WATHEROO WEST ROAD & CAROT WELL ROAD – ROAD WIDENING

CLEARING PERMIT SUPPORTING DOCUMENT

Prepared for: **Shire of Moora**

Prepared by: Clark Lindbeck and Associates Pty Ltd
PO Box 144
BULLCREEK WA 6149
Telephone: 08 9332 0671
Mobile: 0409 109 360
Email:belinda@clarklindbeck.com.au
ABN: 36 166 369 526

CLARK LINDBECK & ASSOCIATES PTY LTD
Environmental Management Consultants

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1.0 INTRODUCTION

1.1 BACKGROUND

The Shire of Moora (Shire) is situated in the heart of the Central Midlands district of Western Australia's Wheatbelt region and comprises a road network of 370km of sealed roads and 614km of unsealed roads.

The Shire aims to provide a good quality road network for the community and ongoing improvements and upgrades are undertaken in their area. As part of these ongoing works, the Shire has identified sections of Watheroo West Road and Carot Well Road which require widening to provide safer road conditions, in particular, when Road trains (class 7) are travelling in opposite directions pass in this section. To enable these works to be undertaken, clearing of native vegetation is required.

1.2 OBJECTIVES

This document is to complement the clearing permit application relating to allow:

- Maximum of 0.8 ha of native vegetation clearing to allow widening of a ~1.6 km section of Watheroo West Road and within the Road Reserve.

  Maximum of 0.4 ha of native vegetation clearing to allow widening of a within a ~8 km section of Carot Well Road and within the Road Reserve.

To assist in the DWER's assessment of the clearing permit application, a summary of the relevant environmental information for the proposed clearing area has been included in this document and an assessment of the proposed clearing with the ten clearing principles.

1.3 LOCATION

The Shire of Moora is situated in the heart of the Central Midlands district of Western Australia's Wheatbelt region and is located 172km north of Perth.

The proposed clearing is on Watheroo West Road (Road Reserve) and Carot Well Road (Road Reserve), located approximately 1.3 km south and 12 km northeast of the town of Watheroo respectively(Figure 1).

The area within the Road Reserves in which the clearing will be undertaken is listed as:

<u>Watheroo West Road</u>

- Lot on Plan: P Road
- Lot ID #: 3737926

<u>Carot Well Road</u>

- Lot on Plan: P Road
- Lot ID #: 3737880.

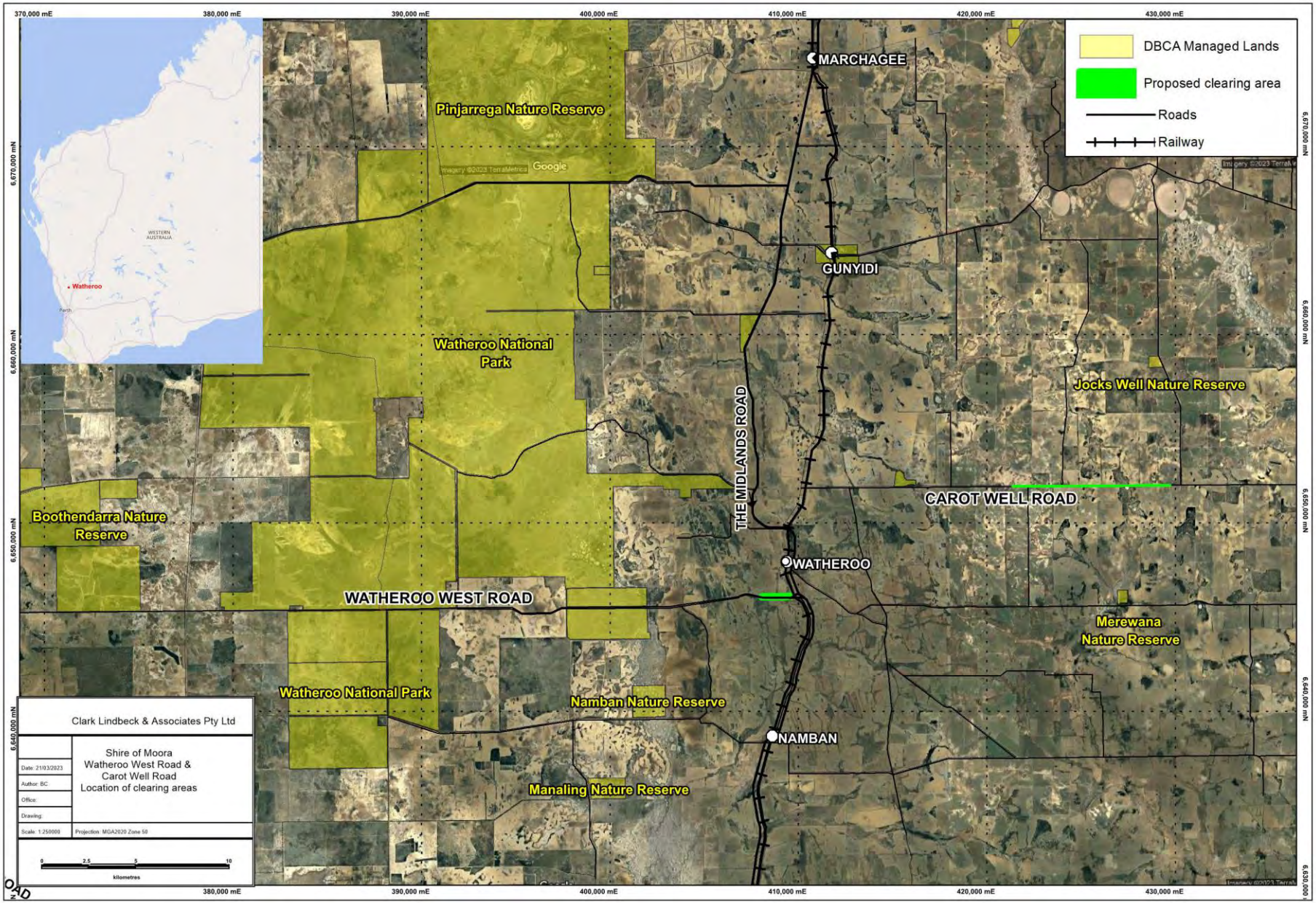

Figure 1: Location of the proposed clearing areas on Watheroo West Road and Carot Well Road

2 PROPOSED CLEARING

2.1 OVERVIEW

The Shire intends to widen Watheroo West Road and Carot Well Road to provide safer road conditions and proposes to clear an average 4m either side of the existing roads.

Further detail is provided in the following sections.

2.2 WATHEROO WEST ROAD

To allow for widening of the Watheroo West Road, the SOM is proposing to clear a maximum of 0.8 ha of native vegetation within an overall clearing area (footprint) of 3.08 ha. This clearing is being undertaken to allow widening of a 1.6 km section of Watheroo West Road to provide safer road conditions (Figures 2-4).

This includes allowance for clearing of the trees assessed by Williams & Son (2022a) and Western Ecological (2023) and the sparse native vegetation found at various points along the area surveyed (Plates 1 and 2).

The aerial imagery shows the shadows of the Eucalyptus occurring which makes the native vegetation occurring appear greater than it is (Plate 1).

Plate 1: Zoomed in section of road (western end 408550m E) showing Eucalypts and sparse understorey. Shadows of trees are prominent

Plate 2: Zoomed in section of road (409150mE) showing and sparse understorey. Shadows of trees are prominent

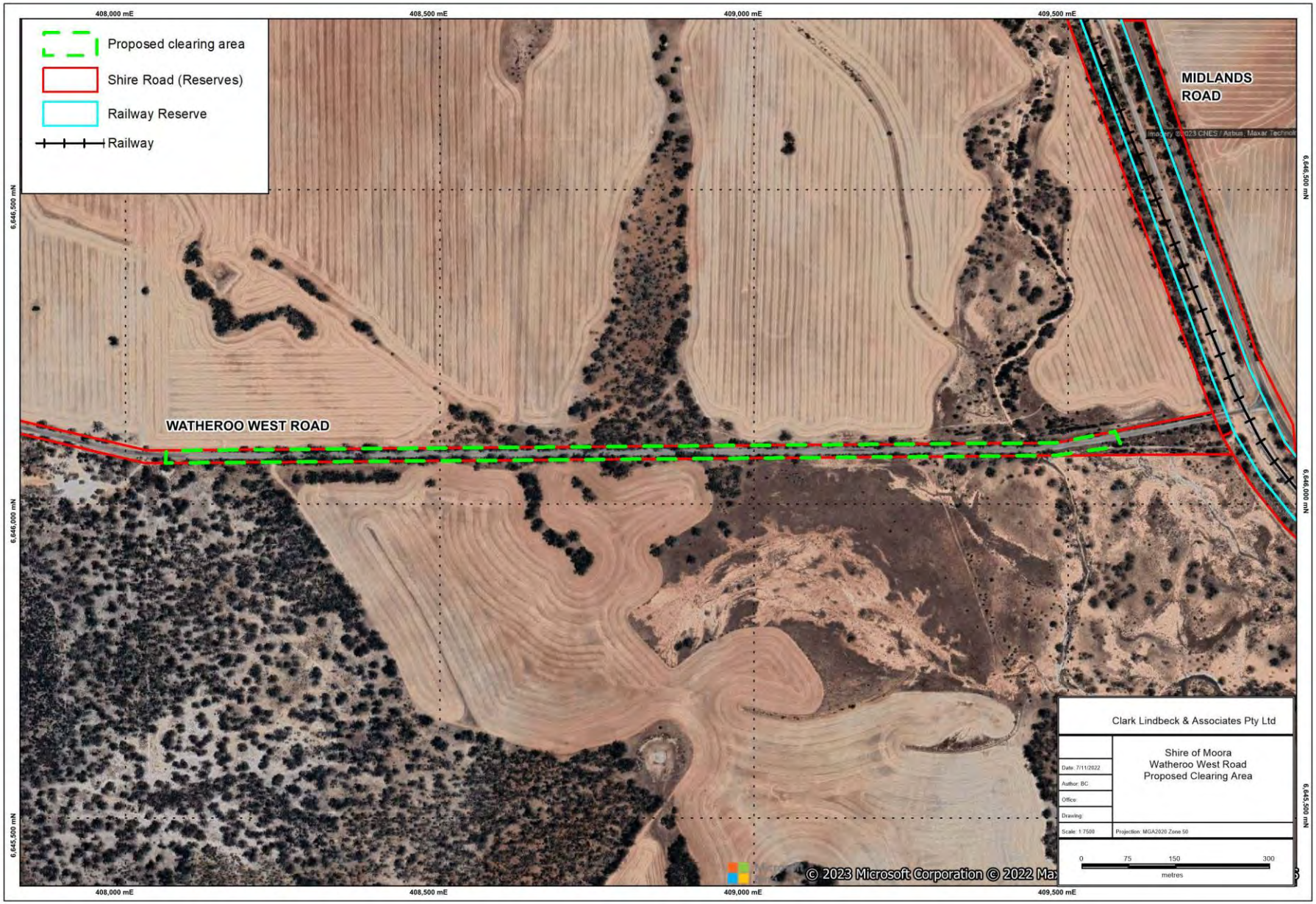

Figure 2: Watheroo West Road - Area of proposed clearing

Figure 3: Western half of area of Watheroo West Road proposed clearing (NB shadows of trees in the aerial image distorts the area of native vegetation)

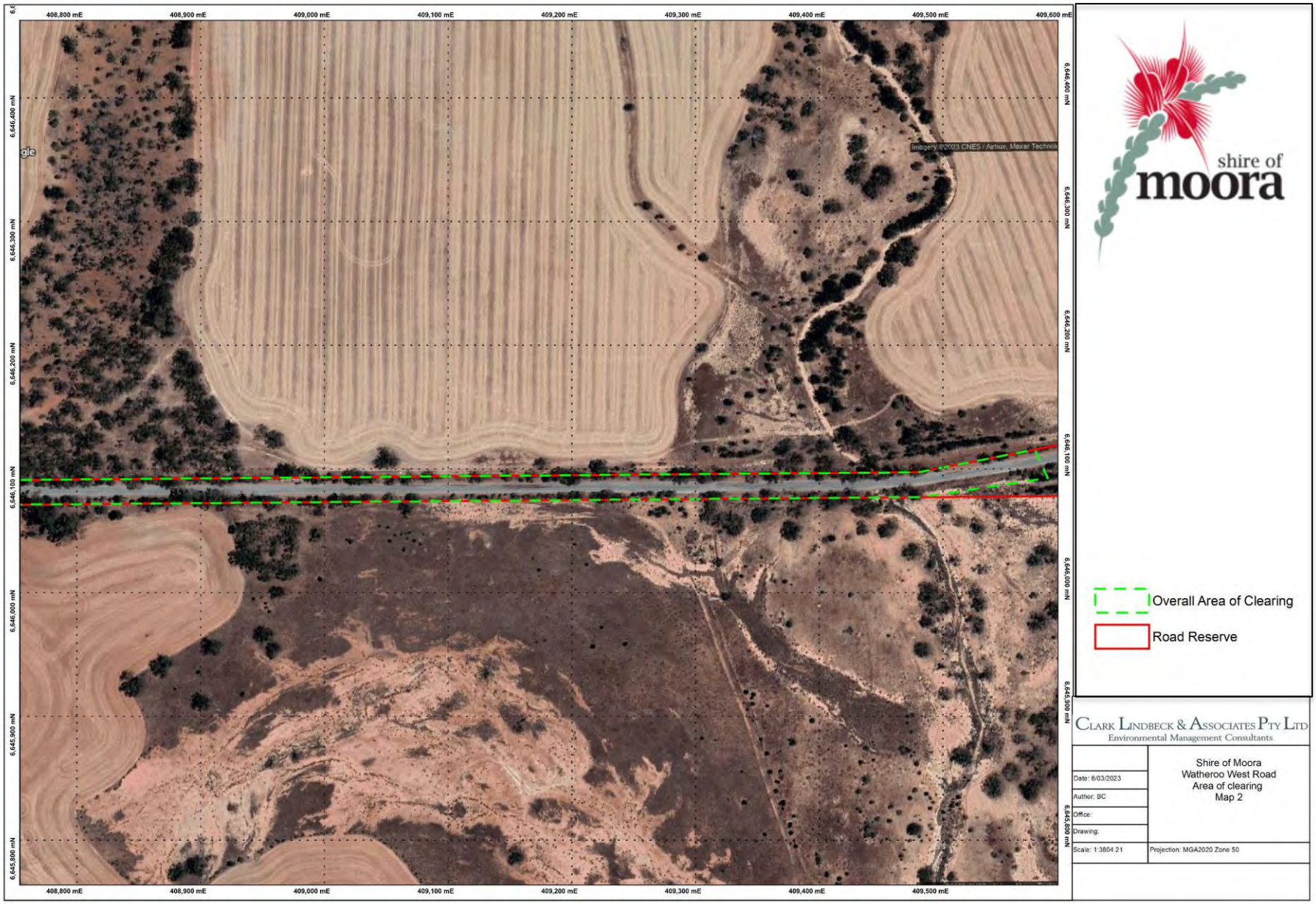

Figure 4: Eastern half of Watheroo West Road area of proposed clearing (NB shadows of trees in the aerial image distorts the area of native vegetation)

2.3 CAROT WELL ROAD

To allow for widening of Carot Well Road, the Shire is proposing to clear a maximum of 0.4 ha of native vegetation within an overall clearing area (footprint) of 16.6 ha. The proposed clearing will allow widening of an approximately 8 km long section of Carot Well Road to provide safer road conditions (Figures 2-6).

While there are large sections of the road with no native vegetation at all, the entire length has been included for continuity and to allow for any individual native plant that needs to be cleared during road works (as the area is located in a Schedule 1 area under the Clearing Regulations).

There is nil to little vegetation on the road verge with the exception of *Eucalyptus* and *Corymbia* trees (Table 1).

Table 1: Photos showing native vegetation to be cleared alongside Carot Well Road within the overall clearing area

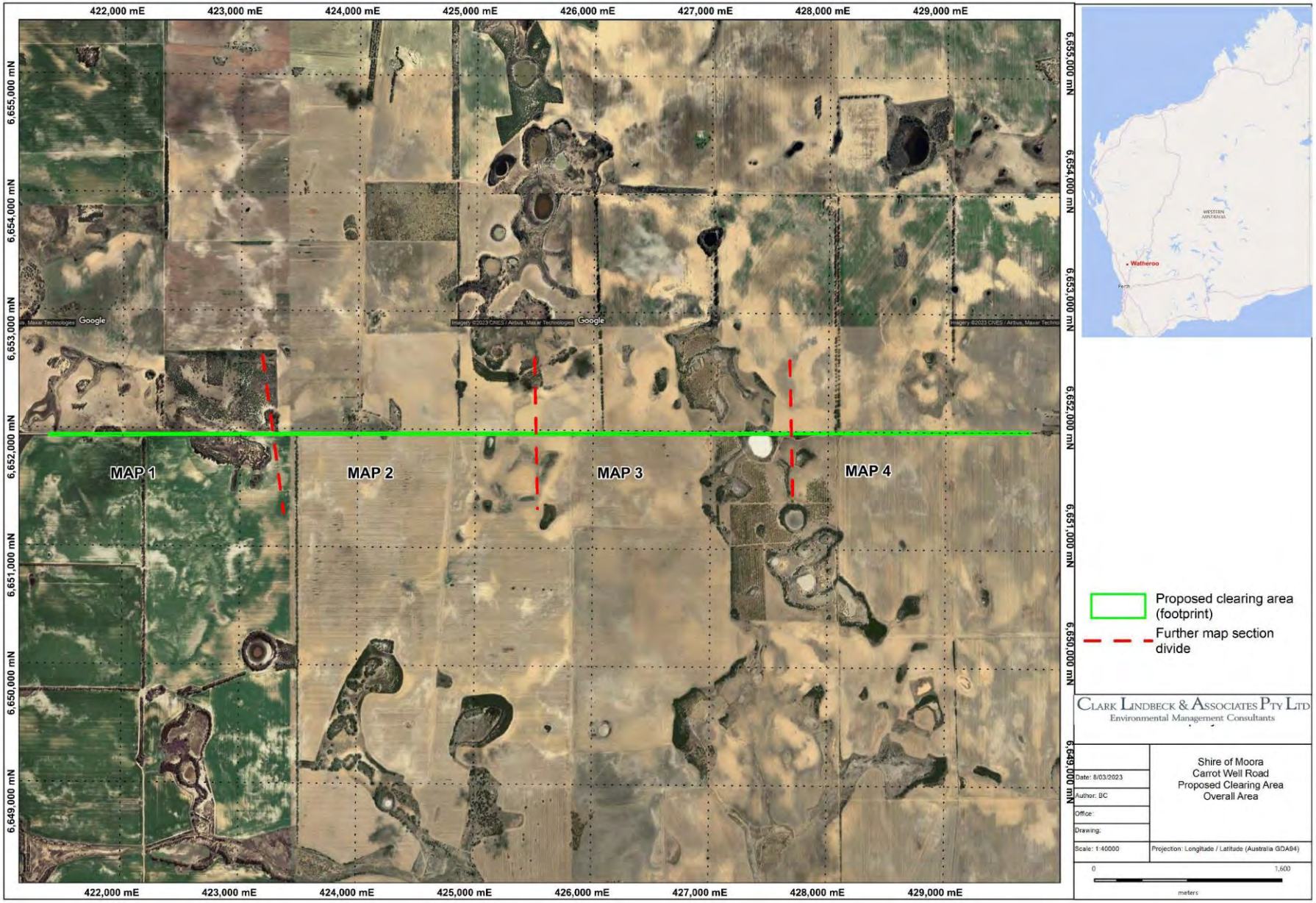

Figure 5: Carot Well Road - Area of proposed clearing (overall map)

