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HANCOCK PROSPECTING PTY LTD

MULGA EAST SHORT-RANGE ENDEMIC INVERTEBRATE FAUNA ASSESSMENT

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EXECUTIVE SUMMARY

Hancock Prospecting Pty Ltd (HPPL) is seeking to develop the Mulga East Iron Ore Project. Ecologia Environment (*ecologia*) was commissioned by Strategen-JBS&G, on behalf of HPPL, to conduct baselines terrestrial fauna surveys, Short-Range Endemic (SRE) invertebrate fauna surveys, of the proposed Mulga East Iron Ore Project Area. The primary objective of the SRE surveys was to understand the SRE invertebrate faunal values and constraints of the area and to help facilitate primary and secondary environmental approvals for the future development of these areas.

A combination of dry pitfall trapping, hand foraging and leaf-litter collection were used to obtain specimens from target SRE invertebrate groups. A total of 2076 trap nights and 6060 minutes of foraging were undertaken at 52 sites within the Project Area across both phases of the survey. Results from the initial survey (*ecologia* 2019) were used to identify and address data gaps and determine site selection for dry pitfall trap sites deployed during the current survey. This ensured all habitat types within the Project Area with the potential to support SRE invertebrate species were comprehensively sampled.

A total of 496 invertebrate specimens were collected across both phases of SRE invertebrate fauna survey from seven target SRE groups including 152 isopods, 129 spiders, one harvestmen, 75 pseudoscorpions, 58 scorpions, 33 millipedes and 48 land snails. Of the specimens recorded, a single isopod species collected within the Project Area during Phase 2 was considered an SRE species, while 23 species were considered potential SRE species including eight isopods, one spider, one harvestman, five pseudoscorpions, one millipede and one terrestrial snail.

Nine specimens which were unidentifiable down to species level due to a lack of morphological features and were from known of likely SRE groups were sent for molecular investigation at the Western Australian Museum (WAM) to determine identity. Single specimens of *Dampetrus* 'OPI001', *Conothele* 'MYG716', *Beierolpium* 'PSE173', *Indolpium* 'PSE175', *Indolpium* 'PSE174' and *Genus 7/*4 'PSE176' were selected for molecular analysis. In addition, specimens from each of the scorpion species complexes *Lychas* 'SCO024', *Lychas* 'hairy tail complex' and *Lychas* 'SCO046'. The results of molecular investigations were cross referenced against WAM databases to confirm SRE status. *Dampetrus* 'OPI001', *Conothele* 'MYG716', *Beierolpium* 'PSE173', *Indolpium* 'PSE175', *Indolpium* 'PSE174' represent newly discovered species and are all considered potential SREs due to data deficiencies regarding their distributions. *Genus 7/*4 'PSE176', *Lychas* 'SCO046' and *Lychas* 'SCO024' do not represent newly discovered species; however, they are considered potential SRE species due to data deficiencies relating to their distribution. *Lychas* 'hairy tail complex' was unable to be identified using molecular analysis due to sample contamination.

Isopod and scorpion specimens from SRE target groups were collected from all habitat types surveyed. Pseudoscorpion and millipede specimens from were collected from all habitat types besides the Chenopod/Cracking Clay Floodplains. Spider specimens were collected from all habitat types besides the Rocky Hills and Chenopod/Cracking Clay Floodplains. Land snail specimens were only collected from Calcrete Stony Plain, Rocky Hills, Mulga Woodland and Stony Spinifex Plains and Hillslopes. The results of this survey indicate that target SRE groups collected utilise a range of different habitat types within the Project Area, with some species exhibiting higher levels of dispersal between habitats than others.

Habitat preferences for target SRE groups were highly variable, with different invertebrate groups exhibiting habitat preferences likely to be associated with variations in microhabitat requirements. The greatest diversity of isopods (four species) and terrestrial snails (three species) was recorded in Calcrete Stony Plains. Drainage Lines were found to support the greatest diversity of scorpions (eight species), Rocky Hills provided the greatest diversity of pseudoscorpions (six species) and millipedes (three species) and the Mulga Woodland habitat yielded three species of spider. The only harvestman specimen obtained during the survey was collected from the Rocky Hills, indicating that this SRE target group has more specific microhabitat requirements. Drainage Lines yielded the largest number of

species from target SRE invertebrate groups, whilst the Rocky Hills yielded the largest number of potential SRE species.

Potential SRE species were recorded in all habitat types (aside from Claypans) with the Rocky Hills habitat (recorded 15 potential SRE species) determined to be most conducive for short-range endemism within the Project Area. As a consequence, the Rocky Hills habitat was classified post-survey as having a SRE suitability ranking of 'High'. Eleven potential SRE species were recorded from the Drainage Lines habitat while Mulga Woodland (nine potential SRE species), Calcrete Stony Plain (eight potential SRE species) and Mixed Eucalypt/Mulga Floodplain (five potential SRE species) were also favourable SRE habitat types. Drainage Lines were assessed as having a post-survey SRE suitability ranking of 'Moderate/ High' and Mulga Woodland and Calcrete Stony Plain were assessed as having a 'Moderate' suitability. The Chenopod/Cracking Clay Floodplain and Stony Spinifex Plains and Hillslopes habitat types were identified as being the least conducive for short-range endemism, with four potential SRE species recorded in each of these habitats across both phases of the survey. The Mixed Eucalypt/Mulga Floodplain, Chenopod/Cracking Clay Floodplain, Stony Spinifex Plains and Hillslopes and Claypan habitat types were each given a post-survey SRE suitability ranking of 'Low'.

Only minor limitations were associated with the survey. Access to the northern portion of the proposed rail corridor within the Yandeyarra Aboriginal Reserve had not been granted at the time of the surveys and access to the western portion of Malay Well (E47/2112) tenement was prohibited due to restrictions in accessing the Wittenoom Asbestos Management Area (WAMA) as no ground-disturbing activities are permitted within this area. Short Range Endemic habitat types within the WAMA (Mulga Woodland, Mixed Eucalypt/Mulga Floodplain and Stony Spinifex Plains and Hillslopes) and Yandeyarra Aboriginal Reserve (Drainage Line, Stony Spinifex Plains and Hillslopes and Rocky Hills) are represented elsewhere within the Project Area and were sampled accordingly, therefore restricted access to these areas is not considered a limitation for the purposes of this survey.

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ABBREVIATIONS

BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016* (WA)
BOM	Bureau of Meteorology
BIF	Banded Ironstone Formation
CALM	Department of Conservation and Land Management (now DBCA)
CAMBA	China – Australia Migratory Bird Agreement
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFWA	Department of Agriculture and Food Western Australia (now DPIRD)
DAWE	Department of Agriculture, Water and Environment (previously DoEE)
DBCA	Department of Biodiversity, Conservation and Attractions (previously DPaW)
DEC	Department of Environment and Conservation (now DBCA)
DWER	Department of Water and Environmental Regulation
DER	Department of Environmental Regulation (now DWER)
DoEE	Department of the Environment and Energy (now DAWE)
DPaW	Department of Parks and Wildlife (now DBCA)
DPIRD	Department of Primary Industry and Regional Development (previously DAFWA)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DAWE)
EPA	Environment Protection Authority
EP Act	*Environment Protection Act 1986* (Commonwealth)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESCAVI	Executive Steering Committee for Australian Vegetation Information
IA	International Agreement
IBRA	Interim Biogeographic Regionalisation for Australia
ICE	Incidence-based Coverage Estimators
IPA	Indigenous Protected Area
IUCN	International Union for Conservation of Nature
LGA	Local Government Area
NMDS	Non-metric Multidimensional Scaling
NVIS	National Vegetation Information System
PEC	Priority Ecological Community
SAC	Species accumulation curve
SRE	Short Range Endemic
TEC	Threatened Ecological Community
TO	Traditional Owners
TPFL	Threatened and Priority Flora database
TPFR	Threatened and Priority Flora Report form
TP List	Threatened and Priority Flora List
WA	Western Australia
WAH	Western Australian Herbarium
WAHERB	Western Australian Herbarium Specimen Database
WAOL	Western Australian Organism List
WC Act	*Wildlife Conservation Act 1950*
WONS	Weeds of National Significance

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

Hancock Prospecting Pty Ltd (HPPL) is seeking to develop the Mulga East Iron Ore Project. In order to meet the Environmental Protection Authority's (EPA) environmental objectives for the environmental factor "*Terrestrial Fauna*" (Environmental Protection Authority 2016a), Ecologia Environment (*ecologia*) was commissioned by Strategen-JBS&G, on behalf of HPPL, to a baseline terrestrial fauna assessment, including Short Range Endemic (SRE) invertebrate fauna surveys, of the proposed Mulga East Iron Ore Project Area (the 'Project Area'). The Project Area is comprised of Mulga East (R 47/0012), Malay Well (E 47/2117) tenements and the proposed Rail corridor (E45/380, L45/381, L45/382 and L45/447 with E47/2044, E45/3593) (Figure 1.1). The primary objectives of the SRE surveys is to better understand the SRE invertebrate faunal values and constraints of the area and to help facilitate primary and secondary environmental approvals (i.e. Part IV EP Act, EPBC Act, Mining Act) for the future development of these areas.

The Project Area is located wholly within the Mulga Downs pastoral station and includes the Mulga East (R47/0012) and Malay Well (E47/2117) tenements. The associated proposed 50 km rail extending from the Roy Hill Iron Ore rail line to the Project Area lies partially within the Mulga Downs Pastoral station, vacant Crown Land and other reserves. The nearest key landscape features include the Karijini National Park which is 15 km to the southwest of the Fortescue River (Figure 1.1), the western portion of which is approximately 60 km east of the Mulga East exploration camp.

A comprehensive description of the proposed Project, which is subject to ongoing studies, is likely to include the following:

- A series of open cut mine pits;
- On site ore processing plant, waste rock landforms, waste fine storage area (or tailings storage facility);
- Mine infrastructure including rail load out facility, workshops, access and service roads, accommodation camp and airport; and
- A rail spur (alignment K) that is approximately 50km in length connecting to the existing Roy Hill Iron Ore rail line.

1.2 SURVEY OBJECTIVES

Strategen-JBS&G required a two phase SRE invertebrate fauna survey to provide baseline information on the presence and/or likelihood of presence of SRE species occurring in the Project Area.

The survey included the following core tasks:

- A desktop review of relevant legislation, ecological databases and existing datasets was undertaken to provide appropriate background information;
- SRE habitat assessment of suitability and mapping;
- SRE fauna (Level 2) survey as required to provide adequate coverage of the Project development envelope and along the rail corridor including dry pitfall trapping and hand foraging (sieving of leaf litter, raking, searching among rock piles, searching on trees and beneath bark);
- Undertake data analysis and prepare an SRE invertebrate fauna survey report using results from previous SRE surveys undertaken within the project area and the current survey.

1.3 LEGISLATIVE AND REGULATORY FRAMEWORK

The survey was designed and undertaken to comply with the following guidance documents:

- Environmental Factor Guideline: Terrestrial Fauna (Environmental Protection Authority 2016a); and
- Technical Guidance: Sampling of short range endemic invertebrate fauna (Environmental Protection Authority 2016b)

500000 550000 600000 650000 700000 750000 800000 850000

7650000 7600000 7550000 7500000 7450000

Millstream Chichester National Park

Millstream Pools

MILLSTREAM YARRALOOLA ROAD

ROEBOURNE WITTENOOM ROAD

Mungaroona Range Nature Reserve

PORT HEDLAND WITTENOOM ROAD

HILLSIDE MARBLE BAR ROAD

RIPON HILLS ROAD

HILLSIDE WOODSTOCK ROAD

SKULL SPRINGS ROAD

BONNEY DOWNS HILLSIDE ROAD

MARBLE BAR ROAD

BONNEY DOWNS NOREENA ROAD

MOUNT BROCKMAN ROAD

TOM PRICE RAILWAY ROAD

HAMERSLEY ROAD

MUNJINA WITTENOOM ROAD

Fortescue Marshes

Karijini (Hamersley Range) Gorges

HAMERSLEY MOUNT BRUCE ROAD

BANJIMA DRIVE

KARIJINI DRIVE

NOREENA ROY HILL ROAD

MARANDOO ROAD

Mt. Bruce coolibah-lignum flats

NANUTARRA WITTENOOM ROAD

TOM PRICE NORTH ROAD

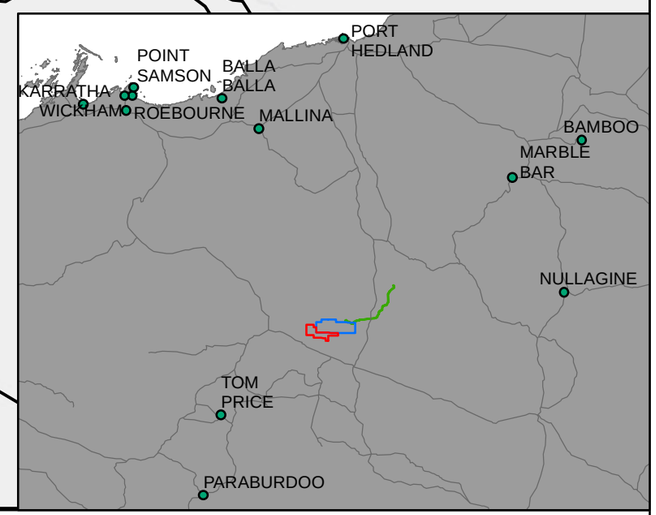
GREAT NORTHERN HIGHWAY

MUNJINA ROY HILL ROAD

JUNA DOWNS ROAD

Karijini National Park

PARABURDOO TOM PRICE ROAD



Tenement Boundary

- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor
- Main Roads
- Nationally Important Wetlands
- DBCA managed lands
- Wittenoom Asbestos Management Area

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Project: 1757
Date: 30 August 2019
Author: TM
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:1,000,000 @ A3

Figure 1.1 Project Area

0 25 50
Kilometers

2 EXISTING ENVIRONMENT

2.1 CLIMATE

The Project Area is in the Pilbara region of Western Australia (WA) and experiences an arid-tropical climate with two distinct seasons: a hot summer from October to April and a mild winter from May to September. Temperatures are generally high, with summer temperatures frequently exceeding 40°C. Light frosts occasionally occur inland during the winter months of July and August.

Rainfall is generally localised, variable and unpredictable, and temperatures are high, resulting in annual evaporation exceeding rainfall by as much as 500 mm per year. Most of the Pilbara has a bimodal rainfall distribution; from December to March rains result from tropical storms producing isolated, sporadic thunderstorms. Tropical cyclones moving south also bring heavy rains. From May to June, extensive cold fronts move eastwards across the state and occasionally reach the Pilbara. These fronts usually produce only light rains. Surface water can be found in some pools and springs in the Pilbara all year round, although watercourses generally flow intermittently due to the short wet season (Beard 1975).

Climatic data is collected by the Bureau of Meteorology (BOM) and long term rainfall data is available from the Mulga Downs weather station (Station Number 5015) (Bureau of Meteorology 2019)} (Figure 2.1); however, this station did not provide temperature data and ceased recording rainfall in June 2018. Mean maximum and minimum temperature data was taken from the nearest weather station at Wittenoom (Station number 5026) and 2019/ 2020 rainfall data was taken from the nearest weather station at Karijini North (Station Number 5098) (Bureau of Meteorology 2019) (Figure 2.1). These stations are located approximately 10 km south west and 12 km south from the Project Area, respectively.

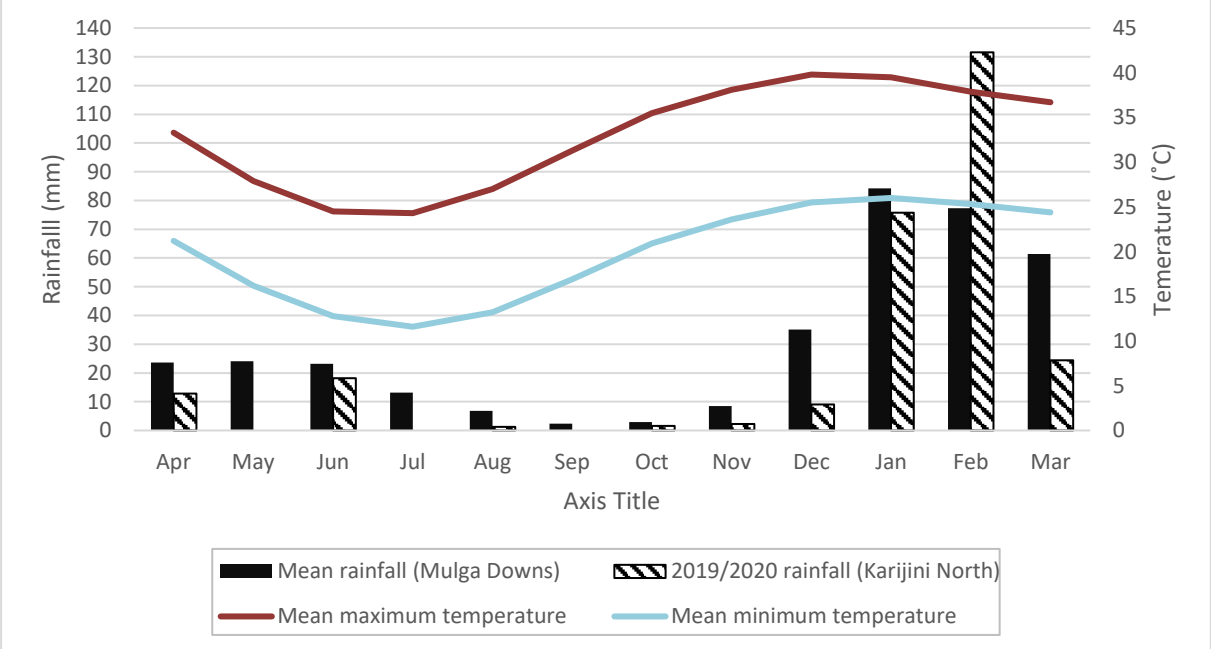

Figure 2.1: Climate data from Mulga Downs (mean rainfall), Karijini North (2019/ 2020 rainfall) and Wittenoom (mean temperature) BOM weather stations.

2.2 IBRA 7 BIOGEOGRAPHIC SUBREGIONS

The Interim Biogeographic Regionalisation for Australia (IBRA) classifies the Australian continent into 85 bioregions on the basis of similar geology, landform, vegetation, fauna and climate characteristics (Department of Sustainability Environment Water Population and Communities 2012). The Project

Area is located within the Pilbara IBRA Bioregion 7 (Department of Sustainability Environment Water Population and Communities 2012), which is further divided into four subregions:

- The Hamersley subregion;
- The Fortescue Plains subregion;
- The Chichester subregion; and
- The Roebourne subregion.

The majority of the Project Area is situated within the Fortescue subregion, although the north eastern corner of the Mulga East tenement and majority of the proposed rail corridor falls within the Chichester sub-region (Figure 2.2).

The Fortescue Plains sub-region includes extensive salt marsh, mulga-bunch grass and short grass communities on alluvial plains in the east, and deeply incised gorges in the western part of the drainage (Kendrick 2001). An extensive calcrete aquifer feeds numerous permanent springs in the central Fortescue, supporting large permanent wetlands with stands of *Eucalyptus camaldulensis* and *Melaleuca argentea* (Kendrick 2001). The climate is semi desert tropical, with an average rainfall of 300 mm, falling mainly in summer cyclonic events, and the sub-regional area is 2,041,914 ha (Kendrick 2001).

The Fortescue Plains subregion is considered to have five ecosystems at risk (Kendrick 2001):

- Ethel Gorge Aquifer Stygobiont Community;
- Permanent wetland communities, Millstream;
- Fortescue Marsh saltbush community;
- Perennial grassland communities in the Fortescue Valley; and
- Grove/intergrove mulga communities at southern end of northern apron of Hamersley Range.

The Chichester sub-region comprises the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. Like the Fortescue Plains, the Chichester sub-region's climate is semi desert tropical and receives 300 mm of rainfall annually. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule and Sherlock). The sub-regional area is 9,044,560 ha (Kendrick and McKenzie 2001).

The Chichester subregion is associated with five ecosystems at risk (Kendrick and McKenzie 2001):

- *Heliotropium, Eragrostis* community on seepages near Mt Montagu, Chichester Range;
- Cracking clay communities of the Chichester Range and Mungaroona Range;
- Specific snakewood communities. Between Roy Hill and Marillana Stations;
- Saltbush Shrublands (de Grey River west side); and
- Saltbush community of the duplex plains - Mosquito Creek series (Nullagine).

2.3 LAND SYSTEMS

The Department of Agriculture Western Australia (Van Vreeswyk *et al.* (2004)) undertook a regional inventory of the Pilbara rangelands to document the land systems present and their condition. The Pilbara Regional Inventory (PRI) which covers 181,723 km^2 is bounded by the Indian Ocean and Roebourne Plains to the north and west, extending to Broome in the north-east and the Ashburton River catchment in the south. The extent of each of the land systems vary greatly, with almost half the area comprised of just six land systems: Augustus, Little Sandy, Newman, Nita, Rocklea and Uaroo (Van Vreeswyk *et al.* 2004).

A total of sixteen land systems occur within the Project Area (Table 2.1, Figure 2.3). Nine land systems account for over 97% of the Project Area with the remaining seven combining to account for less than

3% (Table 2.1, Figure 2.3). These nine land systems include the Coolibah Land System (26.1%), Jamindie Land System (22.7%), Newman Land System (17.7%), Calcrete Land System (7.5%), Boolgeeda Land System (6.3%), Jurrawarrina Land System (4.3%), Hooley Land System (6.7%), Brockman Land System (2.2%), Mackay Land System (3.7%).

