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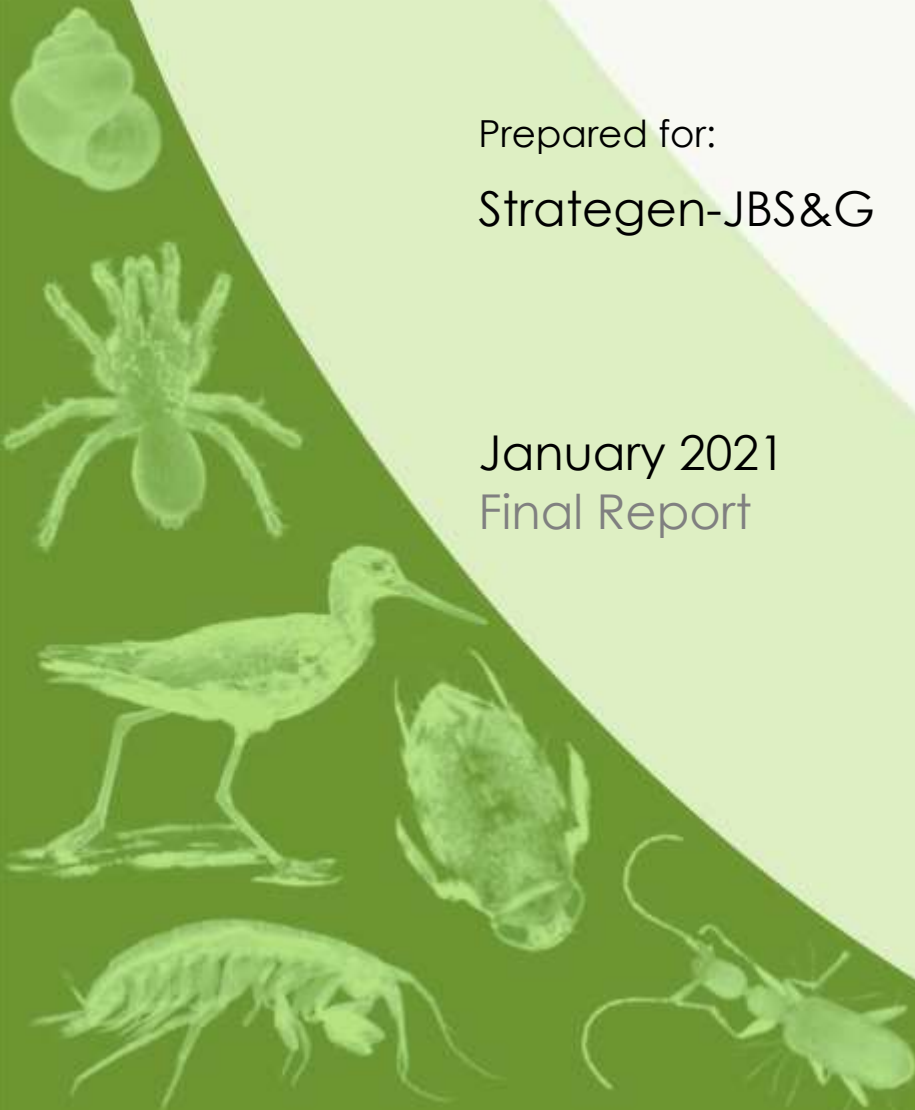
Lots 802 and 803 Erindale Road,
Hamersley: SRE Invertebrate
Desktop Assessment

Prepared for:
Strategen-JBS&G

January 2021
Final Report

Short-Range Endemics | Subterranean Fauna

Waterbirds | Wetlands



Lots 802 and 803 Erindale Road, Hamersley: SRE Invertebrate Desktop Assessment

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EXECUTIVE SUMMARY

Rezoning of the Local Planning Scheme (hereafter referred to as 'the Project') is proposed at Lot 802 Erindale Road, Hamersley, Perth, in an area currently occupied by remnant *Banksia* and jarrah woodland of the Swan Coastal Plain. The proposed development envelope on Lot 802 covers approximately 13.55 ha, with adjacent remnant bushland to the east throughout Lot 803, as well as to the southwest bordering Erindale Road and Reid Highway.

The Environmental Protection Authority (EPA) has identified terrestrial fauna, including short-range endemic (SRE) invertebrates, as a Preliminary Key Environmental Factor for the Project. SRE invertebrate species are defined as having an overall range of less than 10,000 km². They tend to exhibit patchy distributions within their range, slow growth, low fecundity and poor dispersal capabilities. The assessment of SRE invertebrates in Western Australia typically focuses on a selection of ground-dwelling invertebrate groups that contain a high proportion of range-restricted species (SRE Groups).

The purpose of this desktop assessment is to determine the likelihood of conservation significant and SRE invertebrate fauna occurring in the Project area. The assessment is based on the habitat types present at the Project, as well as previous records of terrestrial invertebrates within a search area around the Project (50km north and south, west to the Indian Ocean and east to the edge of the Darling Scarp).

The Project area features several habitat types that could harbour SRE species. The vegetation is broadly composed of a *Banksia*-jarrah woodland remnant; similar woodland remnants in southwestern Australia are known to contain a range of microhabitats that harbour range-restricted invertebrates, including bark, leaf litter beds, soil humus and large debris. Further, *Banksia* woodlands (which particularly dominate Lot 802) typically support highly diverse communities, and their former extent has been considerably fragmented. Several range-restricted invertebrates are associated with *Banksia* woodlands of the Swan Coastal Plain, such as millipedes of the genus *Antichiropus*. The vegetation at the Project also includes some plant species endemic to the region, which may be associated with host-specific invertebrates (for example *Macrozamia ridlei*).

The desktop assessment identified eight Threatened or Priority listed terrestrial invertebrate species within the 50 km search area: two mygalomorph spiders, one millipede and five native bees. Several of these species have been found in Perth bushland remnants similar to the Project area; notably, the trapdoor spider *Idiosoma sigillatum*, which builds its burrows in leaf litter on sandy soils, has been recorded in bushland remnants in the close vicinity of the Project.

The assessment also identified many potential SRE species within the 50 km search area, with 138 species from SRE groups having known or potential ranges of <10,000 km², including spiders (51 species of modern spiders, 37 species of trapdoor spiders), harvestmen (two species), pseudoscorpions (six species), scorpions (three species), slaters (14 species), centipedes (three species), millipedes (14 species) and land snails (six species). Many of these species are endemic to bushland remnants on the Swan Coastal Plain that resemble the Project area habitat. While it is possible that the exact number of SRE Group species has been inflated due to taxonomic uncertainty and informal species assignments, it is clear that a diverse community of potentially restricted species occurs within the search area and many of these species possibly occur within the Project area. There were also 14 potentially range-restricted species from non-SRE groups in the search area, including beetles (eight species), hemipterans (one species), bees (four species) and bush crickets (one species).

It is unclear from existing records what species occur in the Project area. However, the records from the broad search area show that a rich fauna of potential SRE species occurs on the Swan Coastal Plain, with many of the species likely to occur in the habitat of the Project. In addition, some species listed for conservation reasons may possibly occur in the Project.

The level of threat posed by the Project to listed and SRE species cannot be assessed with precision on the basis of current information and is somewhere between low to high, depending on whether listed or potential SRE species occur in the Project area, and whether these species are dependent upon the habitat types within Lot 802.

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1. INTRODUCTION

Rezoning of the Local Planning Scheme (hereafter referred to as 'the Project') is proposed at Lot 802 Erindale Road, Hamersley, Perth (Figure 1), in an area currently occupied by remnant *Banksia* and jarrah woodland of the Swan Coastal Plain. The proposed development envelope on Lot 802 covers approximately 13.55 ha and includes a conservation area of 1.052 ha. Adjacent to Lot 802, remnant bushland also occurs to the east throughout Lot 803, as well as to the southwest bordering Erindale Road and Reid Highway (Figure 1).

The Environmental Protection Authority (EPA) has identified terrestrial fauna, including short-range endemic (SRE) invertebrates, as a Preliminary Key Environmental Factor for the Project. The purpose of this desktop assessment is to determine the likelihood of conservation significant and SRE invertebrate fauna occurring in the Project area. The specific aims are to assess:

- The occurrence of potential SRE species from invertebrate records in the vicinity of the Project;
- The occurrences of any listed species from invertebrate records in the vicinity of the Project (Biodiversity Conservation Act 2016 or Environment Protection and Biodiversity Conservation Act 1999); and
- Determine the likelihood that SRE and listed invertebrate species occur in the Project area, based on the types of habitat present.

2. CONSERVATION FRAMEWORK

2.1. Listing of Threatened Terrestrial Invertebrates

The listing of species for special protection is governed at the federal level under the Environment Protection and Biodiversity Conservation Act 1999, and at the state level under the Biodiversity Conservation Act 2016. The state-level listing of Threatened species (Critically Endangered, Endangered and Vulnerable species; Appendix 1) is maintained by the Department of Biodiversity, Conservation and Attractions (DBCA); additionally, the DBCA maintains a list of Priority species that potentially require protection but do not currently meet survey or data requirements for formal Threatened status (see Appendix 1 for definitions of Priority Categories).

