



Macarthur Minerals Ltd

Ularring Hematite Project, Rail Siding: Desktop Assessment of Invertebrate Short Range Endemics

Final Report

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Ularring Hematite Project, Rail Siding: Desktop Assessment of Invertebrate Short Range Endemics

Bennelongia Pty Ltd
5 Bishop Street
Jolimont WA 6913
www.bennelongia.com.au
ACN 124 110 167

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EXECUTIVE SUMMARY

Macarthur Minerals Ltd plans to develop the Ularring Hematite Project, an open cut iron ore mine focussed on the hematite mineral deposits located approximately 450 km east north-east of Perth in the Yilgarn region. As part of the project, a rail siding (*the Rail Siding*) is proposed 9 km to the south of Menzies alongside the Goldfields Highway. The Rail Siding is located within tenement P29/1895 and covers approximately 117 ha; however, clearing for the construction of the railway and associated infrastructure is not expected to exceed 32 ha. It is possible that clearing may lead to the loss of habitat of short range endemic (SRE) invertebrate species. This report provides an assessment of whether there is likely to be any threat to SRE species from the development of the proposed Rail Siding.

The aims of the report are:

- (1) To determine the likelihood of SRE species occurring at the Rail Siding;
- (2) To assess whether any prospective SRE habitats occur within the proposed Rail Siding;
- (3) To define the degree of connectivity between occurrences of prospective habitats inside and outside the Rail Siding;
- (4) To determine whether the Rail Siding constitutes a significant proportion of the local occurrence of any prospective habitats;
- (5) To assess whether threat to SRE fauna is likely as a result of development of the Rail Siding.

Studies of SREs focus on several Groups of ground dwelling invertebrates, such trapdoor spiders and isopods. Records and information on species belonging to SRE Groups were collated from the database of the Western Australian Museum (WAM), previous environmental impact assessments and primary literature. Records from the WAM were extracted for a 100 x 100 km 'Search Area' surrounding the Rail Siding (-29.321°S to -30.231°S, 120.563°E to 121.594°E). Areas of potential SRE habitat were identified using orthophotos provided by Macarthur Minerals, Beard vegetation mapping and vegetation mapping by Mattiske Consulting Pty Ltd.

The study identified 38 species belonging to six SRE Groups in the Search Area. Five species considered to be of SRE status were recorded, none of which was located within the proposed Rail Siding footprint. The Rail Siding site contains no obvious SRE landforms or vegetation. There are no south-facing rock faces, steep slopes, gullies, rocky outcrops or relictual habitats; the site comprises a mosaic of low-lying natural drainage areas with several vegetation communities that are considered typical of and widespread throughout the region, present on flat, compact, gravelly clays.

Within the constraints of the desktop study, it is considered unlikely that development of the proposed Rail Siding south of Menzies will threaten persistence of any SRE species. This is based on the following two inferences:

1. SRE species are unlikely to occur at the Rail Siding site because of the lack of likely SRE habitat; and
2. In the unlikely event that any SRE species are present, the small size of the impact footprint (less than 32 ha) and the extensive habitat connectivity beyond the site, mean that there is a very low likelihood of any significant impact to local communities or the conservation status of individual species.

Given that there is very little threat to SREs, no further SRE investigations, including field surveys, are considered necessary to adequately assess the impacts posed by the development of the Rail Siding as part of the Ularring Hematite Project.

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1. INTRODUCTION

Macarthur Minerals Limited plans to develop the Ularring Hematite Project, an open-cut iron ore mine focussed on the hematite mineral deposits located approximately 450 km east north-east of Perth in the Yilgarn region (Figure 1.1). As part of the project, a rail siding (*the Rail Siding*) is proposed 9 km to the south of Menzies alongside the Goldfields Highway.

The Rail Siding is located within tenement P29/1895 and covers a total of 135 ha; however, clearing for the construction of the railway and associated infrastructure is not expected to exceed 32 ha. It is possible that clearing may lead to the loss of habitat of short range endemic (SRE) invertebrate species. This report provides an assessment of the threat to SRE species from the development of the proposed Rail Siding to support the project's environmental impact assessment.

Short range endemic species are defined in the Environmental Protection Authority's (EPA) 2009 Guidance Statement No. 20 as '*terrestrial and freshwater invertebrates that have naturally small distributions of less than 10,000 km²*'. In practice, assessment of risk to SRE species in Western Australia is focussed on up to ten groups of terrestrial invertebrates (the SRE Groups) that are characterised by having high proportions of SRE species. The SRE Groups include some families of land snails (Gastropoda), freshwater mussels (Bivalvia), scorpions (Scorpionida), trapdoor and wall crab spiders (Araneae), false scorpions (Pseudoscorpionida), slaters (Isopoda), centipedes (Chilopoda), millipedes (Diplopoda), velvet worms (Onychophora) and megadrile earthworms (Oligochaeta) (EPA 2009). Their restricted ranges are often the result of events that fragmented historically broader distributions, such as the extensive flooding of inland Australia during the Cretaceous and progressive climatic aridification since the Miocene (Harvey 2002). As a result of drying, faunal groups originally associated with historically damp conditions tend to be restricted to relictual islands of cooler more humid habitats, such as caves, rock piles, springs, southern slopes, vegetated gorges and drainage channels (EPA 2009; Harvey 2002). Over time, habitat fragmentation has sometimes led to speciation and an array of distinct taxa where previously there was one species. Associated with having restricted ranges, SREs are characterised by limited capacity for dispersal, confinement to discontinuous habitats, slow growth rates, and low fecundity; all of which make them vulnerable to disturbance (Harvey 2002; Ponder and Colgan 2002).

