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Short-range endemic fauna at the Medcalf Project

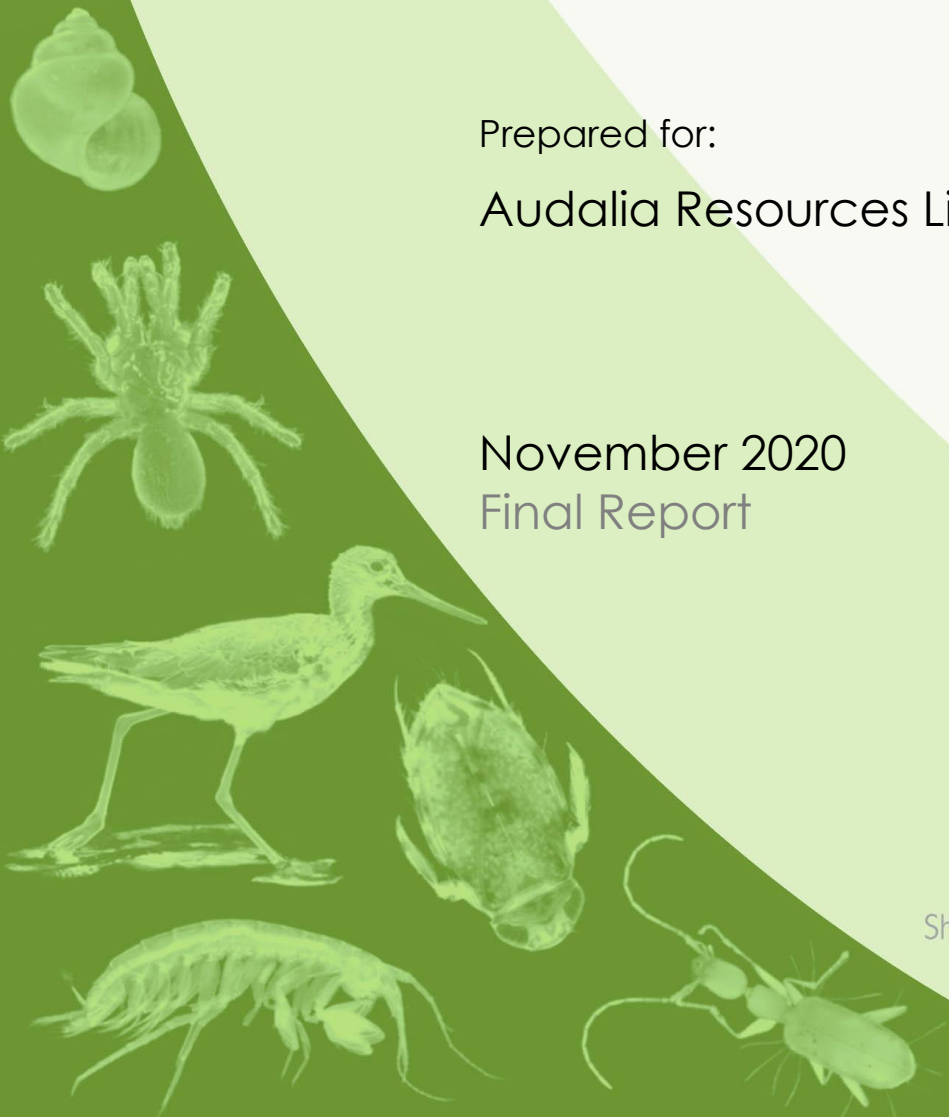
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Audalia Resources Limited

November 2020
Final Report

Short-Range Endemics | Subterranean Fauna

Waterbirds | Wetlands



Short-range endemic fauna at the Medcalf Project

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EXECUTIVE SUMMARY

Audalia Resources Limited proposes to develop the Medcalf Project ('the Project') in the Goldfields-Esperance region of Western Australia. This report presents the results of a desktop review of habitat information and relevant biological records to appraise the values of short-range endemic (SRE) invertebrate fauna in the Project and surrounds.

A desktop search within a radius of 50 km from the approximate Project centroid revealed that at least 34 species belonging to SRE groups have been recorded in the search area, including 12 species of spider, two species of pseudoscorpion, two species of scorpion, six species of centipede, four species of millipede, two species of tiger beetle, three species of slater, and three species of land snail. Most of these records are either not identified to species level or represent specimens recognised as new undescribed species. The remaining nine species are described, but with poorly known distributions, and except for *Pilbarascutigera cf. incola*, they are only known from one or few locations in the search area.

The listed species *Ogyris subterrestris petrina*, *Jalmenus aridus* (both butterflies) and the trapdoor spider *Idiosoma intermedium* could also occur in the vicinity of the project, but they have never been recorded in the search area.

There is a substantial taxonomic uncertainty in the identifications of the records captured in the desktop search, but a diverse community of potentially restricted species clearly occurs within the broad region of the Project. Given the small size of the tenements and the proposed pits, it is unlikely that any SRE species will be restricted to the project area, and even less likely that an SRE species occurs only within the impact footprint. Nevertheless, without conducting an appropriate survey to determine exactly what SRE species are present, it is difficult to evaluate the level of risk that the Project poses to the conservation of SRE invertebrates.