Table 2.1: Land systems within the Project Area (Van Vreeswyk *et al.* 2004)

Land System	Geomorphology	Land Management	Area (ha)	Percentage of Project Area
Coolibah Land System	Depositional surfaces; active flood plains and alluvial plains with shallow, meandering and anastomosing central channels of the Fortescue River.	Vegetation includes perennial grasses and forbs which are preferred by grazing animals and are prone to depletion under uncontrolled grazing. Flood plains highly susceptible to erosion.	8625	26.10%
Jamindie Land System	Depositional surfaces; level plains of clayey and stony alluvium as a mosaic of surfaces with gilgai microrelief, sometimes stony, and non-gilgaied surfaces with abundant stony mantles; mostly sluggish internal drainage but occasional drainage tracts with major through going channels.	Tussock grasslands and snakewood shrub communities are favoured by grazing animals and are prone to degradation (especially the snakewood communities) if overgrazed. Those parts of the system not protected by a stony surface mantle are moderately susceptible to soil erosion.	7503	22.70%
Newman Land System	Erosional surfaces; hill tracts, ridges, plateaux remnants and breakaways with steep upper slopes and more gently inclined lower foot slopes, restricted stony plains and interfluves; moderately spaced tributary drainage patterns incised in narrow valleys in upper parts becoming broader and more widely spaced downstream. Relief up to 100 m.	This system supports predominantly hard spinifex vegetation and is not preferred by livestock. Some areas are poorly accessible, and the system is not prone to degradation or soil erosion.	5846	17.70%
Calcrete Land System	Depositional surfaces; valley fill deposits - stony plains as a mosaic of calcrete tables and low rises elevated up to 10 m above the surrounding surfaces of narrow inter-table drainage areas and restricted sandy plains; drainage patterns absent to sparse tributary tracts and occasional through going trunk channels.	Some shrubs and grasses associated with the spinifex grasslands of this system are attractive to grazing animals and may be depleted if grazing levels are excessive. Low erosion risk.	2487	7.50%
Hooley Land System	Erosional surfaces; hill tracts and domes on granitic rocks with rough crests, associated rocky hill slopes, restricted lower stony plains; narrow, widely spaced tributary drainage floors and channels. Relief up to 100 m.	Much of the system is poorly accessible; hard spinifex vegetation is not preferred by livestock; soft spinifex is moderately preferred. The system is subject to fairly frequent burning and is not susceptible to erosion.	2218	6.70%
Boolgeeda Land System	Predominantly depositional surfaces; very gently inclined stony slopes and plains below hill systems becoming almost level further downslope; closely spaced, dendritic and sub-parallel drainage lines. Relief up to about 20 m.	Hard spinifex grasslands are not preferred by livestock, but soft spinifex is moderately preferred for a few years following fire. Vegetation is generally not prone to degradation and the system is not susceptible to erosion. The system is subject to fairly frequent burning.	2089	6.30%

Land System	Geomorphology	Land Management	Area (ha)	Percentage of Project Area
Jurrawarrina Land System	Depositional surfaces; non-saline plains with hardpan at shallow depth and groved vegetation, stony upper plains and low rises on hardpan or rock, very widely spaced tributary drainage tracts and channels; minor stony gilgai plains, sandy banks and low ridges and hills. Relief up to 30 m.	Most vegetation is only moderately preferred by grazing animals but can become degraded by overgrazing. Drainage tracts (unit 6) are moderately susceptible to erosion, some hardpan plains (unit 3) are slightly susceptible and other parts are inherently resistant.	1424	4.30%
McKay Land System	Erosional surfaces; gently undulating stony plains and interfluves with quartz surface mantles, sandy surfaced plains, minor calcrete plains, closely spaced tributary drainage lines in upper parts of system becoming much wider downslope; minor granite hills, tor fields and quartz ridges. Relief is up to 25 m.	Mature spinifex vegetation is not preferred by grazing animals but younger stands after burning are moderately preferred. Vegetation is generally not prone to grazing induced changes, but fairly regular fires change botanical composition and vegetation structure in the short term. The system has low or very low erosion hazard.	1224	3.70%
Brockman Land System	Depositional surfaces; level, non-saline alluvial plains with clay soils and gilgai microrelief and flanked by slightly more elevated hardpan wash plains, sluggish internal drainage zones on plains and occasional through going trunk channels.	Tussock grasslands on this system are highly preferred by livestock and other animals and are susceptible to overgrazing and degradation. Overgrazing can be prevented by appropriate and management including control of total grazing pressure. Soil erosion, despite the inherent resistance of the system, can occur if vegetative cover is severely depleted.	737	2.20%
Wona Land System	Mostly depositional surfaces; residual plains with a mosaic of stony non-gilgaied and stony gilgaied surfaces, minor gilgai plains without stone mantles, low rises and short slopes on outer margins of the system. Drainage is internal or as short, dendritic, tributary patterns confined to the outer margins of the system. Relief up to 10 m.	Tussock grasslands on gilgai plains (unit 2) are preferentially grazed by livestock and other animals and are prone to degrade if stocking is uncontrolled. Hard spinifex may tend to invade degraded tussock grass sites. The system is generally not susceptible to erosion.	244	0.70%
Rocklea Land System	Flood plains and river terraces subject to fairly regular overbank flooding from major channels and watercourses, sandy banks and poorly defined levees and cobble plains. Banks, levees and slightly higher upper terraces receive less regular flooding than lower terraces and flood plains.	Buffel grass and soft spinifex on this system are highly and moderately preferred respectively by livestock. The system is largely stabilised by buffel and spinifex and accelerated erosion is uncommon. However, susceptibility to erosion is high or very high if vegetative cover is removed.	183	0.60%

Land System	Geomorphology	Land Management	Area (ha)	Percentage of Project Area
White Springs Land System	Depositional surfaces; level stony plains and plains and fans of sandy alluvium with widely spaced through going or sub-parallel distributary creek lines and channels; subject to sheet flow and overbank flooding. Relief less than 10 m.	The system supports soft spinifex vegetation which, except for old mature stands, is moderately preferred by grazing animals. The system is prone to fairly regular burning. Most of the system is not susceptible to erosion or vegetation degradation.	170	0.50%
Urandy Land System	Erosional surfaces; hills, ridges and plateaux remnants on basalt with steep stony slopes, restricted lower slopes, stony interfluves and minor gilgai plains; moderately spaced tributary drainage patterns of small channels in shallow valleys in upper parts becoming broader floors and channels downslope. Relief up to 110 m.	Spinifex hummock grasslands are poorly accessible and are generally not preferred by livestock. The system is subject to fairly regular burning. The system has very low erosion hazard.	164	0.50%
Granitic Land System	Depositional surfaces; level wash plains subject to overland sheet flow and with numerous drainage foci (groves of dense vegetation) arranged as arcuate bands transverse to the direction of sheet flow, level plains with gilgai microrelief, minor areas of sand sheet and sandy banks; sparse to very rare drainage tracts subject to more concentrated sheet flow and with occasional shallow channels. Relief less than 10 m.	Mulga shrublands are moderately preferred, and tussock grasslands highly preferred by grazing animals, and are prone to degradation if overgrazed. Wash plains (unit 3) and drainage tracts (unit 6) are moderately susceptible to soil erosion if vegetative cover is depleted.	60	0.20%
Macroy Land System	Depositional surfaces; plains receiving overland sheet flow and with prominent drainage foci (groves) arranged as right angles to direction of flow, broad drainage tracts receiving more concentrated flow, with or without defined channels and with prominent gilgaied drainage foci; minor plains with clay soils and gilgai microrelief, also occasional through going creek channels.	Much of the vegetation on this system is highly preferred by grazing animals and is prone to degradation if overgrazed. Some hardpan wash plains, drainage tracts and groves (units 2, 3 and 4) are moderately susceptible to erosion.	58	0.20%
River Land System	Erosional surfaces; plateaux and mountains - extensive high plateaux, mountains and strike ridges with vertical escarpments and steep scree slopes and more gently inclined lower slopes; moderately spaced dendritic and rectangular tributary drainage patterns of narrow valleys and gorges with narrow drainage floors and channels. Relief up to 450 m.	Much of the system is inaccessible or poorly accessible and is unsuitable for pastoral purposes. The system contains iron ore deposits which are currently being mined and deposits which are likely to be mined in the future. Spinifex is the dominant vegetation and the system is burnt fairly frequently.	6	0.02%
		Total	33040	100%

2.4 SOILS

Tille (2006) described the soil landscapes of Western Australia's arid rangelands and interior at a broad scale. The Atlas of Australian Soils (Northcote *et al.* 1960-1968) describes soil units on a finer scale and nine soils units have been identified within the Project Area, none of which are considered to be restricted (Figure 2.4, Table 2.2).

The Project Area occurs within the Fortescue Province as described by Tille (2006), and is comprised of ten soil landscape zones. The Mulga East and Malay Well tenements primarily occur within the Fortescue Valley Zone (soil landscape zone 284), described as:

- Alluvial plains, hardpan wash plains and sandplains (with stony plains, floodplains and some salt lakes) on alluvial deposits over sedimentary rocks of the Hamersley Basin. Red deep sands, red loamy earths and red/brown non-cracking clays with some red shallow loams and Hard cracking clays (Tille 2006).

The north-eastern corner of the Project Area and southern portion of the proposed rail corridor falls within the Chichester Ranges Zone (soil landscape zone 282), described as:

- Hills and dissected plateaux (with some stony plains) on basalt and sedimentary rocks of the Hamersley Basin. Stony soils with some red shallow loams and hard cracking clays support spinifex grasslands with kanji and snappy gum (and some tussock grasslands) located in the northern Pilbara between Pannawonica and Nullagine (Tille 2006).

The northern portion of the proposed rail corridor lies within the Abydos Plains and Hills Zone (soil landscape zone 283), described as:

- Stony plains (with some hills) on granitic rocks of the Pilbara Craton (East Pilbara Terrane). Deep red sandy duplexes, red shallow loams with stony soils, red sandy earths and red loamy earths support spinifex grasslands with kanji (and some tussock grasslands) located in the northern Pilbara between the Yandeyarra community, Bamboo Springs Station and Marble Bar (Tille 2006).

Table 2.2: Soil units within the Project Area (Northcote *et al.* 1960-1968)

Unit	Description	Proportion of Project Area (ha)	Total area in PIL (ha)
Oc63	Pediplains on granite; more dissected than unit Oc62 and usually occurring as a zone flanking the mainstream courses: chief soils are hard alkaline red soils (Dr2.33) and (Dr2.43). There are more areas of (Um5.11) soils on calcrete (kunkar) than in unit Oc62 and some (Uc5.11) and (Uc1.22) soils occur along creeks	108 (0.3%)	322277
Gf1	Steep ranges on basic lavas along with dolomites, tuff, banded iron formations, and dolerite dykes, with some narrow valley plains and high-level gently undulating areas of limited extent. The soils are generally shallow and stony and there are large areas without soil cover: chief soils are brown loams (Um6.23) along with significant areas of earthy loams (Um5.51). (Dr2.33) soils occur on lower slopes, with (Uf6.71) and (Ug5.37) on valley floors.	559 (1.6%)	1969690
Oc64	Low stony hills and dissected pediments on granite with occasional basic dykes: the chief soils are hard alkaline red soils (Dr2.33) having shallow stony A horizons. Associated are shallow stony (Uc5.11) soils on steep slopes, (Uc1.22) soils along creek lines, and (Um5.11) soils on patches of calcrete (kunkar)	276 (0.8%)	107823
Ja1	Extensive valley plains largely associated with the Fortescue River: chief soils are earthy clays (Uf6.71) along with some (Ug5.38), (Um5.5), and (Dr2.33) soils. Small areas of calcrete (kunkar) with (Um5.11) soils occur also	19555 (59.1%)	418666
Oc62	Very gently undulating pediplain with low granite outcrops and tors; occasional basic dykes occur as low elongate ridges: chief soils are hard alkaline red soils (Dr2.33) and (Dr2.43) having coarse-textured A horizons up to 18 in. thick. Associated are occasional patches of calcrete (kunkar) with (Um5.11) soils as well as some (Gn2.12) soils	7 (0.02%)	19336
Oc71	Outwash plains with much coarse surface gravel: chief soils are hard alkaline red soils (Dr2.33) but (Uf6.71), (Ug5.38), and (Gn2.12) soils also occur. There are areas of (Gc) soils in proximity to unit Lb12	499 (1.5%)	21348
Oc70	Dissected pediments and low stony hills associated with cherts, jaspilites, and iron ore formations; much coarse surface gravel: chief soils are hard alkaline red soils (Dr2 33) along with some (Dr2.32) and (Um5.52) soils	8255 (24.9%)	78218
MM19	High-level gently undulating plain flanked by areas of basaltic ranges of unit Gfl: chief soils are cracking clays (Ug5.37). Areas of (Uf6.71) and (Dr2.33) soils occur also	209 (0.6%)	25489
Lb12	Valley flats along major drainage lines, associated with limestone and calcareous gravels (kunkar): chief soils are highly calcareous earths (Gc1.12), with minor areas of shallow calcareous loams (Um1.1). Associated are areas of hard red soils (Dr2.33) and some cracking clays (Ug5.37)	3573 (10.8%)	10500
	Total	33040	2973347

2.5 GROUND AND SURFACE WATER VALUES

The Department of the Environment and Energy (DoEE) Protected Matters Search Tool (Department of the Environment and Energy 2018) and the Department of Biodiversity Conservations and Attractions (DBCA) managed lands and waters database were queried for Ramsar Wetlands, Nationally Important Wetlands, and DBCA managed waters occurring near the Project Area. No Ramsar wetlands occur near the Project Area.

The Fortescue Marsh (WA066), which is a Nationally Important Wetland (Department of the Environment and Energy 2018), is defined by the DBCA's Draft Fortescue Marsh Management Strategy 2018-2024 (DBCA 2018) and located to the east of the Goodiadarrie Hills (Figure 2.5). A section of the lower Fortescue River forms part of the Directory of Important Wetlands in Australia (DIWA)

(previously an Australian Nature Conservation Agency (ANCA)) wetland that occurs in the Project Area and comprises the river, its associated floodplains and claypans.

The Project Area occurs within a section of the Fortescue River that forms part of the Priority 1 (BC Act) Freshwater Claypans of the Fortescue Valley Priority Ecological Community (PEC). Several springs, pools and associated claypans occur within the wider PEC. Two of these are in the Project Area including Koodjeepindarranna (small claypan) and Gnalka Gnoona (large claypan). The wetlands associated with the Fortescue Valley have very diverse aquatic invertebrate communities and most of the restricted elements of the Pilbara riparian flora (Pinder *et al.* 2017).

The Karijini (Hamersley Range) Gorges (WA067) occur to the immediate south of the Project Area (Figure 2.5). Aerial imagery was also inspected for any groundwater and surface water values (i.e. wetlands) within the Project Area.

Excluding bores and watering points for cattle, no permanent water bodies have been identified as persisting within the Project Area.

2.6 DBCA MANAGED LANDS AND WATERS

The Project Area lies to the north of Karijini National Park and to the south of the Mungaroona Range National Park (Figure 1.1).

2.7 ABORIGINAL HERITAGE, RESERVES AND MANAGED LANDS

The management of Aboriginal heritage in Western Australia is governed by the *Aboriginal Heritage Act 1972*. The Act recognises there is significant community interest in preserving and protecting places and objects of Aboriginal heritage as part of State heritage (Department of Mines Industry Regulation and Safety 2019). The northern 18 km portion of the proposed rail corridor falls within the Yandeyarra Reserve (Figure 2.5) which is located within the registered Kariyarra people Native Title claim area. Permission for the survey team to access to the reserve was not granted by the Yandeyarra community at the time of survey.

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7580000
7570000
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Tenement Boundary
- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor
- Main Roads

IBRA subregion
- Chichester
- Fortescue
- Hamersley

Chichester

GREAT NORTHERN HIGHWAY

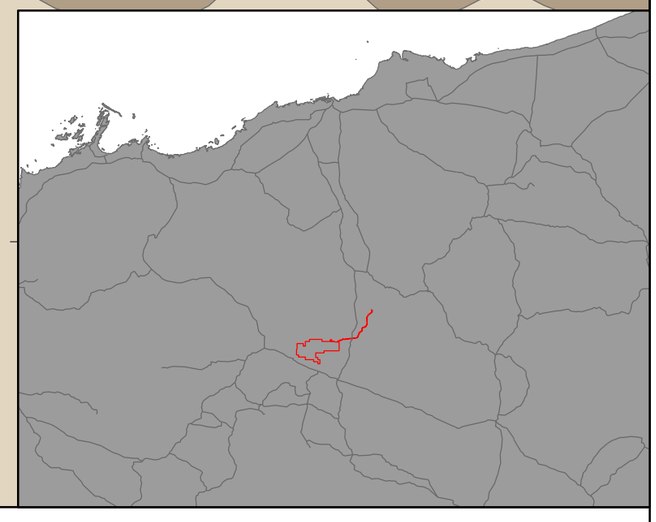
Fortescue

NANUTARRA WITTENOOM ROAD

Hamersley

MUNJINA WITTENOOM ROAD

Hamersley



ecologia ENVIRONMENT

Project: 1827
Date: 25 August 2020
Author: TM
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:200,000 @A3

Figure 2.2 IBRA 7 sub-regions

Service Layer Credits:

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Kilometers

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7580000 7570000 7560000 7550000 7540000

Tenement Boundary

- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor
- Main Roads

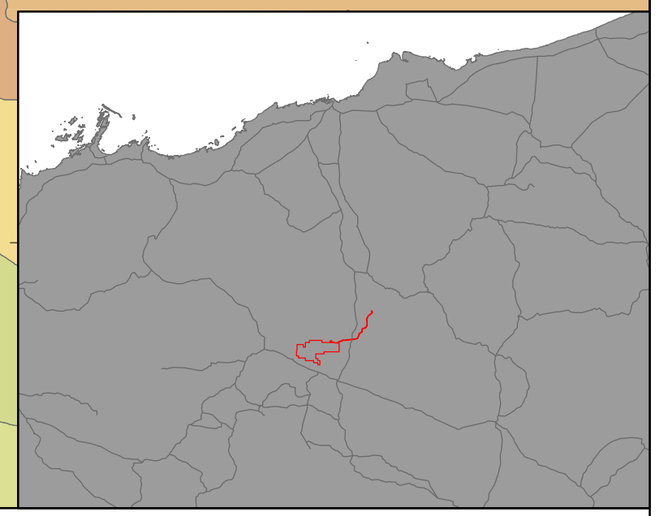
Land system

- Adrian Land System
- Bonney Land System
- Boolgeeda Land System
- Brockman Land System
- Calcrete Land System
- Capricorn Land System
- Christmas Land System
- Coolibah Land System
- Cowra Land System
- Fan Land System
- Granitic Land System
- Hooley Land System
- Jamindie Land System
- Jurrawarrina Land System
- Macroy Land System
- McKay Land System
- Newman Land System
- Platform Land System
- River Land System
- Rocklea Land System
- Urandy Land System
- White Springs Land System
- Wona Land System

GREAT NORTHERN HIGHWAY

NANUTARRA WITTENOOM ROAD

MUNJINA WITTENOOM ROAD



ecologia ENVIRONMENT

Project: 1827
Date: 25 August 2020
Author: TM
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:200,000 @A3

Figure 2.3 Land systems

Service Layer Credits:

0 5 10
Kilometers

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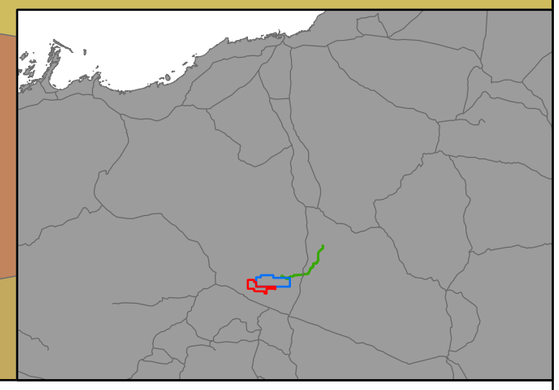
7580000 7570000 7560000 7550000 7540000

Tenement Boundary
- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor

Soil unit
- Fa13
- Gf1
- Ja1
- Lb12
- MM17
- MM19
- My55
- Oc62
- Oc63
- Oc64
- Oc70
- Oc71

Oc62
Oc62
Oc62
MM17
Oc63
Oc64
Oc70
MM19
Gf1
MM19
Oc71
Oc70
Lb12
Ja1
My55
Fa13
Lb12



ecologia ENVIRONMENT

Project: 1827
Date: 25 August 2020
Author: TM
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:200,000 @A3

Figure 2.4 Soil units

Service Layer Credits:

0 5 10
Kilometers

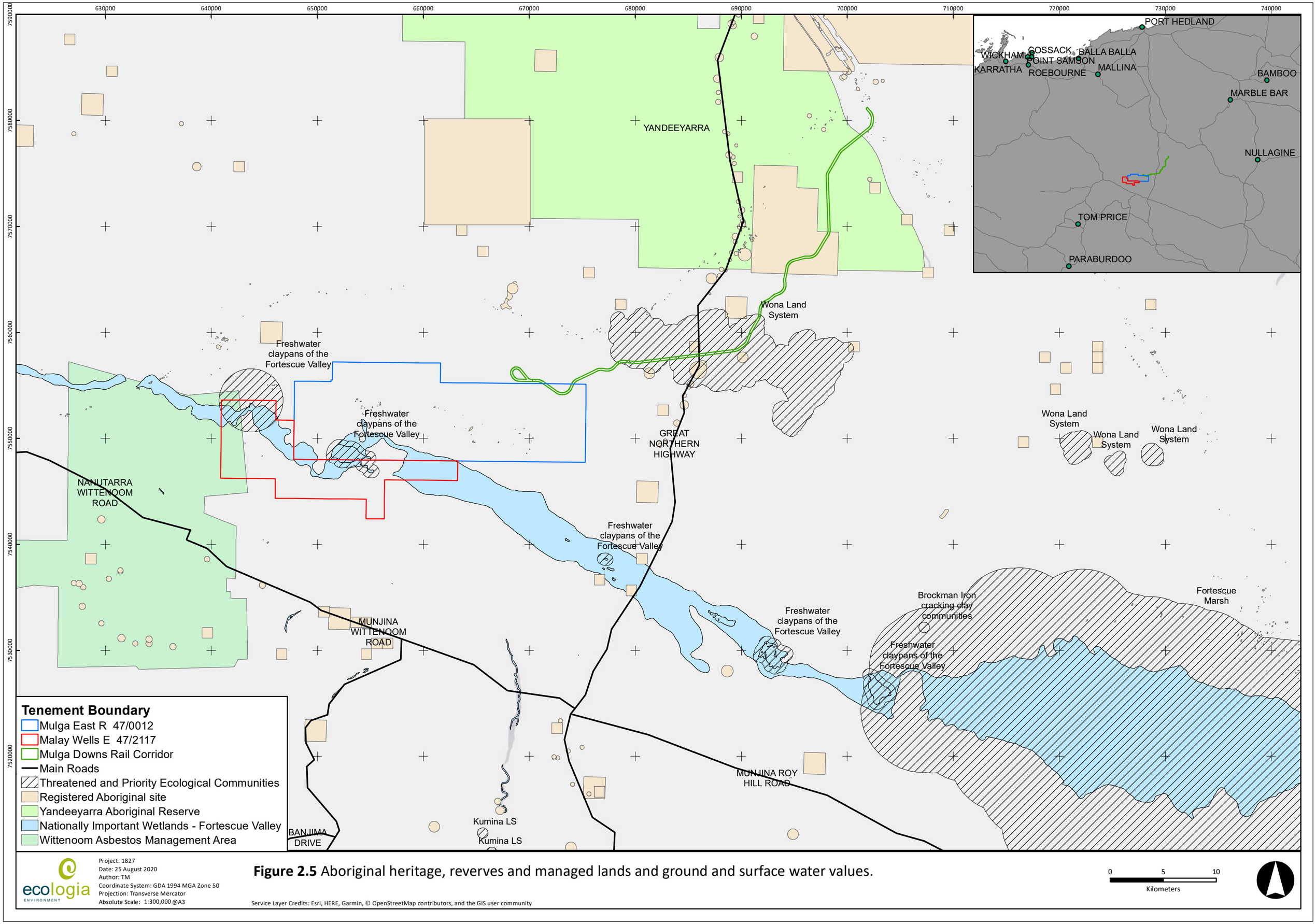


Figure 2.5 Aboriginal heritage, reverves and managed lands and ground and surface water values.

3 METHODOLOGY

3.1 DESKTOP ASSESSMENT

3.1.1 Database searches

The methodology adopted for the desktop study was consistent with that recommended by Environmental Protection Authority (2016b). A review of available relevant survey reports in the vicinity of the Project Area was undertaken, as well as searches of mapping resources and databases listed in Table 3.1 to determine conservation significant species, SREs and communities. The database searches and literature review produced an inventory of SRE and invertebrate fauna with at least the potential to occur within the Project Area.

Table 3.1: Databases searched for the literature review

Database	Search Details
EPBC Act Protected Matters Database (30/10/2018)	Records of matters of national significance under the EPBC Act within 40 km of the Project Area
DBCA Threatened and Priority Fauna Database DBCA Ref: FAUNA#5799 (4/9/2018)	Records of significant fauna species within 40 km of the Project Area
DBCA NatureMap Invertebrates	All invertebrate fauna records within 40 km of the Project Area
WAM Database Arachnids, Crustaceans, Molluscs and Arthropods	All invertebrate fauna records within 40 km of the Project Area
Atlas of Living Australia (Atlas of Living Australia 2020)	Search for all potential SRE species within 40km of Project Area

3.1.2 Data gap analysis, planning and site selection

Prior to the selection of survey sites, previous vertebrate fauna assessments and habitat mapping within the Project Area was consolidated to allow the identification of survey gaps and ensure adequate survey effort was undertaken within all habitat types likely to support suitable microhabitats for SRE invertebrate fauna.

Consideration was given to the geology and landforms deemed most likely to support suitable microhabitats for SRE fauna, such as deep creek lines, sheltered gorges, south-facing slopes, breakaways and areas with high vegetation cover. Habitat types identified within the Project Area were assessed to determine likely presence of sheltered habitats, microhabitats and habitat isolates, as these features are likely to provide refugia for SREs (Environmental Protection Authority 2016b).

3.2 SRE INVERTEBRATE HABITAT

Broad fauna habitat types outlined by *ecologia* (2019) were interrogated for their suitability to support short range endemism. According to Harvey (2002), SRE taxa typically display characteristic ecological and life-history traits including:

- poor dispersal powers;
- confined to discontinuous habitats;
- usually have highly seasonal activity patterns; and
- low levels of fecundity.

The widespread aridification of Australia during the Miocene has resulted in the fragmentation of populations, contraction to relictual habitats and the subsequent evolution of many new species with

small distributions (Environmental Protection Authority 2016b). Mesic environments such as south-west facing slopes, rock piles, drainage systems, deep gorges, and fire refuge areas are most likely to harbour SRE taxa and habitat isolates are more likely to harbour SRE invertebrates than extensive swathes of contiguous habitat (Environmental Protection Authority 2016b).

Habitat complexity, isolation and micro-habitats were taken into consideration when assessing broad fauna habitat types for their SRE suitability and a rating of High (5), Moderate (3) or Low (1) was given.

3.3 SRE INVERTEBRATE FIELD SURVEY

3.3.1 SRE Invertebrate Fauna Survey – Dry Pitfall trapping

Ten dry pitfall traps were established within prospective habitat types at 10 locations for a minimum of seven nights. Small 1L receptacles were dug into the ground, with the lip of the container sitting flush with the surface and intersected by a 5 m drift fence. Sites were checked daily and all invertebrate fauna groups potentially containing SRE species were collected. All potential SRE invertebrates captured in pitfall traps were placed in glass vials and preserved in 100% ethanol. Wet pitfall traps were not used due to ethical concerns surrounding by-catch of vertebrate fauna. All pitfall traps were removed at the end of the survey and the contents (leaf litter and debris) were sieved to record small cryptic species.

