Main Roads Western Australia

Mitchell Freeway Extension (Hester Avenue to Romeo Road)

EPBC 2018/8367 Preliminary Documentation

December 2019

GHD scope and limitations

Main Roads commissioned GHD Pty Ltd (GHD) to develop the Preliminary Documentation for EPBC 2018/8367 Mitchell Freeway Extension (Hester Avenue to Romeo Road) for submission to the Australian Department of the Environment and Energy.

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Executive summary

Main Roads Western Australia (Main Roads) proposes to extend Mitchell Freeway from Hester Avenue to Romeo Road, including an upgrade to Wanneroo Road from Dunstan Road to Trian Road (the Proposal).

The Proposal will extend the Mitchell Freeway north a further 5.6 kilometres (km) from Hester Avenue to Romeo Road, as well as upgrading Wanneroo Road to a dual carriageway for 5.5 km from Dunstan Road to Trian Road.

The Proposal will improve accessibility, travel times and road safety as well as sustaining jobs and enabling regional development in Perth's northern suburbs.

As the Proposal was considered to have a significant impact on Matters of National Environmental Significance (MNES), Main Roads was required to prepare Preliminary Documentation to inform the assessment of the relevant impacts of the Proposal.

This Preliminary Documentation is prepared in response to a request by Department of the Environment and Energy (DEE, 1 May 2019) for additional information to support assessment of impacts for the Mitchell Freeway Extension and Wanneroo Road Upgrade, WA (EPBC 2018/8367) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Proposal will result in significant residual impacts to Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (BWSCP TEC), Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Forest Red-tailed Black Cockatoo (FRTBC, *Calyptorhynchus banksii naso*), due to the following direct impacts:

- Clearing of up to 50.07 ha of BWSCP TEC
- Clearing of up to 328 potential breeding trees for Carnaby's Cockatoo
- Clearing of up to eight trees, each containing between one and four potentially suitable hollows for Carnaby's Cockatoo nesting (totalling 22 potentially suitable hollows in eight trees)
- Clearing of up to 95.61 ha of high quality foraging habitat, 8.56 ha of medium quality foraging habitat and 27.90 ha of low quality foraging habitat for Carnaby's Cockatoo
- Clearing of up to 6.29 ha of high quality foraging habitat, 70.06 ha of medium quality foraging habitat and 27.90 ha of low quality foraging habitat for FRTBC.

The Proposal will not result in impacts to known nesting hollows of Carnaby's Cockatoo.

The Proposal is not expected to result in impacts to FRTBC breeding habitat, as it lies well away from FRTBC breeding areas and does not include large, mature Marri or Jarrah trees with suitable hollows.

Based on the current concept design, Main Roads estimates approximately 60 ha of native vegetation within the DE will either be retained or landscaped/revegetated with a mix of local, native species suitable as Carnaby's Cockatoo and FRTBC foraging habitat.

The Proposal is not expected to result in significant indirect impacts to BWSCP TEC, Carnaby's Cockatoo or FRTBC. The Proposal will not fragment TEC or Black Cockatoo habitat, with clearing being limited to the edges of existing disturbed corridors and the Butler urban residential area. All Dieback assessable vegetation within the DE was assessed as uninfested. The DE is expected to be resilient to Dieback expression due to the presence of well drained, calcareous soils of the Spearwood Dunes.

Main Roads proposes an offset to counterbalance the potential significant residual impacts to BWSCP TEC, Carnaby's Cockatoo and FRTBC.

Implementation of the Proposal:

- Is consistent with the Regional Road reserve under the Metropolitan Region Scheme
- Provides substantial social and economic benefits
- Has been developed with consideration to appropriate stakeholder consultation
- Incorporates substantial impact avoidance and established, effective construction management measures
- Includes design and construction measures that protect and enhance the integrity of adjacent Class A reserves (Neerabup National Park and Neerabup Nature Reserve)
- Is not inconsistent with the Objects of the EPBC Act and principles of economically sustainable development (ESD) including the precautionary principles
- Is not inconsistent with relevant Commonwealth Recovery Plans, Threat Abatement Plans and Conservation Advice
- Will include an offset to counterbalance significant residual impacts.

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1. Introduction

1.1 Proposal

Main Roads Western Australia (Main Roads) proposes to extend Mitchell Freeway north from Hester Avenue to Romeo Road, including an upgrade to Wanneroo Road from Dunstan Road to Trian Road (the Proposal). Figure 1 presents the Proposal location and Development Envelope (DE). The DE comprises an area of approximately 249 ha and represents the preliminary impact footprint.

Mitchell Freeway is the main arterial road that connects the northern suburban areas with Perth's central business district. The freeway currently terminates at Hester Avenue. Perth's northern suburbs have experienced continuing strong growth, with the population of Yanchep, Alkimos and Eglinton forecast to reach 118,000 by 2031[1].

The Proposal will extend the Mitchell Freeway a further 5.6 kilometres (km) from Hester Avenue to Romeo Road, as well as upgrading Wanneroo Road to a dual carriageway for 5.5 km from Dunstan Road to Trian Road. The Proposal will improve accessibility, travel times and road safety as well as sustaining jobs and enabling regional development in Perth's northern suburbs.

The Mitchell Freeway extension works include:

- Constructing a new 5.6 km four lane freeway (two lanes in each direction)
- Completion of northbound on ramp and southbound off ramp at Hester Avenue interchange
- Grade separated interchange at Lukin Drive
- Rail tunnel for the existing rail to exit the freeway median to Butler train station
- Terminate freeway at Romeo Road with a grade separated interchange
- Principal Shared Path on the western side of the freeway
- Romeo Road constructed as dual carriageway with 2 lanes east to Wanneroo Road
- Footpaths/shared paths proposed for Romeo Road
- New/upgraded at-grade intersections at Romeo Road/Wanneroo Road.

The Wanneroo Road upgrade works include:

- Constructing a 5.5 km dual carriageway from Dunstan Road to Trian Road. Existing carriageway to be used where possible
- Intersection improvement to Wanneroo Road and Nowergup Road
- Improvements to the old Wanneroo Road alignment currently acting as a service road
- Modifications to formalise the service road providing safe access and egress to adjoining properties.

1.2 Purpose and scope

On 5 April 2019, a delegate of the Minister for the Environment determined the proposed action was a controlled action and that it will be assessed by Preliminary Documentation. In the

[1] https://www.mediastatements.wa.gov.au/Pages/McGowan/2019/03/Mitchell-Freeway-extension-to-Romeo-Road-to-start-next-year.aspx

decision advice, the Department of the Environment and Energy (DEE) advised it considered the proposed action likely to have a significant impact on MNES including:

- Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (BWSCP TEC)
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*)
- Forest Red-tailed Black Cockatoo (FRTBC, *Calyptorhynchus banksii naso*).

