* sp. *Lyginia barbata* *Mesomelaena pseudostygia* *Patersonia occidentalis* *Pterostylis sanguinea* *Rytidosperma setaceum* *Sowerbaea laxiflora* *Stylidium neurophyllum* *Thysanotus dichotomus*	**Condition** Very Good **Patch size** 4.02 ha **Buffer size** 6.27 ha	Yes TEC01
Location SWA01 **TEC site** TECB002 TECB003	**Soils** White sand **Landform** Undulating plain	**Dominant species** *Banksia attenuata* *Banksia menziesii* **Co-dominant species** *Eucalyptus todtiana* *Nuytsia floribunda* *Adenanthos cygnorum*	*Acacia pulchella* *Astroloma xerophyllum* *Banksia nivea* *Bossiaea eriocarpa* *Calytrix flavescens* *Dampiera* sp. *Daviesia* sp. *Daviesia trifloral*	*Acacia pulchella* *Astroloma xerophyllum* *Banksia nivea* *Bossiaea eriocarpa* *Calytrix flavescens* *Dampiera* sp. *Daviesia* sp. *Daviesia trifloral*	**Condition** Very Good **Patch size** 3.71 ha **Buffer size** 5.34 ha	Yes TEC02

Location and	Soils and	Dominant tree canopy	Native understorey		Vegetation	Result
Vegetation sites MNP2013		**Emergent species** *Eucalyptus marginata* *Corymbia calophylla*	*Eremaea pauciflora* *Gompholobium tomentosum* *Hemigenia* sp. *Hibbertia huegelii* *Hibbertia hypericoides* *Hibbertia* sp. *Hovea trisperma* *Hypolaena exsulca* *Jacksonia floribunda* *Melaleuca* sp. *Petrophile linearis* *Philotheca spicata* *Podotheca gnaphalioides* *Stirlingia latifolia* *Synaphea* sp. *Verticordia* sp. *Xanthorrhoea preissii*	*Eremaea pauciflora* *Gompholobium tomentosum* *Hemigenia* sp. *Hibbertia huegelii* *Hibbertia hypericoides* *Hibbertia* sp. *Hovea trisperma* *Hypolaena exsulca* *Jacksonia floribunda* *Melaleuca* sp. *Petrophile linearis* *Philotheca spicata* *Podotheca gnaphalioides* *Stirlingia latifolia* *Synaphea* sp. *Verticordia* sp. *Xanthorrhoea preissii*		
Location SWA01 and JFA01 **TEC site** TECB004 TECB005 TECB006 **Vegetation sites** MNP2006	**Soils** White sand **Landform** Undulating plain	**Dominant species** *Banksia attenuata* *Banksia menziesii* **Co-dominant species** *Adenanthos cygnorum* **Emergent species** *Eucalyptus marginata* *Corymbia calophylla*	*Acacia pulchella* *Astroloma pallidum* *Astroloma xerophyllum* *Bossiaea eriocarpa* *Calytrix flavescens* *Dampiera* sp. *Daviesia* sp. *Daviesia trifloral* *Eremaea pauciflora* *Gompholobium knightianum* *Gompholobium tomentosum* *Hemigenia* sp. *Hibbertia hypericoides* *Hovea trisperma* *Jacksonia floribunda* *Petrophile linearis* *Philotheca spicata*	*Anigozanthos humilis* *Anigozanthos humilis subsp. chrysanthus P4* *Austrostipa flavescens* *Burchardia congesta* *Burchardia multiflora* *Caladenia flava* *Conostylis aculeata* *Conostylis juncea* *Conostylis setigera* *Dasypogon bromeliifolius* *Desmocladus flexuosus* *Diuris magnifica* *Drosera erythrorhiza* *Drosera pallida* *Haemodorum* sp. *Helichrysum luteoalbum*	**Condition** Excellent **Patch size** 8.82 ha **Buffer size** 10.56 ha	Yes TEC03

Location and	Soils and	Dominant tree canopy	Native understorey		Vegetation	Result
			Stirlingia latifolia *Synaphea spinulosa* *Verticordia* sp. *Xanthorrhoea preissii*	*Hypolaena exsulca* *Laxmannia* sp. *Lepidosperma pubisquameum* *Leporella fimbriata* *Lomandra* sp. *Lyginia barbata* *Mesomelaena pseudostygia* *Patersonia occidentalis* *Prasophyllum hians* *Rhodanthe citrina* *Stylidium neurophyllum* *Stylidium piliferum* *Stylidium schoenoides* *Thysanotus dichotomus* *Tricoryne elatior* *Xanthosia huegelii*		
Location SWA01 **TEC site** TECB007 **Vegetation sites** MNP2002	**Soils** White sand **Landform** Undulating plain	**Dominant species** *Banksia attenuata* *Banksia menziesii* **Co-dominant species** *Eucalyptus todtiana* *Nuytsia floribunda* *Adenanthos cygnorum* **Emergent species** *Eucalyptus marginata*	*Astroloma pallidum* *Beaufortia macrostemon* *Bossiaea eriocarpa* *Calothamnus sanguineus* *Calytrix flavescens* *Conospermum stoechadis* *Dampiera* sp. *Daviesia trifloral* *Eremaea pauciflora* *Gompholobium knightianum* *Gompholobium tomentosum* *Hemigenia* sp. *Hibbertia hypericoides* *Petrophile linearis* *Philotheca spicata* *Pimelea sulphurea* *Scholtzia involucrata* *Stirlingia latifolia*	*Anigozanthos humilis* *Austrostipa flavescens* *Burchardia congesta* *Caladenia flava* *Cassytha flava* *Conostylis aculeata* *Conostylis juncea* *Conostylis setigera* *Desmocladus flexuosus* *Diuris magnifica* *Drosera erythrorhiza* *Drosera menziesii* *Elythranthera brunonis* *Haemodorum sp* *Hyalosperma cotula* *Johnsonia pubescens* *Leporella fimbriata* *Lomandra* sp.	**Condition** Excellent **Patch size** 8.03 ha **Buffer size** 12.94 ha	Yes TEC04

