Shire of Dandaragan: North West Road – SLK 26.08 to 27.78; Vegetation and Flora and Carnaby's Black Cockatoo Habitat Reconnaissance Survey, June 2019

Version 1

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SUMMARY

The Shire of Dandaragan (the Shire) proposes to upgrade and widen a section of North West Road from straight line kilometre (SLK) 26.08 to SLK 27.78 southeast of Badgingarra, Western Australia (WA).

Maia Environmental Consultancy Pty Ltd (Maia) and Western Wildlife were engaged to carry out a reconnaissance survey and Carnaby's Black Cockatoo habitat assessment in the road reserve along this stretch of road (the Survey Area). The Shire plans to widen the bitumen on the northern side of the road by 1 m and works may also include drainage culverts as required.

One threatened flora species protected by federal and WA law has been located within 2.5 km of the Survey Area previously – *Eucalyptus absita* (Endangered *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Critically Endangered *Biodiversity Conservation Act 2016* (BC Act)). Three confirmed priority flora species have been located previously within 2.5 km of the Survey Area: *Allocasuarina grevilleoides*, *Allocasuarina ramosissima* (both Priority (P) 3) and *Grevillea saccata* (P4).

One threatened fauna species protected by the EPBC Act and BC Act has been located within 10 km of the Survey Area - *Calyptorhynchus latirostris* (Carnaby's Black-cockatoo (CBC)) (Endangered under the EPBC Act and the BC Act). No Specially Protected Fauna species have been located previously within 10 km of the Survey Area and neither have any priority fauna species.

No threatened ecological communities (TEC) protected by federal or state law occur in or close to the Survey Area and the Survey Area does not occur within the boundaries of a currently known priority ecological community (PEC).

One pre-European vegetation system association occurs in the Survey Area - 999.2. The remaining extent in the Swan Coastal Plain bioregion is 9.35% in the Dandaragan Plateau subregion 9.36% and in the Shire of Dandaragan 9.35%.

The Survey Area lies in a Schedule 1 area – the Swan Coastal Plain.

The reconnaissance survey was carried out by two botanists on June 16 2019. Conservation significant flora species previously recorded in the surrounding area, those thought possible to occur in the area, and any other uncommon species were targeted. The vegetation was assessed at relevés and notes were made on the vegetation types and their condition. In addition to the flora and vegetation reconnaissance survey the diameter at breast height (DBH) of any *Eucalyptus* or *Corymbia* species suitable as Carnaby's Black Cockatoo breeding habitat were measured. A photograph was taken of each tree measured and notes were made on whether any hollows could be seen. Nuts under Marri trees were examined for evidence of cockatoo foraging and a selection were photographed. The tree data and photographs were assessed by Western Wildlife.

Fifty-eight (58) taxa were collected from the Survey Area (from 39 families and 45 genera). Annual species comprised 19% of the taxa recorded and perennial species 81%; 47% of the taxa were fertile when the survey was carried out.

- No threatened flora species protected by federal or WA law was located in the Survey Area.
- One priority flora species was recorded in the Survey Area: *Banksia dallanneyi* subsp. *pollosta* (P3). Two plants were recorded in one area.
- No weed species listed on any of the national weeds lists or listed as a declared pest in WA was located in the Survey Area.
- Thirteen environmental weed species were recorded in the Survey Area (*Brassica tournefortii*, Prickly Turnip; *Briza maxima*, Blowfly Grass; *Cucumis myriocarpus* subsp. *myriocarpus*; *Ehrharta calycina*, Perennial Veldt Grass; *Eragrostis cilianensis*, Stinkgrass; *Eragrostis curvula*, African Love Grass; *Eragrostis tenuifolia*; *Euphorbia maculata*; *Medicago* sp.; *Pentameris airoides* subsp. *airoides*, False Hairgrass; *Plantago bellardii*; *Romulea rosea*, Guildford Grass and *Ursinia anthemoides*, Ursinia).

Three vegetation types were recorded from the Survey Area – *Corymbia calophylla* Closed Tall Forest, *Acacia microbotrya* Open Tall Forest to Low Woodland and Open Tall Shrubland of *Jacksonia sternbergiana*. The Open Tall Shrubland of *Jacksonia sternbergiana* is similar to the description for the *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region ecological community, listed as a Priority 3(iii) priority ecological community (PEC) in Western Australia and as an Endangered threatened ecological community (TEC) under the EPBC Act. However, there were only two *Banksia prionotes* trees and the dominant layer was the *Jacksonia sternbergiana* shrubland. This was a small patch of vegetation at the eastern-most end of the Survey Area and it appears to be an area of transition in the vegetation. The remaining two vegetation types are not similar to any TEC or PEC listed for the Swan Coastal Plain.

The faunal assemblage is likely to consist mainly of common, generalist species that are capable of persisting in disturbed habitats. Few terrestrial species are likely to occur where the understorey vegetation is absent. However, the canopy of Marri (*Corymbia calophylla*), other trees and scattered shrubs are likely to support some native fauna, mainly birds. As birds are mobile, they are able to take advantage of nectar and seed resources even in fragmented landscapes. Small hollows, even in isolated trees, may be used by birds for breeding, or shelter by arboreal reptiles and insectivorous bats.

The key conservation significant fauna species in the Survey Area is Carnaby's Black-Cockatoo. CBC was not seen or heard in the Survey Area, however, this species has been recorded within 10 km, and the Survey Area falls within the known breeding range of the species. Evidence of foraging CBC (chewed Marri nuts) was present in the Survey Area. All Marri and Banksia treees in the Survey Area are likely to support foraging CBC. The Marri woodlands are potential CBC breeding habitat and 31 live Marri trees with a DBH≥ 500 mm were identified during the survey, although none appeared to contain hollows of a suitable size to currently support CBC breeding. The Survey Area is close to but not within 12 km of a confirmed breeding site and, as several confirmed breeding sites are known from the surrounding area, it is likely that foraging habitat in the Survey Area is used by breeding birds. Foraging habitat in close proximity to breeding habitat is critical for breeding success. No roosting habitat areas are known to occur in the Survey Area and as the Survey Area lacks tall trees in association with riparian habitats, it is unlikely that it supports roosting.

None of the trees will be cleared but some overhanging branches will be pruned to maintain driver safety.

The two *Banksia dallanneyi* subsp. *pollosta* (P3) plants located in the Survey Area are located on the southern side of the road and will not be impacted.

Clearing will be limited to the northern side of the road and within the existing maintenance areas (either cleared areas or disturbed vegetation between the edge of the bitumen and intact vegetation) and includes six overhanging *Jacksonia sternbergiana* shrubs. The total area of clearing will not exceed 0.34 ha which represents 10.03% of the Survey Area. As this roadside vegetation is not included as remnant vegetation in the native vegetation extent layer used to calculate the percentage of remaining remnant vegetation in WA, the current extent of the pre-European vegetation system association 999.2 will not change as a result of this clearing.

Weed cover and diversity is high along the road edge and in the road reserve and the Shire should adopt good weed management practices when carrying out the proposed works to prevent the spread of weeds from a very weedy area and the introduction of even more weed species to the area.

Vegetation classified as moderately susceptible to *Phytophthora cinnamomi* occurs in areas adjacent to the road reserve but not within it. No positive *Phytophthora* species points have been located in the area.

Shire of Dandaragan: North West Road – SLK 26.08 to 27.78; Vegetation and Flora and Carnaby's Black Cockatoo Habitat Reconnaissance Survey, June 2019

Draft 2

1. INTRODUCTION

The Shire of Dandaragan (the Shire) is proposing to widen a section of North West Road from straight line kilometre (SLK) 26.08 to SLK 27.78 southeast of Badgingarra, Western Australia (WA). The Shire plans to widen the bitumen on the northern side of the road by 1 m and the works may include the construction of drainage culverts where required.

Maia Environmental Consultancy Pty Ltd (Maia) was engaged to carry out a flora and vegetation reconnaissance survey and Carnaby's Black Cockatoo tree and habitat survey within the road reserve along this stretch of road. The road reserve is referred to as the Survey Area in this report (**Map 1 and 2, Section 8**).

This report includes background information relevant to a native vegetation clearing permit (NVCP) application, the survey methods, the survey results and a table addressing the 10 clearing principles for the NVCP application.

2. BACKGROUND INFORMATION

2.1 Conservation Significant Flora

Searches using the EPBC Act Protected Matters Search Tool (PMST) (Department of the Environment and Energy (DotEE), 2019a) and NatureMap (DBCA, 2007-) were carried out to gather information on conservation significant flora (CSF) species that could potentially occur in the Survey Area. A 2.5 km buffered line search was carried out using the following coordinates - 30° 28' 34" S, 115° 42' 51" E; 30° 28' 27" S, 115° 42' 18" E; 30° 28' 21" S, 115° 41' 45" E; 30° 28' 14" S, 115° 41' 11" E; 30° 28' 05" S, 115° 40' 29" E; 30° 28' 05" S, 115° 39' 30" E; 30° 28' 07" S, 115° 39' 24" E; 30° 28' 03" S, 115° 38' 54" E. The literature was searched for any reports on flora and vegetation surveys carried out in or close to the Shire previously.

Threatened Flora

Some flora species can be protected by Australian Government legislation (*Environment Protection and Biodiversity Conservation Act 1999*, EPBC Act) or by WA legislation (*Biodiversity Conservation Act 2016*, BC Act) (DotEE, 2019b; Government of Western Australia (GoWA), 2016). Species specially protected by these acts are referred to as threatened species and can be listed as critically endangered, endangered or vulnerable.

On 1 January 2019, the BC Act and *Biodiversity Conservation Regulations 2018* replaced both the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929* and their associated regulations (Department of Biodiversity, Conservation and Attractions (DBCA), 2019a; GoWA, 2016 and 2018). The new BC Act and regulations provide greater protection for threatened species and ecological communities.

The EPBC Act PMST search results listed 17 species for which the species or species habitat may (14 species), is likely to (two species) or is known to (one species) occur in the 2.5 km buffered search area. *Eucalyptus absita* (Endangered) is known from the search area while *Conospermum densiflorum* subsp. *unicephalatum* and *Eucalyptus dolorosa* were listed as likely to occur (both Endangered species). The species or its habitat may occur in the Survey Area for the remaining species: *Banksia serratuloides* subsp. *perissa* (Critically Endangered), *Acacia cochlocarpa* subsp. *cochlocarpa*, *Andersonia gracilis*, *Chamelaucium* sp. Gingin (N.G. Marchant 6), *Daviesia dielsii*, *Eucalyptus impensa*, *Eucalyptus leprophloia*, *Grevillea christineae*, *Hemiandra gardneri*, *Leucopogon obtectus*,

Spirogardnera rubescens, *Thelymitra dedmaniarum* and *Thelymitra stellata* (all Endangered) and *Eucalyptus crispata* (Vulnerable) (DotEE, 2019a; search reference PMST 2T8340; **Appendix 1**).

One threatened flora species protected by these acts has been located within 2.5 km of North West Road – *Eucalyptus absita* (Endangered EPBC Act, Critically Endangered BC Act) (DBCA, 2007-; **Appendix 1**).

All but two of the threatened species listed in the search results are woody perennial species and if they occurred in the Survey Area they could be found. While *Thelymitra dedmaniarum* and *Thelymitra stellata* are listed in the search results none of the records for the species occur within 2.5 km of the Survey Area and none are in pre-European vegetation system association 999.2 that occurs in and around the Survey Area (DBCA, 2007-). The closest *Thelymitra dedmaniarum* NatureMap record is approximately 65 km southeast of the Survey Area and only 3 of 83 *Thelymitra stellata* records shown on NatureMap are in or close to the boundary of the Dandaragan Plateau subregion (the closest record is approximately 16 km to the southwest of the Survey Area) (DBCA, 2007-). In addition to this none of the 20 FloraBase *Thelymitra stellata* records occur in the Survey Area section of the Swan Coastal Plain bioregion and none of the four *Thelymitra dedmaniarum* FloraBase records (WAH, 1998-). Based on this information it is unlikely that these two species would occur in the Survey Area.

Priority Flora

Possible threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Flora List under Priorities (P) 1, 2, 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 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 list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring (DBCA, 2019b).

Three confirmed priority (P) flora species have been located within 2.5 km of North West Road: *Allocasuarina grevilleoides*, *Allocasuarina ramosissima* (both P3) and *Grevillea saccata* (P4) (**Appendix 1**; DBCA, 2007-).

2.2 Conservation Significant Fauna

The following databases were used to gather background information on conservation significant fauna (CSFa) species that could potentially occur in the Survey Area - EPBC Act Protected Matters Search Tool (DotEE, 2019a) and NatureMap (DBCA, 2007-). A 10 km buffer line search was used with the following coordinates - 30° 28' 34" S, 115° 42' 51" E; 30° 28' 27" S, 115° 42' 18" E; 30° 28' 21" S, 115° 41' 45" E; 30° 28' 14" S, 115° 41' 11" E; 30° 28' 05" S, 115° 40' 29" E; 30° 28' 05" S, 115° 39' 30" E; 30° 28' 07" S, 115° 39' 24" E; 30° 28' 03" S, 115° 38' 54" E.

Threatened Fauna

Threatened Fauna are those listed as such under the EPBC Act or BC Act, and can be listed as critically endangered, endangered or vulnerable.

Six threatened fauna species protected by the EPBC Act were listed in the PMST search results: *Calidris ferruginea* (Curlew Sandpiper), *Numensis madagascariensis* (Eastern Curlew) (both Critically Endangered), *Calyptorhynchus latirostris* (Carnaby's Black-cockatoo), *Parantechinus apicalis* (Dibbler) (both Endangered), *Dasyurus geoffroii* (Western Quoll/Chuditch) and *Leipoa ocellata* (Malleefowl) (both Vulnerable) (DotEE, 2019a; search reference PMST AYQSPI, **Appendix 1**).

One Threatened Fauna species protected by these acts has previously been located within 10 km of North West Road – *Calyptorhynchus latirostris* (Carnaby's Black-cockatoo (CBC)) (DBCA, 2007-; **Appendix 1**).

The northern extent of one confirmed breeding area for CBC is close to the western section of the Survey Area (**Map 3, Section 8**) (DBCA, 2018a).

Patches of native vegetation adjacent to, but not in, the Survey Area are identified as requiring investigation for feeding habitat (**Map 3, Section 8**) (DBCA, 2018b).

Migratory Fauna

Migratory Fauna are those listed as such under the EPBC Act or the BC Act.

