PHOENIX
ENVIRONMENTAL SCIENCES

Short-range endemic invertebrate fauna survey for the O'Neil Mine Development

Prepared for GHD Pty Ltd, on behalf of Alcoa of Australia Ltd

June 2024

Final

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Version history

Author	Reviewer	Version	Version number	Date submitted	Submitted to
A. Jacks	K. Crews	Draft for client comments	0.1	21-May-24	T. Sleigh
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EXECUTIVE SUMMARY

Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by GHD Pty Ltd, on behalf of Alcoa Australia Limited (Alcoa), to undertake a baseline short-range endemic (SRE) invertebrate survey for the O'Neil Mine Development (O'Neil; the Project), located approximately 25 km north-east of Dwellingup, Western Australia. The purpose of the survey was to assist in understanding environmental values and constraints, and support business planning and approvals for the Project.

Accordingly, Phoenix completed a 2-phase detailed SRE field survey over 2 seasons, between July and October 2023. The study area for the survey was 10,414.5 ha, of which approximately 1,163.1 ha is currently rehabilitation or cleared land. The study area is in the Northern Jarrah Forest subregion of the Jarrah Forest bioregion.

Sampling was conducted at 17 sites, 12 inside the study area and 5 outside of the study area as reference sites. Three systematic sampling methods were employed at all sites: wet pit trapping, active foraging, and litter /soil sieving. Identification of collected specimens was completed by Phoenix taxonomists, external specialist taxonomists and molecular sequencing. SRE habitat mapping was undertaken based on vegetation mapping provided by Mattiske Consulting. Each habitat was rated for its potential to support SREs (potential habitat rating; PHR) as High, Low or None.

Native vegetation represents 9,249.8 ha (88.8%) of the study area, with 1,020.9 ha (9.8%) comprising rehabilitated land and the remainder 142.2 ha (1.4%) is cleared. Nine SRE habitats were defined within study area, which was dominated by Jarrah/Marri woodland/forest habitats. Five habitats were classified as having High PHR, with habitat attributes that often give rise to specialisation or dependency in invertebrate fauna, particularly more mesic habitats on lower slopes and valley floors. These represented 6,624.8 ha (32.1%) of the study area. The remaining 4 habitats were classified as low PHR.

A total of 64 taxa from groups known to include SREs were collected in the field survey and of these, 45 taxa (70%) from 19 families were classified as SREs, comprising:

- 3 Confirmed SREs, represented by *Antichiropus* 'Phoenix0217' (a millipede), *Urodacus planimanus* (a scorpion) and *Pseudotyrannochthonius* 'Darling Range 2' (a pseudoscorpion)
- 5 Likely SREs, represented by 4 isopods (*Buddelundia* 'sp. 5', Philosciidae 's/1', Pseudodiploexochus 'Phoenix0214' and *Styloniscus* '7') and one millipede (*Podykipus* 'DIP241')
- 37 Potential SREs, represented by 14 mygalomorph spider taxa, 6 isopods, 2 millipedes, 7 opiliones, 3 land snails, one araneomorph spider (family Selenopidae) and 4 pseudoscorpions.

Of the 45 SRE taxa, 28 species are described species or are morphospecies that were matched either morphologically or genetically to previously recorded taxa, and 7 are new species not previously known from morphological or molecular analysis. The remaining 10 are indeterminate taxa.

The high proportion of taxa collected from representatives of SRE groups that were classified as SREs (70%) was consistent with previous Northern Jarrah Forest subregion SRE surveys.

All but 3 of the recorded SRE taxa have been collected from outside the study area from either reference sites in the current survey, or from other SRE surveys of the Northern Jarrah Forest subregion. The 3 taxa are all Potential SRE's, known only from sites within O'Neil are one Mygalomorph spider *Euoplos* 'Phoenix0211'; and 2 isopods, Philosciidae 'Phoenix0208' and Philosciidae 'Phoenix0209'. All 3 were collected from only a single site; however, broader distributions are inferred for each taxon based on habitat of the collected specimens and/or wider distributional records of other (related) SREs from those locations.

Several comparable 2-phase SRE surveys have been undertaken by Phoenix since 2020 in the Northern Jarrah Forest subregion between Jarrahdale and Collie. The current survey at O'Neil recorded a high number of species or morphospecies in common with surveys at adjacent study areas Myara North

and Holyoake. There was also considerable overlap in taxa at other study areas (Holyoake East, Holyoake West and at Worsley).

The current survey highlights the value of continued sampling in increasing knowledge of SRE species, their distributions and habitat requirements, therefore informing Northern Jarrah Forest biodiversity values and conservation significance. While the survey results broadened known distributions for many taxa (including some species previously collected only from one other survey), the absence of additional collections of other SRE taxa from adjacent study areas supports the notion of some species from the subregion having highly restricted distributions.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

BoM	Bureau of Meteorology
DBCA	Department of Biodiversity, Conservation and Attractions
DRA	Disease Risk Area
EIA	Environmental impact assessment
EPA	Environmental Protection Authority
ESA	Environmentally sensitive areas
IBRA	Interim Biogeographic Regionalisation of Australia
MNES	Matter of National Environmental Significance
PDWSA	Proclaimed Drinking Water Source Areas
PHR	Potential habitat rating
SCP	Swan Coastal Plain
SP	Specially protected
SRE	Short-range endemic
SWAA	Surface water allocation areas
WA	Western Australia
T&P	Threatened and Priority
WAM	Western Australian Museum

1 INTRODUCTION

In 2023, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by GHD Pty Ltd, on behalf of Alcoa Australia Limited (Alcoa), to undertake a baseline short-range endemic (SRE) invertebrate survey for the O'Neil Mine Development (O'Neil; the Project), located approximately 25 km north-east of Dwellingup, Western Australia (WA; Figure 1-1). The purpose of the survey was to assist in understanding environmental values and constraints, and support business planning and approvals for the Project.

1.1 BACKGROUND

Alcoa was granted approval to mine bauxite at the Huntly Mine, within mineral lease 1SA (ML1SA), under the *Alumina Refinery Agreement Act 1961*. The Huntly Mine has operated since 1976 and includes several mining regions.

Alcoa is proposing to extend its mining operations within ML1SA to enable continuity of bauxite supply to its Pinjarra Alumina Refinery. O'Neil is one of the regions under investigation for development.

The survey was required to be conducted to a level required to support an environmental impact assessment under Part IV of the WA *Environmental Protection Act 1986* (EP Act), and under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Previous SRE surveys for the Huntly Mine expansion included detailed surveys in the Myara North and Holyoake study areas in 2020 (Phoenix 2021c). Concurrent SRE surveys also took place in the Holyoake East, and Holyoake West study areas (Phoenix in prep.-b) in 2022 and 2023.

1.2 SCOPE OF WORK

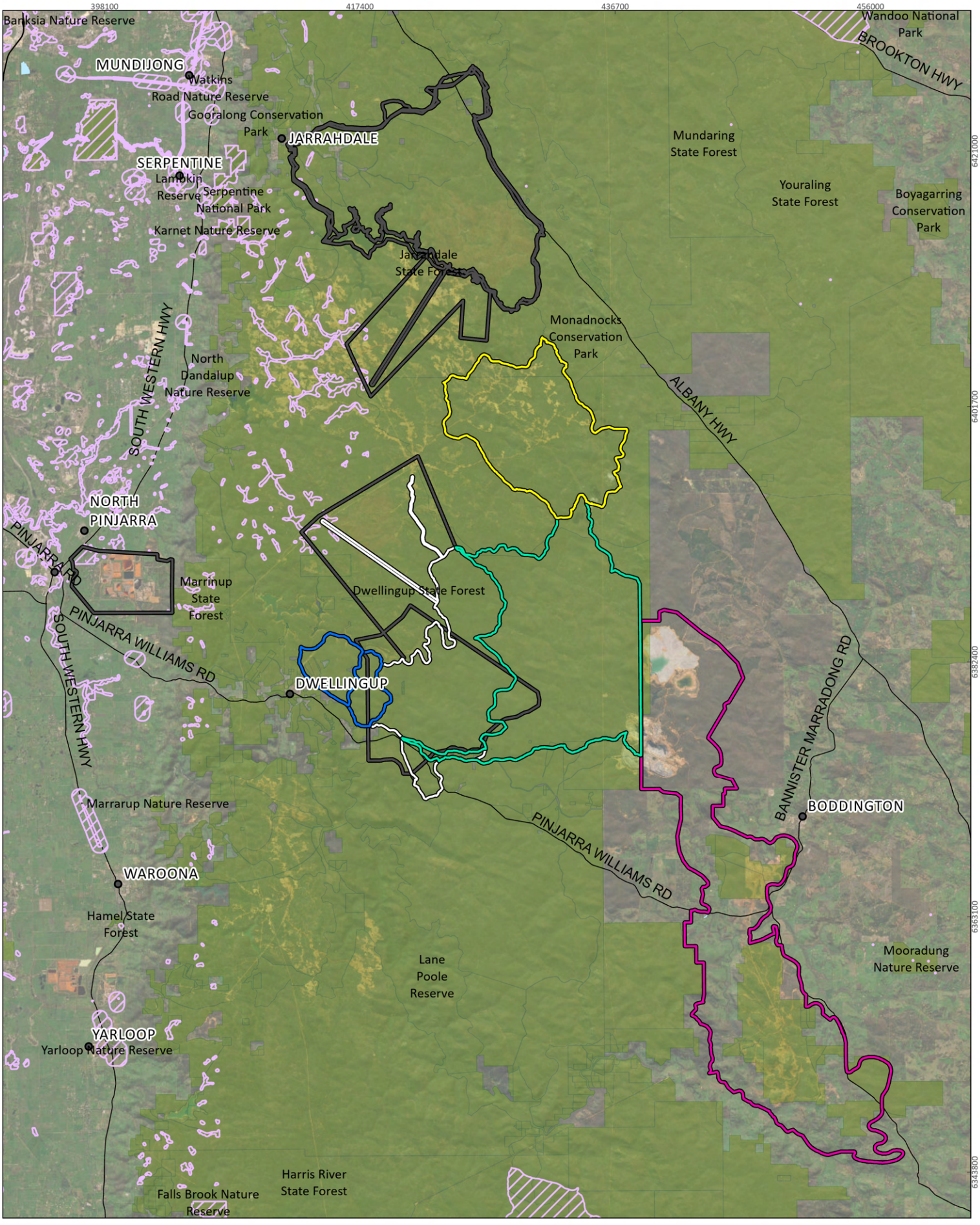
The scope of works for the SRE invertebrate survey was as follows:

- undertake a 2-phase detailed SRE field survey
- prepare a concise technical report documenting desktop review, field survey and data analysis results
- prepare an Index of Biodiversity Surveys for Assessments (IBSA) data package suitable for submission to the IBSA website.

The survey was to be conducted in accordance with *Technical Guidance: Sampling of short-range endemic invertebrate fauna*. Environmental Protection Authority (EPA 2016).

1.3 STUDY AREA

O'Neil (the study area) is 10,414.5 ha, of which approximately 1,163.1 ha is currently rehabilitation or cleared. It partially overlaps areas previously mined for the Huntly Mine operations. The study area is part of a larger scope of investigations for future mining. It is 3.5 km south of the Myara North study area survey by Phoenix in 2020 (Phoenix 2021c) and is directly north of the Holyoake East study area surveyed by Phoenix in 2023 (Phoenix in prep.-b) (Figure 1-1).



GHD Pty Ltd - Holyoake Stage 2 Project
O'Neil Mine Development

Project No	1482
Date	21/05/2024
Drawn by	JL
Map author	AJ

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Kilometers

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- Study area
- Holyoake East (Phoenix in prep)
- Holyoake West (Phoenix in prep)
- Worsley (Phoenix 2021)
- Holyoake (Phoenix 2021)
- Myara North (Phoenix 2021)
- DBCA managed land
- Lakes
- Environmentally Sensitive Areas
- Roads

Figure 1-1

Project location and study area

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2 LEGISLATIVE CONTEXT

The protection of fauna in WA is principally governed by 3 acts:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- State *Biodiversity Conservation Act 2016* (BC Act)
- State *Environmental Protection Act 1986* (EP Act).

2.1 COMMONWEALTH

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance (MNES), require approval from the Australian Government minister for the Environment. The EPBC Act provides for the listing of Threatened native fauna as MNES.

Few invertebrate taxa from WA are listed as MNES. Those that are mostly include species that have experienced significant range contractions and population declines due to habitat loss, for example the Margaret River Marron (*Cherax tenuimanus*) (Critically Endangered) and the Shield-backed Trapdoor Spider (*Idiosoma nigrum*) (Vulnerable) (DoEE 2018).

2.2 STATE

In WA, the BC Act provides for the listing of Threatened fauna species (Government of Western Australia 2018a, b) in the following categories:

- Critically Endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future[1]
- Endangered (EN) – species facing a very high risk of extinction in the wild in the near future[1]
- Vulnerable (VU) – species facing a high risk of extinction in the wild in the medium-term future[1].

Species may also be listed as specially protected (SP) under the BC Act under the category of 'species of special conservation interest' (conservation dependent fauna, CD), including species with a restricted natural range.

The Department of Biodiversity, Conservation and Attractions (DBCA) administers the BC Act and also maintains a non-statutory list of Priority fauna. Priority species are still considered to be of conservation significance – that is they may be Threatened – but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority fauna list are assigned to one of 4 Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

Few SRE invertebrate taxa are currently listed under the BC Act and while there are several invertebrate species on DBCA's Priority list (some of which are SRE taxa), these lists cannot be relied on as a complete guide to significant invertebrate taxa within a particular location. The most up-to-date listings of terrestrial invertebrates and their distribution are available through the WA Museum invertebrate databases.

2.3 OVERVIEW OF SRE INVERTEBRATES

Short-range endemic (SRE) fauna are defined as animals that display restricted geographic distributions, nominally less than 10,000 km^2, that may also be disjunct and highly localised (Harvey

[1] As determined in accordance with criteria set out in the ministerial guidelines.

2002; Ponder & Colgan 2002). Short-range endemism in terrestrial invertebrates is believed to have evolved through two primary processes (Harvey 2002), relictual short-range endemism – where drying climate has forced range contraction into small pockets with remaining moist conditions (e.g. south-facing rock faces or slopes of mountains or gullies) – and habitat specialist SREs that may have settled in particular isolated habitat types (e.g. rocky or granite outcrops) by means of dispersal and evolved in isolation into distinct species. However, SRE invertebrates have also been reported in more widespread habitats such as spinifex plains or woodlands mainly in groups with low dispersal capabilities such as mygalomorph spiders and millipedes.

Short-range endemic fauna need to be considered in environmental impact assessments (EIA) as localised, small populations of species are generally at greater risk of changes in conservation status due to environmental change than other, more widely distributed taxa (EPA 2016).

There can be uncertainty in categorising a specimen as SRE due to a number of factors including poor regional survey density, lack of taxonomic research and problems of identification, i.e. specimens that may represent SREs cannot be identified to species level based on the life stage at hand. For example, in contrast to mature males, juvenile and female millipedes, mygalomorph spiders and scorpions cannot be identified to species level. Molecular techniques such as 'barcoding' (Hebert *et al.* 2003a; Hebert *et al.* 2003b) are routinely employed to overcome taxonomic or identification problems.

3 EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into large 'bioregions' and 'subregions' based on climate, geology, landform, native vegetation and species information (DoEE 2016). The study area is located in the Northern Jarrah Forest subregion (JF1) of the Jarrah Forest bioregion (Figure 3-1) which is predominantly comprised of jarrah–marri forest in the west with bullich and blackbutt in the valleys (Williams & Mitchell 2001). This grades to wandoo and marri woodlands in the east, with powderbark on breakaways. Heath is found on granite rocks and there are extensive but localised sandsheets with *Banksia* low woodlands (Williams & Mitchell 2001).

3.2 LAND SYSTEMS AND SURFACE GEOLOGY

DPIRD undertakes land system mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). While the primary purpose of the mapping is to inform pastoral and agricultural land capability, it is also useful for informing biological assessments. Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004).

The study area intersects 2 land systems, the Darling Plateau and Murray Valleys land system. The Darling Plateau comprises over 93% of the baseline study area (Table 3-1; Figure 3-2).

Table 3-1 Land systems and extent in baseline study area

Land system	Description	Area ha (%)
Darling Plateau System	Lateritic plateau. Duplex sandy gravels, loamy gravels and wet soils. Jarrah-marri-wandoo forest and woodland.	10,385.2 (99.7%)
Murray Valleys System	Western Darling Range from the Avon Valley to Harvey. Deeply incised valleys with Red loamy earths, shallow duplexes and rock outcrop and Jarrah-marri-wandoo forest and woodland with mixed shrubland	29.3 (0.3%)
	TOTAL	**10,414.5**

According to the Surface Geology of Australia 1:1,000,000 scale, Western Australia database (Stewart *et al.* 2008), the study area intersects 4 geological formations (Table 3-2; Figure 3-2).

Table 3-2 Surface geology of the study area, extent by deposit type

Surface geology	Abbreviation	Description	Area (ha)	% of study area
Felsic intrusives 74292	Ag	Undifferentiated felsic intrusive rocks, including monzogranite, granodiorite, granite, tonalite, quartz monzonite, syenogranite, diorite, monzodiorite, pegmatite. Locally metamorphosed, foliated, gneissic. Local abundant mafic and ultramafic inclusions	4,390.3	42.2
Gneiss, granulite, migmatite 74310	An	Banded granitic gneiss (monzogranitic to granodioritic), quartzofeldspathic gneiss	672.7	6.5

Surface geology	Abbreviation	Description	Area (ha)	% of study area
		with mafic bands, migmatite, granofels, mafic and felsic granulites, hypersthene-plagioclase-quartz granulite; schist, pelitic or mafic granofels		
Ferruginous duricrust 38498	Czl	Pisolitic, nodular or vuggy ferruginous laterite; some lateritic soils; ferricrete; magnesite; ferruginous and siliceous duricrusts and reworked products, calcrete, kaolinised rock, gossan; residual ferruginous saprolite	5,184.0	49.8
Sand plain 38499	Czs	Sand or gravel plains; quartz sand sheets commonly with ferruginous pisoliths or pebbles, minor clay; local calcrete, laterite, silcrete, silt, clay, alluvium, colluvium, aeolian sand	167.5	1.6
		TOTAL	**10,414.5**	**100%**

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Kilometers

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Study area

Region, subregion

Jarrah Forest, Northern Jarrah Forest

Swan Coastal Plain, Perth

Figure 3-1

Study area in relation to IBRA bioregions and subregions

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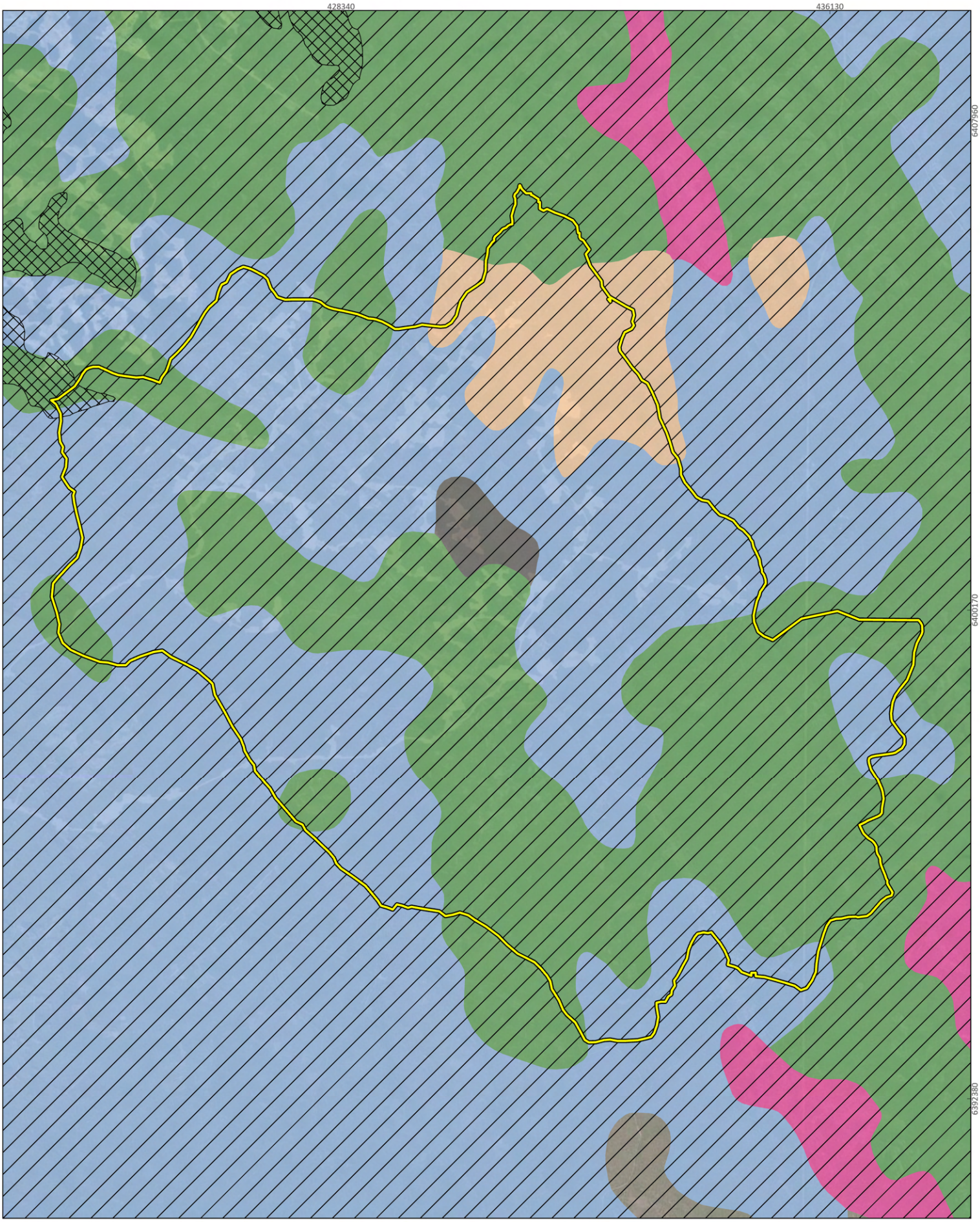

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Study area

Surface geology

Ag
An
Czl
Czs
Qrc

Land system

Darling Plateau System
Murray Valleys System

Figure 3-2

Land systems and surface geology in the study area

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3.3 CLIMATE AND WEATHER

The climate of the Northern Jarrah Forest subregion is Warm Mediterranean, with cool wet winters and warm dry summers. The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and recent historic climate data is Karnet (no. 009111, Latitude: 32.44°S Longitude 116.08°E), located 13.5 km north-west of the study area.

Karnet (1963–2024) records the highest mean maximum monthly temperature (30.7°C) in January (lowest in July 15.5°C) and the lowest minimum mean monthly temperature (6.3°C) in July and August, with the highest (15.8°C) in February (Figure 3-3). The average annual rainfall at Karnet is 1,121.7 mm with June and July recording the highest monthly averages of 203.9 mm and 219.8 mm, respectively (Figure 3-3).

Daily mean maximum and minimum temperatures recorded at Karnet during the survey period were similar to long-term averages leading up to the field survey but were above the long-term annual average during the survey (Figure 3-3). Rainfall at Karnet in 2023 was significantly drier than the long-term average. In 2023, Karnet received a total of 636.2 mm, compared to the 10-year (2013 to 2023) average of 962.7 mm, and long-term average (1965 to 2023) of 1,134.2 mm. The previous year (2022) also experienced a significantly drier year (671.3 mm); however, 2021 and 2020 recorded 1,307 and 1,013 mm respectively. These conditions are considered less favourable for SREs but are a well-documented trend towards a drying climate.

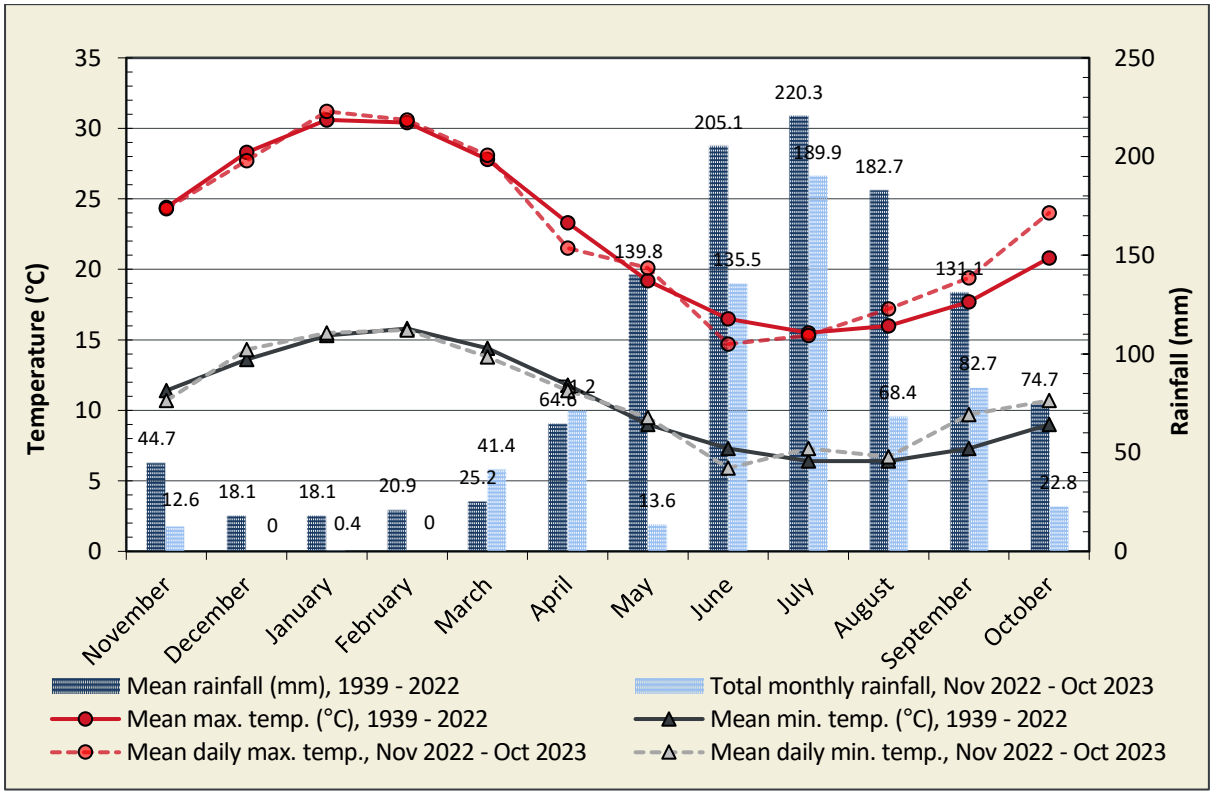


Figure 3-3 Annual climate and weather data for Karnet (no. 009111) and mean monthly data for the 12 months preceding the survey (BoM 2024)

3.4 LAND USE

Land use statistics were derived from the Australian Bureau of Agriculture and Resource Economics and Sciences' Catchment Scale Land Use Mapping for WA 2018 dataset (ABARES 2018), for the Northern Jarrah Forest subregion. The dataset is a compilation derived from various vector datasets,

with land use classified according to the Australian Land Use and Management Classification (v8); a three-tiered hierarchical structure.

Approximately 10,410.9 ha (97.3%) of the study area is 'uncleared' and used for production native forests (Table 3-3). The singular land use in the cleared portion of the study area are roads, occupying <0.1%.