In terms of habitats, the area in and around the Medcalf project includes granite outcrops with heathland, bare saline playa, depressions with samphire bush or chenopod shrubs, and various types of woodland and shrubland found on hillslopes or clay and sandy loam plains. The most prospective of these habitats for SRE groups are the granite outcrops, the depressions with samphire or saline playa, and the shrublands on hillslopes. A field survey targeting invertebrates in these habitats is to be conducted to assess the conservation status of SRE groups in the Medcalf Project.

CONTENTS

Executive Summary	ii
1. Introduction	1
1.1. Project Description	1
1.2. Aims	1
2. SRE Framework	1
3. Desktop	2
3.1. Previous records.....	2
3.2. Listed Invertebrate Species at the Search Area	4
3.3. Habitat	6
3.4. Likelihood of SRE species	6
4. Desktop Conclusions.....	8
5. References.....	10
Appendix 1. Species of SRE invertebrate groups recorded in the Project area and its vicinity.	11

LIST OF FIGURES

Figure 1. Location and proposed layout of the Medcalf Project.	3
Figure 2. Previously collected SRE fauna in the Medcalf Project area.....	5
Figure 3. SRE fauna habitats in the Haul Road Development Envelope for Medcalf Vanadium Project.....	7
Figure 4. Distribution of prior records of SRE group invertebrates based on the desktop review.....	9

1. INTRODUCTION

Audalia Resources Limited (Audalia) proposes to develop the Medcalf Project ('the Project'), south of Lake Johnston and approximately 100 km southwest of Norseman, in the Goldfields-Esperance region of Western Australia (Figure 1). This report presents the results of a desktop review of habitat information and relevant biological records to appraise the values of short range endemic invertebrate fauna in the Project and surrounds.

1.1. Project Description

The Project comprises two tenements that are together referred to as the 'Project area': Mining Lease M 63/656 and Miscellaneous Licence L 63/65 (Figure 1). Mining will target mineralised deposits of vanadium, titanium and iron.

The Project is planned to consist of two development envelopes, representing the mine area and the haul road area. Proposed developments in the mine development envelope include four open cut mine pits, an ore beneficiation plant, a tailings storage facility (TSF), two evaporation ponds, a topsoil and mine closure materials storage areas and support infrastructure, including borefield, accommodation, laydown area, workshops and administration offices (Figure 1).

The Haul Road development envelope is proposed to include a private haul road of approximately 74 km in length running from site to the Coolgardie-Esperance Highway, associated borrow and gravel pits, groundwater bores, an ore transfer hub near the Coolgardie-Esperance Highway and support infrastructure.

1.2. Aims

The specific aims of this assessment are to:

1. Review available vegetation and geological information to assess the prospectivity of habitats in the vicinity of the Project for SRE invertebrate fauna.
2. Compile and evaluate records of SREs within the vicinity of the Project (including listed species and ecological communities), assess ranges of recorded species and incorporate these results into the appraisal of prospectivity.
3. Outline potential impacts to SRE invertebrate fauna from proposed developments.

2. SRE FRAMEWORK

SRE species are defined as having overall ranges of less than 10,000 km² (Harvey 2002). They tend to exhibit patchy distributions within their range, slow growth, low fecundity, and poor dispersal capabilities. Guidelines for the consideration and assessment of SRE invertebrates in Western Australia are provided in *Environmental Factor Guideline: Terrestrial fauna* (EPA 2016a) and *Technical Guidance: Sampling of short range endemic invertebrate fauna* (EPA 2016b). Assessment typically focuses on a number of taxonomic groups (the SRE Groups) that are known to contain at least some, but more commonly moderate to high proportions of, SRE species. The groups include land snails (Gastropoda); millipedes (Diplopoda); centipedes (Chilopoda); pseudoscorpions (Pseudoscorpiones); scorpions (Scorpiones); spiders [Araneae, mainly Mygalomorphae (trapdoor spiders)]; slaters (Isopoda); and harvestmen (Opiliones). Some other groups, such as velvet worms (Onychophora) and earthworms (Oligochaeta), are SRE Groups but are restricted to mesic landscapes.

Groups containing species that are mostly widespread due to high vagility, ecological plasticity or xeric adaptation, may also have species with restricted ranges (e.g. Framenau *et al.* 2008; López-López *et al.* 2016; Rix *et al.* 2015) and, conversely, some species belonging to SRE Groups are in fact widespread. Determining whether a species belonging to an SRE Group really has a significantly restricted range (estimated as less than 10,000 km²) is often difficult. However, the distribution of an SRE Group species is likely to reflect 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. An additional constraint to assessment is that, in some groups, short-range endemism may be

related to life history or behaviour, rather than historical biogeography, and species may be SREs through occupying only part of a widespread habitat (Harvey 2002; Harvey *et al.* 2011; Rix *et al.* 2015).

Here we followed the SRE classification used by the Western Australian Museum (WAM), where a species can be classified into one of the following categories:

1. **Confirmed SREs** have a known distribution range smaller than 10,000 Km². The taxonomy is well known, and the group well represented in collections and/or via comprehensive sampling.
2. **Potential SREs** belong to a group with gaps in our knowledge, either because the group is not well represented in collections, taxonomic knowledge is incomplete, or the distribution is poorly understood due to insufficient sampling.
3. **Widespread (not SRE)** species have a known distribution range larger than 10,000 Km². The taxonomy is well known, and the group well represented in collections via comprehensive sampling.

