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Emerge Environmental Services Pty Ltd ABN 57144772510 trading as Emerge Associates

Attention: Vanessa Slater Coordinator Natural Reserves Shire of Serpentine Jarrahdale 6 Paterson Street Mundijong WA 6123

Delivered by email to: vslater@sjshire.wa.gov.au

Dear Vanessa

BLACK COCKATOO HABITAT TREE SURVEY – PART KINGSBURY DRIVE, KEYSBROOK

1 BACKGROUND

The Shire of Serpentine Jarrahdale (the Shire) are proposing to undertake vegetation clearing within parts of the road reserves of Kingsbury Drive in Serpentine (hereafter referred to as the 'site'). The site extends over 2.12 hectares (ha) as shown in **Figure 1**.

The Shire have submitted a clearing permit application to the Department of Water and Environmental Regulation (DWER). DWER require additional information regarding the quantity and locations of black cockatoo habitat trees within the site. Additionally, DWER have requested photographs showing the site conditions to be taken along the length of the site to assess the vegetation types, vegetation condition and fauna habitat values present.

2 METHODS

2.1 Field survey

2.1.1 Habitat tree survey

Two ecologists from Emerge visited the site on 30 November 2021 to conduct the survey.

During the survey the site was traversed on foot and the presence of black cockatoo habitat trees was recorded. Where habitat trees were observed close the site boundary these were also recorded as a precautionary approach to control for inaccuracy of the GPS unit used.

A 'habitat tree' was defined as a native eucalypt that is typically known to support black cockatoo breeding such as marri, jarrah, blackbutt or tuart with a diameter at breast height (DBH) \geq 50 cm or wandoo and salmon gum with a DBH of \geq 30 cm. As black cockatoos could breed in any suitable hollow, other tree species were also inspected and recorded if they contained a suitable hollow.

To be suitable for use as breeding habitat by black cockatoos it was considered a hollow must:

- have an entrance opening of at least 10 cm but preferably 20-30 cm (Saunders et al. 1982;
 Groom 2010; Johnstone et al. 2013)
- be located at least 3 m from the ground (Saunders 1979b; Johnstone and Storr 1998; Groom 2010; Saunders 2014)
- be located in a trunk or branch that is generally large enough to contain a hollow that has a
 floor diameter of at least 40 cm and depth of 50-200 cm such that it could house an adult
 black cockatoo and nestlings (Saunders 1979a; Johnstone and Storr 1998; Saunders 2014;
 DPaW 2015)
- have vertical or near vertical orientation (Johnstone and Kirkby 2008; Johnstone et al. 2013).

Occasionally, native eucalypts were encountered that met DBH requirements but did not contain a trunk/branch of a sufficient size to support a hollow suitable for use by black cockatoos. For example, the tree may have been less than 3 m tall or had a trunk that forked between 1.3 m and 3 m in height and after the fork no limbs had a diameter of \geq 50 cm or \geq 30 cm for wandoo or salmon gum. These trees were not recorded as habitat trees as the likelihood they would form a suitable hollow was low.

Habitat trees were individually identified and the attributes outlined in **Table 1** were recorded for each tree. Each habitat tree was assigned to a category listed in **Table 2**.

Table 1: Attributes recorded for each habitat tree in the site

Attribute	Description
Image	Trees were individually photographed
GPS location	The location was recorded using a handheld GPS unit
Tree species	Species and common name were identified
Diameter at breast height (DBH) (cm)	DBH was measured at breast height (1.3 m) using a diameter tape
Hollows potentially suitable for breeding by a black cockatoo	Number of hollows potentially suitable for breeding by a black cockatoo recorded (assessed from ground level only)

Table 2: Habitat tree categories

Category	Specifications
Nest	The tree contains a hollow used by black cockatoos for breeding as confirmed by records of black cockatoos, their eggs or fledglings or other evidence of recent nesting activity by black cockatoos.
Suitable hollow(s) with signs of use	The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection^ and potential evidence of use by black cockatoos such as feathers, chew marks or nest material has been recorded within a hollow.
Suitable hollow(s)	The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection^.
Potentially suitable hollow(s)	The tree contains or is suspected to contain one or more hollows that have the potential to be suitable for use by black cockatoos when either viewed from the ground or following an internal hollow inspection that was inconclusive.
No suitable hollow(s)	The tree does not contain hollow(s) that have the potential to be suitable for use by black cockatoos when viewed from the ground or contains hollows that were determined to be unsuitable for use by black cockatoos by internal inspection^.

^Hollow determined to be suitable for use as breeding habitat by black cockatoos as listed above

2.1.2 Photo point

A photo showing the site conditions was taken every 100 m along the site boundary, both along the northern and the southern boundaries of the site.

