Bennelongia Environmental Consultants

Mulga East Subterranean Fauna Baseline Survey

Prepared for:

Hancock Prospecting Pty Ltd

June 2021

Final Report

Short-Range Endemics I Subterranean Fauna

Waterbirds I Wetlands

Mulga East Subterranean Fauna Baseline Survey

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Final	Stuart Halse	Stuart Halse	Email	24 June 2021

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EXECUTIVE SUMMARY

Introduction

JBS&G Pty Ltd (on behalf of Hancock Prospecting Pty Ltd) commissioned Bennelongia Environmental Consultants to write a report on subterranean fauna values at the Mulga East Iron Ore Project, which comprises tenements at Mulga East and Malay Well in the north western part of the Fortescue Valley in the Pilbara region of Western Australia. Subterranean fauna are species that inhabit interstices, voids and fissures in underground geologies. This fauna can be divided into two main groups, air-breathing troglofauna and water-breathing stygofauna.

The report refers to three areas when discussing subterranean fauna: (1) the Project area, which consists of the Mulga East and Malay Well tenements, (2) the Project vicinity in relation to subterranean fauna sampling done outside (although close and relevant to) the Project area by Hancock's consultants or other programs, and (3) the potential subterranean fauna impact area, which comprises the inferred resource outline and a larger area of potential groundwater drawdown.

The report has five aims:

1. Identify all the required environmental approvals for the Project relating to subterranean fauna;
2. Collate all data on subterranean fauna contained in publicly available databases or collected during previous surveys in the Project area and Project vicinity;
3. Report the results of two rounds of additional subterranean field survey conducted by Bennelongia;
4. Identify any gaps in subterranean fauna sampling in relation to geographic coverage or providing species range information; and
5. Identify areas where Project development could be potentially constrained by broad issues associated with subterranean fauna, such as the occurrence of restricted species.

Methods

The desktop study collated available information on subterranean fauna species and habitats in the Project area and Project vicinity. Analysis of survey intensity against inferred project impact areas was undertaken to determine whether the current level of survey effort was adequate for assessment and to highlight areas requiring further work. Additionally, a two round field survey undertaken by Bennelongia, with sampling for troglofauna via scraping and trapping conducted at a total of 120 uncased exploration drill holes. In addition, 119 bores were sampled for stygofauna via net hauling. The report was compiled in accordance with three subterranean fauna guidance documents released by the Environmental Protection Authority, namely the *Environmental Factor Guideline – Subterranean Fauna*, *Technical Guidance – Subterranean Fauna Survey* and *Technical Guidance – Sampling Methods for Subterranean Fauna*.

Results

The Project lies between the Chichester and Hamersley ranges in the north-western (or lower) Fortescue Valley. This sub-region contains substantial areas of prospective habitat for stygofauna and troglofauna, which include depositional units (colluvium and alluvium), channel iron, Marra Mamba Formation and calcrete. The Wittenoom Formation, which also occurs in the region at depth has low prospectivity for subterranean fauna. Most previous surveys for subterranean fauna within the Project area were within the Mulga East tenement, with only three stygofauna samples known to have been collected from Malay Well.

The combined results of all surveys that have been undertaken showed 106 stygofauna species to have been collected in the Project area or its vicinity, including flatworms, nematodes, rotifers, earth worms, mites, amphipods, isopods, syncarids, copepods and ostracods. Sixty-one of these species are known to occur outside the Project area as well, 11 belong to species complexes with uncertain distributions and 26 have not been recorded outside of the Project area to date, of which 13 are known only from a single site. The remaining 8 species could not have their ranges estimated due to taxonomic uncertainty. Regarding troglofauna, 70 species were collected within the Project area, including spiders, palpigrads, pseudoscorpions, schizomids, isopods, diplurans, cockroaches, beetles, flies, true bugs, silverfish, centipedes, millipedes, pauropods and symphylans. Sixty of these species are known only from the Project area and 18 of these are known only from within inferred resource outlines.

Conclusion

A high proportion of the species collected to date have known distributions restricted to the Project area (primarily at Mulga East where most work has been conducted). Comparisons of specimens collected previously in different surveys, as well as genetic analyses, aligned some species identified by different consultants, but the number of species of subterranean fauna known only from the Project area and the potential Project footprint remains high.

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1. INTRODUCTION

Bennelongia Environmental Consultants was commissioned by JBS&G Pty Ltd (on behalf of Hancock Prospecting Pty Ltd) to conduct a baseline assessment of subterranean fauna values for the Mulga East Iron Ore Project (the Project). The Project lies in the central Pilbara of Western Australia, approximately 200 km south of Port Hedland and 185 km north west of Newman and comprises two tenements, Malay Well (E 47/2117) and Mulga East (R 47/12), collectively referred to as 'the Project area' (Figure 1). The Project has an estimated iron resource of 670 million tonnes (with a 50% Fe cut-off) and is likely to consist of numerous open-cut mine pits, an on-site processing plant, waste rock storage and a fine waste storage facility, as well as mine infrastructure that includes a rail load-out facility and rail spur.

Open-cut pits may be mined up to a maximum depth of 90 m below ground level, meaning groundwater drawdown of up to 100 m below ground level may be required to prevent mine pit flooding. These two activities – mine pit excavation and groundwater drawdown – have the potential to result in the removal of subterranean fauna habitat.

Subterranean fauna is a general term applied to species, nearly all of which are invertebrates, that live deep below the ground surface, either in the overlaying unsaturated but humid layers of the regolith and rock or in underlying aquifers of groundwater. Although inconspicuous, subterranean fauna contribute markedly to the overall biodiversity of Australia and, additionally, play important roles in ecosystem function (Hose and Stumpp 2019; Humphreys 2006). Studies on both the Pilbara and Yilgarn cratons in Western Australia have demonstrated that these old landscapes are biodiversity hotspots for subterranean fauna. Guzik *et al.* (2010) suggested that over 4,000 species of subterranean fauna are likely to occur in the western half of Australia, with over 80% of these species not yet discovered.

Most subterranean fauna species satisfy Harvey's (2002) criteria for short-range endemism, namely ranges of less than 10,000 km^2, confinement to discontinuous habitats, slow growth and low fecundity. In fact, ranges of troglofauna are frequently only a few square kilometres in extent. Halse and Pearson 2014) and Eberhard *et al.* (2009) pointed out that a threshold of 1,000 km^2 (or a linear range of 36 km) was more appropriate than Harvey's 10,000 km^2 for recognizing stygofauna with small ranges. Given that locally-restricted species are more vulnerable to extinction following habitat degradation than wider-ranging species (Ponder and Colgan 2002), it follows that the very small ranges of many subterranean species make them highly susceptible to anthropogenic threats, such as habitat degradation and groundwater abstraction.

1.1 Stygofauna

Stygofauna occupy interstices, voids and fissures in groundwater aquifers (Humphreys 1999; Humphreys 2008). Aquifers in alluvium and calcrete deposits within palaeovalleys in Western Australia often contain rich stygal communities, consisting of earthworms (Oligochaeta), beetles (Coleoptera) and Crustacea (amphipods, isopods, copepods, ostracods and syncarids). Many calcretes support communities of species that are mostly endemic to that individual calcrete body (Cooper *et al.* 2002; Guzik *et al.* 2008; Humphreys 2001; Javidkar 2014; Leijs *et al.* 2003; Watts and Humphreys 2006). The aquifers in less transmissive geologies, such as banded iron formations (BIF) and saprolite, rarely support rich stygofaunal communities, although low numbers of species may occur in these geologies too (Bennelongia 2009b; ecologia 2009; GHD 2009).

The physico-chemical tolerances of stygofauna have not been well-defined but some assumptions about tolerance of particular taxa can reasonably be made, based on data for related surface water species. Hose *et al.* (2015) suggested that stygofauna are mostly found in fresh to brackish aquifers with conductivities of less than 3,000 µS cm^{-1} (approximately 1,650 mg L^{-1} TDS), and are seldom found in hypoxic groundwater (<0.3 mg O_2 L^{-1}). Similarly, Halse *et al.* (2014) showed that few stygofauna species occur above 5,000 mg/L (or 2,700 µS cm^{-1}) in the Pilbara, although rich stygofauna communities have been found in conductivities of 40,000 µS cm^{-1} (28,500 mg L^{-1}) or more in the Yilgarn (Halse 2018b).

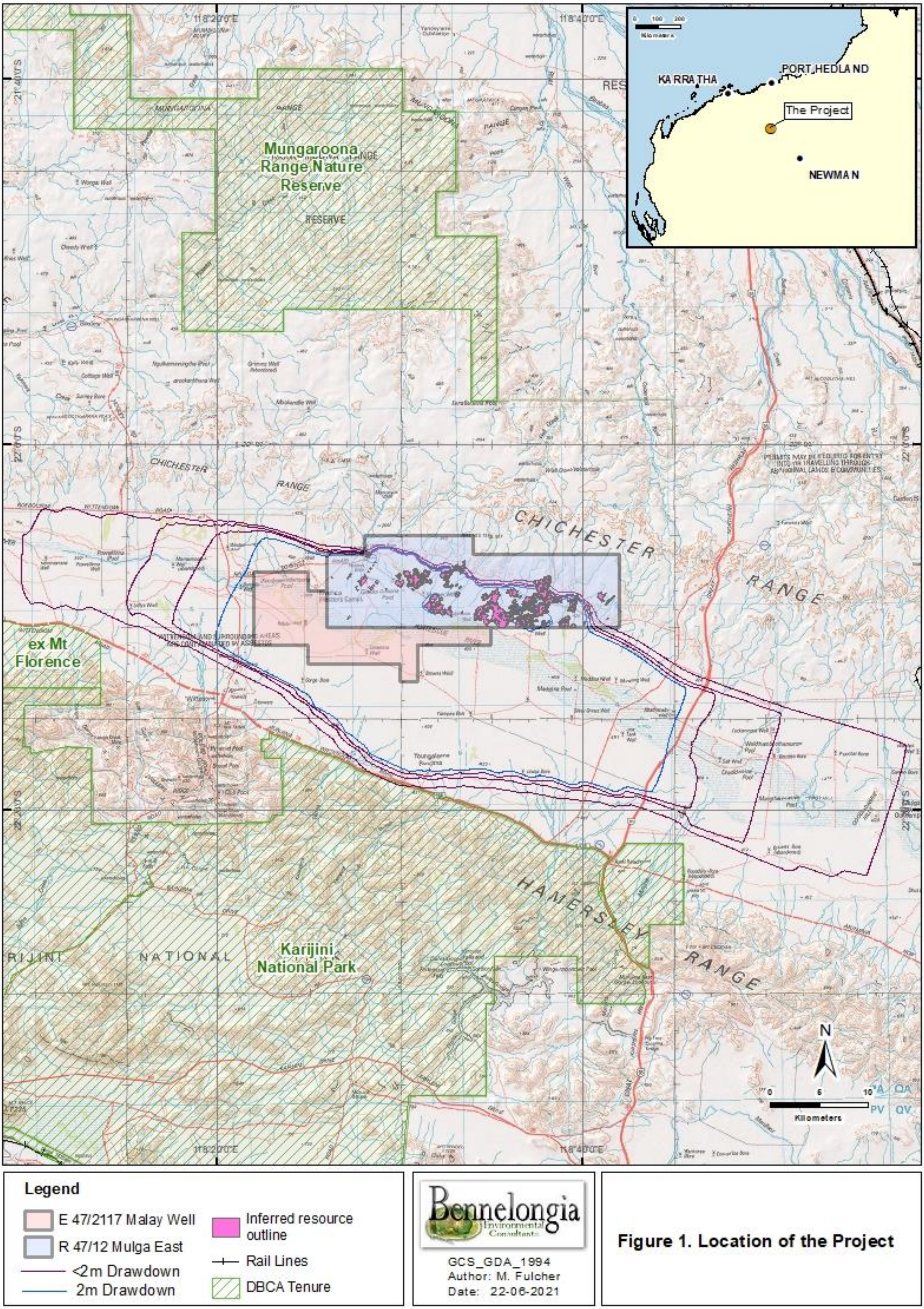


Figure 1. Location of the Project

1.2 Troglofauna

While the earliest troglofauna surveys in Western Australia focussed on cave habitats, subsequent records from pisolitic mesas in the Robe River Valley in the Pilbara (Biota 2006) demonstrated the occurrence of troglofauna in non-karstic formations. Troglofauna have since been recorded throughout the Western Australian landscape, with the greatest diversity and abundance occurring in the Pilbara (Halse 2018a). Troglofauna are represented by a wide variety of invertebrate groups, including isopods, palpigrads, spiders, schizomids, pseudoscorpions, harvestmen, millipedes, centipedes, pauropods, symphylans, bristletails, silverfish, cockroaches, bugs, beetles and fungus-gnats.

Regional patterns of troglofauna occurrence and community composition in various habitats are not well understood because the majority of surveys have focussed on areas of mining development, particularly mineralised iron formations. Consequently, while troglofauna have been found to occur widely in BIF and other iron deposits (e.g. Bennelongia 2008a, b; Biota 2006), there is little basis for assessing the extent of their occurrence in other habitats. Nonetheless, it is known that troglofauna may occur in calcrete and alluvial-detrital deposits in the Pilbara and Yilgarn (Edward and Harvey 2008; Bennelongia 2015c).

1.3 Habitat Requirements

Historically, the focus on subterranean fauna was primarily on their occurrence in large underground caves (Culver *et al.* 2006; Holthuis 1960; Schneider and Culver 2004; Skubała *et al.* 2013; Whitely 1945) but many species have more recently been found living in smaller spaces throughout vadose zones in arid areas (Guzik *et al.* 2010; Halse and Pearson 2014).

Geology influences the presence, richness and distribution of subterranean fauna by providing different types of habitat (Eberhard *et al.* 2005; Hose *et al.* 2015). Generally speaking, more transmissive geologies tend to support more substantial assemblages of subterranean fauna, both in terms of abundance and diversity. For example, Korbel and Hose (2015) found that coarser sediments in alluvial strata tend to host the greatest numbers of stygofauna, with relatively few animals in silty or clay-rich substrates.

Physical and chemical weathering of consolidated strata can also provide habitable spaces through the creation of underground vughs and caves. Chemical deposition of carbonate rich material in the alluvium of palaeochannels has led to the formation of calcrete aquifers that, through the re-working caused by fluctuating watertables, may offer habitat similar to classic karst formations. A considerable number of calcrete aquifers in the Yilgarn and Pilbara are listed as Priority Ecological Communities (PECs, an informal category for protection of natural habitats; see Section 3) on the basis of being known or likely to host rich subterranean communities. The calcrete aquifer occurring near the Project is not listed as a PEC.

In addition to controlling the occurrence of subterranean fauna, geological, topographical and hydrological features may influence subterranean faunal assemblages by allowing, or restricting, dispersal between populations. The relative importance of dispersal and vicariance in explaining spatial patterns of stygal community structure is likely to vary between regions according to historical and present-day geology and hydrogeology (Culver *et al.* 2009; Finston *et al.* 2007; Harms *et al.* 2018). For instance, vertical shifts in the water table may act to unite previously isolated aquifers, thus allowing gene flow between populations (Finston *et al.* 2007). In other cases, subterranean geology and surface drainage patterns result in barricades to dispersal, causing vicariance between populations and subsequent speciation over relatively fine geographical scales. For instance, adjacent mesas of only a few square kilometres in extent in the Pilbara support genetically isolated (and different) species of troglofaunal pseudoscorpions (Harvey and Leng 2008). Some troglofaunal schizomid species in the Hamersley Range also appear to have very small ranges, although the barriers to dispersal are uncertain (Harms *et al.* 2018). In general, there is a high incidence of short-range endemism amongst the Western Australian subterranean fauna, as well as frequent cryptic (or near cryptic) speciation.

2. IMPACTS OF MINING

Mining and associated activities have two broad categories of impact on subterranean fauna:

1. *Primary Impacts* have the potential to threaten the persistence of subterranean species through direct removal of habitat; and
2. *Secondary Impacts* adversely affect subterranean fauna through reducing population densities but do not threaten species persistence. Habitat continues supports some animals within areas of impact or impact areas are relatively small in comparison to the project area.