Specifically, the factors considered when evaluating the SRE status of each species in this report were the known range of the species, habitat(s) at the collection location(s) and the spatial extent and connectivity of these habitats, as well as the distribution patterns of phylogenetically related surrogate species (which are ideally members of the same genus). Even restricted species may be locally widespread around a project area, so identifying potential SRE species is only the first part of a filtering process used to determine whether species may be threatened by a proposed development. The actual level of threat to an SRE species depends on its distribution relative to the development footprint, rather than SRE status alone. Determining the likely level of threat to a species requires consideration of the extent of the species' preferred habitat, both within and outside the study area, as well as the area of disturbance.

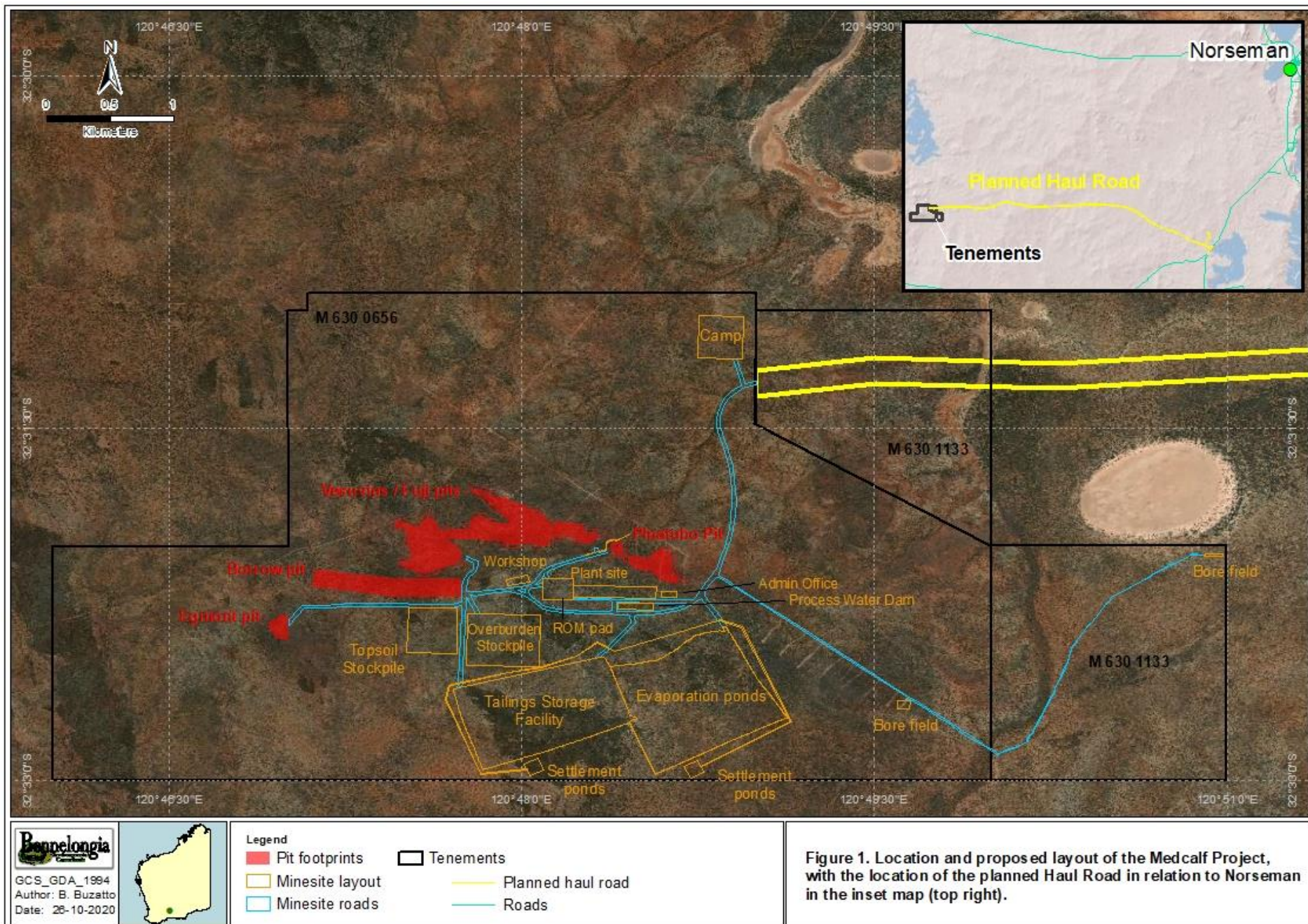
3. DESKTOP

Previous records of terrestrial invertebrates and habitat information were examined to appraise the likelihood of SRE or conservation listed invertebrate species occurring in the vicinity of the Project.

