Memorandum

5 August 2018

To	Main Roads Western Australia		
Copy to			
From	Glen Gaikhorst	Tel	+61 8 6222 8689
Subject	High Street Upgrade - Black Cockatoo Tree Survey	Job no.	6137248

1 Introduction

1.1 Background

In 2002, the Metropolitan Freight Network Review considered options for managing freight demand, improving the sustainability of freight transport, reducing future problems and focusing government intervention to reduce the impact of freight in Western Australia. The Plan included recommendations to upgrade High Street between Stirling Highway and Carrington Street in Fremantle. In November 2007 the then Department for Planning and Infrastructure commissioned a study to prepare a preliminary road design and preferred alignment option for the upgrade.

In 2014, a concept design was determined. The project involved the upgrade of the road to a 4 lane dual carriageway with ultimate design being 6 lanes, and realignment of the High Street and Stirling Highway intersection. GHD Pty Ltd (GHD) was commissioned by Main Roads Western Australia (Main Roads) to complete an Environmental Impacts Assessment (EIA) and Environmental Management Plan for this project, which included a range of supporting technical studies.

The project has since been amended to have a smaller footprint, while still meeting safety and future growth demands. The duration of time since the 2014 assessments and change in potential environmental impacts, necessitates the EIA and selected technical studies to be recompleted to support environmental approvals.

As the project area is located within the habitat distribution of two species of Black Cockatoo with threatened status (Carnaby's Black Cockatoo (Endangered) and Forest Red-tailed Black Cockatoo (Vulnerable), a targeted Black Cockatoo survey was repeated.

1.2 Location and additional survey area

The project area is located on High Street, 2 km east of Fremantle. The works were conducted between Stirling Highway and Carrington Street, 0.03 Straight Line Kilometres (SLK) to 1.49 SLK, in the Shire of Fremantle. The survey area used for vegetation and targeted Black Cockatoo surveys in June and July 2018 is presented in Figure 1.

1.3 Purpose and scope of works

The purpose of the survey was to assess the number of actual and potential breeding and roosting trees and feeding evidence. The outcomes of the survey will be used to inform the environmental assessment and approvals process.

The scope of works was to complete a Black Cockatoo assessment of the survey area. Specifically the scope of works was to:

- Complete a targeted survey for Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo and provide locations and counts, including presence and potential use of Black Cockatoo habitat trees and feeding evidence
- Prepare a memorandum (this document) which outlines the methods and results of the assessment.

1.4 Assumptions and limitations

This memorandum has been prepared by GHD for Main Roads and may only be used and relied on by Main Roads for the purpose agreed between GHD and Main Roads as set out in section 1.3 of this memorandum.

GHD otherwise disclaims responsibility to any person other than Main Roads arising in connection with this memorandum. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this memorandum were limited to those specifically detailed in the memorandum and are subject to the scope limitations set out in the memorandum.

The opinions, conclusions and any recommendations in this memorandum are based on assumptions made by GHD described in this memorandum. GHD disclaims liability arising from any of the assumptions being incorrect.

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Site conditions may change after the date of this memorandum. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this memorandum if the site conditions change.

2 Methodology

An assessment for Black Cockatoo habitat within the survey area was completed between the 26th June and 2nd July 2018. The assessments were undertaken by Glen Gaikhorst and Madi Roberts, with Tony Kirkby visiting the site on the 28th June to assess any potential hollows identified as potentially suitable for Black Cockatoo use. The assessment involved visual and aural assessment of the survey area to identify breeding habitat (presence/absence of actual and potential breeding trees), foraging habitat, current activity, roosting area and any other signs of use by Black Cockatoos. For the purpose of this assessment, the DSEWPaC (2012) Black Cockatoo referral guidelines were used to define breeding, foraging and roosting habitat. Large medium and small hollows were defined as:

- Large = a hollow with an entrance of 12 cm or greater

- Medium = a hollow with an entrance of approximately 8 to 12 cm
- Small = a hollow up to 5 cm.

Hollow sizes are an approximation observed from ground assessment and represent a guide only to potential use of a hollow. A combination of factor are used to determine if a hollow is potential Black Cockatoo suitable or utilised in the past. Some of these factors included chews on and around the hollow entrance, presence of other species, bees, angle and position of hollow and height from ground.