Eight Migratory fauna species protected by the EPBC Act and BC Act were recorded in the PMST search – *Apus pacificus* (Fork-tailed Swift), *Motacilla cinerea* (Grey Wagtail), *Actitis hypoleucos* (Common Sandpiper), *Calidris acuminata* (Sharp-tailed Sandpiper), *Calidris melanotos* (Pectoral Sandpiper), *Pandion haliaetus* (Osprey), *Calidris ferruginea* (Curlew Sandpiper) and *Numensis madagascariensis* (Eastern Curlew). The Curlew Sandpiper and Eastern Curlew are both also listed as Threatened (Critically Endangered). (DotEE, 2019a; search reference PMST AYQSPI, **Appendix 1**)

Specially Protected Fauna

Specially Protected Fauna are those listed as such under the BC Act and may be either 'other specially protected fauna (OS) or conservation dependent fauna (CD).

No Specially Protected Fauna species have been located previously within 10 km of North West Road (DBCA, 2007 ; **Appendix 1**).

Priority Fauna

Possible threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna List under Priorities (P) 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. 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 list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring (DBCA, 2019b).

No Priority Fauna species have been located previously within 10 km of North West Road (DBCA, 2007-; **Appendix 1**).

2.3 Ecological Communities

The following databases were used to gather information on significant ecological communities that could potentially occur in the Survey Area - EPBC Act Protected Matters Search Tool (DotEE, 2019a), DBCA Threatened Ecological Communities (ESRI SLIP public services layer – DBCA, 2017a) and NatureMap (DBCA, 2007-). A 10 km buffer line search was used with the following coordinates - 30° 28' 34" S, 115° 42' 51" E; 30° 28' 27" S, 115° 42' 18" E; 30° 28' 21" S, 115° 41' 45" E; 30° 28' 14" S, 115° 41' 11" E; 30° 28' 05" S, 115° 40' 29" E; 30° 28' 05" S, 115° 39' 30" E; 30° 28' 07" S, 115° 39' 24" E; 30° 28' 03" S, 115° 38' 54" E.

Threatened Ecological Communities

Some ecological communities are protected by Australian Government legislation (the EPBC Act) based on the perceived levels of threat to the community or species population at a national level. They are listed as threatened ecological communities – TECs – and can be listed as Critically Endangered, Endangered or Vulnerable (DotEE, 2019c). The communities are listed by state on the DotEE website (DotEE, 2019d).

Fifteen TECs protected by the EPBC Act occur in the SCP bioregion. One TEC was listed in the PMST search area as 'may occur within the area' – 'Banksia Woodlands of the Swan Coastal Plain ecological community' (Endangered) (DotEE, 2019a). However; none of these TECs are currently known to occur in the Survey Area (DBCA, 2017a).

In WA the Minister for Environment previously listed ecological communities as threatened through a non-statutory process if the community was presumed to be totally destroyed or at risk of becoming totally destroyed. The BC Act provides for the statutory listing of TECs by the Minister. The new legislation also describes statutory processes for preparing recovery plans for TECs, the registration of their critical habitat, and penalties for unauthorised modification of TECs. These TECs are listed as presumed totally destroyed, critically endangered, endangered or vulnerable (DBCA, 2019c).

The most recent WA TEC list is correct to June 28, 2018 (DBCA, 2018c) and includes 23 TECs listed for the SCP bioregion.

The Survey Area (approximate location shown in red on **Figure 1**) does not occur within any current boundaries for a known WA listed TEC (Australian Government, 2019b). The closest buffer for a TEC is approximately 5 km northeast of the eastern end of the Survey Area (Australian Government, 2019c). This is for the Banksia Woodlands of the Swan Coastal Plain ecological community that is listed as a TEC federally but listed as a PEC in Western Australia.

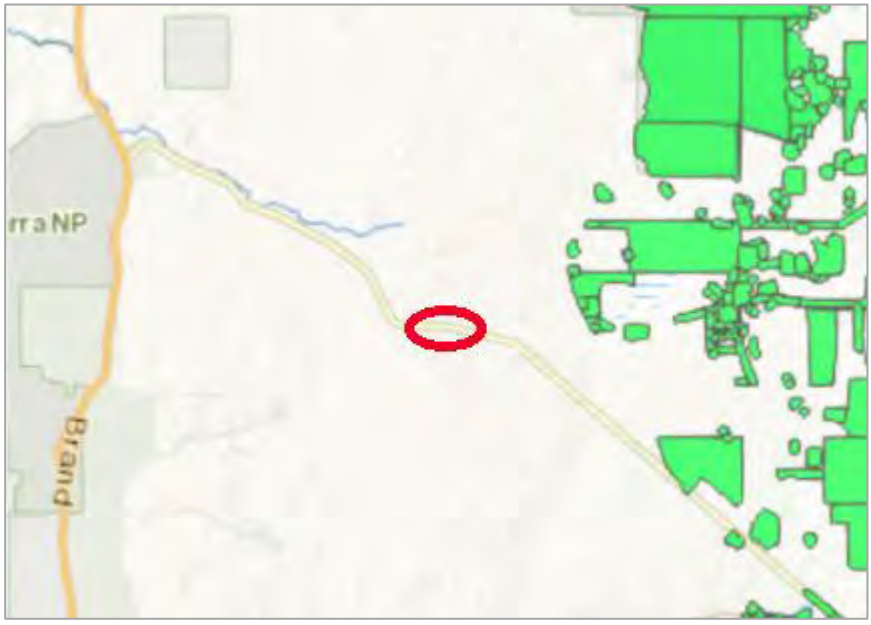


Figure 1: Current TEC boundaries and the Survey Area (red oval) (Australian Government, 2019b)

Priority Ecological Communities

Ecological communities with insufficient information available to be considered a TEC, or which are rare but not currently threatened are placed on a priority list and are referred to as priority ecological communities (PECs; DBCA, 2019a). Definitions, categories and criteria for threatened and priority ecological communities can be found on the DBCA's website (Department of Environment and Conservation (DEC), 2013).

The most recent PEC list is dated January 17, 2019 (DBCA, 2019d) and includes 109 PECs listed in the Midwest region.

The Survey Area does not occur within the boundaries of a currently known PEC (DBCA, 2017a).

The closest PEC to the survey areas is 'Lesueur Coomallo Floristic Community DFGH' P1 PEC. The Survey Area lies approximately 49 km southeast of the indicative boundary for this PEC (Australian Government, 2019b).

2.4 Bioregion, Subregion, Geology, Soils and Pre-European Vegetation

The Survey Area lies in the Swan Coastal Plain (SCP) bioregion and the Dandaragan Plateau subregion (DotEE, 2012) (**Map 4A, Section 8**).

The Survey Area lies in geology units Czl (pisolitic, nodular or vuggy ferruginous laterite; some lateritic soils; ferricrete; magnesite; ferruginous and siliceous duricrusts and reworked products, calcrete, kaolinised rock, gossan; residual ferruginous saprolite) and Czs (sand or gravel plains; quartz sand sheets commonly with ferruginous pisoliths or pebbles, minor clay; local calcrete, laterite, silcrete, silt, clay, alluvium, colluvium, aeolian sand) (Stewart *et al.*, 2008) ((**Map 4B, Section 8**).

The Survey Area lies in Soil Landscape Mapping units 222Da_1d (plateau remnant, plain some hillcrests; shallow red to brown sands over gravel and duricrust, red sandy gravels) and 222Da_3 (colluvial slopes, very gently to gently inclined hillslopes; red to brown and yellow deep sands, some sandy gravels and sandy earths) (Department of Agriculture and Food Western Australia (DAFWA), 2014) (**Map 4C, Section 8**).

The Environmental Protection Authority's (EPA) broad principles for the protection of native terrestrial vegetation and flora indicate that biodiversity should be maintained at sustainable levels. This generally means that ecological communities should be retained at an overall level of at least 30% of the original extent of the ecological community in each region (EPA, 2000). This level is the threshold level below which species loss appears to accelerate exponentially at an ecosystem level. A level of 10% of the original extent is regarded as being a level representing "endangered" (EPA, 2000).

The Survey Area falls in one of the pre-European vegetation associations mapped in the Swan Coastal Plain – vegetation association 999 and system association 999.2 (Department of Primary Industries and Rural Development (DPIRD), 2018; **Map 4D, Section 8**). The pre-European extent of the system association in the Swan Coastal Plain bioregion, the Dandaragan Plateau subregion and the Shire of Dandaragan, the current extent, the percentage remaining and the current extent protected for conservation in the bioregion, subregion and Shire are listed in **Table 1**.

Currently, less than 10% of vegetation system association 999.2 remains and less than 1% of its remaining extent is protected for conservation (GoWA, 2019).

Table 1: Beard's vegetation system association– past and current extent and reservation status

Vegetation System Association (VSA)	System	Structure: Broad Description	
999.2	Dandaragan	Medium woodland; marri	
Pre-European Extent (ha) of VSA in:	Current Extent (ha) of VSA in:	Remaining (%) of VSA in:	Current Extent of VSA Protected (IUCN 1-4) for Conservation (proportion of pre-European extent) (%) in:
Swan Coastal Plain bioregion Dandaragan Plateau subregion Shire of Dandaragan	Swan Coastal Plain bioregion Dandaragan Plateau subregion Shire of Dandaragan	Swan Coastal Plain bioregion Dandaragan Plateau subregion Shire of Dandaragan	Swan Coastal Plain bioregion Dandaragan Plateau subregion Shire of Dandaragan
90,704 90,609 90,841	8,480 8,477 8,495	9.35 9.36 9.35	0.11 0.11 0.11

Source: GoWA, 2019. Note: extents (ha) have been rounded down to nearest whole number.

2.5 Water Courses and Wetlands

Watercourses or wetlands in the vicinity of the survey areas are shown on **Map 5, Section 8**.

No known watercourses and wetlands cross the Survey Area (Lakes, Watercourse Lines and Waterholes (Geoscience Australia, 2006); Geomorphic Wetlands – Cervantes Eneabba (DBCA, 2017b), Geomorphic Wetlands - Cervantes South (DBCA, 2015) and Wheatbelt Wetlands Stage 1 (DBCA, 2017c).

None of the Survey Area occurs within a Directory of Important Wetlands in Australia (DIWA) wetland (DBCA, 2018d). The closest is approximately 35 km south-west of the western end of the Survey Area (**Map 5, Section 8**).

None of the Survey Area occurs within a Ramsar Site (DBCA, 2017d).

No Aquatic Groundwater Dependent Ecosystems (GDEs) cross the Survey Area (BoM, 2017a). Two patches of native vegetation have been classified as having low potential as a Terrestrial GDE (BoM, 2017b) (**Map 6, Section 8**).

2.6 Protected and Significant Areas

DBCA Legislated Lands and Waters are lands and waters defined under acts which are applicable to DBCA (DBCA, 2017e). Tenure categories include but are not limited to, national park, nature reserve, conservation park, marine park, marine nature reserve, marine management area, section 5(1)(g) reserves, State forest and timber reserves.

- None of the Survey Area is in a DBCA Legislated Lands and Waters area (**Map 7, Section 8**). The closest is the southern boundary of Nature Reserve R44081 (un-named), which is approximately 12 km north-east of the eastern end of the Survey Area.

DBCA Lands of Interest are lands for which DBCA is recognised as the manager, but which are not vested under any Act that is administered by DBCA. These lands comprise Crown land and Freehold land for which DBCA has been acknowledged by the Department of Lands as the responsible agency (DBCA, 2017f).

- None of the Survey Area is in a DBCA Lands of Interest area. The closest is the southern boundary of Crown Freehold (Department Interest) 2745/631, which is approximately 12 km north of the centre of the Survey Area (**Map 7, Section 8**).

Environmentally Sensitive Areas are those declared in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005, Government Gazette No. 55 (Department of Water, Environment and Regulation (DWER), 2018a).

- None of the Survey Area is in an Environmentally Sensitive Area. The closest is a potential threatened flora location, which is approximately 7 km west of the western end of the Survey Area (**Map 7, Section 8**).

Schedule 1 Areas are those requiring a permit for clearing resulting from low impact mineral or petroleum activities as declared in Regulation 6 in Government Gazette No. 115 Environmental Protection (Clearing of Native Vegetation) Regulations 2004 - Schedule 1 (DWER, 2018b).

- The Survey Areas lies in a Schedule 1 Area – the Swan Coastal Plain (**Map 7, Section 8**).

The EPA Redbook Recommended Conservation Reserves 1976-1991 are areas recommended for conservation by the Environmental Protection Authority (EPA) of WA (DBCA, 2017g).

- None of the Survey Area is in an EPA Redbook Recommended Conservation Reserve. The closest is the southern boundary of Watheroo National Park, which is approximately 14 km north-east of the eastern end of the Survey Area (**Map 7, Section 8**).

Bush Forever Areas 2000 spatially shows the Bush Forever Policy that ensures bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning and decision making (Department of Planning (DoP), 2017).

- None of the Survey Area is in a Bush Forever area. The closest is located 98 km south of the Survey Area.

Crown reserves are land set aside by the Government on behalf of the community for a wide range of public purposes, including sites for environmental and heritage protection, recreation and sport, open space, community halls special events and government services (Australian Government, 2019).

- None of the Survey Area is in a crown reserve. The closest is located 8 km northeast of the Survey Area.

2.7 Roadside Conservation Values

Roadside conservation values (high, medium-high, medium-low and low) were developed by the Roadside Conservation Committee based on road information about the width, diversity of vegetation, number of native species present, extent of weed cover and adjoining land use (DBCA, 2017h).

- The Survey Area is rated as having medium-high conservation value (score of 8).

2.8 Phytophthora Dieback

Phytophthora is a pathogen that travels from the roots of plants via a microscopic water mould in the soil, soil water or through root-to-root contact and causes *Phytophthora* Dieback (DEC, 2006). Once infected, the root systems of the plants are destroyed thus starving the plants of water and nutrients leading to the eventual death

of the plant. Dieback can lead to loss of biodiversity, extinctions of threatened flora and fauna, reduced species richness of plants, loss of key understorey species and loss of habitat and food sources for fauna. Approximately 40% (2,300 species) of flora species recorded in the South-west botanical province are susceptible to *Phytophthora* Dieback (DEC, 2006). Several *Phytophthora* species are present in native vegetation in the south-west of WA, the most destructive being *Phytophthora cinnamomi*.

Project Dieback has created a publicly available map showing locations of soils samples with a positive reading for *Phytophthora cinnamomi* in the south-west of WA (Project Dieback, 2014a). **Figure 2** indicates the susceptibility of vegetation within and around the Survey Area to *Phytophthora cinnamomi*. VSA 999.2 is rated as having moderate susceptibility (light orange colour on **Figure 2**). No positive *Phytophthora* species points have been located within the Survey Area boundary (as of 30 June 2018) (Project Dieback, 2014a).