On 1 May 2019, DEE requested additional information to inform the assessment of the relevant impacts of the proposed action.

This Preliminary Documentation presents the additional information requested by DEE, to support assessment of the extension of the Mitchell Freeway Extension and upgrade of Wanneroo Road, WA (EPBC 2018/8367, the Proposal) under the EPBC Act.

The structure and content of this report aligns with DEE's request for additional information.

1.3 Proponent

The proponent for the proposed action is the Commissioner of Main Roads and formal contact details are listed in Table 1.

Table 1 Proponent and Proposal key contact

Proponent/Contact	Contact details
Proponent	Commissioner of Main Roads Main Roads Western Australia PO Box 6202 East Perth WA 6002 ABN/ACN 50 860 676 021
Proposal Key Contact	Marni Baetge Environment Officer Infrastructure Delivery Directorate Main Roads Western Australia

376000 377000 378000 379000 380000 381000 382000

6502000 6501000 6500000 6499000 6498000 6497000 6496000 6495000 6494000

YANCHEP

Legend

- Major Road
- Minor Road
- Development Envelope

Trian Rd

CARABOODA

ALKIMOS

Romeo Rd

Neerabup Nature Reserve

Lake Nowergup

NOWERGUP

Neerabup National Park

Wanneroo Rd

BUTLER

JINDALEE

Lukin Dr

RIDGEWOOD

QUINNS ROCKS

MERRIWA

Hester Av

NEERABUP

Neerabup Lake

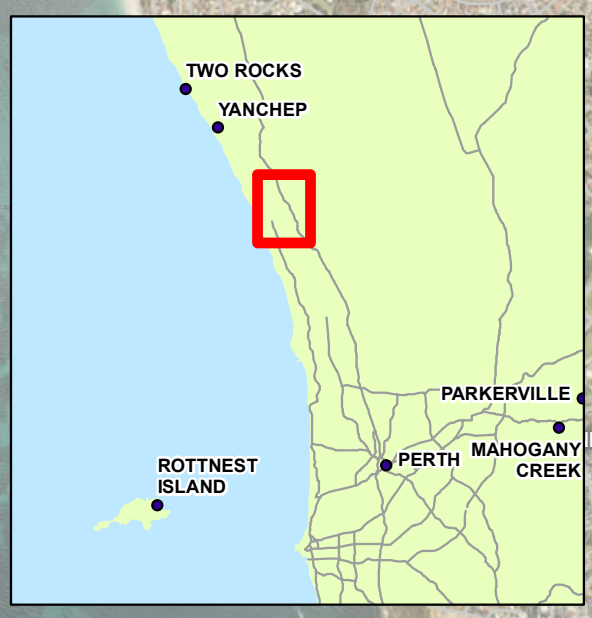
CLARKSON

Mitchell Fwy

Neerabup National Park

IDARIE

Landgate / SLIP



Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometres

N

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

GHD

Main Roads Western Australia
SR155 Mitchell Fwy Extension EPBC PD

Proposal location and Development Envelope

Project No. **61-38302**
Revision No. **0**
Date **10/09/2019**

FIGURE 1

G:\61\38302\GIS\Maps\Working\Figures\6138302_001_Locality_Rev0.mxd
Print date: 10 Sep 2019 - 13:03

Data source: GHD: EPBC Development Envelope - 20190531; ABS: Local Government Areas - 20190220; MRWA: Road network - 20190114; LGATE: Imagery - August 2018; Geoscience Australia: Geodata topo series 3. Created by: afeeney

2. Preliminary Documentation

Table 2 presents a summary of the information requested as part of the Preliminary Documentation and the corresponding section in this report.

Table 2 Information requested for Preliminary Documentation and corresponding section in this report

Information Requested	Section
Listed threatened species and ecological communities	
1. The Department understands that further surveys have been, and will be undertaken to determine the presence and extent of the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (BWSCP TEC) (Endangered) within the proposal site. Please advise, including a map, of the hectares and condition of BWSCP TEC that occurs within the proposal site that will be cleared as part of this proposal.	Section 3.1.3
2. Please advise the hectares, including a map, of foraging, breeding and roosting habitat for the Carnaby's Black Cockatoo (*Calytorhynchus latirostris*) (Endangered) and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable) that occurs within the proposal site and that will be cleared as part of this proposal. Additionally, please advise and provide a map of the number of potential breeding trees (including the number of trees with suitable hollows) that occur within the proposal site and will be cleared as part of this proposal.	Section 4
3. Please confirm whether the BWSCP TEC that occurs within the proposal site forms part of a larger patch. If the BWSCP TEC forms part of a larger patch, please provide details of any potential impacts to the BWSCP TEC in these adjoining and surrounding areas. When discussing potential impacts, please give consideration to the local, regional, state and national scale and the precautionary principle. This discussion should include (but not be limited to) consideration, including appropriate avoidance and mitigation of, fragmentation and edge effect risks, changes in surface water run-off, changes in nutrient cycling, mobilisation of acid sulfate soils and the potential introduction of pathogens and weeds. The discussion should include reference to the 'Banksia Woodland' which was described in the referral as 'well represented' in the Neerabup National Park, which is adjacent to the proposal site.	Section 3.1.3 Section 3.3.2
4. The referral noted that a 'suspected infestation' of Dieback (*Phytophthora cinnamomi*) had previously been identified at Marmion Avenue (8 km south-west of the proposal site). While the potential infestation was outside the proposal site, and only suspected, the Department considers that there is a possibility that the proposal may increase the risk of Dieback infestation in the proposed site and surrounding areas due to the potential of the proposal to disturb soils and vegetation. Please describe the measures that will be undertaken to avoid and/or mitigate the potential impacts of Dieback to the BWSCP TEC at the proposal site and in adjoining areas. This discussion should reference Candlestick Banksia (*Banksia attenuata*), which is present in the proposal site and highly susceptible to Dieback due to its clustered roots.	Section 3.3.2
5. The referral noted the presence of weeds including Bridal Creeper (*Asparagus asparagoides*), Apple of Sodom (*Solanum linnaeanum*) and Arum Lily (*Zantedeschia aethiopica*) within the proposal site. Please identify the measures that will be undertaken to avoid and/or mitigate the impacts of weeds on EPBC Act listed species and ecological communities.	Section 3.4.3