2.2 Data analysis, presentation and mapping

Habitat trees were classified according to the scheme outlined in Table 2 and mapped on aerial imagery. A complete summary of the recorded attributes of habitat trees was compiled in a tabular format.

2.3 Limitations

The survey was undertaken by experienced ecologists with extensive experience in undertaking black cockatoo surveys. The site was surveyed extensively, and all parts of the site could be accessed as required.

A handheld Garmin GPS receiver was used to determine the location of habitat trees in relation to the site boundary. A handheld GPS receiver generally has precision of ±5 metres (m). As a precautionary approach, habitat trees that occurred adjacent to the site boundary were also recorded to control for spatial error. Hence, it is possible that some of the habitat trees recorded are located just outside of the site.

3 RESULTS AND DISCUSSION

3.1 Habitat tree survey

A total of 69 black cockatoo habitat trees were recorded within the site as shown in Figure 2.

The habitat trees comprised 32 *Corymbia calophylla* (marri), 35 *Eucalyptus marginata* (jarrah), three *Eucalyptus patens* (blackbutt) and two stag (dead) trees.

Of the 69 habitat trees recorded in the site, three contain hollows that are potentially suitable for breeding by black cockatoos as observed from the ground. No signs use of these hollows by black cockatoos such as chew marks, scats or feathers were observed during the survey.

A summary of the habitat trees recorded within the site is provided in **Table 3** and an inventory in **Attachment 1**.

Table 3: Habitat trees recorded within the site

Category	No. trees	No. of hollows
Confirmed nest	0	N/A
Potential nest	0	N/A
Suitable hollow(s)	0	N/A
Potentially suitable hollow(s)	3	3
No suitable hollow(s)	69	0

An internal hollow inspection using a pole-mounted camera, drone or tree climber would be required to confirm whether the hollows in the site are suitable for breeding by black cockatoos. The three species of black cockatoo that occur within the vicinity of the site breed at different times of the year. If an internal hollow inspection is undertaken this should be taken into consideration to maximise the chance to detect breeding by these species.

As it was not always possible to determine whether a habitat tree was located within or just outside of the site, trees that were located immediately adjacent to the site boundary were recorded. A

more precise survey would be required to confirm which habitat trees are located within and which are located outside of the site.

3.2 Photo point

A total of 65 photos were taken along the site boundary to show the vegetation and fauna habitat values present as provided in **Attachment 2**. The location of each photo point and the directions of the photographs are shown in **Figure 3**.

The site comprises a mixture of intact native vegetation and disturbed areas comprising scattered native trees (or absent) over bare ground and/or non-native grasses and herbs with occasional native understorey plant species. Intact native vegetation is predominantly located in the western portion of the site.

Summary and closing

We trust that this letter provides sufficient details on the black cockatoo habitat trees and site condition photos taken within the site. Should you have any questions regarding the content of this letter, please do not hesitate to contact the undersigned.

Yours sincerely Emerge Associates

Rachel Weber

SENIOR ENVIRONMENTAL CONSULTANT, TEAM LEADER – ECOLOGY

cc: nil

Encl: Figure 1: Site Location

Figure 2: Black Cockatoo Habitat Trees
Figure 3: Photo Point Location and Direction

Attachment 1: Habitat Tree Data Attachment 2: Photo Point Data

References

Department of Parks and Wildlife (DPaW) 2015, How to design and place artificial hollows for Carnaby's cockatoo, Perth.