Location and	Soils and	Dominant tree canopy	Native understorey		Vegetation	Result
			Synaphea spinulosa *Verticordia* sp. *Xanthorrhoea preissii*	*Lyginia barbata* *Mesomelaena pseudostygia* *Patersonia occidentalis* *Stylidium neurophyllum* *Stylidium piliferum* *Stylidium schoenoides* *Trachymene ornate*		
Location SWA01 **TEC site** TECB001	**Soils** White sand **Landform** Undulating plain	**Dominant species** *Banksia attenuata* *Banksia menziesii* Present but <2%				Not TEC
Location SWA01 **TEC site** TECB007	**Soils** White sand **Landform** Undulating plain	**Dominant species** *Eucalyptus todtiana* *Banksia grandis*				Not TEC
Location SWA01 **TEC site** TECB008	**Soils** White sand **Landform** Undulating plain	**Dominant species** *Banksia attenuata* *Banksia menziesii*			**Condition** Good **Patch size** < 0.5 ha	Not TEC

Appendix 5 Carnaby's Black Cockatoo potential breeding tree records in gaps study area

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT04250	1/04/2015	-31.4847	116.0450	*Eucalyptus wandoo*	480	No	No	No	
HT04664	1/04/2015	-31.4852	116.0451	*Eucalyptus accedens*	300	No	No	No	
HT04672	1/04/2015	-31.4970	116.0412	*Eucalyptus marginata*	800	No	No	No	
HT05906	7/10/2015	-31.5506	115.9977	*Corymbia calophylla*	1040	Yes	No	No	
HT05959	8/10/2015	-31.5020	116.0432	*Corymbia calophylla*	580	No	No	No	
HT06000	8/10/2015	-31.5251	116.0281	*Eucalyptus wandoo*	950	Yes	No	No	
HT06129	8/10/2015	-31.4918	116.0405	*Eucalyptus marginata*	1400	Yes	No	No	Hollows at 5 m, 7 m and 8 m.
HT06346	7/10/2015	-31.5483	116.0021	*Corymbia calophylla*	600	No	No	No	
HT06348	7/10/2015	-31.5482	116.0017	*Eucalyptus wandoo*	760	Yes	Yes	Yes	Well chewed hollow.
HT06644	8/10/2015	-31.4949	116.0416	*Corymbia calophylla*	1080	No	No	No	
HT06645	8/10/2015	-31.4946	116.0404	*Eucalyptus rudis*	1000	No	No	No	
HT12668	18/05/2016	-31.5425	116.0015	*Eucalyptus rudis*	700	No	No	No	
HT12669	18/05/2016	-31.5428	116.0020	*Corymbia calophylla*	500	No	No	No	
HT12670	18/05/2016	-31.5425	116.0015	*Eucalyptus rudis*	700	No	No	No	
HT12671	18/05/2016	-31.5428	116.0020	*Corymbia calophylla*	500	No	No	No	
HT12672	18/05/2016	-31.5173	116.0313	*Corymbia calophylla*	600	No	No	No	
HT12673	18/05/2016	-31.5173	116.0323	*Corymbia calophylla*	500	No	No	No	
HT12674	18/05/2016	-31.5173	116.0322	*Eucalyptus marginata*	1000	No	No	No	
HT12676	18/05/2016	-31.5186	116.0329	*Corymbia calophylla*	650	No	No	No	
HT12677	18/05/2016	-31.5183	116.0330	*Corymbia calophylla*	550	Yes	No	No	Hollow at 8 m.
HT12678	18/05/2016	-31.5180	116.0332	*Eucalyptus* sp.	600	No	No	No	
HT12679	18/05/2016	-31.4917	116.0405	*Corymbia calophylla*	1000	No	No	No	
HT12680	18/05/2016	-31.4922	116.0405	*Eucalyptus marginata*	500	No	No	No	
HT12681	18/05/2016	-31.4953	116.0400	*Eucalyptus marginata*	800	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT12682	18/05/2016	-31.4955	116.0402	*Corymbia calophylla*	1200	No	No	No	
HT12683	18/05/2016	-31.4957	116.0402	*Corymbia calophylla*	950	No	No	No	
HT12684	18/05/2016	-31.4954	116.0403	*Corymbia calophylla*	1000	No	No	No	
HT12685	18/05/2016	-31.4953	116.0404	*Corymbia calophylla*	700	No	No	No	
HT12686	18/05/2016	-31.4953	116.0406	*Corymbia calophylla*	690	No	No	No	
HT12687	18/05/2016	-31.4951	116.0407	*Corymbia calophylla*	800	No	No	No	
HT12688	18/05/2016	-31.4952	116.0409	*Corymbia calophylla*	800	No	No	No	
HT12689	18/05/2016	-31.4954	116.0408	*Eucalyptus marginata*	800	No	No	No	
HT12690	18/05/2016	-31.4958	116.0407	*Eucalyptus marginata*	650	No	No	No	
HT12691	18/05/2016	-31.4961	116.0406	*Eucalyptus marginata*	1400	Yes	No	No	Hollow at 7 m.
HT12692	18/05/2016	-31.4961	116.0406	*Corymbia calophylla*	1000	No	No	No	
HT12693	18/05/2016	-31.4963	116.0402	*Eucalyptus marginata*	1200	Yes	No	No	Multiple hollows at 6 to 12 m.
HT12694	18/05/2016	-31.4964	116.0400	*Eucalyptus marginata*	750	No	No	No	
HT12695	18/05/2016	-31.4964	116.0399	*Corymbia calophylla*	500	No	No	No	
HT12697	18/05/2016	-31.4966	116.0398	*Eucalyptus marginata*	1200	Yes	No	No	Dead.