3.3.2 SRE Invertebrate Fauna Survey – Hand Foraging

Hand foraging for potential SRE species was undertaken at 12 opportunistic sites and at the 10 dry pitfall trap sites for a minimum of one hour in accordance with the *EPA Technical Guidance: Sampling of short range endemic invertebrate fauna* (Environmental Protection Authority 2016b). Foraging focused on suitable microhabitats where potential SRE species may be found across all habitat types (except Claypans), including under boulders (Mygalomorph spiders, harvestmen and pseudoscorpions), crevices/caves (harvestmen and pseudoscorpions), at the base of tree logs (isopods and centipedes), in moist and dry leaf litter (pseudoscorpions, millipedes, scorpions and land snails) and under clumps of *Triodia* (snails). Effort was made to locate the burrows of mygalomorph spiders. All potential SRE invertebrates collected during hand foraging efforts were preserved in 100% ethanol. Hand foraging included:

- Sieving of leaf litter/ soil onsite using a series of sieve sizes ranging from 10 mm – 2 mm;
- Raking through soil, leaf litter and debris to uncover entrances to camouflaged mygalomorph spider burrows and buried land snails;
- Searching among rock piles and turning rocks; and
- Searching on trees and beneath bark.

3.3.3 Phase 2 SRE Invertebrate Fauna Survey – Leaf Litter Collection

Two 1m^2 quadrats (2 m^2) of leaf litter were collected at each of the ten SRE trap sites and at opportunistic foraging sites and separately placed into a leaf-litter reducer (Figure 3.1). The contents from each sample were placed into a paper bag inside a zip-lock bag and stored separately, with a small amount of wet tissue paper placed into each bag to maintain humidity. The samples were later sieved onsite using a series of sieve sizes ranging from 10 mm – 2 mm and all potential SRE invertebrates were collected and preserved in 100% ethanol.

Figure 3.1: Example of leaf litter reducer

3.4 SRE STATUS

Harvey (2002) adopted a conservative approach for determining SRE status and outlined that the maximum geographic range to define a short-range endemic invertebrate is 10,000 km² (100 km x 100 km). SRE taxa may inhabit a far smaller area or be confined to discontinuous or fragmented habitats within its distribution (Environmental Protection Authority 2016b).

SRE status of invertebrate fauna recorded is based on categories developed by the Western Australian Museum (WAM) and modified by the consultant taxonomists to describe the SRE status of taxa using the current knowledge of the distribution and biology of each species. SRE status is defined by one of the categories as listed in Table 3.2. The 2013 WAM SRE categories, which have been developed to describe the SRE status of WA taxa, utilise: (a) unambiguous categories; and (b) explanations of uncertainty. This has been accomplished using a two-tier classification system. In the first tier of classification, geographic distribution and taxonomic certainty are the variables used to split taxa into "Confirmed SREs", "Widespread (not SREs)", and "Potential SREs". In the second tier of classification, "Potential SREs" are categorised according to the reasons why they have been placed into this category and the presence of proxy-indicators for Confirmed SRE or Widespread status. In addition, taxonomists have adapted these categories and incorporated one additional category: "likely SRE". Taxonomists undertook the identification of invertebrate fauna collected during this survey and therefore both SRE categories have been used to determine the SRE status (Table 3.2 and Table 3.3).

Table 3.2: SRE categories used by invertebrate taxonomists

	Taxonomic certainty	Taxonomic uncertainty
Distribution <10 000km2	**Confirmed SRE** • A known distribution of < 10,000 Km2. • The taxonomy is well known. • The group is well represented in collections and/ or via comprehensive sampling.	**Potential SRE** • Patchy sampling has resulted in incomplete knowledge of geographic distribution. • Incomplete taxonomic knowledge. • The group is not well represented in collections. • Category applies where there are significant knowledge gaps. **Sub-categories for this SRE designation are outlined below**
Distribution >10 000km2	**Widespread (not an SRE)** • A known distribution of > 10,000 km2. • The taxonomy is well known. • The group is well represented in collections and/ or via comprehensive sampling.	

SRE Sub-categories

If a taxon is determined to be a "Potential SRE", the following sub-categories will further elucidate this status.

A. Data Deficient:

- There is insufficient data available to determine SRE status.
- Factors that fall under this category include:
    - Lack of geographic information;
    - Lack of taxonomic information;
    - The group may be poorly represented in collections; and
    - The individuals sampled (e.g. juveniles) may prevent identification to species level.

B. Habitat Indicators:

- It is becoming increasingly clear that habitat data can elucidate SRE status; and
- Where habitat is known to be associated with SRE taxa and vice versa, it will be noted here.

C. Morphology Indicators:

- A suite of morphological characters are characteristic of SRE taxa; and
- Where morphological characters are known to be associated with SRE taxa and vice-versa, it will be noted here.

D. Molecular Evidence:

- If molecular work has been done on this taxon (or a close relative), it may reveal patterns congruent or incongruent with SRE status.

E. Research & Expertise:

- Previous research and/ or WAM expertise elucidates taxon SRE status; and
- This category considers the expert knowledge held within the WAM.

The SRE categories utilised include one additional category: "likely SRE". Fauna belonging to this category are included in WAM's "potential SRE" category (Table 3.2, Table 3.3).

Table 3.3: SRE categories

SRE category	Criteria	Typical representative
Confirmed	Confirmed or almost certainly SRE; taxonomy of the group is well known (but not necessarily published); group well represented in collections, from the region in question; high levels of endemism in documented species; inference is often possible from immature specimens.	*Antichiropus* millipedes (ParadoxOSomatidae); scorpions in the genus *Aops* (Urodacidae)
Likely	Taxonomically poorly resolved group; unusual morphology for the group (i.e. some form of troglomorphism); often singleton in survey and few, if any, regional records.	Opiliones in the genus *Dampetrus*; some pseudoscorpions (*Synsphyronus*) and slaters (Philosciidae); araneomorph spiders in the genus *Karaops* (Selenopidae)
Potential	Taxonomically poorly resolved group; often common in certain microhabitats in SRE surveys (i.e. litter dwellers), but no other regional records; congeners often widespread.	Many mygalomorph spiders; some centipedes (Cryptopidae; Geophilomorpha)
Widespread/Not SRE	Taxonomically well resolved (but often not published) and demonstrated wide distribution (i.e. > 10,000 km2)	

3.5 ANALYSIS, TAXONOMY AND NOMENCLATURE

Taxonomy of SRE invertebrate specimens was conducted by relevant taxonomic specialists:

- Spiders – Dr Volker Framenau
- Scorpions, pseudoscorpions, and land snails – Dr Erich Volschenk
- Isopods – Dr Simon L Judd

3.6 DNA SEQUENCING AND IDENTIFICATION

Specimens that were unidentifiable due to a lack of morphological features were supplied to the Western Australian Museum's (WAM) Molecular Systematics Unit (MSU) to determine taxonomic identity using mitochondrial DNA barcoding (Appendix F).

DNA was extracted and DNA barcoding sequences (COI) were amplified by polymerase chain reaction (PCR) in the MSU and sequenced at the Australian Genomic Research Facility (AGRF) Perth node using universal primers (0. Folmer *et al.* 1994). DNA sequences were cross referenced with publicly accessible sequences in GenBank and with datasets derived from current research projects in collaboration with the WAM.

3.7 STUDY TEAM AND LICENCES

The fauna assessments undertaken by *ecologia* was planned, coordinated, executed and reported by those summarised below in Table 3.4. DBCA licences are also provided.

Table 3.4: Study team and licences

Project Staff				
Name	**Qualification**	**Experience**	**Role**	**Project role**
Shaun Grein	B. Sc. Biol.; Grad. Dip. Nat. Resources; MBA	>25 yrs	Managing Director/Principal Scientist	Project management, QA
Tim McCabe	B.Sc. Env. Biol, Dip Proj Mngment, Cert III Vert Pest Mngment	>12 yrs	Senior Zoologist	Project management, SRE field assessment, reporting
Tom Clairs	Cert III Cons Land Mngment	>5 yrs	Field Assistant	SRE field assessment
Claudia Buters	B.Sc Cons. Biol. & Zool.; M WildlifeHth	>5 yrs	Zoologist	Reporting
DBCA Licenses				
Holder	**Type**			**Number**
Tim McCabe	Authorisation to take or disturb Threatened species			TFA 2019-0010
Tim McCabe	Fauna Taking (Biological Assessment) Licence – Regulation 27			BA27000030

3.8 SURVEY LIMITATIONS AND CONSTRAINTS

According to EPA guidelines (Environmental Protection Authority 2016b), terrestrial fauna surveys may be limited by several aspects. An assessment of these aspects regarding the Phase 1 and Phase 2 SRE invertebrate fauna surveys is detailed in Table 3.5.

Table 3.5: Statement of limitations for the SRE invertebrate fauna surveys

Constraint	Comment
Competency and experience of consultants	All members of the survey team were experienced in undertaking SRE invertebrate fauna surveys.
Availability of contextual information at a regional and local scale	Broad scale bioregion, vegetation, land system, and soil, mapping data were available for the Project Area and adequate to provide appropriate contextual information for the Project Area.
Sources of information (e.g. historic or recent)	Comprehensive database records, including WAM SRE database and conservation significant species, were available and considered adequate. Previous SRE surveys conducted within the Project Area were interrogated.
Scope	The study scope was well-defined, and surveys were undertaken adequately to satisfy the needs of the scope.
Proportion of fauna identified recorded and/or collected	All specimens were identified to the lowest level possible by Western Australia's leading invertebrate taxonomists. Taxonomy is sometimes incomplete without male or mature specimens and DNA analysis is required to identify some specimens to species level.
Proportion of task achieved, and further work which might be needed	The assessment was conducted and completed according to an agreed scope.
Timing/weather/season/cycle	The field assessment was undertaken within the appropriate time frames for SRE surveys according to Environmental Protection Authority (2016b). Significant rainfall fell in the months leading up to the survey, although the previous few season have been dry.
Remoteness or access restrictions within the survey area	Remoteness and/or access restrictions did not affect results. Access to the Yandeyarra Aboriginal reserve was not permitted at the time of survey although representative habitat types were surveyed in accessible areas. The western portion of the Malay Well tenement falls within the Wittenoom Asbestos Management Area (WAMA). No survey work could be undertaken in this area.
Disturbances which may affect results of survey	Disturbances did not affect results.
Intensity and completeness	The desktop assessment was considered adequate and was appropriate to gather background information. The SRE survey was considered adequate at the time of reporting.
Resources	All zoologists were suitably qualified and experienced in SRE collection within the Pilbara.

4 RESULTS

4.1 DESKTOP ASSESSMENT

4.1.1 Database searches

DBCA's NatureMap, WAM and ALA invertebrate database search identified 77 records from five known or likely SRE target groups including two mygalomorph spiders, four scorpions, three pseudoscorpions, one land snail and one schizomid (Table 4.1, Figure 4.1). No confirmed SRE species were identified from the database search results and none of the species identified from target SRE groups have previously been recorded from the Project Area.

Table 4.1: SRE invertebrate species from target groups within 40 km of the study area.

Database	Class	Order	Family	Identity
WAM	Arachnida	Araneae	Barychelidae	*Idiommata* `MYG382`
WAM	Arachnida	Araneae	Barychelidae	*Idiommata* `MYG382`
ALA	Arachnida	Araneae	Nemesiidae	*Aname mellosa*
WAM	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* `sp. B33`
WAM	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium* `sp. B17`
WAM	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium* `sp. B17`
WAM	Arachnida	Scorpiones	Buthidae	*Lychas* `splendens ms`
WAM	Arachnida	Scorpiones	Urodacidae	*Urodacus megastigmatus*
WAM	Arachnida	Scorpiones	Urodacidae	*Urodacus* `sp. B09 (?`firetail`)`
WAM	Arachnida	Scorpiones	Urodacidae	*Urodacus* `sp. B09 (?`firetail`)`
WAM	Gastropoda	Stylommatophora	Bothriembryontidae	*Bothriembryon* `Pilbara` n.sp.
DBCA Naturemap	Arachnida	Schizomida	Hubbardiidae	?

4.1.2 Literature review

Three SRE surveys have been previously conducted within the Project Area and interrogated as part of the literature review including:

- Murray's Hills Short-range Endemic (SRE) Pilot Survey (*ecologia* 2009);
- Murrays Hill Transport Corridor Short-range Endemic (SRE) Invertebrate Fauna Survey (Phoenix 2010); and
- Mulga East Baseline Fauna Assessment (*ecologia* 2019)

A summary of previously conducted surveys outlining survey effort and results is detailed in Table 4.2.

The mygalomorph spider, *Synothele* 'MYG127,' was recorded by Phoenix (2010) and considered a likely SRE species; however, further work on SREs within the Pilbara region has established that this species has a wider distribution than first thought and is no longer considered a likely SRE species.

Table 4.2: Previous SRE invertebrate surveys completed within the Project area

Reference	Survey Details	Methods	Broad Fauna Habitat Types	Fauna Recorded	Conservation significant or SRE fauna	Comments
ecologia Environment (2009)	Murrays Hills Short-range Endemic (SRE) Pilot Survey	Wet Pitfall traps Dry pitfall traps Opportunistic sampling-excavation		139 potential SRE specimens collected from six groups	Nil	Of the 139 specimens collected, none have been confirmed as SRE species. Of the specimens that have been identified to species level all were known to have widespread distributions or were known in other areas of Western Australia.
Phoenix Environmental Sciences (2010)	Murrays Hill Transport Corridor Short-range Endemic (SRE) Invertebrate Fauna Survey	Wet Pitfall traps Opportunistic sampling-excavation	Habitats considered as having potential to harbour SRE's: Rocky outcrops/breakaways South facing slopes	Three potential SRE species found	<u>Two likely SRE species and one possible SRE species recorded:</u> Synothele 'MYG127' Synothele 'MYG160' Beierolpium (sp.8/3)	Scale of impact to these species within the survey area was determined to be negligible. All sites where SRE species have been recorded are from the Calcrete and Jamindie land systems which feature low calcrete platforms, plains and stony hardpan plains.
ecologia Environment (2019)	Level 2 SRE Invertebrate Fauna survey	18 Dry pitfall trap sites Opportunistic sampling-excavation, hand foraging	Mulga Woodland Mixed Eucalypt/Mulga Floodplain Rocky Hills Stony Spinifex Plains and Hillslopes Calcrete Stony Plain Chenopod/Cracking Clay Floodplain	97 specimens collected from three groups	<u>Four potential isopod SRE species</u>: *Buddelundia* 15MD *Buddelundia* 14 Buddelundiinae sp indet. *Buddelundia* indet. A <u>Five potential scorpion SRE species</u>: *Xenolpium* sp. *Indolpium* sp.	The SRE survey was conducted concurrently with the Level 2 vertebrate fauna assessment and dry pitfall traps were checked for potential SRE species. Foraging was undertaken within habitat isolates such as rocky outcrops/breakaways and south facing slopes and mulga woodlands which are known to provide habitat for mygalomorph spiders. No confirmed SRE species were recorded.

Reference	Survey Details	Methods	Broad Fauna Habitat Types	Fauna Recorded	Conservation significant or SRE fauna	Comments
			Drainage Line Claypan		*Lychas* 'bituberculatus complex' (now *Lychas* 'SCO024') *Lychas* 'multipunctatus complex' (now *Lychas* 'SCO046') *Urodacus* sp.	

570000 580000 590000 600000 610000 620000 630000 640000 650000 660000 670000 680000 690000 700000

7590000 7580000 7570000 7560000 7550000 7540000 7530000 7520000 7510000

SRE species group
- Spiders
- Pseudoscorpiones
- Scorpiones
- Land snails
- Schizomida

Tenement Boundary
- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor

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Project: 1827
Date: 25 August 2020
Author: TM
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:350,000 @A3

Figure 4.1 Database search results indicating known or likely SRE groups found within 40 km of the study area

0 5 10
Kilometers

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

4.1.3 Data gap analysis

SRE habitat types within the Project Area that were poorly sampled during the initial Level 2 fauna survey completed by *ecologia* (2019) were identified and additional effort was made to adequately sample these habitats for SRE species during the current survey. These included the Chenopod/Cracking Clay Floodplain and Claypan habitats. Claypans exhibit very little to no microhabitats to expected to support short range endemism and as such, were not surveyed. Dry pitfall trapping and hand foraging was undertaken within Chenopod/Cracking Clay Floodplains to eliminate and potential data gaps.

Rocky Hills and south-facing slopes within the Project Area were identified by Phoenix (2010) as potentially harbouring SRE's and were targeted during the initial survey (*ecologia* 2019). Phoenix (2010) recorded potential SRE species within the Jamindie and Calcrete land systems, which coincide with Mulga Woodlands and Calcrete Stony Plains respectively and were also targeted during the initial survey (*ecologia* 2019).

To increase existing knowledge and data gathered within the Project Area, the most prospective microhabitats occurring for SRE invertebrates were resurveyed.

4.2 SRE INVERTEBRATE HABITAT

Based on the results of the reconnaissance survey, preliminary review and interrogation of habitat types from previous fauna surveys (Terrestrial Ecosystems (2013), *ecologia* (2009), *ecologia* (2019)) and vegetation units from previous flora and vegetation surveys (Maia (2012), *ecologia* (2008)) conducted within the Project Area, *ecologia* (2019) determined eight broad vertebrate fauna habitat types occur in the Project Area: Mulga Woodland, Calcrete Stony Plain, Stony Spinifex Plains and Hillslopes, Rocky Hills, Mixed Eucalypt/Mulga Floodplain, Chenopod Cracking Clay Floodplain, Drainage Lines and Claypans.

Apart from Claypans, all other habitat types are considered to provide potential microhabitats for SRE invertebrate fauna, and each was assessed based on habitat suitability for SRE invertebrates. Suitability of each habitat type in relation to SRE invertebrates is outlined in Table 4.3 and habitat mapping in relation to SRE invertebrate survey locations from 2019 and 2020 can be seen in Figure 4.2.

The most prospective SRE habitat within the study area is associated with mesic environments including breakaways and small gorges within the Rocky Hills. However, breakaways and small gorges within Rocky Hills habitat accounts for less than one percent of the Project Area. Stony Spinifex Plains and Hillslopes, Mulga Woodland and Drainage Lines were considered moderately likely to promote short range endemism, followed by Calcrete Stony Plain, Chenopod/Cracking Clay Floodplain and Mixed Eucalypt/Mulga Floodplain which were given low to moderate habitat suitability rankings. The most common habitat types within the Project Area (Mulga Woodlands, Stony Spinifex Plains and Hillslopes and Mixed Eucalypt/Mulga Floodplains) were identified to be generally continuous swathes of similar habitat and widespread in a regional context.

The Claypan habitat type identified during previous Level 1 fauna habitat assessments and Level 2 vertebrate fauna surveys was not surveyed during the current SRE survey, as it was deemed unsuitable for SRE invertebrate species on the basis of low levels of habitat complexity and the absence of suitable microhabitats for SRE species. Chenopod/Cracking Clay Floodplains were not surveyed for SRE invertebrate fauna during the initial Level 2 survey (*ecologia* 2019) This habitat type was prioritised during site selection for the current survey, to ensure that any suitable microhabitats within this habitat were surveyed for potential SRE's.

Table 4.3: Broad fauna habitat types, SRE microhabitats and habitat suitability rating

Broad habitat type	Phase 1 Survey Sites	Current Survey Sites	Area within Project Area		Habitat representation on a regional scale	Vegetation description	SRE habitat suitability assessment	SRE habitat suitability rank	Representative photos
			ha	%					
Drainage Line	MDS011-MDS013	SREPT002, SREPT004, SREPT010	524.7	1.6	Widespread	Scattered *Eucalyptus victrix* or *Corymbia hamersleyana* over an open shrubland of *Acacia tumida* and *A. pyrifolia* over hummock and tussock grasses.	Comprised of localised drainage systems and thick vegetation, with dense and variable leaf litter, organic debris, some deep soils and rocky substrates are present which may provide localised microhabitats for SRE invertebrates. Isolation generally considered low, forming a contiguous swathe of habitat, however, may provide dispersal corridors for some SRE species.	3- Moderate	
Calcrete Stony Plain	MDS02, MDS03, MDS04	SREPT009, MDF003, MDF009, MDF011	2101.5	6.4	Habitat coincides with calcrete land system which is considered well represented in the local area.	Mixed sparse shrubland of *Melaleuca glomerata*, *Eremophila longifolia*, *Acacia* spp., with either *Triodia epactia* hummock grasslands or tussock grasslands of annual *Eragrostis pergracilis*.	Low calcrete platforms and shrubby hard spinifex grasslands contain some leaf litter and sandy soils which is generally considered as low suitability for SRE endemism. However, isolation between similar habitat within the local area is considered moderate.	2- Low/ Moderate	
Rocky Hills	SRE Forage RH1-RH6, MDS009, MDS010, MDS015	SREPT005, SREPT007, SREPT008, MDF007	4008.6	12.1	Widespread	Isolated *Eucalyptus leucophloia* and/or *Corymbia hamersleyana* over sparse shrubland of mixed *Acacia* spp., *Grevillea wickhamii*, *Hakea lorea* and over open *Triodia* sp. hummock grassland.	This habitat type supports south-facing slopes, drainage systems, breakaways, caves and small gorges which are likely to provide isolated, sheltered microhabitats and refugia for potential SRE invertebrates.	4- Moderate/ High	
Mulga Woodland	SRE Forage Mulga1-Mulga6, MDS016-MDS018	SREPT003, MDF004, MDF005, MDF012	11501.8	34.8	Widespread	Open woodland of *Acacia aneura, A. xiphophylla* with isolated *A. pruinocarpa* over *Acacia* spp., *Eremophila* spp., *Dodonaea petiolaris* and *Hakea* sp. over sparse soft grasses or *Triodia* hummock grasslands.	Jamindie land system habitat isolates, deep soils, and dense vegetation are present within this habitat type, creating potential refugia and microhabitats for SRE invertebrates. Relatively widespread and continuous habitat type within the project area and widespread in a regional context.	3- Moderate	

Broad habitat type	Phase 1 Survey Sites	Current Survey Sites	Area within Project Area		Habitat representation on a regional scale	Vegetation description	SRE habitat suitability assessment	SRE habitat suitability rank	Representative photos
			ha	%					
Chenopod/ Cracking Clay Floodplain	Nil	SREPT001	652.3	2	Restricted distribution	Sparse chenopod shrubland of *Sclerolaena trigona, S. bicornis, S. densiflora* over low tussock grasses of *Eragrostis xerophila* on a substrate of cracking clays.	Habitat type offers low levels of habitat complexity and protection for SRE invertebrate species, making these areas unlikely to harbour SRE's despite having a restricted distribution within the Project Area.	2- Low/ Moderate	
Stony Spinifex Plains and Hillslopes	MDS007, MDS008, MDS014	SREPT006	5730.9	17.3	Widespread	Isolated *Eucalyptus leucophloia* over sparse shrubland of mixed *Acacia* spp. over open spinifex hummock grassland. The *Triodia* hummocks found are generally small and few isolated long unburnt patches are present.	Occasional south-facing slopes and low levels of leaf litter are present within this habitat type, providing potential refugia and shelter for invertebrate SRE species. Widespread and continuous habitat type within the Project Area and the region.	1- Low	
Mixed Eucalypt/Mulga Floodplain	MDS01, MDS05, MDS06	MDF001, MDF002, MDF006, MDF008 MDF010	8126.8	24.6	Widespread	Isolated to dense *Eucalyptus victrix* and *Acacia distans* over scattered understory over low grasses. Some open areas are associated with scattered tall trees with grasses and woody debris around the base.	This habitat type is widespread and continuous within the study area. Potentially important habitat for burrowing SRE invertebrate species as deeper soils and dense leaf litter are likely to be present in some areas.	2- Low/ Moderate	
Claypan	No sites	No sites	393.1	1.23%	PEC claypan and restricted to the Fortescue River	Supporting very few isolated trees and little ground vegetation due to seasonal inundation.	This habitat type provides very little suitable habitat for terrestrial SRE invertebrate species and was not sampled. May be important for aquatic invertebrates.	1- Low	

640000 650000 660000 670000 680000 690000 700000

7580000

7570000

7560000

7550000

Phase 1 survey site
- Dry pitfall trapping
- SRE foraging

Phase 2 survey site
- Dry pitfall trapping
- Foraging, leaf litter sieving

SRE habitat suitability
- 1- Low
- 2- Low/ Moderate
- 3- Moderate
- 4- Moderate/ High

Tenement Boundary
- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor

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Absolute Scale: 1:160,000 @A3

Figure 4.2 SRE habitat suitability

0 4.25 8.5
Kilometers

4.3 FIELD SURVEY

A total of 10 dry pitfall sites and 12 hand foraging sites were surveyed during the SRE survey conducted between 16th and 23rd March 2020. A combined total of 2040 trap nights and 8640 minutes of hand foraging were undertaken at 52 sites within the Project Area across both SRE survey phases and total survey effort undertaken within the Project Area is outlined in Table 4.4.