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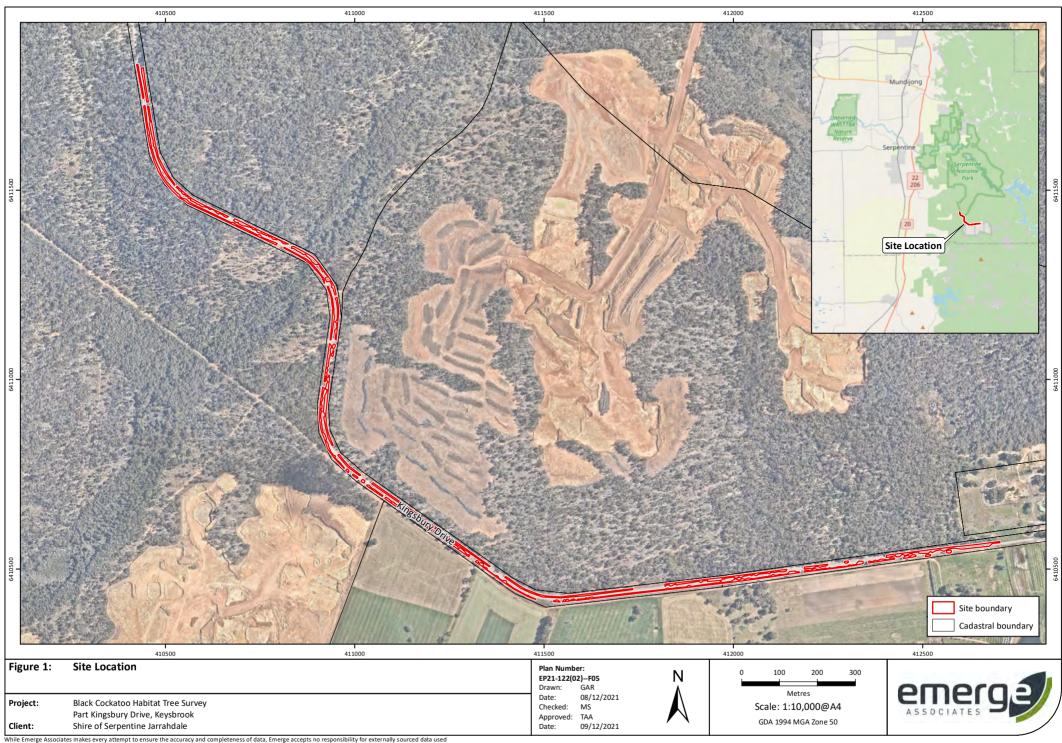
Figures