Apart from the richness of the SRE fauna in the surrounding area, two factors are commonly recognised as important in determining the likelihood of SRE species occurring within a project footprint and being threatened by the project. These are the types of habitat present in the footprint and the wider extent (and connectivity) of the habitats outside the project area.

The assessment in this report of likely threat to any SRE fauna at the Rail Siding is based on the likelihood of a significant SRE fauna being present in the local area of the Rail Siding, the results of habitat assessment, and the size of the Rail Siding.

The aims of the report are:

- (1) To determine the likelihood of SRE species occurring at the Rail Siding;
- (2) To assess whether any prospective SRE habitats occur within the proposed Rail Siding;
- (3) To define the degree of connectivity, for prospective habitats, between habitat occurrences inside and outside the Rail Siding;

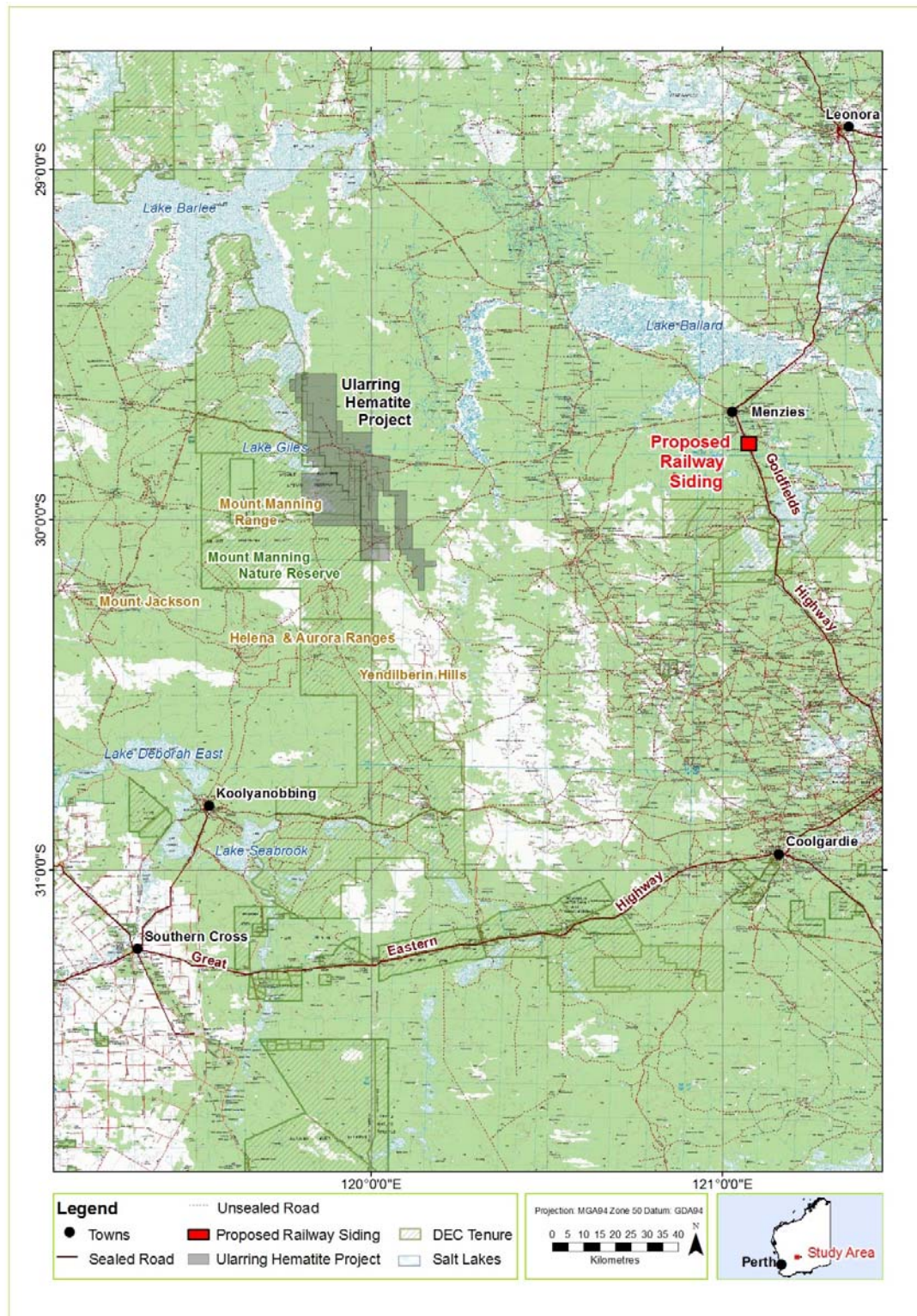


Figure 1.1. Location of the proposed Rail Siding.

- (4) To determine whether the Rail Siding constitutes a significant proportion of the local occurrence of any prospective habitats;
- (5) To assess whether threat to SRE fauna is likely as a result of development of the Rail Siding.

2. CONSERVATION FRAMEWORK

Protection for flora and fauna native to Western Australia is provided at both state and federal levels. At the federal level, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was developed to provide a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places and deals with matters of national environmental significance (<http://www.environment.gov.au/epbc/publications/pubs/epbc-act-fact-sheet.pdf>).

At the state level, native flora and fauna are protected under the *Wildlife Conservation Act 1950* (WC Act; see especially section 14). The highest level of protection is afforded to Schedule 1 species. These are species that are rare or likely to become extinct. A list of the species recognized under the regulations of the WC Act is published in the *Government Gazette*, last updated 6 November 2012.