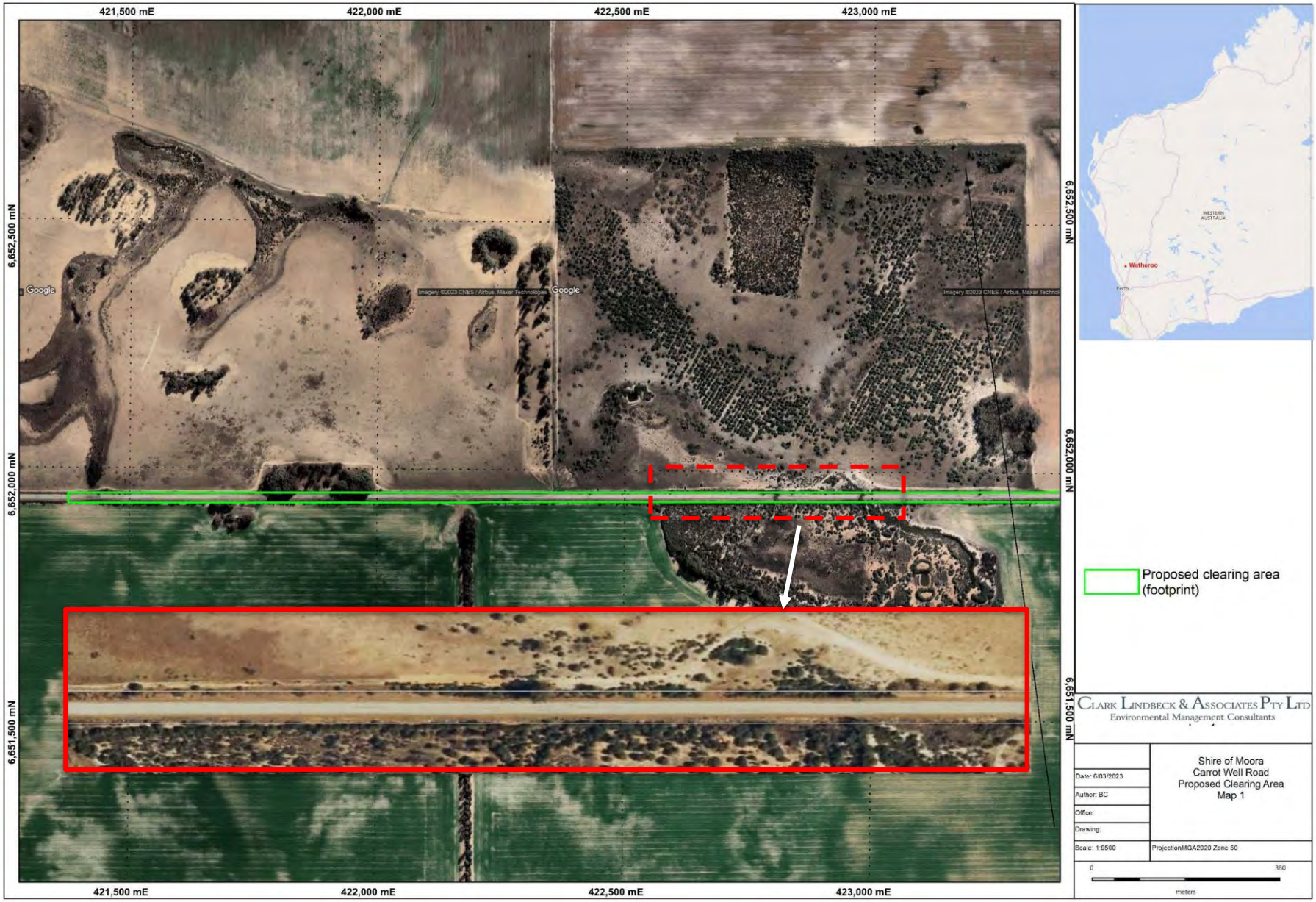

Figure 6: Carot Well Road - Area of proposed clearing – western edge – map 1

Figure 7: Carot Well Road - Area of proposed clearing – midwestern section – map 2

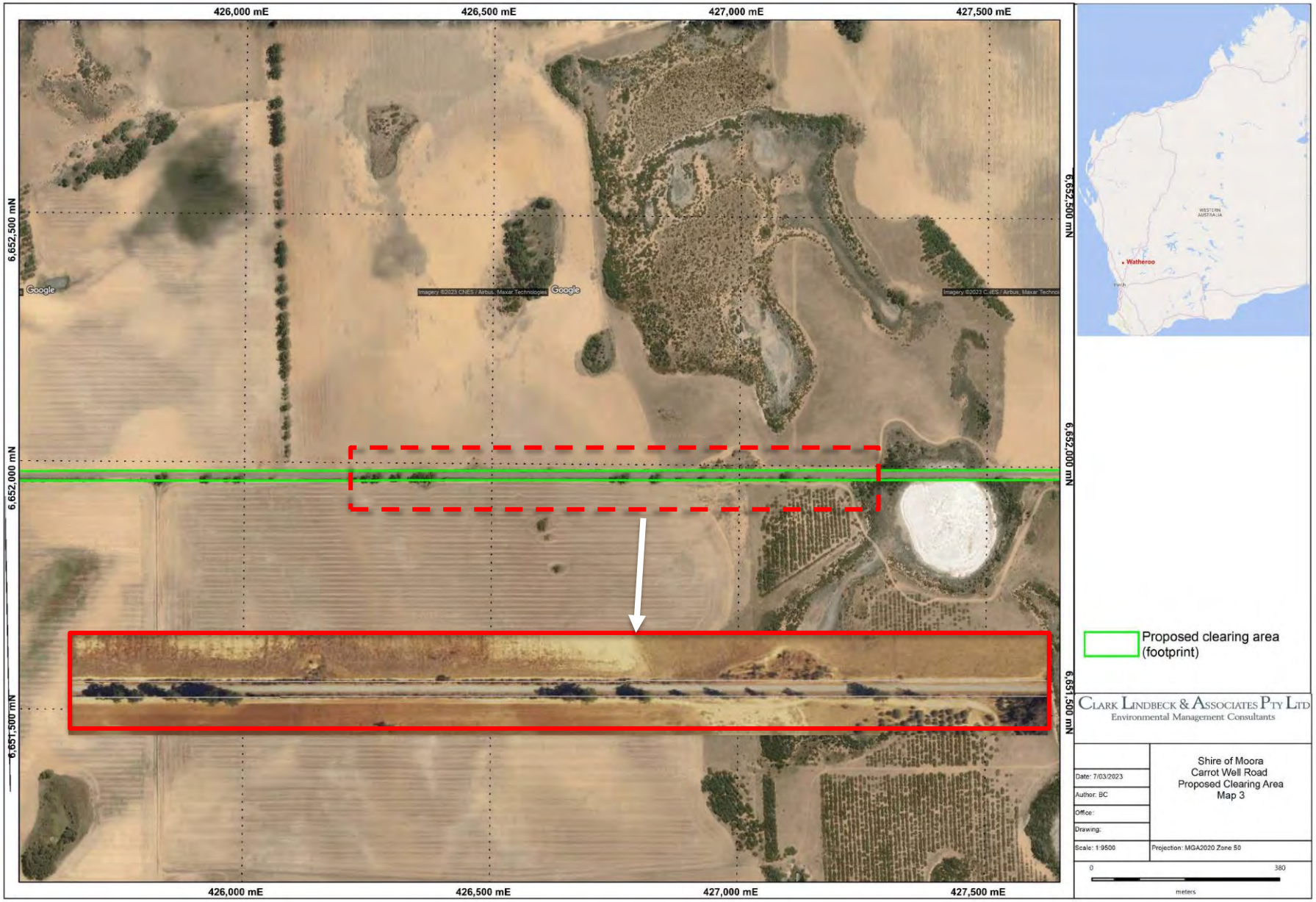

Figure 8: Carot Well Road - Area of proposed clearing – mideastern section – map 3

Figure 9: Carot Well Road - Area of proposed clearing – eastern section – map 4

3 SITE OVERVIEW

3.1 CLIMATE

The climate of the region has a Mediterranean-type climate characterised by seasonal patterns of hot, dry summers and mild, wet winters. The area is subject to high wind speeds, dust storms, lightning storms, high summer temperatures and low winter night temperatures.

The closest meteorological station is Badgingarra Research Station located 48 km west of the proposed clearing area. The average annual rainfall is 536.7 mm with the average monthly rainfall ranging from 8.8 mm in December to 102.5 mm in July.

The mean maximum temperature ranges from 34.6°C in January-February to 17.6°C in July and mean minimum temperature is highest in February (17.8°C) and lowest at 7.1°C in August (Figure 5). The winds are predominantly easterly at 9 am changing to southwesterly by 3 pm (BOM 2022).

Mean annual relative humidity is 64% at 9 am and 44% at 3 pm.

The rainfall for the 8 months preceding the Watheroo West flora survey by Williams and Son in August 2022 (Section 3.5) is provided in Table 2.

The rainfall for the 8 months preceding the flora survey by Williams and Son in December 2022 (Section 3.5) is provided in Table 3.

Table 2: Rainfall preceding Watheroo West Road vegetation survey

Month	Rainfall (mm)
January 2022	0
February 2022	0
March 2022	0
April 2022	0
May 2022	0
June 2022	97.6
July 2022	95.6
August 2022	169 (164mm prior to survey)
TOTAL	**362.2 (357.2 mm prior to survey)**

Table 3: Rainfall preceding Carot Well Road vegetation survey

Month	Rainfall (mm)
May 2022	0
June 2022	97.6
July 2022	95.6
August 2022	169
September 2022	59.0
October 2022	22.2
November 2022	14.4
December 2022	0
TOTAL	**457.8**

3.2 LANDFORM AND SOILS

3.2.1 Soil-landscape zones

The overall region has largely been cleared for agriculture with the areas of proposed clearing located within six soil-landscape zones as presented in Table 4 and Figure 10 and Figure 11.

Table 4: Soil-landscape zones

Soil-landcape zone	Description
Watheroo West Road	
Burabidge Hill 7 Subsystem	Mid slope, gently undulating rises adjacent to valley plain and drainage line on Colluvium, lithic sand. Shallow to deep loamy duplex, red sandy earth and red shallow loam. York gum, Salmon gum, *Acacia* spp..
Burabidge Hill Berkshire Subsystem	Alluvial plain of major tributaries of Moore River (from Gt), narrower and shallower with less Salmon Gum than Bv1 (dd17); loamy earths, loamy duplexes
Coorow 3 Subsystem	Plateau residuals, very gently inclined hillslopes and hillcrests; complex of lateritic gravels, yellow deep sand, sandy earths and some duplexes, shallow rock and rock fragments common.
Carot Well Road	
Balgerbine 1 subsystem	Undulating plain dominated by sand sheets and low dunes over deeply weathered granite with minor outcrops. Yellow deep sand and earths, and sandy duplexes.
Balgerbine 3 Subsystem	Undulating plain dominated by sand sheets over deeply weathered granite with minor outcrops. Yellow deep sand and earths, and sandy duplexes.

3.2.2 Soils

3.2.2.1 Watheroo West Road

The clearing area on Watheroo West Road is located in two soil mapping groups as defined by (Northcote *et al*., (1960 – 1968):

- Qb29: "*Rolling to hilly with some steep slopes; gneissic rock outcrops common: chief soils are hard neutral red soils (Dr2.22) with others such as (Dr2.62) and (Dr3.42). Associated are (Dy3.42) soils on slopes; patches of (Ug5.37) and (Ug5.2) soils with some gilgai also on slopes; colluvial slopes of (Gn2) soils such as (Gn2.12) and (Gn2.45); and variable areas of other soils seem likely*".
- Vd6: "*flat, fairly extensive valley floors: chief soils are hard alkaline yellow mottled soils (Dy3.33). Associated are (Dy3.43) soils along with areas of gilgai and cracking clays (Ug5.37), as well as some (Dr3.33) and (Dr3.43) soils*".

As part of the flora survey of the Watheroo West Road area, Williams & Son (2022a) noted the soils are predominantly red clay.

3.2.2.2 Carot Well Road

The clearing area on Carot Well Road is located in the 'Ms8' soil group as defined by (Northcote *et al*., (1960 – 1968).

"*Gently sloping to gently undulating plateau areas or uplands with long and very gentle slopes and, in places, abrupt erosional scarps: chief soils are (i) on depositional slopes, sandy yellow earths (Gn2.21 and Gn2.22) containing some ironstone gravels, and yellow earthy sands (Uc5.22) often with ironstone gravels at depths below 6-7ft; and (ii) on erosional ridges and slopes, ironstone gravels (KS-Uc4.11) together with (Uc4.11) and (Uc2.12) (both containing ironstone gravels), all underlain by hardened mottled-zone material by depths of 12-24 in. Soil dominance tends to vary locally between (i) and (ii)*

but overall the soils of (i) seem to havea slight dominance over the soils of (ii). Associated are smaller areas of other soils, containing ironstone gravels in its surface horizons".

As part of the flora survey of the Carot Well Road area, Williams & Son (2022b) noted the are deep yellow sands with a very shallow water table.

3.3 HYDROLOGY

The clearing areas are not located within a Proclaimed Surface Water Area under the *Rights in Water Irrigation (RIWI) Act 1914*.

The area is located within the Proclaimed Jurien Groundwater Area.

3.3.1 Watheroo West Road

There are no significant water bodies or drainage lines within or surrounding the proposed clearing area. Surface water lines mapped at the 250K scale in the surrounding areas are shown in Figure 12.

The proposed clearing of the roadside vegetation along Watheroo West Road is not located in an existing drainage line and does not comprise riparian vegetation. Prior to the wide scale agricultural clearing undertaken historically in the region, these areas may have received surface water flows but these have been impacted by the wide-scale clearing and road construction.

The Watheroo Public Drinking Water Reserves (P1 and P2 areas) are located 1.4km northwest of the Watheroo West Road proposed clearing area (to the southern boundary of P2 area) and will not be impacted.

3.3.2 Carot Well Road

There are no significant drainage lines within or surrounding the proposed Carot Well Road clearing area.

Surface water expressions (mapped as 'lakes') in Figure 13 are located either side of Carot Well Road and will not be impacted. As referred to previously, Williams & Son (2022b) noted the shallow water table in proximity to the road.