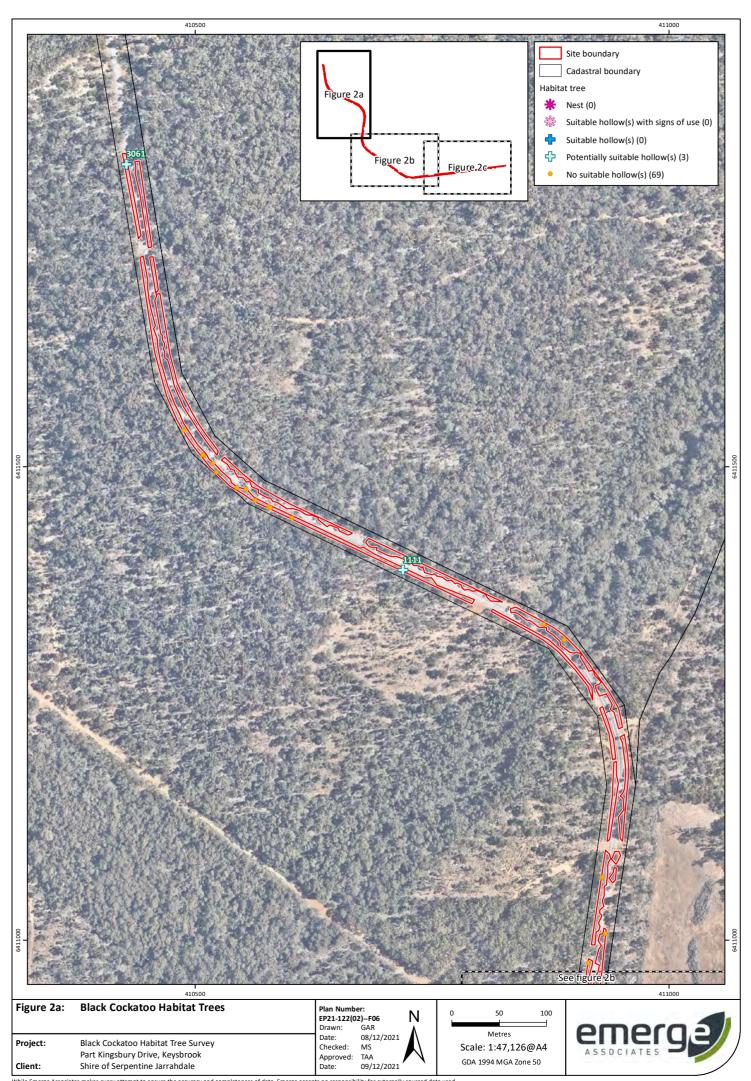


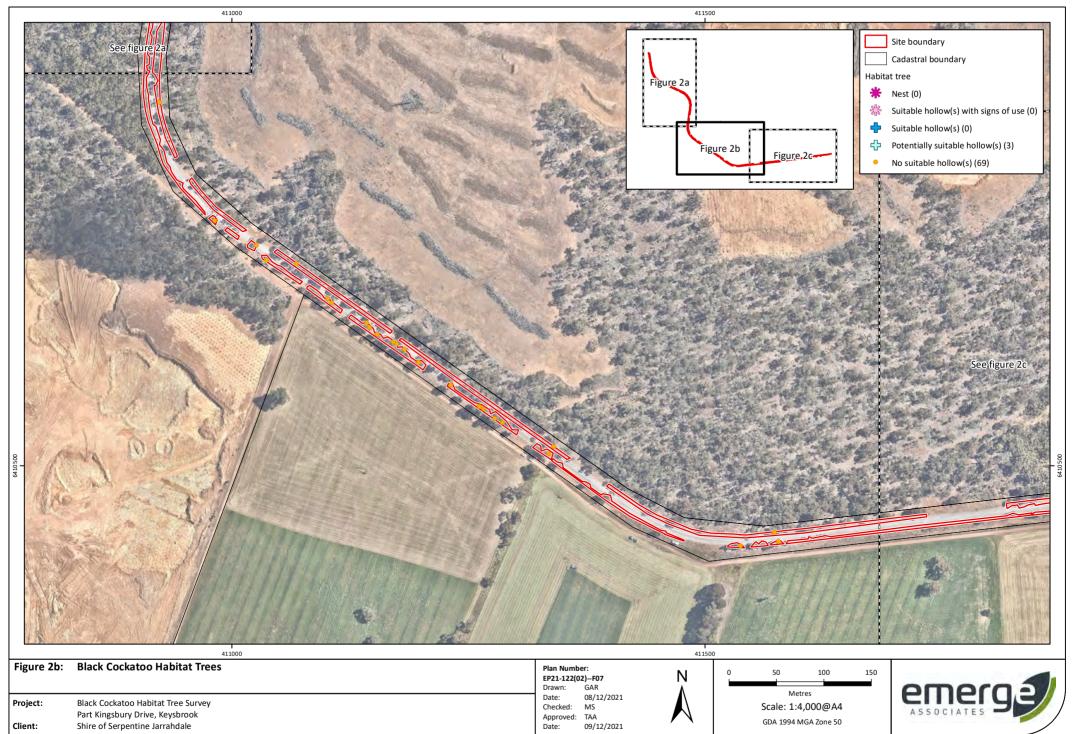
Figure 1: Site Location

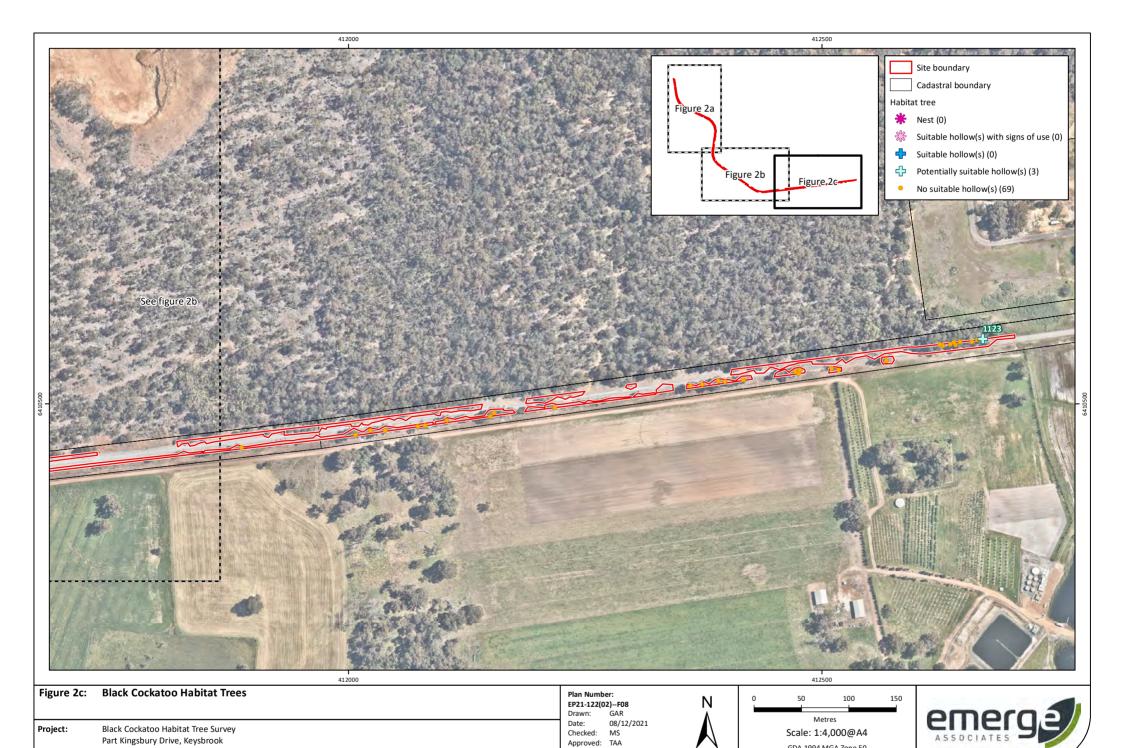
Figure 2: Black Cockatoo Habitat Trees

Figure 3: Photo Point Location and Direction