The large hollows identified within the survey area were investigated further by Tony Kirkby on the 9th July 2018 with the use of a pole camera. Tony's assessment and review comprises part of this assessment.

3 Results

The survey area occurs within the known range of two species of black cockatoo, Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo (DSEWPaC 2012). Baudin's Black Cockatoo sporadically visit the Swan Coastal Plain and are not considered a regular visitor, primarily utilising the Darling Range and associated regions.

3.1 Observations

Forest Red-tailed Black Cockatoo were recorded on several occasions flying over the survey area in flocks of 2 to 6 birds. On two occasions this species was also recorded feeding on Marri nuts, once along Stirling Highway and the other near to the golf course. Along Stirling highway birds were also recorded loafing in Swamp Mahogany.

3.2 Feeding Evidence

Feeding evidence was recorded across the survey area predominantly where Marri and Jarrah were present. Marri and Jarrah feeding appeared mainly by Forrest Red-tailed Black Cockatoo, however some Marri appeared to be utilised by Carnaby's Black Cockatoo. Feeding evidence within the survey area are provided in Table 1.

In the vicinity of the Peppermint record in Table 1, there were numerous other Peppermint trees with feeding evidence on grubs, where the bark had been peeled away exposing the borer's chambers, see Plate 1. This observation was only recorded within the Royal Fremantle Golf Course. Feeding evidence in this locality was also recorded on Cape Lilac drupes, pine cones and possibly Yate, however the Yate nuts were difficult to assess. Cape Lilac is utilised by Forest Red-tailed Black Cockatoo while Carnaby's Black Cockatoo are known to utilise Pine and Yate as a food source. The native species feeding evidence is presented in Figure 3.

Table 1 Black Cockatoo feeding evidence within survey area

Tree Species	Observation	Easting	Northing	Comment
Jarrah	Feeding	384489.8	6453278	Evidence of cockatoo feeding
Jarrah	Feeding	384492.8	6453276	Evidence of cockatoo feeding
Jarrah	Feeding	384625.9	6453277	Evidence of cockatoo feeding
Jarrah	Feeding	384632.7	6453275	Evidence of cockatoo feeding
Marri	Feeding	384647.7	6453279	Evidence of cockatoo feeding
Marri	Feeding	384644.7	6453286	Evidence of cockatoo feeding
Marri	Feeding	384648.8	6453287	Evidence of cockatoo feeding
Marri	Feeding	384652.9	6453280	Evidence of cockatoo feeding
Marri	Feeding	384659.4	6453273	Evidence of cockatoo feeding
Marri	Feeding	384675.9	6453280	Evidence of cockatoo feeding
Marri	Feeding	384664.1	6453287	Evidence of cockatoo feeding
Marri	Feeding	384664.9	6453289	Evidence of cockatoo feeding
Peppermint	Feeding	384680.9	6453291	Evidence of cockatoo feeding
Marri	Feeding	384474.9	6453274	Evidence of cockatoo feeding
Marri	Feeding	384470.4	6453271	Evidence of cockatoo feeding
Marri	Feeding	384458.9	6453270	Evidence of cockatoo feeding
Marri	Feeding	384452.2	6453270	Evidence of cockatoo feeding
Marri	Feeding	384450.3	6453267	Evidence of cockatoo feeding
Marri	Feeding	384444.6	6453278	Evidence of cockatoo feeding
Marri	Feeding	384436.8	6453266	Evidence of cockatoo feeding
Marri	Feeding	383350.3	6453415	Evidence of cockatoo feeding
Marri	Feeding	384457.2	6453289	Evidence of cockatoo feeding
Marri	Feeding	384733.4	6453286	Forest Red-tailed Black Cockatoo feeding
Marri	Feeding	384657.3	6453292	Evidence of cockatoo feeding
Marri	Feeding	384447.9	6453268	Evidence of cockatoo feeding

Plate 1 Feeding evidence by Carnaby's Black Cockatoo on Peppermint Tree branches

3.3 Breeding Habitat

Black cockatoo habitat trees within the survey area are provided in Table 2. In total 58 native Eucalyptus species (Tuart, Marri, Jarrah and Flooded Gum) were recorded in the survey area to have a >500mm DBH.

An additional 4 non-native Eucalyptus (Sugar Gum) were present with hollows that could be utilised now or in the future for Black Cockatoo. These are shown on Figure 2.

