ENVIRONMENTAL FEASIBILITY ASSESSMENT OF A POTENTIAL SANDPIT ON LOT 751 PLAN 49008 BEELERUP

PREPARED FOR:

FRONTINO FAMILY

DECEMBER 2013

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MEMORANDUM

Attention:	Carmel Frontino	From:	Kirsi Kauhanen
Company:	-	Date:	19 December 2013
Subject:	Environmental Feasibility Assessment	Project:	Lot 751 Plan 49008 Beelerup

Please advise if any part of this transmission failed or was misdirected.

1. INTRODUCTION

MBS Environmental was engaged by landowner Carmel Frontino and family to undertake a desktop assessment of a potential sandpit in the southern portion of Lot 751 on Plan 49008 in Beelerup ('Project Area') presented in Figure 1. A Level 1 vegetation and flora survey and a Level 1 fauna survey were undertaken to provide additional ecological information to support this assessment. The purpose of the assessment was to identify potential environmental and planning issues involved with the site and their likely implications on the approval processes. Results of the assessment are summarised in this document.

2. ZONING

In the Shire of Donnybrook-Balingup Town Planning Scheme Number 4, Lot 751 is zoned 'General Farming Pastoral' (Figure 2). Extractive industry operations in this zone are subject to an approval being granted by the Shire Council.

It is noted that the Planning Scheme Number 4 identifies a 'Road Protection Area' along Donnybrook - Boyup Brook Road that runs along the northern edge of Lot 751. The purpose of this zone is to protect the function, amenity and visual character of these roads. The zone extends to 50 m either side of the centre line. Whilst the impact of the zone on extractive industry is not specified in the Scheme text, it can be presumed that any extractive operations should remain out of sight from the road.

Shire of Donnybrook-Balingup Extractive Industry Local Law sets general limits on excavation near property and other boundaries. Limits applicable to Lot 751 include 20 m setback from property boundaries and 40 m setback from any road (including any unformed road reserves). Excavation within these setbacks requires separate written approval from the local government.

3. SURROUNDING LANDUSE AND CLOSEST RESIDENCES

All adjacent properties are zoned 'General Farming Pastoral' apart from state owned Reserve 22860 to the southeast that is zoned as 'Parks and Recreation' and has been used for sand extraction. Within 500 m radius of Lot 751 there is also government owned land zoned for 'General Industry' (mainly undeveloped) and an unnamed nature reserve (R26238, further details in Section 7). Sand extraction has been undertaken on several of the surrounding properties. Despite this and other landuses, native vegetation has largely been retained on the surrounding properties forming a remnant of several hundred hectares.

An aerial photograph from 2012 was studied to identify closest residential dwellings and other sensitive premises and these are presented in Figure 3. Six residential dwellings were identified within 1 km radius of the project area, with only one of these located within 500 m radius (being Lot 750 Plan 49008). Further, Horseman's Club on adjoining Lot 3122 was identified as a sensitive premise. Noise, dust and other potential nuisance from the

extractive operations are unlikely to impact on the identified six residential dwellings, however may impact on the Horseman's Club.

4. SITE ACCESS

The Project Area is currently accessed from the north via Frontino Road that connects to the Donnybrook - Boyup Brook Road. However, the Town Planning Scheme Number 4 indicates that Frontino Road does not extend all the way to the Project Area but rather a narrow strip of land belonging to Lot 3122 (D12025) lies in between. This land is owned by the Shire of Donnybrook-Balingup and the use of this access for extractive industry purposes would need to be clarified with the Shire (contact with Shire made, waiting for response). An alternative unsealed access track to Lot 751 is present in the south, connecting to the Sandhills Road (Figure 2).

5. VEGETATION AND FLORA

Botanist Daniel Marsh undertook a Level 1 vegetation and flora survey of the Project Area on 11 November 2013. A complete survey report is provided as Appendix 1. The survey identified two vegetation communities occurring in the Project Area. The first community comprised open woodland of *Eucalyptus marginata* over a low open woodland of *Nuytsia floribunda*, *Xylomelum occidentale* or *Banksia* spp. over *Xanthorrhoea preissii*, *Dasypogon bromeliifolius* and *Patersonia* spp. The second community comprised low open woodland of *Nuytsia floribunda* and/or *Eucalyptus marginata* over a tall shrubland of *Kunzea glabrescens* over various weed species and the occasional native shrub. The two vegetation communities were similar, with the second one occurring in more degraded parts of the survey area. Both vegetation communities are well represented in the general area and Lot 751 is not considered significant as a remnant of native vegetation that has been extensively cleared. There are no known records of threatened ecological communities in the local area (10 km radius).

The vegetation and flora survey included a search for potential conservation significant species, including both Threatened and Priority species. Database searches identified 29 Threatened and Priority species as potentially occurring in the local area as listed in the survey report (Appendix 1). Search of the Project Area found three locations of *Acacia semitrullata* (Priority 4) presented in Figure 1 of Appendix 1. No other Priority species or any Threatened species were recorded. Priority 4 taxa are defined as species that have been adequately surveyed and that are currently not considered threatened, but that may become threatened in the future if circumstances change and as such these species are in need of monitoring. Generally the presence of Priority 4 taxa does not prevent obtaining a Clearing Permit for the area, although any future extractive operations should try to avoid the recorded individuals of *Acacia semitrullata* where possible.

Vegetation condition was assessed as part of the vegetation survey and the results are presented in Figure 2 of Appendix 1. Vegetation condition varied from completely degraded in the northern portion of the Project Area to very good and excellent in the southern parts of the property. The majority of the property was rated as degraded. It is considerably easier to obtain a Clearing Permit for vegetation in degraded condition than for vegetation in excellent condition. Considering that the area also forms part of an ecological linkage (see Section 6), retention of vegetation that is in excellent and very good condition should be considered in preparation of a Clearing Permit application.

Any Clearing Permit granted for the Project Area is likely to include a condition requiring revegetation of all working areas following completion of sand extraction. Such revegetation condition has been placed on all granted Clearing Permits in the local area.

6. ECOLOGICAL LINKAGES

The Project Area and surrounds form part of the South West Regional Ecological Linkages area. Lot 751 is located less than 100 m from the linkage line that roughly follows the Preston River and is thus classified as a 1a (core linkage) remnant. Impacts on ecological linkages are assessed as part of the Clearing Permit application process. Department of Environment Regulation (DER) has granted a clearing permit (CPS 3451) for a neighbouring property that also contributed to the linkage. In that proposal, clearing was limited to vegetation in

degraded condition, with vegetation in good condition being retained. Further, revegetation of cleared areas following completion of extractive operations was required.

7. CONSERVATION AREAS

The closest conservation area to Lot 751 is an unnamed nature reserve (R26238) approximately 500 m to the south. This reserve is managed by the Conservation Commission for the Purpose of conserving flora and fauna. Further, the Boyanup State Forest, Wellington State Forest and a Conservation Commission timber reserve are located within 5 km of Lot 751. Potential extractive operations on Lot 751 are unlikely to directly impact on any conservation area; however DER may raise the issue of indirect impacts via degradation of local ecological linkages.

8. WEEDS

The vegetation survey recorded several weed species, including one declared pest species *Asparagus asparagoides* (Bridal Creeper). Under the *Biosecurity and Agriculture Management Act 2007* (the BAM Act), all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management). Bridal Creeper is a C3 species meaning that the species is established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest. It is recommended that a weed management plan is prepared as part of any future extractive operations, in order to minimise the spread of weeds within the property and into other areas.

9. DIEBACK

Phytophthora dieback (mostly *P. cinnamomi*) is known to occur in the general area. No dieback survey has been undertaken on Lot 751. Some dieback susceptible species on the property (e.g. Jarrah and Banksia) appear to be in poor health or are dying, however other cause factors such as drought, pests and other diseases cannot be ruled out.

Some clients purchasing sand may ask for evidence that the sand resource is dieback free. The most feasible way to provide such evidence is to undertake a dieback survey of the property prior to vegetation clearing as such a survey involves sampling of vegetation. Dieback status of areas that have already been cleared of vegetation cannot be verified and are described as uninterpretable.

10. FAUNA

Zoologist Greg Harewood undertook Level 1 fauna assessment of the Project Area with field survey on 5 November 2013. A targeted assessment of the site for Western Ringtail Possum and several species of Black Cockatoos was also undertaken. These species are significant as they are protected by the Western Australian *Wildlife Conservation Act 1950* and the commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and are known to occur in the general area. A complete survey report is provided as Appendix 2, including results of database searches undertaken to build an inventory of species potentially occurring in the Project Area.

The field survey found evidence of three listed threatened species (Carnaby's and Baudin's black cockatoos and Forest red-tailed black cockatoo) and one migratory species (Rainbow bee-eater). No evidence of any priority species was recorded. The survey also found no evidence of Western Ringtail Possum and the vegetation within the Project Area was assessed as mostly unsuitable or at best marginal for this species. Rainbow bee-eater, recorded at the site is a common seasonal visitor to the general area and its presence in the Project Area is highly unlikely to impact on the success of any approval applications.

The confirmed occurrence of the three black cockatoo species in the Project Area is significant in terms of environmental approvals for an extractive project. Most of the remnant vegetation within the Project Area was found to represent foraging habitat for the black cockatoo species. Further, a habitat tree assessment was undertaken in line with guidelines from the commonwealth Department of Environment (DoE). The habitat tree

assessment identified 63 trees with diameter at breast height (DBH) of more than 50 cm (potential future nesting trees), with 24 of these trees containing visible hollows. Only four of these trees were considered to contain hollows large enough for black cockatoos and none of these hollows showed any evidence of past or present use. Locations of the habitat trees are presented in Figure 4 of Appendix 2.

The presence of black cockatoo foraging and nesting habitat in the Project Area is likely to trigger referral requirements to the DoE. Any future extractive operations should be planned taking into consideration the EPBC Act referral guidelines for three threatened black cockatoo species (available on the DoE website). Removal of habitat trees, particularly those with hollows large enough for black cockatoos should be avoided and disturbance of foraging vegetation (particularly vegetation in good or better condition) should be minimised. Disturbance of foraging or potential nesting habitat may require environmental offsets to be negotiated with the DoE.

The impacts of vegetation clearing on native fauna will also be assessed as part of the state Clearing Permit application process. It is recommended that vegetation clearing is limited to areas where vegetation condition is already poor and that areas in excellent and very good condition are retained. The quality of fauna habitat is generally directly related to the condition of the vegetation and consequently impacts on fauna can be minimised by limiting clearing on degraded areas.

11. SURFACE AND GROUNDWATER

No surface water is present within the Project Area. The closest expression of surface water to the Project Area is the Preston River approximately 700m to the north and the Thomson Brook approximately 1 km to the east. Potential extractive operations within the Project Area would be very unlikely to impact on either system.

Aquifers in the area have been described as unconfined and localised (Department of Water, Hydrogeological Atlas 2013). The Water Information Reporting tool by Department of Water was used to identify bores in the vicinity of the Project Area and obtain available information on groundwater levels. Only one potentially relevant bore was identified, located approximately 500 m to the northeast of the Project Area on Lot 34. The only groundwater level data for this bore is from 30 September 1989, when standing water level was found to be 12.1 m below ground level, equating to approximately 78 mAHD.

Groundwater level within the Project Area is uncertain and may need to be verified further. In accordance with Department of Water guidelines, sand extraction is required to remain at least 2 m above the maximum groundwater level in order to protect the groundwater resource. It is noted that sand extraction on adjacent Lot 74, located to the west of the Project Area, has not intersected the groundwater table and it is thus unlikely that operations within the Project Area would do so. Groundwater salinity in the general area has been estimated as TDS 0-1,000 mg/L which is defined under water quality guidelines/standards as fresh water.

12. LANDFORM

Approximate landform contours are presented in Figure 4. The elevations range from 95 mAHD to 120 mAHD, with majority of the Project Area sloping gently to the east-northeast.

13. OTHER CLEARING PERMITS

The following Clearing Permit applications were identified in the local area:

- CPS 934 - Shire of Donnybrook-Balingup, up to 26.9 ha, approved in 2007.
- CPS 3195 - Greenside enterprises, 0.1 ha, refused.
- CPS 3451 - TG and JD Sheenan, 3 ha, approved in 2010.
- CPS 4283 - G and S Delfino, 1 ha, approved in 2011.

Copies of these Clearing Permit decisions, including assessment reports, are available on the website of DER at http://der.wa.gov.au/your-environment/native-vegetation/27-clearing-permits.

14. REQUIREMENTS FOR EXTRACTIVE APPROVAL

The results of the feasibility assessment indicate the following in relation to the necessary extractive approvals:

- **Clearing Permit from Department of Environment Regulation:** Clearing Permit applications are assessed against ten clearing principles. Review of decision reports for other Clearing Permit applications in the local area indicate that depending on the scale of the proposed clearing within the Project Area, the proposal may be assessed as 'may be at variance' to some of the clearing principles, most possibly in relation to impacts on fauna and conservation areas. Overall the outlook for a Clearing Permit is viewed as positive due to Clearing Permits having been granted for other proposals in the local area comprising similar vegetation.
- **EPBC Approval from commonwealth Department of Environment:** Due to the presence of black cockatoo foraging habitat and potential breeding habitat within the Project Area, any proposal to clear vegetation for a sandpit will require referral to the DoE. Prior to such a referral, efforts should be made to plan the proposal so that impacts on black cockatoos are either avoided or minimised. Depending on the scale of residual impacts on the species, an environmental offset package may need to be developed. Offsets may include for example improving or re-establishing black cockatoo foraging and nesting habitat and placing land under conservation covenant. Overall the outlook for an EPBC approval is viewed as positive, as long as impacts on black cockatoos can be minimised and there is willingness to offer additional offsets if need be.
- **Extractive Industry Licence from Shire of Donnybrook-Balingup:** Contact has been made with Principal Planner Bob Wallin at the Shire in order to obtain preliminary feedback on feasibility of sand extraction on Lot 751 and response is expected in the next few weeks. On the basis of information available on zoning and landuse of Lot 751 and the surrounds, there appears to be no barriers to sand extraction on Lot 751. Sand extraction has occurred on several of the neighbouring properties, which indicates that sand extraction has been found to be an acceptable landuse in the local area.

15. POTENTIAL EXTRACTIVE AREA

On the basis of the findings of the vegetation and flora survey, the fauna survey and the desktop assessment, the most feasible areas (High Feasibility) with respect to clearing vegetation and avoiding impacts to conservation significant fauna and habitat within the Project Area are the degraded areas as presented in Figure 5. The selected area avoids the four trees with significant hollows and excludes the southern portion of the Project Area that was found to have high environmental values (Low Feasibility). The High Feasibility area would have minimal impact on the environment and should minimise the need for environmental offsets.

A Potential Extractive Area of approximately 14.5 ha has been delineated (Figure 5) which incorporates most of the degraded areas and some of the intact vegetation. The area maximises the potential sand resource within the southern portion of Lot 751 while minimising the impact (less than 46%) on the intact higher value vegetation and habitat.

It may also be desirable to pursue an exemption to the setback along the western boundary of the Potential Extractive Area. On the western side, there is an old sandpit on Lot 74 (P23472) and connecting this old pit with the proposed sandpit on Lot 751 would achieve a more even and stable post-extraction landform across the area. There is a narrow strip of land between Lot 751 and Lot 74 that forms part of Lot 3122 (D12025) and an agreement would also need to be reached on the associated sand resource with the land owner Shire of Donnybrook-Balingup.

Another option to explore would be the potential to resume or arrange a land swap of the southern portion of Lot 3122 which appears not to be used by the Horseman's Club. This would provide additional degraded land for clearing and extraction.

MBS Environmental has experience in obtaining environmental and other approvals required by extractive industry operations, including handling of potential appeal processes and negotiating of environmental offset agreements. Please do not hesitate to contact us should you require any further assistance with this project.

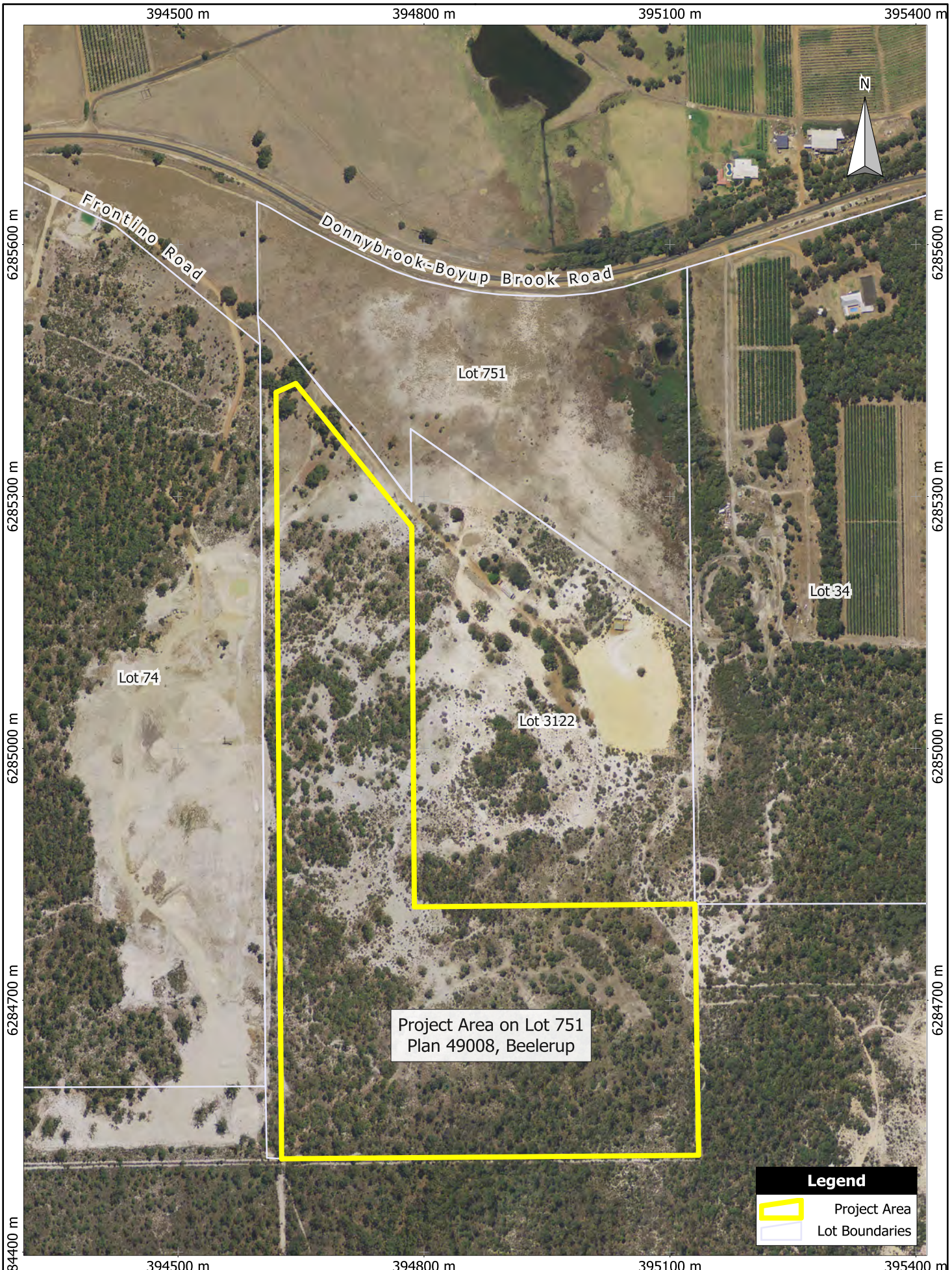
Yours sincerely
MBS Environmental

Kirsi Kauhanen
Senior Environmental Scientist

enc. Figure 1: Project Area
Figure 2: Zoning
Figure 3: Sensitive Premises
Figure 4: Landform Contours
Figure 5: Feasibility Assessment

Appendix 1: Level 1 Flora Survey
Appendix 2: Fauna Assessment

Figures



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Frontino and Family
Lot 751 Plan 49008 Beelerup
Environmental Feasibility Assessment

Figure 1

Project Area

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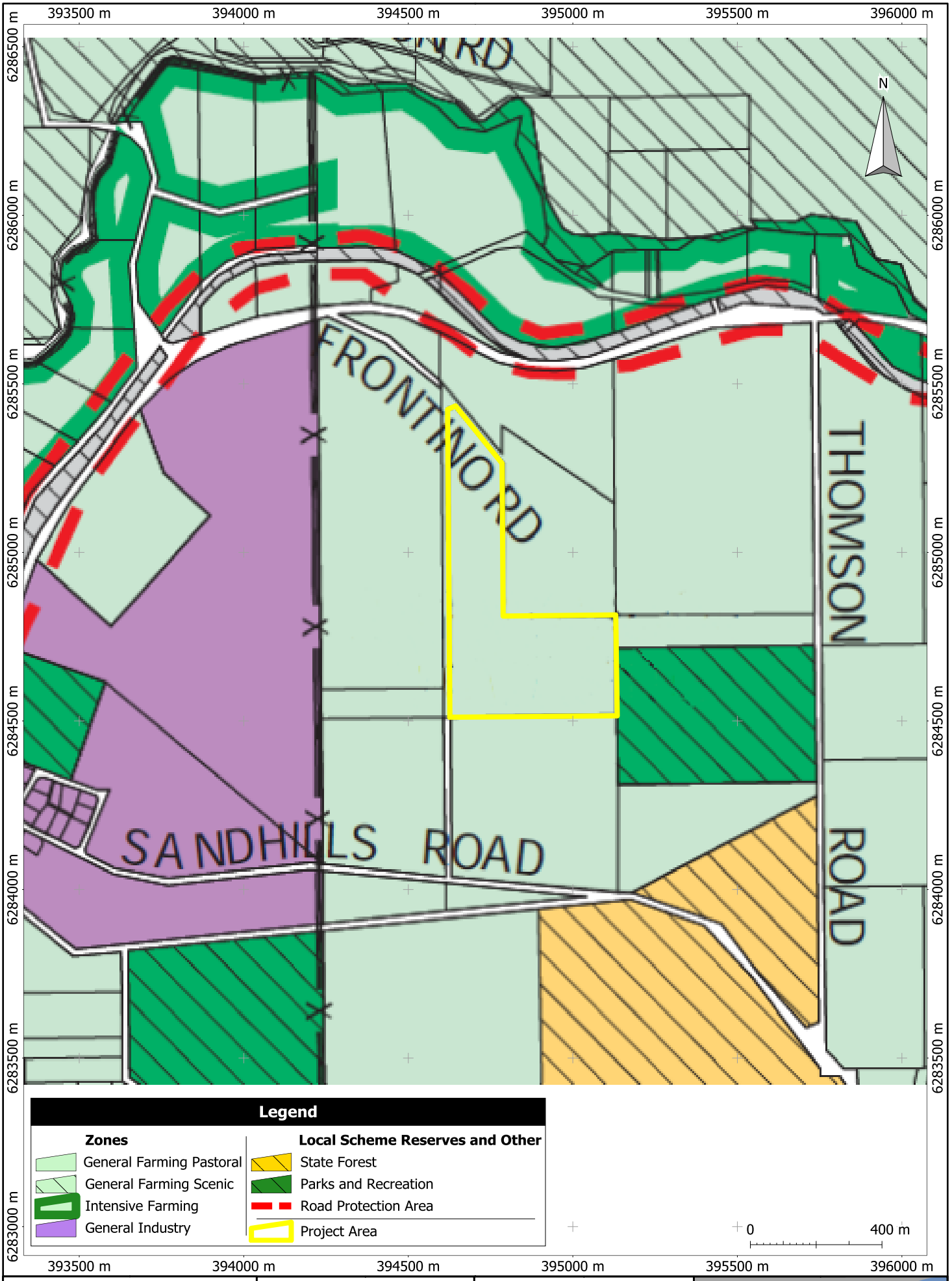