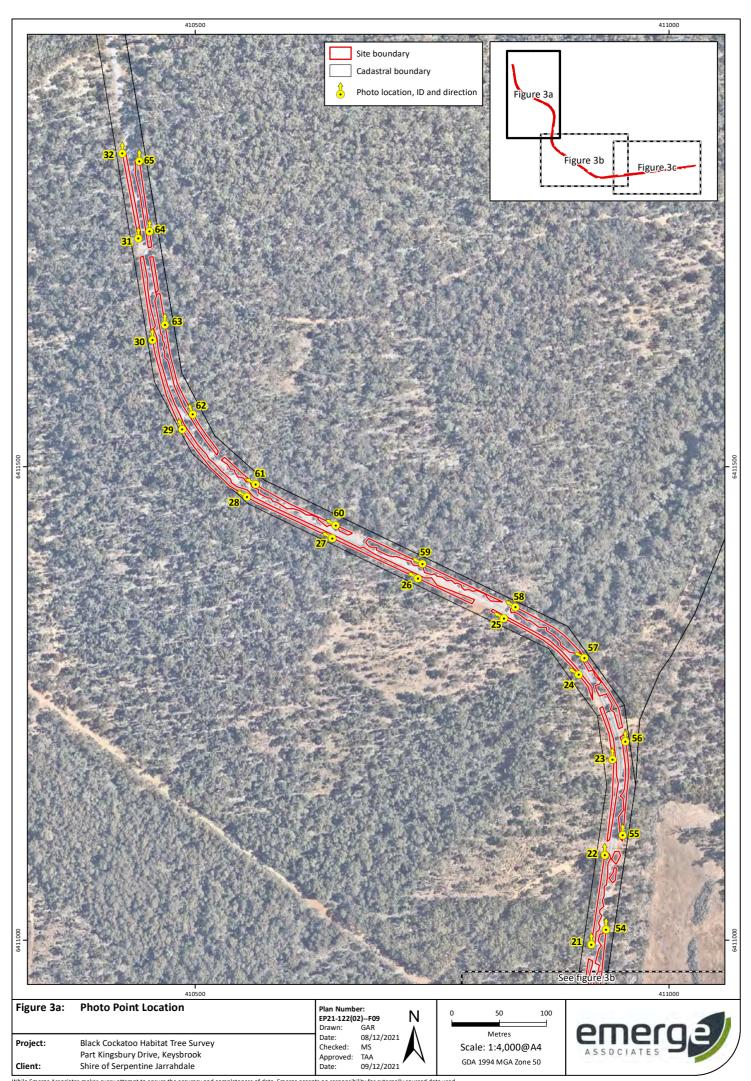


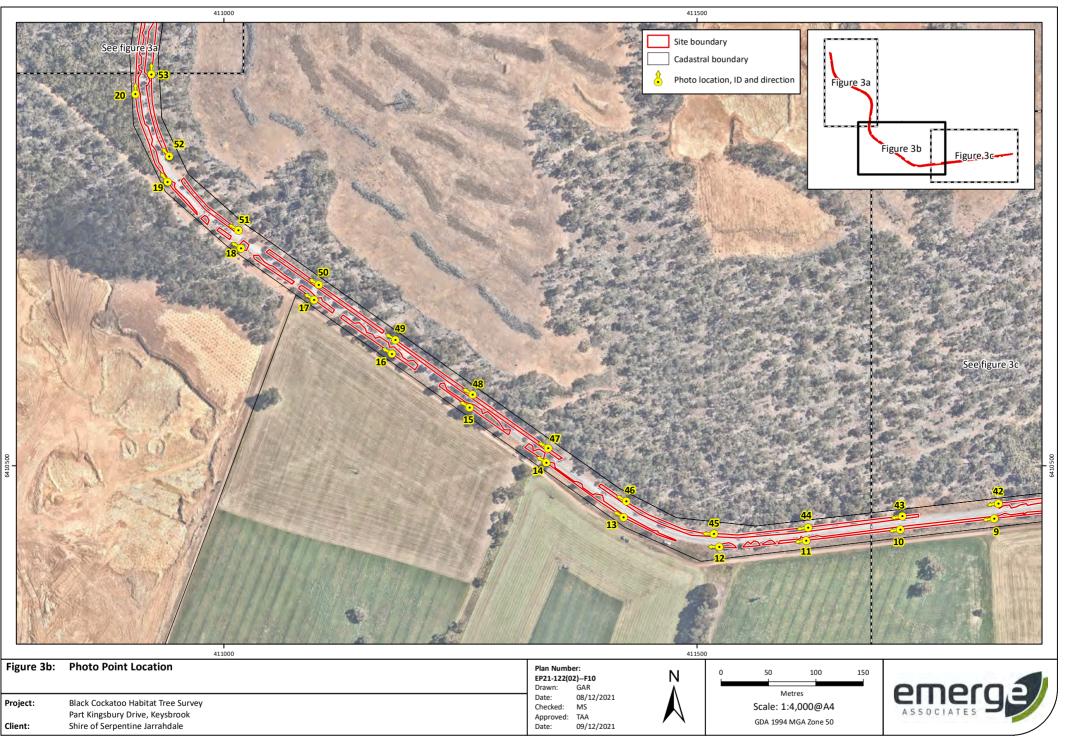


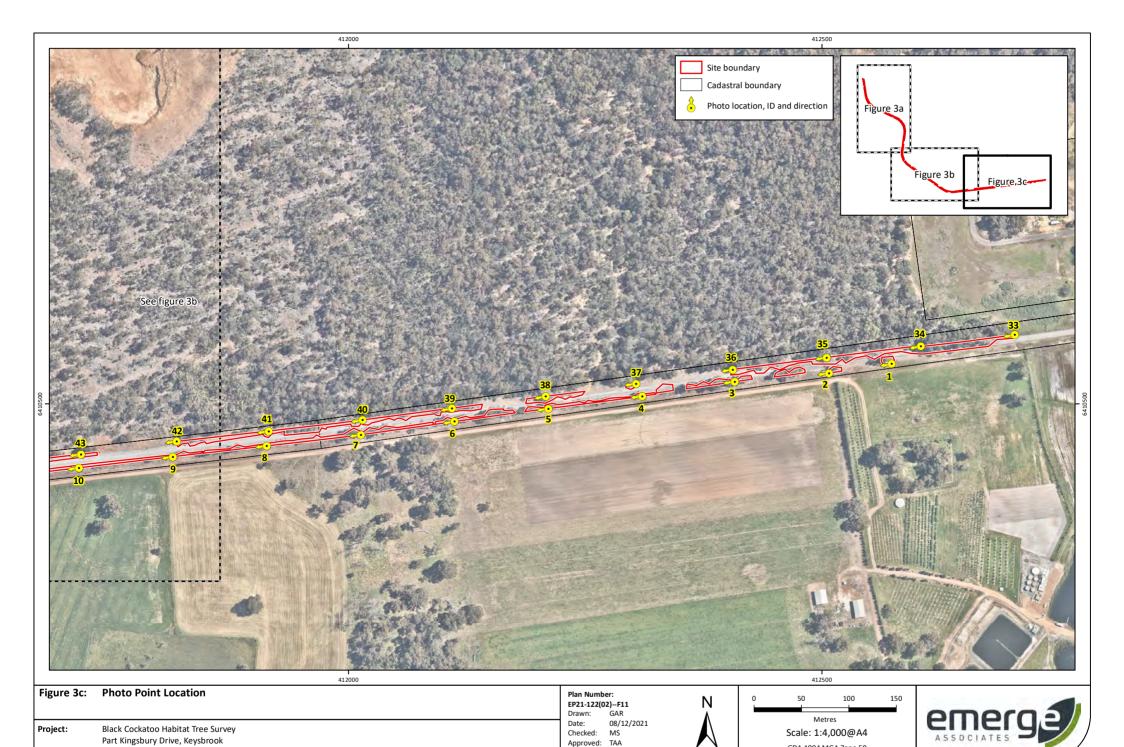
09/12/2021

GDA 1994 MGA Zone 50

Shire of Serpentine Jarrahdale Client: While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used ©Landgate (2021). Nearmap Imagery date: 11/11/2021







09/12/2021

Date:

GDA 1994 MGA Zone 50

Shire of Serpentine Jarrahdale Client: While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used ©Landgate (2021). Nearmap Imagery date: 11/11/2021