2.1 Impacts on Stygofauna

The most common primary impacts on stygofauna are dewatering to prevent flooding of open pit mines and groundwater abstraction to supply water for ore processing. They have the potential to threaten persistence of any stygofauna species with ranges restricted to the area of groundwater drawdown. In addition, the excavation of a mine pit itself is likely to threaten the persistence of any stygofauna species restricted to the pit, although this impact can be assessed when considering dewatering drawdown because the mine pits are contained within the area of drawdown. A significant secondary impact is reinjection of dewatered groundwater. This process may change water chemistry and alter any groundwater stratification present, causing habitat and faunal change (Datry *et al*. 2005; Masciopinto *et al*. 2005; Humphreys 2009).

2.2 Impacts on Troglofauna

Excavation of mine pits is the most significant (and usually only) primary impact affecting troglofauna. However, reinjection of dewatered groundwater can also comprise a primary impact of variable significance as the water table is raised the water table and the volume of available troglofauna habitat is reduced. Other mine-related works, such as the groundwater drawdown associated with dewatering, reduced infiltration associated with waste rock dumps and leakage from tailings dams, have minimal impact compared with pit excavation and are considered secondary impacts.

2.3 Scope of this Report

The purpose of this report is to provide baseline information on subterranean fauna occurrence in and around the Project. Information in the report will provide a framework for subsequent environmental impact assessment to ensure the protection of subterranean fauna conservation values during mine development and operations.

Several surveys for subterranean fauna have already been carried out within the Project area and its immediate vicinity to identify the presence of stygofauna and troglofauna species in this landscape. The report refers to three types of area when discussing subterranean fauna: (1) the Project area, which consists of the Mulga East and Malay Well tenements, (2) the Project vicinity, which includes areas sampled for subterranean fauna close outside the Project area by Hancock's consultants or other programs, and (3) the inferred resource outlines, which approximately correspond with proposed future mine pits (Figure 2).

The specific aims of this report are to:

1. Identify all the required environmental approvals for the Project relating to subterranean fauna;
2. Collate all data on subterranean fauna contained in publicly available databases or collected during previous surveys in the Project area and Project vicinity;
3. Report the results of two rounds of additional subterranean field survey conducted by Bennelongia;
4. Identify any gaps in subterranean fauna sampling in relation to geographic coverage or providing species range information; and
5. Identify areas where Project development could be potentially constrained by broad issues associated with subterranean fauna, such as the occurrence of restricted species.

3. FRAMEWORK

Native flora and fauna in Western Australia are protected at both state and Commonwealth levels. At the national level, a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places is provided via the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act identifies two types of fauna consideration for environmental protection, namely threatened species and threatened ecological communities (TECs, which are natural assemblages of species associated with particular landscapes).

At the state level, protection occurs under the *Biodiversity Conservation Act 2016* (BC Act). The highest level of protection is given to Schedule 1 species that are considered rare, likely to become extinct, or otherwise in need of special protection. The current list of threatened species is provided by the Wildlife Conservation (Specifically Protected Fauna) Notice 2018. The Department of Biodiversity, Conservation and Attractions (DBCA) also maintains a list of priority fauna species that are of conservation importance but, for various reasons, do not meet the criteria for listing as threatened.

Additionally, there is a state list of TECs that are protected under the BC Act (this is larger than the EPBC Act list and has greater focus on subterranean communities). Other communities of potential conservation concern, but for which there is little information, are listed informally by DBCA as priority ecological communities (PECs).

3.1 Subterranean fauna approvals required

As a part of the planning process, it is a requirement to submit a Mining Proposal to the Department of Mines, Industry Regulation and Safety (DMIRS). The guidelines for mining proposals in Western Australia states that proponents shall determine whether short range endemic (SRE) species and/or subterranean fauna are likely to be present and whether appropriate field surveys are required (DMP 2016).

Additionally, the Department of Water and Environmental Regulation (DWER) require licencing for the extraction of groundwater. There are two components of this.

- Section 26D *Rights in Water and Irrigation* Act 1914 (*RIWI* Act) Form 1 covers commencing, constructing, enlarging, deepening or altering a well; and
- Section 5C *RIWI* Act Form 3G is to apply for a licence to take groundwater.

These forms can be submitted together and while they do not explicitly require information regarding subterranean fauna, they may result in actions being required concerning subterranean fauna.

Both DMIRS and DWER may refer projects to the Environment Protection Authority (EPA) if they feel impacts to subterranean fauna (or any other environmental factor) may be sufficient to warrant formal assessment. Alternatively, a proponent can refer a project for assessment if, after the completion of baseline and targeted surveys and project design, it is not able to reduce the significance of an impact or impacts to acceptable levels on key environmental factors (EPA 2018).

In order to conduct subterranean fauna surveys, a Regulation 27 licence to take fauna for scientific purposes needs to be obtained from DBCA. This licence must be obtained by the company conducting the survey rather than by project proponent and the reporting onus is on the individual supervising fieldwork.

4. METHODS

All work presented in this report was conducted as desktop and baseline investigations in accordance with *Environmental Factor Guideline – Subterranean fauna* (EPA 2016a), *Technical Guidance – Subterranean fauna survey* (EPA 2016c), and *Technical Guidance – Sampling methods for subterranean fauna* (EPA 2016b). At the time of undertaking the desktop and field survey, no Project footprint information was available other than what could be inferred from the location of exploration drilling. Prior to reporting, inferred resource outlines were developed. After the report was completed, preliminary groundwater modelling results were made available. These are mapped (e.g. Figure 1) but were not used for the purposes of analysis in the report.

The focus of the desktop and surveys was to document the subterranean fauna community of the Project area. It was requested, however, that this report identify troglofauna species known only from within the inferred resource outlines as well as the Project area. A separate investigation has considered the likelihood of these species actually being restricted to the inferred resource outlines (JBS&G-Strategen 2021). The Project area be used as the estimated extent of groundwater impact, although preliminary modelling suggests the area of groundwater drawdown is larger.

4.1 Desktop study

The geology and hydrogeology of the Project area were reviewed for their prospectivity for subterranean fauna.

Records of subterranean fauna in the Project area and Project vicinity were collated using the results of three dedicated subterranean fauna surveys commissioned by Hancock Prospecting, namely:

- Troglofauna survey of Murray Hill in 2009-2010 (Ecologia 2011) – troglofauna targeted in two rounds of sampling;
- Subterranean fauna survey of the Mulga Downs Project in 2012-2013 (Phoenix 2013) – stygofauna and troglofauna targeted in three rounds of sampling; and
- Troglofauna sampling of the Mulga Downs Project in 2014 (Bennelongia 2014) – stygofauna and troglofauna targeted in a single round of sampling.

The above three surveys predominantly surveyed the Project area, and thus mainly provided information about the wider distribution of species within the Project area. Higher-order identifications were not included in the final count of recorded species unless they belonged to taxonomic units that were not otherwise recorded. Records from outside the Project area were used to assess the known distributions of recorded species and highlight species of potential conservation concern.

Databases of the Department of the Environment and Energy via an EPBC Act Protected Matters search, and DBCA via searches of the Threatened Flora, Fauna and Ecological Communities database and NatureMap were reviewed to identify the occurrence of any listed subterranean fauna species or TECs and PECs in the Project area or vicinity. In addition, the database of the Western Australian Museum was reviewed for the occurrence of any subterranean fauna species in the Project area and Project vicinity collected from sampling done by groups other than Hancock Prospecting consultants. Note that the focus of the desktop was to provide information about the subterranean community/ies within the Project area.

4.2 Field survey

In order to expand on the data and conclusions of the desktop study, a two-season field survey of subterranean fauna was undertaken by Bennelongia. The first round of sampling was conducted in August 2019 and the second round was conducted in January and February 2020 (with retrieval of troglofauna traps occurring about two months after initial sampling in both rounds). Troglofauna was sampled via scraping and trapping at 120 uncased exploration drill holes located inside (impact) and outside (reference) the proposed mine pit. In addition, 119 bores were sampled for stygofauna via net hauling (Table 1). Details of the holes and bores sampled in 2019 and 2020 are provided in Appendix 1.

Table 1. Summary of the 2019-2020 sampling by Bennelongia in the Project area.

Sampling round	Stygofauna	Troglofauna	
		Scrape	Traps
First round (August 2019)	40	60	59
Second round (January to February 2020)	79	60	60
Total	**119**	**120**	**119**

4.2.1 Sampling methods

Sampling occurred mostly in exploration drill holes or, occasionally for stygofauna, in cased bores or wells.

As far as possible, each troglofauna sample represented the combined results of two different, complementary sampling techniques: scraping and trapping. Scraping is an active sampling technique that is used prior to setting traps. In each scraping event, a troglofauna net is prepared with a weighted ring net of 150 µm mesh, and a diameter closely matched to 60% of the bore diameter. This net is lowered to the bottom of a bore or to the water table, and subsequently scraped back to the surface at least four times. In each of these *scrapes* a different section of the wall of the hole is targeted (e.g. north, south) to maximize the organisms retrieved. The contents of each scrape are immediately transferred to 100% ethanol for preservation of the sample and its DNA. Trapping is a passive sampling technique used after the drill hole is scraped. Traps of cylindrical PVC (270 x 70 mm) with holes drilled on the side and top to function as entrances were baited with microwaved leaf litter. Traps were lowered on nylon cord to the end of the bore, or to a few metres above the water table. One trap was set near the bottom of the drill hole or just above the water table. At about one-quarter of holes, a second trap was set approximately halfway between the surface and the first trap. Traps were then left inside bores for nine weeks in 2019 and 14 weeks in 2020. During that period, the bores were sealed to minimise movement of surface animals into the troglofauna traps. When traps were retrieved, their contents were transferred to a zip-lock bag and transported alive to the laboratory in Perth.

Stygofauna were collected by net-hauling, with a small weighted plankton net being lowered to the bottom of the hole and then agitated vigorously to stir benthic and epibenthic fauna into the water column. Animals were captured as the net was slowly retrieved. Six separate net hauls were made (three with 50 µm mesh net and three with 150 µm mesh net). The contents of the net were transferred to 100% ethanol for preservation after each haul. Contamination between sites was avoided by washing the nets between the sampling of different drill holes.

4.2.2 Laboratory processing

All samples were sorted in the laboratory. Leaf litter retrieved from traps was processed in Berlese funnels under halogen lamps for 72 hours, during which time the light and heat drove animals downwards and towards a vial containing 100% ethanol as a preservative. Litter was quickly checked after removal from the funnels to ensure no invertebrates remained. Samples in ethanol from the Berlese fennels were carefully screened under a dissecting microscope.

Troglofauna scrape samples and stygofauna net samples were elutriated to separate animals from sediment and put through sieves to fractionate the contents according to size (53, 90 and 250 µm) to improve searching efficiency. All potential subterranean animals removed from these samples for species or morpho-species level identification using published, unpublished and informal taxonomic keys, as well as species descriptions in the scientific literature. Morphospecies were established using the characters of existing species keys, and the lowest level of identification possible was reached given the constraints of sex, maturity of the specimens (juveniles and females are often impossible to identity to species level) and possible damage to body parts. During the final phase of identification, dissecting and compound microscopes were used, with the process often requiring dissection of specimens. On completion of assessment, representative animals will be lodged with the Western Australian Museum.

4.2.3 Genetic analyses

DNA sequencing was attempted on 55 specimens using the CO1 and, in some cases, the 12S gene to provide improved identifications. However, success rate was low, with sequences obtained for only 18 troglofauna and 18 stygofauna species. DNA extraction and amplification were undertaken by Helix Molecular Solutions. Sequencing was done by the Australian Genomic Research Facility (AGRF). Analysis of the results to confirm or improve species identification was done by Bennelongia.

Depending on the size of the specimens, legs or whole animals were used for DNA extractions using a Qiagen DNeasy Blood & Tissue kit (Qiagen 2006). Elute volumes varied from 40 µL to 200 µL depending on the quantity of material. Primers combinations used for PCR were LCO1490:HCO2198 and LCO1490:HCOoutout for the MT-CO1 gene (Folmer *et al.* 1994; Schwendinger and Giribet 2005) and 12Sai:12RJ and 12Sai:12Sbi for the 12S gene (Kambhampati and Smith 1995; Simon *et al.* 1994). Dual-direction, sanger sequencing was undertaken for PCR products by AGRF. Sequences returned were aligned in Geneious (Kearse *et al.* 2012) and genetic distances between sequences (Tamura-Nei method) were measured as uncorrected p-distances (percentage of nucleotide differences). Sequences on GenBank and in grey literature were included in phylogenetic analysis to provide a framework for assessing intra- and interspecific differences.

In most cases the aim of genetic analyses was to align some specimens/species collected in the 2019-2020 survey with specimens collected in previous surveys. In some cases, the analyses were also used to juveniles to adult animals (on which morphological identification was based) to gather species distribution information.

4.2.4 Personnel

Fieldwork in 2019 and 2020 was undertaken by Jim Cocking and Louis Masarei. Sample sorting was done by Melanie Fulcher, Heather McLetchie, Jessica Tacey and Melita Pennifold. Identifications were performed by Jane McRae (all groups other than ostracods) and Stuart Halse (ostracods). Analyses of DNA sequence data to determine species relationships was done by Bruno Buzatto. Reporting was done by Bruno Buzatto, Huon Clark and Stuart Halse.

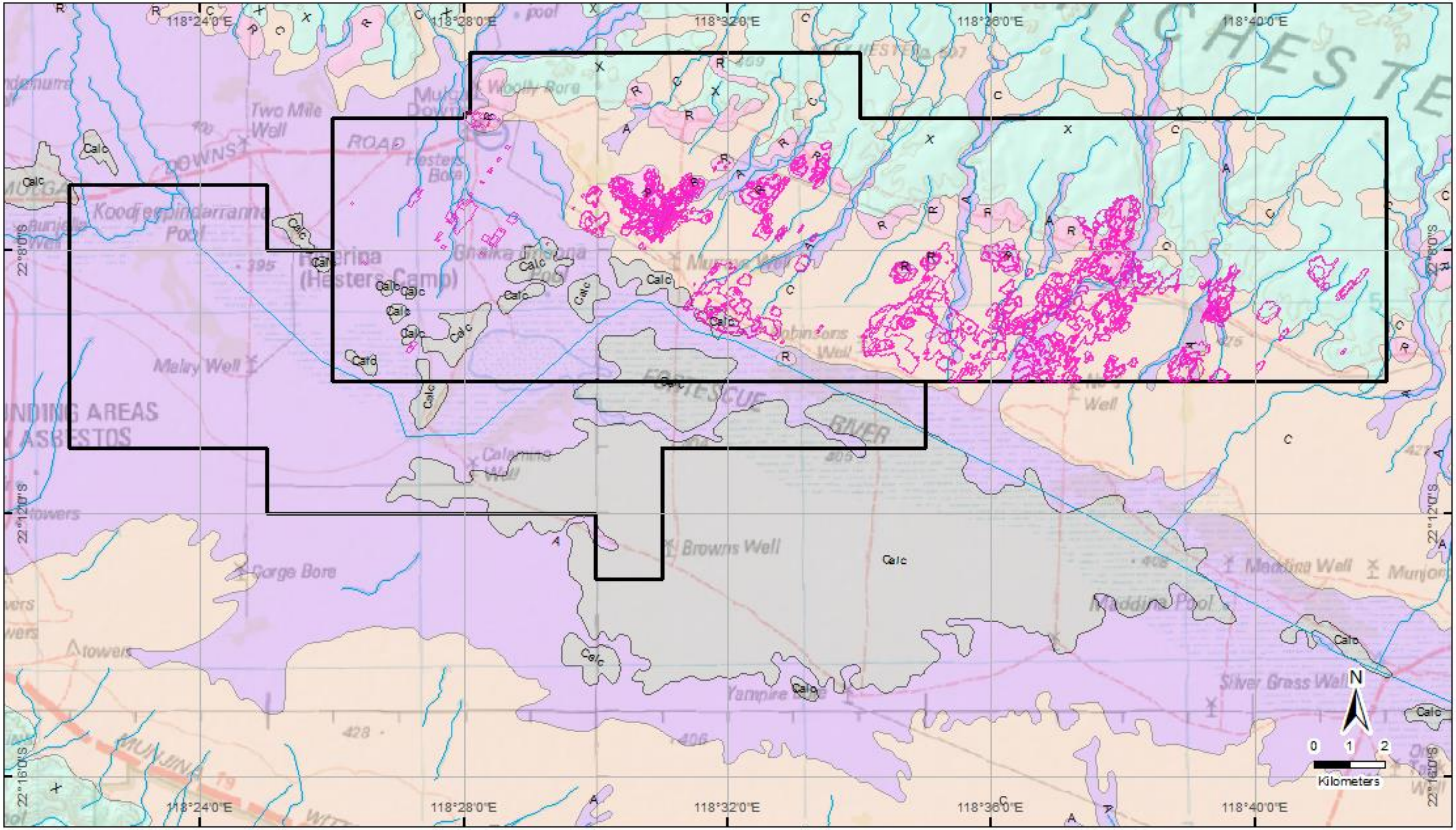
5. RESULTS

5.1 Habitat Prospectivity

The Project is situated on the north flank of the western end of the Fortescue Valley, between the Chichester and Hamersley Ranges, although the Project also extends a short distance north into the Chichester Range (Figure 2). The valley is overlain by depositional units, with large areas of colluvium interspersed with alluvium in creek lines that have washed down from the exposed rock of the Chichester Range (Figure 2). Below the depositional units, there is mainly Wittenoom Formation and Marra Mamba Iron Formation. Some calcrete deposits with high hydraulic conductivity occur below the watertable. The mineralised Marra Mamba Iron Formation often contains abundant water and can also be highly transmissive. Some channel iron deposits are also likely to be present in the Project area, and its vicinity, with moderate to high yielding aquifers. The occurrence of high-yielding aquifers suggests that the Project area is prospective for stygofauna (Halse *et al*. 2014).