Scale: 1:15000 Original Size: A4 Grid: MGA94(50) Source: Shire of Donnybrook-Balingup Town Planning Scheme No 4.	Frontino and Family Lot 751 Plan 49008 Beelerup Environmental Feasibility Assessment	**Figure 2** **Zoning**	Martinick Bosch Sell Pty Ltd 4 Cook St West Perth WA 6005 Ph: (08) 9226 3166 Fax: (08) 9226 3177 info@mbsenvironmental.com.au www.mbsenvironmental.com.au MBS ENVIRONMENTAL

W:\Frontino\Drawings\Assessment Memo Map.map 10/12/2013 F2 Zoning Layout

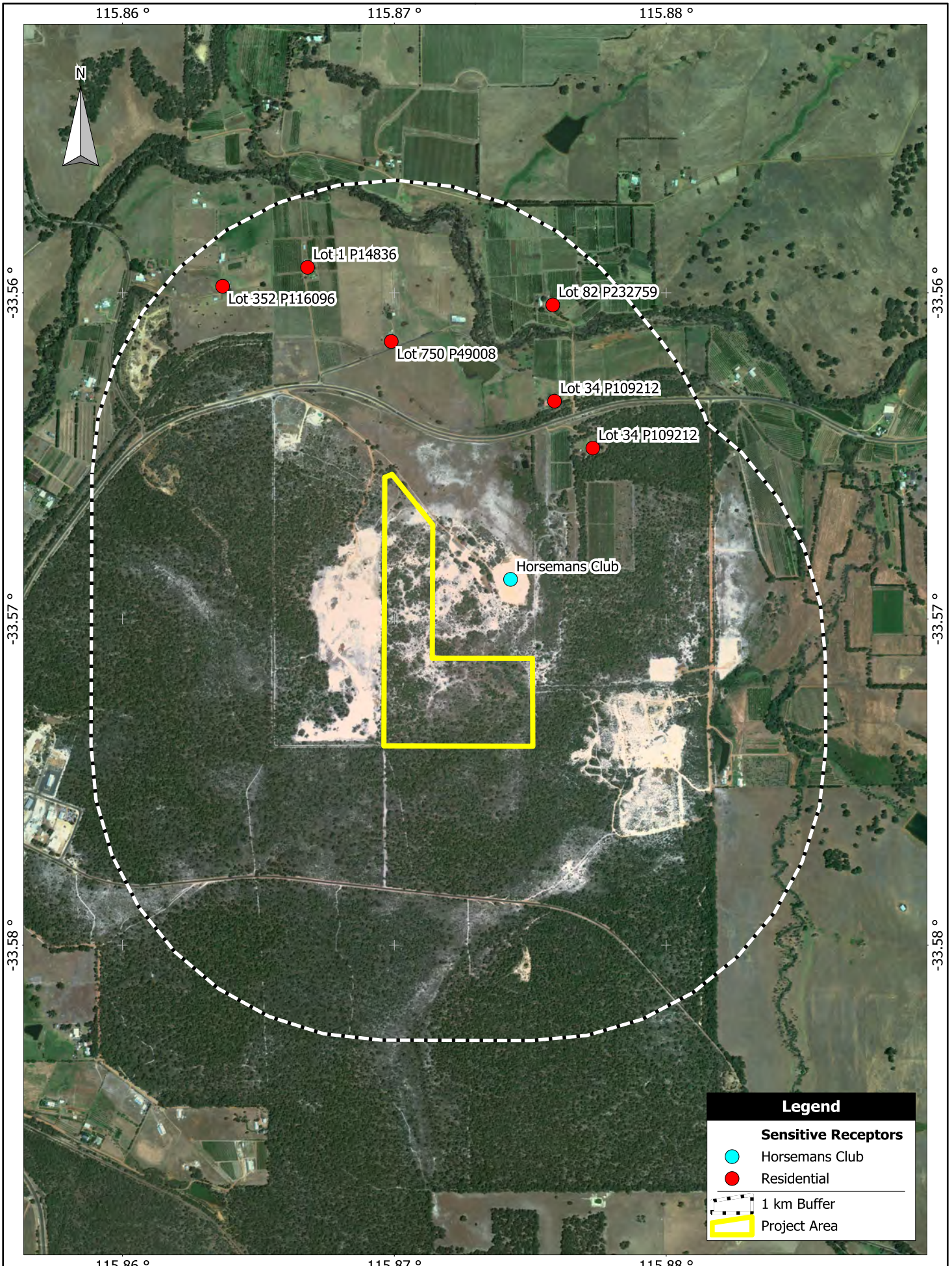

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Figure 3

Sensitive Receptors

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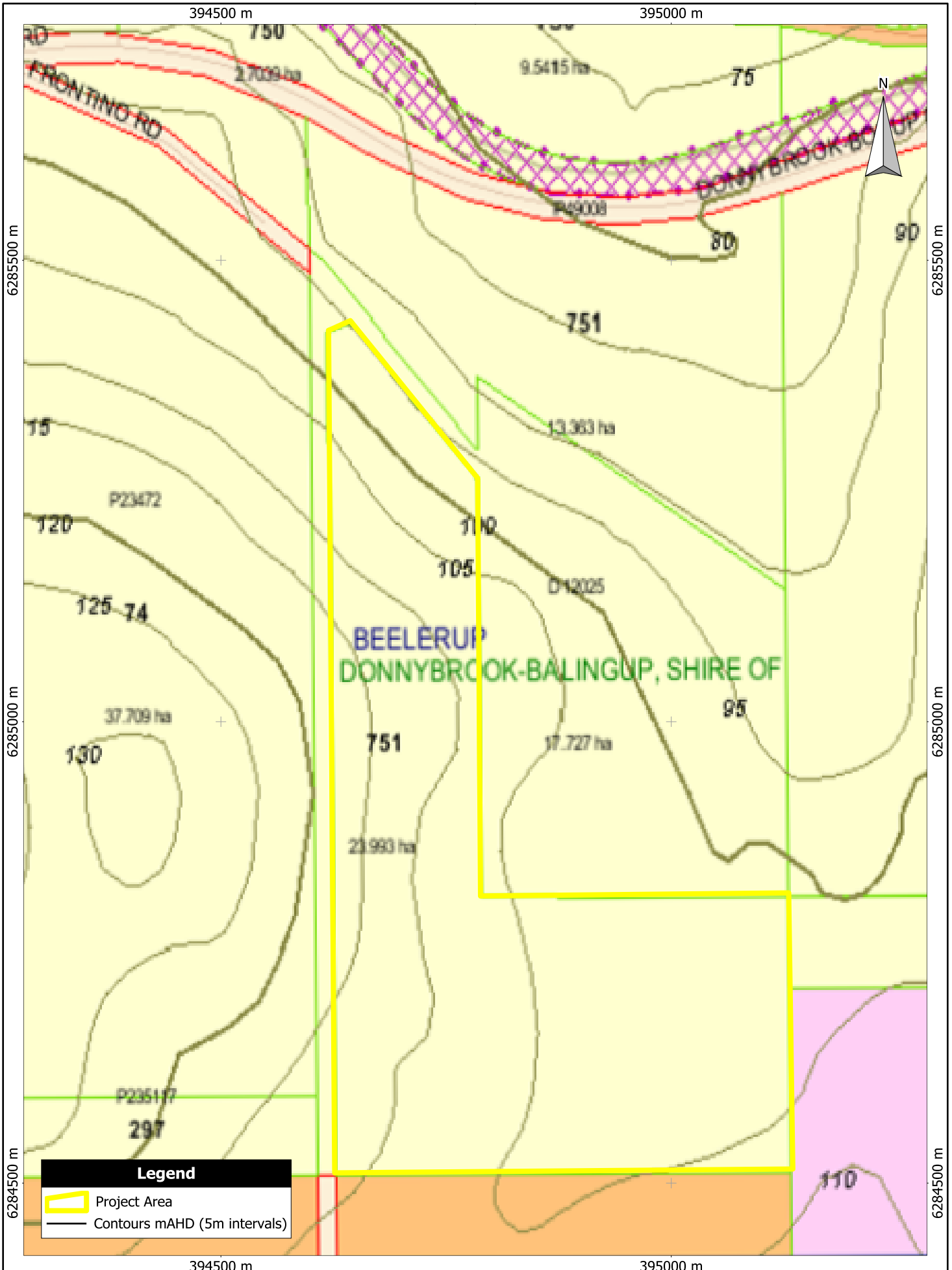
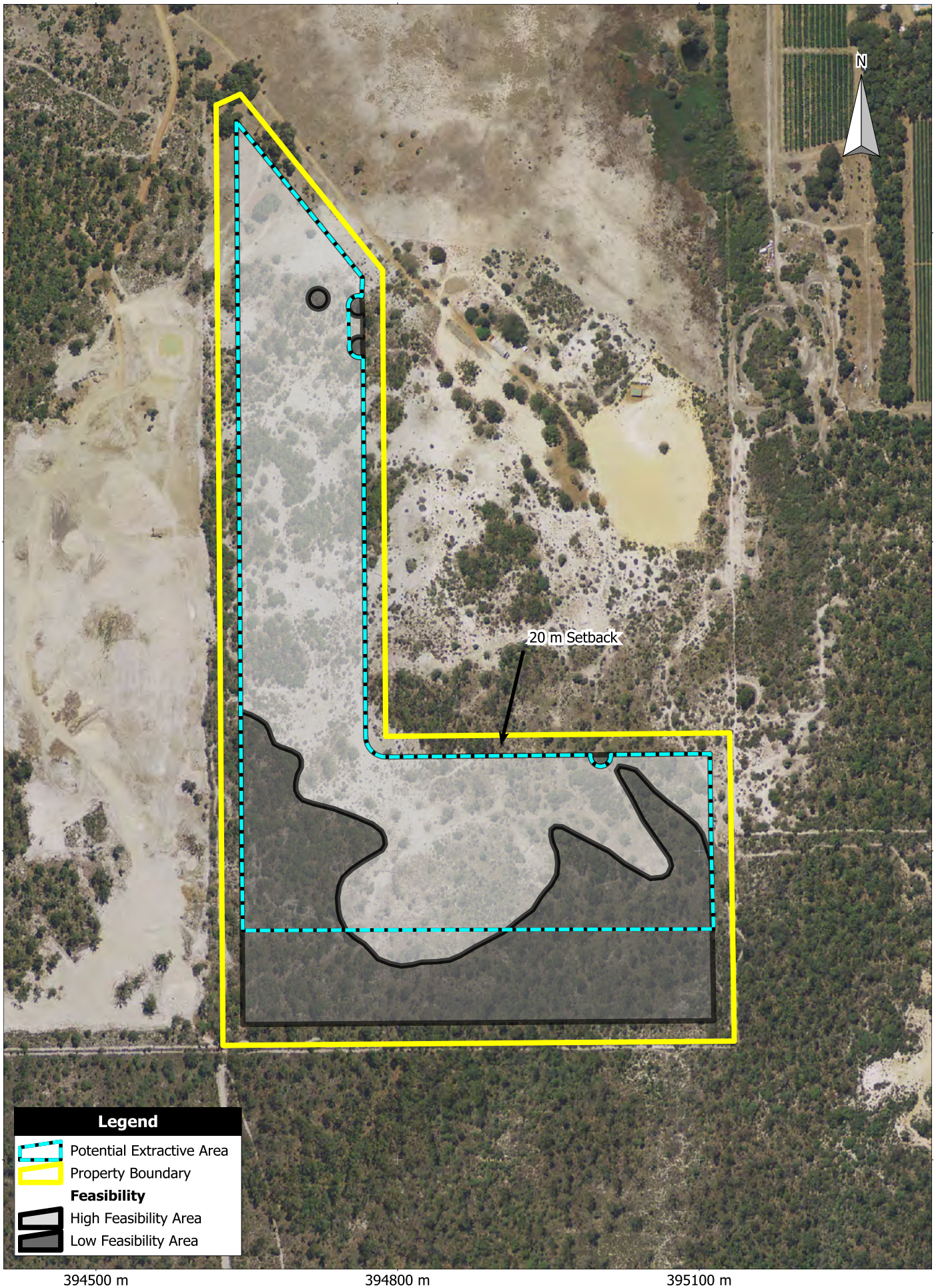


Scale: 1:5500 Original Size: A4 Grid: MGA94(50) Source: Landgate 0 100 m	Frontino and Family Lot 751 Plan 49008 Beelerup Environmental Feasibility Assessment	**Figure 4** **Landform Contours**	Martinick Bosch Sell Pty Ltd 4 Cook St West Perth WA 6005 Ph: (08) 9226 3166 Fax: (08) 9226 3177 info@mbsenvironmental.com.au www.mbsenvironmental.com.au MBS ENVIRONMENTAL

W:\Frontino\Drawings\Assessment Memo Map.map 10/12/2013 F4 Landform Contours Layout



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Frontino and Family
Lot 751 Plan 49008 Beelerup
Environmental Feasibility Assessment

Figure 5

Feasibility Assessment

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Appendix 1: Level 1 Flora Survey

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LEVEL 1 FLORA SURVEY OF LOT 751
BEELERUP, WA

DECEMBER 2013

Daniel Marsh ✈ Botanical Consulting

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Photo 1: Photograph of site DB008 (W1, excellent vegetation condition)

Photo 2: Photograph of site DB007 (W1a, degraded vegetation condition)

1. SUMMARY

Daniel Marsh Botanical Consulting undertook a Level 1 flora survey of the southern portion of Lot 751 Plan 49008 Beelerup in Western Australia (WA) on 11 November 2013. The survey area is approximately 24ha and is located approximately 5km east of the town of Donnybrook. The survey area was traversed by foot and a total of 11 survey sites plus opportunistic recordings and collections were conducted. The sample intensity and time of survey was considered adequate.

A total of 86 vascular plant taxa representative of 72 plant genera and 34 plant families were recorded within the survey area. The majority of the taxa recorded were representative of the Fabaceae (10 taxa), Proteaceae (8 taxa), Poaceae (7 taxa) and Myrtaceae (6 taxa) families.

No Declared Threatened Flora species were recorded within the survey area. One Priority 4 Flora species, *Acacia semitrullata*, was recorded within the survey area. *Acacia semitrullata* (P4) was recorded at three sites (Figure 1), two of which were located in the southern part of the survey area in vegetation considered to be in very good condition (Keighery 1994). The other site was located in the northern section of the survey area in vegetation considered to be degraded (Keighery 1994).

Of the 86 plant taxa recorded within the survey area, 16 species were introduced (19%). One of these introduced taxa, *Asparagus asparagoides*, is a Declared Pest (s22) under the *Biosecurity and Agriculture Management Act 2007* and is grouped in the C3 category (Management).

No Threatened Ecological Communities or Priority Ecological Communities were inferred to occur within the survey area.

Two vegetation communities were defined within the survey area, W1 and W1a. W1 was described as an open woodland of *Eucalyptus marginata* over a low open woodland of *Nuytsia floribunda, Xylomelum occidentale* and sometimes *Banksia* spp. over *Xanthorrhoea preissii, Dasypogon bromeliifolius* and *Patersonia* spp. This community occurred in the southern part of the survey area (Figure 1) and was associated with vegetation considered to be in very good or excellent condition. W1a was described as a low open woodland of *Nuytsia floribunda* and/or *Eucalyptus marginata* over a tall shrubland of *Kunzea glabrescens* over various weed species and the occasional native shrub. This community occurred in the northern parts of the survey area (Figure 1) and was associated with vegetation considered to be in good, degraded and completely degraded condition (Keighery 1994). The species composition did vary slightly with the topography within the survey area, however the most marked difference in composition was between areas of different condition as the degraded areas had an altered understorey.

The vegetation condition within the survey area ranged from excellent at the southern end to completely degraded at the most northern point of the survey area (Figure 2) (Keighery 1994). Disturbance was more pronounced in the degraded areas and included bare ground from equestrian activities, an abundance of weed species and signs of dieback (*Phytophthora cinnamomi*).

2. BACKGROUND

Daniel Marsh Botanical Consulting was commissioned by MBS Environmental to undertake a Level 1 flora survey of the southern portion of Lot 751 Plan 49008 Beelerup, WA. The survey area is approximately 24ha and is located approximately 5km east of the town of Donnybrook along the Donnybrook-Boyup Brook Road. The area is situated on the Darling Fault which delineates the eastern periphery of the southern Perth basin and separates the Archaean granitic rocks of the Yilgarn Block to the east from sediments in the Bunbury Trough, a structural sub-division of the Perth Basin (Wilde and Walker 1982).

Donnybrook experiences a Mediterranean-type of climate, with warm dry summers and cool wet winters. The average annual rainfall for Donnybrook is 985.1 mm and the mean minimum / maximum temperatures for Donnybrook range from 13.9 °C to 30.4 °C in January, and from 5.7 °C to 16.5 °C in July (Bureau of Meteorology 2013).

The survey area occurs within the Jarrah Forest Bioregion as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Department of Parks and Wildlife, DPAW 2013a). Mattiske and Havel (1998) have previously mapped the vegetation complexes of this region at a scale of 1:250000. The survey area is located in an area mapped as the Kirup complex on depressions and swamps on uplands. The Kirup complex is described as open forest to woodland of *Eucalyptus marginata* subsp. *marginata - Corymbia calophylla - Banksia attenuata - Xylomelum occidentale* on sandy slopes in the humid zone.

A desktop search for Declared Threatened and Priority flora that have the potential to occur within the survey area was undertaken using NatureMap and the EPBC Act Protected Matters search tools and the results are presented in Table 1 (DPAW 2013b, Department of Environment, DoE 2013).

Table 1: Conservation coded flora species that have the potential to occur within the Survey Area (DPAW 2013b, DoE 2013).

Species	Conservation Status
Acacia flagelliformis	P4
Acacia semitrullata	P4
Banksia squarrosa subsp. *argillacea*	T
Brachyscias verecundus	T
Caladenia hoffmanii	T
Caladenia huegelii	T
Caladenia winfieldii	T
Caustis sp. Boyanup (G.S. McCutcheon 1706)	P3
Centrolepis caespitose	P4
Chamelaucium sp. C Coast Plain (R.D.Royce 4872)	T
Corybas abditus	P3
Darwinia whicherensis	T
Diuris micrantha	T
Drakaea elastica (Glossy-leaved Hammer Orchid)	T
Drakaea micrantha	T
Gastrolobium papilio (Crisp)	T
Lambertia echinata subsp. *occidentalis*	T

Species	Conservation Status
Logania wendyae	P1
Lomandra whicherensis	P1
Loxocarya magna	P3
Meeboldina decipiens subsp. *decipiens*	P3
Schoenus loliaceus	P2
Sphenotoma drummondii (Benth.)	T
Synaphea hians	P3
Synaphea polypodioides	P3
Synaphea sp. Pinjarra (R. Davis 6578)	T
Synaphea stenoloba	T
Synaphea stenoloba	T
Tetratheca parvifolia	P3

3. METHODS

Prior to undertaking survey work, a desktop search for Declared Threatened and Priority flora and Threatened and Priority Ecological Communities that have the potential to occur within the survey area was undertaken using NatureMap and the EPBC Act Protected Matters search tools (DPAW 2013b, DoE 2013). All species were familiarised at the WA Herbarium. Relevant journal articles and identification aids were photocopied and photographs were taken of reference herbarium specimens for use in the field.

Assessment of flora and vegetation of the survey area was undertaken by Daniel Marsh (flora collection permit no. SL010750) on 11 November 2013. Site maps of the survey area were provided by MBS Environmental and a gpx file of the survey boundary was uploaded on to a handheld GPS for use in the field. A total of 11 sampling sites were selected using aerial photographic maps of the survey area as supplied by MBS Environmental and opportunistic field selection (Figure 3). Survey sites consisted of 10 x 10 m quadrats, the location of which was recorded with a handheld GPS device in GDA94. The survey was undertaken in accordance with the recommendations made in Guidance Statement 51 (Environmental Protection Authority 2004).

The flora and vegetation was described at each survey site and opportunistic collections were undertaken wherever previously unrecorded plants were observed. The following parameters were recorded at each survey site: GPS location, topography, litter cover, soil type and colour, notes on disturbance and vegetation condition, site photograph, and height and percentage cover of species.

Plant taxa that could not be identified in the field were collected systematically, dried and fumigated before identification. Plant specimens collected were identified using keys or through comparisons with pressed specimens at the WA Herbarium. When necessary, plant taxonomists with specialist skills were consulted in order to confirm identification.

Vegetation communities were defined based on structure (Beard 1990) and species composition at each survey site with particular emphasis on the presence and absence of dominant species. Vegetation condition was assessed based on Keighery's condition scale (Keighery 1994).

3. RESULTS

3.1 FLORA

A total of 86 vascular plant taxa representative of 72 plant genera and 34 plant families were recorded within the survey area. The majority of the taxa recorded were representative of the Fabaceae (10 taxa), Proteaceae (8 taxa), Poaceae (7 taxa) and Myrtaceae (6 taxa) families.

No Threatened flora pursuant to Schedule 1 of the *Wildlife Conservation Act 1950* and as listed by the DPAW (2013a) were recorded within the survey area. No Threatened flora pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* and as listed by the Department of Environment (DoE 2013) were recorded within the survey area.

One Priority 4 Flora species, *Acacia semitrullata*, was recorded within the survey area. *Acacia semitrullata* (P4) was recorded at three sites (Table 2, Figure 1), two of which were located in the southern part of the survey area in vegetation considered to be in very good condition (Keighery 1994). The third site was located in the northern part of the survey area in vegetation considered to be degraded (Keighery 1994).

Table 2: GPS locations of significant flora.

Species	Status	Easting	Northing
Acacia semitrullata	P4	394945	6284639
Acacia semitrullata	P4	394682	6284751
Acacia semitrullata	P4	394719	6285175
Asparagus asparagoides	Listed Weed	394705	6284956

Of the 86 plant taxa recorded within the survey area, 16 species were introduced (19%). One of these introduced taxa, *Asparagus asparagoides*, is a Declared Pest (s22) under the *Biosecurity and Agriculture Management Act 2007* (Department of Agriculture and Food, DAF 2013) and is grouped in the C3 category (Management). It was recorded at one site (DB009) within the survey area (Table 2).

3.2 VEGETATION

Two vegetation communities were defined within the survey area, W1 and W1a (Table 3, Figure 1). W1 was described as an open woodland of *Eucalyptus marginata* over a low open woodland of *Nuytsia floribunda*, *Xylomelum occidentale* and sometimes *Banksia* spp. over *Xanthorrhoea preissii*, *Dasypogon bromeliifolius* and *Patersonia* spp. This community occurred in the southern part of the survey area and was associated with vegetation considered to be in very good or excellent condition.

W1a was described as a low open woodland of *Nuytsia floribunda* and/or *Eucalyptus marginata* over a tall shrubland of *Kunzea glabrescens* over various weed species and the occasional native shrub. This community occurred in the northern parts of the survey area and was associated with vegetation considered to be in good, degraded and completely degraded condition (Keighery 1994). While the species composition did vary slightly with the topography within the survey area, the most marked difference in composition was between areas of different condition as the degraded areas had an altered understorey.

A small stand of *Melaleuca preissiana* mixed with *Eucalypus marginata* was recorded at the eastern end of the survey site. Despite the presence of *Melaleuca preissiana* however, the species composition recorded at these sites was similar to that of neighbouring sites.