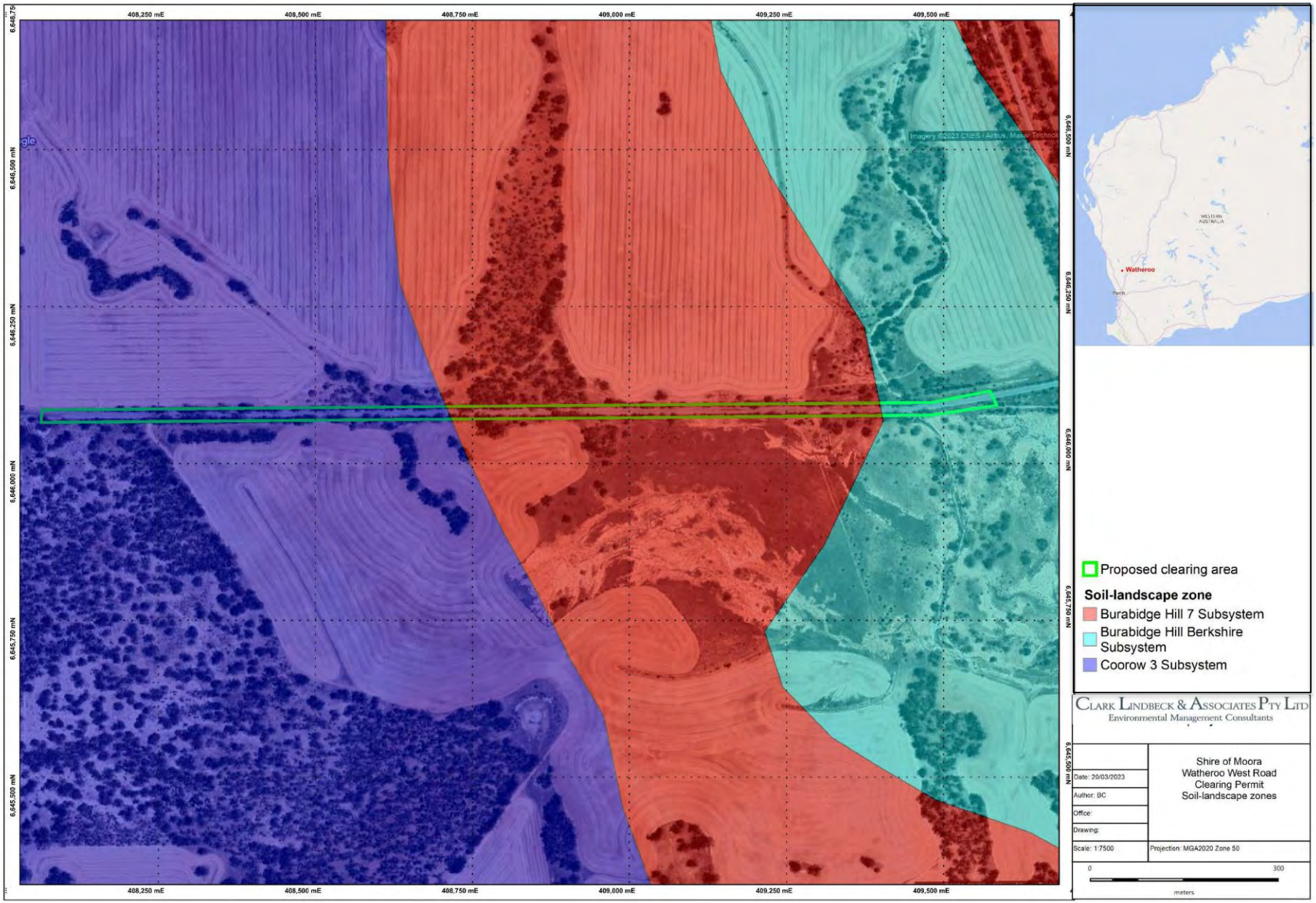

Figure 10: Soil-landscape zones mapped in the Watheroo West Road clearing areas

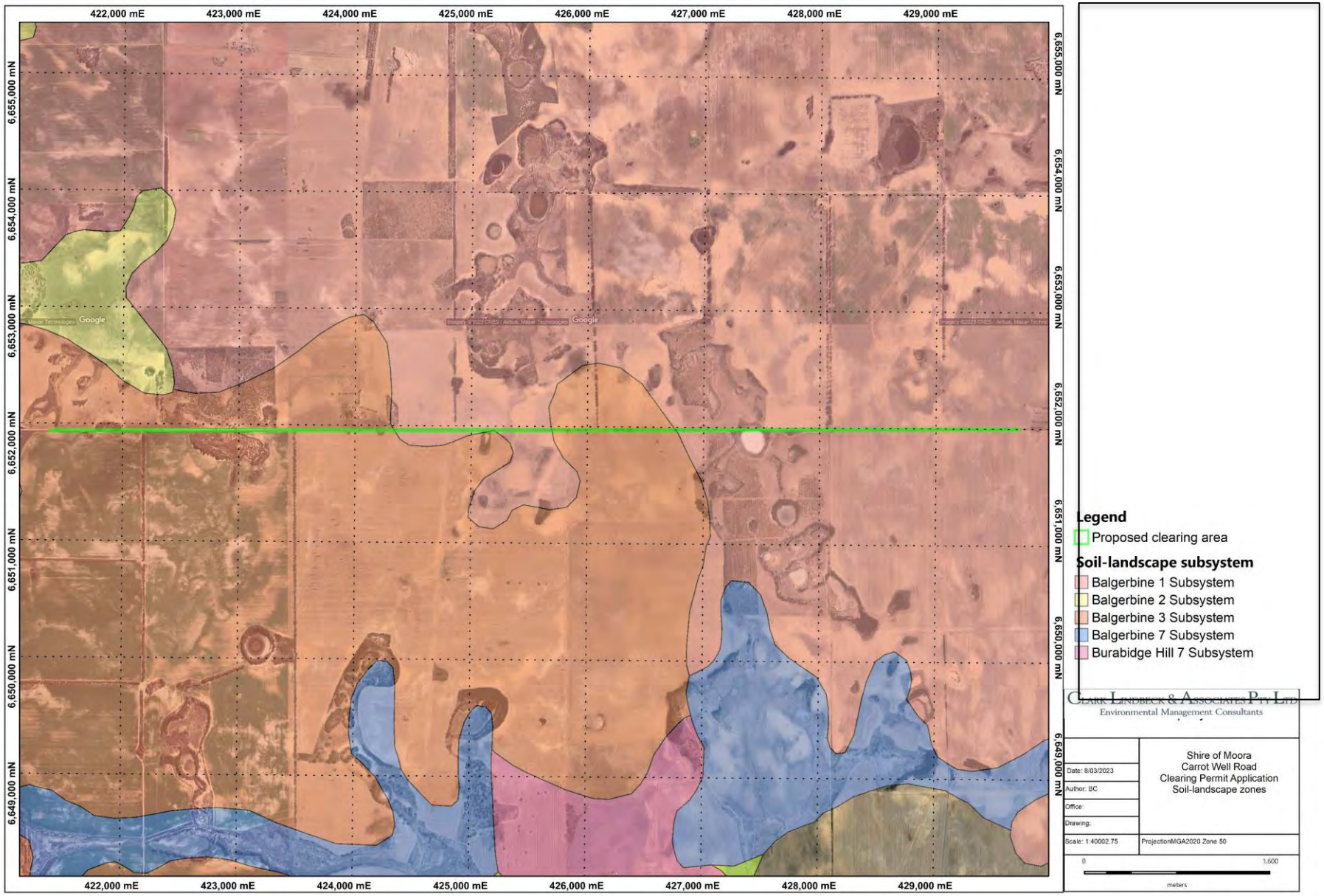

Figure 11: Soil-landscape zones mapped in the Carot Well Road clearing area

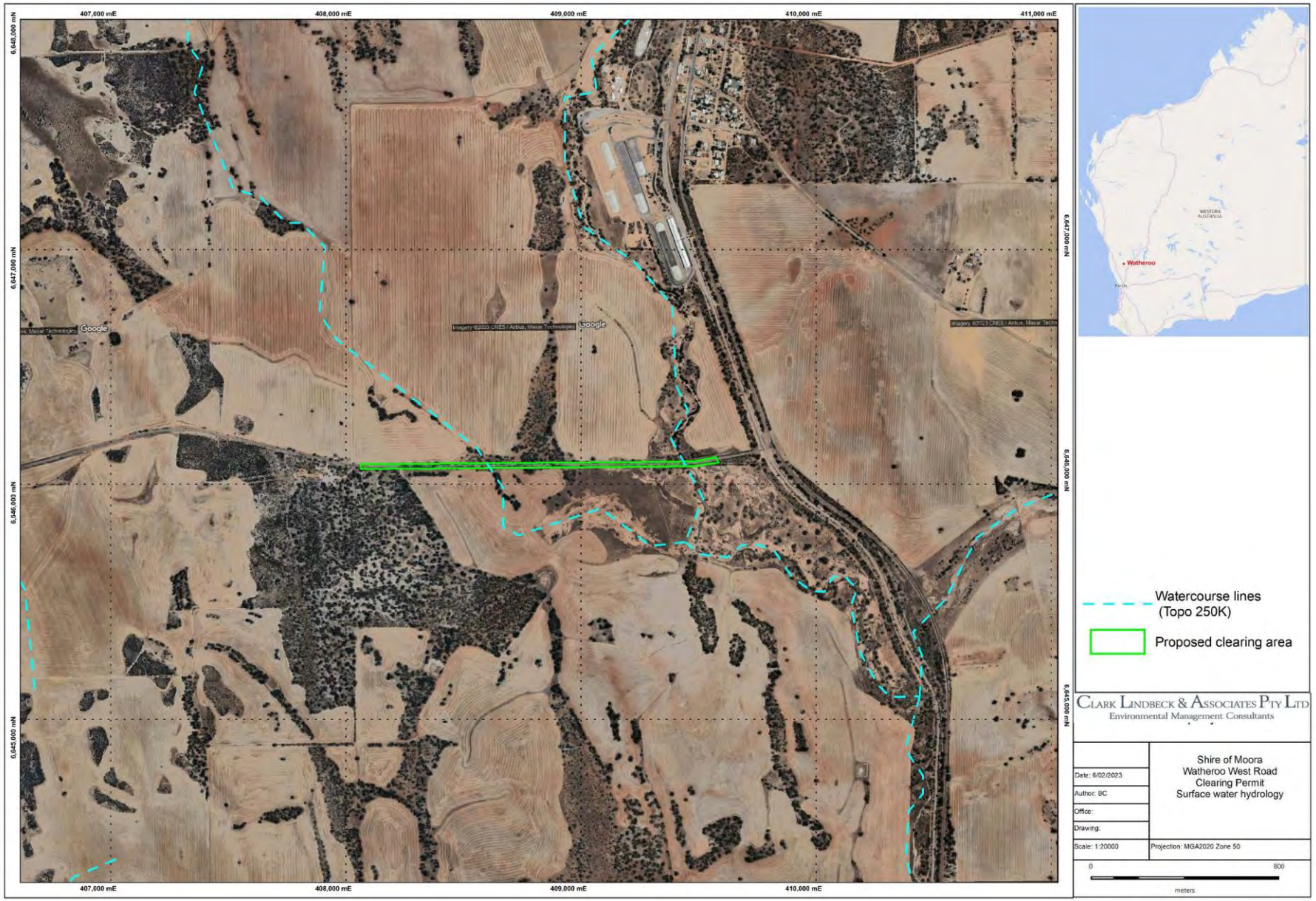

Figure 12: Surface water drainage in Watheroo West Road local area (250K)

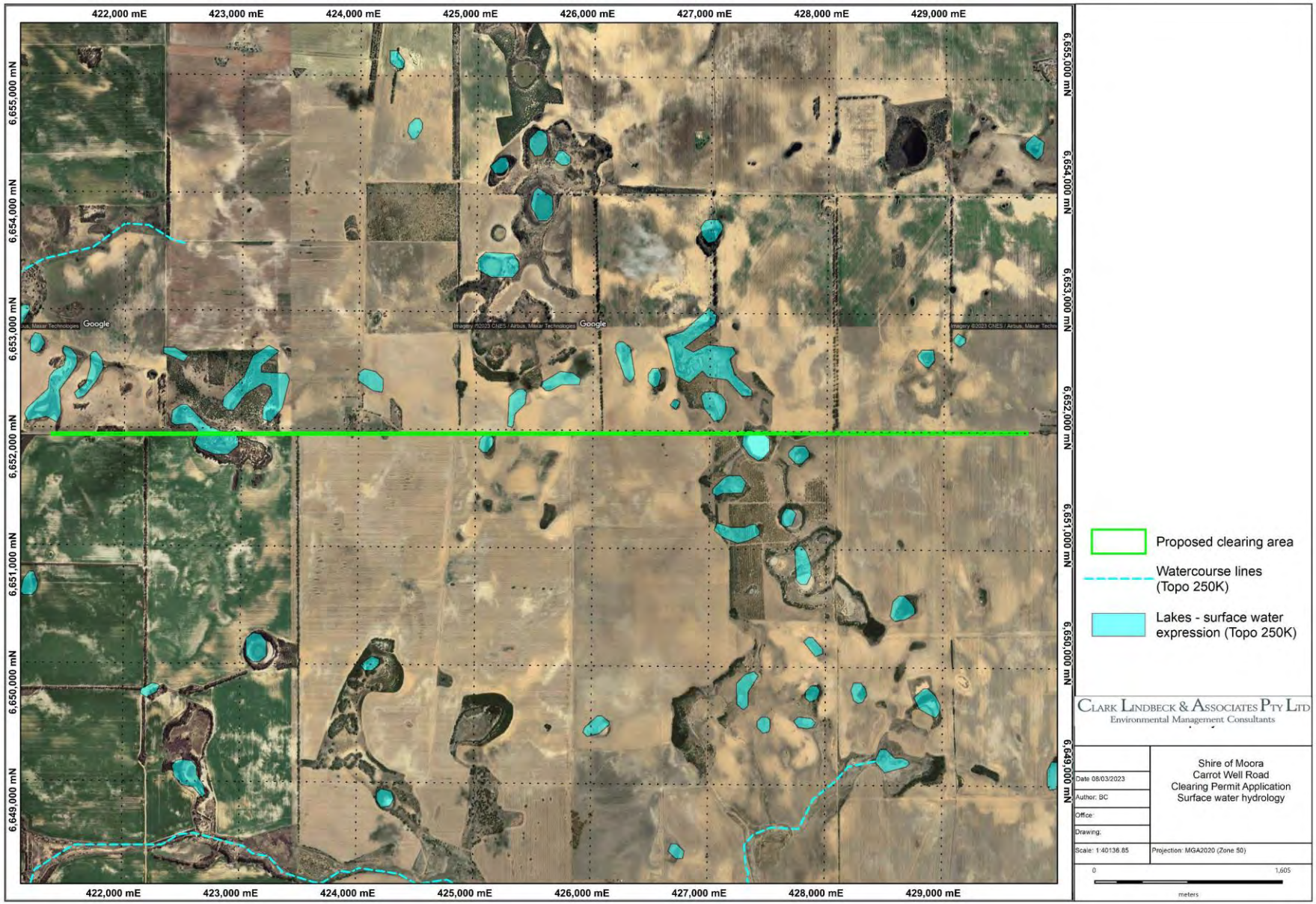

Figure 13: Surface water drainage in Carot Well Road local area (250K)

3.4 VEGETATION AND FLORA

3.4.1 IBRA Region

The proposed clearing areas are located in the Geraldton Sandplains IBRA region (GS2 – Geraldton Hills subregion). The Watheroo West Road clearing is located near the boundary of two IBRA regions, Geraldton Sandplains (GS2 – Geraldton Hills subregion) and Avon Wheatbelt (AW2 - Re-juvenated Drainage subregion), but wholly within GS2.

The Geraldton Sandplains (GS2 – Geraldton Hills subregion) bioregion comprises mainly proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, and lateritic sandplain mantling Permian to Cretaceous strata. Extensive York Gum and Jam wood lands occur on out wash plains associated drainage. The Geraldton Hills subregion (GS2) incorporates the southern end of Carnarvon Basin and northern end of the Perth Basin, with exposed areas of Permian / Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Sand heaths with emergent *Banksia* and *Actinostrobus*, York Gum wood lands on alluvial plains, proteaceous heath and *Acacia* scrubs on limestones depending on depth of coastal-sand mantle, low closed forest of *Acacia rostellifera* (now cleared) on alluvial plains of Greenough and Irwin River (behind beach dune system south of Geraldton) (Desmond & Chant 2001).

3.4.2 Vegetation Type and Extent

Pre-European vegetation extent and status data was sourced from the Department of Agriculture and Food (DAFWA) report (now DPIRD) and its associated GIS file (Shepherd *et al*, 2002). This data comprises Beard's Pre-European vegetation groups.

Based on this data (Shepherd *et al.* 2002), the proposed clearing areas are located within three vegetation associations:

Watheroo West Road

- 142 (Marchagee): Wheatbelt; York gum, salmon gum etc. *Eucalyptus loxophleba, E. salmonophloia*

Carot Well Road

- 694 (Marchagee): Scrub-heath - Mixed heath with scattered tall shrubs Acacia spp., Proteacea and Myrtaceae.
- 1149 (Marchagee): Scrub-heath - Mixed heath with scattered tall shrubs Acacia spp., Proteacea and Myrtaceae.

The current extent of these vegetation groups is presented in Table 5. This vegetation is considered to be remnant vegetation, in particular in the context of remnant vegetation in the Shire of Moora.

Table 5: Current extent of regional vegetation associations (in GS2 IBRA region)

Vegetation Association	Pre-European Extent (Ha)	Current Extent (Ha)	Pre-European extent remaining (%)
142	6,566.10	817.57	12.45
694	172,381.64	54,800.13	31.79
1149	7,113.24	785.94	11.05

3.4.3 Roadside vegetation assessment

3.4.3.1 Overview

Given the large extent of historical clearing in the Shire and areas of roadside remnants, vegetation surveys of roadside vegetation in the Shire of Moora was undertaken in conjunction with the Roadside Conservation Committee (RCC), with survey work completed between September 2011 – June 2013 (RCC 2014).

Approximately 82% of the Shire's 899 km of rural roadsides were assessed by the RCC for their conservation status, and maps were produced highlighting areas of Roadside Conservation Value (RCV) (RCC 2014).

As referenced in RCC (2014), high conservation value roadsides are those with a score between 9 and 12, and generally display the following characteristics:

- intact natural structure consisting of a number of layers, often ground, shrub and tree layers;
- extent of native vegetation greater than 70%, i.e. little or no disturbance;
- high diversity of native flora, i.e. greater than 20 different species;
- few weeds, i.e. less than 30% of the total plants; and
- high value as a biological corridor; i.e. may connect uncleared areas, contain flowering shrubs, tree hollows and/or hollow logs for habitat, and/or environmentally sensitive areas.

Medium-high conservation value roadsides are those with a score between 7 and 8, and generally have the following characteristics:

- generally intact natural structure, with one layer disturbed or absent;
- extent of native vegetation between 30 and 70%;
- medium to high diversity of native flora, i.e. between 6 and 19 species;
- few to half weeds, i.e. between 30 and 70% of the total plants; and
- medium to high value as a biological corridor and with some habitat features.

The RCC (2014) report also noted: "*…alarming decline in the conservation status of many roadside reserves. In some cases the conservation value has declined at a rate of approximately 10% in nine years*".

The RCV map which includes the proposed clearing areas for Watheroo West Road and Carot Well Road are included as Figure 14. The area within which the Watheroo West Road proposed clearing will occur is mapped by RCC (2014) as largely 'Medium-High' and a small section of 'High' RCV (Figure 14), while that for Carot Well Road is mapped by RCC (2014) as ranging from 'Low' to 'Medium-High' and a small section of 'High' RCV (Figure 15).

Noting Williams & Son (2022a; 2022b) identification of the vegetation in the proposed clearing area as 'Completely Degraded' according to Keighery (1994) (Section 3.4.5), being of low species diversity, and that it has been at least 10 years since the RCC survey work, it is considered this decline has occurred along these sections of the Watheroo West and Carot Well roadsides (Plate 3, Table 1).

There are intact areas of remnant vegetation located on the private land either side of Watheroo West Road and these are considered of greater value which can be seen on the aerial imagery and photos (Plate 4).

Plate 3: Example of vegetation alongside existing Watheroo West road (from Williams & Son 2022a)

Plate 4: Eucalypts on private land outside of the Road Reserve shown in background of Photo (from Williams & Son 2022a)

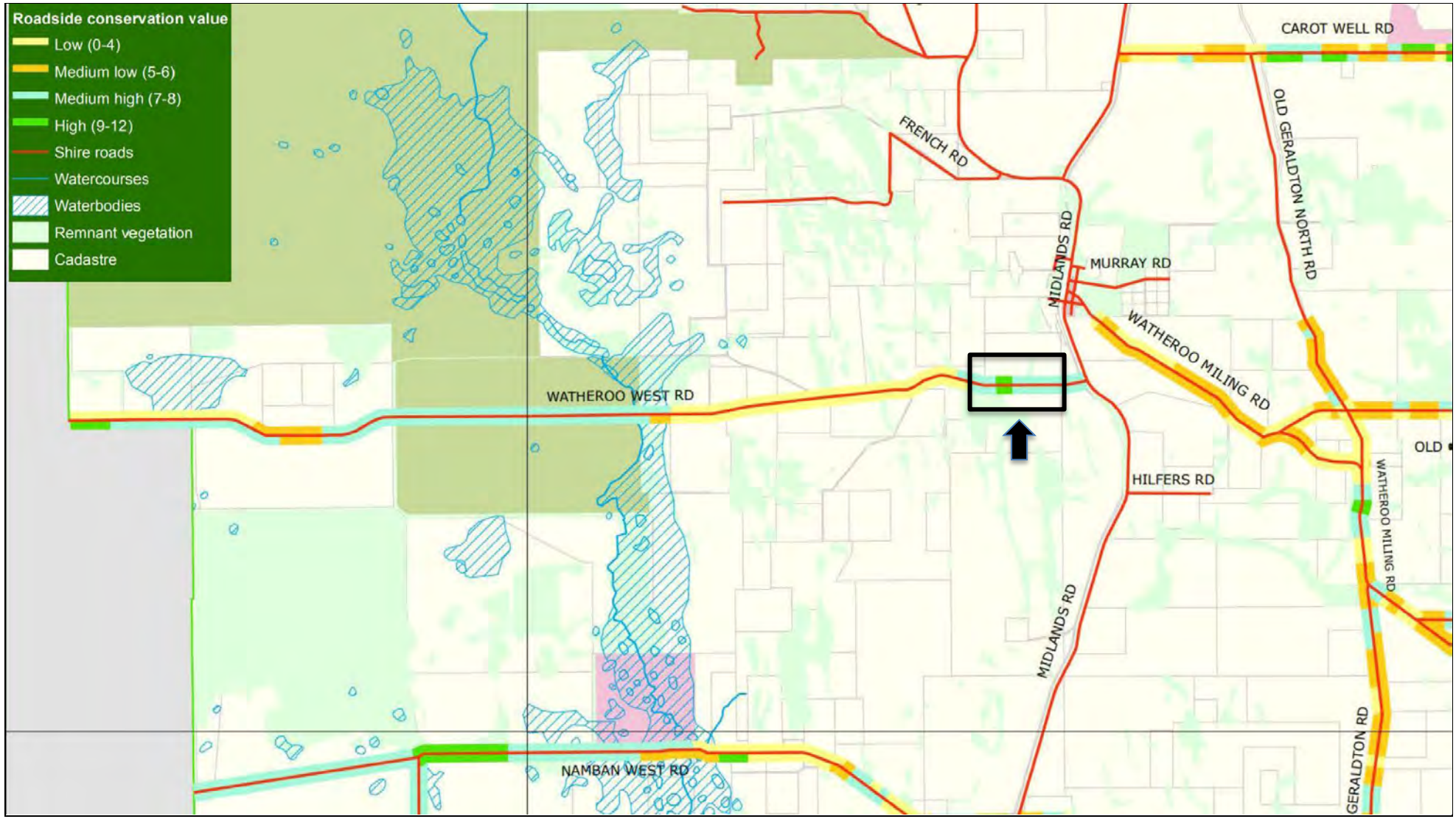

Figure 14: RCV map including eastern section of Watheroo West Road and the proposed clearing area (black arrow) (map from RCC (2014))

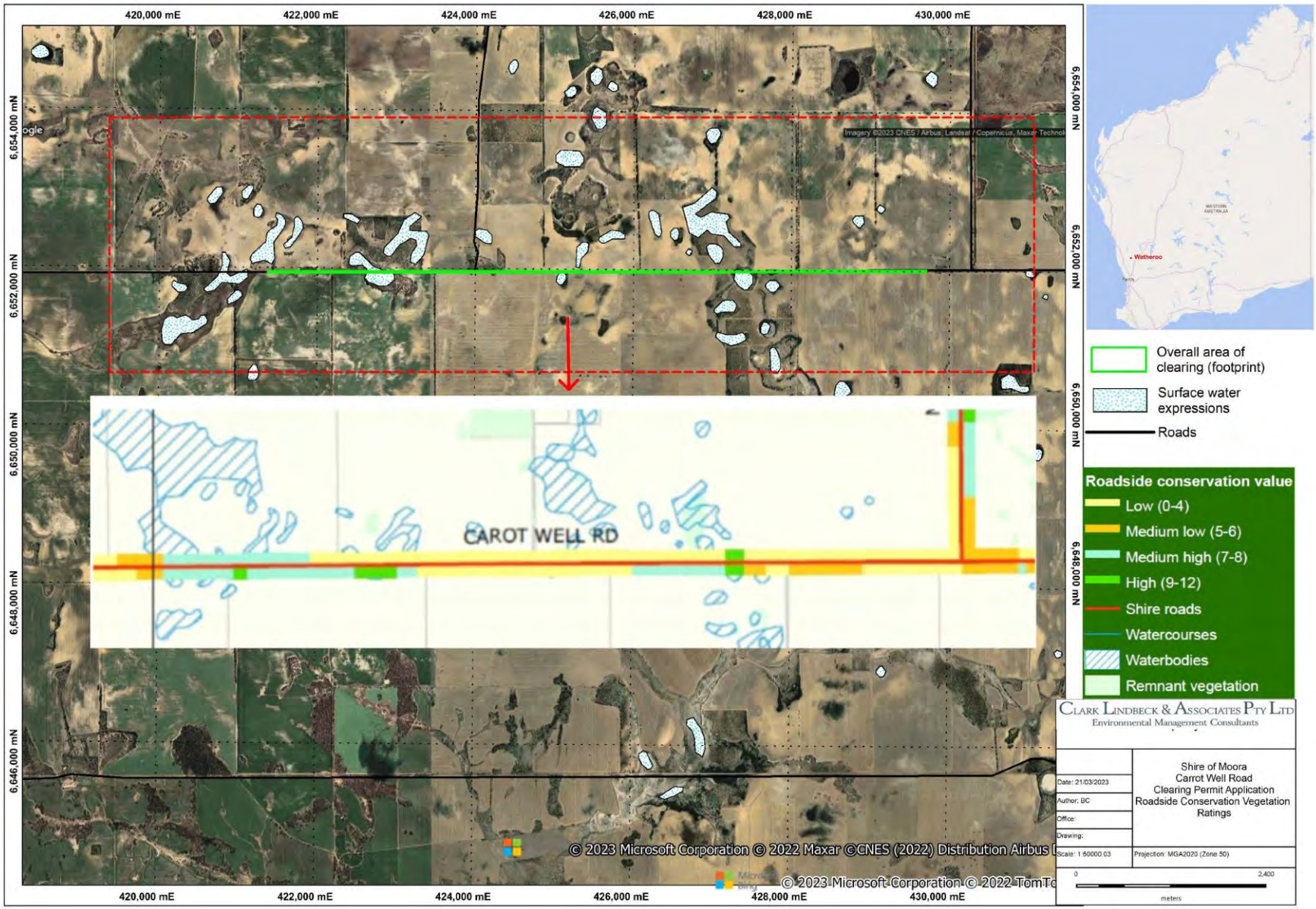

Figure 15: RCV map including eastern section of Carot Well Road and the proposed clearing area

3.4.4 Database Searches

3.4.4.1 Watheroo West Road

The *Environmental Protection and Biodiversity Conservation Act (EPBC) 1999* Protected Matters Search tool (PMST) utilised to provide results for matters of National Environmental Significance within the proposed clearing area (DCCEEW, 2022). The results are attached as Appendix 1.

