Bennelongia Environmental Consultants

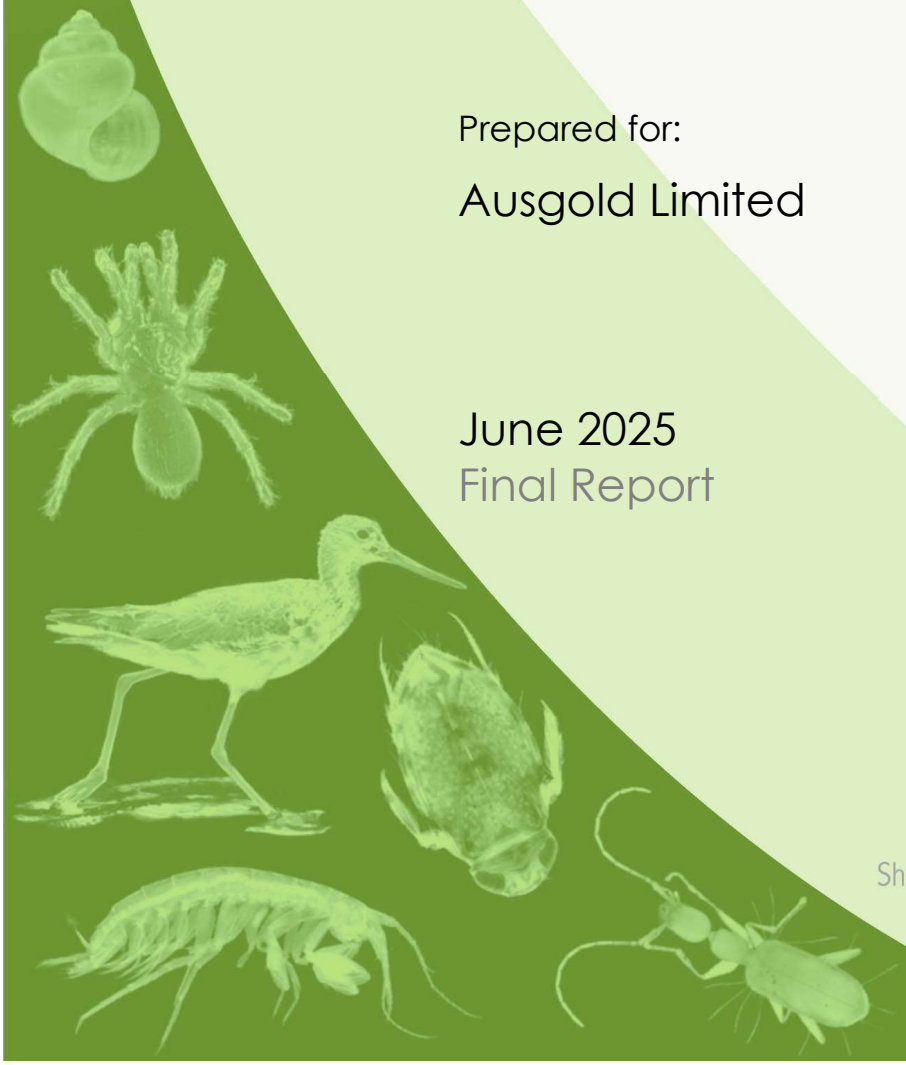
Katanning Gold: Subterranean Fauna Desktop and Survey Report

Prepared for:

Ausgold Limited

June 2025

Final Report



Short-Range Endemics | Subterranean Fauna

Waterbirds | Wetlands

Katanning Gold: Subterranean Fauna Desktop and Survey Report

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EXECUTIVE SUMMARY

Ausgold Limited proposes to recommence mining at the Katanning open pit gold mine (the Project) 40 km north-east of Katanning and 275 km south-east of Perth. In order to determine the likelihood of subterranean fauna occurring in the Project area, Bennelongia has undertaken a desktop review of the potential for subterranean fauna to occur within the Project area, with a single round of basic field survey to support the desktop findings. The likelihood of subterranean fauna occurrence, the survey outcome, and the key threats were considered together to determine the significance of potential impacts on subterranean fauna.

A square of 100 km x 100 km centred on the Project was defined as the Search Area for examining the occurrence of subterranean fauna in the vicinity of the Project. Geological and hydrogeological reports were reviewed to assess whether prospective habitat for subterranean fauna is likely to occur at the Project. Records of subterranean fauna were primarily compiled from the Western Australian Museum and Bennelongia databases. Published research papers, available environmental reports, and online resources were also reviewed.

Based on local and regional geology and hydrogeology, the Project area is not expected to be prospective for troglofauna, with insufficient habitable spaces to support viable populations in the surface and underlying geology. Habitat prospective for stygofauna is expected to be low, with poor vertical and lateral connectivity within fractured rock aquifers. The desktop review did not find any existing records of subterranean fauna in the Search Area, but neither did it find any evidence of previous surveys taking place.