Table 3-3 Land uses of the study area

Land use	Area (ha)	Area (%)
1. Cleared		
1.1 Intensive uses		
1.1.1 Roads	3.6	<0.1
2. Uncleared		
2.1 Conservation and natural environments		
2.1.1 National park	33.1	0.3
2.1.2 Other conserved area	527.9	5.1
2.1.3 Residual native cover	300.5	2.9
2.2 Production from relatively natural environments		
2.2.1 Production native forests	9,549.0	91.7
2.3 Water		
2.3.1 Marsh/wetland	0.4	<0.1
TOTAL	**10,414.5**	**100**

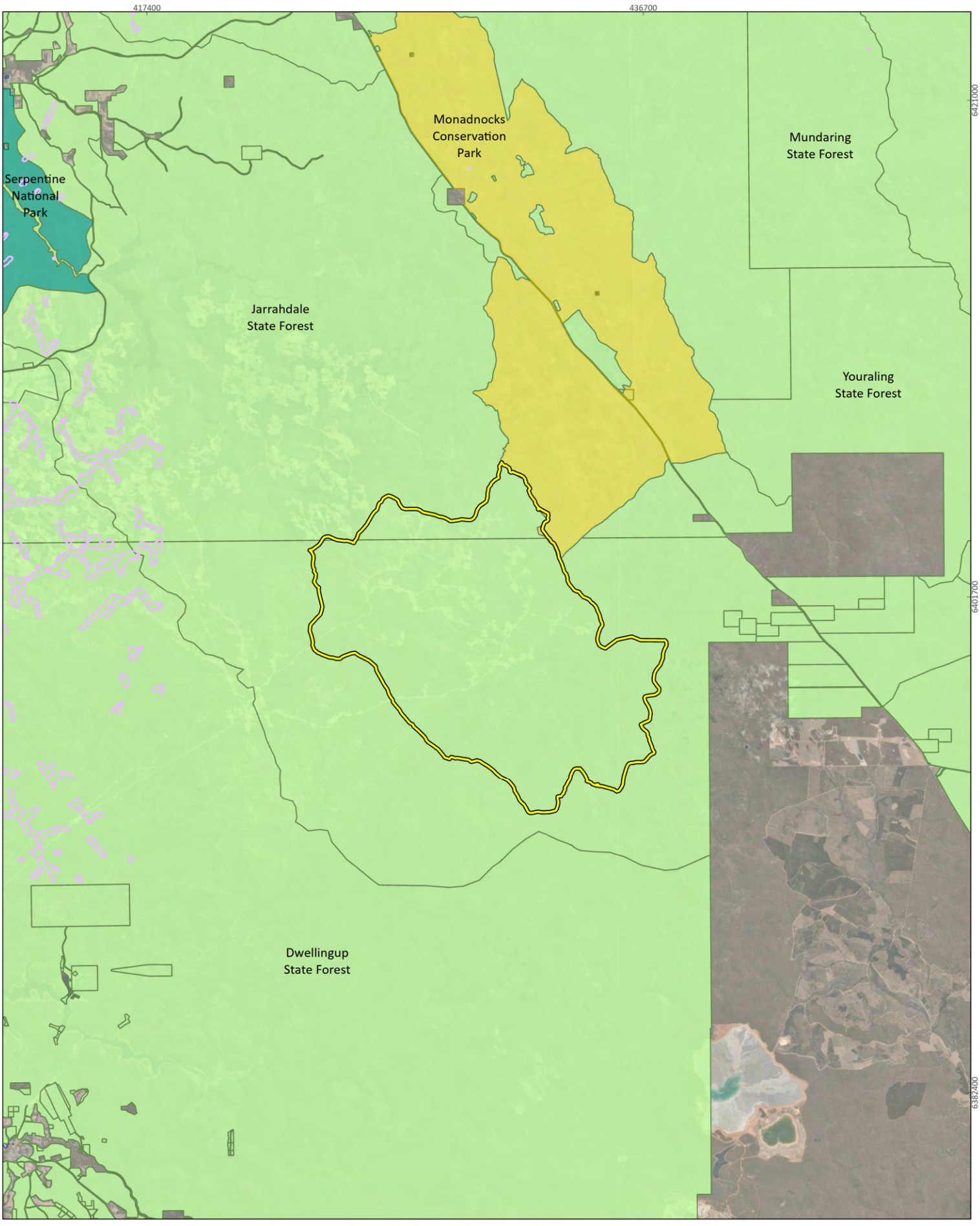
3.5 CONSERVATION RESERVES AND ENVIRONMENTALLY SENSITIVE AREAS

The study area is located almost entirely within Dwellingup State Forest (9,389.8 ha) and Jarrahdale State Forest (991.6 ha; Figure 3-4). A small area falls within Monadnocks Conservation Park (33.1 ha) (a Section 5(1)(g) Reserve), which borders the north-eastern corner of the study area. No environmentally sensitive areas (ESAs) intersect the study area.

3.6 HYDROLOGICAL VALUES

The study area intersects several important urban and agricultural water sources. This includes a surface water allocation area (SWAA): Serpentine River Catchment, and a Proclaimed Drinking Water Source Area (PDWSA) under the *Metropolitan Water Supply Sewerage and Drainage Act 1909* intersect the study area: Serpentine Dam Catchment Area (Figure 3-5). One proclaimed surface water area also intersects the study area: the Serpentine River System, as proclaimed under the *Rights in Water and Irrigation Act 1914*.

Two perennial rivers occur within the study area, Serpentine River and O'Neil Brook. Both rivers drain in a north-westerly direction toward Serpentine Dam, located 17 km north-west of the study area. Several non-perennial unnamed tributaries merging with either the Serpentine River or O'Neill Brook flow though the study area.



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- Study area
- Environmentally Sensitive Areas

DBCA managed lands

- National Park
- Section 5(1)(g) Reserve
- Section 5(1)(h) Reserve
- State Forest

Figure 3-4

Conservation reserves and ESAs in the study area

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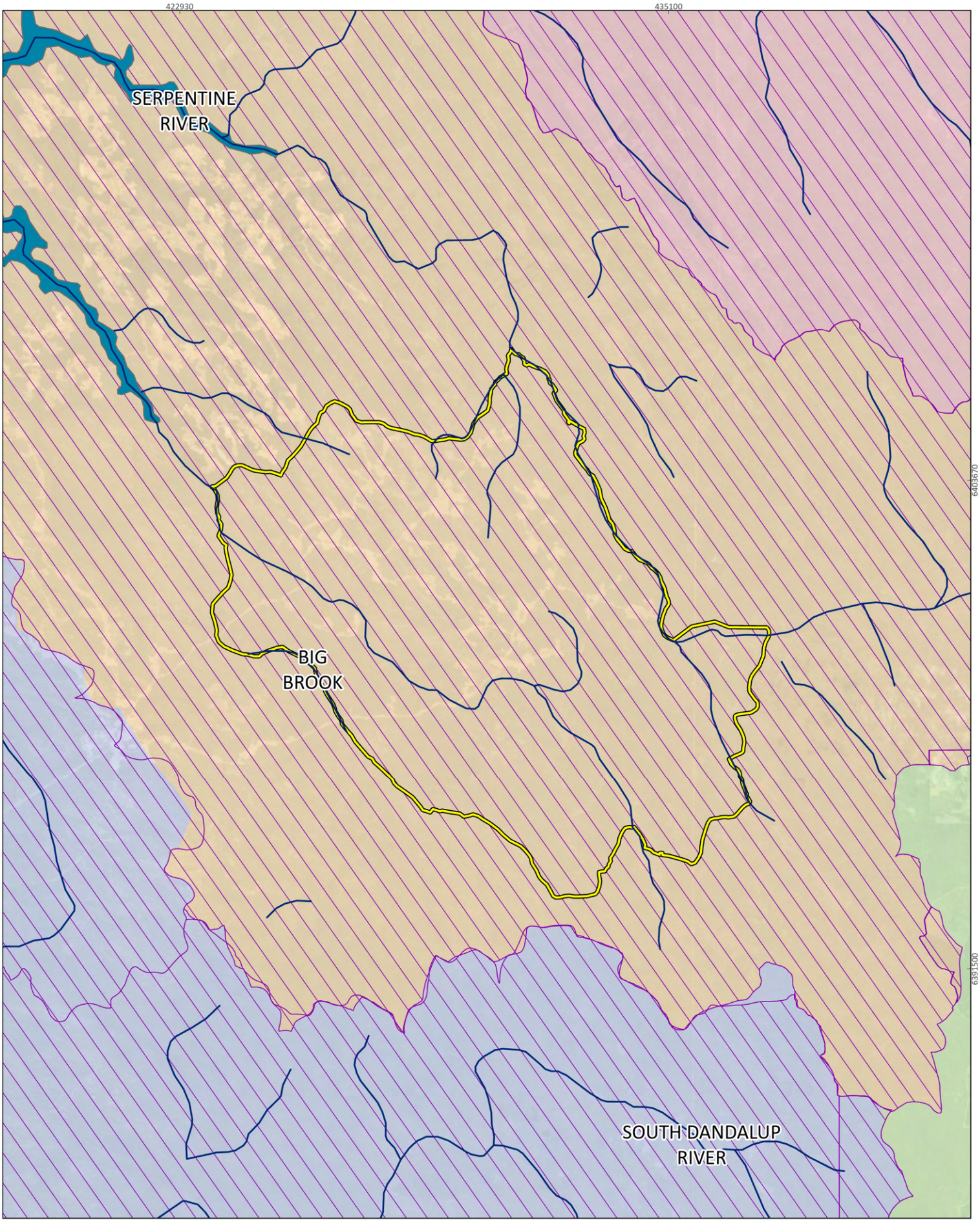

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- Study area
- Serpentine Dam
- Public Drinking Water Source Area
- Watercourses

Surface Water Allocation Area (SWAA)

- Canning River
- Dandalup River System
- Murray River & Tributaries
- Serpentine River Catchment

Figure 3-5

Hydrological values in the study area

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4 METHODS

The SRE invertebrate survey was conducted in accordance with Environmental Protection Authority (EPA) Technical Guidance: Sampling of short-range endemic invertebrate fauna (EPA 2016).

4.1 DESKTOP REVIEW

Searches of several biological databases were undertaken to identify records of SREs from the vicinity of the study area (Table 4-1). A literature search was conducted for accessible reports for biological surveys conducted within 100 km of the study area to build on the lists developed from the database searches (Table 4-2). A significant desktop data source for the current survey were 2 similar large scale SRE surveys conducted by Phoenix (Table 4-2).:

- Phoenix (2021c) – Huntly Mine Expansion Project – Myara North and Holyoake, located south and north of the study area in state forest
- Phoenix (2021a) for the Worsley Expansion Project, located east of the study area in state forest and mining tenure between Boddington and Collie (referred to as 'the Worsley survey' in this report).

The results of these surveys were included in the desktop results and were also analysed together with the results of the current survey to provide additional data to inform species distributions.

Table 4-1 Database searches conducted for the desktop review

Database	Target group/s	Search coordinates and extent
DBCA Threatened and Priority Fauna Database (DBCA 2020b)	Threatened and Priority invertebrates	Study area plus a 5 km buffer
DBCA Threatened and Priority Ecological Communities Database (DBCA 2020a)	TECs and PECs	Study area plus a 5 km buffer
WA Museum Arachnid and Myriapod Database, Mollusca Database	Arachnid, myriapod and mollusc SREs	100 km^2 search area encompassing the Holyoake Stage 2 Project assessment area between -31.669°S, 115.417°E (northwest corner) and -32.907°S, 114.445°E (southeast corner). This search area was then clipped to a 100 km radius buffer to the study area
WA Museum Insect and Mollusc Database	Threatened and Priority invertebrates	As above but clipped to 40 km buffer of the study area

Table 4-2 Survey reports included in the desktop review

Report author	Survey description	Project
Phoenix (2021c)	Short-range endemic invertebrate fauna survey for the Huntly Mine – Myara North and Holyoake	Huntly Mine
Phoenix (2021b)	Identification of invertebrate specimens collected from the Huntly Mine area	Huntly Mine
Phoenix (2021a)	Four-phase short-range endemic invertebrate fauna survey for the Worsley Mine Expansion Project	Worsley Mine Expansion Project

Report author	Survey description	Project
Phoenix (2012)	Level 2 short-range endemic (SRE) invertebrate survey for the Worsley Primary Bauxite Area Expansion Project	Worsley Mine Expansion Project
Outback Ecology (2012)	Terrestrial short-ranged endemic invertebrate fauna baseline survey for the Boddington Gold Mine (BGM)	Newmont BGM

4.2 HABITAT ASSESSMENT

Spatial analysis of several environmental databases was undertaken within the study area:

- Vegetation Complexes (Mattiske & Havel 1998)
- Watercourses (Geoscience Australia 2020)
- Granites (dataset supplied by Alcoa)
- Old growth forest (dataset supplied by Alcoa).

Vegetation complexes within the study area were re-interpreted in relation to SRE invertebrates, based on factors considered important in defining fauna assemblages, including vegetation type and structure, soils/ substrate and position in the landscape. Each fauna habitat was then rated for its potential to support SREs (potential habitat rating; PHR) as follows:

- High – defined/known areas of habitat that contain elements that often give rise to specialisation or dependency in invertebrate fauna, such as aspect (e.g. south-facing slopes, deeply incised gullies), geological features (e.g. granite), soil types that retain water (e.g. clay, loam).
- Low – areas of largely intact native vegetation that occur broadly across the landscape, are less incised and typically link more restricted habitats. This includes land that was cleared but has since been rehabilitated or is in the process of being rehabilitated.
- None – land that has been previously cleared for other uses that no longer contains native vegetation.

4.3 FIELD SURVEY

Field surveys were conducted over 2 seasons, between July and October 2023 (Table 4-3).

The following methods were employed in the survey:

- wet pit trapping (see 4.3.2)
- active foraging (see 4.3.3)
- litter/soil sieving (see 4.3.4).

Table 4-3 Survey dates

Trip #	Dates	Activity
1	24 – 28 July 2023	Install phase 1 wet pitfall traps, foraging/litter sieving
2	29 August – 1 September 2023	Retrieve wet pitfall traps, Install phase 2 wet pitfall traps
3	2 – 6 October 2023	Retrieve phase 2 wet pitfall traps. Foraging/litter sieving

The personnel involved in the surveys are listed in Table 4-4. All survey work was carried out under Fauna Taking (Biological Assessment) licence BA27000664-2 issued by DBCA under the BC Act, with

Reg 4 (received 12/07/2022 from Shawn Debono) and Disease Risk Area (DRA) Permit #3291 issued from DBCA Perth Hills region. Wet pit trapping was carried out under Wildlife Animal Ethics permit WAEC 22-06-71 under the *Animal Welfare Act 2002*.

Table 4-4 Survey personnel

Name	Qualifications	Roles	Years experience
Anna Jacks	BSc (Environmental Science) (Hons)	Field management, field surveys, GIS, report writing, taxonomy, lab work	18+
Simon Pynt	BSc (Zoology)	Field survey	18+
Lachlan Petersen	BSc (Zoology, Physics)	Field survey, Lab work	5+

4.3.1 Site selection

Initial habitat characterisation was undertaken using various remote geographical tools, including aerial photography (Google Earth®), land system maps and topographic maps. Habitats with the potential to support significant terrestrial fauna species were identified based on known habitats of such species within the Jarrah Forest bioregion. Tentative sites were selected for the survey to represent all habitat types. Final survey site selection was conducted after ground-truthing of site characteristics.

At the broadest scale, site selection considered aspect, topography and land systems. At the finer scale, consideration was given to proximity to water bodies (drainage lines and creek), vegetation complexes and condition, soil and rock type (e.g. granite outcrops). Sites were primarily chosen to represent the best example of distinct habitats within the broader habitat associations of the study area with a focus on habitats of SRE taxa identified in the desktop review.

No impact area or indicative disturbance footprint was available for the study area, therefore site selection here focused on representative sampling of habitats and coverage across this area, with some reference sites placed outside the study area (Figure 4-1; Table 4-5).

Habitat descriptions and characteristics were recorded at all sites (Appendix 1).

4.3.2 Wet pit trapping

A total of 17 wet pitfall trapping sites were established across the study area, including 12 inside the study area and 5 outside of the study area as reference sites (Table 4-5; Figure 4-1). Each wet pitfall trap site comprised of five one litre plastic containers with a 70 mm diameter dug in flush with the surface in suitable microhabitats at each site. Pit traps were half-filled with propylene glycol/ethanol mixture, which has been shown to preserve DNA under laboratory conditions in invertebrates (Vink *et al.* 2005) and Phoenix has successfully sequenced the mitochondrial cytochrome oxidase subunit 1 (COI) gene from specimens caught in propylene glycol pitfall traps from previous surveys. All traps were covered with a plastic lid elevated 25 mm above the trap with wooden blocks to minimise by-catch of vertebrates where possible. Traps remained open following the setup and were retrieved approximately 5 weeks later.

4.3.3 Active foraging

Active foraging for SRE invertebrate groups comprised inspection of logs, larger plant debris, within the foliage and stem of shrubs such as *Xanthorrhoea preissii*, the underside of bark of larger trees and the underside of rocks. Methodical searches were conducted amongst the leaf litter of shade-bearing tall shrubs and trees. Rocks and rock crevices were inspected, particularly for pseudoscorpions.

A standardised approach was undertaken whereby each site was sampled for one person hour per phase, a total search effort of 34 hours in total (Table 4-5;). Trapdoor spider burrows identified during the searches were excavated if they were considered inhabited. Excavation involved removing soil from around the burrow to carefully expose the burrow chamber and remove the spider.

4.3.4 Litter/soil sieving

Combined litter/soil sifts were undertaken at all sites, with 3 sifts conducted at each site per phase. In total, 102 sifts were undertaken (Table 4-5). The collection of leaf litter samples was standardised volumetrically by the diameter and height (310 mm x 50 mm = 1.55 L) of the sieves which were filled with compressed litter and the upper layers of underlying soil. Samples were sieved through 3 stages of decreasing mesh size over a round tray and invertebrates were picked from the sieves and tray with forceps. These samples particularly targeted small spiders (Araneomorphae), pseudoscorpions, buthid scorpions, millipedes, smaller species of molluscs and slaters.

Table 4-5 Survey site locations and effort

Site	Habitat description	Lat.	Long.	Inside/ outside O'Neil	Phase 1			Phase 2		
					WPT (# nights)	Foraging (hrs)	Sieves (#)	WPT (# nights)	Foraging (hrs)	Sieves (#)
CMRA-001	E. *rudis*/*Melaleuca* shrubland	-32.5652	116.2321	inside	37	1	3	35	1	3
CMRA-002	Jarrah/Marri forest	-32.5384	116.1932	inside	37	1	3	35	1	3
CMRA-003	Jarrah forest	-32.5270	116.2182	inside	37	1	3	35	1	3
CMRA-005	Jarrah/Marri	-32.5049	116.2435	inside	37	1	3	35	1	3
CMRA-006	Jarrah/Marri/*Casuarina*	-32.5376	116.2622	inside	37	1	3	35	1	3
CMRA-007	Jarrah/Marri forest	-32.499	116.2719	inside	37	1	3	35	1	3
CMRA-008	Jarrah/Marri along drainage	-32.4576	116.2675	outside	37	1	3	35	1	3
OE-001	Jarrah/Marri forest	-32.5736	116.2598	inside	37	1	3	35	1	3
OE-002	Jarrah/Marri along creek	-32.4796	116.3160	outside	37	1	3	35	1	3
OE-003	Jarrah/Marri forest	-32.5283	116.3376	outside	37	1	3	35	1	3
OE-004	Jarrah/Marri at base of granite	-32.4923	116.3332	outside	37	1	3	35	1	3
OE-006	Jarrah/Marri forest	-32.5724	116.2995	inside	37	1	3	35	1	3
OE-007	Jarrah/Marri forest	-32.5230	116.3070	outside	37	1	3	35	1	3
OE-008	Jarrah/Marri forest	-32.5064	116.2905	inside	37	1	3	35	1	3
OE-009	Jarrah/Marri forest	-32.5577	116.2614	inside	37	1	3	35	1	3
OE-010	Wandoo woodland	-32.5627	116.3221	inside	37	1	3	35	1	3
OE-012	Jarrah/*Casuarina* woodland	-32.5458	116.3014	inside	37	1	3	35	1	3

4.4 IDENTIFICATION OF SRE TAXA

4.4.1 SRE status rating

Currently, there is no accepted system to determine the likelihood that a species is an SRE. The WA Museum applies 3 categories: Confirmed, Potential, and Widespread. Confirmed SREs are taxa for which the distribution is known to be less than 10,000 km^2, the taxonomy is well known, and the group is well represented in collections and/or via comprehensive sampling (WAM 2013). Potential SREs include those taxa for which there is incomplete knowledge of taxonomy or geographic distribution, and the group is not well represented in collections. Phoenix applies 4 categories based on the WA Museum criteria (Table 4-6).

Table 4-6 Short-range endemic categories

SRE category	Criteria
Confirmed	Distribution <10,000 km^2. Taxonomy of the group is well known (but not necessarily published); group is well represented in collections, in particular from the region in question; high levels of endemism exist in documented species; inference is often possible from immature specimens.
Likely	Distribution < 10,000 km^2. Taxonomically poorly resolved group but group is generally well represented in collections; unusual morphology for the group (e.g. some form of troglomorphism); often recorded as singletons in survey and few, if any, regional records.
Potential	Distribution <10,000 km^2. Taxonomically poorly resolved group; patchy distribution, often common in certain microhabitats, but no other regional records; congeners (= species in the same genus) both widespread and restricted in distribution.
Widespread	Distribution >10,000 km^2.

4.4.2 SRE taxonomy

Initial higher-level (class, order, family) identifications of specimens were undertaken by Phoenix staff in Phoenix's invertebrate laboratory. Final species designations were allocated using specialist morphological and/or molecular sequencing (Table 4-7).

Where possible, identifications were compared with reference material from the WA Museum and/or taxonomist reference collections.

Table 4-7 Specialist taxonomists

Person	Title	Taxa
Dr Damilo Harms	Taxonomist, Phoenix	Pseudoscorpiones
Dr Karen Cullen	Taxonomist	Iulomorphidae millipedes
Dr Sharon Zuiddam	Taxonomic consultant	Opiliones
Dr Calum Irvine	Zoologist, Phoenix	Selenopidae spiders, Gastropoda, Isopoda
Dr Simon Judd	Taxonomic consultant	Isopoda–advice
Ethan Broom	Zoologist, Phoenix	Scorpiones
Anna Jacks	Invertebrate zoologist, Phoenix	*Antichiropus* millipedes, mygalomorph spiders, molecular analysis

Genomic analysis was undertaken for all specimens for which morphological identification did not provide sufficient taxonomic resolution. A total of 70 specimens were sent for molecular analyses, comprising 47 mygalomorph spiders, 12 millipedes, and 11 isopods etc. Of these, 69 produced a successful sequence. Tissue from each specimen was obtained in Phoenix' laboratory and sequenced by Genotyping Australia.

Sequences were edited and analysed using Genious Prime 2023.0.3. Sequences for comparison were sourced from GenBank (Benson *et al.* 2012) and Phoenix's DNA database using the megablast search function in Geneious. For each sequence, the most similar 10 matches were retrieved. In cases where the retrieved sequences represented a species more than twice, the 2 longest sequences were retained and the shorter conspecific sequences discarded. Where megablast results yielded families differing from the morphological assessment, additional sequences were obtained from GenBank, representing the morphological taxonomic assessment. If all the resulting blast sequences represented organisms from a different taxonomic class, sequences were discarded as likely contamination.

Nucleotide alignment and RAxML Tree builds were used to assess species delineation between survey specimens and relevant reference specimens.

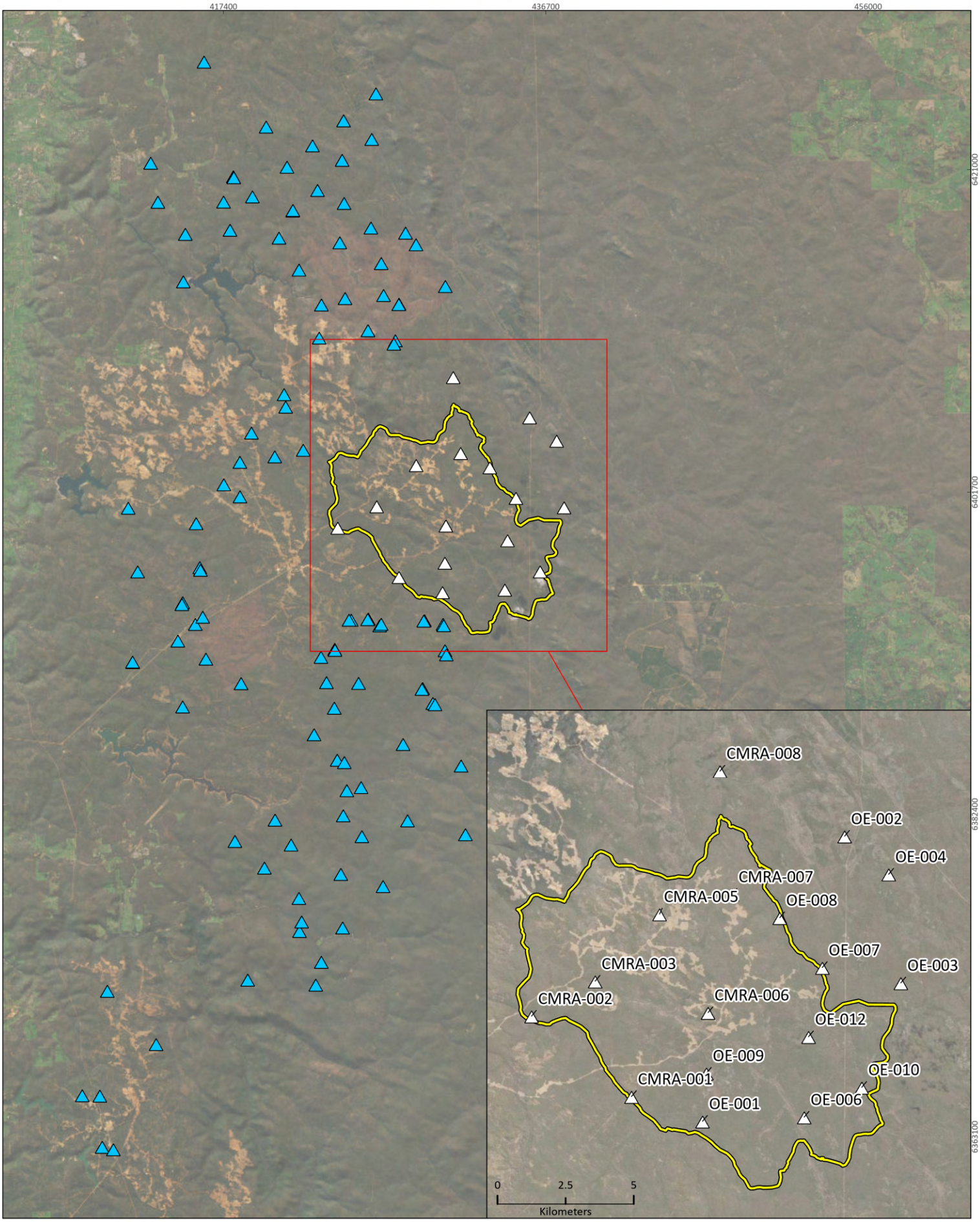
Where mygalomorph spiders failed to return a match to a previously recorded species or a species name not recognised by the WA Museum, sequences were sent to the WA Museum for further analyses.