Schedule 1 species (usually referred to as threatened fauna) are further ranked according to the level of threat to which they are subject, using IUCN Red List criteria.

- | | |
|------------------------|---|
| Critically Endangered: | Considered to be facing an extremely high risk of extinction in the wild; |
| Endangered: | Considered to be facing a very high risk of extinction; and |
| Vulnerable: | Considered to be facing a high risk of extinction in the wild. |

The Department of Environment and Conservation (DEC) also maintains a state list of priority species, assigning rankings of one of five to priority fauna species:

- | | |
|-----------------|--|
| Priority One: | Taxa with few, poorly known populations on threatened lands |
| Priority Two: | Taxa with few, poorly known populations on conservation lands |
| Priority Three: | Taxa with several, poorly known populations, some on conservation lands |
| Priority Four: | Taxa in need of monitoring |
| Priority Five: | Taxa in need of monitoring (conservation dependent). Priority 5 species are currently managed (http://www.dec.wa.gov.au/content/view/852/2010/1/1/). |

Threatened wildlife listings are reviewed annually and changes can be recommended by the Threatened Species Scientific Committee (TSSC). The public is invited to submit nominations to add taxa to, or delete taxa from, the current Specially Protected Fauna lists. The latest fauna listing are contained within the Wildlife Conservation (Specially Protected Fauna) Notice 2012 (<http://www.dec.wa.gov.au/content/view/852/2010/>).

3. REVIEW

3.1. Review Process

Records and information on species belonging to SRE Groups were collated from:

- records in the database of the Western Australian Museum (WAM);
- previous environmental impact assessments (EIAs); and
- the primary literature.

WAM records were extracted for a 100 x 100 km 'Search Area' surrounding the Proposal (-29.321°S to -30.231°S, 120.563°E to 121.594°E, Appendix 1).

The large Search Area was chosen to include the diverse range of habitats surrounding the Rail Siding and to increase the number of invertebrate records available for assessment. There has been limited sampling in the sub-region and invertebrates are often poorly represented in Museum collections, so very little information would have been available from a smaller search area.

Habitats consist of a combination of vegetation, soils, landforms and climate (Elton and Miller 1954). In this report, Environmental Protection Authority guidelines and information contained in previous SRE surveys of the Yilgarn were used to determine which habitats might potentially contain SRE species at the Rail Siding (EPA 2009). Areas of potential SRE habitat were identified using orthophotos provided by Macarthur Minerals, Beard vegetation mapping (1972; 1990), and vegetation mapping by Mattiske (2011). Climate records were sourced from the Australian Bureau of Meteorology.

3.1.1. Determining SRE Status

A two-stage approach was used in this report to identify SREs. First, species recognised as SREs by experts (either in literature or through direct correspondence) were treated automatically as SREs. Otherwise, four attributes were used to determine whether a species was likely to be an SRE (Appendix 2). The attributes were

- (1) The maximum recorded range of the species;
- (2) The number of habitats in which it was recorded;
- (3) Whether these habitats were extensive or well connected with other patches of the same habitats; and
- (4) The proportion of species in the family/genus known to be SREs.

3.2. SREs of the Yilgarn

The habitats considered most likely to support SREs in the Yilgarn include south-facing rock faces and steep slopes, gullies, springs, deep litter beds, rocky outcrops and undisturbed watercourses, or various combinations of these features (Main 1999; EPA 2009). Such habitats support only small, localised populations and the mostly low dispersal powers of SREs lead to the populations often being isolated from each other.

Previous SRE surveys in the Yilgarn have focused on banded ironstone ranges both because they offer prospective SRE habitats and because they are the focus of mining development in the region. Most of the species reported as SREs in the Yilgarn belong to land snails of the family Camaenidae, spiders of the suborder Mygalomorphae (mostly trapdoors), scorpions belonging to the genus *Urodacus*, and millipedes of the genera *Antichiropus* and *Atelomastix* (Bamford 2006; Bamford and Bancroft 2006; DEC 2007; Biota 2009; Ninox 2009; St Barbara 2009; Ecologia 2010; Biota 2011).

The number of species in SRE Groups collected from individual ranges during previous surveys varied from 12 at Parker Range (Lindbeck and Associates 2010), to 17 at Mt Jackson (Biota 2009), 26 at Deception Deposit (Biota 2011), and 26 at Mt Gibson (Harvey 2005; Main 2005; Slack-Smith 2006). In these surveys, it was determined that no actual SRE species occurred at Parker Range; four possible SREs were recognised at Mt Jackson, three at Deception Deposit and none from Mt Gibson. Hence, the proportion of actual or possible SRE species within the SRE Groups appears to be relatively low (0-18%) at the Yilgarn sites surveyed. Ironstone ranges of the Yilgarn may, but do not always, provide habitats for SRE species.

When trying to synthesize survey results, it should be recognized that differences between various surveys probably reflect differences in survey effort and the degree of precaution used in applying criteria to SRE status as well as site differences.

3.3. Habitat Characterisation

3.3.1. Climate

Menzies, approximately 9 km north of the Rail Siding, is the nearest Bureau of Meteorology weather station with climate statistics. Average daily temperatures range between 19 and 34°C in the summer months and 5 and 17°C in winter. Menzies experiences a very low average annual rainfall of only 250 mm. Monthly rainfall averages range from 10 mm in September to 33 mm in February. The Menzies climate is typical of this part of the Yilgarn and the general dryness of the area means that features retaining greater moisture are more likely to represent SRE habitat.

Table 3.1. Climatic data for Menzies.