HT12698	18/05/2016	-31.4966	116.0402	*Corymbia calophylla*	900	No	No	No	
HT12699	18/05/2016	-31.4968	116.0403	*Eucalyptus marginata*	1500	No	No	No	
HT12700	18/05/2016	-31.4969	116.0399	*Eucalyptus marginata*	650	No	No	No	
HT12701	18/05/2016	-31.4970	116.0397	*Eucalyptus marginata*	600	No	No	No	
HT12702	18/05/2016	-31.4970	116.0402	*Eucalyptus marginata*	730	No	No	No	
HT12703	18/05/2016	-31.4971	116.0406	*Eucalyptus* sp.	600	No	No	No	
HT12704	18/05/2016	-31.4678	116.0516	*Corymbia calophylla*	1000	No	No	No	
HT12706	18/05/2016	-31.4756	116.0474	*Corymbia calophylla*	700	No	No	No	
HT12707	18/05/2016	-31.4757	116.0481	*Corymbia calophylla*	750	No	No	No	
HT12708	18/05/2016	-31.4757	116.0485	*Corymbia calophylla*	750	No	No	No	Dead.

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT12709	18/05/2016	-31.4756	116.0489	*Corymbia calophylla*	850	No	No	No	
HT12710	18/05/2016	-31.4757	116.0491	*Corymbia calophylla*	500	No	No	No	
HT12711	18/05/2016	-31.4756	116.0499	*Corymbia calophylla*	500	No	No	No	
HT12713	18/05/2016	-31.4758	116.0505	*Corymbia calophylla*	650	No	No	No	
HT12714	18/05/2016	-31.4756	116.0521	*Corymbia calophylla*	750	No	No	No	
HT12715	18/05/2016	-31.4755	116.0519	*Corymbia calophylla*	1000	No	No	No	
HT12716	18/05/2016	-31.4756	116.0513	*Eucalyptus marginata*	500	No	No	No	
HT12717	18/05/2016	-31.4756	116.0511	*Corymbia calophylla*	500	No	No	No	
HT12718	18/05/2016	-31.4756	116.0511	*Corymbia calophylla*	500	No	No	No	
HT12719	18/05/2016	-31.4756	116.0509	*Corymbia calophylla*	550	No	No	No	
HT12720	18/05/2016	-31.4850	116.0453	*Eucalyptus accedens*	320	No	No	No	
HT12721	18/05/2016	-31.4856	116.0448	*Eucalyptus* sp.	600	No	No	No	Dead.
HT12722	18/05/2016	-31.4866	116.0441	*Corymbia calophylla*	700	No	No	No	
HT12723	18/05/2016	-31.4873	116.0434	*Eucalyptus marginata*	1500	No	No	No	
HT12724	18/05/2016	-31.4873	116.0436	*Corymbia calophylla*	550	No	No	No	
HT12725	18/05/2016	-31.4876	116.0433	*Corymbia calophylla*	550	No	No	No	
HT12726	18/05/2016	-31.4885	116.0433	*Corymbia calophylla*	500	No	No	No	
HT12727	18/05/2016	-31.4951	116.0415	*Eucalyptus marginata*	750	No	No	No	
HT12728	18/05/2016	-31.4951	116.0415	*Eucalyptus marginata*	700	No	No	No	
HT12729	18/05/2016	-31.4954	116.0414	*Eucalyptus marginata*	550	No	No	No	
HT12730	18/05/2016	-31.4955	116.0414	*Eucalyptus marginata*	1100	No	No	No	
HT12731	18/05/2016	-31.4957	116.0414	*Eucalyptus marginata*	500	No	No	No	
HT12732	18/05/2016	-31.4958	116.0414	*Eucalyptus marginata*	700	No	No	No	
HT12733	18/05/2016	-31.4963	116.0414	*Eucalyptus marginata*	520	No	No	No	
HT12734	18/05/2016	-31.4971	116.0413	*Eucalyptus marginata*	690	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT12735	18/05/2016	-31.4972	116.0413	*Corymbia calophylla*	500	No	No	No	
HT12736	18/05/2016	-31.4971	116.0414	*Corymbia calophylla*	500	No	No	No	
HT12737	18/05/2016	-31.4976	116.0413	*Corymbia calophylla*	650	No	No	No	
HT12738	18/05/2016	-31.4977	116.0412	*Corymbia calophylla*	600	No	No	No	
HT12739	18/05/2016	-31.4978	116.0412	*Corymbia calophylla*	500	No	No	No	
HT12740	18/05/2016	-31.4978	116.0412	*Corymbia calophylla*	500	No	No	No	
HT12741	18/05/2016	-31.4979	116.0412	*Corymbia calophylla*	800	No	No	No	
HT12742	18/05/2016	-31.4983	116.0411	*Corymbia calophylla*	1000	No	No	No	
HT12743	18/05/2016	-31.4985	116.0411	*Corymbia calophylla*	750	No	No	No	
HT12744	18/05/2016	-31.4985	116.0412	*Corymbia calophylla*	580	No	No	No	
HT12745	18/05/2016	-31.4994	116.0410	*Corymbia calophylla*	600	No	No	No	
HT12746	18/05/2016	-31.5000	116.0409	*Corymbia calophylla*	600	No	No	No	
HT12747	18/05/2016	-31.5002	116.0409	*Corymbia calophylla*	700	No	No	No	
HT12748	18/05/2016	-31.4996	116.0415	*Corymbia calophylla*	1100	No	No	No	
HT12749	18/05/2016	-31.4997	116.0418	*Corymbia calophylla*	630	No	No	No	
HT12750	18/05/2016	-31.5000	116.0426	*Corymbia calophylla*	530	No	No	No	
HT12751	18/05/2016	-31.5004	116.0427	*Corymbia calophylla*	1500	No	No	No	
HT12752	18/05/2016	-31.5004	116.0423	*Corymbia calophylla*	900	No	No	No	
HT12753	18/05/2016	-31.5003	116.0421	*Corymbia calophylla*	600	No	No	No	
HT12754	18/05/2016	-31.5003	116.0421	*Corymbia calophylla*	500	No	No	No	
HT12755	18/05/2016	-31.5003	116.0418	*Corymbia calophylla*	900	No	No	No	
HT12756	18/05/2016	-31.5004	116.0415	*Corymbia calophylla*	550	No	No	No	
HT12757	18/05/2016	-31.5007	116.0416	*Corymbia calophylla*	520	No	No	No	
HT12758	18/05/2016	-31.5008	116.0416	*Corymbia calophylla*	510	No	No	No	
HT12759	18/05/2016	-31.5008	116.0416	*Corymbia calophylla*	500	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT12760	18/05/2016	-31.5481	116.0011	*Eucalyptus wandoo*	500	No	No	No	
HT12761	18/05/2016	-31.5481	116.0011	*Eucalyptus wandoo*	300	Yes	Yes	Yes	Pair at nest hollow.