A search of the NatureMap database DBCA (DBCA, 2022a) to provide a list of potential Threatened/ Priority flora in the area with a 10km buffer was undertaken and is included as Table 6. The location of Threatened/Priority flora records was viewed in NationalMap to determine their location relative the proposed clearing (Figure 8).

There are records of Priority 1 and Priority 3 flora in proximity to the proposed clearing (Figure 16). These are located outside of the proposed area of clearing.

Table 6: NatureMap records for Threatened/Priority flora within the Watheroo West Road clearing area and 10km buffer

Taxon	Conservation Rating
Acacia aristulata	Threatened
Acacia cochlocarpa subsp. cochlocarpa	Threatened
Daviesia dielsii	Threatened
Gastrolobium appressum	Threatened
Grevillea christineae	Threatened
Caladenia dundasiae	P1
Grevillea amplexans subsp. adpressa	P1
Arnocrinum drummondii	P3
Babingtonia cherticola	P3
Eucalyptus arachnaea subsp. arrecta	P3
Jacksonia carduacea	P3
Menkea draboides	P3
Persoonia chapmaniana	P3
Petrophile biternata	P3
Urodon capitatus	P3
Calothamnus accedens	P4

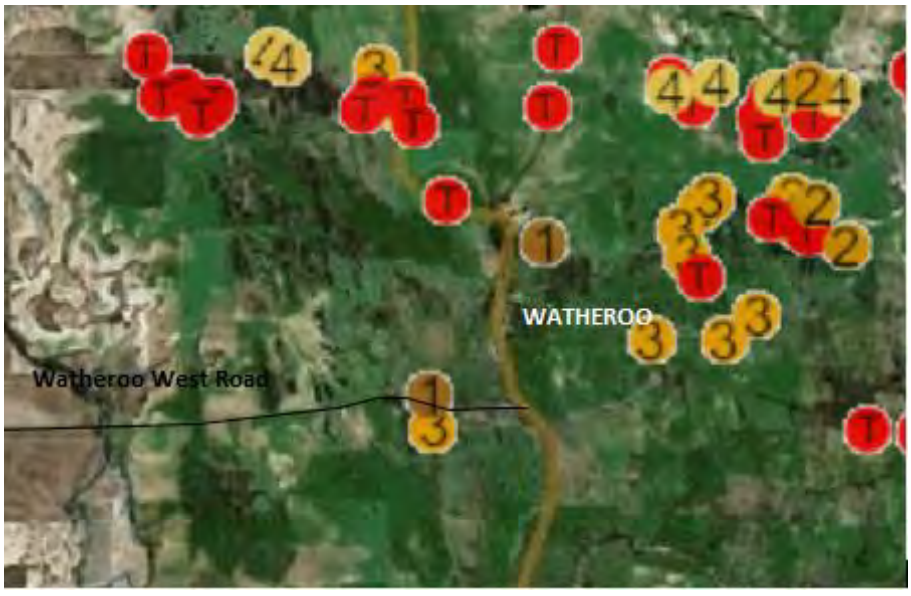

Figure 16: NationalMap view of Threatened/Priority flora records in proximity to clearing area

3.4.4.2 Carot Well Road

The *EPBC Act* Protected Matters Search tool (PMST) utilised to provide results for matters of National Environmental Significance within the proposed clearing area (DCCEEW, 2023). The results are attached as Appendix 1.

A search of the NatureMap database DBCA (DBCA, 2023) to provide a list of potential Threatened/ Priority flora in the area with a 10km buffer was undertaken and is included as Table 7. The location of Threatened/Priority flora records was viewed in NationalMap to determine their location relative the proposed clearing (Figure 18).

There are records of Threatened and Priority flora west of the proposed clearing area (shown as ESA in Figure 17).

Table 7: NatureMap records for Threatened/Priority flora within the clearing area and 10km buffer

Taxon	Conservation Rating
Acacia vassalii	Threatened
Daviesia dielsii	Threatened
Eucalyptus pruiniramis	Threatened
Eucalyptus rhodantha var. rhodantha	Threatened
Gastrolobium appressum	Threatened
Gastrolobium hamulosum	Threatened
Grevillea christineae	Threatened
Hemiandra gardneri	Threatened
Papistylus grandiflorus	P2
Scholtzia quindecim	P2
Thryptomene shirleyae	P2
Balaustion grande	P3
Chamelaucium sp. Wongan Hills (B.H. Smith 1140)	P3
Eucalyptus arachnaea subsp. arrecta	P3
Eucalyptus macrocarpa x pyriformis	P3
Eucalyptus subangusta subsp. virescens	P3
Gastrolobium rotundifolium	P3
Gastrolobium rotundifolium	P3
Grevillea thyrsoides subsp. pustulata	P3
Lechenaultia juncea	P3
Melaleuca sclerophylla	P3
Verticordia venusta	P3
Calothamnus accedens	P4
Eucalyptus rhodantha var. x petiolaris	P4

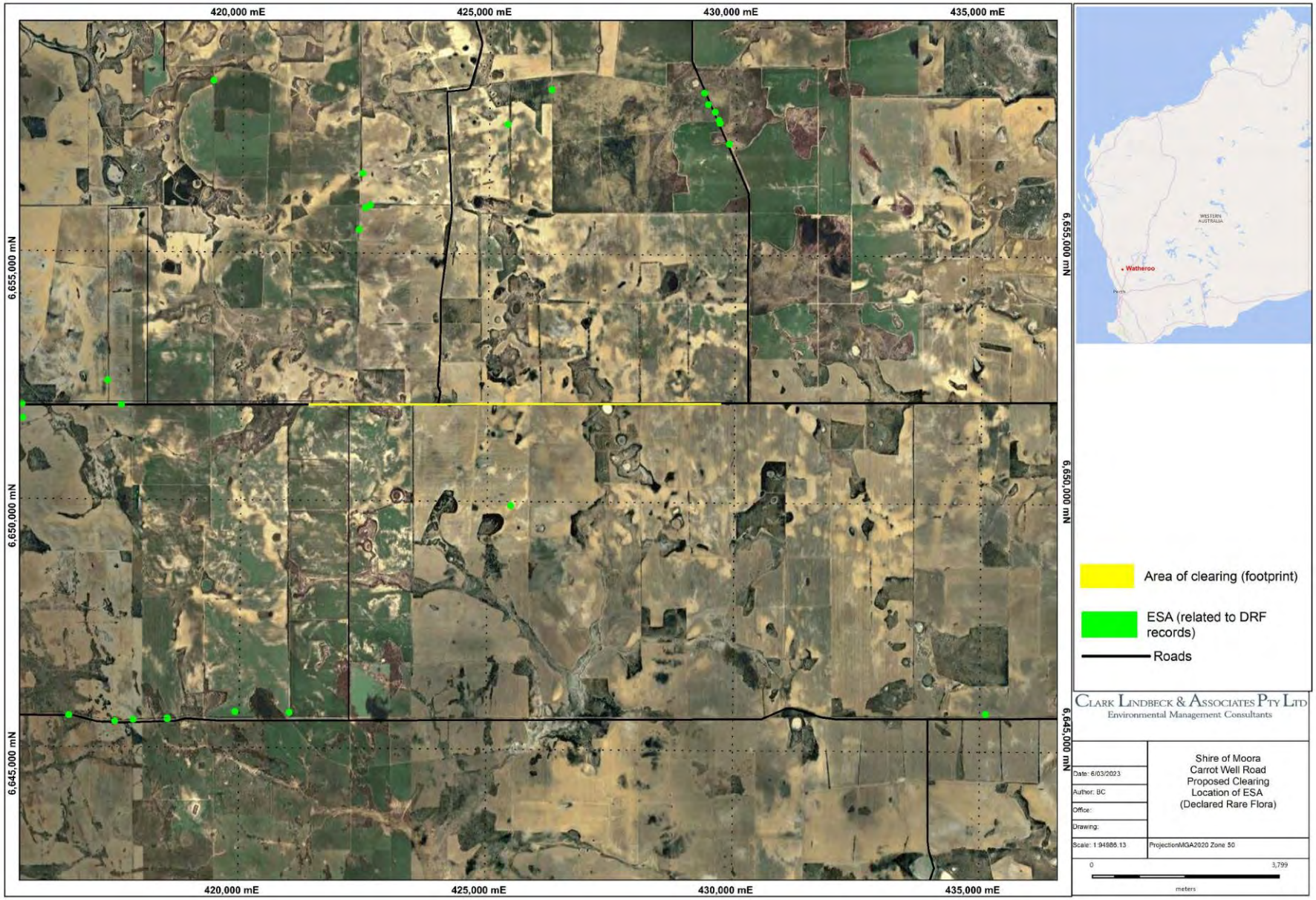

Figure 17: Location of DRF records (ESA) in proximity to Carot Well Road

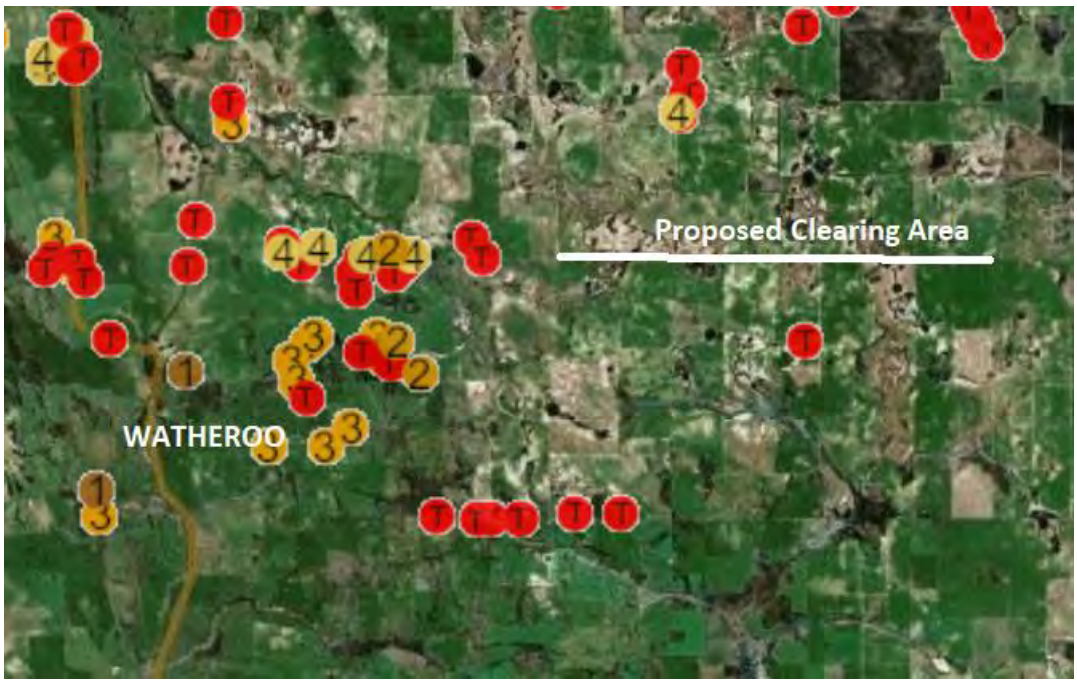

Figure 18: NationalMap view of Threatened/Priority flora records in proximity to Carot Well Road clearing area

3.4.5 Flora Survey

A flora (and other environmental factors) survey of the proposed clearing areas was completed on:

- Watheroo West Road - 22 August 2022 (Williams & Son 2022a).
- Carot Well Road – 9 December 2022 (Williams & Son 2022b).

A copy of the reports are included as Appendix 2 and Appendix 3.

Mr Don Williams, who completed the survey, has had extensive experience working in this botanical district and is used by DBCA for flora survey work, and has worked in the field from North Eneabba to South Badgingarra and the Coast to East of Moora and Carnamah for > 30 years.

Mr Williams is highly experienced in identification of Threatened and Priority flora in this bioregion, in particular in the local area.

The Watheroo West Road survey recorded a total of 11 native species and 5 non-native species (Williams & Son 2022a). *Eucalyptus loxophleba, E.salmonophloia* and *E.wandoo* were the dominant overstorey species and there were few understorey species. No Threatened or Priority flora species were recorded (Williams & Son 2022a).

The Carot Well Road survey recorded two native species *Eucalyptus camaldulensis* and *Corymbia ficifolia* (Williams & Son 2022). Mr Williams believes these species were planted or colonised since widespread land clearing in the area and these are also present on private land either side of the road. No Threatened or Priority flora species were recorded (Williams & Son 2022b).

The native vegetation condition of both areas was recorded as 'Completely Degraded (6)' in accordance with the Keighery Scale (1994).

3.4.6 Threatened and Priority Ecological Communities

Based on a review of layers in NationalMap (2022), EPBC PMST and the list 'Priority Ecological Communities for Western Australia Version 32', there are no known Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC) in the proposed clearing area.

The EPBC PMST search identified the potential occurrence of the TEC 'Eucalypt woodlands of the Western Australian Wheatbelt' which is listed as 'Critically Endangered' under the *EPBC Act 1999*. This EPBC listed TEC is synonymous with the Priority 3 PEC listed by DBCA 'Eucalypt woodlands of the WA Wheatbelt' which is defined as:

> *"The community occurs in the IBRA Avon Wheatbelt 1 and 2 and Western Mallee subregions. It also includes outlying patches in the eastern parts of JAF01 Northern Jarrah Forests and JAF02 Jarrah Forests adjacent to the Avon Wheatbelt, that are off the Darling Range, and receive less than 600 mm mean annual rainfall. The structure of the ecological community is a woodland in which the minimum crown cover of the tree canopy in a mature woodland is 10%. The key dominant or co-dominant species of the tree canopy are species of Eucalyptus trees that typically have a single trunk. Native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs.*
>
> *The description, area and condition thresholds that apply to the EPBC-listed TEC of the same name, also apply to this Priority ecological community".*

The proposed clearing areas are located within the Geraldton Sandplains IBRA region (GS2), not the Avon Wheatbelt IBRA regions referred to in the description above. Further, the vegetation was identified as 'Completely Degraded' by Williams & Son (2022a; 2022b) and is not considered to fulfil the criteria for the EPBC listed TEC, if it was located in the TEC listed IBRA subregions.

3.5 FAUNA

3.5.1 Database Searches

The *EPBC Act* Protected Matters Search tool (PMST) (Appendix 1) and NatureMap search with a 10km buffer from each clearing area (DBCA 2022; DBCA 2023) (Appendix 5) were initially utilised to determine fauna species of conservation significance that could potentially occur in the area of proposed clearing.

It is important to note that the EPBC PMST is not entirely based on point records but also on broader information (e.g., bioclimatic distribution models), whereas the DBCA threatened fauna database is solely based on point records. Consequently, the results of the EPBC PMST are in some cases less accurate, particularly at a local scale. As a result, the EPBC PMST can include species that do not occur in the study area because, for example, there is no habitat available or they are now known to be locally extinct.

The search revealed a total of nine fauna species of conservation significance that could potentially occur, or, have been recorded within 10km of the proposed clearing area (Table 8).

There are records of Carnaby's Black Cockatoo immediately south of the Watheroo West Road proposed clearing area.

Table 8: EPBC PMST and DBCA records of fauna of conservation significance recorded within 10km of the proposed clearing area

SPECIES	CONSERVATION STATUS		LIKELIHOOD OF OCCURRENCE/POTENTIAL IMPACT
	DCCEEW*	DBCA**	
REPTILES			
Aspidites ramsayi (southwest subpop.) Woma		P1	This species preferred habitat is woodlands, heaths and shrublands, often with spinifex. The roadside vegetation in the proposed clearing areas are not considered of a suitable extent to support this species.
AVIFAUNA			
Zanda latirostris (Carnaby's Black Cockatoo)	EN	EN	Records of this species located south of the clearing area. Species is known to breed in the region. No suitable breeding habitat identified and foraging habitat of low value (Western Ecological 2023) – Section 3.5.3.
Falco hypoleucos[*1] (Grey Falcon)	VU		The species frequents timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined water courses (Garnett *et al*. 2011). No local records – identified as potentially occurring from EPBC PMST. There is no suitable habitat in the proposed clearing area, thus this species is not expected to occur.
Leipoa ocellata [*1] (Malleefowl)	VU	VU	Malleefowl prefer habitat with a dense canopy and an open ground layer in which they can construct their mounds (Benshemesh 2007). DBCA record 8km north of proposed Carot Well Road clearing area. There is no suitable habitat in the proposed clearing area (or surrounds), thus the proposed clearing would have no impact on this species.
Rostratula australis[*1] (Australian Painted Snipe)	EN	CR	This species was present only in the EPBC PMST database (there were no records in the DBCA threatened fauna database), and there are limitations with this PMST as outlined above. The species is usually found in shallow inland wetlands, either freshwater or brackish, and often the wetlands are of a type that are temporary or infrequently filled (DEH 2003) . As no such habitat is found in the proposed clearing area, it is not expected to occur or be impacted by the proposed clearing.
MAMMALS			
Dasyurus geoffroii (Chuditch) [*1]	VU	VU	The Chuditch previously occurred throughout arid and semi-arid Australia, but is now primarily restricted to the south west of WA, predominantly the Jarrah Forest and nearby areas. Though, there are small, isolated subpopulations that persist in the Avon Wheatbelt, eastern Goldfields Woodlands and Mallee and in Fitzgerald National Park and Ravensthorpe Range (Woinarski *et al*. 2014). No local records - Listed only in EPBC search results. Considered highly unlikely to occur, not discussed further.
Macroderma gigas[*1] Ghost Bat	VU	VU	This species was present only in the EPBC PMST database (there were no records in the DBCA threatened fauna database), and there are limitations with this PMST as outlined above. This record is considered an error as it is outside of the know distribution of this species, and there is no suitable habitat, not discussed further.
Macrotis lagotis Bilby	VU	VU	This species was present only in the EPBC PMST database (there were no records in the DBCA threatened fauna database), and there are limitations with this PMST as outlined above. This record is considered an error as it is outside of the know distribution of this species, not discussed further.
INVERTEBRATES			
Idiosoma dandaragan (Dandaragan Plateau shield-backed trapdoor spider)		P2	*Idiosoma dandaragan* was one of 15 new trapdoor spider species identified by Rix et al (2018) and has a known extent of occurrence of nearly 1,500 km^2 [1,230 km^2], and an area of occupancy within that range of <500 km^2. Little is known of its biology. Closest DBCA records located 6.8km east and 8km NNW of the Watheroo West Road proposed clearing area; 7.5km southwest of the Carot Well Road proposed clearing area. *Idiosoma* species typically inhabits clay soils of eucalypt woodlands and acacia vegetation, and relies heavily on leaf litter and twigs to build its burrow. Given the narrow linear nature of the native vegetation occurring and location immediately adjacent to the road, it is not considered the proposed clearing area provides suitable habitat for this species to survive (and facilitate ongoing movement of males/females to move and survive). In addition, there is limited leaf litter to provide feeding habitat for this species in the proposed clearing area.