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years
Mean maximum temperature (°C)	35.1	33.9	31.1	26.2	21.3	17.7	17.0	19.0	23.1	26.8	30.7	33.9	26.3	94
Mean minimum temperature (°C)	19.7	19.4	17.2	13.4	9.3	6.7	5.3	6.1	8.6	11.7	15.5	18.2	12.6	94
Mean rainfall (mm)	20.7	33.1	25.3	21.5	25.8	28.3	23.0	19.6	10.4	11.4	14.7	15.7	249.4	112
Mean no. of days of rain $\geq$ 1 mm	2.0	2.4	2.6	2.5	3.3	4.0	3.9	3.3	2.0	1.8	2.1	2.1	32.0	103

Data courtesy of the Australian Bureau of Meteorology website (2012).

3.3.2. Vegetation and Landform

The Rail Siding is within the Austin Botanical District according to Beard (1976, 1990), corresponding to the East Murchison sub-region (MUR1) of the Murchison Bioregion, as defined by the Interim Biogeographical Regionalisation for Australia (Cowan 2001).

The Rail Siding site contains no obvious SRE landforms or vegetation; there are no south-facing rock faces, steep slopes, gullies, rocky outcrops, relictual habitats or other features likely to retain more moisture than the surrounding areas. The site comprises a mosaic of low-lying natural drainage areas with several vegetation communities (typical and widespread throughout the region) present on flat, compact, gravelly clays (Mattiske 2011).

Seven distinct vegetation communities were identified in the Rail Siding by Mattiske (2011), including one woodland and six shrubland communities (Figure 3.1). A mixture of *Acacia* and *Casuarina* shrub communities dominated the majority of the site with mixed eucalypt woodland communities dominating the low-lying natural drainage areas. Changes in the dominance of eucalypt and *Acacia* species characterised the distinct vegetation communities (Mattiske 2011).

Especially when the broader-scale mapping of Beard (1972) and Cowan (2001) is taken into account, the vegetation communities within the Rail Siding are well connected to the same communities beyond the site. There is an absence of obvious SRE habitats within the Rail Siding.



Figure 3.1. Vegetation Communities in the Rail Siding.

Legend explanation is given in Appendix 3

3.4. Potential SRE and Listed Species

While there are a number of mines sites (inactive or proposed) in the Search Area (Appendix 1), no EIAs for SREs could be located in a literature search. However, records from database of the WAM, indicate that there has been considerable survey effort in the Search Area, particularly around Goongarrie Station and Credo Station, 20 km south and 32 km south-west of the Rail Siding (Figure 3.2, Appendix 4).

Thirty-eight species belonging to six SRE Groups have been recorded in the Search Area (Appendix 4). There were no records of any listed invertebrate species. Five species were considered to be SREs according to WAM staff (Table 3.2). These were two species of mygalomorph spider and a single species of pseudoscorpion. Millipedes and molluscs each accounted for a SRE single species. An account of the species in each SRE Group is given under the sub-headings below.

3.4.1.1. Mygalomorph Spiders

Twelve species of mygalomorph spiders belonging to four families (Actinopodidae, Barychelidae, Idiopidae and Nemesiidae) were recorded in the Search Area. Two described species, *Kwonkan goongarriensis* and *Synothele goongarrie* (families Nemesiidae and Barychelidae respectively), were considered to be SREs (Table 3.2, Appendix 4). The four records of *Kwonkan goongarriensis*, from both inside and outside the Search Area, show the species has a range of more than 95 km. *Synothele goongarrie* is known from a single record 18 km south of the Rail Siding.

3.4.1.2. Pseudoscorpions

WAM records listed a single species of pseudoscorpion, *Conicochernes* 'PSE024', in the Search Area (Appendix 4). WAM staff considered it to be an SRE, though multiple records show a range extending more than 80 km. Harvey (2002) considered very few pseudoscorpions were likely to be SREs with the exception of troglobites although, since then, a more precautionary approach has been used in assessment of epigeal pseudoscorpion ranges (Mark Castalanelli pers. comm., WAM).

3.4.1.3. Scorpions

Seven species of scorpions, belonging to two families (Buthidae and Urodacidae) were recorded in the Search Area (Appendix 4). Few scorpions are thought to be SREs (see Harvey 2002), with the exception of some *Urodacus* (Koch 1977; Volschenk and Prendini 2008). Three *Urodacus* species (*U. hoplurus*, *U. similis* and *Urodacus* 'armatus') had multiple records inside and beyond of the Search Area and none was considered to be an SRE.

Table 3.2. SRE species documented in the Search Area.

Note: SRE status has been applied by Museum of Western Australia

Higher Groups	Species	Notes on Range and/or Conservation Significance
Arachnida		
Araneae		
	Mygalomorphae	
	<i>Kwonkan goongarriensis</i>	Four records both inside and outside of search area. Range >95 km
	<i>Synothele goongarrie</i>	Single record ~18 km S of Proposed Rail Siding
	Pseudoscorpion	
	Panctenata	
	<i>Conicochernes</i> 'PSE024'	Several records both inside and outside of search area. Range >80 km
Diplopoda		
	Polydesmida	
	<i>Antichiropus</i> 'credo'	Two records both inside and outside search area. Range >40 km
Mollusca		
	Gastropoda	
	<i>Pupilla</i> cf. <i>ficulnea</i>	Single record ~49 km SW of Proposed Rail Siding. Relationship to central Australian <i>P. ficulnea</i> unknown.