Figure 2: *Phytophthora cinnamomi* susceptibility (dark orange = high susceptibility, light orange = medium susceptibility) (Project Dieback, 2014a)

Priority Protection Areas (PPAs) are areas representing significant biodiverse ecosystems and communities vulnerable to Phytophthora Dieback in the south-west of WA and identified for state level Phytophthora Dieback management and investment (Project Dieback, 2014b). The goal is to protect and conserve the most significant examples of biodiverse ecosystems and communities in the south-west, which are vulnerable to or threatened by Phytophthora Dieback (Project Dieback, 2014b). No PPAs are known to occur in the Survey Area (Project Dieback, 2014a).

2.9 Rainfall

The closest Bureau of Meteorology (BoM) weather station to the Survey Area is Badgingarra Research Station (BoM station number 9037) located approximately 18 km northwest of the Survey Area. Long-term (1962 to 2019) and June 2018 to May 2019 monthly total rainfall data collected at Badgingarra Research Station is listed in **Table 2** (BoM, 2019).

Most of the yearly rainfall is typically received during the winter months from June to August at Badgingarra (**Table 2**) (BoM, 2019).

Rainfall received between June 2018 and May 2019 (289.8 millimetres (mm)) was much lower than the annual long-term mean (539.2 mm).

Total rainfall in the three months before the June survey (March, April and May – 25.2 mm) was much lower than the long-term mean for those three months (111.2 mm).

Based on the rainfall data recorded in the months before the survey and the long-term records the vegetation in the Survey Area should have been in below average condition.

Table 2: Actual (June 2018 to May 2019) and long-term (1962-2019) monthly rainfall (mm) at Badgingarra Research Station (BoM, 2019)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rainfall records (mm) from Badgingarra Research Station (Station Number 9037, 1962 - 2019)													
L-t $^{62-19}$	11.0	14.6	16.3	26.9	68.0	97.0	102.0	83.9	49.3	27.3	18.8	9.1	539.2
2018						54.0	145.0	24.2	4.0	35.2	0.0	1.0	263.4 (Jun-Dec)
2019	1.2	0.0	0.4	16.6	8.2								26.4 (Jan to May)

Note: L-t $^{62-19}$ = long-term rainfall data recorded from 1962-2019 (BoM, 2019).

3. SURVEY METHODS

EPA (2016) was used as a guide and a flora and vegetation desktop study was carried out followed by a flora and vegetation reconnaissance survey and a CBC tree habitat assessment.

The reconnaissance survey was carried out by two botanists on June 16 2019. The botanists walked traverses within the road reserve (prioritising the southern road verge where both understorey and overstorey were present and assessed the vegetation at seven relevés (**Map 8, Section 8**).

The following parameters were recorded at each relevé site:

- Location details including Global Positioning System (GPS) co-ordinates (Geocentric Datum of Australia, 1994 (GDA94)).
- Site parameters such as soil description, topography and general habitat description, rock type and cover.
- A photograph of the site.
- Vegetation condition using the scale and criteria in EPA (2016).
- Notes on any disturbance to the vegetation.
- Fire history.
- A description of the vegetation structure including the height, percentage cover and dominant species within each stratum.
- The name, height, percentage cover and any other significant recording details for any other species located at the relevé.

Conservation significant flora species thought possible to occur in the area and any other uncommon species were targeted while walking traverses. Specimens of any known or suspected conservation significant species encountered during the survey were collected for determination at the WA Herbarium.

In addition to the relevés and traverses the diameter at breast height (DBH) of the *Eucalyptus* / *Corymbia* trees within the Survey Area was measured to determine whether they were suitable Carnaby's Black Cockatoo breeding habitat (trees with a DBH greater than 500 mm). A photograph was taken of each tree and notes were made on whether any hollows could be seen. Any nuts under trees were examined for evidence of cockatoo foraging and photographed. This information was then assessed by Western Wildlife.

The botanists also recorded whether any CBC were heard or seen while carrying out the TFS and, if they were, made a note of the number of birds, the location and time that they were seen.

The botanists also walked along the edge of the bitumen and along the edge of what appeared to be the ongoing maintenance strip for that section of the road. The tracks recorded on the GPS were used to define the existing disturbed areas in the Survey Area.

The area of existing disturbance and undisturbed vegetation are listed in **Table 3**.

Table 3: Native vegetation and existing disturbance in the Survey Area

Feature	Area (ha)
Bitumen	0.93
Existing maintenance areas (either cleared areas or disturbed vegetation between edge of bitumen and intact vegetation)	1.41
Remaining vegetation	1.05
Total in road reserve / Survey Area	3.39

4. SURVEY RESULTS

4.1 Flora

General Flora

A combined list of 58 taxa was collated from the Survey Area (**Table 11, Appendix 2**). The number of taxa recorded, along with the number of families and genera represented, the percentage of annual and perennial species and the percentage of the species list that was flowering or fruiting or both when the survey was carried out is listed in **Table 4**.

Table 4: Flora information

Attribute	
Families	39
Genera	45
Taxa	58
Annual % / perennial %	19 / 81
Flowering % / fruiting % / flowering and fruiting % / fertile overall %	19 / 19 / 9 / 47

The vegetation in the area is not particularly diverse and this reflects the weedy understorey and sparse vegetation along most of the northern side of the road and some of the southern side. Maia (2016) carried out a reconnaissance survey along the eastern section of Jurien East Road in 2016 (Maia, 2017) and species richness at 27 relevés assessed ranged between 11 and 49. Species richness at the Survey Area ranged between four and 14. The vegetation in the Survey Area is therefore much less diverse than that along Jurien East Road.

Conservation Significant Flora

No threatened flora species protected by the Commonwealth EPBC Act or the state BC Act was located in the Survey Area.

One priority flora species was recorded in the Survey Area – *Banksia dallanneyi* subsp. *pollosta* (P3) (**Figure 3**). Two *Banksia dallanneyi* subsp. *pollosta* plants were recorded in one area (**Map 9, Section 8**).

Figure 3: *Banksia Dallanneyi* Subsp. *Pollosta* (Priority 3) (WAH, 1998-)

[Photography by M. Pieroni. Image used with the permission of the Western Australian Herbarium, Department of Biodiversity, Conservation and Attractions (https://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Tuesday, 2 July 2019]

Weeds

- No weed species listed on any of the national weeds lists or listed as a declared pest in Western Australia was located in either of the two polygons.
- Thirteen environmental weed species were recorded in the Survey Area (*Brassica tournefortii*, Prickly Turnip; *Briza maxima*, Blowfly Grass; *Cucumis myriocarpus* subsp. *myriocarpus*; *Ehrharta calycina*, Perennial Veldt Grass; *Eragrostis cilianensis*, Stinkgrass; *Eragrostis curvula*, African Love Grass; *Eragrostis tenuifolia*; *Euphorbia maculata*; *Medicago* sp.; *Pentameris airoides* subsp. *airoides*, False Hairgrass; *Plantago bellardii*; *Romulea rosea*, Guildford Grass and *Ursinia anthemoides*, Ursinia).

The weeds were most dense within the northern section of the road reserve but there were also areas where the weeds were dense within the southern section of the road reserve.

The DBCA prioritises weeds in each region based on their invasiveness, ecological impact, potential and current distribution and feasibility of control. The resulting priorities focus on weeds considered to be high impact, rapidly invasive and still at a population size that can feasibly be eradicated or contained to a manageable size (DBCA, 2019e). The Wheatbelt region species prioritisation process 2014 impact and invasiveness ratings spread-sheet lists 300 weed species for which the impact and invasiveness have been ranked and a further 18 weed species that have been listed as priority alert species (DBCA, 2019f).

The impact and invasiveness ratings for the 13 weed species located in the Survey Area are listed in **Table 5**. Two of the thirteen weed species have High ecological impact and Rapid Invasiveness ratings – *Briza maxima* and *Romulea rosea*.

Table 5: Environmental weed species recorded in the Survey Area

Species	Rank	
	Ecological impact	Invasiveness
Brassica tournefortii (Prickly Turnip)	Unknown	Rapid
Briza maxima (Blowfly Grass)	High	Rapid
Cucumis myriocarpus subsp. *myriocarpus*	Not Listed	Not Listed
Ehrharta calycina (Perennial Veldt Grass)	High	Moderate
Eragrostis cilianensis (Stinkgrass)	Unknown	Unknown

Species	Rank	
	Ecological impact	Invasiveness
Eragrostis curvula (African Love Grass)	High	Moderate
Eragrostis tenuifolia	Not Listed	Not Listed
Euphorbia maculata	Not Listed	Not Listed
Medicago sp.	Unknown	Unknown
Pentameris airoides subsp. *airoides* (False Hairgrass)	Unknown	Unknown
Plantago bellardii	Not Listed	Not Listed
Romulea rosea (Guildford Grass)	High	Rapid
Ursinia anthemoides (Ursinia)	Unknown	Rapid

4.2 Fauna

General Fauna

The faunal assemblage is likely to consist mainly of common, generalist species that are capable of persisting in disturbed habitats. Few terrestrial species are likely to occur where the understorey vegetation is absent (**Figure 4**).

However, the canopy of Marri (*Corymbia calophylla*), other trees and scattered shrubs are likely to support some native fauna, mainly birds. As birds are mobile, they are able to take advantage of nectar and seed resources even in fragmented landscapes. Small hollows, even in isolated trees, may be used by birds for breeding, or shelter by arboreal reptiles and insectivorous bats.

Figure 4: Example of area where understorey vegetation is absent

Carnaby's Black Cockatoo

The key conservation significant fauna species in the Survey Area is Carnaby's Black-Cockatoo.

Carnaby's black-cockatoo (CBC) (*Calyptorhynchus latirostris*) is listed as Endangered under both the EBPC Act and BC Act. It is endemic to the southwest of WA, occurring mostly in the wheatbelt but also on the Swan Coastal

Plain and wetter southwest (Johnstone and Storr, 1998; DPaW, 2013). The population size is estimated to be 40,000 birds and still declining (Garnett *et al*. 2011).

Typically, CBC breeds in the inland wheatbelt region, nesting in large hollows in smooth-barked eucalypts such as the Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*Eucalyptus wandoo*), though it also uses other tree species such as Marri (*Corymbia calophylla*) (Johnstone and Storr, 1998; DPaW, 2013). During the non-breeding season (January – July), most of the population moves west and south towards the coast (DPaW, 2013).

CBC forage on the seeds of a range of plant species, but are particularly attracted to proteaceous heaths, *Banksia* and *Eucalyptus* woodlands and pine plantations (Johnstone and Storr, 1998). On the Swan Coastal Plain, important food plants include *Banksia attenuata*, *B. menziesii*, *B. grandis*, *B. ilicifolia*, *B. sessilis*, *B. prionotes*, Marri (*Corymbia calophylla*) and Jarrah (*Eucalyptus marginata*) (Shah, 2006). In breeding areas it is important to have sufficient foraging resources in close proximity to nest hollows, typically within 12 km (Garnett *et al*. 2011).

CBC generally roost in tall native or introduced eucalypts or pines in riparian habitats or near permanent water (DSEWPaC, 2012). Shah (2006) found that of 16 CBC roost sites she identified on the Swan Coastal Plain, all but one were in *Pinus* or *Eucalyptus* species. Similarly, Burnham *et al*. (2010) found that 29 CBC roost sites for which the tree species were recorded were in *Pinus* or *Eucalyptus* species.

The main threats to CBC are habitat loss, competition for nesting hollows, habitat degradation and illegal trade in eggs and nestlings (DSEWPaC, 2012). Habitat loss is the primary cause of the decline of this species, with much of its wheatbelt breeding habitat cleared or fragmented, and the clearing of heathland around breeding sites has reduced the foraging opportunities for birds raising young (Cale, 2003). Within remnant wheatbelt woodlands there is little regeneration of eucalypts and the remaining hollows are deteriorating, and CBC may face competition for remaining hollows from other bird species and feral bees (*Apis mellifera*) (DSEWPaC, 2012; Cale, 2003).

CBC was not observed or heard in the Survey Area while the survey was being carried out, however, this species has been recorded within 10 km on the NatureMap database (DBCA 2007-), and the Survey Area falls within the known breeding range of the species as presented by DSEWPaC (2012). Evidence of foraging CBC (chewed Marri nuts) was present in the Survey Area (**Figure 5**). All Marri and Banksia trees in the Survey Area are likely to support foraging CBC.

Figure 5 – Chewed Marri nuts in the North West Road Survey Area

The Marri woodlands are potential CBC breeding habitat. Thirty-one (31) live Marri trees with a DBH≥ 500 mm were identified during the survey, although none appeared to contain hollows of a suitable size to currently support CBC breeding. Tree locations are shown on **Map 10, Section 8** and each tree is shown and the data collected is listed in **Table 12, Appendix 3**. The Survey Area is close to, but not within, 12 km of a confirmed breeding site. However, as several confirmed breeding sites are known from the surrounding area (**Map 3, Section 8**), it is likely that foraging habitat in the Survey Area is used by breeding birds. Foraging habitat within close proximity to breeding habitat is critical for breeding success (potential foraging vegetation is shown on **Map 10, Section 8**.

No CBC roost sites are known to occur in the Survey Area. As the Survey Area lacks tall trees in association with riparian habitats, it is unlikely that it supports roosting.

Other significant fauna species

Other than Carnaby's Black-Cockatoo, the survey area is unlikely to be of importance to any other Threatened fauna species. The Curlew Sandpiper and Eastern Curlew are both migratory shorebirds, and no suitable wetland habitats are present. The Chuditch (Western Quoll) is a wide-ranging species that was once widespread across Australia, but now resides mainly in the south-west forests and mallee woodlands. It is likely to be very uncommon in the region, and the habitats present in the survey area are unlikely to be sufficient to support a population. Therefore, the Chuditch is only likely to be present if dispersing through the area. The Malleefowl is uncommon in the region, and no suitably dense mallee woodlands, *Acacia* or Sheoak shrublands are present to support this species. The Dibbler is restricted to offshore islands in this region, with the only mainland populations known from the south coast, so is not likely to occur.

The Survey Area is unlikely to be important for any Migratory fauna. There is no suitable wetland habitat for Migratory shorebirds, or for the Grey Wagtail, a vagrant species that also occurs around wetlands. The Fork-tailed Swift is largely aerial in Australia, and although it may overfly the Survey Area, no terrestrial habitat is likely to be of importance.

The Survey Area is unlikely to be of importance to any Specially Protected species. The Peregrine Falcon (*Falco peregrinus,* other specially protected fauna) is likely to occur in the region, but this species is very wide-ranging, and the Survey Area would represent only a small part of a much larger foraging range.

The Survey Area is unlikely to be of importance to any Priority Fauna. The Western Brush Wallaby (*Notomacropus irma* – P4) potentially occurs in larger reserves in the region but is unlikely to occur in the Survey Area due to the lack of suitable sheltering vegetation.

