



Talison Lithium Pty Ltd
GREENBUSHES LITHIUM OPERATION

ENV-MP-0011

Wellington Mills Offset Area Management Plan

TALISON GREENBUSHES LITHIUM OPERATION

WELLINGTON MILLS OFFSET AREA MANAGEMENT PLAN

Prepared by Onshore Environmental for

Talison Lithium Pty Ltd

ABN: 15 140 122 078

Greenbushes, Western Australia

As part of the Approval for Greenbushes Lithium Mine expansion

Australian Government Department of Energy and Environment Approval (EPBC 2018/8206)



Declaration of Accuracy

In making this declaration, I am aware that section 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed

A handwritten signature in black ink, appearing to read 'Craig Dawson', written over a horizontal line.

Full name (please print)

Craig Dawson

Organisation (please print)

Talison Lithium Pty Ltd

Date 9/11/2023



Document Status						
Rev No.	Author	Reviewer/s	Date	Approved for Issue		
				Name	Distributed To	Date
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TABLE WITH EPBC APPROVAL CONDITIONS

Approval for Greenbushes Lithium Mine Expansion WA (EPBC 2018/8206)

Condition	Condition Requirement	Plan Reference	Demonstration of how the plan addresses condition requirements and commitments made in the plan to address condition requirements
6	Within six (6) months of commencement of the action the approval holder must provide to the Department and the DBCA finalised management plans for the offsets required under Conditions 4 and 5.	Page iv	This Plan outlines management actions to be implemented by Talison and DBCA for the Wellington Mills Offset Area. It also outlines monitoring and reporting responsibilities that will be undertaken by Talison.
6	The management plans must be prepared by a suitably qualified field ecologist in accordance with the Department's Environmental Management Plan Guidelines and the EPBC Act Environmental Offsets Policy.	Page iv	The Plan was prepared by Dr Darren Brearley and Ms Jessica Waters from Onshore Environmental. The Plan was prepared in accordance with the Department's Environmental Management Plan Guidelines and the EPBC Act Environmental Offsets Policy.
6	These plans must be initially provided in draft form for feedback by the Department and the DBCA and must include evidence of the arrangements that the approval holder has put in place to ensure that the management plans will be fully implemented.	Page iv	The DBCA was consulted during preparation of the draft Plan, with feedback from meetings, subsequent discussions and report review incorporated into the draft document. The Plan has subsequently been provided to the Department for comment.
6	The management plans for those offset sites must require management of the properties for a period of at least 20 years and deliver improvements in the ability of the offset sites to provide habitat for Protected Matters so that all properties provide very high quality black cockatoo habitat, in line with the offset calculations provided by the approval holder to the Department on 03 September 2019.	Section 3.1 & 3.2, Pages 14-17	The Plan includes requirements that the Wellington Mills Offset Area be managed by DBCA for a period of 20 years. The Plan will deliver improvements to the habitat quality at the Offset Area through the management of threats to existing habitats, specifically weed control, and dieback and fire management.



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Condition	Condition Requirement	Plan Reference	Demonstration of how the plan addresses condition requirements and commitments made in the plan to address condition requirements
6	The finalised management plans must be implemented.	Sections 5-7, Pages 20-23	The finalised management plan will be implemented by DBCA and Talison and includes performance indicators, monitoring, adaptive management and contingency measures to ensure that the Plan will be effectively implemented.



EXECUTIVE SUMMARY

The Wellington Mills Management Plan (the **Plan**) was developed to satisfy Condition 6 of the Department of Agriculture, Water and the Environment's (**DAWE**) (previously the Department of Energy and Environment) approval of the Talison Lithium Pty Ltd (**Talison, Company**) Greenbushes Lithium Operation (**Site, Mine**) Expansion (EPBC referral 2018/8206) (the **Project**). The Project involves the clearing of 350 hectares (**ha**) of native vegetation which may impact on Protected Matters including three (3) species of Black Cockatoo, the Western Ringtail Possum and the Chuditch. The Plan was prepared to offset potential impacts to these Protected Matters from the Project.

The key impacts to Protected Matters arising from the Project are associated with the direct clearing of up to 350ha of habitat suitable for three species of Black Cockatoo within the Mine Development Envelope (**MDE**), and the possible direct loss of individuals. Additional indirect impacts include those from the alteration or fragmentation of habitats, the introduction of feral predators or new invasive weed species/infestations, and altered fire regimes, causing injury, death or loss of habitat for Protected Matters.

The objective of the Plan is to protect and enhance habitat condition at the Wellington Mills Offset Area in order to provide high quality habitat for Black Cockatoos. The Plan aims to:

- protect and improve the quality of existing habitat and trees at the Wellington Mills Offset Area that will provide nesting sites for Black Cockatoos in the future; and
- protect existing suitable hollows within the Wellington Mills Offset Area.

The Department of Biodiversity, Conservation and Attractions (**DBCA**) will use the DBCA Disturbance Approval System (**DAS**) or an approved Prescribed Fire Plan (**PFPP**) as the planning and control mechanisms for management operations at the Wellington Mills Offset Area. Any operations undertaken at the Wellington Mills Offset Area will be planned and managed in accordance with these documents and processes.

Talison is responsible for undertaking, or providing agreed funds to the DBCA to contribute to the management of the Wellington Mills Offset Area. Talison will also undertake monitoring at Spring 2022, and then at six (6) year intervals for the lifetime of the plan (20 years), i.e. Spring 2028, Spring 2034 and Spring 2040. An Environmental Offset Report will be published by the company following each monitoring event.



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1.0 INTRODUCTION

1.1 Background

Talison owns and operates the Greenbushes Lithium Operation (**Site, Mine**) within Greenbushes State Forest 20 (**SF20**) in the Shire of Bridgetown-Greenbushes Western Australia, approximately 250 kilometres (**km**) south of Perth and 80km southeast of the port of Bunbury (Figure 1).

On 19 August 2019 the WA Minister for Environment authorised the implementation of an expansion of the Mine under section 45 of the *Environmental Protection Act 1986* (WA) (**EP Act, Ministerial Statement 1111**). Condition 8 of Ministerial Statement 1111 requires the provision of environmental offsets to counterbalance the significant residual impact to threatened and specially protected species listed under the *Biodiversity Conservation Act 2016* (**BC Act**).

The Project was also approved under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**) on 14 November 2019 (EPBC 2018/8206). Conditions 4 to 8 of EPBC 2018/8206 require the provision of environmental offsets to counterbalance impacts on Protected Matters.

As part of its implementation of the environmental offset requirements in Ministerial Statement 1111 and EPBC 2018/8206, Talison has identified and facilitated the provision of suitable land (**Offset Lands**) to the State of WA for management and future reservation as State Forest and classification as a forest conservation area under the *Conservation and Land Management Act 1984* (**CALM Act**). Talison will also provide funds to contribute to the DBCA for the management of the Offset Lands.

The DBCA will assist Talison by administering the provision of the Offset Lands to the State of WA and facilitating the future reservation of the Offset Lands as State Forest and classification as forest conservation areas under section 62 of the CALM Act.

A Memorandum of Understanding (**MOU**) is in preparation and sets out how Talison and the DBCA will fulfil the above understandings.

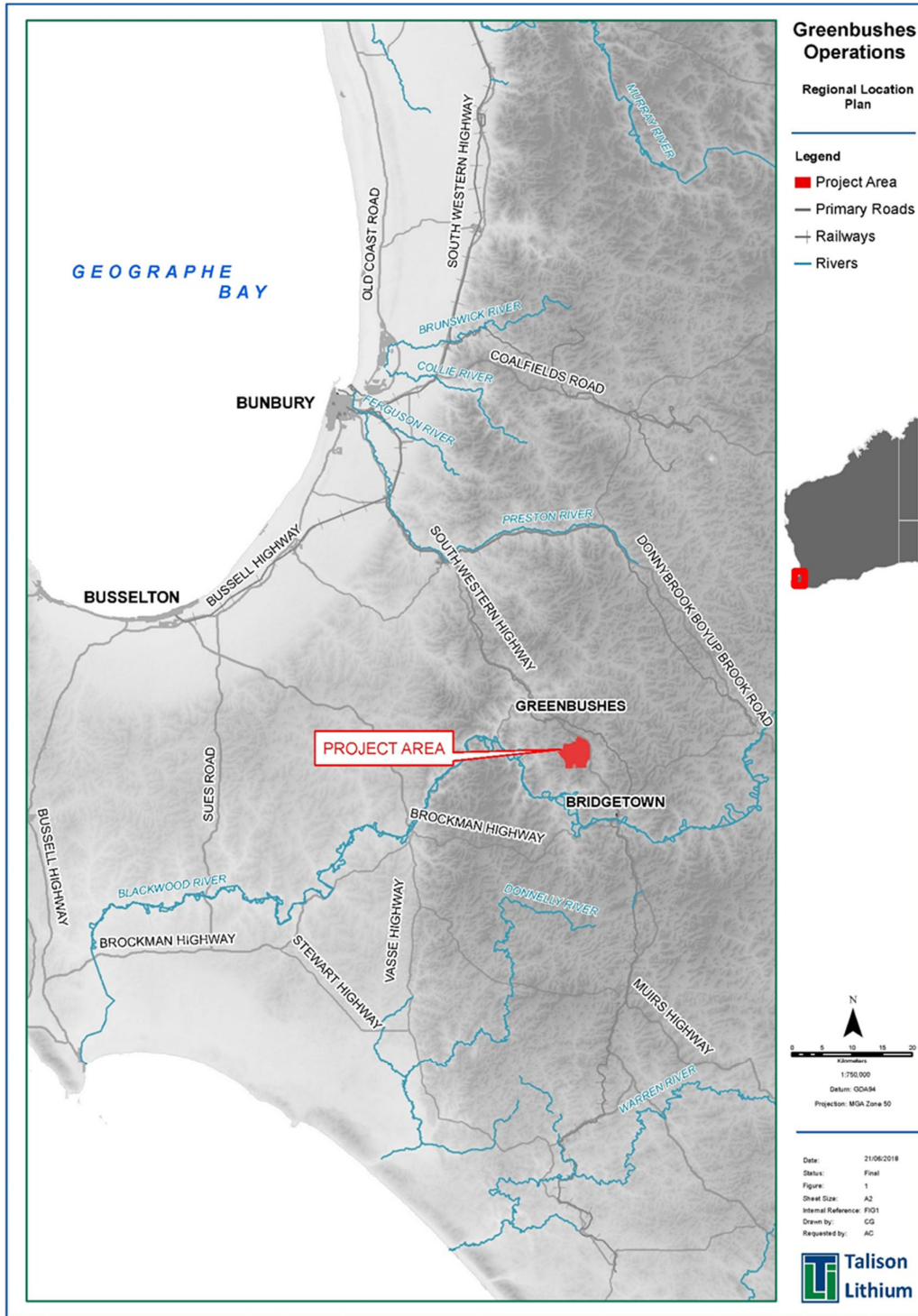


Figure 1: Location of Talison Greenbushes Lithium Operation.



1.2 Environmental Offset

Talison has identified a significant residual impact to five (5) threatened species listed under the EPBC Act (three (3) Black Cockatoo species, Western Ringtail Possum and Chuditch), associated with the proposed clearing of native vegetation for the Project. Talison will counteract these impacts through the implementation of an environmental offset in accordance with the Principles of the WA Government's Environmental Offset Policy (GoWA 2011) and the Australian Government's EPBC Act Environmental Offsets Policy (the **Policy**) (DSEWPAC 2012a).

Talison has been working to identify measures that, in combination, would constitute an acceptable and cost-effective package of environmental offsets that would satisfy the requirements of the Policy, as per the acceptance criteria. The *Offsets Assessment Guide* (DSEWPac 2012b) was used to characterise and quantify the residual impacts that require offsetting under the policy. The policy requires that a minimum of 90% of the offset package go towards directly offsetting residual impacts to the attribute of the protected matter that will be affected (**'direct offsets'**), with the remainder having the option of including offsets that are less directed towards the specific nature of the impact (**'indirect offsets'**).

Efforts by Talison to identify suitable environmental offsets has included regular liaison with the DBCA. DBCA has a land acquisition program for adding suitable areas of environmental value that meet its selection criteria, to its conservation estate. The criteria include the suitable area being contiguous with existing estate or sufficiently large in its own right relative to the environmental values that the site contains. Potential synergies may arise in circumstances where DBCA's acquisition program and requirements under the Policy coincide. Talison and DBCA have identified four (4) areas of land that in combination satisfy both DBCA's criteria and those of the policy:

- Carlotta: Part Lot 11189 On Deposited Plan (DP) 204910, Mount Leewin Loop Road, Carlotta and Part Lot 11215 On DP 204910, Mount Leewin Loop Road, Carlotta (145.6ha);
- Tone Bridge: Part of Lot 12416 and Part of Lot 12372 On Deposited Plan 206989 Cootayerup Road, Chowerup (411ha);
- Wellington Mills: Lot 153 On Deposited Plan (DP) 72265 South Road, Wellington Mills (81ha); and
- Bowelling: Part of Lot 4095 (CT1892/724) Bowelling-McAlinden Road, Bowelling (1,160ha).

This Plan details the management measures for the Wellington Mills Offset Area with separate management plans prepared for the other Offset Areas at Carlotta, Tone Bridge and Bowelling. The Plan was prepared in accordance with DAWE's Environmental Management Plan Guidelines and the EPBC Act Environmental Offsets Policy (2012).



1.3 Purpose of the Offset Management Plan

The purpose of the Plan is to:

- outline the management measures to be undertaken to improve the quality of habitat at the Wellington Mills Offset Area;
- describe monitoring procedures to determine the success of the habitat improvement measures;
- describe reporting requirements for the actions to be implemented in the Plan;
- describe the risks associated with the implementation of the Plan; and
- outline contingency measures and an adaptive management approach that can be utilised to minimise the risks associated with the Plan.



2.0 EXISTING ENVIRONMENT

2.1 Location

The Wellington Mills Offset Area is located at Lot 153 South Road, Wellington Mills. The site is situated 15 km north east of Donnybrook and 45 km north of the Mine (Figure 1). The Wellington Mills Offset Area is shown in Figure 2 and comprises 81ha of native vegetation. The property is bordered to the north, east and south by the Lowden Forest Block of the Wellington State Forest, and the Wellington National Park lies adjacent to the north-western corner (Figure 2). The Lowden Forest Block of the Wellington State Forest is to be included in the proposed 7,360 ha expansion of the Wellington National Park.

2.2 Flora and Vegetation

2.2.1 Regional Vegetation Mapping

The Wellington Mills Offset Area occurs in the Bridgetown System within the Menzies Sub-district of the Darling Botanical District, in the South-West Botanical Province (Beard 1981). The Menzies Sub-district (southern jarrah forest) covers a total area of 26,572 square kilometres (km²), of which 18,715 km² (70%) originally supported jarrah and jarrah-marri forest (Beard 1990). It is estimated that approximately 61% of the total area has been cleared since European settlement, mainly in the valleys which are free of laterite, leaving the forest intact on laterised higher plateau levels.

The Menzies Sub-district is characterised by Jarrah stands on laterite within some Marri and Wandoo woodlands. Valley soils are often richer and Blackbutt (*Eucalyptus patens*) is more dominant in these areas. Flooded Gum (*Eucalyptus rudis*) is common along stream banks and Bullich (*Eucalyptus megacarpa*) is also present in some areas.

Vegetation complexes of the Southern Jarrah Forest have most recently been defined by Heddle *et al.* (1980) and updated by Mattiske and Havel (1998). Mattiske and Havel (1998) describe vegetation of the survey area as 'mixture of open forest of *Eucalyptus marginata* - *Corymbia calophylla* with some *Eucalyptus patens* on slopes'.

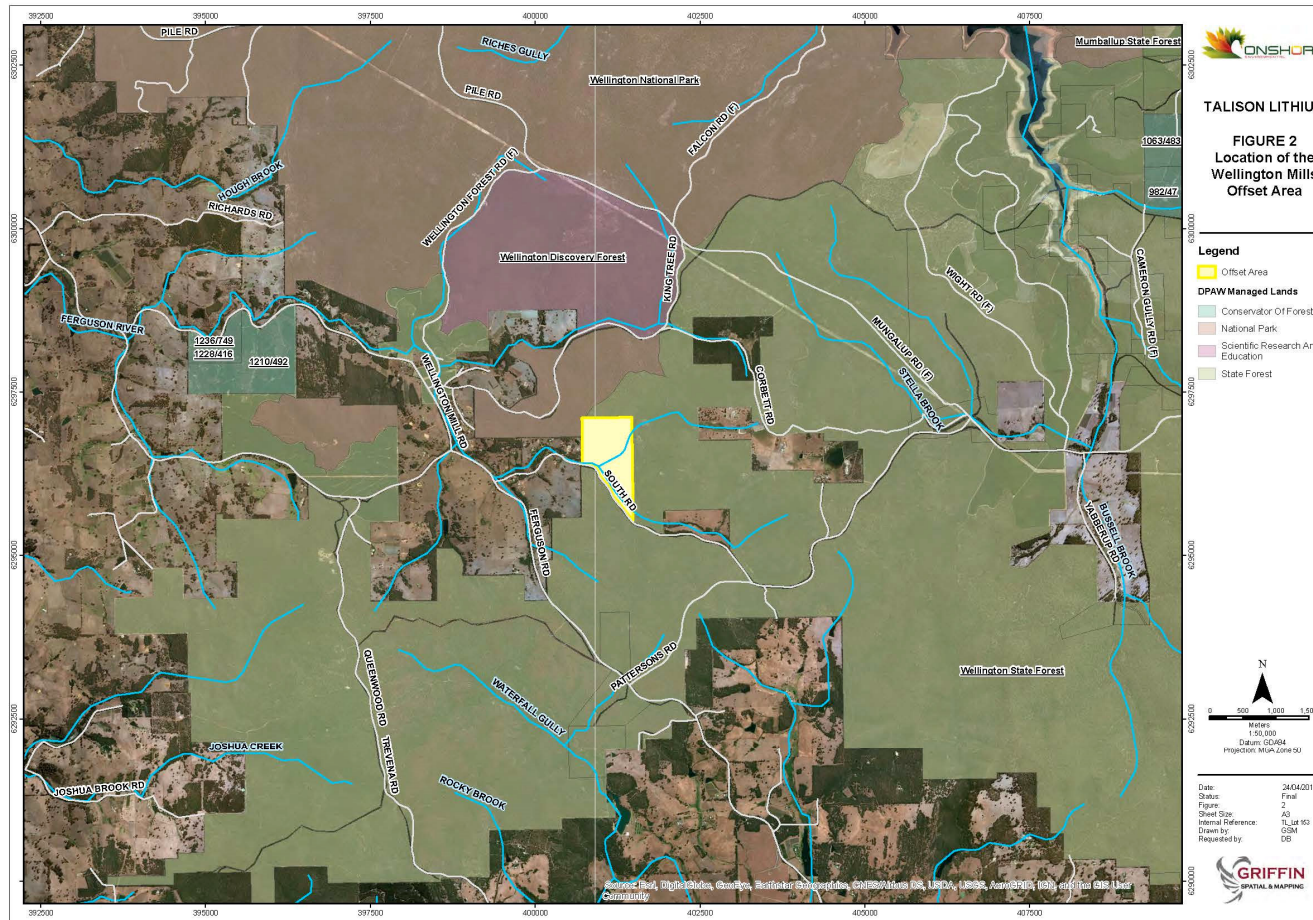


Figure 2: Location of the Wellington Mills Offset Area.



2.2.2 Vegetation Types

Onshore Environmental (**Onshore**) completed a reconnaissance flora and vegetation survey of the Wellington Mills Offset Area (Figure 2) as part of Talison's investigation into suitable offset areas in 2019 (Onshore Environmental 2019a, Appendix 1). Native vegetation with highest conservation value occurred across the northern, eastern and southern sectors of the Wellington Mills Offset Area, where it forms strong linkages with adjacent native vegetation within the Lowden Forest Block of the Wellington State Forest (proposed Wellington National Park extension).

Three (3) vegetation types supporting Jarrah-Marri forest on lateritic hill crests and slopes accounted for 56% of the native vegetation extent within the Wellington Mills Offset Area. Three (3) additional vegetation types supporting Blackbutt-Marri-Peppermint closed forest and forest on lower hill slopes and minor drainage lines accounted for 29.1% of the native vegetation extent within the Wellington Mills Offset Area. Less well represented were *Corymbia calophylla* / *Agonis flexuosa* woodlands on middle and lower hill slopes (10.58 ha or 13%) and *Xanthorrhoea* Scrub on granitic outcrops (0.44 ha or 0.5%) (Figure 3, Table 1).

Vegetation condition across the majority of the Wellington Mills Offset Area was rated as *very good* (67.22 ha or 83%) and included the northern, eastern and southern sectors which abut the Lowden Forest Block of the Wellington State Forest (Figure 4). Two (2) patches of vegetation were considered to be in *degraded* condition within the Wellington Mills Offset Area, totalling 12.90 ha or 16%. This included a block in the western central sector of the Wellington Mills Offset Area that had obvious effects from historical grazing by domestic stock (sheep and cattle), historical logging and prominent soil disturbances. This block had some patches in *good* condition but overall was rated as *degraded*. A minor drainage line in the eastern central sector of the Wellington Mills Offset Area was also rated as *degraded* as it contained some areas dominated by Blackberry (**Rubus anglocandicans*), a problematic weed in moist habitats throughout southwestern Australia.

The major disturbance impact throughout the Wellington Mills Offset Area was related to historical logging, although due to the size of some of the individual trees, it appeared that the area had not been felled for a significant period of time. Introduced flora (weeds) were a minor component of the flora, however the survey was conducted during a dry period of the year (April) before many herbaceous weed species had germinated. Eight (8) species of introduced flora taxa were recorded:

- **Briza maxima* (Blowfly Grass);
- **Briza minor* (Shivery Grass);
- **Centaurium erythraea* (Common Centaury);
- **Conyza bonariensis* (Flaxleaf Fleabane);
- **Hypochaeris glabra* (Flatweed);
- **Parentucellia latifolia* (Common Bartsia)
- **Rubus anglocandicans* (Blackberry); and
- **Solanum nigrum* (Black Berry Nightshade).

All introduced taxa were present at low densities except for **Rubus anglocandicans* (Blackberry), which was observed in dense thickets along some of the minor drainage channels within the Wellington Mills Offset Area.



Table 1: Vegetation types present within the Wellington Mills Offset Area.