Species that did not return a match to an existing species was given a unique 'PhoenixXXXX' morpho-code (ie. *Euoplos* 'Phoenix0211').

SRE specimens collected during the survey have been lodged with the WA Museum.

4.4.3 Analysis of survey completeness

The efficiency of the survey effort was evaluated by comparing the observed species richness against the predicted species richness of 4 widely used species richness estimators. Species accumulation curves were calculated with Primer V6 (Clarke & Gorley 2006) to obtain an estimate of survey completeness, i.e. whether the results adequately represent the assemblage of the study area. All sample types were aggregated per site and no data transformation was undertaken. The maximum number of permutations was set at 999.



GHD Pty Ltd - Holyoake Stage 2 Project
O'Neil Mine Development

Project No	1482
Date	21/05/2024
Drawn by	JL
Map author	AJ

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Kilometers

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Study area
2-phase SRE site
Previous survey sites (Phoenix 2021)

Figure 4-1

Survey sites

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5 RESULTS

5.1 DESKTOP REVIEW

5.1.1 Species records

The desktop review identified a total of 395 taxa from 9 invertebrate groups within the desktop search area (Table 5-1; Figure 5-1). Of these records, 39 are Confirmed (C) SRE taxa, 17 are Likely (L) SRE taxa, 237 are Potential (P) SRE taxa and 102 are widespread (W) taxa (Table 5-1). Of the Potential SREs, 3 are also Priority 3 (P3) fauna (Table 5-1).

No desktop records of SREs were returned inside the study area; however, the Confirmed SRE scorpion *Urodacus planimanus*, a species that is common throughout the Jarrah Forest, but with a well-documented range of less than 10,000 km^2 has been recorded just 130 m outside of the study area. Five other Potential SREs with indeterminate taxonomy have been recorded within 5 km of the study area. No Threatened terrestrial invertebrates were identified in the desktop review.

Mygalomorph spiders represented the largest group of SREs in the desktop results, accounting for approximately one-third of all taxa, and 42% of all SRE taxa (C, L and P). Millipedes and slaters were also well represented in the desktop results with 19% of all taxa (21% of SRE taxa), and 16% of all taxa (15% of SRE taxa), respectively (Table 5-1). SRE pseudoscorpions, Opiliones (harvest spiders), land snails and scorpions were also returned in the desktop searches. Velvet worms were also returned; however, only widespread species are known from the desktop search area.

Thirty-eight of the 39 Confirmed SREs are millipedes, of which most belong to the genus *Antichiropus*. The remaining single species is the scorpion *Urodacus planimanus*. Four of the 39 Confirmed SRE taxa are formally described species: *Antichiropus minimus*, *A. whistleri*, *Dinocambala ingens* (all millipedes) and *U. planimanus* (the scorpion).

Table 5-1 Summary of taxa from the desktop review, by taxonomic group and status

Group	Status					Total
	Confirmed	Likely	Potential	Widespread	Priority/ P3	
Mygalomorph spider			125	12	3	140
Araneomorph spider			1	2		3
Harvestmen spider			18	3		21
Scorpion	1		8	9		18
Pseudoscorpion			23	26		49
Millipede	38	2	23	10		73
Land snail			6	17		23
Slater		15	30	21		66
Velvet worm				2		2
Total	**39**	**17**	**234**	**102**	**3**	**395**

The 3 Priority species identified within the area of the desktop review comprise 3 mygalomorph spiders:

- *Idiosoma sigillatum* (P3) – all records within the desktop search area are located to the west between Ledge Point and Bunbury along the Swan Coastal Plain (SWA). This species is unlikely to occur in the study area.

- *Idiosoma schoknechtorum* (P3) – recorded from 23 km north of the study area in the Northern Jarrah Forest. This species may occur in the study area.
- *Euoplos inornatus* (P3) – 20 records from locations between Muchea (north of Perth) and Boddington, and a single record from Narrogin. A recent male specimen collected by Phoenix (2021a) extended the known range of this species 34 km further south than was previously known; however, most records are from the foothills of the Darling Scarp. This species may occur in the study area.

Of the 295 SRE or significant taxa, 31 are named species, 220 comprise taxa named only to morphospecies codes as applied by the WA Museum or are not identified to confirmed species level (i.e. "sp." or "cf.") and 44 taxa are unidentifiable/ indeterminate ("sp. indet.", i.e. female or juvenile specimens) or could not be identified to species or morphospecies and may represent new species or other species listed in the same genus where records exist.

There is an apparent divide of species between bioregions, with 195 (66%) SRE taxa from the desktop review only recorded within the Jarrah Forest bioregion, and 63 (21%) exclusively from the SWA bioregion. A total of 38 (13%) species were collected from more than one bioregion; however, 21 of these are indeterminate species and may represent a widespread species. One SRE species from the Jarrah Forest bioregion was also recorded in the Avon Wheatbelt bioregion.

A recent survey of Holyoake and Myara North (Phoenix 2021c) revealed a high diversity of SRE taxa. Between the 2 study areas, 83 SRE taxa were recorded, including 25 new and 10 Confirmed SREs. Based on these results and considering the proximity of Myara North and Holyoake to the current study area, a high diversity of SRE taxa was expected to occur in the study area.

5.1.2 SRE habitats

Based on Mattiske (2024) vegetation mapping and re-interpretation for SRE habitat, a total of 9 SRE habitats were defined within study area (Table 5-2). Native vegetation represents 9,249.8 ha (88.8%) of the study area and 1,020.9 ha (9.8%) represents rehabilitated land. The remainder (1.4%) is cleared (e.g. for infrastructure, plantations or dams;

Table 5-3).

The study area was dominated by Jarrah/Marri woodland/forest habitats (2, 4 and 5), with SRE Habitat 4 being the most abundant, comprising 57.4 % of the study area, and occurring evenly throughout, followed by SRE habitat 2, comprising 14.1% of the study area. The south-eastern part of the study area is more diverse, with habitats 1, 3, 7 and 11 primarily occurring in this area.

Notable habitats that were in low abundance within the study area but present in the other nearby areas such Myara North and Holyoake study areas, were SRE habitat 1 (*Melaleuca* woodlands/shrublands), and 11 (Open wandoo woodlands). Large granite outcrops were also absent from this study area.

Approximately 3,339.3 ha (32.1%) of the study area has a high potential habitat rating (PHR).

Two habitats (1 and 7) were not surveyed because representation in the study area was very low:

- 1–*Melaleuca* woodlands/shrublands on seasonally wet or water-logged clays and clay-loams on valley floors (0.88% of the study area). Site CMRA-001 is mapped as being in Habitat 10, (being Flooded Gum); however, *Melaleuca* was also dense in the understory.
- 7–Open forest to woodland of Jarrah/Marri on slopes and less undulating hills (0.39% of the study area); this is similar to habitat 4.

Rehabilitated areas were not surveyed due to the lower quality of habitat for SREs. Rehabilitation occurs mainly in the north-western part of the study area.

Table 5-2 Description of SRE habitats in the baseline study area and corresponding vegetation types

SRE habitat code	Vegetation units (Mattiske 2021)	SRE habitat description	PHR[1]
1	A	*Melaleuca* woodlands/shrublands on seasonally wet or water-logged clays and clay-loams on valley floors	High
2	AW, AW/CW, C, D, DA, DG, J, CW	Open Jarrah/Marri or Blackbutt woodlands on sands, clay-loam or sandy-gravel on lower slopes and valley floors	High
3	GR, G, G1, R, RG	Heath/shrubland/woodland on shallow soils on granite or outcrops	High
4	P, PS, PT, S, SP, ST, T, TS	Open forest to woodland of Jarrah/Marri on sandy-loam gravelly soils on mid-slopes and ridges	Low
5	WA, PW, SW, W, WD	Open forest of Jarrah/Marri forest, seasonally moist, sandy gravels on slopes	High
6	Cleared, plantation	Cleared land (including plantations, dams)	n/a
7	AD, E	Open forest to woodland of Jarrah/Marri on slopes and less undulating hills	Low
10	AC, AX, AY	Open woodlands of Wandoo and/or Flooded Gum on seasonally wet or water-logged clays and clay-loams on valley floors	High
11	M, Y, YG, YS	Open woodlands of Wandoo with clay-loams and some gravel on slopes	Low
12	n/a	Rehabilitation (post-mining rehabilitation using mostly native species)	Low

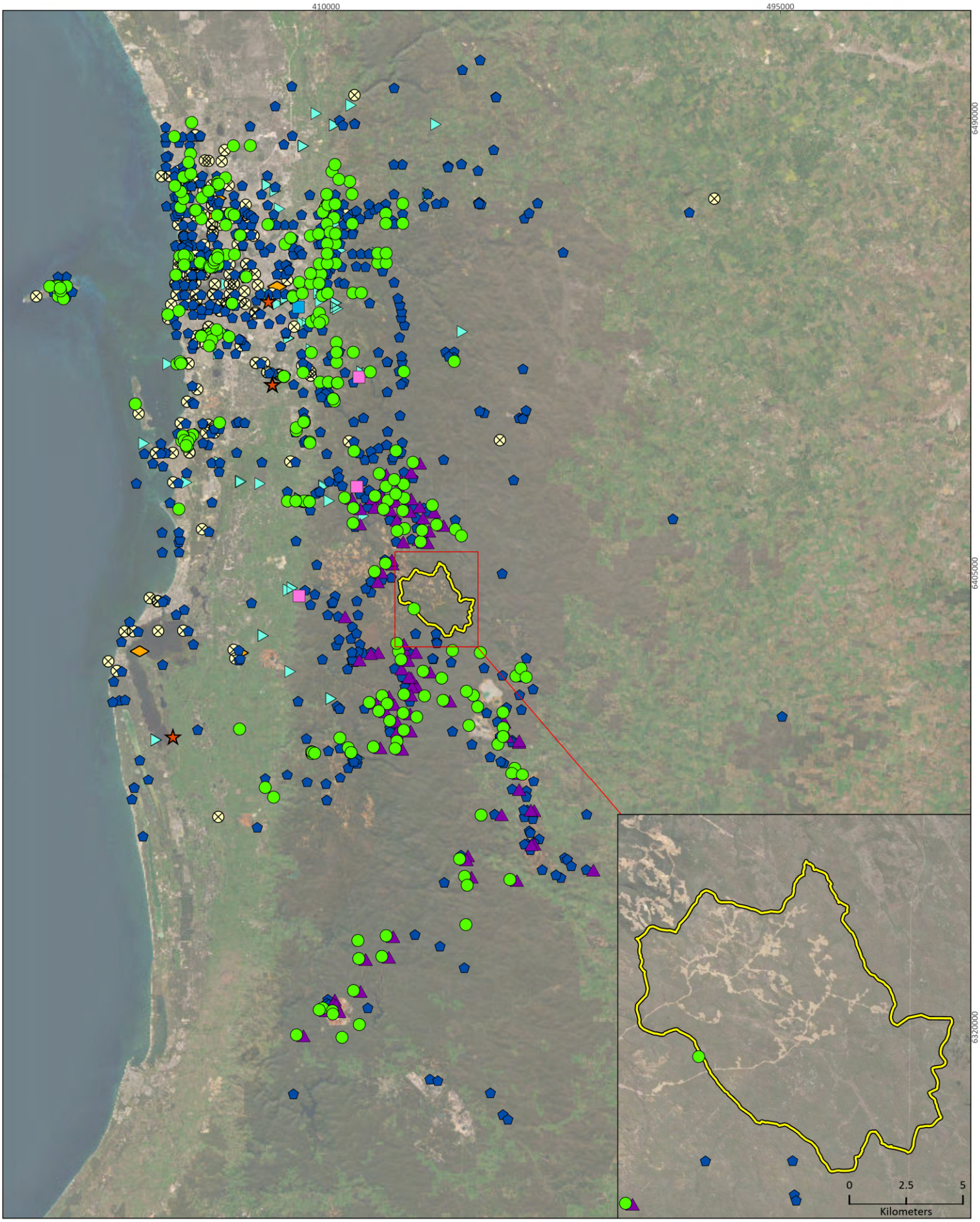
Table 5-3 Extent of each SRE habitat in the study area

SRE habitat type	PHR[1]	Survey sites	Area (ha, (%))
1	High		91.4 (0.9%)
2	High	CMRA-005, OE-008, OE-006, CMRA-003, *OE-002^*	1,463.7 (14.1%)
3	High	*OE-004^*	237.3 (2.3%)
4	Low	CMRA-006, OE-012, OE-001, *OE-003, OE-007*	5,977.5 (57.4%)
5	High	CMRA-007, CMRA-002, OE-009	975.0 (9.4%)
6 (cleared)	n/a		142.2 (1.4%)
7	Low		40.9 (0.4%)
10	High	CMRA-001, *CMRA-008*	429.7 (4.1%)
11	Low	OE-010	35.9 (0.3%)
12 (Rehabilitation)	Low		1,020.9 (9.8%)
Total			**10,414.5**

1 – Potential habitat rating.

^ – outside of vegetation mapping, habitat type extrapolated using site description.

Italics = site located outside of study area.



GHD Pty Ltd - Holyoake Stage 2 Project
O'Neil Mine Development

Project No	1482
Date	21/05/2024
Drawn by	JL
Map author	AJ

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Kilometers

1:914,500(at A4) GDA 1994 MGA Zone 50

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Study area
Status
Confirmed
EN
Likely
P2
P3
Potential
Potential/P3
Restricted
VU

Figure 5-1
Desktop SRE records

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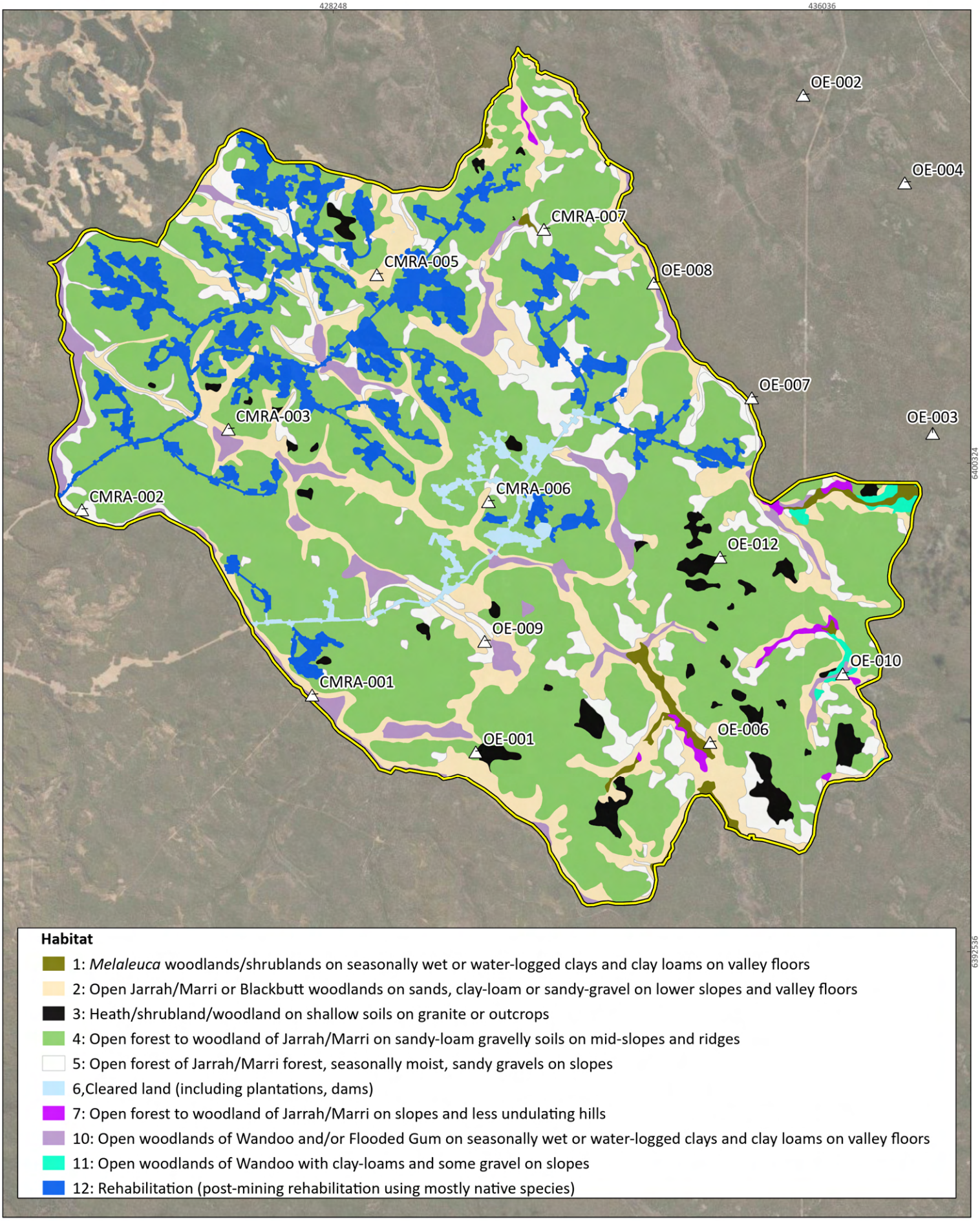

GHD Pty Ltd - Holyoake Stage 2 Project
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Project No	1482
Date	21/05/2024
Drawn by	JL
Map author	AJ

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Study area
Survey site

Figure 5-2

SRE habitats in the study area

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5.2 FIELD SURVEY

5.2.1 Species records

A total of 64 taxa from groups known to include SREs were collected in the field survey and of these, 45 taxa (70%) were classified as SREs (Table 5-4), as follows:

- 3 are Confirmed SREs, represented by:
    - *Antichiropus* 'Phoenix0217' (millipede)
    - *Urodacus planimanus* (scorpion)
    - *Pseudotyrannochthonius* 'Darling Range 2' (pseudoscorpion)
- 5 are Likely SREs, represented by 4 isopods and one millipede
    - *Buddelundia* 'sp. 5' (isopod)
    - Philosciidae 's/1' (isopod)
    - Pseudodiploexochus 'Phoenix0214' (isopod)
    - *Styloniscus* '7' (isopod)
    - *Podykipus* 'DIP241' (millipede)
- 37 are Potential SREs represented by members of all target groups.

Table 5-4 Summary of taxa collected during the survey, by taxonomic group and status

SRE group	Status				Total
	Confirmed	Likely	Potential	Widespread	
Araneomorph spider			1		1
Land snail			3	2	5
Millipede	1	1	2	3	7
Mygalomorph spider			14	2	16
Opiliones			7		7
Pseudoscorpion	1		4	4	9
Scorpion	1			3	4
Slater		4	6	4	14
Velvet worm				1	1
Total	**3**	**5**	**37**	**19**	**64**

A total of 19 taxa were collected that were Widespread, therefore not considered SREs (Table 5-5). These were represented by pseudoscorpions (4 taxa), millipedes (3 taxa), scorpions (3 species), slaters (4 species), mygalomorphs (2 species), land snails (2 species) and a velvet worm.

Of the 45 SRE taxa from the survey, 28 species are described species or are morphospecies that were matched either morphologically or genetically to previously recorded species and 7 are new species not previously known from morphological or molecular analysis (Table 5-5). The remaining 10 are indeterminate taxa which may represent new or Widespread species but the uncertainty around these taxa cannot be resolved, and they are therefore not discussed further. Of the 28 species or morphospecies, 12 are mygalomorph spiders, 7 are isopods, 2 are scorpions, 4 are pseudoscorpions, 2 are land snails, and one each of Opiliones, land snail and millipede.

Of the 7 new species, 3 are currently known from sites within O'Neil only:

- Mygalomorph spider (Figure 5-3)
    - *Euoplos* 'Phoenix0211', recorded from one site within O'Neil (CMRA-002, 100 m from the study area boundary)
- Isopod (Figure 5-7)
    - Philosciidae 'Phoenix0208', recorded from one site within O'Neil (CMRA-006)
    - Philosciidae 'Phoenix0209', recorded from one site within O'Neil (CMRA-007).

The remaining species collected from the study area were either recorded outside O'Neil during the survey, e.g. from reference sites, other areas of the Projects (e.g. Holyoake) or were matched to a taxon identified from the desktop review (Table 5-5; Figure 5-3 –Figure 5-8).

From the full list of 64 taxa collected, 21 species have been formally described, of which 7 are considered SREs. A further 28 were allocated to morphospecies based on previously collected specimens, or newly collected specimens that were not the same as any other taxon known from the WA Museum collection or by the taxonomist.

The remaining 27 are indeterminate (including 23 belonging to taxa that have SRE representatives) due to poor taxonomic knowledge, poor genetic knowledge, inadequate life stage or sex, or a specimen in poor condition. The indeterminate 'SRE' taxa could represent any of the collected or previously collected taxa, or possibly new taxa.

A total of 1,379 specimens were recorded from the survey. The majority (63.1%) were collected in wet pitfall traps and 36.9% were collected via active searches, i.e. foraging, litter sift and burrow excavations (Table 5-5).

Millipede, isopod, pseudoscorpion and Opiliones records were much higher in wet pitfall traps than other collection methods (Table 5-6). Of the 7 species recorded from O'Neil, most (86.7% of wet pitfall specimens and 77% of all millipede specimens), comprised of a single Widespread and abundant species *Atelomastix nigrescens*. This species was the most abundantly collected in the survey with a total of 315 specimens. The isopod *Styloniscus* '1' was the second most abundant species with 198 specimens collected, of which 166 were from wet pitfall traps.

Mygalomorph and araneomorph spiders were the only SRE groups in which active searches yielded a higher number of records. Scorpions and land snails were recorded relatively evenly between active searching and pitfall trap sample methods.

A total of 70 specimens were sequenced, comprising 47 mygalomorph spiders, 12 millipedes and, and 11 isopods, mostly indeterminate taxa due to being juveniles, females, too small and singletons or poor condition. Tissue from each specimen was obtained in Phoenix's laboratory and sequenced by Genotyping Australia. Of these, 69 specimens produced a successful sequence, 8 taxa were found be significantly different to specimens where a taxonomist was able to allocate a species or morphospecies identification. Three of these however were previously recorded by Phoenix in 2021 from Holyoake.

Table 5-5 Specimens from SRE groups recorded in the field survey

Higher order/ Family	Species	SRE status [1]	SRE hab. code	PHR[2]	Outside SA[3]	Within SA[3]	Sites[4]	Comments
Class: Arachnida, Infraorder: Mygalomorphae (mygalomorph spiders)								
Anamidae	*Aname* 'Phoenix0010'	P	4	L	Y	N	*OE-003*	Molecular match to a specimen from Holyoake (Phoenix 2021) and Holyoake East study area
Anamidae	Anamidae sp. indet.	P	10	H	Y	N	*CMRA-008*	CMRA-008 is a reference site, specimen failed sequencing, likely represents a collected specimen
Anamidae	*Proshermacha* 'MYG485'	P	5, 2	H	Y	Y	CMRA-007, OE-006	Also known from records from Myara North to Boddington (800 km^2), more common in the Dwellingup area
Anamidae	*Proshermacha* 'MYG495'	P	4	L	Y	Y	*OE-003*, OE-012	Also known from Holyoake and to Boddington
Anamidae	*Proshermacha* 'MYG658'	P	2	H	Y	Y	*OE-002*	Also known from 3 other records in Myara North, Holyoake East and Collie
Anamidae	*Proshermacha* 'Phoenix0027'	P	2, 3, 4, 5, 10,	H, L	Y	Y	CMRA-003, CMRA-005, CMRA-006, *CMRA-008*, OE-001, *OE-002*, OE-006, *OE-007*, OE-008, OE-009, OE-012	Also known from 2 locations at Myara North
Anamidae	*Teyl* 'MYG245'	P	5	H	Y	Y	CMRA-007	Also known from 2 locations SE of the study area, both 15 km NW of Boddington
Anamidae	*Teyl* 'MYG355'	P	2, 5	H	Y	Y	CMRA-002, CMRA-003, OE-008	Also known from Holyoake East and Myara North
Barychelidae	*Synothele michaelseni*	W	2	H	Y	Y	CMRA-003	Also known from Perth and near Bindoon
Barychelidae	*Synothele mullaloo*	P	2, 3, 4, 5, 10, 11	H, L	Y	Y	CMRA-001, CMRA-003, CMRA-007, *CMRA-008*, OE-001, *OE-003, OE-004*, OE-006, *OE-007*, OE-008, OE-009, OE-010	Also known from Holyoake, Holyoake East, Holyoake West, and near Boddington
Idiopidae	*Bungulla harrisonae*	P	2	H	Y	Y	CMRA-003, OE-008	Also known from a record near Mundaring, ca. 140 km north of the study area
Idiopidae	*Eucyrtops* 'MYG645'	P	5, 10,	H	Y	Y	CMRA-001, CMRA-002, OE-001, OE-012	Also known from Holyoake, Holyoake East, Holyoake West and Quindanning

Higher order/ Family	Species	SRE status [1]	SRE hab. code	PHR[2]	Outside SA[3]	Within SA[3]	Sites[4]	Comments
Idiopidae	*Eucyrtops* 'Phoenix0029'	P	2, 3, 4	H, L	Y	N	*OE-002*, *OE-004*, *OE-007*	Also known from 2 locations at Myara North
Idiopidae	*Euoplos* 'Phoenix0211'	P	5	H	**N**	**Y**	CMRA-002	Recorded 100 m from O'Neil boundary
Idiopidae	*Idiosoma jarrah*	W	4, 5	H, L	Y	Y	CMRA-007, OE-012	Also known from numerous records from Holyoake, Myara North and Mundaring. Common near Mundaring
Idiopidae	*Idiosoma* 'WAM T129362'	P	5, 11	H, L	Y	Y	CMRA-002, OE-009, OE-010	Aso known from records at Myara North and Holyoake East
Class: Arachnida, Infraorder: Araneomorphae (araneomorph spiders)								
Selenopidae	*Karaops* sp. indet.	P	3, 11	H, L	Y	Y	CMRA-005, OE-010	Likely represents a widespread species, either *K. jarrit* or *K. ellenae*, both widespread throughout the Jarrah Forest
Class: Arachnida, Order: Opiliones (Harvestmen spiders)								
Neopilionidae	*Ballarra longipalpus*	P	2, 3, 4, 5, 10	H, L	Y	Y	CMRA-001, *CMRA-008*, OE-001, *OE-002*, *OE-003*, *OE-004*, *OE-007*, OE-008, OE-009, OE-010, OE-012	Also known from Holyoake East, Holyoake West, Myara North, Perth and Perth Hills
Neopilionidae	*Megalopsalis* sp. indet.	P	2, 3, 4, 5, 10, 11	H, L	Y	Y	CMRA-001, CMRA-002, CMRA-005, CMRA-007, *CMRA-008*, OE-001, *OE-003*, *OE-004*, *OE-007*, OE-008, OE-010	This genus occurs in Holyoke East, Holyoake West, Perth and Perth Hills
Neopilionidae	Neopilionidae sp. indet.	P	2, 3, 4, 5, 10	H, L	Y	Y	CMRA-001, CMRA-002, CMRA-003, CMRA-005, OE-001, *OE-002*, *OE-007*, OE-008, OE-009, OE-010	This family occurs in Holyoake East, Perth and Perth Hills
Triaenonychidae	Triaenonychidae 'genus 003' sp. indet.	P	5	H		Y	CMRA-002	Other members of this genus occur near Boddington
Triaenonychidae	Triaenonychidae 'genus 004' sp. indet.	P	2, 3, 4, 5	H, L	Y	Y	CMRA-002, CMRA-003, CMRA-007, *OE-003*, *OE-004*, OE-012	Other members of this genus occur near Myara North