The basic stygofauna survey was undertaken at the Project from 9–10 October 2023, with 12 sites being sampled. No subterranean fauna were collected in any of the samples. Water chemistry results were within habitable ranges for stygofauna, indicating this is not a limiting factor for populations to occur. Overall, the field survey indicates the likelihood of subterranean populations occurring within the Project area itself is low and, accordingly, the threat to subterranean fauna conservation values from mining and groundwater abstraction is very low.

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1. INTRODUCTION

Ausgold Limited proposes to recommence mining at the Katanning open pit gold mine (the Project) 40 km north-east of Katanning and 275 km south-east of Perth in the Great Southern region of Western Australia (Figure 1). Ausgold Limited has requested that Bennelongia Environmental Consultants (Bennelongia) undertake a desktop review of the potential for subterranean fauna to occur within the Project area, with a single round of field survey to support the desktop findings. The review and survey follow relevant guidelines for subterranean fauna assessment (EPA 2016a, b, 2021).

Information on proposed developments was reviewed to determine the key potential threats to subterranean fauna. The likelihood of subterranean fauna occurrence, the survey outcome, and the key threats were considered together to determine the significance of any potential impacts on subterranean fauna. The assessment of habitat prospectivity considered:

- Local and regional geological and hydrogeological information and mapping.
- Habitat information collected during previous field survey and reviews.
- Drill core photographs and lithological logs.

This report documents the methods and results of the desktop review and subsequent field survey.

1.1. Subterranean Fauna Framework

1.1.1. Subterranean Fauna

Subterranean species occur underground across much of Western Australia. They include two distinct animal communities: aquatic stygofauna in groundwater and air-breathing troglofauna in the vadose zone between the surface and the water table. For the purposes of this report, only the stygofauna occurring in various types of aquifers are considered, and those species in springs and riverbeds with close surface connections are ignored. Due to relatively uniform selection pressures in underground habitats, true subterranean fauna typically exhibit many convergent morphological and physiological characteristics, such as reduced or absent eyes, loss of pigmentation, loss of wings, elongate sensory structures, a shift towards K-selection breeding strategy, and decreased metabolism (Gibert and Deharveng 2002). The overwhelming majority of subterranean species in Western Australia are invertebrates but at least two fishes and one snake have also been found.

Subterranean fauna contributes markedly to the overall biodiversity of Australia. The Pilbara and Yilgarn regions of Western Australia, in particular, are recognised as places of globally significant subterranean fauna populations with an estimated 4,500 or more subterranean species likely to occur in these regions (Guzik *et al.* 2010; Halse 2018a), the majority of which are undescribed. Many stygofauna species are short range endemics (SREs), with much smaller ranges than Harvey's SRE range criterion of 10,000 km^2 (Harvey 2002). Given that species with small ranges are more vulnerable to extinction following habitat degradation than wider ranging species (Ponder and Colgan 2002), it follows that subterranean taxa are highly susceptible to anthropogenic threats, particularly large-scale excavation and groundwater abstraction.

1.1.2. Habitat Requirements

The occurrence and distribution of subterranean fauna within a region is closely related to lithology and geology. The subterranean spaces that both stygofauna and troglofauna inhabit include interstices, voids, vugs, cavities and fissures. Geologies that contain many such spaces represent the most prospective habitat. Both vertical and lateral connectivity of these spaces are factors in determining the distribution of subterranean fauna. Vertical connectivity to the surface is important for supplying carbon and nutrients into the vadose zone and then into underlying aquifers, as well as the recharge of aquifers by rainfall (Korbel and Hose 2011). Lateral connectivity enables underground dispersal, allowing animals to move about and interact in viable-sized species populations. Geological features such as dykes may

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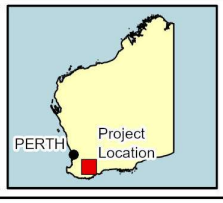

Legend

- Towns
- Katanning Gold Project
- State Highway
- Main Roads

Figure 1. Location of the Ausgold Katanning Gold Project

act as barriers to dispersal of subterranean fauna and lead to species having highly restricted ranges, while chemistry (especially dissolved calcium and carbonate) affects the occurrence of many species.