Code	Broad Floristic Formation and Vegetation Type	Area (ha)	Black Cockatoo Habitat Values
	<i>Eucalyptus</i> Dense Forest		
MI EpCcAfBs AfTotBs TotTIAu	Dense Forest of <i>Eucalyptus patens</i> , <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> (+/- <i>Banksia seminuda</i>) over Low Forest A of <i>Agonis flexuosa</i> and <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> (+/- <i>Banksia seminuda</i>) over Scrub of <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> , <i>Taxandria linearifolia</i> and <i>Acacia urophylla</i> (+/- <i>Bossiaea aquifolium</i>) over Open Tall Sedges of <i>Lepidosperma tetraquetrum</i> with Open Low Scrub B of <i>Pteridium esculentum</i> and <i>Macrozamia riedlei</i> over Very Open Climbers of <i>Clematis pubescens</i> over Scattered Ferns of <i>Adiantum aethiopicum</i> on brown loams or silty clay loams on incised and meandering minor drainage lines and drainage flats	11.4	Foraging, roosting, potentially nesting
	<i>Eucalyptus</i> Forest		
HS EpCcEm Af DdAppBaq	Forest of <i>Eucalyptus patens</i> and <i>Corymbia calophylla</i> (+/- <i>Eucalyptus marginata</i>) over Low Woodland of <i>Agonis flexuosa</i> over Open Low Scrub A of <i>Diplolaena drummondii</i> , <i>Acacia pulchella</i> var. <i>pulchella</i> and <i>Bossiaea aquifolium</i> over Open Dwarf Scrub C of <i>Macrozamia riedlei</i> over Open Dwarf Scrub D of <i>Phyllanthus calycinus</i> , <i>Tremandra stelligera</i> and <i>Hibbertia pilosa</i> on brown loams on lower hill slopes	10.9	Foraging, roosting, potentially nesting
HS EmCc HhAl PuXgTo	Forest of <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> over Low Heath D of <i>Hibbertia hypericoides</i> (and <i>Acacia lateritcola</i>) over Open Low Sedges of <i>Patersonia umbrosa</i> var. <i>xanthina</i> , <i>Xanthorrhoea gracilis</i> and <i>Tetraria octandra</i> over Open Low Woodland B of <i>Persoonia longifolia</i> over Open Scrub of <i>Bossiaea aquifolium</i> and <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> over <i>Pteridium esculentum</i> , <i>Macrozamia riedlei</i> and <i>Diplolaena drummondii</i> on brown silty loams on lateritic hill slopes	27.1	Foraging, roosting, potentially nesting



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HC EmCc HhHsLc BgPl	Forest of <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> over Low Heath D of <i>Hibbertia hypericoides</i> , <i>Hibbertia silvestris</i> and <i>Leucopogon capitellatus</i> with Low Woodland A of <i>Banksia grandis</i> and <i>Persoonia longifolia</i> over Open Low Sedges of <i>Patersonia umbrosa</i> var. <i>xanthina</i> and <i>Xanthorrhoea gracilis</i> with Open Scrub of <i>Bossiaea aquifolium</i> and <i>Bossiaea linophylla</i> over Open Dwarf Scrub C of <i>Pteridium esculentum</i> and <i>Macrozamia riedlei</i> on orange to grey-brown loamy sands on lateritic hill crests and upper hill slopes	15.3	Foraging, roosting, potentially nesting
HS EmCc HhPcLc AfEmCcPl	Forest of <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> over Low Heath D of <i>Hibbertia hypericoides</i> , <i>Phyllanthus calycinus</i> and <i>Leucopogon capitellatus</i> with Open Low Woodland A of <i>Agonis flexuosa</i> , <i>Eucalyptus marginata</i> (regen) and <i>Corymbia calophylla</i> (regen) (and <i>Persoonia longifolia</i>) over Open Low Scrub A of <i>Xanthorrhoea preissii</i> over Open Dwarf Scrub C of <i>Diplolaena drummondii</i> , <i>Macrozamia riedlei</i> and <i>Acacia lateriticola</i> on brown silty loams on lateritic middle and lower hill slopes	3.2	Foraging, roosting, potentially nesting
MI EpCc Tot TotBaq	Forest of <i>Eucalyptus patens</i> and <i>Corymbia calophylla</i> over Low Woodland B of <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> over Scrub of <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> and <i>Bossiaea aquifolium</i> over Open Tall Sedges of <i>Lepidosperma tetraquetrum</i> with Open Low Scrub B of <i>Pteridium esculentum</i> , <i>Thomasia</i> sp. Big Brook and * <i>Rubus anglocandicans</i> over Open Dwarf Scrub D of <i>Tremandra stelligera</i> and <i>Hibbertia silvestris</i> over Very Open Climbers of <i>Clematis pubescens</i> on brown loamy sands and sandy loams on incised minor drainage lines and adjacent stream banks	1.3	Foraging, roosting, potentially nesting
	<i>Corymbia</i> Woodland		



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Code	Broad Floristic Formation and Vegetation Type	Area (ha)	Black Cockatoo Habitat Values
HS CcAf AfCc HpDdMr	Woodland of <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> over Low Woodland A of <i>Agonis flexuosa</i> and <i>Corymbia calophylla</i> over Open Low Scrub B of <i>Hibbertia pilosa</i> , <i>Diplolaena drummondii</i> and <i>Macrozamia riedlei</i> over Open Dwarf Scrub D of <i>Hibbertia hypericoides</i> and <i>Phyllanthus calycinus</i> on brown silty or sandy loams on middle and lower hill slopes	10.6	Foraging, roosting, potentially nesting
	<i>Xanthorrhoea</i> Low Scrub A		
HS Tp EmCc	Low Scrub A of <i>Xanthorrhoea preissii</i> , <i>Diplolaena drummondii</i> and <i>Acacia pulchella</i> var. <i>pulchella</i> with Open Low Woodland A of <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> over Open Dwarf Scrub D of <i>Phyllanthus calycinus</i> , <i>Cryptandra arbutiflora</i> var. <i>arbutiflora</i> and <i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> (and <i>Hibbertia hypericoides</i>) over Very Open Low Sedges of <i>Stypandra glauca</i> , <i>Lepidosperma</i> aff. <i>drummondii</i> and <i>Patersonia occidentalis</i> var. <i>latifolia</i> over Open Mosses on grey loamy sands on granitic outcropping	0.4	Foraging and Roosting

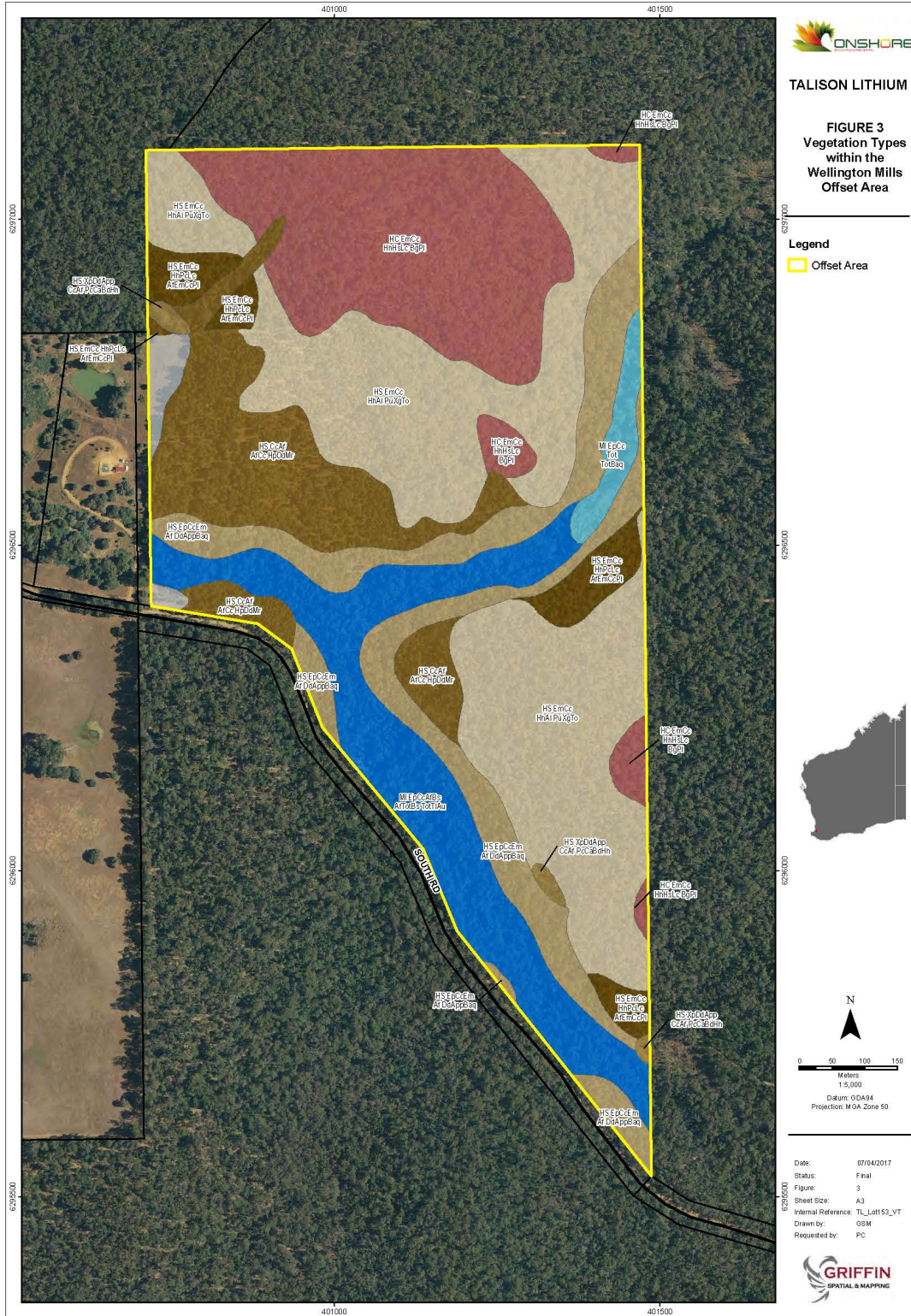




Figure 3: Vegetation types within the Wellington Mills Offset Area.

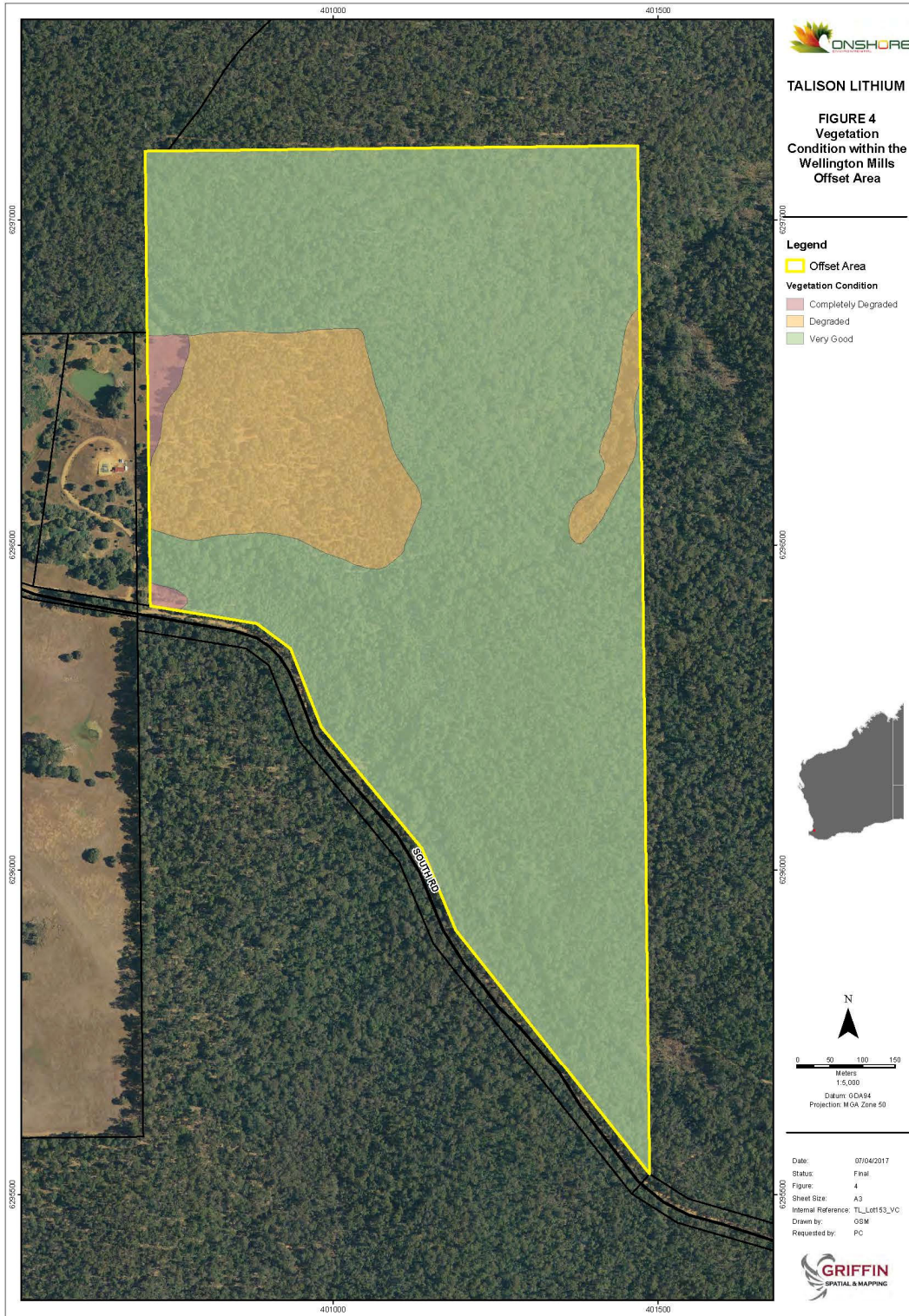


Figure 4: Vegetation condition within the Wellington Mills Offset Area.



2.3 Fauna Habitats

Onshore Environmental completed a Level 1 vertebrate fauna survey of the Wellington Mills Offset Area (Onshore Environmental 2019b, Appendix 2). Three (3) main fauna habitats types were identified and mapped during the field survey; Hillslope/Hillcrest, Drainage Line and Granite (Figure 5, Table 2).

The majority of the Wellington Mills Offset Area was mapped as Hillslopes/Hillcrests with Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*) and Peppermint (*Agonis flexuosa*) forest and an open shrub mid-storey. The Drainage Line habitat occurred through the central and southern parts of the Wellington Mills Offset Area and supported trees of Yarri (*Eucalyptus patens*), Marri and Peppermint with a dense understorey of shrubs and sedges. This habitat provides good connectivity due to the relatively dense understorey and dense tree cover. Small pockets of Granite habitat were also recorded; these areas were dominated by low shrubs and scattered Peppermint and Marri trees.

Table 2: Fauna habitat mapped within the Wellington Mills Offset Area.

Habitat Type	Description
Hillcrest/Hillslopes	Forest of Jarrah, Marri and Peppermint trees with open scrubs on brown loam and loamy sands.
Drainage Lines	Dense forest of Yarri, Marri and Peppermint trees over a thick understorey of scrubs and tall sedges on brown loams and clay.
Granite	Granite outcropping dominated by low scrub with open low woodland of Marri and Peppermint tree on grey loamy sands.

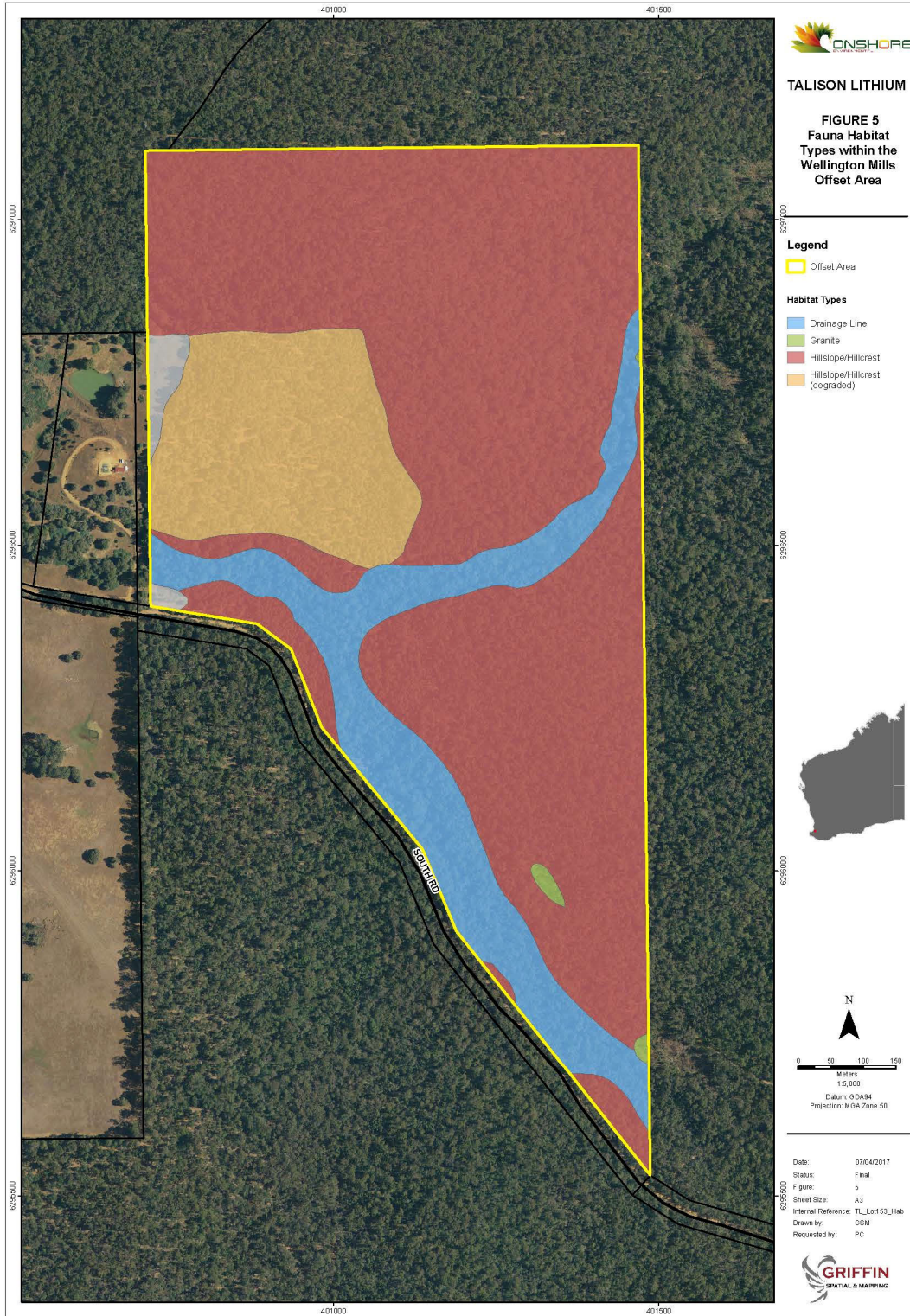


Figure 5: Fauna Habitat types within the Wellington Mills Offset Area.



2.4 Presence of Protected Matters within the Offset Area

2.4.1 Black Cockatoos

Existing native vegetation at the Wellington Mills Offset Area provides suitable habitat for the three (3) species of Black Cockatoos. Vegetation types consisting of Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*) and Yarri (*Eucalyptus patens*) present suitable foraging and roosting habitat (Table 1). To assess the potential for future nesting trees within the Wellington Mills Offset Area, suitable tree species (i.e. *Corymbia/Eucalyptus* species) that had a diameter at breast height of equal to or greater than 50 centimetres (cm) were counted within defined areas at the two (2) habitat types. Trees with a diameter at breast height of over 50cm were relatively common at the Wellington Mills Offset Area with an estimated density of 86 trees per ha on Hillslopes/Hillcrests, and 140 trees per ha on Drainage Lines. None of the trees observed within the Wellington Mills Offset Area contained hollows deemed suitable for use by Black Cockatoos, due to the small entrance sizes (Onshore Environmental 2019b, Appendix 2).

2.4.2 Western Ringtail Possum

The Drainage Line habitat within the Wellington Mills Offset Area supports a Dense Forest of *Eucalyptus patens* (Yarri), *Corymbia calophylla* (Marri) and *Agonis flexuosa* (Peppermint) which is considered to be suitable for Western Ringtail Possums. Active searches recorded old (inactive) dreys, however no recent evidence or individual possums were observed.

The Hillslope/Hillcrest habitat was also assessed as suitable habitat due to the structure of the mid-storey and upper-storey, however this habitat offered slightly less canopy connectivity than the Drainage Line habitat.

2.4.3 Chuditch

The Chuditch was assessed during a desktop assessment as likely to occur within the Wellington Mills Offset Area based on the presence of suitable habitat and previous records in the area (Onshore Environmental 2019b). The Chuditch inhabits Jarrah forest, in moist densely vegetated and steeply sloping forest, and drier open, gently sloping forest particularly in riparian vegetation (Orrell and Morris 1994). Chuditch may utilise the hillslope/hillcrest and drainage line habitats at the Wellington Mills Offset Area which provides denser undergrowth and litter suitable for dens and refuge sites. They may also forage and disperse through the hillslope/hillcrest habitat type.



3.0 ENVIRONMENTAL MANAGEMENT MEASURES

3.1 Management Objectives

Key threats to Black Cockatoos include the loss of suitable habitat for breeding, night roosting and foraging. Therefore, the objective of the Plan is to protect and maintain the habitat condition at the Wellington Mills Offset Area by undertaking prescribed burning to reduce the likelihood of catastrophic wildfire impacting on habitat. Management actions are discussed further in Section 3.2.

The Plan will be implemented for a period of 20 years and reviewed every five (5) years so that operational targets and budgets can be revised and customised to management priorities over the forward period. Monitoring and reporting will continue until the condition requirements are achieved. The successful completion of the condition requirements within the timeframes are subject to natural conditions and unexpected events, and the risks identified in Section 4.

As part of the process for formalising the Wellington Mills lot as an environmental offset, the land title will be transferred to DBCA. After the completion of the Plan, providing the conditions of approval in relation to the site are met, the Wellington Mills Offset Area will be managed by DBCA as State forest (Forest Conservation Area). The transfer of the land rights from a private owner to the DBCA and reservation as agreed by DBCA ensures that the habitat within the site will be formally protected in perpetuity.

3.2 Management Actions for Existing Habitat

The DBCA will use the DBCA DAS or an approved PFP as the planning and control mechanisms for management operations at the Wellington Mills Offset Area. The DAS is an online portal used to assess, approve and manage proposed activities (other than prescribed fire) on CALM Act lands where vegetation, the environment or values that the DBCA is responsible will be altered and/or disturbed. All proposals are managed in accordance with departmental objectives, associated management plans, and land use categories with an objective to remove and/or minimise disturbance impacts to As Low As is Reasonably Practicable (**ALARP**). Similarly, the PFP is a detailed planning document for prescribed burns to identify the value within and adjoining the burn area, fuel types, fuel quantities, appropriate weather and fuel moisture conditions for the required burn purpose and intensity. Any operations undertaken at the Wellington Mills Offset Area will be planned and managed in accordance with these documents and processes.

Management actions that will be implemented to protect and maintain the existing habitat for Protected Matters with particular focus on Black Cockatoos within the Wellington Mills Offset Area are described below. A summary of these actions, the associated performance indicators and timing of the actions are presented in Table 3.



Table 3 : Management actions to be implemented to protect existing habitat within the Wellington Mills Offset Area.

Management Objectives	Threats	Management Actions	Performance Indicator	Timing	Responsibility
Protect, maintain and manage existing habitat for Protected Matters including the Black Cockatoo at the Wellington Mills Offset Area to deliver improvements in habitat. Protect and maintain existing suitable foraging habitat and hollows within the Wellington Mills Offset Area, to deliver improvements in habitat. Protect and maintain suitable habitat that will provide suitable future nesting sites for Black Cockatoos, to deliver improvements in habitat.	Fire	Maintenance of fire breaks and tracks within the property. Fire management for the site will be integrated with management of the surrounding Lowden Forest Block of the Wellington State Forest by DBCA. This is likely to involve up to three control burns over a 20 year period.	Compliance with DBCA Fire Management strategy.	Ongoing	DBCA
	Weeds	Implement weed control programs aligned with the adjoining Lowden Forest Block of the Wellington State Forest.	Compliance with SW regions in priority setting for weed management on DBCA-managed lands.	Ongoing	Talison/DBCA
	Dieback	Those undertaking monitoring/management activities will have regard to: <ul style="list-style-type: none"> Policy Statement 3: Management of <i>Phytophthora</i> and disease caused by it (Department of Parks and Wildlife [DPaW] (2015); and <i>Phytophthora</i> Dieback Management Manual (DBCA 2017). Dieback management by DBCA at the Wellington Mills Offset Area will be integrated with wider management currently being implemented within the adjoining Lowden Forest Block of the Wellington State Forest.	Compliance with DBCA Dieback Management Procedures.	Ongoing	DBCA/Talison



3.2.1 Fire Management

Management at the Wellington Mills Offset Area will use and respond to fire in a manner that mitigates the risk of adverse impacts of bushfire. Fire management will have consideration for Black Cockatoos and other protected species, specifically the impact on significant habitats including tree hollows, as well as the availability of food for Black Cockatoos in the local area (foraging value).