Higher order/ Family	Species	SRE status [1]	SRE hab. code	PHR[2]	Outside SA[3]	Within SA[3]	Sites[4]	Comments
Triaenonychidae	Triaenonychidae 'genus 008' sp. indet.	P	2, 3, 4, 5, 10, 11	H, L	Y	Y	CMRA-001, CMRA-002, CMRA-003, CMRA-005, CMRA-007, *CMRA-008*, OE-001, *OE-004*, OE-006, *OE-007*, OE-008, OE-009, OE-010, OE-012	Other members of this genus occur at Myara North, Holyoake East, Holyoake, Holyoake West, and north to Mundaring
Trigoniulidae	*Calliuncus* sp. indet.	P	2, 5	H	Y	Y	CMRA-002, CMRA-003	Other members of this genus occur at Myara North, Holyoake, Holyoake West, and near Boddington
Class: Arachnida, Order: Scorpiones (scorpions)								
Bothriuridae	*Cercophonius sulcatus*	W	2, 3, 4, 5, 10, 11	H, L	Y	Y	CMRA-001, CMRA-003, CMRA-005, CMRA-006, CMRA-007, *CMRA-008*, OE-001, *OE-002*, *OE-00*4, OE-006, OE-008, OE-009, OE-010	Widespread and common, particularly on the SCP and near Mundaring. Other nearby records from Boddington, Waroona, Holyoake and Myara North
Buthidae	*Lychas* 'austroccidentalis'	W	2, 3	H	Y	Y	CMRA-005, OE-006	Widespread and common from SCP, Perth Hills, Boddington, Waroona, Holyoake and Myara North
Urodacidae	*Urodacus novaehollandiae*	W	2, 4, 5, 10, 11	H, L	Y	Y	CMRA-001, CMRA-002, CMRA-003, OE-008, OE-009, OE-010, OE-012	Widespread and common from SCP, Perth Hills, Boddington, Waroona, Holyoake and Myara North
Urodacidae	*Urodacus planimanus*	C	2, 3, 4, 5,	H, L	Y	Y	CMRA-002, CMRA-007, OE-001, *OE-002*, *OE-003*, *OE-004*, OE-006, OE-008	Common in the Perth Hills to Myara North and Holyoake
Class: Arachnida, Order: Pseudoscorpiones (pseudoscorpions)								
Atemnidae	*Oratemnus curtus*	W	2, 4	H, L	Y	Y	CMRA-003, CMRA-006	Widespread throughout the Southwest, from Perth to Albany
Chthoniidae	*Austrochthonius* 'medium 2'	P	2, 3, 4	H, L	Y	Y	*OE-004*, OE-008	Only known the study area and a reference site
Chthoniidae	*Austrochthonius muchmorei*	P	2, 3, 4, 10, 11	H, L	Y	Y	CMRA-001, CMRA-003, CMRA-005, *CMRA-008*, *OE-002*, *OE-003*, *OE-004*, OE-006, *OE-007*, OE-008, OE-010	Commonly collected between Byford and Collie
Chthoniidae	*Austrochthonius* 'PSE188, similis'	P	2, 4, 5, 10	H, L	Y	Y	CMRA-001, CMRA-006, CMRA-007, OE-001, *OE-003*, *OE-007*, OE-008, OE-010, OE-012	Common in the Southwest, also known from Mundaring, Perth, Myara North and Boddington

Higher order/ Family	Species	SRE status [1]	SRE hab. code	PHR[2]	Outside SA[3]	Within SA[3]	Sites[4]	Comments
Chthoniidae	*Austrochthonius* 'PSE191, grandis'	P	2, 3, 4, 5, 11	H, L	Y	Y	CMRA-007, *OE-002*, *OE-003*, *OE-004*, OE-010	Also known from Holyoake, Myara North, and near Boddington
Chthoniidae	*Lagynochthonius australicus*	W	2, 4, 5	H,L	Y	Y	CMRA-002, OE-001, OE-008	Widespread across the Southwest, also collected from Holyoake, Holyoake East and Holyoake West
Geogarypidae	*Synsphyronus magnus*	W	2, 4	H, L	Y	Y	CMRA-003, CMRA-006	Widespread across the Southwest, Perth Hills, SCP and Manjimup
Olpiidae	*Beierolpium bornemisszai*	W	5	H	Y	Y	CMRA-002	Also known from Myara North, near Boddington and near Collie
Pseudotyrannochthoniidae	*Pseudotyrannochthonius* 'Darling Range 2' ('DS2')	C	2, 3, 4, 5	H, L	Y	Y	CMRA-002, CMRA-003, CMRA-007, *OE-004*, *OE-007*, OE-008	Also known from Perth Hills, Myara North, Holyoake East and Holyoake West
Class: Diplopoda (millipedes)								
Dalodesmidae	*Sphaerotrichopus* `sp. indet.`	P	10	H	Y	?	*CMRA-008*	This genus was also recorded from Holyoake East. Likely the same species. Sequencing failed. Other members of this genus are known from the Jarrahdale and Mundaring areas
Iulomorphidae	*Atelomastix nigrescens*	W	2, 3, 4, 5	H, L	Y	Y	CMRA-002, CMRA-003, CMRA-005, CMRA-006, CMRA-007, OE-002, *OE-007*, *OE-008*, OE-012	Widespread species commonly recorded from Myara North, Holyoake, Holyoake East, Holyoake West and Boddington
Iulomorphidae	*Podykipus collinus*	P	2, 3, 11	H, L	Y	Y	OE-004, OE-006, OE-010	Also known from Holyoake East and Holyoake West
Iulomorphidae	*Podykipus* 'DIP241'	L	5	H	Y	Y	CMRA-007	A new species, also recorded from 2 sites at Holyoake East
Iulomorphidae	*Podykipus leptoiuloides*	W	4, 5, 10	H, L	Y	Y	CMRA-002, CMRA-006, *CMRA-008*, OE-009	Widespread species commonly recorded from Myara North. Also recorded from Holyoake, Holyoake West and Boddington
Paradoxosomatidae	*Antichiropus* 'Phoenix0217'	C	3, 5, 10, 4, 11	H, L	Y	Y	CMRA-001, CMRA-002, CMRA-005, CMRA-007, *OE-003*, *OE-007*, OE-010	A new species known only from 7 sites within or near O'Neil. Two of these sites are reference sites outside of the study area and

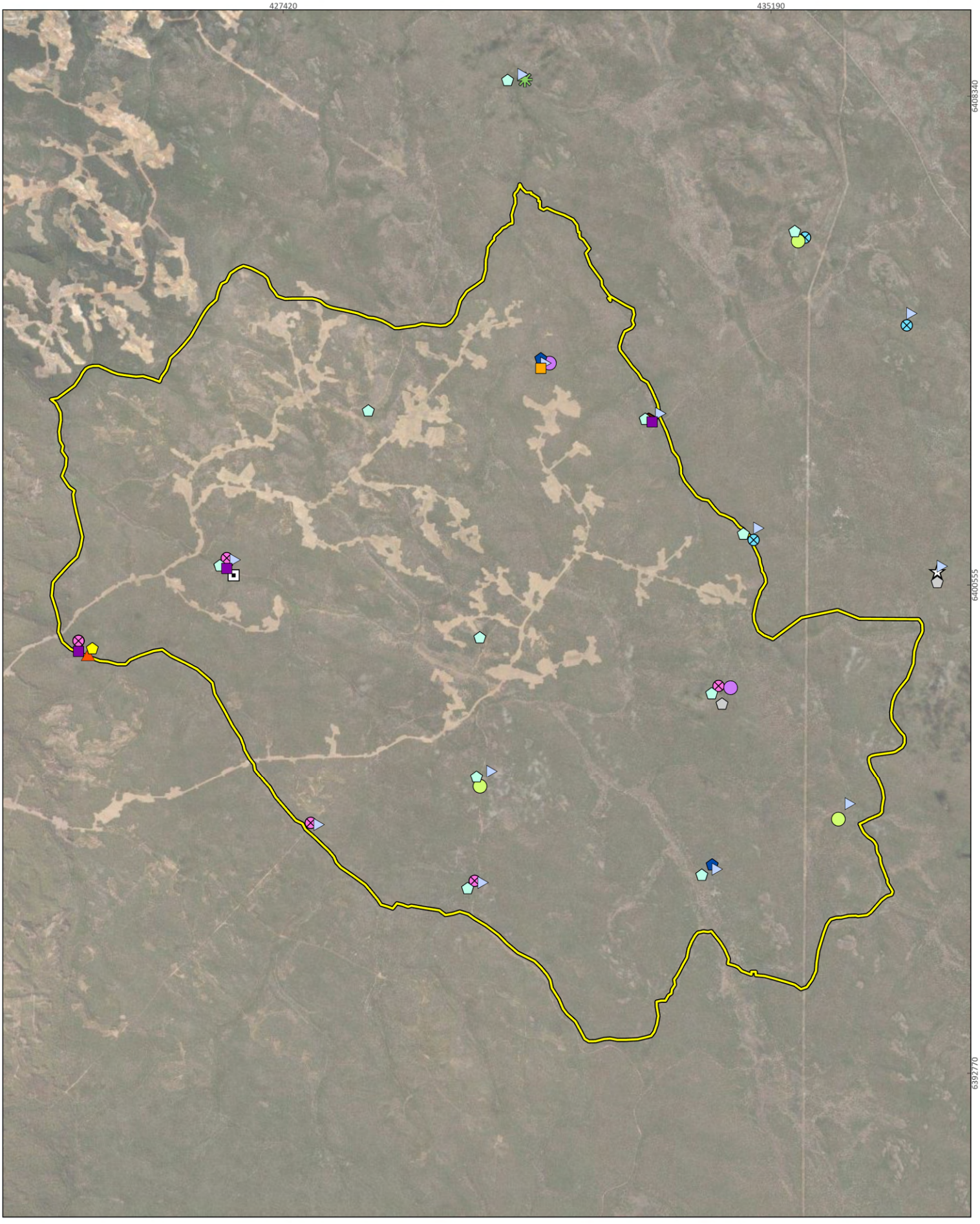
Higher order/ Family	Species	SRE status [1]	SRE hab. code	PHR[2]	Outside SA[3]	Within SA[3]	Sites[4]	Comments
								another 2 sites are within 200 m of the study area boundary
Paradoxosomatidae	*Antichiropus variabilis*	W	2, 3, 4, 5, 10, 11	H, L	Y	Y	CMRA-001, CMRA-002, CMRA-005, *CMRA-008*, OE-001, OE-002, *OE-003*, *OE-004*, OE-005, OE-006, *OE-007*, OE-009, OE-010, OE-012	Common, widespread species, most records are from Mundaring, Boddington, Myara North and Holyoake, however also known from north of Bindoon and south of Manjimup
Class: Malacostraca, Order: Isopoda (slaters)								
Armadillidae	*Acanthodillo* '1'	P	2	H	Y	Y	OE-010	Also known from Holyoake and Holyoake East and near Boddington
Armadillidae	*Armadillo flavus*	P	5, 11	H, L	Y	Y	CMRA-002, OE-010	Also known from a few records near Holyoake East, Holyoake West, Myara North, Collie and near Byford
Armadillidae	*Buddelundia nitidissima*	W	2, 3, 4, 5, 10, 11	H, L	Y	Y	CMRA-006, CMRA-007, *CMRA-008*, *OE-002*, OE-003, *OE-004*, OE-006, OE-008, OE-010, OE-012	Commonly collected from Holyoake, Quindanning, Boddington and Myara North
Armadillidae	*Buddelundia* 'sp. 04'	P	3	H	Y	N	*OE-004*	Also known from near Boddington and Perth Hills
Armadillidae	*Buddelundia* 'sp. 5'	L	2, 4, 5, 10	H, L	Y	Y	CMRA-001, CMRA-002, CMRA-003, CMRA-006, *OE-007*	Also known from Holyoake, Holyoake East, Holyoake West and Myara North
Armadillidae	*Pseudodiploexochus* 'Phoenix0214'	L	2, 4, 5, 10	H, L	Y	Y	CMRA-002, CMRA-003, CMRA-006, CMRA-007, OE-001, *OE-003*, *OE-007*	A new species recorded from 7 sites in or near O'Neil, and one reference site near Holyoake West
Armadillidae	*Spherillo* '5'	W	2, 3	H	Y	Y	CMRA-003, OE-008	Also commonly known from Myara North, Holyoake East, Boddington and Collie
Philosciidae	*Laevophiloscia* '1'	W	2, 3, 4, 5, 11	H, L	Y	Y	CMRA-002, CMRA-003, CMRA-005, CMRA-006, CMRA-007, *OE-002*, *OE-003*, OE-004, OE-006, *OE-007*, OE-008, OE-009, OE-010, OE-012	Commonly collected throughout the Northern Jarrah Forest and near Perth on the SCP
Philosciidae	*Laevophiloscia* '2'	W	2, 3, 4, 5, 10,	H, L	Y	Y	CMRA-001, CMRA-002, CMRA-003, CMRA-005, CMRA-006, CMRA-007,	Commonly collected throughout the Northern Jarrah Forest and near Perth on the SCP

Higher order/ Family	Species	SRE status [1]	SRE hab. code	PHR[2]	Outside SA[3]	Within SA[3]	Sites[4]	Comments
							CMRA-008, OE-001, OE-002, *OE-003*, OE-006, OE-008, OE-009	
Philosciidae	Philosciidae 'Phoenix0208'	P	4	L	N	Y	CMRA-006	2 specimens collected from a pitfall trap Sequenced but unsuccessful
Philosciidae	Philosciidae 'Phoenix0209'	P	5	H	N	Y	CMRA-007	2 specimens collected from a foraging sample Sequenced but no close matches
Philosciidae	Philosciidae 's/1'	L	2, 3, 4, 5, 10,	H, L	Y	Y	CMRA-007, *CMRA-008*, OE-001, *OE-003*, OE-004, *OE-007*, OE-008, OE-009, OE-012	Commonly recorded from Myara North and Holyoake East. Also known from Holyoake, and Perth Hills
Styloniscidae	*Styloniscus* '1'	P	2, 3, 4, 5, 10, 11	H, L	Y	Y	CMRA-002, CMRA-003, CMRA-005, CMRA-006, CMRA-007, *CMRA-008*, OE-001, *OE-002*, OE-003, *OE-004*, OE-006, *OE-007*, OE-008, OE-009, OE-010, OE-012	Commonly recorded from Myara North, Holyoake East and Holyoake West. Also known from Holyoake, Boddington and Collie
Styloniscidae	*Styloniscus* '7'	L	2, 3, 5	H	Y	Y	CMRA-002, CMRA-003, CMRA-005, *OE-004*	Also known from Holyoake East, Myara North, Boddington and Collie
Class: Gastropoda, Superorder: Eupulmonata (land snail)								
Bothriembryontidae	*Bothriembryon* cf. *bradshawi*	W	2, 3, 11	H, L	Y	Y	*OE-002*, *OE-004*, OE-010	Also collected from Holyoake and Holyoake East and Boddington
Bothriembryontidae	*Bothriembryon* cf. *serpentinus*	P	2	H	Y	Y	CMRA-003	Also collected from near Boddington, Collie, Waroona, Dwellingup, and Jarrahdale
Charopidae	*Annoselix* cf. *dolosa*	P	2	H	Y	Y	CMRA-003, OE-006	Also collected from Holyoake West, Myara North and near Boddington
Charopidae	*Luinodiscus* cf. sublesta	W	2, 4	H, L	Y	Y	CMRA-003, OE-008, OE-012	Also known from near Boddington
Punctidae	cf. *Westralaoma* sp. indet.	P	2	H	Y	Y	OE-008	Also collected from Holyoake East
Phylum: Onychophora (velvet worms)								
Peripatopsidae	*Occipperipatoides gilesii*	W	2, 3, 11	H, L	Y	Y	CMRA-003, CMRA-005, OE-008, OE-010	Also known from numerous records between Holyoake, Holyoake East, Holyoake West, Myara Norther and north to Mundaring

1 – SRE status (C = confirmed, P = Potential, L = Likely; H = High, L=Low); 2 – Potential habitat rating (H = High, L = Low); 3 – SA (study area); 4 – Italics = reference sites (outside of O'Neil).

Table 5-6 SRE records by sample type

SRE group/sample type	Active searching			Wet pitfall trap	Total
	Burrow excavation	Foraging	Litter sieve		
Araneomorph spider		100%			100%
Land snail		30%	10%	60%	100%
Millipede	0.2%	19.6%	8.3%	71.8%	100%
Mygalomorph spider	45.9%	42.2%	0%	11.9%	100%
Opiliones		17.1%	18.5%	64.4%	100%
Pseudoscorpion			35.8%	64.2%	100%
Scorpion		49.3%		50.7%	100%
Slater		11.0%	18.9%	70.1%	100%
Velvet worm		80%	20%		100%
Total	**3.7%**	**18.4%**	**14.8%**	**63.1%**	**100%**



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Project No	1482
Date	21/05/2024
Drawn by	JL
Map author	AJ

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Kilometers

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- Study area

Species, SRE status

- *Aname* 'Phoenix0010', Potential
- Anamidae sp. indet., Potential
- *Bungulla harrisonae*, Potential
- *Eucyrtops* 'MYG645', Potential
- *Eucyrtops* 'Phoenix0029', Potential
- *Euoplos* 'Phoenix0211', Potential
- *Idiosoma* 'WAM T129362', Potential
- *Idiosoma jarrah*, Widespread
- *Proshermacha* 'MYG485', Potential
- *Proshermacha* 'MYG495', Potential
- *Proshermacha* 'MYG658', Potential
- *Proshermacha* 'Phoenix0027', Potential
- *Synothele michaelseni*, Widespread
- *Synothele mullaloo*, Potential
- *Teyl* 'MYG245', Potential
- *Teyl* 'MYG355', Potential

Figure 5-3

Field records of SRE and significant mygalomorph spiders

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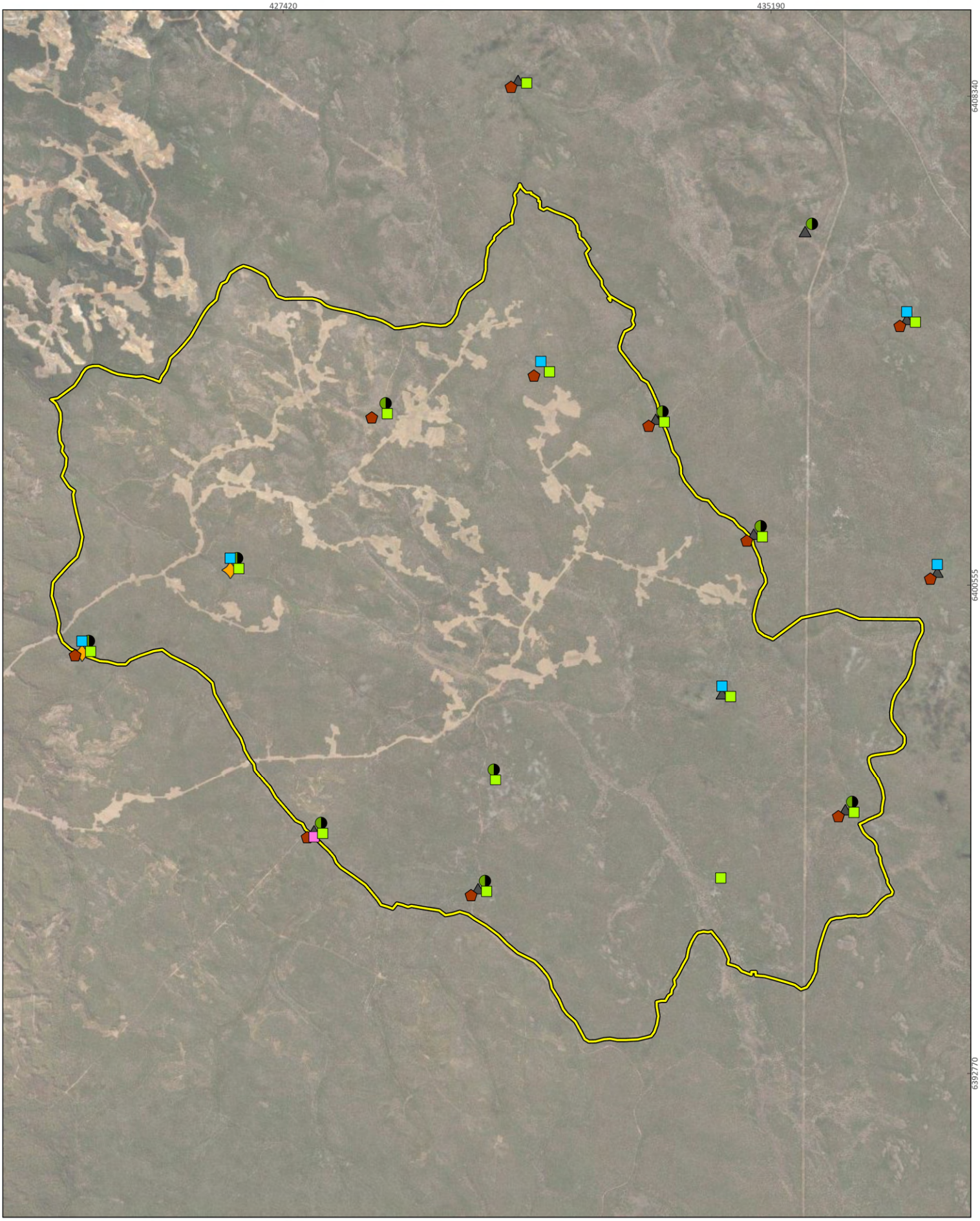

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Study area

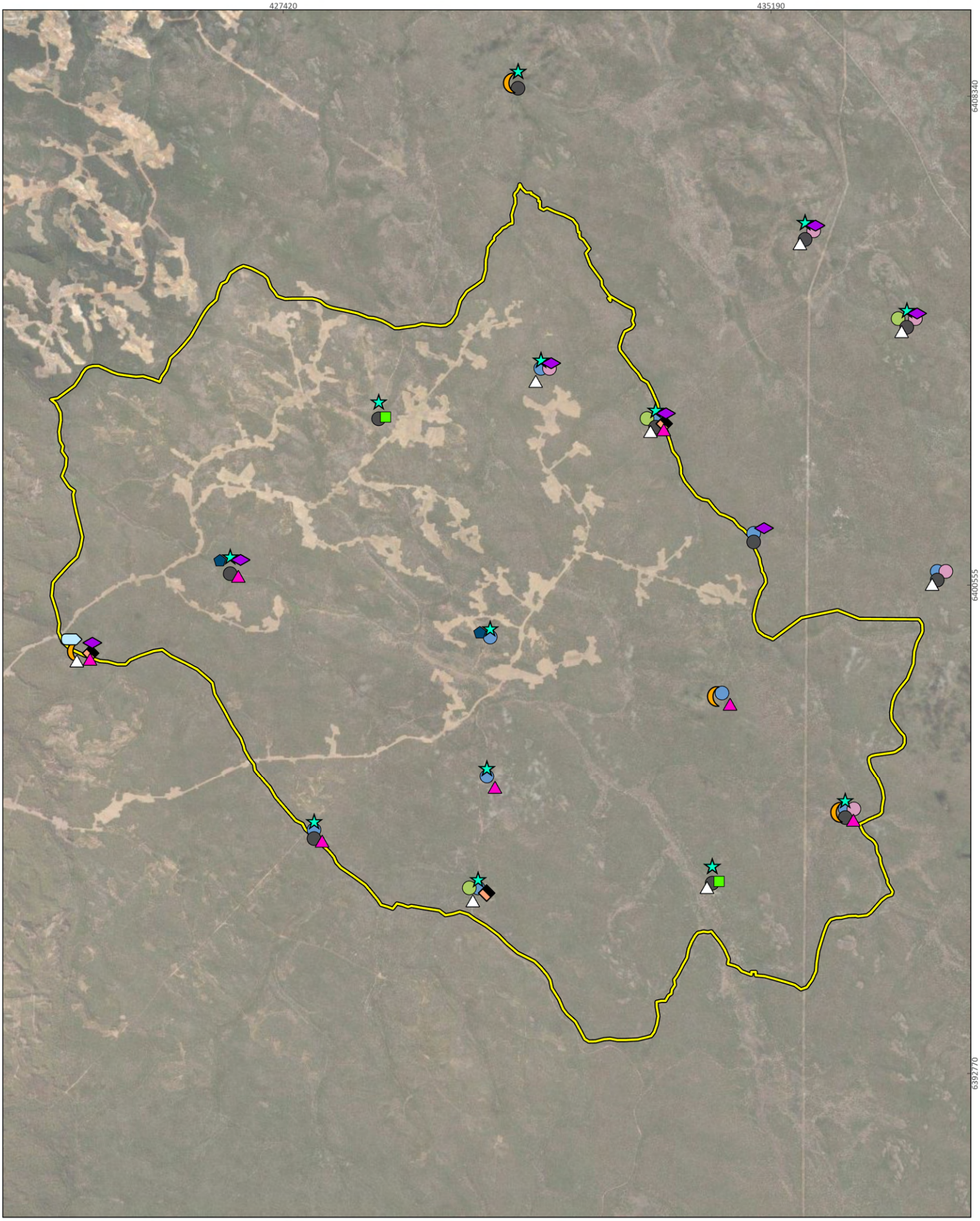
Species, SRE status

- *Ballarra longipalpus*, Potential
- *Calliuncus* sp. indet., Potential
- *Megalopsalis* sp. indet., Potential
- Neopilionidae sp. indet., Potential
- Triaenonychidae 'genus 003' sp. indet., Potential
- Triaenonychidae 'genus 004' sp. indet., Potential
- Triaenonychidae 'genus 008' sp. indet., Potential

Figure 5-4

Field records of SRE opiliones (harvest spiders)