Information Requested	Section
6. The referral noted that the proposed measures to be undertaken to avoid and/or mitigate impacts on EPBC Act listed species and ecological communities will be detailed in an Environmental Management Plan (EMP). Please ensure that the EMP is consistent with the Department's Environmental Management Plan Guidelines (2014) (available on the Department's website at http://www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines). Additionally and if available, please provide a copy of the draft EMP to the Department for review. Note: Management plans must use terms such as 'will' and 'must' when committing to management actions, instead of 'where possible', 'as required', 'should' or 'may'. The Department will consider the terms used when assessing the proposed management measures within the management plan and may require further assurance in relation to measures which reduce potential impacts to EPBC Act listed species.	Section 3.4 and Appendix C EMP is consistent with this terminology
7. For the EPBC Act listed species and ecological communities proposed to be impacted by this proposal, please provide an overall conclusion as to the environmental acceptability of the proposal including: • A discussion on the consideration against the requirements of the EPBC Act, including the objects of the EPBC Act, the principles of ecologically sustainable development and the precautionary principle • Reasons justifying undertaking the proposal in the manner proposed, including the acceptability of the avoidance and mitigation measures • If relevant, a discussion of residual impacts and any compensatory measures (e.g. offsets) proposed or required for significant residual impacts on EPBC Act listed species and ecological communities, and the relative degree of compensation and acceptability.	Sections 4.4, 4.5 and 4.6
Recovery plans / Threat abatement plans	
8. Please demonstrate that the action is not inconsistent with any relevant recovery plan or threat abatement plan, including {but not limited to): • Department of Parks and Wildlife (2013). Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan. Department of Parks and Wildlife, Perth, Western Australia • Department of the Environment and Energy (2018). Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi*. Canberra: Commonwealth of Australia • Chapman, T. (2008). Forest Black Cockatoo (Baudin's Cockatoo *Calyptorhynchus baudinii* and Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*) Recovery Plan. Department of Environment and Conservation, Western Australia • Please demonstrate that the action has had regard to any relevant conservation advice, including (but not limited to): – Threatened Species Scientific Committee (2016). Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community. Canberra: Department of the Environment and Energy – Department of the Environment, Water, Heritage and the Arts (2009). Approved Conservation Advice for Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo). Canberra: Department of the Environment, Water, Heritage and the Arts.	Section 4.7
Offsets	
9. To the extent that impacts to EPBC Act listed species and ecological communities cannot be avoided or mitigated, provide details of an	Section 5

Information Requested	Section
offset(s) intended to compensate for residual significant impacts on EPBC Act listed species and ecological communities (if any), including: • The type of offset/s proposed • The extent to which the proposed offset correlates to, and adequately compensates for, the residual significant impacts on EPBC Act listed species and communities • Suitability of the location of any proposed offset site for EPBC Act listed species and communities • Conservation gain to be achieved by the offset i.e. positive management strategies that improve the site or averting the future loss, degradation or damage of the protected matter • Time it will take to achieve the proposed conservation gain • Level of certainty that the proposed offset will be successful • Current land tenure of any proposed land-based offset and the method of securing and managing that offset for 20 years or the period of impact (whichever is less).	
10. Please demonstrate how any proposed offset is consistent with the Department's EPBC Act Environmental Offsets Policy (October 2012), and provide a completed offsets assessment guide and justification for the figures used to complete the offsets assessment guide.	Section 5
Social and economic considerations	
11. The Preliminary Documentation must address the economic and social impacts (both positive and negative) of the proposal. Consideration of economic and social matters may include: • Details of any public consultation activities undertaken and the outcomes • Details of any consultation with Indigenous stakeholders including any cultural and/or traditional activities in or relating to the proposal site • Any monitoring programs to monitor ongoing changes to economic and social characteristics potentially affected by the proposal • Projected economic costs and benefits of the proposal including the basis for their estimation through cost/benefit analysis or similar studies • Employment opportunities expected to be generated by the proposal at each phase of the proposal • Benefits to the local and wider community as a result of the proposal. Economic and social impacts should be considered at the local, regional and national levels. Details of the relevant cost and benefits of any alternative options to the proposal may also be requested.	Section 6

3. Listed threatened species and ecological communities

3.1 Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community

3.1.1 Background

The BWSCP TEC is listed as Endangered under the EPBC Act and a Priority Ecological Community (PEC) by the Department of Biodiversity, Conservation and Attractions (DBCA).

The BWSCP TEC is a woodland restricted to Western Australia's Swan Coastal Plain (SCP) and adjacent areas including Dandaragan Plateau in the north and Darling Scarp in the east. The TEC has ongoing threats predominantly through clearing and fragmentation for urban development, as well as mining, fire regime and climate change, invasive species and *Phytophthora* dieback (TSSC 2016).

A key diagnostic feature is a prominent tree layer of *Banksia* species, with scattered eucalypts and other tree species often present among or emerging above the Banksia canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The TEC is characterised by a high level of endemism and considerable localised variation in species composition across its range (TSSC 2016). The TEC listing covers approximately 20 sub-communities or Floristic Community Types (FTCs), some of which are more common while others are highly restricted and listed as Threatened or Priority ecological communities (PEC) in Western Australia (TSSC 2016). Banksia Woodlands provide habitat for nationally threatened flora/fauna species including Carnaby's Cockatoo and FRTBC (TSSC 2016). Carnaby's Cockatoo is expected to forage on the canopy and understorey of the community, whereas FRTBC is expected to forage on eucalypts, where these are present in the community (see Sections 3.2.1 and 3.2.2).

3.1.2 Survey

Main Roads commissioned GHD (2019) to complete a biological survey during spring 2018 over the DE and its vicinity, which included:

1. A single season detailed and targeted vegetation and flora survey that encompassed the DE with a 50 m approx. buffer (400 ha), which was defined as the survey area in GHD (2019)
2. Reconnaissance vegetation and flora survey over an extended survey area as defined in GHD (2019) (646.5 ha) including:
   - Land between Mitchell Freeway and Wanneroo Road, within Neerabup National Park, between Hester Avenue and Karaborup Road
   - Approximate 1.7 km long by 600 m wide corridor east of Wanneroo Road including part of Neerabup Nature Reserve
   - Approximate 1.9 km long by 700 m wide corridor around Romeo Road to the north.

The extended survey was undertaken to provide local context of environmental values, consistent with Environmental Protection Authority (EPA) *Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment* (2016) for linear corridor surveys. The extended survey also enabled definition of the wider extent and condition of patches of BWSCP TEC that occur within the DE.

Appendix A presents the biological survey report.

3.1.3 Extent and condition

To assist in the assessment of potential impacts to BWSCP TEC, the GHD (2019) survey and extended survey areas have been combined to present a total survey area.

The biological survey identified two vegetation types as representing the BWSCP TEC:

- VT01 – Banksia low woodland
- VT02 – Tuart / Banksia open woodland.

The biological survey concluded the two vegetation types were most likely representative of FCT 28: Spearwood *Banksia attenuata* or *Banksia attenuata* – Eucalyptus woodlands. FCT 28 is a relatively common sub-community of the BWSCP TEC and is not listed in Western Australia as a TEC under the *Biodiversity Conservation Act 2016* (BC Act). However FCT 28 is considered a component of the Commonwealth TEC due to key structural features as detailed by the TSSC (2016).