Fire management for the Wellington Mills Offset Area will be integrated with management of the adjoining Lowden Forest Block of the Wellington State Forest, which is likely to involve up to three (3) control burns, based on a 6-8 year rotation, over the life of this plan. Appropriate fire regimes will contribute to avoiding the catastrophic outcomes associated with large scale bushfire events.

3.2.2 Weed Control

A total of eight introduced species (weeds) were recorded from the Wellington Mills Offset Area during the reconnaissance flora and vegetation survey (Onshore Environmental 2019a) (Table 4). One (1) of these species represents a risk to native vegetation; **Rubus anglocandicans* (Blackberry).

Blackberry was recorded from the drainage line in the north east corner of the Wellington Mills Offset Area and has the potential to locally outcompete native species and establish dense thickets along the immediate drainage line. A weed control program aimed at reducing the prominence of Blackberry from the immediate area will be implemented by Talison. Ongoing management will subsequently be undertaken by DBCA through the integration with priority setting for weed management currently being implemented within the adjoining Lowden Forest Block of the Wellington State Forest.

Table 4: Weed species recorded from the Wellington Mills Offset Area.

Genus	Species	Common Name
<i>*Briza</i>	<i>maxima</i>	Blowfly Grass
<i>*Briza</i>	<i>minor</i>	Shivery Grass
<i>*Centaureum</i>	<i>erythraea</i>	Common Centaury
<i>*Conyza</i>	<i>bonariensis</i>	Flaxleaf Fleabane
<i>*Hypochaeris</i>	<i>glabra</i>	Smooth Cats-ear
<i>*Parentucellia</i>	<i>latifolia</i>	Common Bartsia
<i>*Rubus</i>	<i>anglocandicans</i>	Blackberry
<i>*Solanum</i>	<i>nigrum</i>	Black nightshade



3.2.3 Dieback Management

There key objective for the Wellington Mills Offset Area is to reduce the risk for introduction or spread of *Phytophthora* Dieback to the site. When undertaking the proposed management and monitoring activities, Talison and DBCA will have regard to:

- Policy Statement 3: Management of *Phytophthora* and disease caused by it (Department of Parks and Wildlife [DPaW] (2015); and
- *Phytophthora* Dieback Management Manual (DBCA 2017).

Dieback management at the Wellington Mills Offset Area by DBCA will be integrated with wider management currently being implemented within the adjoining Lowden Forest Block of the Wellington State Forest and undertaken as required in the DAS or PFP approval documents.



4.0 RISK ASSESSMENT

A risk assessment was undertaken for the Wellington Mills Offset Area to consider the risks associated with achieving the objectives of the Plan (Table 5). The risks are identified and characterised as low, medium, high or severe, as derived from the likelihood (highly likely, likely, possible, unlikely, rare) and consequence (minor, moderate, high, major and critical) risk matrix based on the Department of Environment Guidelines for Developing Environmental Management Plans (DoE 2014).

The risk analysis assesses the risk of not achieving the management objectives. It may be necessary to re-evaluate and modify the risk analysis and contingency measures throughout the period of the Plan, particularly if any unforeseen risks or issues emerge during the implementation of the Plan.

Table 5: Risk management for the Wellington Mills Offset Area.

Risk	Likelihood	Consequence	Inherent Risk	Trigger	Contingency Measures
Objectives: <ul style="list-style-type: none"> protect and improve the quality of existing habitat and trees at the Wellington Mills Offset Area that will provide nesting sites for Black Cockatoos in the future; and protect existing suitable hollows within the Wellington Mills Offset Area. 					
Uncontrolled fires occur within the Wellington Mills Offset Area	Possible	High	Medium	Unplanned fire occurring within Wellington Mills Offset Area.	DBCA undertake fire management practices within the Wellington Mills Offset Area and incorporate with the surrounding Lowden Forest Block of the Wellington State Forest.
Damage to vegetation from vandalism e.g. 4wd vehicles, off-road motorbikes etc.	Possible	Minor	Low	Evidence of damage to vegetation from unauthorised entry.	DBCA will identify access points and introduce signage, or other site management as required.



Risk	Likelihood	Consequence	Inherent Risk	Trigger	Contingency Measures
Increase in population(s) of Declared Pests	Possible	Minor	Low	Monitoring undertaken by Talison indicates additional populations or increased coverage of Declared weed or pest species in the Wellington Mills Offset Area.	Talison /DBCA review requirement for additional weed/pest control measures.
Human induced Dieback spread and/or disease is significantly affecting vegetation within the Wellington Mills Offset Area	Possible	Moderate	Medium	Unexplained senescence of dieback susceptible species.	DBCA to determine requirement for additional dieback control measures.



5.0 MONITORING PROGRAM

Talison will be responsible for implementing a qualitative monitoring program at the Wellington Mills Offset Area to document evidence that required management actions are being implemented as required by the Plan, aimed at protecting and maintaining habitat for Protected Matters, in particular the Black Cockatoo.

Monitoring of the management actions will be undertaken by a suitably qualified professional in Spring 2022, and then at six (6) year intervals for the lifetime of the plan (20 years), i.e. Spring 2028, Spring 2034 and Spring 2040.

The results of the annual monitoring will be included in Talison's Annual Environmental Offset Report as described in Section 6.0.

5.1 Qualitative Monitoring

The Wellington Mills Offset Area will be evaluated against the management actions and performance indicators with respect to:

- Fire management;
- Weed control; and
- *Phytophthora* Dieback management.

Monitoring results will be reported in the Annual Environmental Offset Report as described in Section 6.



6.0 REPORTING AND REVIEW

6.1 Reporting

Compliance reporting frequency and timing for the Wellington Mills Offset Area will be submitted annually from 2021 in accordance with Condition 14 EPBC 2018/8206 compliance reporting requirements. Talison will submit a compliance report annually by the 14 December to DAWE.

The annual compliance reports prepared by Talison and submitted to DAWE will include:

- a review of management actions and performance indicators for activities undertaken in the previous 12 months under the Plan; and
- a summary of compliance against the Plan.

Talison will notify the DAWE of any incident at the site, non-compliance with the conditions, or non-compliance with the commitments or performance indicators made in the Plan. The notification will be given in writing as soon as practicable, and no later than two (2) business days after the incident or non-compliance. The notification will include the following information:

- any condition which is or may be in breach;
- the location (including coordinates), date and time of the incident and/or non-compliance; and
- a short description of the incident and/or non-compliance.

6.2 Adaptive Management

The management approach for the Wellington Mills Offset Area will be adaptive through ongoing review and reporting measures, to ensure that it achieves the identified purpose, environmental objectives of the Plan and ultimately meets requirements of the EPBC condition.

The Plan will be formally reviewed five yearly by a suitably qualified and experienced person. In addition to the scheduled review, the Plan will be reviewed if:

- new information is learned from monitoring, or monitoring indicates that performance indicators are not being achieved;
- new information becomes available about Protected Matters (e.g. a change in conservation status of a species); or
- new requirements need to be included as a consequence of approvals being issued or modified.

Where an adaptive management response is required to respond to any issues identified in the implementation of management measures and monitoring, Talison will in consultation with DBCA, identify and implement the management response in order to more effectively meet the environmental objectives of the Plan.

The following potential adaptive management actions have been developed to respond in the event that performance indicators show that the condition of the Wellington Mills Offset Area is declining, or if there is an incident involving Protected Matters at the site:

- investigate cause;



- Talison and DBCA in consultation will review and revise the Plan and management measures as required; and
- Talison and DBCA in consultation will implement additional contingency measures identified as part of the risk assessment.



7.0 ROLES AND RESPONSIBILITIES

Talison is responsible for:

- purchasing and transferring ownership of the Wellington Mills Offset Area to the State of WA for management and future reservation as State forest, classified as a forest conservation area under the CALM Act;
- undertaking or providing agreed funds to the DBCA towards the management of the Wellington Mills Offset Area to achieve the required standards and approval conditions;
- engaging a suitably qualified professional to undertake monitoring where required after DBCA take ownership and management responsibility for the Wellington Mills Offset Area; and
- report compliance against the Plan.

The DBCA is responsible for:

- integrating the management of the Wellington Mills Offset Area with the surrounding Lowden Forest Block of the Wellington State Forest and Wellington National Park and manage in accordance with requirements of the CALM Act and Forest Management Plan 2014-2023;
- facilitate future reservation as State forest and classification as forest conservation areas under section 62 of the CALM Act; and
- facilitate access by Talison, or their agents, to the Wellington Mills Offset Area to undertake necessary actions detailed in this Plan, or other relevant activities.



8.0 GLOSSARY

Black Cockatoo habitat includes foraging, breeding, potential breeding and roosting habitat for Black Cockatoos, as defined in the *EPBC Act Referral Guidelines for three species of Western Australian black cockatoos: Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), (Endangered) Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) (Vulnerable) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable)* (October 2012).

Black Cockatoo/s means the EPBC Act listed Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*).

Business day means a day that is not a Saturday, a Sunday or a public holiday in the state or territory of the action.

Clearing means the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of vegetation (but not including weeds)

Commencement of the action means the first instance of any specified activity associated with the action including clearance of vegetation and construction of any infrastructure. Commencement does not include minor physical disturbance necessary to:

- undertake pre-clearance surveys or monitoring programs;
- install signage and or temporary fencing to prevent unapproved use of the project area;
- protect environmental and property assets from fire, weeds and feral animals, including
 - construction of fencing, and maintenance of existing surface access tracks;
- install temporary site facilities for persons undertaking pre-commencement activities so long as these are located where they have no impact on the Protected Matters.

DBCA is the Western Australian Department of Biodiversity, Conservation and Attractions or any future entity that retains that agency's roles and responsibilities.

Department means the Australian Government agency responsible for administering the EPBC Act. Previously the Department of Environment and Energy and now (since February 2020) the Department of Agriculture, Water and the Environment.

EPBC Act means the Environment Protection and Biodiversity Conservation Act 1999.

Habitat quality means the capacity of the land to provide ecosystem services for Protected Matters.

Incident means any event which has the potential to, or does, impact on one or more protected matter(s).

Known nesting hollow means any tree bearing a hollow in use or showing historical evidence of use by Black Cockatoos for breeding, as verified by a suitably qualified field ecologist, including any hollow identified during the investigation required by Condition 2.



Ministerial Statement 1111 means the Statement that a proposal may be implemented for Greenbushes Lithium Mine Expansion Statement No. 1111 as signed by the WA Minister for Environment on 19 August 2019 or as subsequently amended/replaced.

Offset Area is the area as defined in the table in Condition 4 and in Condition 5. These areas are also identified in the Maps at Attachment B as follows:

- the areas within the yellow outline in Map 1
- the areas within the yellow outline that are hatched in orange and green in Map 2
- the area within the yellow outline that is hatched in green in Map 3
- the area within the yellow outline that is not shaded in green in Map 4.

Plan(s) means any of the documents required to be prepared, approved by the Minister, and/or implemented by the approval holder and published on the website in accordance with these conditions (includes action management plans and/or strategies).

Project Area is the area Greenbushes Mine Expansion area also referred to as the Mine Development Area (MDE).

Protected Matter/s means a matter protected under a controlling provision in Part 3 of the EPBC Act for which this approval has effect including, but not limited to, Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*), Chuditch (*Dasyurus geoffroii*) and Western Ringtail Possum (*Pseudocheirus occidentalis*).

Suitable nesting hollow means any tree bearing a hollow capable of being used by the Black Cockatoos for breeding, as identified by a suitably qualified person.

Suitably qualified field person means a person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative independent assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.

Suitably qualified field ecologist means a person who has professional qualifications and at least 3 years of work experience designing and implementing surveys for Black Cockatoo Habitat, and can give an authoritative assessment and advice on the presence of suitable nesting hollows using relevant protocols, standards, methods and/or literature.

Website means a set of related web pages located under a single domain name attributed to the approval holder and available to the public.



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Talison Lithium Pty Ltd
GREENBUSHES LITHIUM OPERATION

ENV-MP-0011

Wellington Mills Offset Area Management Plan

APPENDIX 1

FLORA AND VEGETATION SURVEY LOT 153 SOUTH ROAD, WELLINGTON MILLS (ONSHORE ENVIRONMENTAL 2019A)



Flora and Vegetation Survey Lot 153 South Road, Wellington Mills

Prepared for Talison Lithium
5 May 2019



Document Status						
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1.0 INTRODUCTION

1.1 Background

Talison Lithium Pty Ltd (Talison) owns and operates the existing lithium mine near the town of Greenbushes in south west Western Australia. The Greenbushes operation represents the world's largest known lithium reserve and has been producing lithium for 25 years, contributing to Australia's position as one of the two top global producers of lithium.

Talison is proposing to undertake an expansion at the Greenbushes Mine, aimed at increasing supply of lithium to the market. The proposed expansion will require 350 hectares (ha) of native vegetation to be cleared outside existing approval areas.

In 2018, Talison referred its proposal to expand operations to the Department of Energy and Environment (DoEE) for assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The referral was made on the basis that the expansion would require the clearing of 350 ha of native vegetation known to contain habitat for listed threatened species, namely:

- Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* (Vulnerable; confirmed as present);
- Baudin's Cockatoo *Calyptorhynchus baudinii* (Vulnerable; secondary evidence recorded); and
- Carnaby's Cockatoo *Calyptorhynchus latirostris* (Endangered; secondary evidence recorded).

1.2 EPBC Environmental Offsets Policy

DoEE has advised Talison that the *EPBC Environmental Offsets Policy* (DSEWPAC 2012a) would apply to the proposed clearing of native vegetation, to compensate for residual impacts to the three threatened black cockatoo species (collectively referred to by DoEE as forest black cockatoos - FBC). In response, Talison has been working to identify measures that, in combination, would constitute an acceptable and cost-effective package of environmental offsets that would satisfy the requirements of the EPBC Policy, as per the policy's acceptance criteria.

The *EPBC Offsets Assessment Guide* (DSEWPAC 2012b) has been used to characterise and quantify the residual impacts that require offsetting under the EPBC Policy. The Policy requires that a minimum of 90% of the offset package go towards directly offsetting residual impacts to the attribute of the protected matter that will be affected ('direct offsets'), with the remainder having the option of including offsets that are less directed towards the specific nature of the impact ('indirect offsets').

Efforts by Talison to identify suitable environmental offsets has included regular liaison with the WA Department of Biodiversity Conservation and Attractions (DBCA). DBCA has a land acquisition program for adding to its conservation estate suitable areas of environmental value that meet its selection criteria. The criteria includes the area being contiguous with existing estate or sufficiently large in its own right relative to the environmental values that the site contains.

Potential synergies may arise in circumstances where DBCA's acquisition program and EPBC offset requirements coincide. Talison and DBCA have identified a securable lot that potentially satisfies both DBCA's criteria and those of the *EPBC Environmental Offsets Policy*; Lot 153 South Road, Wellington Mills (Figure 1).

The northwest corner of the 81 hectare lot adjoins the Wellington National Park, with the north, east and southern boundaries abutting the Arcadia State Forest and within the proposed Wellington National Park expansion.

1.3 Scope of Works

To support environmental approvals for the proposed Greenbushes Mine expansion, Onshore Environmental Consultants Pty Ltd (Onshore Environmental) was commissioned by Talison to undertake a reconnaissance flora and vegetation survey of an 81 hectare offset lot at Wellington Mills, herein referred to as 'the study area'. The objectives of the survey were to describe and map vegetation associations, assess and map vegetation condition, and undertake targeted searches for significant flora taxa within the study area.

1.4 Biogeographic Regions

The Interim Biogeographic Regionalisation for Australia (IBRA) describes a system of 89 'biogeographic regions' (bioregions) and 419 subregions covering the entire Australian continent (IBRA7). Bioregions are defined on the basis of climate, geology, landforms, vegetation and fauna. The study area is situated in the Jarrah Forest bioregion (Thackway and Cresswell 1995). The Jarrah Forest bioregion is divided into two subregions; the Northern Jarrah Forest (JF1) and the Southern Jarrah Forest (JF2). The study area is located within the Southern Jarrah Forest subregion.

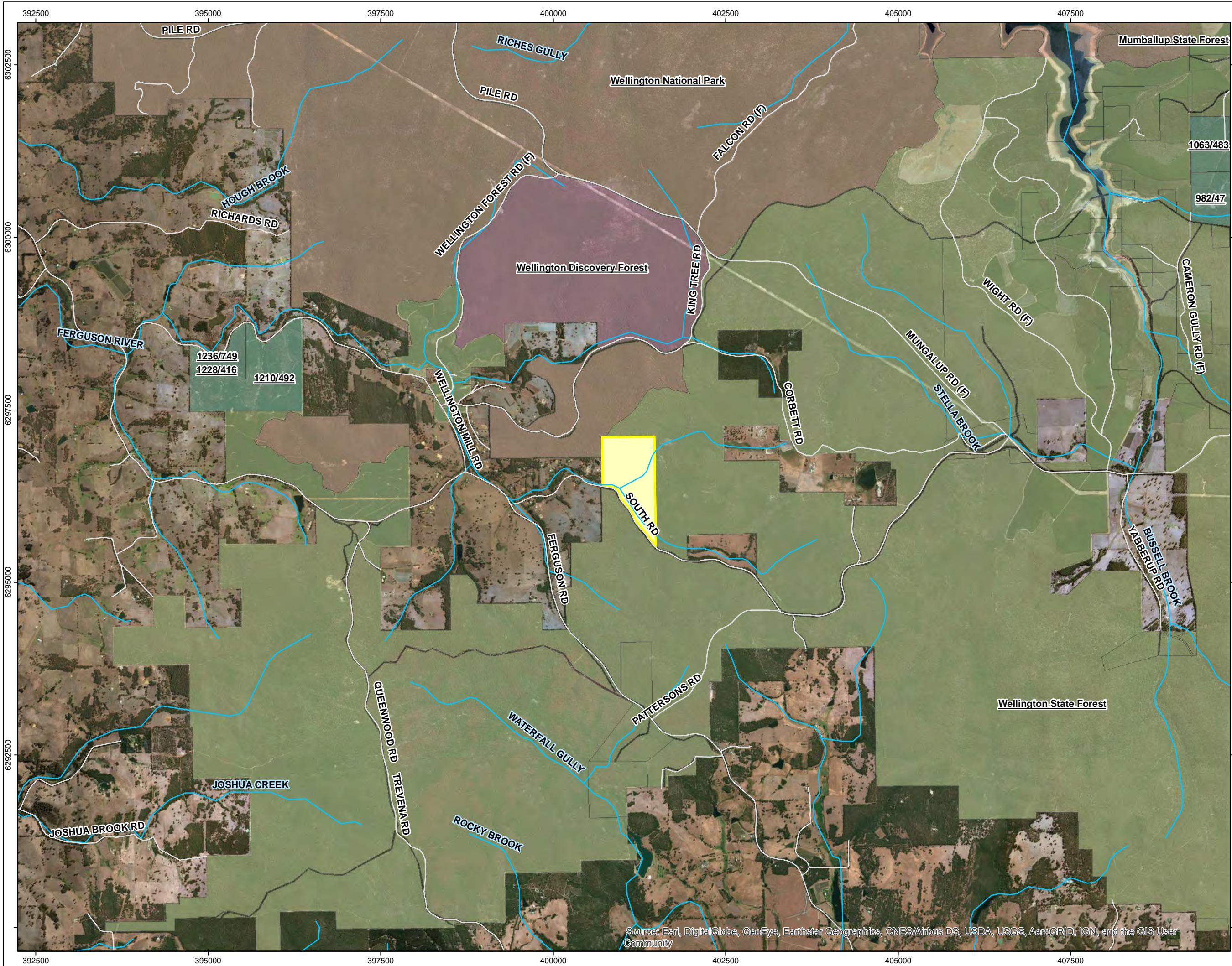
The Southern Jarrah Forest is described as; "Duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and in the eastern part, by Wandoo - Marri woodlands on clayey soils. Eluvial and alluvial deposits support *Agonis* shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands (Hearn, Williams, Comer and Beecham 2002)."

1.5 Land Use

The majority of the study area forms a consolidated block of intact remnant native vegetation, with the only noticeable disturbance related to historical felling of jarrah saw logs. There is evidence of historical grazing by domestic stock along the western boundary where the offset lot fringes cleared farmland, forming an edge effect. A small portion of the impacted vegetation has been cleared at the same location (less than 1 hectare).

1.6 Geology and Soils

The study area lies within the Yilgarn Craton geological province which is composed of belts of metamorphosed sedimentary and volcanic rocks, including large areas of granite. It forms part of the larger Darling Plateau physiographic unit, which is an undulating surface (250–300 m above sea level) overlain by ridges, plateaus, valleys and plains. These landforms are strongly influenced by the uplift of the Yilgarn Craton and the underlying geological nature of the substrate or basement rock, as well as features such as faults. Three major landform units occur within the study area; lateritic uplands, granite outcrops, and minor valleys.



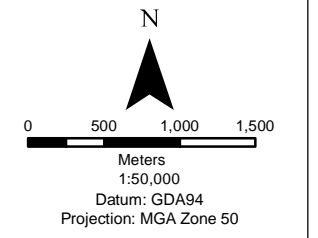
TALISON LITHIUM

Lot 153

Location

Legend

- Study Area
- DPAW Managed Lands**
- Conservator Of Forests
- National Park
- Scientific Research And Education
- State Forest



Date: 24/04/2019
 Status: Final
 Figure: 1
 Sheet Size: A3
 Internal Reference: TL_Lot 153
 Drawn by: GSM
 Requested by: DB



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1.7 Flora and Vegetation

The study area occurs in the Bridgetown System within the Menzies Sub-district of the Darling Botanical District, in the South-West Botanical Province (Beard 1981). The Menzies Sub-district (southern jarrah forest) covers a total area of 26,572 km², of which 18,715 km² (70%) originally supported jarrah and jarrah-marri forest (Beard 1990). It is estimated that approximately 61% of the total area has been cleared since European settlement, mainly in the valleys which are free of laterite, leaving the forest intact on laterised higher plateau levels.

The Menzies Sub-district is characterised by Jarrah stands on laterite within some Marri and Wandoo woodlands. Valley soils are often richer and Blackbutt (*Eucalyptus patens*) is more dominant in these areas. Flooded Gum (*Eucalyptus rudis*) is common along stream banks and Bullich (*Eucalyptus megacarpa*) is also present in some areas. Within the study area vegetation is dominated by Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) forest over the tall shrubs bull banksia (*Banksia grandis*) and snotty gobble (*Persoonia longifolia*). The lower understorey strata contains a range of plant genera including *Hakea*, *Acacia*, *Xanthorrhoea*, *Adenanthos*, *Hovea*, *Leucopogon*, *Macrozamia*, *Leucopogon*, *Bossiaea*, *Daviesia*, *Grevillea*, *Patersonia*, *Styphelia* and *Kennedia*.

A variety of published studies that relate to flora and vegetation of the southern jarrah forest are listed below:

- Distribution & prehistory of karri, jarrah & marri - Churchill (1968);
- Structure & composition of the karri forest around Pemberton - McArthur and Clifton (1975);
- Vegetation mapping of the Manjimup-Pemberton area - (Smith 1972);
- Vegetation mapping of the Swan area - Beard (1981);
- Vegetation mapping of the Darling System - Heddle *et al.* (1980); and
- Vegetation mapping as part of the Regional Forest Agreement - Mattiske and Havel (1998).