3.1. Previous records

Previous survey records of terrestrial invertebrate species from SRE Groups within a radius of approximately 50 km from the Project centroid (32° 32.04 S, 120° 48.18 E; Figure 2) were compiled by searching the databases of the WAM and Bennelongia. SRE Group invertebrates collected as bycatch during previous fauna surveys (Bennelongia 2020; Harewood 2015; Phoenix 2014) in the area were also considered. This type of desktop search gives only an indication of the level of species richness that can be expected, rather than a precise number of species that exists in the area. Appendix 1 provides a tabulated list of species recorded in the search area. Due to incomplete or inconsistent taxonomy for some records, it is not usually practicable to determine the exact number of species that has been collected. Some recorded species may contain multiple taxa and, conversely, some specimens assigned to different taxa may in reality represent the same species.

Based on the desktop search, 342 individuals from at least 34 species belonging to SRE groups have been recorded in the search area, including 12 species of spider, two species of pseudoscorpion, two species of scorpion, six species of centipede, four species of millipede, two species of tiger beetle, three species of slater, and three species of land snail (Appendix 1). Thirty-one records are identified to higher order only due to being the wrong sex (females) or life stage (juveniles) for species identification. Sixteen of these might belong to other species already recorded (not viewed as unique species, such as *Aname* sp., for example), whereas the other 15 must represent unique species, as no other species from the same family/genus were recorded in the search area (such as the isopod *Philosciidae* sp., for example).



Out of the remaining species, 10 are recognised as new species that have not been formally described yet, and therefore they have provisional names (such as *Aname* 'MYG398', for example). The last nine species (*Kwonkan currycomboides*, *Synothele houstoni*, *Blakistonia olea*, *Pilbarascutigera* cf. *incola*, *Antichiropus cincinnus* and *A. paracalothamnus*, *Cicindela avita* and *C. vannideki*, and *Bothriembryon* cf. *sedgwicki*) are described, and most of them (with the only exception of *Pilbarascutigera* cf. *incola*) are only known from one or few locations in the search area.

Using species records as a proxy for sampling coverage, effort to collect terrestrial invertebrates (particularly targeting SRE Groups) in the vicinity of the Project has occurred predominantly around McDermid Rock (at the north end of the search area), Peak Charles National Park (southeast end of search area), and in the centre of the tenement (Figure 4). Moreover, most of the collection of SRE groups in the area occurred as bycatch from vertebrate or subterranean fauna surveys (Bennelongia 2020; Harewood 2015, 2020). Sampling appears to have occurred in woodlands and shrublands in clay loam plains and hillslopes, while very little or no sampling has occurred on sandy loam plains.

3.2. Listed Invertebrate Species at the Search Area

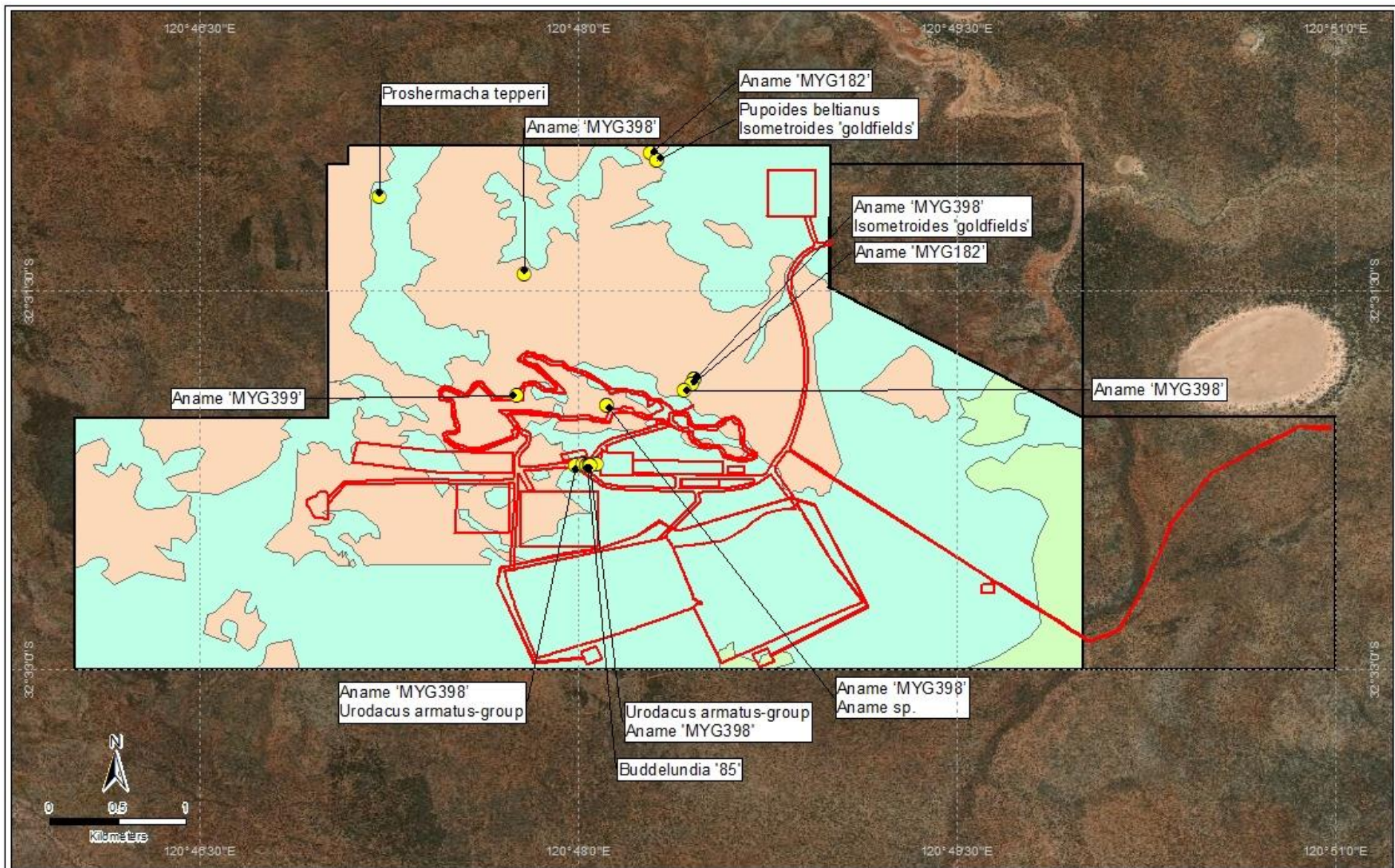
An ecological community comprising a naturally occurring biological assemblage in a particular habitat type may be listed by the Minister for the Environment as a Threatened Ecological Community (TEC) if it is presumed to be totally destroyed, critically endangered, endangered or vulnerable. A community that is threatened but does not meet these criteria, is rare but not threatened, is near threatened, has recently been removed from the TEC list, or is conservation-dependent, may be listed by the Department of Biodiversity, Conservation and Attractions (DBCA) as a Priority Ecological Community (PEC). There are no PECs or TECs in the vicinity of the search area listed on a basis of terrestrial SRE taxa.