Table 3: Vegetation Communities defined within the survey area at Lot 751 Beelerup, WA

Code	Vegetation Community Description
W1	Open woodland of *Eucalyptus marginata* over a low open woodland of *Nuytsia floribunda*, *Xylomelum occidentale* and sometimes *Banksia* spp. over *Xanthorrhoea preissii*, *Dasypogon bromeliifolius* and *Patersonia* spp.
W1a	Low open woodland of *Nuytsia floribunda* and/or *Eucalyptus marginata* over a tall shrubland of *Kunzea glabrescens* over various weed species and the occasional native shrub.

The vegetation condition within the survey area ranged from excellent down at the southern end to completely degraded at the most northern point of the survey area (Figure 2) (Keighery 1994). Disturbance was more pronounced in the degraded areas and included bare ground from equestrian activities, an abundance of weed species and signs of dieback (*Phytophthora cinnamomi*).

Photo 1: Photograph of site DB008 (W1, excellent vegetation condition)

Photo 2: Photograph of site DB007 (W1a, degraded vegetation condition)

4. DISCUSSION AND CONCLUSIONS

No Declared Threatened Flora species were recorded within the survey area. One Priority 4 Flora species, *Acacia semitrullata*, was recorded at three sites within the survey area. *Acacia semitrullata* (P4) is described as a slender, erect, pungent shrub growing from 0.2 to 0.7m high. It flowers from May to October and has been recorded growing on white/grey sand, sometimes over laterite, clay, sandplains and swampy areas (DPAW 2013a). Its distribution extends 100km north-south from Mandurah to Augusta and has been recorded approximately 50km inland from the coast. There are 85 records of *Acacia semitrullata* (P4) listed on Florabase, four of which occur in neighbouring bushland to the south of the survey area (DPAW 2013a). Three of these records occur in the DEC estate R26238 to the south of Sandhills Rd.

The timing of the survey was considered good as annual species were present and an Orchidaceae species, *Thelymitra crinita*, was recorded at multiple sites. The sampling intensity was also considered adequate.

Of the 86 plant taxa recorded within the survey area, 16 species were introduced (19%). One of these introduced taxa, *Asparagus asparagoides*, is a Declared Pest (s22) under the *Biosecurity and Agriculture Management Act 2007* (DAF 2013) and is grouped in the C3 category (Management). Pests will be assigned to this category if they are established in WA but it is feasible, or desirable, to manage them in order to limit their damage (DAF 2013). Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest (DAF 2013). The occurrence of *Asparagus asparagoides* appeared to be confined to one site (DB009) within the survey area (Table 2).

Two vegetation communities were defined within the survey area, W1 and W1a (Table 3). W1 was described as an open woodland of *Eucalyptus marginata* over a low open woodland of *Nuytsia floribunda*, *Xylomelum occidentale* and sometimes *Banksia* spp. over *Xanthorrhoea preissii*, *Daspogon bromeliifolius* and *Patersonia* spp.. This community occurred in the southern part of the survey area and was associated with vegetation considered to be in very good or excellent condition. The soils and dominant species present are congruent with the Kirup vegetation complex (Mattiske and Havel 1998). The Kirup complex is poorly represented within the Jarrah Forest Bioregion (Mattiske and Havel 1998) however, neighbouring bushland to the south of the survey area, including DEC estate R26238 has been mapped as Kirup complex (Mattiske and Havel 1998).

W1a was described as a low open woodland of *Nuytsia floribunda* and/or *Eucalyptus marginata* over a tall shrubland of *Kunzea glabrescens* over various weed species and the occasional native shrub. This community occurred in the northern parts of the survey area and was associated with good, degraded and completely degraded condition (Keighery 1994). While the species composition did vary slightly with the topography within the survey area, the most marked difference in composition was between areas of different condition as the degraded areas had an altered understorey.

A small stand of *Melaleuca preissiana* mixed with *Eucalypus marginata* was recorded at the eastern end of the survey site (DB002 and DB003). Despite the presence of *Melaleuca preissiana* however, the species composition recorded at these sites was similar to that of neighbouring sites.

Disturbance was more pronounced in the degraded areas and included bare ground from equestrian activities, an abundance of weed species and signs of dieback (*Phytophthora cinnamomi*). Clearing could potentially lead to the spread of these introduced species, including *Phytophthora cinnamomi*. Care should be taken with regard to hygiene when operating in areas where introduced species are present in order to ensure these species do not become more widespread in the local area.

5. REFERENCES

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APPENDIX A: SUMMARY OF THE VASCULAR PLANTS RECORDED WITHIN THE SURVEY AREA

Note: * denotes introduced species; P4 denotes Priority Flora Species

Family	Species
ANARTHRIACEAE	*Anarthria prolifera* *Lyginia barbata*
ANARTHRIACEAE	*Daucus glochidiatus* *Xanthosia huegelii*
ARALIACEAE	*Trachymene pilosa*
ASPARAGACEAE	**Asparagus asparagoides* *Laxmannia squarrosa* *Lomandra caespitosa* *Thysanotus patersonii*
ASTERACEAE	*Asteridea pulverulenta* **Carduus pycnocephalus* **Hypochaeris glabra* **Ursinia anthemoides*
CAMPANULACEAE	*Isotoma hypocrateriformis*
CARYOPHYLLACEAE	**Silene gallica* var. *quinquevulnera*
CASUARINACEAE	*Allocasuarina humilis*
CELASTRACEAE	*Stackhousia monogyna*
COLCHICACEAE	*Burchardia congesta*
CYPERACEAE	*Lepidosperma pubisquameum* *Mesomelaena tetragona* *Schoenus curvifolius*
DASYPOGONACEAE	*Dasypogon bromeliifolius*
DENNSTAEDTIACEAE	*Pteridium esculentum*
DILLENIACEAE	*Hibbertia hypericoides* *Hibbertia racemosa* *Hibbertia vaginata*
ERICACEAE	*Conostephium pendulum* *Leucopogon propinquus*

APPENDIX A: SUMMARY OF THE VASCULAR PLANTS RECORDED WITHIN THE SURVEY AREA

Note: * denotes introduced species; P4 denotes Priority Flora Species

Family	Species
FABACEAE	*Acacia extensa* *Acacia semitrullata* (P4) *Bossiaea eriocarpa* *Daviesia physodes* *Gompholobium confertum* *Gompholobium marginatum* *Gompholobium tomentosum* *Jacksonia furcellata* **Lotus subbiflorus* **Trifolium campestre* var. *campestre*
GOODENIACEAE	*Lechenaultia biloba* *Scaevola calliptera*
HAEMODORACEAE	*Anigozanthos manglesii* *Conostylis aculeata* subsp. *aculeata* *Haemodorum simplex* *Haemodorum spicatum* *Phlebocarya ciliate*
HEMEROCALLIDACEAE	*Agrostocrinum hirsutum* *Johnsonia acaulis* *Tricoryne elatior*
IRIDACEAE	*Patersonia occidentalis* var. *occidentalis* *Patersonia umbrosa* var. *xanthina*
LAMIACEAE	*Hemiandra pungens*
LORANTHACEAE	*Nuytsia floribunda*
MYRTACEAE	*Corymbia calophylla* *Eucalyptus marginata* *Hypocalymma robustum* *Kunzea glabrescens* *Melaleuca preissiana* *Melaleuca thymoides*
ORCHIDACEAE	*Thelymitra crinita*
OROBANCHACEAE	**Orobanche minor*
PINACEAE	**Pinus* sp.

APPENDIX A: SUMMARY OF THE VASCULAR PLANTS RECORDED WITHIN THE SURVEY AREA

Note: * denotes introduced species; P4 denotes Priority Flora Species

Family	Species
POACEAE	**Aira praecox* **Aira caryophyllea* *Austrostipa compressa* **Avena barbata* **Briza maxima* **Briza minor* **Ehrharta calycina*
POLYGALACEAE	*Comesperma calymega*
PRIMULACEAE	**Lysimachia arvensis*
PROTEACEAE	*Adenanthos meisneri* *Adenanthos obovatus* *Banksia attenuata* *Banksia grandis* *Persoonia longifolia* *Petrophile linearis* *Stirlingia latifolia* *Xylomelum occidentale*
RESTIONACEAE	*Desmocladus fasciculatus* *Hypolaena exsulca*
STYLIDIACEAE	*Levenhookia pusilla* *Stylidium brunonianum* *Stylidium piliferum* *Stylidium repens*
XANTHORRHOEACEAE	*Xanthorrhoea preissii*
ZAMIACEAE	*Macrozamia riedlei*

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 05/11/2013

Kingdom	Plantae
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Rectangle'
Extent	115°45' 29" E, 115°58' 45" E, 33°28' 23" S, 33°39' 50" S
Group By	Family

Family	Species	Records
Asparagaceae	1	1
Cyperaceae	2	7
Elaeocarpaceae	1	8
Fabaceae	2	15
Loganiaceae	1	1
Myrtaceae	1	1
Orchidaceae	2	2
Proteaceae	5	13
Restionaceae	2	3
TOTAL	**17**	**51**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Asparagaceae					
1.	33298	*Lomandra whicherensis*		P1	
Cyperaceae					
2.	13766	*Caustis sp. Boyanup (G.S. McCutcheon 1706)*		P3	
3.	999	*Schoenus loliaceus*		P2	
Elaeocarpaceae					
4.	4538	*Tetratheca parvifolia*		P3	
Fabaceae					
5.	3339	*Acacia flagelliformis*		P4	
6.	3537	*Acacia semitrullata*		P4	
Loganiaceae					
7.	29553	*Logania wendyae*		P1	
Myrtaceae					
8.	34765	*Darwinia whicherensis*		T	
Orchidaceae					
9.	12935	*Corybas abditus*		P3	
10.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
Proteaceae					
11.	32046	*Banksia squarrosa subsp. argillacea*		T	
12.	16769	*Synaphea hians*		P3	
13.	31767	*Synaphea polypodioides*		P3	
14.	19055	*Synaphea sp. Pinjarra (R. Davis 6578)*		T	
15.	16749	*Synaphea stenoloba*		T	
Restionaceae					
16.	13779	*Loxocarya magna*		P3	
17.	17976	*Meeboldina decipiens subsp. decipiens*		P3	

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

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Australian Government

Department of the Environment

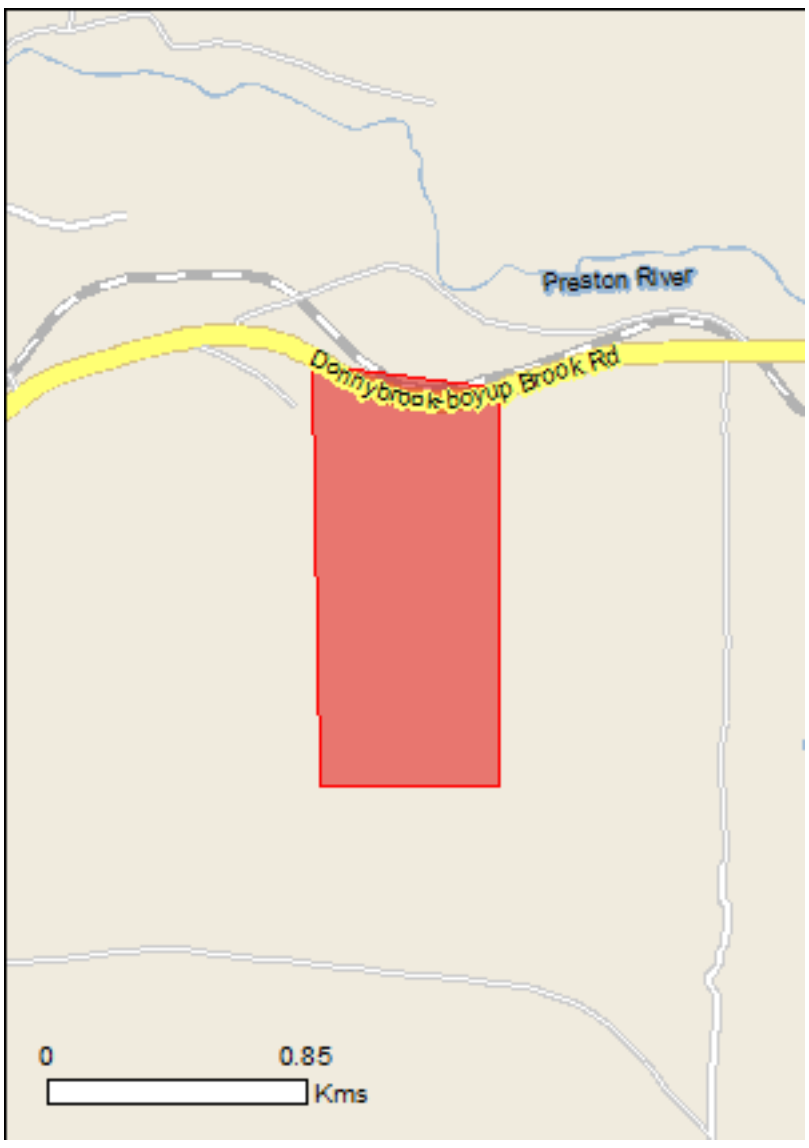
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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.

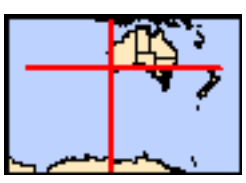
Report created: 05/11/13 23:04:55



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 Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	22
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

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

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.

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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	6
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine	None

Extra Information

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

Place on the RNE:	10
State and Territory Reserves:	1
Regional Forest Agreements:	1
Invasive Species:	24
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii		
Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Breeding known to occur within area
Calyptorhynchus latirostris		
Carnaby's Black-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
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum [25911]	Vulnerable	Species or species habitat known to occur within area
Setonix brachyurus		
Quokka [229]	Vulnerable	Species or species habitat may occur within area
Plants		
Banksia nivea subsp. uliginosa		
Swamp Honeypot [82766]	Endangered	Species or species habitat may occur within area
Banksia squarrosa subsp. argillacea		
Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Brachyscias verecundus		
Ironstone Brachyscias [81321]	Critically Endangered	Species or species habitat may occur within area
Caladenia hoffmanii		
Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat likely to occur within area
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
Caladenia winfieldii		
Majestic Spider-orchid [64504]	Endangered	Species or species habitat may occur within area
Centrolepis caespitosa		
[6393]	Endangered	Species or species habitat may occur within area
Chamelaucium sp. C Coast Plain (R.D.Royce 4872)		
Royce's Waxflower [82023]	Vulnerable	Species or species habitat may occur within area
Darwinia whicherensis		
Abba Bell [83193]	Endangered	Species or species habitat may occur within area
Diuris micrantha		
Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Drakaea micrantha		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Gastrolobium papilio		
Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat may occur within area
Lambertia echinata subsp. occidentalis		
Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area
Sphenotoma drummondii		
[21160]	Endangered	Species or species habitat may occur within area
Synaphea stenoloba		
Dwellingup Synaphea [66311]	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		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

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		
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 known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Historic		
Brookview Farm Homestead	WA	Indicative Place
Careydale Farm Homestead	WA	Indicative Place
Old Brookhampton Farm Group	WA	Indicative Place
Old Brookhampton Hall	WA	Indicative Place
St Thomas Anglican Church	WA	Indicative Place
Torridon Farm Homestead	WA	Indicative Place
All Saints Anglican Church	WA	Registered
Anchor and Hope Inn (former)	WA	Registered
Crendon Farm Homestead	WA	Registered
Soldiers Memorial Hall	WA	Registered

State and Territory Reserves [Resource Information]

Name	State
Unnamed WA26238	WA

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

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
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		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
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		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
Sus scrofa Pig [6]		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
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Coordinates

-33.56361 115.86444,-33.56417 115.87,-33.57389 115.87,-33.57389 115.86472,-33.56361 115.86444

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 Heritage and Register of National Estate properties, Wetlands of International 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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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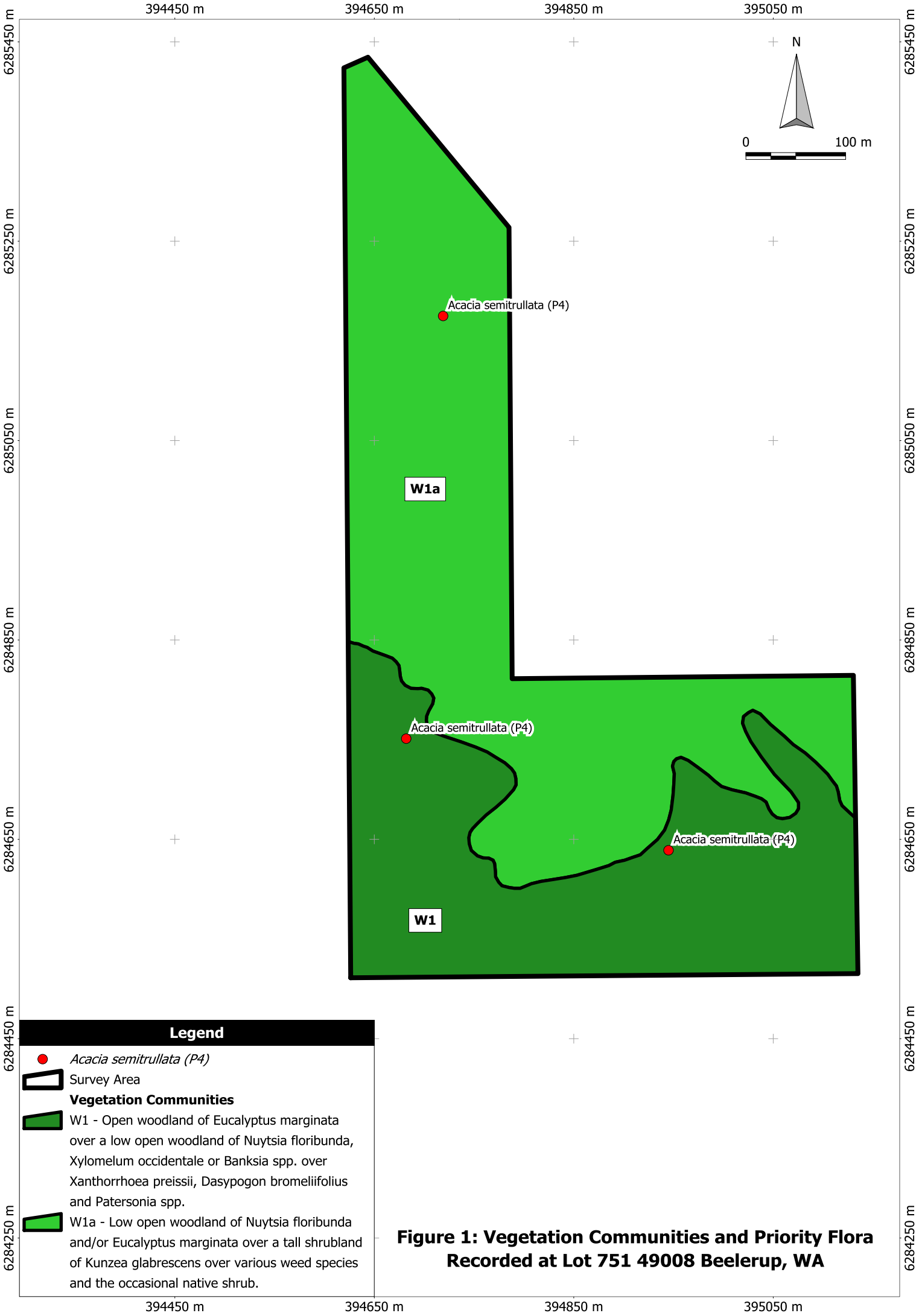

Figure 1: Vegetation Communities and Priority Flora Recorded at Lot 751 49008 Beelerup, WA