Colluvium, alluvium, calcrete, channel iron and Marra Mamba are also potentially prospective for troglofauna (Halse and Pearson 2014; Humphreys 1999; Mokany *et al.* 2017). However, areas with a very shallow water table (i.e. less than 5 m) are unlikely to be prospective for troglofauna as minimal habitat is available, especially when considering that natural fluctuations in the water table may intermittently further reduce the amount of habitat available. Similarly, areas with a deep water table, i.e. >30 m, are unlikely to support rich or diverse stygofauna communities due to limited surface inputs of nutrients and energy (Halse *et al.* 2014). The water table in the Project area is mostly 4 to 6 m below ground level but increases to approximately 30 m below ground level where ground is elevated.

Previous work conducted along the Chichester Range has demonstrated through sampling results that suitable habitat exists in the area for both troglofauna and stygofauna (Bennelongia 2009a, 2011, 2012, 2015a, 2018). The undulating foot slopes of the Chichester Range continue along the northern length of the Fortescue Valley for approximately 200 km (van Vreeswyk *et al.* 2004) and, by inference, suitable



GCS_GDA_1994
Author: M. Curran
Date: 1-3-2019

Legend

- Resource outline
- Mulga East
- Drainage

Surficial Geology

- Alluvium (A)
- Colluvium (C)
- Calcrete (Calc)
- Residual (R)
- Exposed rock (X)

Figure 2. Surficial geology in the vicnity of the Project at the scale of 1:500,000 (Marnham & Morris 2003)

habitats for both stygofauna and troglofauna are likely to occur within Project area and Project vicinity. However, there is a hydrological divide in the Fortescue Valley at the Goodiadarrie Hills (Aquaterra 2004), meaning that saline water from below the Fortescue Marsh does not extend downstream to the Project. As a result, the species composition of the stygofauna community near the Project is likely to be distinct from that of the community east of the divide (Bennelongia 2015b).

5.2 Total sampling effort

Current best practice for troglofauna sampling involves both scraping and trapping. The relative effort expended on these methods differed between the 2019-2020 and earlier surveys and, to facilitate comparisons of the sampling effort across surveys, it was standardised in the following way. When scraping occurred at a drill hole, it was treated as collecting half a sample unit and, similarly, setting traps was treated as a half sample. Ideally, a full 'sample unit' equates to one hole being scraped (regardless of how many times the net was dropped down the hole when sampling) and trapped (regardless of how many traps were placed in the hole) during one visit but it may also comprise two scrape half-samples or two trap half-samples.

Standardised sampling effort to date at the Project area and its vicinity is large (Table 2), with 261 units of stygofauna sampling and 434.5 units of troglofauna sampling (Figure 5). Only sampling initiated by Hancock Prospecting is shown. A caveat is that sampling by Ecologia (2011) yielded only three species and very few animals and should probably not be included in the calculation of sampling effort. It is omitted from Figure 5.

Table 2. Sample effort for subterranean fauna within the Project.

Target fauna and method	2009-2010 Ecologia	2012-2013 Phoenix	2014 Bennelongia	2019-2020 Bennelongia	Total
Stygofauna					
Net	-	103	37	119	**259**
Karaman-Chappuis	-	2	-		**2**
Stygofauna sample effort	**-**	**105**	**37**	**119**	**261**
Troglofauna					
Scrape	68	121	119	120	**428**
Single Trap	-	120	77	118	**315**
Double Trap	97	-	24	1	**122**
Banana Trap	-	4	-	-	**4**
Troglofauna sample effort*	**82.5**	**122.5**	**110**	**119.5**	**434.5**

5.3 Sampling results

The results of all sampling in the Project area and vicinity have been assembled in Table 3 and Table 4. Species names have been updated where necessary (and possible) to maintain consistency of identifications across surveys and to achieve the most accurate species lists possible. However, despite attempts to align taxonomy, some species may be listed under multiple names, due to nomenclature differing between consultants. It is also noted that abundance values for each species were not reported in Phoenix (2013) and therefore the number of specimens collected is likely to be slightly underestimated.

5.3.1 Stygofauna

At least 106 stygofauna species have been collected in the Project area. Groups represented included flatworms (at least one species), nematodes (or round worms; at least one species), rotifers (at least three species), earth worms (13 species), mites (at least three species), amphipods (11 species), isopods (three species), syncarids (10 species), copepods (31 species) and ostracods (30 species; Table 3).

Of the 106 species:

- 26 are known only from the Project area, with 13 species were collected as single animals or only from one hole, while the other 13 species had multiple occurrences and linear ranges of 3 to 22 km (Figure 4 and Figure 5);

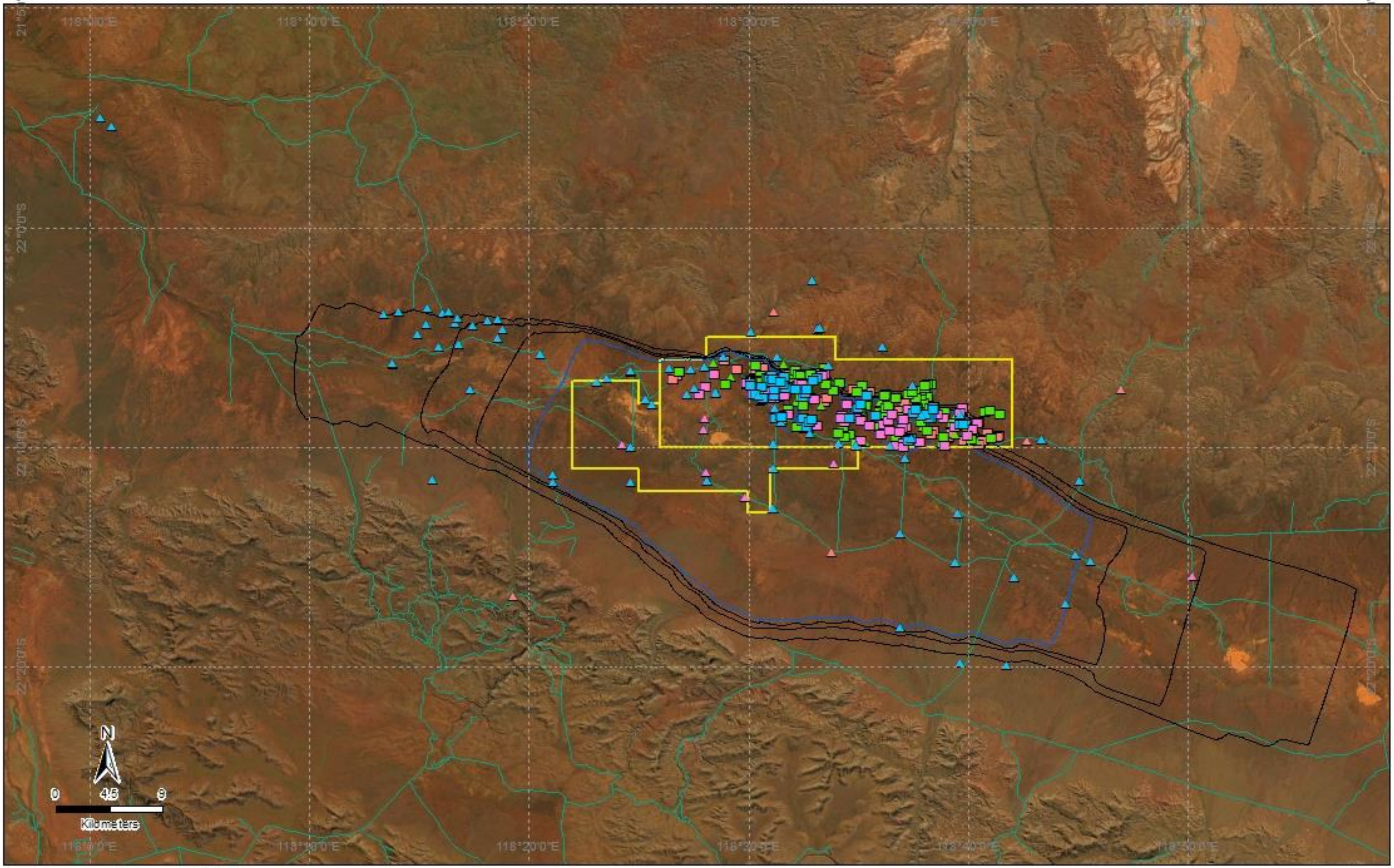


Figure 3. Sites sampled by Bennelongia and Phoenix. The Project area and groundwater drawdown are shown.

Table 3. Stygofauna species found in the Project area and Project vicinity.
Grey denotes higher order identifications that might belong to other listed species (not always viewed as unique species); blue represents species complexes; pink shows species only known from the Project area. * indicates a species investigated genetically; ** indicates genetic analysis was attempted, but the individuals failed to return sequences.

Higher Order Identification	Lowest identification	No. of specimens	Only Known from Project	**Notes on Distribution** (superscript 'a' indicates taxon collected in the latest 2019-2020 survey, whereas 'b' indicates taxon collected in the previous surveys)
Platyhelminthes	Platyhelminthes sp.	1	-	Not assessed in EIA per EPA (2016c)[a]
Turbelaria			-	
	Turbellaria sp.	7	-	Not assessed in EIA per EPA (2016c)[a]
Nematoda	Nematoda spp.	218	-	Not assessed in EIA per EPA (2016c)[a,b]
Rotifera	Rotifera sp.	40	-	Not assessed in EIA per EPA (2016c)[b]
	Bdelloidea sp. 2:2	5	No	Not assessed in EIA per EPA (2016c)[b]
Ploima				
Lecanidae	*Lecane leontina*	1	No	Recorded throughout WA[a], not assessed in EIA (EPA 2016c)
Notommatidae	*Cephalodella* sp.	2	-	Higher order identification[a], not assessed in EIA (EPA 2016c)
Annelida				
Aphanoneura				
Aeolosomatidae	*Aeolosoma* sp.	1	-	Higher order identification[a]
	Aeolosomatidae sp.	52	-	Higher order identification, but likely to represent a single species[a,b]
Clitellata				
Oligochaeta				
Enchytraeida	*Enchytraeus* sp. AP PSS1 s.l.	53	-	Species complex and may be restricted to the Project area[b]
	Enchytraeus sp. AP PSS2 s.l.	222	-	Species complex and may be restricted to the Project area[b]
	Enchytraeus \`Ench7\`*	27	No	Genetically aligned to *Enchytraeus* \`Ench7\` from Kutayi (~160 km ESE)[a]
	Enchytraeidae \`2 bundle\` s.l. (long thin)**	3	-	Species complex and may be restricted to the Project area[a]
	*Enchytraeus \`E06-01\`**	84	No	Genetically aligned to *Enchytraeus* \`E06-01\` from BHP Quarry 8 (105 km linear range)[a]
Haplotaxida				
Naididae	*Pristina longiseta*	398	No	Recorded throughout WA[a,b]
	Dero (Dero) nivea	1	No	Recorded throughout WA[a]
	Pristina aequiseta	10	No	Recorded throughout WA[a]
Phreodrilidae	Phreodrilidae sp. AP DVC s.l.**	52	-	Species complex possibly restricted to the Project but common/widespread in the area[a,b]
	Phreodrilidae sp. AP SVC*	6	No	Genetically divergent at least 11.6% (in COI) from any other species in the family, linear range of 48 Km in this survey[a], also found outside project area
	Phreodrilus peniculus	1	No	Recorded throughout the Pilbara and Gascoyne[b]
Tubificidae	Tubificidae sp.**	7	-	Higher order identification[a,b]
Arthropoda				

Higher Order Identification	Lowest identification	No. of specimens	Only Known from Project	**Notes on Distribution** (superscript 'a' indicates taxon collected in the latest 2019-2020 survey, whereas 'b' indicates taxon collected in the previous surveys)
Acari				
Mideopsidae	*Guineaxonopsis* sp. B03 (S01 group)	2	Yes	Known only from the Project area, linear range 20 km[b]
	Guineaxonopsis `BAC011`	6	No	Known only from this survey, outside of the Project area in a single location[a]
Halacaridae	Halacaridae sp.	68	-	Higher order identification[b]
Malacostraca				
Amphipoda				
Paramelitidae	Paramelitidae `MH1`	66	No	Known from both sides of Fortescue River at Mulga East and Pyramid Pool[b]
	Paramelitidae sp. B47	366	No	Linear range 53.3 km[a,b], also found outside Project area
	Paramelitidae sp. B48	185	No	Linear range of 49 km[a,b], also found out of the Project area
	Paramelitidae Genus 2 `BAM181`	180	No	Known only from this survey, linear range 26.2 km[a], also found out of project area
	Paramelitidae Genus 2 sp.	26	-	Higher order identification[a]
	Paramelitidae sp.	1	-	Higher order identification[a]
	Pilbarus `BAM175`	33	No	Known only from this survey, linear range 30 km[a], also found out of project area
	Chydaekata `BAM180`*	8	Yes	Known only from the Project area, linear range 4.1 km[a]; compared genetically to Paramelitidae MH1, but not B47 and B48
	Maarrka `BAM182`*	2	Yes	Known only from a single location in the Project area[a]; compared genetically to Paramelitidae MH1, but not B47 and B48
	Maarrka `BAM185`*	1	Yes	Singleton known only from the Project area[a]; compared genetically to Paramelitidae MH1, but not B47 and B48
Bogidiellidae	*Bogidiella* `BAM183`**	1	Yes	Singleton, known only from the Project area[a]
Eriopisidae	*Nedsia* sp.**	3	-	Higher order identification[a]
Neoniphargidae	Neoniphargidae `BAM176`	7	Yes	Known only from the Project area, linear range 6.8 km[a]
Isopoda				
Microcerberidae	Microcerberidae `BIS389`	1	No	Singleton, known only from this survey from a single location outside the Project area[a]
Tainisopidae	*Pygolabis* `BIS388`**	2	No	Known only from a single bore near the Project area[a]
	Pygolabis `MH1`*	11	Yes	Known only from the Project area, linear range 6 km[a,b]
	Pygolabis sp.	1	-	Higher order identification[a]
Syncarida				
Bathynellaceae				
Bathynellidae	Bathynellidae sp.*/*Pilbaranella* sp.	12	-	Higher order identification[a,b]; compared genetically to *Pilbaranella* MH1 and MH2, but not B18
	Pilbaranella `MH1`	3	Yes	Known only from the Project area, linear range 15.8 km, collected in stygofauna nets and a surface Karaman-Chappuis sample[b]