The survey wasn't carried out within the breeding season of the white-tailed species but Forest Red tailed Black Cockatoos breed in all months but mainly spring and autumn and were breeding in the forest at the time of the survey (Tony Kirkby pers comm.). The survey area was traversed on the 28th June 2018 by Glen Gaikhorst and Tony Kirkby for potential Cockatoo hollows. Small, medium and large hollows were inspected via ground assessment. From ground inspection there were four hollows that appeared large and had evidence of being previously worked (i.e. chews present). The pole camera inspection of the four large hollows found only one hollow is suitable for Black Cockatoo use. This hollow demonstrated evident of internal workings however the nesting chamber was not conducive with recent Black Cockatoo use (i.e. uneven and unworked, with no nesting materials present) and likely utilised by Galah or Rainbow Lorikeet. The remaining suspected hollows had chews present on the exterior but were either dead ends or not a hollow. The pole camera hollow inspection data can be seen in Table 3. The mapped Black Cockatoo trees can be seen in Figure 2.

Table 2 Black cockatoo habitat trees

Point ID	Easting	Northing	Botanic Name	Tree Species	DBH	Hollows	Hollow Height	Hollow Entrance size	Hollow assessed via observation and pole camera
Veg 115	384698	6453299	*Eucalyptus gomphocephala*	Tuart	0.76	n	n	n	
Veg 128	384600	6453302	*Eucalyptus gomphocephala*	Tuart	0.89	n	n	n	
Veg 130	384536	6453301	*Eucalyptus gomphocephala*	Tuart	0.71	n	n	n	
Veg 131	384547	6453301	*Eucalyptus gomphocephala*	Tuart	0.95	n	n	n	
Veg 132	384557	6453301	*Eucalyptus gomphocephala*	Tuart	0.73	n	n	n	
Veg 133	384567	6453301	*Eucalyptus gomphocephala*	Tuart	0.72	n	n	n	
Veg 134	384577	6453302	*Eucalyptus gomphocephala*	Tuart	0.72	n	n	n	
Veg 137	384501	6453299	*Eucalyptus gomphocephala*	Tuart	0.87	n	n	n	
Veg 138	384475	6453298	*Eucalyptus gomphocephala*	Tuart	0.62	n	n	n	
Veg 139	384447	6453297	*Eucalyptus gomphocephala*	Tuart	0.89	n	n	n	
Veg 140	384439	6453297	*Eucalyptus gomphocephala*	Tuart	0.59	n	n	n	
Veg 184	383511	6453250	*Eucalyptus gomphocephala*	Tuart	0.81	n	n	n	
Veg 191	384486	6453274	*Corymbia calophylla*	Marri	0.51	1 small	10 m	4 cm	
Veg 198	384500	6453286	*Corymbia calophylla*	Marri	0.54	n	n	n	
Veg 214	384604	6453279	*Eucalyptus gomphocephala*	Tuart	0.84	n	n	n	
Veg 219	384626	6453277	*Eucalyptus marginata*	Jarrah	0.67	n	n	n	

Point ID	Easting	Northing	Botanic Name	Tree Species	DBH	Hollows	Hollow Height	Hollow Entrance size	Hollow assessed via observation and pole camera
Veg 220	384633	6453275	*Eucalyptus marginata*	Jarrah	1.04	n	n	n	
Veg 221	384633	6453288	*Eucalyptus marginata*	Jarrah	0.93	n	n	n	
Veg 223	384637	6453284	*Eucalyptus marginata*	Jarrah	0.56	n	n	n	
Veg 225	384648	6453279	*Corymbia calophylla*	Marri	0.57	n	n	n	
Veg 227	384649	6453287	*Corymbia calophylla*	Marri	0.74	n	n	n	
Veg 228	384653	6453280	*Corymbia calophylla*	Marri	0.7	n	n	n	
Veg 230	384668	6453278	*Corymbia calophylla*	Marri	0.72	n	n	n	
Veg 231	384676	6453280	*Corymbia calophylla*	Marri	0.73	n	n	n	
Veg 233	384664	6453287	*Corymbia calophylla*	Marri	0.54	n	n	n	
Veg 234	384657	6453290	*Corymbia calophylla*	Marri	0.52	n	n	n	
Veg 242	384665	6453289	*Corymbia calophylla*	Marri	0.83	n	n	n	
Veg 248	384683	6453290	*Eucalyptus marginata*	Jarrah	0.6	n	n	n	
Veg 263	384752	6453270	*Eucalyptus cladocalyx*	Sugar Gum	0.8	1 large	4 m	15 cm	Potential in the future, internal chews but nest area unworked
Veg 343	383945	6453270	*Eucalyptus gomphocephala*	Tuart	0.57	n	n	n	
Veg 344	383936	6453270	*Eucalyptus gomphocephala*	Tuart	0.64	n	n	n	
Veg 349	384466	6453282	*Corymbia calophylla*	Marri	0.58	n	n	n	