Attachment 1

Habitat Tree Data





ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1066	412568.28	6410545.28	65	Corymbia calophylla	No suitable hollow(s)	
1067	412517.88	6410535.97	51	Corymbia calophylla	No suitable hollow(s)	
1068	412510.53	6410537.46	72	Corymbia calophylla	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1069	412475.89	6410532.39	46	Corymbia calophylla	No suitable hollow(s)	
1070	412476.63	6410535.95	60	Corymbia calophylla	No suitable hollow(s)	Carrier Schaller Lider
1071	412472.12	6410533.56	63	Corymbia calophylla	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1072	412417.37	6410525.56	65	Corymbia calophylla	No suitable hollow(s)	
1073	412397.57	6410523.61	76	Corymbia calophylla	No suitable hollow(s)	
1074	412390.69	6410524.29	65	Corymbia calophylla	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1075	412373.70	6410520.75	69	Eucalyptus marginata	No suitable hollow(s)	
1076	412361.45	6410518.67	76	Eucalyptus marginata	No suitable hollow(s)	
1077	412217.94	6410496.21	69	Corymbia calophylla	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1078	412153.73	6410490.53	83	Corymbia calophylla	No suitable hollow(s)	
1079	412149.79	6410486.97	50	Eucalyptus marginata	No suitable hollow(s)	
1080	412103.73	6410482.46	51	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1081	412080.76	6410477.14	57	Stag	No suitable hollow(s)	
1082	412073.42	6410476.13	53	Corymbia calophylla	No suitable hollow(s)	
1083	412038.87	6410471.70	98	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1084	412023.26	6410472.00	50	Corymbia calophylla	No suitable hollow(s)	
1085	412007.32	6410467.10	85	Corymbia calophylla	No suitable hollow(s)	
1086	411886.63	6410453.84	61	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1087	411577.81	6410419.86	53	Corymbia calophylla	No suitable hollow(s)	
1088	411537.52	6410415.30	46	Corymbia calophylla	No suitable hollow(s)	
1089	411335.37	6410513.07	62	Corymbia calophylla	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1090	411286.29	6410545.67	50	Eucalyptus marginata	No suitable hollow(s)	
1091	411277.86	6410549.66	51	Corymbia calophylla	No suitable hollow(s)	
1092	411266.32	6410559.80	64	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1093	411261.63	6410562.20	61	Corymbia calophylla	No suitable hollow(s)	
1094	411231.55	6410585.37	70	Eucalyptus marginata	No suitable hollow(s)	
1095	411197.63	6410609.19	54	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1096	411182.66	6410622.58	71	Eucalyptus marginata	No suitable hollow(s)	
1097	411174.49	6410628.24	52	Eucalyptus marginata	No suitable hollow(s)	
1098	411170.55	6410630.57	54	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1099	411153.62	6410639.00	61	Eucalyptus marginata	No suitable hollow(s)	
1100	411145.65	6410646.13	54	Eucalyptus marginata	No suitable hollow(s)	
1101	411142.64	6410650.72	66	Corymbia calophylla	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1102	411105.77	6410671.94	70	Eucalyptus marginata	No suitable hollow(s)	
1103	411101.80	6410675.97	55	Eucalyptus marginata	No suitable hollow(s)	
1104	411036.66	6410716.75	58	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1105	411026.09	6410732.62	75	Eucalyptus marginata	No suitable hollow(s)	
1106	410982.23	6410758.62	55	Eucalyptus marginata	No suitable hollow(s)	
1107	410914.83	6410975.60	57	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1109	410929.11	6411065.80	53	Corymbia calophylla	No suitable hollow(s)	
1111	410719.36	6411390.70	126	Eucalyptus marginata	Potentially suitable hollow(s)	
1112	410602.18	6411445.98	84	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1113	410577.27	6411458.35	57	Eucalyptus marginata	No suitable hollow(s)	
1114	410579.35	6411456.70	59	Eucalyptus marginata	No suitable hollow(s)	
1115	410563.68	6411464.26	94	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1116	410553.70	6411476.10	50	Eucalyptus marginata	No suitable hollow(s)	
1117	410544.10	6411477.79	81	Eucalyptus marginata	No suitable hollow(s)	
1118	410522.17	6411494.26	57	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1119	410518.95	6411503.50	56	Eucalyptus marginata	No suitable hollow(s)	
1120	410509.19	6411512.18	62	Eucalyptus marginata	No suitable hollow(s)	
1121	410508.15	6411512.83	76	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1122	410487.87	6411538.61	55	Eucalyptus marginata	No suitable hollow(s)	
1123	412670.09	6410568.45	103	Corymbia calophylla	Potentially suitable hollow(s)	
1124	412646.20	6410565.49	90	Other	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
1125	412624.70	6410563.02	90	Corymbia calophylla	No suitable hollow(s)	
3048	412641.38	6410561.99	105	Corymbia calophylla	No suitable hollow(s)	
3049	412639.65	6410564.74	66	Corymbia calophylla	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
3051	411573.54	6410429.91	50	Corymbia calophylla	No suitable hollow(s)	
3052	411340.39	6410520.30	52	Eucalyptus marginata	No suitable hollow(s)	
3053	411068.47	6410713.48	179	Eucalyptus marginata	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
3054	410923.53	6410883.71	76	Corymbia calophylla	No suitable hollow(s)	
3055	410932.83	6411006.85	57	Corymbia calophylla	No suitable hollow(s)	
3057	410889.56	6411317.00	50	Eucalyptus patens	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
3058	410867.88	6411333.21	53	Eucalyptus patens	No suitable hollow(s)	
3061	410427.37	6411819.90	145	Stag	Potentially suitable hollow(s)	
3062	412664.62	6410567.80	98	Corymbia calophylla	No suitable hollow(s)	