Higher Order Identification	Lowest identification	No. of specimens	Only Known from Project	**Notes on Distribution** (superscript 'a' indicates taxon collected in the latest 2019-2020 survey, whereas 'b' indicates taxon collected in the previous surveys)
	Pilbaranella \`MH2\`	3	Yes	Known only from one single location in the Project area[b]
	Pilbaranella sp. B18	1	Yes	Singleton, known only from the Project area[b]
Parabathynellidae	*Atopobathynella* sp. B09	10	Yes	Known only from the Project area, linear range 3 km[b], collected in a stygofauna net and a surface Karaman-Chappuis sample, also called Parabathynellidae \`MH1\`
	Billibathynella sp. B08*	1	No	Also known from 18 km SW[a], not compared genetically to B10 and B11, but morphologically very different to B10
	Billibathynella sp. B10	1	Yes	Singleton, known only from the Project area[b], morphologically different to B08 and B11
	Billibathynella sp. B11	14	Yes	Known only from the Project area, linear range 10.3 km[b]. Morphologically very similar to B08, and genetic comparison not possible, so they could represent the same species
	nr *Billibathynella* \`MH2\`*	5	Yes	Known only from the Project area, linear range 18 km[b], collected in stygofauna nets and a surface Karaman-Chappuis sample, also called Parabathynellidae \`MH2\`. This could be the same species as the record below, which would expand the range to 22 km
	Billibathynella sp.*	1	-	Higher order identification[a]; genetically similar (10.1% in COI) to *Billibathynella* MH2, but borderline intra vs interspecific divergence
	Parabathynellidae \`MH3\`	2	Yes	Singleton, known only from the Project area[b]
	Brevisomabathynella sp.*	4	No	Higher order identification[a]; compared genetically to other congeneric species, but not to Parabathynellidae \`MH3\`. Not aligned to other species known
	Parabathynellidae sp.**	2	-	Higher order identification[a]
Maxillopoda				
Copepoda	Copepoda sp.	14	-	Higher order identification[a]
Cyclopoida	Cyclopoida sp.**	7	-	Higher order identification[a]
Cyclopidae	*Australocyclops similis* s.l.	64	-	Species complex and may be restricted to the Project area[b]
	Apocyclops dengizicus	23	No	Recorded throughout WA[a]
	Diacyclops humphreysi s.l.**	1965	-	Species complex and may be restricted to the Project area[b]
	Diacyclops scanloni s.l.	70	-	Species complex and may be restricted to the Project area[a,b]
	Diacyclops einslei	34	No	Recorded throughout the Pilbara[a]
	Diacyclops reidae	1	Yes	Singleton, known only from the Project area[a]
	Diacyclops sobeprolatus	102	No	Recorded throughout the Pilbara[a]
	Diacyclops sp.	46	-	Species complex and may be restricted to the Project area[b]
	Dussartcyclops sp. B11**	34	Yes	Known only from the Project area, linear range 22.3 km[a]
	Dussartcyclops sp. B13	9	No	Recorded throughout the Pilbara[a]
	Mesocyclops brooksi	202	-	Widespread across most of Australia[a,b]
	Mesocyclops notius	129	No	Recorded throughout the Pilbara[a,b]
	Mesocyclops sp.	31	-	Higher order identification[a,b]

Higher Order Identification	Lowest identification	No. of specimens	Only Known from Project	**Notes on Distribution** (superscript 'a' indicates taxon collected in the latest 2019-2020 survey, whereas 'b' indicates taxon collected in the previous surveys)
	Microcyclops varicans	186	No	Recorded throughout WA[a,b]
	Orbuscyclops westaustraliensis	1	No	Recorded throughout the Pilbara[b]
	Paracyclops nr *chiltoni* (PSW)	2	No	Recorded throughout the Pilbara[a]
	Pescecyclops pilbaricus s.l.	41	-	Species complex and may be restricted to the Project area[a,b]
	Pilbaracyclops sp. B03 (nr *frustratio*)	3	No	Recorded throughout the Pilbara[b]
	Thermocyclops aberrans	48	No	Recorded throughout the Pilbara[a]
	Thermocyclops decipiens	100	No	Recorded throughout the Pilbara[a]
	Thermocyclops sp.	16	-	Higher order identification[a]
	Cyclopidae sp.	6	-	Higher order identification[a]
Harpacticoida				
Ameiridae	*Abnitocrella* `BHA274` (nr *eberhardi*)**	36	No	Known only from this survey, but also outside the Project area, linear range 6.5 km[a]
	*Abnitocrella eberhardi**	140	No	Along the Fortescue River at Mulga Downs and Mt Florence, linear range 106 km[a,b]
	Megastygonitocrella sp. B04	140	No	Along the Fortescue valley west of Goodiadarrie Hills at Mulga East and Mt Florence[a,b]
	Nitokra `BHA275`	21	No	Known only from inside and near the Project area, linear range 9.8 km[a]
	Ameiridae sp.	1	-	Higher order identification[a]
Canthocamptidae	Canthocamptidae sp. B03	26	Yes	Known only from the Project area, six locations within a linear range of 2.8 km[b]
	Canthocamptus australicus	15	No	Recorded throughout WA[b]
	Elaphoidella sp. B02	8	No	Known only from this survey, linear range of 72 km[a,b], also found out of the Project area
Miraciidae	*Schizopera* `BHA277`	2	Yes	Known only from the Project area in single location[a]
Parastenocarididae	*Dussartstenocaris* sp. B01	65	No	Linear range of 53 km[a,b], also found out of the Project area, collected in surface Karaman-Chappuis sample
	Dussartstenocaris sp.	1	-	Higher order identification[b]
	Parastenocaris `BHA276`	145	Yes	Known only from the Project area, linear range 12 km[a]
	Parastenocaris jane	26	No	Recorded throughout WA[a]
	Parastenocaris sp. B18*	7	Yes	Known only from the Project area, linear range 16 km[a,b]
	Parastenocaris sp. B29*	107	Yes	Known only from the Project area, linear range 9.5 km[a,b]
	Parastenocarididae sp.	15	-	Higher order identification[b]
Ostracoda	Ostracoda sp. unident.	1	-	Higher order identification[b]
Candonidae	*Areacandona arteria*	2	No	Recorded at Mulga Downs and Telfer[b]
	Areacandona mulgae	3	No	Recorded throughout the Pilbara[b]
	Areacandona brookanthana	6	No	Recorded throughout the Pilbara[b]
	Areacandona cf. *clementia*	1	-	Species complex and may be restricted to the Project[b]

Higher Order Identification	Lowest identification	No. of specimens	Only Known from Project	**Notes on Distribution** (superscript 'a' indicates taxon collected in the latest 2019-2020 survey, whereas 'b' indicates taxon collected in the previous surveys)
	Areacandona `BOS1381`	2	Yes	Known only from the Project area in single location[a]
	Areacandona `BOS1433`	49	No	Known only from this survey, linear range of 32.3 km[a], also found out of the Project area
	Areacandona `BOS1438`	29	No	Known only from this survey, linear range of 60 km[a], also found out of the Project area
	Areacandona `BOS1441`	32	No	Known only from this survey, linear range of 22 km[a], also found out of the Project area
	Candonidae `BOS1376`	1	Yes	Singleton, known only from the Project area[a]
	Candonopsis tenuis	14	No	Recorded throughout WA[b]
	Candonopsis sp.	1	-	Higher order identification[a]
	Deminutiocandona cf. *quasimica*	2	-	Species complex and may be restricted to the Project[b]
	Humphreyscandona waldockae	25	No	Recorded throughout the Pilbara[b]
	Humphreyscandona `BOS1372`	50	No	Known only from this survey, linear range of 25 km[a], also found out of the Project area
	Humphreyscandona `BOS1379`	48	Yes	Known only from the Project area in single location[a]
	Humphreyscandona `BOS1435`*	1	Yes	Singleton, known only from the Project area[a]
	Humphreyscandona `BOS1439`	1	No	Singleton, known only from this survey from a single location outside the Project area[a]
	Meridiescandona `BOS297`	2	No	Known from both sides of Fortescue River at Mulga East and Pyramid Pool[b]
Cyprididae	*Bennelongia tirigie*	10	No	Recorded throughout the Pilbara[a]
	Cypretta seurati	368	No	Found throughout central WA[a,b]
	Cypretta sp.	21	-	Higher order identification[a]
	Cyprididae `BOS1375`	113	No	Known only from this survey, but with a large linear range of 83.7 km[a]
	Cyprididae `BOS1436`	1	No	Singleton, known only from this survey from outside the Project area[a]
	Cypridopsis `BOS1377`	122	No	Known only from this survey, but with a large linear range of 45.5 km[a]
	Cypridopsis `BOS666`	30	No	Recorded throughout the Pilbara[a]
	*Cyprinotus kimberleyensis**	216	No	Genetically aligned to *Cyprinotus cingalensis,* widespread in WA[a]
	Riocypris fitzroyi	13	No	Recorded throughout the Pilbara[a]
	Sarscypridopsis sp.	2	-	Higher order identification[a]
	Stenocypris major	22	No	Recorded throughout the Pilbara[a]
	Strandesia sp. 466	1	No	Recorded throughout the Pilbara[b]
	Cyprididae sp./Cypridopsinae sp.	6	-	Higher order identification[a,b]
Ilyocyprididae	*Ilyocypris australiensis*	1	No	Recorded throughout WA[a]
Limnocytheridae	*Limnocythere stationis*	19	No	Recorded throughout the Pilbara[a]

- Eleven species belong to species complexes (containing multiple species that have not been systematically defined) and therefore have uncertain, but potentially restricted, ranges;
- Eight taxa could not be identified to species level but they must represent distinct species in the list because there are no other records of that high order group. The ranges of these taxa/species and whether they also occur outside the project area could not be determined; and
- 61 species are known to occur outside the Project area, either because they were also collected in the Project vicinity or, more commonly, because other sampling programs have shown them to occur elsewhere in the Pilbara and occasionally even further afield (Table 3, notes on distribution).

The currently modelled (but not finalised) extent of groundwater drawdown is significantly larger than the Project area (Figure 3), so that the figures above should be treated as an indicative underestimate of the number of stygofauna species known only from a potential Project disturbance footprint.

5.3.2 Troglofauna

Up to 70 species of troglofauna were collected within the Project area. Troglofauna were represented by 15 major groups: spiders (four species), palpigrads (three species), pseudoscorpions (seven species), schizomids (four species), isopods (six species), diplurans (eight species), cockroaches (one species), beetles (nine species), flies (one species), true bugs (three species), silverfish (six species), centipedes (six species), millipedes (two species), pauropods (six species) and symphylans (four species).

Sixty of these species are currently known only from the Project area and 18 of these are known only from within inferred resource outlines, including 17 species recorded from a single sample and one species, Palpigradi sp. B18, known from two locations inside inferred resource outlines (Figure 6).

5.3.3 Genetic Sequencing

With sequences obtained for only 65% of specimens submitted, the results of genetic analysis were less informative than hoped for. With the limited data available, interpretations about species relationships based on sequence data were complex and often needed to be informed by animal morphology as well as the sequence results. Accordingly, sequence results are not provided in this report. It is indicated in the Table 3 and Table 4 if genetic results were used to align particular species.

5.4 TECs, PECs and Listed Species

A search of Western Australian listed TECs and PECs revealed the closest of these to the Project is the Priority 4 PEC *Stygofaunal community of the Western Fortescue Plains freshwater aquifer*. This PEC is situated approximately 160 km to the north west of the Project. There are also two Priority 1 PECs, *Subterranean invertebrate communities of mesas in the Robe Valley Region* and *Subterranean invertebrate community of pisolitic hills in the Pilbara*, located approximately 201 km and 240 km to the west of the Project, respectively. None of these PECs is considered to be threatened by the Project. A search of three databases - EPBC Protected matter search tool, DBCA's listed species (including NatureMap) and the ALA, did not identify any listed subterranean species or other listed communities within 100 km of the Project area.

6. DISCUSSION

6.1 Species of Significance

No listed species were identified within the Project area or the Project vicinity from Government database searches.

6.2 Community richness

Although richer communities are known elsewhere in the Pilbara, the 106 and 70 species, respectively, of stygofauna and troglofauna recorded in the Project area represent speciose subterranean fauna communities when compared with the range of previous Pilbara survey results (Bennelongia 2015b, Biota 2017; Biologic

Table 4. Troglofauna species found within the Project area.

Grey denotes higher order identifications that probably belong to another listed species (not currently viewed as additional species); blue represents species complexes; pink denotes species currently only known from resource outlines. * indicates a species investigated genetically; ** indicates genetic analysis was attempted, but the individuals failed to return sequences.

Higher Order Identification	Lowest Identification	No. of Specimens	In resource outline only	Notes on Distribution
Arthropoda				
Chelicerata				
Arachnida				
Araneae				
Oonopidae	Oonopidae sp.**	1	-	Higher order identification[b]
Gnaphosidae	Gnaphosidae sp. B03	1	Yes	Singleton, only known from resource outline[b]
Symphytognathidae	*Anapistula* `MH1`	4	No	Only known from Project area, linear range 14.7 km[b]
Trochanteriidae	Trochanteriidae sp. B01	1	No	Singleton, only known from Project area[b]
Palpigradi	Palpigradi `MH1`*	2	No	Only known from Project area[a, b]
	Palpigradi `MH2`	1	No	Singleton, only known from Project area[b]
	Palpigradi sp.*	2	-	Higher order identification[a,b]; Genetics aligned one specimen (removed from here) with MH1, the other 2 could not be genetically compared to B18)
	Palpigradi sp. B18	6	Yes	Only known from Project area[b], linear range 4 km (reference area lies between the two locations). Possibly conspecific with MH1 or MH2
Pseudoscorpiones				
Chthoniidae	*Tyrannochthonius* `MH1`	4	No	Only known from Project area[b], linear range 9.9 km. Possibly conspecific with B35 or B36
	Tyrannochthonius sp. B35	1	Yes	Singleton, only known from Project area[b]
	Tyrannochthonius sp. B36	1	Yes	Singleton, only known from Project area[b]
	Tyrannochthonius `BPS229`	2	No	Known only from the Project area in single location[a]
	Tyrannochthonius sp.*	1	-	Higher order identification[a]; juvenile, and genetics did not align it with anything else (no sequences from previously collected species to compare)
	Austrochthonius `BPS257`	1	Yes	Singleton, only known from Project area[a]
Hyidae	*Indohya* ?`PSE002`	3	No	Singleton, only known from Project area but its affinity with the terrestrial species `PSE002` suggests it is not a troglofaunal species. Previously called Indohya `MH1`[b]
	Indohya sp.	1	-	Higher order identification[b]
Olpiidae	*Linnaeolpium* sp. B03	1	Yes	Singleton, only known from Project area[b]
	Linnaeolpium sp.*	1	-	Higher order identification[a]; genetics did not align it with anything else, but comparison with B03 was impossible morphologically or genetically

Higher Order Identification	Lowest Identification	No. of Specimens	In resource outline only	Notes on Distribution
Schizomida				
Hubbardiidae	*Draculoides* \`SCH084-DNA\`	1	Yes	Singleton, only known from Project area, previously called *Draculoides* \`MH1\`[b]
	Draculoides \`SCH085-DNA\`	1	Yes	Singleton, only known from Project area, previously called *Draculoides* \`MH2\`[b]
	Draculoides sp. B53	3	No	Singleton, only known from Project area[b]
	Draculoides sp. B54	1	No	Singleton, only known from Project area[b]
	Draculoides sp.	1	-	Higher order identification[a,b]
Crustacea				
Isopoda				
Philosciidae	nr *Andricophiloscia* sp. B18	1	No	Singleton, only known from Project area[b]
Armadillidae	*Buddelundia* sp. B57*	16	No	Only known from Project, linear range 1.8 km[a,b]
	Troglarmadillo \`MH1\`	1	Yes	Singleton, only known from Project area. Possibly conspecific with B54 or B55[b]
	Troglarmadillo sp. B54	209	No	Only known from Project, linear range 16.6 km[a,b]
	Troglarmadillo sp. B55	3	No	Only known from Project area, linear range 6.7 km[b]
	Troglarmadillo \`BIS392\`*	13	No	Only known from Project area at a single site[a]; compared genetically to other *Troglarmadillo*, but comparison not possible with *T.* MH1
	Troglarmadillo sp.	4	-	Higher order identification[a,b]
Hexapoda				
Entognatha				
Diplura	Diplura sp.	1	-	Higher order identification[b]
Campodeidae	Campodeidae sp. B10	1	Yes	Singleton, only known from Project area[b]
	Campodeidae sp.*	1	Yes	Higher order identification[b]; All legs and cerci missing and genetics did not align it with anything else (but could not be compared to B10)
Japygidae	Japygidae sp.	7	-	Higher order identification[a,b]
	Japygidae \`MH1\`	2	No	Only known from Project, linear range 13.6 km[b]
	Japygidae \`MH2\`	2	No	Only known from Project, linear range 11 km[b]
Parajapygidae	Parajapygidae sp.*	2	-	Higher order identification[a,b]; compared genetically to MH1, but not B29 or B30
	Parajapygidae \`MH1\`* / sp. B29	4	No	Only known from Project, linear range 3.2 km. Genetically aligned to B29[a,b]
	Parajapygidae sp. B30	1	Yes	Singleton, only known from Project area[b]
Projapygidae	Projapygidae \`MH1\`	3	No	Only known from Project, linear range 16.8 km. Possibly conspecific with B18[b]
	Projapygidae sp. B18	1	Yes	Singleton, only known from Project area[b]
	Projapygidae \`BDP182\`*	1	Yes	Singleton, only known from Project area[a]; Compared genetically to MH1, but comparison with B18 not possible
Insecta				
Blattodea				