4.3 Vegetation Types

Three vegetation types were recorded in the Survey Area and they are described in **Table 6** along with the species associated with each vegetation type and a photograph. The vegetation types are shown on **Map 11, Section 8** and the relevés data and photographs are in **Table 13, Appendix 4**.

*Js*OTS is similar to the *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region ecological community, listed as Priority 3(iii) PEC in Western Australia and as an Endangered TEC under the EPBC Act. However, there were only two *Banksia prionotes* trees in the area and the dominant layer was the *Jacksonia sternbergiana* shrubland. This was a small patch of vegetation in the east of the Survey Area and it appears to be an area of transition in the vegetation. The remaining two vegetation types are not similar to any TEC or PEC listed for the Swan Coastal Plain.

Table 6: Vegetation types recorded along North West Road between SLK 26.08 to 27.78

Site Description	Associated species Area mapped	Photographs
*Cc***CTF** Closed Tall Forest (CTF) of *Corymbia calophylla* with a Tussock Grassland of *Eragrostis curvula** and *Ehrharta calycina** sometimes with Isolated Tall Shrubs of *Jacksonia sternbergiana* and Sparse Low Shrubland of *Hibbertia subvaginata* or *Scholtzia laxiflora*.	Associated species *Dianella revoluta* var. *divaricata*, *Haemodorum paniculatum*, *Kennedia prostrata*, *Briza maxima** Area mapped 0.46 ha (13.4% of the Survey Area)	
*Am***OTF/LW** Open Tall Forest (OTF) to Low Woodland (LW) of *Acacia microbotrya*, an Open Mid Shrubland of *Jacksonia sternbergiana* and a Sparse Tall Shrubland of *Corymbia calophylla* (juveniles).	Associated species *Dianella revoluta* var. *divaricata*, *Brassica tournefortii**, *Eragrostis curvula** Area mapped 0.06 ha (1.8% of the Survey Area)	
*Js***OTS** Open Tall Shrubland (OTS) of *Jacksonia sternbergiana* with an Open Low Woodland of *Banksia prionotes*, a Sparse Low Shrubland of *Hypocalymma angustifolium* and Sparse Tussock Grassland of *Eragrostis curvula**.	Associated species *Austrostipa elegantissima*, *Ericomyrtus ?serpyllifolia* Area mapped 0.03 ha (0.8% of the Survey Area)	

Note: * indicates a weed species.

4.4 Vegetation Condition

Vegetation condition was assessed using the vegetation condition scale for the South West and Interzone Botanical Provinces (**Table 7**) (EPA, 2016).

Vegetation condition was rated as Very Good to Completely Degraded because of the existing clearing and the number and density of weed species present in the road reserve. Vegetation condition is shown on **Map 12, Section 8**.

Table 7: Vegetation condition scale (EPA, 2016)

Vegetation condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Poor	
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

5. IMPACTS AND CLEARING PRINCIPLES

5.1 Impacts

Flora

The two *Banksia dallanneyi* subsp. *pollosta* (P3) plants located in the Survey Area are located on the southern side of the road and will not be impacted.

Vegetation

The Shire plan to clear a 1 m wide strip along the northern side of the road and within the existing maintenance areas (either cleared areas or disturbed vegetation between the edge of the bitumen and intact vegetation) and includes six overhanging *Jacksonia sternbergiana* shrubs. An additional 1 m has been included in the impact calculations (total of 2 m) to allow for potential clearing if any drainage culverts are required. The total area of clearing will not exceed 0.34 ha which represents 10.03% of the Survey Area.

As this roadside vegetation is not included as remnant vegetation in the native vegetation extent layer used to calculate the percentage of remaining remnant vegetation in WA, the current extent of the pre-European vegetation system association 999.2 will not change as a result of this clearing.

Carnaby's Black Cockatoo Potential Breeding and Foraging

Thirty-one potential *Corymbia calophylla* CBC breeding trees were located in the Marri woodland in the Survey Area (live trees with a DBH ≥ 500 mm); although no suitable hollows were identified. While the Survey Area is not within 12 km of a known breeding site it is likely that the foraging habitat present is used by breeding birds. The Marri and Banksia trees present in the Survey Area are potential foraging habitat, and evidence of foraging (chewed Marri nuts) was detected. No *Corymbia calophylla* trees will be removed during the works but any overhanging branches will be pruned.

5.1 Clearing Principles

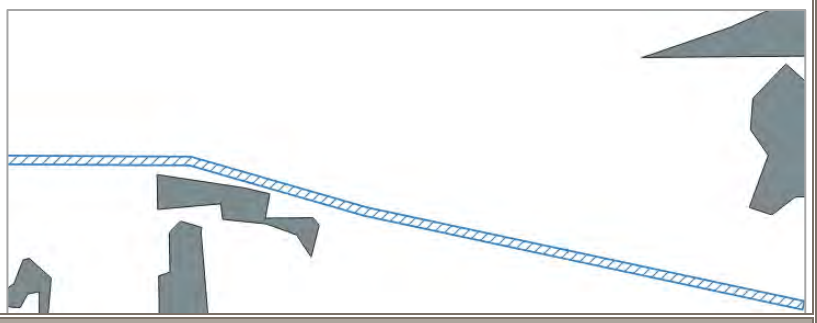
Under the *Environmental Protection Act 1986* (EP Act), clearing of native vegetation requires a permit unless its purpose is exempt. Any vegetation clearing requiring a NVCP needs to address 10 clearing principles as part of the permitting process. The 10 clearing principles are addressed with respect to the Survey Area in **Table 8**.

Table 8: Clearing principles and the Survey Area

	Clearing principle	Proposed roadworks - North West Road SLK 26.08 km to 27.78 km, Shire of Dandaragan
1	**Native vegetation should not be cleared if it comprises a high level of biological diversity.**	**Unlikely to be at variance to this principle** Many weed species were recorded in the road corridor – particularly on the northern side of the road, which has been mostly parkland cleared with only a few trees and sparse shrubs remaining or regrowing. Because of this, vegetation condition in the Survey Area was rated as Very Good to Completely Degraded. Fifty-eight taxa were recorded from the Survey Area. The vegetation in the area is not particularly diverse and this reflects the weedy understorey and sparse non-weedy upper storey vegetation along the northern side of the road and in some areas of the southern side of the road. Maia (2016) carried out a reconnaissance survey along the eastern section of Jurien East Road and species richness at 27 relevés assessed ranged between 11 and 49. Species richness at the Survey Area ranged between four and 14. In addition to this the Survey Area is not in an area indicated as having high plant species richness on NatureMap (DBCA, 2007-).

	Clearing principle	Proposed roadworks - North West Road SLK 26.08 km to 27.78 km, Shire of Dandaragan
		Two plants of the P3 flora species *Banksia dallanneyi* subsp. *pollosta* were recorded at one location in the Survey Area. One of the vegetation types (*Js*OTS) is similar to the description for the *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region ecological community, listed as Priority 3(iii) PEC in Western Australia and as an Endangered TEC under the federal *Environment Protection and Biodiversity Conservation Act 1999*. However, there were only two *Banksia prionotes* trees and the dominant layer was the *Jacksonia sternbergiana* shrubland. This vegetation was in a small patch in the east of the Survey Area and it appears to be an area of transition in the vegetation. The remaining two vegetation types are not similar to any TEC or PEC listed for the Swan Coastal Plain. Clearing will be limited to the northern side of the road and within the existing maintenance areas (either cleared areas or disturbed vegetation between the edge of the bitumen and intact vegetation) and includes six overhanging *Jacksonia sternbergiana* shrubs. These areas are not diverse and mainly consist of weed species.
2	**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.**	**Unlikely to be at variance to this principle** The native vegetation in the Survey Area is likely to be important for Carnaby's Black-cockatoo (*Calyptorhynchus latirostris*). This species is listed as Endangered under the EPBC Act and BC Act. The Marri woodland in the Survey Area is potential breeding habitat (though no suitable hollows were identified), with 31 Marri trees (*Corymbia calophylla*) with a DBH≥ 500 mm in the Survey Area. Although not within 12 km of a known breeding site, several confirmed breeding sites occur in the surrounding area, and it is likely that the foraging habitat present is used by breeding birds. The Marri and *Banksia* trees present in the Survey Area are potential foraging habitat, and evidence of foraging (chewed Marri nuts) was detected. No Marri or *Banksia* trees will be cleared but any overhanging branches will be pruned.
3	**Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.**	**Unlikely to be at variance to this principle** No threatened flora species were located in the Survey Area. One priority species was located – *Banksia dallanneyi* subsp. *pollosta* (P3). Two plants were recorded in one area on the southern side of the road and will not be impacted. FloraBase lists 17 records for this species in Western Australia and NatureMap states that there are 28 records. The FloraBase, NatureMap, Maia and other data from readily available reports were collated to estimate a currently known number of plants and populations for the species. These records resulted in a total of 190 plants and 23 populations (using a 500 m buffer around plant locations to discriminate them – non-touching buffers were counted as separate populations).

	Clearing principle	Proposed roadworks - North West Road SLK 26.08 km to 27.78 km, Shire of Dandaragan
		Nine of the 23 populations are in conservation tenure (Wanagarren Nature Reserve (NR), Nilgen NR, Gnangara-Moore River State Forest, Moore River National Park (NP), Watheroo NP, Bundarra NR, Mogumber NR and Wongan Hills NR), therefore approximately 39% of the populations used by Maia for this analysis are in protected areas (WAH, 1998-). The species is listed as occurring in the following bioregions (subregions): Avon Wheatbelt (Avon Wheatbelt P2); Geraldton Sandplains (Lesueur Sandplain); Jarrah Forest (Northern Jarrah Forest), Swan Coastal Plain (Dandaragan Plateau and Perth). The vegetation in the Survey Area is therefore not necessary for the continued existence of this P3 species.
4	**Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a TEC.**	**Unlikely to be at variance to this principle** The vegetation of the Survey Area does not comprise the whole or part of a TEC. One of the vegetation types in the Survey Area - *Js*OTS - is similar to the description for the Banksia woodlands of the Swan Coastal Plain ecological community, listed as a P3(iii) PEC in Western Australia and as an Endangered TEC under the EPBC Act; however, the dominant layer was the *Jacksonia sternbergiana* shrubland rather than the *Banksia prionotes* woodland. This vegetation type occurs on the southern side of the road and will not impacted by the clearing.
5	**Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.**	**Unlikely to be at variance to this principle** Native vegetation in the Swan Coastal Plain bioregion has been extensively cleared and only 9.35% / 9.36% of the one vegetation system association (999.2) in which the Survey Area occurs currently remains in the Swan Coastal Plain bioregion / Dandaragan Plateau subregion (GoWA, 2019).

	Clearing principle	Proposed roadworks - North West Road SLK 26.08 km to 27.78 km, Shire of Dandaragan
		The road reserve vegetation of the Survey Area is not mapped as a native vegetation remnant in the Native Vegetation Extent layer (DPIRD, 2019) (see below - road reserve shown as blue hatching and Native Vegetation Extent as grey polygons) and therefore its removal should not reduce the percentage of the remaining extent of this vegetation system association in the subregion. Clearing will be limited to the northern side of the road and within the existing maintenance areas (either cleared areas or disturbed vegetation between edge of bitumen and intact vegetation) and includes six overhanging *Jacksonia sternbergiana* shrubs. 
6	**Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.**	**Not at variance to this principle** There are no watercourses or wetlands in or close to the Survey Area.
7	**Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.**	**Unlikely to be at variance to this principle** The proposed clearing is unlikely to cause appreciable land degradation as the northern section of the application area has already been mostly cleared and is adjacent to cleared agricultural land.
8	**Native vegetation should not be cleared if the clearing of vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**	**Not at variance to this principle** The closest conservation area is Nature Reserve R44081 south of and adjacent to the southern boundary of Watheroo National Park, which is approximately 16 km northeast of the Survey Area. The vegetation clearing will not impact on the environmental values of this conservation area. The southern boundary of a block of land which is indicated as Crown Freehold – Dept Interest is approximately 11 km north of the Survey Area and this will not be impacted by the proposed works.

	Clearing principle	Proposed roadworks - North West Road SLK 26.08 km to 27.78 km, Shire of Dandaragan
9	**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.**	**Unlikely to be at variance to this principle** The relatively small area of additional clearing proposed along this existing road should not cause long-term deterioration in the quality of surface or underground water.
10	**Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.**	**Unlikely to be at variance to this principle** The relatively small area of additional clearing proposed along the existing road corridor should not cause or exacerbate the incidence or intensity of flooding. The works may include drainage along the edges of the road.

6. PROJECT PERSONNEL, LICENCES AND LIMITATIONS

The survey was carried out and the report prepared by the personnel listed in **Table 9.**

Table 9: Project personnel and licences

Botanist	Flora licence number
Christina Cox (survey and report)	Worked with Conrad Slee (see below)
Rochelle Haycock (report)	Not applicable
Scott Hitchcock (report)	Not applicable
Michael Pezzaniti (report)	Not applicable
Conrad Slee (survey and plant identification)	SW019805
Jen Wilcox, Western Wildlife (report)	Not applicable

Technical Guidance, Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016), states that any survey-specific issues / limitations should be addressed in a limitations section and that the following set of limitations should be addressed as standard, whether they were a limitation of survey or not:

- Availability of contextual information at a regional and local scale;
- Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed;
- Proportion of flora recorded and/or collected, any identification issues;
- Was the appropriate area fully surveyed (effort and extent);
- Access restrictions within the survey area;
- Survey timing, rainfall, season of survey; and
- Disturbance that may have affected the results of survey such as fire, flood or clearing.

Table 10 addresses any survey-specific issues / limitations.

Table 10: Limitations

Limitation	Comment
	No limitation
Availability of contextual information at a regional and local scale	A desktop study was carried out to gather contextual information at a regional and local scale. The EPBC Act Protected Matters search tool, NatureMap and NationalMap were used to gather information. Relevant environmental GIS layers were downloaded and Beard's pre-European vegetation mapping, soil landscape systems and GoWA's vegetation statistics were used to provide context. Some information was available on other flora and vegetation surveys conducted within or close to the boundary of the Shire of Dandaragan. Shape files were not available for the road reserve, the existing road, the existing mowing area or the areas to be cleared. Therefore the road reserve in the Survey Area was traced using Tengraph (DMIRS, 2019). The edge of the bitumen was walked recording the track and waypoints on a GPS while walking and the boundary of what appeared to be the regularly mowed strip of vegetation was walked and the track and waypoints recorded on a GPS while walking. Shape files were then created using this data and these shape files were used to calculate the area of existing clearing and disturbed vegetation. The canopy of the trees and patches of native vegetation were digitized from aerial imagery and all of these shape files were used to estimate impacts. The proposed impact area was created by Maia by adding a 2 m buffer to the northern extent of the existing bitumen.
Limitation	**Comment**
	No limitation
Competency /experience of the team carrying out the survey, including experience in the bioregion surveyed	Conrad Slee has more than 15 years of experience of conducting botanical surveys in WA and in the Swan Coastal Plain bioregion. Christina Cox also has more than 15 years of experience in carrying out botanical surveys in WA, including in the Swan Coastal Plain bioregion. One or more specimens for each of the species encountered during the survey were collected for formal identification using the resources of the WA Herbarium in Perth. The specimens were identified by Conrad Slee, a botanist with more than 15 years of experience in the taxonomy of the flora of the WA. Conrad also liaised with experts at the WA Herbarium as necessary.