Table 4.4: Total SRE invertebrate survey effort within the Project Area

Phase	Site	Habitat Type	Easting	Northing	Survey effort	
					Trap nights (nights)	Hand Foraging (mins)
Phase 1	MDS001	Mixed Eucalypt /Mulga Floodplain	118.5195	-22.1491	70	240
	MDS002	Calcrete Stony Plain	118.5195	-22.1705	70	240
	MDS003	Calcrete Stony Plain	118.5025	-22.2068	70	240
	MDS004	Calcrete Stony Plain	118.5199	-22.1654	70	240
	MDS005	Mixed Eucalypt /Mulga Floodplain	118.4687	-22.1818	70	240
	MDS006	Mixed Eucalypt /Mulga Floodplain	118.5196	-22.1559	70	240
	MDS007	Stony Spinifex Plains and Hillslopes	118.5037	-22.0975	90	240
	MDS008	Stony Spinifex Plains and Hillslopes	118.5181	-22.0886	90	240
	MDS009	Rocky Hills	118.5564	-22.1128	70	240
	MDS010	Rocky Hills	118.6342	-22.1362	90	240
	MDS011	Drainage Line	118.5648	-22.1203	70	240
	MDS012	Drainage Line	118.6398	-22.1117	70	240
	MDS013	Drainage Line	118.5943	-22.1274	70	240
	MDS014	Stony Spinifex Plains and Hillslopes	118.6026	-22.1341	70	240
	MDS015	Rocky Hills	118.6411	-22.1113	80	240
	MDS016	Mulga Woodland	118.5188	-22.1181	80	240
	MDS017	Mulga Woodland	118.5507	-22.1232	70	240
	MDS018	Mulga Woodland	118.6225	-22.1449	70	240
	SRE Forage Mulga 1	Mulga Woodland	118.6415	-22.1473	0	120
	SRE Forage Mulga 2	Mulga Woodland	118.534	-22.1488	0	60
	SRE Forage Mulga 3	Mulga Woodland	118.5489	-22.1569	0	60
	SRE Forage Mulga 4	Mulga Woodland	118.6714	-22.165	0	60

Phase	Site	Habitat Type	Easting	Northing	Survey effort	
					Trap nights (nights)	Hand Foraging (mins)
	SRE Forage Mulga 5	Mulga Woodland	118.5622	-22.1394	0	60
	SRE Forage Mulga 6	Mulga Woodland	118.5821	-22.1347	0	60
	SRE Forage RH1	Rocky Hills	118.6377	-22.123	0	240
	SRE Forage RH2	Rocky Hills	118.6354	-22.1155	0	480
	SRE Forage RH3	Rocky Hills	118.6359	-22.1246	0	120
	SRE Forage RH4	Rocky Hills	118.6417	-22.1144	0	180
	SRE Forage RH5	Rocky Hills	118.6352	-22.127	0	120
	SRE Forage RH6	Rocky Hills	118.6329	-22.1309	0	120
Phase 2	SREPT001	Chenopod/Cracking Clay Floodplain	651239	7551913	70	120
	SREPT002	Drainage Line	664447	7552845	70	120
	SREPT003	Mulga Woodland	673205	7548570	70	120
	SREPT004	Drainage Line	656794	7556083	70	120
	SREPT005	Rocky Hills	661680	7553854	70	120
	SREPT006	Stony Spinifex Plains and Hillslopes	661833	7552778	70	120
	SREPT007	Rocky Hills	667838	7552188	70	120
	SREPT008	Rocky Hills	664627	7553674	70	120
	SREPT009	Calcrete Stony Plain	651115	7549412	70	120
	SREPT010	Drainage Line	661678	7553360	70	120
	MDF001	Mixed Eucalypt/Mulga Floodplain	645827	7552926	0	120
	MDF002	Mixed Eucalypt/Mulga Floodplain	646571	7551007	0	120
	MDF003	Calcrete Stony Plain	650430	7545802	0	120
	MDF004	Mulga Woodland	646513	7545112	0	120
	MDF005	Mulga Woodland	654185	7553796	0	120

Phase	Site	Habitat Type	Easting	Northing	Survey effort	
					Trap nights (nights)	Hand Foraging (mins)
	MDF006	Mixed Eucalypt/Mulga Floodplain	661381	7547621	0	120
	MDF007	Rocky Hills	691817	7562521	0	120
	MDF008	Mixed Eucalypt/Mulga Floodplain	645648	7548407	0	120
	MDF009	Calcrete Stony Plain	652586	7544573	0	120
	MDF010	Mixed Eucalypt/Mulga Floodplain	656703	7546638	0	120
	MDF011	Calcrete Stony Plain	656628	7547852	0	120
	MDF012	Mulga Woodland	658964	7551959	0	120
Total survey effort					2040 trap nights	8640 mins hand foraging

645000 650000 655000 660000 665000 670000 675000 680000 685000 690000

7570000 7565000 7560000 7555000 7550000 7545000 7540000

Phase 1 survey site
- Dry pitfall trapping
- SRE foraging

Phase 2 survey site
- Dry pitfall trapping
- Foraging, leaf litter sieving

Tenement Boundary
- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor

Broad fauna habitat
- Mulga Woodland
- Mixed Eucalypt/ Mulga Floodplain
- Stony Spinifex Plains and Hillslopes
- Calcrete Stony Plain
- Rocky Hills
- Drainage Line
- Chenopod/ Cracking Clay Floodplain
- Claypan

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Projection: Transverse Mercator
Absolute Scale: 1:135,000 @A3

Figure 4.3 SRE invertebrate sampling sites

0 3.75 7.5
Kilometers

4.4 INVERTEBRATE FAUNA RECORDED

A total of 130 isopods, 72 spiders, one harvestman, 56 pseudoscorpions, 36 scorpions, 33 millipedes and 48 land snails were recorded from 22 sites during the current SRE invertebrate fauna survey conducted over 8 days in March 2020.

A total of 496 invertebrate specimens have been collected from 52 sites during both phases of SRE invertebrate fauna surveys comprising 152 isopods, 129 spiders, one harvestman, 75 pseudoscorpions, 58 scorpions, 33 millipedes and 48 land snails. All specimen records from phase 1 and phase 2 can be seen in Appendix C. WAM molecular identification report can be seen in Appendix D.

4.4.1 Isopods

One hundred and thirty isopod specimens were collected from nine sites during the survey. Specimens were provided to isopod taxonomist Dr Simon Judd for identification and nine species belonging to two families were recorded including eight species from the family Armadillidae (pers.comm). A single specimen (*Oniscidea* sp. indet.) (collected during the current survey) did not belong to the Armadillidae family; however, this specimen was unable to be conclusively identified due to poor specimen quality.

Within the Armadillidae family, five species belong to the genus *Buddelundia* (*Buddelundia* 10BF, Buddelundia 14FM, Buddelundia 15MD, *Buddelundia* 56 and *Buddelundia* sp. indet. 1) and three species to an undescribed genus (Buddelundiinae sp. indet. A, Buddelundiinae sp. indet. B and Buddelundiinae sp. indet.).

Of the nine species collected from the project area, one species (*Buddelundia* 56) is considered a likely SRE species and the remaining eight species are considered potential SREs.

Twenty-two isopod specimens were collected from nine sites during the initial survey (*ecologia* 2019) and a total of 152 individual specimens were collected from 18 sites within the Project Area during both phases of SRE invertebrate survey. Locations of potential SRE species recorded can be seen in Figure 4.4.

Family Armadillidae

Buddelundia 10BF (2019: MDS03, MDS04) previously determined as *Buddelundia* sp. indet. A

In the initial survey, three individuals of this species were recorded in the Calcrete Stony Plain habitat type within the project area (ecologia 2019). This species was not collected during the current survey. This morphospecies matches a group of specimens found about 100 km to the WSW of the Project Area. There is still further taxonomic work needed and these few specimens form a disjunct distribution within the morphospecies. This species should be considered a potential SRE species.

Buddelundia 14FM (Phase 1: MDS07) (2020: SREPT002, SREPT003, SREPT004, SREPT007 SREPT008, SREPT010, MDF005) previously determined as *Buddelundia* 14

In the initial survey, only a single specimen was collected within the Stony Spinifex Plains and Hillslope habitat type, and it was not possible to determine which form of Buddelundia 14 this specimen represented (ecologia 2019). During current survey, this species was the most widespread isopod species with 53 specimens recorded across seven sites within the Drainage Line, Mulga Woodland and Rocky Hill habitat types. This species should be considered a potential SRE species.

Buddelundia 15MD (Phase 1: MDS01, MDS02, MDS03, MDS05, MDS06) (2020: MDF003)

This species was the most common isopod recorded during initial survey, with 15 specimens collected from five sites within the Mixed Eucalypt/Mulga Floodplain and Calcrete Stony Plain (ecologia 2019). In the current survey, this species was only recorded at a single site, with three specimens collected

within the Calcrete Stony Plain. These specimens were morphologically similar to Buddelundia 15 which is a widespread species complex in the Hamersley Range, however, these specimens differed in several important characters from those found elsewhere and were, therefore, allocated their own species number for the purposes of this report. Buddelundia 15MD is likely to have a restricted distribution and should be considered a potential SRE species.

Buddelundia 56 (2020: SREPT001, SREPT002)

Fifty-eight individual specimens of *Buddelundia* 56 were recorded from two sites within the Chenopod/Cracking Clay Floodplain and Drainage Line during the current survey. This morphospecies was not collected in the initial survey (*ecologia* 2019). This species is considered an SRE species by Dr Simon Judd (pers. comm).

Buddelundia sp. indet. 1 (2020: SREPT007)

A single female specimen of Buddelundia sp. indet. 1 was recorded in the Rocky Hills during the current survey. This specimen was identified as a small and possibly cryptic form of Buddelundia; however, there are numerous morphospecies of this type and it was not possible to make a determination based upon this single specimen. This species was not recorded in the initial survey (ecologia 2019). It should be considered a potential SRE species.

Buddelundiinae sp. indet. A (Phase 1: MDS02)

In the initial survey, this morphospecies was represented by a single female specimen collected in the Calcrete Stony Plain (ecologia 2019). This species was not recorded in the current survey. Isopods of this type belong to an undescribed genus closely related to Buddelundia. Although only two adult *Buddelundiinae* sp. were collected, they are morphologically distinct enough to be considered discrete morphospecies. This type of isopod lacks the morphological characters used to determine species of Buddelundia and it is difficult to establish reliable morphospecies. The genus is far less common than Buddelundia and requires extensive work which is not possible at this stage. Given current taxonomic uncertainty this should be considered a potential SRE species.

Buddelundiinae sp. indet. B (2020: SREPT008)

This species was not recorded in the initial survey (ecologia 2019). The single female specimen collected from a Rocky Hills site in the current survey was clearly morphologically different to the *Buddelundiinae* sp. indet. A specimen described above. It should be considered a potential SRE species.

Buddelundiinae sp. indet. (Phase 1: MDS16) (2020: SREPT004, MDF005)

One specimen collected in the initial survey (*ecologia* 2019) and two specimens collected in current survey are juveniles which could not be identified. They could be either of the two morphospecies outlined above or a different one. They should, therefore, be considered a potential SRE species. The specimen from the initial survey was recorded in the Mulga Woodland (*ecologia* 2019) and the specimens from the current survey were recorded in the Drainage Line and Mulga Woodland.

Family Philosciidae?

Oniscidea sp. indet.

A single specimen in poor condition from an unknown family (*Oniscidea* sp. indet) was recorded in the Chenopod/Cracking Clay Floodplain during the current survey. The specimen did not belong to the Armadillidae family and was believed to possibly belong to the family Philosciidae. The single specimen was dehydrated and partly decomposed, and no further identification was possible. Any native non-armadillids collected in the Pilbara are usually potential SRE species, therefore this species should be considered a potential SRE species.

4.4.2 Spiders

A total of 129 individual spider specimens were collected across 26 sites within the Project Area during both SRE surveys. A total of 72 specimens were recorded from 13 sites during the current survey and 57 specimens were collected from 17 sites during initial survey (*ecologia* 2019).

All specimens were provided to arachnid specialist Dr Volker Framenau, who identified 27 specimens from the initial survey (*ecologia* 2019) and six specimens from the current survey belonging to target SRE groups. Four species were identified including *Aname mellosa* Harvey, Framenau, Woycieszek, Rix & Harvey, 2012 (family Anamidae), *Synothele* 'MYG127' (family Barychelidae), *Gaius tealei* Rix, Raven & Harvey, 2018 (family Idiopidae) and *Conothele* 'MYG716' (family Halonoproctidae) (pers. comm).

Of these, *Conothele* 'MYG716', is considered a potential SRE species while the remaining three species are widespread and unlikely to be considered SRE species.

Aname mellosa Harvey, Framenau, Woycieszek, Rix & Harvey, 2012

Three male *Aname mellosa* specimens were recorded in the Calcrete Stony Plain during the current survey. This is a widespread species in the Pilbara, although genetic studies suggested the potential of cryptic species to occur. Subpopulations of this species do not generally represent SREs (Volker W. Framenau pers. comm).

This species was the most abundant in the initial survey with seventeen specimens recorded from the Calcrete Stony Plain, Stony Spinifex Plains and Hillslopes, Drainage Line and Mulga Woodlands and is not considered an SRE species (*ecologia* 2019).

Synothele 'MYG127'

In current survey a single, male *Synothele* 'MYG127' specimen was recorded in the Calcrete Stony Plain. Seven individuals were recorded in Calcrete Stony Plain, Stony Spinifex Plains and Hillslopes and Mixed Eucalypt/Mulga Floodplain habitat types during the initial survey (*ecologia* 2019). This species is widespread in the Pilbara and is not considered an SRE species.

Gaius tealei Rix, Raven & Harvey, 2018

A single, female *Gaius tealei* specimen was recorded in Mulga Woodlands during the current survey. In the initial survey (*ecologia* 2019), two mature female specimens from Mulga Woodlands were tentatively identified as *Gaius tealei*, however male specimens are necessary for a definitive identification and these were not collected during either phase of this survey (*ecologia* 2019). If this identification is correct, this is a widespread species occurring from the central Pilbara into the central Murchison IBRA bioregion and is not considered an SRE species.

Conothele 'MYG716' (formerly identified as *Conothele* sp. indet.)

A single, juvenile specimen of *Conothele* 'MYG716' was recorded in Mulga Woodland during the current survey and was sent for molecular identification at the WAM. Molecular identification indicated that this specimen is 11.68% divergent from its nearest congener and represents a newly discovered species. This species was not recorded in the initial survey (*ecologia* 2019). The genus is highly diverse in WA and the Pilbara region with high localised distribution patterns making it likely that this specimen is an SRE species. This species is considered a potential SRE species because of data deficiencies regarding their distribution.

4.4.3 Harvestmen

Dampetrus OPI001 (formerly identified as *Dampetrus* HBI-6519)

A single, juvenile specimen of *Dampetrus* HBI-6519 was recorded in the Rocky Hills during the current survey (Figure 4.5). This species was not recorded in the initial survey (*ecologia* 2019). Species in the

Dampetrus genus have been found previously in the Pilbara in isolated locations, with generally new species at each. Due to a lack of morphological taxonomic reference material for harvestmen, this specimen was sent to the WAM for molecular identification and was described as a newly discovered species, *Dampetrus* 'OPI001'. Molecular identification indicated that this specimen is 20.37% divergent from its nearest congener and represents a newly discovered species. This species is considered a potential SRE species due to data deficiencies regarding its distribution.

4.4.4 Scorpions

Thirty-six individuals were recorded from seven sites during the current survey. A combined total of 58 scorpion specimens were collected from 21 sites across both phases of the SRE invertebrate survey. Locations of potential SRE species recorded can be seen in Figure 4.6.

All specimens were provided to expert Dr Erich S. Volschenk, who identified 10 species from two families within the Project Area: *Isometroides* 'pilbara 1' (family Buthidae), *Lychas* 'pilbara 1' (family Buthidae) *Lychas* 'adonis' (family Buthidae), *Lychas* 'SCO024' (family Buthidae), *Lychas* 'hairy tail complex' (family Buthidae), *Lychas* 'SCO046' (family Buthidae), *Lychas* 'harveyi complex' (family Buthidae), *Lychas* sp. 4 (family Buthidae), *Urodacus* 'pearcei' (family Urodacidae) and Urodacus sp. (family Urodacidae) (pers. comm).

Five species (*Lychas* 'SCO024', *Lychas* 'hairy tail complex', *Lychas* 'SCO046', Lychas sp.4 and *Urodacus* sp.) are considered potential SRE species while the remaining five species are widespread and are unlikely to be SRE species.

Family Buthidae

Isometroides 'pilbara 1'

Five specimens of this species were collected from Mulga Woodland, Drainage Line and Mixed Eucalypt/Mulga Floodplain habitats during the initial survey (*ecologia* 2019). This species was not recorded during the current survey. It is considered widespread in the Pilbara.

Lychas 'pilbara 1'

One specimen of this species was collected during the initial survey within the Stony Spinifex Plains and Hillslopes (*ecologia* 2019). This species was not recorded in the current survey. It is considered widespread in the Pilbara.

Lychas 'adonis'

Three specimens of this species were collected from Drainage Line habitat sites during the current survey. This species was not recorded during the initial survey (*ecologia* 2019) and is considered a widespread species which is found throughout most arid parts of Australia.

Lychas 'SCO024' (formerly identified as *Lychas* 'bitertuberculatus complex')

This scorpion group represents an unresolved complex and a single specimen was sent to the WAM for molecular identification. The specimen is a sister to another undescribed Lychas 'SCO024'. The assumption has been made that all specimens formerly identified as *Lychas* 'bitertuberculatus complex' are the same species as *Lychas* 'SCO024'. Four specimens of *Lychas* 'SCO024' were recorded in the Drainage Line and Rocky Hills during the current survey and one specimen from a Rocky Hills during the initial survey (*ecologia* 2019). Molecular data indicates the presence of multiple species within each group, some of which may be SREs. This species is considered a potential SRE species because of data deficiencies regarding their distribution.

Lychas 'hairy tail complex'

Eight specimens of *Lychas* 'hairy tail complex' were recorded in the Chenopod/Cracking Clay Floodplain, Drainage Line and Rocky Hills during the current survey. This species complex was not recorded during the initial survey (*ecologia* 2019). This scorpion group represents an unresolved complex. Molecular data indicates the presence of multiple species within each group, some of which may be SREs. Further investigations involving comparisons of their DNA sequences would be required for more accurate identification of these specimens. A specimen was sent to the WAM for molecular identification and was unsuccessful due to a contaminated sample. This species is considered a potential SRE species because of data deficiencies regarding their distribution.

Lychas 'SCO046' (formerly identified as *Lychas* 'multipunctatus complex')

This scorpion group represents an unresolved complex and a single specimen was sent to the WAM for molecular identification and falls into a clade known as *Lychas* 'SCO046'. The assumption has been made that all specimens formerly identified as *Lychas* 'multipunctatus complex' are the same species as *Lychas* 'SCO046'.

Three specimens of *Lychas* 'SCO046' were recorded in the Drainage Line habitat type during the current survey and four specimens were recorded in the Calcrete Stony Plain and Mixed Eucalypt/Mulga Floodplain during the initial survey (*ecologia* 2019). This species is considered a potential SRE species because of data deficiencies regarding their distribution.

Lychas 'harveyi complex'

Ten specimens were collected from the Drainage Line and Mulga Woodland during the current survey and five specimens of this species were recorded in the Mulga Woodland, Calcrete Stony Plain, Drainage Line and Mixed Eucalypt/Mulga Floodplain the initial survey (*ecologia* 2019). Although this species represents a complex of at least two species, the distributions of both suspect species is widespread in the Pilbara. Therefore, this species is not considered an SRE.

Lychas sp. 4

Three specimens of *Lychas* sp. 4 were recorded in the Chenopod/Cracking Clay Floodplain during the current survey. This species was described as very unusual by Dr Erich Volschenk (pers. comm) and is referred to as *Lychas* sp. 4 within the context of this report. It appears very similar to *Lychas* 'pilbara1' but differs in the arrangement of diagnostic setae on the metasoma. There is a chance that this is an unusual morphology of *Lychas* 'pilbara1' which is widespread in the Pilbara. The relationship of this species with Lychas sp.4 and Lychas 'pilbara1' should be assessed further by comparing their DNA sequences. Lychas sp.4 is considered a potential SRE owing to data deficiency regarding its taxonomy. This species was not recorded during the initial survey (*ecologia* 2019).

Family Urodacidae

Urodacus 'pearcei'

During the current survey five specimens were collected from the Rocky Hills and Mulga Woodland. Three specimens of this species were recorded in the Stony Spinifex Plains and Hillslopes and Drainage Line during the initial survey (*ecologia* 2019). This species is widespread in the Pilbara and is not considered an SRE.

Urodacus sp.

Three specimens of this genus which were unable to be identified to species level were collected from the Mulga Woodland and Drainage Line during the initial survey (*ecologia* 2019). During the current survey, all five specimens collected from this genus were able to be identified to species level. This genus of scorpions contains many widespread species as well as a few SREs. As most of the

taxonomically informative features are in adult males, it is very difficult to identify adult females and juveniles without molecular investigation. Specimens classified as *Urodacus* sp. in the initial survey were either juveniles or adult females and are considered a potential SRE (*ecologia* 2019).

4.4.5 Pseudoscorpions

A total of 56 pseudoscorpions were recorded from 16 sites during the current survey. A combined total of 75 pseudoscorpions were collected from 20 sites during both survey phases. Locations of potential SRE species recorded can be seen in Figure 4.7.

Seven species, identified by Dr Erich S. Volschenk (pers. comm) include: *Beierolpium* 'PSE173' (family Olpiidae), *Indolpium* sp. (family Olpiidae), *Indolpium* 'PSE175' (family Olpiidae) and *Indolpium* 'PSE174' (family Olpiidae), Genus 7/4 'PSE176' (family Olpiidae), Xenolpium sp. (family Olpiidae) and *Afrosternophorus* sp. (family Sternophoridae). All six species from the Olpiidae family are considered potential SREs due to data deficiencies.
One species (*Afrosternophorus* sp.) is considered widespread in the Pilbara and not considered an SRE.

Family Olpiidae
Beierolpium 'PSE173' (formerly identified as *Beierolpium* '8/3')
In the initial survey (*ecologia* 2019) a single specimen of this species was recorded in the Rocky Hills and one specimen was recorded in the Calcrete Stony Plain during the current survey. A specimen representing this complex was sent to the WAM for molecular identification and this sequence is 17.56% divergent from its nearest congener and represents a newly discovered species. This species is considered a potential SRE species due to data deficiencies regarding its distribution limits.

Indolpium sp.
In the initial survey, a single, juvenile specimen of this species was collected from a Rocky Hills site, however it was unable to be assigned to a morphospecies code (*ecologia* 2019). Seven very small juvenile specimens of *Indolpium* sp. were recorded in the Mulga Woodland and Drainage Line during the current survey, which were unable to be assigned to a morphospecies. This species is considered a potential SRE species due to data deficiencies regarding its identity and distribution limits.

Indolpium 'PSE175' (formerly identified as *Indolpium* sp. 1)
This morphospecies was not recorded in the initial survey (*ecologia* 2019). This species was identified by Dr Erich S. Volschenk as *Indolpium* sp. 1 and a single sample was sent to the WAM and molecular identification indicated that this specimen is 15.57% divergent from its nearest congener and represents a newly discovered species described as *Indolpium* 'PSE175'. The assumption has been made that all species identified as *Indolpium* sp. 2 recorded within the Project Area are *Indolpium* 'PSE174'.

Eight specimens of *Indolpium* 'PSE175' were recorded in the Drainage Line and Rocky Hills during the current survey. An additional seven subadult specimens suspected to be *Indolpium* 'PSE175' were recorded in the Mixed Eucalypt/Mulga Floodplain, Stony Spinifex Plains and Hillslopes, Rocky Hills and Mulga Woodlands. Molecular identification indicated that this specimen is 15.57% divergent from its nearest congener and represents a newly discovered species. This species is considered a potential SRE species due to data deficiencies regarding its distribution limits.