PHOENIX ENVIRONMENTAL SCIENCES



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- Study area

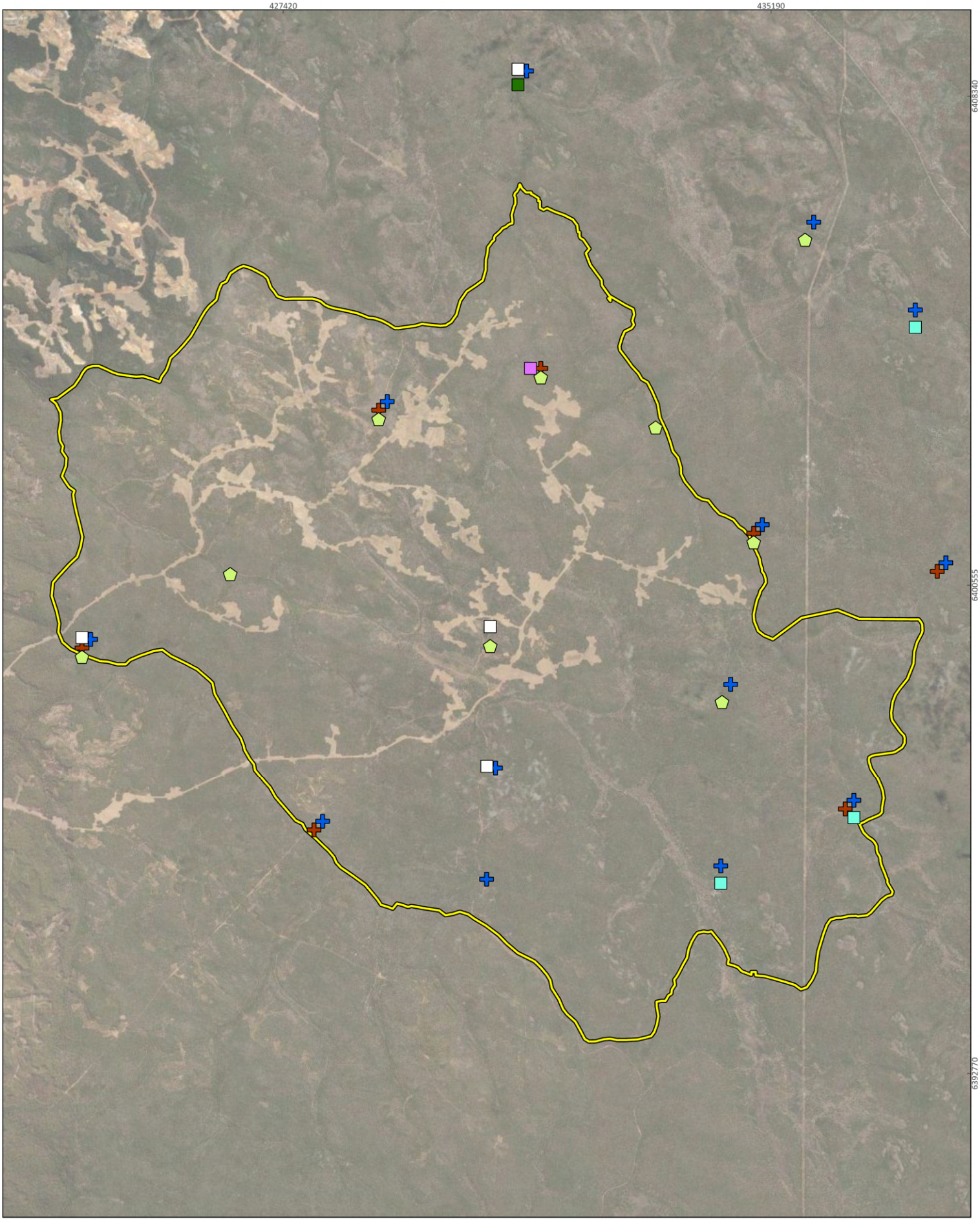
Species, SRE status

- *Austrochthonius* 'PSE188, similis', Potential
- *Austrochthonius* 'PSE191, grandis', Potential
- *Austrochthonius* 'medium 2', Potential
- *Austrochthonius muchmorei*, Potential
- *Beierolpium bornemisszai*, Widespread
- *Cercophonius sulcatus*, Widespread
- *Lagynochthonius australicus*, Widespread
- *Lychas* 'austroccidentalis', Widespread
- *Oratemnus curtus*, Widespread
- *Pseudotyrannochthonius* 'Darling Range 2', Confirmed
- *Synsphyronus magnus*, Widespread
- *Urodacus novaehollandiae*, Widespread
- *Urodacus planimanus*, Confirmed

Figure 5-5

Field records of SRE scorpions and pseudoscorpions

PHOENIX ENVIRONMENTAL SCIENCES



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Study area

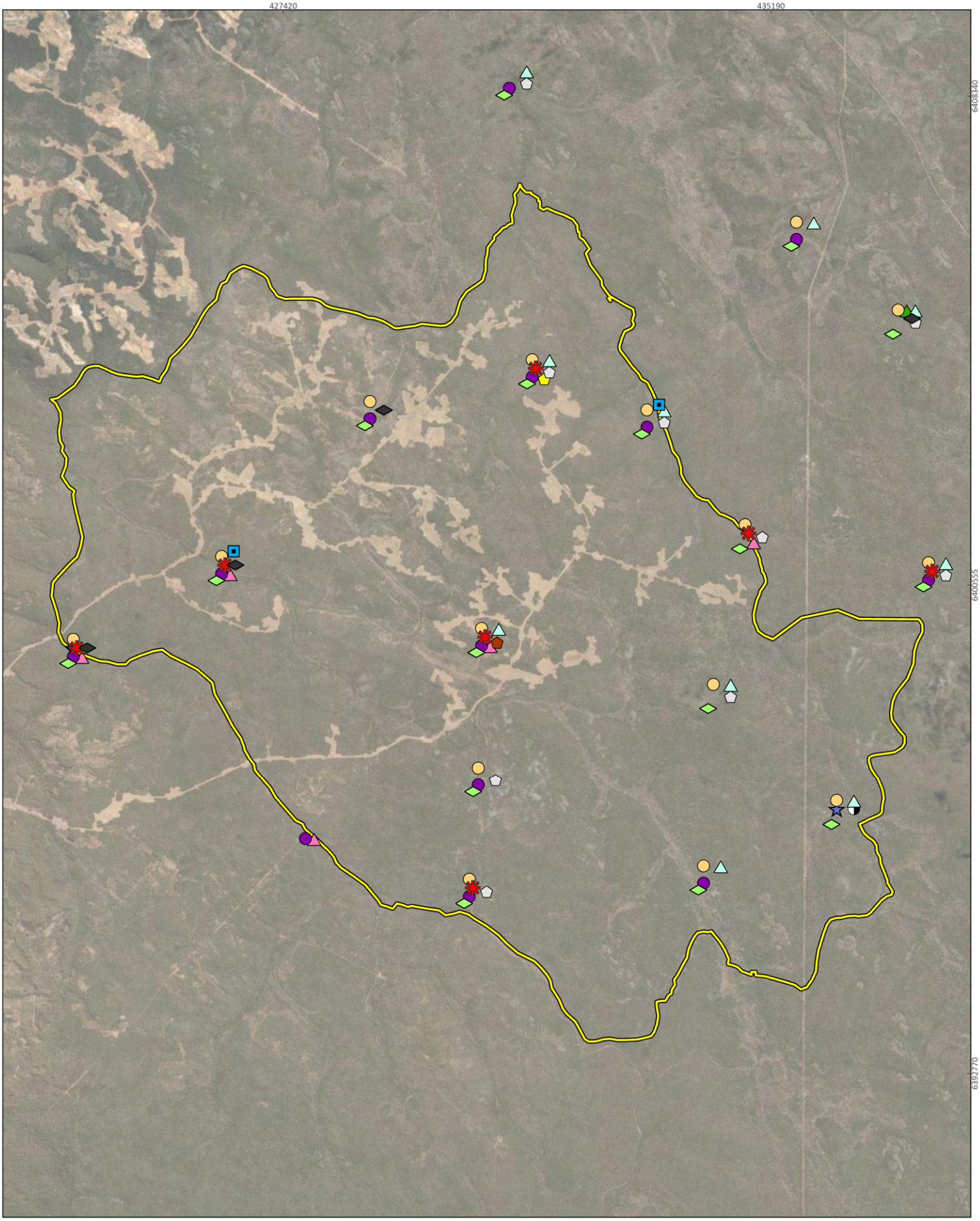
Species, SRE status

- *Antichiropus* 'Phoenix0217', Confirmed
- *Antichiropus variabilis*, Widespread
- *Atelomastix nigrescens*, Widespread
- *Podykipus* 'DIP241', Likely
- *Podykipus collinus*, Potential
- *Podykipus leptoiuloides*, Widespread
- *Sphaerotrichopus* `sp. indet.`, Potential

Figure 5-6

Field records of SRE millipedes

PHOENIX ENVIRONMENTAL SCIENCES



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Study area

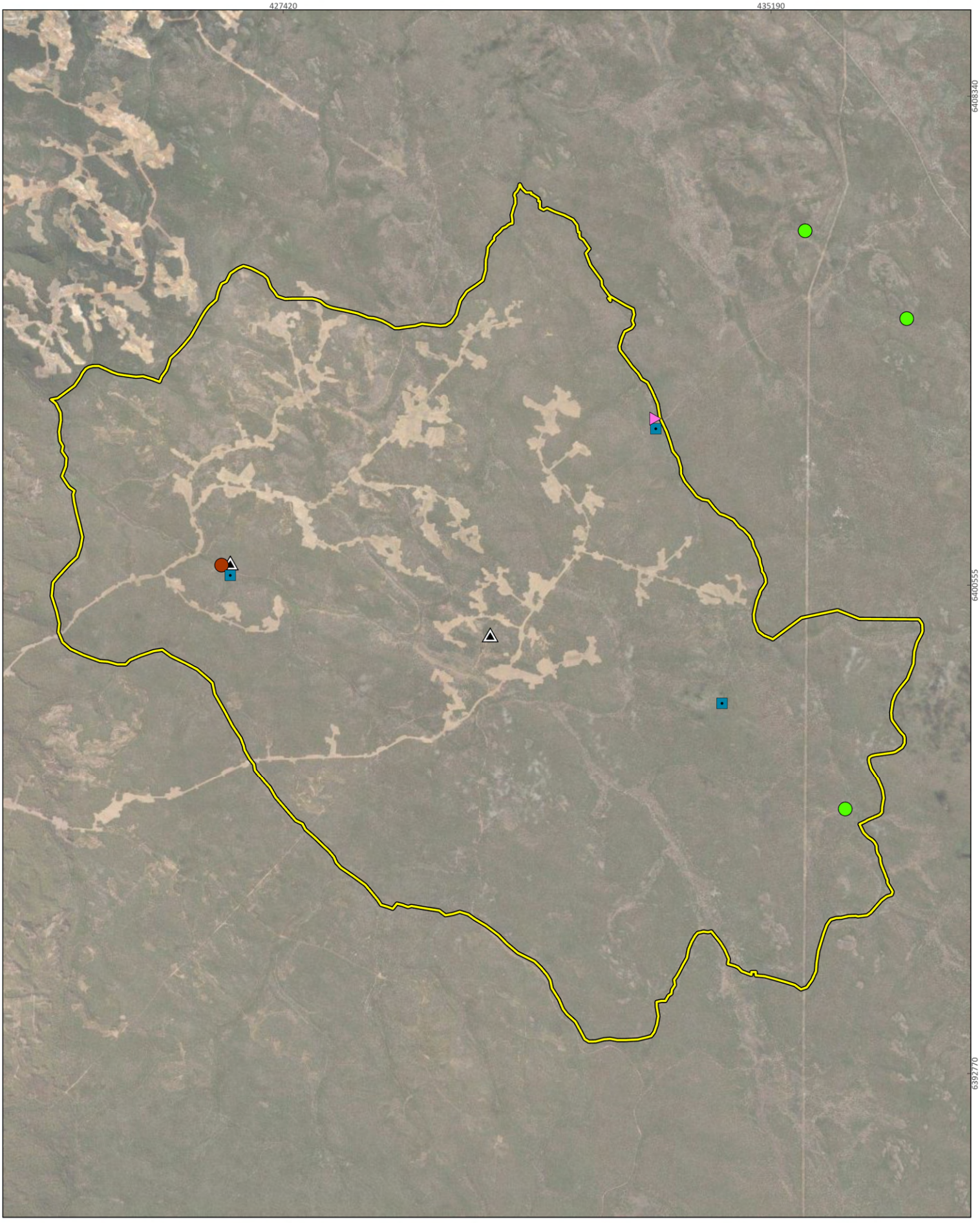
Species, SRE status

- *Acanthodillo* '1', Potential
- *Armadillo flavus*, Potential
- *Buddelundia* 'sp. 04', Potential
- *Buddelundia* 'sp. 5', Likely
- *Buddelundia nitidissima*, Widespread
- *Laevophiloscia* '1', Widespread
- *Laevophiloscia* '2', Widespread
- Philosciidae 'Phoenix0208', Potential
- Philosciidae 'Phoenix0209', Potential
- Philosciidae 's/1', Likely
- *Pseudodiploexochus* 'Phoenix0214', Likely
- *Spherillo* '5', Widespread
- *Styloniscus* '1', Potential
- *Styloniscus* '7', Likely

Figure 5-7

Field records of SRE isopods

PHOENIX ENVIRONMENTAL SCIENCES



GHD Pty Ltd - Holyoake Stage 2 Project
O'Neil Mine Development

Project No	1482
Date	21/05/2024
Drawn by	JL
Map author	AJ

0 1 2
Kilometers

1:77,880 (at A4) GDA 1994 MGA Zone 50

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Study area

Species, SRE status

- *Annoselix* cf. *dolosa*, Potential
- *Bothriembryon bradshawi*, Widespread
- *Bothriembryon* cf. *serpentinus*, Potential
- *Luinodiscus* cf. *sublesta*, Widespread
- cf. *Westralaoma* sp. indet., Potential

Figure 5-8

Field records of SRE land snails

PHOENIX ENVIRONMENTAL SCIENCES

5.2.2 SRE taxa and fauna habitats

A summary of SRE taxa recorded per habitat type is presented below (Table 5-7). Six native fauna habitats recorded SRE taxa, as follows:

- High Potential SRE habitats
    - SRE habitat 2: Open Jarrah/Marri or Blackbutt woodlands on sands, clay-loam or sandy-gravel on lower slopes and valley floors (46 taxa)
    - SRE habitat 3: Heath/shrubland/woodland on shallow soils on granite or outcrops (21 taxa)
    - SRE habitat 5: Open forest of Jarrah/Marri forest, seasonally moist, sandy gravels on slopes (39 taxa)
    - SRE habitat 10: Open woodlands of Wandoo and Flooded Gum on seasonally wet or water-logged clays and clay-loams on valley floors (23 taxa)
    - SRE habitat 11: Open woodlands of Wandoo with clay-loams and some gravel on slopes (23 taxa)
- Low Potential SRE habitats
    - SRE habitat 4: Open forest of Jarrah/Marri on sandy-loam gravelly soils on mid slopes and ridges (37 taxa).

Habitat type 2 (Open Jarrah/Marri or Blackbutt woodlands on sands, clay-loam or sandy-gravel on lower slopes and valley floor) recorded the highest number of SRE taxa (46 taxa), followed by SRE habitat 5 (39 taxa). Both are high Potential SRE habitats, and the second and fourth most widespread habitat in the study area, respectively. The most widespread and the only Low Potential SRE habitat (4) recorded 37 species. Both habitat 2 and habitat 4 sampled the same number of sites (5 sites each).

Of the 64 SRE taxa recorded from the study area, 61 were collected from High Potential SRE habitats (2, 3, 5, 10 and 11) and of these, 17 were recorded only from a single habitat type or site within the study area; however, 14 of these are known from outside the study area. The remaining 3 taxa were recorded from a single habitat type or site within study area and are the only known records of those species:

- *Euoplos* 'Phoenix0211' (High Potential SRE habitat 5)
- Philosciidae 'Phoenix0208' (Low Potential SRE habitat 4)
- Philosciidae 'Phoenix0209' (High Potential SRE habitat 5).

One taxon is known from only one habitat type but has been recorded from Holyoake East (Phoenix, in prep):

- *Podykipus* 'DIP241' (High Potential SRE habitat 5 and SRE habitats 4 (Low) in the O'Neil and 2 (High) from Holyoake).

Two species known only from the survey were collected from at least 2 habitat types:

- *Antichiropus* 'Phoenix0217' (High Potential SRE habitats 2, 5, and 10)
- *Austrochthonius* 'medium 2' (High Potential SRE habitats 2 and 5).

Table 5-7 Summary of SRE taxa recorded in this survey with respect to fauna habitat

Taxa	Fauna habitat						Number of habitat types
	High SRE Potential			Low SRE Potential			
	2 (5 sites)	3 (1 site)	5 (3 sites)	10 (2 sites)	4 (5 sites)	11 (1 site)	
Araneomorph spiders							
Karaops sp. indet.	●					●	2
Mygalomorph spiders							
Aname 'Phoenix0010'					●		1
Anamidae sp. indet.				●			1
Bungulla harrisonae	●						1
Eucyrtops 'MYG645'	●		●	●	●		4
Eucyrtops 'Phoenix0029'	●	●			●		3
Euoplos 'Phoenix0211'			●				1
Idiosoma jarrah			●		●		2
Idiosoma 'WAM T129362'	●		●			●	3
Proshermacha 'MYG485'	●		●				2
Proshermacha 'MYG495'					●		1
Proshermacha 'MYG658'			●				1
Proshermacha 'Phoenix0027'	●		●	●	●		4
Synothele michaelseni	●						1
Synothele mullaloo	●	●	●	●	●	●	6
Synsphyronus magnus			●				1
Teyl 'MYG245'			●				1
Teyl 'MYG355'	●		●				2
Opiliones							
Ballarra longipalpus	●	●		●	●	●	5
Calliuncus sp. indet.	●		●				2
Megalopsalis sp. indet.	●	●	●	●	●	●	6
Neopilionidae sp. indet.	●		●	●	●	●	5
Triaenonychidae 'genus 003' sp. indet.				●			1
Triaenonychidae 'genus 004' sp. indet.	●	●	●		●		4
Triaenonychidae 'genus 008' sp. indet.	●	●	●	●	●	●	6
Pseudoscorpions							
Austrochthonius 'medium 2'	●	●			●		3
Austrochthonius muchmorei	●	●		●	●	●	5
Austrochthonius 'PSE188, similis'	●		●	●	●	●	5
Austrochthonius 'PSE191, grandis'	●	●	●		●	●	5
Beierolpium bornemisszai			●	●	●	●	4
Lagynochthonius australicus	●		●		●		3
Oratemnus curtus	●				●		2
Pseudotyrannochthonius 'DS 2'	●	●	●		●		4
Scorpions							
Cercophonius sulcatus	●	●	●	●	●	●	6

Taxa	Fauna habitat						Number of habitat types
	High SRE Potential			Low SRE Potential			
	2 (5 sites)	3 (1 site)	5 (3 sites)	10 (2 sites)	4 (5 sites)	11 (1 site)	
Lychas 'austroccidentalis'	●						1
Urodacus novaehollandiae	●		●	●	●	●	5
Urodacus planimanus	●	●	●		●		4
Millipedes							
Atelomastix nigrescens	●		●		●		3
Antichiropus 'Phoenix0217'	●		●	●	●	●	5
Antichiropus variabilis	●	●	●	●	●	●	6
Podykipus collinus	●	●				●	3
Podykipus 'DIP241'			●				1
Podykipus leptoiuloides			●	●	●		3
Sphaerotrichopus `sp. indet.`				●			1
Slaters							
Acanthodillo '1'						●	1
Armadillo flavus			●			●	2
Buddelundia nitidissima	●	●	●	●	●	●	6
Buddelundia 'sp. 04'		●					1
Buddelundia 'sp. 5'	●		●	●	●		4
Laevophiloscia '1'	●	●	●		●	●	5
Laevophiloscia '2'	●		●	●	●		4
Philosciidae 'Phoenix0208'					●		1
Philosciidae 'Phoenix0209'			●				1
Philosciidae 's/1'	●	●	●	●	●		5
Pseudodiploexochus 'Phoenix0214'	●		●		●		3
Spherillo '5'	●						1
Styloniscus '1'	●	●	●	●	●	●	6
Styloniscus '7'	●	●	●				3
Land snails							
Annoselix cf. *dolosa*	●				●		2
Bothriembryon bradshawi	●	●				●	3
Bothriembryon cf. *serpentinus*	●						1
Luinodiscus cf. sublesta	●				●		2
cf. *Westraloma* sp. indet.	●						1
Velvet worms							
Occipperipatoides gilesii	●					●	1
Total	**46**	**21**	**39**	**23**	**37**	**23**	

5.3 STATISTICAL ANALYSIS OF SURVEY COMPLETENESS

The species records for the survey were aggregated for the species accumulation analysis. The curves of all 4 indices of 7 orders examined (Figure 5-9 - Figure 5-15) were beginning to flatten or had flattened, suggesting most species in these orders had been collected. Three of the 4 curves for the groups Scorpiones, Pseudoscorpiones and Diplopoda had flattened, suggesting few taxa remain undetected.

Species accumulation curves were not analysed for Selenopidae (flat spiders) or Onychophora (velvet worms), which are typically SRE taxa in other bioregions, were not included because they only contained a few representatives, and all of these were described and known to be Widespread.

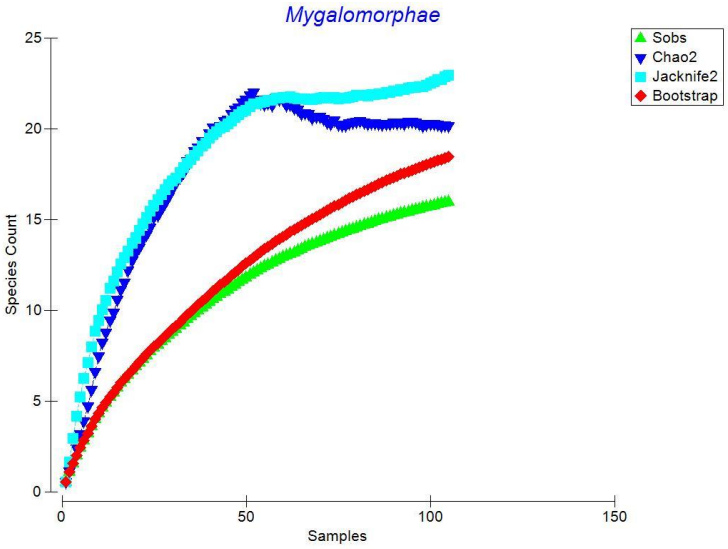

Figure 5-9 Species accumulation curve for Mygalomorphae

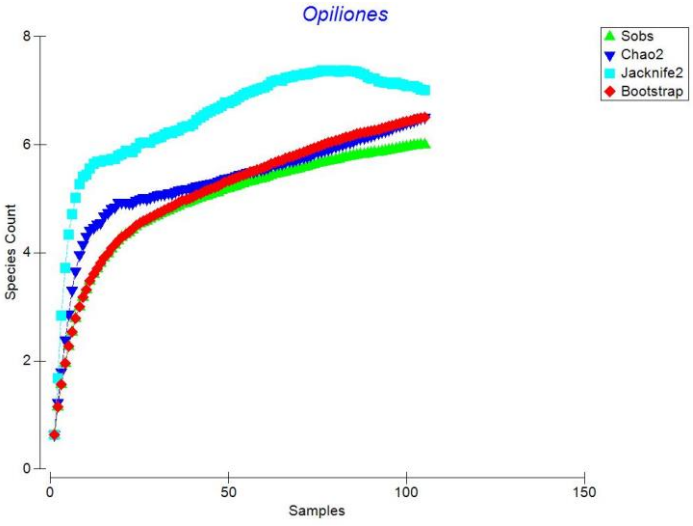

Figure 5-10 Species accumulation curve for Opiliones

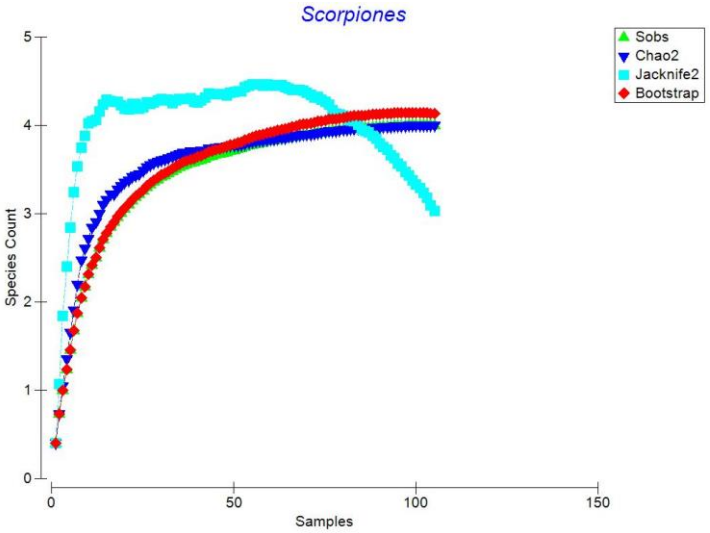

Figure 5-11 Species accumulation curve for Scorpiones

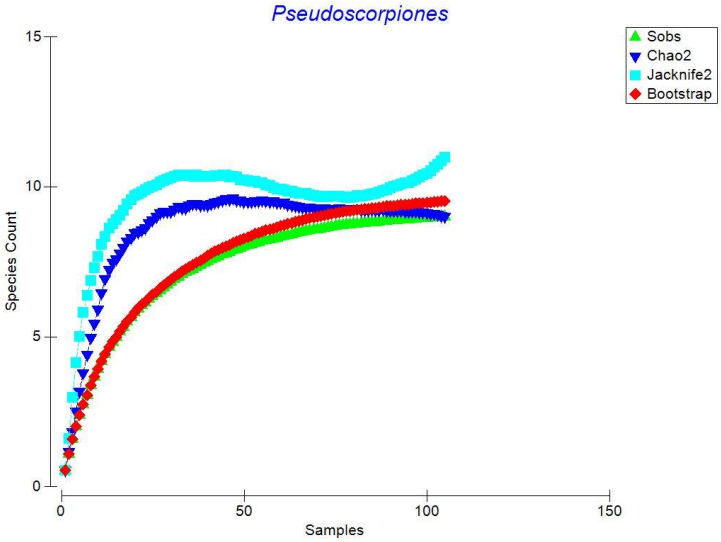

Figure 5-12 Species accumulation curve for Pseudoscorpiones

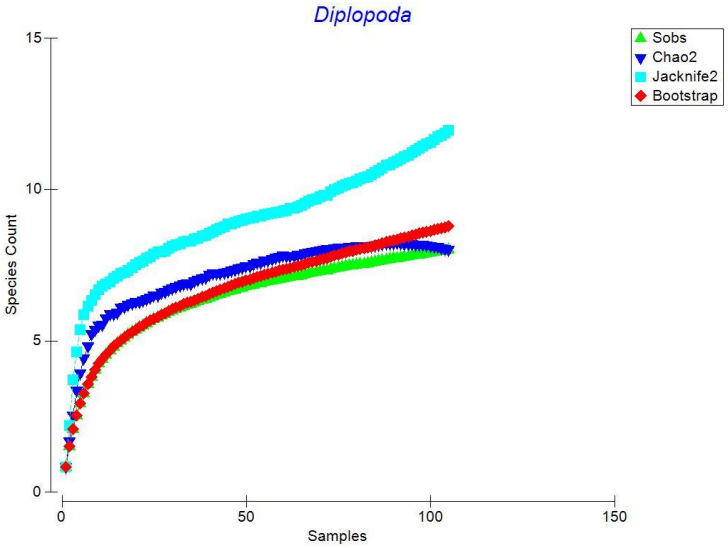

Figure 5-13 Species accumulation curve for Diplopoda

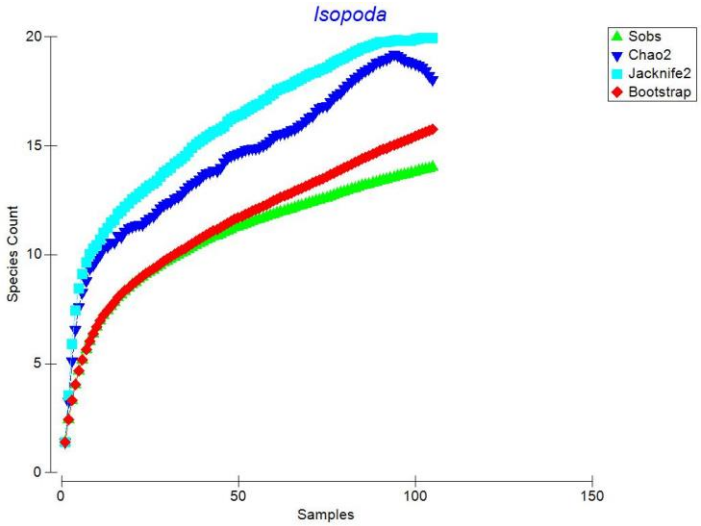

Figure 5-14 Species accumulation curve for Isopoda

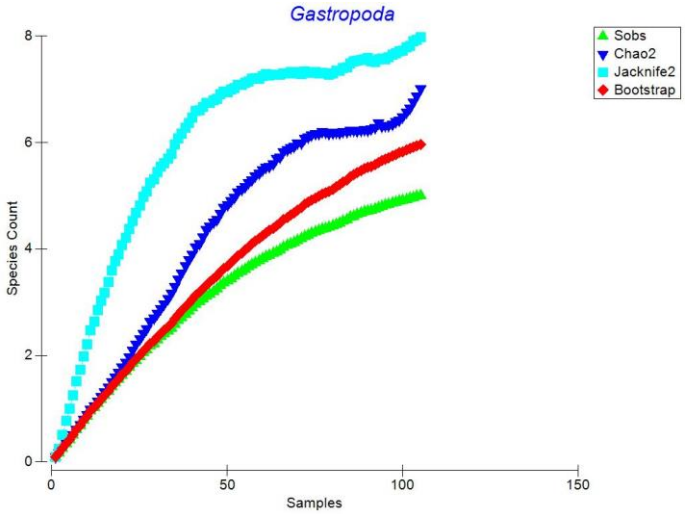

Figure 5-15 Species accumulation curve for Mollusca

6 DISCUSSION

6.1 SPECIES RECORDS

This survey recorded a diverse range of SRE invertebrate fauna in the study area. A total of 64 taxa were recorded from the survey, of which 58 were collected from sites within O'Neil. All but 3 taxa (potential SRE's) have been collected from outside the study area from either reference sites or other surveys, therefore have known wider distributions. Further comment is provided in section 6.5 on the 3 taxa that are known only from the study area, as these species are potentially most at risk from the Project.