Higher Order Identification	Lowest Identification	No. of Specimens	In resource outline only	Notes on Distribution
Nocticolidae	*Nocticola* `MH1`	39	No	Only known from Project area, linear range 15.7 km. Previously called *Nocticola* sp. B34 (Bennelongia 2014) [a,b]
	Nocticola sp.	27	-	Higher order identification[a,b]
Coleoptera				
	Coleoptera `BCO196`	10	No	Only known from Project area at a single site[a]
	Coleoptera `BCO207`	5	No	Only known from Project area, linear range 2 km[a]
	Coleoptera `BCO208`	1	No	Only known from Project area at a single site[a]
	Coleoptera sp. B07	2	Yes	Only known from a single location in the Project area[b]
Carabidae	*Gracilanillus* `BCO176`	1	No	Singleton from Project area, previously called Bembidiinae sp. B22[b]
	Gracilanillus sp.	1	-	Higher order identification[a]
	Magnanillus `BCO175` (nr *quartermainei*)	10	No	Only known from Project area, linear range 18.6 km, previously called Anillini `MH1` and Bembiinae sp. B21[b]
Curculionidae	Curculionidae Genus 1 sp. B12	10	No	Only known from Project area, linear range 8.1 km[b]
	Curculionidae Genus 2 sp. B18	6	No	Only known from Project area, linear range 8.1 km[b]
Ptiliidae	*Ptinella* sp. B01	2	No	Recorded throughout the central Pilbara[b]
Diptera				
Sciaridae	Sciaridae sp. B01	19	No	Recorded throughout central WA[a,b]
Hemiptera				
Meenoplidae	Meenoplidae sp.	6	-	Higher order identification[b]
	Meenoplidae sp. Solomon 1	1	No	Known from Mulga East and Solomon mine. Previously called Meenoplidae `USF`[b]
	Phaconeura sp.*	9	No	Higher order identification[a,b]; Nymph, compared genetically to all other species reported, but **12.5%** divergence to everything else – probably new species.
	Phaconeura sp. B04	39	No	Troglophile recorded across WA. Previously called Meenoplidae `widespread`[b]
Zygentoma				
Nicoletiidae	Nicoletiinae sp.	2	-	Higher order identification[b]
	Atelurinae `MH1`	6	No	Only known from Project, linear range 12 km. Previously called Atelurinae sp. B20 (Bennelongia 2014) [a,b]
	Trinemura sp.	10	-	Higher order identification[a,b]
	Trinemura `MH1`	6	No	Only known from Project area, linear range 15.5 km[b]
	Trinemura `MH2`	7	No	Only known from Project area, linear range 8.5 km[b]
	Trinemura sp. B27*	12	No	Only known from Project area, linear range 7.2 km[a,b]; compared genetically to MH1, MH2 and Atelurinae MH1

Higher Order Identification	Lowest Identification	No. of Specimens	In resource outline only	Notes on Distribution
	Trinemura sp. B28*	11	No	Only known from Project area, linear range 7.3 km[a,b]; compared genetically to many *Trinemura*, but not MH1 and MH2 (different gene sequenced)
	Dodecastyla sp.	4	-	Higher order identification[a]
Myriapoda				
Chilopoda				
Scolopendrida				
Cryptopidae	*Cryptops* \`MH1\`*	2	No	Only known from Project area[a,b]
	Cryptops \`MH2\`	3	No	Recorded inside and immediately outside the Project area[b]
	Cryptops sp. B41	1	No	Singleton, only known from Project area[b]
	Cryptops sp. B42	1	No	Singleton, only known from Project area[b]
Scolopendridae	*Cormocephalus* \`CHI003\`	1	No	Widespread in central Pilbara. Previously called *Cormocephalus* \`MH1\`[b]
	Cormocephalus pyropygus	2	No	Only known from Project area, linear range 13.6 km[a]
Diplopoda				
Polydesmida	Polydesmida \`BDI065\`	3	No	Only known from Project area at a single site[a]
Polyxenida				
Lophoproctidae	*Lophoturus madecassus*	960	No	Previously called Polyxenidae sp. (Ecologia 2011) and Polyxenidae \`PXD1\` (Phoenix 2013) [a,b]
Pauropoda	Pauropoda sp.	2	-	Higher order identification[b]
Pauropodidae	Pauropodidae \`MH1\`	1	Yes	Singleton, only known from Project area[b]
	Pauropodidae \`MH2\`	3	No	Only known from Project area, linear range 18.2 km[b]
	Pauropodidae \`MH3\`	2	No	Only known from Project area, linear range 15 km[b]
	Pauropodidae sp. B01	2	No	Recorded throughout the Pilbara[a,b]
	Pauropodidae \`BPU089\`*	2	No	Only known from Project area, linear range 4.9 km[a]; compared genetically to B01, MH1 and MH2, but not MH3
	Pauropodidae \`BPU090\`*	8	No	Only known from Project area, linear range 25.7 km[a]; compared genetically to B01, MH1 and MH2, but not MH3
	Pauropodidae sp.*	1	-	Higher order identification[b]; compared genetically to B01, MH1 and MH2, but not MH3
Symphyla				
Scolopendrellidae	*Symphylella* \`BSYM094\`**	1	Yes	Singleton, only known from Project area[a]
	Symphylella sp. B20	1	Yes	Singleton, only known from Project area[b]
	Symphylella sp.**	1	-	Higher order identification[a]
Scutigerellidae	*Hanseniella* \`MH1\`	4	No	Only known from Project area[b]
	Hanseniella sp.**	1	-	Higher order identification[b]

2018), as well as with various global comparisons (Moldovan *et al.* 2018). This is partially due to the extremely high sampling effort (Table 2, Figure 3), albeit lighter to the south-east.

6.2.1 Non-listed Species of Possible Conservation Significance

6.2.2 Styofauna

Based on the results of all surveys combined, 26 species of stygofauna have been collected to date only from within the Project area. In addition, 11 stygofauna 'species' known more widely actually belong to species-complexes and populations of these taxa within the Project area may also comprise species restricted to the Project area (rather than widespread species as currently assumed). Thus, there are possibly as many as 37 species known only from the Project area (Figure 4 and Figure 5), although it is highly unlikely that all 11 species complexes are represented by species restricted to the Project area. Any species known only from the Project area has the potential to be of conservation concern.

6.2.3 Troglofauna

Based on existing sampling, 60 species have been collected to date only from the Project area. Eighteen of these have been found only within inferred resource outlines (Figure 6). The occurrence of nearly all species as singletons means that species distributions are not well documented currently and any additional records of these 'restricted' species will frequently occur outside the inferred resource outlines.

6.2.4 Particular Groups

Several of the taxonomic groups known from the Project area contain mostly species that are likely to have tightly local ranges (i.e. linear ranges of a few kilometres at most). A brief description of these animal groups is given below, although it should be recognised comments are based on the inferred resource outlines being the potential impact area for troglofauna. Species in other groups may also have limited ranges. While stygofauna species tend to have larger ranges than troglofaunal species, areas of groundwater drawdown are usually larger and more continuous than the mine pit layout of a mine hub.

Annelid worms

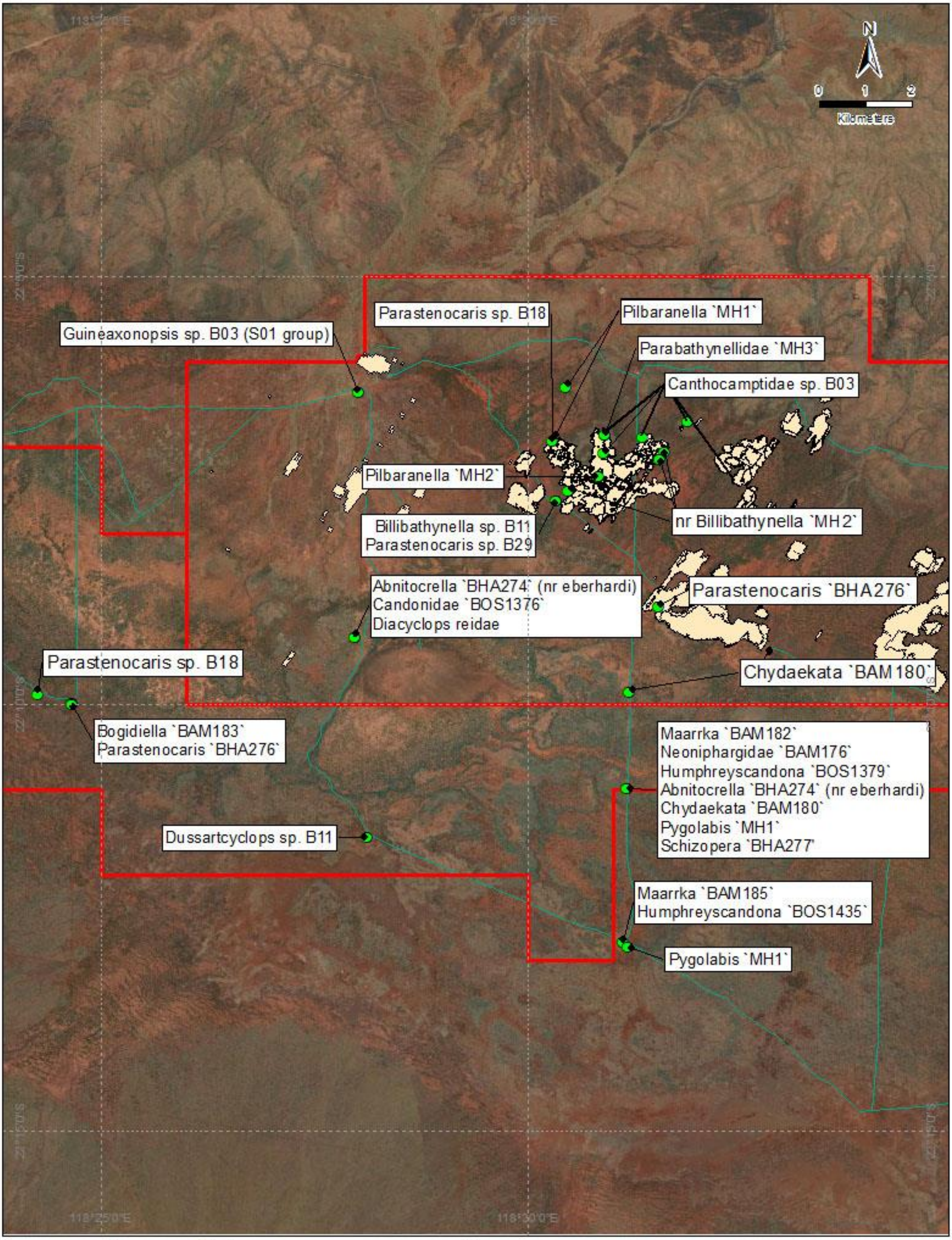
Information garnered in recent years about stygofaunal annelids has made identification of the species within this phylum more complex than recognised when the early surveys reported here were undertaken, and DNA sequencing is now regularly used for this group. Our genetic work narrowed the number of species of annelid worms in the Project area to 11 with a couple of higher level identifications and aligned specimens from two of the species complexes to populations over 100 km away. The likelihood of the other nine species being restricted to the Project area is low, as Brown *et al.* (2015) found that many annelid worms appear to have catchment-scale distributions. However, there is substantial variation in the range of individual species.

Amphipods

Amphipods are common in stygofauna communities and might represent up to 16% of the species in these communities in the Pilbara (Halse 2018b). Accordingly, at least 11 species of amphipods were recorded the Project area and vicinity, and five of the species are only known from the Project area with ranges varying from a single location to a linear distance of 6.8 km. Therefore, some stygofauna amphipods are likely of conservation significance.

Isopods

Slaters (isopods) are one of the more speciose groups of troglofauna in the Pilbara and the median range for species in this group was calculated by Halse and Pearson (2014) as 2.5 km^2. Six species of troglofaunal slaters were collected in the Project area, and one of these was collected only from within inferred resource outlines. However, in this case (*Troglarmadillo* `MH1`) it is possible that two other species collected in the area, but outside the resource outlines (namely *Troglarmadillo* B54 and *T.* B55),



GCS GDA 1994
Author: bbuzatto
Date: 30/09/2020

Legend

Stygofauna restricted to Project area

Inferred resource outlines

Figure 4. Distribution of stygofauna potentially restricted to the Mulga East Project area, focusing on the western part of the area.

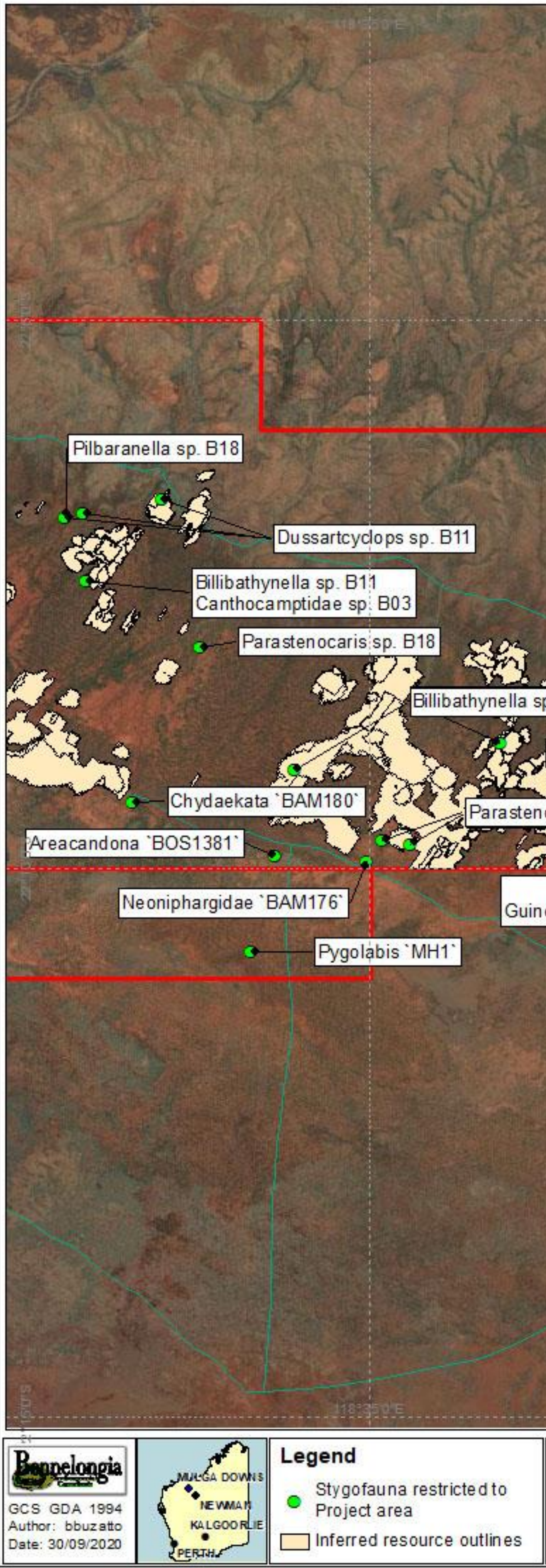
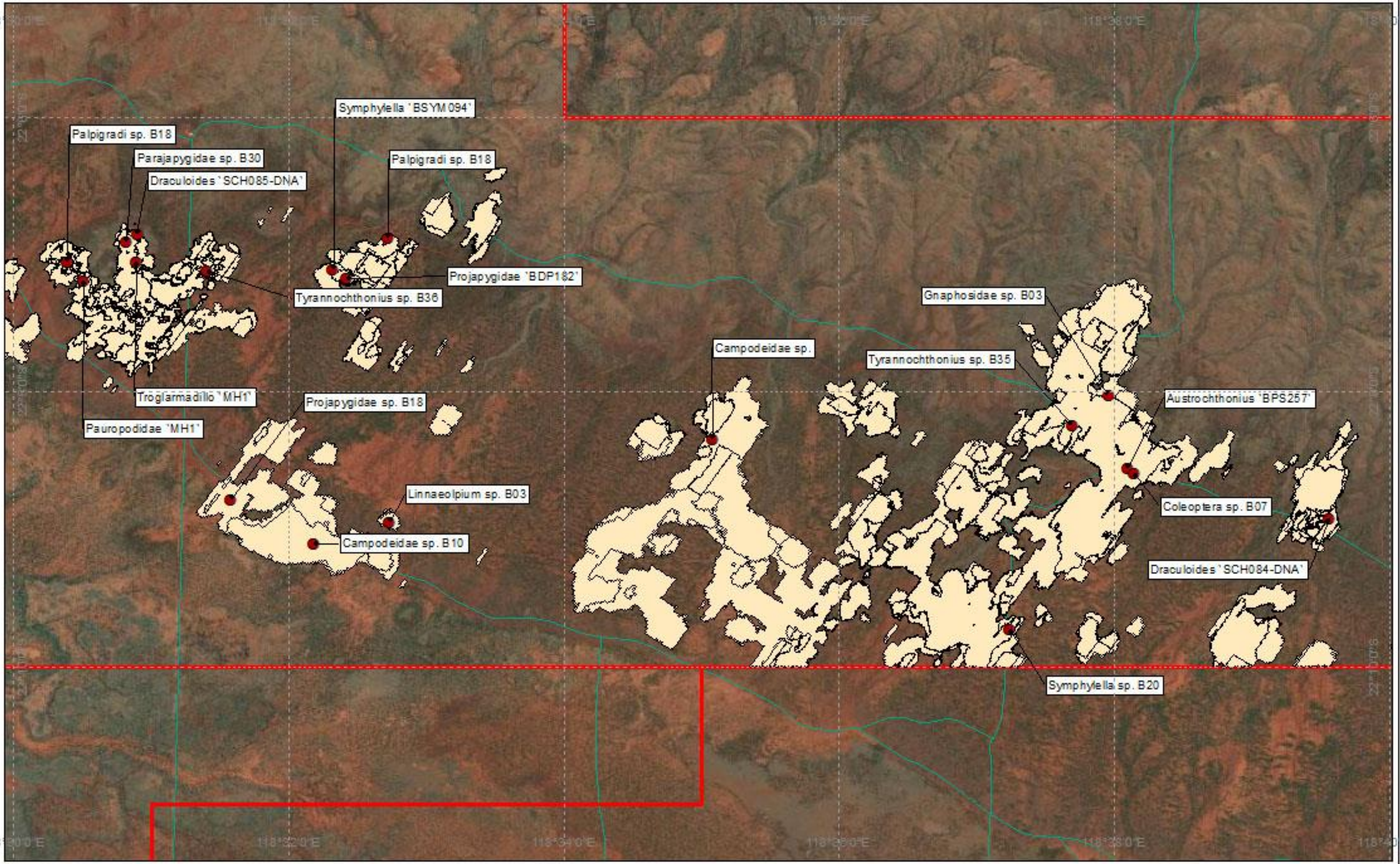