Limitation	Comment
Proportion of flora recorded and/or collected, any identification issues	**No limitation** Fifty-eight (58) taxa from 39 families and 45 genera were recorded: 19% of the 58 taxa were annual and 81% perennial and 47% of them were identified from specimens with reproductive material (flowers / fruit). Three taxa could not be confirmed beyond genus because no flowering or fruiting material was found. It is unlikely that these three queried taxa are conservation significant. Barbara Rye determined two Myrtaceae shrubs to queried species (not conservation significant) and the third taxon is a weed species. A species list was generated by NatureMap for a line along the road corridor buffered by 2.5 km included 25 taxa and 58 (DBCA, 2007-) were collected from the Survey Area. Based on this information the proportion of the flora collected and identified based on sampling, survey time, area surveyed and intensity of survey effort was good.
Was the appropriate area fully surveyed (effort and extent)	**No limitation** A combined flora and vegetation reconnaissance survey and targeted flora survey was conducted over the Survey Area by two botanists for one day. While both sides of the road reserve were assessed most effort was expended on the southern half where there were more patches of sometimes dense native vegetation compared with the northern side which is mostly parkland cleared. Plants of known and suspected conservation significance were targeted and counted and their locations recorded on a GPS. All trees with a DBH greater than 500 mm were measured.
Access restrictions within the survey area	**No limitation** There were no access problems. The Survey Area is alongside an existing road.
Survey timing, rainfall, season of survey	**No limitation** The survey was conducted in June 2019 (winter). Rainfall in Badgingarra over the three months below the survey was below average. Therefore the flora and vegetation could have been in below average condition in June 2019. Approximately 19% of the species recorded were annual species and approximately 47% of the flora taxa recorded were reproductive (flowering, fruiting or both flowering and fruiting) when the survey was carried out. Based on the amount of fertile material the survey was carried out at an acceptable time of year.
Disturbances (fire, flood, accidental human intervention etc.)	**No limitation** Many sections of the Survey Area are disturbed / degraded as the road reserve is mostly narrow and in many areas there is no understorey, particularly on the northern side of the road. In addition to this there are access roads for properties along that section of the road. Otherwise there was no evidence of recent fire or other types of human intervention.

7. CONCLUSIONS

One threatened flora species protected by federal and WA law has been located within 2.5 km of the Survey Area previously – *Eucalyptus absita* (Endangered *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Critically Endangered *Biodiversity Conservation Act 2016* (BC Act)). Three confirmed priority flora species have been located previously within 2.5 km of the Survey Area: *Allocasuarina grevilleoides*, *Allocasuarina ramosissima* (both Priority (P) 3) and *Grevillea saccata* (P4).

One threatened fauna species protected by the EPBC Act and BC Act has been located within 10 km of the Survey Area - *Calyptorhynchus latirostris* (Carnaby's Black-cockatoo (CBC)) (Endangered under the EPBC Act and the BC Act). No Specially Protected Fauna species have been located previously within 10 km of the Survey Area and neither have any priority fauna species.

No threatened ecological communities (TEC) protected by federal or state law occur in or close to the Survey Area and the Survey Area does not occur within the boundaries of a currently known priority ecological community (PEC).

One pre-European vegetation system association occurs in the Survey Area - 999.2. The remaining extent in the Swan Coastal Plain bioregion is 9.35% in the Dandaragan Plateau subregion 9.36% and in the Shire of Dandaragan 9.35%.

The Survey Area lies in a Schedule 1 area – the Swan Coastal Plain.

Fifty-eight (58) taxa were collected from the Survey Area (from 39 families and 45 genera). Annual species comprised 19% of the taxa recorded and perennial species 81%; 47% of the taxa were fertile (flowering/fruiting) when the survey was carried out.

- No threatened flora species protected by federal or WA law was located in the Survey Area.
- One priority flora species was recorded in the Survey Area: *Banksia dallanneyi* subsp. *pollosta* (P3). Two plants were recorded in one area.
- No weed species listed on any of the national weeds lists or listed as a declared pest in WA was located in the Survey Area.
- Thirteen environmental weed species were recorded in the Survey Area (*Brassica tournefortii*, Prickly Turnip; *Briza maxima*, Blowfly Grass; *Cucumis myriocarpus* subsp. *myriocarpus*; *Ehrharta calycina*, Perennial Veldt Grass; *Eragrostis cilianensis*, Stinkgrass; *Eragrostis curvula*, African Love Grass; *Eragrostis tenuifolia*; *Euphorbia maculata*; *Medicago* sp.; *Pentameris airoides* subsp. *airoides*, False Hairgrass; *Plantago bellardii*; *Romulea rosea*, Guildford Grass and *Ursinia anthemoides*, Ursinia).

Three vegetation types were recorded from the Survey Area – *Corymbia calophylla* Closed Tall Forest, *Acacia microbotrya* Open Tall Forest to Low Woodland and Open Tall Shrubland of *Jacksonia stenbergiana*. The Open Tall Shrubland of *Jacksonia stenbergiana* is similar to the description for the *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region ecological community, listed as a Priority 3(iii) PEC in Western Australia and as an Endangered TEC under the EPBC Act. However, there were only two *Banksia prionotes* trees in the patch of vegetation and the dominant layer was the *Jacksonia sternbergiana* shrubland. It is a small patch of vegetation at the eastern-most end of the Survey Area and it appears to be an area of transition in the vegetation. The remaining two vegetation types are not similar to any TEC or PEC listed for the Swan Coastal Plain.

The faunal assemblage is likely to consist mainly of common, generalist species that are capable of persisting in disturbed habitats. Few terrestrial species are likely to occur where the understorey vegetation is absent. However, the canopy of Marri (*Corymbia calophylla*), other trees and scattered shrubs are likely to support some native fauna, mainly birds. As birds are mobile, they are able to take advantage of nectar and seed resources even

in fragmented landscapes. Small hollows, even in isolated trees, may be used by birds for breeding, or shelter by arboreal reptiles and insectivorous bats.

The key conservation significant fauna species in the Survey Area is Carnaby's Black-Cockatoo. CBC was not seen or heard in the Survey Area, however, this species has been recorded within 10 km, and the Survey Area falls within the known breeding range of the species. Evidence of foraging CBC (chewed Marri nuts) was present in the Survey Area. All Marri and banksias in the Survey Area are likely to support foraging CBC. The Marri woodlands are potential CBC breeding habitat and 31 live Marri trees with a DBH≥ 500 mm were identified during the survey, although none appeared to contain hollows of a suitable size to currently support CBC breeding. The Survey Area is close to but not within 12 km of a confirmed breeding site and, as several confirmed breeding sites are known from the surrounding area, it is likely that foraging habitat in the Survey Area is used by breeding birds. Foraging habitat in close proximity to breeding habitat is critical for breeding success. No roosting habitat areas are known to occur in the Survey Area and as the Survey Area lacks tall trees in association with riparian habitats, it is unlikely that it supports roosting. None of these trees will be cleared but some overhanging branches will be pruned to maintain driver safety.

The two *Banksia dallanneyi* subsp. *pollosta* (P3) plants located in the Survey Area will not be impacted.

Clearing will be limited to the northern side of the road and within the existing maintenance areas (either cleared areas or disturbed vegetation between the edge of the bitumen and intact vegetation) and includes six overhanging *Jacksonia sternbergiana* shrubs. The total area of clearing will not exceed 0.34 ha which represents 10.03% of the Survey Area. As this roadside vegetation is not included as remnant vegetation in the native vegetation extent layer used to calculate the percentage of remaining remnant vegetation in WA, the current extent of the pre-European vegetation system association 999.2 will not change as a result of this clearing. Nonetheless it is remnant vegetation in a highly cleared area.

Large numbers of weeds were observed along the road edge and in the road reserve and the Shire should adopt good weed management practices when carrying out the proposed works to prevent the spread of weeds from a very weedy area and the introduction of even more weed species to the area.

Vegetation classified as moderately susceptible to *Phytophthora cinnamomi* occurs in areas adjacent to the road reserve but not within it. No positive *Phytophthora* species points have been located in the area.

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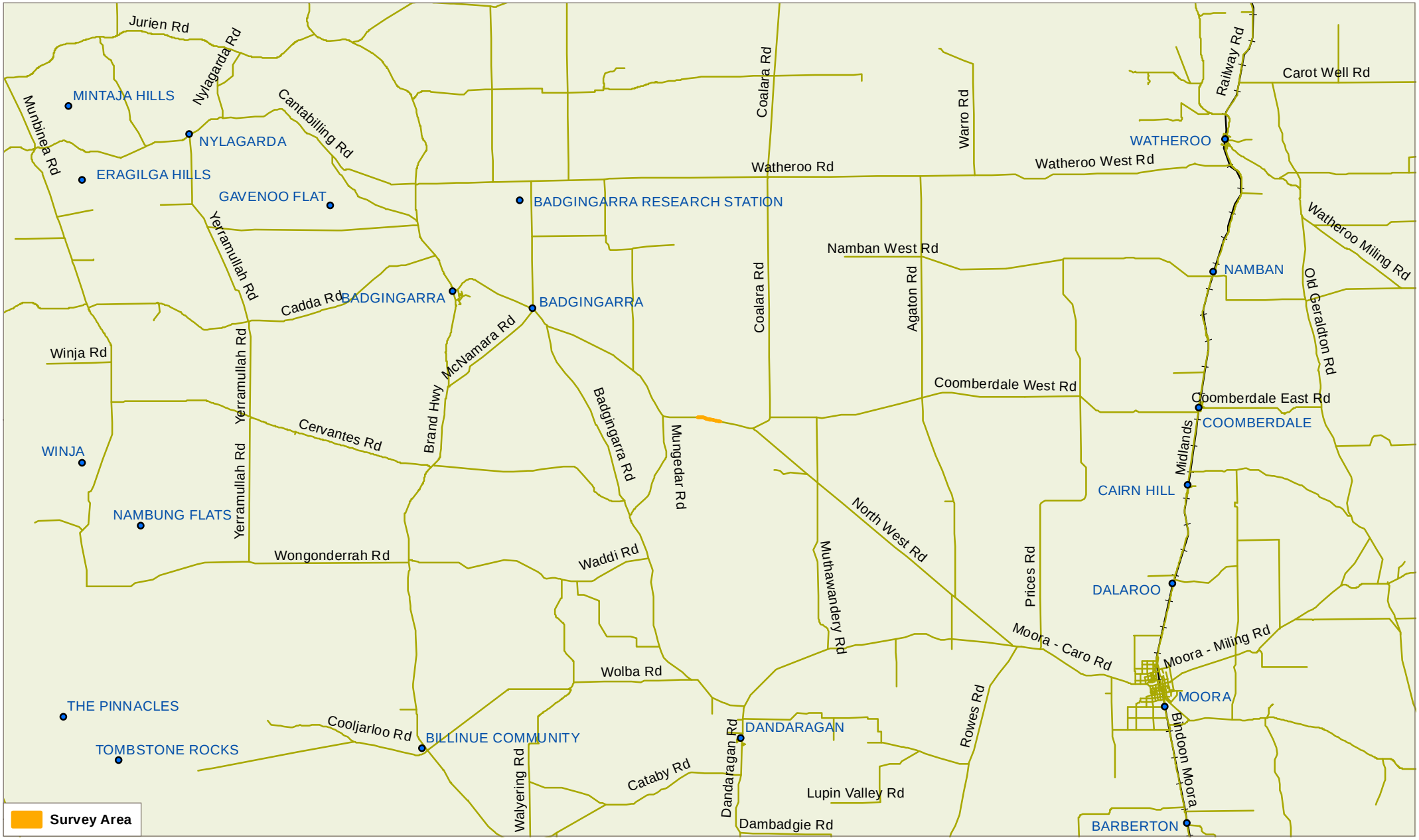
9. MAPS



Places (Geoscience, 20060101)
Road Network (Main Roads, 20190516)
Railways (Geoscience, 20060101)

General Location

N

0 7.5
Kilometres
Datum: GDA 1994, MGA 50

Map: 1
Prepared for: SofD
Drawn by: RH
Date: 3/07/2019
Version: 1 **Size:** A4

Road Network (Main Roads, 20190516)