Indolpium 'PSE174' (formerly identified as *Indolpium* sp. 2)
This morphospecies was not recorded in the initial survey (*ecologia* 2019). This species was identified by Dr Erich S. Volschenk as *Indolpium* sp. 2 and a single sample was sent to the WAM and molecular identification indicated that this specimen is 14.96% divergent from its nearest congener and

represents a newly discovered species described as *Indolpium* 'PSE174'. The assumption has been made that all species identified as *Indolpium* sp. 2 recorded within the Project Area are *Indolpium* 'PSE174'.

Seven specimens of *Indolpium* 'PSE174' were recorded in the Mulga Woodland, Rocky Hills, Stony Spinifex Plains and Hillslopes and Mixed Eucalypt/Mulga Floodplain during the current survey. An additional 18 subadult specimens suspected to be *Indolpium* 'PSE174' were recorded at 11 sites and were collected in all habitat types besides the Chenopod/Cracking Clay Floodplain. This species is considered a potential SRE species due to data deficiencies regarding its distribution limits.

Genus 7/4 'PSE176' (formerly identified as Olpiidae sp. 3)

During the current survey, seven specimens of Genus 7/4 'PSE176' were recorded in the Stony Spinifex Plains and Hillslopes, Rocky Hills, Mixed Eucalypt/Mulga Floodplain and Drainage Line habitat types. An additional two subadult specimens suspected to be Genus 7/4 'PSE176' were also recorded in the Drainage Line and Rocky Hills. Molecular identification indicated that this specimen belongs to a clade known as *Genus 7/4* PSE176 and represents a known species. This species is considered a potential SRE species due to data deficiencies regarding its distribution limits.

Xenolpium sp.

In the initial survey, seventeen specimens of this species were recorded within the Rocky Hill habitat (*ecologia* 2019). This species was not collected during the current survey. This species is considered a potential SRE species due to data deficiencies regarding its identity and distribution limits.

Family Sternophoridae

Afrosternophorus sp.

In the current survey, a single, juvenile specimen of this species was collected at a Drainage Line site. Members of this family are poorly known in Western Australia; however, a single widespread species is known from the Pilbara. This species was not collected during the initial survey and is not considered an SRE species (*ecologia* 2019).

4.4.6 Millipedes

A total of 33 individuals were recorded from 12 sites during the current survey, from three different families. Three species, identified by Dr Erich S. Volschenk (pers. comm) include: *Polyxenida* sp. (family Polyxenida), *Polyxenidae* sp. (family Polyxenidae) and *Austrostrophus* sp. (family Trigoniulidae). No millipedes were recorded during the initial survey (*ecologia* 2019). Locations of potential SRE species recorded can be seen in Figure 4.8.

Of these species, Austrostrophus sp. is considered a potential SRE due to data deficiencies and *Polyxenida* sp. and *Polyxenidae* sp. are considered widespread in the Pilbara and are not considered SRE species.

Family Polyxenida

Polyxenida sp.

Twenty-six specimens of this species were recorded in current survey and were recorded in all habitat types besides Chenopod/Cracking Clay. This species was not recorded during the initial survey (*ecologia* 2019). This species is widespread in the Pilbara and is not considered an SRE species.

Family Polyxenidae

Polyxenidae sp.

Four specimens of this species were recorded at a single site in the Rocky Hills during current survey. This species was not recorded in the initial survey (*ecologia* 2019), is widespread in the Pilbara and is not considered an SRE species.

Family Trigoniulidae

Austrostrophus sp.

Three specimens of this species were recorded in the Rocky Hills and Mulga Woodland during the current survey. This species was not recorded in the initial survey (*ecologia* 2019). This species is considered a potential SRE, however further molecular investigation is required to resolve the taxonomic identity of this species.

4.4.7 Land Snails

During the current survey, a total of 48 specimens were collected from seven sites, belonging to five families. Five species, identified by Dr Erich S. Volschenk (pers. comm) include: *Rhagada radleyi (*family Camaenidae), *Pupillidae* sp. (family Pupillidae), *Eremopeas interioris (*family Subulinidae), *Austrosuccinea* sp. (family Succineidae) and *Physa* sp. (family Physidae). No snail specimens were collected during the initial survey (*ecologia* 2019).

One species, *Austrosuccinea* sp., is considered an SRE on the basis of data deficiencies while the remaining four species are widespread in the Pilbara and are not considered SRE species.

Family Camaenidae

Rhagada radleyi

Twenty-one individuals were collected during the current survey. Of the specimens collected, only a single fresh shell was present, and all remaining specimens were dead shells. All individuals were collected from sites within the Calcrete Stony Plain habitat type. This species is widespread in the Pilbara and is not considered to be an SRE species.

Family Pupillidae

Pupillidae sp.

Eighteen specimens of this species were collected during the current survey from the Stony Spinifex Plains and Hillslopes and Calcrete Stony Plain. This species is widespread in the Pilbara and is not considered to be an SRE species.

Family Subulinidae

Eremopeas interioris

A single specimen of this species was collected from a Mulga Woodland site during the current survey and is widespread in the Pilbara. It is not considered to be an SRE species.

Family Succineidae

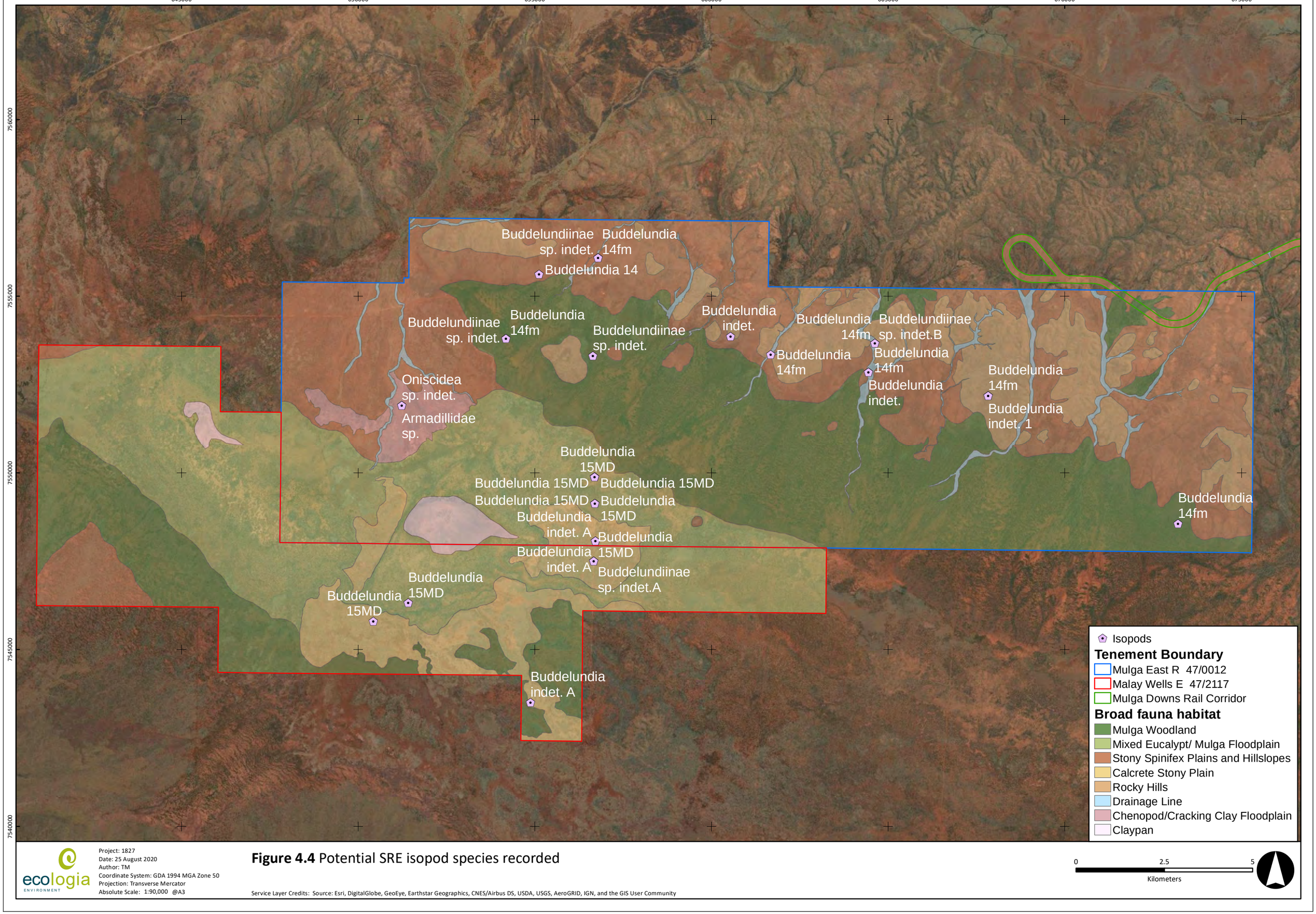
Austrosuccinea sp.

A single *Austrosuccinea* sp. shell from this species collected during the current survey was found in the Calcrete Stony Plain. This species is a potential SRE species; however, the only specimen collected was a long dead shell and it is unlikely that DNA sequences will be able to be obtained from this specimen, making further molecular investigation impossible.

Family Physidae

Physa sp.

Seven specimens were collected in the Rocky Hills during the current survey. This is an aquatic species and specimens may have been washed into the Project Area during a flooding event. This species is considered widespread and is an introduced species in Australia.



ecologia ENVIRONMENT

Project: 1827
Date: 25 August 2020
Author: TM
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:90,000 @A3

Figure 4.4 Potential SRE isopod species recorded

645000 650000 655000 660000 665000 670000 675000

7560000 7555000 7550000 7545000 7540000

Dampetrus
OPI001

Conothele
MYG716

Taxon
- Dampetrus OPI001
- Conothele MYG716

Tenement Boundary
- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor

Broad fauna habitat
- Mulga Woodland
- Mixed Eucalypt/ Mulga Floodplain
- Stony Spinifex Plains and Hillslopes
- Calcrete Stony Plain
- Rocky Hills
- Drainage Line
- Chenopod/ Cracking Clay Floodplain
- Claypan

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Projection: Transverse Mercator
Absolute Scale: 1:90,000 @A3

Figure 4.5 Potential SRE spider and harvestman species recorded

0 2.5 5
Kilometers

645000 650000 655000 660000 665000 670000 675000

7560000 7555000 7550000 7545000 7540000

Lychas 'hairy tail complex'
Lychas SCO024
Lychas 'hairy tail complex'
Urodacus sp.
Urodacus sp.
Lychas 'hairy tail complex'
Lychas SCO024
Lychas SCO024
Lychas 'hairy tail complex'
Lychas SCO046
Urodacus sp.
Lychas SCO024
Lychas SCO024
Lychas 'hairy tail complex'
Lychas sp. 4
Lychas sp. 4
Lychas SCO046
Lychas SCO046
Lychas SCO046
Lychas SCO046

Scorpions

Tenement Boundary
- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor

Broad fauna habitat
- Mulga Woodland
- Mixed Eucalypt/ Mulga Floodplain
- Stony Spinifex Plains and Hillslopes
- Calcrete Stony Plain
- Rocky Hills
- Drainage Line
- Chenopod/ Cracking Clay Floodplain
- Claypan

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Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:90,000 @A3

Figure 4.6 Potential SRE scorpion species recorded

0 2.5 5
Kilometers

645000 650000 655000 660000 665000 670000 675000

7560000 7555000 7550000 7545000 7540000

Genus 7/4 PSE176
Genus 7/4 PSE176
Xenolpium sp.
Xenolpium sp.
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE175
Indolpium PSE175
Genus 7/4 PSE176
Xenolpium sp.
indolpium sp.
Xenolpium sp.
Xenolpium sp.
Xenolpium sp.
Indolpium PSE174
Indolpium PSE174
Indolpium PSE175
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Indolpium PSE174
Beierolpium PSE173
Indolpium PSE175
Indolpium PSE175
Indolpium PSE174
Indolpium PSE174

Pseudoscorpions

Tenement Boundary

- Mulga East R 47/0012
- Malay Wells E 47/2117
- Mulga Downs Rail Corridor

Broad fauna habitat

- Mulga Woodland
- Mixed Eucalypt/ Mulga Floodplain
- Stony Spinifex Plains and Hillslopes
- Calcrete Stony Plain
- Rocky Hills
- Drainage Line
- Chenopod/ Cracking Clay Floodplain
- Claypan

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Figure 4.7 Potential SRE pseudoscorpion species recorded

0 2.5 5
Kilometers

645000 650000 655000 660000 665000 670000 675000

7560000 7555000 7550000 7545000 7540000

Austrostrophus sp.

Austrostrophus sp.

Austrostrophus sp.

Austrosuccinea sp.

Millipedes

Tenement Boundary

Mulga East R 47/0012

Malay Wells E 47/2117

Mulga Downs Rail Corridor

Broad fauna habitat

Mulga Woodland

Mixed Eucalypt/ Mulga Floodplain

Stony Spinifex Plains and Hillslopes

Calcrete Stony Plain

Rocky Hills

Drainage Line

Chenopod/Cracking Clay Floodplain

Claypan

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Projection: Transverse Mercator
Absolute Scale: 1:90,000 @A3

Figure 4.4 Potential SRE millipede species recorded

0 2.5 5
Kilometers

5 DISCUSSION

5.1 SRE INVERTEBRATE HABITAT

Eight broad fauna habitat types were identified within the Project Area: Mixed Eucalypt/Mulga Floodplain, Calcrete Stony Plain, Stony Spinifex Plains and Hillslopes, Rocky Hills, Drainage Line, Mulga Woodland, Chenopod/Cracking Clay Floodplain and Claypan habitat types. Aside from the Claypan (PEC) and Chenopod/Cracking Clay Floodplain habitat types, the remaining habitats identified are not restricted to the Project Area and are considered widespread at both local and regional scales.

Isopod and scorpion specimens from SRE groups targeted during the SRE surveys were collected from all habitat types surveyed. Pseudoscorpions and millipede specimens from SRE target groups were collected from all habitat types besides the Chenopod/Cracking Clay Floodplains. Spider specimens from SRE target groups were collected from all habitat types besides the Rocky Hills and Chenopod/Cracking Clay Floodplains. Land snail specimens were only collected from Calcrete Stony Plain, Rocky Hills, Mulga Woodland and Stony Spinifex Plains and Hillslopes habitat types. A single harvestman specimen was collected from the Rocky Hills. The results of the current survey indicate that target SRE groups collected during this survey utilise a range of different habitat types within the Project Area, with some species exhibiting higher levels of dispersal between habitats than others.

Habitat preferences for target SRE groups within the Project Area were highly variable, with different invertebrate groups exhibiting habitat preferences likely to be associated with differences in microhabitat requirements. The greatest diversity of isopods (four species) and terrestrial snails (three species) was recorded in Calcrete Stony Plains, Drainage Lines were found to support the greatest diversity of scorpions (eight species), the Rocky Hills provided the greatest diversity of pseudoscorpions (six species) and millipedes (three species) and the Mulga Woodland habitat yielded the most spider species (three species). The Drainage Line habitat type was found to yield the largest number of species from target SRE invertebrate groups, whilst the Rocky Hills habitat type yielded the largest number of potential SRE species.

Based on the number of potential SRE invertebrate species and diversity of SRE target groups collected within each habitat type across both survey phases, habitat suitability rankings provided in Table 4.3 have been revised and post-survey SRE suitability rankings are provided in Table 5.1.

A summary of invertebrates recorded from target SRE groups and their capture habitat type can be seen in Table 5.2. Potential SRE species were recorded in all habitat types (apart from Claypans) and Rocky Hills (15 species) were found to be most conducive for short-range endemism within the Project Area. Drainage Lines recorded 11 potential SRE species followed by Mulga Woodland (nine potential SRE species), Calcrete Stony Plain (8 potential SRE species) and Mixed Eucalypt/Mulga Floodplain (5 potential SRE species). The Chenopod/Cracking Clay Floodplain and Stony Spinifex Plains and Hillslopes habitat types were found to be the least conducive habitat type for short-range endemism, with four potential SRE species recorded in each of these habitats across both phases of the survey.

Table 5.1 Post-survey SRE suitability rankings

Broad habitat type	Post-survey SRE suitability ranking
Drainage Line	4 - Moderate/ High
Calcrete Stony Plain	3 - Moderate
Rocky Hills	5 - High
Mulga Woodland	3 - Moderate
Chenopod/Cracking Clay Floodplain	1 - Low
Stony Spinifex Plains and Hillslopes	1 - Low
Mixed Eucalypt/Mulga Floodplain	1 - Low
Claypan	1 - Low

Table 5.2 Species by habitat type matrix.

Broad Invertebrate Species Group	Survey Phase	Broad Habitat Type							
		Drainage Line	Calcrete Stony Plain	Rocky Hills	Mulga Woodland	Chenopod/Cracking Clay Floodplain	Stony Spinifex Plains and Hillslopes	Mixed Eucalypt/ Mulga Floodplain	Claypan
Isopods	**Phase 1 (initial)**	None	•*Buddelundia* 10BF* •*Buddelundia 15MD** •*Buddelundiinae sp. indet. A**	None	•*Buddelundiinae* sp. indet. *	None	•*Buddelundia* 14FM*	•*Buddelundia* 15MD*	No sites
	Phase 2 (current)	•*Buddelundia* 14FM* •*Buddelundia* 56** •*Buddelundiinae* sp. indet. *	•*Buddelundia* 15MD*	•*Buddelundia* 14FM* •*Buddelundia* sp. indet. 1* •*Buddelundiinae* sp. indet. B*	•*Buddelundia* 14FM* •*Buddelundiinae* sp. indet. *	•*Buddelundia* 56* •*Oniscidea* sp. indet*	None	None	No sites
Spiders	**Phase 1**	•*Aname mellosa*	•*Aname mellosa* •*Synothele* 'MYG127'	None	•*Aname mellosa* •*Gaius tealei*	None	•*Aname mellosa* •*Synothele* 'MYG127'	•*Synothele* 'MYG127'	No sites
	Phase 2	None	•*Aname mellosa* •*Synothele* 'MYG127'	None	•*Gaius tealei* •*Conothele 'MYG716'**	None	None	None	No sites
Harvestman	**Phase 1**	None	None	None	None	None	None	None	No sites
	Phase 2	None	None	•*Dampetrus* OPI001*	None	None	None	None	No sites
Scorpions	**Phase 1**	•*Isometroides* 'pilbara 1' •*Lychas* 'harveyi complex' •*Urodacus* 'pearcei' •*Urodacus* sp.*	• *Lychas* 'SCO046'* •*Lychas* 'harveyi complex'	• *Lychas* 'SCO024'*	•*Isometroides* 'pilbara 1' •*Lychas* 'harveyi complex' •*Urodacus* sp.*	None	•*Lychas* 'pilbara 1' •*Urodacus* 'pearcei'	•*Isometroides* 'pilbara 1' • *Lychas* 'SCO046'* •*Lychas* 'harveyi complex'	No sites
	Phase 2	•*Lychas 'adonis'* •*Lychas* 'SCO024'* •*Lychas* 'hairy tail complex'* •*Lychas* 'SCO046'* •*Lychas* 'harveyi complex'	None	• *Lychas* 'SCO024'* •*Lychas* 'hairy tail complex'* •*Urodacus* 'pearcei'	•*Lychas* 'harveyi complex' •*Urodacus* 'pearcei'	•*Lychas* 'hairy tail complex'* •*Lychas* sp. 4*	None	None	No sites
Pseudoscorpions	**Phase 1**	None	None	•*Beierolpium* 'PSE173'* •*Indolpium* sp.* •*Xenolpium* sp.*	None	None	None	None	No sites
	Phase 2	•*Indolpium* sp.* •*Indolpium* 'PSE175'* • *Indolpium* 'PSE174'* •*Genus 7/4* 'PSE176'* •*Afrosternophorus* sp.	• *Beierolpium* 'PSE173'* • *Indolpium* 'PSE174'*	• *Indolpium* 'PSE175'* • *Indolpium* 'PSE174'* • *Genus 7/4* 'PSE176'*	•*Indolpium* sp.* • *Indolpium* 'PSE175'* • *Indolpium* 'PSE174'*	None	• *Indolpium* 'PSE175'* • *Indolpium* 'PSE174'* • *Genus 7/4* 'PSE176'*	• *Indolpium* 'PSE175'* • *Indolpium* 'PSE174'* • *Genus 7/4* 'PSE176'*	No sites
Millipedes	**Phase 1**	None	None	None	None	None	None	None	No sites
	Phase 2	•*Polyxenida* sp.	•*Polyxenida* sp.	•*Polyxenida* sp. •*Polyxenidae* sp. •*Austrostrophus* sp.*	•*Polyxenida* sp. •*Austrostrophus* sp.*	None	•*Polyxenida* sp.	•*Polyxenida* sp.	No sites
Land Snails	**Phase 1**	None	None	None	None	None	None	None	No sites
	Phase 2	None	•*Rhagada radleyi* •*Pupillidae sp.* •*Austrosuccinea sp.**	•*Physa* sp.	•*Eremopeas interioris*	None	•*Pupillidae* sp.	None	No sites
Total number of species from representative SRE groups		**19 (11 SRE/Potential SRE)**	**16 (8 potential SRE)**	**18 (15 potential SRE species)**	**18 (9 potential SRE species)**	**4 (4 potential SRE species)**	**10 (4 potential SRE species)**	**9 (5 potential SRE species)**	**0**

* denotes a potential SRE species, ** denotes a known SRE species

5.2 FIELD SURVEY

A total of 2040 trap nights and 8640 minutes of hand foraging was conducted at 52 sites within the Project Area across both phases of the SRE surveys (*ecologia* 2019). Results from the initial SRE survey (*ecologia* 2019) were used to identify and address data gaps from the first phase of the survey and informed site selection for dry pitfall trap sites deployed during the current survey. This ensured all habitat types within the Project Area with the potential to support SRE invertebrate species were comprehensively sampled. The Calcrete Stony Plain, Rocky Hills, Mixed Eucalypt/Mulga Floodplains and Mulga Woodland habitat types were found to be most productive during the initial survey (*ecologia* 2019) and were sampled intensively during the current survey, resulting in a threefold increase in the number of invertebrate specimens collected from target SRE invertebrate groups.

5.3 SRE INVERTEBRATE FAUNA RECORDED

Invertebrate specimens were collected from seven target SRE groups including: isopods, spiders, harvestmen, scorpions, pseudoscorpions, millipedes and land snails. Of the specimens obtained across both phases of the survey, a single isopod species collected within the Project Area during the current survey was considered a definite SRE species by Dr Simon Judd (pers. comm) and 23 species were considered potential SRE species (Appendix E). The 23 potential SRE species recorded within the Project Area were comprised of: eight isopods, one spider, one harvestman, five pseudoscorpions, one millipede and one terrestrial snail.

5.3.1 Isopods

Isopod specimens from two families, comprising nine species, were obtained across both phases of the survey. Of these, eight species (*Buddelundia* 10BF, Buddelundia 14FM, Buddelundia 15MD, *Buddelundia* sp. indet. 1, Buddelundiinae sp. indet. A, Buddelundiinae sp. indet. B, Buddelundiinae sp. indet. and *Oniscidea* sp. indet.) were classified as potential SREs and one species (*Buddelundia* 56) was considered an obvious SRE by Dr Simon Judd (pers. comm). *Buddelundia* 14FM was the most widespread isopod species recorded during this survey (four habitat types), indicating that dispersal of this species within the Project Area is less restricted than expected for a potential SRE species. The Calcrete Stony Plain habitat type was found to be the most conducive for potential SREs, which may be due to the presence of calcium carbonate-rich substrates which are used by isopods to build their hard cuticles (Zimmer 2002). Potential SRE species were found across all habitats within the Project Area besides from the Claypan, suggesting that this group of invertebrates occupies a diverse range of habitats.

5.3.2 Spiders

Spider specimens from four families, comprising four species, were collected across both phases of the survey. Of these, only one species (*Conothele* MYG716) collected during the current survey is considered a potential SRE. *Synothele* 'MYG127' was recorded within the Project Area during both phases of the survey and has been previously recorded outside of the Project Area (Table 4.2). This species is known to be widespread across the Pilbara and is not considered to be an SRE species. *Aname mellosa* was also recorded during this survey; however, this species has been recorded within 40km of the study area and is not considered to be an SRE species by Dr Volker Framenau (pers. comm).

Conothele MYG716 was recorded within a single habitat during this survey, indicating that the distribution of this species within the Project Area is likely to be restricted. This species was only recorded in the Mulga Woodland, suggesting that soils within this habitat type are favourable for burrowing. Mulga Woodlands are not a restricted habitat type and it is likely that this species is found outside of the Project Area. The collection of two other (widespread) trapdoor spider species (*Aname mellosa* and *Gaius tealei*) from within the Mulga Woodland during this survey supports this finding.