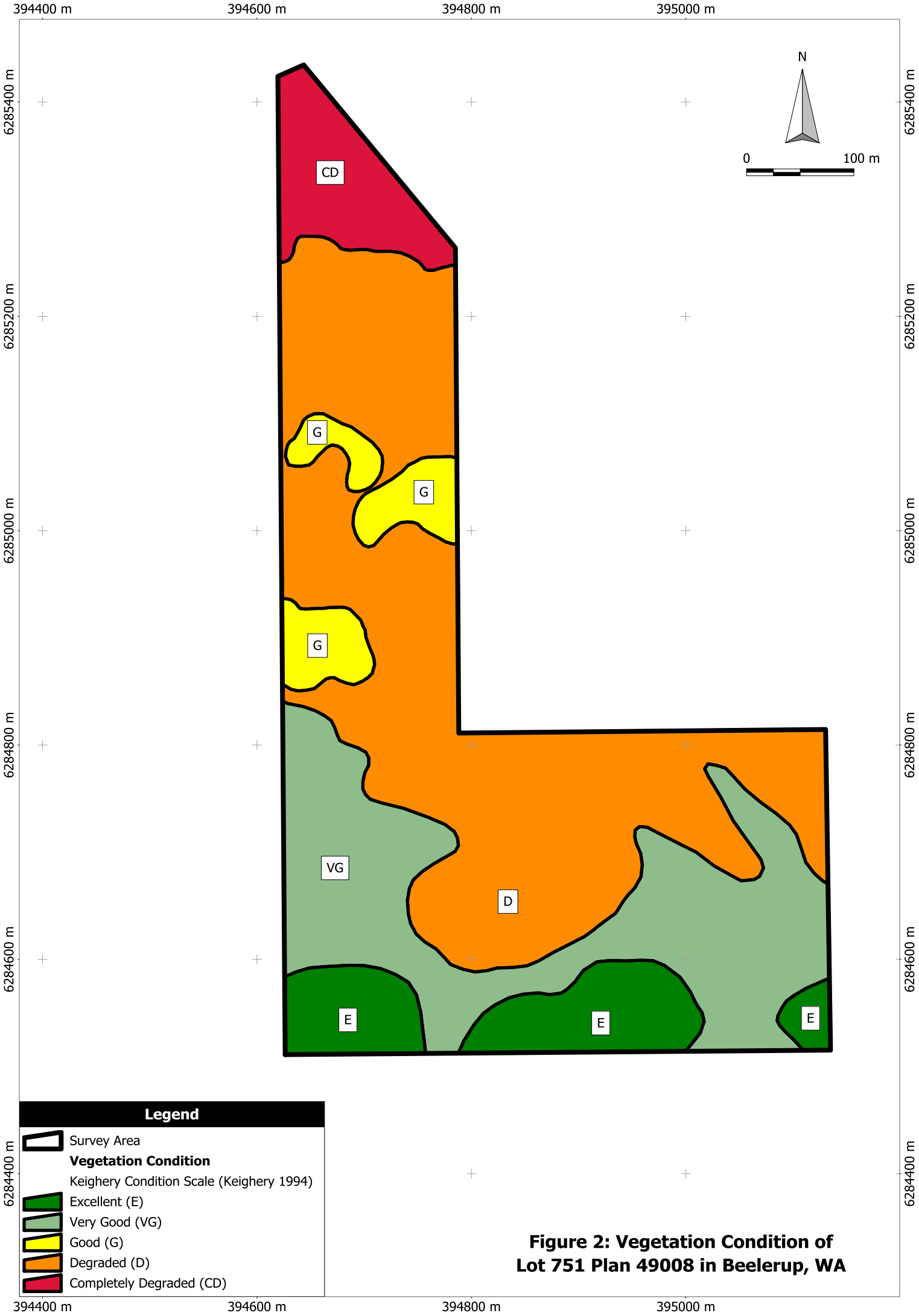

Figure 2: Vegetation Condition of Lot 751 Plan 49008 in Beelerup, WA

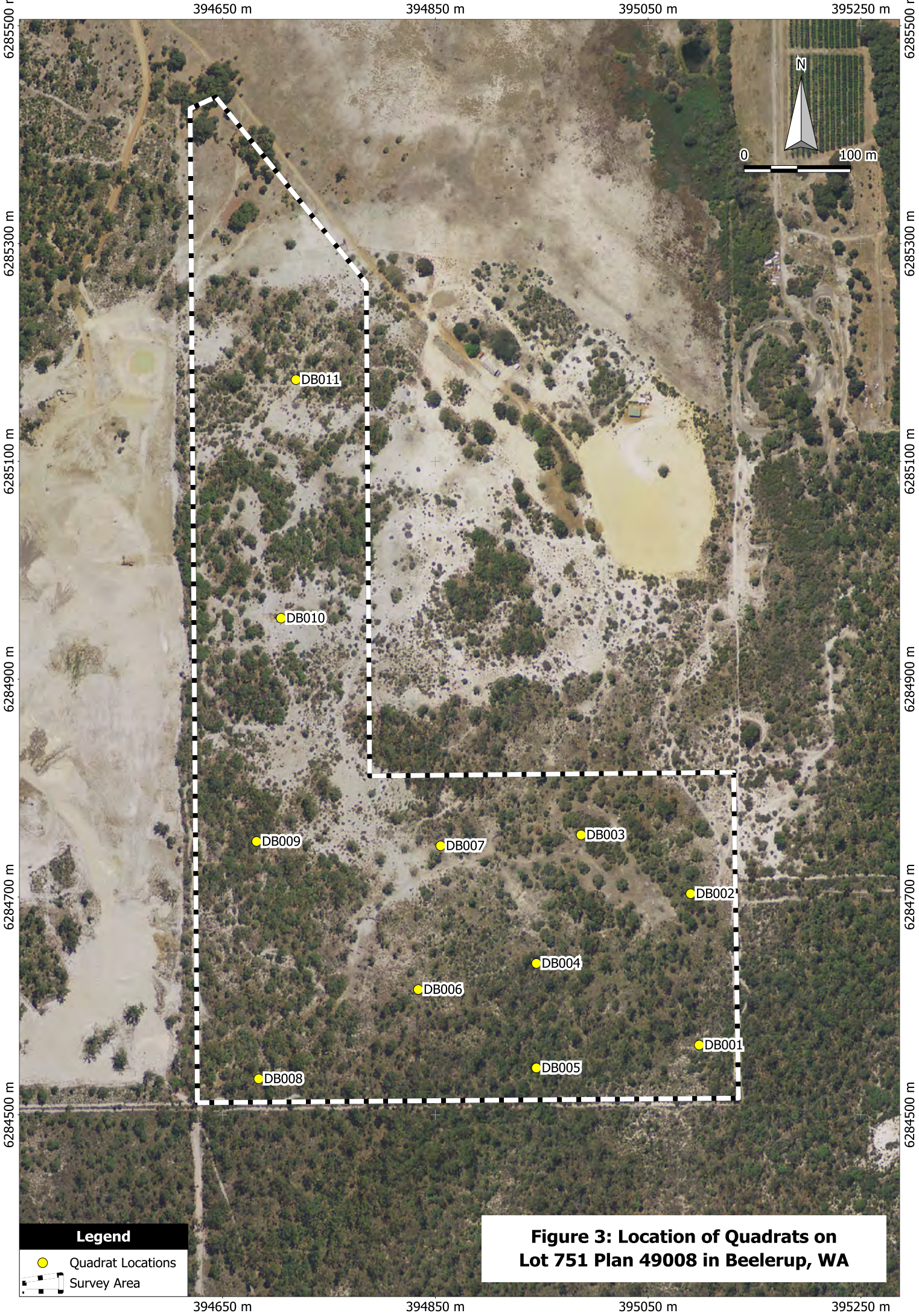

Figure 3: Location of Quadrats on Lot 751 Plan 49008 in Beelerup, WA

Appendix 2: Fauna Assessment

Fauna Assessment

Lot 751
Donnybrook-Boyup Brook Road
Beelerup

NOVEMBER 2013
Version 1

On behalf of:
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SUMMARY

This report details the results of a fauna assessment of the southern section of Lot 751 Donnybrook - Boyup Brook Road, Beelerup (the site) (Figure 1). The site is located about 4 km east of the Donnybrook townsite and has a total area of about 24 hectares (ha) (Figure 2).

It is understood that the land owners are investigating the potential to develop the area for the purpose of sand extraction. The exact area has yet to be finalised and it is understood that the main aim of the assessment reported on here is to provide information on the fauna values of the site to allow for impacts (if any) to be minimised by allowing informed decisions on the location and scale of sand extraction activities to be made.

The scope of works was to conduct a level 1 fauna survey as defined by the Environmental Protection Authority (EPA 2004). Because some listed threatened species (i.e. western ringtail possums (WRP) and several species of black cockatoo) are known to occur in the general area, the scope of the survey work was expanded to include targeted assessment of the site's significance to these particular species.

The assessment has included a desktop study and a series of site surveys. Daytime and night time field survey work at the site was carried out on the 5 November, 2013.

The study area has been subject to considerable historical disturbances and now consists of a mosaic of cleared, partly cleared and vegetated areas. Disturbances apparent included previous sand extraction activities (existing pits and cleared areas), livestock grazing, horse riding activities, logging and common evidence of the effects of dieback (dead jarrah and banksia trees). Much of the vegetation now present is regrowth that has occurred subsequent to previous clearing/plant death.

The better quality vegetation, where present, consists primarily of an open forest of jarrah (*Eucalyptus marginata)* over a low open woodland of *Banksia attenuata*, *Nuytsia floribunda* and *Xylomelum occidentale* over an open heath/open low heath containing *Xanthorrhoea preissii* and *Macrozamia riedlei*. In some areas a low open woodland of banksia predominates and jarrah is present as scattered emergent trees. Areas of the above-mentioned units in poorer condition lack native groundcover and weeds or bare sand dominate.

Paperbark (*Melaleuca preissiana*) in association with *Nuytsia floribunda* forms a low very open woodland with some emergent jarrah in the north - east corner of the southern section of the study area.

Marri (*Corymbia calophylla*) is rare and is only represented by a small number of specimens in the north of the study area and as a few scattered individuals in the better quality vegetation in the southern section of Lot 751.

The vegetation within the degraded/highly degraded areas varies from tall shrubland (*Kunzea glabrescens*) to a very open low shrubland or very open woodland over bare sand.

Soil across the site is comprised of a very course/gravelly grey sand.

The better quality vegetation in the extreme southern section of the site is continuous with vegetation of a similar type that extends into vacant crown land, which in turn adjoins further south an unnamed DPaW managed reserve (R 26238 - Ryall Block).

Plates 1 to 4 illustrate the nature of some of the vegetation units/habitats present within the study area. More detail on composition of the vegetation on site can be found within the flora and vegetation report (in preparation).

Opportunistic fauna observations are listed in Appendix B. A total of 30 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area. One introduced species was also observed.

Evidence of three listed threatened species was recorded (Carnaby's or Baudin's black cockatoo – foraging evidence, forest red-tailed black cockatoo – foraging evidence and heard calling). One migratory species was seen (rainbow bee-eater). No evidence of any DPaW priority species was observed.

No evidence of western ringtail possums (WRPs) using vegetation within the study area was found during any stage of the assessment (day or night time surveys).

Vegetation within the study area appears to be mostly unsuitable or at best marginal for this species to utilise primarily due to a lack of midstorey vegetation or where present a lack of midstorey canopy connectivity which the species favours (G Harewood pers. obs.).

Western ringtail possums are however known to frequent the general area (Greg Harewood pers. obs.) and given the presence of some suitable habitat in and adjoining the site, mainly in the extreme south eastern area it may frequent the area on occasions but the site overall does not appear to be supporting a population or a significant portion of a population of the species.

The habitat tree assessment identified a total of 63 trees with a DBH of >50cms within the study area (Figure 4). Twenty four of the 63 trees were observed to contain hollows of some type with four possibly having large enough hollows for black cockatoos to use for nesting though this assessment was based on the size of the entrance into an apparent hollow only. No evidence (e.g. chew marks) of past or present use of any hollow by black cockatoos was seen.

Additional details on each observed habitat tree can be found in Appendix D.

Foraging evidence attributed to all three species of black cockatoo was observed during the site survey in the form of chewed marri fruits, jarrah fruits and chewed banksia cones. Jarrah and banksia trees form the main component of almost all of the remnant vegetation onsite and therefore most of the remnant vegetation represents foraging habitat for black cockatoos.

No existing roosting trees (trees used at night by black cockatoos to rest) were identified during the survey period.

With respect to native vertebrate fauna, 21 mammals (includes nine bat species), 80 bird, 27 reptile and three frog species have previously been recorded in the general area, some of which have the potential to occur in or utilise sections of the study area at times.

Of the 131 native animals that are listed as potentially occurring in the area, seven are considered to be endangered/vulnerable or in need of special protection under State and/or Federal law. In addition, one migratory species and three DPaW priority species may also frequent the area at times.

The exact extent of development within the site is not known at this stage however the possible impacts on specific species of conservation significance previously recorded in the general area is provided in the table below. Additional information on those species listed is provided in Appendix E.

Likelihood of Occurrence and Possible Impacts – Fauna Species of Conservation Significance **(continues on following page).**

Common Name	Genus & Species	Conservation Status	Habitat Present	Likelihood of Occurrence	Possible Impacts
Unnamed cricket	*Pachysaga strobila*	P1	No?	Unlikely	No Impact.
Southern Carpet Python	*Morelia spilota imbricata*	S4	No/Marginal	Unlikely	No Impact.
Malleefowl	*Leipoa ocellata*	S1, VU, Mig	No	Unlikely - species locally extinct.	No Impact.
Great Egret	*Ardea alba*	S3, Mig	No	Unlikely	No Impact.
Cattle Egret	*Ardea ibis*	S3, Mig	No	Unlikely	No Impact.
Osprey	*Pandion haliaetus*	Mig	No	Unlikely	No Impact.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	S3, Mig	No	Unlikely	No Impact.
Peregrine Falcon	*Falco peregrinus*	S4	Yes	Possible	Loss/modification of a small area of habitat. No significant impact likely.

Common Name	Genus & Species	Conservation Status	Habitat Present	Likelihood of Occurrence	Possible Impacts
Carnaby`s Black Cockatoo	*Calyptorhynchus latirostris*	S1, EN	Yes	Known to occur	Loss/modification of small areas of habitat.
Baudin`s Black Cockatoo	*Calyptorhynchus baudinii*	S1, VU	Yes	Known to occur	Loss/modification of small areas of habitat.
Forest Red-tailed Black Cockatoo	*Calyptorhynchus banksii naso*	S1, VU	Yes	Known to occur	Loss/modification of small areas of habitat.
Masked Owl (SW population)	*Tyto n. novaehollandiae*	P3	Yes/Marginal	Possible/Infrequent	Loss/modification of a small area of habitat. No significant impact likely.
Fork-tailed Swift	*Apus pacificus*	S3, Mig	Yes	Flyover only.	No impact. Uncommon aerial species.
Rainbow Bee-eater	*Merops ornatus*	S3, Mig	Yes	Known to occur	Loss/modification of a small area of habitat. No significant impact likely.
Chuditch	*Dasyurus geoffroii*	S1, VU	Yes/Marginal	Possible/Infrequent	Loss/modification of a small area of habitat. No significant impact likely.
Southern Brush-tailed Phascogale	*Phascogale tapoatafa ssp*	S1	Yes	Possible	Loss/modification of small areas of habitat. No significant impact likely.
Southern Brown Bandicoot	*Isoodon obesulus fusciventer*	P5	Yes	Possible	Loss of some habitat. Potential for individuals to be killed or injured during clearing. No significant impact likely.
Western Ringtail Possum	*Pseudocheirus occidentalis*	S1, VU	No/Marginal	Possible/Infrequent	Loss/modification of small areas of habitat. No significant impact likely.
Western Brush Wallaby	*Macropus irma*	P4	No	Unlikely	No Impact.
Quokka	*Setonix brachyurus*	S1, VU	No	Unlikely	No impact.
Western False Pipistrelle	*Falsistrellus mackenziei*	P4	Yes	Possible	Loss of some habitat. No significant impact likely.

Constraints on development within the study area will largely be centred on the presence of habitat used or potentially used by a number of conservation significant fauna species. The potential impacts on these species and/or their habitat will need to be taken into consideration during the planning stages within the aim of minimising/mitigating impacts so as to facilitate approvals.

1. INTRODUCTION

This report details the results of a fauna assessment of the southern section of Lot 751 Donnybrook - Boyup Brook Road, Beelerup (the site). The site is located about 4 km east of the Donnybrook townsite in south west Western Australia and is centred at approximately 33.571302°S and 115.865963°E (Figure 1). The southern section of Lot 751 has a total area of about 24 hectares (ha) (Figure 2).

2. DEVELOPMENT PROPOSAL

It is understood that the land owners are investigating the potential to develop the area for the purpose of sand extraction. The exact area has yet to be finalised and it is understood that the main aim of the assessment reported on here is to provide information on the fauna values of the site to allow for impacts (if any) to be minimised by allowing informed decisions on the location and scale of sand extraction activities to be made. Once a proposal has been formulated it is anticipated that the information presented will also be used by regulatory authorities to assess the potential impact of any proposal on fauna and fauna habitats as part of any required approval process.

3. SCOPE OF WORKS

The scope of works was to conduct a level 1 fauna survey as defined by the EPA (EPA 2004). Because some listed threatened species (i.e. western ringtail possums and several species of black cockatoo) are known to occur in the general area, the scope of the survey work was expanded to include targeted assessment of the site's significance to these species. The fauna assessment has therefore included:

1. Level 1 Fauna Survey (to EPA standard).

2. Targeted searches for evidence of western ringtail possums (WRPs – dreys, scats and individuals) including one nocturnal count.

3. Targeted searches for black cockatoo foraging, nesting and roosting habitat.

4. Report summarising results.

Note: For the purposes of this report the term black cockatoo is in reference to Baudin's black cockatoo *Calyptorhynchus baudinii*, Carnaby's black cockatoo *Calyptorhynchus latirostris* and the forest red-tailed black cockatoo *Calyptorhynchus banksii naso*.

4. METHODS

4.1 POTENTIAL FAUNA INVENTORY - DESKTOP STUDY

4.1.1 Database Searches

Searches of the following databases were undertaken to aid in the compilation of a list of vertebrate fauna potentially occurring within the study area:

- DPaW's NatureMap Database Search (combined data from DPaW, Western Australian Museum, Birds Australia and consultants reports) (DPaW 2013b): and

- Protected matters search tool (Department of Sustainability, Environment, Water, Population and Communities – DSEWPaC 2013).

It should be noted that these lists are based on observations from a much broader area than the site itself and therefore may include species that would only ever occur as vagrants in the actual proposal area due to a lack of suitable habitat or the presence of only marginal habitat. The databases also often included very old records and in some cases the species in question have become locally or regionally extinct.

Information from these sources should therefore be taken as indicative only and local knowledge and information needs also to be taken into consideration when determining what actual species may be present within the specific area being investigated.

4.1.2 Previous Fauna Surveys in the Area

Fauna surveys, assessments and reviews have been undertaken in nearby areas in the past, though not all are publically available and could not be referenced. The most significant of those available have been used as the primary reference material for compiling the potential fauna assemblage for the general area. Those reports referred to included, but were not limited to:

- Bamford, M. J., & A. R. (2000). Proposed Gwindinup mineral sands mine, Fauna surveys August and December 1999. Unpublished report to Cable Sands (WA) Pty Ltd.

- Bamford, M. J., & Wilcox J.A. (2004). The use of the proposed sand mining area at Gwindinup by threatened species. Unpublished report to Cable Sands (WA) Pty Ltd.

- Bancroft, W. & Bamford, M. J. (2008). Fauna values of Bemax's Happy Valley mineral sands deposit. Unpublished report to Bemax Resources Ltd.

As with the databases searches some reports refer to species that would not occur in the study area due to a lack of suitable habitat (extent and/or quality) and this fact was taken into consideration when compiling the potential fauna species list for the study area. It should also be noted that the NatureMap database is likely to include some records from previous fauna surveys in the area including some of those listed above.

4.1.3 Existing Publications

The following represent the main publications used to identify and refine the potential fauna species list for the study area:

- Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). The New Atlas of Australian Birds. Royal Australasian Ornithologists Union, Victoria.

- Bush, B., Maryan, B., Browne-Cooper, R. & Robinson, D. (2007). Reptiles and Frogs in the Bush: Southwestern Australia. UWA Press, Nedlands.

- Churchill, S. (2008). Australian Bats. Second Edition, Allen & Unwin.

- Johnstone, R.E. and Storr, G.M. (1998). Handbook of Western Australian Birds: Volume 1 – Non-passerines (Emu to Dollarbird). Western Australian Museum, Perth Western Australia.

- Johnstone, R.E. and Storr, G.M. (2004). Handbook of Western Australian Birds: Volume 2 – Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth Western Australia.

- Menkhorst, P. and Knight, F. (2011). A Field Guide to the Mammals of Australia. Oxford University Press, Melbourne.

- Morgan, D.L., Beatty, S.J., Klunzinger, M.W, Allen, M.G. and Burnham, Q.E (2011). Field Guide to the Freshwater Fishes, Crayfishes and Mussels of South Western Australia. Published by SERCUL.

- Storr, G.M., Smith, L.A. and Johnstone R.E. (1983). Lizards of Western Australia II: Dragons and Monitors. WA Museum, Perth.

- Storr, G.M., Smith, L.A. and Johnstone R.E. (1990). Lizards of Western Australia III: Geckos and Pygopods. WA Museum, Perth.

- Storr, G.M., Smith, L.A. and Johnstone R.E. (1999). Lizards of Western Australia I: Skinks. Revised Edition, WA Museum, Perth.

- Storr, G.M., Smith, L.A. and Johnstone R.E. (2002). Snakes of Western Australia. Revised Edition, WA Museum, Perth.

- Tyler M.J. & Doughty P. (2009). Field Guide to Frogs of Western Australia, Fourth Edition, WA Museum, Perth.

- Van Dyck, S., Gynther, I. & Baker, A. Eds (2013). Field Companion to The Mammals of Australia. Queensland Museum.

- Wilson, S. and Swan, G. (2013). A Complete Guide to Reptiles of Australia. Reed, New Holland, Sydney.

4.1.4 Fauna of Conservation Significance

The conservation significance of fauna species has been assessed using data from the following sources:

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*). Administered by the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC);

- *Wildlife Conservation Act 1950 (WC Act).* Administered by the Western Australian Department of Parks and Wildlife (DPaW) (Govt. of WA 2012);

- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List - the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and the

- DPaW Priority Fauna list. A non-legislative list maintained by the DPaW for management purposes (DPaW 2013a).

The *EPBC Act* also requires the compilation of a list of migratory species that are recognised under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA);
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and
- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

(Note - Species listed under JAMBA are also protected under Schedule 3 of the *WC Act*.)

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as matters of national environmental significance (NES) under the *EPBC Act*.

The conservation status of all vertebrate fauna species listed as occurring or possibly occurring in the vicinity of the study area has been assessed using the most recent lists published in accordance with the above-mentioned instruments and is indicated as such in the fauna listings of this report. A full listing of conservation codes are provided in Appendix A.

A number of other species not listed in official lists can also be considered of local or regional conservation significance. These include species that have a restricted range, those that occur in breeding colonies and those at the limit of their range.

While not classified as rare, threatened or vulnerable under any State or Commonwealth legislation, a number of bird species have been listed as of significance on the Swan Coastal portion of the Perth Metropolitan Region (Bush Forever - Government of Western Australia 1998 and 2000). The bird species are often referred to as Bush Forever Decreaser Species. The three categories used for birds within the Bush Forever documents are:

- Habitat specialists with reduced distribution on the Swan Coastal Plain (code Bh)
- Wide ranging Species with reduced population's on the Swan Coastal Plain. (code Bp)
- Extinct in the Perth region (code Be)

Other fauna species of regional significance due to declining populations on the Swan Coastal Plain, especially between Mandurah and Busselton, include the honey possum and pygmy possum (Dell 2000).

While the study area is not on the Swan Coastal Plain, the presence of Bush Forever species should be taken into consideration when determining the fauna values of a specific location. Bush Forever decreaser species are indicated as such within the species list held in Appendix B.

4.1.5 Invertebrates

It can be difficult to identify what may be significant invertebrate species (e.g. Short Range Endemics - SREs) as there are uncertainties in determining the range-restrictions of many species due to lack of surveys, lack of taxonomic resolutions within target taxa and problems in identifying certain life stages. Where invertebrates are collected during surveys, a high percentage are likely to be unknown, or for known species there can be limited knowledge or information on their distribution (Harvey 2002).

For this project, the assessment for conservation significant invertebrates has been limited to those listed by the DPaW and *EPBC Act* database searches (which rely on distribution records and known habitat preferences). No assessment of the potential for SRE invertebrates to be present has been made.

4.1.6 Taxonomy and Nomenclature

Taxonomy and nomenclature for fauna species used in this report is generally taken from the DPaW's WA Fauna Census Database which is assumed to follow Aplin and Smith (2001) for amphibians and reptiles, How *et al*. (2001) for mammals and Johnstone (2001) for birds.

Common names are taken from the Western Australia Museum (WAM) recognised primary common name listings when specified, though where common names are not provided they have been acquired from other publications. Sources include Van Dyck *et al.* (2013), Bush *et al.* (2007), Wilson and Swan (2013), Bush *et al.* (2002), Tyler *et al.* (2000), Christidis and Boles (2008) and Glauret (1961). Not all common names are generally accepted.

4.2 SITE SURVEYS

Daytime and nocturnal field survey work at the site was carried out by Greg Harewood (B.Sc. Zoology) on the 5 November, 2013.

4.2.1 Fauna Habitat Assessment

Vegetation units observed during the site survey have been used to define broad fauna habitat types across the site.

The main aim of the habitat assessment was to determine if it was likely that any species of conservation significance would be utilising the areas that maybe impacted on as a consequence of development at the site. The habitat information obtained was also used to aid in finalising the overall potential fauna list.

As part of the desktop literature review, available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area was researched. During the field survey the habitats within the study area were assessed and specific elements identified, if present, to determine the likelihood of listed threatened species utilising the area and its significance to them.

4.2.2 Opportunistic Fauna Observations

Opportunistic observations of fauna species was made during all field survey work which involved a series of transects across the site while searching microhabitats such as logs, rocks, leaf litter, observations of bird species with binoculars during the day and head torching at night.

4.2.3 Western Ringtail Possum Assessment

To determine if western ringtail possums were utilising the study area the following was carried out:

- Daytime survey of the site searching for dreys, obvious tree hollows (and other potential daytime refuge habitat), scats and individual WRPs;
- One night time survey to locate and record the distribution and abundance of WRPs; and
- Determination of the amount and quality of WRP habitat within the study area.

4.2.4 Black Cockatoo Habitat Assessment

The black cockatoo habitat assessment included a:

- Habitat tree survey: This involved the identification of all suitable trees species within the study area that have a diameter at breast height

(DBH) of over 50cm (irrespective of the presence/absence of suitable hollows – DSEWPaC/DPaW criteria). The location of each tree identified was recorded with a GPS and details on tree species, number and size of hollows (if any) noted.

Target tree species in this area included jarrah and marri or any other suitable *Corymbia/Eucalyptus* species of a suitable size that may be present. Peppermints, *Banksia*, Sheoak and *Melaleuca* tree species (for example) were not assessed as they typically do not develop hollows that are used by black cockatoos.