Invertebrate species listed as Priority by DBCA that could occur in the vicinity of the Project include two species of butterfly and one species of trapdoor spider.

The critically endangered butterfly *Ogyris subterrestris petrina* is known from two sites near Kalgoorlie (ALA 2020) and occurs in mallee-dominated woodland. This species depends on the sugar ant (*Camponotus terebrans*), with the butterfly depositing its eggs at the entrances of sugar ant nests at the base of living trees and shrubs of various species. The host ant species is widespread across Australia. There are no records of this butterfly species in the search area and its primary habitat is woodlands where the host ant constructs nests. This habitat type is present in the search area, but the Project will have a minimal impact on it due to the small pit outlines.

The Priority 1 butterfly *Jalmenus aridus* is known from a handful of records near Kalgoorlie and Ngaanyatjarraku in the Northern Yilgarn, indicating that it may be rare but widespread in the Yilgarn. The species is not commonly collected and is poorly represented in Australian research collections. The larvae of this butterfly feed on the leaves and flowers of *Senna* spp. and *Acacia tetragonophylla* (Graham and Moulds 1988). Both host plants occur widely in the Yilgarn and are generalist species that do not occur on specific geologies or soils, so this butterfly may be widespread but poorly sampled. Both *Senna* spp. and *Acacia tetragonophylla* are likely to occur in the Project area, although the impact to habitats containing these plant species will be regionally negligible, and the conservation status of the butterfly is unlikely to be impacted.

The Priority 3 shield-backed trapdoor spider *Idiosoma intermedium* belongs to a group of species in the family Idiopidae characterised by enlarged and sclerotised third abdominal sigilla and, in some species, highly sclerotised abdominal shields used for burrow defence. There are now understood to be 17 species in this group, called the *nigrum*-group (Rix *et al.* 2018). *Idiosoma intermedium* has a relatively widespread distribution in the eastern Wheatbelt and north-western Coolgardie bioregions, but a 'Priority 3' recommendation was based on its occurrence in areas prospective for mining. It is possible that this species occurs in the vicinity of the Project area but is unlikely to be significantly threatened by development due to the small, proposed extent of clearing relative to its entire range.



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Date: 26-10-2020

● SREs previously collected	■ Clay Loam Plain Woodlands / Shrublands
■ Total footprint of project	■ Hillslope Woodlands / Shrublands
■ Tenements	■ Sand Loam Plain Woodlands / Shrublands

Figure 2: Previously collected SRE fauna in the Mine Development Envelope for Medcalf Vanadium Project, along with the project footprint and vegetation mapping.

3.3. Habitat

Habitat prospectivity was assessed by reviewing recent vegetation (Botanica 2017) and vertebrate fauna (Harewood 2020) reporting, as well as observations from previous site visits by Bennelongia. Emphasis was placed on identifying relict, isolated, sheltered, or moist habitats but 'specialist' habitats, such as rocky outcrops and ranges, may also harbour SRE species. Isolated or patchy habitats are generally considered to be more prospective for SRE species. It is also recognised that depressions and bare saline playas in Western Australia may host a variety of specialist invertebrate taxa, including wolf spiders (family Lycosidae) and tiger beetles (family Carabidae) that are halotolerant and may have restricted distributions (Durrant and Guthrie 2004; Framenau and Hudson 2017; López-López *et al.* 2016), although overall there has been relatively little documentation of such species and communities.