Stygofauna Habitat

The most productive known stygofauna habitats in Western Australia are aquifers in alluvium and calcrete associated with palaeochannel deposits. Aquifers in mafic rock can be productive and aquifers in some iron formations (especially channel iron formation) may contain abundant stygofauna (Halse *et al.* 2014). The aquifers in other fractured or vuggy rock formations also have the potential to support stygofauna. In general, stygofauna community richness declines with increasing depth to the water table, principally due to reduced supply of carbon and nutrients (Humphreys 2006), with highest densities occurring when the water table is less than 30 m below ground surface. However, animals have been occasionally recorded where depth to water table is nearly 90 m (Halse *et al.* 2014). Stygofauna occur in varying salinities but are mostly found in fresh to moderately saline waters with conductivities of less than 50,000 µS/cm. While oxygen levels are difficult to measure accurately, stygofauna are uncommon in hypoxic groundwater with under 0.3 mg O2/L (Halse 2018a; Hose *et al.* 2015).

Troglofauna Habitat

Troglofauna species are outcompeted by surface soil species in the uppermost soil layers but become dominant at depth, provided relative humidity is high (Halse 2018b). Important habitats for troglofauna are mineralized or weathered iron formations and calcrete. Troglofauna species are also found in various detritals, including colluvium, although their importance as habitat is variable. Some other vuggy rock formations are also likely to support troglofauna but there have been insufficient survey efforts to estimate their importance. Areas with very shallow water tables, where the whole soil profile occasionally saturates from surface to water table, are unsuitable for troglofauna.

1.2. Potential Impacts

The effects of developing mining infrastructure and subsequent mining operations on subterranean fauna conservation values can be broadly divided into two categories of impact:

1. Primary impacts – these are the impacts with potential to cause extinction, or removal of local populations, of subterranean fauna. Direct removal of habitat is the most common primary impact, usually in the form of mine pit excavation (troglofauna) or water abstraction for pit dewatering and processing water (stygofauna). It is usually considered that ≥2-m of groundwater drawdown is sufficient to impact stygofauna.
2. Secondary impacts – these are impacts that only reduce population densities of subterranean fauna. Secondary impacts commonly affect habitat quality and include pollutants, blast vibration, increased turbidity, and the shadowing effects of surface infrastructure that reduce recharge. In an extreme form, some secondary impacts, such as salinisation, can threaten species persistence through physiological stress.

This report does not consider the possible effects of secondary impacts because these usually do not threaten species persistence and require detailed information about mine operations to provide the basis for assessment.

1.3. Conservation Legislation

Native flora and fauna in Western Australia are protected at both State and Commonwealth levels. At the national level, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, and ecological communities. However, the threatened fauna lists of the EPBC Act currently place little emphasis on subterranean fauna.

At the state level, the *Biodiversity Conservation Act 2016* (BC Act) provides a legal framework for protection of species, particularly for species listed by the Minister for the Environment as 'threatened,'

and this list includes some subterranean species. In addition to the list of threatened species under the BC Act, the Department of Biodiversity, Conservation and Attractions (DBCA) maintains a list of priority species that are of conservation importance but, for various reasons including data deficiency, do not meet the criteria for listing as threatened.

Both the EPBC and BC Acts provide frameworks for the protection of threatened ecological communities (TECs). Within Western Australia, DBCA also recognises communities of potential conservation concern, but for which there is not enough information to support listing, as priority ecological communities (PECs). The list of TECs and PECs recognised under the BC Act and by DBCA is larger than the EPBC Act TEC list and has much greater focus on subterranean communities.

2. DESKTOP ASSESSMENT

2.1. Methods

A comprehensive review of previous subterranean fauna records and existing geological and hydrogeological reports was conducted to assess whether subterranean fauna, or habitat prospective for subterranean fauna, occur in and around the Project. For this review, a Search Area of 100 x 100 km centred on the Project was defined (Figure 2; top left: 33.097°S,117.378°E; bottom right 33.999°S,118.451°E). Records of subterranean fauna within the search area were primarily compiled from the Western Australian Museum (WAM) and Bennelongia databases. Published research papers, available environmental reports, and online resources were also reviewed. Additionally, lists of conservation-significant communities and species (BC Act and EPBC Act) were consulted for the desktop assessment.

2.2. Results

2.2.1. Geology

The Project is located in the south-west corner of the Yilgarn Craton, where basement rock is largely composed of Archaean gneiss and granitoid (De Silva *et al.* 2000; SRK Consulting 2022). In the Project area there is extensive coverage by Cainozoic sediments. Saprolite consisting mostly of silt, clay and sand extends to a depth of about 30-60 m below ground level (mbgl) (Appendix 1). The saprock underneath consist of weathered granite and gneiss to a depth of up to 70 m. The underlying basement rock consists of mafic granulite and quartz monzonite that are intersected by dolerite dykes running east-west (Figure 3). Dolerite dykes often form barriers to movement for subterranean fauna and can result in isolation of species and communities on either side of these landforms. The Project area lies just north of an extensive palaeovalley (Figures 2 and 3). The saprolite in the Project area appears to contain few, if any, habitable spaces for subterranean fauna.