For the purposes of this study a potential cockatoo nest hollow was defined as:

Generally any tree which is alive or dead that contains one or more visible hollows (cavities within the trunk or branches) suitable for occupation by any of the three black cockatoo species for the purpose of nesting/breeding. Hollows that had an entrance greater than about 12cm in diameter and would allow the entry of a cockatoo (white tailed or red-tailed) into a suitably orientated and sized branch/trunk, were recorded as a "potential nest hollow".

Identified hollows (if any) were examined using binoculars for evidence of actual use by black cockatoos (e.g. chewing around hollow entrance, scarring and scratch marks on trunks and branches). Trees with possible nest hollows were also scratched and raked with a large stick/pole to flush any sitting birds from hollows and calls of chicks were also listened for.

- Black cockatoo foraging assessment: The location and nature of black cockatoo foraging evidence observed (e.g. chewed fruits around base of trees) during the field survey was recorded.

- Roosting habitat survey: Direct and indirect evidence of black cockatoos roosting within trees on site was noted if observed (e.g. branch clippings, droppings or moulted feathers).

5. SURVEY CONSTRAINTS

No seasonal sampling has been carried out as part of this fauna assessment. The conclusions presented are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are

therefore merely indicative of the environmental condition of the site at the time of the field assessments. It should also be recognised that site conditions can change with time.

Some fauna species are reported as potentially occurring within the study area based on there being suitable habitat (quality and extent) within the study area or immediately adjacent. With respect to opportunistic observations, the possibility exists that certain species may not have been detected during field investigations due to:

- seasonal inactivity during the field survey;
- species present within micro habitats not surveyed;
- cryptic species able to avoid detection; and
- transient wide-ranging species not present during the survey period.

Lack of observational data on some species should therefore not necessarily be taken as an indication that a species is absent from the site.

The habitat requirements and ecology of many of the species known to occur in the wider area are often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitat or microhabitat within the study area. As a consequence of this limitation the potential fauna list produced is most likely an overestimation of those species that actually utilise the study area for some purpose. Some species may be present in the general area but may only use the study area itself on rare occasions or as vagrants.

In recognition of the abovementioned survey limitations, a precautionary approach has been adopted for this assessment. Any fauna species that would possibly occur within the study area (or immediately adjacent), as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the Author, has been assumed to potentially occur in the study area.

During the western ringtail possum assessment and the black cockatoo habitat survey, trees with hollows were recorded. It should be noted that identifying hollows suitable for fauna species from ground level has limitations. Generally the full characteristics of any hollow seen are not fully evident (e.g. internal dimensions). It is also difficult to locate all hollows within all trees as some are not observable from ground level.

The location of habitat trees was recorded using a handheld GPS. The accuracy of the GPS cannot be guaranteed above a level of about 5 to 10 metres, though it should be noted that in some circumstance the accuracy can be worse or better than this.

6. RESULTS

6.1 POTENTIAL FAUNA INVENTORY - DESKTOP STUDY

A list of fauna species considered most likely to occur in the study area has compiled from information obtained during the desktop study and is presented in Appendix B. This listing was refined after information gathered during the site reconnaissance survey was assessed.

The results of some previous fauna surveys carried out in the general area are summarised in this species listing as are the DPaW NatureMap database search results. The raw database search results from NatureMap (DPaW 2013b) and the Protected Matters Search Tool (DSEWPaC 2013) are contained within Appendix C.

The list of potential fauna takes into consideration that firstly the species in question is not known to be locally extinct and secondly that suitable habitat for each species, as identified during the habitat assessment, is present within the study area, though compiling an accurate list has limitations (see Section 5 above) and therefore, as mentioned the listing is likely to be an overestimation of the fauna species actually present.

6.2 SITE SURVEYS

6.2.1 Fauna Habitat Assessment

The study area has been subject to considerable historical disturbances and now consists of a mosaic of cleared, partly cleared and vegetated areas. Disturbances apparent included previous sand extraction activities (existing pits and cleared areas), livestock grazing, horse riding activities, logging and common evidence of the effects of dieback (dead jarrah and banksia trees). Much of the vegetation now present is regrowth that has occurred subsequent to previous clearing/plant death.

The better quality vegetation, where present, consists primarily of an open forest of jarrah (*Eucalyptus marginata)* over a low open woodland of *Banksia attenuata*, *Nuytsia floribunda* and *Xylomelum occidentale* over an open heath/open low heath containing *Xanthorrhoea preissii* and *Macrozamia riedlei*.

In some areas a low open woodland of banksia predominates and jarrah is present as scattered emergent trees. Areas of the above-mentioned units in poorer condition lack native groundcover and weeds or bare sand dominate.

Paperbark (*Melaleuca preissiana*) in association with *Nuytsia floribunda* forms a low very open woodland with some emergent jarrah in the north - east corner of the southern section of the study area.

Marri (*Corymbia calophylla*) is rare and is only represented by a small number of specimens in the north of the study area and as a few scattered individuals in the better quality vegetation in the southern section of Lot 751.

The vegetation within the degraded/highly degraded areas varies from tall shrubland (*Kunzea glabrescens*) to a very open low shrubland or very open woodland over bare sand.

Soil across the site is comprised of a very course/gravelly grey sand.

The better quality vegetation in the extreme southern section of the site is continuous with vegetation of a similar type that extends into vacant crown land, which in turn adjoins further south an unnamed DPaW managed reserve (R 26238 - Ryall Block).

Plates 1 to 4 illustrate the nature of some of the vegetation units/habitats present within the study area. More detail on composition of the vegetation on site can be found within the flora and vegetation report (in preparation).

6.2.2 Opportunistic Fauna Observations

Opportunistic fauna observations are listed in Appendix B. A total of 30 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area. One introduced species was also observed.

Evidence of three listed threatened species was recorded (Carnaby's or Baudin's black cockatoo – foraging evidence, forest red-tailed black cockatoo – foraging evidence and heard calling). One migratory species was seen (rainbow bee-eater). No evidence of any DPaW priority species was observed.

6.2.3 Western Ringtail Possum Assessment

No evidence of western ringtail possums (WRPs) using vegetation within the study area was found during any stage of the assessment (day or night time surveys).

Vegetation within the study area appears to be mostly unsuitable or at best marginal for this species to utilise primarily due to a lack of midstorey vegetation or where present a lack of midstorey canopy connectivity which the species favours (G Harewood pers. obs.).

Western ringtail possums are however known to frequent the general area (Greg Harewood pers. obs.) and given the presence of some suitable habitat in and adjoining the site, mainly in the extreme south eastern area it may frequent the area on occasions but the site overall does not appear to be supporting a population or a significant portion of a population of the species.

6.2.4 Black Cockatoo Habitat Assessment

The habitat tree assessment identified a total of 63 trees with a DBH of >50cms within the study area (Figure 4). Fifty seven of the trees were jarrah (*E. marginata*) and three were marri (*C. calophylla*). Three of the trees could not be identified to species level as they were dead and had no distinguishing characteristics evident.

Twenty four of the 63 trees were observed to contain hollows of some type with four possibly having large enough hollows for black cockatoos to use for nesting though this assessment was based on the size of the entrance into an apparent hollow only. No evidence (e.g. chew marks) of past or present use of any hollow by black cockatoos was seen.

Additional details on each observed habitat tree can be found in Appendix D.

Foraging evidence attributed to all three species of black cockatoo was observed during the site survey in the form of chewed marri fruits, jarrah fruits and chewed banksia cones. Marri foraging was attributed to Baudin's and the forest red-tailed black cockatoo while chewed banksia cones was attributed to Carnaby's or Baudin's black cockatoo.

Jarrah and banksia trees form the main component of almost all of the remnant vegetation onsite and therefore most of the remnant vegetation represents foraging habitat for black cockatoos. It is difficult to accurately measure the extent of this habitat given the highly fragmented nature of most of the remaining vegetation which is interspersed with areas of cleared ground and scattered plants of various types in different stages of regrowth.

No existing roosting trees (trees used at night by black cockatoos to rest) were identified during the survey period.

6.3 FAUNA INVENTORY – SUMMARY

6.3.1 Vertebrate Fauna

Table 1 summarises the number of fauna species potentially occurring within the study area, based on results from the desktop study and observations made during the field assessment. A complete list of vertebrate fauna possibly inhabiting or frequenting the study area is located in Appendix B.

Not all species listed as potentially occurring within the study area in existing databases and publications (i.e. *EPBC Act* Threatened Fauna and Migratory species lists, DPaW's NatureMap database, various reports and publications) are shown in the expected listing in Appendix B. Some species have been excluded from this list based largely on the lack of suitable habitat at the study site and in the general area or known local extinction even if suitable habitat is present.

Table 1: Summary of Potential Vertebrate Fauna Species (as listed in Appendix B)

Group	Total number of potential species	Potential number of specially protected species	Potential number of migratory species	Potential number of priority species	Number of species observed during field survey
Fish	0	0	0	0	0
Amphibians	3	0	0	0	0
Reptiles	27	0	0	0	0
Birds	84[4]	4	1	1	28
Non-Volant Mammals	16[4]	3	0	1	3[1]
Volant Mammals (Bats)	9	0	0	1	0
Total	**139[8]**	**7**	**1**	**3**	**31[1]**

Superscript = number of introduced species included in total.

Despite the omission of some species it should be noted that the list provided is still very likely an over estimation of the fauna species utilising the site (either on

a regular or infrequent basis) as a result of the precautionary approach adopted for the assessment and in some cases only parts of the study area represent potentially suitable habitat for the species listed.

6.3.2 Vertebrate Fauna of Conservation Significance

A review of the *EPBC Act* threatened fauna list, DPaW's Threatened Fauna Database and Priority List, unpublished reports and scientific publications identified 20 specially protected, priority or migratory vertebrate fauna species as potentially occurring in the general vicinity of the study area.

Based on the habitats present and current documented distributions it is considered possible that 11 vertebrate fauna species of conservation significance may use the study area for some purpose at times. Habitat for some of these species on-site, while considered possibly suitable, may be marginal in extent/quality and species listed below may only visit the area for short periods, or as rare/uncommon vagrants. Species have been totally omitted from the potential list for the site (Appendix B), principally due to lack of suitable habitat on-site (including extent or quality) or known local extinction.

In summary, four vertebrate fauna species of conservation significance (listed as State or Federal threatened/migratory species or DPaW priority species) were positively identified as utilising the study area for some purpose during the survey period, these being:

- *Calyptorhynchus latirostris* Carnaby`s Black Cockatoo – S1 (*WC Act*), Endangered (*EPBC Act*)
  Foraging evidence possibly left by this species or Baudin's black cockatoos (chewed banksia cones) or the Forest Red-tailed Black Cockatoo (chewed jarrah fruits) observed.

- *Calyptorhynchus baudinii* Baudin`s Black Cockatoo - S1 (*WC Act*), Vulnerable (*EPBC Act*)
  Foraging evidence left by this species found (chewed marri fruits and possibly chewed banksia cones).

- *Calyptorhynchus banksii naso* Forest Red-tailed Black Cockatoo – S1 (*WC Act*), Vulnerable (*EPBC Act*)
  Foraging evidence left by this species found (chewed marri and jarrah fruits). Individuals of this species were heard calling during the field survey.

- *Merops ornatus* Rainbow Bee-eater – S3 (*WC Act*), Migratory (*EPBC Act*)
  A single individual observe foraging onsite during site survey.

An additional seven species of conservation significance may possibly utilise the study area for some purpose at times but their current status on-site and/or in the general area is, in some cases, difficult to determine because they were not sighted during the survey period or evidence of use of the study area was not found. These species are listed below:

- *Falco peregrinus* Peregrine Falcon - S4 (*WC Act*)
  This species potentially utilises some sections of the study area as part of a much larger home range. No potential nest sites observed.

- *Tyto novaehollandae* Masked Owl – P3 (DEC Priority Species)
  May occasionally reside in general area though status uncertain. It is unlikely to be specifically attracted to the site. Listed as a potential species but would most probably only ever occur rarely.

- *Dasyurus geoffroii* Chuditch - S1 (*WC Act*), Vulnerable (*EPBC Act*)
  Possibly present in general area and therefore it is possible that individuals of this species may utilise the better quality sections of the study site as part of a larger home range.

- *Phascogale tapoatafa ssp* Southern Brush-tailed Phascogale - S1 (*WC Act*)
  Known to occur in surrounding areas and therefore it is possible that individuals of this species utilise the study area.

- *Pseudocheirus occidentalis* Western Ringtail Possum - S1 (*WC Act*), Vulnerable (*EPBC Act*)
  No evidence of this species using the site found but it may on occasions be present in small numbers and or as transient individuals.

- *Isoodon obesulus fusciventer* Quenda – P5 (DPaW Priority Species)
  Habitat especially in far south where ground cover most continuous and dense appears suitable for this species to utilise.

- *Falsistrellus mackenziei* Western False Pipistrelle - P4 (DPaW Priority Species)
  Possibility exists that this species may forage and roost (in tree hollows) within the site.

A number of other species of conservation significance, while possibly present in the general area, are not listed as potential species due to known localised extinction (and no subsequent recruitment from adjoining areas) and/or lack of suitable habitat and/or the presence of feral predators. Details on these species and reasons for their omission are provided in Appendix E and Table 2.

Thirty two bird species that potentially frequent or occur in the study site are noted as Bush Forever Decreaser Species in the Perth Metropolitan Region

(eleven species were sighted/identified as having used the study area during the survey). Decreaser species are a significant issue in biodiversity conservation in the Perth section of the coastal plain as there have been marked reductions in range and population levels of many sedentary bird species as a consequence of disturbance and land clearing (Dell & Hyder-Griffiths 2002).

6.3.3 Invertebrate Fauna of Conservation Significance

A single priority invertebrate species appeared in the DPaW database search (DPaW 2013b). This probability that the site represents significant habitat for this species (*Pachysaga strobila* an un-named P1 cricket) is however considered to be very low. Additional details on this species and the reason for its omission from the likely species listing is provided in Appendix E and Table 2.

7. FAUNA VALUES

7.1 LOCAL AND REGIONAL CONSERVATION SIGNIFICANCE OF THE STUDY AREA

The conservation significance of the study area has been determined by applying site specific criteria such as:

- Fauna species and/or habitat present that is poorly represented in the general vicinity of the study area;
- Fauna habitat within the study site supporting species of conservation or other significance;
- Fauna habitat in better condition than other similar locations in general vicinity.

Natural areas within the south west of Western Australia have been significantly altered since European settlement in the 1830's and a variety of environmental factors, in particular habitat fragmentation and fire, will continue to threaten many species of fauna with local extinction. As the local development of land progresses the significance of any remnant vegetation increases.

The results of the fauna assessment indicate that the study site is utilise and/or potentially hosts a range of fauna species some of which are of special conservation significance. Of most significance is the presence of habitat suitable for the black cockatoos. The remnant vegetation within the study site

must therefore be considered to have some local conservation value given this fact.

Remnant vegetation within the study site is however largely degraded and only makes up a very small proportion of the total remnant vegetation in the immediate vicinity and therefore its regional significance to fauna could be regarded as relatively low. More continuous, better quality vegetation occurs to the south of Lot 751 in vacant crown land and in an existing reserve.

7.2 VALUE OF THE STUDY AREA AS AN ECOLOGICAL LINKAGE/WILDLIFE CORRIDOR

Linkage with adjacent bushland areas has been identified as a natural attribute of high priority in the assessment of a sites regional significance (EPA 2003b, Molloy *et al.* 2009).

Detailed analyses of potential ecological linkages for the south west (Molloy *et al.* 2009) also shows vegetation within the study area as being adjacent to a recognised ecological linkage and forms part of a 1a (core linkage) remnant. Vegetation within Lot 751 must therefore be seen as contributing to the value of this linkage given the fact that many other sections along the axis line of the corridor are cleared though its overall contribution to the linkage is relatively low given the limited extent of vegetation within the site and its largely degraded nature.

8. POTENTIAL IMPACTS

In general the most significant potential impacts to fauna of any development include:

- Loss of vegetation/fauna habitat that may be used for foraging, breeding, roosting, or dispersal (includes loss of hollow bearing trees);
- Fragmentation of vegetation/fauna habitat which may restrict the movement of some fauna species;
- Modifications to surface hydrology, siltation of creek lines;
- Changes to fire regimes;
- Pollution (e.g. oil spills);
- Noise/Light/Dust;

- Spread of plant pathogens (e.g. dieback) and weeds;
- Potential increase in the number of predatory introduced species (e.g. cats);
- Death or injury of fauna during clearing and construction; and
- An increase in fauna road kills subsequent to development.

The exact extent of development within the site is not known at this stage however the possible impacts on specific species of conservation significance previously recorded in the general area is provided in the table below. Additional information on those species listed is provided in Appendix E.

Table 2: Likelihood of Occurrence and Possible Impacts – Fauna Species of Conservation Significance (continues on following pages).

Common Name	Genus & Species	Conservation Status	Habitat Present	Likelihood of Occurrence	Possible Impacts
Unnamed cricket	*Pachysaga strobila*	P1	No?	Unlikely	No Impact.
Southern Carpet Python	*Morelia spilota imbricata*	S4	No/Marginal	Unlikely	No Impact.
Malleefowl	*Leipoa ocellata*	S1, VU, Mig	No	Unlikely - species locally extinct.	No Impact.
Great Egret	*Ardea alba*	S3, Mig	No	Unlikely	No Impact.
Cattle Egret	*Ardea ibis*	S3, Mig	No	Unlikely	No Impact.
Osprey	*Pandion haliaetus*	Mig	No	Unlikely	No Impact.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	S3, Mig	No	Unlikely	No Impact.
Peregrine Falcon	*Falco peregrinus*	S4	Yes	Possible	Loss/modification of a small area of habitat. No significant impact likely.
Carnaby`s Black Cockatoo	*Calyptorhynchus latirostris*	S1, EN	Yes	Known to occur	Loss/modification of small areas of habitat.
Baudin`s Black Cockatoo	*Calyptorhynchus baudinii*	S1, VU	Yes	Known to occur	Loss/modification of small areas of habitat.

Common Name	Genus & Species	Conservation Status	Habitat Present	Likelihood of Occurrence	Possible Impacts
Forest Red-tailed Black Cockatoo	*Calyptorhynchus banksii naso*	S1, VU	Yes	Known to occur	Loss/modification of small areas of habitat.
Masked Owl (SW population)	*Tyto n. novaehollandiae*	P3	Yes/Marginal	Possible/Infrequent	Loss/modification of a small area of habitat. No significant impact likely.
Fork-tailed Swift	*Apus pacificus*	S3, Mig	Yes	Flyover only.	No impact. Uncommon aerial species.
Rainbow Bee-eater	*Merops ornatus*	S3, Mig	Yes	Known to occur	Loss/modification of a small area of habitat. No significant impact likely.
Chuditch	*Dasyurus geoffroii*	S1, VU	Yes/Marginal	Possible/Infrequent	Loss/modification of a small area of habitat. No significant impact likely.
Southern Brush-tailed Phascogale	*Phascogale tapoatafa ssp*	S1	Yes	Possible	Loss/modification of small areas of habitat. No significant impact likely.
Southern Brown Bandicoot	*Isoodon obesulus fusciventer*	P5	Yes	Possible	Loss of some habitat. Potential for individuals to be killed or injured during clearing. No significant impact likely.
Western Ringtail Possum	*Pseudocheirus occidentalis*	S1, VU	No/Marginal	Possible/Infrequent	Loss/modification of small areas of habitat. No significant impact likely.
Western Brush Wallaby	*Macropus irma*	P4	No	Unlikely	No Impact.
Quokka	*Setonix brachyurus*	S1, VU	No	Unlikely	No impact.
Western False Pipistrelle	*Falsistrellus mackenziei*	P4	Yes	Possible	Loss of some habitat. No significant impact likely.

See Appendix A for conservation status codes

9. CONCLUSION

The fauna assessment within the study area was undertaken for the purposes of delineating and characterising the fauna habitats and faunal assemblages present and to identify potential impacts development at the site may have. Targeted searches for western ringtail possums and black cockatoo individuals and their habitat were also carried out.

With respect to native vertebrate fauna, 21 mammals (includes nine bat species), 80 bird, 27 reptile and three frog species have previously been recorded in the general area, some of which have the potential to occur in or utilise sections of the study area at times.

Of the 131 native animals that are listed as potentially occurring in the area, seven are considered to be endangered/vulnerable or in need of special

protection under State and/or Federal law. In addition, one migratory species and three DPaW priority species may also frequent the area at times.

Constraints on development within the study area will largely be centred on the presence of habitat used or potentially used by a number of conservation significant fauna species. The potential impacts on these species and/or their habitat will need to be taken into consideration during the planning stages within the aim of minimising/mitigating impacts so as to facilitate approvals.