Vegetation complexes of the southern jarrah forest have most recently been defined by Heddle *et al.* (1980) and updated by Mattiske and Havel (1998). Mattiske and Havel (1998) describe vegetation of the survey area as 'mixture of open forest of *Eucalyptus marginata* - *Corymbia calophylla* with some *Eucalyptus patens* on slopes'.

2.0 METHODOLOGY

2.1 Legislation and Guidance Statements

The reconnaissance vegetation survey was carried out in a manner that was compliant with Environmental Protection Authority (EPA) requirements for the environmental surveying and reporting of flora and vegetation in Western Australia:

- Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a); and
- Environmental Factor Guideline: Flora and Vegetation (EPA 2016b).

2.2 Database Searches

Database searches were completed for information relating to rare flora (DBCA 2019a), TECs and PECs (DBCA 2019b) previously recorded within, or in close proximity to, the study area. The database searches were extended beyond the immediate limits of the study area to place flora and vegetation values into a regional context. The search co-ordinate used was a 15 km radius around the central point of the study area; GDA94 Zone 50 401125 mE 6296750 mN. The State database search investigated three DBCA databases:

- The DBCA Threatened Flora Database (DBCA 2019a);
- The DBCA Threatened and Priority Flora List (DBCA 2019b); and
- The Western Australian Herbarium Specimen Database for priority species opportunistically collected in the area of interest.

A search of the EPBC Act Protected Matters database was undertaken for a 10 km radius around the study area (DoE 2019), as well as a search of the International Union for Conservation of Nature (IUCN) database (IUCN 2019). A comprehensive literature review of surveys previously completed within or in close proximity to the study area was also undertaken.

2.3 Field Survey Methodology

2.3.1 *Timing and Personnel*

The flora and vegetation survey was completed by Principal Botanists Dr Darren Brearley and Dr Jerome Bull working over a three day field trip from the 10th to the 12th April 2019.

2.3.2 *Sampling of Study Sites*

The field survey involved systematic sampling to record relevé vegetation descriptions and note changes in vegetation structure and composition. The following environmental parameters were recorded at relevé sampling points:

- Landform;
- Aspect;
- Soil colour and soil type;
- Rock type;
- Slope (angle);
- Vegetation condition;
- Disturbance (caused by fire, clearing, grazing etc);
- Age since fire;
- Broad floristic formation;
- Vegetation association description; and

- Height and percentage ground cover provided by individual plant taxa.

Other parameters recorded for each study site were:

- Relevé site number and date of assessment;
- Names of the botanists undertaking the assessment;
- Location description and waypoint - GPS coordinate (GDA94) using a handheld GPS; and
- Photograph number.

2.3.3 Targeted Surveys for Conservation Significant Species

Targeted searches for species of conservation significance likely to occur within the study area were completed. All vegetation polygons defined were ground truthed during the survey to record opportunistic collections for significant flora. This coverage also allowed for closer examination of specific landforms where significant flora may be expected to occur.

2.3.4 Vegetation Association and Condition Mapping

The vegetation mapping utilised high-resolution aerial photography of the study area at a scale of 1:3,000, with definition of vegetation polygons based on shading patterns. Ground-truthing of the study area was completed during the survey with vegetation descriptions made within selected vegetation polygons to confirm dominant structural layers and associated plant taxa.

The location of relevé sites assessed during the survey was overlaid on the aerial photography, and associated flora and vegetation data used to provide vegetation association descriptions for individual polygons defined. Description of vegetation structure follows the height, life form and density classes of Muir (1977) (see Appendix 1). This is largely a structural classification suitable for broader scale mapping, but taking all ecologically significant strata into account. Vegetation condition for each of the study sites was determined using a recognised rating scale (based on Keighery 1994, see Appendix 2).

3.0 RESULTS

3.1 Desktop Review

3.1.1 Previous Flora and Vegetation Surveys

The study area lies within the Darling Botanical District of the South-Western Botanical Province as recognised by Diels (1906) and later developed by Gardner (1942) and Beard (1979, 1981).

Historical broad scale vegetation mapping in the region has been completed by:

- Smith (1974) in the Collie area (1:250,000);
- Heddle *et al.* (1980) in the System 6 area; Perth, Pinjarra and Collie areas (1:250,000); and
- Mattiske and Havel (1998) in the vegetation mapping for the Regional Forest Agreement.

While there has been a significant number of baseline flora and vegetation surveys associated with coal mining approvals completed within the Collie Basin, less literature is publicly available for the Wellington Mills area.

Baseline survey work has been completed as part of a management plan developed by the DBCA and covering the Wellington National Park, Westralia Conservation Park, Westralia Forest Conservation Area and the Wellington Discovery Forest (DEC 2008). There were 331 native plant taxa representing 72 families recorded from limited surveys within the planning area. The largest number of species belong to the family Fabaceae, followed by Myrtaceae, Proteaceae and Asteraceae. Significant flora previously recorded include one Priority 1 species (*Hemigenia rigida*), two Priority 3 species (*Acacia oncinophylla* subsp. *oncinophylla*, *Tetralochea parvifolia*) and two Priority 4 species (*Grevillea ripicola*, *Senecio leucoglossus*). Vegetation is representative of that of the jarrah forest, displaying a remarkable structural homogeneity in overstorey species, dominated by jarrah (*Eucalyptus marginata* subsp. *marginata*), marri (*Corymbia calophylla*) and, on deeper valley soils, blackbutt (*Eucalyptus patens*). The diversity in floristic composition, adaptive characteristics displayed by plants, patterns of groupings and the structural features of vegetation communities coincides with changes in environmental conditions across the jarrah forest, principally variations in climate, topography and soil type.

A survey of vascular plant species associated with granite outcrops in Wellington National Park, immediately north-west of the study area, was undertaken by Smith and Sage (2006) in spring and summer 2002. A total of 108 species, including ten introduced taxa, were identified. The most frequently represented genera were Orchidaceae (8 species), Asteraceae (8), Apiaceae (6), Myrtaceae (6), and Poaceae (6). The granite outcrop vegetation formed a continuum dependant mainly on soil depth, ranging from lichen encrusting otherwise bare rock surfaces, through moss swards and herbfields, to shrublands and heathlands on deeper soils. It contrasts with that of the surrounding forest both in regard to species composition and structure. This is mainly because of a higher proportion of obligate seeders due to lower fire frequencies, the high summer water stress levels and a wide variety of habitat types within a relatively small area.

3.1.2 Threatened Flora listed under the EPBC Act

A search of the EPBC Act Protected Matters database was undertaken within a 10 km buffer of the study area (DoEE 2019). The database search listed four Threatened

Flora or their habitat within the search area; *Caladenia hoffmanii* (Endangered), *Diuris micrantha* and *Eleocharis keigheryi* (Vulnerable), and *Synaphea* sp. Fairbridge Farm (D. Papenfus) (Critically Endangered). No Threatened Ecological Communities (TECs) were recorded in the search.

3.1.3 Threatened Flora listed under the IUCN Red List Database

A search of the International Union for Conservation of Nature (IUCN) database was also conducted (IUCN 2019). No Threatened Flora was listed as likely to occur within the study area from this search.

3.1.4 Threatened Flora listed under the WA Wildlife Conservation (Rare Flora) Notice

There are no Threatened Flora species recorded within a 10 km radius of the study area according to the DBCA rare flora databases (Figure 2, DBCA 2019a).

There were no TECs occurring within the 10 km radius around the study area (Figure 3).

3.1.5 Priority Flora recognised by DBCA

The DBCA rare flora database search (DBCA 2019a) identified one Priority 2 species (*Stylidium acuminatum* subsp. *acuminatum*), one Priority 3 species (*Acacia oncinophylla* subsp. *oncinophylla*), and three Priority 4 species (*Acacia semitrullata*, *Boronia tenuis*, *Senecio leucoglossus*) (Table 1, Figure 2). Four of the Priority flora taxa were determined as being 'likely' to occur within the study area (Table 1).

There were no PECs occurring within the 10 km radius around the study area (Figure 3).

Table 1 Significant flora recorded in or around the survey area from the commonwealth and state database searches, literature and local knowledge. SCC - State Conservation Code, FCC - Federal Conservation Code

Taxon	SCC	FCC	Habitat	Present - 10km radius	Suitable habitat present	Likelihood in study area
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>	3		Granitic soils	Yes	Yes	Likely
<i>Acacia semitrullata</i>	4		Sandplains, swampy areas	Yes	No	Possible
<i>Boronia tenuis</i>	4		Laterite, stony soils, granite	Yes	Yes	Likely
<i>Caladenia hoffmanii</i>	T	E	Clay, loam, laterite, granite. Rocky outcrops, hillsides, ridges, gullies	No	Yes	Possible
<i>Diuris micrantha</i>	T	V	Winter wet depressions or swamps	No	No	Unlikely
<i>Eleocharis keigheryi</i>	T	V	Emergent in freshwater; creeks and claypans	No	No	Unlikely
<i>Hemigenia rigida</i>	1		Hillslopes, granite outcrops, flats, ironstone ridges	No	Yes	Possible
<i>Senecio leucoglossus</i>	4		Gravelly lateritic or granitic soils. Granite outcrops, slopes	Yes	Yes	Likely
<i>Stylidium acuminatum</i> subsp. <i>acuminatum</i>	2		Clayey sand over laterite. Hillslopes, ridges and valleys	Yes	Yes	Likely
<i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus)	T	CE	Sandy with lateritic pebbles. Near winter-wet flats, in low woodland	No	No	Unlikely
<i>Tetratheca parvifolia</i>	3		Lateritic soils, open forest	No	Yes	Unlikely



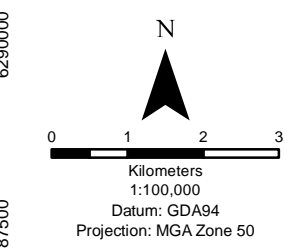
TALISON LITHIUM

Lot 153

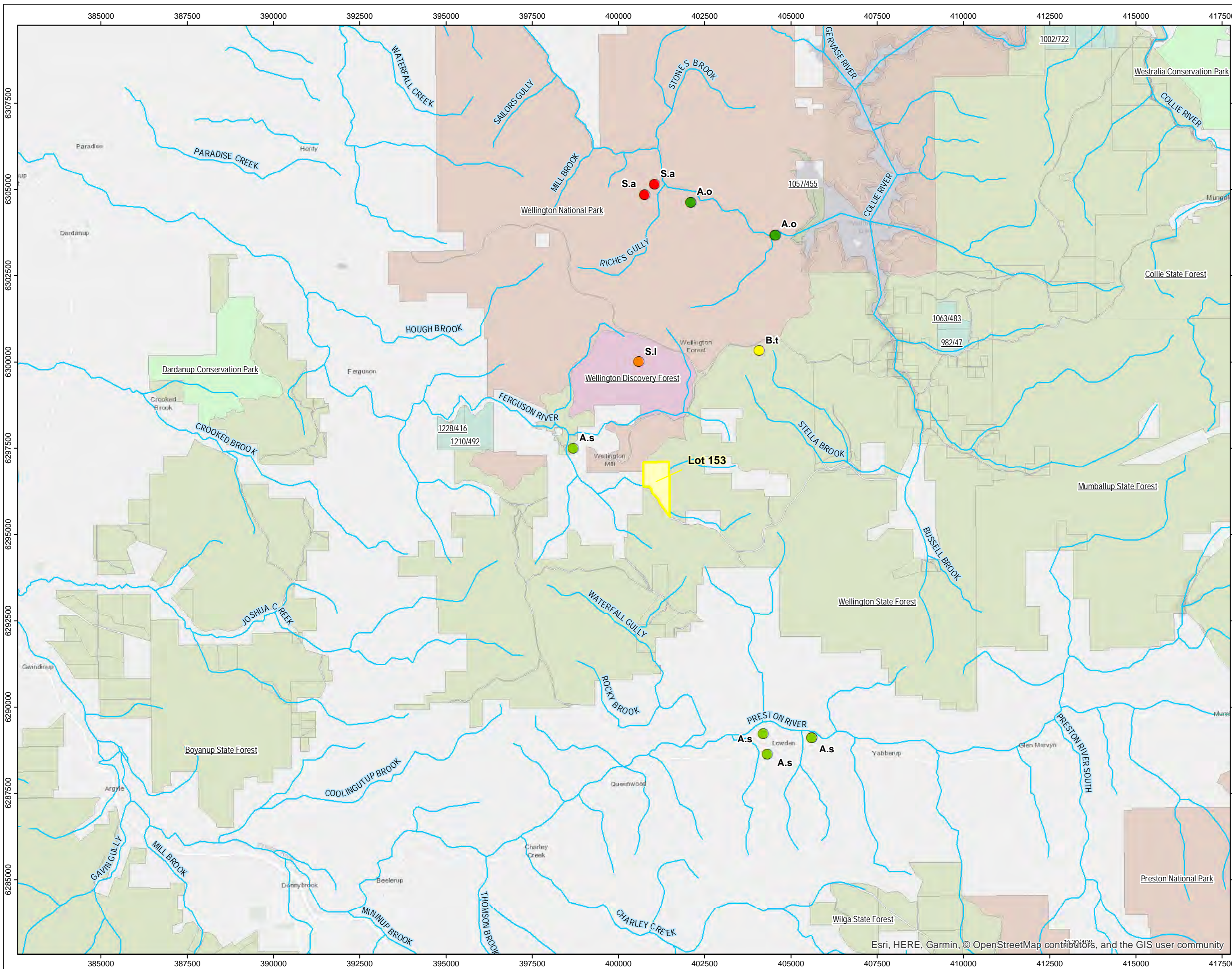
Significant database flora locations in relation to the study area

Legend

- Study Area
- DPAW Managed Lands**
- Conservation Park
- Conservator Of Forests
- National Park
- Scientific Research And Education
- State Forest
- Treatened and Priority Flora**
- Acacia oncinophylla subsp. oncinophylla (A.o)
- Acacia semitrullata (A.s)
- Boronia tenuis (B.t)
- Senecio leucoglossus (S.l)
- Stylidium acuminatum subsp. acuminatum (S.a)



Date: 24/04/2019
 Status: Final
 Figure: 2
 Sheet Size: A3
 Internal Reference: TL_Lot 153 TPF
 Drawn by: GSM
 Requested by: DB





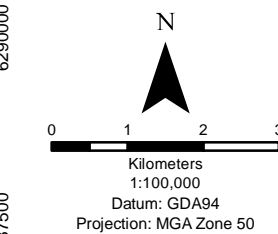
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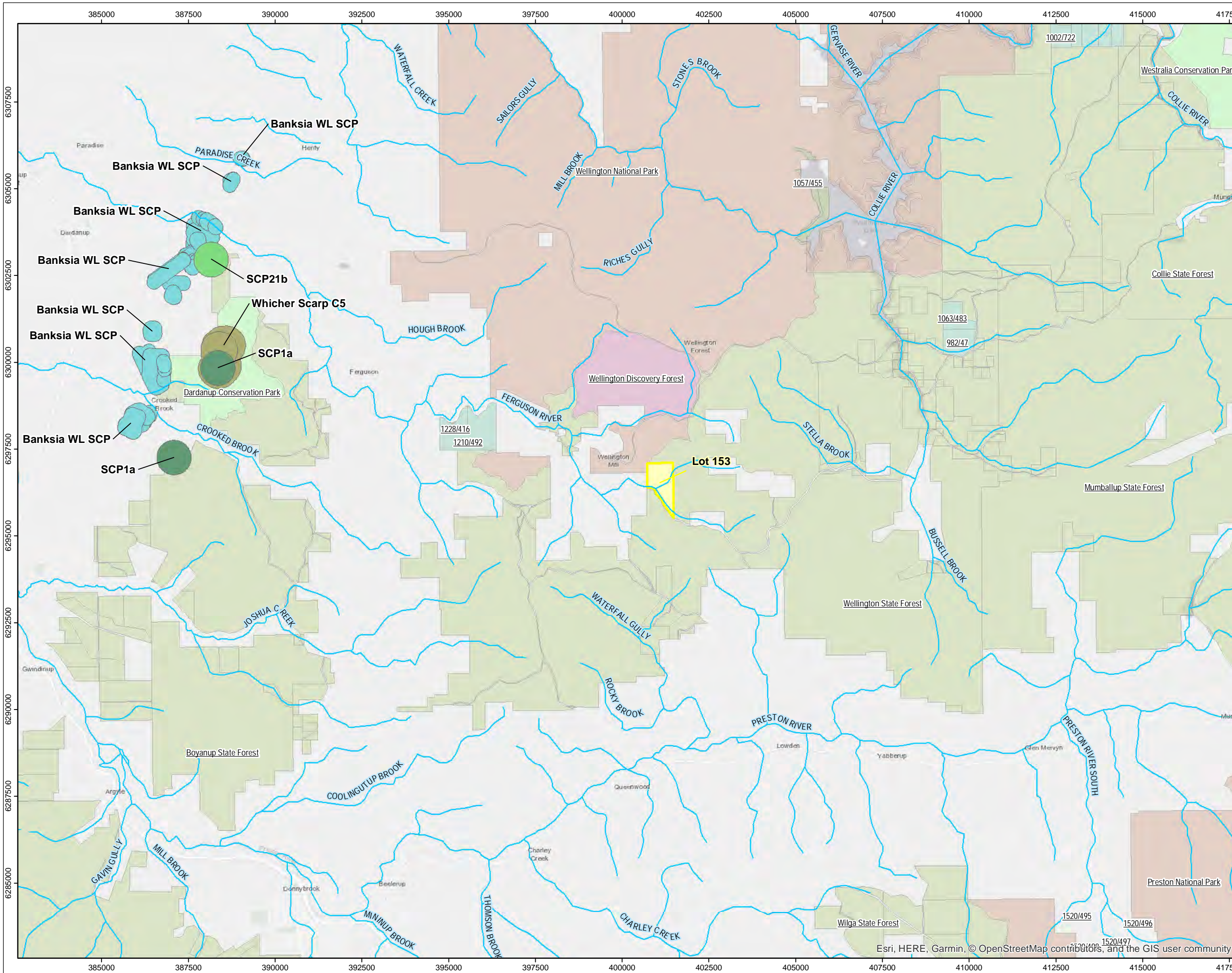
PEC/TEC Communities in relation to the study area

Legend

- Study Area
- DBCAs Managed Lands**
 - Conservation Park
 - Conservator Of Forests
 - National Park
 - Scientific Research And Education
 - State Forest
- PEC/TEC Locations**
 - Banksia WL SCP - Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region
 - SCP1a - Eucalyptus haematoxylon - E. marginata woodlands on Whicher foothills
 - SCP21b - Southern Banksia attenuata woodlands
 - Whicher Scarp C5 - Dardanup Jarrah and Mountain Marri woodland on laterite



Date: 24/04/2019
 Status: Final
 Figure: 3
 Sheet Size: A3
 Internal Reference: TL_Lot 153 PTEC
 Drawn by: GSM
 Requested by: DB



3.2 Conservation Significant Flora

3.2.1 Threatened Flora

None of the plant taxa recorded from the study area were gazetted as Threatened Flora (T) pursuant to subsection (2) of section 23F of the WC Act, or listed under the Commonwealth EPBC Act.

3.2.2 Priority Flora

None of the plant taxa recorded from the study area were identified as Priority Flora, as listed by DBCA.

3.2.3 Flora of Interest

A list of the total flora recorded from within the study site is provided in Appendix 3. There were two plant taxa recorded from the study area that were determined to be flora of interest; they are described in more detail below.

Patersonia occidentalis var. *latifolia*

There was one flora taxon with a small range extension recorded from the study area; *Patersonia occidentalis* var. *latifolia* (Purple Flags). This species is a robust caespitose, rhizomatous, perennial, sedge-like herb that grows to 0.7 m high with thick glaucous leaves and large though delicate purple flowers. It typically grows in upland flats, hill slopes and valleys on a variety of substrates such as grey-brown sand or sandy clays, yellow-brown gravelly loams or red-brown gravelly clays, often associated with laterite (in the southerly populations along the Darling Scarp) or limestone (in the northerly populations, along the coastline) (WAH 2019).

It is widely distributed throughout the southwest, extending approximately 1,000 km from Kalbarri in the north to Albany in the south. It has been recorded from the Wheatbelt, Geraldton Sandplains, Jarrah Forest, Swan Coastal Plain and Warren bioregions (IBRA 2018) (WAH 2019). The closest documented population of *Patersonia occidentalis* var. *latifolia* to the study area is located approximately 50 km west near the locality of Bowelling, between Collie and Darkan, along of the Collie-Darkan Road.

This species was opportunistically recorded from two locations within the study area, representing two separate populations. At both locations cover abundance was approximately 2%. One population was on a granite outcrop with *Xanthorrhoea preissii*, and the other on a hill crest dominated by Jarrah, Marri and Bull Banksia (*Banksia grandis*) Forest.

Lepidosperma sp. indet. 'robust, granite'

Lepidosperma sp. indet. 'robust, granite' is a rhizomatous, tufted perennial sedge, found on a large granite outcrop abutting the southeast corner of the study area. It was recorded as a single population approximating 100 individuals (c. 2% cover abundance), noting that the outcrop extended outside the perimeter of the study area and into surrounding state forest.

The genus *Lepidosperma* is recognised as a poorly understood group within southwestern Australia and many taxa have yet to be formally described and published in relevant taxonomic journals. There is a lack of up-to-date identification keys in the literature and consequently confirmation of this taxon cannot be verified without scientific inquiry.

3.3 Vegetation Associations

A total of eight vegetation types from four broad landforms were described and mapped from the study area (Figure 4). The vegetation types were classified into four broad floristic formations according to dominant vegetation strata (Table 2).

Remnant native vegetation covers 80.12 hectares (98.9%) of the study area, with a further 0.87 hectares covered by cleared pasture fringing farmland along the western boundary. Native vegetation with highest conservation value occurred across the northern, eastern and southern sectors of the study area, where it formed strong linkages with adjacent native vegetation within state forest (proposed Wellington National Park extension).

Three vegetation types supporting jarrah-marri forest on lateritic hill crests and slopes accounted for 56% of the native vegetation extent within the study area (Figure 4):

- HC EmCc HhHsLc BgPI - Forest of *Eucalyptus marginata* and *Corymbia calophylla* over Low Heath D of *Hibbertia hypericoides*, *Hibbertia silvestris* and *Leucopogon capitellatus* with Low Woodland A of *Banksia grandis* and *Persoonia longifolia* over Open Low Sedges of *Patersonia umbrosa* var. *xanthina* and *Xanthorrhoea gracilis* with Open Scrub of *Bossiaea aquifolium* and *Bossiaea linophylla* over Open Dwarf Scrub C of *Pteridium esculentum* and *Macrozamia riedlei* on orange to grey-brown loamy sands on lateritic hill crests and upper hill slopes (15.29 ha or 19%);
- HS EmCc HhAl PuXgTo - Forest of *Eucalyptus marginata* and *Corymbia calophylla* over Low Heath D of *Hibbertia hypericoides* (and *Acacia lateriticola*) over Open Low Sedges of *Patersonia umbrosa* var. *xanthina*, *Xanthorrhoea gracilis* and *Tetraria octandra* over Open Low Woodland B of *Persoonia longifolia* over Open Scrub of *Bossiaea aquifolium* and *Trymalium odoratissimum* subsp. *trifidum* over *Pteridium esculentum*, *Macrozamia riedlei* and *Diplolaena drummondii* on brown silty loams on lateritic hill slopes (27.06 ha or 33%); and
- HS EmCc HhPcLc AfEmCcPI - Forest of *Eucalyptus marginata* and *Corymbia calophylla* over Low Heath D of *Hibbertia hypericoides*, *Phyllanthus calycinus* and *Leucopogon capitellatus* with Open Low Woodland A of *Agonis flexuosa*, *Eucalyptus marginata* (regen) and *Corymbia calophylla* (regen) (and *Persoonia longifolia*) over Open Low Scrub A of *Xanthorrhoea preissii* over Open Dwarf Scrub C of *Diplolaena drummondii*, *Macrozamia riedlei* and *Acacia lateriticola* on brown silty loams on lateritic middle and lower hill slopes (3.21 ha or 4%).