5.3.3 Harvestmen

A single species of harvestman was collected during the current survey. This newly discovered species was identified as *Dampetrus* OPI001 and was only recorded in the Rocky Hills, indicating that the distribution of this species within the Project Area is likely to be restricted to habitats containing protection from fire, boulders and crevices. Although this habitat type is considered common on a local and regional scale, species in the Dampetrus genus are known from only isolated locations.

5.3.4 Scorpions

Scorpion specimens from two families, comprising ten species, were collected across both survey phases. Of these, five species (*Lychas SCO024*, *Lychas* 'hairy tail complex', *Lychas* SCO046, *Lychas* sp. 4 and *Urodacus* sp.) were considered potential SREs. *Lychas* 'harveyi complex' and *Urodacus* 'pearcei' were found to be widespread throughout the Project Area and were recorded in four habitats each, demonstrating the capacity of these species to disperse between different habitat types. This finding is supported by Dr Erich S. Volschenk (pers. comm), who reports that both species are known to be widespread throughout the Pilbara in addition to being widespread within the Project Area. Drainage Lines were found to be the most suitable habitat for SRE scorpions within the Project Area, with four potential SRE species recorded within this habitat type. This habitat type encompasses large volumes of dense, variable leaf litter, rocky substrates and deep substrates which provide shelter for SRE species and the arthropod species they prey upon. SRE species were collected from all habitat types besides from the Claypan and Stony Spinifex Plains and Hillslopes, indicating that this invertebrate group can occupy a range of habitat types and may be prone to short-range endemism.

5.3.5 Pseudoscorpions

Pseudoscorpions from two families, comprising seven species, were collected across both phases of the survey. Of these all six species within the Olpiidae family (*Beierolpium* PSE173, *Indolpium* sp., *Indolpium* PSE175 and *Indolpium* PSE174, Genus 7/4 PSE176 and Xenolpium sp.) are considered potential SREs due to data deficiencies. *Indolpium* PSE174 (six habitat types) and *Indolpium* PSE175 were recorded in five habitat types during the survey, indicating that dispersal of these species between different habitats within the Project Area is higher than anticipated for a potential SRE species and it is considered likely that these species will be found outside of the Project Area.

SRE species were collected from all habitat types besides Claypan and Chenopod/Cracking Clay, indicating that this group of invertebrates is capable of occupying microhabitats across a wide range of habitats and may be prone to short-range endemism.

The Rocky Hills (6 potential SRE species) and Drainage Lines (4 potential SRE species) provided the greatest diversity of SRE pseudoscorpion species, indicating that these habitat types contain important microhabitats and refugia and may promote short-range endemism in pseudoscorpions. Rocky Hills and Drainage Lines typically exhibit moderate to high levels of leaf litter and detritus as well as *Eucalyptus* species, which are known niches for this target group.

5.3.6 Millipedes

Millipede specimens from three families, comprising three species, were collected during the current survey. Only one species (*Austrostophus* sp.) was identified as a potential SRE, due to data deficiencies. The *Polyxenida* sp. recorded during the survey was found within all habitats besides the Claypan and Chenopod/Cracking Clay Floodplain, demonstrating the capacity of this species to disperse between different habitat types within the Project Area. This finding is supported by Dr Erich Volschenk (pers. comm) who reports this species as widespread across the Pilbara. Although millipede specimens were obtained from all habitat types besides Chenopod/Cracking Clay Floodplains and Claypans, *Austrostophus* sp. was only collected in two habitat types (Mulga Woodlands and Rocky Hills),

indicating that this species has a lower capacity for dispersal than the widespread *Polyxenida* sp. recorded during this survey.

5.3.7 Land Snails

Land snail specimens from five families, comprising five species, were collected during the current survey. Of these, only a single species (*Austrosuccinea* sp.) was considered a potential SRE. *Austrosuccinea* sp. was only recorded in a single habitat type (Calcrete Stony Plain) within the Project Area, demonstrating the low dispersal capabilities of this species. The Calcrete Stony Plains provided the greatest diversity of terrestrial snail species (three species), which may be associated with the presence of calcium carbonate-rich soils which are an important resource used by terrestrial snails for shell growth and repairs (CADÉE 1999).

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7 APPENDICES

APPENDIX A DEFINITIONS

Significant Terrestrial Fauna

According to EPA Factor Guideline: Terrestrial Fauna (Environmental Protection Authority 2016a), terrestrial fauna may be considered significant for a number of reasons including, but not restricted to:

- Being identified as a Threatened or Priority species;
- Species with restricted distribution;
- Degree of historical impact from threatening processes; and
- Providing an important function required to maintain the ecological integrity of a significant ecosystem.

Additionally, as described in EPA Guidance (Environmental Protection Authority 2016c) terrestrial fauna may be considered significant for the following reasons:

- Species is protected by international agreement or treaty (i.e. migratory fauna);
- Species is a short-range endemic;
- Species has declining populations or distribution;
- Species is at the extreme of its range, or is part of an outlying population; and
- Species is undescribed.

Fauna habitats may be significant if they provide habitat important to the life history of a significant species, i.e. breeding, feeding and roosting or aggregation areas, or where they are unique or isolated habitats, for example wetlands, in the landscape or region (Environmental Protection Authority 2016c).

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia)

At the Commonwealth level, Threatened Fauna are protected under Section 178 of the EPBC Act, which may list species as: extinct, extinct in the wild, critically endangered, endangered, vulnerable, and conservation dependent. In addition, under sections 209 and 248 of the Act, some migratory and marine species are protected under international agreements. EPBC Act conservation code definitions can be found in below.

Biodiversity Conservation Act 2016 (Western Australia)

At a state level, fauna species are protected under the BC Act. Threatened, Extinct and Specially Protected fauna are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such. BC Act conservation code definitions can be found below.

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna. Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act* 2016 (BC Act).

Specially protected fauna under section 13(1) of the BC Act are species that meet one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Priority Fauna (DBCA)

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna. Species that are adequately known, are rare but not threatened, or

meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations. Priority conservation code definitions can be found below.

Threatened Fauna Categories (EPBC Act)

Code	Definition
EX	**Extinct** Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
EW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CR	**Critically Endangered** Taxa which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation programme, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Threatened Fauna Categories (BC Act)

Category	Code	Definition	Schedule
Critically Endangered	CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines." Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.	**Schedule 1**
Endangered	EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.	**Schedule 2**
Vulnerable	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.	**Schedule 3**
Extinct species	EX	Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for extinct fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.	**Schedule 4**

Category	Code	Definition	Schedule
Extinct in the wild species	EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).	Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Migratory	MI	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.	**Schedule 5**
Species of special conservation interest (conservation dependent fauna)	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.	**Schedule 6**
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.	**Schedule 7**

Definition of codes for Priority Fauna (BC Act)

Code	Definition
P1: Priority One	**Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2: Priority Two	**Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3: Priority Three	**Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4: Priority Four	**Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

APPENDIX B EPBC PROTECTED MATTERS SEARCH TOOL (40 KM BUFFER)

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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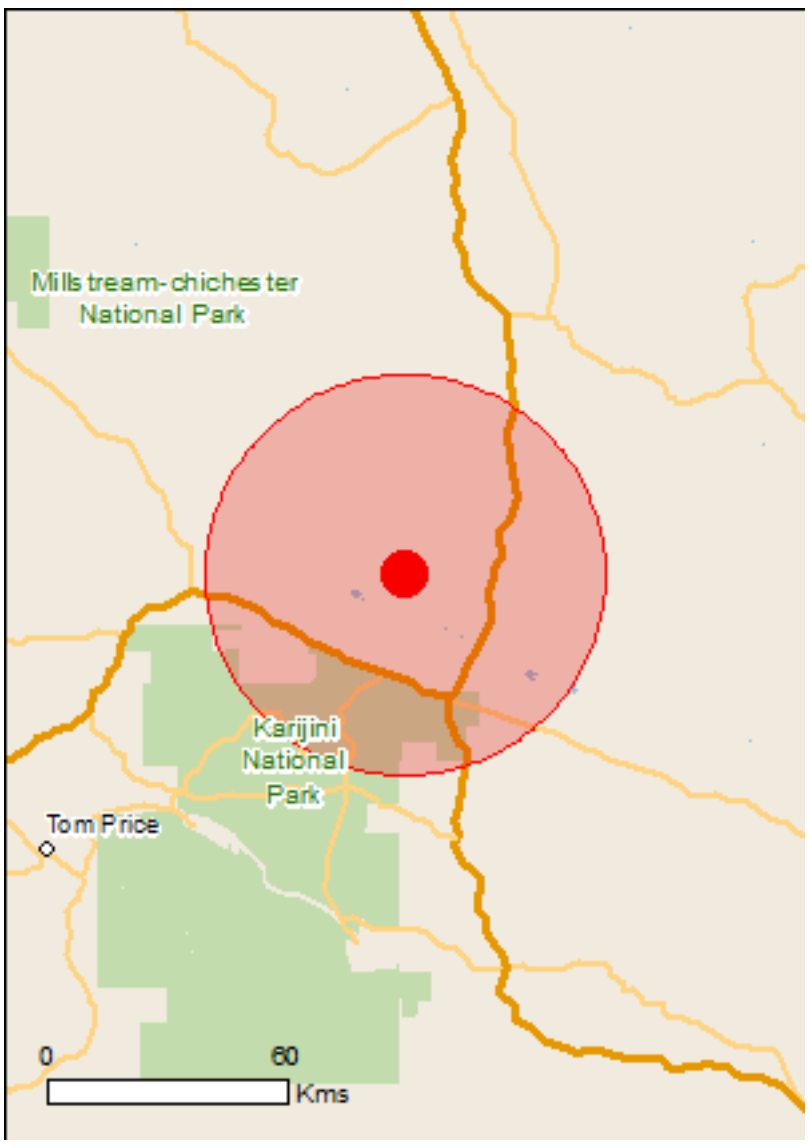

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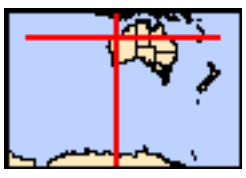

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	8
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	9
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis		
Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus		
Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas		
Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis		
Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form)		
Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Liasis olivaceus barroni		
Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Karijini	WA
Mungaroona Range	WA

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Fortescue Marshes	WA
Karijini (Hamersley Range) Gorges	WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-22.11935 118.59046

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX C SRE INVERTEBRATE RESULTS

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200157	Arachnida	Acari	Acari^	Acari	sp.	Acari sp.	NT	non-target	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200479	Arachnida	Acari	Acari^	Acari	sp.	Acari sp.	NT	non-target	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		40348	Arachnida	Araneae	Barychelidae	Synothele	`MYG127`	Synothele `MYG127`		Widespread	Calcrete Stony Plain	MDS02	656669.3044	7547514.805	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40349	Arachnida	Araneae	Barychelidae	Synothele	`MYG127`	Synothele `MYG127`		Widespread	Mixed Eucalypt/Mulga Floodplain	MDS06	656699.0174	7549133.681	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40350	Arachnida	Araneae	Barychelidae	Synothele	`MYG127`	Synothele `MYG127`		Widespread	Stony Spinifex Plains and Hillslopes	MDS07	655123.5642	7555618.64	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40352	Arachnida	Araneae	Barychelidae	Synothele	`MYG127`	Synothele `MYG127`		Widespread	Mulga Woodland	MDS16	656652.2397	7553319.51	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40353	Arachnida	Araneae	Barychelidae	Synothele	`MYG127`	Synothele `MYG127`		Widespread	Mulga Woodland	MDS16	656652.2397	7553319.51	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40354	Arachnida	Araneae	Barychelidae	Synothele	`MYG127`	Synothele `MYG127`		Widespread	Mulga Woodland	MDS16	656652.2397	7553319.51	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40351	Arachnida	Araneae	Barychelidae	Synothele	`MYG127`	Synothele `MYG127`		Widespread	Mulga Woodland	MDS18	667321.5257	7550246.175	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2		HBI N18397-2	Arachnida	Araneae	Barychelidae	Synothele	`MYG127`	Synothele `MYG127`		Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		40330	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Calcrete Stony Plain	MDS02	656669.3044	7547514.805	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40331	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Calcrete Stony Plain	MDS02	656669.3044	7547514.805	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40332	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Calcrete Stony Plain	MDS02	656669.3044	7547514.805	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40333	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Calcrete Stony Plain	MDS04	656714.1845	7548082.719	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40334	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Calcrete Stony Plain	MDS04	656714.1845	7548082.719	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40335	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Stony Spinifex Plains and Hillslopes	MDS07	655123.5642	7555618.64	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40336	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Stony Spinifex Plains and Hillslopes	MDS07	655123.5642	7555618.64	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40337	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Stony Spinifex Plains and Hillslopes	MDS07	655123.5642	7555618.64	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40347	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Stony Spinifex Plains and Hillslopes	MDS07	655123.5642	7555618.64	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40338	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Stony Spinifex Plains and Hillslopes	MDS08	656614.1597	7556588.43	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40339	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Stony Spinifex Plains and Hillslopes	MDS08	656614.1597	7556588.43	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40340	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Stony Spinifex Plains and Hillslopes	MDS08	656614.1597	7556588.43	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40341	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Drainage Line	MDS11	661398.7511	7553022.82	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40342	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Drainage Line	MDS12	669148.6868	7553903.235	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 1		40343	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Drainage Line	MDS13	664432.7127	7552211.555	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40344	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Stony Spinifex Plains and Hillslopes	MDS14	665278.2624	7551455.562	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		40329	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Mulga Woodland	MDS16	656652.2397	7553319.51	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2		HBI N18397-1	Arachnida	Araneae	Anamidae	Aname	mellosa	Aname mellosa Harvey, Framenau et al. 2012		Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	WAMT151329	HBI N18402-5	Arachnida	Araneae	Halonoproctidae	Conothele	MYG716	Conothele MYG716	Molecular identification completed, originally identified as Conothele HBI N18402-5	Potential SRE: DD	mulga woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	dry pitfall trap
Phase 1		40328	Arachnida	Araneae	Idiopidae	Gaius	tealei	Gaius tealei Rix, Raven & Harvey, 2018		Widespread	Mulga Woodland	MDS17	659944.6451	7552718.922	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		40327	Arachnida	Araneae	Idiopidae	Gaius	tealei	Gaius tealei Rix, Raven & Harvey, 2018		Widespread	Mulga Woodland	SRE Mulga 1	669279.9284	7549955.067	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 2		HBI N18398-1	Arachnida	Araneae	Idiopidae	Gaius	tealei	Gaius tealei Rix, Raven & Harvey, 2018		Widespread	Mulga Woodlands	MDF005	654185.357	7553795.7	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Burrow excavation
Phase 2	NA	AES200365	Insecta	Coleoptera	Coleoptera^	Coleoptera	sp.	Coleoptera sp.	NT	non-target	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200158	Collembola	Collembola^	Collembola^	Collembola	sp.	Collembola sp.	NT	Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200165	Insecta	Diptera	Diptera^	Diptera	sp.	Diptera sp.	NT	non-target	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200381	Gastropoda	Eupulmonata	Subulinidae	Eremopeas	interioris	Eremopeas interioris		Widespread	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200664	Gastropoda	Eupulmonata	Camaenidae	Rhagada	radleyi	Rhagada radleyi	new shell	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200667	Gastropoda	Eupulmonata	Camaenidae	Rhagada	radleyi	Rhagada radleyi	old shells	Widespread	Calcrete Stony Plain	MDF011	656627.7211	7547852.281	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200668	Gastropoda	Eupulmonata	Camaenidae	Rhagada	radleyi	Rhagada radleyi	old shells	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200669	Gastropoda	Eupulmonata	Camaenidae	Rhagada	radleyi	Rhagada radleyi	old shells	Widespread	Calcrete Stony Plain	MDF009	652586.3693	7544572.973	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200670	Gastropoda	Eupulmonata	Camaenidae	Rhagada	radleyi	Rhagada radleyi	old shells	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200671	Gastropoda	Eupulmonata	Camaenidae	Rhagada	radleyi	Rhagada radleyi	old shells	Widespread	Calcrete Stony Plain	MDF003	650429.7594	7545801.992	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200482	Gastropoda	Eupulmonata	Succineidae	Austrosuccinea	sp.	Austrosuccinea sp.		Potential SRE: DD	Calcrete Stony Plain	MDF003	650429.7594	7545801.992	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200160	Gastropoda	Eupulmonata	Pupillidae	Pupillidae	sp.	Pupillidae sp.		Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200460	Gastropoda	Eupulmonata	Pupillidae	Pupillidae	sp.	Pupillidae sp.		Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200462	Gastropoda	Eupulmonata	Pupillidae	Pupillidae	sp.	Pupillidae sp.		Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200659	Gastropoda	Eupulmonata	Pupillidae	Pupillidae	sp.	Pupillidae sp.		Widespread	Calcrete Stony Plain	MDF011	656627.7211	7547852.281	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200184	Insecta	Hemiptera	Hemiptera^	Hemiptera	sp.	Hemiptera sp.	NT	non-target	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200262	Insecta	Hemiptera	Hemiptera^	Hemiptera	sp.	Hemiptera sp.	NT	non-target	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		SJ5451	Malacostraca	Isopoda	Armadillidae	Buddelundia	14	Buddelundia 14		Potential SRE: DD	Stony Spinifex Plain	MDS07	655123.5642	7555618.64	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2		SJ5656	Malacostraca	Isopoda	Armadillidae	Buddelundia	56	Buddelundia 56	Good specimens. Males females and juveniles	Likely SRE	Chenopod cracking clay floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		SJ5657	Malacostraca	Isopoda	Armadillidae	Buddelundia	56	Buddelundia 56	8 males, 6 females	Likely SRE	Drainage line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		DISCARD	Malacostraca	Isopoda	Armadillidae	Buddelundia	14fm	Buddelundia 14fm	1 juvenile, poor condition	Potential SRE: DD	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		SJ5658	Malacostraca	Isopoda	Armadillidae	Buddelundia	14fm	Buddelundia 14fm	13 males, 22 females, 1 juvenile	Potential SRE: DD	Drainage line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		SJ5661	Malacostraca	Isopoda	Armadillidae	Buddelundia	14fm	Buddelundia 14fm	3 males, 3 females	Potential SRE: DD	Drainage line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		SJ5662	Malacostraca	Isopoda	Armadillidae	Buddelundia	14fm	Buddelundia 14fm	1 male, 1 juvenile	Potential SRE: DD	Mulga Woodland	MDF005	654185.357	7553795.7	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Burrow excavation
Phase 2		SJ5664	Malacostraca	Isopoda	Armadillidae	Buddelundia	14fm	Buddelundia 14fm	2 males, 2 females	Potential SRE: DD	Rocky Hill - south facing slope	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		SJ5666	Malacostraca	Isopoda	Armadillidae	Buddelundia	14fm	Buddelundia 14fm	1 female, 1 juvenile	Potential SRE: DD	Rocky Hill - south facing slope	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		SJ5668	Malacostraca	Isopoda	Armadillidae	Buddelundia	14fm	Buddelundia 14fm	1 male, 1 female	Potential SRE: DD	Drainage line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		SJ5439	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Mixed Eucalypt/Mulga Floodplain	MDS01	656693.0981	7549882.47	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5440	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Mixed Eucalypt/Mulga Floodplain	MDS01	656693.0981	7549882.47	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5441	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Mixed Eucalypt/Mulga Floodplain	MDS01	656693.0981	7549882.47	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		Discarded	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Mixed Eucalypt/Mulga Floodplain	MDS01	656693.0981	7549882.47	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5442	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Mixed Eucalypt/Mulga Floodplain	MDS01	656693.0981	7549882.47	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5443	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Calcrete stony plain	MDS02	656669.3044	7547514.805	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5448	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Calcrete stony plain	MDS05	651421.3392	7546322.248	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5449	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Mixed Eucalypt/Mulga Floodplain	MDS06	656699.0174	7549133.681	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5450	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD		Potential SRE: DD	Mixed Eucalypt/Mulga Floodplain	MDS06	656699.0174	7549133.681	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2		SJ5660	Malacostraca	Isopoda	Armadillidae	Buddelundia	15MD	Buddelundia 15MD	3 males, 1 juvenile female	Potential SRE: DD	Calcrete Stony Plain, Under spinifex	MDF003	650429.7594	7545801.992	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Hand Collected