2.2. SRE Terrestrial Invertebrates

In addition to formal listing of Threatened and Priority fauna, the assessment of SRE invertebrates in Western Australia is prescribed by the Environmental Protection Authority (EPA 2016a, b). Under this framework, SRE species are broadly defined as having an overall range of less than 10,000 km², following Harvey (2002). They are usually characterised by patchy or fragmented distributions within their range, slow growth, low fecundity and poor dispersal capabilities. Assessment of environmental impacts on SREs typically focuses on several taxonomic groups (the SRE Groups) that are known to contain high proportions species with these characteristics. In southwestern Australia, these groups include land snails (Gastropoda); millipedes (Diplopoda); centipedes (Chilopoda); pseudoscorpions (Pseudoscorpiones); scorpions (Scorpiones); spiders [Araneae, mainly Mygalomorphae (trapdoor spiders), but also some modern spiders within Araneomorphae]; slaters (Isopoda), harvestmen (Opiliones), velvet worms (Onychophora) and earthworms (Oligochaeta).

The SRE Groups listed above provide a useful practical framework for identifying potential restricted species, however it is important to note two further points. First, SREs can also occur in groups where most other species are widespread, due to high vagility, ecological plasticity or xeric adaptation (Framenau *et al.* 2008; Rix *et al.* 2015). Second, and conversely, many species belonging to SRE Groups are in fact widespread. Therefore, determining whether a species has a significantly restricted range (notionally <10,000 km²) is more difficult than simply identifying them as belonging to an SRE Group. One guide is that the distribution of an SRE Group species is likely to be confined to the extent of its preferred or obligate habitat(s), so that species that are only found in restricted or patchy habitats usually have smaller ranges than those collected from extensive or common habitats. Nevertheless, in some

groups there may be some species turnover in widespread habitats (e.g. due to climatic gradients) that results in a species occupying only part of a widespread habitat and, therefore, being an SRE with a range that is much smaller than the extent of its apparently suitable habitat (Rix *et al.* 2015).

In this desktop assessment the SRE status of each species in the search area (see Section 4) was determined using a modified version of the Western Australian Museum's (WAM) SRE classification system (Appendix 2). The modifications used by Bennelongia aim to account for the fact that many recorded species have limited available data on their taxonomy, range, habitat preferences, and/or natural history.

First, species in the SRE Groups identified above were assigned to the following categories:

- *Widespread (not an SRE)*
- *Confirmed SRE*
- *Likely potential SRE*
- *Unlikely potential SRE.*

Species were considered *widespread* if they have a known distribution $> 10,000 \text{ km}^2$. If species have a known distribution $< 10,000 \text{ km}^2$, they were considered *confirmed SREs* if their taxonomy is well known and they belong to groups that are well represented in collections. For species that have currently been recorded from areas $< 10,000 \text{ km}^2$, but are taxonomically uncertain, belong to groups that are not well represented in collections, and/or are associated with patchy sampling effort, we assign them as *likely* or *unlikely potential SREs* based on the following information (if available):

- Habitat indicators and degree of specialisation (e.g. occur in one or multiple habitats);
- Research and expertise (expert information of the biology and ecology of related species); and/or
- Molecular evidence regarding the genetic variability within sampling areas.

If species are data deficient in all these areas, the precautionary approach was taken of assigning them *likely potential SREs*; although we highlight these species in our results and note the lack of available data.

Second, potentially range-restricted species from non-SRE groups were assessed, i.e. groups where most species are widespread. For species in these groups that have currently recorded distributions $< 10,000 \text{ km}^2$, we apply the same criteria as above to determine whether any are *confirmed SREs*, *likely potential SREs*, or *unlikely potential SREs*.



Figure 1: Location of the proposed rezoning at Lot 802, Erindale Road, Perth ('the Project').

3. LOCAL ENVIRONMENT

3.1. Regional Setting: Swan Coastal Plain

The Perth metropolitan area is located within the Swan Coastal Plain, one of 419 Australian sub-regions recognised by the Interim Biogeographic Regionalisation of Australia (IBRA) [<http://www.environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps>; accessed 13 October 2020]. The Swan Coastal Plain covers low-lying areas from Cape Naturaliste to Jurien Bay, bordered to the west by the Indian Ocean and to the east by the Darling Escarpment. The surface geology of the sub-region primarily consists of a parallel series of Quaternary sand dunes, along with areas of alluvial, colluvial and lacustrine deposits (Figure 2). The bordering Darling Escarpment is an uplifted section of the much older (Archean) Yilgarn Craton, which primarily consists of granite terrains (Myers and Watkins 1985). The climate of the Swan Coastal Plain is Mediterranean, with cool, wet winters and warm, dry summers. The plain is part of a broader, ancient landscape in southwestern Australia that is isolated by bordering oceans and arid areas, and has remained unglaciated for hundreds of millions of years (Hopper and Gioia 2004). As a result of the long period of isolation, weathering and climatic stability, the region is characterised by high levels of diversity and endemism in both its flora and fauna; indeed, the Southwest Australian Floristic Region is recognised as a listed global biodiversity hotspot (Hopper and Gioia 2004). The Swan Coastal Plain itself is characterised by seasonally wet eucalypt (e.g. jarrah, *Eucalyptus marginata*, and marri, *Corymbia calophylla*) and *Banksia* woodlands, with more open forests (e.g. tuart, *E. gomphocephala*, and peppermint, *Agonis flexuosa*) common in some places, particularly south of Bunbury (Rix *et al.* 2015). Along the coast in the northern part of the subregion, as it crosses into the transitional rainfall zone, sandy heathlands and shrublands ('Kwongan' vegetation) can be prevalent (Rix *et al.* 2015).

3.2. SRE Invertebrates of the Swan Coastal Plain

Despite its proximity and familiarity to most residents of Western Australia, the fauna of the Swan Coastal Plain has traditionally received less attention than other sub-regions of southwestern Australia (Rix *et al.* 2010). It has often been assumed that complex topologies such as the Darling Scarp will be more conducive to short-range endemic species than flat landscapes such as the Swan Coastal Plain, due to the occurrence of granite outcrops, sheltered gullies and other refugial habitats. However, there is a growing recognition that there can be considerable fine-scale differentiation of both microhabitats (for example, litter and substrate variation) and faunal assemblages on the Swan Coastal Plain, resulting in many endemic and range-restricted species (Rix *et al.* 2015; Rix *et al.* 2010). Several species of spider are restricted to leaf litter habitats on Quindalup dune systems (Rix 2006; Rix *et al.* 2010), while the millipede genus *Antichiropus*, one of the most diverse invertebrate genera in Western Australia (Framenau *et al.* 2008), contains one described species and likely several undescribed species that are endemic to bushland of the Swan Coastal Plain (Car *et al.* 2013). Bushland remnants in the Perth metropolitan region are considered important residual habitats for invertebrates; with larger remnants tending to host more diverse invertebrate communities (Harvey *et al.* 1997).

Extensive fragmentation of original habitats associated with the Perth metropolitan area has placed further pressure on the persistence of specialist and low-dispersing invertebrate species. For example, Rix *et al.* (2017a) found that the trapdoor spider *Idiosoma sigillatum* had declined across much of its former range and was now restricted to remnant reserves and woodland in and around the Perth metropolitan area, resulting it in meeting the criteria for 'vulnerable' assessment on the IUCN Red List. There are also several species of invertebrates on the Swan Coastal Plain from groups typically considered non-SRE that have been formally listed as threatened, such as native bees and moths (Pille Arnold *et al.* 2019; Williams 2009).