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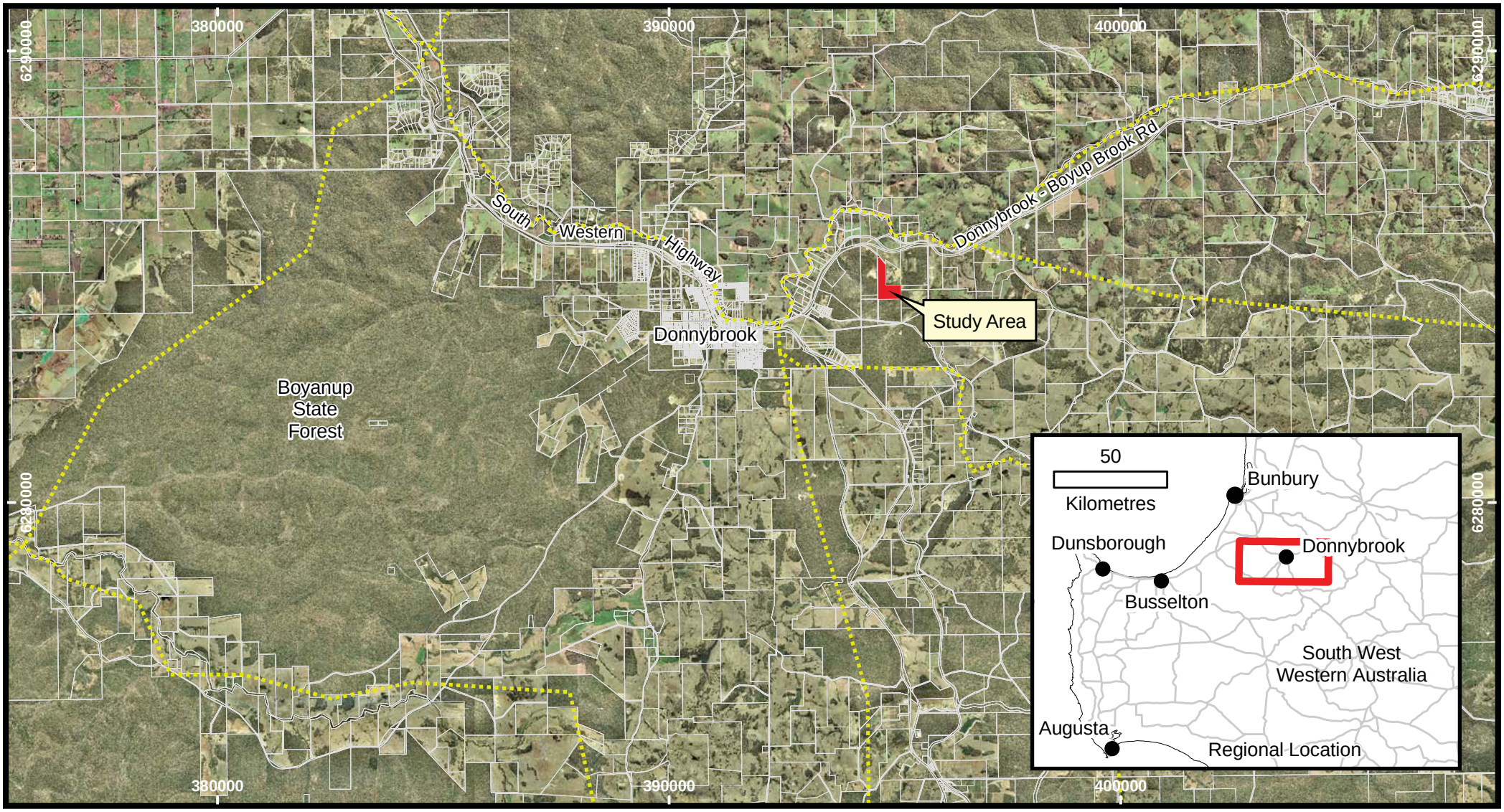
FIGURES



Legend

- Lot 751 (part)
- Regional Ecological Linkage (Axis Line)

0 2 4 6 8 10

Kilometres

MGA Zone 50

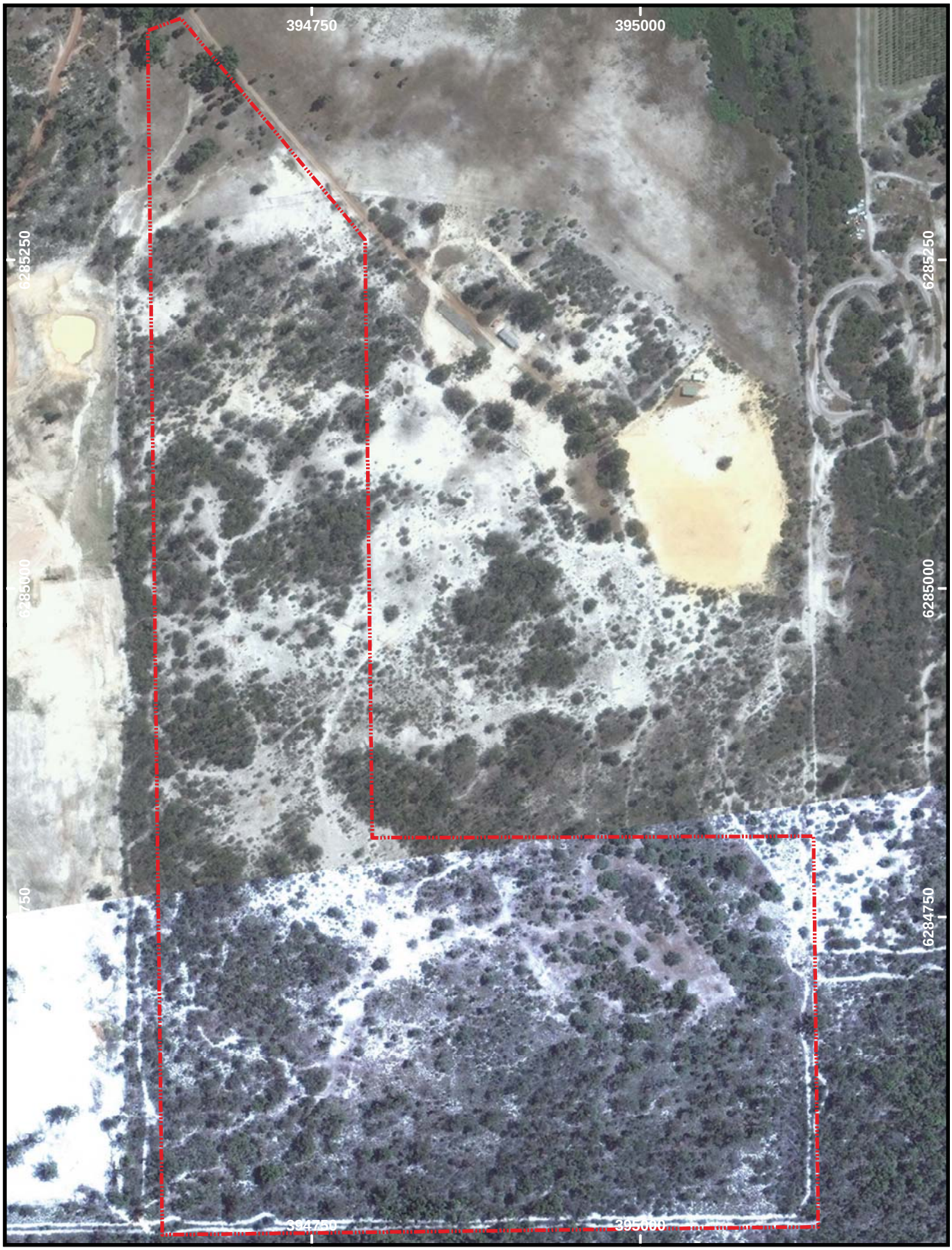
Fauna Survey

Lot 751
Donnybrook - Boyup Brook Rd
Beelerup

Study Area and Surrounds

DRAWN:G Harewood
DATE : Nov 2013
SCALE: 1:120,000

Figure: 1



Legend

Study Area

N

0 50 100 150 200

Meters

Fauna Assessment

DRAWN: G Harewood

DATE : Nov 2013

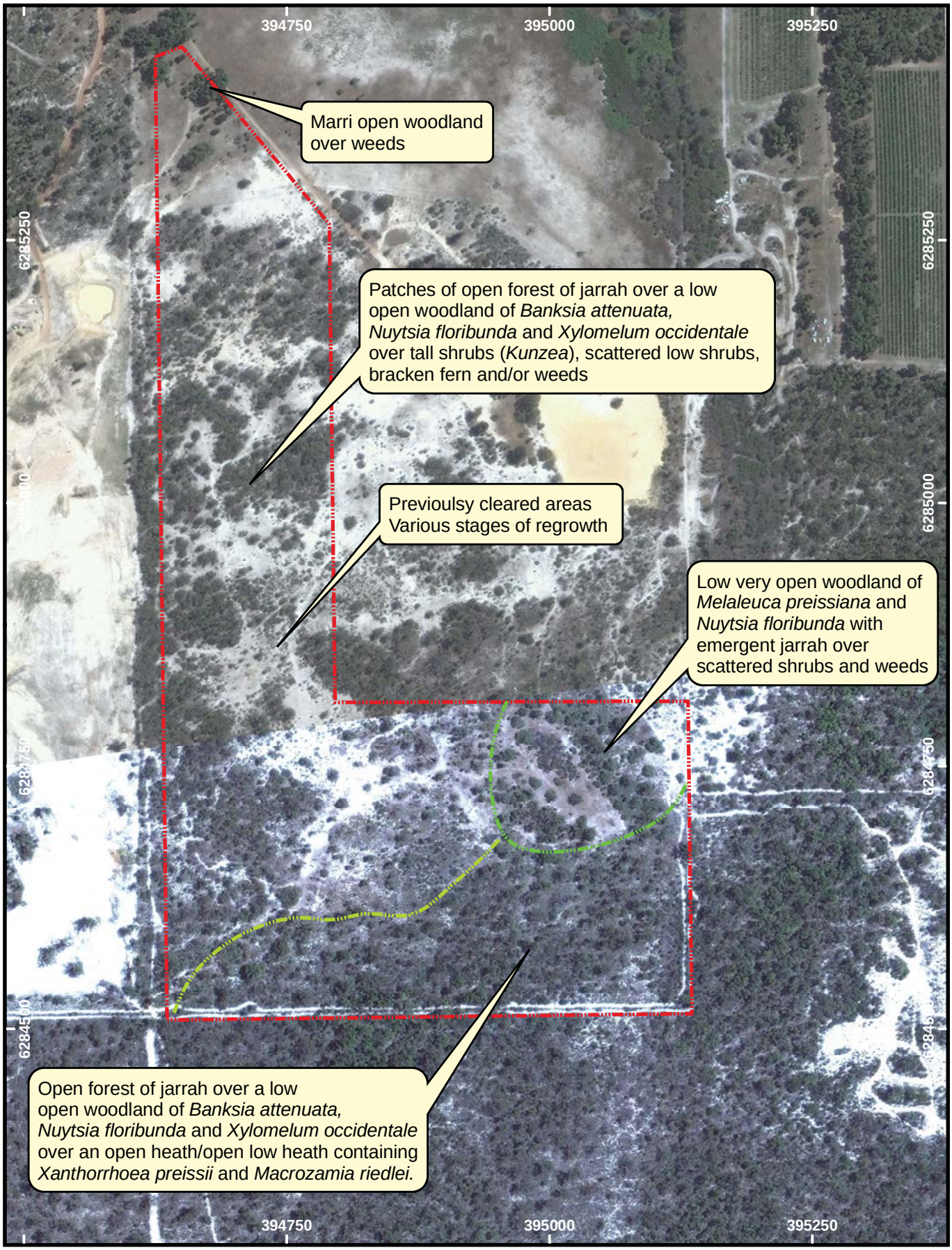
SCALE: 1:4,000

MGA Zone 50

Lot 751
Donnybrook - Boyup Brook Rd
Beelerup

Study Area Air Photo

Figure: 2



Legend

Study Area

N

0 50 100 150 200

Meters

Fauna Assessment

Lot 751
Donnybrook - Boyup Brook Rd
Beelerup

Fauna Habitats

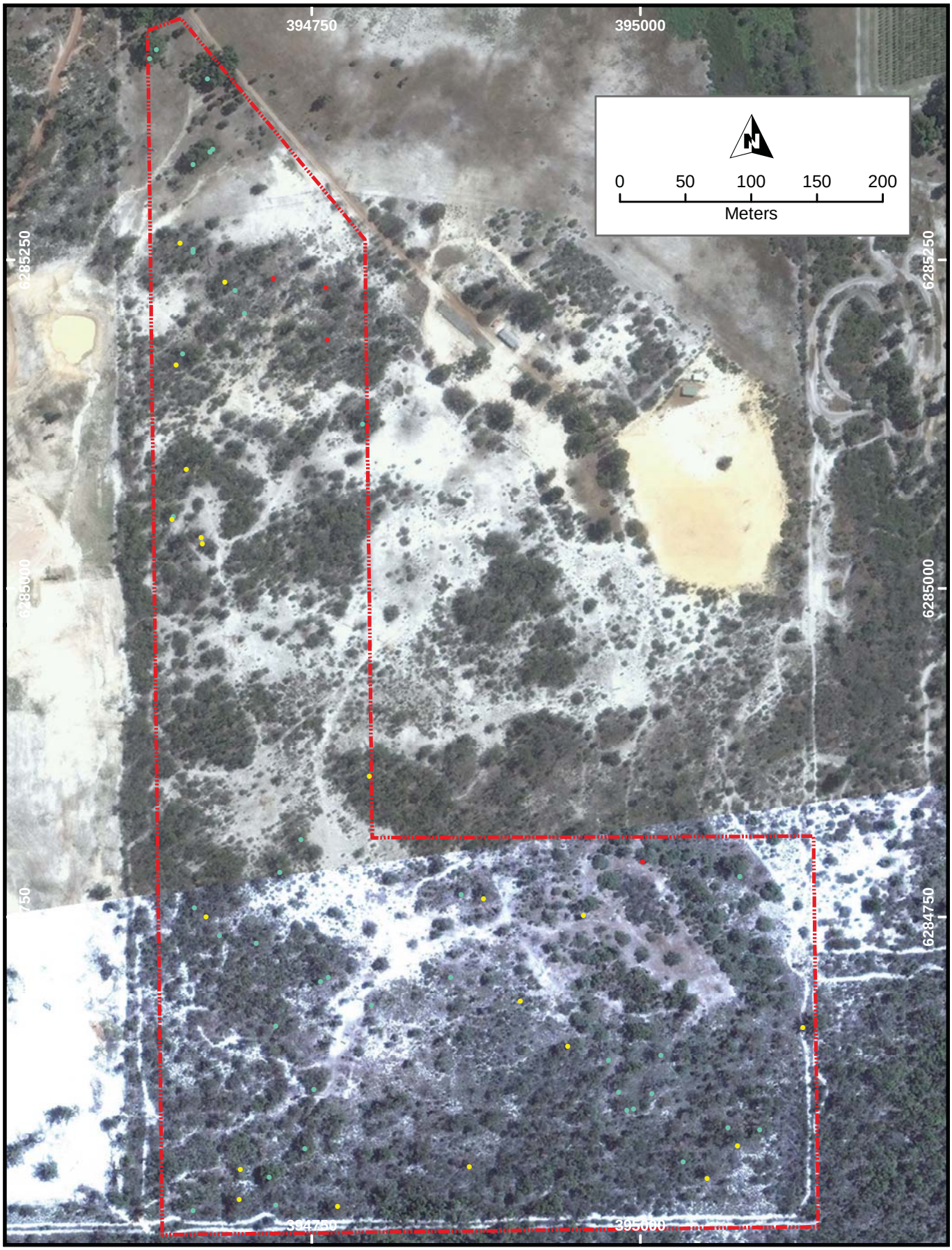
DRAWN: G Harewood

DATE : Nov 2013

SCALE: 1:5,000

MGA Zone 50

Figure: 3



Legend

- Study Area
- Tree >50cm DBH, no hollows seen
- Tree >50cm DBH, one or more hollows seen
- Tree >50cm DBH, one or more hollows possibly suitable for a Black Cockatoo

Fauna Assessment

DRAWN: G Harewood

DATE : Nov 2013

SCALE: 1:4,000

MGA Zone 50

Lot 751
Donnybrook - Boyup Brook Rd
Beelerup

Habitat Trees (DBH >50cm)

Figure: 4

PLATES

Plate 1: Regrowth open shrubland within previous sand extraction area.

Plate 2: Open woodland of jarrah over low woodland of *Nuytsia floribunda* and *Xylomelum occidentale* over an open heath/open low heath containing *Xanthorrhoea preissii* and *Macrozamia riedlei*.

Plate 3: Low very open woodland of paperbark and *Nuytsia floribunda* with emergent jarrah over open shrubland of *Xanthorrhoea preissii* and weeds.

Plate 4: Open woodland of jarrah over low woodland of *Nuytsia floribunda* and *Xylomelum occidentale* over a low open shrubland and weeds.

APPENDIX A

CONSERVATION CATEGORIES

EPBC Act (1999) Threatened Fauna Categories

Category	Code	Description
Extinct	E	There is no reasonable doubt that the last member of the species has died.
*Extinct in the wild	EW	A species (a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
*Critically endangered	CE	A species is facing an extremely high risk of extinction in the wild in the immediate future.
*Endangered	EN	A species: (a) is not critically endangered; and (b) is facing a very high risk of extinction in the wild in the near future.
*Vulnerable	VU	A species (a) is not critically endangered or endangered; and (b) is facing a high risk of extinction in the wild in the medium-term future.
Conservation dependent	CD	A species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered
*Migratory	Migratory	(a) all migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and (c) all native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Marine	Ma	Species in the list established under s248 of the EPBC Act

Note: Only species in those categories marked with an asterix are matters of national environmental significance under the *EPBC Act*.

Western Australian Wildlife Conservation Act (1950) Threatened Fauna Categories

Category	Code	Description
Schedule 1	S1	Fauna which is rare or likely to become extinct Threatened fauna (Schedule 1) are further ranked by the DEC according to their level of threat using IUCN Red List criteria: **CR: Critically Endangered** - considered to be facing an extremely high risk of extinction in the wild. **EN: Endangered** - considered to be facing a very high risk of extinction in the wild. **VU: Vulnerable** - considered to be facing a high risk of extinction in the wild.
Schedule 2	S2	Fauna which is presumed extinct
Schedule 3	S3	Birds which are subject to an agreement between the governments of Australia and Japan (JAMBA) relating to the protection of migratory birds and birds in danger of extinction
Schedule 4	S4	Fauna that is otherwise in need of special protection

Western Australian DPaW Priority Fauna Categories

Category	Code	Description
Priority 1	P1	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes..
Priority 2	P2	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
Priority 3	P3	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
Priority 4	P4	(a) **Rare**. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. (b) **Near Threatened**. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
Priority 5	P5	Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

IUCN Red List Threatened Species Categories

Category	Code	Description
Extinct	EX	Taxa for which there is no reasonable doubt that the last individual has died.
Extinct in the Wild	EW	Taxa which is known only to survive in cultivation, in captivity or and as a naturalised population well outside its past range and it has not been recorded in known or expected habitat despite exhaustive survey over a time frame appropriate to its life cycle and form.
Critically Endangered	CR	Taxa facing an extremely high risk of extinction in the wild.
Endangered	EN	Taxa facing a very high risk of extinction in the wild.
Vulnerable	VU	Taxa facing a high risk of extinction in the wild.
Near Threatened	NT	Taxa which has been evaluated but does not qualify for CR, EN or VU now but is close to qualifying or likely to qualify in the near future.
Least Concern	LC	Taxa which has been evaluated but does not qualify for CR, EN, VU, or NT but is likely to qualify for NT in the near future.
Data Deficient	DD	Taxa for which there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

A full list of categories and their meanings are available at:

http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria

APPENDIX B

FAUNA OBSERVED OR POTENTIALLY IN STUDY AREA

Fauna Observed or Potentially in Study Area

Lot 751 Donnybrook - Boyup Brook Road, Beelerup, W.A.

Compiled by Greg Harewood - November 2013

Recorded (Trapped/Sighted/Heard/Signs) = X

Approx Centroid 33.571143°S and 115..865868°E

Harewood, G. (2013). Fauna Assessment Lot 751 Donnybrook - Boyup Brook Road, Beelerup. Unpublished report for MBS.

Bamford, M. J., and A. R. (2000). Proposed Gwindinup mineral sands mine, Fauna surveys August and December 1999, Unpublished report to Cable Sands (WA) Pty Ltd.

Bamford, M. J., and Wilcox J.A. (2004). The use of the proposed sand mining area at Gwindinup by threatened species. Unpublished report to Cable Sands (WA) Pty Ltd.

Bancroft, W. and Bamford, M. J. (2008). Fauna values of Bemax's Happy Valley mineral sands deposit. Unpublished report to Bemax Resources Ltd.

DPaW (2013b). NatureMap Database Search. "By Circle" 115°52' 00" E, 33°34' 12" S– Study area (plus 10km buffer), 30/10/2013.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Amphibians							
Myobatrachidae Ground or Burrowing Frogs							
Heleioporus eyrei	Moaning Frog	LC		X			X
Limnodynastes dorsalis	Banjo Frog	LC		X			
Pseudophryne guentheri	Güenther`s Toadlet	LC					
Reptiles							
Gekkonidae Geckoes							
Christinus marmoratus	Marbled Gecko					X	
Diplodactylus polyophthalmus	Speckled Stone Gecko			X		X	

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Pygopodidae Legless Lizards							
Aprasia pulchella	Pretty Worm Lizard			X			X
Lialis burtonis	Common Snake Lizard					X	
Pygopus lepidopodus	Southern Scaleyfoot					X	
Agamidae Dragon Lizards							
Pogona minor	Western Bearded Dragon			X		X	
Varanidae Monitor's or Goanna's							
Varanus gouldii	Gould's Sand Monitor					X	
Varanus rosenbergi	Heath Monitor					X	

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Scincidae Skinks							
Acritoscincus trilineatum	South-western Cool Skink			X		X	
Cryptoblepharus buchananii	Fence Skink			X		X	
Ctenotus impar	South-western Odd-striped Ctenotus			X		X	
Ctenotus labillardieri	Red-legged Skink			X		X	
Egernia kingii	King's Skink						
Egernia napoleonis	Salmon-bellied Skink			X		X	
Hemiergis peronii tridactyla	Three-toed Mulch Skink			X		X	
Lerista distinguenda	South-western Four-toed Lerista			X		X	X
Menetia greyii	Dwarf Skink			X		X	
Morethia lineoocellata	Western Pale-flecked Morethia			X		X	
Morethia obscura	Dusky Morethia			X		X	X
Tiliqua rugosa rugosa	Western Bobtail			X	X	X	

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Typhlopidae Blind Snakes							
Ramphotyphlops australis	Southern Blind Snake			X		X	X
Ramphotyphlops pinguis	Stout Blind Snake					X	
Elapidae Elapid Snakes							
Echiopsis curta	Bardick						
Notechis scutatus	Tiger Snake			X			
Parasuta gouldii	Gould's Hooded Snake						
Parasuta nigriceps	Black-backed Snake						
Pseudonaja affinis	Dugite					X	X

Birds

Casuariidae Emus, Cassowarries							
Dromaius novaehollandiae	Emu	Bp LC		X		X	X

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Phasianidae Quails, Pheasants							
Coturnix pectoralis	Stubble Quail	LC				X	
Coturnix ypsilophora	Brown Quail	LC					
Accipitridae Kites, Goshawks, Eagles, Harriers							
Accipiter cirrocephalus	Collared Sparrowhawk	Bp LC				X	
Accipiter fasciatus	Brown Goshawk	Bp LC		X		X	X
Aquila audax	Wedge-tailed Eagle	Bp LC		X		X	X
Aquila morphnoides	Little Eagle	Bp LC		X			
Elanus caeruleus	Black-shouldered Kite	LC					
Haliastur sphenurus	Whistling Kite	Bp LC					X
Hamirostra isura	Square-tailed Kite	Bp LC		X		X	

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Falconidae Falcons							
Falco berigora	Brown Falcon	Bp LC		X			X
Falco cenchroides	Australian Kestrel	LC		X	X	X	X
Falco longipennis	Australian Hobby	LC					
Falco peregrinus	Peregrine Falcon	S4 Bp LC		X			X
Turnicidae Button-quails							
Turnix varia	Painted Button-quail	Bp LC		X		X	
Columbidae Pigeons, Doves							
Columba livia	Domestic Pigeon	Introduced					
Ocyphaps lophotes	Crested Pigeon	LC	X	X		X	X
Phaps chalcoptera	Common Bronzewing	Bh LC	X	X		X	X
Streptopelia senegalensis	Laughing Turtle-Dove	Introduced					

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Cacatuidae Cockatoos, Corellas							
Cacatua sanguinea	Little Corella	Introduced					
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	S1 VU Be LC	X	X	X	X	X
Calyptorhynchus baudinii	Baudin`s Black Cockatoo	S1 EN Bp EN C2a(ii)	X		X	X	X
Calyptorhynchus latirostris	Carnaby`s Black Cockatoo	S1 EN Bp EN A2bcd+3bcd	X	X	X	X	X
Eolophus roseicapilla	Galah	LC	X	X			
Psittacidae Parrots							
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	LC		X			
Neophema elegans	Elegant Parrot	LC				X	X
Platycercus icterotis icterotis	Western Rosella (Western ssp)	Bp LC		X	X	X	
Platycercus spurius	Red-capped Parrot	LC	X	X	X	X	X
Platycercus zonarius	Australian Ringneck Parrot	LC	X	X	X	X	X
Polytelis anthopeplus	Regent Parrot	LC					X

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Cuculidae Parasitic Cuckoos							
Cacomantis flabelliformis	Fan-tailed Cuckoo	LC		X		X	X
Chrysococcyx basalis	Horsfield`s Bronze Cuckoo	LC		X		X	
Chrysococcyx lucidus	Shining Bronze Cuckoo	LC	X	X		X	
Cuculus pallidus	Pallid Cuckoo	LC					
Strigidae Hawk Owls							
Ninox novaeseelandiae	Boobook Owl	LC		X	X		X
Tytonidae Barn Owls							
Tyto alba	Barn Owl	LC					
Tyto n. novaehollandiae	Masked Owl (SW population)	P3 Bp					X
Podargidae Frogmouths							
Podargus strigoides	Tawny Frogmouth	LC		X	X		X