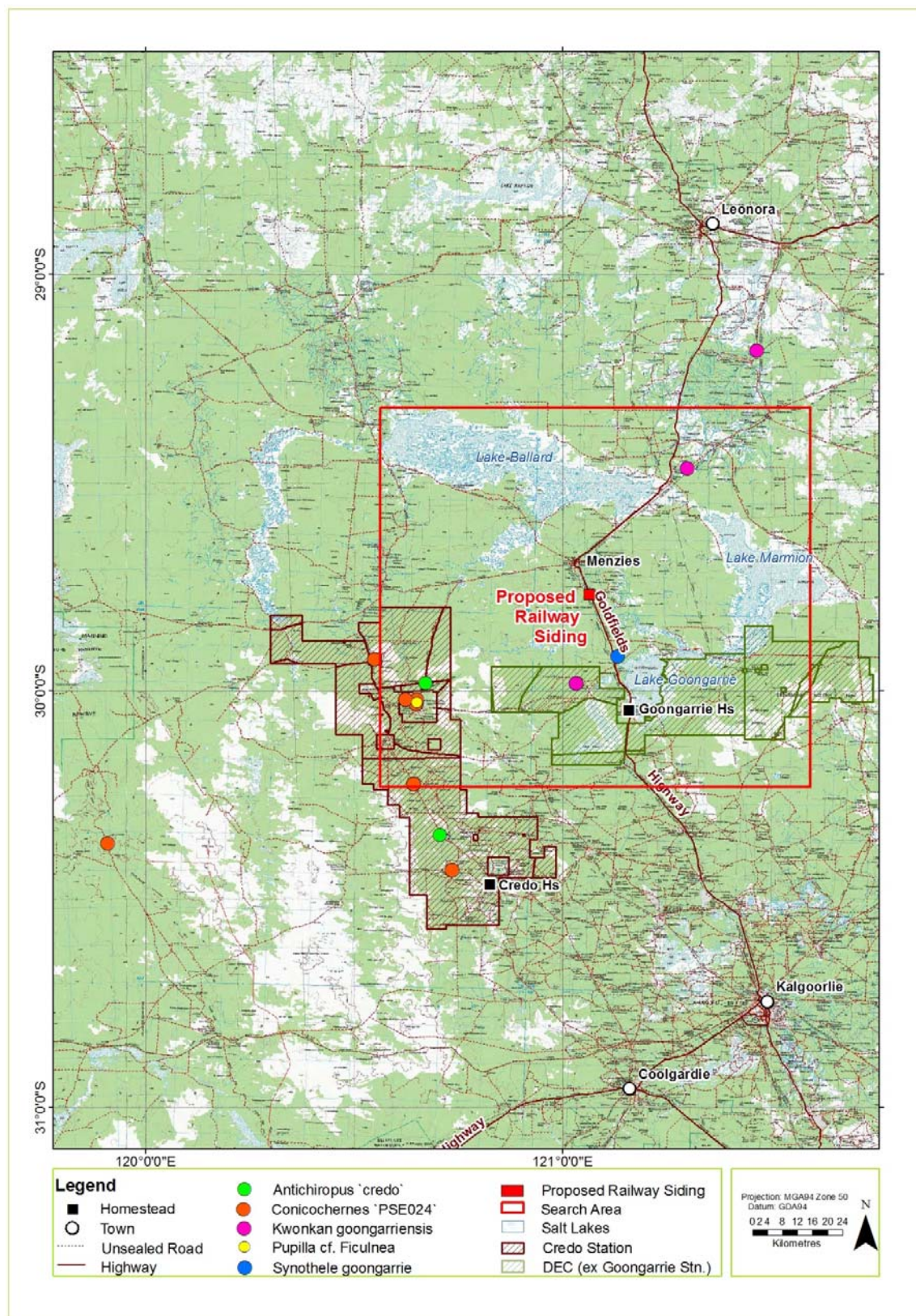


Figure 3.2. SRE species documented in the Search Area and surrounds.

3.4.1.4. Centipedes

Seven species of centipedes representing two orders were collected. Six species belonged to the order Scolopendrida and one to the Scutigera. All species were formally named and considered to be widespread.

3.4.1.5. Millipedes

Three species of millipedes representing two orders have been collected. One species, *Antichiropus* 'credo', belonging to the family of polydesmid millipede, Paradoxosomatidae, was classified by WAM staff as an SRE (Table 3.2). Polydesmid millipedes, including the genus *Antichiropus*, which is the most abundant and speciose millipede genus in Western Australia, are known to contain many SRE species (Harvey 2002). *Antichiropus* 'credo' is considered a SRE on the basis of four records, two within the Search Area. Current records demonstrate a linear range of about 40 km.

3.4.1.6. Land Snails

Eight species of land snails belonging to four families (Pupillidae, Camaenidae, Succineidae and Bothriembryontidae) were recorded in the Search Area. All of these families have widespread distributions across WA, although Camaenidae and Bothriembryontidae families are known to contain many SRE species. Of the eight snail species in the Search Area, only *Pupilla* cf. *ficulnea* is currently considered to be an SRE, principally because its relationship to central Australian *P. ficulnea* is unknown (C. Whisson pers. comm., WAM). *Pupilla* cf. *ficulnea* is known from a single record approximately 50 km south-west of the Rail Siding.

3.5. Desktop Summary and Assessment

This study identified 38 species belonging to six SRE Groups in the Search Area surrounding the Rail Siding. Five of these species are considered to be SREs, although this is a precautionary assessment. None of the five species was recorded within the proposed Rail Siding footprint. The number of species recorded within the large Search Area is somewhat higher than recorded in site surveys conducted in the Yilgarn (12-26 species belonging to SRE Groups, 0-4 SRE species). This reflects the larger size of the Search Area.