The Survey Area

N

0 0.125

Kilometres

Datum: GDA 1994, MGA 50

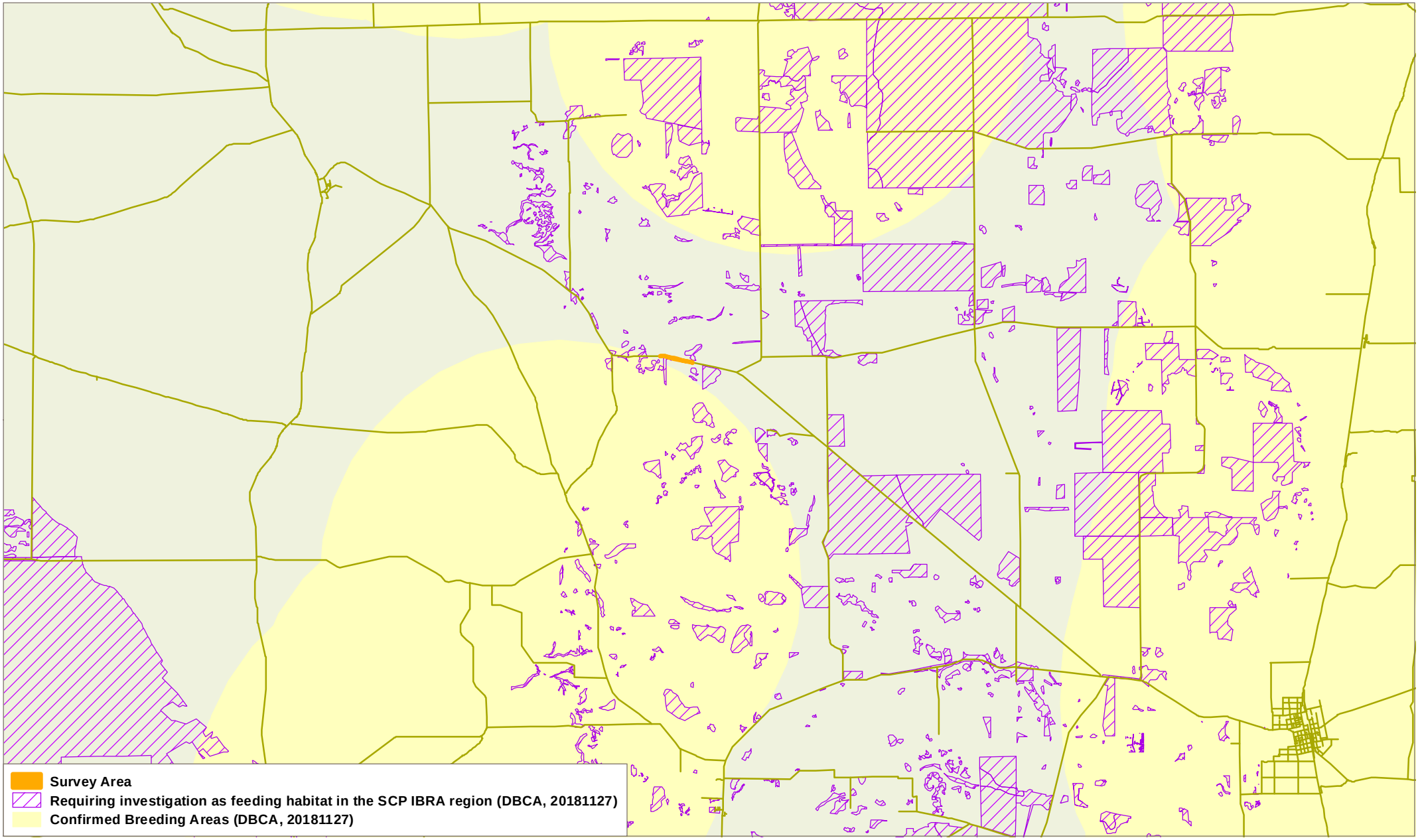
Map: 2

Prepared for: SofD

Drawn by: RH

Date: 3/07/2019

Version: 1 **Size:** A4



Road Network (Main Roads, 20190618)

Carnaby's Black Cockatoo Areas - DBCA

maia

N

0 5

Kilometres

Datum: GDA 1994, MGA 50

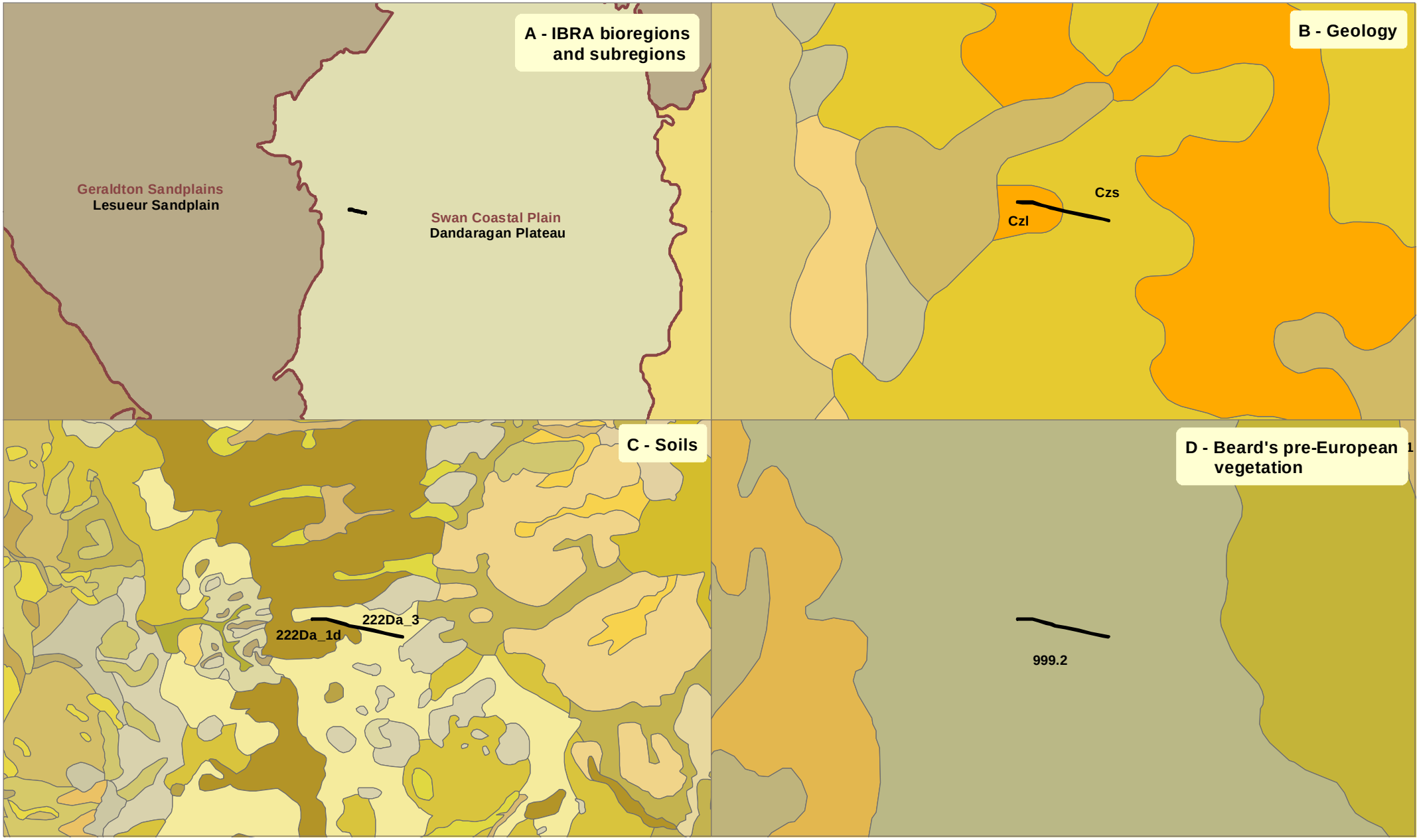
Map: 3

Prepared for: SofD

Drawn by: RH

Date: 3/07/2019

Version: 1 **Size:** A4



Survey Area

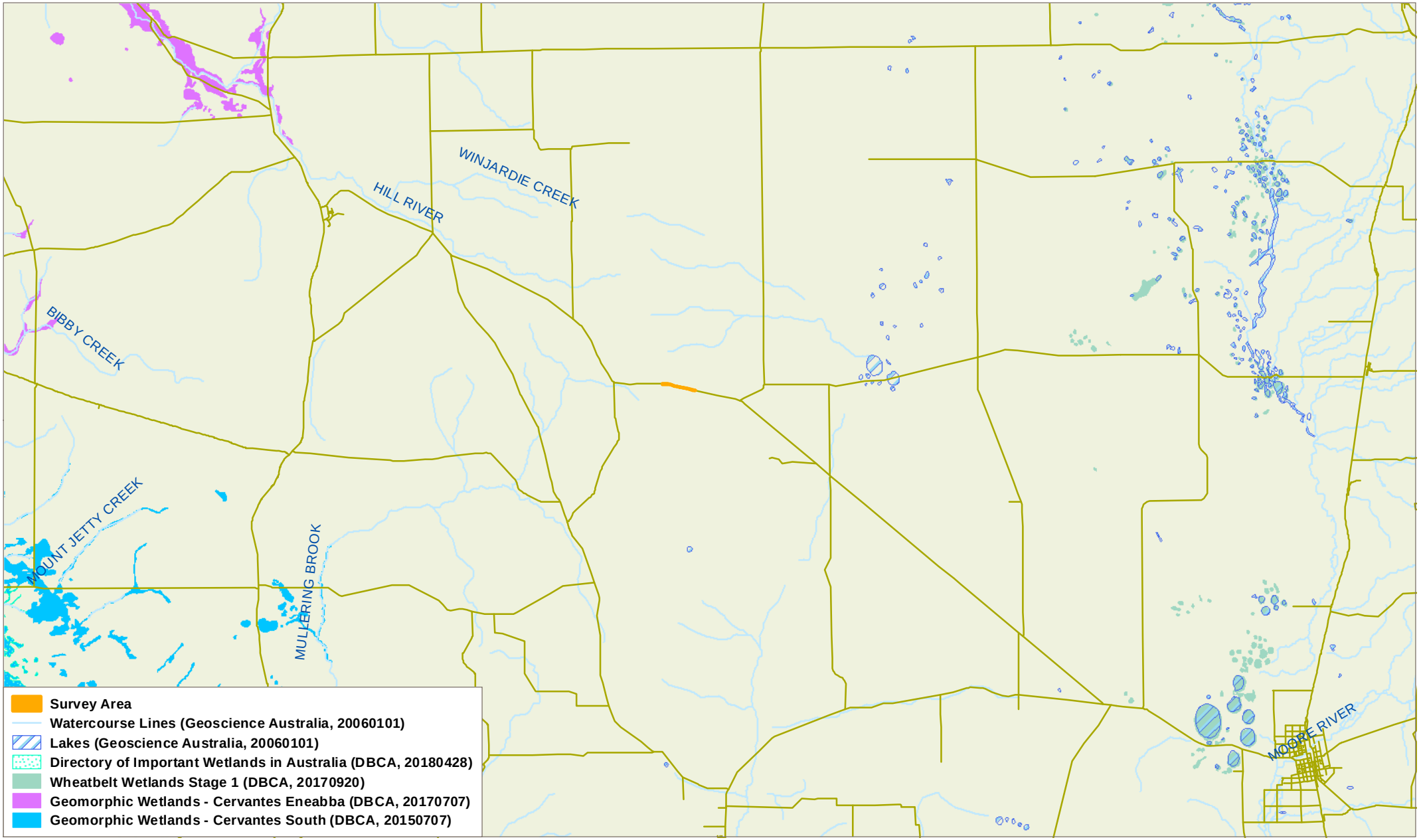
IBRA Bioregions and Subregions, Geology, Soil Landscape Mapping and Beard's Pre-European Vegetation (Vegetation System Associations)

maia

N

Datum: GDA 1994, MGA 50

Map: 4
Prepared for: SofD
Drawn by: RH
Date: 3/07/2019
Version: 1 **Size:** A4



Location Map

Road Network (Main Roads, 20190516)