The Medcalf Project area hosts a high diversity of vegetation types, including an estimated 205 plant species in 10 major vegetation groups across five landforms (Botanica 2017). There is certainly much overlap between some of these groups in terms of their function as habitat for terrestrial invertebrates in general, and for SRE groups. Within the proposed mine area, Harewood (2020) identified three main fauna habitats for vertebrates, consisting of shrublands or woodlands on clay loam plains, hillslopes and sandy loam plains (Figure 2). Two of these habitats, namely the woodlands / shrublands on clay loam and sandy loam plains, comprise most of the habitat found in the proposed haul road development envelope, which also includes a small proportion (1-5%) of granite outcrops with heathland and depressions with samphire shrub and bare saline playa (Figure 3). Given that these habitats were categorized based on suitability of habitats for terrestrial vertebrates, they have limited suitability as indicators for SRE invertebrates, as these animals are often distributed at the microhabitat scale.

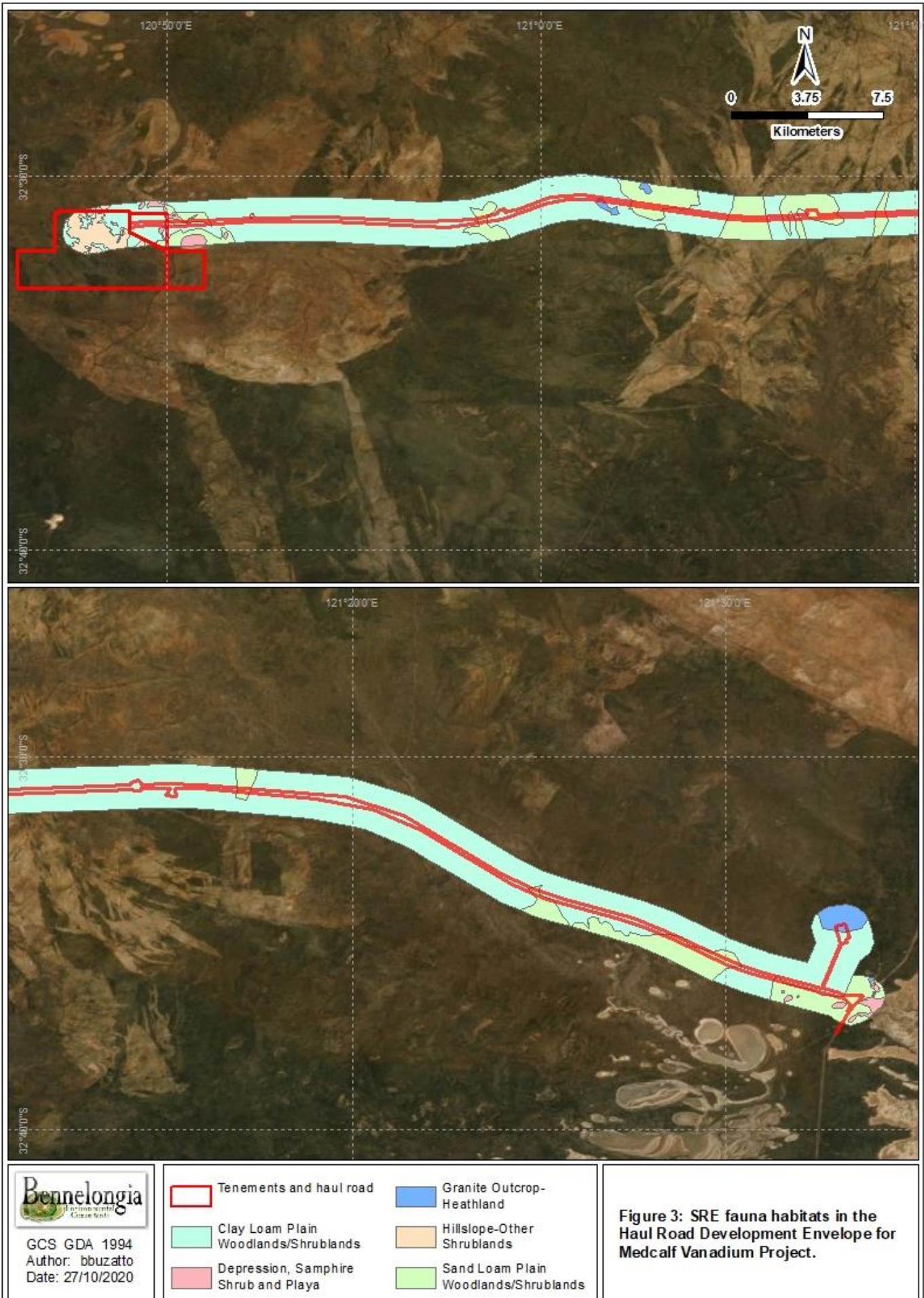
In broad terms, the habitats for terrestrial invertebrates in and around the Medcalf project include granite outcrops with heathland, bare saline playa, depressions with samphire bush or chenopod shrubs, and various types of woodland and shrubland found in hillslopes or clay and sandy loam plains. The majority of these habitats are likely to be widespread or very widespread throughout the wider Great Western Woodlands. The most spatially isolated and restricted habitats are the granite outcrops, the depressions with samphire or saline playa, and the shrublands on hillslopes (Figure 3).