Figure 5. Distribution of stygofauna potentially restricted to the Mulga East Project area, focusing on the eastern part of the area.



Bennelongia

GCS GDA 1994
Author: bbuzatto
Date: 30/09/2020

Legend

Troglofauna restricted to resource outlines

Inferred resource outlines

Figure 6. Distribution of troglofauna potentially restricted to inferred resource outlines in the Mulga East Project area.

are actually the same species. Thus, it is probably unlikely that troglofaunal slaters in the Project are of conservation significance.

There is less information on the ranges of stygofaunal slaters and the early work suggesting relatively wide ranges of some isopods (Keable and Wilson 2006) needs re-assessment (see Finston *et al*. 2009). Three species of stygofauna slaters were identified in or near the Project area and may have conservation significanceconservation significance.

Syncarids
Syncarids are very small shrimp-like crustacean stygofauna. The Western Australian syncarid fauna is significantly diverse (Guzik *et al.* 2008; Perina *et al.* 2018) and this is also the case in aquifers at Mulga East, with at least 10 species recorded. Except for *Billibathynella* sp. B08 (also known from Solomon Mine) and *Brevisomabathynella* sp. (found outside the Project Area in this survey), the syncarids are currently known only from the Project area. These species are likely to have confined geographic distributions, as ranges in the group are typically small with many species endemic to single aquifers (Guzik *et al.* 2008; Perina *et al*. 2019). Of the syncarids collected, three species were only collected from a single bore so far. Stygofauna syncarids are likely to be of conservation significance.

Copepods
Copepods are tiny stygofaunal crustaceans and are very diverse in the Pilbara and in groundwater worldwide. A substantial proportion of the cyclopoid copepod species in the Pilbara are stygophiles that occur widely in groundwaters of this region, while harpacticoid copepods usually stygobites with small ranges. Seven of the 31 species recorded in the Project area currently appear to be conservation significant, including two cyclopoid and five harpacticoid species.

Ostracods
Ostracods are the most speciose group of animals in the Pilbara stygofauna community and most species are restricted to single sub-regions (Halse *et al.* 2014). Four of the 30 species of ostracod in the Project area are known only from the Project area and are conservation significant.

Spiders
Spiders have amongst the smallest ranges of troglofauna as calculated by Halse and Pearson (2014) with a median range of 3.7 km^2. In total four spider species have been collected, all currently only known from the Project area. One, Gnaphosidae sp. B03, is a singleton from within the resource outlines and is conservation significant. Of the other three species, two are singletons and the other is known from four specimens with a linear range of 14.7 km.

Pseudoscorpions
Seven pseudoscorpion species have been identified within the Project, although one is unlikely to be a troglobite with a very small range (*Indohya* ?`PSE002`) because of its probable alignment with a surface species (*Indohya* `PSE002`). The remaining species are only known from the Project area and four only from within inferred resource outlines. Four of these belong to the genus *Tyrannochthonius* and may in fact comprise two species, although further genetic work would be required to confirm this. It is possible that the species are restricted to inferred resource outlines and are conservation significant, as is the case with species in adjacent mesas (i.e. ranges of a few square kilometres) in the Robe Valley (Edward and Harvey 2008).

Schizomids
Short-tailed whipscorpions are another troglofaunal group comprised of species with particularly small ranges in the Pilbara (Framenau *et al.* 2018; Harms *et al.* 2018; Harvey *et al.* 2008). The median range of schizomids calculated by Halse and Pearson (2014) was 5.4 km^2. Up to four schizomid species have collected from within the Project area and vicinity, none of which has been recorded elsewhere. Three

of the four schizomids were found as singletons, and two of these were collected only from within inferred resource outlines and, hence, are potentially conservation significant.

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APPENDIX 1. SAMPLES COLLECTED IN 2019 AND 2020.

Target, type of fauna being sampled; Retrieve, date traps retrieved, ST, sampling method used; SWL, standing water level (m bgl); EOH, end of hole (m bgl).

Hole	Latitude	Longitude	Target	VisitDate	Retrieve	ST	SWL	EOH
md_hyp1	-22.07645	118.55440	Stygofauna	21-Feb-20	21-Feb-20	BR		
md_hyp1	-22.07645	118.55440	Stygofauna	21-Feb-20	21-Feb-20	KC		
md_hyp2	-22.06153	118.25659	Stygofauna	22-Feb-20	22-Feb-20	KC		
md_hyp3	-22.08168	118.24879	Stygofauna	23-Feb-20	23-Feb-20	KC		
md_hyp4	-22.11486	118.39313	Stygofauna	21-Feb-20	21-Feb-20	BR		
md_kar2	-22.19283	118.75217	Stygofauna	20-Feb-20	20-Feb-20	BR		
md_kar2	-22.19283	118.75217	Stygofauna	20-Feb-20	20-Feb-20	KC		
md_kar3	-22.16136	118.72364	Stygofauna	20-Feb-20	20-Feb-20	BR		
md_kar3	-22.16136	118.72364	Stygofauna	20-Feb-20	20-Feb-20	KC		
1475	-21.92333	118.01706	Stygofauna	02-Feb-20	02-Feb-20	Net	6.64	20
Astas Bore	-22.06390	118.27288	Stygofauna	23-Feb-20	23-Feb-20	Net	14.6	30
BC02	-22.08400	118.31040	Stygofauna	22-Feb-20	22-Feb-20	Net	7.25	21
Blowout Bore	-22.09072	118.26512	Stygofauna	23-Feb-20	23-Feb-20	Net	6.82	23
Boundary Bore	-22.10314	118.22962	Stygofauna	23-Feb-20	23-Feb-20	Net	5.1	10
Boundary Well	-22.10402	118.22984	Stygofauna	23-Feb-20	23-Feb-20	Net	2.52	5
Browns Bore	-22.21403	118.51956	Stygofauna	10-Aug-19	10-Aug-19	Net	3.83	5
Browns Bore	-22.21403	118.51956	Stygofauna	02-Feb-20	02-Feb-20	Net	3.92	4.65
Calamina Bore	-22.19277	118.46867	Stygofauna	10-Aug-19	10-Aug-19	Net	4.36	34
Calamina Bore	-22.19277	118.46867	Stygofauna	21-Feb-20	21-Feb-20	Net	4.37	30
Calamina Well	-22.19293	118.46868	Stygofauna	21-Feb-20	21-Feb-20	Net	4.42	6
Company	-22.33045	118.66157	Stygofauna	03-Feb-20	03-Feb-20	Net	35.7	45
Ebathacalby bore	-22.24846	118.74883	Stygofauna	12-Aug-19	12-Aug-19	Net	4.64	6
Ebathacalby bore	-22.24846	118.74883	Stygofauna	20-Feb-20	20-Feb-20	Net	4.65	6
FV0001R	-22.28565	118.74147	Stygofauna	20-Feb-20	20-Feb-20	Net	4.74	54
Hesters Bore	-22.10588	118.46698	Stygofauna	09-Aug-19	09-Aug-19	Net	11.6	30
Hesters Bore	-22.10588	118.46698	Stygofauna	01-Feb-20	01-Feb-20	Net	11.3	25.5
Horaces Well	-22.07958	118.50221	Stygofauna	21-Feb-20	21-Feb-20	Net	7.81	18
Maddina Well	-22.21778	118.65944	Stygofauna	12-Aug-19	12-Aug-19	Net	4.85	8
Maddina Well	-22.21778	118.65944	Stygofauna	03-Feb-20	03-Feb-20	Net	0	5
Malay Bore	-22.16679	118.41104	Stygofauna	21-Feb-20	21-Feb-20	Net	4.23	7
Malay Well	-22.16661	118.41101	Stygofauna	10-Aug-19	10-Aug-19	Net	4.6	28
Malay Well	-22.16661	118.41101	Stygofauna	21-Feb-20	21-Feb-20	Net	4.23	6
Marnamoonah Well	-22.12303	118.28915	Stygofauna	13-Aug-19	13-Aug-19	Net	3.58	6
Marnamoonah Well	-22.12303	118.28915	Stygofauna	23-Feb-20	23-Feb-20	Net	5	7
MD5047	-22.12260	118.45935	Stygofauna	01-Feb-20	01-Feb-20	Net	7.57	14.5
MD5382	-22.06883	118.27984	Stygofauna	22-Feb-20	22-Feb-20	Net	11.5	82
MD5455	-22.06375	118.23521	Stygofauna	23-Feb-20	23-Feb-20	Net	17.5	72
MD5461	-22.06565	118.22360	Stygofauna	23-Feb-20	23-Feb-20	Net	17.1	90
MD5733	-22.07246	118.27792	Stygofauna	22-Feb-20	22-Feb-20	Net	10.7	30
MD6143	-22.16011	118.62443	Stygofauna	03-Feb-20	03-Feb-20	Net	14.7	42
MD6605	-22.06531	118.26818	Stygofauna	22-Feb-20	22-Feb-20	Net	15	106
MD6946	-22.07417	118.29149	Stygofauna	22-Feb-20	22-Feb-20	Net	10.6	14
MDCMB09	-22.18320	118.51933	Stygofauna	02-Feb-20	02-Feb-20	Net	4.8	24

Hole	Latitude	Longitude	Target	VisitDate	Retrieve	ST	SWL	EOH
MDPB0007	-22.12837	118.50856	Stygofauna	24-Feb-20	24-Feb-20	Net	4.77	50
MDPB0011	-22.12567	118.47573	Stygofauna	21-Feb-20	21-Feb-20	Net	5.6	23
MDPB0013	-22.16561	118.58277	Stygofauna	20-Feb-20	20-Feb-20	Net	5.13	113
MDPB0013B	-22.16562	118.58277	Stygofauna	02-Feb-20	02-Feb-20	Net	5.05	35
MDPB0014	-22.16470	118.51997	Stygofauna	02-Feb-20	02-Feb-20	Net	4.5	29
MDPZ2475	-22.12692	118.50548	Stygofauna	01-Feb-20	01-Feb-20	Net	5.22	53
MDPZ7449C	-22.13202	118.50928	Stygofauna	10-Aug-19	10-Aug-19	Net	5.18	10
MDPZ7450C	-22.12552	118.47588	Stygofauna	10-Aug-19	10-Aug-19	Net	6.31	42
MDPZ7450C	-22.12552	118.47588	Stygofauna	21-Feb-20	21-Feb-20	Net	6.3	20
MDPZ7451S	-22.14486	118.46721	Stygofauna	10-Aug-19	10-Aug-19	Net	4.77	42
MDPZ7452C	-22.18642	118.46804	Stygofauna	12-Aug-19	12-Aug-19	Net	4.37	32
MDPZ7453S	-22.15357	118.46606	Stygofauna	10-Aug-19	10-Aug-19	Net	6.07	17
MDPZ7454A	-22.09876	118.52246	Stygofauna	09-Aug-19	09-Aug-19	Net	26.7	58
MDPZ7454A	-22.09876	118.52246	Stygofauna	20-Feb-20	20-Feb-20	Net	26.9	59
MDPZ7455	-22.10540	118.56169	Stygofauna	11-Aug-19	11-Aug-19	Net	31.6	62
MDPZ7455	-22.10540	118.56169	Stygofauna	19-Feb-20	19-Feb-20	Net	31.7	46
MDPZ7456C	-22.16615	118.60837	Stygofauna	11-Aug-19	11-Aug-19	Net	8.36	41
MDPZ7456C	-22.16615	118.60837	Stygofauna	03-Feb-20	03-Feb-20	Net	7.44	42
MDPZ7457C	-22.16448	118.51969	Stygofauna	10-Aug-19	10-Aug-19	Net	4.63	35
MDPZ7457C	-22.16448	118.51969	Stygofauna	02-Feb-20	02-Feb-20	Net	4.73	35
MDPZ7458C	-22.18322	118.51934	Stygofauna	11-Aug-19	11-Aug-19	Net	4.38	41
MDPZ7458C	-22.18322	118.51934	Stygofauna	02-Feb-20	02-Feb-20	Net	4.44	35
MDPZ7459	-22.10765	118.45695	Stygofauna	09-Aug-19	09-Aug-19	Net	11.1	28
MDPZ7459	-22.10765	118.45695	Stygofauna	21-Feb-20	21-Feb-20	Net	11.3	28
MDPZ7460C	-22.16564	118.58278	Stygofauna	11-Aug-19	11-Aug-19	Net	5.32	29
MDPZ7460C	-22.16564	118.58278	Stygofauna	20-Feb-20	20-Feb-20	Net	5.22	29
MDPZ7462C	-22.16480	118.40442	Stygofauna	10-Aug-19	10-Aug-19	Net	5.1	35
MDPZ7463	-22.11706	118.38506	Stygofauna	10-Aug-19	10-Aug-19	Net	5.46	88
MDPZ7463	-22.11706	118.38506	Stygofauna	21-Feb-20	21-Feb-20	Net	4.64	88
MDPZ7464	-22.12716	118.45359	Stygofauna	11-Aug-19	11-Aug-19	Net	6.57	88
MDPZ7464	-22.12716	118.45359	Stygofauna	01-Feb-20	01-Feb-20	Net	6.65	75
MDPZ7466	-22.14197	118.66127	Stygofauna	11-Aug-19	11-Aug-19	Net	34.5	64
MDPZ7466	-22.14197	118.66127	Stygofauna	20-Feb-20	20-Feb-20	Net	34.5	56
MDPZ7467	-22.12018	118.62555	Stygofauna	11-Aug-19	11-Aug-19	Net	43.3	64
MDPZ7467	-22.12018	118.62555	Stygofauna	20-Feb-20	20-Feb-20	Net	43.2	55
MDPZ7468C	-22.13453	118.42729	Stygofauna	10-Aug-19	10-Aug-19	Net	4.8	52
MDPZ7468C	-22.13453	118.42729	Stygofauna	24-Feb-20	24-Feb-20	Net	4.86	52
MDPZ7469C	-22.14771	118.52541	Stygofauna	12-Aug-19	12-Aug-19	Net	3.34	52
MDPZ7469C	-22.14771	118.52541	Stygofauna	30-Jan-20	30-Jan-20	Net	3.36	40
MDPZ7470C	-22.17934	118.56521	Stygofauna	11-Aug-19	11-Aug-19	Net	4.59	23
MDUNK01	-22.20484	118.49774	Stygofauna	13-Aug-19	13-Aug-19	Net	3.75	25
MDWB0011	-22.07727	118.55315	Stygofauna	10-Aug-19	10-Aug-19	Net	21.9	33
MDWB0011	-22.07727	118.55315	Stygofauna	21-Feb-20	21-Feb-20	Net	22.9	40
MDWB0013	-22.09068	118.60200	Stygofauna	20-Feb-20	20-Feb-20	Net	17.5	46
MDWB0033	-22.09798	118.48180	Stygofauna	21-Feb-20	21-Feb-20	Net	12.1	30
MDWB0034	-22.14343	118.63168	Stygofauna	20-Feb-20	20-Feb-20	Net	23.8	45
MDWB0035	-22.10748	118.44051	Stygofauna	21-Feb-20	21-Feb-20	Net	10	34