Figure 2, Table 3 and Table 4 present the extent and condition of patches of BWSCP TEC within the total survey area and DE. These patches meet the diagnostic criteria for the TEC including patch size and condition, using the condition rating scale devised by Keighery (1994) and adapted by EPA (2016). The patches are dissected by dirt roads, tracks and firebreaks which are less than 30 m wide and are not expected to significantly alter the functionality of the communities.

In summary, the BWSCP TEC covers approximately 350 ha over 13 patches within and in the vicinity of the DE. The TEC is predominantly (285.40 ha or 82% of total) contained within a single large patch (Patch 4), which is primarily located within Neerabup National Park. The remaining 12 patches are relatively small in area, varying from approximately 1 to 14 ha.

The DE covers approximately 50 ha of BWSCP TEC over seven patches. The TEC within the DE is relatively degraded compared to the TEC in the wider Survey Area, particularly that of Neerabup National Park. Within the DE, 57% of the TEC is in relatively poorer condition (Good to Completely Degraded), while in the Survey Area outside the DE, the vegetation is in much better condition with only 8% in Good to Completely Degraded condition (refer to Table 3 and Table 4). The relatively degraded condition of the TEC within the DE is expected given the DE lies over and is adjacent to existing disturbed areas along transport corridors and urban residential areas.

3.1.4 Local context

The local context for the BWSCP TEC was assessed through mapping of remnant vegetation complexes (Heddle *et al* 1980) associated with the TEC, as identified in the Conservation Advice (TSSC 2016). The results of the assessment are presented in Table 5 and Figure 3.

As presented in Table 5 and Figure 3, there are large areas of remnant vegetation complexes that may contain TEC in the vicinity of the DE, including large areas protected under Bush Forever and/or DBCA managed lands. Of the 5075 ha of remnant vegetation that may contain TEC mapped within 5 km of the DE, approximately 3047 ha (60%) lies within reserved lands.

375500 376000 376500 377000 377500 378000 378500

6503000 6502500 6502000 6501500 6501000 6500500 6500000 6499500

Legend

- Major Road
- Minor Road
- Development Envelope
- TEC Survey

Vegetation Conditions

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

Patch 11
Patch 11
Wanneroo Rd
Patch 1
Patch 1
Patch 1
Patch 1
Patch 1
Patch 1
Patch 1
Patch 2
Patch 2
Patch 2
Patch 2
Patch 3
Patch 3
Patch 3
Patch 3
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Patch 4
Neerabup National Park
SLIP

Paper Size ISO A3

0 100 200 300

Metres

N

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

GHD

Main Roads Western Australia
SR155 Mitchell Fwy Extension EPBC PD

Banksia Woodlands of the Swan Coastal Plain TEC

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FIGURE 2
Page 1 of 4

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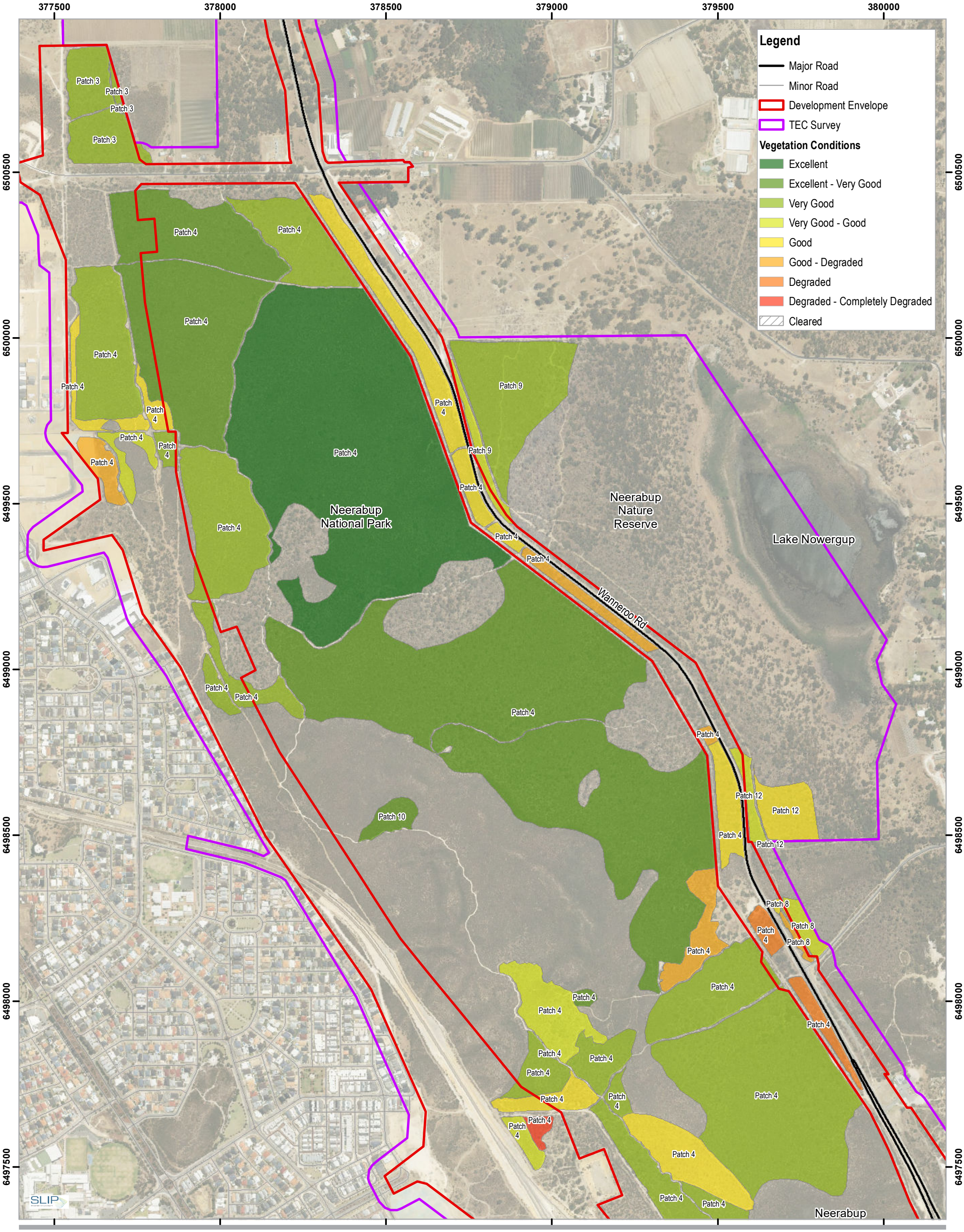
Print date: 10 Sep 2019 - 13:33

Data source: GHD: EPBC Development Envelope - 20190531, TEC Survey Area - 20190220, Banksia Woodlands of the SCP TEC - 20190604; LGATE: Imagery - April 2019; MRWA: Road network - 20190114.
Created by: afeeney