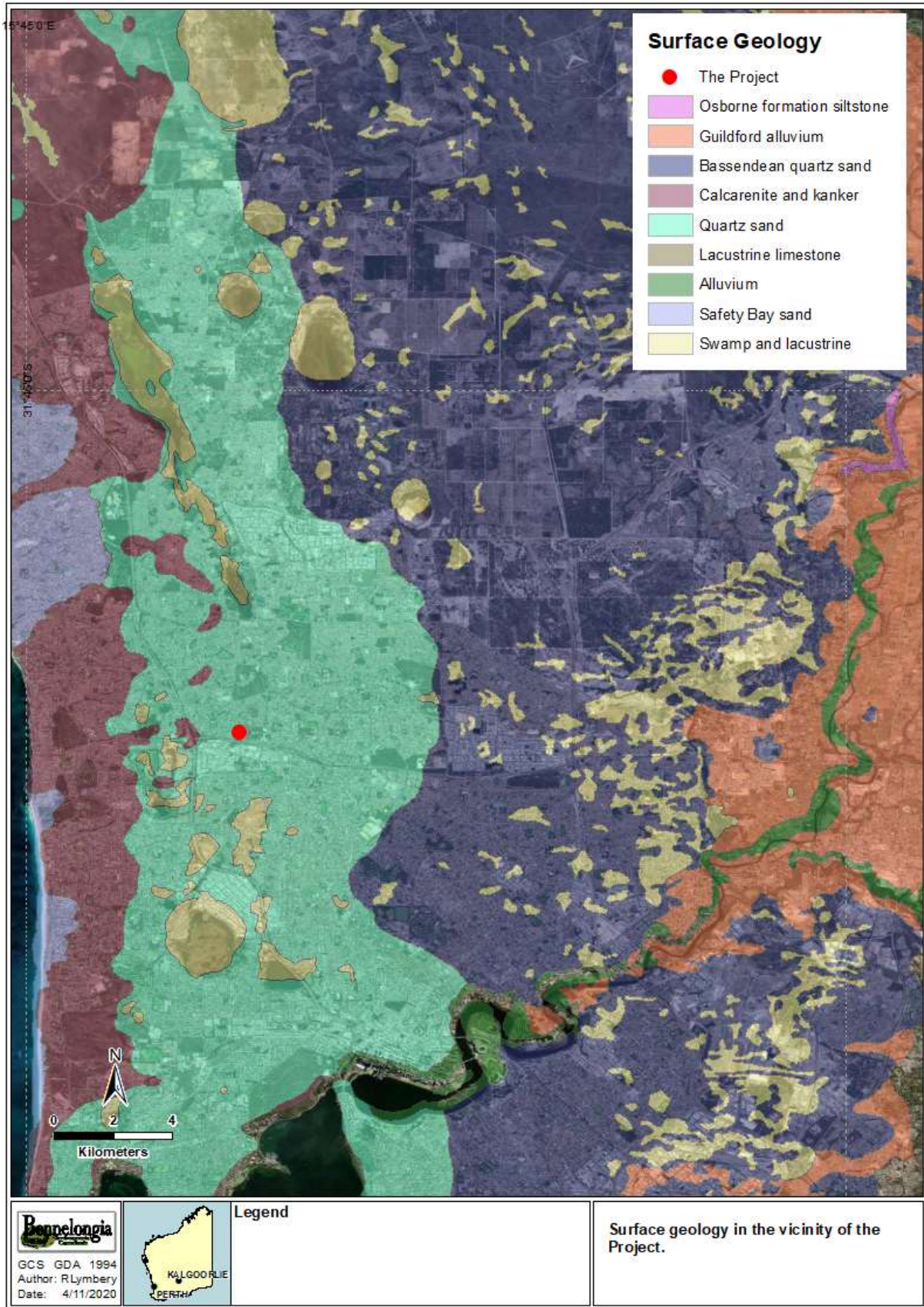


Figure 2: Surface geology in the vicinity of the Project.

3.3. Habitat Types in the Project Area

The vegetation at the Project, and the adjacent Lot 803, is broadly composed of a remnant *Banksia-eucalypt* (jarrah, *Eucalyptus marginata*) woodland. Specific vegetation mapping at Lots 802 and 803 was undertaken by Strategen-JBS&G (2020), which resulted in the identification of seven vegetation units, along with cleared land and parkland (Table 1; Figure 3). Lot 802, where the Project development is planned to occur, is dominated by low to mid *Banksia* (*B. attenuata* and *B. menziesii*) woodland over diverse shrubs and heath, with *Xanthorrhoea priessi* particularly prevalent in the understorey (Figure 3; Table 1). Most vegetation in the Project area was considered to be in good or very good condition (Figure 4).

Several of the habitat types at the project have the potential to harbour SRE species. *Banksia-eucalypt* woodlands are generally considered to have moderate suitability for SRE fauna (Invertebrate Solutions 2019) and can contain microhabitats that might harbour SRE groups, including bark, leaf litter beds, soil humus and large debris. Such microhabitats in Swan Coastal Plain bushland remnants have allowed the persistence of many relictual species such as ground-dwelling spiders within both Mygalomorphae and Araneomorphae (Jocqué 1995; Main 2012; Rix 2009). More specifically, *Banksia* woodland is recognised as both a highly diverse and highly threatened ecosystem, having declined from its original extent on the Swan Coastal Plain by approximately 50-60% (Pille Arnold *et al.* 2019; Threatened Species Scientific Committee 2016). Several threatened, priority and range-restricted invertebrates are known to be associated with *Banksia* woodlands, such as the graceful sun moth (*Synemon gratiosa*; (listed as P4 under BCA 2016, with a range of approximately 5000 km²; i.e. is a confirmed SRE) and millipedes in the genus *Antichiropus* (Threatened Species Scientific Committee 2016).

Table 1: Vegetation units at Lots 802 and 803 identified by Strategen-JBS&G (2020).

Vegetation type	Description
BaDdSc	<i>Banksia attenuata</i> and <i>B. menziesii</i> isolated low to mid woodland over <i>Xanthorrhoea preissii</i> , <i>Hakea prostrata</i> , <i>Hibbertia hypericoides</i> , <i>Daviesia divaricata</i> subsp. <i>divaricata</i> and <i>Grevillea vestita</i> subsp. <i>vestita</i> open mid heathland over <i>Thysanotus dichotomus</i> , <i>Scaevola canescens</i> , and <i>Ptilotus polystachyus</i> herbland.
BaXpHh	<i>Banksia attenuata</i> and <i>B. menziesii</i> low woodland with some areas of <i>Eucalyptus marginata</i> mid open woodland over <i>Xanthorrhoea preissii</i> , with scattered <i>Macrozamia riedlei</i> , <i>Hakea prostrata</i> and <i>Jacksonia furcellata</i> tall sparse to open shrubland over <i>Hibbertia hypericoides</i> , <i>Petrophile macrostachya</i> , <i>Daviesia nudiflora</i> var. <i>nudiflora</i> heathland.
BpTrJs	<i>Banksia prionotes</i> low woodland over <i>Templetonia retusa</i> sparse mid shrubland over <i>Jacksonia sericea</i> , <i>Daviesia nudiflora</i> subsp. <i>nudiflora</i> and <i>Avena barbata</i> mixed open heathland/ tussock grassland.
BpXpAn	Woodland of <i>Banksia prionotes</i> over open shrubland of <i>Xanthorrhoea preissii</i> , <i>Grevillea vestita</i> and <i>Stirlingia latifolia</i> over open herbland of <i>Alexgeorgea nitens</i> , <i>Mesomelaena pseudostygia</i> and <i>Corynotheca micrantha</i> with occasional <i>Eucalyptus marginata</i> and <i>Banksia menziesii</i> .
GvCm	Open shrubland of <i>Grevillea vestita</i> with occasional <i>Macrozamia riedlei</i> and <i>Xanthorrhoea preissii</i> over closed herbland of <i>Corynotheca micrantha</i> , <i>Ehrharta calycina</i> and <i>Pelargonium capitatum</i> .
EmBmXp	Open woodland of <i>Eucalyptus marginata</i> , <i>Banksia menziesii</i> and <i>Banksia attenuata</i> over open shrubland of <i>Xanthorrhoea preissii</i> , <i>Calytrix fraseri</i> and <i>Gastrolobium capitatum</i> over open herbland of <i>Patersonia occidentalis</i> , <i>Tetraria octandra</i> and <i>Desmocladus flexuosus</i> .
EcJfBm	Closed grassland of <i>Ehrharta calycina</i> with emergent <i>Jacksonia furcellata</i> and <i>Banksia menziesii</i> .

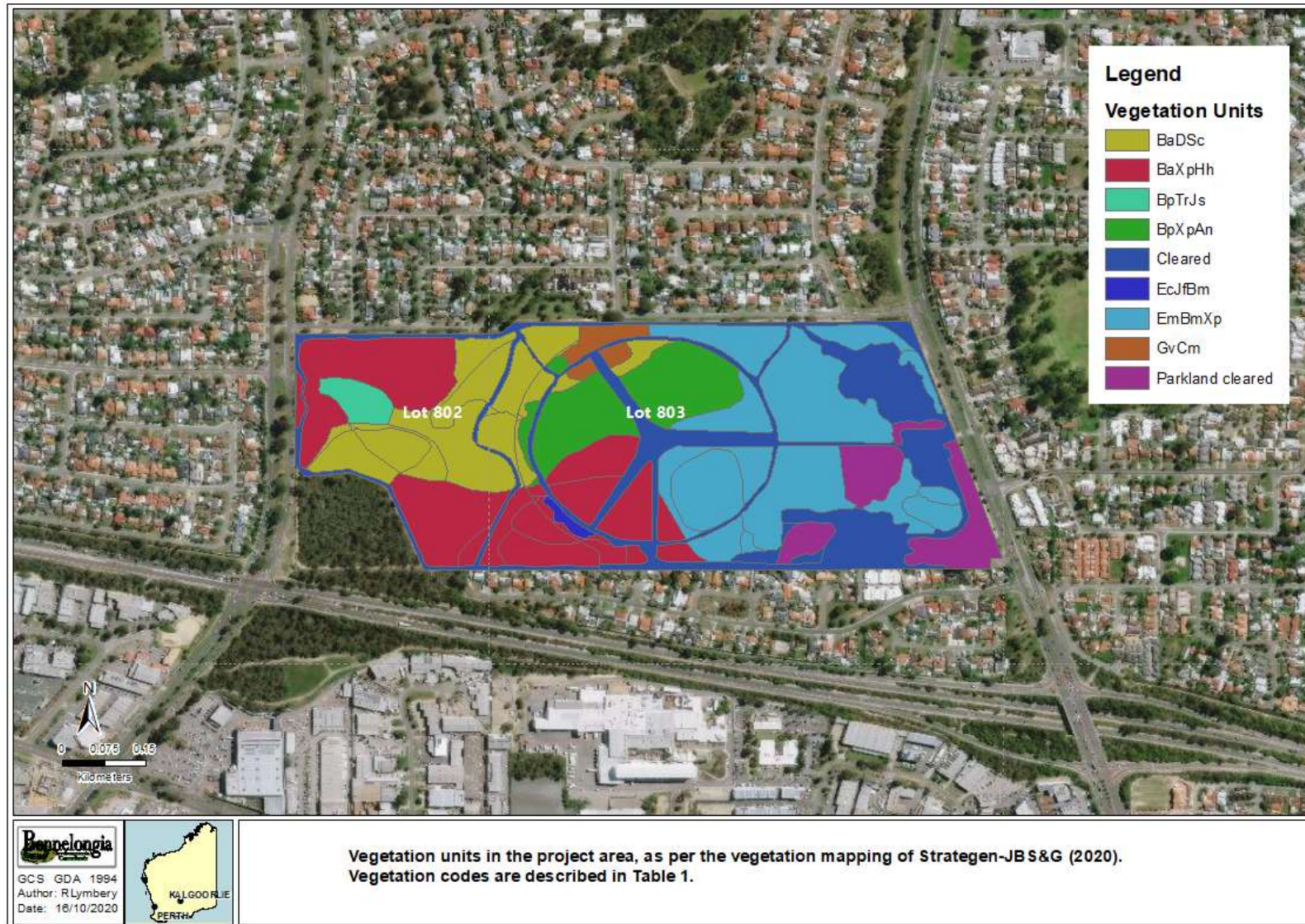


Figure 3: Vegetation units in the project area, as per the vegetation mapping of Strategen-JBS&G (2020). Vegetation codes are described in Table 1.