3.4. Likelihood of SRE species

Based on the desktop review, the most prospective habitats for SRE species in and around the Medcalf Project area are:

- Granite outcrops with heathland, especially on south facing slopes.
- Depressions with samphire or saline playa.
- Mixed woodlands and shrubland on hillslopes.

Habitats on other landforms have been demonstrated to host species from SRE Groups and can also be considered prospective for potential SRE species. However, as they are more extensive and well-connected throughout the wider landscape, the species present are generally likely to have larger distributions than species in restricted habitats.

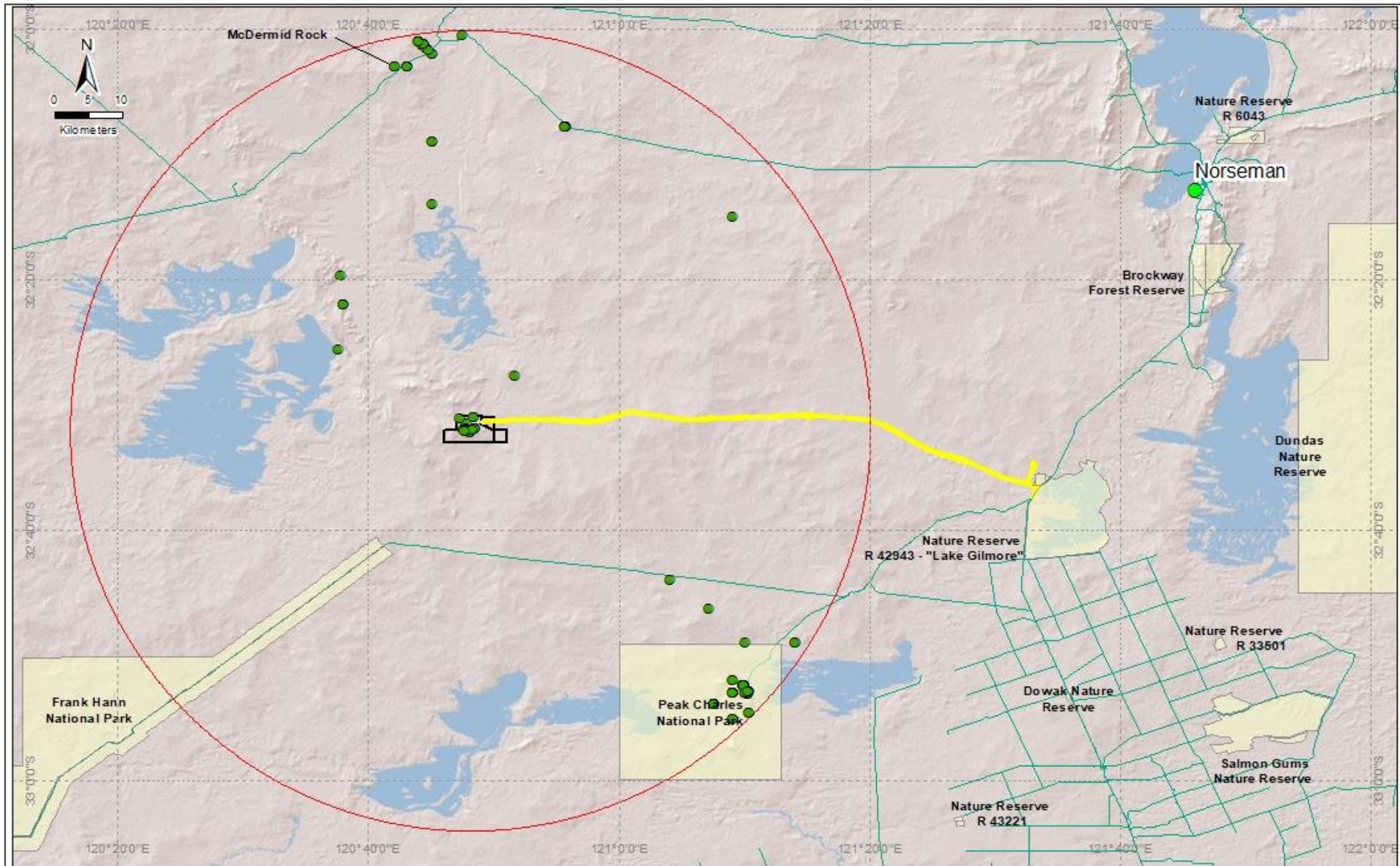


4. DESKTOP CONCLUSIONS

The desktop search identified moderate to high diversity of species from SRE groups from within the search area around the Project. This diversity is partially a result of the proximity of the project to two areas that received relatively high SRE sampling effort, namely Peak Charles National Park and McDermid Rock (Figure 4). The desktop search revealed that 34 species of SRE are likely to be present in the project area, and three listed invertebrates (the butterflies *Ogyris subterrestris petrina* and *Jalmenus aridus*; and the trapdoor spider *Idiosoma intermedium*) could also occur in the vicinity of the project, although they have never been recorded in the search area.