* – listed under the *Environmental Protection and Biodiversity Conservation Act 1999*

** - under *Biodiversity Conservation Act 2016*

[*1] – from the EPBC PMST results

3.5.2 Site Assessment

As part of the flora survey, Williams & Son (2022a; 2022), who has worked in the areas for >30 years, made the following observations regarding the occurrence of fauna in the proposed clearing areas:

Watheroo West Road

- The only resident fauna noted were numerous colonies of ant species.
- A modest number of avian fauna (birds) was noted to be passing through. None appeared to have nest sites in the *Eucalyptus* species within the survey area.
- No Marsupial fauna was observed and there was no evidence of any other mammals.
- No Reptile fauna was observed.
- Williams and Son (2022) recorded the following species which potentially provide potential Carnaby's habitat: *Eucalyptus loxophleba, Eucalyptus salmonophloia and* Euc*alyptus wandoo*, and completed a supplementary survey to assess these trees, the results of which was used as the basis for the Western Ecological assessment (Section 3.5.3).

Carot Well Road

- The only resident fauna noted were numerous colonies of ant species.
- A modest number of avian fauna (birds) was noted to be passing through. None appeared to have nest sites in the *Eucalyptus* species within the survey area.
- No Marsupial fauna was observed and there was no evidence of any other mammals.
- No Reptile fauna was observed.
- There is minimal-no understorey in the proposed area to be cleared.

3.5.3 Carnaby's Black Cockatoo Habitat

3.5.3.1 Overview

There are numerous records of Carnaby's Black Cockatoo in the local area and region (DBCA 2022). Based on the spatial layers available for 'Black Cockatoo Breeding Area' the area is located an overall Black Cockatoo breeding area in the region (Government of WA 2022).

To further assess the potential impacts to Carnaby's Black Cockatoo, Western Ecological (2023) completed a targeted habitat assessment for this species on 2 February 2023 in the proposed clearing areas with the field assessment consisting of (Appendix 4):

- Breeding trees assessment – trees considered to be suitable (i.e. suitable species and DBH >500mm; 300mm for Wandoo and Salmon gum) for nesting were examined.
- Foraging habitat assessment – assessing the occurrence of habitat (shrub and tree species) known to be important dietary items for Carnaby's Black Cockatoo e.g. Proteaceous species and evidence of feeding.
- Night roosting assessment – assessing occurrence of tree species known to be used for roosting and evidence of roosting i.e. feathers etc.

3.5.3.2 Breeding Habitat

Watheroo West Road

The Wheatbelt contains open woodlands including York Gum (*E. loxophleba*), Wandoo (*E. wandoo*), Salmon Gum (*E. salmonophloia*) and Flooded Gum (*E. rudis*) used by Carnaby's Cockatoo for breeding.

This region extends north of the traditional Wheatbelt area, where York Gum and Kwongan heath foraging resources are accessed by Carnaby's Cockatoo (DAWE 2022).

Western Ecological (2023) assessment recorded 29 potential breeding trees comprising (Figure 19 - detailed list in Appendix 3 of Appendix 4, pp 19):

- 21 Salmon Gum *(E.salmonophloia)*
- 4 York Gum *(Eucalyptus loxophleba)*
- 4 Wandoo *(*E.*wandoo*)*.*

Western Ecological (2023) concluded that "*These trees are unlikely to form hollows suitable for nesting in the main trunk in the near future and possibly some will never, despite them meeting the Black Cockatoo referral guidelines for potential breeding trees*". This is owing to:

- many of the main trunks split into multiple trunks or branches at 2-5m, or
- split at ground level into multiple trunks or forms that make them unsuitable for nesting.

The Western Ecological (2023) shows examples of such trees in their report.

The area to the immediate south of the western end of clearing area appears to have over 2,000 mature *Eucalyptus wandoo* in good condition (*pers.comm* Don Williams). As the area is located on private property an accurate estimate could not be undertaken.

Carot Well Road

Western Ecological (2023) assessment recorded 16 potential breeding trees comprising (Figure 20 - detailed list in Appendix 4 of Appendix 4, pp 20):

- 4 Salmon Gum *(E.salmonophloia)*
- 4 Red Gum *(Eucalyptus camuldulensis)*
- 10 Eucalypt (not identified to species level by Western Ecological).

None of these 16 potential breeding trees had a hollow considered to be a large enough opening, at an appropriate height and in the main trunk (vertical hollow) to be considered a potential nesting tree when viewed from the ground (Western Ecological 2023).

Consistent with the trees assessed at Watheroo West Road (Section 3.5.3.3), these trees are considered unlikely to form hollows for nesting in the near future and some possibly never will (Western Ecological 2023).

3.5.3.3 Foraging Habitat

Western Ecological (2023) identified little to no foraging habitat for Carnaby's Cockatoo in either clearing area, noting the road edge consists mostly of weedy grasses with no midstorey (no shrub layer) and being adjacent to wheatfields and paddocks.

While Salmon Gum recorded in the survey is recognised as a food item for Carnaby's Cockatoo, Western Ecological (2023) stated it is not a preferred item and as such would be considered low quality foraging habitat at best.

No signs of forging were recorded.

3.5.3.4 Roosting Habitat

No evidence of roosting was recorded by Western Ecological (2023).

Figure 19: Potential Carnaby's Black Cockatoo Breeding Trees on Watheroo West Road (from Western Ecological 2023)

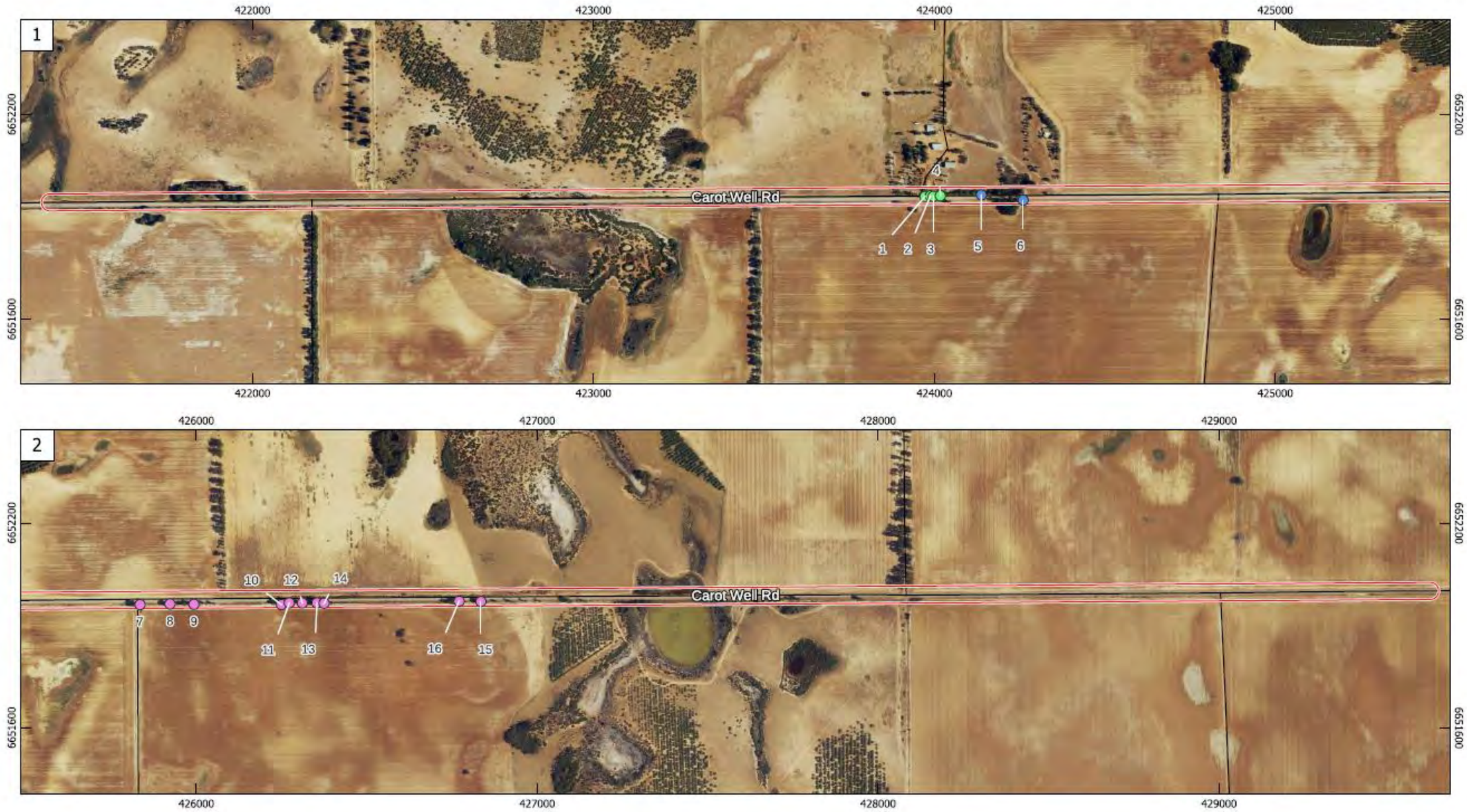

Figure 20: Potential Carnaby's Black Cockatoo Breeding Trees on Carot Well Road (from Western Ecological 2023)

3.5.4 Idiosoma dandaragan

Records of the trapdoor spider *Idiosoma dandaragan* (P2) have been recorded approximately 6.8 km east and 8km NNW of the proposed clearing area along Watheroo West Road, and approximately 7.5 km southwest of the Carot Well Road area.

Idiosoma dandaragan was one of 15 new trapdoor spider species identified by Rix et al (2018) (formerly referred to as *I.nigrum*) and has a known extent of occurrence of nearly 1,500 km^2 [1,230 km^2], and an area of occupancy within that range of <500 km^2 with little known to date about its biology (Figure 21).

Given the narrow linear nature of the native vegetation occurring and location immediately adjacent to the road, it is not considered the proposed clearing area provides suitable habitat for this species to survive (and facilitate ongoing movement of males/females to move and survive). In addition, there is limited leaf litter to provide feeding habitat for this species in the proposed clearing area.

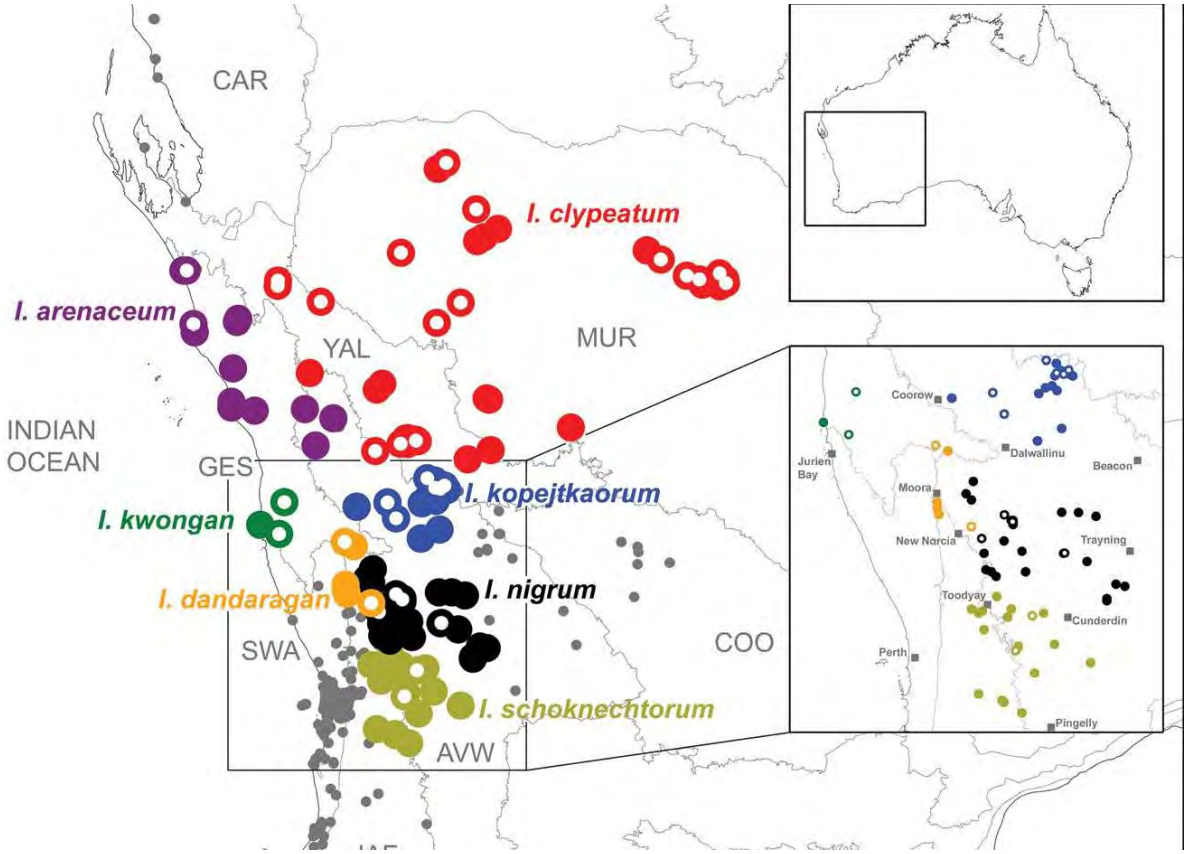

Figure 21: Locations of shield-backed trapped spiders Idiosoma sp. recorded (from Rix *et al* 2018)

3.6 CONSERVATION AREAS IN ADJACENT AREAS

The Department of Water and Environmental Regulation (DWER) Clearing Permit System Map Viewer was used to determine the location of any ESA's and Conservation Reserves (DWER, 2022).

The proposed clearing area is not located within an ESA or conservation area. The nearest ESA area associated with Threatened flora records and are located >2km from the proposed clearing areas.

4 CLEARING PERMIT PRINCIPLES

a) Native vegetation should not be cleared if it comprises a high level of biological diversity

The proposed clearing area lies within the IBRA region Geraldton Sandplains (GS2 – Geraldton Hills subregion) in an area which has been subject to significant historical clearing for agriculture .

For Watheroo West Road, the native vegetation to be cleared comprises roadside vegetation and is of low diversity, with only 11 native species recorded by Williams & Son (2022a) along the entire 2 km length surveyed. The vegetation condition was identified as 'Completely Degraded'.

Only 2-3 species occur on Carot Well Road with no understorey species (Williams & Son 2023) and identified as being in 'Completely Degraded' condition.

Based on the above, the proposed clearing envelope is not considered to comprise a high level of biological diversity.

Based on the above, the proposed clearing is not at variance to this Principle.

(b) Native vegetation should not be cleared if it comprises the whole, or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Records of Carnaby's Black Cockatoo in the local area and region are known from DBCA records.

Only 11 species of native flora were recorded in the proposed clearing area on Watheroo West Road, with the area comprising little native understorey and a number of weed species. Only 2-3 species of Eucalypts were recorded on Carot Well Road.

The potential for the trees to be cleared to provide Carnaby's Black Cockatoo was assessed in the clearing areas by Western Ecological (2023). Based on the Western Ecological (2023) assessment, none of the potential Carnaby's breeding trees (in accordance with DAWE 2022 guidelines) are breeding trees and are considered *"unlikely to form hollows suitable for nesting in the main trunk in the near future and possibly some will never, despite them meeting the Black Cockatoo referral guidelines for potential breeding trees*". This is owing to:

- many of the main trunks split into multiple trunks or branches at 2-5m, or
- split at ground level into multiple trunks or forms that make them unsuitable for nesting.

In addition, Western Ecological (2023) recorded the following in relation to Carnaby's Cockatoo:

- Little to no foraging habitat. While *E.wandoo* may provide foraging habitat, it is considered the proposed clearing area provides low quality foraging habitat for Carnaby's Black Cockatoo.
- No signs of foraging.
- No signs of roosting.

In relation to *Idiosoma dandaragan*, given the narrow linear nature of the native vegetation that is present and location immediately adjacent to the road, it is not considered the proposed clearing area provides suitable habitat for this species to survive (and facilitate ongoing movement of males/females to move and survive). In addition, there is limited leaf litter to provide feeding habitat for this species in the proposed clearing area.

The Shire considers that the proposed clearing area is not necessary for the on-going maintenance of any significant fauna or fauna habitat.

Given the above, the proposed clearing will not be at variance to this Principle.

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

No plant taxa located in the proposed clearing area are gazetted as Threatened under the EPBC Act or BC Act .

No Priority flora has been recorded in the proposed clearing area.

Given the above, the proposed clearing will not be at variance to this Principle.

(d) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a Threatened Ecological Community (TEC).

No TEC's are listed under the Commonwealth EPBC Act or endorsed by the Western Australian Minister for the Environment for the Project area.

The proposed clearing area is located outside of the Avon Wheatbelt IBRA region within which the "Eucalypt Woodlands of the Wheatbelt" TEC is located and comprises vegetation condition rated 'Completely Degraded' which is inconsistent with the TEC description.

Therefore, the proposed clearing is not at variance to this Principle.

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Based on the of its Pre-European vegetation extent remaining ( ) the vegetation to be cleared is considered as a remnant in an area that has been extensively cleared. However, the vegetation is in a degraded condition and the clearing of 1.2 ha will not significantly reduce the extent of the groups.

Therefore, the proposed clearing is at variance to this Principle. As the vegetation condition is 'completely degraded' it is not considered significant remnant vegetation.

(f) Native vegetation should not be cleared if it is growing, in, or in association with, an environment associated with a watercourse or wetlands.

The degraded roadside vegetation proposed to be cleared is not growing in or associated with a watercourse or wetland.

The proposed clearing is not at variance to this Principle.

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

The vegetation to be cleared is located immediately adjacent to the Watheroo West and Carot Well Roads and in an area which has been subject to historical clearing for agriculture.

The proposed clearing of 1.2 ha of vegetation is not likely to lead to land degradation issues such as salinity, water logging or acidic soils and therefore is not at variance to this Principle.

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

There are no conservation or nature reserves within the Project area.

Given the distance to the nearest conservation areas, the proposed clearing will not have any impact on the environmental values of the area. The proposed clearing, therefore, is not at variance to this Principle.

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

There is no surface water of significance, large drainage lines, lakes or swamps in or in close proximity to the proposed clearing area.

The area proposed to be cleared does not fall within a Public Drinking Water Source Area (PDWSA) or PDWSA Protection Zone.

The clearing of 1.2 ha of native vegetation is not likely to cause deterioration in the quality of surface or groundwater and, therefore, the proposed clearing is not at variance to this Principle.

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

The area proposed to be cleared comprises the roadside vegetation alongside the existing Watheroo West and Carot Well Roads which is in 'Completely Degraded' .

As there is little surface flow during normal rains in the local area, the proposed clearing of 1.2 ha is not likely to cause or exacerbate the incidence or intensity of flooding. Therefore, the proposed clearing is not at variance to this Principle.