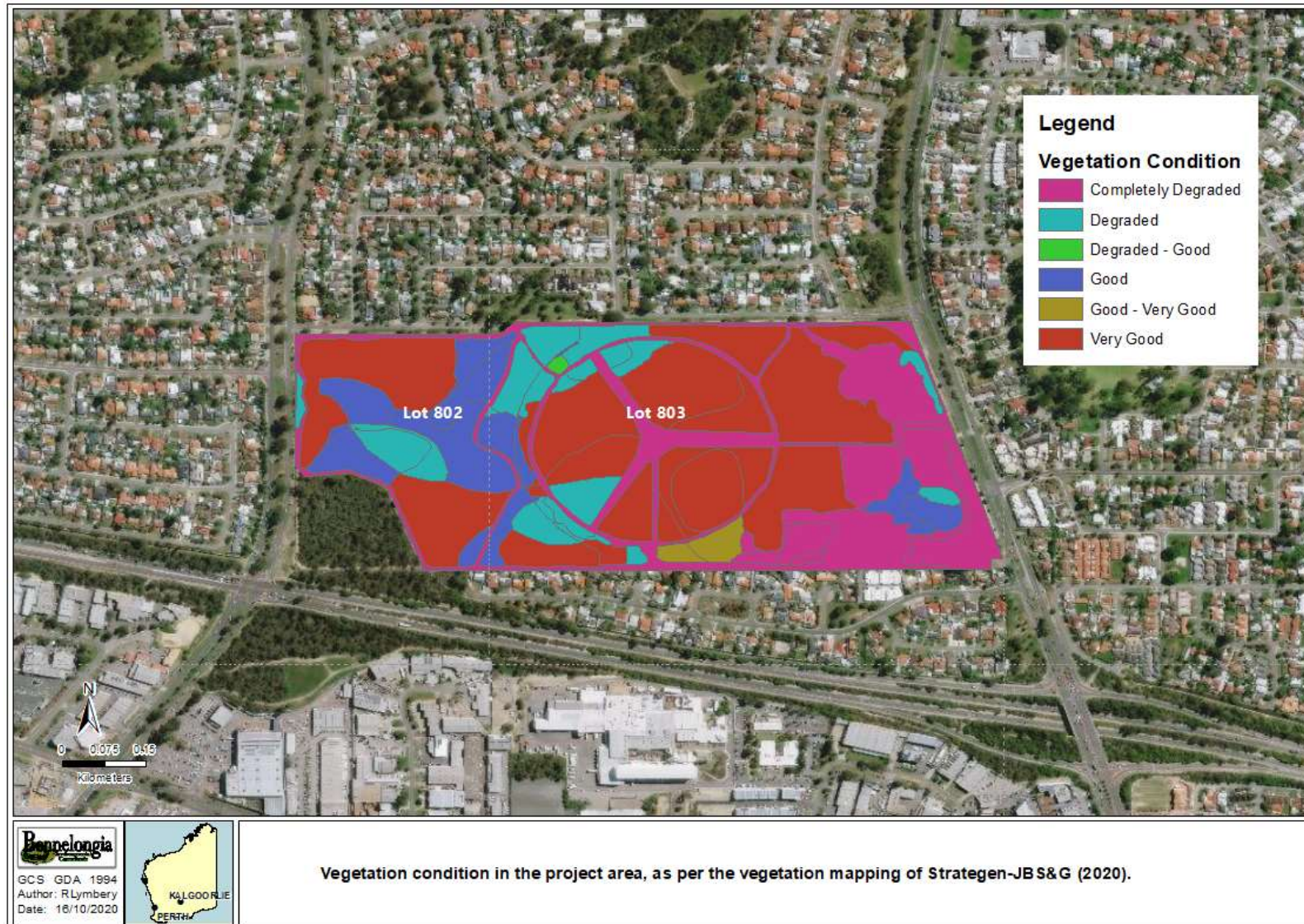


Figure 4: Vegetation condition in the project area, as per the vegetation mapping of Strategen-JBS&G (2020).

4. DESKTOP SURVEY METHODS AND RESULTS

Previous records of terrestrial invertebrate species were collated from Bennelongia and Western Australian Museum (WAM) databases, along with published taxonomic literature, from a search area that extended 50km north and south of the Project, bordered on the east by the Darling Scarp and on the west by the Indian Ocean (decimal degrees search area, top left: -31.4°S:115.5°E, bottom right -32.3°S:116.3°E). The Darling Scarp was excluded from the search area, as it is topographically and geologically distinct from the Swan Coastal Plain, and likely to contain many habitats and species that are not representative of the latter. We first determined whether any invertebrates recorded in the search area were listed as Threatened or Priority species. For the remaining species, we applied the criteria outlined above (Section 2.2.) to identify *confirmed* or *potential SREs*, separately for SRE Group and non-SRE Group species. Many of the records were higher order identifications for which the species had not been determined; these were retained in the final list only if there were no other species-level identifications within the same taxonomic group.

4.1. Listed Threatened Invertebrates in the Search Area

The desktop search identified eight listed invertebrate species within the 50 km search area (Table 2; Figures 5 and 6): two Priority mygalomorph spiders, one Priority midge, two Priority bees and three Threatened bees (*Leioproctus douglasiellus*, *Neopasiphae simplicior*, and *Hesperocolletes douglasi*). Several of these species have been found in bushland remnants in Perth that resemble the Project area habitat.

Table 2: Listed Threatened and Priority terrestrial invertebrates in the 50 km search area.

Higher Classification	Lowest Identification	BCA (2016) Status	EPBC (1999) Status	Presence of habitat in Project area	Likelihood of occurrence in Project area
Arthropoda					
Araneae					
Chelicerata					
Arachnida					
Mygalomorphae					
Idiopidae	<i>Euoplos inornatus</i>	P3		Yes	Moderate
	<i>Idiosoma sigillatum</i>	P3		Yes	High
Myriapoda					
Diptera					
Ceratopogonidae	<i>Austroconops mcmillani</i>	P2		Yes	Low
Hexapoda					
Insecta					
Hymenoptera					
Colletidae	<i>Hesperocolletes douglasi</i>	CR		Yes	Low-Moderate
	<i>Hylaeus globuliferus</i>	P3		Yes	Moderate
	<i>Leioproctus contrarius</i>	P3		Yes	Moderate
	<i>Leioproctus douglasiellus</i>	EN	CR	Yes	Moderate
	<i>Neopasiphae simplicior</i>	EN	CR	Yes	Low

Euoplos inornatus

The spider *Euoplos inornatus* occurs mostly on the western Darling Scarp, where it appears to prefer riparian habitats in jarrah forest (Rix *et al.* 2017b). However, there are two outlying populations in Perth that have been identified as *E. inornatus* based on morphological characters. The records in Perth occur some distance from the Project, in Kings Park and the Mount Henry Peninsula (Figure 6); however, these

populations are likely to be in *Banksia* woodland habitats similar to those in the Project area (Threatened Species Scientific Committee 2016).

Idiosoma sigillatum

The spider *Idiosoma sigillatum* is the most commonly recorded of the listed species within the 50 km search area (Figure 5). This species builds its burrows in leaf litter on sandy soils; it has become locally extinct across much of its former range, but populations still occur in some bushland fragments in Perth (Rix *et al.* 2017a; Rix *et al.* 2017b). This species has also been recorded in habitat fragments in the close vicinity of the Project (Figure 5).

Austroconops mcmillani

The biting midge *Austroconops mcmillani* is one of only two extant species in a relictual Cretaceous genus (Borkent and Craig 2004). Recorded populations in the Perth area are some distance from the Project, with the nearest records being in Yanchep National Park north of Perth (Figure 5). This species is considered likely to occur in *Banksia* woodland of the Swan Coastal Plain by the Threatened Species Scientific Committee (2016). However, this species is dependent on aquatic habitats for its larval stages and is therefore unlikely to occur within the Project area where there are no surface water features.

Hesperocolletes douglasi

Douglas' broad-headed bee, *H. douglasi*, was until recently known only from Rottnest Island. However, Pille Arnold *et al.* (2019) found a second specimen from remnant *Banksia* woodland of the northern Perth area (Figure 6). It is currently unclear whether it occurs in other *Banksia* woodland fragments in the metropolitan area.