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 1		SJ5453	Malacostraca	Isopoda	Armadillidae	indet.	Buddelundiinae sp. indet.	Buddelundiinae sp. indet.		Potential SRE: DD	Mulga Woodland	MDS16	656652.2397	7553319.51	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2		DISCARD	Malacostraca	Isopoda	Armadillidae	indet.	Buddelundiinae sp. indet.	Buddelundiinae sp. indet.	1 female, poor condition	Potential SRE: DD	Drainage line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		SJ5663	Malacostraca	Isopoda	Armadillidae	indet.	Buddelundiinae sp. indet.	Buddelundiinae sp. indet.	1 female, slightly damaged dorsum Pe7. Juvenile?	Potential SRE: DD	Mulga Woodland	MDF005	654185.357	7553795.7	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Burrow excavation
Phase 1		SJ5444	Malacostraca	Isopoda	Armadillidae	indet.	Buddelundiinae sp. indet.A	Buddelundiinae sp. indet.A		Potential SRE: DD	Calcrete stony plain	MDS02	656669.3044	7547514.805	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2		SJ5667	Malacostraca	Isopoda	Armadillidae	indet.	Buddelundiinae sp. indet.B	Buddelundiinae sp. indet.B	1 female	Potential SRE: DD	Rocky Hill - south facing slope	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		SJ5452	Malacostraca	Isopoda	Armadillidae	Buddelundia	indet.	Buddelundia indet.		Potential SRE: DD	Rocky Hills	MDS09	660542.217	7553870.05	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 2		SJ5659	Malacostraca	Isopoda	Armadillidae	Buddelundia	indet.	Buddelundia indet.	11 mancas, no det. possible	Potential SRE: DD	Drainage line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2		SJ5665	Malacostraca	Isopoda	Armadillidae	Buddelundia	indet. 1	Buddelundia indet. 1	1 female, small species. Buddelundia 13 form	Potential SRE: DD	Rocky Hill - south facing slope	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		SJ5445	Malacostraca	Isopoda	Armadillidae	Buddelundia	indet. A	Buddelundia indet. A		Potential SRE: DD	Calcrete stony plain	MDS03	654879.775	7543509.808	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5446	Malacostraca	Isopoda	Armadillidae	Buddelundia	indet. A	Buddelundia indet. A		Potential SRE: DD	Calcrete stony plain	MDS04	656714.1845	7548082.719	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		SJ5447	Malacostraca	Isopoda	Armadillidae	Buddelundia	indet. A	Buddelundia indet. A		Potential SRE: DD	Calcrete stony plain	MDS04	656714.1845	7548082.719	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2		DISCARD?	Malacostraca	Isopoda	Philosciidae?	indet.	Oniscidea sp. indet.	Oniscidea sp. indet.	Dehydrated specimen . No det. possible	Potential SRE: DD	Chenopod cracking clay floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200257	Malacostraca	Isopoda	Armadillidae	Armadillidae	sp.	Armadillidae sp.		Potential SRE: DD	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	WAMT151330	HBI N18399-1	Arachnida	Opiliones	Assamidae	Dampetrus	OPI001	Dampetrus OPI001	Molecular identification, originally identified as Dampestrus HBI N18399-1	Potential SRE: DD	south facing slope on rocky hill	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	dry pitfall trap
Phase 2	NA	AES200563	Gastropoda	Panpulmonata	Physidae	Physa	sp.	Physa sp.		Widespread	Rocky Hills	MDF007	691817.1769	7562520.834	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200566	Gastropoda	Panpulmonata	Physidae	Physa	sp.	Physa sp.		Widespread	Rocky Hills	MDF007	691817.1769	7562520.834	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200161	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Rocky Hills	SREPT005	661680.3118	7553854.377	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200167	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200168	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200260	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200269	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200282	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200358	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Rocky Hills	SREPT005	661680.3118	7553854.377	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200362	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200458	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200465	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200468	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200480	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200559	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200565	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Calcrete Stony Plain	MDF011	656627.7211	7547852.281	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200568	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200577	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Mixed Eucalypt/ Mulga Floodplain	MDF010	656703.3232	7546638.062	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200578	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Mulga Woodland	MDF012	658963.7495	7551959.005	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200580	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Calcrete Stony Plain	MDF009	652586.3693	7544572.973	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200582	Diplopoda	Polyxenida	Polyxenida^	Polyxenida	sp.	Polyxenida sp.	NT	Widespread	Mixed Eucalypt/ Mulga Floodplain	MDF010	656703.3232	7546638.062	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200180	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae	sp.	Polyxenidae sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	WAMT151328	AES200662	Arachnida	Pseudoscorpiones	Olpiidae	Beierolpium	PSE173	Beierolpium PSE173	Molecular identification completed, originally identified as Beierolpium '8/3'	Potential SRE: DD	Calcrete Stony Plain	MDF011	656627.7211	7547852.281	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	7547852.281
Phase 2	WAMT151332	AES200567	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	Molecular identification completed, originally identified as Indolpium sp. 2	Potential SRE: DD	Mixed Eucalypt/ Mulga Floodplain	MDF008	645647.8944	7548406.826	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200183	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200273	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200284	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200380	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200175	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200275	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200371	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Rocky Hills	SREPT005	661680.3118	7553854.377	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200383	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200466	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200478	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Mulga Woodland	MDF004	646513.4797	7545112.059	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200558	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Drainage Line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200560	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200564	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Mixed Eucalypt/ Mulga Floodplain	MDF001	645827.2074	7552926.375	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200570	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Calcrete Stony Plain	MDF009	652586.3693	7544572.973	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200665	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Calcrete Stony Plain	MDF011	656627.7211	7547852.281	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200666	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE174	Indolpium PSE174	originally identified as Indolpium sp. 2	Potential SRE: DD	Mixed Eucalypt/ Mulga Floodplain	MDF002	646570.9321	7551007.49	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 1		AES190152	Arachnida	Pseudoscorpiones	Olpiidae	Beirolpium	PSE174	Beirolpium PSE174	originally identified as Beierolpium '8/3'	Widespread	Rocky Hills	RH4	669338.1446	7553598.67	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 2	WAMT151331	AES200281	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	Molecular identification completed, originally identified as Indolpium sp. 1	Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200270	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200271	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200272	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200360	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200159	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200379	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200569	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200658	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Mixed Eucalypt/ Mulga Floodplain	MDF010	656703.3232	7546638.062	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200663	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium	PSE175	Indolpium PSE175	originally identified as Indolpium sp. 1	Potential SRE: DD	Mixed Eucalypt/ Mulga Floodplain	MDF010	656703.3232	7546638.062	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	WAMT151333	AES200557	Arachnida	Pseudoscorpiones	Olpiidae	Genus 7/4	PSE176	Genus 7/4 PSE176	Molecular identification completed, originally identified as Olpiidae sp.3	Potential SRE: DD	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES20016	Arachnida	Pseudoscorpiones	Olpiidae	Genus 7/4	PSE176	Genus 7/4 PSE176	Potentailly Genus 7/4 PSE179	Potential SRE: DD	Rocky Hills	SREPT005	661680.3118	7553854.377	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200169	Arachnida	Pseudoscorpiones	Olpiidae	Genus 7/4	PSE176	Genus 7/4 PSE176	Potentailly Genus 7/4 PSE177	Potential SRE: DD	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200181	Arachnida	Pseudoscorpiones	Olpiidae	Genus 7/4	PSE176	Genus 7/4 PSE176	Potentailly Genus 7/4 PSE179	Potential SRE: DD	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200571	Arachnida	Pseudoscorpiones	Olpiidae	Genus 7/4	PSE176	Genus 7/4 PSE176	Potentailly Genus 7/4 PSE179	Potential SRE: DD	Mixed Eucalypt/ Mulga Floodplain	MDF002	646570.9321	7551007.49	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200280	Arachnida	Pseudoscorpiones	Olpiidae	Genus 7/4	PSE176	Genus 7/4 PSE176	Potentailly Genus 7/4 PSE176	Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200171	Arachnida	Pseudoscorpiones	Olpiidae	Genus 7/4	PSE176	Genus 7/4 PSE176	Potentailly Genus 7/4 PSE178	Potential SRE: DD	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200182	Arachnida	Pseudoscorpiones	Olpiidae	Genus 7/4	PSE176	Genus 7/4 PSE176	Potentailly Genus 7/4 PSE179	Potential SRE: DD	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		AES190166	Arachnida	Pseudoscorpiones	Olpiidae	indolpium	sp.	indolpium sp.		Potential SRE: DD	Rocky Hills	RH2	668683.0034	7553483.376	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190157	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	MDS09	660542.217	7553870.05	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190171	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	MDS09	660542.217	7553870.05	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190134	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	MDS09	660542.217	7553870.05	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190158	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	MDS09	660542.217	7553870.05	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190146	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	MDS09	660542.217	7553870.05	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190145	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	MDS09	660542.217	7553870.05	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190156	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	MDS09	660542.217	7553870.05	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190170	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH2	668683.0034	7553483.376	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190151	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH2	668683.0034	7553483.376	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190172	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH2	668683.0034	7553483.376	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190164	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH2	668683.0034	7553483.376	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190150	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH2	668683.0034	7553483.376	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190153	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH2	668683.0034	7553483.376	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190173	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH3	668727.247	7552469.134	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190147	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH3	668727.247	7552469.134	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190142	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH4	669338.1446	7553598.67	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 1		AES190162	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium	sp.	Xenolpium sp.		Potential SRE: DD	Rocky Hills	RH4	669338.1446	7553598.67	4/04/2019	16/04/2019	McCabe, T.	Forage
Phase 2	NA	AES200170	Arachnida	Pseudoscorpiones	Sternophoridae	Afrosternophorus	sp.	Afrosternophorus sp.		Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200261	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		Indolpium		Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200277	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		Indolpium		Potential SRE: DD	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200561	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		Indolpium		Potential SRE: DD	Drainage Line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200584	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		Indolpium		Potential SRE: DD	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200166	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200173	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200174	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200258	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200265	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200279	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200283	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200359	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200361	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200361	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200363	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200364	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200366	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200375	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200376	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200377	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200457	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200459	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200459	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200463	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200464	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200467	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200469	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200470	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200472	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200576	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Calcrete Stony Plain	MDF009	652586.3693	7544572.973	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Forage
Phase 2	NA	AES200583	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Drainage Line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200657	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200660	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200661	Chilopoda	Scolopendromorpha	Scolopendridae	Scolopendridae	sp.	Scolopendridae sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		AES190154	Arachnida	Scorpiones	Buthidae	Isometroides	'pilbara 1'	Isometroides 'pilbara 1'		Widespread	Mixed Eucalypt/Mulga Floodplain	MDS01	656693.0981	7549882.47	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190140	Arachnida	Scorpiones	Buthidae	Isometroides	'pilbara 1'	Isometroides 'pilbara 1'		Widespread	Drainage Line	MDS11	661398.7511	7553022.82	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190133	Arachnida	Scorpiones	Buthidae	Isometroides	'pilbara 1'	Isometroides 'pilbara 1'		Widespread	Mulga Woodland	MDS17	659944.6451	7552718.922	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190136	Arachnida	Scorpiones	Buthidae	Isometroides	'pilbara 1'	Isometroides 'pilbara 1'		Widespread	Mulga Woodland	MDS17	659944.6451	7552718.922	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190144	Arachnida	Scorpiones	Buthidae	Isometroides	'pilbara 1'	Isometroides 'pilbara 1'		Widespread	Mulga Woodland	MDS18	667321.5257	7550246.175	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2	NA	AES200266	Arachnida	Scorpiones	Buthidae	Lychas	adonis'	Lychas adonis'		Widespread	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200278	Arachnida	Scorpiones	Buthidae	Lychas	adonis'	Lychas adonis'		Widespread	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200484	Arachnida	Scorpiones	Buthidae	Lychas	adonis'	Lychas adonis'		Widespread	Drainage Line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	WAMT151335	AES200574	Arachnida	Scorpiones	Buthidae	Lychas	hairy tail complex'	Lychas hairy tail complex'	Molecualr identification failed due to contaminated sample	Potential SRE: DD	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200172	Arachnida	Scorpiones	Buthidae	Lychas	hairy tail complex'	Lychas hairy tail complex'		Potential SRE: DD	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200267	Arachnida	Scorpiones	Buthidae	Lychas	hairy tail complex'	Lychas hairy tail complex'		Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200367	Arachnida	Scorpiones	Buthidae	Lychas	hairy tail complex'	Lychas hairy tail complex'		Potential SRE: DD	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200461	Arachnida	Scorpiones	Buthidae	Lychas	hairy tail complex'	Lychas hairy tail complex'		Potential SRE: DD	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200471	Arachnida	Scorpiones	Buthidae	Lychas	hairy tail complex'	Lychas hairy tail complex'		Potential SRE: DD	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200164	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas harveyi complex'		Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200274	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas harveyi complex'		Widespread	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200572	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas harveyi complex'		Widespread	Drainage Line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200579	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas harveyi complex'		Widespread	Drainage Line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200581	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas harveyi complex'		Widespread	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		AES190148	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas 'harveyi complex'		Widespread	Mixed Eucalypt/Mulga Floodplain	MDS01	656693.0981	7549882.47	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190149	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas 'harveyi complex'		Widespread	Calcrete Stony Plain	MDS03	654879.775	7543509.808	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190163	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas 'harveyi complex'		Widespread	Calcrete Stony Plain	MDS04	656714.1845	7548082.719	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190159	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas 'harveyi complex'		Widespread	Drainage Line	MDS11	661398.7511	7553022.82	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190141	Arachnida	Scorpiones	Buthidae	Lychas	harveyi complex'	Lychas 'harveyi complex'		Widespread	Mulga Woodland	MDS17	659944.6451	7552718.922	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190137	Arachnida	Scorpiones	Urodacidae	Urodacus	pearcei	Urodacus pearcei		Widespread	Drainage Line	MDS13	664432.7127	7552211.555	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190132	Arachnida	Scorpiones	Urodacidae	Urodacus	pearcei	Urodacus pearcei		Widespread	Stony Spinifex Plains and Hillslopes	MDS14	665278.2624	7551455.562	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190138	Arachnida	Scorpiones	Urodacidae	Urodacus	pearcei	Urodacus pearcei		Widespread	Stony Spinifex Plains and Hillslopes	MDS14	665278.2624	7551455.562	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2	NA	AES200176	Arachnida	Scorpiones	Urodacidae	Urodacus	pearcei'	Urodacus pearcei'		Widespread	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200177	Arachnida	Scorpiones	Urodacidae	Urodacus	pearcei'	Urodacus pearcei'		Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200178	Arachnida	Scorpiones	Urodacidae	Urodacus	pearcei'	Urodacus pearcei'		Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200378	Arachnida	Scorpiones	Urodacidae	Urodacus	pearcei'	Urodacus pearcei'		Widespread	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		AES190165	Arachnida	Scorpiones	Buthidae	Lychas	pilbara 1'	Lychas 'pilbara 1'		Widespread	Stony Spinifex Plains and Hillslopes	MDS07	655123.5642	7555618.64	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190160	Arachnida	Scorpiones	Buthidae	Lychas	SCO024	Lychas SCO024	originally identified as Lychas 'bituberculatus complex'	Potential SRE: DD	Rocky Hills	RH2	668683.0034	7553483.376	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2	NA	AES200163	Arachnida	Scorpiones	Buthidae	Lychas	SCO024	Lychas SCO024	originally identified as Lychas 'bituberculatus complex'	Potential SRE: DD	Drainage Line	SREPT004	656794.4569	7556082.824	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200264	Arachnida	Scorpiones	Buthidae	Lychas	SCO024	Lychas SCO024	originally identified as Lychas 'bituberculatus complex'	Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200268	Arachnida	Scorpiones	Buthidae	Lychas	SCO024	Lychas SCO024	originally identified as Lychas 'bituberculatus complex'	Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	WAMT151334	AES200179	Arachnida	Scorpiones	Buthidae	Lychas	SCO024	Lychas SCO024	Molecular identification completed, originally identified as Lychas 'bituberculatus complex'	Potential SRE: DD	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		AES190168	Arachnida	Scorpiones	Buthidae	Lychas	SCO046	Lychas SCO046	originally identified as Lychas 'multipunctatus complex'	Potential SRE: DD	Calcrete Stony Plain	MDS02	656669.3044	7547514.805	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190161	Arachnida	Scorpiones	Buthidae	Lychas	SCO046	Lychas SCO046	originally identified as Lychas 'multipunctatus complex'	Potential SRE: DD	Calcrete Stony Plain	MDS03	654879.775	7543509.808	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190167	Arachnida	Scorpiones	Buthidae	Lychas	SCO046	Lychas SCO046	originally identified as Lychas 'multipunctatus complex'	Potential SRE: DD	Calcrete Stony Plain	MDS04	656714.1845	7548082.719	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190169	Arachnida	Scorpiones	Buthidae	Lychas	SCO046	Lychas SCO046	originally identified as Lychas 'multipunctatus complex'	Potential SRE: DD	Mixed Eucalypt/Mulga Floodplain	MDS06	656699.0174	7549133.681	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	WAMT151336	AES200263	Arachnida	Scorpiones	Buthidae	Lychas	SCO046	Lychas SCO046	Molecular identification completed, originally identified as Lychas 'multipunctatus complex'	Potential SRE: DD	Drainage Line	SREPT002	664447.1918	7552844.558	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 1		AES190139	Arachnida	Scorpiones	Urodacidae	Urodacus	sp.	Urodacus sp.		Potential SRE: DD	Drainage Line	MDS11	661398.7511	7553022.82	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190135	Arachnida	Scorpiones	Urodacidae	Urodacus	sp.	Urodacus sp.		Potential SRE: DD	Drainage Line	MDS12	669148.6868	7553903.235	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 1		AES190134	Arachnida	Scorpiones	Urodacidae	Urodacus	sp.	Urodacus sp.		Potential SRE: DD	Mulga Woodland	MDS16	656652.2397	7553319.51	4/04/2019	16/04/2019	McCabe, T.	Dry pitfall trap
Phase 2	NA	AES200573	Arachnida	Scorpiones	Buthidae	Lychas	sp. 4	Lychas sp. 4	sp. 4	Potential SRE: DD	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200575	Arachnida	Scorpiones	Buthidae	Lychas	sp. 4	Lychas sp. 4	sp. 4	Potential SRE: DD	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200481	Arachnida	Scorpiones	Buthidae	Lychas	sp. 4	Lychas sp. 4	sp. 4	Widespread	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200259	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Chenopod/ Cracking Clay Floodplain	SREPT001	651239.4758	7551913.162	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200370	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Rocky Hills	SREPT005	661680.3118	7553854.377	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200372	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200373	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Stony Spinifex Plains and Hillslopes	SREPT006	661832.5416	7552777.959	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200374	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200382	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200384	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200473	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200474	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200475	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200483	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Drainage Line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200562	Chilopoda	Scutigeromorpha	Scutigeromorpha^	Scutigeromorpha	sp.	Scutigeromorpha sp.	NT	Widespread	Drainage Line	SREPT010	661678.2122	7553360.109	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200276	Diplopoda	Spirobolida	Trigoniulidae	Austrostrophus	sp.	Austrostrophus sp.		Potential SRE: DD	Mulga Woodland	SREPT003	673205.4375	7548570.373	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200368	Diplopoda	Spirobolida	Trigoniulidae	Austrostrophus	sp.	Austrostrophus sp.		Potential SRE: DD	Rocky Hills	SREPT007	667837.7752	7552187.776	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200477	Diplopoda	Spirobolida	Trigoniulidae	Austrostrophus	sp.	Austrostrophus sp.		Potential SRE: DD	Rocky Hills	SREPT008	664626.7458	7553673.717	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap
Phase 2	NA	AES200357	Insecta	Thysanura	Thysanura^	Thysanura	sp.	Thysanura sp.	NT	non-target	Rocky Hills	SREPT005	661680.3118	7553854.377	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

Phase	WAM RegNo	FLDNO	CLASS	ORDER	FAMILY	GENUS	SPECIES	Taxon	Remarks	SRE	HABITAT TYPE	SITE CODE	Easting	Northing	DTFR	DTTO	COLLTOR	COLLMETH
Phase 2	NA	AES200476	Insecta	Thysanura	Thysanura^	Thysanura	sp.	Thysanura sp.	NT	non-target	Calcrete Stony Plain	SREPT009	651114.5752	7549412.326	16/03/2020	23/03/2020	McCabe, T., Clairs, T.	Dry pitfall trap

APPENDIX D WAM MOLECULAR IDENTIFICATION OF ARTHROPODS FROM MULGA DOWNS STATION, WESTERN AUSTRALIA

Molecular identification of terrestrial arthropods from Mulga Downs Station, Western Australia

Report to *Ecologia*

09 October 2020

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GOVERNMENT OF WESTERN AUSTRALIA

WESTERN AUSTRALIAN MUSEUM

Summary

Ecologia requested the sequencing and identification of mitochondrial COI sequences from nine specimens of terrestrial arthropods from Mulga Downs Station. The main objectives of the WA Museum's Molecular Systematics Unit (MSU) were to use COI barcoding to determine the taxonomic identity of the specimens.

DNA was extracted and DNA barcoding sequences (COI) were amplified by PCR in the MSU and sequenced at the Australian Genomic Research Facility (AGRF) Perth node, using universal primers (Folmer et al 1994). DNA sequences were BLASTED against publicly accessible sequences in GenBank and with data sets derived from current research projects in collaboration with the WA Museum. The top 10 blast hits for each major taxon were gathered, duplicates removed, and analysed with a Maximum Likelihood phylogenetic analysis using a GTR+G model of evolution and 100 bootstraps (RAxML). Distances were calculated via tree-based estimates of identical bases in Geneious v11.1.5. A summary of specimen identifications is in Table 1.

Table 1. Summary of queried sequences generated by the WA Museum.

FAMILY	GENUS	SPECIES	# OF SPECIMENS	# OF SEQUENCES
Assamiidae	*Dampetrus*	OPI001	1	1
Buthidae	*Lychas*	SCO024	1	1
Buthidae	*Lychas*	SCO046	1	1
Halonoproctidae	*Conothele*	MYG716	1	1
Olpiidae	*Beierolpium*	PSE173	1	1
Olpiidae	*Indolpium*	PSE175	1	1
Olpiidae	*Indolpium*	PSE174	1	1
Olpiidae	Genus 7/4	PSE176	1	1

Results

COI DNA barcodes were amplified and successfully sequenced from eight of the nine specimens. One specimen produced sequences that reflected human contamination. The COI sequences were compared to existing data held by the WA Museum and its collaborators, and the publicly accessible GenBank database. A summary of the comparison is provided in Table 2. The resulting Maximum Likelihood tree is provided in Appendix 2 for visualisation of genetic relationships. The new DNA sequences have GenBank accession numbers available in Appendix 1, as well as with the raw data in Appendix 3.

Table 2. Summary of identifications of queried specimens (alphabetical by family).

REGNO	FAMILY	SPECIES	SUMMARY OF RESULTS
WAMT151330	Assamiidae	*Dampetrus* OPI001 (new)	This sequence is 20.37% divergent from its nearest congener WAMT113557, and represents a newly discovered species.
WAMT151334	Buthidae	*Lychas* SCO024 (known)	This sequence falls into a clade known as *Lychas* SCO024. There is some genetic structure in the clade, which is common for Buthidae. It is sister to another undescribed *Lychas* SCO024.
WAMT151336	Buthidae	*Lychas* SCO046 (known)	This sequence falls into a clade known as *Lychas* SCO046. the sequence is 1.93% divergent from its nearest conspecific (WAMT97367).
WAMT151329	Halonoproctidae	*Conothele* MYG716 (new)	This sequence is 11.68% divergent from its nearest congener WAMT89034 (MK735582), and represents a newly discovered species.
WAMT151328	Olpiidae	*Beierolpium* PSE173 (new)	This sequence is 17.56% divergent from its nearest congener WAMT122360, and represents a newly discovered species.

WAMT151331	Olpiidae	*Indolpium* PSE175 (new)	This sequence is 15.57% divergent from its nearest congener WAMT113765, and represents a newly discovered species.
WAMT151332	Olpiidae	*Indolpium* PSE174 (new)	This sequence is 14.96% divergent from its nearest congener WAMT102895, and represents a newly discovered species.
WAMT151333	Olpiidae	Genus 7/4 PSE176 (known, new code)	This sequence falls into a clade known as *Genus 7/4* PSE176, and there is essentially no genetic variation within this species.

Conclusions

The main objectives were to compare successful COI sequences from the queried specimens to DNA barcoding sequences held with WAM and collaborators, and those publicly accessible in GenBank. All species recovered in this data set are undescribed. Three were known previously from other specimens, and five were newly discovered taxa.

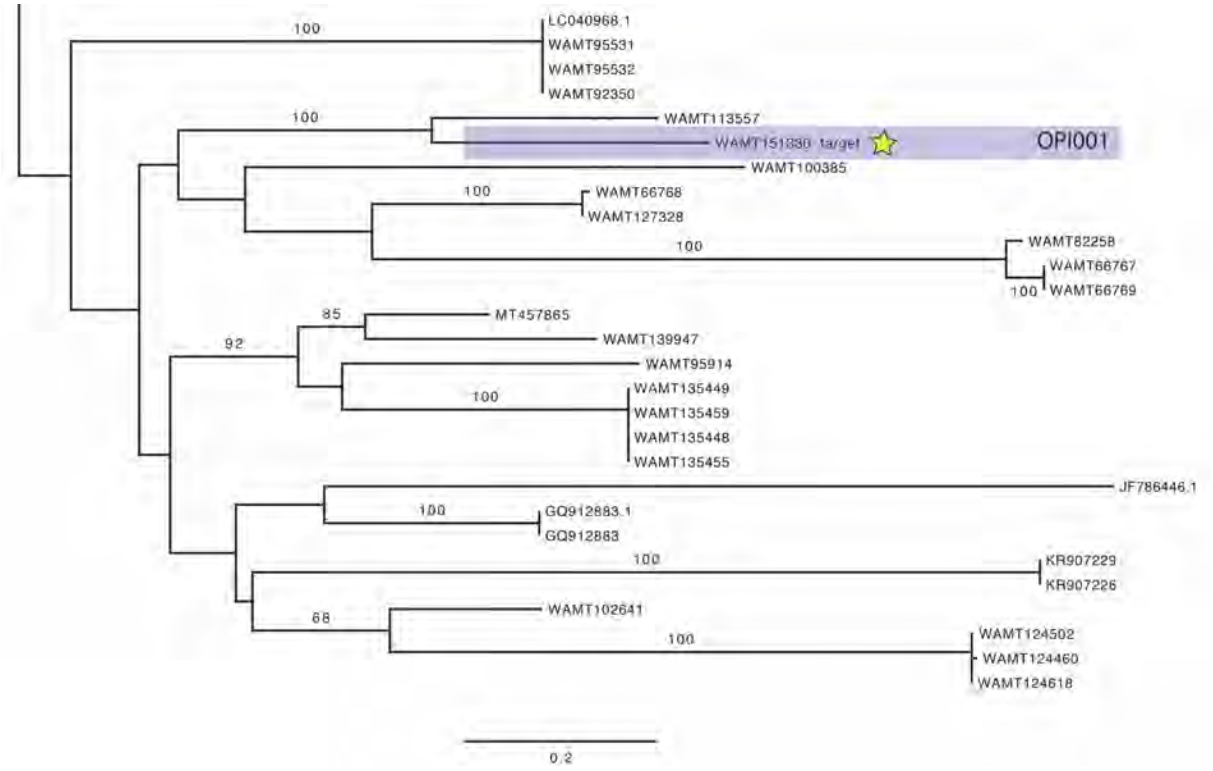
References

Vrijenhoek, R. (1994). DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Mol Mar Biol Biotechnol*, *3*(5), 294-9.