Hole	Latitude	Longitude	Target	VisitDate	Retrieve	ST	SWL	EOH
MDWB0036	-22.15654	118.54722	Stygofauna	24-Feb-20	24-Feb-20	Net	4.03	18
MDWB0054	-22.08896	118.28096	Stygofauna	22-Feb-20	22-Feb-20	Net	5.89	30
MDWF0013	-22.09071	118.60199	Stygofauna	11-Aug-19	11-Aug-19	Net	17.3	52
Mountain Well	-22.33226	118.69645	Stygofauna	03-Feb-20	03-Feb-20	Net		
Murrays Well	-22.13783	118.52080	Stygofauna	11-Aug-19	11-Aug-19	Net	4.66	6
Murrays Well	-22.13783	118.52080	Stygofauna	01-Feb-20	01-Feb-20	Net	4.77	5.77
Nine Inch Bore	-22.07752	118.31351	Stygofauna	22-Feb-20	22-Feb-20	Net	10.9	50
No. 3 Well	-22.17552	118.61949	Stygofauna	11-Aug-19	11-Aug-19	Net	7.14	10
No. 3 Well	-22.17552	118.61949	Stygofauna	03-Feb-20	03-Feb-20	Net	6.84	9
Old Station Bore	-22.13103	118.42261	Stygofauna	10-Aug-19	10-Aug-19	Net	5.96	28
Old Station Bore	-22.13103	118.42261	Stygofauna	24-Feb-20	24-Feb-20	Net	4.27	8
One Tank Well	-22.26561	118.70250	Stygofauna	12-Aug-19	12-Aug-19	Net	5.12	7
One Tank Well	-22.26561	118.70250	Stygofauna	03-Feb-20	03-Feb-20	Net	5.17	7
Pipally Well	-22.23311	118.61580	Stygofauna	12-Aug-19	12-Aug-19	Net	4.33	6
Pipally Well	-22.23311	118.61580	Stygofauna	03-Feb-20	03-Feb-20	Net	4.4	5.5
Robinsons Well	-22.16460	118.56882	Stygofauna	11-Aug-19	11-Aug-19	Net	2.51	6
Robinsons Well	-22.16460	118.56882	Stygofauna	24-Feb-20	24-Feb-20	Net	1	7
Salt Well	-22.29500	118.78944	Stygofauna	12-Aug-19	12-Aug-19	Net	3.6	5
Salt Well	-22.29500	118.78944	Stygofauna	20-Feb-20	20-Feb-20	Net	3.6	5
Silver Grass Well	-22.25505	118.65750	Stygofauna	12-Aug-19	12-Aug-19	Net	2.89	7
Silver Grass Well	-22.25505	118.65750	Stygofauna	03-Feb-20	03-Feb-20	Net	3.56	7
The 39th	-22.07400	118.25601	Stygofauna	23-Feb-20	23-Feb-20	Net	10.2	20
The Pools	-21.91651	118.00812	Stygofauna	02-Feb-20	02-Feb-20	Net	4.49	24
Tuckanoona Well	-22.26505	118.83800	Stygofauna	12-Aug-19	12-Aug-19	Net	2.5	10
Two Day Well	-22.04015	118.54915	Stygofauna	21-Feb-20	21-Feb-20	Net	5.37	8
Two Mile Bore	-22.10938	118.41124	Stygofauna	21-Feb-20	21-Feb-20	Net	5.16	25
Two Mile Well	-22.10943	118.41112	Stygofauna	13-Aug-19	13-Aug-19	Net	5.57	7
Two Mile Well	-22.10943	118.41112	Stygofauna	21-Feb-20	21-Feb-20	Net	4.93	7
Unknown 5	-22.21322	118.51851	Stygofauna	02-Feb-20	02-Feb-20	Net	4.48	24
Unknown Bore 6	-22.25368	118.76083	Stygofauna	20-Feb-20	20-Feb-20	Net	4.3	34
Unknown Bore 9	-22.19320	118.41132	Stygofauna	21-Feb-20	21-Feb-20	Net	11	30
WB18 ARP007	-22.19158	118.26019	Stygofauna	23-Feb-20	23-Feb-20	Net	56.3	110
WB18KRP0004	-22.30438	118.61598	Stygofauna	03-Feb-20	03-Feb-20	Net	23.6	99
WF0188	-22.06951	118.31036	Stygofauna	22-Feb-20	22-Feb-20	Net	12.4	24
WF0190	-22.07048	118.30267	Stygofauna	22-Feb-20	22-Feb-20	Net	12.4	14
Windemurra Well	-22.09653	118.34278	Stygofauna	21-Feb-20	21-Feb-20	Net	4.8	9
Wittenoom Bore 2	-22.18813	118.35209	Stygofauna	21-Feb-20	21-Feb-20	Net	23.5	34
Wittenoom Reservoir No. 1	-22.19328	118.35221	Stygofauna	21-Feb-20	21-Feb-20	Net	25.9	27
MD0266	-22.13781	118.63911	Troglofauna	30-Jan-20	30-Jan-20	Scrape	30	
MD0266	-22.13781	118.63911	Troglofauna	30-Jan-20	06-May-20	Trap 1	30	
MD0276	-22.16152	118.62139	Troglofauna	30-Jan-20	30-Jan-20	Scrape	12	
MD0276	-22.16152	118.62139	Troglofauna	30-Jan-20	06-May-20	Trap 1	12	
MD0300	-22.14344	118.59704	Troglofauna	31-Jan-20	31-Jan-20	Scrape		3
MD0300	-22.14344	118.59704	Troglofauna	31-Jan-20		Trap 1		3
MD0305	-22.15077	118.59157	Troglofauna	09-Aug-19	09-Aug-19	Scrape	10	
MD0305	-22.15077	118.59157	Troglofauna	09-Aug-19	02-Oct-19	Trap 1	10	
MD0307	-22.12778	118.58988	Troglofauna	31-Jan-20	31-Jan-20	Scrape		20

Hole	Latitude	Longitude	Target	VisitDate	Retrieve	ST	SWL	EOH
MD0307	-22.12778	118.58988	Troglofauna	31-Jan-20	06-May-20	Trap 1		20
MD0314	-22.13813	118.58218	Troglofauna	31-Jan-20	31-Jan-20	Scrape	15	
MD0314	-22.13813	118.58218	Troglofauna	31-Jan-20	06-May-20	Trap 1	15	
MD0319	-22.14548	118.57644	Troglofauna	31-Jan-20	31-Jan-20	Scrape	3	
MD0319	-22.14548	118.57644	Troglofauna	31-Jan-20	06-May-20	Trap 1	3	
MD0350	-22.12366	118.53612	Troglofauna	31-Jan-20	31-Jan-20	Scrape		3
MD0350	-22.12366	118.53612	Troglofauna	31-Jan-20	06-May-20	Trap 1		3
MD0383	-22.12100	118.52877	Troglofauna	07-Aug-19	07-Aug-19	Scrape	12	
MD0383	-22.12100	118.52877	Troglofauna	07-Aug-19	03-Oct-19	Trap 1	12	
MD0398	-22.14898	118.67334	Troglofauna	07-Aug-19	07-Aug-19	Scrape		16
MD0398	-22.14898	118.67334	Troglofauna	07-Aug-19	03-Oct-19	Trap 1		16
MD0401	-22.15343	118.67001	Troglofauna	07-Aug-19	07-Aug-19	Scrape	18	
MD0401	-22.15343	118.67001	Troglofauna	07-Aug-19	03-Oct-19	Trap 1	18	
MD0405	-22.14726	118.66040	Troglofauna	30-Jan-20	30-Jan-20	Scrape		2
MD0405	-22.14726	118.66040	Troglofauna	30-Jan-20	06-May-20	Trap 1		2
MD0417	-22.15795	118.66663	Troglofauna	07-Aug-19	07-Aug-19	Scrape	17	
MD0417	-22.15795	118.66663	Troglofauna	07-Aug-19	03-Oct-19	Trap 1	17	
MD0483	-22.12082	118.50989	Troglofauna	01-Feb-20	01-Feb-20	Scrape		4
MD0483	-22.12082	118.50989	Troglofauna	01-Feb-20	06-May-20	Trap 1		4
MD0537	-22.11345	118.52730	Troglofauna	31-Jan-20	31-Jan-20	Scrape	16	
MD0537	-22.11345	118.52730	Troglofauna	31-Jan-20	06-May-20	Trap 1	16	
MD0685	-22.14183	118.52963	Troglofauna	09-Aug-19	09-Aug-19	Scrape	5	
MD0685	-22.14183	118.52963	Troglofauna	09-Aug-19	02-Oct-19	Trap 1	5	
MD0689	-22.14548	118.54110	Troglofauna	30-Jan-20	30-Jan-20	Scrape	7	
MD0689	-22.14548	118.54110	Troglofauna	30-Jan-20	06-May-20	Trap 1	7	
MD0690	-22.14691	118.54004	Troglofauna	30-Jan-20	30-Jan-20	Scrape	4	
MD0690	-22.14691	118.54004	Troglofauna	30-Jan-20	06-May-20	Trap 1	4	
MD0701	-22.15040	118.55156	Troglofauna	09-Aug-19	09-Aug-19	Scrape		5
MD0701	-22.15040	118.55156	Troglofauna	09-Aug-19	02-Oct-19	Trap 1		5
MD0725	-22.14980	118.66325	Troglofauna	30-Jan-20	30-Jan-20	Scrape		20
MD0725	-22.14980	118.66325	Troglofauna	30-Jan-20	06-May-20	Trap 1		20
MD0752	-22.13881	118.64061	Troglofauna	30-Jan-20	30-Jan-20	Scrape		18
MD0752	-22.13881	118.64061	Troglofauna	30-Jan-20		Trap 1		18
MD0843	-22.12960	118.51997	Troglofauna	06-Aug-19	06-Aug-19	Scrape		6
MD0843	-22.12960	118.51997	Troglofauna	06-Aug-19	02-Oct-19	Trap 1		6
MD0945	-22.11293	118.51810	Troglofauna	31-Jan-20	31-Jan-20	Scrape	15	
MD0945	-22.11293	118.51810	Troglofauna	31-Jan-20	06-May-20	Trap 1	15	
MD1082	-22.12675	118.50554	Troglofauna	01-Feb-20	01-Feb-20	Scrape	4	
MD1082	-22.12675	118.50554	Troglofauna	01-Feb-20	06-May-20	Trap 1	4	
MD1121	-22.14510	118.63835	Troglofauna	30-Jan-20	30-Jan-20	Scrape	19	
MD1121	-22.14510	118.63835	Troglofauna	30-Jan-20	06-May-20	Trap 1	19	
MD1301	-22.11507	118.55211	Troglofauna	31-Jan-20	31-Jan-20	Scrape	15	
MD1301	-22.11507	118.55211	Troglofauna	31-Jan-20		Trap 1	15	
MD1333	-22.14512	118.56991	Troglofauna	09-Aug-19	09-Aug-19	Scrape	6	
MD1333	-22.14512	118.56991	Troglofauna	09-Aug-19	03-Oct-19	Trap 1	6	
MD1334	-22.14361	118.57105	Troglofauna	09-Aug-19	09-Aug-19	Scrape	9	
MD1334	-22.14361	118.57105	Troglofauna	09-Aug-19	03-Oct-19	Trap 1	9	

Hole	Latitude	Longitude	Target	VisitDate	Retrieve	ST	SWL	EOH
MD1458	-22.11986	118.52601	Troglofauna	31-Jan-20	31-Jan-20	Scrape	13	
MD1458	-22.11986	118.52601	Troglofauna	31-Jan-20	06-May-20	Trap 1	13	
MD1545	-22.12773	118.51952	Troglofauna	31-Jan-20	31-Jan-20	Scrape		6
MD1545	-22.12773	118.51952	Troglofauna	31-Jan-20	06-May-20	Trap 1		6
MD1556	-22.12202	118.52499	Troglofauna	07-Aug-19	07-Aug-19	Scrape	10	
MD1556	-22.12202	118.52499	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	10	
MD1556	-22.12202	118.52499	Troglofauna	07-Aug-19	02-Oct-19	Trap 2	10	
MD1631	-22.12288	118.51956	Troglofauna	31-Jan-20	31-Jan-20	Scrape		8
MD1631	-22.12288	118.51956	Troglofauna	31-Jan-20	06-May-20	Trap 1		8
MD1763	-22.11716	118.50144	Troglofauna	01-Feb-20	01-Feb-20	Scrape		7
MD1763	-22.11716	118.50144	Troglofauna	01-Feb-20	06-May-20	Trap 1		7
MD1791	-22.11874	118.50138	Troglofauna	01-Feb-20	01-Feb-20	Scrape		5
MD1791	-22.11874	118.50138	Troglofauna	01-Feb-20	06-May-20	Trap 1		5
MD1796	-22.11692	118.50282	Troglofauna	01-Feb-20	01-Feb-20	Scrape	7	
MD1796	-22.11692	118.50282	Troglofauna	01-Feb-20	06-May-20	Trap 1	7	
MD1813	-22.12000	118.50167	Troglofauna	01-Feb-20	01-Feb-20	Scrape		3
MD1813	-22.12000	118.50167	Troglofauna	01-Feb-20	06-May-20	Trap 1		3
MD2023	-22.11598	118.51829	Troglofauna	01-Feb-20	01-Feb-20	Scrape	13	
MD2023	-22.11598	118.51829	Troglofauna	01-Feb-20	06-May-20	Trap 1	13	
MD2038	-22.11621	118.51699	Troglofauna	31-Jan-20	31-Jan-20	Scrape	12	
MD2038	-22.11621	118.51699	Troglofauna	31-Jan-20	06-May-20	Trap 1	12	
MD2040	-22.11546	118.51754	Troglofauna	31-Jan-20	31-Jan-20	Scrape	12	
MD2040	-22.11546	118.51754	Troglofauna	31-Jan-20	06-May-20	Trap 1	12	
MD2059	-22.11533	118.51573	Troglofauna	31-Jan-20	31-Jan-20	Scrape	17	
MD2059	-22.11533	118.51573	Troglofauna	31-Jan-20	06-May-20	Trap 1	17	
MD2120	-22.11772	118.51764	Troglofauna	01-Feb-20	01-Feb-20	Scrape	11	
MD2120	-22.11772	118.51764	Troglofauna	01-Feb-20	06-May-20	Trap 1	11	
MD2146	-22.12943	118.51111	Troglofauna	01-Feb-20	01-Feb-20	Scrape	5	
MD2146	-22.12943	118.51111	Troglofauna	01-Feb-20	06-May-20	Trap 1	5	
MD2147	-22.12981	118.51085	Troglofauna	01-Feb-20	01-Feb-20	Scrape	6	
MD2147	-22.12981	118.51085	Troglofauna	01-Feb-20	06-May-20	Trap 1	6	
MD2148	-22.13020	118.51057	Troglofauna	01-Feb-20	01-Feb-20	Scrape	5	
MD2148	-22.13020	118.51057	Troglofauna	01-Feb-20	06-May-20	Trap 1	5	
MD2149	-22.13059	118.51032	Troglofauna	01-Feb-20	01-Feb-20	Scrape	4	
MD2149	-22.13059	118.51032	Troglofauna	01-Feb-20	06-May-20	Trap 1	4	
MD2166	-22.13004	118.50950	Troglofauna	06-Aug-19	06-Aug-19	Scrape	5	
MD2166	-22.13004	118.50950	Troglofauna	06-Aug-19	02-Oct-19	Trap 1	5	
MD2309	-22.12716	118.50338	Troglofauna	07-Aug-19	07-Aug-19	Scrape		5
MD2309	-22.12716	118.50338	Troglofauna	07-Aug-19	02-Oct-19	Trap 1		5
MD2570	-22.11792	118.52425	Troglofauna	01-Feb-20	01-Feb-20	Scrape		6
MD2570	-22.11792	118.52425	Troglofauna	01-Feb-20		Trap 1		6
MD2627	-22.11879	118.49899	Troglofauna	07-Aug-19	07-Aug-19	Scrape	6	
MD2627	-22.11879	118.49899	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	6	
MD2633	-22.11983	118.49884	Troglofauna	07-Aug-19	07-Aug-19	Scrape	6	
MD2633	-22.11983	118.49884	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	6	
MD2926	-22.11852	118.53867	Troglofauna	08-Aug-19	08-Aug-19	Scrape	15	
MD2926	-22.11852	118.53867	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	15	