Hylaeus globuliferus

The Priority 3 bee *Hylaeus globuliferus* occurs throughout southwestern Australia, with the records in the 50 km search area occurring in bushland remnants of northern Perth (Figure 6). This species appears to be a Proteaceae specialist (Houston 2018), relying on plants such as the *Banksia* species that occur in the Project area.

Leioproctus contrarius

The short-tongued bee *Leioproctus contrarius* is known only from the SCP, where it is a likely inhabitant of *Banksia* woodland fragment (Threatened Species Scientific Committee 2016). Records have typically been associated with host plants of the family Goodeniaceae, and it may be a specialist of *Leshcenaultia* flowers (Houston 2018). Species of *Leshcenaultia* were not recorded in the vegetation survey of the Project area, however other members of the family Goodeniaceae were, such as *Scaevola canescens*.

Leioproctus douglasiellus

Similar to its congener, *Leioproctus contrarius*, the threatened bee *L. douglasiellus* has only been recorded from the Swan Coastal Plain and is a likely inhabitant of *Banksia* woodlands (Threatened Species Scientific Committee 2016). It has also been recorded on host plants within Goodeniaceae (DSEWPC 2013), although it is currently unclear whether it is a specialist of particular species/genera.

Neopasiphae simplicior

The threatened bee *Neopasiphae simplicior* is known only from a single location at Forrestdale Lake, where it has been collected on flowers of *Goodeni*, *Lobelia*, *Angianthus* and *Velleia* (DEWHA 2008). The Threatened Species Scientific Committee (2016) considers it a likely inhabitant of *Banksia* woodland communities on the SCP; however, the only known location of this species is not in the vicinity of the Project.

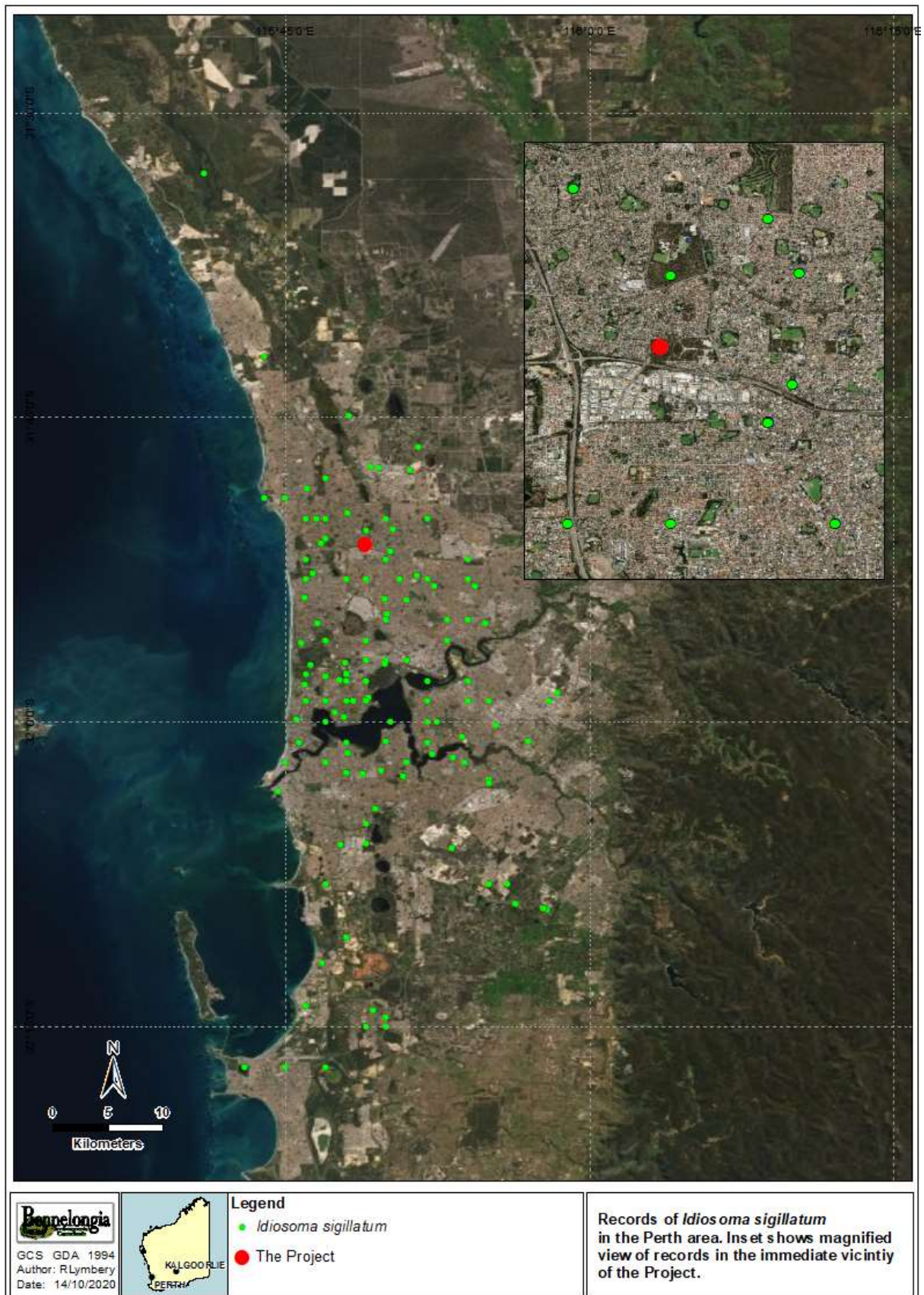


Figure 5: Records of *Idiosoma sigillatum* in the Perth area. Inset shows magnified view of records in the immediate vicinity of the Project.

4.2. SRE Invertebrates in the Search Area

4.2.1. SRE Group Species

Using the WAM and Bennelongia databases, we recognized 138 species from SRE Groups (see Section 2.2) with known or potential ranges of <10,000 km² (full species list is provided in Appendix 3). Of these, three species were considered *confirmed SREs*; the anapid spiders *Raveniella arenacea* and *R. subcirrata*, and the millipede *Antichiropus whistleri*, all of which are endemic to the Swan Coastal Plain (Car *et al.* 2013; Rix *et al.* 2010). Of the species assigned as *potential SREs*, 132 were considered *likely potential SREs* (39 of these were 'likely' by default due to lack of data) and 9 were considered *unlikely potential SREs*. Below, we briefly outline the results for each group, with some comments on likely habitats in comparison to the Project area where this information is available. We note that given the large number of potential SRE species in the 50 km search area, it is only possible to make general comments on habitat requirements for most groups.

Araneomorph (modern) spiders

A total of 51 *potential* or *confirmed SRE* species were recorded from diverse groups of ground-dwelling modern spiders (14 families represented in total), with the highest species richness recorded among goblin spiders, jumping spiders, tangle-web spiders and ant spiders. Many species are endemic to the Swan Coastal Plain and/or appear restricted to remnant bushland habitats that resemble those in the Project area. For example, the micropholcommatid spiders *Raveniella arenacea* and *R. subcirrata* are *confirmed SREs* that are found only in leaf litter habitats of Quindalup dune systems (Rix *et al.* 2010). Similarly, several species of jumping spiders in the genera *Lycidas* and *Maratus* are litter dwellers of forest habitats (including *Banksia* and jarrah woodlands such as those of the Project area), and/or have only been recorded from coastal distributions of the Perth area (Richardson *et al.* 2006; Waldock 2013).

Mygalomorph (trapdoor) spiders

We identified 37 *potential SRE* species of mygalomorph spiders from five families in the search area, with particularly high numbers of species within Anamididae (previously a subfamily of Nemesiidae; Opatova *et al.* 2020), Barychelidae and Idiopidae. Trapdoor spiders are well-known to be likely candidates for SRE status, given their sedentary behaviour (often building permanent burrows), specialised preferences for relictual leaf litter habitats, long lifespans and slow generation times (Main 2001). While many of the trapdoor spider records in this desktop assessment are undescribed or morphological species assignments (Appendix 3), they fall within genera known to contain many restricted species, such as *Missulena*, *Aname*, *Teyl* and *Idiosoma* (Harvey *et al.* 2012; Main 1985; Miglio *et al.* 2014; Rix *et al.* 2018). Trapdoor spider communities are known to occur in *Banksia* woodland habitats similar to those of the Project area (Mason *et al.* 2019; Mason *et al.* 2018; Rix *et al.* 2018).

Opiliones (harvestmen)

Two *potential SRE* species of harvestmen were recorded from the families Neopilionidae and Triaenonychidae. These were undescribed species of *Megalopsalis* and *Nunciella*, considered *likely potential SREs* due to data deficiency. While harvestmen may represent good SRE candidates due to limited dispersal capability and specialised microhabitat requirements (Framenau *et al.* 2008), the likely distributions of these two species cannot be determined without further taxonomic information. In relation to the specific habitats within the Project area, it is currently unclear whether species of harvestmen within *Megalopsalis* or *Nunciella* have any association with *Banksia* woodland, although there are records of the genera from Perth jarrah habitats (e.g. Koch and Majer 1980).

Pseudoscorpions

Six *potential SRE* species of pseudoscorpions were recorded from four families in the search area. As for the harvestmen species above, these were all uncertain or morphological species identifications, and it is therefore difficult to determine their likely ranges. However, several of the species are from groups (e.g. Chernetidae, Garypidae) known to contain other species with restricted ranges and specialised

habitat preferences, such as within leaf bases of *Xanthorrhoea preissii* (Harvey 2018), which occur in several vegetation units of the Project area (Table 1).