HT12762	18/05/2016	-31.5483	116.0006	*Eucalyptus wandoo*	600	Yes	Yes	Yes	Hollow at 10 m. Pair of Carnaby's Black Cockatoo above nest hollow.
HT12763	18/05/2016	-31.5484	116.0003	*Eucalyptus wandoo*	1000	Yes	Yes	Yes	Hollow at 10 m. Pair of Carnaby's Black Cockatoos at nest hollow.
HT12764	18/05/2016	-31.5484	116.0002	*Eucalyptus wandoo*	300	No	No	No	
HT12765	18/05/2016	-31.5483	116.0002	*Eucalyptus wandoo*	850	Yes	Yes	Yes	Holow at 7 m. Pair of Carnaby's Black Cockatoos prospecting hollow.
HT12766	18/05/2016	-31.5484	116.0001	*Eucalyptus wandoo*	600	No	No	No	
HT12767	18/05/2016	-31.5484	116.0000	*Eucalyptus wandoo*	700	Yes	Yes	Yes	Pair of Carnaby's Black Cockatoo at hollow. Chick heard.
HT12768	18/05/2016	-31.5485	115.9999	*Eucalyptus wandoo*	300	No	No	No	
HT12769	18/05/2016	-31.5486	115.9998	*Eucalyptus wandoo*	450	No	No	No	
HT12770	18/05/2016	-31.5486	115.9997	*Eucalyptus wandoo*	400	No	No	No	
HT12771	18/05/2016	-31.5486	116.0004	*Eucalyptus wandoo*	400	No	No	No	
HT12772	18/05/2016	-31.5486	116.0004	*Eucalyptus wandoo*	400	No	No	No	
HT12773	18/05/2016	-31.5425	116.0021	*Eucalyptus rudis*	980	No	No	No	
HT12778	18/05/2016	-31.5131	116.0344	*Eucalyptus marginata*	605	No	No	No	
HT12780	18/05/2016	-31.5121	116.0346	*Eucalyptus marginata*	790	Yes	No	No	Two top hollows present.
HT12781	18/05/2016	-31.5121	116.0346	*Eucalyptus marginata*	1010	Yes	No	No	Large vertical hollows present.
HT12782	18/05/2016	-31.5120	116.0344	*Corymbia calophylla*	695	No	No	No	
HT12783	18/05/2016	-31.5120	116.0346	*Eucalyptus marginata*	1110	Yes	No	No	Two hollows present.
HT12784	18/05/2016	-31.5119	116.0347	*Eucalyptus marginata*	870	No	No	No	
HT12785	18/05/2016	-31.5115	116.0351	*Corymbia calophylla*	860	No	No	No	
HT12786	18/05/2016	-31.5085	116.0368	*Corymbia calophylla*	500	No	No	No	
HT12787	18/05/2016	-31.5090	116.0366	*Eucalyptus marginata*	500	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT12789	18/05/2016	-31.5111	116.0353	*Corymbia calophylla*	600	No	No	No	
HT12790	18/05/2016	-31.5112	116.0352	*Corymbia calophylla*	600	No	No	No	
HT12791	18/05/2016	-31.5113	116.0352	*Corymbia calophylla*	600	No	No	No	
HT12792	18/05/2016	-31.4974	116.0407	*Eucalyptus marginata*	710	No	No	No	
HT12793	18/05/2016	-31.4977	116.0404	*Corymbia calophylla*	810	No	No	No	
HT12794	18/05/2016	-31.4979	116.0402	*Eucalyptus marginata*	1800	Yes	No	No	Multiple hollows present.
HT12795	18/05/2016	-31.4979	116.0407	*Corymbia calophylla*	1500	Yes	No	No	One hollow present.
HT12796	18/05/2016	-31.4987	116.0404	*Corymbia calophylla*	1140	No	No	No	One hollow present.
HT12797	18/05/2016	-31.4994	116.0402	*Corymbia calophylla*	1310	No	No	No	
HT12798	18/05/2016	-31.4997	116.0401	*Eucalyptus marginata*	1060	No	No	No	
HT12799	18/05/2016	-31.5004	116.0401	*Eucalyptus marginata*	880	No	No	No	
HT12800	18/05/2016	-31.5027	116.0400	*Corymbia calophylla*	675	No	No	No	
HT12801	18/05/2016	-31.5029	116.0396	*Corymbia calophylla*	1070	No	No	No	
HT12802	18/05/2016	-31.5031	116.0394	*Corymbia calophylla*	910	No	No	No	
HT12804	18/05/2016	-31.5039	116.0395	*Eucalyptus marginata*	1010	Yes	No	No	One hollow present.