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APPENDICES

Appendix 1: EPBC PMST Results

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 27-Oct-2022

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	24
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	1
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Eucalypt Woodlands of the Western Australian Wheatbelt	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Macroderma gigas](#) Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area	In feature area
PLANT			
[Acacia aristulata](#) Watheroo Wattle [64822]	Endangered	Species or species habitat may occur within area	In feature area
[Acacia cochlocarpa subsp. cochlocarpa](#) Spiral-fruited Wattle [23877]	Endangered	Species or species habitat may occur within area	In feature area
[Caladenia drakeoides](#) Hinged Dragon Orchid [68687]	Endangered	Species or species habitat may occur within area	In feature area
[Chorizema humile](#) Prostrate Flame Pea [32573]	Endangered	Species or species habitat may occur within area	In feature area
[Conospermum densiflorum subsp. unicephalatum](#) One-headed Smokebush [64871]	Endangered	Species or species habitat may occur within area	In feature area
[Dasymalla axillaris](#) Native Foxglove [38829]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Daviesia dielsii](#) Diels' Daviesia [19617]	Endangered	Species or species habitat may occur within area	In feature area
[Eremophila scaberula](#) Rough Emu Bush [16729]	Endangered	Species or species habitat likely to occur within area	In feature area
[Eucalyptus pruiniramis](#) Midlands Gum, Jingymia Gum [56403]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Eucalyptus rhodantha](#) Rose Mallee [9362]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gastrolobium appressum			
Scale-leaf Poison [7358]	Vulnerable	Species or species habitat may occur within area	In feature area
Gastrolobium hamulosum			
Hook-point Poison [9212]	Endangered	Species or species habitat may occur within area	In feature area
Grevillea christineae			
Christine's Grevillea [64520]	Endangered	Species or species habitat likely to occur within area	In feature area
Hemiandra gardneri			
Red Snakebush [7945]	Endangered	Species or species habitat known to occur within area	In feature area
Synaphea quartzitica			
Quartz-loving Synaphea [64978]	Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Egernia stokesii badia			
Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat may occur within area	In feature area
SPIDER			
Idiosoma nigrum			
Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider [66798]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species		[Resource Information]	
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Motacilla cinerea			
Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Unknown		
Commonwealth Land - [50951]	WA	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
[Bubulcus ibis as Ardea ibis](#) Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Extra Information

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Appendix 2: Watheroo West Road Survey Report (Williams & Son 2022a)

Shire of Moora. Report on Flora and other Environmental factors relating to application to clear native vegetation within the eastern most 2 kilometers of Watheroo West Road reserve for the Moora Shire.

Initial flora survey conducted 22-08-2022.

Report prepared for the Shire of Moora by Donald Williams. Williams & Son. Tootbardi Road Badgingarra 6521

Email hivallee@westnet.com.au Phone 0896523035

Limitations of report.

This report has been compiled by Donald Williams, Williams and Son On behalf of the Shire of Moora. Every attempt has been made at correct identification and current nomenclature.

The report is based on conditions encountered and information gleaned during preparation of this report. The preparation of this report has been made in a professional and independent manner.

The author appreciates the value of the unique flora of the area and has considerable experience in revegetation and general vegetation of the area. The author is prepared to be involved in the management and continuation of this application.

Contents

1 Description of area

The area surveyed is the eastern end of Watheroo West Road. Being from the eastern end of the wider sealed surface eastwards towards the rail line for the extent of concerned vegetation.

The survey area is the full width of the Road reserve or to the property fence lines north and south of the road reserve.

The soils are predominantly red clay.

The native vegetation condition, Keighery Scale 1994 is Completely Degraded (6) This is the most degraded level. There is no evidence of species on the Threatened and Priority species List.

The species observed generally show no signs of regeneration of native species.

There appears to be no evidence of Phytophthora infection.

2 Flora list for survey area and notes

Native species	
Name	Comments
Acacia acuminatum	Common will survive earthworks and fire. Has set a large quantity hard seed.
Austrostipa variabilis	Small number
Dianella revoluta	Very few
Eucalyptus loxophleba	Very old up to 4 meters height no regeneration may regenerate with fire (not recommended) or disturbance.
Eucalyptus salmonophloia	19 individual mature specimens no apparent regeneration
Euc*alyptus wandoo*	34 stems. Some resprouting I.e. more than 1 trunk from a single root stock perhaps due to past damage.
Jacksonia hakeoides	Very few
Hakea recurva	Approaching senescence
Leptospermum erubescens	Very few well of road centre near edge of reserve
Santalum spicatum	20+ Does have some juvenile population
Tecticornia Sp.	May be introduced, not threatened.

Introduced non-native species (Weeds)	
Common Name Annuals	Scientific Name
Barley grass	*Hordeum leporinum*
Cape weed	*Arctotheca calendula*
Radish	*Raphanus raphanistrum*
Rye Grass	*Lolium Sp.*
Wild Oats	*Avena barbarta*

Note. There do not appear to be any declared weeds. There do not appear to be any perennial weeds

3 Priority flora explanation

Search for priority and D.R.F flora.

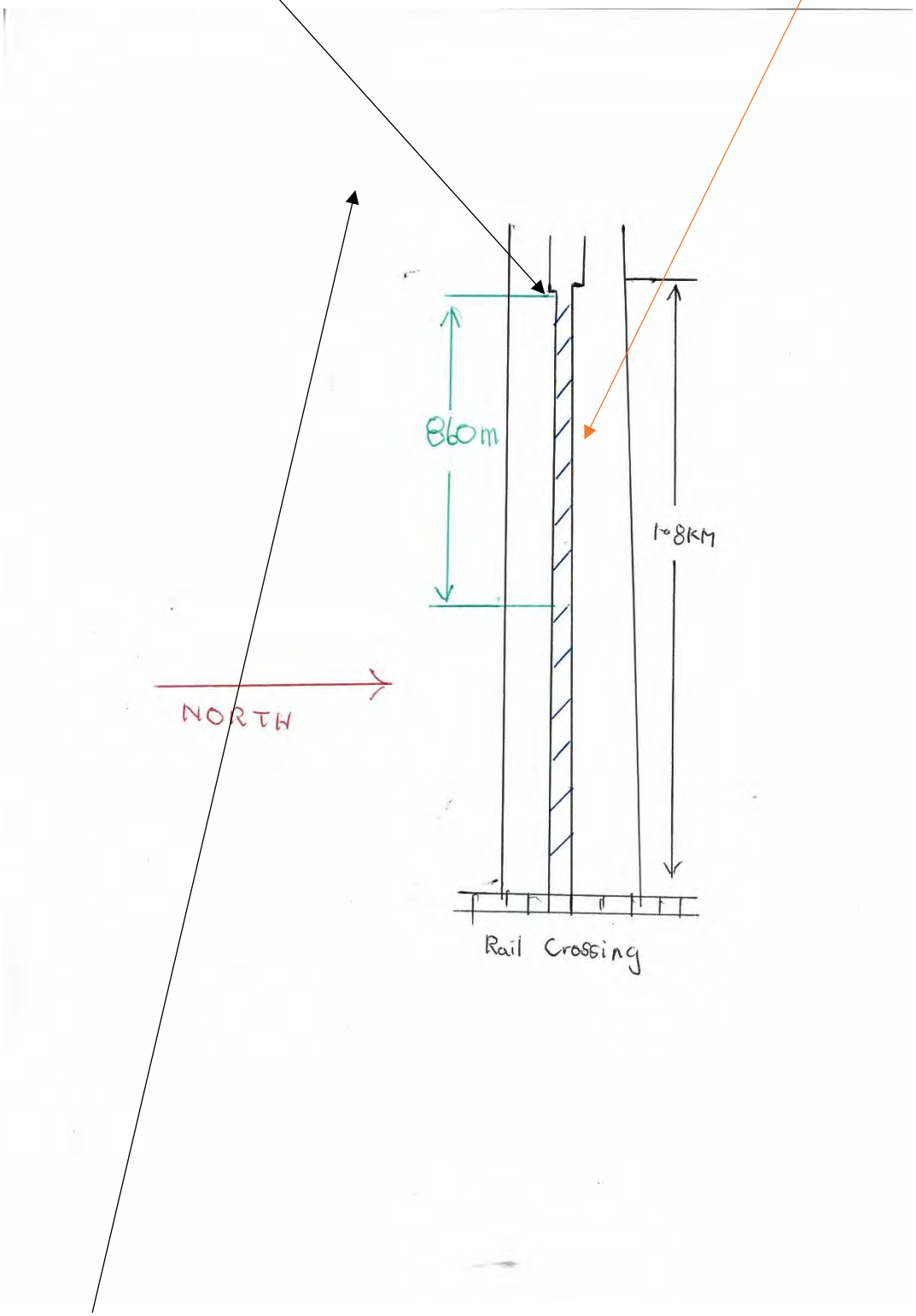
The area of study was searched for all priority and D.R.F species considered likely to occur in the study area. The table below describes species searched for none were located.

Species and P rating	Result and comment
Eucalyptus carnabyi D R F This species was searched for and not located	This species occurs in deep yellow sand as the survey area is clay to gravel it was not expected to be sighted. Does occur east of Watheroo.
Eucalyptus rhodantha D R F This species was searched for and not located	This species occurs in deep yellow and white sand. As the survey area is clay it was not expected to be sighted.
Gastrolobium rotundifolium P3 Not located on site	The species *Gastrolobium rotundifolium* has been identified to the west of Moora townsite in similar clay. Not located on this site. Has a distinctive form.
Melaleuca sclerophylla P3 Not located on site.	The soil at the survey site is probably too high a clay content for this species.

4 Map not to scale showing sections as surveyed

*Eucalyptus salmonophloia & Eucalyptus wandoo b*oth side of road for 860 meters to the east.

Newer wider seal to west older narrow seal to east.



Area of *Eucalyptus wandoo* outside of survey area.

5 Fauna

The only resident fauna noted were numerous colonies of ant species.

A modest number of avian fauna (birds) was noted to be passing through. None appeared to have nest sites in the *Eucalyptus* species within the survey area.

No Marsupial fauna was observed and there was no evidence of any.

No Reptile fauna was observed.

6 Summary recommendations

1 The area surveyed is seriously degraded. The loss of Carnaby's Cockatoo feed habitat would be virtually nil.

2 Over the past 20 years the Moora shire has been involved in extensive plantings of areas including large numbers of Carnaby's food species in areas such as Wheatbin Road.

3 In some places there are *Eucalyptus* species very close to the edge of the seal. It was evident when conducting the survey that an unsafe condition exists when Road trains (class 7) travelling in opposite directions pass at these points.

4. There are a considerable number of the species *Eucalyptus wandoo* to the southwest of the survey area.

5 It would be possible to preserve a population of the *Santalum spicatum* (Sandalwood) if road widening was to occur.

7 Explanatory pictures

Looking westwards showing *Eucalyptus salmonophloia* very close to seal.

Looking Westwards showing *Eucalyptus salmonophloia* very close to seal also showing red clay nature of the soil and complete lack of native species understory. Note introduced grass species.

Showing considerable numbers of the species *Eucalyptus wandoo* in the adjoining area to the southwest of the study area.

Showing number of smaller examples of the species *Santalum spicatum*. Also, some smaller examples of *Eucalyptus wandoo*.

8 References

Western Weeds, a guide to the weeds of Western Australia.

B.M.J Hussey G.J. Keighery R.D. Cousins J. Dodd S.G. Lloyd

How to know Western Australian Wildflowers. W.E. Blackall and B.J. Grieve

Guide to Wildflowers of Western Australia. Simon Nevill & Nathan McQuoid.

Field Guide to Hi-Vallee Farm Jolanda Keebles, Don and Joy Williams and Mike Hislop.

Florabase – the Western Australian Flora.

Appendix 3: Carot Well Road Survey Report (Williams & Son 2022b)

Shire of Moora. Report on Flora and other Environmental factors relating to application to clear vegetation within the 8 kilometer section of Carrot Well Road reserve details in report. For the Moora Shire.

Initial flora survey conducted 09-12-2022.

Report prepared for the Shire of Moora by Donald Williams. Williams & Son. Tootbardi Road Badgingarra 6521

Email hivallee@westnet.com.au Phone 0896523035

Limitations of report.

This report has been compiled by Donald Williams, Williams and Son on behalf of the Shire of Moora. Every attempt has been made at correct identification and current nomenclature.

The report is based on conditions encountered and information gleaned during preparation of this report. The preparation of this report has been made in a professional and independent manner.

The author appreciates the value of the unique flora of the area and has considerable experience in revegetation and general vegetation of the area. The author is prepared to be involved in the management and continuation of this application.

Contents.

1 Description of area

The area surveyed is 8 kilometres of Carrot Well Road. The Survey commences 11.1 kilometres east of the western end of Carrot Well Road.

The survey area is the full width of the Road reserve or to the property fence lines north and south of the road reserve.

The soils are deep yellow sands with a very shallow water table. This applies to the entire length of the survey

The native vegetation condition on the Keighery Scale 1994 is Completely Degraded (6). This is the most degraded level. There is no evidence of species on the Threatened and Priority species List.

The 2 species observed, *Eucalyptus camaldulensis* and *Corymbia ficifolia* have either colonised or been planted since land clearing.

There appears to be no evidence of Phytophthora infection.

2 Flora explanation of native species and details of 4 individual sites

Site 1

Is located at 0422982e 6651949n. There are 2 *Eucalyptus camaldulensis* at this site. 1 on either side of the road. It would appear that these have colonised the site. The water table appears to be about 1 metre below the surface. The species *Eucalyptus camaldulensis* would not have occurred at this site pre land clearing. It would have occurred along drainage lines I.e. creeks and rivers.

Site 2

Is centred on 0424220e 6651953n over a total length of approximately 75 metres. There are 12 *Eucalyptus camaldulensis* at this site. The 12 are on either side of the road. An exact count is difficult as the exact road boundary is difficult to ascertain. There is a large colony extending 30 metres north and south of the road It would appear that these have colonised the site. The water table appears to be about 1 metre below the surface. The species *Eucalyptus camaldulensis* would not have occurred at this site pre land clearing. It would have occurred along drainage lines I.e. creeks and rivers.

Site 3

Is centred on 0427144e 6651980n and is 1300 metres east west. There are 19 *Corymbia ficifolia.* These are located on the south side of the road only. They are mature trees. It is presumed that they were planted as they are 24 metres apart or multiples of this figure. The species *Corymbia ficifolia* naturally only occurs in the south of this state ref. Florabase – the Western Australian Flora. The species are located in the lower profile therefore have obviously located the shallow water table.

Site 4

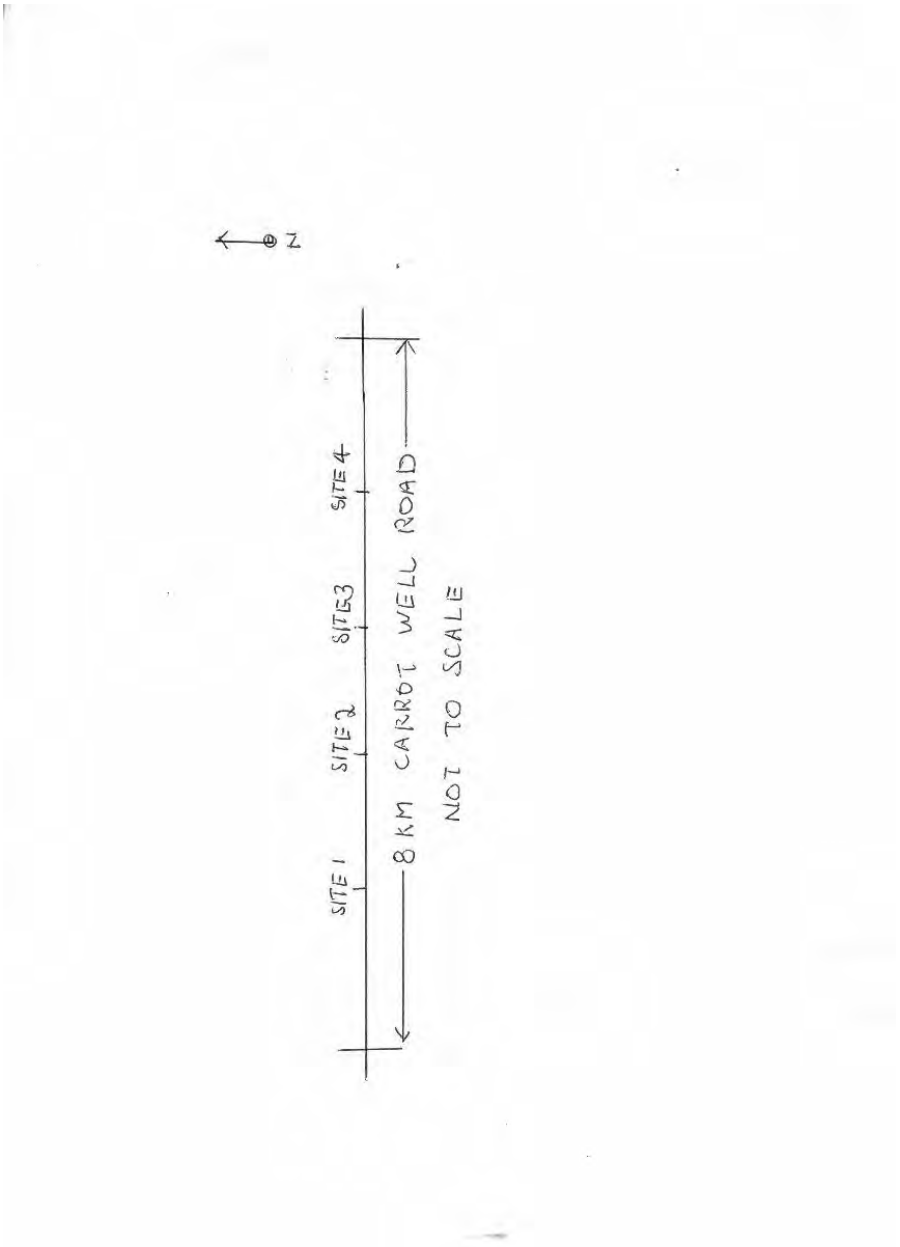
Is centred on 0427676e 6651982n and is 1300 metres east west. There are 6 *Corymbia ficifolia.* These are located on the south side of the road only. They are mature trees. It is presumed that they were planted as they are 24 metres apart or multiples of this figure. The species *Corymbia ficifolia* has colonised in the area of native vegetation to the south of the road on private property. The species *Corymbia ficifolia* naturally only occurs in the south of this state ref. Florabase – the Western Australian Flora. The species are located in the lower profile therefore have obviously located the shallow water table.

3 Priority flora explanation

Search for Priority and D.R.F flora. (Declared rare and threatened)

The area of study was searched for all Priority and D.R.F species considered likely to occur in the study area. The absence of native vegetation in the survey area (with the exception of the trees previously identified) enabled the conclusion that there are no priority and D.R.F species.

4 Map of site



5 Fauna

A small number of avian fauna were observed passing through the survey area. They were

1. Pink and grey galah *Elophus* Sp.
2. Bronze wing pigeon.

It is presumed that the removal of the roadside trees will not affect either of these species. There is no evidence of nesting hollows.

6 Summary recommendations

1 The area surveyed is seriously degraded. The loss of Carnaby's Cockatoo feed habitat would be nil.

2 Over the past 20 years the Moora shire has been involved in extensive plantings of areas including large numbers of Carnaby's food species in areas such as Wheatbin Road.

3 In some places there are *Eucalyptus* and *Corymbia* species are close to the edge of the seal. It was evident when conducting the survey that an unsafe condition exists when road trains (class 7) travelling in opposite directions pass at these points.

4. There are a considerable number of the species *Eucalyptus camaldulensis* and *Corymbia calophylla* that have successfully colonised on private property adjoining the survey area.

7 Explanatory pictures

Showing 1 of 2 *Eucalyptus camaldulensis* at site 1.

Showing large colony of *Eucalyptus camaldulensis* on private property adjoining site 2.

7 Explanatory pictures

Showing *Corymbia calophylla* at site 4. Note road works are already hindered by the trees,

Showing very shallow water table between sites 3 and 4. Note old vegetation in water indicating a rise in water table since land clearing.

7 Explanatory pictures.

From towards Eastern end looking West. Note degraded edge of seal and lack of vegetation on verge.

Showing eastern end of project. 19.15 kilometres from Western end of Carrot well Road

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8 References

Field Guide to Eucalypts Brooker and Kleinig Volume 2.

Florabase – the Western Australian Flora.