Scorpions

Three species of scorpions in the search area, from the families Buthidae and Urodacidae, were identified as *potential SREs*. Two of these were undescribed species of *Lychas* (provisionally '*majera*' and '*majerorum*') and were considered *likely potential SREs* by default due to data deficiency. The described species was *Urodacus planimanus*, which is only known from southwest Western Australia (Koch 1977; Volschenk *et al.* 2012). A relatively rich non-SRE scorpion fauna occurs in the broader Perth area (Smith 1995). Many species, including *U. planimanus*, are likely to prefer rock outcroppings on slopes of the Darling Scarp rather than the more topographically uniform metropolitan area (Koch 1978).

Isopods (slaters)

Fourteen slater species within the search area were considered *potential SREs*; these were from three families (Armadillidae, Philosciidea and Styloniscidae), along with an undescribed ligiamorph. Several of these are morphospecies of *Buddelundia* and Philosciidae known from soil, leaf litter and log microhabitats in bushland remnants on sandy soils of the Swan Coastal Plain (Judd 2004). It is uncertain whether these isopod groups are associated with *Banksia* woodland, but jarrah (which occurs in some vegetation units in the Project area) appears to be an important component of many prospective habitats for such species (Judd 2004).

Chilopods (centipedes)

Three species of centipede within the search area were considered *potential SREs*, one each from the families Chilenophilidae (*Eurytion incisunguis*), Cryptopidae (unknown *Cryptops* species) and Scolopendridae (*Notiasemus glauerti*). *Eurytion incisunguis* and *N. glauerti* are known only from the Perth area and considered *likely potential SREs*. Little is known about the habitat requirements of these two described species, although *N. glauerti* has been collected from locations across Perth containing remnant bushland likely to resemble that of the Project area (Koch 1985). There is limited information on *Cryptops* species in Perth, but the only described species in southwestern Australia (*C. australis*) also occurs in eastern Australia; we therefore consider the unknown *Cryptops* species an *unlikely potential SRE*.

Diplopods (millipedes)

We identified 14 species of millipedes within the search area as *potential SREs*, primarily polydesmids in the family Paradoxosomatidae, but also an unidentified species from the family Siphonotidae and two species from the family Iulomorphidae (*Dinocambala ingens* and *Podykipus collinus*). The two iulomorphid species are both restricted to the Perth area and considered *likely potential SREs* (Edward and Harvey 2010; Framenau *et al.* 2008), but *D. ingens* is restricted to the Darling Scarp and thus unlikely to occur in the Project area. The recorded polydesmids are all from the genus *Antichiropus*, including the *confirmed SRE* species *A. whistleri*; most known species in this genus have restricted ranges due to an inability to tolerate open, unvegetated areas away from protected microhabitats (Framenau *et al.* 2008). Several species in the genus, including *A. whistleri*, are restricted to bushland remnants on the SCP that resemble the Project area habitat (Car *et al.* 2013).

Gastropods (land snails)

Six species of *potential SRE* snails were recorded in the search area, from the families Bothriembryontidae, Charopidae, Hygromidae, Punctidae and Succineidae. *Bothriembryon* species (three in the search area) are typically limited to cool, moist microhabitats in coastal southwestern WA (Whisson 2019), and many are considered SREs (Framenau *et al.* 2008). In terms of the specific habitat of the Project area, several *Bothriembryon* species are known to inhabit *Banksia*-jarrah woodlands on sandy soils (Whisson and Ryan 2019). The charopid species (*Epinicium restifer* and *Luinodiscus sublestsa*) are from a group of primarily leaf litter dwellers in refugial damp woodland patches (Shea *et al.* 2012), and both the recorded species are known only from the Perth area. Similarly, *Succinea contenta* has only been recorded in the Perth area and Rottnest Island.

4.2.2. Non-SRE Group Species

Fourteen potentially range-restricted species were recorded from non-SRE groups (Appendix 4). Of these, 12 were considered *likely potential SREs* (seven species were assigned to this category due to data deficiency) and two were considered *unlikely potential SREs*. The bulk of potential SREs from non-SRE groups were beetles (families Boganiidae, Buprestidae, Carabidae and Tenebrionidae), although there was also one hemipteran from the family Cixiidae, four bees from the family Colletidae, and one bush cricket from the family Tettigoniidae.

Many of the non-SRE Group species reported here, particularly the beetles, have been recorded only in the Perth area but have poorly-defined taxonomy and sampling; it is therefore unclear whether they are truly range-restricted or would be found more widely under a larger sampling effort. Some of the better-defined species in this list appear to be tied to specialised habitats. For example, the boganiid beetle *Paracucujus rostratus* is closely associated with flowers of *Macrozamia ridlei* in southwest jarrah forests (Escalona *et al.* 2015), which matches vegetation type BaXpHh recorded in the Project area (Table 1; Figure 3; Strategen-JBS&G 2020). Additionally, several of the bee records are from genera that contain species endemic to the Swan Coastal Plain, such as *Euhesma* and *Leioproctus*.

4.3. Assessment of potential impacts to listed and SRE invertebrates

Two types of impacts on faunal communities are typically associated with development projects: *primary impacts*, through activities (mainly land clearing) that result in complete loss of habitat; and *secondary impacts*, that result in degradation of habitat rather than complete loss, for example through vehicle movements (and associated vibrations and/or dust), weed encroachment, and clearing of small areas and infrastructure corridors (causing fragmentation and edge effects). Primary impacts can either cause extinction of local populations, if all habitat within a local area is cleared, or species extinction if species have a range restricted to the development envelope. Secondary impacts are unlikely to cause extinction of either species or local populations, however they can cause reductions in population size.

The overall risk posed by development projects can be assessed through a combination of the likelihood of occurrence of significant species, their known ranges relative to project envelopes, and the likely consequences of potential impact types.

For this desktop assessment, the estimates of risks posed to SRE and listed terrestrial invertebrates by the Project are necessarily imprecise; a very large number of potential SRE species have been recorded in the 50 km search area on the SCP, and it cannot be determined with accuracy how many of these will occur within the specific Project area. While many individual species may have a low likelihood of occurring within the Project area, some species are very likely to be found in *Banksia*-jarrah remnants like the Project area habitat, such as some trapdoor spiders, jumping spiders, and *Bothriembryon* snails. Therefore, the overall likelihood that *at least one* of the potential SRE species occurs within the project area is high.

Similarly, the listed threatened and priority species in the 50 km search area vary in their likelihood of occurrence at the Project itself. Some species are unlikely to occur within the specific Project area, such as *Austroconops mcmillani*, which depends on surface water for larvae, and *Hesperocolletes douglasi*, which has only been collected at two locations a considerable distance from the Project. On the other hand, the spider *Idiosoma sigillatum* is considered to have a high likelihood of occurring in the Project area, as it has been collected in bushland in close proximity to the Project. The spider *Euoplos inornatus* and the bees *Hylaeus globuliferus*, *Leioproctus contrarius* and *L. douglasiellus* are all considered to have a moderate likelihood of occurring in the Project area, due to the suitability of *Banksia* woodland habitat for these species.

The consequences of the proposed rezoning for any species that do occur within the project area are also difficult to assess, due to a lack of information on specific habitat requirements for many of the species. Lot 802, the site of the proposed rezoning, contains the majority of vegetation type BaDdSc at

the Project (although a small amount also occurs in the northeast corner of Lot 803) and approximately half of the extent of vegetation type BaXpHh at the Project. Both vegetation types represent *Banksia attenuata* and *B. menziesii* low woodland over shrub and heathland characterised by *Xanthorrhoea preissii*, *Hakia prostrata*, *Hibbertia hypercoides* and *Davesia* spp. BaDdSc is the only vegetation type containing *Scaevola canescens* from the family Goodeniaceae, which could be a prospective host plant for some of the listed bee species. BaXpHh also contains *Macrozamia riedlei*, which has been associated with some habitat specialist invertebrates in the 50km search area such as the boganiid *Paracucujus rostratus*. If any invertebrate species are closely associated with these vegetation types, the proposed rezoning could substantially reduce and/or fragment the extent of habitat at the Project; although approximately half of BaXpHh extends into Lot 803.

Additionally, vegetation type BpTrJs within the Project area only occurs within a small patch at Lot 802 and does not extend into Lot 803. This represents *Banksia prionotes* woodland over *Templetonia retusa* shrubland and open heathland/tussock grassland. A future development in line with the proposed rezoning would remove this habitat type from the Project area. It is unknown whether any of the listed or potential SRE species in the 50 km search area have particular associations with the plant communities in this vegetation type.

A potential secondary impact of the proposed rezoning is fragmentation that disrupts the connectivity of the Project area vegetation with the remnant bushland southwest bordering Erindale Road and Reid Highway, at the southwest corner of Lot 802. However, the remnant bushland bordering Erindale Road and Reid Highway is itself under proposal for clearing and development as part of an intersection upgrade. Therefore, the connection of the roadside vegetation to Lot 802 is unlikely to represent future value for SREs.

In summary, the level of threat posed to terrestrial invertebrates by the proposed rezoning could range from low to high, depending on whether any of the listed or potential SRE species do occur in the Project area, and whether they are dependent upon the specific habitat types within Lot 802.