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Metres

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

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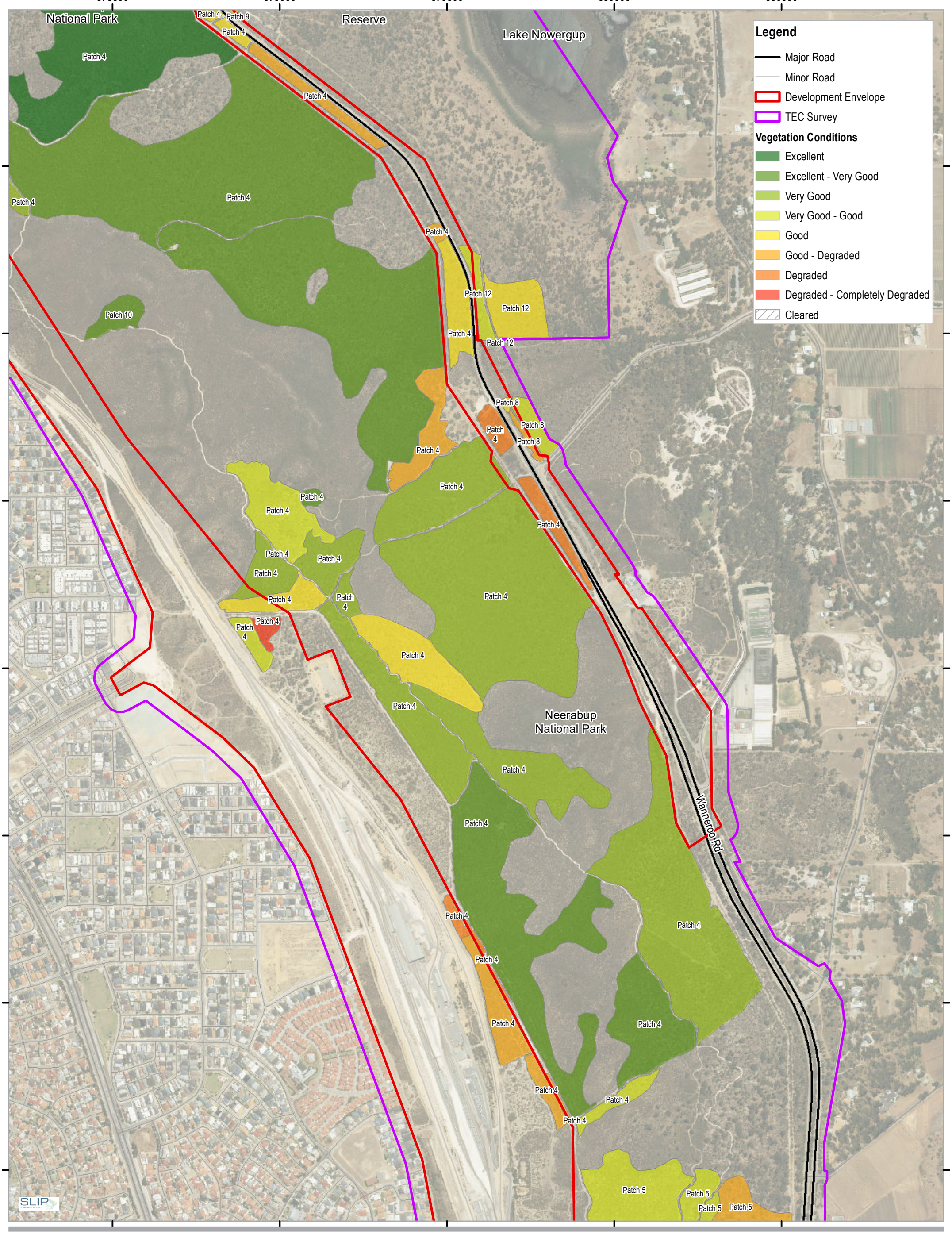

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Metres

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FIGURE 2
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Created by: afeeney

379000 379500 380000 380500 381000 381500

6498500 6498000 6497500 6497000 6496500 6496000 6495500

Neerabup National Park

Wanneroo Rd

Legend

- Major Road
- Minor Road
- Development Envelope
- TEC Survey

Vegetation Conditions

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

Patch 4 Patch 5 Patch 6 Patch 7 Patch 8 Patch 12 Patch 13

SLIP

Paper Size ISO A3

0 100 200 300

Metres

N

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

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FIGURE 2
Page 4 of 4

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Print date: 10 Sep 2019 - 13:34

Data source: GHD: EPBC Development Envelope - 20190531, TEC Survey Area - 20190220, Banksia Woodlands of the SCP TEC - 20190604; LGATE: Imagery - April 2019; MRWA: Road network - 20190114.
Created by: afeeney

Table 3 Banksia Woodlands of the Swan Coastal Plain TEC – patches within the total survey area

Patch No.	Extent within total survey area (ha)	Area of VT01 (ha)	Area of VT02 (ha)	Vegetation Condition – Area (ha)								Patch area within DE to be potentially cleared	
				Excellent	Excellent-Very Good	Very Good	Very Good-Good	Good	Good-Degraded	Degraded	Degraded – Completely Degraded	Area (ha)	Proportion
1	12.04	12.04	-	-	-	7.41	-	3.62	-	1.01		-	-
2	2.90	2.90	-	-	-	1.86	-	-	-	1.03		-	-
3	5.90	5.90	-	-	-	5.90	-	-	-	-		5.73	97%
4	285.40	284.18	1.22	50.22	109.22	89.86	7.34	16.58	9.00	2.66	0.53	37.57	13%
5	14.14	10.03	4.11	-	-	-	10.80	0.00	3.34	-		-	-
6	0.07	0.07	-	-	-	-	0.07	-	-	-		-	-
7	1.71	1.71	-	-	-	-	1.71	-	-	-		-	-
8	1.37	1.37	-	-	-	-	0.99	0.10	0.28	-		0.43	31%
9	10.74	10.74	-	-	-	9.46	1.27	-	-	-		0.26	2%
10	1.29	1.29	-	-	1.29	-	-	-	-	-		-	-
11	4.43	1.38	3.05	-	-	-	-	4.43	-	-		2.76	62%
12	3.81	-	3.81	-	-	-	0.98	2.82	-	-		0.20	5%
13	5.84	5.84	-	-	-	-	5.75	0.00	-	0.09		3.11	53%
TEC total (ha)	**349.64**	**337.46**	**12.18**	**50.22**	**110.51**	**114.51**	**28.85**	**27.61**	**12.62**	**4.79**	**0.53**	**50.07**	**14%**
Proportion of TEC total	100%	97%	3%	14%	32%	33%	8%	8%	4%	1%	0%		
TEC within DE to be potentially cleared (ha)	**50.07**	**47.27**	**2.80**	**0.00**	**4.41**	**16.74**	**5.61**	**13.73**	**6.52**	**2.53**	**0.53**		
Proportion of total within DE to be potentially cleared	14%	14%	23%	0%	4%	15%	19%	50%	52%	53%	100%		
TEC outside DE to be avoided (ha)	**299.57**	**290.19**	**9.38**	**50.22**	**106.10**	**97.76**	**23.23**	**13.89**	**6.11**	**2.26**	**0.00**		
Proportion of TEC outside DE	100%	97%	3%	17%	35%	33%	8%	5%	2%	1%	0%		