2.2.2. Hydrogeology

Palaeovalleys often harbour transmissive geologies appropriate for subterranean fauna. While there are palaeovalleys around the Project area, they do not overlap the proposed pits.

Depth to groundwater across the Project varies from 2-15 mbgl, with groundwater ranging from marginal to saline, typically within 6000 – 29000 µS/cm (SRK Consulting 2022, 2025), which is within habitable ranges for stygofauna. There are four types of aquifer in and around the Project: surficial, sedimentary, weathered rock, and fractured rock aquifers (De Silva *et al.* 2000). Sedimentary aquifers occupy major palaeochannels, are transmissive, and contain large volumes of groundwater but do not occur in the Project area. A complex network of faults and dykes occurs at the Project, holding a large volume of groundwater. A one-to-two-month lag between peak rainfall and peak groundwater level suggests poor vertical connectivity to the surface (SRK Consulting 2025). Lateral connectivity is also likely to be limited due to the network of cross-cutting dykes.

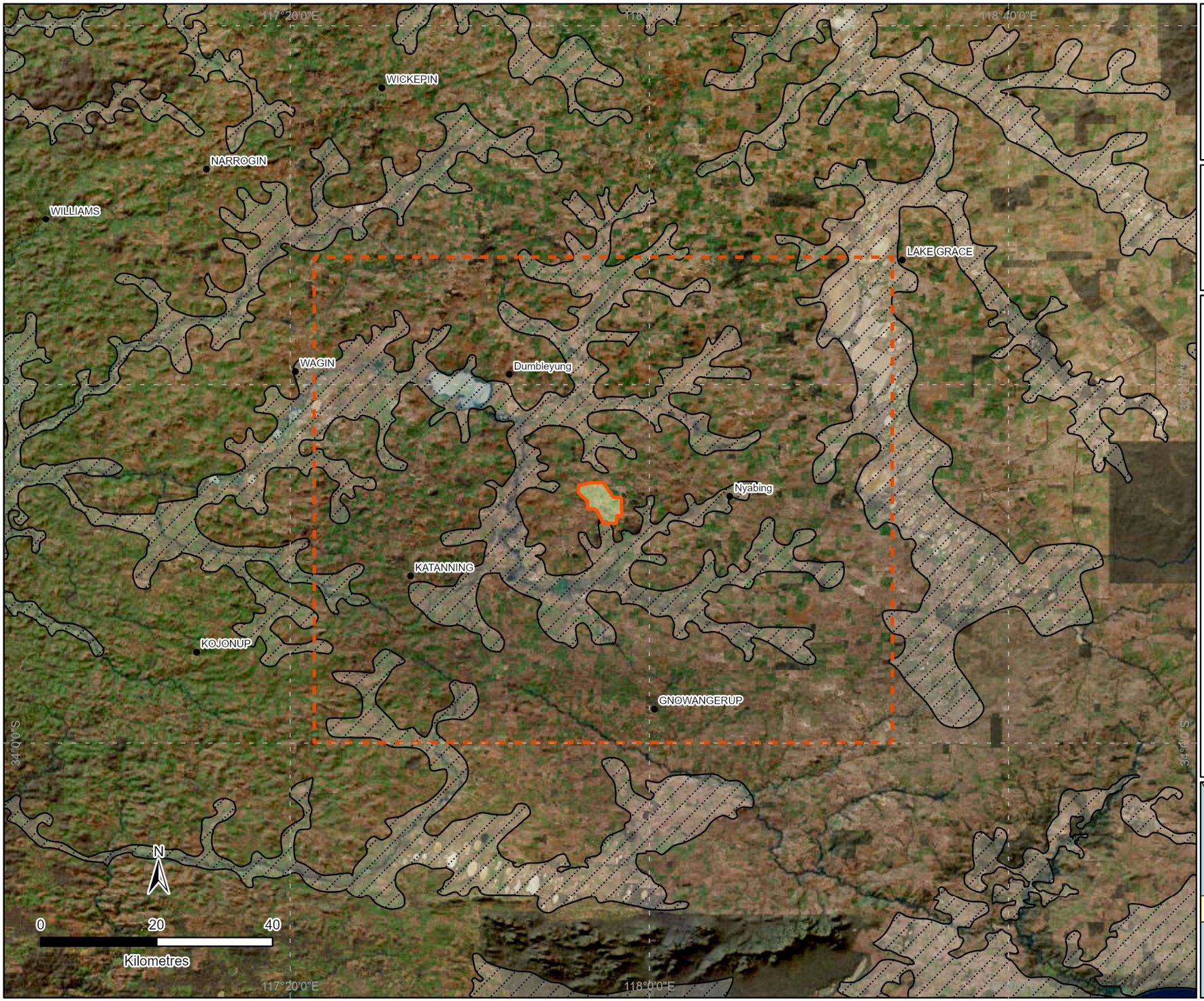

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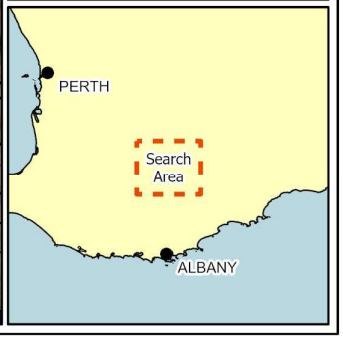
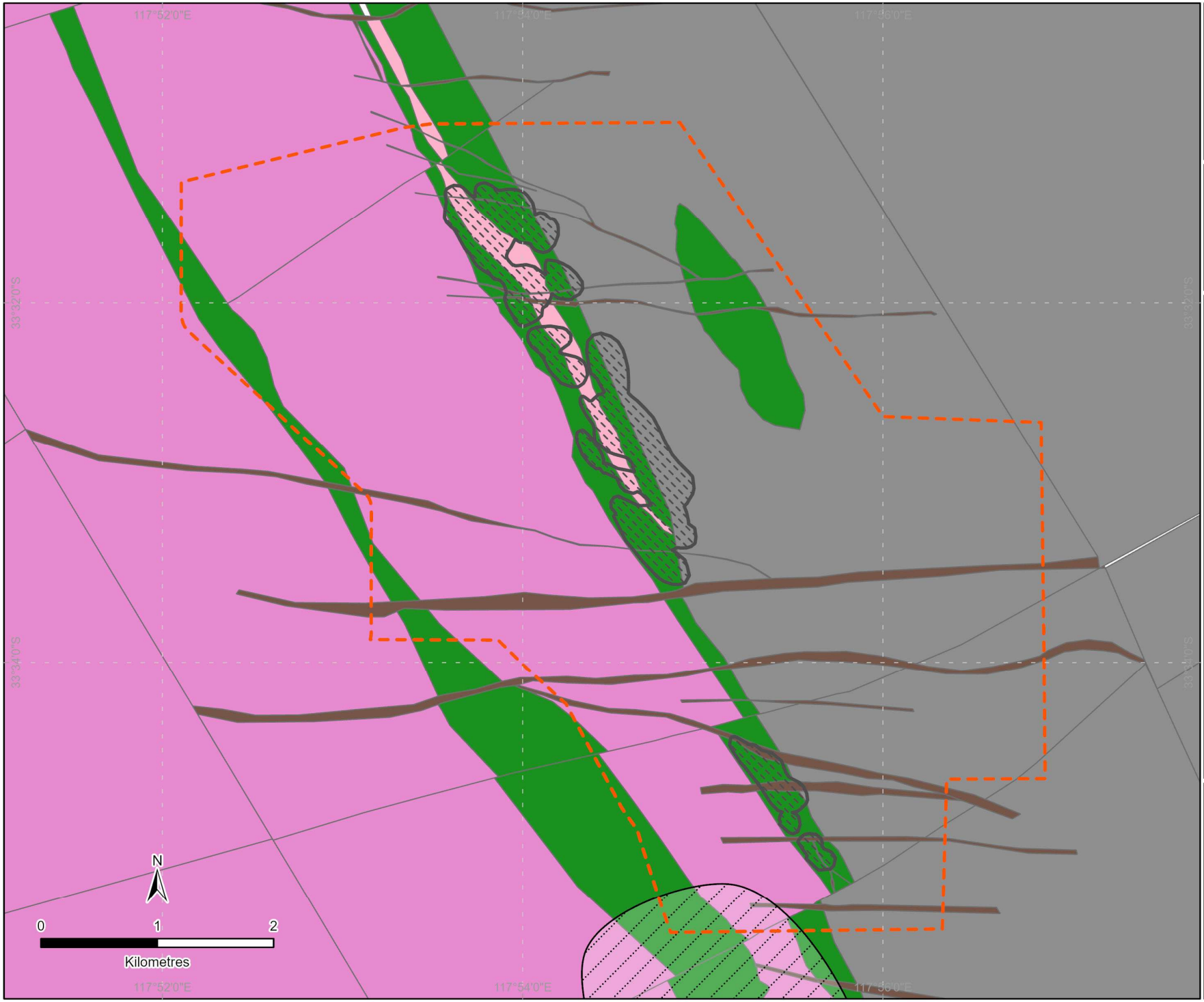
Figure 2. Desktop Search Area

Legend

- Towns
- Proposed Disturbance Envelope
- 100x100 Search Area
- Palaeovalleys





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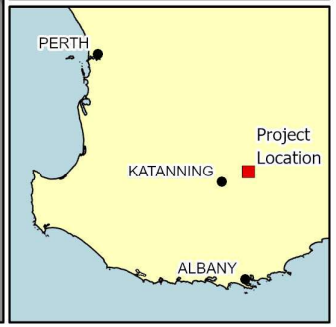
Date: 19/01/2024

Figure 3. Underlying Geology of Katanning Gold Project (data provided by Ausgold Ltd)

Legend

- 2022 PFS Pit Designs
- Proposed Disturbance Envelope
- quartz monzonite
- mafic granulite
- dolerite
- metasediments
- granite
- Palaeovalleys



Overall, the hydrogeology at the Project suggests there is little suitable habitat for subterranean fauna.