The Rail Siding site contains no obvious SRE landforms or vegetation. There are no south-facing rock faces, steep slopes, gullies, rocky outcrops or relictual habitats; the site comprises a mosaic of low-lying natural drainage areas with several vegetation communities (typical and widespread throughout the region) present on flat, compact, gravelly clays.

Given that SRE species occur in the Search Area, it is possible that SREs occur within the Rail Siding site. However, because there is no obvious SRE habitat, a risk-based approach to assessment suggests it is unlikely that SRE species occur. Furthermore, in the event that SRE species do occupy the Rail Siding site, they would almost certainly occur beyond the clearing footprint and tenement area (32 ha and 117 ha, respectively), commensurate with the extensive nature of the habitat. In that case, there would be no threat to such species.

4. CONCLUSION AND RECOMMENDATIONS

Within the constraints of the desktop study, it is unlikely that development of the proposed Rail Siding located south of Menzies will threaten persistence of any SRE species. This is based on the following two facts:

- (1) SRE species are unlikely to occur at the Rail Siding site because of the lack of likely SRE habitat;

- (2) In the unlikely event that SRE species are present, the small impact footprint (less than 32 ha) and the extensive habitat connectivity beyond the site, mean that there is a very low likelihood of impact at the species level.

Due to the low level of threat identified to SREs, no further SRE investigations are considered necessary to adequately assess the impacts posed by the development of the Rail Siding as part of the Ularring Hematite Project.