Three vegetation types supporting blackbutt-marri-peppermint closed forests and forests on lower hill slopes and minor drainage lines accounted for 29.1 percent of the native vegetation extent within the study area (Figure 4):

- MI EpCcAfBs AfTotBs TotTIAu - Dense Forest of *Eucalyptus patens*, *Corymbia calophylla* and *Agonis flexuosa* (+/- *Banksia seminuda*) over Low Forest A of *Agonis flexuosa* and *Trymalium odoratissimum* subsp. *trifidum* (+/- *Banksia seminuda*) over Scrub of *Trymalium odoratissimum* subsp. *trifidum*, *Taxandria linearifolia* and *Acacia urophylla* (+/- *Bossiaea aquifolium*) over Open Tall Sedges of *Lepidosperma tetraquetrum* with Open Low Scrub B of *Pteridium esculentum* and *Macrozamia riedlei* over Very Open Climbers of *Clematis pubescens* over Scattered Ferns of *Adiantum aethiopicum* on brown loams or silty clay loams on incised and meandering minor drainage lines and drainage flats (11.36 ha or 14%);

- HS EpCcEm Af DdAppBaq - Forest of *Eucalyptus patens* and *Corymbia calophylla* (+/- *Eucalyptus marginata*) over Low Woodland of *Agonis flexuosa* over Open Low Scrub A of *Diplolaena drummondii*, *Acacia pulchella* var. *pulchella* and *Bossiaea aquifolium* over Open Dwarf Scrub C of *Macrozamia riedlei* over Open Dwarf Scrub D of *Phyllanthus calycinus*, *Tremandra stelligera* and *Hibbertia pilosa* on brown loams on lower hill slopes (10.88 ha or 13%); and
- MI EpCc Tot TotBaq - Forest of *Eucalyptus patens* and *Corymbia calophylla* over Low Woodland B of *Trymalium odoratissimum* subsp. *trifidum* over Scrub of *Trymalium odoratissimum* subsp. *trifidum* and *Bossiaea aquifolium* over Open Tall Sedges of *Lepidosperma tetraquetrum* with Open Low Scrub B of *Pteridium esculentum*, *Thomasia* sp. Big Brook (M. Koch 2373) and **Rubus anglocandicans* over Open Dwarf Scrub D of *Tremandra stelligera* and *Hibbertia silvestris* over Very Open Climbers of *Clematis pubescens* on brown loamy sands and sandy loams on incised minor drainage lines and adjacent stream banks (1.32 ha or 2%).

Less well represented were *Corymbia calophylla* / *Agonis flexuosa* woodlands on middle and lower hill slopes (10.58 ha or 13%) and *Xanthorrhoea* - characterised Scrub on granitic outcrops (0.44 ha or 0.5%) (Figure 4).

Vegetation condition across the majority of the study area was rated as *very good* (67.22 ha or 83%) and this included the northern, eastern and southern sectors which abut state forest. Two patches of vegetation were considered to be in *degraded* condition within the study area, totalling 12.90 ha or 16%. This included a large block in the western central sector of the study area that had obvious effects from historical grazing by domestic stock (sheep and cattle), historical logging and prominent soil disturbances. This block had some patches in *good* condition but was overall rated as *degraded*. A minor drainage line in the eastern central sector of the study area was also rated as *degraded* as it contained some areas dominated by blackberry (*Rubus anglocandicans*), a problematic weed in moist habitats throughout southwestern Australia (Figure 5).

A small area (0.87 ha or 1%) of the study area was determined to be *completely degraded*. These areas included a small patch of 'parkland cleared' vegetation in the southwest corner adjacent to South Road, as well as a thin section of cleared paddock along the central western edge of the study area (Figure 5). This area appeared to be contiguous with and used by the adjacent property for grazing.

The major disturbance impact throughout the study area was related to historical logging, although due to the size of some of the individual trees, it appeared that the area had not been felled for a significant period of time. Introduced flora (weeds) were a minor component of the flora, however the survey was conducted during a dry period of the year (April) and before many herbaceous weed species have germinated. Eight species of introduced flora taxa were recorded:

- *Briza maxima* (Blowfly Grass);
- *Briza minor* (Shivery Grass);
- *Centaureum erythraea* (Common centaury);
- *Conyza bonariensis* (Flaxleaf Fleabane);
- *Hypochaeris glabra* (Flatweed);
- *Parentucellia latifolia* (Common Bartsia)
- *Rubus anglocandicans* (Blackberry); and
- *Solanum nigrum* (Black Berry Nightshade).

All introduced taxa were in low density except for *Rubus anglocandicans* (Blackberry), which was observed in dense thickets along some of the minor drainage channels within the study area. Some of these infestations may require management due to the potential for Blackberry to spread and infest waterways across the region.

Table 2 Vegetation types mapped within the study area.

Code	Broad Floristic Formation and Vegetation Type	Area (ha)	% of Area
	<i>Eucalyptus</i> Dense Forest		
MI EpCcAfBs AfTotBs TotTIAu	Dense Forest of <i>Eucalyptus patens</i> , <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> (+/- <i>Banksia seminuda</i>) over Low Forest A of <i>Agonis flexuosa</i> and <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> (+/- <i>Banksia seminuda</i>) over Scrub of <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> , <i>Taxandria linearifolia</i> and <i>Acacia urophylla</i> (+/- <i>Bossiaea aquifolium</i>) over Open Tall Sedges of <i>Lepidosperma tetraquetrum</i> with Open Low Scrub B of <i>Pteridium esculentum</i> and <i>Macrozamia riedlei</i> over Very Open Climbers of <i>Clematis pubescens</i> over Scattered Ferns of <i>Adiantum aethiopicum</i> on brown loams or silty clay loams on incised and meandering minor drainage lines and drainage flats	11.36	14.0
	<i>Eucalyptus</i> Forest		
HS EpCcEm Af DdAppBaq	Forest of <i>Eucalyptus patens</i> and <i>Corymbia calophylla</i> (+/- <i>Eucalyptus marginata</i>) over Low Woodland of <i>Agonis flexuosa</i> over Open Low Scrub A of <i>Diplolaena drummondii</i> , <i>Acacia pulchella</i> var. <i>pulchella</i> and <i>Bossiaea aquifolium</i> over Open Dwarf Scrub C of <i>Macrozamia riedlei</i> over Open Dwarf Scrub D of <i>Phyllanthus calycinus</i> , <i>Tremandra stelligera</i> and <i>Hibbertia pilosa</i> on brown loams on lower hill slopes	10.88	10.4
HS EmCc HhAl PuXgTo	Forest of <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> over Low Heath D of <i>Hibbertia hypericoides</i> (and <i>Acacia lateriticola</i>) over Open Low Sedges of <i>Patersonia umbrosa</i> var. <i>xanthina</i> , <i>Xanthorrhoea gracilis</i> and <i>Tetraria octandra</i> over Open Low Woodland B of <i>Persoonia longifolia</i> over Open Scrub of <i>Bossiaea aquifolium</i> and <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> over <i>Pteridium esculentum</i> , <i>Macrozamia riedlei</i> and <i>Diplolaena drummondii</i> on brown silty loams on lateritic hill slopes	27.06	33.4
HC EmCc HhHsLc BgPI	Forest of <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> over Low Heath D of <i>Hibbertia hypericoides</i> , <i>Hibbertia silvestris</i> and <i>Leucopogon capitellatus</i> with Low Woodland A of <i>Banksia grandis</i> and <i>Persoonia longifolia</i> over Open Low Sedges of <i>Patersonia umbrosa</i> var. <i>xanthina</i> and <i>Xanthorrhoea gracilis</i> with Open Scrub of <i>Bossiaea aquifolium</i> and <i>Bossiaea linophylla</i> over Open Dwarf Scrub C of <i>Pteridium esculentum</i> and <i>Macrozamia riedlei</i> on orange to grey-brown loamy sands on lateritic hill crests and upper hill slopes	15.29	18.9
HS EmCc HhPcLc AfEmCcPI	Forest of <i>Eucalyptus marginata</i> and <i>Corymbia calophylla</i> over Low Heath D of <i>Hibbertia hypericoides</i> , <i>Phyllanthus calycinus</i> and <i>Leucopogon capitellatus</i> with Open Low Woodland A of <i>Agonis flexuosa</i> , <i>Eucalyptus marginata</i> (regen) and <i>Corymbia calophylla</i> (regen) (and <i>Persoonia longifolia</i>) over Open Low Scrub A of <i>Xanthorrhoea preissii</i> over Open Dwarf Scrub C of <i>Diplolaena drummondii</i> , <i>Macrozamia riedlei</i> and <i>Acacia lateriticola</i> on brown silty loams on lateritic middle and lower hill slopes	3.21	4.0

Code	Broad Floristic Formation and Vegetation Type	Area (ha)	% of Area
MI EpCc Tot TotBaq	Forest of <i>Eucalyptus patens</i> and <i>Corymbia calophylla</i> over Low Woodland B of <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> over Scrub of <i>Trymalium odoratissimum</i> subsp. <i>trifidum</i> and <i>Bossiaea aquifolium</i> over Open Tall Sedges of <i>Lepidosperma tetraquetrum</i> with Open Low Scrub B of <i>Pteridium esculentum</i> , <i>Thomasia</i> sp. Big Brook and * <i>Rubus anglocandicans</i> over Open Dwarf Scrub D of <i>Tremandra stelligera</i> and <i>Hibbertia silvestris</i> over Very Open Climbers of <i>Clematis pubescens</i> on brown loamy sands and sandy loams on incised minor drainage lines and adjacent stream banks	1.32	1.6
	<i>Corymbia</i> Woodland		
HS CcAf AfCc HpDdMr	Woodland of <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> over Low Woodland A of <i>Agonis flexuosa</i> and <i>Corymbia calophylla</i> over Open Low Scrub B of <i>Hibbertia pilosa</i> , <i>Diplolaena drummondii</i> and <i>Macrozamia riedlei</i> over Open Dwarf Scrub D of <i>Hibbertia hypericoides</i> and <i>Phyllanthus calycinus</i> on brown silty or sandy loams on middle and lower hill slopes	10.58	13.1
	<i>Xanthorrhoea</i> Low Scrub A		
GR XpDdApp CcAf PcCaBdHh	Low Scrub A of <i>Xanthorrhoea preissii</i> , <i>Diplolaena drummondii</i> and <i>Acacia pulchella</i> var. <i>pulchella</i> with Open Low Woodland A of <i>Corymbia calophylla</i> and <i>Agonis flexuosa</i> over Open Dwarf Scrub D of <i>Phyllanthus calycinus</i> , <i>Cryptandra arbutiflora</i> var. <i>arbutiflora</i> and <i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> (and <i>Hibbertia hypericoides</i>) over Very Open Low Sedges of <i>Stypandra glauca</i> , <i>Lepidosperma</i> aff. <i>drummondii</i> and <i>Patersonia occidentalis</i> var. <i>latifolia</i> over Open Mosses on grey loamy sands on granitic outcropping	0.44	0.5

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TALISON LITHIUM

Lot 153 Wellington Mills Vegetation Types

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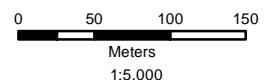
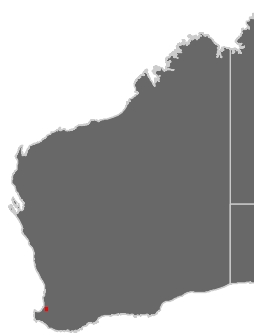
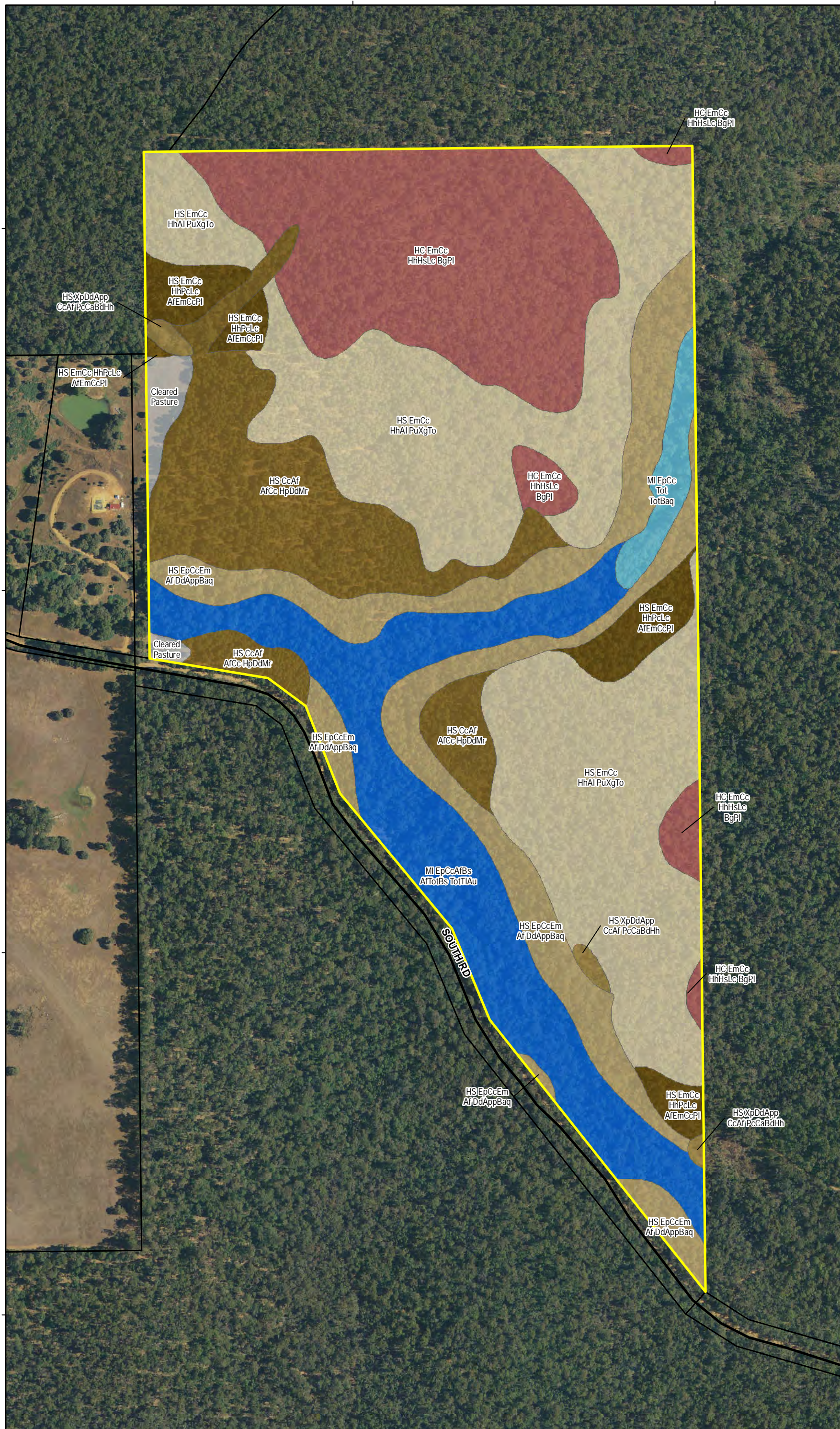
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TALISON LITHIUM

Lot 153
Wellington Mills


Vegetation Types Legend

Legend

 Study Area


Vegetation Types

Hill Crest


 HC EmCc HhHsLc BgPI

Forest of *Eucalyptus marginata* and *Corymbia calophylla* over Low Heath D of *Hibbertia hypericoides*, *Hibbertia silvestris* and *Leucopogon capitellatus* with Low Woodland A of *Banksia grandis* and *Persoonia longifolia* over Open Low Sedges of *Patersonia umbrosa* var. *xanthina* and *Xanthorrhoea gracilis* with Open Scrub of *Bossiaea aquifolium* and *Bossiaea linophylla* over Open Dwarf Scrub C of *Pteridium esculentum* and *Macrozamia riedlei* on orange to grey-brown loamy sands on lateritic hill crests and upper hill slopes

Hillslope

 HS EmCc HhAl PuXgTo

Forest of *Eucalyptus marginata* and *Corymbia calophylla* over Low Heath D of *Hibbertia hypericoides* (and *Acacia lateritcola*) over Open Low Sedges of *Patersonia umbrosa* var. *xanthina*, *Xanthorrhoea gracilis* and *Tetraria octandra* over Open Low Woodland B of *Persoonia longifolia* over Open Scrub of *Bossiaea aquifolium* and *Trymalium odoratissimum* subsp. *trifidum* over *Pteridium esculentum*, *Macrozamia riedlei* and *Diplolaena drummondii* on brown silty loams on lateritic hill slopes

 HS EpCcEm Af DdAppBaq

Forest of *Eucalyptus patens* and *Corymbia calophylla* (+/- *Eucalyptus marginata*) over Low Woodland of *Agonis flexuosa* over Open Low Scrub A of *Diplolaena drummondii*, *Acacia pulchella* var. *pulchella* and *Bossiaea aquifolium* over Open Dwarf Scrub C of *Macrozamia riedlei* over Open Dwarf Scrub D of *Phyllanthus calycinus*, *Tremandra stelligera* and *Hibbertia pilosa* on brown loams on lower hill slopes

 GR XpDdApp CcAf PccCaBdHh

Low Scrub A of *Xanthorrhoea preissii*, *Diplolaena drummondii* and *Acacia pulchella* var. *pulchella* with Open Low Woodland A of *Corymbia calophylla* and *Agonis flexuosa* over Open Dwarf Scrub D of *Phyllanthus calycinus*, *Cryptandra arbutiflora* var. *arbutiflora* and *Banksia dallanneyi* subsp. *dallanneyi* (and *Hibbertia hypericoides*) over Very Open Low Sedges of *Stypantra glauca*, *Lepidosperma* aff. *drummondii* and *Patersonia occidentalis* var. *latifolia* over Open Mosses on grey loamy sands on granitic outcropping

 HS CcAf AfCc HpDdMr

Woodland of *Corymbia calophylla* and *Agonis flexuosa* over Low Woodland A of *Agonis flexuosa* and *Corymbia calophylla* over Open Low Scrub B of *Hibbertia pilosa*, *Diplolaena drummondii* and *Macrozamia riedlei* over Open Dwarf Scrub D of *Hibbertia hypericoides* and *Phyllanthus calycinus* on brown silty or sandy loams on middle and lower hill slopes

 HS EmCc HhPcLc AfEmCcPI

Forest of *Eucalyptus marginata* and *Corymbia calophylla* over Low Heath D of *Hibbertia hypericoides*, *Phyllanthus calycinus* and *Leucopogon capitellatus* with Open Low Woodland A of *Agonis flexuosa*, *Eucalyptus marginata* (regen) and *Corymbia calophylla* (regen) (and *Persoonia longifolia*) over Open Low Scrub A of *Xanthorrhoea preissii* over Open Dwarf Scrub C of *Diplolaena drummondii*, *Macrozamia riedlei* and *Acacia lateritcola* on brown silty loams on lateritic middle and lower hill slopes

Medium Drainage Line

 MI EpCc Tot TotBaq

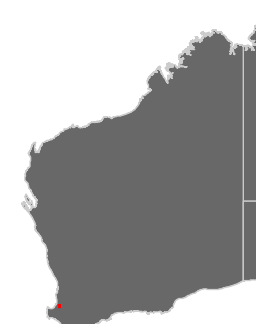
Forest of *Eucalyptus patens* and *Corymbia calophylla* over Low Woodland B of *Trymalium odoratissimum* subsp. *trifidum* over Scrub of *Trymalium odoratissimum* subsp. *trifidum* and *Bossiaea aquifolium* over Open Tall Sedges of *Lepidosperma tetraquetrum* with Open Low Scrub B of *Pteridium esculentum*, *Thomasia* sp. Big Brook and **Rubus anglocandicans* over Open Dwarf Scrub D of *Tremandra stelligera* and *Hibbertia silvestris* over Very Open Climbers of *Clematis pubescens* on brown loamy sands and sandy loams on incised minor drainage lines and adjacent stream banks

 MI EpCcAfBs AfTotBs TotTIAu

Dense Forest of *Eucalyptus patens*, *Corymbia calophylla* and *Agonis flexuosa* (+/- *Banksia seminuda*) over Low Forest A of *Agonis flexuosa* and *Trymalium odoratissimum* subsp. *trifidum* (+/- *Banksia seminuda*) over Scrub of *Trymalium odoratissimum* subsp. *trifidum*, *Taxandria linearifolia* and *Acacia urophylla* (+/- *Bossiaea aquifolium*) over Open Tall Sedges of *Lepidosperma tetraquetrum* with Open Low Scrub B of *Pteridium esculentum* and *Macrozamia riedlei* over Very Open Climbers of *Clematis pubescens* over Scattered Ferns of *Adiantum aethiopicum* on brown loams or silty clay loams on incised and meandering minor drainage lines and drainage flats

Other

 Cleared Pasture



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TALISON LITHIUM

Lot 153 Wellington Mills

Vegetation Condition

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Legend

Study Area

Vegetation Condition

Completely Degraded

Poor

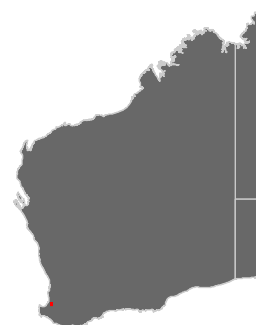
Very Good

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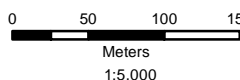
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3.4 Vegetation Representation and Reservation

3.4.1 Beard (1981) Vegetation Associations

The study area occurs in the Menzies Sub-district of the Darling Botanical District, in the South-West Botanical Province (Beard 1981). The Menzies Sub-district (southern jarrah forest) covers a total area of 26,572 km², of which 18,715 km² (70 percent) originally supported jarrah and jarrah-marri forest (Beard 1981).

The study area lies within the Bridgetown Vegetation System as recognised by Beard (1981). Within this system, there are two vegetation associations that intersect the study area:

- Vegetation Association 3 - Medium Forest; Jarrah-Marri; and
- Vegetation Association 1184 - Medium woodland-fringing; jarrah, marri, *Eucalyptus rudis* and *Agonis flexuosa*.

When determining representation and reservation of these two vegetation associations (Table 3), Vegetation Associations 3 and 1184 was both determined to be well represented at all levels, statewide, bioregional (IBRA and IBRA sub-region), and local government authority, with greater than 30% of the Pre-European extent remaining.

Vegetation Association 1184 was determined to be poorly reserved within the Southern Jarrah Forest sub-region and within the Shire of Dardanup, with less than 15% of the current extent protected for conservation (Table 3).

3.4.2 Mattiske and Havel (1998) Vegetation Complexes

The representation of vegetation complexes within the reserve system has been published as part of the Regional Forest Agreement process and updated as part of the latest Forest Management Plan. At the complex level, there were two vegetation complexes (as described and mapped by Mattiske and Havel 1998) represented within the study area:

- Lowden (Lo) - Open forest of *Corymbia calophylla* - *Eucalyptus marginata* subsp. *marginata* - *Agonis flexuosa* with some *Eucalyptus wandoo* and occasional *Corymbia haematoxylon* on slopes, and woodland of *Eucalyptus rudis* - *Melaleuca raphiophylla* on valley floors in the humid zone; and
- Yarragil 1 (Yg1) - Open forest of *Eucalyptus marginata* subsp. *marginata* - *Corymbia calophylla* on slopes with mixtures of *Eucalyptus patens* and *Eucalyptus megacarpa* on the valley floors in humid and subhumid zones.