Watercourses and Wetlands

maia

N

0 5

Kilometres

Datum: GDA 1994, MGA 50

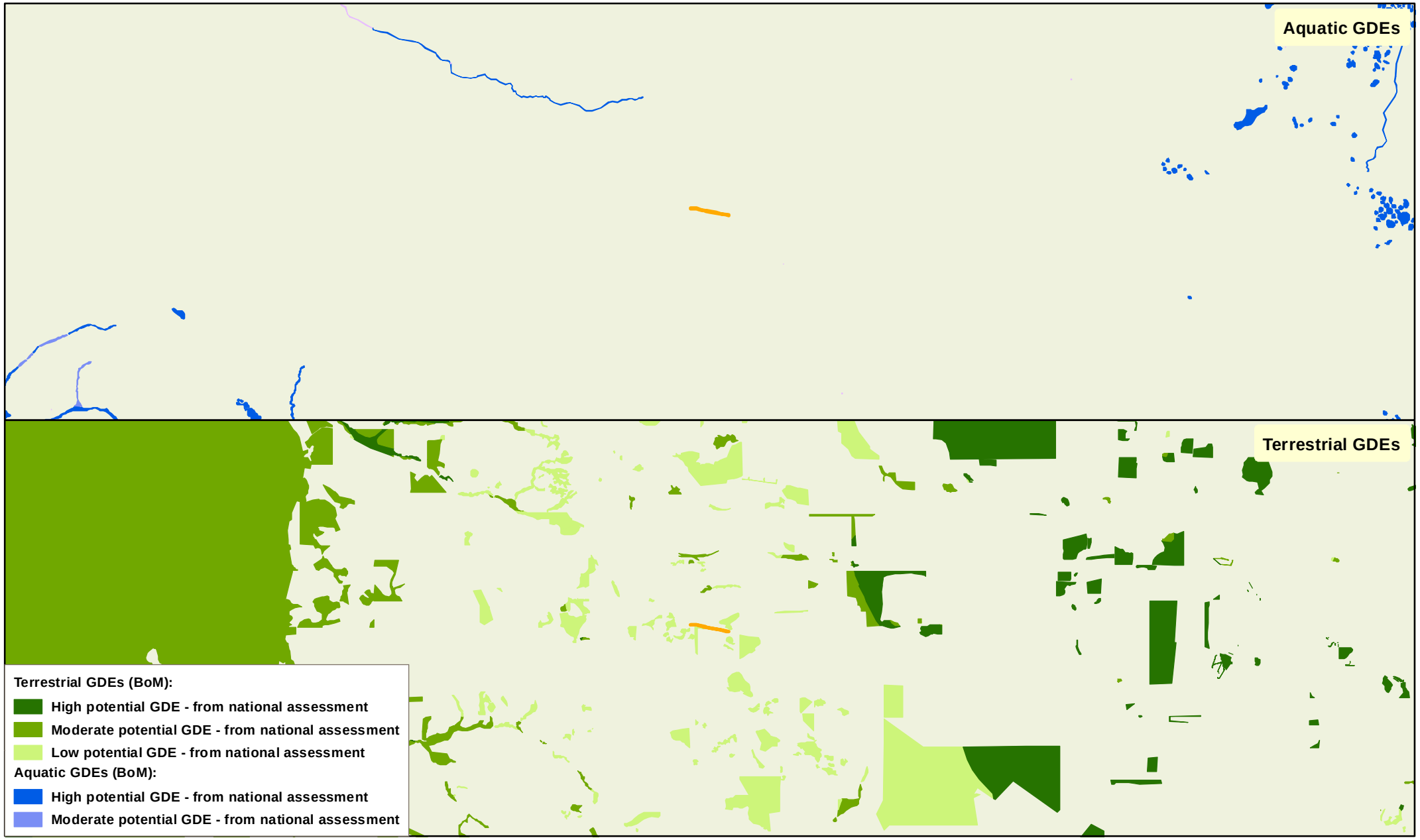
Map: 5

Prepared for: SofD

Drawn by: RH

Date: 3/07/2019

Version: 1 **Size:** A4



Survey Area

Aquatic and Terrestrial Groundwater Dependent Ecosystems

maia

N

0 5

Kilometres

Datum: GDA 1994, MGA 50

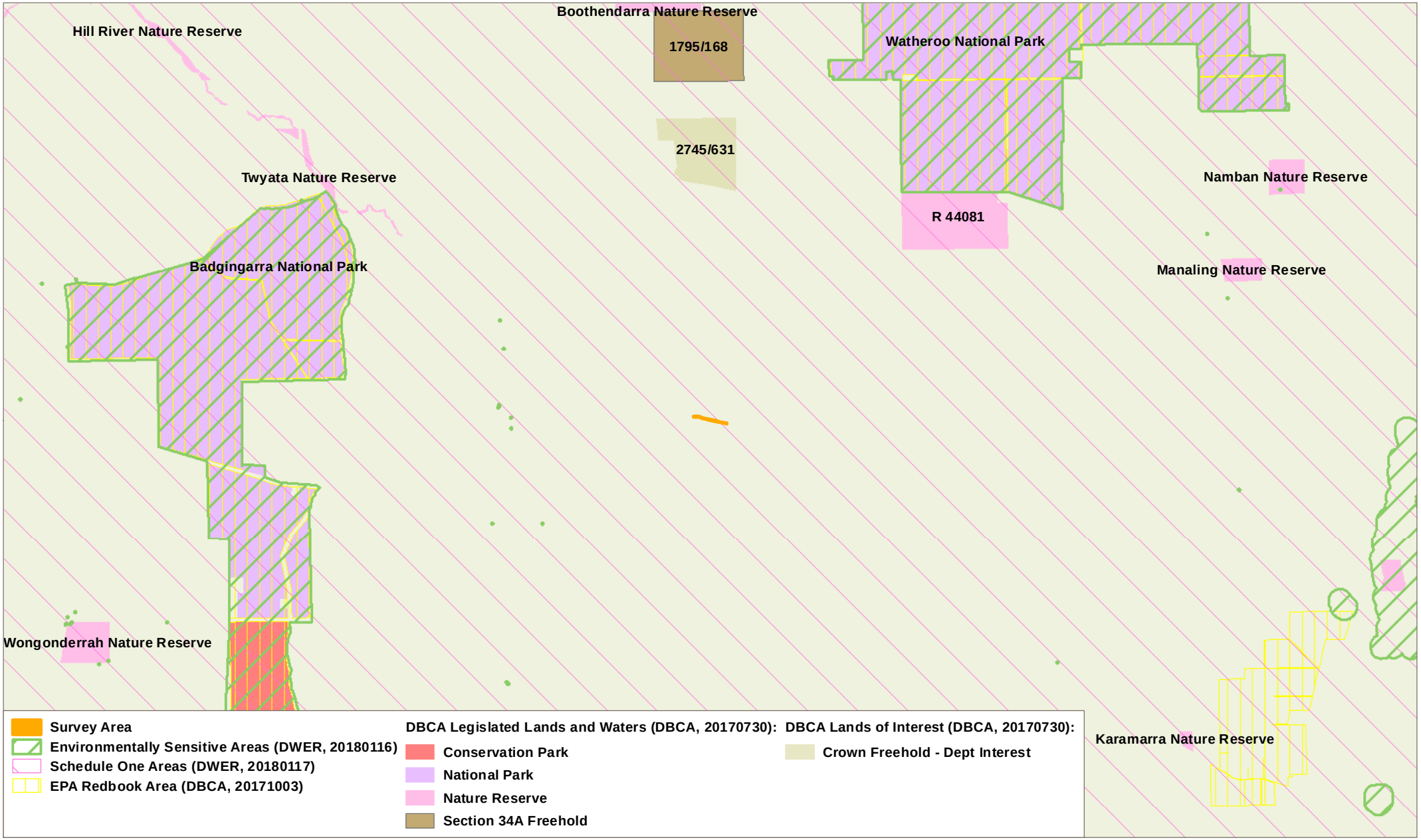
Map: 6

Prepared for: SofD

Drawn by: RH

Date: 3/07/2019

Version: 1 **Size:** A4



Protected and Significant Areas

maia

N

0 5

Kilometres

Datum: GDA 1994, MGA 50

Map: 7

Prepared for: SofD

Drawn by: RH

Date: 3/07/2019

Version: 1 **Size:** A4

Relevés

N

0 0.125

Kilometres

Datum: GDA 1994, MGA 50

Map: 8

Prepared for: SofD

Drawn by: RH

Date: 3/07/2019

Version: 1 **Size:** A4

Conservation Significant Flora

N

0 0.125

Kilometres

Datum: GDA 1994, MGA 50

Map: 9

Prepared for: SofD

Drawn by: RH

Date: 23/07/2019

Version: 2 **Size:** A4

Carnaby's Black Cockatoo
Potential Foraging Vegetation and
Potential Breeding Trees

maia

N

0 50

Metres

Datum: GDA 1994, MGA 50

Map: 10
Prepared for: SofD
Drawn by: RH
Date: 25/07/2019
Version: 3 **Size:** A4

Proposed impact area

Road reserve

Maia Vegetation Types and Existing Disturbance

N

0 50

Metres

Datum: GDA 1994, MGA 50

Map: 11

Prepared for: SofD

Drawn by: RH SH

Date: 27/07/2019

Version: 3 **Size:** A4

Proposed impact area

Road reserve

Vegetation Condition

N

0 50

Metres

Datum: GDA 1994, MGA 50

Map: 12

Prepared for: SofD

Drawn by: RH SH

Date: 27/07/2019

Version: 3 **Size:** A4

APPENDIX 1: SEARCH RESULTS

EPBC PMST search results (PMST 2T8340) – flora 2.5 km buffer

Australian Government
Department of the Environment and Energy

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.

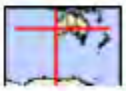
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 28/05/19 15:23:50

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 2.5Km



Summary

Matters of National Environmental 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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	22
Listed Migratory Species:	8

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 environment anywhere.

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 Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	13
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	13
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
Plants		
Acacia cochlocarpa subsp. cochlocarpa Spiral-fruited Wattle [23877]	Endangered	Species or species habitat may occur within area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Banksia serratuloides subsp. perissa Northern Serrate Dryandra [82767]	Critically Endangered	Species or species habitat may occur within area
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat may occur within area
Conospermum densiflorum subsp. unicephalatum One-headed Smokebush [64871]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Daviesia dielsii Diels' Daviesia [19617]	Endangered	Species or species habitat may occur within area
Eucalyptus absita Badgingarra Box [24260]	Endangered	Species or species habitat known to occur within area
Eucalyptus crispata Yandanooka Mallee [24268]	Vulnerable	Species or species habitat may occur within area
Eucalyptus dolorosa Dandaragan Mallee, Mount Misery Mallee [56709]	Endangered	Species or species habitat likely to occur within area
Eucalyptus impensa Eneabba Mallee [56711]	Endangered	Species or species habitat may occur within area
Eucalyptus leprophloia Scaly Butt Mallee, Scaly-butt Mallee [56712]	Endangered	Species or species habitat may occur within area
Grevillea christineae Christine's Grevillea [64520]	Endangered	Species or species habitat may occur within area
Hemiandra gardneri Red Snakebush [7945]	Endangered	Species or species habitat may occur within area
Leucopogon obtectus Hidden Beard-heath [19614]	Endangered	Species or species habitat may occur within area
Spirogardnera rubescens Spiral Bush [15667]	Endangered	Species or species habitat may occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat may occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Extra Information

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliabl distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-30.47611 115.71417,-30.47417 115.705,-30.4725 115.69583,-30.47056 115.68639,-30.46806 115.67472,-30.46806 115.65833,-30.46861 115.65667,-30.4675 115.64833

NatureMap search results – flora 2.5 km buffer

NatureMap

North West Rd - 2.5km Line

Created By Scott Hitchcock on 28/05/2019

Kingdom	Plantae
Core Datasets Only	Yes
Method	'By Line'
Vertices	30° 28' 34" S,115° 42' 51" E 30° 28' 27" S,115° 42' 18" E 30° 28' 21" S,115° 41' 45" E 30° 28' 14" S,115° 41' 11" E 30° 28' 05" S,115° 40' 29" E 30° 28' 05" S,115° 39' 30" E 30° 28' 07" S,115° 39' 24" E 30° 28' 03" S,115° 38' 54" E
Group By	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	25	32
Priority 3	2	3
Priority 4	1	2
Rare or likely to become extinct	1	1
TOTAL	29	38

	Name ID	Species Name	Naturalised	Conservation Code	*Endemic To Query Area
Rare or likely to become extinct					
1.	13093	*Eucalyptus absita (Badgingarra Box)*		T	
Priority 3					
2.	1729	*Allocasuarina grevilleoides*		P3	
3.	1736	*Allocasuarina ramosissima*		P3	
Priority 4					
4.	2087	*Grevillea saccata (Pouched Grevillea)*		P4	
Non-conservation taxon					
5.	3442	*Acacia microbotrya (Manna Wattle, Kalyong)*			
6.	1734	*Allocasuarina microstachya*			
7.	6337	*Astroloma stomarrhena (Red Swamp Cranberry)*			
8.	32518	*Banksia hewardiana*			
9.	32215	*Banksia kippistiana var. kippistiana*			
10.	1828	*Banksia leptophylla*			
11.	32074	*Banksia shuttleworthiana (Bearded Dryandra)*			
12.	1383	*Burchardia bairdiae*			
13.	5417	*Cadthamnus longissimus*			
14.	5439	*Calytrix angulata (Yellow Starflower)*			
15.	14808	*Chamelaucium drummondii subsp. drummondii*			
16.	1435	*Conostylis hiemalis*			
17.		*Encomyrtus sp.*			
18.	17670	*Hakea anadenia*			
19.	5420	*Leucopogon oldfieldii*			
20.	48184	*Leucopogon stenophyllus*			
21.	16255	*Opercularia vaginata (Dog Weed)*			
22.	16874	*Petrophile recurva*			
23.	11402	*Pimelea imbricata var. piligera*			
24.	5268	*Pimelea sulphurea (Yellow Banjine)*			
25.	18353	*Pithocarpa pulchella var. pulchella*			
26.	6262	*Platysace xerophila*			
27.	4266	*Templetonia retusa (Cockies Tongues)*			
28.	6101	*Verticordia nitens (Morrison Featherflower, Kooljeningara)*			
29.	10822	*Verticordia nobilis*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.

Page 1

EPBC PMST search results (PMST AYQSPI) – fauna 10.0 km buffer

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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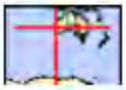
Report created: 12/06/19 15:25:45

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental 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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	31
Listed Migratory Species:	8

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 environment anywhere.

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 Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	15
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Parantechinus apicalis Dibbler [313]	Endangered	Species or species habitat may occur within area
Plants		
Acacia cochlocarpa subsp. cochlocarpa Spiral-fruited Wattle [23877]	Endangered	Species or species habitat may occur within area
Acacia forrestiana Forest's Wattle [17235]	Vulnerable	Species or species habitat likely to occur within area
Acacia splendens Splendid Wattle, Dandaragan Wattle [81510]	Endangered	Species or species habitat likely to occur within area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Banksia serratuloides subsp. perissa Northern Serrate Dryandra [82767]	Critically Endangered	Species or species habitat may occur within area
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat may occur within area
Conospermum densiflorum subsp. unicephalatum One-headed Smokebush [64871]	Endangered	Species or species habitat likely to occur within area
Daviesia dielsii Diels' Daviesia [19617]	Endangered	Species or species habitat may occur within area
Eremophila scaberula Rough Emu Bush [16729]	Endangered	Species or species habitat may occur within area
Eucalyptus absita Badgingarra Box [24260]	Endangered	Species or species habitat known to occur within area
Eucalyptus crispata Yandanooka Mallee [24268]	Vulnerable	Species or species habitat may occur within area
Eucalyptus dolorosa Dandaragan Mallee, Mount Misery Mallee [56709]	Endangered	Species or species habitat likely to occur within area
Eucalyptus impensa Eneabba Mallee [56711]	Endangered	Species or species habitat may occur within area
Eucalyptus leprophloia Scaly Butt Mallee, Scaly-butt Mallee [56712]	Endangered	Species or species habitat may occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
Grevillea christineae Christine's Grevillea [64520]	Endangered	Species or species habitat likely to occur within area
Hakea megalosperma Lesueur Hakea [10505]	Vulnerable	Species or species habitat likely to occur within area
Hemiandra gardneri Red Snakebush [7945]	Endangered	Species or species habitat likely to occur within area
Leucopogon obtectus Hidden Beard-heath [19614]	Endangered	Species or species habitat may occur within area
Paracaleana dixonii Sandplain Duck Orchid [86882]	Endangered	Species or species habitat likely to occur within area
Ptychosema pusillum Dwarf Pea [11268]	Vulnerable	Species or species habitat may occur within area
Spirogardnera rubescens Spiral Bush [15667]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Thelymitra dedmaniarum		
Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat may occur within area
Thelymitra stellata		
Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area
Reptiles		
Egernia stokesii badia		
Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-30.47611 115.71417,-30.47417 115.705,-30.4725 115.69583,-30.47056 115.68639,-30.46806 115.67472,-30.46806 115.65833,-30.46861 115.65667,-30.4675 115.64833

NatureMap search results – fauna 10.0 km Buffer

NatureMap

19-08 ConSigFauna 10km Line

Created By Scott Hitchcock on 11/06/2019

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Method "By Line"
Vertices 30° 28' 34" S,115° 42' 51" E 30° 28' 27" S,115° 42' 18" E 30° 28' 21" S,115° 41' 45" E 30° 28' 14" S,115° 41' 11" E 30° 28' 05" S,115° 40' 29" E 30° 28' 05" S,115° 39' 30" E 30° 28' 07" S,115° 39' 24" E 30° 28' 03" S,115° 38' 54" E
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	37	63
Rare or likely to become extinct	1	20
TOTAL	38	83

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Rare or likely to become extinct					
1.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
Non-conservation taxon					
2.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
3.	24262	*Acanthiza inornata (Western Thornbill)*			
4.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
5.		*Barnardius zonarius*			
6.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
7.	24723	*Cacatua pastinator subsp. butleri (Butler's Corella)*			
8.	24725	*Cacatua roseicapilla subsp. assimilis (Galah)*			
9.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
10.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
11.	25582	*Corvus coronoides (Australian Raven)*			
12.	25595	*Cracticus tibicen (Australian Magpie)*			
13.	24918	*Crenadactylus ocellatus subsp. ocellatus (Clawless Gecko)*			
14.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	N		
15.	25251	*Echiopsis curta (Bardick)*			
16.		*Eolophus roseicapillus*			
17.	25530	*Gerygone fusca (Western Gerygone)*			
18.	24443	*Grallina cyanoleuca (Magpie-lark)*			
19.	25005	*Liaris burtoni*			
20.	25661	*Lichmera indistincta (Brown Honeyeater)*			
21.	25654	*Malurus splendens (Splendid Fairy-wren)*			
22.		*Maratus pavonis*			
23.	24598	*Merops ornatus (Rainbow Bee-eater)*			
24.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
25.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
26.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
27.	25682	*Pardalotus striatus (Striated Pardalote)*			
28.	48061	*Petrochelidon nigricans (Tree Martin)*			
29.	24659	*Petroica goodenovii (Red-capped Robin)*			
30.	24750	*Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)*			
31.	25261	*Pseudechis australis (Mulga Snake)*			
32.	24245	*Rattus rattus (Black Rat)*	Y		
33.	48096	*Rhipidura albiscapa (Grey Fantail)*			
34.	25614	*Rhipidura leucophrys (White Wagtail)*			
35.	24108	*Smithopsis crassicaudata (Fat-tailed Dunnart)*			
36.	24112	*Smithopsis granulipes (White-tailed Dunnart)*			
37.		*Tasmanicosa leuckartii*			
38.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.