Appendix 4: Western Ecological (2023) Survey Report

22 February 2023

Carnaby's Cockatoo Habitat Assessment – Shire of Moora

To: Belinda Clark – Director & Manager – Approvals

Company: Clark Lindbeck & Associates

Email: belinda@clarklindbeck.com.au

1. Introduction

1.1 Background

Western Ecological (WE) was commissioned in February 2023 by the Shire of Moora (the Shire) to undertake a Carnaby's Black Cockatoo (Carnaby's Cockatoo) (*Zanda latirostris*) habitat assessment near the town of Watheroo in the Wheatbelt. Two sections of road (to the paddock fence line) were to be assessed for Carnaby's Cockatoo habitat – Watheroo Road and Carot Well Road (Figure 1). The Shire plans to widen these two sections, and as a result the clearing of vegetation may be required, which could potentially include Carnaby's Cockatoo habitat. Carnaby's Cockatoo is a threatened species listed as Endangered (En) under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Western Australian Biodiversity Conservation Act 2016* (BC Act).

1.2 Objectives and Scope

The scope of work (SoW) to be undertaken was as follows:

- Undertake a Carnaby's Cockatoo habitat assessment of two road sections - Watheroo and Carot Well
- Document the above in a short letter report.

1.3 Legislative context

Fauna in Western Australia is protected formally and informally by various legislative and non-legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) – Commonwealth Government*
- *Biodiversity Conservation Act 2016 (BC Act) – WA State Government.*

Non-legislative measures:

- WA Department of Biodiversity, Conservation and Attractions (DBCA) Priority lists for flora, ecological communities and fauna.

A short description of each is given below. Other definitions, including species conservation categories, are provided in Appendix 1.

EPBC Act

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) aims to protect matters of national environmental significance, which are detailed in Appendix 1. Under the EPBC Act, the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e., Critically Endangered [CrEn], Endangered [En] and Vulnerable [Vu]) or Migratory.

Bird species protected as Migratory under the EPBC Act include those listed under international migratory bird agreements relating to the protection of birds, which migrate between Australia and other countries, for which Australia has agreed. This includes the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the EPBC Act. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e., any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas, the EPBC Act does not consider these species to be matters of national environmental significance, so are not protected under the Act.

BC Act

The *Biodiversity Conservation Act 2016* (BC Act) replaced both the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929* and came into effect on 1 January 2019. The aim of the new Act is to conserve and protect biodiversity and to promote the ecologically sustainable use of biodiversity components in the State, and will bring more activities within the scope of biodiversity laws.

Taxa listed as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1a, 1b, and 1c), or is a rediscovered species to be regarded as threatened species under section 26(2) of the BC Act. Other categories include extinct or extinct in the wild and they are listed under section 23 (1) of the BC Act (Appendix 1).

If species meet one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection, they are covered under section 13(1) of the BC Act and are called specially protected species. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act can't also be listed as Specially Protected species (see Appendix 1 for a more detailed description of each threat category).

Threatened Ecological Communities (TECs) are also covered under the BC Act and are placed into three categories of critically endangered, endangered or vulnerable under section 27(1a, 1b, and 1c) of the BC Act depending on their threat status.

DBCA Priority Species and Communities

DBCA lists species that are possibly threatened but that do not meet criteria for listing under the BC Act, or are otherwise data deficient, and adds them to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Consideration of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations (Appendix 1 for more detail of the priority codes).

The DBCA also has a list of Priority Ecological Communities (PECs) that have scant information available to be considered a TEC, or which are rare but not currently threatened. Ecological communities that do not meet survey criteria or that are not sufficiently defined are added to the PEC list under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as a TEC. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for near threatened, or that have been recently removed from the threatened list, are placed in priority 4. These ecological communities require regular monitoring.

Informal Recognition of Threatened Fauna

Certain populations or communities of fauna may be of local significance or interest because of their patterns of distribution and abundance. For example, fauna may be locally significant because they are range extensions to the previously known distribution or are newly discovered species (and have the potential to be of conservation significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, and changed fire regimes) and relict populations of such species assume local importance for DBCA. It is not uncommon for DBCA to make comment on these species of interest.

2. Methods

2.1 Survey Guidance

The Carnaby's Cockatoo habitat assessment was completed in accordance with the following EPA and DCCEEW requirements for the environmental surveying and reporting of fauna surveys in WA, where relevant and practical, and as documented in:

- Commonwealth Department of Agriculture, Water and the Environment (DAWE [now DCCEEW) referral guideline for 3 WA threatened Black Cockatoo species (2022)
- EPA Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020).

2.2 Carnaby's Cockatoo Habitat Assessment

The field assessment was undertaken on the 3rd February 2023 by two qualified and experienced Zoologists (Dr Ron Firth and Laura Stevens).

Please note there are three species of Black Cockatoo in the south west of WA that are listed under the EPBC Act , however, the two road sections are only in the known distributional range of Carnaby's Cockatoo (Appendix 2 - Black Cockatoo distribution maps [DAWE 2022]).

The field assessment consisted of the following components when applicable.

Breeding Tree Assessment

Carnaby's Cockatoos nest in large hollow-bearing trees, generally in woodlands or forests, but can do in other situations. The size of the tree can be a useful indication of the hollow-bearing potential of the tree. During the survey trees considered to be suitable for nesting based on the following criteria were examined if present:

- Native trees (e.g., Marri [*Corymbia calophylla*], Jarrah [*Eucalyptus marginata*], Wandoo [*Eucalyptus wandoo*], Salmon Gum [*Eucalyptus salmonophloia*], Tuart [*Eucalyptus gomphocephala*], York Gum [*Eucalyptus loxophleba*] and Flooded Gum [*Eucalyptus rudis*)
- Diameter at breast height (DBH – 1.3 m) ≥ 500 mm (300 mm for Wandoo and Salmon Gum)
- GPS co-ordinates were recorded using a hand held GPS
- Suitable Black Cockatoo breeding hollows were assessed (from the ground) if present and based on the following:
  - Approx. ≥ 120 mm diameter at the entrance
  - location of hollow (i.e., situated on main trunk)
  - direction of hollow
  - height of hollow
  - depth of hollow (where possible to assess from the ground)
  - evidence of nesting activity (beak marks around hollow entrance, feathers and bespatter below hollow or on ground).

Foraging Assessment

The Carnaby's Cockatoo habitat assessment involved assessing the habitat for shrub and tree species known to be important dietary items for Carnaby's Cockatoo e.g., Proteaceous plant species (*Banksia* spp., *Hakea* spp., *Grevillea* spp.), Marri and other Eucalypts and included looking for the following (if present):

- Native trees and shrubs (as mentioned above)
- Evidence of feeding (chewed cones, seed and nut material)
- Opportunistic observations of Black Cockatoos in the survey area.

Foraging habitat quality criteria (semi quantitative) based on preferred known food items has been developed, their extent in an area being assessed and the condition of the habitat. Please note that we have attempted to keep this criterion simple, practicable and repeatable across habitats and regions so that assessments are consistent as is practicable (see Table 1 below).

Table 1: Foraging habitat quality and the criteria it is assessed against.

Please note that the primary and secondary food sources have been identified in the literature and these will be cited in the results section (should they be present in the survey areas).

Foraging Habitat Quality	Criteria
High Quality	• Primary food sources present and dominant (high relative abundance) in an area greater than 1 ha • Secondary food sources also present in medium to high relative abundance in an area greater than 1 ha • No recent extensive fire (>1 year) and limited to no signs of disease such as *Phytophthora cinnamomi* and or Marri canker
Medium Quality	• Primary food sources present but not dominant (medium relative abundance) in an area greater than 1 ha, and or • Secondary food sources also present in medium to high relative abundance in an area greater than 1 ha • No recent extensive fire (>1 year) and limited signs of disease such as *Phytophthora cinnamomi* and or Marri canker.
Low Quality	• Very limited to no primary food sources present in an area, and or • Secondary food sources also present in low to medium relative abundance • Recent fire (<1 year) and or signs of disease such as *Phytophthora cinnamomi* and or Marri canker
Nil	• Self-explanatory.

Night Roosting Assessment

Night roosting sites are often situated to access local food and water sources, as well as providing a protected place to roost. Roost sites are typically used sequentially for periods of 4–6 weeks, and may be a traditional roost used over many years.

Surveying for roosting habitat was carried out in the survey area, with a focus on tree species known to be used for roosting and included looking for signs such as large numbers of feathers and bespatter under trees.

3. Results

3.1 Potential Carnaby's Cockatoo Habitat Watheroo Road

While undertaking the assessment three Carnaby's Cockatoos were seen and heard flying across the road, but they did not perch on any trees in the survey area.

Potential Carnaby's Cockatoo Breeding Habitat

During the Carnaby's Cockatoo habitat assessment 29 potential breeding trees were recorded in the survey area, the locations and details of which can be seen on Figure 2 and in Appendix 3. Of these 29 potential breeding trees, 21 were Salmon Gum, four were Wandoo, and four were York Gum (Figure 2 and Appendix 3).

None of these 29 potential breeding trees had a hollow considered to have a large enough opening, at an appropriate height and in the main trunk (vertical hollow) to be considered a potential nesting tree when viewed from the ground.

Although 25 of the potential breeding trees had a DBH that measured ≥ 300 mm in the case of Salmon Gum and Wandoo, and four of the York Gums had a DBH that measured ≥ 500 mm, many of the main trunks of these trees split (into multiple trunks or branches) at a height of approximately between 2-5 m (or split at ground level into two main trunks or other forms that make them unsuitable for nesting). These trees are unlikely to form hollows suitable for nesting in the main trunk in the near future and possibly some will never, despite them meeting the Black Cockatoo referral guidelines for potential breeding trees (Figure 2 and Appendix 3). Some examples of trees from the survey area that are unlikely to be suitable nesting trees in the future can be seen below (see Plates 1-9).

Plate 1. Salmon Gum (Tree 3). Main trunk splits at several points along the main trunk (4 m and 6 m) into smaller branches.

Plate 2. Salmon Gum (Tree 7). Main trunk divides at multiple points, beginning at about 4 m into smaller branches.

Plate 3. Salmon Gum (Tree 10). Main trunk splits at about 4 m into multiple branches.

Plate 4. York Gum (Tree 13). The main trunk bends at about 5 m and then splits into smaller branches.

Plate 5. York Gum (Tree 15). The main trunk splits at about 1.5 m and then both trunks are not vertical.

Plate 6. York Gum (Tree 16). Main trunk divides at about 1.5 m into 3 trunks.

Plate 7. Salmon Gum (Tree 17). Two main trunks that divide at around 1 m and then split into multiple branches at approximately 5 m.

Plate 8. Salmon Gum (Tree 23). Main trunk divides into multiple branches at approximately 4 m.

Plate 9. Salmon Gum (Tree 29). Main trunk divides into two main trunks at about 1.5 m.

Potential Carnaby's Cockatoo Foraging Habitat

The survey area has little to no foraging habitat for Carnaby's Cockatoo. The road edge consists mostly of weedy grasses, there is no midstorey (no shrub layer) and is adjacent to wheatfields and paddocks (see plates 1-9 above). Salmon Gum is recognised as a food item for Carnaby's Cockatoo, however, it is not a preferred item and as such would be considered low quality foraging habitat at best. No signs of forging were recorded.

Night Roosting Assessment

No evidence of roosting was recorded in the survey area during the assessment.

3.2 Potential Carnaby's Cockatoo Habitat Carot Well Road

While undertaking the assessment no Carnaby's Cockatoos were seen or heard flying in or adjacent to survey area.

Potential Carnaby's Cockatoo Breeding Habitat

During the Carnaby's Cockatoo habitat assessment 16 potential breeding trees were recorded in the survey area, the locations and details of which can be seen on Figure 3 and in Appendix 3. Of these 16 potential breeding trees, four were Salmon Gum, two were Red Gum (*Eucalyptus camaldulensis*) and 10 were a Eucalypt, but the species is not known. These unknown Eucalypts had been planted on the road side and were mostly likely a WA non endemic (Figure 3 and Appendix 3).

None of these 16 potential breeding trees had a hollow considered to have a large enough opening, at an appropriate height and in the main trunk (vertical hollow) to be considered a potential nesting tree when viewed from the ground.

Although 16 of the potential breeding trees had a DBH that measured ≥ 300 mm in the case of Salmon Gum, and a DBH that measured ≥ 500 mm for the other two Eucalypts, many of the main trunks of these trees split (into multiple trunks or branches) at a height of approximately between 1-5 m. These trees are unlikely to form hollows suitable for nesting in the near future and possibly some will never, despite them meeting the Black Cockatoo referral guidelines for potential breeding trees (Figure

3 and Appendix 3). Some examples of trees from the survey area that are unlikely to be suitable nesting trees in the future can be seen below (see Plates 10-12).

Plate 10. Salmon Gum (Tree 1). Main trunk splits into three main trunks or branches at approximately 1.2 m.

Plate 11. Red Gum (Tree 6). Main trunk divides into two main branches at about 3 m and then many branches (first tree on left)

Plate 12. *Eucalypt* sp. (Tree 7). Main trunk divides into multiple branches at about 4 m and then many branches.

Potential Carnaby's Cockatoo Foraging Habitat

The survey area has little to no foraging habitat for Carnaby's Cockatoo. The road edge consists mostly of weedy grasses, there is no midstorey (no shrub layer) and is adjacent to wheatfields and paddocks (see plates 10-12 above). Salmon Gum is recognised as a food item for Carnaby's Cockatoo, however, it is not a preferred item and as such would be considered low quality foraging habitat at best and there were only a few trees in the survey area. No signs of forging were recorded.

Night Roosting Assessment

No evidence of roosting was recorded in the survey area during the assessment.

4. Discussion

Carnaby's Cockatoo is endemic to south-west WA, and is distributed from the Murchison River to Esperance and inland to Coorow, Kellerberrin and Lake Cronin (Cale 2003). The species was once common, but the population has declined significantly in the last half century, and is now locally extinct in some areas (Johnstone & Storr 1998; Shah 2006). In the last 45 years (prior to Cale 2003) the species has suffered a 50% reduction in its abundance (Cale 2003). More recent information suggests this decline has continued. This reduction is due to the clearing of core breeding habitat in the wheatbelt, the deterioration of nesting hollows, and clearing of food resources on the Swan Coastal Plain (SCP) (Cale 2003). The total population of Carnaby's Cockatoo was estimated to be 40,000 in 2008 (Johnstone & Kirkby 2008). Since then, trend analyses of the seven Great Cocky Counts 2010 – 2017 identified strong indications that the population of Carnaby's -Cockatoo inhabiting the Perth-Peel Coastal Plain continues to decline.

Carnaby's Cockatoos feed on seeds, nuts and flowers of a variety of native and exotic plants. Food plants include a variety of Eucalyptus species, such as Marri, Jarrah, Swan River Blackbutt (*Eucalyptus patens*), Coastal Blackbutt (*Eucalyptus todtiana*), Caesia (*Eucalyptus caesia*) and Salmon Gum, as well as Pine trees (Pinus sp.), Grevillea, Allocasuarina, and Hakea species (Shah 2006). The seeds from a variety of Banksia species and the cones of Pine trees provide the highest energetic yield (Cooper et al. 2002).

Breeding has been recorded from early July to mid-December, and primarily occurs in the wheatbelt in the semi-arid and subhumid interior (Johnstone & Storr 1998). However, this species is currently expanding its breeding range westward and south into the Jarrah-Marri forests of the Darling Scarp (e.g., Wungong Dam Catchment) and into the Tuart forests of the SCP including Yanchep, Baldivis, Lake Clifton and near Bunbury (Johnstone et al. 2011).

Carnaby's Cockatoo display strong pair bonds and mate for life. They nest in hollows of smooth-barked eucalypts particularly Salmon Gum and Wandoo but nests have also been found in other Eucalypt species including York Gum (*Eucalyptus loxophleba*), Flooded Gum (*Eucalyptus rudis*), the rough-barked Marri and Tuart (Johnstone et.al 2011). They nest in large hollow bearing trees that most commonly have a vertical aspect, an entrance of about 270 mm, a depth of 1.2 m, and a floor diameter of approximately 400 mm (Saunders and Dawson 2018). In most nests in Tuart, eggs are laid on a mat of wood chips at the bottom of a large hollow (mostly top entry hollows) ranging from a few cm's to five m deep (Johnstone et al. 2011). Clutch size is 1–2 eggs, more typically two; only one young is reared (Saunders 1986). Incubation lasts for 29 days and only the female incubates and broods. The nestling is brooded by the female during which time both rely on food from the male. Once brooding is complete, the female then leaves the nest each day at dawn, sometimes returning mid-morning (with the male) to feed the chick (Johnstone et al. 2011). After approximately three weeks she ceases to brood and the chick is fed by one or both parents in the morning and in the late evening (Johnstone et al. 2011).

Approximately 87% (525,732 ha) of potential Carnaby's Cockatoo habitat (i.e., areas of vegetation that contain flora species and vegetation types that could support the species' breeding, feeding and night roosting activities) has been cleared in the wheatbelt since European settlement. The south-west region is now a severely fragmented landscape and the further loss of foraging habitat, the lack of suitable breeding sites, climate change, alterations in the landscape, changing forest structure with almost every part of the Jarrah-Marri forest logged in the past and with most trees too young to form hollows, and competition with exotic species, exacerbate the future conservation of Carnaby's Cockatoo (Johnstone et al. 2011).

Both Watheroo and Carot Well road have little to no foraging habitat, and what is present is of low quality (Salmon Gum trees). There is also potential breeding habitat present at both survey areas, however, many of those tress that meet the criteria for potential breeding trees have a growth form that is unlikely to produce hollows of a suitable size and at a suitable position in the tree for nesting i.e., high enough of the ground and in a main trunk (vertical hollow). No hollows of suitable size for nesting were recorded in any of the potential breeding trees during the assessment when viewed from the ground.

Carnaby's Cockatoos were seen and heard flying over the Watheroo Road during the survey, but none perched while the survey was being undertaken. No Carnaby's Cockatoos were seen or heard flying over the Carot Well Road survey area.