5. CONCLUSIONS

The Project area, including the site of planned rezoning at Lot 802, features several habitat types that could be suitable for SRE species. The vegetation is broadly composed of a *Banksia*-jarrah woodland remnant; similar woodland remnants in southwestern Australia are known to contain a range of microhabitats that harbour range-restricted invertebrates, including bark, leaf litter beds, soil humus and large debris. Further, *Banksia* woodlands (which particularly dominate Lot 802) typically support communities on the Swan Coastal Plain, and their former extent has been considerably fragmented. Several range-restricted invertebrates are associated with *Banksia* woodlands of the Swan Coastal Plain, such as SRE millipedes of the genus *Antichiropus*. The vegetation at the Project also includes some plant species endemic to the region, which may be associated with host-specific invertebrates (for example *Macrozamia riedlei*).

The desktop assessment identified eight Threatened or Priority listed terrestrial invertebrate species within the 50 km search area; two mygalomorph spiders, one millipede and five native bees. Several of these species have been found in Perth bushland remnants similar to the Project area; notably, the trapdoor spider *Idiosoma sigillatum*, which builds its burrows in leaf litter on sandy soils, has been recorded in bushland remnants in the close vicinity of the Project area. The assessment also identified a high diversity of potential SRE species within the search area, with 138 species from SRE groups with known or potential ranges of <10,000 km², including spiders (51 species of modern spiders, 37 species of trapdoor spiders), harvestmen (two species), pseudoscorpions (six species), scorpions (three species), slaters (14 species), centipedes (three species), millipedes (14 species) and land snails (six species). Many of these species are endemic to bushland remnants on the Swan Coastal Plain that resemble the Project area habitat. While it is possible that the exact number of SRE Group species has been inflated due to

taxonomic uncertainty and informal species assignments, it is clear that a diverse community of potentially restricted species occurs within the search area and may occur within the Project. There were also 14 potentially range-restricted species from non-SRE groups in the search area, including beetles (eight species), hemipterans (one species), bees (four species) and bush crickets (one species). Most of these 14 species from non-SRE groups have poorly defined taxonomy and sampling, and it therefore remains to be determined whether they are truly range-restricted.

It is unclear from existing records what species occur in the Project area. However, the records from the broad search area show that a rich fauna of potential SRE species occurs on the Swan Coastal Plain, with many of the species likely to occur in the habitat of the Project. In addition, some species listed for conservation reasons may possibly occur in the Project. Some of these listed species belong to SRE Groups, while others are range restricted species belonging to non-SRE Groups. The level of threat posed to terrestrial invertebrates by the proposed rezoning is somewhere between low to high, depending on whether listed or potential SRE species occur in the Project area, and whether these species are dependent upon the habitat types within Lot 802.

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7. APPENDICES

Appendix 1 – Threatened and Priority Species Categories

Western Australia – Biodiversity Conservation Act (2016)

The following is reproduced from:

Department of Biodiversity, Conservation and Attractions. *Conservation Codes for Western Australian Flora and Fauna*. Available at: <https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation%20code%20definitions.pdf> (Accessed 14 October 2020).

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.

- CR, 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”.
- EN, 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”.
- VU, 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”.

Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

- P1: 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.
- P2: 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.

- **P3:** 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.
- **P4:** (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.

Australia – Environmental Protection and Biodiversity Conservation Act 1999

Listing of species under the EPBCA 1999 is based on the IUCN Red List categories and criteria for threatened species listing. In addition to the categories Extinct (EX) and Extinct in the Wild (EW), these include:

- **CR, Critically Endangered:** Considered to be facing an extremely high risk of extinction in the wild
- **EN, Endangered:** Considered to be facing a very high risk of extinction in the wild.
- **VU, Vulnerable:** Considered to be facing a high risk of extinction in the wild.

These considerations are based on the criteria set out in:

IUCN (2000) *IUCN Red List and Criteria, V 3.1*. Available at http://s3.amazonaws.com/iucnredlist-newcms/staging/public/attachments/3097/redlist_cats_crit_en.pdf (Accessed 14 October 2020).

Additionally, under the EPBCA 1999 species in Australia can be listed under the category Conservation Dependent, if:

- (a) 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; or
- (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

For more information, see:

Threatened Species Scientific Committee (2014) *Guidelines for assessing the conservation status of a native species*. Available at <https://www.environment.gov.au/system/files/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2020.pdf> (Accessed 14 October 2020).

Appendix 2 – Western Australian Museum SRE Classification System

Confirmed SREs are species with well understood taxonomy that are well represented in collections or come from areas that have been well sampled and have a known distribution range <10,000 km².

Potential SREs are species that belong to genus or other taxonomic grouping for which there are gaps in our knowledge, either because the taxon is not well represented in collections, taxonomic knowledge is incomplete, or species distributions are imperfectly understood because sampling has been patchy.

Widespread (not SRE) species have a known distribution range >10,000 km². The taxonomy of the species is well understood and it is well represented in collections.

The WAM uses five further sub-categories if a species is determined to be a "Potential SRE". These relate to the reasons for treating a species as a Potential SRE:

1. Data deficient: This is a precautionary sub-category because classification because the species is treated as a Potential SRE because there are insufficient data available to determine SRE status, either because there is a lack of geographic and taxonomic information, or because the individuals sampled cannot be identified to species level (e.g. wrong sex, juvenile, damaged);
2. Habitat Indicators: Here and in the following sub-categories, there is some evidence available from which the likely SRE status of the species may be inferred. For example, habitat indicators may suggest a species is likely to be an SRE because of its association with a particular habitat;
3. Morphological Indicators: The likely SRE status of a species may be determined through its morphological characteristics;
4. Molecular Evidence: DNA sequence data reveal patterns congruent with the species being an SRE; and
5. Research & Expertise: Available research data and/or WAM expertise may provide the basis for considering a species likely to be an SRE.

Appendix 3 – All Confirmed and Potential SREs Species from SRE Groups in the Search Area

*Species marked with an asterisk under the SRE category column were data deficient and assigned as *likely potential SREs* by default (see Section 2.2).

Higher Classification	Lowest Identification	SRE category
Arthropoda		
Chelicerata		
Arachnida		
Araneae		
Araneomorphae		
Anapidae	<i>Micropholcomma`sp.`</i>	Likely potential SRE
	<i>Raveniella arenacea</i>	Confirmed SRE
	<i>Raveniella subcirrata</i>	Confirmed SRE
Araneidae	<i>Paralarinia`sp.`</i>	Likely potential SRE*
Hersiliidae	<i>Tamopsis darlingtoniana</i>	Likely potential SRE*
Lamponidae	<i>Pseudolampona woodman</i>	Likely potential SRE
Lycosidae	<i>Artoria`sp.`</i>	Unlikely potential SRE
Malkaridae	<i>Westrarchaea sinuosa</i>	Likely potential SRE
Miturgidae	<i>`Miturgopelma`echidna`</i>	Unlikely potential SRE
Oonopidae	<i>Opopaea framenau</i>	Likely potential SRE*
	<i>Opopaea gracillima</i>	Likely potential SRE*
	<i>Opopaea marangaroo</i>	Likely potential SRE*
	<i>Opopaea rixi</i>	Likely potential SRE*
	<i>Orchestina`aeroporta`</i>	Likely potential SRE*
	<i>Xestaspis`UBS Cat sp. 128`</i>	Likely potential SRE*
	<i>Xestaspis`UBS Cat sp. 19`</i>	Likely potential SRE*
Orsolobidae	<i>Tasmanoonops`forsteri`</i>	Likely potential SRE
	<i>Tasmanoonops`tuberosus`</i>	Likely potential SRE
Salticidae	<i>Holoplatys dejongi</i>	Likely potential SRE*
	<i>`Lycidas`big embolis`</i>	Likely potential SRE
	<i>Lycidas`Brookdale sp. 1`</i>	Likely potential SRE
	<i>Lycidas`gyngyn`</i>	Likely potential SRE
	<i>Maratus clupeatus</i>	Likely potential SRE
	<i>Maratus mungaich</i>	Likely potential SRE
	<i>Maratus`roo`</i>	Likely potential SRE*
	<i>Maratus`sp. O`</i>	Likely potential SRE*
	<i>Maratus speciosus</i>	Likely potential SRE
	<i>Maratus speculifer</i>	Likely potential SRE
	<i>Maratus spicatus</i>	Likely potential SRE
	<i>Proszynellus nasalis</i>	Likely potential SRE*
Theridiidae	<i>`Ctenopalpus`thaleri`</i>	Likely potential SRE*
	<i>`Diagnogala`molliventer`</i>	Likely potential SRE*
	<i>`Tremaulus`grayi`</i>	Likely potential SRE*
	<i>Billima attrita</i>	Likely potential SRE*
	<i>Enoplognatha`UBS Cat sp. 103`</i>	Unlikely potential SRE