Table 4 Banksia Woodlands of the Swan Coastal Plain TEC – patches within the Development Envelope

Patch No.	Area within DE (ha)	Area of VT01 (ha)	Area of VT02 (ha	Vegetation Condition – Area (ha)							
				Excellent	Excellent-Very Good	Very Good	Very Good-Good	Good	Good-Degraded	Degraded	Degraded – Completely Degraded
3	5.73	5.73	-	-	-	5.73	-	-	-	-	
4	37.57	36.35	1.22	-	4.41	11.01	2.07	10.87	6.24	2.44	0.53
8	0.43	0.43	-	-	-	-	0.06	0.09	0.28	-	
9	0.26	0.26	-	-	-	-	0.26	-	-	-	
11	2.76	1.38	1.38	-	-	-	-	2.76	-	-	
12	0.20	-	0.20	-	-	-	0.20	-	-	-	
13	3.11	3.11	0.00	-	-	-	3.02	-	-	0.09	
Total	**50.07**	**47.27**	**2.80**	**-**	**4.41**	**16.74**	**5.61**	**13.73**	**6.52**	**2.53**	0.53
Proportion of TEC within DE	**100%**	**94%**	**6%**	**0%**	**9%**	**33%**	**11%**	**27%**	**13%**	**5%**	**1%**

375000 380000 385000

6505000 6500000 6495000 6490000

Legend

- Development Envelope
- 5 km Buffer
- DBCA Legislated Lands and Waters
- Bush Forever
- Conservation Category Wetland

Vegetation Complexes associated with the TEC

- Strong
- Moderate
- Minor
- None

YANCHEP
EGLINTON
PINJAR
CARABOODA
ALKIMOS
NOWERGUP
JINDALEE
BUTLER
QUINNS ROCKS
MERRIWA
RIDGEWOOD
NEERABUP
CLARKSON
MINDARIE
BANKSIA GROVE
CARRAMAR
TAMALA PARK
KINROSS
BURNS BEACH
TAPPING
WANNEROO
JOONDALUP
MARIGINIUP
CURRAMBINE
ASHBY
ILUKA
SINAGRA

Landgate / SLIP

Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

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

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Banksia Woodlands of the Swan Coastal Plain TEC – local context

Project No. **61-38302**
Revision No. **0**
Date **21/08/2019**

FIGURE 3

G:\61\38302\GIS\Maps\Working\Figures\6138302_003_HeddleVegetation_Rev0.mxd
Print date: 21 Aug 2019 - 12:45

Data source: GHD: EPBC Development Envelope - 20190531; ABS: Local Government Areas - 20190220; DBCA: Carnabys Cockatoo Areas requiring investigation as feeding habitat in the Swan Coastal Plain (SCP) IBRA Region - 20181127, DBCA Legislated Lands and Water - 20170730, Geomorphic Wetlands - 20190509; DoP: Bush Forever - 20180123; MRWA: Ecological community, Vegetation Complexes associated with the TEC, Road network - 20190114; LGATE: Imagery - August 2018; Geoscience Australia: Geodata topo series 3. Created by: afeeney

Table 5 Banksia Woodlands of the Swan Coastal Plain TEC – local context

Complex	Association with TEC as per TSSC (2016)	Extent remaining within DE (ha)	Extent remaining within 5km of DE (ha)	Extent within 5km and within DBCA lands and/or Bush Forever	Proportion within DBCA lands and/or Bush Forever	DE as a proportion of extent within 5km
Cottesloe Complex Central And South	Minor	121	4734	2716	57%	2.55%
Cottesloe Complex North	Strong	0	158	148	93%	nil
Karrakatta Complex Central And South	Moderate	0	183	183	100%	nil
Total		**121**	**5075**	**3047**	**60%**	**2.38%**

3.2 Black Cockatoos

3.2.1 Carnaby's Cockatoo

Carnaby's Cockatoo is listed as Endangered under the EPBC Act and Schedule 2 under the BC Act. The species is endemic to the south-west of Western Australia. Its range and abundance has significantly reduced due to land clearing for agriculture, forestry and urban development. It faces continuing threats on the SCP as important feeding habitat is cleared.

Carnaby's Cockatoos breed in eucalypt woodlands between the Stirling Range and Three Springs. The Proposal is within the known breeding range of the species (DSEWPaC 2012). The species nests in hollows in live or dead trees of *Eucalyptus salmonophloia* (Salmon Gum), *E. wandoo* (Wandoo), *E. gomphocephala* (Tuart), *E. marginata* (Jarrah), *E. rudis* (Flooded Gum), *E. loxophleba* subsp. *loxophleba* (York Gum), *E. accedens* (Powderbark), *E. diversicolor* (Karri) and *Corymbia calophylla* (Marri). Breeding occurs mainly from July to mid-December.

There has been a shift in the breeding range of this species since the middle of the last century to the west and south, with a more rapid shift in the past 10 to 30 years, moving into the Tuart forests of the SCP and the Jarrah Marri forests of the Darling Scarp (Johnstone and Kirkby 2009). The closest recorded breeding site is located approximately 14 km to the south of the Proposal, at Joondalup (Johnstone, R 2019, pers. comm.).

Breeding success for Carnaby's Cockatoo is largely dependent on suitable feeding habitat adjacent to the nest site, to provide the necessary food for the survival of the chick. Breeding individuals forage no more than approximately 20 km from their nesting hollows, so having sufficient foraging resources close to breeding areas (particularly within a 12 km radius) is critical to its breeding success.

The species is a post-nuptial nomad with many individuals spending the non-breeding season on the SCP (including the Perth metropolitan region) from December to July. Some non-breeding individuals (usually juveniles) will remain on the SCP during the breeding season. The species feeds in the canopy and understorey. On the SCP, important foraging species consist of *Banksia attenuata*, *B. menziesii*, *B. grandis*, *B. ilicifolia*, *B. sessilis*, *B. prionotes*, Marri, Jarrah and non-native *Pinus* species (Valentine and Stock 2008, Higgins 1999).

