

## 65771 M08 Smiths Beach Subterranean Fauna Risk Assessment (Rev 0)

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|----------|-------------|-------------|-----------------------|
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### Smiths Beach Project, Yallingup – Coastal Tourism Village – Subterranean fauna; Response to Submissions

#### Purpose and scope

This memorandum (memo) has been prepared as part of the response to submissions following the eight week Public Environmental Review of the Environmental Review Document. The Proposal is being assessed as an accredited assessment under the *Environmental Protection Act 1986* (EP Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This memo has been prepared to address comment 89 and 90 - EPA Services and Technical Agency Comments. Specifically, this memo provides a discussion on the potential impacts to the four Threatened Ecological Communities (Aquatic Root Mat Communities) which are listed under the *Biodiversity Conservation Act 2016* (BC Act) and the EPBC Act.

#### Subterranean fauna – Leeuwin-Naturaliste Ridge

##### Aquatic Root Mat Communities 1-4 of the Leeuwin-Naturaliste Ridge - Threatened Ecological Communities (Critically Endangered, BBC Act; Endangered, EPBC)

The Threatened Ecological Communities (TECs) associated with subterranean fauna of the Leeuwin-Naturaliste Ridge are the four root mat communities:

- Aquatic Root Mat Community Number 1 of Caves of the Leeuwin-Naturaliste Ridge (Easter and Jewel Caves);
- Aquatic Root Mat Community Number 2 of Caves of the Leeuwin-Naturaliste Ridge (Strongs Cave);
- Aquatic Root Mat Community Number 3 of Caves of the Leeuwin-Naturaliste Ridge (Kudjal Yolgah and Budjur Mar Caves); and
- Aquatic Root Mat Community Number 4 of Caves of the Leeuwin-Naturaliste Ridge (Calgardup Cave).

These caves were listed following work by Jasinka (1997). Each of the four listed cave communities is recognised as distinct due to their differing composition of aquatic subterranean species (forming the four communities). Tree roots which penetrate the limestone to tap the groundwater in cave pools and streams grow in the form of dense mats. These root mat communities have been found to contain a unique community of subterranean fauna, including several obligate invertebrate fauna.

A subsequent study by Eberhard (2004) found Community No. 1 is limited in distribution to a small karst aquifer comprising Jewel Cave, Labyrinth Cave and Easter Cave located in the southern portion of the Leeuwin-Naturaliste Ridge.

The Leeuwin-Naturaliste Ridge is a linear band (approximately 6 km wide) of coastal Tamala limestone between Cape Naturaliste and Cape Leeuwin. The Leeuwin Naturaliste Ridge contains syngenetic karst – a term for karst features, including caves, that form within a soft porous, soluble sediment at the same time as

it is being cemented into a rock. During the formation of the karst (dissolution and redeposition of the calcium carbonate from the dune system) a brecciated calcrete layer forms known as caprock. Beneath this caprock the percolating water becomes focussed and eventually (to simplify) caves may form (Grimes 2006).

The limestone formations which host the Leeuwin-Naturaliste Ridge caves can be up to 150 m thick, typically in areas of elevated limestone (WSP 2024). Many of these caves have formed along a subterranean water course. The TECs contain subterranean streams which are a westward flowing drainage system and can be of groundwater origin or a continuation of surface creeks that flow into the karst. Eberhard's (2004) study on Jewel and Easter Caves showed that these caves form a greater part of a karst system which comprises four watertable maze caves which are hydraulically connected (Jewel-Easter-Labyrinth). Many of these caves are drying because of a reduced rainfall pattern in the southwest (Eberhard and Davies 2010).

The Leeuwin-Naturaliste Ridge caves, including the TECs, are shown in Figure 1 and Figure 2. In relation to the Development Envelope, these TECs are approximately 40 km to the south. A few caves are located north east of the Development Envelope, however these caves are not TECs. The catchment for the TECs is considered to be east of the TECs. The Development Envelope lies in a different catchment and does not intersect any of the TECs catchments.

### **Subterranean Fauna Habitat – Smiths Beach**

In the vicinity of the Development Envelope the only geological unit that is known to contain karst features is the Tamala Limestone unit. No karst features have been documented as present within 1 km of the Development Envelope and Tamala Limestone was not encountered during the previous geotechnical investigations (Golder 2021). The regional geological map indicates that suitable limestone formations were present along the southern boundary of the Development Envelope as shown in Figure 3. An assessment by WSP (2004) concluded that the likelihood that there is a cave (karst) system beneath the Development Envelope is low (WSP 2024).