Higher Classification	Lowest Identification	SRE category
	<i>Enoplognatha bidens</i>	Unlikely potential SRE
	<i>Phycosoma</i> `L1-complex`	Unlikely potential SRE
Thomisidae	<i>Xysticus periscelis</i>	Likely potential SRE*
Trochanteriidae	<i>Tinytrema yarra</i>	Likely potential SRE
Zodariidae	`Asteron grp` `sp. 1 (942)`	Likely potential SRE*
	`Australutica? Cat Gen.1` `UBS Cat sp. 2`	Likely potential SRE
	<i>Asteron</i> `species group`	Likely potential SRE*
	<i>Australutica</i> `Brookdale sp. 1`	Likely potential SRE*
	<i>Australutica</i> `UBS Cat sp. 119`	Likely potential SRE*
	<i>Chilumena</i> `sp. nov.`	Likely potential SRE*
	<i>Holasteron wamuseum</i>	Likely potential SRE
	<i>Masasteron tuart</i>	Likely potential SRE
	<i>Neostorena</i> `Brookdale sp. 1`	Likely potential SRE*
	<i>Neostorena</i> `sp. 2`	Likely potential SRE*
	<i>Neostorena</i> `UBS sp. 2`	Likely potential SRE*
	<i>Pentasteron</i> `sp. nov. 3`	Likely potential SRE*
Mygalomorphae		
Actinopodidae	<i>Missulena</i> `black chelicerae`	Likely potential SRE
	<i>Missulena</i> `hoggi spp. group`	Likely potential SRE
	<i>Missulena hoggi</i>	Likely potential SRE
Anamidae	`Chenistonia` `tepperi`	Likely potential SRE
	<i>Aname</i> `coastal plain`	Likely potential SRE
	<i>Aname</i> `false black wish-bone`	Likely potential SRE
	<i>Aname</i> `kwonkan spp. group.`	Likely potential SRE
	<i>Aname</i> `metropolitan`	Likely potential SRE
	<i>Aname</i> `MYG405`	Likely potential SRE
	<i>Aname</i> `MYG496`	Likely potential SRE
	<i>Aname</i> `MYG633`	Likely potential SRE
	<i>Aname</i> `sp. nov.`	Likely potential SRE
	<i>Aname</i> `UBS Cat sp. 126`	Likely potential SRE
	<i>Aname</i> `UBS sp. 2`	Likely potential SRE
	<i>Chenistonia</i> `maculata?`	Likely potential SRE
	<i>Kwonkan</i> `Cat sp. 126`	Likely potential SRE
	<i>Kwonkan</i> `MYG060`	Likely potential SRE
	<i>Kwonkan</i> `UBS Cat sp. 124`	Likely potential SRE
	<i>Kwonkan</i> `UBS Cat sp. 126`	Likely potential SRE
	<i>Proshermacha</i> `MYG449`	Likely potential SRE
	<i>Proshermacha</i> `MYG490`	Likely potential SRE
	<i>Proshermacha</i> `sp.`	Likely potential SRE
	<i>Teyl</i> `MYG249`	Likely potential SRE
	<i>Teyl</i> `UBS Cat sp. 149`	Likely potential SRE
	<i>Teyl</i> `waldockae`	Likely potential SRE
Barychelidae	<i>Idiommata</i> `cf. blackwalli`	Likely potential SRE
	<i>Idiommata</i> `UBS Cat sp. 123`	Likely potential SRE
	<i>Synothele michaelsoni</i>	Likely potential SRE
	<i>Synothele mullaloo</i>	Likely potential SRE

Higher Classification	Lowest Identification	SRE category
	<i>Synothele rastelloides</i>	Unlikely potential SRE
Euagridae	<i>Cethegus`sp.`</i>	Likely potential SRE
Idiopidae	<i>Gaius`villosus?`</i>	Likely potential SRE
	<i>Idiosoma`coastal plain sp.`</i>	Likely potential SRE
	<i>Idiosoma`MYG188`</i>	Likely potential SRE
	<i>Idiosoma`MYG189`</i>	Likely potential SRE
	<i>Idiosoma`rhapsiduca sp. group`</i>	Likely potential SRE
	<i>Idiosoma`sp. nov. nec (cf. rhapsiduca)`</i>	Likely potential SRE
Opiliones		
Neopilionidae	<i>Megalopsalis`sp.`</i>	Likely potential SRE*
Triaenonychidae	<i>Nunciella`sp. nov.`</i>	Likely potential SRE*
Pseudoscorpiones		
Chernetidae	<i>`Genus indet.``tarsus IV without tactile seta`</i>	Likely potential SRE
	<i>`PSEAAF`PSE130`</i>	Likely potential SRE
Chthoniidae	<i>Austrochthonius`similis`</i>	Likely potential SRE*
	<i>Austrochthonius`sp. nov. 4`</i>	Likely potential SRE*
Garypidae	<i>Synsphyronus`sp.`</i>	Likely potential SRE
Olpidae	<i>Beierolpium`sp.`</i>	Likely potential SRE
Scorpiones		
Buthidae	<i>Lychas`majeri`</i>	Likely potential SRE*
	<i>Lychas`majerorum`</i>	Likely potential SRE*
Urodacidae	<i>Urodacus planimanus</i>	Likely potential SRE
Crustacea		
Malacostraca		
Eumalacostrata		
Isopoda		
Ligiamorpha	<i>Ligiamorpha`sp.`</i>	Likely potential SRE
Armadillidae	<i>Armadillidae indet</i>	Likely potential SRE*
	<i>Buddelundia`sp. 3 (Judd 2002)`</i>	Likely potential SRE
	<i>Buddelundia`sp. 4 (Judd 2002)`</i>	Likely potential SRE
	<i>Buddelundia`sp. 7 (Judd 2002)`</i>	Likely potential SRE
	<i>Buddelundia cinerascens</i>	Likely potential SRE
	<i>Buddelundia inaequalis</i>	Likely potential SRE
	<i>Buddelundia indet.</i>	Likely potential SRE
	<i>Buddelundia nigripes</i>	Unlikely potential SRE
	<i>Cubaris`sp. 2 (Judd 2002)`</i>	Likely potential SRE
	<i>Spherillo`sp. 2 (Judd 2002)`</i>	Unlikely potential SRE
Philosciidae	<i>Philosciidae`sp. 1 (Judd 2002)`</i>	Likely potential SRE
	<i>Philosciidae`sp.`</i>	Likely potential SRE
Styloniscidae	<i>Styloniscidae`sp.`</i>	Likely potential SRE*
Myriapoda		
Chilopoda		
Geophilida	<i>Eurytion incisunguis</i>	Likely potential SRE
Chilenophilidae		
Scolopendrida		

Higher Classification	Lowest Identification	SRE category
Cryptopidae	<i>Cryptops`cf. australis`</i>	Unlikely potential SRE
Scolopendridae	<i>Notiasemus glauerti</i>	Likely potential SRE
Diplopoda		
Polydesmida		
Paradoxosomatidae	<i>Antichiropus`GI/UBS1, DIP082/DIP172`</i>	Likely potential SRE
	<i>Antichiropus`janine, DIP022`</i>	Likely potential SRE
	<i>Antichiropus`rotnnest, DIP172`</i>	Likely potential SRE
	<i>Antichiropus`sp.`</i>	Likely potential SRE
	<i>Antichiropus`UBS1/GI, DIP141`</i>	Likely potential SRE
	<i>Antichiropus`UBS2, disgregus, DIP126`</i>	Likely potential SRE
	<i>Antichiropus`UBS2`UBS2, disgregus, DIP126`</i>	Likely potential SRE
	<i>Antichiropus`UBS3, DIP127`</i>	Likely potential SRE
	<i>Antichiropus`woodvale, DIP167`</i>	Likely potential SRE
	<i>Antichiropus accinctus DIP126`</i>	Likely potential SRE
	<i>Antichiropus whistleri</i>	Confirmed SRE
Polyzoniida		
Siphonotidae	<i>`Genus indet.``sp.`</i>	Likely potential SRE
Spirostreptida		
Iulomorphidae	<i>Dinocambala ingens</i>	Likely potential SRE
	<i>Podykipus collinus</i>	Likely potential SRE
Mollusca		
Gastropoda		
Stylommatophora		
Bothriembryontidae	<i>Bothriembryon cf. bulla</i>	Likely potential SRE
	<i>Bothriembryon kendricki</i>	Likely potential SRE
Charopidae	<i>Epinicium restifer</i>	Likely potential SRE
	<i>Luinodiscus sublesta</i>	Likely potential SRE
Hygromidae	<i>Hygromidae sp.</i>	Likely potential SRE*
Punctidae	<i>Westralaoma sp.</i>	Likely potential SRE*
Succineidae	<i>Succinea contenta</i>	Likely potential SRE

Appendix 4 – Potential SREs Species from non-SRE Groups in the Search Area

*Species marked with an asterisk under the SRE category column were data deficient and assigned as *likely potential SREs* by default (see Section 2.2).

Higher Classification	Lowest Identification	SRE category
Arthropoda		
Hexapoda		
Insecta		
Coleoptera		
Boganiidae	<i>Boganiidae`sp.`</i>	Likely potential SRE*
	<i>Paracucujus rostratus</i>	Likely potential SRE
Buprestidae	<i>Agrilus kangaroo</i>	Likely potential SRE*
	<i>Cisseis speciosa</i>	Likely potential SRE*
Carabidae	<i>Amblytelus rugosifrons</i>	Likely potential SRE
	<i>Gnathoxys pannuceus</i>	Likely potential SRE*
	<i>Neonomius`sp.`</i>	Likely potential SRE
Tenebrionidae	<i>Doyenia crematogastris</i>	Likely potential SRE*
Hemiptera		
Cixiidae	<i>Leades rufinus</i>	Likely potential SRE*
Hymenoptera		
Colletidae	<i>Euhesma`sp.`</i>	Likely potential SRE
	<i>Leioproctus`sp.`</i>	Likely potential SRE
	<i>Paracolletes`sp.`</i>	Likely potential SRE*
	<i>Trichocolletes`sp.`</i>	Unlikely potential SRE
Orthoptera		
Tettigoniidae	<i>Caedicia longipennis</i>	Unlikely potential SRE