HT12807	18/05/2016	-31.4756	116.0477	*Corymbia calophylla*	760	No	No	No	
HT12808	18/05/2016	-31.4756	116.0479	*Eucalyptus accedens*	500	No	No	No	
HT12809	18/05/2016	-31.4756	116.0480	*Corymbia calophylla*	690	No	No	No	
HT12810	18/05/2016	-31.4756	116.0481	*Corymbia calophylla*	960	No	No	No	
HT12811	18/05/2016	-31.4756	116.0482	*Corymbia calophylla*	570	No	No	No	
HT12812	18/05/2016	-31.4756	116.0483	*Corymbia calophylla*	825	No	No	No	
HT12813	18/05/2016	-31.4756	116.0485	*Corymbia calophylla*	1040	No	No	No	
HT12814	18/05/2016	-31.4756	116.0487	*Corymbia calophylla*	620	No	No	No	
HT12815	18/05/2016	-31.4756	116.0488	*Corymbia calophylla*	650	No	No	No	
HT12816	18/05/2016	-31.4756	116.0492	*Eucalyptus accedens*	540	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT12817	18/05/2016	-31.4756	116.0493	*Eucalyptus accedens*	420	No	No	No	
HT12818	18/05/2016	-31.4756	116.0496	*Corymbia calophylla*	2100	No	No	No	
HT12819	18/05/2016	-31.4756	116.0495	*Corymbia calophylla*	530	No	No	No	
HT12820	18/05/2016	-31.4756	116.0499	*Corymbia calophylla*	835	No	No	No	
HT12821	18/05/2016	-31.4756	116.0500	*Eucalyptus accedens*	680	No	No	No	
HT12822	18/05/2016	-31.4756	116.0502	*Eucalyptus wandoo*	500	No	No	No	
HT12823	18/05/2016	-31.4756	116.0503	*Corymbia calophylla*	930	No	No	No	
HT12824	18/05/2016	-31.4755	116.0505	*Eucalyptus accedens*	380	No	No	No	
HT12825	18/05/2016	-31.4858	116.0438	*Corymbia calophylla*	700	No	No	No	
HT12826	18/05/2016	-31.5018	116.0409	*Corymbia calophylla*	720	No	No	No	
HT12827	18/05/2016	-31.5017	116.0409	*Corymbia calophylla*	960	No	No	No	
HT12828	18/05/2016	-31.5018	116.0417	*Corymbia calophylla*	1000	No	No	No	
HT12829	18/05/2016	-31.5016	116.0418	*Eucalyptus* sp.	700	No	No	No	
HT12830	18/05/2016	-31.5018	116.0420	*Eucalyptus* sp.	700	No	No	No	
HT12831	18/05/2016	-31.5011	116.0432	*Eucalyptus* sp.	660	No	No	No	
HT12832	18/05/2016	-31.5011	116.0427	*Corymbia calophylla*	720	No	No	No	
HT12833	18/05/2016	-31.5012	116.0421	*Corymbia calophylla*	930	No	No	No	
HT12834	18/05/2016	-31.5012	116.0420	*Corymbia calophylla*	590	No	No	No	
HT12835	18/05/2016	-31.5012	116.0420	*Corymbia calophylla*	710	No	No	No	
HT12836	18/05/2016	-31.5008	116.0427	*Corymbia calophylla*	670	No	No	No	
HT12837	18/05/2016	-31.5006	116.0428	*Corymbia calophylla*	800	No	No	No	
HT12838	18/05/2016	-31.5006	116.0432	*Corymbia calophylla*	760	No	No	No	
HT12839	18/05/2016	-31.5003	116.0435	*Corymbia calophylla*	920	No	No	No	
HT12840	18/05/2016	-31.5002	116.0435	*Corymbia calophylla*	520	No	No	No	
HT12841	18/05/2016	-31.5002	116.0436	*Corymbia calophylla*	670	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT12842	18/05/2016	-31.5005	116.0439	*Eucalyptus accedens*	480	No	No	No	
HT12843	18/05/2016	-31.5013	116.0438	*Corymbia calophylla*	700	No	No	No	
HT12844	18/05/2016	-31.5014	116.0439	*Corymbia calophylla*	900	Yes	No	No	
HT12845	18/05/2016	-31.5484	116.0015	*Eucalyptus wandoo*	620	Yes	No	No	
HT12846	18/05/2016	-31.5484	116.0015	*Eucalyptus wandoo*	530	Yes	No	No	
HT12847	18/05/2016	-31.5484	116.0015	*Eucalyptus wandoo*	430	No	No	No	
HT12848	18/05/2016	-31.5485	116.0013	*Eucalyptus wandoo*	880	No	No	No	
HT12849	18/05/2016	-31.5486	116.0017	*Eucalyptus wandoo*	870	Yes	No	No	
HT12850	18/05/2016	-31.5486	116.0008	*Eucalyptus marginata*	800	No	No	No	
HT13477	18/10/2016	-31.5503	115.9982	*Eucalyptus marginata*	700	No	No	No	
HT13478	18/10/2016	-31.5501	115.9982	*Eucalyptus marginata*	500	No	No	No	Dead.
HT13479	18/10/2016	-31.5498	115.9984	*Eucalyptus marginata*	800	No	No	No	Dead.