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Caprimulgidae Nightjars							
Eurostopodus argus	Spotted Nightjar	LC					
Aegothelidae Owlet-nightjars							
Aegotheles cristatus	Australian Owlet-nightjar	LC		X		X	
Halcyonidae Tree Kingfishers							
Dacelo novaeguineae	Laughing Kookaburra	Introduced		X	X	X	X
Todiramphus sanctus	Sacred Kingfisher	LC		X	X	X	X
Meropidae Bee-eaters							
Merops ornatus	Rainbow Bee-eater	S3 Mig JA LC	X	X	X	X	X
Maluridae Fairy Wrens, GrassWrens							
Malurus splendens	Splendid Fairy-wren	Bh LC	X	X	X	X	X

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Pardalotidae Pardalotes, Bristlebirds, Scrubwrens, Gerygones, Thornbills							
Acanthiza apicalis	Broad-tailed Thornbill	Bh LC	X	X	X	X	X
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	Bh LC	X	X	X	X	X
Acanthiza inornata	Western Thornbill	Bh LC		X	X	X	X
Gerygone fusca	Western Gerygone	LC	X	X	X	X	X
Pardalotus punctatus	Spotted Pardalote	LC		X		X	X
Pardalotus striatus	Striated Pardalote	LC	X	X	X	X	X
Sericornis frontalis	White-browed Scrubwren	Bh LC		X	X	X	X
Smicrornis brevirostris	Weebill	Bh LC		X	X	X	X

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Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Meliphagidae Honeyeaters, Chats							
Acanthorhynchus superciliosus	Western Spinebill	LC	X	X	X	X	X
Anthochaera carunculata	Red Wattlebird	LC	X	X	X	X	X
Lichenostomus virescens	Singing Honeyeater	LC					
Lichmera indistincta	Brown Honeyeater	LC	X	X	X	X	X
Melithreptus chloropsis	Western White-naped Honeyeater	LC		X		X	
Phylidonyris nigra	White-cheeked Honeyeater	Bp LC					
Phylidonyris novaehollandiae	New Holland Honeyeater	Bp LC		X		X	X
Petroicidae Australian Robins							
Eopsaltria australis	Western Yellow Robin	Bh LC		X	X	X	
Microeca fascinans	Jacky Winter	LC					
Petroica multicolor	Scarlet Robin	Bh LC	X	X		X	X

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Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Neosittidae Sitellas							
Daphoenositta chrysoptera	Varied Sittella	Bh LC		X		X	X
Pachycephalidae Crested Shrike-tit, Crested Bellbird, Shrike Thrushes, Whistlers							
Colluricincla harmonica	Grey Shrike-thrush	Bh LC	X	X	X	X	X
Pachycephala pectoralis	Golden Whistler	Bh LC	X	X		X	X
Pachycephala rufiventris	Rufous Whistler	LC		X	X		X
Dicruridae Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo							
Grallina cyanoleuca	Magpie-lark	LC		X			X
Rhipidura fuliginosa	Grey Fantail	LC	X	X	X	X	
Rhipidura leucophrys	Willie Wagtail	LC	X	X		X	X
Campephagidae Cuckoo-shrikes, Trillers							
Coracina novaehollandiae	Black-faced Cuckoo-shrike	LC		X		X	X
Lalage sueurii	White-winged Triller	LC		X		X	

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = Least Concern - see Appendix A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Artamidae Woodswallows, Butcherbirds, Currawongs							
Artamus cinereus	Black-faced Woodswallow	Bp LC		X		X	X
Artamus cyanopterus	Dusky Woodswallow	Bp LC	X	X		X	X
Cracticus tibicen	Australian Magpie	LC	X	X	X	X	X
Cracticus torquatus	Grey Butcherbird	LC	X	X		X	X
Strepera versicolor	Grey Currawong	Bp LC		X	X	X	X
Corvidae Ravens, Crows							
Corvus coronoides	Australian Raven	LC	X	X	X	X	X
Motacillidae Old World Pipits, Wagtails							
Anthus novaeseelandiae	Australian Pipit	LC		X			
Dicaeidae Flowerpeckers							
Dicaeum hirundinaceum	Mistletoebird	LC					X

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Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Hirundinidae Swallows, Martins							
Hirundo neoxena	Welcome Swallow	LC		X			X
Hirundo nigricans	Tree Martin	LC		X		X	
Sylviidae Old World Warblers							
Cincloramphus cruralis	Brown Songlark	LC					
Cincloramphus mathewsi	Rufous Songlark	LC		X			
Zosteropidae White-eyes							
Zosterops lateralis	Grey-breasted White-eye	LC	X	X	X	X	

Mammals

Tachyglossidae Echidnas							
Tachyglossus aculeatus	Echidna	LC		X		X	

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Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Dasyuridae Carnivorous Marsupials							
Antechinus flavipes	Yellow-footed Antechinus, Mardo	LC		X		X	
Dasyurus geoffroii	Chuditch	S1 VU VU C1		X			X
Phascogale tapoatafa ssp	Southern Brush-tailed Phascogale	S1 NT		X		X	X
Sminthopsis gilberti	Gilbert`s Dunnart	LC		X		X	X
Peramelidae Bandicoots							
Isoodon obesulus fusciventer	Southern Brown Bandicoot	P5 LC		X	X	X	X
Phalangeridae Brushtail Possums, Cuscuses							
Trichosurus vulpecula	Common Brushtail Possum	LC	X	X	X	X	X
Burramyidae Pygmy Possums							
Cercartetus concinnus	Western Pygmy-possum	LC		X		X	
Tarsipedidae Honey Possum							
Tarsipes rostratus	Honey Possum	LC		X			

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Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Pseudocheiridae Ringtail Posssums							
Pseudocheirus occidentalis	Western Ringtail Possum	S1 VU VU C2a		X			X
Macropodidae Kangaroos, Wallabies							
Macropus fuliginosus	Western Grey Kangaroo	LC	X	X	X	X	
Molossidae Freetail Bats							
Mormopterus planiceps	Western Freetail Bat	LC					
Tadarida australis	White-striped Freetail-bat	LC		X			

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Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Vespertilionidae Ordinary Bats							
Chalinolobus gouldii	Gould`s Wattled Bat	LC					X
Chalinolobus morio	Chocolate Wattled Bat	LC					
Falsistrellus mackenziei	Western False Pipistrelle	P4 VU A2c					
Nyctophilus geoffroyi	Lesser Long-eared Bat	LC					X
Nyctophilus gouldi	Gould`s Long-eared Bat	LC					
Nyctophilus major major	Western Long-eared Bat						
Vespadelus regulus	Southern Forest Bat	LC		X			
Muridae Rats, Mice							
Mus musculus	House Mouse	Introduced		X			X
Rattus fuscipes	Western Bush Rat	LC					
Canidae Dogs, Foxes							
Vulpes vulpes	Red Fox	Introduced		X		X	

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Class **Family** *Species*	Common Name	Conservation Status	Harewood ('13) Lot 751 Beelerup	Bamford and Bamford ('00) Gwindinup	Bamford and Willcox ('04) Gwindinup	Bancroft and Bamford ('07) Happy Valley	DPaW NatureMap ('13)
Felidae Cats							
Felis catus	Cat	Introduced					
Leporidae Rabbits, Hares							
Oryctolagus cuniculus	Rabbit	Introduced	X	X		X	

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APPENDIX C

DPAW & *EPBC* DATABASE SEARCH RESULTS

NatureMap
Mapping Western Australia's biodiversity

NatureMap - Invertebrates - Lot 751

Created By Greg Harewood on 08/11/2013

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Species Group Invertebrates
Method 'By Circle'
Centre 115°52' 00" E,33°34' 12" S
Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	-12082	*Akamptogonus novarae*			
2.	-12196	*Aname mainae*			
3.	-11630	*Artoria flavimana*			
4.	-12810	*Cercophonius sulcatus*			
5.	-12846	*Missulena granulosa subsp. hoggi*			
6.	33989	*Pachysaga strobila (cricket)*		P1	
7.	-12778	*Urodacus novaehollandiae*			

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

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap - Frogs - Lot 751

Created By Greg Harewood on 30/10/2013

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Species Group Amphibians
Method 'By Circle'
Centre 115°52' 00" E,33°34' 12" S
Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	25410	*Heleioporus eyrei (Moaning Frog)*			

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

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap - Reptiles - Lot 751

Created By Greg Harewood on 30/10/2013

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Species Group	Reptiles
Method	'By Circle'
Centre	115°52' 00" E,33°34' 12" S
Buffer	10km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	24990	*Aprasia pulchella*			
2.	25118	*Hemiergis peronii subsp. tridactyla*			
3.	25131	*Lerista distinguenda*			
4.	25192	*Morethia obscura*			
5.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
6.	25271	*Ramphotyphlops australis*			
7.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			

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

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap - Birds - Lot 751

Created By Greg Harewood on 30/10/2013

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Species Group Birds
Method 'By Circle'
Centre 115°52' 00" E,33°34' 12" S
Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
2.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
3.	24262	*Acanthiza inornata (Western Thornbill)*			
4.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
5.	25536	*Accipiter fasciatus (Brown Goshawk)*			
6.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
7.	24312	*Anas gracilis (Grey Teal)*			
8.	24315	*Anas rhynchotis (Australasian Shoveler)*			
9.	24316	*Anas superciliosa (Pacific Black Duck)*			
10.	24561	*Anthochaera carunculata (Red Wattlebird)*			
11.	24285	*Aquila audax (Wedge-tailed Eagle)*			
12.	41324	*Ardea modesta (Eastern Great Egret)*		IA	
13.	24341	*Ardea pacifica (White-necked Heron)*			
14.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
15.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
16.	24318	*Aythya australis (Hardhead)*			
17.	24319	*Biziura lobata (Musk Duck)*			
18.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
19.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
20.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
21.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	
22.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)*		T	
23.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
24.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
25.	24288	*Circus approximans (Swamp Harrier)*			
26.	24396	*Climacteris rufa (Rufous Treecreeper)*			
27.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
28.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
29.	25592	*Corvus coronoides (Australian Raven)*			
30.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
31.	25595	*Cracticus tibicen (Australian Magpie)*			
32.	25596	*Cracticus torquatus (Grey Butcherbird)*			
33.	24322	*Cygnus atratus (Black Swan)*			
34.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
35.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
36.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
37.	24470	*Dromaius novaehollandiae (Emu)*			
38.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
39.	24567	*Epthianura albifrons (White-fronted Chat)*			
40.	25621	*Falco berigora (Brown Falcon)*			
41.	25622	*Falco cenchroides (Australian Kestrel)*			
42.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
43.	25727	*Fulica atra (Eurasian Coot)*			
44.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
45.	25530	*Gerygone fusca (Western Gerygone)*			
46.	24443	*Grallina cyanoleuca (Magpie-lark)*			
47.	24295	*Haliastur sphenurus (Whistling Kite)*			
48.	24491	*Hirundo neoxena (Welcome Swallow)*			
49.	25661	*Lichmera indistincta (Brown Honeyeater)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
50.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
51.	25654	*Malurus splendens (Splendid Fairy-wren)*			
52.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
53.	25610	*Myiagra inquieta (Restless Flycatcher)*			
54.	24738	*Neophema elegans (Elegant Parrot)*			
55.	25748	*Ninox novaeseelandiae (Boobook Owl)*			
56.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
57.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
58.	24328	*Oxyura australis (Blue-billed Duck)*			
59.	25679	*Pachycephala pectoralis (Golden Whistler)*			
60.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
61.	24693	*Pachyptila desolata (Antarctic Prion)*			
62.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
63.	25682	*Pardalotus striatus (Striated Pardalote)*			
64.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
65.	24660	*Petroica multicolor subsp. campbelli (Scarlet Robin)*			
66.	25697	*Phalacrocorax carbo (Great Cormorant)*			
67.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
68.	25699	*Phalacrocorax varius (Pied Cormorant)*			
69.	24409	*Phaps chalcoptera (Common Bronzewing)*			
70.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
71.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
72.	25720	*Platycercus icterotis (Western Rosella)*			
73.	24745	*Platycercus icterotis subsp. icterotis (Western Rosella)*			
74.	24747	*Platycercus spurius (Red-capped Parrot)*			
75.	24750	*Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)*			
76.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
77.	25704	*Podiceps cristatus (Great Crested Grebe)*			
78.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
79.	25722	*Polytelis anthopeplus (Regent Parrot)*			
80.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
81.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
82.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
83.	30948	*Smicrornis brevirostris (Weebill)*			
84.	24645	*Stagonopleura oculata (Red-eared Firetail)*			
85.	25597	*Strepera versicolor (Grey Currawong)*			
86.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
87.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
88.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
89.	24844	*Threskiornis molucca (Australian White Ibis)*			
90.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
91.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
92.	24851	*Turnix velox (Little Button-quail)*			
93.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southern subsp))*		P3	
94.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

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

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap - Mammals - Lot 751

Created By Greg Harewood on 30/10/2013

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Species Group Mammals
Method 'By Circle'
Centre 115°52' 00" E,33°34' 12" S
Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	24251	*Bos taurus (European Cattle)*	Y		
2.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
3.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
4.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
5.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
6.	24223	*Mus musculus (House Mouse)*	Y		
7.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
8.	24099	*Phascogale tapoatafa subsp. tapoatafa (Southern Brush-tailed Phascogale, Wambenger)*		T	
9.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum)*		T	
10.	24245	*Rattus rattus (Black Rat)*	Y		
11.	24111	*Sminthopsis gilberti (Gilbert's Dunnart)*			
12.	-17953	*Sminthopsis murina*			
13.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
14.	24206	*Vespadelus regulus (Southern Forest Bat)*			

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
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3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Australian Government
Department of the Environment

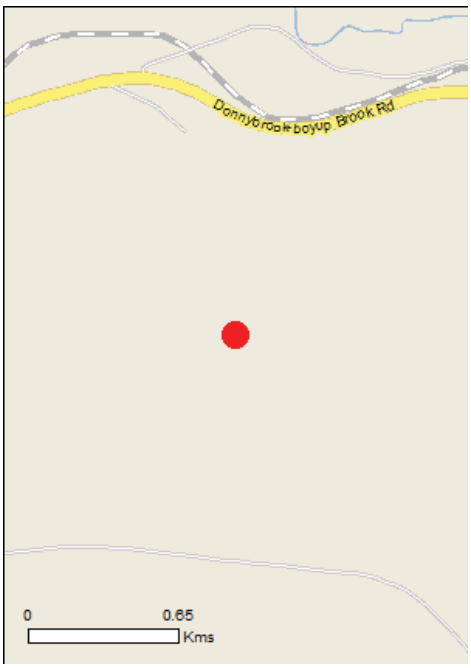
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

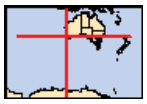
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

Report created: 07/11/13 14:30:16



Coordinates
Buffer: 0.0Km



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 Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	8
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

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

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.

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:	6
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine	None

Extra Information

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

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	1
Invasive Species:	18
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii		
Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Breeding likely to occur within area
Calyptorhynchus latirostris		
Carnaby's Black-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
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum [25911]	Vulnerable	Species or species habitat may occur within area
Setonix brachyurus		
Quokka [229]	Vulnerable	Species or species habitat may occur within area
Plants		
Caladenia hoffmanii		
Hoffman's Spider-orchid [56719]	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		

Name	Threatened	Type of Presence
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
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 likely to 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		
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 likely to occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

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
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		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		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
Sus scrofa Pig [6]		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,		Species or species

Name	Status	Type of Presence
Florist's Smilax, Smilax Asparagus [22473]		habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Coordinates

-33.57114 115.86587

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 Heritage and Register of National Estate properties, Wetlands of International 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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX D

HABITAT TREE DETAILS

Habitat Trees
Datum - GDA 94

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	Number of Hollows	Hollow Type 1	Hollow Size 1 (cm)	Hollow Type 2	Hollow Size 2 (cm)	Hollow Type 3	Hollow Size 3 (cm)	Hollow Type 4	Hollow Size 4 (cm)	Hollow Type 5	Hollow Size 5 (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
1	50H	394627	6285403	Marri	20m+	0													No	
1a	50H	394632	6285410	Marri	20m+	0													No	
2	50H	394671	6285388	Marri	20m+	0													No	
3	50H	394675	6285334	Jarrah	15 to 20m	0													No	
4	50H	394673	6285332	Jarrah	15 to 20m	0													No	
5	50H	394660	6285323	Jarrah	15 to 20m	0													No	
6	50H	394650	6285263	Jarrah	15 to 20m	1	Fissure	5 to 12cm											No	Depth of hollows unknown
7	50H	394660	6285256	Dead Jarrah	15 to 20m	0													No	
8	50H	394660	6285258	Jarrah	15 to 20m	0													No	
9	50H	394684	6285233	Jarrah	15 to 20m	5+	Knot Hole	5 to 12cm	Spout Branch	5 to 12cm	Branch	<5cm	Branch	5 to 12cm	Branch	5 to 12cm			No	Depth of hollows unknown
10	50H	394692	6285227	Jarrah	15 to 20m	0													No	
11	50H	394699	6285209	Jarrah	15 to 20m	0													No	
12	50H	394721	6285236	Jarrah	20m+	5+	Branch	12 to 20cm	Spout Branch	12 to 20cm	Branch	5 to 12cm	Branch	<5cm	Spout Branch	20cm+			Yes	Depth of hollows unknown
13	50H	394761	6285229	Dead Jarrah	5 to 10m	5+	Branch	5 to 12cm	Branch	12 to 20cm	Spout Branch	12 to 20cm	Branch	<5cm	Branch	5 to 12cm			Yes	Depth of hollows unknown
14	50H	394762	6285189	Jarrah	15 to 20m	4	Knot Hole	12 to 20cm	Branch	5 to 12cm	Spout Branch	5 to 12cm							Yes	Depth of hollows unknown
15	50H	394652	6285179	Jarrah	15 to 20m	0													No	
16	50H	394647	6285170	Dead Jarrah	15 to 20m	5+	Branch	5 to 12cm	Branch	<5cm	Branch	5 to 12cm		<5cm	Spout Branch	5 to 12cm			No	Depth of hollows unknown
17	50H	394655	6285091	Dead Jarrah	15 to 20m	5+	Branch	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm	Branch	<5cm	Spout Branch	5 to 12cm			No	Depth of hollows unknown
18	50H	394645	6285055	Jarrah	5 to 10m	0													No	
19	50H	394644	6285053	Dead Jarrah	15 to 20m	5+	Branch	<5cm	Branch	5 to 12cm	Branch	5 to 12cm	Branch	<5cm	Branch	5 to 12cm			No	Depth of hollows unknown
20	50H	394666	6285039	Jarrah	15 to 20m	5+	Knot Hole	5 to 12cm	Knot Hole	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm	Spout Branch	5 to 12cm			No	Depth of hollows unknown
21	50H	394667	6285034	Dead Jarrah	20m+	5+	Branch	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm			No	Depth of hollows unknown
22	50H	394789	6285125	Jarrah	15 to 20m	0													No	
23	50H	394742	6284809	Jarrah	15 to 20m	0													No	
24	50H	394726	6284784	Jarrah	15 to 20m	0													No	
25	50H	394661	6284757	Jarrah	15 to 20m	0													No	
26	50H	394670	6284750	Jarrah	15 to 20m	4	Knot Hole	<5cm	Knot Hole	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm					No	Depth of hollows unknown
27	50H	394680	6284736	Jarrah	5 to 10m	0													No	
28	50H	394708	6284730	Jarrah	15 to 20m	0													No	
29	50H	394723	6284667	Jarrah	15 to 20m	0													No	
30	50H	394752	6284619	Jarrah	15 to 20m	0													No	
31	50H	394763	6284704	Jarrah	15 to 20m	0													No	
32	50H	394757	6284701	Jarrah	15 to 20m	0													No	
33	50H	394796	6284683	Dead Jarrah	15 to 20m	0													No	Spout trunk but not hollow
34	50H	394856	6284704	Dead Unknown	15 to 20m	0													No	
35	50H	394864	6284767	Dead Jarrah	15 to 20m	0													No	
36	50H	394881	6284764	Jarrah	20m+	1	Knot Hole	5 to 12cm											No	Depth of hollows unknown
37	50H	394957	6284751	Jarrah	15 to 20m	1	Knot Hole	5 to 12cm											No	Depth of hollows unknown
38	50H	395002	6284792	Dead Unknown	15 to 20m	5+	Spout Trunk	20cm+	Spout Branch	12 to 20cm	Spout Branch	12 to 20cm	Branch	5 to 12cm	Branch	5 to 12cm			Yes	Depth of hollows unknown
39	50H	395076	6284781	Jarrah	20m+	0													No	
40	50H	395124	6284666	Jarrah	20m+	5+	Knot Hole	<5cm	Knot Hole	<5cm	Knot Hole	<5cm	Knot Hole	5 to 12cm	Branch	<5cm			No	Depth of hollows unknown
41	50H	395091	6284588	Dead Jarrah	15 to 20m	0													No	
42	50H	395074	6284576	Jarrah	15 to 20m	3	Branch	5 to 12cm	Branch	<5cm	Branch	5 to 12cm							No	Depth of hollows unknown
43	50H	395067	6284590	Jarrah	15 to 20m	0													No	
44	50H	395051	6284551	Jarrah	15 to 20m	1	Fissure	5 to 12cm											No	Depth of hollows unknown
45	50H	395033	6284564	Jarrah	15 to 20m	0													No	
46	50H	394870	6284560	Jarrah	20m+	5+	Knot Hole	5 to 12cm	Knot Hole	<5cm	Knot Hole	<5cm	Branch	<5cm	Branch	5 to 12cm			No	Depth of hollows unknown
47	50H	394770	6284530	Jarrah	20m+	5+	Branch	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm	Branch	5 to 12cm			No	Depth of hollows unknown
48	50H	394723	6284531	Jarrah	15 to 20m	0													No	
49	50H	394695	6284535	Jarrah	20m+	3	Spout Branch	12 to 20cm	Spout Branch	5 to 12cm	Spout Branch	5 to 12cm							No	Depth of hollows unknown
50	50H	394660	6284527	Jarrah	15 to 20m	0													No	
51	50H	394696	6284558	Jarrah	15 to 20m	3	Spout Branch	5 to 12cm	Spout Branch	5 to 12cm	Spout Branch	5 to 12cm							No	Depth of hollows unknown

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	Number of Hollows	Hollow Type 1	Hollow Size 1 (cm)	Hollow Type 2	Hollow Size 2 (cm)	Hollow Type 3	Hollow Size 3 (cm)	Hollow Type 4	Hollow Size 4 (cm)	Hollow Type 5	Hollow Size 5 (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
52	50H	394718	6284552	Jarrah	15 to 20m	0													No	
53	50H	394745	6284574	Jarrah	15 to 20m	0													No	
54	50H	394945	6284652	Dead Jarrah	15 to 20m	5+	Fissure	<5cm	Branch	<5cm	Branch	<5cm		5 to 12cm	Branch	<5cm	Bees		No	Depth of hollows unknown
55	50H	394976	6284641	Jarrah	15 to 20m	0													No	
56	50H	394984	6284617	Jarrah	15 to 20m	0													No	
57	50H	394990	6284603	Jarrah	15 to 20m	0													No	
58	50H	394995	6284604	Jarrah	15 to 20m	0													No	
59	50H	395009	6284616	Jarrah	20m+	0													No	
60	50H	395016	6284645	Jarrah	15 to 20m	0													No	
61	50H	394909	6284686	Dead Unknown	15 to 20m	5+	Branch	5 to 12cm	Branch	<5cm	Branch	<5cm	Branch	5 to 12cm	Branch	<5cm			No	Depth of hollows unknown
62	50H	394794	6284857	Jarrah	20m+	5+	Knot Hole	5 to 12cm	Knot Hole	<5cm	Branch	5 to 12cm	Branch	5 to 12cm	Branch	<5cm			No	Depth of hollows unknown

APPENDIX E

SIGNIFICANT SPECIES PROFILES

Unnamed Cricket *Pachysaga strobila*

Status and Distribution: Listed as Priority 1 by the DPaW. Full distribution is not known. DPaW database list only two records, one near Vasse and one near Donnybrook.