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APPENDIX 2 SPECIES LIST

Table 11: Species list

Note: * = weed species, P3 = priority three species, RE = range extension, Fl = flowering, Fr = fruiting.

Family	Taxa	Flowering (FL), Fruiting (Fr)
Amaranthaceae	*Ptilotus polystachyus*	Fl
Asparagaceae	*Lomandra preissii*	
Asteraceae	***Ursinia anthemoides****	
Brassicaceae	***Brassica tournefortii****	
Cucurbitaceae	***Cucumis myriocarpus* subsp. *myriocarpus****	Fr
Cyperaceae	*Caustis dioica*	
Cyperaceae	*Lepidosperma resinosum*	Fr
Cyperaceae	*Lepidosperma* sp. P1 small head (M.D. Tindale 166A)	Fr
Dilleniaceae	*Hibbertia hypericoides* subsp. *hypericoides*	
Dilleniaceae	*Hibbertia subvaginata*	Fl
Ericaceae	*Leucopogon propinquus*	Fl
Euphorbiaceae	***Euphorbia maculata**** **(RE)**	FlFr
Fabaceae	*Acacia andrewsii*	
Fabaceae	*Acacia lasiocarpa* var. *sedifolia*	Fl
Fabaceae	*Acacia microbotrya*	FlFr
Fabaceae	*Acacia saligna*	
Fabaceae	*Daviesia divaricata* subsp. *divaricata*	Fr
Fabaceae	*Gompholobium aristatum*	Fr
Fabaceae	*Isotropis drummondii*	Fl
Fabaceae	*Jacksonia nutans*	
Fabaceae	*Jacksonia sternbergiana*	FlFr
Fabaceae	*Kennedia prostrata*	
Fabaceae	***Medicago* sp.***	
Geraniaceae	*Erodium cygnorum*	
Goodeniaceae	*Lechenaultia linarioides*	Fl
Goodeniaceae	*Scaevola repens* subsp. Northern Sandplains (R.J. Cranfield & P.J. Spencer 8445)	FlFr
Haemodoraceae	*Conostylis seminuda*	
Haemodoraceae	*Haemodorum paniculatum*	Fr
Hemerocallidaceae	*Corynotheca micrantha* var. *micrantha*	
Hemerocallidaceae	*Dianella revoluta* var. *divaricata*	
Hemerocallidaceae	*Tricoryne elatior*	FlFr
Iridaceae	***Romulea rosea****	
Myrtaceae	*Corymbia calophylla*	
Myrtaceae	*Ericomyrtus ?serpyllifolia*	
Myrtaceae	*Hypocalymma angustifolium*	
Myrtaceae	*Melaleuca platycalyx*	
Myrtaceae	*Scholtzia ?parviflora*	
Myrtaceae	*Scholtzia laxiflora*	
Phyllanthaceae	*Phyllanthus calycinus*	

Family	Taxa	Flowering (FL), Fruiting (Fr)
Plantaginaceae	***Plantago bellardii****	Fl
Poaceae	*Aristida holathera*	
Poaceae	*Austrostipa elegantissima*	
Poaceae	***Briza maxima****	
Poaceae	***Ehrharta calycina****	
Poaceae	***Eragrostis cilianensis****	Fr
Poaceae	***Eragrostis curvula****	
Poaceae	***Eragrostis tenuifolia**** **(RE)**	Fr
Poaceae	***Pentameris airoides* subsp. *airoides****	Fr
Polygonaceae	*Muehlenbeckia adpressa*	
Proteaceae	***Banksia dallanneyi* subsp. *pollosta* (P3)**	
Proteaceae	*Banksia prionotes*	Fl
Proteaceae	*Banksia sessilis* var. *cygnorum*	
Proteaceae	*Grevillea vestita* subsp. *vestita*	Fl
Restionaceae	*Desmocladus flexuosus*	Fr
Rubiaceae	*Opercularia vaginata*	Fl
Sapindaceae	*Diplopeltis huegelii* subsp. *lehmannii*	Fr
Scrophulariaceae	*Eremophila glabra* subsp. *tomentosa*	
Thymelaeaceae	*Pimelea floribunda*	Fl

Note: sp. = species, subsp. = subspecies, var. = variety.

APPENDIX 3 TREES

Table 12: Tree data from North West Road SLK 26.08 to 27.78

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC1	374014	6628300	73.2	Small hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC2	373990	6628306	70.7	No visible hollows	
Corymbia calophylla	CC3	373849	6628340	100.3	Hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC4	373731	6628364	74.5	Small hollows	 Right hand tree in photograph
Corymbia calophylla	CC5	373709	6628366	61.7	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC6	373702	6628370	61.7	No visible hollows	
Corymbia calophylla	CC7	373700	6628370	65.2	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC8	373588	6628394	119.7	Hollows	
Corymbia calophylla	CC9	373476	6628418	93.3	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC10	373465	6628423	67.2	No visible hollows	
Corymbia calophylla	CC11	373449	6628425	64.9	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC12	373437	6628429	52.5	No visible hollows	
Corymbia calophylla	CC13	373325	6628450	63.0	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC14	373299	6628461	69.4	No visible hollows	 CC14 left hand tree and CC15 right hand tree
Corymbia calophylla	CC15	373291	6628462	55.4	No visible hollows	See above

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC16	373167	6628494	59.5	No visible hollows	
Corymbia calophylla	CC17	373101	6628511	62.7	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC18	373039	6628546	99.6	Hollows	
Corymbia calophylla	CC19	372930	6628547	78.6	Hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC20	372923	6628580	90.4	No visible hollows	 CC20 left hand tree, CC21 right hand tree
Corymbia calophylla	CC21	372908	6628583	89.4	No visible hollows	See above

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC22	372887	6628561	56.0	No visible hollows	
Corymbia calophylla	CC23	372849	6628588	55.4	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC24	372836	6628602	60.2	No visible hollows	
Corymbia calophylla	CC25	372797	6628573	52.5	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC26	372783	6628577	115.8	Small hollows	
Corymbia calophylla	CC27	372766	6628578	85.0	No visible hollows	

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC28	372722	6628576	56.0	No visible hollows	 CC28 left hand tree
Corymbia calophylla	CC29	372721	6628577	57.0	No visible hollows	 CC29 is middle tree in photograph

Species	Tree reference number	Easting (mE)	Northing (mN)	DBH (cm)	Hollow comments	Photograph
Corymbia calophylla	CC30	372720	6628575	63.0	No visible hollows	 CC30 is right hand tree in photograph
Corymbia calophylla	CC31	372641	6628576	51.9	No visible hollows	 CC31 is left hand tree in photograph

APPENDIX 4 RELEVÉS

Table 13: Relevés

Relevé:	NWR-1	Described by:	Christina Cox and Conrad Slee		Date:	16/06/2019	Photo:
Location (GDA94):		MGA50	372785	mE	6628576	mN	
Habitat:		Sandplain very gentle north facing slope (plateau)					
Soil:		Brown sandy-loam loose soil (0, covered with litter%)					
Rocks:		No rocks					
Mapped as:		*Cc*CTF					
Vegetation Association:		Closed Tall Forest of *Corymbia calophylla* with Tussock Grassland of *Eragrostis curvula** and *Ehrharta calycina** and Isolated Tall Shrubs of *Jacksonia sternbergiana.*					
Vegetation Condition:		Poor					
Disturbances:		Weeds, road					
Fire Age:		None evident					
Species:		*Corymbia calophylla, Ehrharta calycina*, Eragrostis curvula*.*					
Relevé:	**NWR-2**	**Described by:**	**Christina Cox and Conrad Slee**		**Date:**	**16/06/2019**	**Photo:**
Location (GDA94):		MGA51	372900	mE	6628585	mN	
Habitat:		Low rise very gentle north facing slope (plateau)					
Soil:		Red-white sandy-loam loose soil (0, covered with litter%)					
Rocks:		No rocks					
Mapped as:		*Cc*CTF					
Vegetation Association:		Closed Tall Forest of *Corymbia calophylla* with a Tussock Grassland of *Eragrostis curvula** and *Ehrharta calycina** with an Open Low Shrubland of *Opercularia vaginata* and *Desmocladus flexuosus* with Isolated Low Trees of *Corymbia calophylla* with Isolated Tall Shrubs of *Jacksonia sternbergiana* and Isolated Mid Shrubs of *Corymbia calophylla*.					
Vegetation Condition:		Poor					
Disturbances:		Weeds, road					
Fire Age:		None evident					
Species:		*Briza maxima*, Corymbia calophylla, Desmocladus flexuosus, Dianella revoluta* var. *divaricata, Ehrharta calycina*, Eragrostis curvula*, Haemodorum paniculatum, Jacksonia sternbergiana, Kennedia prostrata.*					
Relevé:	**NWR-3**	**Described by:**	**Christina Cox and Conrad Slee**		**Date:**	**16/06/2019**	**Photo:**
Location (GDA94):		MGA52	372952	mE	6628848	mN	
Habitat:		Sandplain very gentle north facing slope (plateau)					
Soil:		Red-white sandy-loam loose soil (0, covered with litter%)					
Rocks:		No rocks					
Mapped as:		*Cc*CTF					
Vegetation Association:		Tall Shrubland of *Jacksonia sternbergiana* with an Open Low Woodland of *Corymbia calophylla* with a Sparse Mid Shrubland of *Corymbia calophylla* and a Sparse Tussock Grassland of *Eragrostis curvula*.*					
Vegetation Condition:		Good					
Disturbances:		Weeds, road					
Fire Age:		None evident					
Species:		*Conostylis seminuda, Corymbia calophylla, Corynotheca micrantha* var. *micrantha, Daviesia divaricata* subsp. *divaricata, Dianella revoluta* var. *divaricata, Ehrharta calycina*, Eragrostis curvula*, Hibbertia subvaginata, Jacksonia*					

	sternbergiana, Opercularia vaginata.					
Relevé:	**NWR-4**	**Described by:**	**Christina Cox and Conrad Slee**	**Date:**	**16/06/2019**	**Photo:**
Location (GDA94):		MGA51	373341	mE	6628448	mN
Habitat:		Sandplain very gentle north facing slope (plateau)				
Soil:		Brown sandy-loam loose soil (20%)				
Rocks:		Laterite stones (30%)				
Mapped as:		*Cc*CTF				
Vegetation Association:		Open Tall Forest of *Corymbia calophylla* with an Open Tall Shrubland of *Jacksonia* sternbergiana with an Open Mid Shrubland of *Jacksonia sternbergiana* with a Sparse Low Shrubland of *Hibbertia subvaginata* with a Sparse Tussock Grassland of *Ehrharta calycina** with a Sparse Herbland of *Opercularia vaginata* and Isolated Low Trees of *Corymbia calophylla*.				
Vegetation Condition:		Very Good				
Disturbances:		Weeds, road				
Fire Age:		None evident				
Species:		*Caustis dioica*, *Corymbia calophylla*, *Dianella revoluta* var. *divaricata*, *Ehrharta calycina**, *Eragrostis cilianensis**, *Eragrostis curvula**, *Erodium cygnorum*, *Euphorbia maculata**, *Hibbertia subvaginata*, *Jacksonia sternbergiana*.				
Relevé:	**NWR-5**	**Described by:**	**Christina Cox and Conrad Slee**	**Date:**	**16/06/2019**	**Photo:**
Location (GDA94):		MGA52	373483	mE	6628418	mN
Habitat:		Sandplain very gentle north facing slope (plateau)				
Soil:		Brown sandy-loam loose soil (10%)				
Rocks:		Laterite stones (30%)				
Mapped as:		*Am*OTF/LW				
Vegetation Association:		Open Tall Forest of *Acacia microbotrya* with a Low Woodland of *Acacia microbotrya* with an Open Mid Shrubland of *Jacksonia sternbergiana* and a Sparse Tall Shrubland of *Corymbia calophylla*.				
Vegetation Condition:		Very good				
Disturbances:		Weeds, road				
Fire Age:		None evident				
Species:		*Acacia microbotrya*, *Brassica tournefortii**, *Corymbia calophylla*, *Dianella revoluta* var. *divaricata*, *Eragrostis curvula**, *Jacksonia sternbergiana.*				
Relevé:	**NWR-6**	**Described by:**	**Christina Cox and Conrad Slee**	**Date:**	**16/06/2019**	**Photo:**
Location (GDA94):		MGA53	374219	mE	6628261	mN
Habitat:		Sandplain very gentle north facing slope (plateau)				
Soil:		Brown coarse sand loose soil (30%)				
Rocks:		No rocks				
Mapped as:		*Js*OTS				
Vegetation Association:		Open Tall Shrubland of *Jacksonia sternbergiana* with an Open Low Woodland of *Banksia prionotes* with a Sparse Mid Shrubland of *Jacksonia sternbergiana* with a Sparse Low Shrubland of *Hypocalymma angustifolium* and Sparse Tussock Grassland of *Eragrostis curvula**.				
Vegetation Condition:		Very good				
Disturbances:		Weeds, road				
Fire Age:		None evident				
Species:		*Austrostipa elegantissima*, *Banksia prionotes*, *Eragrostis curvula**, *Ericomyrtus ?serpyllifolia*, *Hypocalymma angustifolium*, *Jacksonia sternbergiana*.				

Relevé:	NWR-7	Described by:	Christina Cox and Conrad Slee	Date:	16/06/2019	Photo:
Location (GDA94):		MGA54	374101 mE	6628286 mN		
Habitat:		Sandplain very gentle north facing slope (plateau)				
Soil:		Brown coarse sand loose soil (10%)				
Rocks:		No rocks				
Mapped as:		*Cc*OTW				
Vegetation Association:		Open Tall Shrubland of *Jacksonia sternbergiana* with an Open Low Woodland of *Corymbia calophylla* with a Sparse Mid Shrubland of *Scholtzia laxiflora* and a Sparse Tussock Grassland of *Eragrostis curvula**.				
Vegetation Condition:		Good				
Disturbances:		Weeds, road				
Fire Age:		None evident				
Species:		*Corymbia calophylla*, *Jacksonia sternbergiana*, *Scholtzia* ?*parviflora*, *Scholtzia laxiflora.*				

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