These Lowden and Yarragil 1 vegetation complexes currently have 14 percent and 52 percent of the pre-European extent remaining within the South West Forest Region, and 13.9 percent and 29.9 percent of the Pre-European extent protected for conservation. The Lowden vegetation complex is known to un-common and under-represented within formal conservation reserves (Department of Conservation and Environment 2008).

Table 3 Pre-European extent of vegetation represented on the basis of identified datasets.

Vegetation System / Association	Pre-European Extent (ha)	Extent Remaining (ha)	% Extent of Pre-European	% Current Extent Protected (IUCN I - IV) for Conservation (proportion of Current Extent)
Beard Vegetation Association				
Beard Vegetation Association 3	2,661,404	1,806,035	67.86	26.87
Beard Vegetation Association 1184	63,562	25,132	39.54	16.94
Vegetation System				
Bridgetown System 3.1	700,920	456,448	65.12	28.87
Bridgetown System 1184	49,559	19,746	39.84	15.03
Jarraah Forest (JAF)				
Beard Vegetation Association 3	2,390,591	1,606,736	67.21	23.97
Beard Vegetation Association 1184	63,562	25,132	39.54	16.94
Southern Jarraah Forest JAF02				
Beard Vegetation Association 3	1,482,491	883,557	59.60	31.03
Beard Vegetation Association 1184	49,559	19,746	39.84	5.99
Shire of Dardanup				
Beard Vegetation Association 3	13,106	10,426	79.55	47.69
Beard Vegetation Association 1184	7,267	3,541	48.73	28.45
Mattiske Vegetation Complex**				
Lowdon (Lo)	17,048	2,440	14.31	13.9
Yarragil 1 (Yg1)	80,046	41,802	52.22	29.9

4.0 SUMMARY

Talison propose to increase the current (approved) area of the Greenbushes Lithium Operations from 1,591 hectares to 1,989 hectares, representing a 398 hectare (or 25 percent) increase to the current approved extent of the mine. The proposed expansion will require 350 hectares of native vegetation to be cleared outside existing approval areas. This vegetation is known to contain habitat for three listed threatened species of forest black cockatoos.

As part of a larger package to compensate for residual impacts to the three forest black cockatoos, Talison has identified a privately held parcel of land at Wellington Mills supporting remnant native vegetation. In April 2019, Onshore Environmental completed a reconnaissance flora and vegetation survey of remnant vegetation at the site to describe and map the vegetation types present, and rate and map associated vegetation condition.

A total of eight vegetation types from four broad floristic formations and occurring across four landforms were described and mapped from the study area. Remnant native vegetation covered 80.1 hectares, with a further 0.9 hectares along the western boundary cleared for annual pasture.

Three vegetation types supported jarrah-marri forest on lateritic hill crests and slopes (45.6 hectares or 56%), three vegetation types supported blackbutt-marri-peppermint closed forests and forests on lower hill slopes and minor drainage lines (23.6 hectares or 29%), *Corymbia calophylla* / *Agonis flexuosa* woodland occurred on middle and lower hill slopes (10.6 hectares or 13%), and *Xanthorrhoea* Scrub occurred on granitic outcrops (0.4 hectares or 0.5%).

Vegetation condition across the majority of the study area was rated as *very good* (67.2 hectares or 83%). Two areas of vegetation were rated as *degraded* (12.9 hectares or 16%) including a large block in the western central sector of the study area that had obvious effects from historical grazing by domestic stock (sheep and cattle), historical logging and prominent soil disturbance. A minor drainage line in the eastern central sector of the study area was also rated as *degraded* as parts were dominated by the invasive perennial weed Blackberry (*Rubus anglocandicans*). A small area of 'parkland cleared' vegetation fringing adjacent farmland in the southwest and central western sectors of the study area was rated as *completely degraded* (0.9 hectares or 1%).

The entire study area had been historically harvested for jarrah logs but dense regrowth suggested this was greater than 50 years ago. Introduced species were a minor component of the vegetation, with eight weed taxa recorded; *Briza maxima*, *Briza minor*, *Centaureum erythraea*, *Conyza bonariensis*, *Hypochaeris glabra*, *Parentucellia latifolia*, *Rubus anglocandicans* and *Solanum nigrum*. All of the weeds were recorded at low density with the exception of *Rubus anglocandicans* (Blackberry), which formed localised thickets along minor drainage channels within the study area.

Broad scale vegetation mapping confirms that remnant native vegetation present within portion of the site is poorly represented and poorly reserved at a state, regional and local level. The site-based survey confirmed that vegetation extent and condition supported vegetation values worthy of conservation.

5.0 STUDY TEAM

The reconnaissance vegetation survey was planned, coordinated and executed by the following personnel:

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PO Box 227

YALLINGUP WA 6282

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Project Staff

Dr Darren Brearley

PhD Project Manager and Principal Botanist

Dr Jerome Bull

PhD Principal Botanist and Taxonomist

Mr Todd Griffin

BSc GIS and Mapping Specialist

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APPENDIX 1

Vegetation Classifications following Muir (1997)

LIFE FORM / HEIGHT CLASS	Canopy Cover			
	DENSE 70% - 100%	MID 30% - 70%	DENSE SPARSE 10% - 30%	VERY SPARSE 2% - 10%
Trees > 30 m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
Trees 15 – 30 m	Dense Forest	Forest	Woodland	Open Woodland
Trees 5 – 15 m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
Trees < 5 m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs > 2 m	Dense Thicket	Thicket	Scrub	Open Scrub
Shrubs 1.5 – 2 m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
Shrubs 1 - 1.5 m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
Shrubs 0.5 – 1 m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
Shrubs 0 - 0.5 m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
Hummock grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
Bunch grass > 0.5 m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
Bunch grass < 0.5 m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
Sedges > 0.5 m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
Sedges < 0.5 m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverworts	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

APPENDIX 2

**Vegetation condition scale
(as developed by Keighery 1994)**

Condition	Scale	Description
Pristine	1	Pristine or nearly so, no obvious signs of disturbance.
Excellent	2	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	3	Vegetation structure altered; obvious signs of disturbance.
Good	4	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
Degraded	5	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching Very Good condition without intensive management.
Completely Degraded	6	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

APPENDIX 3

Species List

Family	Genus	Species	Epithet	Subspecific Rank
Adiantaceae	Adiantum	aethiopicum		
Adiantaceae	Cheilanthes	sieberi		
Anthericaceae	Laxmannia	squarrosa		
Asteraceae	*Conyza	bonariensis		
Asteraceae	*Hypochaeris	glabra		
Asteraceae	Lagenophora	huegelii		
Asteraceae	Pithocarpa	ramosa		
Asteraceae	Senecio	sp. indet.		
Cyperaceae	Lepidosperma	aff. drummondii		
Cyperaceae	Lepidosperma	leptostachyum		
Cyperaceae	Lepidosperma	tetraquetrum		
Cyperaceae	Tetragia	octandra		
Cyperaceae	Tetragia		sp.	Jarrah Forest
Dasyopogonaceae	Lomandra	drummondii		
Dasyopogonaceae	Lomandra	caespitosa		
Dennstaedtiaceae	Pteridium	esculentum		
Dilleniaceae	Hibbertia	amplexicaulis		
Dilleniaceae	Hibbertia	commutata		
Dilleniaceae	Hibbertia	hypericoides		
Dilleniaceae	Hibbertia	pilosa		
Dilleniaceae	Hibbertia	silvestris		
Elaeocarpaceae	Tetratheca	hirsuta	subsp.	viminea
Elaeocarpaceae	Tremandra	stelligera		
Ericaceae	Astroloma	ciliatum		
Ericaceae	Leucopogon	capitellatus		
Ericaceae	Leucopogon	propinquus		
Ericaceae	Leucopogon	verticillatus		
Euphorbiaceae	Monotaxis	occidentalis		
Fabaceae	Acacia	lateritcola		
Fabaceae	Acacia	pulchella	var.	pulchella
Fabaceae	Acacia	pulchella	var.	glaberrima
Fabaceae	Acacia	urophylla		
Fabaceae	Bossiaea	aquifolium		
Fabaceae	Bossiaea	linophylla		
Fabaceae	Bossiaea	ornata		
Fabaceae	Chorizema	cordatum		
Fabaceae	Kennedia	carinata		
Fabaceae	Paraserianthes	lophantha	subsp.	lophantha
Gentianaceae	*Centaurium	erythraea		
Goodeniaceae	Scaevola	calliptera		
Haemodoraceae	Haemodorum	sp. indet.		
Iridaceae	Patersonia	occidentalis	var.	latifolia
Iridaceae	Patersonia	umbrosa	var.	xanthina
Lamiaceae	Hemigenia	incana		
Lamiaceae	Hemigenia	pritzelii		
Lauraceae	Cassytha	sp. indet.		
Malvaceae	Thomasia		sp.	Big Brook (M. Koch 2373)
Myrtaceae	Agonis	flexuosa		
Myrtaceae	Babingtonia	camphorosmae		
Myrtaceae	Corymbia	calophylla		

Family	Genus	Species	Epithet	Subspecific Rank
Myrtaceae	Darwinia	citriodora		
Myrtaceae	Eucalyptus	marginata	subsp.	marginata
Myrtaceae	Eucalyptus	patens		
Myrtaceae	Hypocalymma	angustifolium		
Myrtaceae	Taxandria	linearifolia		
Orobanchaceae	*Parentucellia	latifolia		
Phormiaceae	Stypandra	glauca		
Phyllanthaceae	Phyllanthus	calycinus		
Pittosporaceae	Billardiera	cf. variifolia		
Poaceae	*Briza	maxima		
Poaceae	*Briza	minor		
Poaceae	Austrostipa	sp. indet.		
Poaceae	Tetrarrhena	laevis		
Polygonaceae	Comesperma	sp. indet.		
Proteaceae	Banksia	grandis		
Proteaceae	Banksia	dallanneyi		
Proteaceae	Banksia	seminuda		
Proteaceae	Hakea	amplexicaulis		
Proteaceae	Hakea	lissocarpha		
Proteaceae	Hakea	ruscifolia		
Proteaceae	Persoonia	longifolia		
Proteaceae	Synaphea	gracillima		
Ranunculaceae	Clematis	pubescens		
Restionaceae	Hypolaena	exsulca		
Rhamnaceae	Cryptandra	arbutiflora	var.	arbutiflora
Rhamnaceae	Trymalium	odoratissimum	subsp.	trifidum
Rosaceae	*Rubus	anglocandicans		
Rubiaceae	Opercularia	hispidula		
Rutaceae	Boronia	cf. spathulata		
Rutaceae	Diplolaena	drummondii		
Solanaceae	*Solanum	nigrum		
Stylidiaceae	Stylidium	sp. indet.		
Thymelaeaceae	Pimelea	sp. indet.		
Xanthorrhoeaceae	Xanthorrhoea	gracilis		
Xanthorrhoeaceae	Xanthorrhoea	preissii		
Zamiaceae	Macrozamia	riedlei		



Talison Lithium Pty Ltd
GREENBUSHES LITHIUM OPERATION

ENV-MP-0011

Wellington Mills Offset Area Management Plan

APPENDIX 2

LEVEL 1 VERTEBRATE FAUNA SURVEY WELLINGTON MILLS OFFSET AREA (ONSHORE ENVIRONMENTAL 2019B)



Level 1 Vertebrate Fauna Survey Wellington Mills Offset Area

Prepared for Talison Lithium
24 May 2019



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				Name	Distributed To	Date
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EXECUTIVE SUMMARY

Talison Lithium Pty Ltd (Talison) owns and operates the existing lithium mine near the town of Greenbushes, situated approximately 250 km south of Perth in south-west Western Australia. As part of the current expansion of mining operations at the Greenbushes Mine, Onshore Environmental Consultants Pty Ltd (Onshore Environmental) was commissioned to undertake a vertebrate fauna survey of the proposed offset lot at Wellington Mills (referred to as the study area).

The field survey was completed over four days by a Senior Zoologist and Principal Botanist from Onshore Environmental. Field work was undertaken on the 10th and 12th of April, and between 23rd and 24th of April 2019.

Two conservation significant fauna species were recorded from the study area during the survey:

- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the *Environment Protect and Biodiversity Conservation Act 1999* (EPBC Act) and the *Biodiversity Conservation Act 2016* (BC Act); and
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and the BC Act.

Evidence of the Western Ringtail Possum (*Pseudocheirus occidentalis*) (listed as Critically Endangered under the EPBC Act and the BC Act) was recorded from the study area. Old (inactive) dreys were observed from within the Drainage Line habitat of the study area.

Five introduced fauna species (feral animals) were observed within the study area during the survey:

- House Mouse (*Mus musculus*);
- Black Rat (*Rattus rattus*);
- European Rabbit (*Oryctolagus cuniculus*);
- Red Fox (*Vulpes vulpes*); and
- Sheep (*Ovis aries*).

Three main fauna habitats types were identified and mapped within the study area: Hillslope/Hillcrest, Drainage Line and Granite, with the majority of the study area consisting of hillslopes and hillcrests with Jarrah/Marri Forest and open shrub mid-story. Additional areas of the study area were mapped as Cleared Pasture and one portion of the Hillslope/Hillcrest area was mapped as being degraded habitat due to lack of understorey vegetation.

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1.0 INTRODUCTION

1.1 Background

Talison Lithium Pty Ltd (Talison) owns and operates a lithium mine near the town of Greenbushes in the south west of Western Australia. The Greenbushes operation represents the world's largest known lithium reserve and has been producing lithium for 25 years, contributing to Australia's position as one of the two top global producers of lithium.

Talison is proposing to undertake an expansion at the Greenbushes Mine, aimed at increasing supply of lithium to the market. The proposed expansion will require 350 hectares (ha) of native vegetation to be cleared outside existing approval areas.

In 2018, Talison referred its proposal to expand operations to the Department of Energy and Environment (DoEE) for assessment under the EPBC Act. The referral was made on the basis that the expansion would require the clearing of 350 ha of native vegetation known to contain habitat for listed threatened species, namely:

- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the EPBC Act and the BC Act;
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) – listed as Endangered under the EPBC Act and the BC Act; and
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and the BC Act.

1.2 Environmental Offsets

DoEE has advised Talison that the *EPBC Act Environmental Offsets Policy* (the Policy) (Department of Sustainability, Environment, Water, Population and Communities [DSEWPaC] 2012a) would apply to the proposed clearing of native vegetation, to compensate for residual impacts to the three Threatened black cockatoo species.

In response, Talison has been working to identify measures that, in combination, would constitute an acceptable and cost effective package of environmental offsets that would satisfy the requirements of the Policy, as per the acceptance criteria.

The *Offsets Assessment Guide* (DSEWPaC 2012b) has been used to characterise and quantify the residual impacts that require offsetting under the Policy. The Policy requires that a minimum of 90% of the offset package go towards directly offsetting residual impacts to the attribute of the protected matter that will be affected ('direct offsets'), with the remainder having the option of including offsets that are less directed towards the specific nature of the impact ('indirect offsets').

Efforts by Talison to identify suitable environmental offsets has included regular liaison with the Department of Biodiversity Conservation and Attractions (DBCA). DBCA has a land acquisition program for adding suitable areas of environmental value that meet its selection criteria, to its conservation estate. The criteria includes the suitable area being contiguous with existing estate or sufficiently large in its own right relative to the environmental values that the site contains.

Potential synergies may arise in circumstances where DBCA's acquisition program and requirements under the Policy coincide. Talison and DBCA have identified a securable lot that

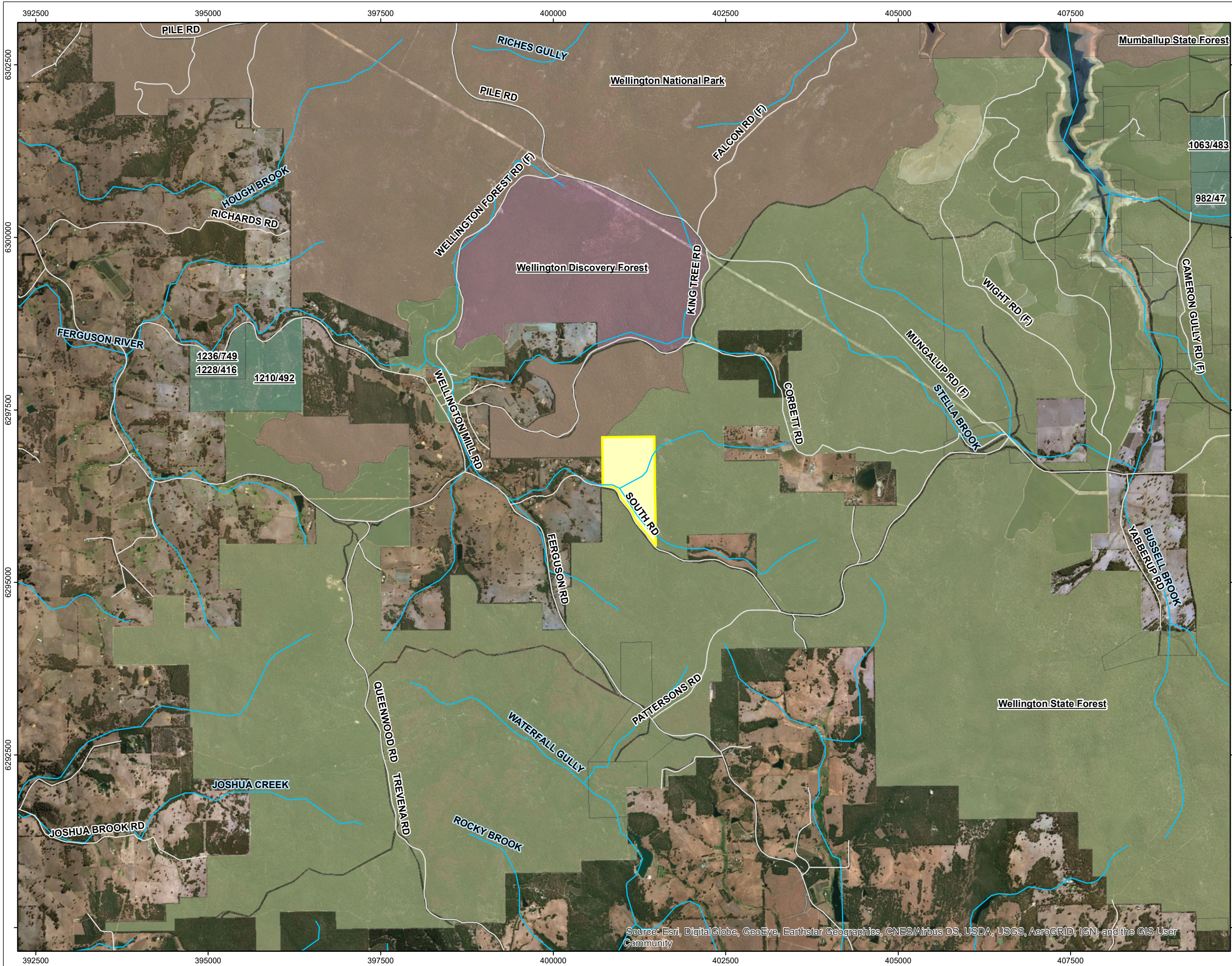
potentially satisfies both DBCA's criteria and those of the Policy; Lot 153 South Road, Wellington Mills (Figure 1).

1.3 Purpose of the Survey

To support environmental approvals for the proposed Greenbushes Mine expansion, Onshore Environmental was commissioned by Talison to undertake a Level 1 vertebrate fauna survey of the proposed 81 ha offset lot at Wellington Mills.

The objectives of the survey were to:

- describe and map fauna habitats present within the study area, and assess their likelihood to support fauna species of conservation significance; and
- undertake targeted searches for fauna species of conservation significance within the study area.



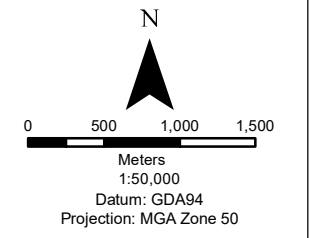
TALISON LITHIUM

Lot 153

Location

Legend

- Study Area
- DPAW Managed Lands**
- Conservator Of Forests
- National Park
- Scientific Research And Education
- State Forest



Date: 24/04/2019
 Status: Draft
 Figure: 1
 Sheet Size: A3
 Internal Reference: TL_Lot 153
 Drawn by: GSM
 Requested by: DB



1.4 Climate

The study area occurs on a boundary between the dry Mediterranean region to the north which experiences six dry months per year, and the moderate Mediterranean region to the south which experiences four dry months per year (Beard 1981). The region has cool wet winters and hot dry summers. Average annual rainfall at the closest weather station (Ferguson Valley) is 908 mm (Bureau of Meteorology [BOM] 2019), with the majority of falls occurring during the winter period from May to September, associated with cold fronts moving across the south-west of Western Australia.

The annual rainfall for the twelve-month period prior to the May 2019 field survey was 851 mm, which is below the long-term average of 908 mm (Figure 2). Temperatures experienced during the survey period were typical for the time of year and aligned with the monthly long-term averages.

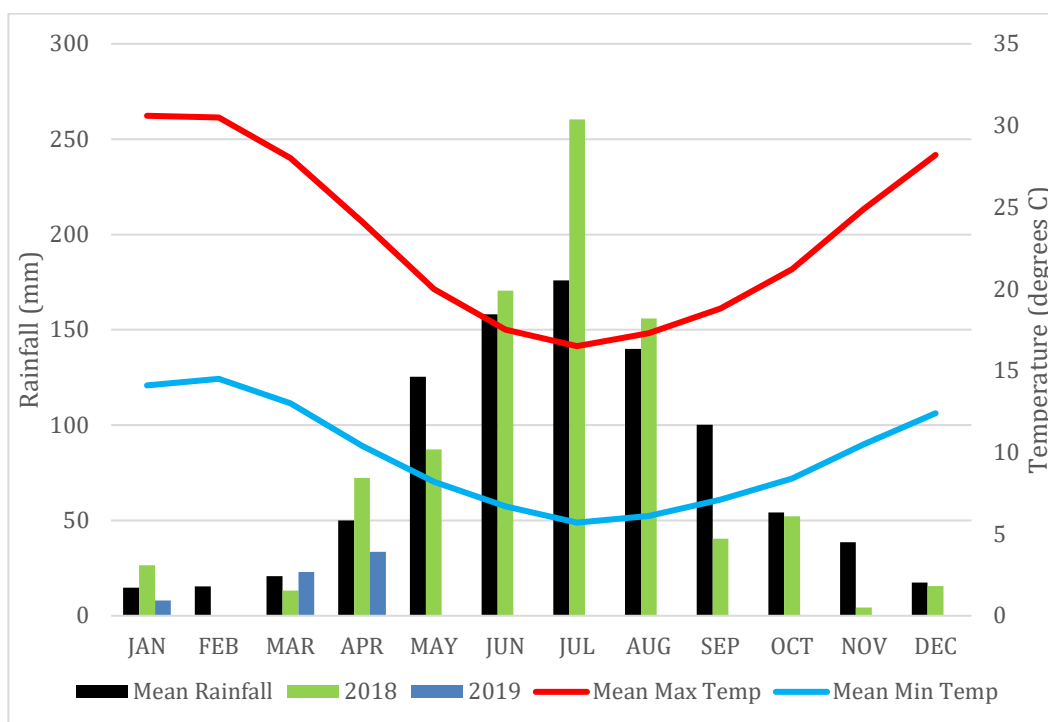


Figure 2 Climatic data – rainfall data is from the Ferguson Valley Weather Station (9912) and temperature data from the Donnybrook Weather Station (9534) (BOM 2019).