Point ID	Easting	Northing	Botanic Name	Tree Species	DBH	Hollows	Hollow Height	Hollow Entrance size	Hollow assessed via observation and pole camera
Veg 350	384475	6453274	*Corymbia calophylla*	Marri	0.53	1 small	5 m	5 cm	
Veg 352	384470	6453271	*Corymbia calophylla*	Marri	0.54	n	n	n	
Veg 366	384450	6453267	*Corymbia calophylla*	Marri	0.6	n	n	n	
Veg 368	384445	6453278	*Corymbia calophylla*	Marri	0.54	n	n	n	
Veg 433	383296	6453586	*Eucalyptus gomphocephala*	Tuart	0.7	n	n	n	
Veg 517	383350	6453415	*Corymbia calophylla*	Marri	0.58	n	n	n	
Veg 545	383545	6453257	*Eucalyptus rudis*	Flooded Gum	0.5	n	n	n	
Veg 553	383558	6453270	*Eucalyptus gomphocephala*	Tuart	0.75	1 x medium, 1 x large	2 m, 4 m	25 cm, 10 cm	Hollows to low
Veg 554	383587	6453271	*Eucalyptus gomphocephala*	Tuart	0.67	2 x small, 1 x medium	3 m	2 x 15 cm, 1 x 30 cm	
Veg 556	383613	6453272	*Eucalyptus rudis*	Flooded Gum	0.92	n	n	n	
Veg 559	383902	6453362	*Eucalyptus cladocalyx*	Sugar Gum	1.3	1 large	5 m	15 cm several entrances	Dead end hollow, shallow
Veg 560	383903	6453338	*Eucalyptus cladocalyx*	Sugar Gum	1.47	2 medium, 1 small	all 4 m	8 cm, 8 cm, 5 cm	No hollows
Veg 561	383903	6453325	*Eucalyptus cladocalyx*	Sugar Gum	1.17	1 large 2 medium	all 4 m	10, 12 ,8 cm,	No hollows
Veg 567	384457	6453289	*Corymbia calophylla*	Marri	0.77	n	n	n	
Veg 578	384623	6453285	*Eucalyptus marginata*	Jarrah	1.58	n	n	n	
Veg 580	384714	6453284	*Corymbia calophylla*	Marri	0.97	n	n	n	

Point ID	Easting	Northing	Botanic Name	Tree Species	DBH	Hollows	Hollow Height	Hollow Entrance size	Hollow assessed via observation and pole camera
Veg 582	383510	6453269	*Eucalyptus gomphocephala*	Tuart	1.1	3 medium to large	2 m	30 cm	Hollows to low
Veg 584	383949	6453269	*Eucalyptus gomphocephala*	Tuart	1.17	n	n	n	
Veg 585	384431	6453281	*Eucalyptus gomphocephala*	Tuart	2.6	1 large bees present	15 m	20 cm	Potential use in the future
Veg 587	384415	6453266	*Eucalyptus gomphocephala*	Tuart	1.65	1 medium galah activity, chews	14 m	6 cm	
Veg 593	383935	6453280	*Eucalyptus gomphocephala*	Tuart	1.21	1 x small, 1 x medium	3 m, 4 m	5 cm, 10 cm	
Veg 594	383944	6453280	*Eucalyptus gomphocephala*	Tuart	1.4	n	n	n	
Veg 595	383984	6453281	*Eucalyptus gomphocephala*	Tuart	1.72	5 or more small to medium	from 2 m	range 5 cm to 10 cm	
Veg 601	383536	6453261	*Eucalyptus gomphocephala*	Tuart	1.4	n	n	n	
Veg 603	383570	6453270	*Eucalyptus gomphocephala*	Tuart	1.07	1 medium with bees, 1 medium	3.5 m, 3 m	25 cm, 20 cm	Hollows to low
Veg 768	384677	6453288	*Eucalyptus marginata*	Jarrah	0.56	n	n	n	
Veg 793	383398	6453398	*Eucalyptus gomphocephala*	Tuart	1.11	2 smalls	4 m	4 cm	
Veg 859	383525	6453247	*Eucalyptus gomphocephala*	Tuart	0.87	n	n	n	
Veg 889	383165	6453533	*Eucalyptus gomphocephala*	Tuart	0.82	n	n	n	
Veg 900	383166	6453405	*Eucalyptus gomphocephala*	Tuart	0.92	2 medium, 1 large	2 m and 2x 2.5 m	2x 15 cm, 20 cm,	Hollows to low