2.2.3. Subterranean Fauna Records

The databases of WAM, Bennelongia and available literature contain no records of subterranean fauna within the Search Area. No TECs or PECs are listed in the Search Area either. Bennelongia has not previously carried out subterranean fauna surveys in this area, and a search for other available subterranean fauna surveys did not discover evidence of previous surveys occurring in this area. For the purposes of the desktop review, no subterranean species are known to occur in the Search Area.

3. STYGOFAUNA FIELD SURVEY

Following the desktop search for species records, a basic survey consisting of one round of stygofauna sampling was conducted from 9–10 of October 2023 to confirm the results of the desktop assessment. In total, 12 stygofauna samples were collected in and around the Project area (Figure 4). Three of the bores sampled sit within palaeovalleys near the Project; the remainder are within the Project area. For a complete list of sampled holes, please refer to Appendix 2. Sampling for stygofauna was conducted according to the principles laid out for subterranean fauna sampling by the Environmental Protection Authority (EPA) in *Environmental Factor Guideline – subterranean fauna* (EPA 2016a) and *Technical Guidance – subterranean fauna surveys for environmental impact assessment* (EPA 2021).

3.1. Methods

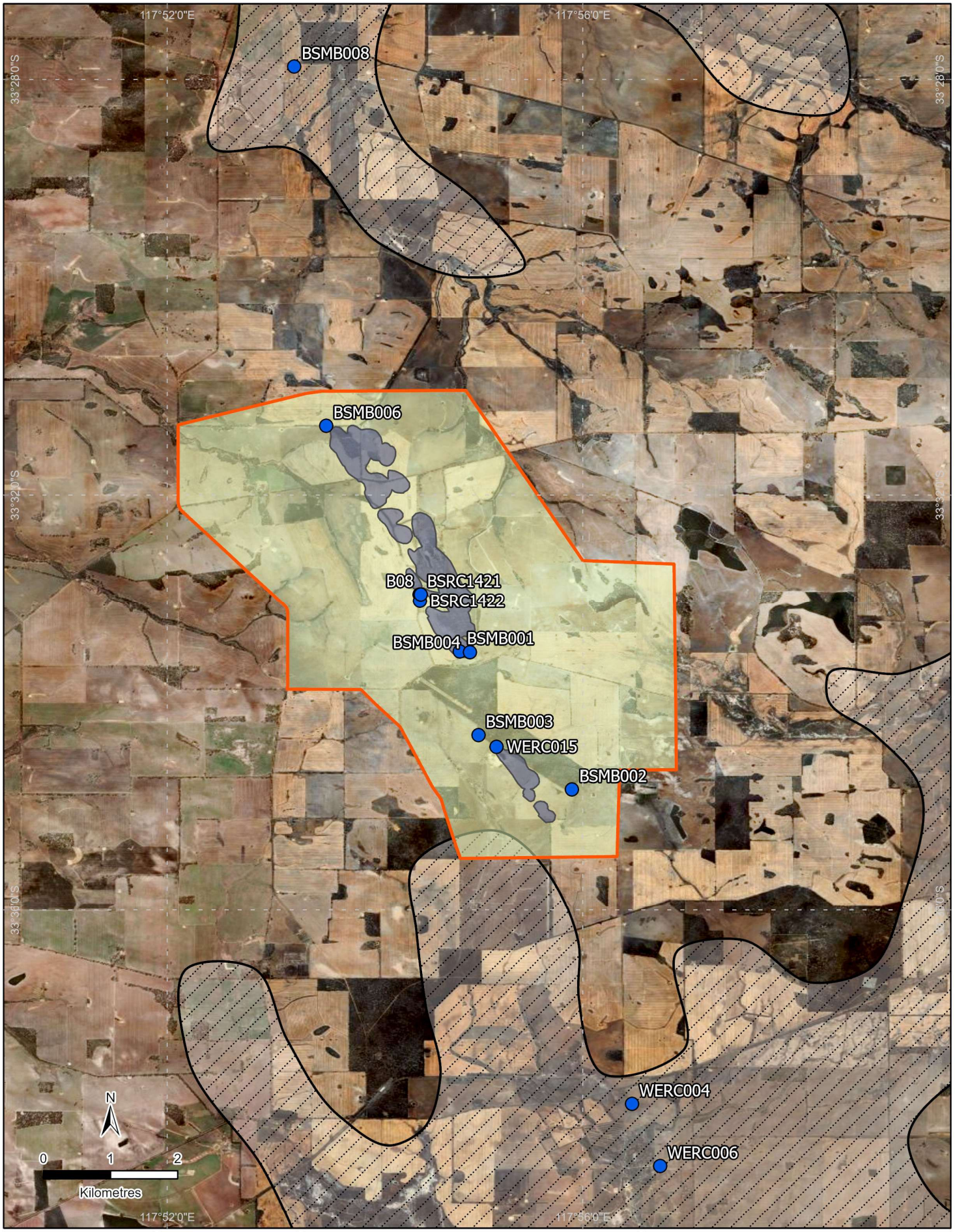
Stygofauna samples were collected using weighted plankton nets. Where possible, six hauls were taken at each site, three using a 50-µm mesh net and three with a 150-µm mesh net. The net was lowered to the bottom of the hole and jerked up and down briefly to agitate benthos (increasing the likelihood of collecting benthic species) and then slowly retrieved. Contents of the net were transferred to a 125-ml polycarbonate vial after each haul, flushed with bore water to reduce fine sediment content, preserved in 100% ethanol, and refrigerated at a constant 4 °C. Nets were washed between holes to minimise site-to-site contamination. Temperature, salinity as electrical conductivity (EC), pH, and standing water level (using a Solinst meter) were measured *in situ* at each site.