The SRE assemblage comprised 3 Confirmed SREs (one millipede, one scorpion, and one pseudoscorpion), 5 Likely SREs (4 isopods and one millipede) and 37 Potential SREs (14 mygalomorphs, 7 opiliones, 6 isopods, 4 pseudoscorpions, 3 land snails, 2 millipedes, and one araneomorph spider). The 3 Confirmed SRE taxa were mainly classified as such based on knowledge of the specific taxonomic group:

- The Confirmed SRE millipede *Antichiropus* 'Phoenix0217' was recorded from 7 sites during the survey (CMRA-001, CMRA-002, CMRA-005, CMRA-007, OE-003, OE-007, OE-010; Habitats 1, 5, 2 (High) and 4 and 11 (L). Of the described *Antichiropus* species, only a few have ranges that exceed the nominal limits of short-range endemism (Car & Harvey 2014). All other species of the genus are SREs and many are known from only a few hundred square kilometres (Car & Harvey 2014; Car *et al.* 2013; Wojcieszek & Simmons 2011). From the specimens obtained from 2023 and 2024, molecular and morphological studies were undertaken, and a distinct clade was formed from specimens from this area. However, due to the complex relationship between the molecular and morphological identifications of *Antichiropus* specimens from the Northern Jarrah Forest subregion, more survey work and taxonomy (both morphological and molecular) is required to delineate between morphospecies and their distributions.
- The Confirmed SRE scorpion *Urodacus planimanus* is restricted to the western parts of the Northern Jarrah Forest subregion (E. Volschenk pers. comm.); however, the species is very close to exceeding the nominal upper limit of 10,000 km^2 for SREs and records are common within its range.
- The Confirmed SRE pseudoscorpion presently undescribed but referred to as *Pseudotyrannochthonius '*Darling Range 2' in a recent phylogenetic analysis of the family in south-western Australia (Harms 2018). This is a Confirmed SRE species that occurs in the Perth Hills, between Dwellingup (northern distributional limit) and Collie (southern limit) where it is moderately common in undisturbed microhabitats with high moisture retention and abundant leaf litter.

Taxa were recorded from all main target SRE groups relevant to southern WA but there was high variability in species richness between groups, with mygalomorph spiders and isopods represented by much higher diversity than others.

The high proportion of taxa collected from representatives of SRE groups that were classified as SREs (70%) was consistent with previous Northern Jarrah Forest subregion SRE surveys (Table 6-1). This is likely attributable to 2 main factors:

- A known diverse ecosystem comprising of a relatively narrow strip of hills and gullies with widescale clearing to the east and west.
- The use of molecular analysis enabled resolution of distinct taxa which otherwise would be unable to be morphologically identified due to life stage (juveniles), sex (females), or a simple lack of taxonomic knowledge.

The evolution of endemism within the Jarrah Forest has been documented by Wardell-Johnson and Horwitz (2000) to be the outcome of the long and complex geological and climatic history of the region. Through the interrogation of molecular results and geographic datasets, it can be inferred that active speciation via sympatry is prominent within the Northern Jarrah Forest subregion. Examples from within the 2 most speciose taxon groups from the survey, mygalomorph spiders and millipedes, demonstrate clear sister-species that overlap in distribution; however, are genetically dissimilar. This study highlights a clear gap of knowledge relating to uncovering cryptic, sympatric and/or allopatric speciation within the Northern Jarrah Forest subregion and highlights potential endemicity for many taxa.

6.2 SRE HABITATS

Native vegetation occupies 88.8% of the study area and comprises of 8 SRE habitats. An additional 9.8% represents rehabilitated land and the remainder (1.4%) is cleared (e.g. for infrastructure, plantations or dams). This is slightly lower than other study areas that were subject to SRE surveys (Holyoake, Holyoake East and Myara), which consist of around 96% to 97% native vegetation. Holyoake West is comprised of approximately 89.5% native vegetation; however, the non-native areas in Holyoake West are primarily agriculture and plantations and have not been rehabilitated with native vegetation like O'Neil.

Of the SRE habitats defined within the study area, 5 were classified as having High PHR with habitat attributes that often give rise to specialisation or dependency in invertebrate fauna, particularly more mesic habitats on lower slopes and valley floors and large isolated granite outcrops. These represented 6,624.8 ha (32.1%) of the study area.

Rehabilitated areas covered 9.8% of the study area and represent parts of the study area that have been previously mined. This is a relatively large proportion in comparison with other study areas (Holyoake, Holyoake East, Holyoake West and Myara) and the near regional landscape. Rehabilitated areas have been shown to support some SRE taxa, generally the more common and less restricted SRE taxa, and also have lower diversity than sites with remnant vegetation (Phoenix 2021a, c).

A total of 38 out of the 64 taxa were recorded from both Low and High PHR habitats, and most of these are now known to have wider distributions; however, 23 were recorded only from High PHR habitats, and 3 were recorded only from Low PHR habitats. Despite 6 of the 17 sites being situated in the Low PHR habitat, and the remaining 11 in High PHR habitats, the proportion of taxa recorded only in a High PHR habitat is much greater, indicating High PHR habitats are more favourable for highly range-restricted SRE taxa.

All habitats except Low PHR habitat 4 recorded similar diversity relative to the number of sites sampled. Although habitat 4 recorded a high diversity of SRE taxa, the diversity was noticeably lower than habitats with similar numbers of site sampled sites, i.e. habitat 2 had the same number of sites but recorded 9 more taxa, and habitat 5 recorded 2 more taxa than habitat 4 despite surveying 2 less sites in that habitat type.

The other Low PHR SRE habitat, 11, recorded a relatively high diversity, indicating that despite its position higher in the landscape, it might support habitat features desirable for SREs. The Low PHR habitats mainly woodlands on mid and upper slopes, occur more broadly and typically lacked distinguishing features that facilitate habitat specialisation. At the site level however, microhabitat features suitable for SREs were sometimes present that are not reflected in the broader scale habitat mapping.

Given that only one species (Philosciidae 'Phoenix0208') was recorded only from a single Low PHR habitat is site/habitat (CMRA-006, habitat 4) which is widespread, and that species is from a very poorly studied group of SREs, this species is unlikely to be highly restricted. This supports the notion from Phoenix (2021c) that taxa within the Low PHR habitats, such as habitat 4 are unlikely to be highly restricted.

It is possible that finer habitat attributes within habitats or sites may be influencing distribution of some species that were only recorded from one habitat/site type, making inferences about distribution and habitat preference difficult.

6.3 SURVEY COMPLETENESS

A total of 12 sites were systematically surveyed in the study area across an area of 10,414.5 ha and an additional 5 sites outside of the study area, across 9 habitat types. From this survey, 64 taxa from 9 SRE groups were delineated; however, species accumulation curves were only run for 7 of these as taxa from velvet worms and selenopids appear to be widespread from the region, with no new species recorded from several large-scale regional surveys (Phoenix 2021a, c, in prep.-a). Species accumulation curves from Scorpiones, Pseudoscorpiones and Diplopoda suggest few taxa remain undetected and that additional efforts focused on these orders is likely to only marginally improve the knowledge concerning the species richness of these groups.

The curves of the indices of the remaining 5 SRE groups (mygalomorphs, isopods, millipedes, opiliones and land snails) continued to rise slightly indicating that these groups are more speciose and additional taxa remain to be collected. These trends are considered reflective of the high level of endemicity, and hence diversity, in the Northern Jarrah Forest subregion as concluded by Wardell-Johnson and Horwitz (1996) and Wardell-Johnson and Horwitz (2000).

6.4 COMPARISON BETWEEN OTHER SURVEYS

Since 2020, several comparable 2-phase SRE surveys have been undertaken in the Northern Jarrah Forest between Jarrahdale and Collie (Figure 1-1):

- Myara North (Phoenix 2021c) – 3.5 km north of the study area
- Holyoake (Phoenix 2021c) – 5 km south-west of the study area
- Holyoake East (Phoenix in prep.-b) – directly south of the study area
- Holyoake West (Phoenix in prep.-b) – 15 km south-west of the study area
- Worsley (Phoenix 2021a) – 15 km east of the study area and extends to Collie.

The study area is situated between Myara North and Holyoake. Phoenix (2021c) noted considerable differences in the SRE assemblages between Myara North and Holyoake, with just 30 out of 83 taxa (36%) being common to both study areas, and 36 and 17 SRE taxa being exclusively recorded from the Myara North and Holyoake, respectively.

Being situated between Myara North and Holyoake, we expected more overlap to occur, and perhaps fewer species to ultimately be known exclusively from each study area once O'Neil was sampled. This was certainly the case for some taxa; the survey at O'Neil recorded 38 species or morphospecies in common with Myara North, and 39 species or morphospecies in common with Holyoake. Furthermore, 39 species or morphospecies from O'Neil were in common with taxa from Holyoake East, 22 from Holyoake West and 42 were in common with the Worsley studies.

The current survey highlights the value of continued sampling in increasing knowledge of species, their distributions and habitat tolerances, therefore informing Northern Jarrah Forest biodiversity values and conservation significance. While the survey results broadened known distributions for many taxa, the absence of additional collections of other SRE taxa from adjacent study areas supports the notion of some species from the subregion having highly restricted ranges. In summary, 16 species or morphospecies are known from all 6 surveys (Table 6-1), 12 species or morphospecies from 5 surveys, 16 species or morphospecies from 4 surveys and 32 from 2 surveys. A total of 89 species or

morphospecies are known from only one of the surveys, although most of these are not restricted to the study areas or impact areas within the study areas.

It makes sense that Holyoake West, being the smallest and furthest away from O'Neil had the least in common. Worsley however, also being a similar distance at its closest point had the largest number of species in common with O'Neil, but it is a much larger study area than Holyoake West with a wider variety of habitats. Being one of the most central study areas, O'Neil has a similar number of common/different species to those at Holyoake, Holyoake East and Myara North.

Three species that were previously only known from Myara North were re-recorded during the current survey, extending their known distribution:

- *Proshermacha* 'Phoenix0027' – previously only known from 2 sites in Myara North, now also known from another 11 sites in O'Neil
- *Eucyrtops* 'Phoenix0029' – previously only known from 3 sites in Myara North, now also known from another 3 sites in O'Neil
- Dalodesmidae 'Phoenix0038' – previously only known from 2 sites in Myara North, now also possibly known from another 2 sites in Holyoake East and a site in O'Neil; however, molecular tests failed.

No taxa that were only known from Holyoake were recorded in the O'Neil study area; however, 6 taxa previously only known from Holyoake were re-recorded from Holyoake East or Holyoake West, and one taxon from Myara North was also re-recorded from Holyoake East (Phoenix in prep.-b).

Species assemblage is similar across all studies, with mygalomorph spiders being the dominant group, comprising (25-40% of all taxa), followed by isopods and millipedes (10-20% of all taxa), with the remaining SRE groups all representing less than 10% of the assemblage in each study area (

Table 6-2).

Compared to the other study areas, the habitat within O'Neil is fairly consistent, i.e. primarily consisting of Jarrah/Marri forest with a mix of upland and valley habitats. Large granite outcrops were absent from O'Neil and there was very little wandoo woodland present. The habitat is also less connected with current and historic mining taking place; however, it is not likely this has affected SRE communities as the vast majority is still remnant vegetation and isolation of habitats has not occurred.

Table 6-1 Species or morphospecies common to Huntly and Worsley study areas

Species	O'Neil	Holyoake East	Holyoake West	Holyoake	Myara North	Worsley
Acanthodillo '1'	□	□		□		
Acanthodillo '5'		□				□
Akamptogonus novarae					□	
Aname 'Phoenix0004'					□	
Aname 'Phoenix0006'		□		□		
Aname 'Phoenix0010'	□	□		□		□
Aname 'Phoenix0020'		□		□		
Aname 'Phoenix0037'				□		□
Anamidae 'Phoenix0009'					□	□
Anamidae 'Phoenix0022'						□
Annoselix cf. *dolosa*	□		□		□	□
Antichiropus 'DIP046, boddington'						□
Antichiropus 'DIP097, marradong'		□		□		□
Antichiropus 'DIP108, mt saddleback'						□
Antichiropus 'DIP135, minnivale2?'					□	
Antichiropus 'DIP202, WorsleyDNA18'						□
Antichiropus 'DIP224, dwellingup'				□	□	
Antichiropus 'forest'				□		
Antichiropus 'holyoake'				□		
Antichiropus 'jarrah'					□	
Antichiropus 'Mini'					□	
Antichiropus 'Myara'				□		
Antichiropus 'Phoenix0216'		□	□			
Antichiropus 'Phoenix0217'	□					
Antichiropus 'Phoenix0218'		□				
Antichiropus 'southern'			□	□		
Antichiropus variabilis	□	□	□	□	□	□
Antichiropus 'Worsley DIP176'						□
Armadillo flavus	□			□	□	□
Atelomastix nigrescens	□	□	□	□	□	
Aurecocrypta 'Phoenix0014'						□
Austrochthonius 'medium 2'	□					
Austrochthonius muchmorei	□	□	□	□	□	□
Austrochthonius 'PSE188'	□	□		□	□	□
Austrochthonius 'PSE191, grandis'	□			□		□
Ballarra longipalpus	□	□		□		□
Barychelidae 'WorsleyDNA10'						□

Species	O'Neil	Holyoake East	Holyoake West	Holyoake	Myara North	Worsley
Beierolpium bornemisszai	□	□	□	□	□	□
Beierolpium 'WorsleyDNA18'						□
Beierolpium 'WorsleyDNA19'						□
Bothriembryon cf. *bradshawi*	□	□		□		□
Bothriembryon cf. *indutus*					□	
Bothriembryon cf. *serpentinus*	□					
Buddelundia nigripes					□	□
Buddelundia nitidissima	□	□	□	□	□	□
Buddelundia 'sp. 04'	□					□
Buddelundia 'sp. 5'	□	□	□	□	□	
Buddelundia sp. indet. A (Worsley)						□
Bungulla harrisonae	□			□	□	
Bungulla 'WorsleyDNA11'						□
Calliuncus 'WorsleyDNA21'						□
Cercophonius sulcatus	□	□	□	□	□	□
cf *'Sphaerotrichopus'*? 'WorsleyDNA01'						□
cf. *Westralaoma* sp. indet.	□	□		□	□	
Chernetidae 'boddington'		□	□		□	□
Dalodesmidae 'Phoenix0038'				□	□	
Eucanippe nemestrina		□				
Eucyrtops `collie`						□
Eucyrtops latior					□	□
Eucyrtops 'MYG645'	□	□	□	□	□	□
Eucyrtops 'Phoenix0001'						□
Eucyrtops 'Phoenix0018'						□
Eucyrtops 'Phoenix0029'	□				□	
Eucyrtops 'Phoenix0030'					□	
Eucyrtops 'Phoenix0032'				□	□	
Eucyrtops 'Phoenix0043'						□
Eucyrtops 'Phoenix0045'						□
Euoplos inornatus						□
Euoplos 'Phoenix0011'					□	
Euoplos 'Phoenix0012'		□	□	□		
Euoplos 'Phoenix0013'						□
Euoplos 'Phoenix0211'	□					
Geogarypus taylori					□	
Idiosoma jarrah	□	□		□	□	□
Idiosoma 'MYG741'						□
Idiosoma 'MYG790'		□	□	□		
Idiosoma 'Phoenix0002'						□
Idiosoma 'rhaphiduca group'						□
Idiosoma 'WAM T129362'	□	□		□	□	
Isometroides 'jarrah'		□			□	
Iulomorphidae 'WorsleyDNA20'						□

Species	O'Neil	Holyoake East	Holyoake West	Holyoake	Myara North	Worsley
Karaops ellenae				□	□	
Karaops jarrit		□		□		
Kwonkan 'Phoenix0005'		□			□	
Kwonkan 'Phoenix0008'			□	□		
Kwonkan 'Phoenix0210'		□				
Laevophiloscia '1'	□	□	□	□	□	□
Laevophiloscia '2'	□	□	□	□	□	□
Laevophiloscia cf. perlata						□
Lagynochthonius australicus	□		□	□	□	□
Luinodiscus cf. sublesta	□					□
Lychas 'austroccidentalis'	□	□		□	□	□
Megalopsalis 'WorsleyDNA22'						□
Megalopsalis 'WorsleyDNA23'						□
'Megalosiphon' 'WorsleyDNA14'		□				
'Megalosiphon' 'WorsleyDNA15'		□	□			
Missulena 'MYG198'		□		□		
Missulena 'MYG639'						□
Missulena 'Phoenix0046'						□
Nunciella 'WorsleyDNA25'						□
Occipperipatoides gilesii	□	□	□	□	□	□
Ommatoiulus moreletii		□	□	□	□	□
Oratemnus curtus	□					□
Paraplatyarthridae sp. indet.				□	□	□
Paraplatyarthrus sp. indet. A						□
Paraplatyarthrus sp. indet. B						□
Paraplatyarthrus sp. indet. C						□
Paraplatyarthrus sp. indet. D						□
Philosciidae 'Phoenix0208'	□					
Philosciidae 'Phoenix0209'	□					
Philosciidae 's/1'	□	□		□	□	□
Podykipus collinus	□	□	□			□
Podykipus 'DIP241'	□	□				□
Podykipus leptoiuloides	□	□	□	□	□	□
Proshermacha 'MYG485'	□	□	□	□	□	□
Proshermacha 'MYG495'	□	□		□	□	
Proshermacha 'MYG646'						□
Proshermacha 'MYG658'	□	□		□	□	□
Proshermacha 'Phoenix0024'					□	
Proshermacha 'Phoenix0027'	□				□	
Proshermacha 'Phoenix0028'					□	
Proshermacha 'Phoenix0213'		□				
Proshermacha 'WorsleyDNA12'						□
Protochelifer 'boddington'		□		□	□	□
Protogarypinus giganteus				□		

Species	O'Neil	Holyoake East	Holyoake West	Holyoake	Myara North	Worsley
Pseudodiploexochus '1'						□
Pseudodiploexochus 'Phoenix0214'	□	□	□			
Pseudodiploexochus sp. indet.				□	□	
Pseudodiploexochus sp. indet. A (Worsley)						□
Pseudodiploexochus sp. indet. B (Worsley)						□
Pseudotyrannochthonius 'Darling Range 2'	□	□	□	□	□	□
Siphonotidae `DIPAAF` `DIP188` `boddington`					□	□
Siphonotidae `DIPAAF` `WorsleyDNA14`						□
Siphonotidae `DIPAAF` `WorsleyDNA15`						□
Siphonotidae `DIPAAG` `DIP189` `collie`		□	□	□		□
Siphonotidae `DIPAAG` `DIP192` `mt saddleback`		□		□	□	□
Siphonotidae `DIPAAG` 'Phoenix0040, DIP219'				□	□	
Siphonotidae `DIPAAH` `DIP190` `harris river`						□
Siphonotidae 'DIPAAF' 'cf. michaelseni'		□	□	□	□	□
Sphaerotrichopus `sp. indet.`	□	□				□
Spherillo '1'			□		□	
Spherillo '5'	□	□		□	□	□
Styloniscus '1'	□	□	□	□	□	□
Styloniscus '7'	□	□	□	□	□	□
Styloniscus 'A' (Worsley)						□
Styloniscus 'B' (Worsley)						□
Synothele michaelseni	□	□	□	□	□	□
Synothele mullaloo	□	□		□	□	
Synothele 'MYG640'						□
Synothele rubripes						□
Synothele 'WorsleyDNA17'						□
Synsphyronus magnus	□					
Teyl 'MYG241'		□				
Teyl 'MYG245'	□				□	
Teyl 'MYG355'	□	□		□	□	
Teyl 'Phoenix0007'				□	□	
Teyl 'Phoenix0017'						□
Teyl 'Phoenix0019'					□	
Teyl 'Phoenix0021'					□	
Teyl 'Phoenix0212'		□				
Triaenonychidae 'genus 003' sp. indet.	□					□
Triaenonychidae 'genus 003' 'WorsleyDNA24'						□

Species	O'Neil	Holyoake East	Holyoake West	Holyoake	Myara North	Worsley
Triaenonychidae 'genus 003' 'WorsleyDNA26'						□
Triaenonychidae 'genus 003' 'WorsleyDNA27'						□
Triaenonychidae 'genus 004' sp. indet.	□					
Triaenonychidae 'genus 008' sp. indet.	□	□	□	□	□	□
Triaenonychidae 'genus 008' sp. indet.						□
Triaenonychidae 'genus 008' 'WorsleyDNA28'						□
Triaenonychidae 'genus 008' 'WorsleyDNA29'						□
Triaenonychidae 'genus 008' 'WorsleyDNA30'						□
Urodacus novaehollandiae	□	□		□	□	□
Urodacus planimanus	□	□		□	□	

Table 6-2 Comparison of Huntly and Worsley studies, by report

Survey	O'Neil	Holyoake East and Holyoake West (Phoenix in prep.-b)	Myara North and Holyoake (Phoenix 2021c)	Worsley (Phoenix 2021a)
Baseline study area size (ha)	10,414.5 ha	24,737	28,132 ha	124,651 ha 29,360 (CBME and WMDE) 95,291 (regional study area)
Number of sites	17 sites in toral	32 sites in total 26 HE 6 HW	60 sites in total 28 MN-MA 22 H-MA 5 MN-CC 3 H-CC 1 MN-HR 1 H-HR	47 sites in total 10 CBME (2019) 22 WMDE (2019) 15 regional study area (2020)
Number of taxa from SRE groups	64	76	117	134
Number of SRE taxa	Confirmed: 3 Likely: 5 Potential: 37 Total: 45	Confirmed: 8 Likely: 7 Potential: 41 Total: 56	Confirmed: 11 Likely: 5 Potential: 67 Total: 83	Confirmed: 9 Likely: 12 Potential: 77 Total: 98
% of taxa from SRE groups that are SREs	70%	74%	73%	73%
Number of families and genera	Families: 25 Genera: 34	Families: 28 Genera: 41	Families: 19 Genera: 24	Families: 19 Genera: 30
Number of taxa in each group	Mygalomorphs: 16 (25.0%) Opiliones: 7 (10.9%) Pseudoscorpions: 9 (14.0%) Scorpions: 4 (6.25%) Millipedes: 17 (22.7%) Isopods: 7 (10.9%) Land snails: 5 (7.8%) Araneomorphs: 1 (1.6%) velvet worm: 1 (1.6%)	Mygalomorphs: 23 (30.7%) Opiliones: 5 (6.7%) Pseudoscorpions: 7 (9.3%) Scorpions: 5 (6.7%) Millipedes: 17 (22.7%) Isopods: 13 (17.3%) Land snails: 3 (4.0%) Araneomorphs: 2 (2.7%) velvet worm: 1 (1.3%)	Mygalomorphs: 35 (42.2%) Opiliones: 7 (8.4%) Pseudoscorpions: 2 (2.4%) Scorpions: 2 (2.4%) Millipedes: 16 (19.3%) Isopods: 16 (19.3%) Land snails: 5 (6.0%)	Mygalomorphs: 40 (40.8%) Opiliones: 8 (8.2%) Pseudoscorpions: 4 (4.1%) Scorpions: 0 Millipedes: 19 (19.4%) Isopods: 24 (24.5%) Land snails: 3 (3%)
Number of native habitat types	8	TBC	8	9
Number of sites in rehabilitation survey	0	0	12	8

6.5 REVIEW OF TAXA KNOWN ONLY FROM THE STUDY AREA

A total of 3 taxa are known only from the study area. These are represented by one mygalomorph spider and 2 isopods. The other species were collected at 2 or more sites and have been collected outside the study area.

6.5.1 *Euoplos* 'Phoenix0211'

Euoplos is a widely distributed genus in Australia. It includes *Euoplos inornatus*, a Priority 3 species, which was returned in the desktop review.

Only one juvenile (singleton) was collected from a wet pitfall trap, therefore morphological comparison could not be made. The specimen was sequenced and analysed against the Phoenix and GenBank database, and upon no matches was then analysed against Museum databases by Dr. Michael Rix. The specimen does not closely match any other species of *Euoplos* that have been sequenced by the WAM. It is part of the difficult and unrevised *Euoplos inornatus* complex, which includes *E. inornatus*, *E. festivus* plus several other undescribed species from the Jarrah Forest and Warren bioregions. This specimen is 12.2% divergent from *Euoplos* 'Phoenix0012' from Holyoake Corridors (Phoenix 2021c), 11.9–12.5% divergent from *E. inornatus*; and 12.4% divergent from *E. Festivus* (WAM database). With Idiopid mygalomorph spiders, a divergence of 8.5% may be considered conservatively conspecific with decreasing divergence having higher confidence for conspecifity.

Euoplos 'Phoenix0211' was collected from one site (CMRA-002), a High PHR habitat comprising of Open forest of Jarrah/Marri forest, seasonally moist, sandy gravels on slopes. The site is located approximately 100 m from the O'Neil boundary (Figure 5-3) and there do not appear to be any restricted microhabitats or geographical barriers present, so it is likely this species also occurs outside the study area. The specimen was caught in a wet pitfall trap, so it is not known if the site/habitat is breeding/burrowing habitat or just dispersal habitat, as no females were collected from burrows, which could have been either not seen or not present at the site. It is unlikely to have travelled too far from its original site, however.