1.5 Biogeographic Regions

The latest version of the Interim Biogeographic Regionalisation for Australia (IBRA 7) divides Australia into 89 bioregions based on climate, geology, landform, native vegetation and species information, and includes 419 sub-regions (DoEE 2018). The bioregions and sub-regions are the reporting unit for assessing the status of native ecosystems and their level of protection in the National Reserve System.

The study area is located within the Southern Jarrah Forest (JF2) sub-region within the Jarrah Forest bioregion. The Southern Jarrah Forest sub-region is described as, “*Duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Marri-Wandoo woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands. The climate is Warm Mediterranean*” (Hearn et al. 2002).

The vegetation of the sub-region is described as “Jarrah-Marri forest in the west grading to Marri and Wandoo woodlands in the east. There are extensive areas of swamp vegetation in the south-east, dominated by Paperbarks and Swamp Yate. The understory component of the forest and woodland reflects the more mesic nature of this area. The majority of the diversity in the communities occurs on the lower slopes or near granite soils where there are rapid changes in site conditions” (Hearn *et al.* 2002).

1.6 Land Use

The majority of the study area forms a consolidated block of intact remnant native vegetation, with the only noticeable disturbance related to historical felling of jarrah saw logs. There is evidence of historical grazing by domestic stock along the western boundary where the study area fringes cleared farmland, forming an edge effect. A small portion of the impacted vegetation has been cleared at the same location (representing less than one hectare in total).

1.7 Landforms and Soils

The study area lies within the Yilgarn Craton geological province which is composed of belts of metamorphosed sedimentary and volcanic rocks, including large areas of granite. It forms part of the larger Darling Plateau physiographic unit, which is an undulating surface (250–300 m above sea level) overlain by ridges, plateaus, valleys and plains. These landforms are strongly influenced by the uplift of the Yilgarn Craton and the underlying geological nature of the substrate or basement rock, as well as features such as faults. Two major landform units occur within the study area; lateritic uplands and minor valleys.

1.8 Flora and Vegetation

The study area occurs in the Bridgetown System of the Menzies sub-district of the Darling Botanical District, in the South-West Botanical Province (Beard 1981). The Menzies sub-district (Southern Jarrah Forest) covers a total area of 26,572 km², of which 18,715 km² (70%) originally supported jarrah and jarrah-marri forest (Beard 1990). It is estimated that approximately 61% of the total area has been cleared since European settlement, mainly in the valleys which are free of laterite, leaving the forest intact on laterised higher plateau levels.

The Menzies sub-district is characterised by Jarrah stands on laterite within some Marri and Wandoo woodlands. Valley soils are often richer and Blackbutt (*Eucalyptus patens*) is more dominant in these areas. Flooded Gum (*Eucalyptus rudis*) is common along stream banks and Bullich (*Eucalyptus megacarpa*) is also present in some areas. Within the study area vegetation is dominated by Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) forest over the tall shrubs bull banksia (*Banksia grandis*) and snotty gobble (*Persoonia longifolia*). The lower understory strata contains a range of plant genera including *Hakea*, *Acacia*, *Xanthorrhoea*, *Adenanthos*, *Hovea*, *Leucopogon*, *Macrozamia*, *Leucopogon*, *Bossiaea*, *Daviesia*, *Grevillea*, *Patersonia*, *Styphelia* and *Kennedia*.

Vegetation complexes of the Southern Jarrah Forest have most recently been defined by Heddle *et al.* (1980) and updated by Matiske and Havel (1998). Matiske and Havel (1998) describe vegetation of the survey area as ‘mixture of open forest of *Eucalyptus marginata* - *Corymbia calophylla* with some *Eucalyptus patens* on slopes’.

2.0 METHODOLOGY

2.1 Guidance Statements

The single-season Level 1 vertebrate fauna survey was carried out in a manner that was compliant with Environmental Protection Authority (EPA) requirements for the environmental surveying and reporting of vertebrate fauna in Western Australia:

- Statement of Environmental Principles, Factors and Objectives (EPA 2018);
- Environmental Factor Guideline Terrestrial Fauna (EPA 2016a);
- Technical Guidance Sampling Methods for Terrestrial Vertebrate Fauna (EPA 2016b);
- Technical Guidance Terrestrial Fauna Surveys (EPA 2016c);
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010a) Survey Guidelines for Australia's Threatened Bats;
- DEWHA (2010b) Survey Guidelines for Australia's Threatened Birds;
- DSEWPaC (2011a) Survey Guidelines for Australia's Threatened Mammals;
- DSEWPaC (2011b) Survey Guidelines for Australia's Threatened Reptiles;
- DEWHA (2010c) Survey Guidelines for Australia's Threatened Frogs;
- DSEWPaC (2012c) EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species; and
- Department of Parks and Wildlife (DPaW) (2017) Western Ringtail Possum Recovery Plan.

2.2 Desktop Assessment

2.2.1 Literature Review

Regional scale reports relevant to the study area locality were reviewed, including:

- a summary of bioregional data (Hearn *et al.* 2002); and
- vegetation description and mapping by Beard (1981), and more recently by Heddle *et al.* (1980) and by Mattiske and Havel (1998).

In addition, there was a review of all publicly available literature for the surrounding area (within 20 km). This comprised the Management Plan for the adjacent Wellington National Park (Department of Environmental and Conservation, and Conservation Commission of Western Australia 2008). The literature review is summarised in more detail in Section 3.1.1.

2.2.2 Database Searches

The desktop assessment included databases relating to significant fauna, Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) previously collected or described within, or in close proximity to, the study area. For this report the search was extended beyond the study area to place vertebrate fauna values into a local and regional context. The following databases were searched:

- NatureMap: This database represents the most comprehensive source of information on the distribution of Western Australia's fauna (20 km radial search around the central point GDA94 Zone 50 - 401100E 6296500N, accessed 2 May 2019) (DPaW 2019);
- DBCA's Threatened Fauna Database was searched to confirm the NatureMap results (20 km radial search around the central point GDA94 Zone 50 - 401100E 6296500N, accessed 13 May 2019) (DBCA 2019a);

- DBCA's TEC, PEC and Environmentally Sensitive Areas (ESAs) database was searched to identify significant communities (20 km radial search around the central point GDA94 Zone 50 - 401100E 6296500N, accessed 17 April 2019) (DBCA 2019b);
- EPBC Act Protected Matters database (20 km radial search around the central point GDA94 Zone 50 - 401100E 6296500N, accessed 2 May 2019) (DoEE 2019); and
- International Union for Conservation of Nature (IUCN) database (accessed 2 May 2019) (IUCN 2018).

2.2.3 Assessment of Conservation Significance

The conservation significance of fauna and ecological communities are classified at a Commonwealth, State and Local level on the basis of various Acts and Agreements, including:

International Level:

- IUCN: The IUCN 'Red List' lists species at risk under nine categories (status codes) (Appendix 1); and
- International Conventions: Migratory taxa listed under the Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), and Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Commonwealth Level:

- EPBC Act: The DoEE lists Threatened fauna and ecological communities, which are determined by the Threatened Species Scientific Committee according to criteria set out in the Act. The Act lists flora that are considered to be of conservation significance under one of six categories (Appendix 2).

State Level:

- BC Act: At a State level, native fauna species are protected under the BC Act – *Biodiversity Conservation Regulations 2018*. A number of species are assigned an additional level of conservation significance based on a limited number of known populations and the perceived threats to these locations (Appendix 3); and
- DBCA Priority list: DBCA produces a list of Priority species and ecological communities that have not been assigned statutory protection under the BC Act. Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added under Priorities 1, 2 or 3. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been removed from the threatened species list for other taxonomic reasons, are placed in Priority 4. These species require regular monitoring (see Appendix 4). The list of PECs identifies those that need further investigation before nomination for TEC status at a State level.

Local Level:

- Species may be considered of local conservation significance because of their patterns of distribution and abundance. Although not formally protected by legislation, such species are acknowledged to be in decline as a result of threatening processes, primarily habitat loss through land clearing.

2.2.4 Assessment of Likelihood of Occurrence in the Study Area

A list of conservation significant fauna species occurring within a 20 km radius of the study area was compiled during the literature review and database searches. The likelihood of each taxon occurring within the study area was assessed using a set of rankings and criteria (Table 1) based on presence of suitable landform (inferred from aerial imagery with contours overlaid, and from knowledge of the adjacent areas), and distance to known records.

Table 1 Ranking system used to assign the likelihood that a species would occur in the study area.

Rank	Criteria
Recorded	The species has been recorded in the study area.
Likely to occur	The species has previously been recorded from a landform/habitat which is present within the study area, and there are previous records within immediate surrounds of the study area.
Possible to occur	The species has previously been recorded from a landform/habitat which is present within the study area, and there are previous records within a 20 km radius of the study area.
Unlikely to occur	The landform/habitat from which the species has previously been recorded is absent within the study area, and/or there are no previous records within a 20 km radius of the study area.

2.3 Field Survey Methodology

2.3.1 Timing and Personnel

The vertebrate fauna survey was completed by Senior Zoologist, Mr Michael Brown, between 23rd and 24th of April 2019, with additional habitat surveying completed by Principal Botanists, Dr Jerome Bull and Dr Darren Brearley, on the 10th and 12th of April 2019.

2.3.2 Surveying of Study Area

The study area was walked and assessed to document habitat characteristics including evaluation of the presence of habitats suitable to support conservation significant fauna.

The survey recorded any observations of fauna species made, via primary or secondary evidence, from within the study area. In addition, low intensity sampling was undertaken throughout the study area, involving bird census, active foraging and the use of motion cameras. Targeted searches (as detailed below) were also undertaken for conservation significant fauna species identified during the database review.

The following parameters were recorded for all conservation significant fauna:

- co-ordinate locations;
- description of habitat in which the species was located; and
- photograph of the species, evidence of species and/or habitat.

Active Foraging

Active foraging, involving raking litter and turning over rocks, was completed throughout the study area. Records were captured for any conservation significant species sighted during foraging.

Bird Census

Timed bird census (40 minutes each) were completed within the study area, totally 240 minutes. The bird census were undertaken at the commencement of each day when conditions were more favourable for bird activity. Records were captured for any conservation significant bird species sighted during the census. Opportunistic records of conservation significant bird sightings throughout the day were also recorded during the wider field survey.

Motion Cameras

Motion camera were set up throughout the study area within habitats deemed most to be utilised by conservation significant fauna species. Motion cameras were baited with universal bait. A total of 17 cameras were deployed for a total of seven nights.

2.3.3 Targeted Surveys for Conservation Significant Species

Tree Hollow Searches and Tree Density Assessments

Tree hollows were actively searched for during transect walks within the study area. If a tree hollow was encountered, it was assessed for its suitability to provide habitat for conservation significant species (namely, Western Ringtail Possums and black cockatoos) and other species. Those hollows deemed appropriate (i.e. sufficient size) were assessed further (as per below). To determine approximate densities of potential future habitat trees (trees >50cm diameter) tree counts were conducted in defined areas (i.e. 50 x 50 m quadrats). Tree numbers within these areas were then extrapolated to a per hectare density for different habitats within the study area.

Black Cockatoo Searches

Habitats used by black cockatoos have been placed into three categories by DSEWPaC (2012c), these being:

- Breeding Habitat;
- Foraging Habitat; and
- Night Roosting Habitat.

Breeding habitat for black cockatoos was assessed by the identification of all suitable breeding trees that had a diameter at breast height (DBH) of equal to or greater than 50 cm. Target tree species included marri and jarrah and any other *Corymbia/Eucalyptus* species of a suitable size that were present. The location of each tree identified (with appropriate DBH) was recorded along with details on the number and size of hollows present (if any).

Trees were examined to identify hollows using binoculars and evidence of actual use by black cockatoos (e.g. chewing around hollow entrance, scarring and scratch marks on trunks and branches). Any suitable hollows observed were further investigated using a drone to categorise the hollows, based on the size of the hollow entrance, and its suitability for black cockatoos to use (i.e. greater than 10 cm in diameter) and to nest in (i.e. deep enough).

Any evidence of foraging (e.g. chewed fruits around the base of trees) was recorded, and the type of foraging was also detailed. Potential foraging habitat was documented notwithstanding of the presence of foraging evidence.

Any evidence of roosting (e.g. branch clippings, droppings or moulted feathers) within trees was recorded.

Drey Searches

Dreys were actively searched to provide evidence of the presence of Western Ringtail Possums. Each active drey encountered was photographed (where possible) and a GPS point recorded.

Nocturnal Searches

Three hours of nocturnal searches were undertaken on the evening of the 23rd April 2019 within suitable habitat in the study area. The nocturnal searches involved spotlighting trees and undertaking foot transects using a head torch with any fauna of conservation significance recorded and a GPS co-ordinate taken.

2.3.4 Fauna Habitat Mapping

Assessments of the fauna habitats were undertaken throughout the study area to document habitat characteristics and map the fauna habitat types. The fauna habitat mapping utilised high-resolution aerial photography of the study area at a scale of 1:3,000. Ground-truthing of the study area was completed during the survey with habitat characteristics recorded at each habitat assessment site, and the habitat type selected for each polygon. Vegetation association mapping was utilised to further aid in characterising the habitat map accuracy across the full extent of the study area.

2.3.5 Species Identification and Nomenclature

Vertebrate fauna species were identified at the time of observation in the field or via camera footage by the Senior Zoologist. All species were able to be fully identified with no specimens needed to be taken for further examination. Nomenclature and conservation significance rankings used in this report are in accordance with the current listing of WA fauna recognised by the DBCA and the Western Australian Museum.

2.4 Field Survey Constraints

The EPA Technical Guidance (EPA 2016c) list potential limitations that field surveys may encounter. Limitations associated with the Level 1 vertebrate fauna survey, are addressed in Table 2. There were no survey-specific limitations for this survey.

Table 2 Relevance of limitations, as identified by EPA (2016c), to the Wellington Mills vertebrate survey.

Constraint	Relevance
Competency/experience of the consultant carrying out the survey	The Senior Zoologist working on the survey have in excess of 12 years experience in the south-west, and has completed previous fauna surveys for Talison.
Scope (faunal groups sampled and were some sampling methods not able to be employed because of constraints)	The study area was assessed and all allocated tasks detailed in the scope of works were achieved during the survey, with foraging, bird census, motion cameras, nocturnal searches and targeted searches undertaken.
Proportion of fauna identified, recorded and/or collected	All fauna species were identified and recorded in the field when observed or via camera footage.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data	There has been no previous fauna survey work completed within the study area. However, there is information available for the adjacent national park.
Proportion of the task achieved and further work which might be needed	The Level 1 vertebrate fauna survey was aimed at mapping fauna habitats within the study area and assessing their suitability to support fauna species of conservation significance, as well as targeting fauna species of conservation significance. All allocated tasks detailed in the scope of works were achieved during the survey.
Timing/weather/season/cycle	The survey was completed in April 2019 under good seasonal conditions with average rainfall and temperatures experienced, providing favourable conditions for the surveying of fauna species.
Disturbances which affected results of survey	There were no disturbances recorded within the study area that influenced survey outcomes.

Constraint	Relevance
Intensity	A Senior Zoologist and Principal Botanists working over a four day period traversed and sampled suitable habitat within the study area, and assessed habitats during the field survey, representing an adequate survey intensity for a Level 1 survey.
Completeness	All allocated tasks detailed in the scope of works were adequately completed during the Level 1 survey.
Resources	All resources required to complete the Level 1 survey were available.
Remoteness and/or access problems	There were no access restrictions experienced during the survey with the study area accessible by vehicle and on foot; noting that fauna habitat mapping was facilitated by high-resolution aerial photography.
Availability of contextual information on the region	There has been no previous fauna survey work completed within the study area. However, there is information available for the adjacent national park.

3.0 RESULTS

3.1 Desktop Assessment

3.1.1 Literature Review

The literature review for the surrounding area resulted in no previous fauna surveys nearby to the study area that were publicly available for review. There is however, a management plan for the adjacent Wellington National Park (Department of Environmental and Conservation, and Conservation Commission of Western Australia 2008) which was reviewed and relevant information is summarised below.

Wellington National Park, Westralia Conservation Park and Wellington Discovery Forest Management Plan

The habitat of the area was described broadly as Jarrah Forest, with granite outcrops, wetlands and riparian zones. There area also contained important habitat features comprising the ecologically mature forest along the Collie River, which provides tree hollows, thickets and vegetative corridors for fauna movement.

A total of 15 currently listed fauna of conservation significance are known from, or considered likely to occur in, the area:

Mammals:

- Chuditch (*Dasyurus geoffroi*) – listed as Vulnerable under the EPBC Act and the BC Act;
- South-western Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) – listed as Conservation Dependent under the BC Act;
- Southwestern Brown Bandicoot (*Isoodon fusciventer*) – listed as Priority 4;
- Western Ringtail Possum (*Pseudocheirus occidentalis*) – listed as Critically Endangered under the EPBC Act and the BC Act;
- Woylie (*Bettongia penicillata*) – listed as Endangered under the EPBC Act and Critically Endangered under the BC Act;
- Western Brush Wallaby (*Notamacropus irma*) – listed as Priority 4;
- Quokka (*Setonix brachyurus*) – listed as Vulnerable under the EPBC Act and the BC Act;
- Water-rat (*Hydromys chrysogaster*) – listed as Priority 4; and
- Western False Pipistrelle (*Falsistrellus mackenziei*) – listed as Priority 4.

Reptiles:

- Dell's Skink (*Ctenotus delli*) – listed as Priority 4.

Birds:

- Masked Owl (southwest) (*Tyto novaehollandiae novaehollandiae*) – listed as Priority 3;
- Peregrine Falcon (*Falco peregrinus*) – listed as Other Specially Protected under the BC Act;
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the EPBC Act and the BC Act;
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and the BC Act; and
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) – listed as Endangered under the EPBC Act and the BC Act.

3.1.2 Database Searches

Threatened Fauna listed under the EPBC Act

A search of the EPBC Act Protected Matters database was undertaken for a 20 km buffer around the study area (DoEE 2019). The database search listed 12 Threatened fauna species, or species habitat, that may occur in the study area:

Mammals:

- Chuditch (*Dasyurus geoffroii*) – listed as Vulnerable;
- Numbat (*Myrmecobius fasciatus*) – listed as Endangered;
- Western Ringtail Possum (*Pseudocheirus occidentalis*) – listed as Critically Endangered;
- Woylie (*Bettongia penicillata*) – listed as Endangered; and
- Quokka (*Setonix brachyurus*) – listed as Vulnerable.

Birds:

- Malleefowl (*Leipoa ocellata*) – listed as Vulnerable;
- Australasian Bittern (*Botaurus poiciloptilus*) – listed as Endangered;
- Eastern Curlew (*Numenius madagascariensis*) – listed as Critically Endangered;
- Curlew Sandpiper (*Calidris ferruginea*) – listed as Critically Endangered;
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable;
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered; and
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) – listed as Endangered.

The database search also identified eight Migratory bird species, or species habitat, that may occur in the study area:

- Osprey (*Pandion haliaetus*);
- Eastern Curlew (*Numenius madagascariensis*);
- Common Sandpiper (*Actitis hypoleucos*);
- Pectoral Sandpiper (*Calidris melanotos*);
- Sharp-tailed Sandpiper (*Calidris acuminata*);
- Curlew Sandpiper (*Calidris ferruginea*);
- Fork-tailed Swift (*Apus pacificus*); and
- Grey Wagtail (*Motacilla cinerea*).

Threatened Fauna listed under the BC Act

The DBCA Threatened Fauna database search (DBCA 2019a) and NatureMap search (DPaW 2019) identified 14 species listed under the BC Act from around the study area:

Mammals:

- Chuditch (*Dasyurus geoffroii*) – listed as Vulnerable;
- South-western Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) – listed as Conservation Dependent;
- Numbat (*Myrmecobius fasciatus*) – listed as Endangered;
- Western Ringtail Possum (*Pseudocheirus occidentalis*) – listed as Critically Endangered;
- Woylie (*Bettongia penicillata ogilbyi*) – listed as Critically Endangered; and
- Quokka (*Setonix brachyurus*) – listed as Vulnerable.

Birds:

- Glossy Ibis (*Plegadis falcinellus*) – listed as Migratory;
- Osprey (*Pandion haliaetus*) – listed as Migratory;
- Common Sandpiper (*Actitis hypoleucos*) – listed as Migratory;
- Peregrine Falcon (*Falco peregrinus*) – listed as Other Specially Protected;
- Fork-tailed Swift (*Apus pacificus*) – listed as Migratory;
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable;
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered; and
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) – listed as Endangered.

Priority Fauna recognised by the DBCA

The DBCA Threatened Fauna database search (DBCA 2019a) and NatureMap search (DPaW 2019) identified six Priority fauna species as potentially occurring around the study area:

Mammals:

- Southwestern Brown Bandicoot (*Isodon fusciventer*) – listed as Priority 4;
- Western Brush Wallaby (*Notamacropus irma*) – listed as Priority 4;
- Water-rat (*Hydromys chrysogaster*) – listed as Priority 4; and
- Western False Pipistrelle (*Falsistrellus mackenziei*) – listed as Priority 4.

Birds:

- Blue-billed Duck (*Oxyura australis*) – listed as Priority 4; and
- Masked Owl (southwest) (*Tyto novaehollandiae novaehollandiae*) – listed as Priority 3.

A total of 28 conservation significant species were identified during the desktop assessment, comprising 10 mammals, one reptile and 17 bird species.

Based on the known distributions and habitat preferences of the species and comparison with the habitats identified and mapped within the study area, seven species were determined as being “likely” to occur within the study area (Table 3). Six species were determined as “possible” to occur in the study area (Table 3). The remaining species identified as “unlikely” to occur (Table 3).

Table 3 Conservation significant fauna species identified during the desktop assessment.

Common Name	Scientific Name	Cons. Code				Habitat Preference	Suitable Habitat Present	Likelihood in the Study Area
		EPBC Act	BC Act	IUCN	DBCAs			
Mammals								
Chuditch	<i>Dasyurus geoffroii</i>	VU	VU	NT		Jarrah forest, in moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest particularly in riparian vegetation (Orell & Morris 1994).	Yes	Likely
South-western Brush-tailed Phascogale	<i>Phascogale tapoatafa wambenger</i>		CD	NT		Dry sclerophyll forests and open woodlands that contain hollow-bearing trees with a sparse ground cover (Woinarski <i>et al.</i> 2014).	Yes	Likely
Numbat	<i>Myrmecobius fasciatus</i>	EN	EN	EN		Eucalypts forests and woodland, notably wandoo and jarrah woodland (Van Dyck & Strahan 2008).	Yes	Unlikely ¹
Southwestern Brown Bandicoot	<i>Isoodon fusciventer</i>				P4	Jarrah forest and swamp habitats, preferring dense vegetation around wetland fringes and heathland (Cooper 1998, Woinarski <i>et al.</i> 2014).	No	Unlikely
Western Ringtail Possum	<i>Pseudocheirus occidentalis</i>	CE	CE	CE		Coastal <i>Agonis flexuosa</i> forest or eucalypt woodland or forest with a mid-story of <i>Agonis flexuosa</i> (DPaW 2017, Jones <i>et al.</i> 1994). Additionally, inland forest areas that have been unlogged and unburnt for long periods (Wayne <i>et al.</i> 2006).	Yes	Likely

¹ Due to no known recent recordings of this species from the local area.