In the laboratory, all samples were elutriated to separate animals from sediment and sieved to fractionate the contents according to size (53, 90 and 250 µm) to improve searching efficiency prior to screening under a dissecting microscope. During this process, any potential subterranean fauna were removed from samples during screening for later species level identification.

3.2. Results

No subterranean species were collected in any of the samples.

In line with the information in hydrogeological reporting (SRK Consulting 2022), depth to groundwater at the sampled bores averaged 7.8 m (range 0-18.4 m). At two locations water was even flowing from the bores. Groundwater salinity measured at the time of sampling was variable and ranged from close to fresh (2,348 µS/cm) to saline (48,200 µS/cm), averaging 20,045 µS/cm (Appendix 1). Most sites had typical pH levels, but water at sites WERC006 (pH 3.39), B08 (pH 4.38), and, to a lesser extent, BSMB008 (pH 5.04) was markedly acidic.



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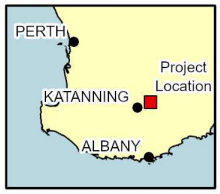

Legend

- Survey Sites
- Palaeovalleys
- 2022 PFS Pit Designs
- Proposed Disturbance Envelope

Figure 4. Stygofauna Field Survey Sampling Sites

4. DISCUSSION

Based on local and regional geology and hydrogeology, the Project area is not expected to be prospective for troglofauna, with insufficient habitable spaces to support viable populations in the surface and underlying geology. Neither is habitat considered prospective for stygofauna. While the aquifers within the Project area hold a large volume of groundwater, poor vertical and lateral connectivity is expected, restricting the flow of nutrients and dispersion of fauna. The desktop review did not find any existing records, nor any evidence of previous surveys taking place. The field survey did not collect any stygofauna (nor troglofauna as by-catch).

Water chemistry results were within habitable ranges for stygofauna, indicating water quality is unlikely to be the factor constraining the occurrence of stygofauna. Overall, the field survey supports results of the desktop review in showing that the likelihood of subterranean species being present in the Project area itself is low and, accordingly, the threat to subterranean fauna from Project development and groundwater abstraction is very low.

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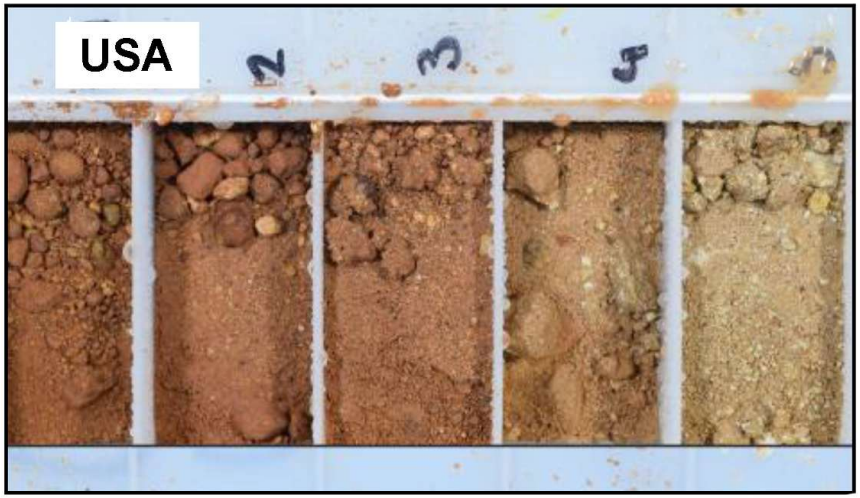