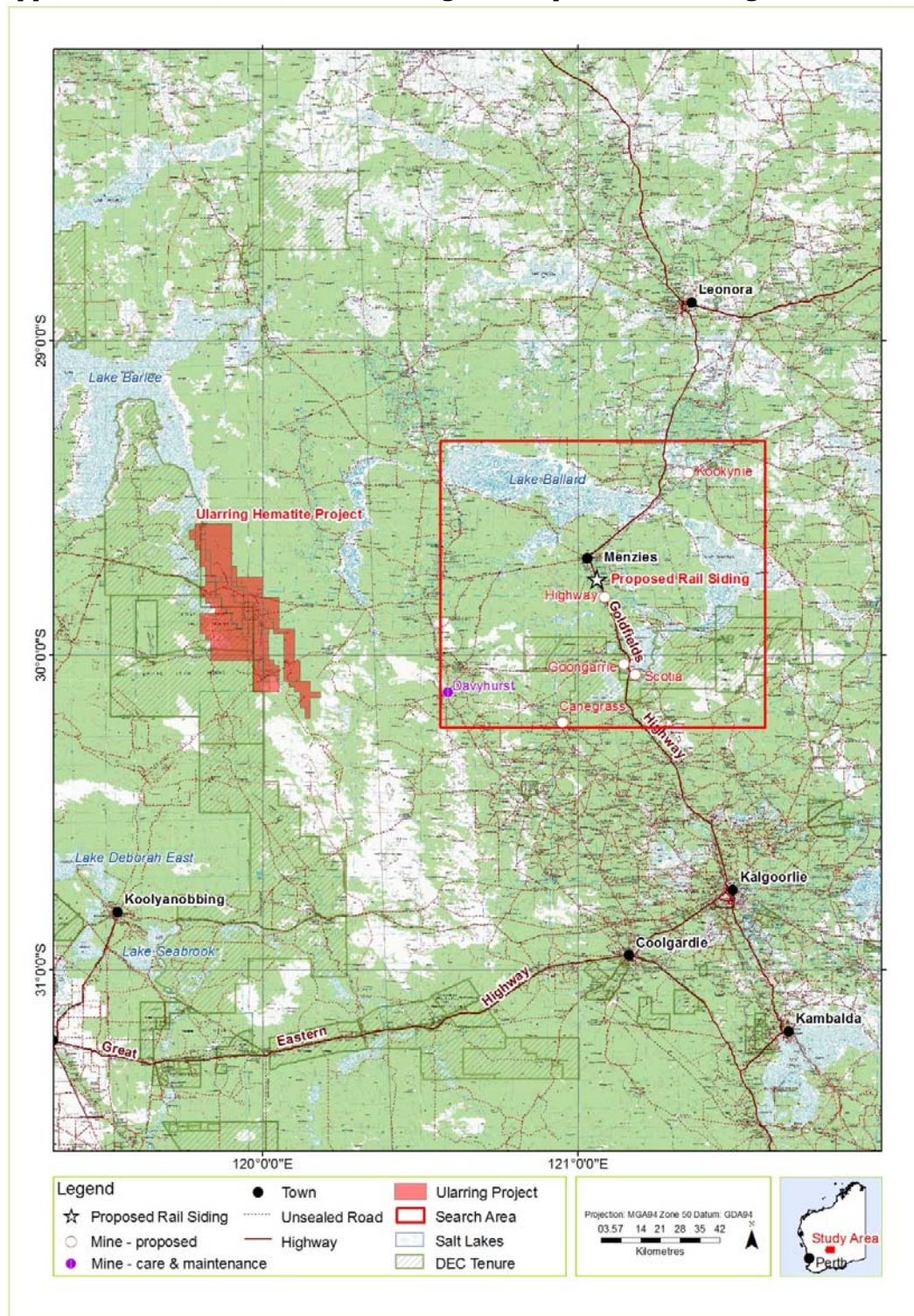
5. REFERENCES

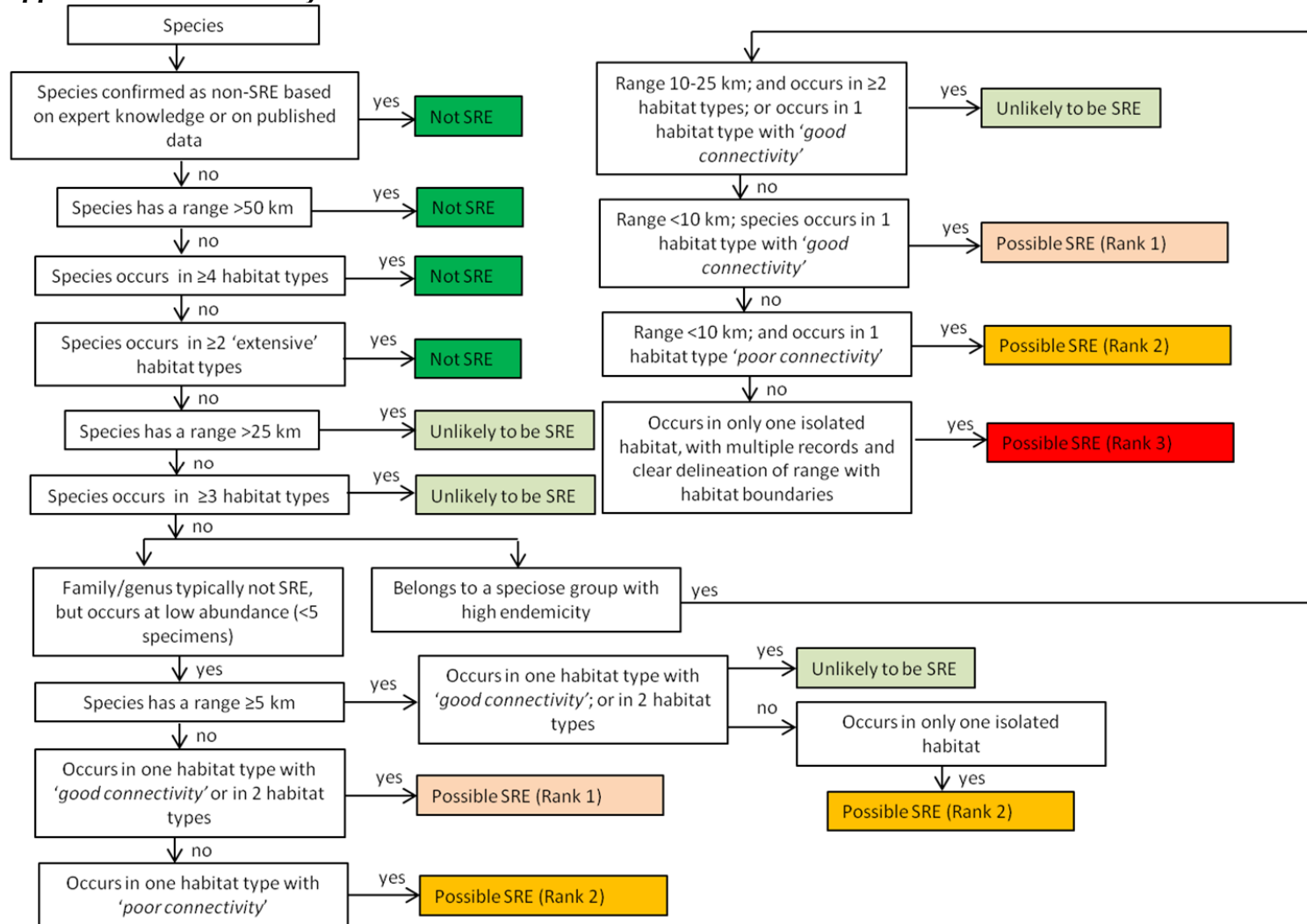
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6. APPENDICES

Appendix 1. Search Area Surrounding the Proposed Rail Siding



Appendix 2. Flow Chart of Criteria Used to Assess SRE Status

Appendix 3. Vegetation Communities in the Proposed Rail Siding

	W1: Open woodland of <i>Eucalyptus oleosa</i> subsp. <i>oleosa</i> and <i>Eucalyptus longissima</i> over <i>Acacia aneura</i> and <i>Acacia tetragonophylla</i> over <i>Dodonaea rigida</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> and <i>Eremophila metallicorum</i> over <i>Ptilotus obovatus</i> var. <i>obovatus</i> , <i>Maireana tomentosa</i> and <i>Ptilotus exaltatus</i> var. <i>exaltatus</i> on flats with red sandy clays.
	S1: Open scrub of <i>Casuarina pauper</i> over <i>Atriplex vesicaria</i> and <i>Atriplex nummularia</i> over <i>Streptoglossa liatroides</i> , <i>Solanum lasiophyllum</i> , <i>Maireana tomentosa</i> subsp. <i>tomentosa</i> and <i>Dissocarpus paradoxus</i> on flats with red clays and quartz pebbles.
	S2: Scrub of <i>Acacia sibirica</i> , <i>Acacia mulganeura</i> , <i>Santalum acuminatum</i> and <i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i> with occasional emergent <i>Eucalyptus horistes</i> and <i>Casuarina pauper</i> over <i>Dodonaea lobulata</i> , <i>Scaevola spinescens</i> and <i>Senna artemisioides</i> subsp. <i>filifolia</i> over <i>Ptilotus obovatus</i> var. <i>obovatus</i> , <i>Solanum lasiophyllum</i> and <i>Olearia muelleri</i> on flats with red sands and lateritic pebbles.
	S3: Low scrub of <i>Acacia aneura</i> and <i>Acacia mulganeura</i> over sparse understorey of <i>Sida calyxhymenia</i> and <i>Aristida contorta</i> on flats with compact red/brown clays.
	S4: Open scrub of <i>Acacia aneura</i> , <i>Acacia ramulosa</i> var. <i>ramulosa</i> and <i>Acacia jamesiana</i> over <i>Dodonaea rigida</i> and <i>Scaevola spinescens</i> over <i>Helipterum craspedioides</i> , <i>Monachather paradoxus</i> , <i>Solanum lasiophyllum</i> and <i>Velleia rosea</i> on flats with red clays and small ironstone and/or quartz pebbles.
	S5: Open scrub of <i>Casuarina pauper</i> and <i>Acacia aneura</i> over <i>Acacia tetragonophylla</i> and <i>Scaevola spinescens</i> over <i>Eremophila decipiens</i> subsp. <i>decipiens</i> , <i>Dodonaea rigida</i> and <i>Senna cardiosperma</i> over <i>Aristida contorta</i> and <i>Solanum nummularium</i> on flats with compact red clays and small ironstone pebbles.
	S6: Tall open scrub of <i>Acacia aneura</i> , <i>Acacia jamesiana</i> and <i>Acacia mulganeura</i> with occasional emergent <i>Eucalyptus horistes</i> over <i>Acacia tetragonophylla</i> , <i>Scaevola spinescens</i> , <i>Eremophila clarkei</i> , <i>Dodonaea rigida</i> and <i>Senna cardiosperma</i> over <i>Ptilotus obovatus</i> var. <i>obovatus</i> , <i>Solanum lasiophyllum</i> , <i>Ptilotus exaltatus</i> var. <i>exaltatus</i> and <i>Aristida contorta</i> on flats with red sandy clays and small ironstone pebbles.