3.2.2 Forest Red-tailed Black Cockatoo

The FRTBC is listed as Vulnerable under the EPBC Act and Schedule 3 under the BC Act. This subspecies is endemic to the southwest of Western Australia. It displays erratic breeding activity in the summer and winter seasons (Kirkby 2018). These birds primarily nest in hollows of large, mature Marri trees and to a lesser extent Jarrah, Blackbutt Bullich and Wandoo (Johnstone, Kirkby and Sarti 2013). Key breeding areas are within the Jarrah-Marri forest of the Darling Scarp/Plateau or adjacent areas of the SCP, with limited records on the western extent of the SCP (e.g. at Murdoch University and possibly Perry Lakes) (Johnstone, Kirkby and Sarti 2017). The closest recorded breeding site is approximately 30 km to the east of the Proposal, at Ellenbrook (Johnstone, R 2019, pers. comm.).

The FRTBC is a canopy feeder, with a diet primarily consisting of seeds of Marri and Jarrah and, in recent times, the seeds of *Melia azedarach* (Cape Lilac) (Johnstone, Kirkby and Sarti 2017). Other, less important foods include *E. patens* (Blackbutt), Karri, *Allocasuarina fraseriana* (Sheok), *Persoonia longifolia* (Snotty Gobble), *Hakea* spp., Tuart and *E. decipien*s (Johnstone, Kirkby and Sarti 2017).

3.2.3 Survey

The biological survey commissioned by Main Roads for the DE and its vicinity included a Level 2 fauna assessment and targeted habitat assessment for Carnaby's Cockatoo and FRTBC. The habitat assessment included assessment of the presence, quality and extent of habitat, using definitions of breeding, foraging and night roosting habitat in accordance with DSEWPaC (2012) Black Cockatoo referral guidelines (GHD 2019). The survey included identification of potential breeding trees within an area that encompassed the DE with a buffer, which was defined as the survey area in GHD (2019). The initial survey was completed in August 2018, with follow-up monitoring in November 2018 and January/February 2019 for trees with potential Black Cockatoo breeding hollows. Twenty nine tree plots were employed in the extended survey area (as defined in GHD (2019)) in August 2019 to extrapolate Black Cockatoo habitat and potential for trees with potential Black Cockatoo breeding hollows.

Appendix A presents the biological survey report.

3.2.4 Habitat assessment

Carnaby's Cockatoo and FRTBC individuals were recorded flying and foraging within the DE and extended survey area (GHD 2019). The largest group of Carnaby's Cockatoo recorded consisted of 17 birds, while the largest group of FRTBC recorded consisted of 7 birds (GHD 2019).

Breeding habitat

Black cockatoo breeding habitat is considered to consist of tree species known to support breeding within the range of the species, which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow (being greater than 500 mm DBH for most Eucalypts or 300 mm in the case of Wandoo and Salmon Gum) (DSEWPaC 2012). The suitable DBH trees are referred to within this Preliminary Documentation as 'potential breeding trees', however this does not mean that such trees contain hollows or suitable hollows for nesting.

GHD (2019) identified a total of 328 potential breeding trees within the DE, as presented in Table 6 and Figure 4. Of these trees, eight had hollows with sufficient external/internal dimensions suitable for breeding or demonstrating signs of use. These trees had between one to four potentially suitable hollows present for a total of 22 suitable hollows, which were assessed via visual inspection and/or via a pole camera (if within 12 m from the ground). The 22

suitable hollows were monitored in August, November and January/February 2018/2019, during which no Black Cockatoo use was evident or recorded (GHD 2019).

Table 6 Potential Black Cockatoo breeding trees within the Development Envelope

Tree species	Number of potential breeding trees	Number of trees with suitable hollows (large or signs of use)	Number of suitable hollows (large/medium or signs of use)*
Tuart	256	8	22
Jarrah	58	-	-
Marri	11	-	-
Flooded Gum	2	-	-
Other eucalypt species	1	-	-
Total	328	8	22

The biological survey included 29 tree plots in the extended survey area, recording a total of 151 potential breeding trees for an average of approximately 5.2 trees per 0.25 ha plot or approximately 20.8 trees/ha (GHD 2019). This density of trees was comparable to the density recorded in the targeted black cockatoo habitat assessment of the DE. The tree plot data suggests the survey area outside the DE may support in the order of 2800 potential breeding trees, based on an average of 20.8 trees per ha over the 134.56 ha of Tuart forest and Jarrah woodland mapped in the survey area outside the DE. The extent of potential breeding trees may be greater including scattered trees in other vegetation/fauna habitat types such as Banksia woodlands and cleared/disturbed areas.

The DE is considered to represent breeding habitat for Carnaby's Cockatoo, given it is located within the modelled breeding range (DSWEPaC 2012), the availability of potential breeding trees with suitable hollows, and the availability of quality foraging resources in the vicinity. No evidence of breeding was recorded within the DE during the monitoring of potentially suitable hollows over the 2018/19 breeding period, despite the occupation and foraging by Carnaby's Cockatoos in the DE and extended survey area.

The DE is not considered to represent breeding habitat for the FRTBC as the DE is beyond the mapped breeding area for this species, which is predominantly within Jarrah-Marri forest of the Darling Scarp/Plateau (approximately 30 km to the east). Breeding on the SCP has been limited to isolated locations to the south (e.g. Murdoch University) or to the east closer to the Darling Scarp (e.g. Ellenbrook and Mundijong). FRTBC breeding habitat typically comprise very large and very old Marri trees (Johnstone, Kirkby and Sarti 2013). The Marri trees within the DE do not have suitable hollows for Black Cockatoos. While the species has more recently been utilising and persisting in the northern portions of the SCP (Johnstone, Kirby and Sarti 2017) this has been related to foraging rather than breeding (Johnstone R. 2019, pers. comm.).

375500 376000 376500 377000 377500 378000 378500

6503000 6502500 6502000 6501500 6501000 6500500 6500000 6499500

Legend

Black Cockatoo potential breeding trees

- Flooded Gum
- Eucalyptus sp.
- Jarrah
- Marri
- Tuart
- Trees with suitable hollows (monitored sites)
- Major Road
- Minor Road
- Development Envelope
- Total Survey Area

Forest Red-tailed Black Cockatoo

- Quality
- Low Quality

Carnaby's Cockatoo

- Quality
- Low Quality

Trian Rd

Romeo Rd

Wanneroo Rd

Neerabup National Park

SLIP

Paper Size ISO A3

0 100 200 300

Metres

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

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Black Cockatoo Foraging and Breeding Habitat

Project No. **61-38302**
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FIGURE 4
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G:\61\38302\GIS\Maps\Working\Figures\6138302_004_BlackCockForagingBreedingHabitat_Rev0.mxd
Print date: 10 Sep 2019 - 13:46

Data source: GHD: EPBC Development Envelope - 20190531, Black Cockatoo Potential Breeding Trees, Trees with suitable hollows (monitored sites) - 20190225, Black Cockatoo Foraging Habitat - 20190305; LGATE: Imagery - August 2018; MRWA: Road network - 20190114. Created by: afeeney