HT13481	18/10/2016	-31.5493	115.9989	*Eucalyptus wandoo*	450	No	No	No	
HT13482	18/10/2016	-31.5492	115.9992	*Eucalyptus wandoo*	1000	No	No	No	
HT13483	18/10/2016	-31.5488	115.9996	*Eucalyptus wandoo*	450	No	No	No	
HT13484	18/10/2016	-31.5488	116.0018	*Eucalyptus wandoo*	1100	Yes	Yes	No	
HT13485	18/10/2016	-31.5526	116.0000	*Corymbia calophylla*	1000	No	No	No	
HT13486	18/10/2016	-31.5528	115.9999	*Corymbia calophylla*	500	No	No	No	
HT13487	18/10/2016	-31.5529	115.9998	*Eucalyptus marginata*	1000	No	No	No	
HT13488	18/10/2016	-31.5529	115.9993	*Eucalyptus marginata*	500	No	No	No	
HT13489	18/10/2016	-31.5532	115.9993	*Corymbia calophylla*	1100	No	No	No	
HT13490	18/10/2016	-31.5533	115.9993	*Corymbia calophylla*	800	No	No	No	
HT13491	18/10/2016	-31.5534	115.9991	*Corymbia calophylla*	600	No	No	No	
HT13492	18/10/2016	-31.5534	115.9990	*Corymbia calophylla*	500	No	No	No	
HT13493	18/10/2016	-31.5535	115.9989	*Corymbia calophylla*	500	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT13494	18/10/2016	-31.5533	115.9986	*Corymbia calophylla*	900	No	No	No	
HT13495	18/10/2016	-31.5526	115.9984	*Eucalyptus marginata*	1000	Yes	No	No	Multiple small hollows present.
HT13496	18/10/2016	-31.5524	115.9985	*Corymbia calophylla*	550	No	No	No	
HT13497	18/10/2016	-31.5522	115.9984	*Eucalyptus marginata*	1005	Yes	Yes	No	Hollow at 4 m.
HT13498	18/10/2016	-31.5518	115.9990	*Eucalyptus marginata*	1000	No	No	No	
HT13499	18/10/2016	-31.5517	115.9991	*Corymbia calophylla*	600	No	No	No	
HT13500	18/10/2016	-31.5513	115.9992	*Corymbia calophylla*	500	No	No	No	
HT13501	18/10/2016	-31.5512	115.9992	*Eucalyptus marginata*	600	No	No	No	
HT13502	18/10/2016	-31.5512	115.9994	*Eucalyptus marginata*	950	No	No	No	Dead.
HT13503	18/10/2016	-31.5509	115.9988	*Eucalyptus marginata*	750	Yes	Yes	No	Dead. Hollow at top of tree.
HT13504	18/10/2016	-31.5507	115.9993	*Corymbia calophylla*	700	No	No	No	
HT13505	18/10/2016	-31.5506	115.9991	*Eucalyptus* sp.	600	Yes	Yes	No	Dead. Hollow at 6 m.
HT13506	18/10/2016	-31.5499	115.9990	*Eucalyptus wandoo*	900	Yes	Yes	No	Hollows at 10 m and 13 m. Owl emerged from one hollow.
HT13507	18/10/2016	-31.5499	115.9991	*Eucalyptus wandoo*	700	Yes	Yes	No	Hollow at 7 m.
HT13508	18/10/2016	-31.5498	115.9990	*Eucalyptus wandoo*	1100	No	Yes	No	Dead. Multiple hollows present. Bees present
HT13509	18/10/2016	-31.5518	115.9987	*Eucalyptus marginata*	650	No	No	No	Dead.
HT13510	18/10/2016	-31.5519	115.9988	*Eucalyptus marginata*	900	Yes	No	No	Dead.
HT13511	18/10/2016	-31.5531	115.9974	*Corymbia calophylla*	1000	Yes	Yes	No	Hollow at 12 m.
HT13512	18/10/2016	-31.5525	115.9977	*Corymbia calophylla*	600	No	No	No	
HT13513	18/10/2016	-31.5523	115.9978	*Eucalyptus marginata*	850	No	No	No	Dead.
HT13514	18/10/2016	-31.5522	115.9978	*Corymbia calophylla*	700	No	No	No	
HT13515	18/10/2016	-31.5521	115.9978	*Eucalyptus marginata*	1005	No	No	No	Dead.
HT13516	18/10/2016	-31.5521	115.9981	*Eucalyptus marginata*	1400	Yes	No	No	Dead. Multiple hollows present.
HT13517	18/10/2016	-31.5519	115.9972	*Eucalyptus marginata*	1200	No	No	No	Dead.

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT13518	18/10/2016	-31.5519	115.9971	*Eucalyptus sp.*	1400	No	No	No	Dead.
HT13519	18/10/2016	-31.5274	116.0294	*Eucalyptus wandoo*	700	No	No	No	
HT13520	18/10/2016	-31.5271	116.0304	*Eucalyptus wandoo*	680	No	No	No	
HT13521	18/10/2016	-31.5271	116.0303	*Eucalyptus wandoo*	800	No	No	No	
HT13522	18/10/2016	-31.5271	116.0305	*Eucalyptus wandoo*	650	No	No	No	
HT13523	18/10/2016	-31.5273	116.0307	*Eucalyptus wandoo*	850	Yes	Yes	No	Hollow present in main trunk.
HT13524	18/10/2016	-31.5265	116.0302	*Eucalyptus wandoo*	650	Yes	No	No	Bees present.
HT13525	18/10/2016	-31.5265	116.0301	*Eucalyptus wandoo*	500	No	No	No	
HT13526	18/10/2016	-31.5262	116.0304	*Eucalyptus wandoo*	300	No	No	No	
HT13527	18/10/2016	-31.5262	116.0304	*Eucalyptus wandoo*	650	No	No	No	
HT13528	18/10/2016	-31.5248	116.0317	*Eucalyptus wandoo*	1800	Yes	No	No	
HT13529	18/10/2016	-31.5225	116.0333	*Eucalyptus wandoo*	650	Yes	No	No	
HT13531	18/10/2016	-31.5212	116.0342	*Corymbia calophylla*	800	No	No	No	
HT13532	18/10/2016	-31.5205	116.0344	*Eucalyptus marginata*	950	No	No	No	
HT13536	18/10/2016	-31.5503	115.9987	*Eucalyptus marginata*	600	No	No	No	
HT13537	18/10/2016	-31.5503	115.9987	*Eucalyptus marginata*	500	No	No	No	
HT13538	18/10/2016	-31.5502	115.9985	*Corymbia calophylla*	600	No	No	No	
HT13539	18/10/2016	-31.5503	115.9987	*Eucalyptus marginata*	600	No	No	No	
HT13540	18/10/2016	-31.5499	115.9987	*Eucalyptus marginata*	750	No	No	No	Dead.