Appendix 4. WAM Database Records within the Search Area

Note: SRE status has been applied by Museum of Western Australia

Higher Groups	Species	SRE Status	Locality
Arachnida			
Mygalomorphae	<i>Aganippe</i> `sp. nov.`	Not considered SRE	Goongarrie Station
	<i>Aname</i> `sp.`	Not considered SRE	Credo Station
	<i>Aname tepperi</i>	Not considered SRE	Goongarrie Station
	<i>Eucyrtops</i> `sp.`	Not considered SRE	Credo Station
	<i>Gaius</i> `sp. (female)`	Not considered SRE	Credo Station
	<i>Kwonkan goongarriensis</i>	SRE	Goongarrie Station
	<i>Mandjelia humphreysi</i>	Not considered SRE	Goongarrie Station
	<i>Missulena</i> `MYG049`	Not considered SRE	Morley Find, via Menzies
	<i>Synothele goongarrie</i>	SRE	Goongarrie Station
	<i>Teyl</i> `door building sp.?'	Not considered SRE	Goongarrie Station
	<i>Teyl</i> `double-door building sp.?'	Not considered SRE	Goongarrie Station
	<i>Teyl</i> `sp. indet. (juv.)`	Not considered SRE	Goongarrie Station
Pseudoscorpiones			
Panctenata	<i>Conicochernes</i> `PSE024`	SRE	Credo Station
Scorpiones			
Buthidae	<i>Lychas</i> `adonis`	Not considered SRE	Goongarrie Station
	<i>Lychas annulatus</i>	Not considered SRE	Goongarrie Station, 20 km W. of Menzies
	<i>Lychas jonesae</i>	Not considered SRE	Goongarrie Station
	<i>Lychas splendens</i>	Not considered SRE	Goongarrie Station
Urodacidae	<i>Urodacus</i> `armatus`	Not considered SRE	Goongarrie Station, 6 km N. Of Menzies
	<i>Urodacus hoplurus</i>	Not considered SRE	Menzies District, 8 km ESE of Kookynie
	<i>Urodacus similis</i>	Not considered SRE	Goongarrie Station
Chilopoda			
Scolopendrida	<i>Cormocephalus strigosus</i>	Not considered SRE	Goongarrie Station
	<i>Cormocephalus turneri</i>	Not considered SRE	Goongarrie Station
	<i>Ethmostigmus curtipes</i>	Not considered SRE	Goongarrie Station
	<i>Ethmostigmus rubripes</i>	Not considered SRE	Goongarrie Station
	<i>Scolopendra laeta</i>	Not considered SRE	Goongarrie Station
	<i>Scolopendra morsitans</i>	Not considered SRE	Goongarrie Station, Comet Vale Siding
Scutigera	<i>Allothreua maculata</i>	Not considered SRE	Davyhurst
Diplopoda			
Polydesmida			
	<i>Antichiropus</i> `credo`	SRE	Credo Station
	<i>Antichiropus</i> `sp. indet. (female)`	Not considered SRE	Lake Goongarrie, Butterfly
Polyxenida			
	<i>Phryssonotus novaehollandiae</i>	Not considered SRE	Credo Station
Mollusca			
Gastropoda	<i>Bothriembryon</i> cf. <i>sedgwicki</i>	Not considered SRE	Credo Station
	<i>Gastrocopta</i> cf. <i>margaretae</i>	Not considered SRE	Credo Station
	<i>Pupilla</i> cf. <i>ficulnea</i>	SRE	Credo Station
	<i>Pupoides adelaidae</i>	Not considered SRE	Credo Station
	<i>Pupoides myoporinae</i>	Not considered SRE	Credo Station
	<i>Sinumelon</i> cf. <i>kalgum</i>	Not considered SRE	Credo Station
	<i>Sinumelon kalgum</i>	Not considered SRE	Niagara
	<i>Succinea</i> cf. <i>aridicola</i>	Not considered SRE	Credo Station