Table 3 Hollows inspected via pole camera

Hollow Point ID	Tree species	Image	Conclusion
Veg 263	Sugar Gum		Hollow heavily chewed and consistent with Black Cockatoo, however nest area unworked or looked to be utilised by other species possibly Galah. A possible Black Cockatoo hollow in the future.
Veg 559	Sugar Gum		Small hollow but not deep, chews at entrance likely Rainbow Lorikeet or Galah.
Veg 560	Sugar Gum	No hollow	No Hollow
Veg 561	Sugar Gum	No hollow	No Hollow

3.4 Roosting

No roosting evidence was recorded during the surveys. Black cockatoo are known to roost in the region with the closest known roost located approximately 3 km away in Willagee.

3.5 Summary

Within the survey area Forest Red-tailed Black Cockatoo and Carnaby Black Cockatoo were recorded utilising the site. A description of the extent of the foraging, potential breeding and roosting habitat for black cockatoos within the survey area is summarised in Table 4.

Table 4 Summary and extent of black cockatoo habitat within the survey area

Habitat type	Presence within the survey area
Foraging habitat	Habitat types (remnant and planted areas) within the survey area contain suitable foraging species, which are considered to provide high quality foraging habitat for black cockatoos within an otherwise modified landscape. Foraging evidence by black cockatoos was recorded on 25 separate occasions on Jarrah, Marri and Peppermint tree within the survey area. Numerous observations of feeding on Pine cones was also recorded within the survey area.
Actual breeding habitat	No breeding events were recorded by black cockatoos at the time of the survey. One tree (Point ID Veg 263) a Sugar Gum has a large hollow that could be utilised by Black Cockatoo (See Figure 2).
Potential breeding habitat	62 potential breeding habitat trees (>500mm DBH) were recorded within the survey area comprising of: • 58 Native eucalyptus species (Tuart, Marri, Jarrah and Flooded Gum) of which 12 had either small, medium or large hollows. • 4 Non-native (to WA) Eucalypt species (Sugar Gum) had hollows present. These were identified by Tony Kirkby and inspected via pole camera. Only one tree (Point ID Veg 263) had a large hollow present that could be used in the future.
Roosting habitat	No roosting sites were recorded as being used by black cockatoos.

Regards

Glen Gaikhorst
Senior Zoologist

Tony Kirkby
Senior Cockatoo Researcher

References

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, *EPBC Act referral guidelines for three threatened black cockatoo species*, Canberra, Australia, Department of Sustainability, Environment, Water, Population and Communities.