377500 378000 378500 379000 379500 380000

6500500 6500000 6499500 6499000 6498500 6498000 6497500

Legend

Black Cockatoo potential breeding trees

- Flooded Gum
- Eucalyptus sp.
- Jarrah
- Marri
- Tuart
- Trees with suitable hollows (monitored sites)
- Major Road
- Minor Road
- Development Envelope
- Total Survey Area

Forest Red-tailed Black Cockatoo

- Quality
- Low Quality

Carnaby's Cockatoo

- Quality
- Low Quality

Wanneroo Rd

Neerabup National Park

Neerabup Nature Reserve

Lake Nowergup

Wanneroo Rd

SLIP

Paper Size ISO A3

0 100 200 300

Metres

N

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

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Black Cockatoo Foraging and Breeding Habitat

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FIGURE 4
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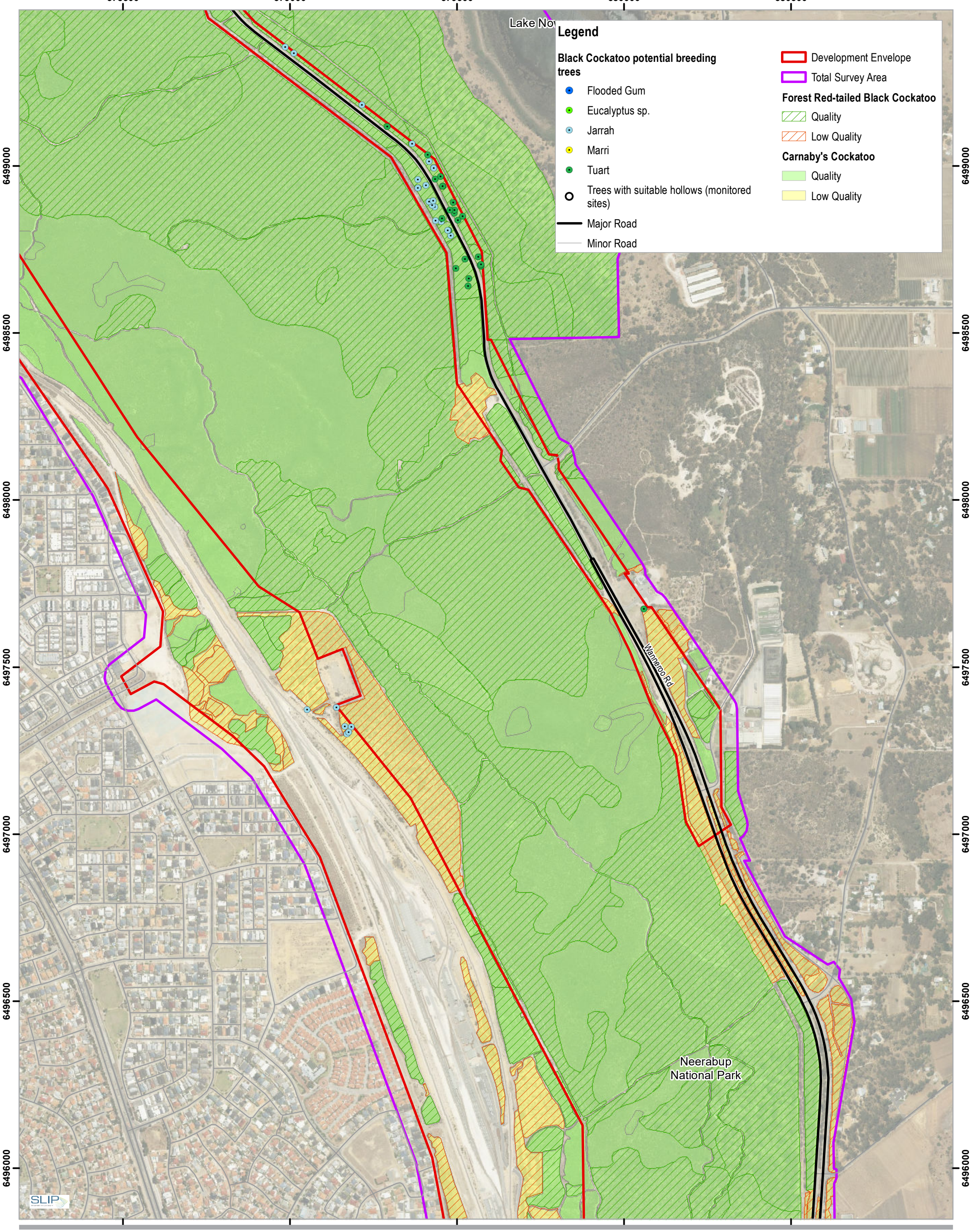
Print date: 10 Sep 2019 - 13:47

Data source: GHD: EPBC Development Envelope - 20190531, Black Cockatoo Potential Breeding Trees, Trees with suitable hollows (monitored sites) - 20190225, Black Cockatoo Foraging Habitat - 20190305; LGATE: Imagery - August 2018; MRWA: Road network - 20190114. Created by: afeeney



Paper Size ISO A3

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Metres

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

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Black Cockatoo Foraging and Breeding Habitat

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FIGURE 4
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Print date: 10 Sep 2019 - 13:47

Data source: GHD: EPBC Development Envelope - 20190531, Black Cockatoo Potential Breeding Trees, Trees with suitable hollows (monitored sites) - 20190225, Black Cockatoo Foraging Habitat - 20190305; LGATE: Imagery - August 2018; MRWA: Road network - 20190114. Created by: afeeney

379000 379500 380000 380500 381000 381500

6498500 6498000 6497500 6497000 6496500 6496000 6495500

Legend

Black Cockatoo potential breeding trees

- Flooded Gum
- Eucalyptus sp.
- Jarrah
- Marri
- Tuart
- Trees with suitable hollows (monitored sites)
- Major Road
- Minor Road
- Development Envelope
- Total Survey Area

Forest Red-tailed Black Cockatoo

- Quality
- Low Quality

Carnaby's Cockatoo

- Quality
- Low Quality

Wanneroo Rd

Neerabup National Park

Hester Av

SLIP

Paper Size ISO A3

0 100 200 300

Metres

N

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

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FIGURE 4
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G:\61\38302\GIS\Maps\Working\Figures\6138302_004_BlackCockForagingBreedingHabitat_Rev0.mxd
Print date: 10 Sep 2019 - 13:47

Data source: GHD: EPBC Development Envelope - 20190531, Black Cockatoo Potential Breeding Trees, Trees with suitable hollows (monitored sites) - 20190225, Black Cockatoo Foraging Habitat - 20190305; LGATE: Imagery - August 2018; MRWA: Road network - 20190114. Created by: afeeney