Habitat: Not documented.

Likely presence in study area: Given the lack of published records and apparent knowledge on this species, its status within the study area is difficult to determine. The probability of it being present within the study site can however be regarded as being extremely low.

Potential impact of development: No impact on this species or its preferred habitat is considered likely.

Southern Carpet Python *Morelia spilota imbricata*

Status and Distribution: The south western population is classified as Schedule 4 under the *WC Act*. This subspecies has wide distribution within the south west but is uncommon. Occurs north to Geraldton and Yalgoo and east to Pinjin, Kalgoorlie, Fraser Range and Eyre (Storr *et al*. 2002). Records from Dalyellup (2007 Perkins Brothers Builders pers. comm.), Peppermint Grove Beach (2006 Eleanor Bennett pers. comm.) and Gwindinup (Bamford 2000). Also known from Leschenault Conservation Park and in coastal dunes northwards including Yalgorup National Park (G Harewood pers. obs).

Habitat: This species has been recorded from semi-arid coastal and inland habitats, Banksia woodland, Eucalypt woodlands, and grasslands. Most often found utilising hollow logs in addition the burrows of other animals for shelter. Often arboreal and will also use tree hollows for refuge.

Likely presence in study area: The fragmented nature of the vegetation in this area and/or its generally degraded nature would make it difficult for a population of this species to persist and it would be very unlikely to frequent the study area.

Potential impact of development: No impact on this species will occur as it is considered unlikely to be present.

Malleefowl *Leipoa ocellata*

Status and Distribution: This species is listed as Schedule 1 under the WC *Act* and as Vulnerable and Migratory under the *EPBC Act (1999)*. Originally common, but now generally rare to uncommon and patchily distributed.

Current distribution mainly southern arid and semi-arid zones, north to Shark Bay, Jingemarra, Colga Downs and Yeelirrie, east to Earnest Giles Range, Yeo Lake, lower Ponton Creek and to Eucla and west and south to Cockleshell Gully, the Wongan Hills, Stirling Range, Beaufort Inlet, Hatters Hill, Mt Ragged and Point Malcolm (Johnstone and Storr 1998).

Habitat: Mainly scrubs and thickets of mallee *Eucalyptus* spp., boree *Melaleuca lanceolata* and bowgada *Acacia linophylla*, also dense litter forming shrublands.

Likely presence in study area: This species is regionally extinct and would never, under normal circumstances occur in the Donnybrook area.

Potential impact of development: No impact on this species will occur as it is unlikely to be present.

Great Egret *Ardea alba*

Status and Distribution: This species of egret is listed as Migratory under the *EPBC Act* and under international agreements to which Australia is a signatory. The Great Egret is common and very widespread in any suitable permanent or temporary habitat (Morcombe 2004).

Habitat: Wetlands, flooded pasture, dams, estuarine mudflats, mangroves and reefs (Morcombe 2004).

Likely presence in study area: No suitable habitat.

Potential impact of development: No impact on this species will occur as it is unlikely to be present.

Cattle Egret *Ardea ibis*

Status and Distribution: This species of egret is listed as Migratory under the *EPBC Act* and under international agreements to which Australia is a signatory. The cattle egret is common in the north sections of its range but is an irregular visitor to the better watered parts of the state (Johnstone and Storr 1998). The population is expanding (Morcombe 2004).

Habitat: Moist pastures with tall grasses, shallow open wetlands and margins, mudflats (Morcombe 2004). In the south west most often seen in association with cattle (G Harewood pers. obs).

Likely presence in study area: No suitable habitat.

Potential impact of development: No impact on this species will occur as it is unlikely to be present.

Osprey *Pandion haliaetus*

Status and Distribution: This species is listed as Migratory under the *EPBC Act* and under international agreements to which Australia is a signatory. Moderately common to very common in sheltered seas around the north and west coast islands south to 31°S; uncommon to common on mainland coasts, estuaries and large rivers north of tropic, rare to uncommon elsewhere (Johnstone and Storr 1998).

Habitat: Coasts, estuaries, bays, inlets, islands, and surrounding waters, coral atolls, reefs, lagoons, rock cliffs and stacks. Ascends larger rivers (Pizzey & Knight 2012). Construct nests on prominent headland, large trees, communication towers (Simpson & Day 2010).

Likely presence in study area: There is no suitable habitat for this species to utilise within the study area.

Potential impact of development: No impact on this species or its preferred habitat will occur as a consequence of development occurring at the site.

White-bellied Sea Eagle *Haliaeetus leucogaster*

Status and Distribution: This species is listed as Schedule 3 under the *WC Act* and as Migratory under the *EPBC Act* and under international agreements to which Australia is a signatory. White-bellied sea eagles are moderately common to common on Kimberley and Pilbara islands, coasts and estuaries, on Bernier, Dorre and Dirk Hartog Is., in Houtman Abrolhos and in the Archipelago of the Recherche; rare to uncommon elsewhere (Johnstone and Storr 1998). Also found in New Guinea, Indonesia, China, southeast Asia and India. Scarce near major coastal cities (Morcombe 2004).

Habitat: They nest and forage usually near the coast over islands, reefs, headlands, beaches, bays, estuaries, mangroves, but will also live near seasonally flooded inland swamps, lagoons and floodplains, often far inland on large pools of major rivers. Established pairs usually sedentary, immatures dispersive (Morcombe 2004). White-bellied Sea-Eagles build a large stick nest, which is used for many seasons in succession.

Likely presence in study area: There is no suitable habitat for this species to utilise within the study area.

Potential impact of development: No impact on this species or its preferred habitat will occur as a consequence of development occurring at the site.

Peregrine Falcon *Falco peregrinus*

Status and Distribution: This species is listed as Schedule 4 under the *WC Act*. Individuals of this species are uncommon/rare but wide ranging across Australia. Moderately common at higher levels of the Stirling Range, uncommon in hilly, north west Kimberley, Hamersley and Darling Ranges; rare or scarce elsewhere (Johnstone and Storr 1998).

Habitat: Diverse from rainforest to arid shrublands, from coastal heath to alpine (Morcombe 2004). Mainly about cliffs along coasts, rivers and ranges and about wooded watercourses and lakes (Johnstone and Storr 1998). The species utilises the ledges, cliff faces and large hollows/broken spouts of trees for nesting. It will also occasionally use the abandoned nests of other birds of prey.

Likely presence in study area: This species potentially utilises some sections of the study area as part of a much larger home range. No potential nest sites observed.

Potential impact of development: No impact anticipated. This species will continue to utilise the area, if it does now, despite any proposed development.

Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*

Status and Distribution: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. Found in the humid and subhumid south west, mainly hilly interior, north to Gingin and east to Mt Helena, Christmas Tree Well, North Bannister, Mt Saddleback, Rock Gully and the upper King River (Johnstone and Storr 1998).

Habitat: Eucalypt forests, feeds on marri, jarrah, blackbutt, karri, sheoak and snottygobble. The Forest Red-tailed Black Cockatoo nests in the large hollows of marri, jarrah and karri (Johnstone and Kirkby 1999). In marri, the nest hollows of the Forest Red-tailed Black Cockatoo range from 8-14m above ground, the entrance is 12 – 41cm in diameter and the depth is one to five metres (Johnstone and Storr 1998).

Breeding commences in winter/spring. There are few records of breeding in the Forest Red-tailed Black Cockatoo (Johnstone and Storr 1998), but eggs are laid in October and November (Johnstone 1997; Johnstone and Storr 1998). Recent data however indicates that breeding in all months of the year occurs with peaks in spring and autumn–winter (Ron Johnstone pers comms). Incubation period 29 – 31 days. Young fledge at 8 to 9 weeks (Simpson and Day 2004).

Likely presence in study area: Individuals of this species were heard calling during the field survey and foraging evidence observed (chewed marri and jarrah fruits). Almost all of the vegetation present represents foraging habitat for this species (e.g. marri trees, jarrah trees) and using DSEWPaC criteria the area also contains potential breeding habitat (i.e. any suitable tree species with a DBH>50cm). May also roost on site though no evidence of this was found.

Potential impact of development: Loss of a relatively small areas of existing and potential foraging, breeding and roosting habitat.

Baudin's Black- Cockatoo *Calyptorhynchus baudinii*

Status and Distribution: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. Confined to the south-west of Western Australia, north to Gidgegannup, east to Mt Helena, Wandering, Quindanning, Kojonup, Frankland and King River and west to the eastern strip of the Swan Coastal Plain including West Midland, Byford, Nth Dandalup, Yarloop, Wokalup and Bunbury (Johnstone and Storr 1998). On the southern Swan Coastal Plain this cockatoo is in some areas resident

but mainly a migrant moving from the deep south-west to the central and northern Darling Range. Between March and September most flocks move north and are concentrated in the northern parts of the Darling Range. During this period birds forage well out onto the southern Swan Coastal Plain to areas such as Harvey, Myalup, Bunbury, Capel, Dunsborough and Meelup. While generally more common in the Darling Range this species can also be common on parts of the southern Swan Coastal Plain especially in mid-August – September when flocks begin to return to their breeding quarters (Johnstone 2008).

Habitat: Mainly eucalypt forests where it feeds primarily on the Marri seeds, (Morcombe, 2003), Banksia, Hakeas and *Erodium* sp. Also strips bark from trees in search of beetle larvae (Johnstone and Storr 1998). This species of cockatoo nests in large tree hollows, 30–40 cm in diameter and more than 30 cm deep (Saunders 1974).

Baudin's Black-Cockatoo breeds in late winter and spring, from August to November or December (Gould 1972; Johnstone 1997; Saunders 1974; Saunders *et al*. 1985). Eggs laid in October (Johnstone and Storr 1998). Based on observations at currently known nest sites breeding mainly occurs within the October-December period (Ron Johnstone pers comms). Incubation is 28 – 30 days. Young fledge at 8 to 9 weeks (Simpson and Day 2004).

J	F	M	A	M	J	J	A	S	O	N	D

Period in which breeding is most likely to commence
Period in which fledging/weening could extend througho

Likely presence in study area: Evidence of foraging by this species observed onsite (chewed marri fruit and possibly banksia cones). Almost all of the vegetation present represents foraging habitat for this species (e.g. marri trees, banksia trees) and using DSEWPaC criteria the area also contains potential breeding habitat (i.e. any suitable tree species with a DBH>50cm). May also roost on site though no evidence of this was found.

Potential impact of development: Loss of a relatively small areas of existing and potential foraging, breeding and roosting habitat.

Carnaby's Black- Cockatoo *Calyptorhynchus latirostris*

Status and Distribution: Carnaby's Black Cockatoo is listed as Scheduled 1 under the *WC Act* and as Endangered under the *EPBC Act*. Confined to the south-west of Western Australia, north to the lower Murchison River and east to Nabawa, Wilroy, Waddi Forest, Nugadong, Manmanning, Durokoppin, Noongar (Moorine Rock), Lake Cronin, Ravensthorpe Range, head of Oldfield River, 20 km ESE of Condingup and Cape Arid; also casual on Rottnest Island (Johnstone and Storr 1998).

Habitat: Forests, woodlands, heathlands, farms; feeds on Banksia, Hakeas and Marri. Carnaby's Cockatoo has specific nesting site requirements. Nests are mostly in smoothed-barked eucalypts with the nest hollows ranging from 2.5 to 12m above

the ground, an entrance from 23-30cm diameter and a depth of 0.1-2.5m (Johnstone and Storr, 1998).

Breeding occurs in winter/spring mainly in eastern forest and wheatbelt where they can find mature hollow bearing trees to nest in (Morcombe, 2003). Judging from records in the Storr-Johnstone Bird Data Bank, this species is currently expanding its breeding range westward and south into the Jarrah – Marri forest of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain including the region between Mandurah and Bunbury. Carnaby's Black Cockatoo has been known to breed close to the town of Mandurah, as well as at Dawesville, Lake Clifton and Baldivis (pers. comm., Ron Johnstone, WA Museum) and there are small resident populations on the southern Swan Coastal Plain near Mandurah, Lake Clifton and near Bunbury. At each of these sites the birds forage in remnant vegetation and adjacent pine plantations (Johnstone 2008).

Carnaby's Black-Cockatoo lays eggs from July or August to October or November, with most clutches being laid in August and September (Saunders 1986). Birds in inland regions may begin laying up to three weeks earlier than those in coastal areas (Saunders 1977). The female incubates the eggs over a period of 28-29 days. The young depart the nest 10–12 weeks after hatching (Saunders 1977; Smith & Saunders 1986).

J	F	M	A	M	J	J	A	S	O	N	D

Period in which breeding is most likely to commence
Period in which fledging/weening could extend through

Likely presence in study area: Evidence of foraging possibly by this species observed onsite (chewed jarrah fruits and banksia cones). Almost all of the vegetation present represents foraging habitat for this species (e.g. marri trees, banksia trees) and using DSEWPaC criteria the area also contains potential breeding habitat (i.e. any suitable tree species with a DBH>50cm). May also roost on site though no evidence of this was found.

Potential impact of development: Loss of a relatively small areas of existing and potential foraging, breeding and roosting habitat.

Masked Owl *Tyto novaehollandae novaehollandae*

Status and Distribution: Listed as Priority 3 by DPaW. Found north to Yanchep and east to Yealering, Gnowangerup and Albany, casual further north. Locally common in south west but generally uncommon (Johnstone and Storr 1998).

Habitat: Roosts and nests in heavy forest, hunts over open woodlands and farmlands (Morcombe 2004). Probably breeding in forested deep south west with some autumn–winter wanderings northwards (Johnstone and Storr 1998).

Likely presence in study area: May occasionally reside in general area though status uncertain. It is unlikely to be specifically attracted to the site. Listed as a potential species but would most probably only ever occur rarely, if at all.

Potential impact of development: Loss or modification of some potential habitat but no significant impact on this species is anticipated given the small area of potential habitat involved.

Fork-tailed Swift *Apus pacificus*

Status and Distribution: The Fork-tailed Swift is listed as Schedule 3 under the *WC Act* and as Migratory under the *EPBC Act* and under international agreements to which Australia is a signatory. It is a summer migrant (Oct-Apr) to Australia (Morcombe 2004).

Habitat: Low to very high airspace over varied habitat from rainforest to semi desert (Morcombe 2004).

Likely presence in study area: It is potentially a very occasional summer visitor to the study area but is entirely aerial and largely independent of terrestrial habitats. Not listed as a potential species.

Potential impact of development: No impact on this species will occur.

Rainbow Bee-eater *Merops ornatus*

Status and Distribution: This species is listed as Schedule 3 under the *WC Act* and as Migratory under the *EPBC Act* and under international agreements to which Australia is a signatory. The Rainbow Bee-eater is a common summer migrant to southern Australia but in the north they are resident (Morcombe 2004).

Habitat: Open country, of woodlands, open forest, semi arid scrub, grasslands, clearings in heavier forest, farmlands (Morcombe 2004). Breeds underground in burrows where areas of suitable soft soil, firm enough to support tunnel building exist.

Likely presence in study area: Observed foraging onsite during site survey. Possibly breeds in some sections of the study area though population levels would not be significant as it usually breeds in pairs, rarely in small colonies (Johnstone and Storr 1998).

Potential impact of development: Despite the potential for breeding no significant impact (as defined by DSEWPaC) under any circumstances are anticipated as the individuals present onsite at any one time are unlikely to represent a substantial proportion of the population. It can be expected to continue to utilise the area, as it does now, despite any future development.

Chuditch *Dasyurus geoffroii*

Status and Distribution: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act.* Formerly occurred over nearly 70 per cent of Australia. The

Chuditch now has a patchy distribution throughout the jarrah forest and mixed karri/marri/jarrah forest of southwest Western Australia. Also occurs in very low numbers in the Midwest, Wheatbelt and South Coast Regions with records from Moora to the north, Yellowdine to the east and south to Hopetoun.

Habitat: Chuditch are known to have occupied a wide range of habitats from woodlands, dry sclerophyll (leafy) forests, riparian vegetation, beaches and deserts. Riparian vegetation appears to support higher densities of Chuditch, possibly because food supply is better or more reliable and better cover is offered by dense vegetation. Chuditch appear to utilise native vegetation along road sides in the wheatbelt (CALM 1994). The estimated home range of a male Chuditch is over 15 km^2 whilst that for females is 3-4 km^2 (Sorena and Soderquist 1995).

Likely presence in study area: Habitat marginal due to fragmented nature and general degraded state. While its presence in the general area cannot be totally discounted the fragmented nature of the bushland would make it very difficult for a population of this species to persist and any individuals ever present would most likely be of transient individuals.

Potential impact of development: Loss or modification of some potential habitat but no significant impact on this species is anticipated given the small area likely to be impacted on and the presence of more extensive bushland nearby.

Southern Brush-tailed Phascogale *Phascogale tapoatafa ssp*

Status and Distribution: Listed as Scheduled 1 under the *WC Act*. Present distribution is believed to have been reduced to approximately 50 per cent of its former range. Now known from Perth and south to Albany, west of Albany Highway. Occurs at low densities in the northern jarrah forest. Highest densities occur in the Perup/Kingston area, Collie River valley, and near Margaret River and Busselton (DEC information pamphlet). Records are less common from wetter forests.

Habitat: This subspecies has been observed in dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover. A nocturnal carnivore relying on tree hollows as nest sites. The home range for a female Brush-tailed Phascogale is estimated at between 20 and 70 ha, whilst that for males is given as twice that of females. In addition, they tend to utilise a large number (approximately 20) of different nest sites throughout their range (Soderquist 1995).

Likely presence in study area: This species is known to persist in nearby areas such as Gwindinup (Bamford 2000) and as habitat in some sections of the site appear suitable its presence cannot be discounted.

Potential impact of development: Loss/modification of a small area of potential habitat, though no significant impact is anticipated given the limited extent of habit likely to be involved.

Quenda *Isoodon obesulus fusciventer*

Status and Distribution: Listed as Priority 5 by DPaW. Widely distributed in the south west from near Cervantes north of Perth to east of Esperance, patchy distribution through the Jarrah and Karri forest and on the Swan Coastal Plain, and inland as far as Hyden. Has been translocated to Julimar State Forest, Hills Forest Mundaring, Tutanning Nature Reserve, Boyagin Nature Reserve, Dongolocking Nature Reserve, Leschenault Conservation Park, and Karakamia and Paruna Sanctuaries (DEC information pamphlet) and Nambung National Park (DEC pers. coms.)

Habitat: Dense scrubby, often swampy, vegetation with dense cover up to one metre high, often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover. Populations inhabiting Jarrah and Wandoo forests are usually associated with watercourses. Quendas can thrive in more open habitat subject to exotic predator control (DEC information pamphlet).

Likely presence in study area: Habitat especially in far south where ground cover most continuous and dense appears suitable for this species to utilise.

Potential impact of development: Loss/modification of small areas of potential habitat and the possibility that individuals may be killed or injured during clearing.

Western Ringtail Possum *Pseudocheirus occidentalis*

Status and Distribution: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act.* Common in suitable habitat (de Tores 2008). The highest densities of this species are recorded in Peppermint habitat near Busselton area; relatively high densities are found in Jarrah/Marri forest at Perup (de Tores 2008).

The Western Ringtail Possum has a restricted distribution in south-western Western Australia. Most known populations (natural and translocated) are now restricted to near coastal areas of the south west from the Dawesville area to the Waychinicup National Park. Inland, it is also known to be relatively common in a small part of the lower Collie River valley, the Perup Nature Reserve and surrounding forest blocks near Manjimup. It was recently recorded in stands of Peppermint near the Harvey River and in Jarrah/Marri forest near Collie; however, the long term persistence of the species in these areas is not confirmed (de Tores *et al* 2004). The Western Ringtail was formerly more widespread: in the 1970s it was known from Casuarina woodlands in the wheatbelt near Pingelly (south-east of Perth), and it is thought to have once occurred throughout much of south-western Western Australia (but not necessarily continuously distributed) (Maxwell et al. 1996; de Tores 2008).

The species is widespread and relatively common in vegetated remnants within the Swan Coastal Plain and along the Whicher Scarp between Bunbury and Busselton (G. Harewood per. obs.).

Habitat: The Western Ringtail Possum was once located in a variety of habitats including Coastal Peppermint, Coastal Peppermint-Tuart, Jarrah-Marri associations, Sheoak woodland, and eucalypt woodland and mallee. Coastal populations mostly inhabit Peppermint-Tuart associations with highest densities in habitats with dense, relatively lush vegetation. In these areas the main determinants of suitable habitat for WRPs appears to be the presence of *Agonis flexuosa* either as the dominant tree or as an understorey component of Eucalypt forest or woodland (Jones *et al*. 1994a). Inland, the largest known populations occur in the Upper Warren area east of Manjimup (Wayne *et al* 2005). In this area the peppermint tree is naturally absent and various jarrah-marri associations constitute the species refuge and foraging habitat.

Likely presence in study area: No evidence of this species using the site found but it may on occasions be present in small numbers and or as transient individuals.

Potential impact of development: Loss/modification of small areas of marginal habitat. Significant impact unlikely.

Western Brush Wallaby *Macropus irma*

Status and Distribution: Listed as Priority 4 by DEC. The Western Brush Wallaby is distributed across the south-west of Western Australia from north of Kalbarri to Cape Arid (DEC information pamphlet).

Habitat: The species optimum habitat is open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in karri forest (DEC information pamphlet).

Likely presence in study area: The fragmented nature of the vegetation in the wider area and/or its generally degraded nature would make it difficult for this species to persist and it would be very unlikely to frequent the study area.

Potential impact of development: No impact on this species is anticipated as it is considered unlikely to pre present.

Quokka *Setonix brachyurus*

Status and Distribution: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. Rare and restricted in south west W.A. from south of Perth to Two Peoples Bay. The distribution of the Quokka includes Rottnest and Bald Islands, and at least 25 known sites on the mainland, including Two Peoples Bay Nature Reserve, Torndirrup National Park, Mt Manypeaks National Park, Walpole-Nornalup National Park, and various swamp areas through the south-west forests from Jarrahdale to Walpole. Known population just south of Bunbury.

Habitat: Mainland populations of this species are currently restricted to densely vegetated coastal heaths, swamps, riverine habitats including tea-tree thickets on

sandy soils along creek systems where they are less vulnerable to predation. The species is nocturnal.

Likely presence in study area: No potential habitat onsite for this species.

Potential impact of development: No impact on this species or its preferred habitat will occur.

Western False Pipistrelle *Falsistrellus mackenziei*

Status and Distribution: Listed as Priority 4 by DEC and as Vulnerable by the ICUN. Confined to south west W.A. south of Perth and east to the wheat belt. Most records from Karri forests but also recorded in wetter stands of jarrah and tuart and woodlands on the Swan Coastal Plain (Menkhorst and Knight 2011). Range appears to be contracting southwards, presumably due to drying climate (B. Bullen pers comms).

Habitat: This species of bat occurs in high forest and coastal woodlands. It roosts in small colonies in tree hollows and forages at canopy level and in the cathedral-like spaces between trees.

Likely presence in study area: Possibility exists that this species may forage and roost (in tree hollows) within the area.

Potential impact of development: Loss/modification of a small area of potential foraging and possible roosting habitat (hollow trees), though no significant impact I considered likely given the small area of potential habitat likely to be involved.

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The conclusions are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of preparing the report. Also it should be recognised that site conditions, can change with time.

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