Attachment 1 – Figures

Paper Size ISO A4

0 0.09 0.18 0.27 0.36

Kilometers

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

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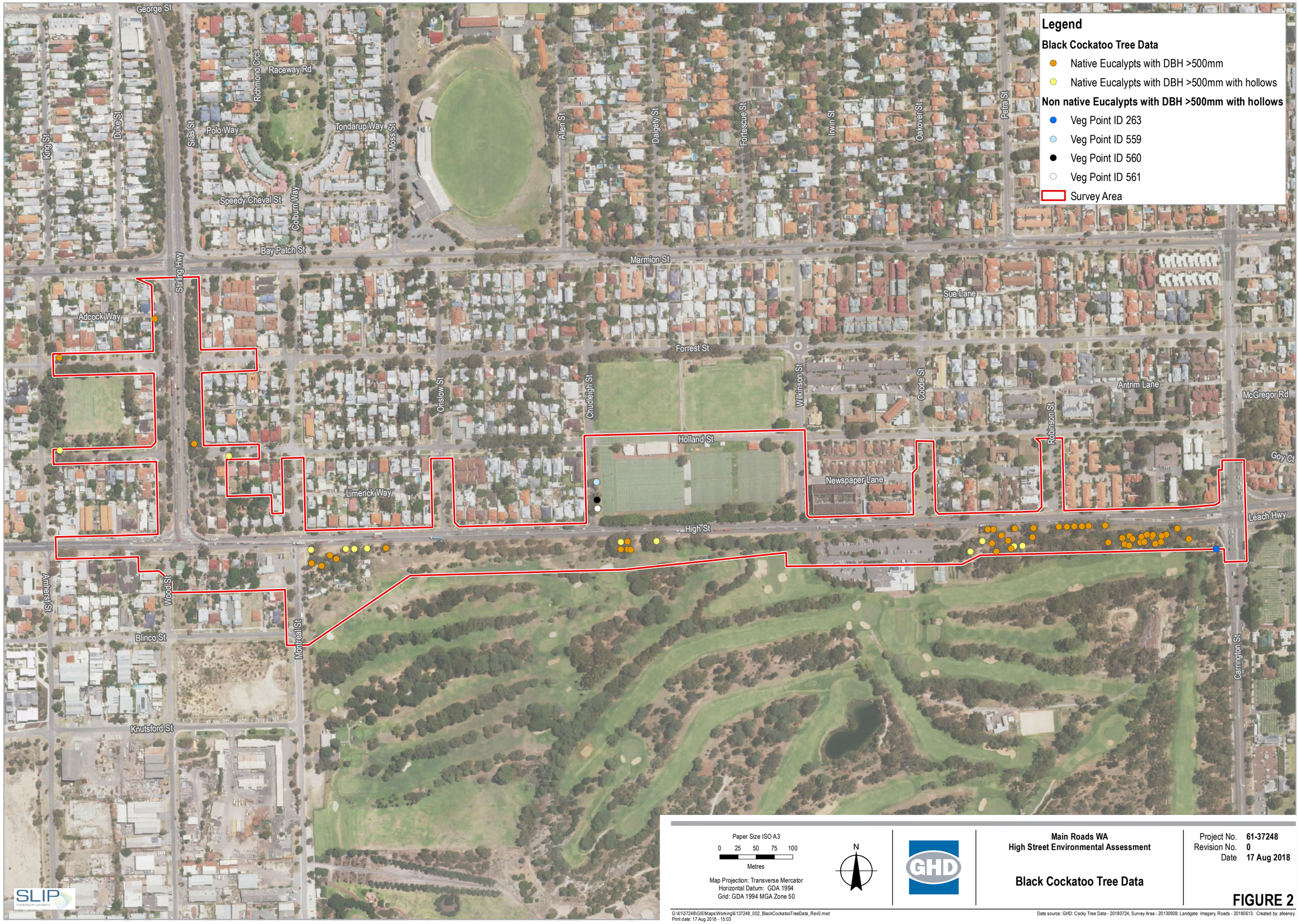
GHD

Main Roads WA
High Street Upgrade
Stirling Highway (0.03 SLK) to
Carrington Street (1.48 SLK)

Survey area location

Project No. 61-37248
Revision No. draft v 1
Date 01/07/2018

FIGURE 1



Paper Size ISO A3

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Main Roads WA
High Street Environmental Assessment

Black Cockatoo Tree Data

Project No. **61-37248**
Revision No. **0**
Date **17 Aug 2018**

FIGURE 2

G:\61\37248\GIS\Maps\Working\61137248_002_BlackCockatooTreeData_Rev0.mxd
Print date: 17 Aug 2018 - 15:03

Data source: GHD: Cocky Tree Data - 20180724, Survey Area - 20130909; Landgate: Imagery, Roads - 20180613. Created by: afeeney

Paper Size ISO A3

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Main Roads WA
High Street Environmental Assessment

Black Cockatoo Feeding Evidence

Project No. **61-37248**
Revision No. **0**
Date **17 Aug 2018**

FIGURE 3

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Print date: 17 Aug 2018 - 14:27

Data source: GHD: Feeding Evidence - 20180724, Survey Area - 20130909; Landgate: Imagery, Roads - 20180613. Created by: afeeney