HT13541	18/10/2016	-31.5496	115.9988	*Eucalyptus wandoo*	500	No	No	No	
HT13542	18/10/2016	-31.5496	115.9989	*Eucalyptus* sp.	600	No	No	No	Dead.
HT13543	18/10/2016	-31.5494	115.9991	*Corymbia calophylla*	650	No	No	No	Dead.
HT13544	18/10/2016	-31.5491	115.9997	*Corymbia calophylla*	700	No	No	No	
HT13545	18/10/2016	-31.5491	115.9997	*Corymbia calophylla*	550	No	No	No	
HT13546	18/10/2016	-31.5490	115.9998	*Corymbia calophylla*	600	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT13547	18/10/2016	-31.5494	116.0013	*Corymbia calophylla*	550	No	No	No	
HT13548	18/10/2016	-31.5496	116.0012	*Corymbia calophylla*	650	No	No	No	
HT13549	18/10/2016	-31.5516	116.0005	*Corymbia calophylla*	650	No	No	No	
HT13550	18/10/2016	-31.5516	116.0006	*Corymbia calophylla*	500	No	No	No	
HT13551	18/10/2016	-31.5524	115.9998	*Corymbia calophylla*	600	No	No	No	
HT13552	18/10/2016	-31.5525	115.9996	*Corymbia calophylla*	500	No	No	No	
HT13553	18/10/2016	-31.5524	115.9994	*Corymbia calophylla*	600	No	No	No	
HT13554	18/10/2016	-31.5525	115.9992	*Eucalyptus marginata*	700	No	No	No	
HT13555	18/10/2016	-31.5527	115.9990	*Corymbia calophylla*	650	No	No	No	
HT13556	18/10/2016	-31.5528	115.9988	*Corymbia calophylla*	600	No	No	No	
HT13557	18/10/2016	-31.5529	115.9989	*Corymbia calophylla*	950	No	No	No	
HT13558	18/10/2016	-31.5533	115.9988	*Corymbia calophylla*	750	No	No	No	
HT13559	18/10/2016	-31.5524	115.9987	*Eucalyptus* sp.	650	No	No	No	Dead.
HT13560	18/10/2016	-31.5519	115.9989	*Eucalyptus marginata*	550	No	No	No	Dead.
HT13561	18/10/2016	-31.5519	115.9987	*Eucalyptus marginata*	600	No	No	No	Dead.
HT13562	18/10/2016	-31.5520	115.9992	*Eucalyptus marginata*	600	No	No	No	
HT13563	18/10/2016	-31.5521	115.9995	*Corymbia calophylla*	750	No	No	No	
HT13564	18/10/2016	-31.5515	115.9999	*Corymbia calophylla*	550	No	No	No	
HT13565	18/10/2016	-31.5514	116.0001	*Corymbia calophylla*	600	No	No	No	
HT13566	18/10/2016	-31.5511	115.9999	*Corymbia calophylla*	700	No	No	No	
HT13567	18/10/2016	-31.5511	115.9996	*Eucalyptus marginata*	1000	Yes	No	No	Hollow at 8 m.
HT13568	18/10/2016	-31.5503	115.9997	*Eucalyptus marginata*	550	No	No	No	
HT13569	18/10/2016	-31.5501	115.9998	*Corymbia calophylla*	650	No	No	No	
HT13570	18/10/2016	-31.5498	115.9998	*Eucalyptus marginata*	600	No	No	No	
HT13571	18/10/2016	-31.5496	115.9999	*Eucalyptus wandoo*	1000	Yes	No	No	Hollow at 10 m.

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT13572	18/10/2016	-31.5498	115.9996	*Corymbia calophylla*	950	Yes	No	No	Hollow at 5 m.
HT13573	18/10/2016	-31.5491	115.9997	*Corymbia calophylla*	700	No	No	No	
HT13574	18/10/2016	-31.5506	115.9987	*Eucalyptus* sp.	650	No	No	No	Dead.
HT13575	18/10/2016	-31.5506	115.9981	*Corymbia calophylla*	800	No	No	No	
HT13576	18/10/2016	-31.5505	115.9977	*Corymbia calophylla*	1100	No	No	No	
HT13577	18/10/2016	-31.5508	115.9976	*Corymbia calophylla*	900	Yes	No	No	Dead. Hollow at 7 m.
HT13578	18/10/2016	-31.5508	115.9977	*Corymbia calophylla*	750	No	No	No	Dead.
HT13579	18/10/2016	-31.5510	115.9977	*Eucalyptus* sp.	500	No	No	No	
HT13580	18/10/2016	-31.5511	115.9977	*Corymbia calophylla*	800	No	No	No	
HT13581	18/10/2016	-31.5513	115.9979	*Eucalyptus* sp.	750	No	No	No	Dead.
HT13582	18/10/2016	-31.5515	115.9984	*Corymbia calophylla*	650	No	No	No	
HT13583	18/10/2016	-31.5517	115.9982	*Corymbia calophylla*	550	No	No	No	
HT13584	18/10/2016	-31.5517	115.9981	*Eucalyptus marginata*	1000	Yes	No	No	Hollow at 7 m.
HT13585	18/10/2016	-31.5516	115.9978	*Eucalyptus* sp.	1200	Yes	No	No	Dead. Hollow at 8 m.
HT13586	18/10/2016	-31.5519	115.9977	*Eucalyptus marginata*	600	No	No	No	
HT13587	18/10/2016	-31.5519	115.9983	*Eucalyptus* sp.	750	No	No	No	Dead.