Common Name	Scientific Name	Cons. Code				Habitat Preference	Suitable Habitat Present	Likelihood in the Study Area
		EPBC Act	BC Act	IUCN	DBCA			
Woylie	<i>Bettongia penicillata ogilbyi</i>	EN	CE	CE		Woodlands and adjacent heaths with a dense understory of shrubs (Woinarski <i>et al.</i> 2014).	Yes (limited areas only)	Possible
Western Brush Wallaby	<i>Notamacropus irma</i>				P4	Wide-range of habitats including low <i>Banksia</i> woodlands, Jarrah/Marri woodlands and moist <i>Melaleuca</i> lowlands, favours open, grassy areas (Wann & Bell 1997, Woinarski <i>et al.</i> 2014).	Yes	Likely
Quokka	<i>Setonix brachyurus</i>	VU	VU	VU		Habitat varies, but prefer <i>Acacia</i> and <i>Melaleuca</i> thickets. Associated with <i>Taxandria linearifolia</i> in Jarrah Forest (de Tores 2008).	No	Unlikely
Water-rat	<i>Hydromys chrysogaster</i>				P4	Permanent bodies of fresh or brackish water, subalpine streams to lakes and farm dams (Van Dyck & Strahan 2008).	No	Unlikely
Western False Pipistrelle	<i>Falsistrellus mackenziei</i>			NT	P4	Tall forests and woodlands in higher rainfall parts of the south-west, particularly Karri forests but also Tuart and Jarrah forests (Woinarski <i>et al.</i> 2014).	Yes (limited areas only)	Possible
Reptiles								
Dell's Skink	<i>Ctenotus delli</i>				P4	Dry sclerophyll forest on stony hills and ranges (Cogger 2014).	Yes (limited areas only)	Possible
Birds								
Blue-billed Duck	<i>Oxyura australis</i>			NT	P4	Mainly deep freshwater swamps and lakes, occasionally salt lakes and estuaries freshened by flood waters (Johnstone & Storr 1998).	No	Unlikely

Common Name	Scientific Name	Cons. Code				Habitat Preference	Suitable Habitat Present	Likelihood in the Study Area
		EPBC Act	BC Act	IUCN	DBCA			
Malleefowl	<i>Leipoa ocellata</i>	VU	VU	VU		Semi-arid shrublands and low woodlands dominated by mallee eucalypts and/or acacias (Benshemesh 2007).	Yes (limited areas only)	Possible
Glossy Ibis	<i>Plegadis falcinellus</i>	MG	MG			Freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone <i>et al.</i> 2013).	No	Unlikely
Australasian Bittern	<i>Botaurus poiciloptilus</i>	EN	EN	EN		Tall dense Typha and sedges in freshwater swamps (Johnstone & Storr 1998).	No	Unlikely
Osprey	<i>Pandion haliaetus</i>	MG	MG			Sheltered seas around islands, tidal creeks, estuaries and saltwork ponds, and large river pools (Johnstone <i>et al.</i> 2013).	No	Unlikely
Eastern Curlew	<i>Numenius madagascariensis</i>	CE, MG	CE	EN		Tidal mudflats, also reef flats, sandy beaches (Johnstone & Storr 1998).	No	Unlikely
Common Sandpiper	<i>Actitis hypoleucos</i>	MG	MG			Edge of sheltered waters, salt or fresh, estuaries, river pools, claypans, drying swamps (Johnstone & Storr 1998).	No	Unlikely
Pectoral Sandpiper	<i>Calidris melanotos</i>	MG	MG			Fresh waterbodies including swamps, lagoons and river pools (Johnstone & Storr 1998).	No	Unlikely
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	MG	MG			Coastal and inland areas saline and fresh or brackish wetlands (Geering <i>et al.</i> 2007).	No	Unlikely
Curlew Sandpiper	<i>Calidris ferruginea</i>	CE, MG	CE	NT		Intertidal mudflats in sheltered coastal areas (Geering <i>et al.</i> 2007).	No	Unlikely

Common Name	Scientific Name	Cons. Code				Habitat Preference	Suitable Habitat Present	Likelihood in the Study Area
		EPBC Act	BC Act	IUCN	DBCA			
Masked Owl	<i>Tyto novaehollandiae</i>				P3	Forested areas and occasionally dry woodland areas (Johnstone & Storr 1998).	Yes (limited areas only)	Possible
Fork-tailed Swift	<i>Apus pacificus</i>	MG	MG			Entirely aerial species (Johnstone & Storr 1998).	N/A	Possible
Peregrine Falcon	<i>Falco peregrinus</i>		OS			Coastal cliffs, rivers and ranges, wooded watercourses and lakes (Johnstone & Storr 1998).	No	Unlikely
Forest Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii naso</i>	VU	VU			Eucalypt forests, areas of seeding Marri, Jarrah, Blackbutt, Karri and Sheoak (Johnstone & Storr 1998).	Yes	Likely
Carnaby's Cockatoo	<i>Calyptorhynchus latirostris</i>	EN	EN	EN		Eucalypt woodlands and forests and adjacent area of Proteaceous scrubs and heaths (Johnstone & Storr 1998).	Yes	Likely
Baudin's Cockatoo	<i>Calyptorhynchus baudinii</i>	EN	EN	EN		Eucalypt forest, areas of Marri, Karri and Wandoo (Johnstone & Storr, 1998, Johnstone & Kirkby 2008).	Yes	Likely
Grey Wagtail	<i>Motacilla cinerea</i>	MG	MG			Various habitats with open waterbodies (Johnstone & Storr 2004).	No	Unlikely

3.1.3 Ecological Communities

TECs listed under State and Federal Legislation

A search of the EPBC Act Protected Matters database (DoEE 2019) and the DBCA ecological communities database (DBCA 2019b) identified no fauna related Federal listed TECs previously recorded within, or adjacent to, the study area.

PECs recognised by DBCA

A search of the State database (DBCA 2019b) identified no fauna related PECs previously recorded within, or adjacent to, the study area.

Environmentally Sensitive Areas

There are no Environmentally Sensitive Area (ESA) identified within or adjacent to the study area.

3.2 Level 1 Fauna Survey

3.2.1 Vertebrate Fauna Species

Threatened Fauna listed under the BC Act and EPBC Act

Two vertebrate fauna species listed under the BC Act and the EPBC Act were recorded from the study area:

- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the EPBC Act and the BC Act; and
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and the BC Act.

Evidence of the Western Ringtail Possum (*Pseudocheirus occidentalis*) (listed as Critically Endangered under the EPBC Act and the BC Act) was recorded from the study area. Old (inactive) dreys were observed from within the Drainage Line habitat of the study area. No recent evidence or individual possums were observed during the field survey despite targeted searches.

Priority Fauna recognised by the DBCA

No Priority fauna species, as recognised by the DBCA, were recorded from the study area.

Introduced Fauna species

Five introduced fauna species (feral animals) were observed within the study area during the survey:

- House Mouse (**Mus musculus*);
- Black Rat (**Rattus rattus*);
- European Rabbit (**Oryctolagus cuniculus*);
- Red Fox (**Vulpes vulpes*); and
- Sheep (**Ovis aries*).

All five feral animals were recorded from motion cameras set up in the study area.

The Laughing Kookaburra (*Dacelo novaeguineae*) was also recorded during the survey. This species was previously referred to as introduced species but is now considered naturalised in the area.

A full list of species recorded is provided in Appendix 5.

3.2.2 Fauna Habitat

Habitat Types

Three main fauna habitats types were identified and mapped within the study area during the field survey: Hillslope/Hillcrest, Drainage Line and Granite (Figure 3; Table 4).

The majority of the study area was mapped as Hillslopes/Hillcrests with Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*) and Peppermint (*Agonis flexuosa*) forest and an open shrub mid-story.

The Drainage Line habitat occurred through the central and southern part of the study area and supported trees of Yarri (*Eucalyptus patens*), Marri and Peppermint with a dense understory of shrubs and sedges. This habitat provides good connectivity due to the relatively dense understory and dense tree cover.

Small pockets of Granite habitat were identified. These areas were dominated by low scrubs and scattered Peppermint and Marri trees.

Additional areas of the study area were mapped as Cleared Pasture and one portion of the Hillslope/Hillcrest area was mapped as being degraded habitat due to lack of understorey vegetation due to historical disturbance (Figure 3).

Table 4 Fauna habitat mapped within the study area.

Habitat Type	Description
Hillcrest/Hillslopes	Forest of Jarrah, Marri and Peppermint trees with open scrubs on brown loam and loamy sands.
Drainage Lines	Dense forest of Yarri, Marri and Peppermint trees over a thick understorey of scrubs and tall sedges on brown loams and clay.
Granite	Granite outcropping dominated by low scrub with open low woodland of Marri and Peppermint Tree on grey loamy sands.
Cleared Pasture	Areas of cleared annual pasture on farmland or cleared areas.

401000

401500



TALISON LITHIUM

Lot 153 Wellington Mills

Habitat Types

Legend

Study Area

Habitat Types

Cleared Pasture

Drainage Line

Granite

Hillslope/Hillcrest

Hillslope/Hillcrest (degraded)

6297000

6297000

6296500

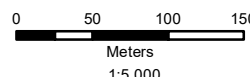
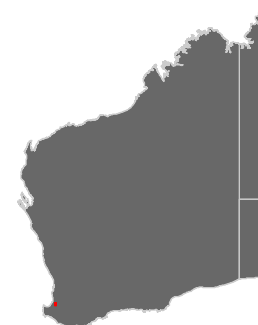
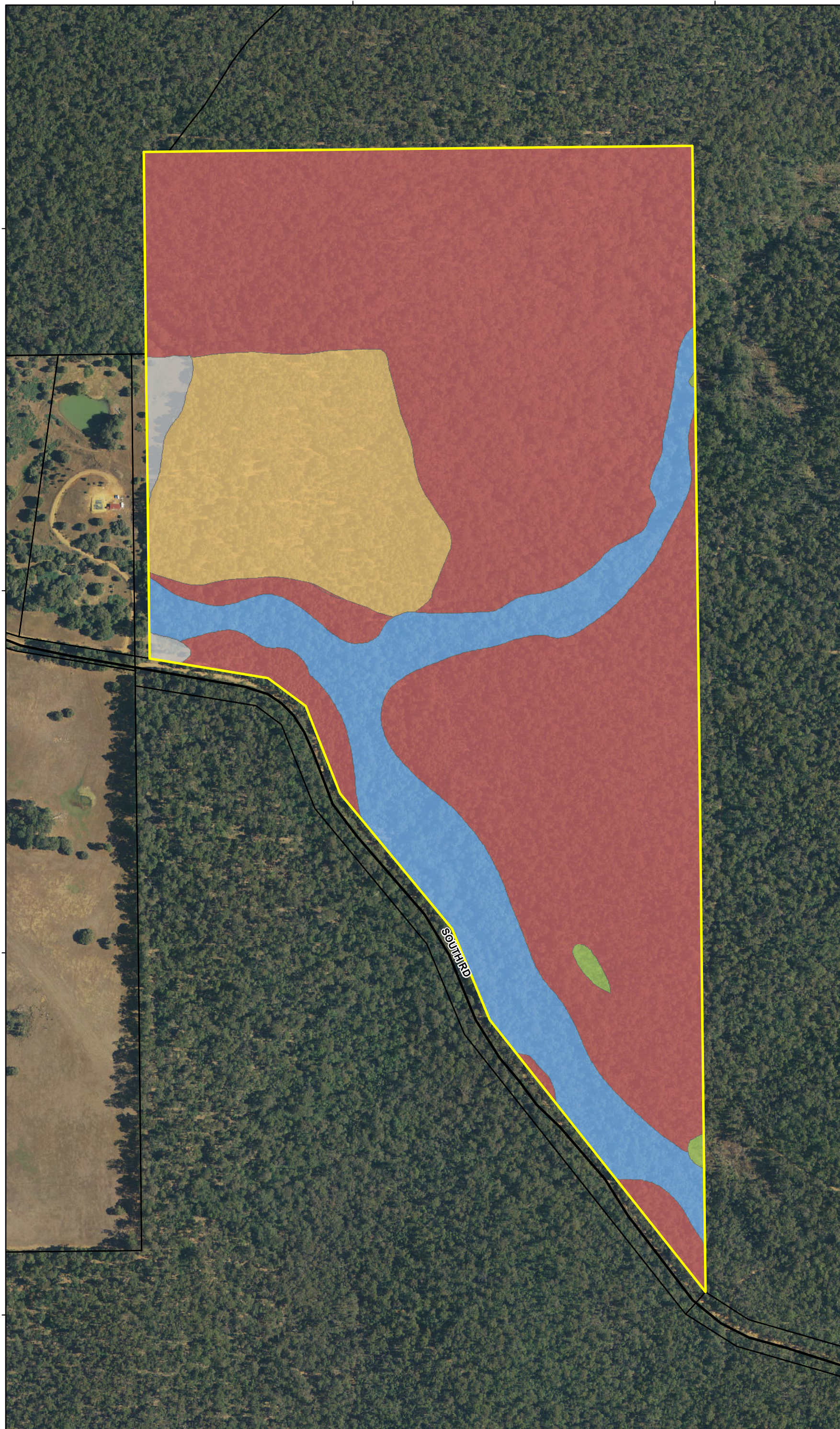
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Status: Draft
Figure: 3
Sheet Size: A3
Internal Reference: TL_Lot153_Hab
Drawn by: GSM
Requested by: PC



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3.2.3 Fauna Habitats and Species of Significance

Assessment of Habitat Trees

To assess the potential for habitat trees within the study area, suitable tree species (i.e. Corymbia/Eucalyptus species) that had a DBH of equal to or greater than 50 cm were counted within defined areas (i.e. 50 x 50 m quadrats) throughout the study area. Trees with a diameter at breast height of over 50 cm were relatively common within the Drainage Line habitat with an average density of 140 trees per ha. The average density within the Hillslope/Hillcrest habitat was 86 trees per ha, which reduced to only 4 trees per ha within the Hillslope/Hillcrest habitat identified as degraded, due to historical disturbance in the area.

None of the trees observed within the study area contained hollows deemed suitable for use by black cockatoos, due to the small entrance size.

Black Cockatoos

Habitats within the study area were assessed for the use by, and suitability for, black cockatoos. There were sightings of, and evidence of foraging, by Forest Red-tailed Cockatoos and Carnaby's Cockatoos from within the study area. The majority of habitats within the study area are deemed to be suitable foraging habitat for the cockatoos, with the exception of areas of cleared annual pasture (Figure 3).

No evidence of roosting or breeding from black cockatoos was observed during the field survey, with tree hollows assessed in the study area being deemed as unsuitable for use due to the small size. The Hillslope/Hillcrest habitat however was deemed to be suitable for roosting and foraging for all three black cockatoo species, and may potentially provide future breeding habitat once tree hollows become of a suitable size.

Western Ringtail Possum

Dreys were actively searched for within the study area to provide evidence of the presence of Western Ringtail Possums. Only old (inactive) dreys were observed from within the Drainage Line habitat of the study area, with no recent evidence or individual possums observed during the field survey.

The Drainage Line habitat within the study area is considered to be suitable for Western Ringtail Possums, with the habitat comprising a well structured mid-story and upper-story strata and canopy connectivity that Western Ringtail Possums require. The Hillslope/Hillcrest habitat was also assessed as suitable due to the structure of the mid-story and upper-story, however offered slight less canopy connectivity than the Drainage Line habitat.

The area of degraded Hillslope/Hillcrest habitat was lacking a connectivity and was considered unsuitable habitat for the Western Ringtail Possum. Areas comprised of cleared pasture do not provide habitat for this species.

South-western Brush-tailed Phascogale

The South-western Brush-tailed Phascogale was assessed during the desktop assessment as likely to occur within the study area. This species is known to inhabit dry sclerophyll forests and open woodlands that contain hollow-bearing trees with a sparse ground cover (Woinarski *et al.* 2014). South-western Brush-tailed Phascogales rely on tree hollows for nesting, with the hollows observed within the study area

assessed as providing potential habitat for usage by phascogales. Individuals may utilise the Hillslope/Hillcrest and Drainage Line habitat types of the study area for foraging.

Chuditch

The Chuditch was assessed during the desktop assessment as likely to occur within the study area. The Chuditch inhabits Jarrah forest, in moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest particularly in riparian vegetation (Orell & Morris 1994). Within the study area this species may possibly utilise the Hillslope/Hillcrest and Drainage Line habitats for foraging or dispersing.

Western Brush Wallaby

The Western Brush Wallaby was assessed during the desktop assessment as likely to occur within the study area. This species is known to inhabit a wide-range of habitats including Jarrah/Marri woodlands (Woinarski *et al.* 2014), and therefore is considered likely to utilise the habitats present within the study area.

4.0 SUMMARY

Talison owns and operates the existing lithium mine near the town of Greenbushes, situated approximately 250 km south of Perth in south-west Western Australia. As part of the current expansion of mining operations at the Greenbushes Mine, Onshore Environmental was commissioned to undertake a vertebrate fauna survey of the proposed offset lot at Wellington Mills (referred to as the study area).

The vertebrate fauna survey was completed by Senior Zoologist, Mr Michael Brown, between 23rd and 24th of April 2019, with additional habitat surveying completed by Principal Botanists, Dr Jerome Bull and Dr Darren Brearley, on the 10th and 12th of April 2019.

Two vertebrate fauna species listed under the BC Act and the EPBC Act were recorded from the study area:

- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the EPBC Act and the BC Act; and
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and the BC Act.

Evidence of the Western Ringtail Possum (*Pseudocheirus occidentalis*) (listed as Critically Endangered under the EPBC Act and the BC Act) was also recorded from the study area. Old (inactive) dreys were observed from within the Drainage Line habitat of the study area.

An additional four species of conservation significance were assessed as likely to occur in the study area based on habitat preference and previous recordings of the species from the surrounding area.

Five introduced fauna species (feral animals) were observed during the survey:

- House Mouse (*Mus musculus*);
- Black Rat (*Rattus rattus*);
- European Rabbit (*Oryctolagus cuniculus*);
- Red Fox (*Vulpes vulpes*); and
- Sheep (*Ovis aries*).

Three main fauna habitat types were described and mapped from the study area, with a majority of the study area consisting of the Hillslope/Hillcrest habitat type, along with areas of Drainage Line and Granite outcropping. Additional areas of the study area were mapped as Cleared Pasture and one portion of the Hillslope/Hillcrest area was mapped as being degraded.

Habitats within the study area were assessed for the use by, and suitability for, black cockatoos. There were sightings of, and evidence of foraging, by Forest Red-tailed Cockatoos and Carnaby's Cockatoos from within the study area, but no evidence of roosting or breeding. None of the trees assessed within the study area contain hollows that were deemed to be usable for use by black cockatoos.

Dreys were actively searched for within the study area with a number of old (inactive) dreys recorded from within the Drainage Line habitat. No recent evidence of Western Ringtail Possums were recorded during the survey despite targeted searches. The lack of recent evidence of this species may be due to the high density of foxes recorded

from within the study area (recorded via motion cameras). The implementation of management and control methods for the fox may aid in increasing the occurrence of Western Ringtail Possums in the area.

The majority of habitats within the study area are considered to be suitable for Western Ringtail Possums, specifically the Drainage Line habitat type. The South-western Brush-tailed Phascogale, Chuditch and Western Brush Wallaby were assessed during the desktop assessment as being likely to occur within the study area. These species likely to utilise the Hillslope/Hillcrest and Drainage Line habitat types for foraging, with the tree hollows observed within the study area consisted suitable for use by phascogales.

5.0 STUDY TEAM

The Level 1 vertebrate fauna survey was planned, co-ordinated and executed by the following personnel:

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Mrs Breanne Menezies	BSc	Senior Environmental Advisor
Mr Todd Griffin	BSc	GIS and Mapping Specialist

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APPENDIX 1

Status codes for species listed on the IUCN 'Red List'

Category	Description
Extinct (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	A taxon is Data Deficient when 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 taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.
Not Evaluated (NE)	A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

APPENDIX 2

Conservation categories for species listed under the EPBC Act

Category	Description
Extinct	A species is extinct if there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A species is categorised as extinct in the wild if it is only known to survive in cultivations, in captivity, or as a naturalised population well outside its past range; or if it has not been recorded in its known/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	The species is facing an extremely high risk of extinction in the wild and in the immediate future.
Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival, or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Conservation Dependent	The species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

APPENDIX 3

Conservation categories for species listed under the BC Act

Fauna Species – Biodiversity Conservation Act 2016

Category	Description
Critically Endangered	Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”.
Endangered	Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”.
Vulnerable	Threatened species considered to be “facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”.
Conservation Dependent	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines
Other Specially Protected	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines

APPENDIX 4

Conservation codes for Western Australian species

Threatened Species

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

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

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

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

Priority One: Poorly-known species

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

Priority Two: Poorly-known species

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

Priority Three: Poorly-known species

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

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

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

APPENDIX 5

List of all fauna species recorded within the study area

Common Name	Species Name	Observation Type	Status
Mammals			
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	Camera	
Brush-tailed Possum	<i>Trichosurus vulpecula</i>	Night Sighting	
Western Grey Kangaroo	<i>Macropus fuliginosus</i>	Day Sighting, Scats, Camera	
House Mouse	* <i>Mus musculus</i>	Camera	Introduced
Black Rat	* <i>Rattus rattus</i>	Camera	Introduced
European Rabbit	* <i>Oryctolagus cuniculus</i>	Camera	Introduced
Red Fox	* <i>Vulpes vulpes</i>	Camera	Introduced
Sheep	* <i>Ovis aries</i>	Camera	Introduced
Birds			
Emu	<i>Dromaius novaehollandiae</i>	Scats	
Wedge-tailed Eagle	<i>Aquila audax</i>	Day Sighting	
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	Camera	
Southern Boobook	<i>Ninox novaeseelandiae</i>	Night Sighting	
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	Day Sighting	Naturalised
Forest Red-tailed Black Cockatoo	<i>Calyptorhynchus banksii naso</i>	Day Sighting, Foraging evidence	VU (EPBC Act & BC Act)
Carnby's Cockatoo	<i>Calyptorhynchus latirostris</i>	Day Sighting	EN (EPBC Act & BC Act)
Australian Ringneck	<i>Platycercus zonarius</i>	Day Sighting	
Red-winged Fairywren	<i>Malurus elegans</i>	Camera	
White-cheeked Honeyeater	<i>Phylidonyris niger</i>	Day Sighting	
Red Wattlebird	<i>Anthochaera carunculata</i>	Day Sighting	
White-browed Scrubwren	<i>Sericornis frontalis</i>	Camera	
Weebill	<i>Smicrornis brevirostris</i>	Day Sighting	
Western Gerygone	<i>Gerygone fusca</i>	Day Sighting	
Broad-tailed Thornbill	<i>Acanthiza apicalis</i>	Day Sighting	
Australian Magpie	<i>Cracticus tibicen</i>	Day Sighting	
Black-faced Cuckoo Shrike	<i>Coracina novaehollandiae</i>	Day Sighting	

Common Name	Species Name	Observation Type	Status
Western Golden Whistler	<i>Pachycephala occidentalis</i>	Day Sighting	
Grey-shrike Thrush	<i>Colluricincla harmonica</i>	Calling	
Willie Wagtail	<i>Rhipidura leucophrys</i>	Day Sighting	
Australian Raven	<i>Corvus coronoides</i>	Day Sighting	
Hooded Robin	<i>Melanodryas cucullata</i>	Day Sighting	
Scarlet Robin	<i>Petroica boodang</i>	Day Sighting	
Red-capped Robin	<i>Petroica goodenovii</i>	Calling	
Silveryeye	<i>Zosterops lateralis</i>	Day Sighting	
Mistletoe Bird	<i>Dicaeum hirundinaceum</i>	Day Sighting	
Reptiles			
Shrubland Morethia Skink	<i>Morethia obscura</i>	Day Sighting	
Shingle Back	<i>Tiliqua rugosa</i>	Day Sighting	
Heath Monitor	<i>Varanus rosenbergi</i>	Day Sighting	
Amphibian			
Moaning Frog	<i>Heleioporus eyrei</i>	Calling at Night	


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