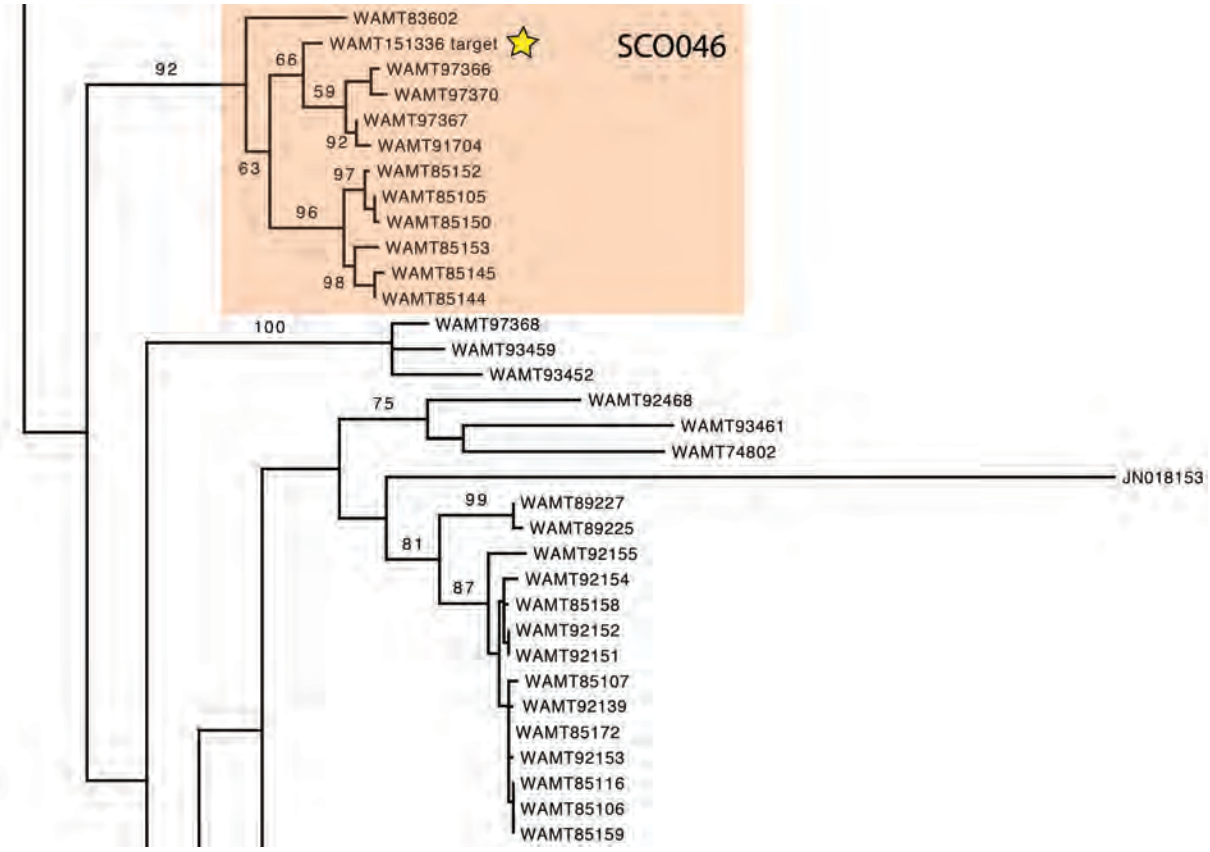
Appendix 1. Specimen data for all specimens. Greyed out samples did not produce usable sequences to be included in analysis

REGNO	FIELD NO	GenBank NO	FAMILY	GENUS	SPECIES	SITE	LATITUDE	LONGITUDE
WAMT151328	AES200662	MW078440	Olpiidae	Beierolpium	PSE173	Mulga Downs Station, ca. 31 km NW. of Munjina	22°10'02.91"S	118°31'08.64"E
WAMT151329	HBI N18402-5	MW078436	Halonoproctidae	Conothele	MYG716	Mulga Downs Station, ca. 31 km NW. of Munjina	22°09'33.88"S	118°40'46.99"E
WAMT151330	HBI N18399-1	MW078441	Assamiidae	Dampetrus	OPI001	Mulga Downs Station, ca. 31 km NW. of Munjina	22°07'38.18"S	118°37'38.3"E
WAMT151331	AES200281	MW078439	Olpiidae	Indolpium	PSE175	Mulga Downs Station, ca. 31 km NW. of Munjina	22°07'17.99"S	118°35'39.75"E
WAMT151332	AES200567	MW078438	Olpiidae	Indolpium	PSE174	Mulga Downs Station, ca. 31 km NW. of Munjina	22°09'48.32"S	118°24'45.19"E
WAMT151333	AES200557	MW078437	Olpiidae	Genus 7/4	PSE176	Mulga Downs Station, ca. 31 km NW. of Munjina	22°07'21.04"S	118°34'08.54"E
WAMT151334	AES200179	MW078435	Buthidae	Lychas	SCO024	Mulga Downs Station, ca. 31 km NW. of Munjina	22°07'38.18"S	118°37'38.30"E
WAMT151335	AES200574		Buthidae	Lychas	`hairy tail complex`	Mulga Downs Station, ca. 31 km NW. of Munjina	22°07'52.60"S	118°27'59.19"E
WAMT151336	AES200263	MW078434	Buthidae	Lychas	SCO046	Mulga Downs Station, ca. 31 km NW. of Munjina	22°07'17.99"S	118°35'39.75"E

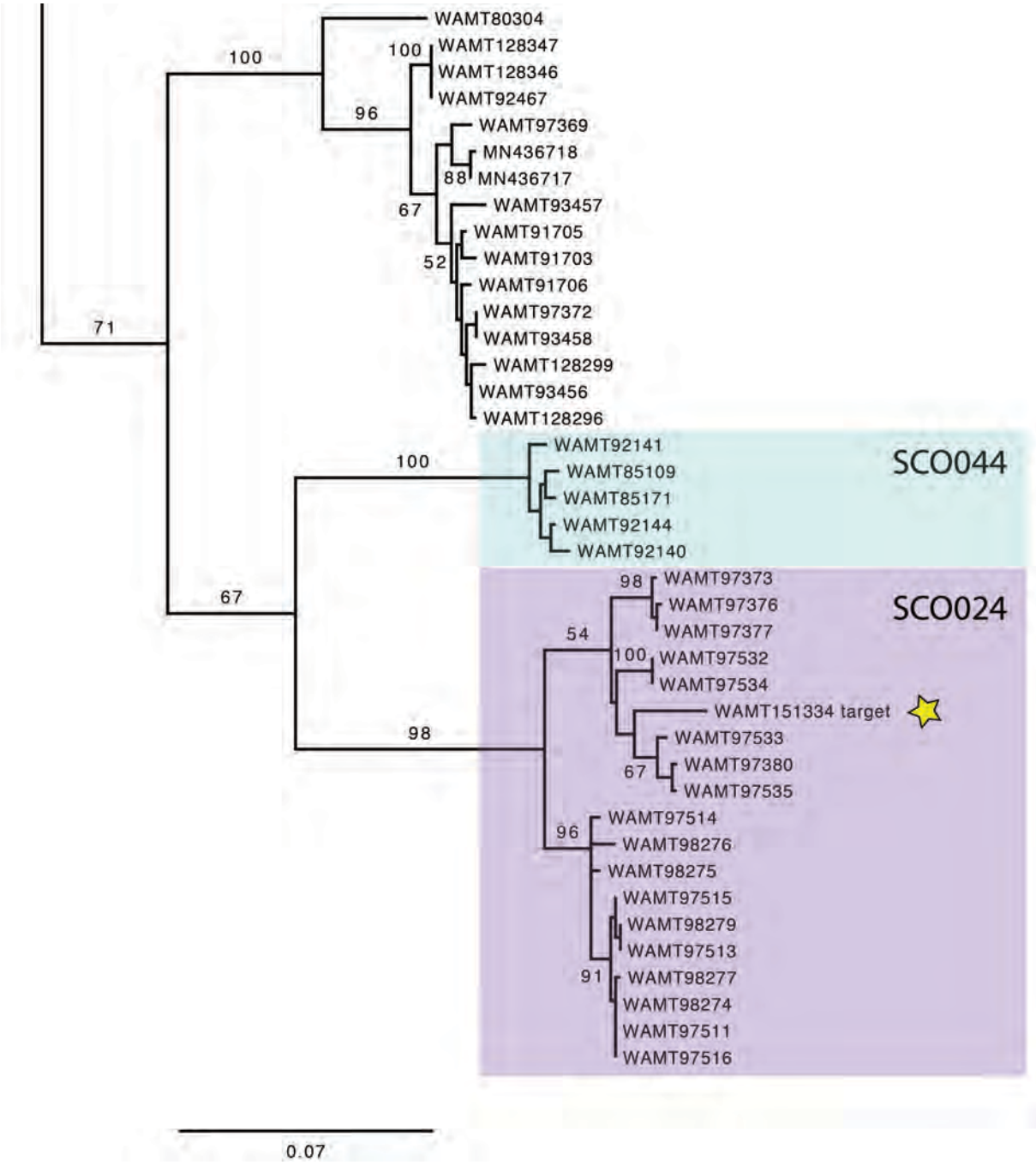
Appendix 2a. Excerpt from Maximum Likelihood tree of Assamiidae, *Dampetrus* COI, to be used *ONLY* for visualisation of genetic relationships. Bootstrap values less than 50 have been removed.



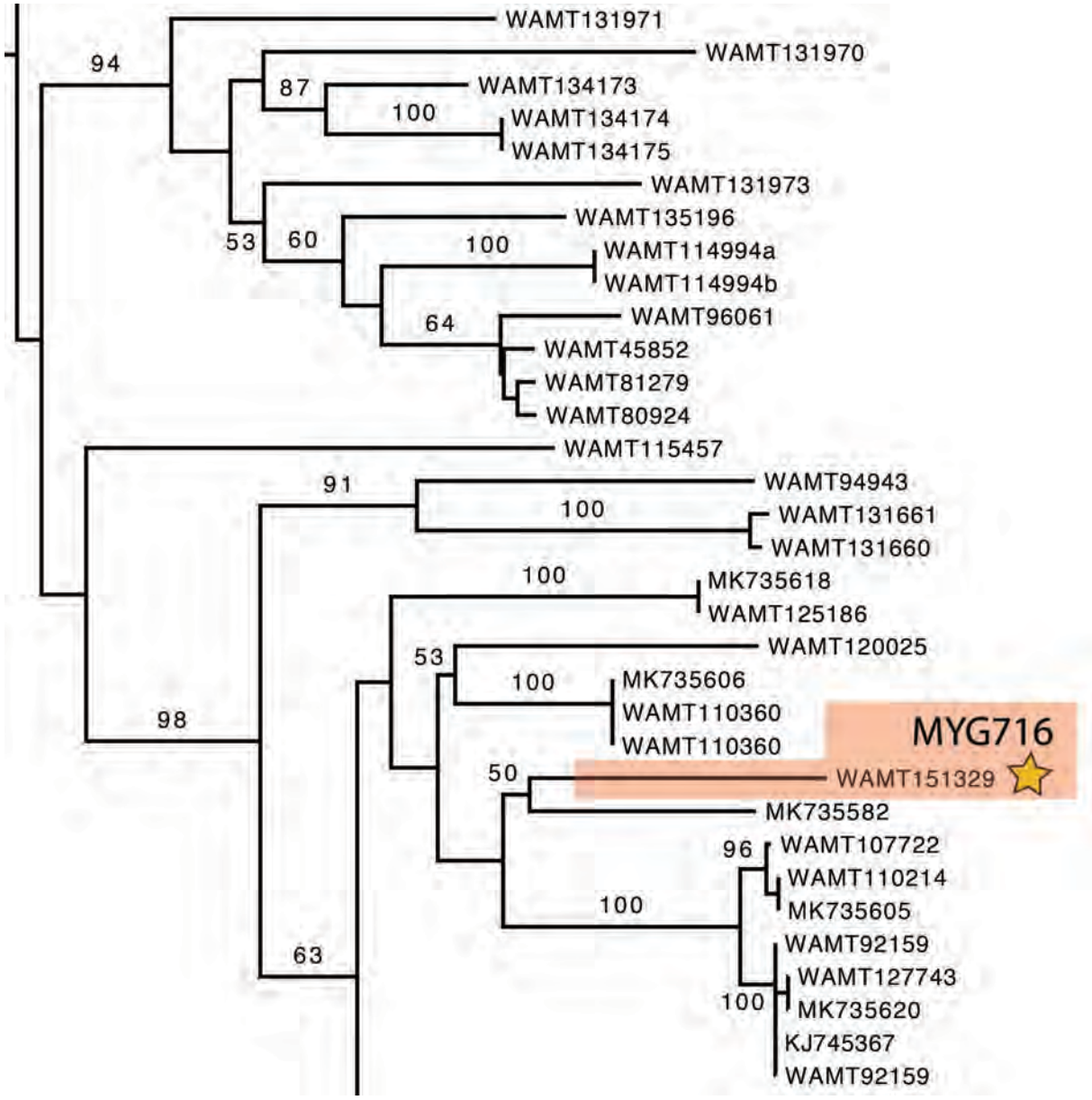
Appendix 2b. Excerpt from Maximum Likelihood tree of Buthidae, *Lychas* COI, to be used *ONLY* for visualisation of genetic relationships. Bootstrap values less than 50 have been removed.



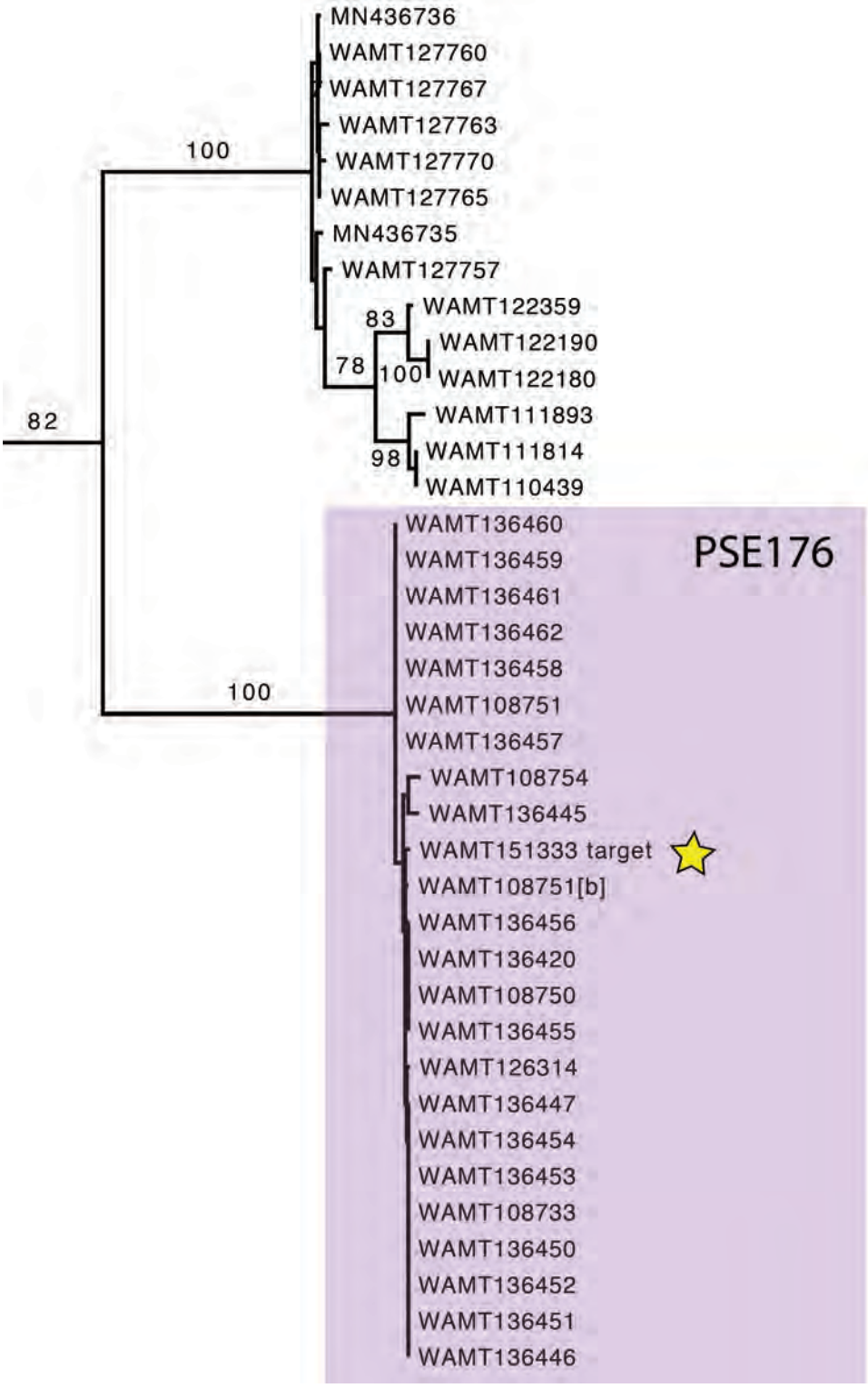
Appendix 2c. Excerpt from Maximum Likelihood tree of Buthidae, *Lychas* COI, to be used *ONLY* for visualisation of genetic relationships. Bootstrap values less than 50 have been removed.



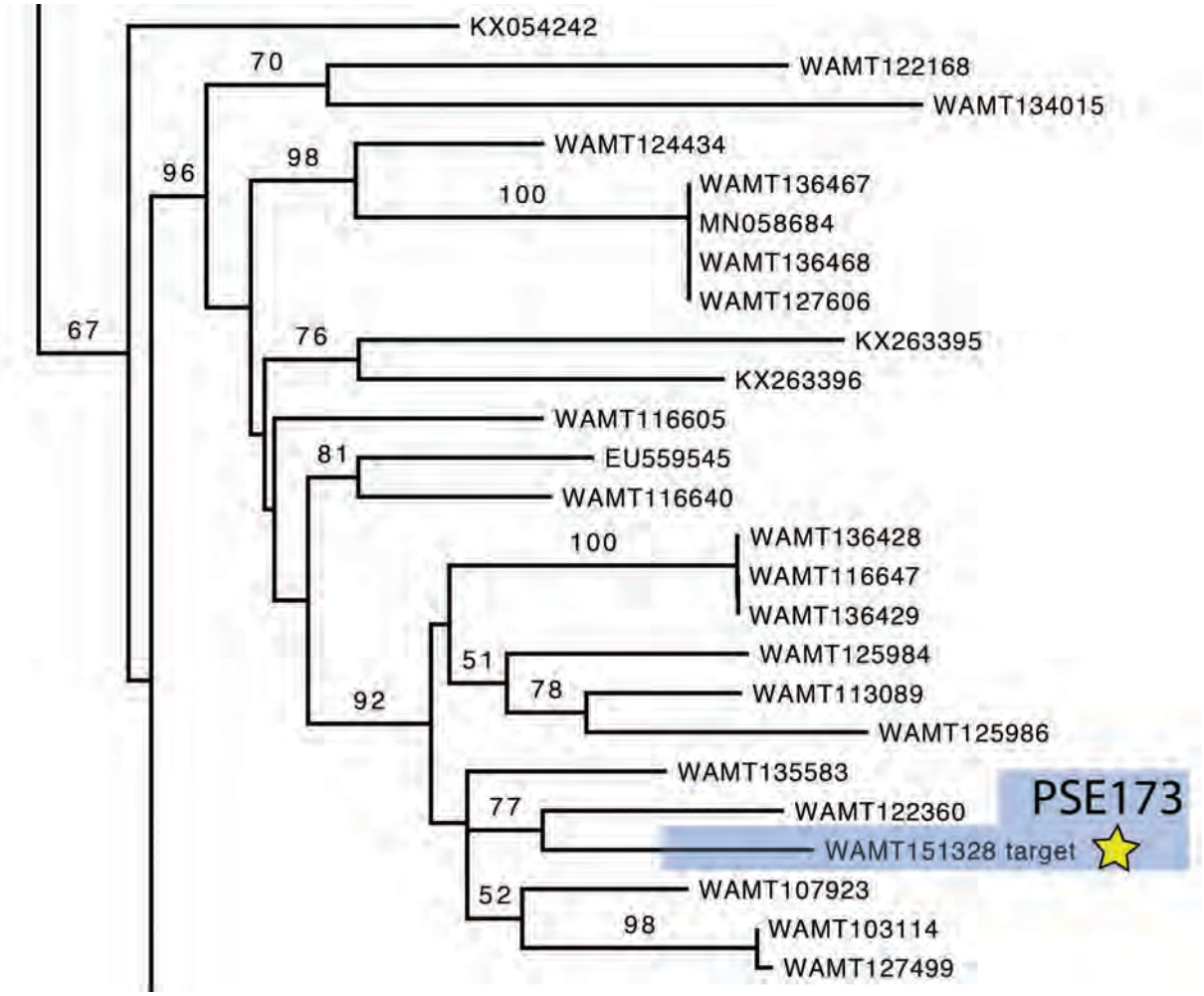
Appendix 2d. Excerpt from Maximum Likelihood tree of Halonoproctidae, *Conothele* COI, to be used *ONLY* for visualisation of genetic relationships. Bootstrap values less than 50 have been removed.



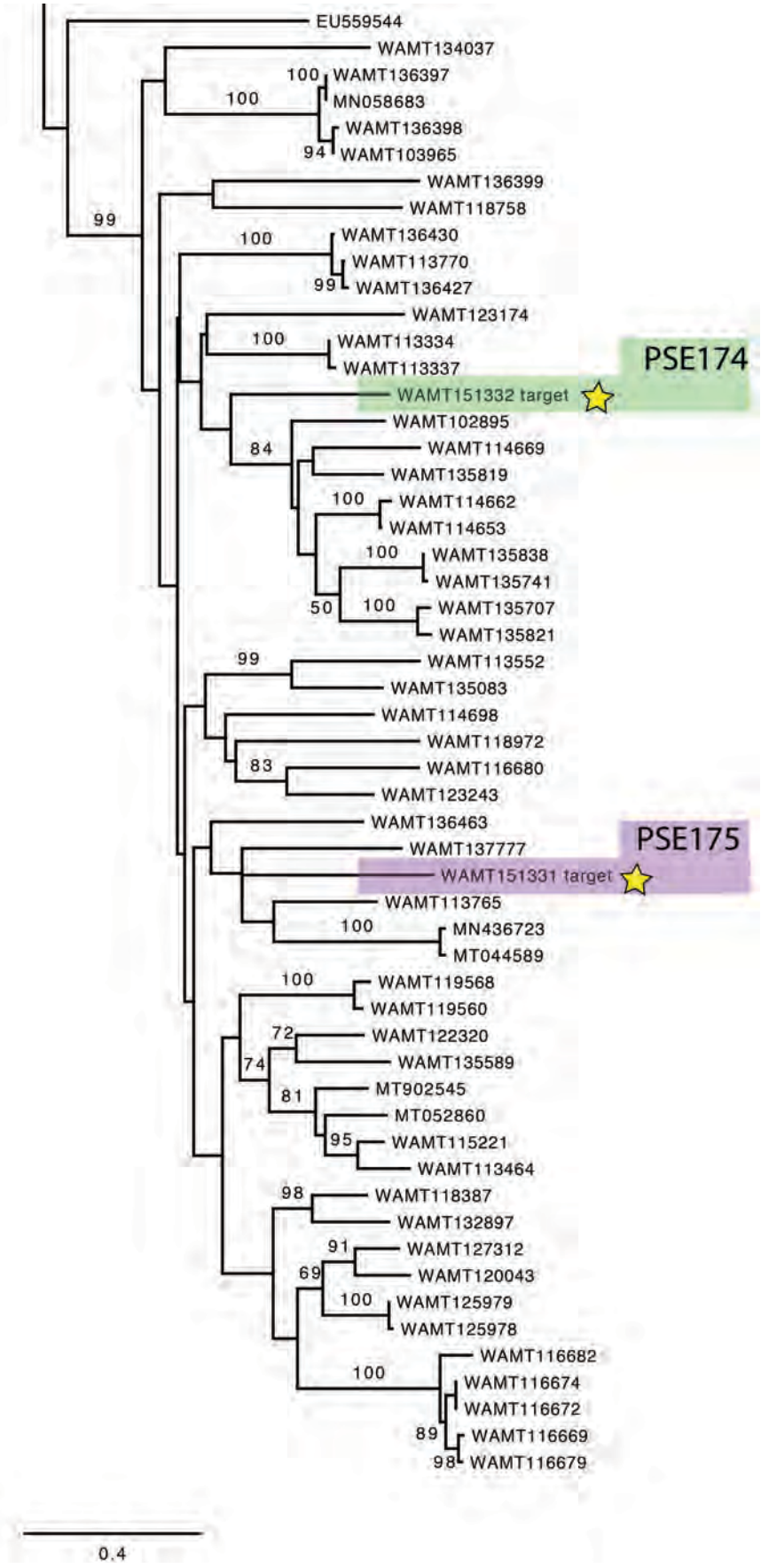
Appendix 2e. Excerpt from Maximum Likelihood tree of Olpiidae, Genus 7/4 COI, to be used *ONLY* for visualisation of genetic relationships. Bootstrap values less than 50 have been removed.



Appendix 2f. Excerpt from Maximum Likelihood tree of Olpiidae, *Beierolpium* COI, to be used *ONLY* for visualisation of genetic relationships. Bootstrap values less than 50 have been removed.



Appendix 2g. Excerpt from Maximum Likelihood tree of Olpiidae, *Indolpium* COI, to be used *ONLY* for visualisation of genetic relationships. Bootstrap values less than 50 have been removed.



Appendix 3. COI DNA sequence data generated in this report

>WAMT151328 = MW078440

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TCTCGAAATCAATTGACTTAGTCATTTTCTCATTACATCTAGCAGGAGCTAGATCTATCCTTGGTGCAATTAA
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>WAMT151329 = MW078436

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>WAMT151330 = MW078441

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C

>WAMT151331 = MW078438

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>WAMT151332 = MW078438

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>WAMT151333 = MW078437

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>WAMT151334 = MW078435

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T

>WAMT151336 = MW078434

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T