5. References

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Figures

Figure 1 - Project Location

0 1 2 km

GDA2020 - MGA Zone 50

Legend

Survey Area

Ref: 209_003_RevB.qgz

www.gispro.com.au

Figure 2 - Potential Breeding Trees Watheroo Road

0 100 200 m

GDA2020 - MGA Zone 50

Legend

Potential Breeding Tree

- Eucalyptus loxophleba
- Eucalyptus salmonophloia
- Eucalyptus wandoo

Survey Area

www.gispro.com.au

Ref: 209_001_RevA.qgz

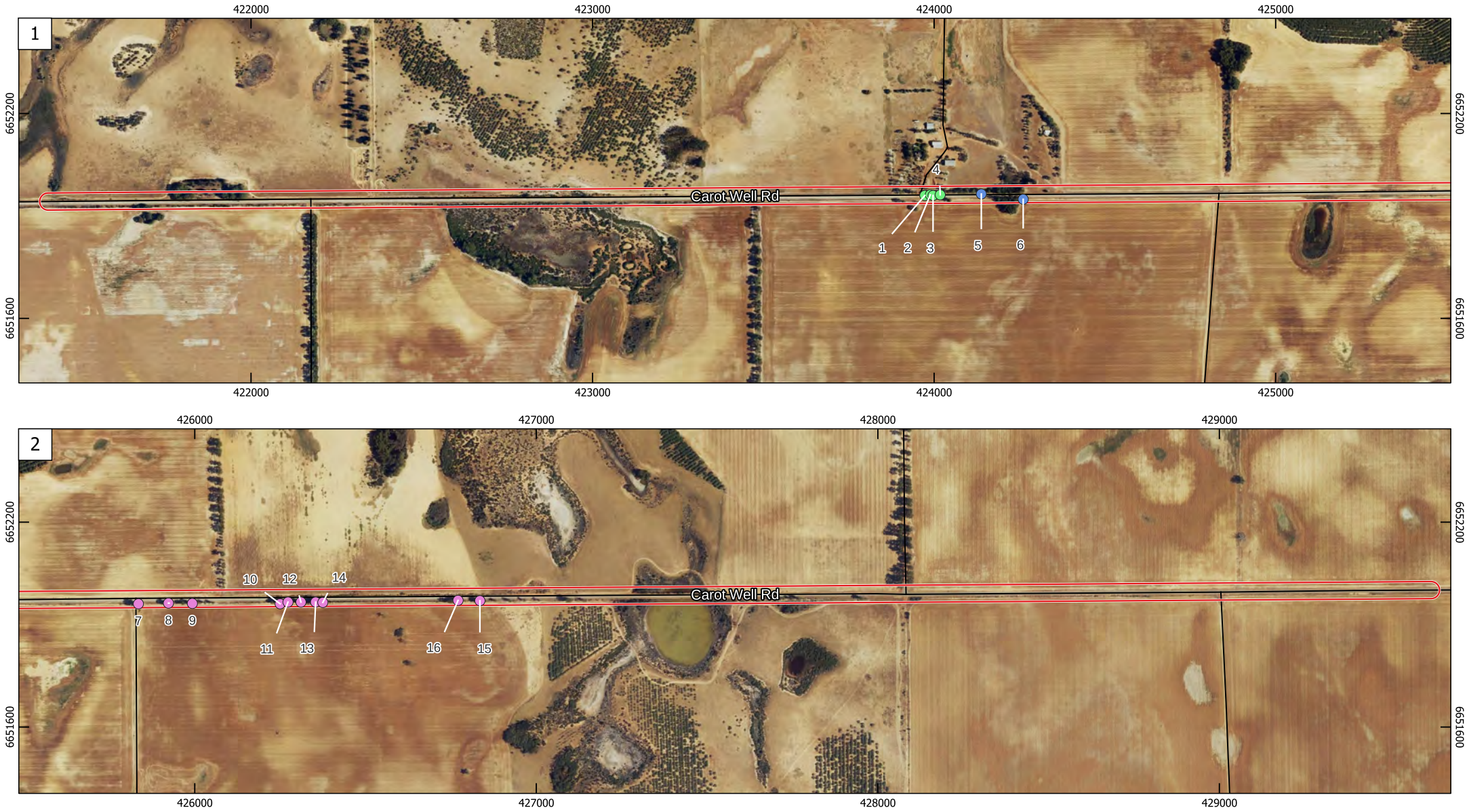


Figure 3 - Potential Breeding Trees Carot Well Road

0 100 200 300 m

GDA2020 - MGA Zone 50

Legend

Potential Breeding Tree

- Eucalyptus camaldulensis
- Eucalyptus salmonophloia
- Eucalyptus sp.

Survey Area

Ref: 209_002_RevA.qgz

www.gispro.com.au

Appendix 1: Conservation Categories

Categories of Threatened Fauna Species under the EPBC Act

Conservation Code	Description
Ex	Extinct Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.
ExW	Extinct in the Wild Taxa which are known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	Critically Endangered Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
En	Endangered Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Vu	Vulnerable Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Source: Environment Protection and Biodiversity Conservation Act 1999.

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

CONSERVATION CODES

For Western Australian Flora and Fauna

Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016.*

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

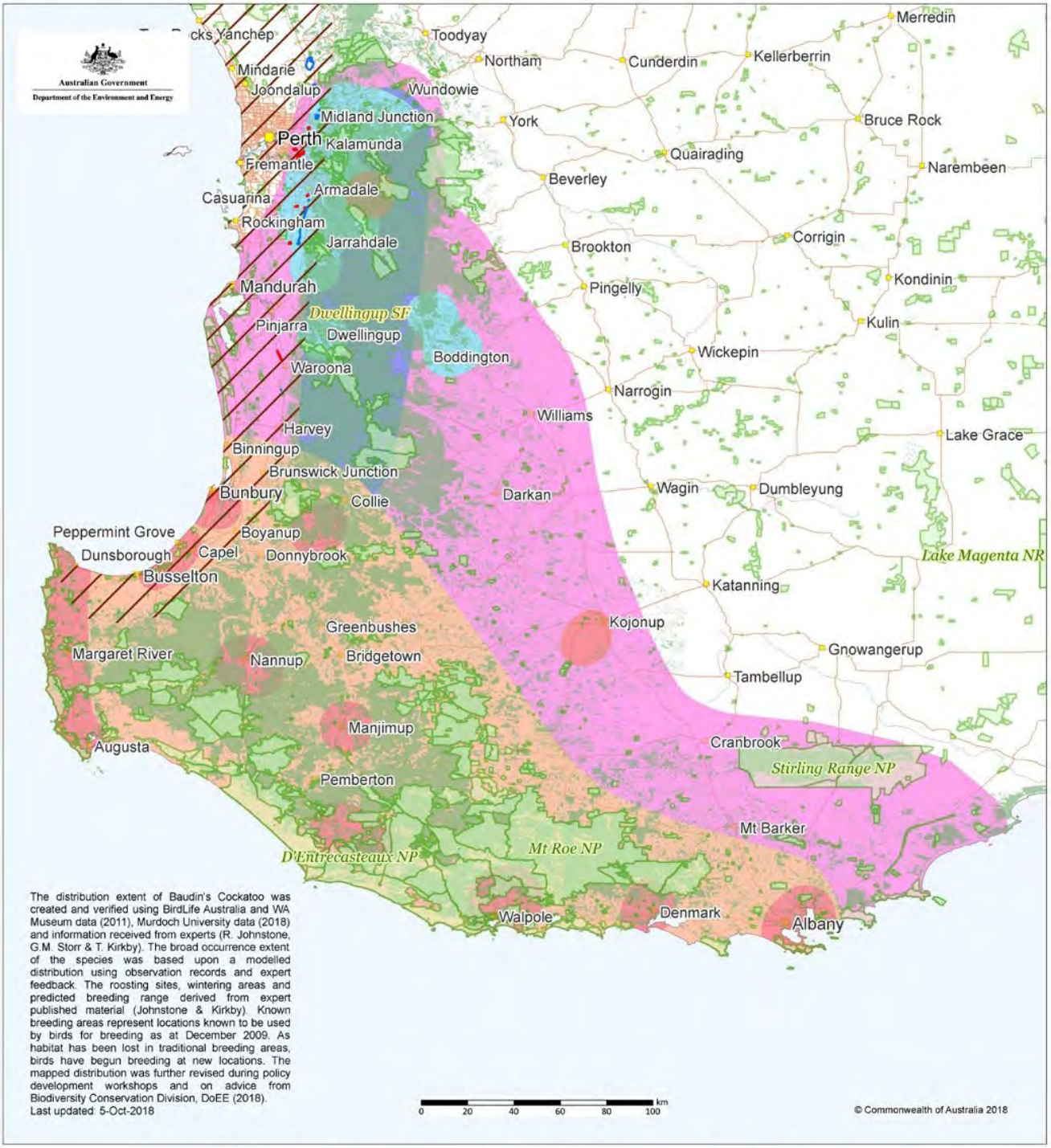
4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

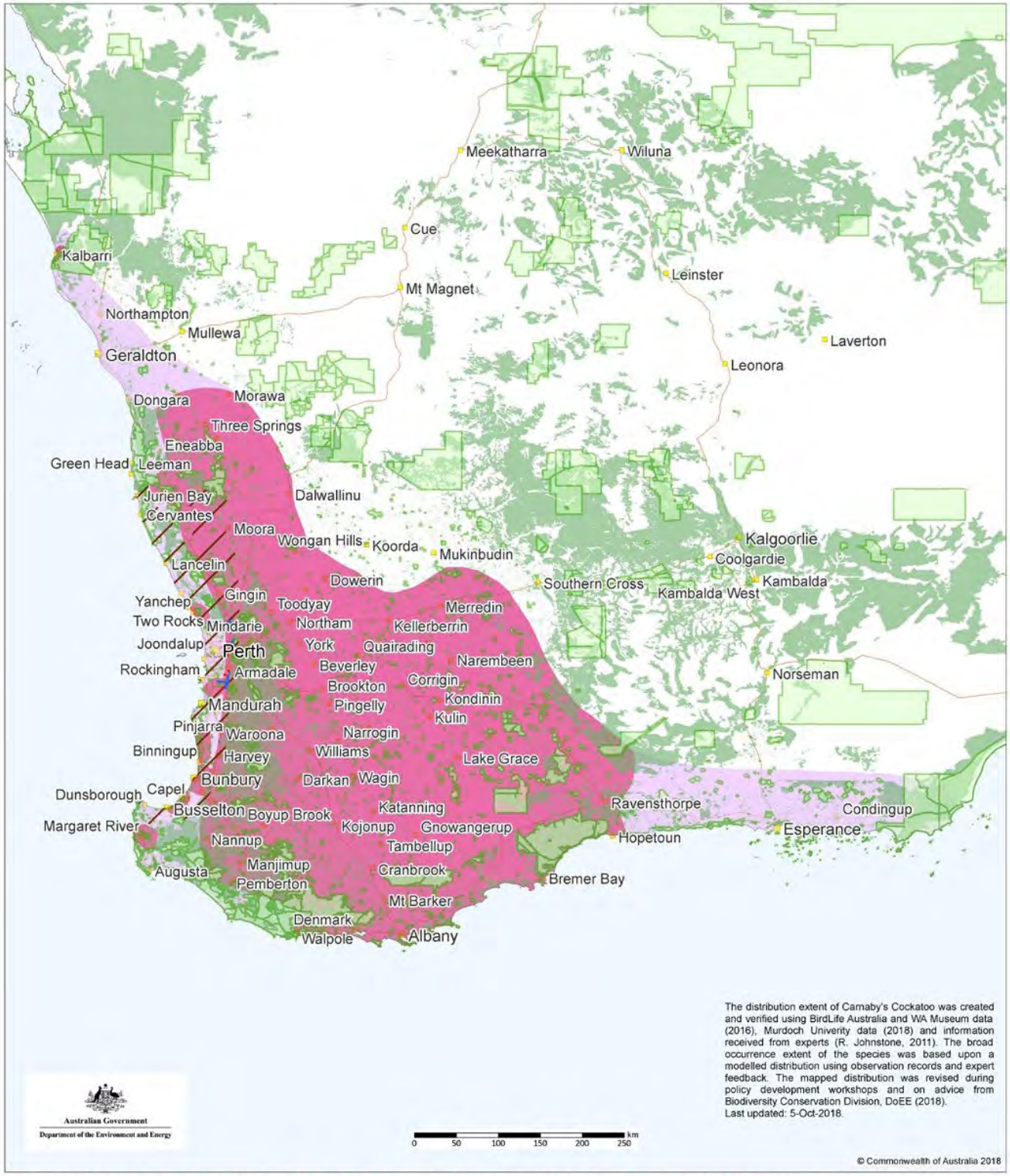
[1] The definition of flora includes algae, fungi and lichens
[2]Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Appendix 2: Black Cockatoo Distribution Maps

Map 2 Modelled distribution for Baudin's Cockatoo (*Zanda baudinii*)



Map 3 Modelled distribution for Carnaby's Cockatoo (*Zanda latirostris*)



INDICATIVE MAP ONLY: For the latest departmental information, please refer to the Protected Matters Search Tool and the Species Profiles & Threats Database at http://www.environment.gov.au/biodiversity/threatened/index.html

Produced by:
Environmental Resources Information Network 2018

Contextual data source:
National Vegetation Information System (NVIS 5.1) 2018
Interim Biogeographic Regionalisation for Australia (IBRA) version 7 2012
Collaborative Australian Protected Area Database (CAPAD) 2016
Geoscience Australia GEODATA TOPO 250K Topographic Data Series 3 2006

Projection: Geographic
Datum: GDA94

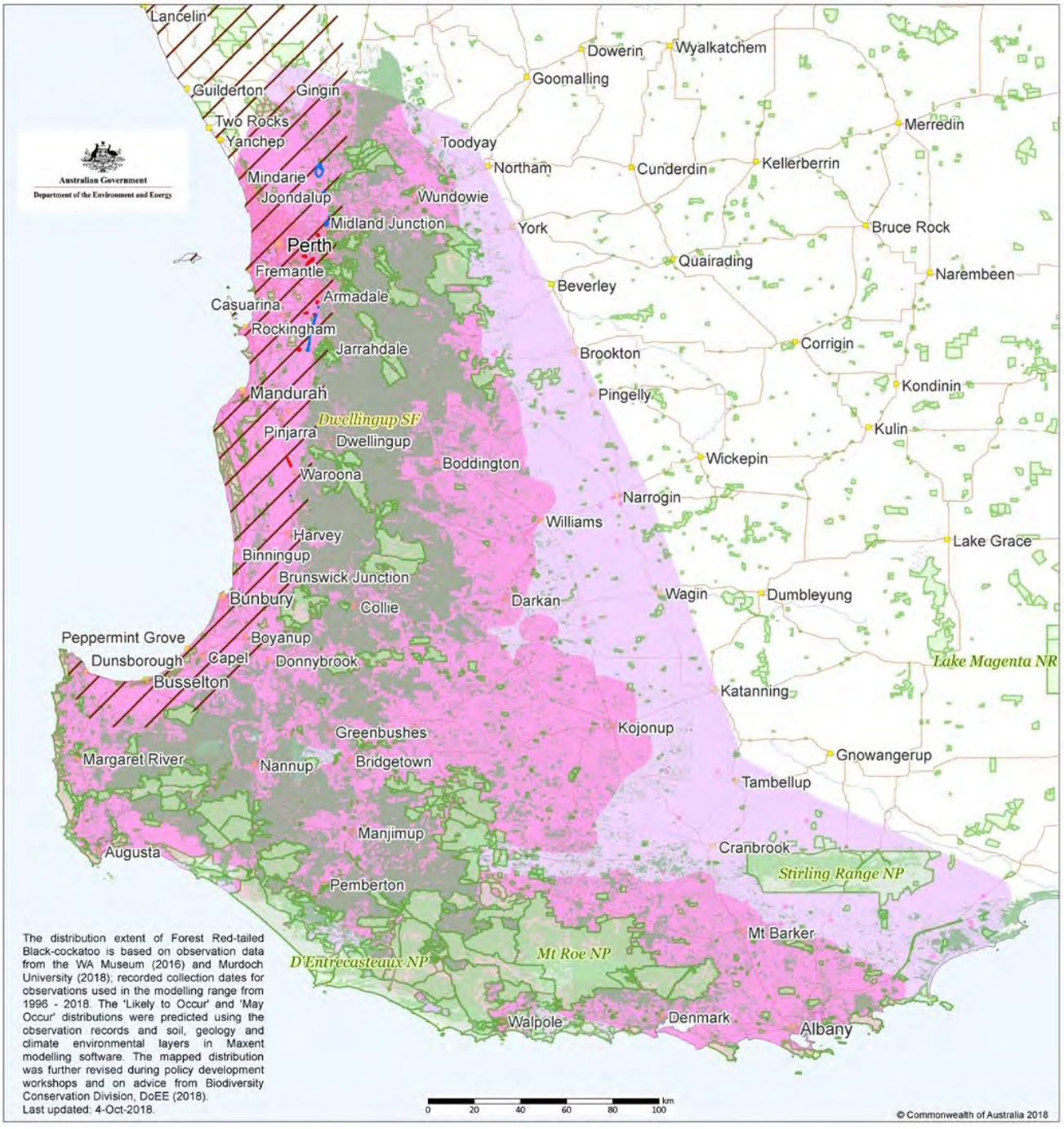
Conservation Areas
Jarrah, Karri, Marri, Salmon Gum, Wandoo, Banksia, Grevillea, Dryandra and Hakea

Species
Breeding Range
Non-breeding Range

Ecological Communites
Corymbia calophylla - Xanthorrhea preissii woodlands and shrublands of the Swan Coastal Plain
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain
Banksia Woodlands of the Swan Coastal Plain

Cities & Towns
Roads (sealed)
Roads (unsealed)
State Border

Map 4 Modelled distribution for Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)



The distribution extent of Forest Red-tailed Black-cockatoo is based on observation data from the WA Museum (2016) and Murdoch University (2018); recorded collection dates for observations used in the modelling range from 1996 - 2018. The 'Likely to Occur' and 'May Occur' distributions were predicted using the observation records and soil, geology and climate environmental layers in Maxent modelling software. The mapped distribution was further revised during policy development workshops and on advice from Biodiversity Conservation Division, DoEE (2018).
Last updated: 4-Oct-2018.

INDICATIVE MAP ONLY: For the latest departmental information, please refer to the Protected Matters Search Tool and the Species Profiles & Threats Database at http://www.environment.gov.au/biodiversity/threatened/index.html

Produced by:
Environmental Resources Information Network 2018

Contextual data source:
National Vegetation Information System (NVIS 5.1) 2018
Interim Biogeographic Regionalisation for Australia (IBRA) version 7 2012
Collaborative Australian Protected Area Database (CAPAD) 2016
Geoscience Australia GEODATA TOPO 250K Topographic Data Series 3 2006

Projection: Geographic
Datum: GDA94

Conservation Areas
Jarrah, Karri and Marri

Species
Likely to Occur
May Occur

Ecological Communities
Corymbia calophylla - Xanthorrhea preissii woodlands and shrublands of the Swan Coastal Plain
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain
Banksia Woodlands of the Swan Coastal Plain

Cities & Towns
Roads (sealed)
Roads (unsealed)
State Border
Major Rivers
Lakes/Reservoirs
Non-perennial Lakes

Appendix 3: Potential Nesting Tree Data

Watheroo Road Potential Nesting Tree Data				
Species	Tree Number	DBH (mm)	Easting	Northing
Eucalyptus wandoo	1	500	0408069	6646067
Eucalyptus wandoo	2	390	0408232	6646067
Eucalyptus salmonophloia	3	470	0408247	6646066
Eucalyptus salmonophloia	4	370	0408265	6646067
Eucalyptus salmonophloia	5	500	0408298	6646063
Eucalyptus salmonophloia	6	630	0408299	6646069
Eucalyptus salmonophloia	7	500	0408306	6646070
Eucalyptus wandoo	8	820	0408324	6646068
Eucalyptus salmonophloia	9	460	0408340	6646068
Eucalyptus salmonophloia	10	730	0408379	6646069
Eucalyptus salmonophloia	11	780	0408391	6646082
Eucalyptus salmonophloia	12	360	0408390	6646083
Eucalyptus loxophleba	13	560	0408360	6646080
Eucalyptus salmonophloia	14	620	0408298	6646082
Eucalyptus loxophleba	15	600	0408436	6646060
Eucalyptus loxophleba	16	570	0408541	6646066
Eucalyptus salmonophloia	17	570	0408591	6646069
Eucalyptus wandoo	18	580	0408681	6646086
Eucalyptus salmonophloia	19	510	0408767	6646074
Eucalyptus salmonophloia	20	460	0408800	6646075
Eucalyptus loxophleba	21	570	0408747	6646085
Eucalyptus salmonophloia	22	500	0408890	6646073
Eucalyptus salmonophloia	23	650	0408907	6646073
Eucalyptus salmonophloia	24	490	0408918	6646074
Eucalyptus salmonophloia	25	460	0408923	6646073
Eucalyptus salmonophloia	26	420	0408938	6646074
Eucalyptus salmonophloia	27	470	0408953	6646074
Eucalyptus salmonophloia	28	380	0409012	6646073
Eucalyptus salmonophloia	29	770	0408878	6646082

Carot Well Road Potential Nesting Tree Data				
Species	Tree Number	DBH (mm)	Easting	Northing
Eucalyptus salmonophloia	1	470	423973	6651960
Eucalyptus salmonophloia	2	550	423989	6651962
Eucalyptus salmonophloia	3	680	423997	6651960
Eucalyptus salmonophloia	4	680	424018	6651962
Eucalyptus camaldulensis	5	860	424191	6654947
Eucalyptus camaldulensis	6	600	424261	6651949
Eucalyptus sp.	7	≥1000	425835	6651961
Eucalyptus sp.	8	≥1000	425923	6651963
Eucalyptus sp.	9	≥1000	425993	6651962
Eucalyptus sp.	10	≥1000	426250	6651961
Eucalyptus sp.	11	≥1000	426273	6651966
Eucalyptus sp.	12	≥1000	426311	6651966
Eucalyptus sp.	13	≥1000	426354	6651966
Eucalyptus sp.	14	≥1000	426375	6651965
Eucalyptus sp.	15	≥1000	426835	6651970
Eucalyptus sp.	16	≥1000	426771	6651971