Hole	Latitude	Longitude	Target	VisitDate	Retrieve	ST	SWL	EOH
MD2936	-22.11953	118.54028	Troglofauna	08-Aug-19	08-Aug-19	Scrape		13
MD2936	-22.11953	118.54028	Troglofauna	08-Aug-19	03-Oct-19	Trap 1		13
MD2970	-22.15067	118.54438	Troglofauna	30-Jan-20	30-Jan-20	Scrape	1	
MD2970	-22.15067	118.54438	Troglofauna	30-Jan-20	06-May-20	Trap 1	1	
MD2972	-22.14770	118.54657	Troglofauna	30-Jan-20	30-Jan-20	Scrape	3	
MD2972	-22.14770	118.54657	Troglofauna	30-Jan-20	06-May-20	Trap 1	3	
MD2973	-22.14618	118.54771	Troglofauna	30-Jan-20	30-Jan-20	Scrape		7
MD2973	-22.14618	118.54771	Troglofauna	30-Jan-20	06-May-20	Trap 1		7
MD2976	-22.14510	118.52021	Troglofauna	29-Jan-20	29-Jan-20	Scrape	3	
MD2976	-22.14510	118.52021	Troglofauna	29-Jan-20	06-May-20	Trap 1	3	
MD2983	-22.14415	118.52568	Troglofauna	30-Jan-20	30-Jan-20	Scrape	3	
MD2983	-22.14415	118.52568	Troglofauna	30-Jan-20	06-May-20	Trap 1	3	
MD2992	-22.13097	118.54958	Troglofauna	08-Aug-19	08-Aug-19	Scrape	13	
MD2992	-22.13097	118.54958	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	13	
MD3014	-22.13502	118.57479	Troglofauna	09-Aug-19	09-Aug-19	Scrape		5
MD3014	-22.13502	118.57479	Troglofauna	09-Aug-19	03-Oct-19	Trap 1		5
MD3028	-22.13639	118.64011	Troglofauna	30-Jan-20	30-Jan-20	Scrape		10
MD3028	-22.13639	118.64011	Troglofauna	30-Jan-20	06-May-20	Trap 1		10
MD3115	-22.13505	118.58520	Troglofauna	31-Jan-20	31-Jan-20	Scrape		22
MD3115	-22.13505	118.58520	Troglofauna	31-Jan-20	06-May-20	Trap 1		22
MD3118	-22.13728	118.58356	Troglofauna	31-Jan-20	31-Jan-20	Scrape	18	
MD3118	-22.13728	118.58356	Troglofauna	31-Jan-20	06-May-20	Trap 1	18	
MD3162	-22.14709	118.60576	Troglofauna	08-Aug-19	08-Aug-19	Scrape	12	
MD3162	-22.14709	118.60576	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	12	
MD3207	-22.14261	118.63492	Troglofauna	30-Jan-20	30-Jan-20	Scrape	23	
MD3207	-22.14261	118.63492	Troglofauna	30-Jan-20	06-May-20	Trap 1	23	
MD3257	-22.14494	118.63670	Troglofauna	30-Jan-20	30-Jan-20	Scrape	21	
MD3257	-22.14494	118.63670	Troglofauna	30-Jan-20	06-May-20	Trap 1	21	
MD3285	-22.15462	118.60730	Troglofauna	08-Aug-19	08-Aug-19	Scrape	5	
MD3285	-22.15462	118.60730	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	5	
MD3379	-22.15191	118.65628	Troglofauna	07-Aug-19	07-Aug-19	Scrape	18	
MD3379	-22.15191	118.65628	Troglofauna	07-Aug-19	03-Oct-19	Trap 1	18	
MD3802	-22.14262	118.60908	Troglofauna	08-Aug-19	08-Aug-19	Scrape	17	
MD3802	-22.14262	118.60908	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	17	
MD3805	-22.12271	118.52853	Troglofauna	31-Jan-20	31-Jan-20	Scrape	10	
MD3805	-22.12271	118.52853	Troglofauna	31-Jan-20	06-May-20	Trap 1	10	
MD3809	-22.12612	118.52833	Troglofauna	07-Aug-19	07-Aug-19	Scrape		9
MD3809	-22.12612	118.52833	Troglofauna	07-Aug-19	03-Oct-19	Trap 1		9
MD3812	-22.12839	118.52672	Troglofauna	07-Aug-19	07-Aug-19	Scrape		5
MD3812	-22.12839	118.52672	Troglofauna	07-Aug-19	03-Oct-19	Trap 1		5
MD3841	-22.12407	118.54397	Troglofauna	31-Jan-20	31-Jan-20	Scrape	16	
MD3841	-22.12407	118.54397	Troglofauna	31-Jan-20	06-May-20	Trap 1	16	
MD3842	-22.12334	118.54452	Troglofauna	31-Jan-20	31-Jan-20	Scrape	17	
MD3842	-22.12334	118.54452	Troglofauna	31-Jan-20	06-May-20	Trap 1	17	
MD3851	-22.11665	118.54943	Troglofauna	31-Jan-20	31-Jan-20	Scrape		20
MD3851	-22.11665	118.54943	Troglofauna	31-Jan-20	06-May-20	Trap 1		20
MD3853	-22.12608	118.54367	Troglofauna	31-Jan-20	31-Jan-20	Scrape	16	

Hole	Latitude	Longitude	Target	VisitDate	Retrieve	ST	SWL	EOH
MD3853	-22.12608	118.54367	Troglofauna	31-Jan-20	06-May-20	Trap 1	16	
MD3855	-22.12905	118.54147	Troglofauna	31-Jan-20	31-Jan-20	Scrape	12	
MD3855	-22.12905	118.54147	Troglofauna	31-Jan-20	06-May-20	Trap 1	12	
MD3874	-22.15241	118.54546	Troglofauna	08-Aug-19	08-Aug-19	Scrape	5	
MD3874	-22.15241	118.54546	Troglofauna	08-Aug-19	02-Oct-19	Trap 1	5	
MD3876	-22.14838	118.54603	Troglofauna	30-Jan-20	30-Jan-20	Scrape	7	
MD3876	-22.14838	118.54603	Troglofauna	30-Jan-20	06-May-20	Trap 1	7	
MD3878	-22.15138	118.54387	Troglofauna	30-Jan-20	30-Jan-20	Scrape	5	
MD3878	-22.15138	118.54387	Troglofauna	30-Jan-20	06-May-20	Trap 1	5	
MD3918	-22.14311	118.52410	Troglofauna	30-Jan-20	30-Jan-20	Scrape	2	
MD3918	-22.14311	118.52410	Troglofauna	30-Jan-20	06-May-20	Trap 1	2	
MD3937	-22.14772	118.57242	Troglofauna	09-Aug-19	09-Aug-19	Scrape	6	
MD3937	-22.14772	118.57242	Troglofauna	09-Aug-19	03-Oct-19	Trap 1	6	
MD3980	-22.13908	118.58465	Troglofauna	08-Aug-19	08-Aug-19	Scrape	14	
MD3980	-22.13908	118.58465	Troglofauna	08-Aug-19	02-Oct-19	Trap 1	14	
MD3985	-22.14280	118.58190	Troglofauna	08-Aug-19	08-Aug-19	Scrape	12	
MD3985	-22.14280	118.58190	Troglofauna	08-Aug-19	02-Oct-19	Trap 1	12	
MD4115	-22.11221	118.55742	Troglofauna	08-Aug-19	08-Aug-19	Scrape		5
MD4129	-22.11303	118.55585	Troglofauna	08-Aug-19	08-Aug-19	Scrape		24
MD4129	-22.11303	118.55585	Troglofauna	08-Aug-19	03-Oct-19	Trap 1		24
MD4276	-22.14256	118.64318	Troglofauna	08-Aug-19	08-Aug-19	Scrape	20	
MD4276	-22.14256	118.64318	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	20	
MD4414	-22.14685	118.58481	Troglofauna	09-Aug-19	09-Aug-19	Scrape	11	
MD4414	-22.14685	118.58481	Troglofauna	09-Aug-19	02-Oct-19	Trap 1	11	
MD4542	-22.13726	118.66240	Troglofauna	07-Aug-19	07-Aug-19	Scrape		13
MD4554	-22.14144	118.66040	Troglofauna	07-Aug-19	07-Aug-19	Scrape		14
MD4554	-22.14144	118.66040	Troglofauna	07-Aug-19	03-Oct-19	Trap 1		14
MD4575	-22.14994	118.66001	Troglofauna	30-Jan-20	30-Jan-20	Scrape	20	
MD4575	-22.14994	118.66001	Troglofauna	30-Jan-20	06-May-20	Trap 1	20	
MD4597	-22.16607	118.64939	Troglofauna	07-Aug-19	07-Aug-19	Scrape	11	
MD4597	-22.16607	118.64939	Troglofauna	07-Aug-19	03-Oct-19	Trap 1	11	
MD4605	-22.12986	118.51673	Troglofauna	07-Aug-19	07-Aug-19	Scrape	6	
MD4605	-22.12986	118.51673	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	6	
MD4622	-22.12640	118.52340	Troglofauna	07-Aug-19	07-Aug-19	Scrape	8	
MD4622	-22.12640	118.52340	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	8	
MD4623	-22.12713	118.52286	Troglofauna	07-Aug-19	07-Aug-19	Scrape	9	
MD4623	-22.12713	118.52286	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	9	
MD4646	-22.13011	118.51124	Troglofauna	01-Feb-20	01-Feb-20	Scrape	5	
MD4646	-22.13011	118.51124	Troglofauna	01-Feb-20	06-May-20	Trap 1	5	
MD4656	-22.13001	118.51192	Troglofauna	06-Aug-19	06-Aug-19	Scrape		5
MD4656	-22.13001	118.51192	Troglofauna	06-Aug-19	02-Oct-19	Trap 1		5
MD4754	-22.15295	118.61671	Troglofauna	09-Aug-19	09-Aug-19	Scrape		13
MD4754	-22.15295	118.61671	Troglofauna	09-Aug-19	03-Oct-19	Trap 1		13
MD4757	-22.15520	118.61507	Troglofauna	09-Aug-19	09-Aug-19	Scrape	11	
MD4757	-22.15520	118.61507	Troglofauna	09-Aug-19	03-Oct-19	Trap 1	11	
MD4800	-22.15177	118.61995	Troglofauna	08-Aug-19	08-Aug-19	Scrape	13	
MD4800	-22.15177	118.61995	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	13	

Hole	Latitude	Longitude	Target	VisitDate	Retrieve	ST	SWL	EOH
MD4814	-22.16449	118.61765	Troglofauna	08-Aug-19	08-Aug-19	Scrape		10
MD4814	-22.16449	118.61765	Troglofauna	08-Aug-19	03-Oct-19	Trap 1		10
MD4821	-22.16032	118.62309	Troglofauna	30-Jan-20	30-Jan-20	Scrape	11	
MD4821	-22.16032	118.62309	Troglofauna	30-Jan-20	06-May-20	Trap 1	11	
MD4824	-22.16256	118.62144	Troglofauna	30-Jan-20	30-Jan-20	Scrape		7
MD4824	-22.16256	118.62144	Troglofauna	30-Jan-20		Trap 1		7
MD4902	-22.16365	118.63001	Troglofauna	08-Aug-19	08-Aug-19	Scrape	10	
MD4902	-22.16365	118.63001	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	10	
MD4921	-22.13884	118.62714	Troglofauna	31-Jan-20	31-Jan-20	Scrape	15	
MD4921	-22.13884	118.62714	Troglofauna	31-Jan-20	06-May-20	Trap 1	15	
MD4969	-22.15032	118.60222	Troglofauna	08-Aug-19	08-Aug-19	Scrape		11
MD4969	-22.15032	118.60222	Troglofauna	08-Aug-19	03-Oct-19	Trap 1		11
MD5051	-22.12691	118.46280	Troglofauna	07-Aug-19	07-Aug-19	Scrape	7	
MD5051	-22.12691	118.46280	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	7	
MD5054	-22.12107	118.46736	Troglofauna	07-Aug-19	07-Aug-19	Scrape	7	
MD5054	-22.12107	118.46736	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	7	
MD5062	-22.11220	118.47395	Troglofauna	07-Aug-19	07-Aug-19	Scrape	8	
MD5062	-22.11220	118.47395	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	8	
MD6089	-22.16239	118.58514	Troglofauna	09-Aug-19	09-Aug-19	Scrape	5	
MD6089	-22.16239	118.58514	Troglofauna	09-Aug-19	02-Oct-19	Trap 1	5	
MD6141	-22.16652	118.61736	Troglofauna	09-Aug-19	09-Aug-19	Scrape		10
MD6141	-22.16652	118.61736	Troglofauna	09-Aug-19	03-Oct-19	Trap 1		10
MD6153	-22.14570	118.61733	Troglofauna	08-Aug-19	08-Aug-19	Scrape	15	
MD6153	-22.14570	118.61733	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	15	
MD6225	-22.16620	118.61170	Troglofauna	08-Aug-19	08-Aug-19	Scrape	8	
MD6225	-22.16620	118.61170	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	8	
MD6304	-22.15779	118.60021	Troglofauna	08-Aug-19	08-Aug-19	Scrape	7	
MD6304	-22.15779	118.60021	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	7	
MD6362	-22.13849	118.62148	Troglofauna	08-Aug-19	08-Aug-19	Scrape	20	
MD6362	-22.13849	118.62148	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	20	
MD6388	-22.14105	118.62546	Troglofauna	30-Jan-20	30-Jan-20	Scrape	18	
MD6388	-22.14105	118.62546	Troglofauna	30-Jan-20	06-May-20	Trap 1	18	
MD6390	-22.14059	118.62815	Troglofauna	08-Aug-19	08-Aug-19	Scrape		13
MD6390	-22.14059	118.62815	Troglofauna	08-Aug-19	03-Oct-19	Trap 1		13
MD6444	-22.14483	118.64854	Troglofauna	08-Aug-19	08-Aug-19	Scrape	14	
MD6444	-22.14483	118.64854	Troglofauna	08-Aug-19	03-Oct-19	Trap 1	14	
MDH0092	-22.12520	118.51491	Troglofauna	07-Aug-19	07-Aug-19	Scrape		7
MDH0092	-22.12520	118.51491	Troglofauna	07-Aug-19	02-Oct-19	Trap 1		7
MDH0139	-22.12145	118.50236	Troglofauna	07-Aug-19	07-Aug-19	Scrape	7	
MDH0139	-22.12145	118.50236	Troglofauna	07-Aug-19	02-Oct-19	Trap 1	7	
MDH0146	-22.12095	118.50506	Troglofauna	06-Aug-19	06-Aug-19	Scrape	5	
MDH0146	-22.12095	118.50506	Troglofauna	06-Aug-19	02-Oct-19	Trap 1	5	