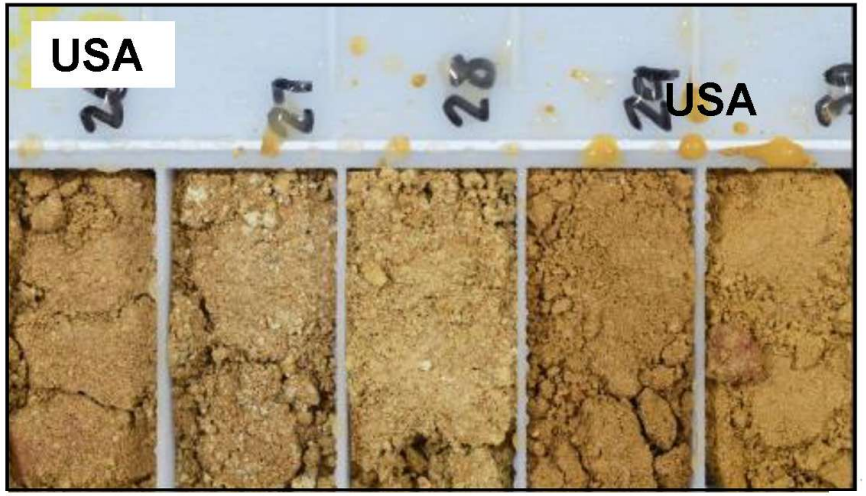

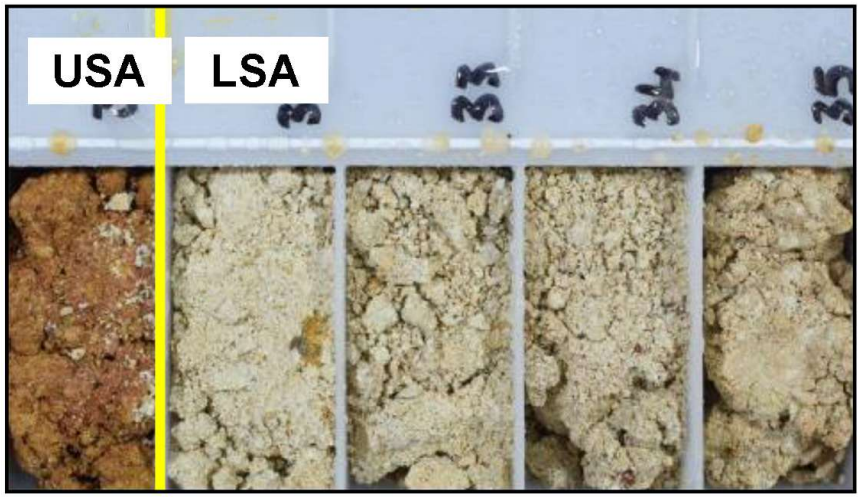

Appendix 1. Geology of Project area.
USA, upper saprolite;
LSA, lower saprolite.
Depths below ground as marked on trays.

Photos supplied by Ausgold

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Appendix 2. Holes sampled for stygofauna in the 2023 survey.

SWL, standing water level (mbgl); EOH, end of hole (mbgl); Temp, temperature (°C); EC, electrical conductivity (µS/cm).

Bore Hole ID	Latitude	Longitude	Visit Date	SWL	EOH	pH	Temp	EC
WERC004	-33.631108	117.941241	9/10/2023	0	26	6.18	20.5	42,100
WERC006	-33.641064	117.945737	9/10/2023	0.73	14	3.39	20.9	48,200
WERC015	-33.573747	117.919505	9/10/2023	0	117	6.83	19.7	13,100
BSMB001	-33.558489	117.913573	10/10/2023	6.9	76	6.88	18.7	8,980
BSMB002	-33.580575	117.931597	10/10/2023	18.4	83	7.15	18.1	11,100
BSMB003	-33.571861	117.916593	10/10/2023	9.4	73	6.93	18.3	9,260
BSMB004	-33.558616	117.915222	10/10/2023	4.5	9	5.96	17	2,348
BSMB006	-33.522247	117.892152	10/10/2023	8.2	32	6.11	21.4	24,600
BSMB008	-33.464594	117.88706	10/10/2023	2.09	23	5.04	18.8	40,100
BSRC1421	-33.54924	117.907176	10/10/2023	14.85	87	6.64	18.6	14,100
BSRC1422	-33.550315	117.90719	10/10/2023	12.75	48	6.75	20.1	20,000
B08	-33.54924	117.907359	10/10/2023	16.16	28	4.38	19.4	6,650