HT13588	18/10/2016	-31.5517	115.9985	*Corymbia calophylla*	650	No	No	No	
HT13589	18/10/2016	-31.5514	115.9974	*Eucalyptus marginata*	500	No	No	No	
HT13590	18/10/2016	-31.5514	115.9973	*Eucalyptus marginata*	500	No	No	No	
HT13591	18/10/2016	-31.5515	115.9972	*Eucalyptus marginata*	600	No	No	No	Dead.
HT13592	18/10/2016	-31.5272	116.0297	*Eucalyptus wandoo*	350	No	No	No	
HT13593	18/10/2016	-31.5272	116.0297	*Eucalyptus wandoo*	400	No	No	No	
HT13594	18/10/2016	-31.5273	116.0298	*Eucalyptus wandoo*	700	No	No	No	
HT13595	18/10/2016	-31.5274	116.0299	*Eucalyptus wandoo*	650	No	No	No	
HT13596	18/10/2016	-31.5274	116.0299	*Eucalyptus wandoo*	500	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT13597	18/10/2016	-31.5273	116.0303	*Eucalyptus wandoo*	400	No	No	No	
HT13600	18/10/2016	-31.5264	116.0305	*Eucalyptus wandoo*	800	Yes	No	No	Dead. Hollow at 8 m.
HT13603	18/10/2016	-31.5268	116.0298	*Eucalyptus wandoo*	650	No	No	No	
HT13604	18/10/2016	-31.5268	116.0298	*Eucalyptus wandoo*	450	No	No	No	
HT13605	18/10/2016	-31.5268	116.0299	*Eucalyptus wandoo*	550	No	No	No	
HT13782	2/11/2016	-31.5448	116.0049	*Corymbia calophylla*	590	No	No	No	
HT13783	2/11/2016	-31.5449	116.0052	*Eucalyptus marginata*	500	No	No	No	
HT13784	2/11/2016	-31.5449	116.0054	*Eucalyptus marginata*	710	Yes	No	No	
HT13785	2/11/2016	-31.5448	116.0056	*Eucalyptus marginata*	670	No	No	No	
HT13786	2/11/2016	-31.5448	116.0061	*Eucalyptus marginata*	720	No	No	No	
HT13787	2/11/2016	-31.5448	116.0061	*Eucalyptus marginata*	620	No	No	No	
HT13795	2/11/2016	-31.5425	116.0088	*Eucalyptus marginata*	1830	Yes	No	No	
HT13796	2/11/2016	-31.5196	116.0370	*Corymbia calophylla*	530	No	No	No	
HT13797	2/11/2016	-31.5195	116.0370	*Eucalyptus wandoo*	540	No	No	No	
HT13798	2/11/2016	-31.5196	116.0369	*Corymbia calophylla*	720	No	No	No	
HT13799	2/11/2016	-31.5195	116.0369	*Corymbia calophylla*	580	No	No	No	
HT13800	2/11/2016	-31.5195	116.0369	*Eucalyptus wandoo*	320	No	No	No	
HT13801	2/11/2016	-31.5195	116.0369	*Eucalyptus wandoo*	420	No	No	No	
HT13802	2/11/2016	-31.5192	116.0380	*Eucalyptus marginata*	520	No	No	No	
HT13803	2/11/2016	-31.5175	116.0322	*Eucalyptus marginata*	620	No	No	No	
HT13804	2/11/2016	-31.4641	116.0527	*Corymbia calophylla*	1020	No	No	No	
HT13805	2/11/2016	-31.4641	116.0527	*Corymbia calophylla*	1000	No	No	No	
HT13806	2/11/2016	-31.4642	116.0529	*Corymbia calophylla*	920	No	No	No	
HT13807	2/11/2016	-31.4641	116.0529	*Corymbia calophylla*	640	No	No	No	
HT13961	2/11/2016	-31.5429	116.0085	*Eucalyptus marginata*	550	No	No	No	

Name	Date	Latitude	Longitude	Tree species	DBH (mm)	Hollows present	Suitable for Carnaby's	Evidence of use by Carnaby's	Comments
HT13962	2/11/2016	-31.5429	116.0086	*Eucalyptus marginata*	800	No	No	No	
HT13963	2/11/2016	-31.5194	116.0370	*Eucalyptus wandoo*	375	No	No	No	
HT13964	2/11/2016	-31.5195	116.0371	*Eucalyptus wandoo*	405	No	No	No	
HT13965	2/11/2016	-31.5195	116.0372	*Eucalyptus wandoo*	440	No	No	No	
HT13966	2/11/2016	-31.5194	116.0374	*Corymbia calophylla*	785	No	No	No	
HT13967	2/11/2016	-31.5193	116.0376	*Eucalyptus marginata*	720	No	No	No	
HT13968	2/11/2016	-31.5194	116.0376	*Eucalyptus wandoo*	465	No	No	No	
HT13969	2/11/2016	-31.5195	116.0375	*Eucalyptus marginata*	1040	No	No	No	
HT13970	2/11/2016	-31.5194	116.0378	*Corymbia calophylla*	785	No	No	No	
HT13971	2/11/2016	-31.4641	116.0530	*Corymbia calophylla*	780	No	No	No	
HT13972	2/11/2016	-31.4641	116.0529	*Corymbia calophylla*	710	No	No	No	
HT14749		-31.5484	116.0000	*Eucalyptus wandoo*		Yes	Yes	yes	Carnaby's Black Cockatoo pair at hollow. chick heard.
HT14807	9/11/2016	-31.5424	116.0088	*Eucalyptus wandoo*		Yes	Yes	No	
HT14808	9/11/2016	-31.5426	116.0087	*Eucalyptus wandoo*		Yes	Yes	No	
HT13950	1/11/2016	-31.5451	116.0060	*Corymbia calophylla*	700	No	No	No	
HT13957	1/11/2016	-31.5435	116.0079	*Eucalyptus marginata*	550	No	No	No	
HT13958	1/11/2016	-31.5435	116.0080	*Eucalyptus marginata*	800	No	No	No