ID No.	Easting	Northing	DBH (cm)	Species	Category	Photo
3063	412658.74	6410565.69	51	Corymbia calophylla	No suitable hollow(s)	
3064	412636.01	6410563.27	58	Corymbia calophylla	No suitable hollow(s)	
3065	412628.13	6410561.32	102	Corymbia calophylla	No suitable hollow(s)	

Attachment 2

Photo Point Data





Photo ID	Easting	Northing	Image
1	412573.86	6410542.63	
2	412507.53	6410532.68	
3	412408.13	6410523.60	



Photo ID	Easting	Northing	Image
4	412310.10	6410508.26	
5	412210.96	6410495.27	
6	412111.92	6410481.53	



Photo ID	Easting	Northing	Image
7	412012.87	6410467.76	
8	411913.59	6410455.83	
9	411814.25	6410444.43	



Photo ID	Easting	Northing	Image
10	411714.93	6410432.82	
11	411615.60	6410421.20	
12	411523.81	6410414.47	



Photo ID	Easting	Northing	Image
13	411422.52	6410445.49	
14	411340.95	6410503.29	
15	411259.97	6410561.32	



Photo ID	Easting	Northing	Image
16	411177.69	6410618.16	
17	411095.51	6410675.10	
18	411018.36	6410729.43	



Photo ID	Easting	Northing	Image
19	410940.85	6410799.65	
20	410906.67	6410892.10	
21	410918.08	6410994.97	



Photo ID	Easting	Northing	Image
22	410932.09	6411090.02	
23	410940.20	6411190.86	
24	410904.73	6411280.32	



Photo ID	Easting	Northing	Image
25	410825.89	6411340.13	
26	410735.20	6411382.09	
27	410644.75	6411424.72	



Photo ID	Easting	Northing	Image
28	410554.79	6411468.27	
29	410486.39	6411539.59	
30	410455.00	6411633.96	



Photo ID	Easting	Northing	Image
31	410440.00	6411741.08	
32	410422.95	6411831.28	
33	412703.89	6410572.99	



Photo ID	Easting	Northing	Image
34	412604.65	6410560.72	
35	412505.37	6410549.09	
36	412406.15	6410536.58	



Photo ID	Easting	Northing	Image
37	412303.66	6410521.38	
38	412208.20	6410508.11	
39	412108.99	6410495.63	



Photo ID	Easting	Northing	Image
40	412014.77	6410483.29	
41	411915.46	6410471.55	
42	411818.50	6410460.52	



Photo ID	Easting	Northing	Image
43	411717.00	6410446.94	
44	411617.70	6410435.11	
45	411518.19	6410428.44	



Photo ID	Easting	Northing	Image
46	411425.56	6410462.30	
47	411342.88	6410518.54	
48	411263.21	6410575.05	



Photo ID	Easting	Northing	Image
49	411181.65	6410632.91	
50	411100.48	6410691.26	
51	411015.66	6410748.49	



Photo ID	Easting	Northing	Image
52	410942.51	6410826.56	
53	410923.67	6410913.12	
54	410933.55	6411011.02	



Photo ID	Easting	Northing	Image
55	410951.21	6411110.39	
56	410953.97	6411209.87	
57	410910.90	6411298.13	



Photo ID	Easting	Northing	Image
58	410838.21	6411351.91	
59	410739.83	6411397.50	
60	410648.62	6411438.25	



Photo ID	Easting	Northing	Image
61	410563.71	6411481.61	
62	410497.59	6411555.48	
63	410468.03	6411650.13	



Photo ID	Easting	Northing	Image
64	410451.78	6411748.72	
65	410440.94	6411823.04	