6.5.2 Philosciidae 'Phoenix0208' and 'Phoenix0209'

The Philosciidae are a poorly known family within the isopod order. There are several common morpho-species within the family identified by Judd (2004) and Judd and Horwitz (2003). Many of these were widely recorded during the survey and from the other Northern Jarrah Forest surveys, e.g. Philosciidae 's/1' was recorded from 5 of the 6 studies, and *Laevophiloscia* '1' and *Laevophiloscia* '2' which are known from all 6 studies. These 2 specimens were morphologically different (pers. comm. Dr. Simon Judd) and considered different species:

- Philosciidae 'Phoenix0208 was recorded from one site within O'Neil (CMRA-006), a Low PHR habitat (4 – Open forest to woodland of Jarrah/Marri on sandy-loam gravelly soils on mid-slopes and ridges). This habitat type occupies 57.4% of the study area. This specimen was sequenced; however, it failed to amplify. The specimen was described as "body outline complete, no waist, 2 flagellum, setae all over". Only 2 specimens of this species were recorded from the one site from a wet pitfall trap, indicating it is also a very cryptic animal. Six other isopods were collected from this site that were all recorded from several other locations, including 3 species considered Likely or Potential SREs (Figure 5-7). Therefore, it is reasonable to infer that Philosciidae 'Phoenix0208' is also likely to occur more broadly outside the study area.
- Philosciidae 'Phoenix0209' recorded from one site within O'Neil (CMRA-007), a High PHR habitat (5 – Open forest of Jarrah/Marri forest, seasonally moist, sandy gravels on slopes). This habitat type occupies 9.4% of the study area. This specimen was sequenced; however, there were no close matches. Only 2 specimens of this species were recorded from the one site from foraging, indicating it is also a very cryptic animal. Six other isopods were collected

from this site that were all recorded from several other locations, including 3 species considered Likely or Potential SREs (Figure 5-7). Therefore, it is reasonable to infer that Philosciidae 'Phoenix0209' is also likely to occur more broadly outside the study area.

6.6 CONCLUSION

A rich assemblage of invertebrate taxa was recorded from the study area with 64 SREs collected, represented by 3 Confirmed, 5 Likely and 37 Potential SREs. Taxa were recorded from several SRE groups but there was high variability in species richness between groups, with mygalomorph spiders, millipedes and isopods having highest species richness.

Only 3 taxa collected from the survey (*Euoplos* 'Phoenix0211', Philosciidae 'Phoenix0208' and 'Philosciidae 'Phoenix0209'); are currently known only from the study area, all from single sites, although broader distributions outside the study area are inferred for all. The remaining 62 taxa are known from outside the study area, indicating that O'Neil does not support extreme range-restricted taxa; however, like study areas from the previous surveys of the Northern Jarrah Forest subregion, it does provide habitat for several species likely to meet the definition of an SRE and it is anticipated that with additional sampling, many of the potential SRE taxa from the survey would be reclassified as likely or confirmed SREs.

Some groups of SREs are still poorly known, even the relatively well studied groups such as mygalomorph spiders and *Antichiropus* millipedes, with 7 new species recorded from the survey. With the use of molecular techniques, we have been able to identify and learn more about species previously considered unidentifiable.

Several species previously only known from one other survey, or from a handful of records, were re-collected in this survey, highlighting the importance of surveying to increase knowledge of SRE values in the Northern Jarrah Forest subregion.

The impacts to SREs from the proposal are variable, with highly restricted species or species where few records/locations are known, are most at most risk, these include:

- *Antichiropus* 'Phoenix 0017' – recorded from 7 sites but is only known from the study area
- *Austrochthonius* 'medium 2 – recorded from 2 sites, of which one is outside the study area
- *Euoplos* 'Phoenix011'– recorded from 2 sites, of which one is outside the study area, however close to the boundary therefore is highly likely to occur outside the study area
- Philosciidae 'Phoenix0208' – recorded from 1 site within the study are but based on habitat, is likely to occur more broadly
- Philosciidae 'Phoenix0209'– recorded from 1 site within the study area, however using species surrogates, we may infer this species is not restricted to the habitat it was recorded from.

The remaining species appear to be unrestricted to a particular habitat type and/or the study area, therefore their habitat may constitute the range from which they are currently known rather than habitat types. These taxa mostly occur in both High and Low habitat types, however for some species we are still seeing local restriction (ie. In several habitat types but not widespread throughout the region, indicating that spatial distance and the presence and abundance of habitat features (e.g. fallen logs, leaf litter, coarse woody debris, grass trees) may play a larger role in species distributions than general habitat type.

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Appendix 1 Survey site descriptions

Site details			
Site	**CMRA-001**	**Position (WGS84)**	116.2320298 -32.56517451
Slope	gentle	**Topography**	riparian zone
Soil colour	brown, orange	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	none

Site description

Melaleuca shrubland

Habitat	shrubland
Disturbance	evidence of feral animals, vehicle tracks

Vegetation condition		**Fire age**	< 1
year			
Total veg. cover (%)	69.0	**Litter distribution**	even/continuous
Tree cover (%)	5.0	**Litter depth (cm)**	2.0
Shrub cover (%)	60.0	**Litter cover (%)**	100.0
Grass cover (%)	2.0		
Herb cover (%)	2.0		

Site details			
Site	**CMRA-002**	**Position (WGS84)**	116.1929147 -32.538773
Slope	moderate	**Topography**	hill slope
Soil colour	brown, orange	**Soil texture**	clay loam and laterite
Rock cover (%)	5	**Rock type**	laterite

Site description

Jarrah/Marri forest over grass tree and *Banksia grandis* over mixed shrubs and herbs

Habitat	forest		
Disturbance	historic clearing		
Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	101.0	**Litter distribution**	even/continuous
Tree cover (%)	30.0	**Litter depth (cm)**	2.0
Shrub cover (%)	60.0	**Litter cover (%)**	100.0
Grass cover (%)	1.0		
Herb cover (%)	10.0		

Site details			
Site	**CMRA-003**	**Position (WGS84)**	116.2181588 -32.5269559
Slope		**Topography**	hill slope
Soil colour	orange, brown	**Soil texture**	clay loam and laterite
Rock cover (%)	0	**Rock type**	laterite

Site description

Jarrah over grass tree over mixed herbs

Habitat	forest
Disturbance	

Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	155.0	**Litter distribution**	even/continuous
Tree cover (%)	50.0	**Litter depth (cm)**	5.0
Shrub cover (%)	50.0	**Litter cover (%)**	100.0
Grass cover (%)	5.0		
Herb cover (%)	50.0		

Site details			
Site	**CMRA-005**	**Position (WGS84)**	116.2435601 -32.50487347
Slope	gentle	**Topography**	undulating plain
Soil colour	brown-grey	**Soil texture**	gravel, loam
Rock cover (%)	1	**Rock type**	laterite

Site description

Dense Jarrah, Marri, and Casuarina forest with an understory of mixed shrubs (*Banksia sessilis* and *Xanthorrhoea preissii* trees that vary from open to very dense. On a gentle slope with small patches of orange laterite gravel, otherwise continuous leaf litter

Habitat	forest
Disturbance	vehicle tracks

Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	100.0	**Litter distribution**	even/continuous
Tree cover (%)	40.0	**Litter depth (cm)**	1.0
Shrub cover (%)	50.0	**Litter cover (%)**	90.0
Grass cover (%)	0.0		
Herb cover (%)	10.0		

Site details			
Site	**CMRA-006**	**Position (WGS84)**	116.2621741 -32.53763225
Slope	gentle	**Topography**	hill slope
Soil colour	brown, orange	**Soil texture**	clay loam and laterite
Rock cover (%)	5	**Rock type**	laterite

Site description

Jarrah and Marri forest with *Allocasuarina* over *Banksia grandis* over mixed herbs

Habitat	forest		
Disturbance	excavation, current operations, historic clearing, vehicle tracks		
Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	96.0	**Litter distribution**	even/continuous
Tree cover (%)	50.0	**Litter depth (cm)**	2.0
Shrub cover (%)	25.0	**Litter cover (%)**	75.0
Grass cover (%)	1.0		
Herb cover (%)	20.0		

Site details			
Site	**CMRA-007**	**Position (WGS84)**	116.2719306 -32.49863711
Slope	gentle	**Topography**	undulating plain
Soil colour	brown-grey	**Soil texture**	gravel, loam
Rock cover (%)	1	**Rock type**	laterite

Site description

Jarrah and Marri forest on gentle slope over dense understory of mixed shrubs and herbs.

Habitat	forest
Disturbance	evidence of feral animals, historic clearing, vehicle tracks

Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	105.0	**Litter distribution**	even/continuous
Tree cover (%)	40.0	**Litter depth (cm)**	1.0
Shrub cover (%)	60.0	**Litter cover (%)**	95.0
Grass cover (%)	0.0		
Herb cover (%)	5.0		

Site details			
Site	**CMRA-008**	**Position (WGS84)**	116.2675706 -32.45759268
Slope	Negligible	**Topography**	foot slope
Soil colour	brown	**Soil texture**	clay loam
Rock cover (%)	0	**Rock type**	laterite

Site description

Mix of open and dense Jarrah and Marri woodland over mixed shrub understory alongside a drainage line.

Habitat	forest
Disturbance	vehicle tracks

Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	115.0	**Litter distribution**	even/continuous
Tree cover (%)	30.0	**Litter depth (cm)**	2.0
Shrub cover (%)	80.0	**Litter cover (%)**	100.0
Grass cover (%)	0.0		
Herb cover (%)	5.0		

Site details			
Site	**OE-001**	**Position (WGS84)**	116.2597356 -32.57356674
Slope	gentle	**Topography**	hill slope
Soil colour	orange, brown	**Soil texture**	clay loam and laterite
Rock cover (%)	5	**Rock type**	laterite

Site description

Jarrah and Marri

Habitat	forest
Disturbance	historic clearing

Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	86.0	**Litter distribution**	even/continuous
Tree cover (%)	50.0	**Litter depth (cm)**	5.0
Shrub cover (%)	10.0	**Litter cover (%)**	100.0
Grass cover (%)	1.0		
Herb cover (%)	25.0		

Site details			
Site	**OE-002**	**Position (WGS84)**	116.3159995 -32.47956468
Slope	gentle	**Topography**	foot slope
Soil colour	brown, orange	**Soil texture**	clay loam and laterite
Rock cover (%)	1	**Rock type**	laterite

Site description

Jarrah and Marri forest over Xanthorrhoea preissii over mixed herbs. Footslope next to small flowing creek.

Habitat	forest
Disturbance	

Vegetation condition		**Fire age**	>5 years
Total veg. cover (%)	155.0	**Litter distribution**	even/continuous
Tree cover (%)	50.0	**Litter depth (cm)**	5.0
Shrub cover (%)	50.0	**Litter cover (%)**	100.0
Grass cover (%)	5.0		
Herb cover (%)	50.0		

Site details			
Site	**OE-003**	**Position (WGS84)**	116.3379463 -32.52855857
Slope	gentle	**Topography**	undulating plain
Soil colour	brown, orange	**Soil texture**	clay loam and laterite
Rock cover (%)	2	**Rock type**	laterite

Site description

Jarrah and Marri forest over *Banksia grandis* and *Xanthorrhoea preissii*.

Habitat	forest		
Disturbance	excavation, historic clearing, vehicle tracks		
Vegetation condition		**Fire age**	<1 year
Total veg. cover (%)	71.0	**Litter distribution**	even/continuous
Tree cover (%)	50.0	**Litter depth (cm)**	2.0
Shrub cover (%)	10.0	**Litter cover (%)**	75.0
Grass cover (%)	1.0		
Herb cover (%)	10.0		

Site details			
Site	**OE-004**	**Position (WGS84)**	116.3331779 -32.49229165
Slope	gentle	**Topography**	foot slope
Soil colour	brown, orange	**Soil texture**	clay loam and laterite
Rock cover (%)	1	**Rock type**	laterite

Site description

Jarrah and Marri open forest over Xanthorrhoea preissii and mixed herb understory at southern base of large granite outcrop

Habitat	forest
Disturbance	historic clearing

Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	152.0	**Litter distribution**	even/continuous
Tree cover (%)	20.0	**Litter depth (cm)**	3.0
Shrub cover (%)	40.0	**Litter cover (%)**	100.0
Grass cover (%)	2.0		
Herb cover (%)	90.0		

Site details			
Site	**OE-006**	**Position (WGS84)**	116.299519 -32.57243208
Slope	Gentle	**Topography**	Mid slope
Soil colour	Brown, orange	**Soil texture**	clay loam and laterite
Rock cover (%)	5	**Rock type**	laterite

Site description

Jarrah forest over *Xanthorrhoea preissii* over mixed herbs

Habitat	forest		
Disturbance	historic clearing, vehicle tracks		
Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	151.0	**Litter distribution**	even/continuous
Tree cover (%)	50.0	**Litter depth (cm)**	3.0
Shrub cover (%)	50.0	**Litter cover (%)**	100.0
Grass cover (%)	1.0		
Herb cover (%)	50.0		

Site details			
Site	**OE-007**	**Position (WGS84)**	116.3069551 -32.52303474
Slope	moderate	**Topography**	hill slope
Soil colour	orange, brown	**Soil texture**	clay loam and laterite
Rock cover (%)	5	**Rock type**	laterite

Site description

Jarrah forest over grass trees over mixed herbs on south facing slope

Habitat	forest
Disturbance	historic clearing, vehicle tracks

Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	112.0	**Litter distribution**	even/continuous
Tree cover (%)	50.0	**Litter depth (cm)**	100.0
Shrub cover (%)	50.0	**Litter cover (%)**	100.0
Grass cover (%)	2.0		
Herb cover (%)	10.0		

Site details			
Site	**OE-008**	**Position (WGS84)**	116.2904667 -32.50640649
Slope	moderate	**Topography**	hill slope
Soil colour	brown, orange	**Soil texture**	gravel, sandy loam
Rock cover (%)	5	**Rock type**	laterite

Site description

Jarrah Mand Marri forest

Habitat	forest		
Disturbance	vehicle tracks, evidence of feral animals, historic clearing		
Vegetation condition		**Fire age**	< 1 year
Total veg. cover (%)	96.0	**Litter distribution**	even/continuous
Tree cover (%)	20.0	**Litter depth (cm)**	1.0
Shrub cover (%)	70.0	**Litter cover (%)**	100.0
Grass cover (%)	1.0		
Herb cover (%)	5.0		

Site details			
Site	**OE-009**	**Position (WGS84)**	116.2614176 -32.5577234
Slope	negligible 1-5% cover	**Topography**	plain
Soil colour	brown	**Soil texture**	loam
Rock cover (%)	0	**Rock type**	laterite

Site description

Jarrah and marri forest with open understory of moderately dense grass trees. Recent fire has removed most other veg. Ground is covered in fresh *Banksia* sprouts.

Habitat	forest
Disturbance	vehicle tracks

Vegetation condition		**Fire age**	< 1 year
Total veg. cover (%)	100.0	**Litter distribution**	even/continuous
Tree cover (%)	60.0	**Litter depth (cm)**	1.0
Shrub cover (%)	30.0	**Litter cover (%)**	90.0
Grass cover (%)	5.0		
Herb cover (%)	5.0		

Site details			
Site	**OE-010**	**Position (WGS84)**	116.3220867 -32.56273127
Slope	gentle	**Topography**	hill top
Soil colour	brown,orange	**Soil texture**	clay loam and laterite
Rock cover (%)	5	**Rock type**	laterite

Site description			
Wandoo woodland			
Habitat	woodland		
Disturbance	vehicle tracks, historic clearing		
Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	111.0	**Litter distribution**	even/continuous
Tree cover (%)	20.0	**Litter depth (cm)**	2.0
Shrub cover (%)	50.0	**Litter cover (%)**	50.0
Grass cover (%)	1.0		
Herb cover (%)	40.0		

Site details			
Site	**OE-012**	**Position (WGS84)**	116.301462, -32.54583401
Slope	moderate	**Topography**	hill slope
Soil colour	orange, brown	**Soil texture**	clay loam and laterite
Rock cover (%)	1	**Rock type**	laterite

Site description

Casuarina woodland with scattered jarrah and *banksia grandis*. Sparse understory

Habitat	woodland
Disturbance	excavation, historic clearing

Vegetation condition		**Fire age**	1-5 years
Total veg. cover (%)	82.0	**Litter distribution**	even/continuous
Tree cover (%)	50.0	**Litter depth (cm)**	3.0
Shrub cover (%)	2.0	**Litter cover (%)**	100.0
Grass cover (%)	10.0		
Herb cover (%)	20.0		