There is a great deal of taxonomic uncertainty in the identifications of the records captured in the desktop search, and it is possible that this results in an inflation of the species numbers. However, it is clear that a diverse community of potentially restricted species occurs within the broad region of the Project, and the tenements almost certainly contain at least some SRE species. Given the small size of the tenements, it is unlikely that any SRE species will be restricted to the project area, and the possibility of SRE species occurring only within the impact footprint of the project is negligible, given the small size of the disturbance footprint. Nevertheless, without conducting an appropriate survey to determine exactly what SRE species are present, it is difficult to evaluate the level of risk that the Project poses to the conservation of SRE invertebrates. To address this, a detailed SRE survey is planned at the Project, with the results expected to be made publicly available in January 2021.

In terms of habitats for terrestrial invertebrates, the area in and around the Medcalf project includes granite outcrops with heathland, bare saline playa, depressions with samphire bush or chenopod shrubs, and various types of woodland and shrubland found in hillslopes or clay and sandy loam plains. Given their spatial isolation and restricted availability in the general landscape, the most prospective of these habitats for SRE groups are the granite outcrops, the depressions with samphire bush or saline playa, and the shrublands on hillslopes. A field survey targeting SRE groups in these particular habitats, both in the tenement and along the proposed haul road development envelope, is to be conducted to clarify the conservation values of SRE invertebrates in the Medcalf Project.



Legend

- SRE records
- Tenements
- DBCA Legislated Lands
- Desktop search area
- Haul road development envelope
- Roads

Figure 4. Distribution of prior records of SRE group invertebrates based on the desktop review.

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Appendix 1. Species of SRE invertebrate groups recorded in the Project area and its vicinity.

Described species known to be widespread (non-SRE, with ranges larger than 10,000 Km²) were removed from the table. Grey denotes higher order identifications that might belong to other listed species (not viewed as unique species); blue represents species complexes.

Higher Classification	Lowest Identification	Sample method				
		Forage	Litter	Pitfall traps	Subterranean bycatch	Unknown
ARTHROPODA						
ARACHNIDA						
Araneae						
Anamidae	<i>Aname</i> `MYG398`	1		4		
	<i>Aname</i> `MYG399`			1		
	<i>Aname</i> sp.			1		7
	<i>Proshermacha</i> sp.					1
	<i>Teyl</i> `MYG510`			1		
	<i>Kwonkan currycomboides</i>					2
	Anamidae sp.	1				
Barychelidae	<i>Idiommata</i> sp.					1
	<i>Synothele houstoni</i>					1
Euagridae	<i>Cethegus</i> sp.					1
Halonoproctidae	<i>Conothele</i> sp.					1
Idiopidae	<i>Blakistonia olea</i>					1
	<i>Blakistonia</i> sp.					2
	<i>Idiosoma</i> `charlesi`					1
	<i>Idiosoma</i> sp.	1				
	Arbanitinae sp.			2		
Unknown family	Mygalomorphae sp.	4				
Lycosidae	Lycosidae sp.	1				1
Pseudoscorpiones						
Garypidae	<i>Synsphyronus</i> `8/3 McDermid Rock`					7
Garypinidae	<i>Amblyolpium</i> `WA1`	1				
	Pseudoscorpiones sp.					6
Scorpiones						
Buthidae	<i>Isometroides</i> `goldfields 1`			3		
	<i>Isometroides</i> sp.					2
Urodacidae	<i>Urodacus</i> `armatus complex`	5				
	<i>Urodacus</i> sp.			5		5
CHILOPODA						
Geophilida						
Chilenophilidae	Chilenophilidae sp.	1				
Geophilidae	Geophilidae sp.					1
Unknown family	Geophilida sp.		1			
Scolopendrida						
Scolopendridae	<i>Cormocephalus</i> sp.	1				

	Scolopendridae sp.					4
Scutigera						
Scutigeridae	<i>Pilbarascutigera cf. incola</i>					1
	<i>cf. Prothereura sp.</i>					1
Lithobiomorpha						
Henicopidae	<i>Lamyctes 'nr africanus'</i>				3	
Unknown family	Lithobiomorpha sp.				1	
DIPLOPODA						
Polydesmida						
Paradoxosomatidae	<i>Antichiropus `saeda`</i>	8				
	<i>Antichiropus cincinnus</i>					1
	<i>Antichiropus paracalothamnus</i>	16				
	<i>Antichiropus sp.</i>	3				
Unknown order	Diplopoda sp.					4
Spirostreptida						
Iulomorphidae	<i>Atelomastix sp.</i>	14				
INSECTA						
Coleoptera						
Carabidae	<i>Cicindela avita</i>					1
	<i>Cicindela vannideki</i>					1
MALACOSTRACA						
Isopoda						
Armadillidae	<i>Buddelundia sp.</i>					3
	<i>Pseudodiploexochus sp.</i>				8	
Philosciidae	Philosciidae sp.				2	
MOLLUSCA						
GASTROPODA						
Stylommatophora						
Bothriembryontidae	<i>Bothriembryon cf. sedgwicki</i>					13
	<i>Bothriembryon sp.</i>	132				27
cf. Hygromiidae	cf. Hygromiidae sp.	8				
Punctidae	<i>Westralaoma sp.</i>					10
	Punctidae sp.					7
Abundance (per collection method)		197	1	17	14	113
Estimated species (per collection method)		12	1	6	3	23
Total abundance		342				
Total number of estimated species		34				