Appendix 2 Short-range endemic invertebrate desktop results

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Class: Araneae, Infraorder: Mygalomorphae					
Actinopodidae	*Missulena* 'MYG198'	P		JF	
Actinopodidae	*Missulena* 'black chelicerae'	P	inside building	SCP	
Actinopodidae	*Missulena granulosa*	W	sandy loam	JF/SCP	
Actinopodidae	*Missulena hoggi*	P	tuart woodland, jarrah/marri forest, degraded shrubland	JF/SCP	
Actinopodidae	*Missulena* 'MYG198'	P	jarrah/marri forest; drainage line	JF	
Actinopodidae	*Missulena occatoria*	W		JF/SCP	
Actinopodidae	*Missulena* 'Phoenix0046'	P		JF	
Actinopodidae	*Missulena* 'sp. indet'	P		JF/SCP	
Anamidae	*Aname* 'Brennan sp. 1'	P		JF	
Anamidae	*Aname* 'Brennan sp. 2'	P	excavated from burrow	JF	
Anamidae	*Aname* 'cf. mainae'	P	wattle	JF	
Anamidae	*Aname* 'coastal plain'	P		SCP	
Anamidae	*Aname* 'Dwellingup'	P		JF	
Anamidae	*Aname* 'false black wish-bone'	P		SCP	
Anamidae	*Aname* 'kwonkan spp. group.'	P		SCP	
Anamidae	*Aname mainae*	P	wetland with Melaleuca & marri, dryandra, Acacia, urban areas	JF/SCP	
Anamidae	*Aname* 'metropolitan'	P		SCP	
Anamidae	*Aname* 'MYG010'	P		JF	
Anamidae	*Aname* 'MYG119'	P		JF	
Anamidae	*Aname* 'MYG242'	P	plain	JF	
Anamidae	*Aname* 'MYG242'	P	swale	JF	
Anamidae	*Aname* 'MYG383'	P	jarrah forest	JF	
Anamidae	*Aname* 'MYG405'	P		SCP	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Anamidae	*Aname* 'MYG496'	P		SCP	
Anamidae	*Aname* 'MYG633'	P		SCP	
Anamidae	*Aname* 'Phoenix0004'	P	jarrah/marri forest	JF	
Anamidae	*Aname* 'Phoenix0006'	P	jarrah/marri forest; hill slope	JF	
Anamidae	*Aname* 'Phoenix0010'	P	jarrah/marri forest	JF	
Anamidae	*Aname* 'Phoenix0020'	P	jarrah/marri forest	JF	
Anamidae	*Aname* 'Phoenix0036'	P	jarrah/marri forest	JF	
Anamidae	*Aname* 'Phoenix0037'	P	jarrah/marri forest	JF	
Anamidae	*Aname* 'sp. indet'	P	woodland, forest	JF/SCP	
Anamidae	*Aname* 'sp. nov.'	P		JF/SCP	
Anamidae	*Aname tepperi*	W		SCP	
Anamidae	*Aname* 'UBS Cat sp. 126'	P		SCP	
Anamidae	*Aname* 'UBS sp. 2'	P		SCP	
Anamidae	*Aname* 'WorsleyDNA09'	P		JF	
Anamidae	Anamidae 'Phoenix0009'	P	undulating jarrah/marri forest heading towards dam	JF	
Anamidae	Anamidae 'Phoenix0022'	P		JF	
Anamidae	Anamidae 'sp. indet'	P	tuart woodland	SCP	
Anamidae	*Chenistonia* 'maculata?'	P		SCP	
Anamidae	*Chenistonia* 'tepperi'	P		SCP	
Anamidae	*Kwonkan* 'MYG060'	P		SCP	
Anamidae	*Kwonkan* 'PES0329'	P		SCP	
Anamidae	*Kwonkan* 'Phoenix0005'	P	creekline	JF	
Anamidae	*Kwonkan* 'Phoenix0008'	P	jarrah/marri forest; undulating plain	JF	
Anamidae	*Kwonkan* 'sp. indet'	P	jarrah/marri woodland, Allocasuarina	JF/SCP	
Anamidae	*Kwonkan* 'sp. nov.'	P		JF	
Anamidae	*Kwonkan* 'UBS Cat sp. 124'	P		SCP	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Anamidae	*Kwonkan* 'UBS Cat sp. 126'	P		SCP	
Anamidae	*Proshermacha* 'MYG449'	P	wetland with Melaleuca & marri	SCP	
Anamidae	*Proshermacha* 'MYG485'	P	jarrah/marri forest, rehab	JF	
Anamidae	*Proshermacha* 'MYG495'	P	Plain	JF	
Anamidae	*Proshermacha* 'MYG596'	P	drainage depression	JF	
Anamidae	*Proshermacha* 'MYG658'	P	ex burrow; under sheoak trees, in mixed jarrah woodland	JF	
Anamidae	*Proshermacha* 'Phoenix0023'	P	jarrah/marri forest; hill slope, granite	JF	
Anamidae	*Proshermacha* 'Phoenix0024'	P	south-facing slope in jarrah/marri forest	JF	
Anamidae	*Proshermacha* 'Phoenix0027'	P	gully in jarrah/marri forest	JF	
Anamidae	*Proshermacha* 'Phoenix0028'	P	hilltop in jarrah/marri forest	JF	
Anamidae	*Proshermacha* 'sp. indet'	P	tuart, melaleuca/banksia, laterite, granite, forest, drainage	JF/SCP	
Anamidae	*Proshermacha subarmata*	P		JF	
Anamidae	*Proshermacha* 'villosa'	P		JF	
Anamidae	*Proshermacha* 'WorsleyDNA12'	P		JF	
Anamidae	*Teyl* 'Brennan sp. 2'	P		JF	
Anamidae	*Teyl* 'luculentus?'	P	wandoo woodland	JF	
Anamidae	*Teyl* 'mandgedal sp. group'	P		JF	
Anamidae	*Teyl* 'MYG241'	P	wandoo woodland	JF	
Anamidae	*Teyl* 'MYG245'	P	Jarrah/Marri	JF	
Anamidae	*Teyl* 'MYG249'	P	Melaleuca woodland, reafforestation	SCP	
Anamidae	*Teyl* 'MYG355'	P	jarrah/marri forest	JF	
Anamidae	*Teyl* 'Phoenix0007'	P	jarrah/marri forest, rehab	JF	
Anamidae	*Teyl* 'Phoenix0019'	P	jarrah/marri forest on hilltop with granite outcropping	JF	
Anamidae	*Teyl* 'Phoenix0021'	P	mid slope of jarrah/marri forest	JF	
Anamidae	*Teyl* 'sampeyae'	P	under granite rock, wandoo woodland	JF	
Anamidae	*Teyl* 'sp. indet'	P	wandoo, jarrah/marri, granite, drainage, rehab	JF/SCP	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Anamidae	*Teyl* 'UBS Cat sp. 148'	P		SCP	
Anamidae	*Teyl* 'UBS Cat sp. 149'	P		SCP	
Anamidae	*Teyl* 'waldockae'	P	melaleuca/banksia woodland, tuart woodland, degraded shrubland	SCP	
Barychelidae	*Aurecocrypta lugubris*	W		SCP	
Barychelidae	*Aurecocrypta* 'Phoenix0014'	P		JF	
Barychelidae	Barychelidae 'sp. indet'	P	forset	JF	
Barychelidae	Barychelidae 'WorsleyDNA10'	P		JF	
Barychelidae	*Idiommata blackwalli*	W	forest, urban areas	JF/SCP	
Barychelidae	*Idiommata* 'sp. indet'	P	jarrah forest	JF/SCP	
Barychelidae	*Idiommata* 'UBS Cat sp. 123'	P		SCP	
Barychelidae	*Synothele durokoppin*	W	Jarrah/Marri, Wandoo, granite	JF/SCP	
Barychelidae	*Synothele harveyi*	P		JF	
Barychelidae	*Synothele longbottomi*	W		JF	
Barychelidae	*Synothele michaelseni*	W	jarrah/marri forest; hill slope	JF/SCP	
Barychelidae	*Synothele mullaloo*	P	Wandoo Woodland, tuart	JF/SCP	
Barychelidae	*Synothele* 'Phoenix0015'	P	jarrah/marri forest; hill slope	JF	
Barychelidae	*Synothele* 'Phoenix0016'	P	jarrah/marri forest; drainage line	JF	
Barychelidae	*Synothele rastelloides*	P		SCP	
Barychelidae	*Synothele rubripes*	P	woodland	JF	
Barychelidae	*Synothele* 'sp. indet'	P	Wandoo Woodland, sheoak, granite	JF/SCP	
Barychelidae	*Synothele* 'WorsleyDNA17'	P		JF	
Euagridae	*Cethegus fugax*	W	under laterite boulder, jarrah/marri	JF	
Euagridae	*Cethegus* 'sp. indet'	P	Jarrah/Marri forest, drainage depression	JF/SCP	
Idiopidae	*Bungulla* 'WorsleyDNA11'	P		JF	
Idiopidae	*Bungulla harrisonae*	P	jarrah forest	JF	
Idiopidae	*Bungulla parva*	P		JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Idiopidae	*Eucanippe nemestrina*	P		JF	
Idiopidae	*Eucyrtops latior*	P	Jarrah/Marri, hilltop, flat	JF/SCP	
Idiopidae	*Eucyrtops* 'MYG142'	P	running on rocks, drizzle,late afternoon	JF	
Idiopidae	*Eucyrtops* 'MYG645'	P		JF	
Idiopidae	*Eucyrtops* 'Phoenix0001'	P		JF	
Idiopidae	*Eucyrtops* 'Phoenix0003'	P	jarrah/marri forest, rehab	JF	
Idiopidae	*Eucyrtops* 'Phoenix0018'	P		JF	
Idiopidae	*Eucyrtops* 'Phoenix0029'	P	marri, jarrah and allocasuarina on mid-slope	JF	
Idiopidae	*Eucyrtops* 'Phoenix0030'	P	hilltop in jarrah/marri forest, granite, creek	JF	
Idiopidae	*Eucyrtops* 'Phoenix0032'	P	jarrah/marri forest; hill slope	JF	
Idiopidae	*Eucyrtops* 'Phoenix0033'	P	jarrah/marri forest, rehab	JF	
Idiopidae	*Eucyrtops* 'Phoenix0043'	P		JF	
Idiopidae	*Eucyrtops* 'Phoenix0044'	P		JF	
Idiopidae	*Eucyrtops* 'Phoenix0045'	P		JF	
Idiopidae	*Eucyrtops* 'sp. indet'	P	wandoo, drainage	JF/SCP	
Idiopidae	*Eucyrtops* 'WorsleyDNA06'	P	jarrah/marri forest; undulating plain	JF	
Idiopidae	*Euoplos* 'minimus'	P		JF	
Idiopidae	*Euoplos* 'Phoenix0011'	P	undulating white sands in jarrah/marri forest	JF	
Idiopidae	*Euoplos* 'Phoenix0012'	P	jarrah/marri forest; hill slope	JF	
Idiopidae	*Euoplos* 'Phoenix0013'	P		JF	
Idiopidae	*Euoplos* 'sp. indet'	P		JF	
Idiopidae	*Euoplos* 'sp. nov.'	P		JF	
Idiopidae	*Gaius cooperi*	P		JF	
Idiopidae	*Gaius* 'sp. indet'	P		SCP	
Idiopidae	*Gaius villosus*	W		SCP	
Idiopidae	*Idiosoma* 'MYG741'	P		JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Idiopidae	*Idiosoma jarrah*	W	forest, Jarrah/Marri	JF	
Idiopidae	*Idiosoma* 'MYG075'	P	under rock	JF	
Idiopidae	*Idiosoma* 'MYG187'	P	jarrah/marri	JF	
Idiopidae	*Idiosoma* 'MYG188'	P	coastal plain woodland	SCP	
Idiopidae	*Idiosoma* 'MYG189'	P		SCP	
Idiopidae	*Idiosoma* 'Phoenix0002'	P		JF	
Idiopidae	*Idiosoma* 'Phoenix0035'	P	jarrah/marri forest; hill slope	JF	
Idiopidae	*Idiosoma rhaphiduca*	W		JF/SCP	
Idiopidae	*Idiosoma schoknechtorum*	P/P3		JF	
Idiopidae	*Idiosoma* 'sp. indet'	P	woodland, reafforestation,	JF/SCP	
Idiopidae	*Idiosoma* 'WAM T129362'	P	jarrah/marri forest, granite	JF	
Idiopidae	*Euoplos inornatus*	P/P3	in clay bank, jarrah forest, limestone/sand	JF/SCP	
Idiopidae	*Idiosoma sigillatum*	P/P3	woodland, pine, urban areas	SCP/AW	
Class: Araneae, Infraorder: Araneomorphae					
Selenopidae	*Karaops ellenae*	W	granite, jarrah/Marri forest, plain, creekline	JF/SCP	
Selenopidae	*Karaops jarrit*	W	jarrah/marri forest; undulating plain	JF/SCP	
Selenopidae	*Karaops* 'sp. indet'	P	granite, jarrah, Banksia gully	JF/SCP	
Class: Araneae, Order: Opiliones					
Caddidae	*Hesperopilio mainae*	P		JF	
Lomanellidae	*Abaddon despoliator*	P	jarrah/marri forest; hill slope	JF	
Neopilionidae	*Ballarra longipalpus*	P	limestone	JF/SCP	
Neopilionidae	*Ballarra* 'sp. indet'	P	Melaleuca/Banksia woodland	SCP	
Neopilionidae	*Megalopsalis* 'sp. indet'	P	Melaleuca/Banksia woodland, Jarrah/Marri,	JF/SCP	
Neopilionidae	*Megalopsalis tanisphyros*	W		JF/SCP	
Neopilionidae	Neopilionidae 'sp. indet'	P	Jarrah/Marri, stream edge	JF/SCP	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Triaenonychidae	*Calliuncus* 'sp. indet'	P	jarrah/marri forest	JF	
Triaenonychidae	*Nunciella aspera*	W	Jarrah banksia gully	JF/SCP	
Triaenonychidae	*Nunciella karriensis*	W	marri, macrozamia. rich immature soil	JF	
Triaenonychidae	*Nunciella* 'sp. 10'	P		SCP	
Triaenonychidae	*Nunciella* 'sp. 6?'	P	under granite rock on granite outcrop	JF	
Triaenonychidae	*Nunciella* 'sp. indet'	P	Jarrah, Casuarina, granite, limestone, pine plantation, drainage, Bullich	JF/SCP	
Triaenonychidae	*Nunciella* 'sp. nov.'	P		JF	
Triaenonychidae	*Perthacantha* 'sp. indet'	P		JF	
Triaenonychidae	Triaenonychidae 'Genus 3' 'sp. indet'	P	forest adjacent to stream, woodland	JF	
Triaenonychidae	Triaenonychidae 'Genus 4' 'sp. indet'	P	wandoo woodland, jarrah forest	JF	
Triaenonychidae	Triaenonychidae 'Genus 8' 'dna - S Zuiddam study'	P	Marri, regrowth eucalypt forest with complex understorey	JF	
Triaenonychidae	Triaenonychidae 'Genus 8' 'sp. indet'	P	forest litter, jarrah/marri woodland	JF	
Triaenonychidae	Triaenonychidae 'Genus 8' 'sp.5, dna - S Zuiddam study'	P		JF	
Triaenonychidae	Trianonychidae 'sp. indet'	P	south-facing slope in jarrah/marri forest	JF	
Class: Araneae, Order: Scorpiones					
Bothriuridae	*Cercophonius granulosus*	W	Tuart and Banksia bushland, Allocaruarina	JF/SCP	
Bothriuridae	*Cercophonius michaelseni*	W		SCP	
Bothriuridae	*Cercophonius* 'sp. indet'	P	Melaleuca woodland, Marri, urban aras	JF/SCP	
Bothriuridae	*Cercophonius squama*	W	Jarah/Marri, Wandoo, Banksia, Melaleuca, gully, drainage, sand, rehab	JF/SCP	
Buthidae	*Isometroides* 'jarrah'	P	jarrah/marri forest	JF	
Buthidae	*Isometroides* 'sp. indet'	P	Banksia woodland	JF/SCP	
Buthidae	*Isometroides* 'vescus'	W	tuart forest	JF/SCP	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Buthidae	*Lychas* 'austroccidentalis'	W	Banksia, Tuart, Melaleuca, Marri, granite, limestone, rehab, urban areas	JF/SCP	
Buthidae	*Lychas* 'majeri'	P		SCP	
Buthidae	*Lychas* 'majerorum'	P	Banksia woodland, along a sandy track	SCP	
Buthidae	*Lychas* 'prendinii'	P		SCP	
Buthidae	*Lychas* 'sp. indet'	P	Banksia, Melaleuca, drainage	JF/SCP	
Buthidae	*Lychas splendens*	W		JF/SCP	
Urodacidae	*Urodacus* 'armatus'	W		JF/SCP	
Urodacidae	*Urodacus hartmeyeri*	W		SCP	
Urodacidae	*Urodacus novaehollandiae*	W	Banksia, Jarrah/Marri, Wandoo, Bulich, granite, laterite, tuart, allocasuarina, drainage, urban areas	JF/SCP	
Urodacidae	*Urodacus planimanus*	C	jarrah/marri, wandoo, granite	JF	
Urodacidae	*Urodacus* 'woodwardii'	P		SCP	
Class: Araneae, Order: Pseudoscorpiones					
Atemnidae	Atemnidae 'sp. indet'	P	forest adjacent to stream	JF	
Atemnidae	*Oratemnus curtus*	W		JF/SCP	
Atemnidae	*Oratemnus* 'sp. indet'	W	jarrah/marri forest; woodland	JF	
Cheiridiidae	*Apocheiridium* 'sp. indet'	P	under bark	SCP	
Cheliferidae	*Protochelifer* 'boddington'	W	jarrah/marri forest	JF	
Cheliferidae	*Protochelifer* 'sp. indet'	W	Jarrah/Marri, grasstree	JF	
Chernetidae	*Balgachernes occultus*	P	in crown of Xanthorrhoea preisii	JF	
Chernetidae	Chernetidae 'boddington'	W	jarrah/marri/allocasuarina forest on hill, creekline	JF	
Chernetidae	Chernetidae 'sp. indet'	P	Melaleuca woodland	JF/SCP	
Chernetidae	Chernetidae 'tarsus IV without tactile seta'	P		JF/SCP	
Chernetidae	*Haplochernes* 'sp. indet'	P	granite outcrop	JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Chernetidae	*Lamprochernes savignyi*	W	associated with fly	SCP	
Chernetidae	*Nesidiochernes* 'sp. indet'	W		SCP	
Chernetidae	PSEAAF' 'PSE130'	P		SCP	
Chthoniidae	*Austrochthonius* '4'	P		SCP	
Chthoniidae	*Austrochthonius australis*	W	Marri	JF	
Chthoniidae	*Austrochthonius muchmorei*	W	jarrah/marri forest, Wandoo woodland, drainage	JF	
Chthoniidae	*Austrochthonius* 'PSE188, similis'	W	forest, woodland, banksia, granite, limestone	JF/SCP	
Chthoniidae	*Austrochthonius* 'PSE189, austini'	P	Jarrah/Marri	JF	
Chthoniidae	*Austrochthonius* 'PSE191, grandis'	W	jarrah/marri forest; sheoak, drainage	JF	
Chthoniidae	*Austrochthonius* 'PSE192, lesueuri'	P	under Blackbutt, last burnt 26-27/01/1961	JF	
Chthoniidae	*Austrochthonius* 'sp. indet'	W	Jarrah/Marii woodland forest	JF/SCP	
Chthoniidae	*Austrochthonius* 'sp. nov. 4'	P		SCP	
Chthoniidae	Chthoniidae 'sp. indet'	P	riparian zone	JF	
Chthoniidae	*Lagynochthonius australicus*	W	Jarrah/Marri, Shoak, reahb	JF	
Chthoniidae	*Lagynochthonius* 'sp. indet'	W	jarrah forest	JF	
Chthoniidae	*Tyrannochthonius australicus*	W		JF	
Chthoniidae	*Tyrannochthonius* 'sp. indet'	W	under rock	JF	
Garypidae	*Synsphyronus callus*	W		SCP	
Garypidae	*Synsphyronus magnus*	W	pine, Jarrah	JF/SCP	
Garypidae	*Synsphyronus mimulus*	W		JF	
Garypidae	*Synsphyronus* 'sp. indet'	P	under marri bark, summit	JF/SCP	
Garypinidae	*Aldabrinus* 'PSE187'	P		SCP	
Garypinidae	*Protogarypinus giganteus*	W	jarrah/marri forest	JF/SCP	
Garypinidae	*Protogarypinus* 'sp. indet'	W	Xanthorrhoea skirts	JF	
Garypinidae	*Solinus* 'sp. indet'	P	under bark	SCP	
Geogarypidae	*Geogarypus* 'sp. indet'	W	jarrah/marri forest between two granite outcrops	JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Geogarypidae	*Geogarypus taylori*	W	Jarrah/Marri, drainage, granite, rehab	JF/SCP	
Olpiidae	*Beierolpium bornemisszai*	W	jarrah/marri forest; gully, granite	JF	
Olpiidae	*Beierolpium* 'sp. 8/4'	P		JF	
Olpiidae	*Beierolpium* 'sp. 8/4 lge'	P	Jarrah/Marri	JF	
Olpiidae	*Beierolpium* 'sp. indet'	P	jarrah/marri forest between granite outcrops, woodland	JF/SCP	
Olpiidae	*Indolpium* 'sp. indet'	P	Jarrah/Marri, drainage	JF	
Olpiidae	*Xenolpium* 'sp. indet'	P		SCP	
Pseudotyrannochthoniidae	*Pseudotyrannochthonius* 'Darling Range 1'	P	wandoo woodland, Jarrah/Marri woodland	JF	
Pseudotyrannochthoniidae	*Pseudotyrannochthonius* 'Darling Range 2'	W	Jarrah/Marri, sheoak	JF	
Pseudotyrannochthoniidae	*Pseudotyrannochthonius* 'Darling Range 3'	P	Marri	JF	
Syarinidae	*Ideoblothrus* 'sp. Perth'	P	marri litter	JF	
Withiidae	*Withius piger*	W		JF/SCP	
Class: Diplopoda					
Dalodesmidae	cf Sphaerotrichopus?' 'sp. indet'	P	woodland	JF	
Dalodesmidae	Dalodesmidae 'Phoenix0038'	P	hilltop in jarrah/marri forest	JF	
Dalodesmidae	*Sphaerotrichopus ramosus*	P		JF/SCP	
Dalodesmidae	*Sphaerotrichopus* 'sp. indet'	P		JF	
Dalodesmidae	*Sphaerotrichopus* 'S-W forests'	P		JF	
Henicopidae	*Dichelobius flavens*	W		SCP	
Iulomorphidae	*Atelomastix nigrescens*	W	jarrah/marri forest, woodland, drainage, granite, bullich,	JF	
Iulomorphidae	*Atelomastix* 'sp. indet'	W	forest (upland), bullich	JF	
Iulomorphidae	*Dinocambala ingens*	C	granite, leaf litter	JF/SCP	
Iulomorphidae	Iulomorphidae 'Genus indet.' 'large, black sp.'	P		JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Iulomorphidae	Iulomorphidae 'Genus indet.' 'small, brown sp.'	P	under rock	JF	
Iulomorphidae	*Podykipus collinus*	P		SCP	
Iulomorphidae	*Podykipus leptoiuloides*	W	Jarrah/Marri, Bullich, Creekline, Wandoo, granite, rehab	JF	
Iulomorphidae	Polyzoniida 'Phoenix0039'	P	jarrah/marri forest; hill slope	JF	
Iulomorphidae	Polyzoniida 'Phoenix0042'	P	jarrah/marri forest in gully	JF	
Iulomorphidae	Polyzoniida 'Phoenix0043'	P	jarrah/marri forest in gully	JF	
Iulomorphidae	Polyzoniida 'Phoenix0044'	P	undulating forest/woodland	JF	
Paradoxosomatidae	*Akamptogonus novarae*	W	leaf litter, Jarrah/Marri forest, Wandoo, Banksia	JF/SCP	
Paradoxosomatidae	*Antichiropus* 'boddington'	C	woodland	JF	
Paradoxosomatidae	*Antichiropus* 'DIP022, janine'	C	from bike path	SCP	
Paradoxosomatidae	*Antichiropus* 'DIP062, darling'	C		JF	
Paradoxosomatidae	*Antichiropus* 'DIP082/DIP172, GI/UBS1'	C	Tuart forest, limestone, reafforestation, Melaleuca	SCP	
Paradoxosomatidae	*Antichiropus* 'DIP097, marradong'	C	granite, Jarrah/Marri woodland, Wandoo, drainage	JF	
Paradoxosomatidae	*Antichiropus* 'DIP108, mt saddleback'	C		JF	
Paradoxosomatidae	*Antichiropus* 'DIP112, Norman Road 1'	C		SCP	
Paradoxosomatidae	*Antichiropus* 'DIP126, accinctus'	C		SCP	
Paradoxosomatidae	*Antichiropus* 'DIP126, UBS2, disgregus'	C	open woodland, Melaleuca, Banksia, tuart	SCP	
Paradoxosomatidae	*Antichiropus* 'DIP127, UBS3'	C	Melaleuca, Acacia, Tuart	SCP	
Paradoxosomatidae	*Antichiropus* 'DIP141, UBS1/GI'	C		SCP	
Paradoxosomatidae	*Antichiropus* 'DIP143, serpentine'	C	Jarrah forest	JF	
Paradoxosomatidae	*Antichiropus* 'DIP166 whistlepipe'	C	under rock	JF	
Paradoxosomatidae	*Antichiropus* 'DIP168, susannah'	C		JF	
Paradoxosomatidae	*Antichiropus* 'DIP170, nadia'	C	walking on path	SCP	
Paradoxosomatidae	*Antichiropus* 'DIP171, ellisbrook'	C	under rock, heath on ridge	JF	
Paradoxosomatidae	*Antichiropus* 'DIP172, rottnest'	C	tuart woodland	SCP	
Paradoxosomatidae	*Antichiropus* 'DIP177, Collie'	C		JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Paradoxosomatidae	*Antichiropus* 'DIP178, bannister'	C	woodland	JF	
Paradoxosomatidae	*Antichiropus* 'DIP181, lane poole'	C	jarrah forest	JF	
Paradoxosomatidae	*Antichiropus* 'DIP182, saddleback 3'	C	jarrah/marri forest	JF	
Paradoxosomatidae	*Antichiropus* 'DIP183, southwest'	C	jarrah/marri forest	JF	
Paradoxosomatidae	*Antichiropus* 'DIP186, kirsten'	C	on laterite loam/granite	JF	
Paradoxosomatidae	*Antichiropus* 'dwellingup'	C	jarrah/marri forest; hill slope, between granite, gully	JF	
Paradoxosomatidae	*Antichiropus* 'forest'	C	forest	JF	
Paradoxosomatidae	*Antichiropus* 'holyoake'	C	jarrah/marri forest; undulating plain	JF	
Paradoxosomatidae	*Antichiropus* 'jarrah'	C	forest	JF	
Paradoxosomatidae	*Antichiropus* 'Mini'	C	jarrah/marri forest; hill slope	JF	
Paradoxosomatidae	*Antichiropus minimus*	C		JF	
Paradoxosomatidae	*Antichiropus* 'Myara'	C	jarrah/marri forest; hill slope	JF	
Paradoxosomatidae	*Antichiropus* 'southern'	C	jarrah/marri forest; drainage line	JF	
Paradoxosomatidae	*Antichiropus* 'sp. indet'	P	Jarrah/Marri, Wandoo, Melealecua, Banksia, rehab, pine, drainage	JF/SCP	
Paradoxosomatidae	*Antichiropus variabilis*	W	granite, forest, woodland, banksia, arrah/marri, gully, granite	JF/SCP	
Paradoxosomatidae	*Antichiropus whistleri*	C	Heath, tuart, banksia, woodland, marri	SCP	
Polyxenidae	*Unixenus attemsi*	W	forest litter, jarrah / marri woodland	JF/SCP	
Polyxenidae	*Unixenus mjoebergi*	W	forest litter, jarrah / marri woodland	JF/SCP	
Siphonotidae	DIPAAG, Hesperisiphon' 'cacaoi'	P	leaf litter	JF	
Siphonotidae	DIPAAF' 'DIP188?'	P		JF	
Siphonotidae	DIPAAG' 'DIP189' 'collie'	P	jarrah/marri forest; hill slope	JF	
Siphonotidae	*Megalosiphon'* 'cf. michaelseni'	P	woodland	JF	
Siphonotidae	*Megalosiphon'* 'sp. indet'	P	woodland	JF	
Siphonotidae	*Megalosiphon'* 'WorsleyDNA14'	P		JF	
Siphonotidae	*Megalosiphon'* 'WorsleyDNA15'	P		JF	
Siphonotidae	*Rhinotus michaelseni*	P		JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Siphonotidae	Siphonotidae 'DIPAAF' 'cf. michaelseni'	Lik.	Jarrah/Marri woodland	JF	
Siphonotidae	Siphonotidae 'DIPAAF' 'DIP188' 'boddington'	C		JF	
Siphonotidae	Siphonotidae 'DIPAAF' 'sp. indet'	Lik.	Not mapped	JF	
Siphonotidae	Siphonotidae 'DIPAAF' WorsleyDNA14'	P	Open Jarrah/Marri woodlands on sands, clay loam or sandy-gravel on lower slopes and valley floors	JF	
Siphonotidae	Siphonotidae 'DIPAAF' 'WorsleyDNA15'	P	Open forest of Jarrah/Marri on sandy-loam gravelly soils on mid slopes and ridges	JF	
Siphonotidae	Siphonotidae 'DIPAAG' 'DIP189' 'collie'	C	Jarrah/Marri forest	JF	
Siphonotidae	Siphonotidae 'DIPAAG' 'DIP192' 'mt saddleback'	C		JF	
Siphonotidae	Siphonotidae 'DIPAAH' 'DIP190' 'harris river'	C		JF	
Siphonotidae	Siphonotidae 'genus indet.' 'Marradong'	P		JF	
Siphonotidae	Siphonotidae 'Marradong'	C		JF	
Siphonotidae	*Siphonotus flavomarginatus*	W		SCP	
Synxenidae	*Phryssonotus novaehollandiae*	W		SCP	
Class: Malacostraca, Order: Isopoda					
Platyarthidae	*Trichorhina* cf. australiensis	W		JF	
Armadillidae	*Pseudodiploexochus* sp. indet.	Lik.	forest, woodland	JF	
Armadillidae	*Pseudodiploexochus* sp. indet. A (Worsley)	Lik.		JF	
Armadillidae	*Pseudodiploexochus* sp. indet. B (Worsley)	P		JF	
Armadillidae	*Pseudodiploexochus* 'X'	Lik.		JF	
Armadillidae	*Acanthodillo* '1'	P		JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Armadillidae	*Acanthodillo* '5'	P	woodland	JF	
Armadillidae	*Acanthodillo* flavus	P	forest, woodland	JF/SCP	
Armadillidae	*Acanthodillo* 'sp. 2 (Judd 2002)'	P		JF/SCP	
Armadillidae	*Acanthodillo* 'sp. 3 (Judd 2002)'	P		JF	
Armadillidae	*Buddelundia* '5' (Huntly)	Lik.	forest, woodland	JF	
Armadillidae	*Buddelundia cinerascens*	P	banksia	SCP	
Armadillidae	*Buddelundia inaequalis*	P	Under Rocks	SCP	
Armadillidae	*Buddelundia nigripes*	P	forest	JF/SCP	
Armadillidae	*Buddelundia nitidissima*	W	forest, woodland, shrubland	JF/SCP	
Armadillidae	*Buddelundia opaca*	W		JF/SCP	
Armadillidae	*Buddelundia* 'sp. 04'	P		JF	
Armadillidae	*Buddelundia* 'sp. 1 (Judd 2002)'	P		SCP	
Armadillidae	*Buddelundia* 'sp. 3 (Judd 2002)'	P		SCP	
Armadillidae	*Buddelundia* 'sp. 5 (Judd 2002)'	P		JF	
Armadillidae	*Buddelundia* 'sp. 7 (Judd 2002)'	P	Marri	SCP	
Armadillidae	*Buddelundia* sp. indet.	P	forest	JF	
Armadillidae	*Buddelundia* sp. indet. A (Worsley)	Lik.		JF	
Armadillidae	*Cubaris* 'sp. 1 (Judd 2002)'	P		SCP	
Armadillidae	*Cubaris* 'sp. 2 (Judd 2002)'	P		SCP	
Armadillidae	*Laevophiloscia* '2'	W	forest, woodland	JF	
Armadillidae	*Laevophiloscia* cf. perlata	P		JF	
Armadillidae	*Laevophiloscia* cf. yalgoonensis	W		JF	
Armadillidae	*Pseudodiploexochus* '1'	Lik.		JF	
Armadillidae	*Pseudodiploexochus* 'sp. 1 (Judd 2002)'	W	Leaf Litter	JF/SCP	
Armadillidae	*Pseudodiploexochus* 'sp. 2 (Judd 2002)'	W	Jarrah, Banksia, Allocasuarina,	JF/SCP	
Armadillidae	*Spherillo* '1'	Lik.	woodland	JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Armadillidae	*Spherillo* '5'	W		JF	
Armadillidae	*Spherillo* 'sp. 2 (Judd 2002)'	P		SCP	
Armadillidae	*Spherillo* 'sp. 3 (Judd 2002)'	P	Under Bark Eucalyptus Diversicolor	SCP	
Armadillidae	*Spherillo* 'sp. 4 (Judd 2002)'	P	Jarrah, Marri, Sheoak, Wandoo	JF/Avon Wheatbelt	
Armadillidae	*Spherillo* 'sp. 5 (Judd 2002)'	W	Jarrah/Marri	JF/SCP	
Philosciidae	*Laevophiloscia* '1'	P	forest	JF	
Philosciidae	*Laevophiloscia perlata*	W		JF/SCP	
Philosciidae	*Laevophiloscia* 'sp. 1 (Judd 2002)'	W		JF	
Philosciidae	*Laevophiloscia* 'sp. 2 (Judd 2002)'	W	Under Rotting Bark In Bed Of Lit	JF	
Philosciidae	*Laevophiloscia* sp. indet.	P	forest	JF	
Philosciidae	*Laevophiloscia yalgoonensis*	W		SCP	
Philosciidae	Philosciidae 's'	Lik.	forest, woodland	JF	
Philosciidae	Philosciidae 'sp. 1 (Judd 2002)'	W	Leaf Litter	JF/SCP	
Platyarthridae	Paraplatyarthridae sp. indet.	P	woodland	JF	
Platyarthridae	*Paraplatyarthrus* sp. indet.	P	forest	JF	
Platyarthridae	*Paraplatyarthrus* sp. indet. A	Lik.		JF	
Platyarthridae	*Paraplatyarthrus* sp. indet. B	Lik.		JF	
Platyarthridae	*Paraplatyarthrus* sp. indet. C	Lik.		JF	
Platyarthridae	*Paraplatyarthrus* sp. indet. D	Lik.		JF	
Platyarthridae	Platyarthridae 'sp. 1 (Judd 2002)'	W		SCP	
Platyarthridae	Platyarthridae 'sp. 2 (Judd 2002)'	W		JF	
Platyarthridae	Platyarthridae 'sp. 3 (Judd 2002)'	W		SCP	
Platyarthridae	Platyarthridae 'sp. 3 (Judd 2002)'	W		SCP	
Platyarthridae	Platyarthridae sp. indet.	P		JF	
Platyarthidae	*Trichorhina* 'sp. 1 (Judd 2002)'	W	Under Rocks	SCP	
Platyarthidae	*Trichorhina* sp. indet.	P		JF	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Styloniscidae	*Styloniscus* '1'	P	woodland, forest	JF	
Styloniscidae	*Styloniscus* '2'	P		JF	
Styloniscidae	*Styloniscus* '7'	Lik.	forest	JF	
Styloniscidae	*Styloniscus* 'A' (Worsley)	Lik.		JF	
Styloniscidae	*Styloniscus* 'B' (Worsley)	Lik.		JF	
Styloniscidae	*Styloniscus* 'sp. 1 (Judd 2002)'	W	Jarrah, swamp	JF/SCP	
Styloniscidae	*Styloniscus* 'sp. 7 (Judd 2002)'	W	Jarrah	SCP	
Styloniscidae	*Styloniscus* sp. indet.	P	forest	JF	
Class: Gastropoda					
Bothriembryontidae	*Bothriembryon bradshawi*	W		SCP	
Bothriembryontidae	*Bothriembryon bulla*	W	Damp yellow/white sandy soil, deep F.nodosa leaf litter; Banksia sessilis, sand dune, limestone	JF/SCP	
Bothriembryontidae	*Bothriembryon* cf. bradshawi	P	open woodland on plain; veldt grass	JF/SCP	
Bothriembryontidae	*Bothriembryon* cf. bulla	P		SCP	
Bothriembryontidae	*Bothriembryon* cf. indutus	P	woodland, forest	JF	
Bothriembryontidae	*Bothriembryon* cf. kendricki	W	granite	JF/SCP	
Bothriembryontidae	*Bothriembryon* cf. serpentinus	P	granite, sandy	JF	
Bothriembryontidae	*Bothriembryon indutus*	W	granite/limestone	JF/SCP	
Bothriembryontidae	*Bothriembryon kendricki*	W	sand, leaf litter, granite, doleraite, laterite	JF/SCP	
Bothriembryontidae	*Bothriembryon serpentinus*	P	granite, doleraite, clay/loam, leaf litter	JF/SCP	
Charopidae	*Annoselix* cf. dolosa	W	open woodland on moderate hill mid-slope	JF	
Charopidae	*Annoselix* dolosa	W		JF	
Charopidae	*Epinicium restifer*	P	side of stream under stones	SCP	
Charopidae	*Luinodiscus* cf. repens	W		JF	
Charopidae	*Luinodiscus* cf. sublestus	W	limestone boulders	JF	
Charopidae	*Luinodiscus sublestus*	W	occassional limestone boulders	SCP	
Helicidae	*Theba pisana*	W	Limestone	SCP	

Family	Taxon	SRE status1	Habitat	IBRA2	Record in study area
Punctidae	cf. Paralaoma caputspinulae	W	Loam	SCP	
Pupillidae	*Omegapilla* australis	W	Stones		
Succineidae	*Succinea* cf. contenta	W	many large limestone boulders outcropping	SCP	
Succineidae	*Succinea contenta*	W		JF/SCP	
Succineidae	*Succinea scalarina*	W		SCP	
Succineidae	*Succinea strigillata*	W		SCP	
Glacidorbidae	*Glacidorbis occidentalis*	P3	Sand/gravel	JF	
Class: Bivalvia					
Hyriidae	*Westralunio carteri*	VU	sand/mud	JF/SCP	
Phylum: Onychophora					
Peripatopsidae	*Occiperipatoides gilesii*	W	Marri, Banksia, granite	JF/SCP	
Peripatopsidae	*Occiperipatoides* 'sp. indet'	W	Jarrah/Marri, granite	JF	

1 – SRE status (C = confirmed, P = potential, L = likely, W = widespread). 2 – JAF = Jarrah Forest, SCP = Swan Coastal Plain, AW = Avon Wheatbelt.