Further to this and as discussed in Section 8.3.3 of the ERD, the survey undertaken by Dr Logan to support the original Smiths Beach Proposal in 2005 found no significant karst features and no indicators of concealed karst features. The limestone that was observed on the property was considered too thin to support any significant karst features and as a result, Dr Logan concluded that "in the boundaries of the property, karst risks are negligible" (ATA 2007).

The soil investigations completed for the Proposal identified shallow soils (surficial sediments) overlying gneiss (fractured rock) across the Development Envelope. The thickness of the surficial sediments from the drilling program identified the thickness of the surficial sediments up to around 10.7 m to more than 16 m. The surficial sediments were identified to be less than 3 m thick at the western and eastern margins of the site, while the thickness of the surficial sediments was generally greater than 3 m, up to 10 m –16 m, across most of the central portion of the site.

This sediment typically comprised a dark brown to brown/ orange or pale-yellow fine to coarse grained sand. At some locations there were minor brown to orange clay lenses at the base of the surficial sediments that directly overlie the gneiss (fractured rock). The lithology logs did not identify limestone within the surficial sediments overlying the gneiss (fractured rock), confirming it was highly unlikely that limestone was present within the Development Envelope.

The Development Envelope is in the Busselton-Capel Groundwater Area and Cape to Cape North Groundwater Subarea, west of the Dunsborough Fault within the Leeuwin Complex (Figure 3). The Leeuwin Complex comprises a layer of surficial sediments, referred as a surficial aquifer (when saturated), which overlies the regional fractured rock aquifer. No springs originating from limestone were identified in the Development Envelope.

While troglofauna are not restricted to caves and have been documented in other geologies, investigations for the Proposal concluded that prospectivity of suitable troglofauna habitat was low.

Habitat likely to support subterranean fauna was considered highly unlikely to occur within the Development Envelope. This is valid for both stygofauna and troglofauna.

### Gnarabup Tourism Development

The Gnarabup Tourism Development which is currently undergoing environmental assessment by the EPA (EPA Assessment 2318) is 45 km south of the Proposal and 5 km to 13 km north of the TECs. The geology of Gnarabup contains karstic caprock within the Development Envelope. Core logs also identified limestone. Two boreholes were sampled for stygofauna by Invertebrate Solutions (2024a). No stygofauna were collected from either borehole.

The colluvium and alluvium, which is typically troglofauna habitat, was found to be primarily sand at Gnarabup and therefore considered not suitable for troglofauna (Invertebrate Solutions 2024b).

### Risk to subterranean fauna

The following has been considered when assessing the risk to the key factor subterranean fauna:

- No suitable subterranean fauna habitat was identified within the Development Envelope
- Investigations and supporting drill core photos and logs did not identify limestone. No caprock was found across the Development Envelope and there are no limestone formations which are associated with the many caves on the Leeuwin-Naturaliste Ridge;
- Groundwater was not intersected during studies; and
- The only potential aquifer is a perched aquifer which is replenished via rainfall and does not appear to be of limestone origin. No subterranean streams were identified.

In assessing the risk to subterranean fauna and the adequacy of studies the following was considered:

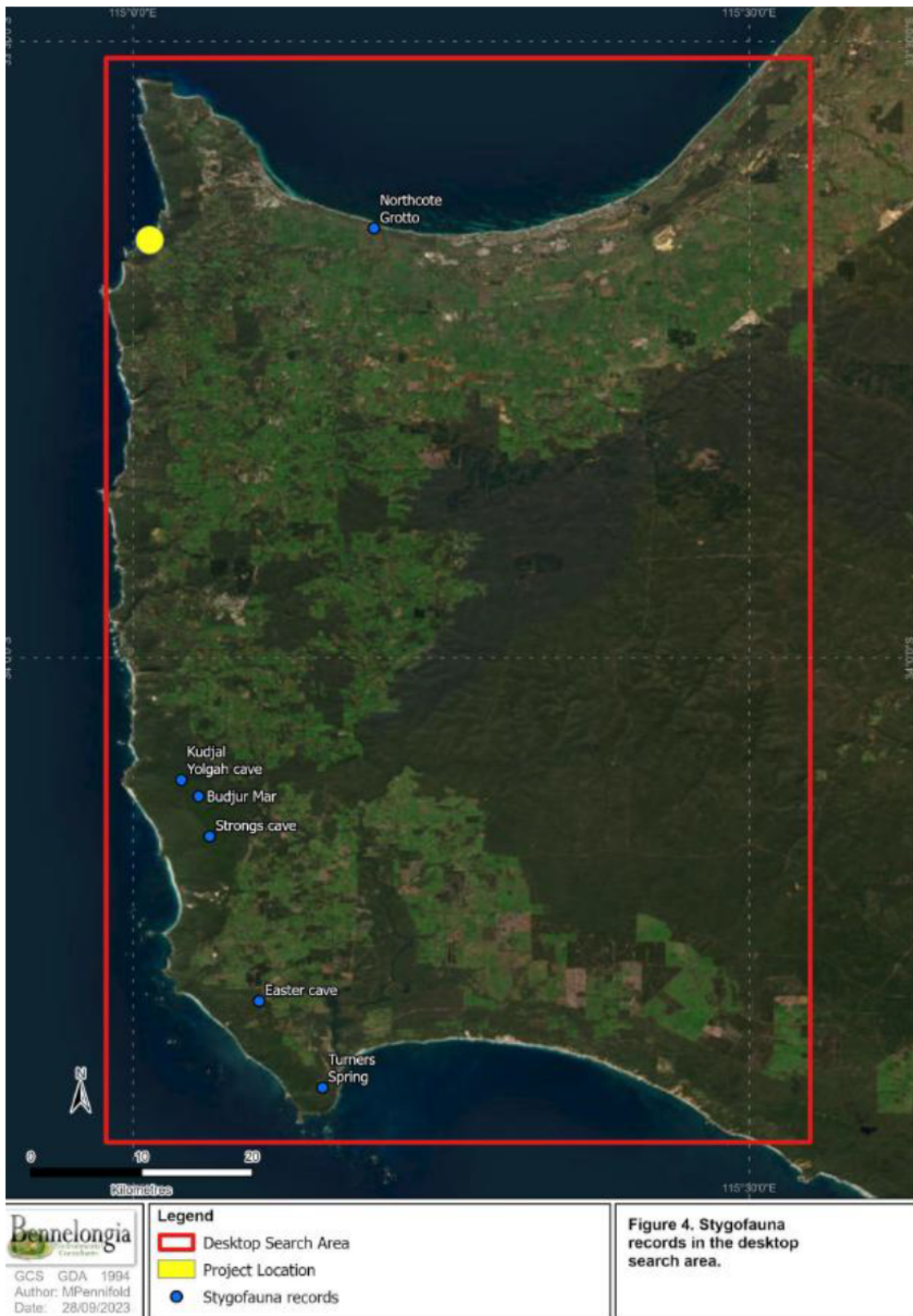
- The Proposal does not require abstraction of groundwater;
- Earthworks/excavation is not expected to be below 3 m and is intermittent across the Development Envelope. Investigations did not identify habitat suitable for troglofauna at this depth;
- Removal of vegetation may alter groundwater and surface water flow; however, as the area is not considered to support habitat for subterranean fauna habitat this is not considered as a risk;
- With respect to risk to the TECs and any caves in the proximity of the Proposal, drainage is west and not in the direction of the closest caves to the north. The Proposal does not lie within the catchment of the TECs and the risk from pollution to these caves is highly unlikely; and
- Any risk of pollution from the Proposal will be mitigated through the management of wastewater which will be regulated through the works approval and license process under Part V of the *Environmental Protection Act 1986*.

As a comparison, studies for the Gnarabup Tourism Development identified geologies which could support karst formation and potentially subterranean habitat (limestone, caprock and water intersected). The EPA noted that stygofauna was not detected from the two bores sampled within the development envelope and considered proponent sampling was adequate given the geology of the area. The EPA also noted the survey findings that the development envelope is unlikely to host significant stygofauna or troglofauna. The EPA considered that the proposal is unlikely to have a significant impact on subterranean fauna (EPA Report 1782).

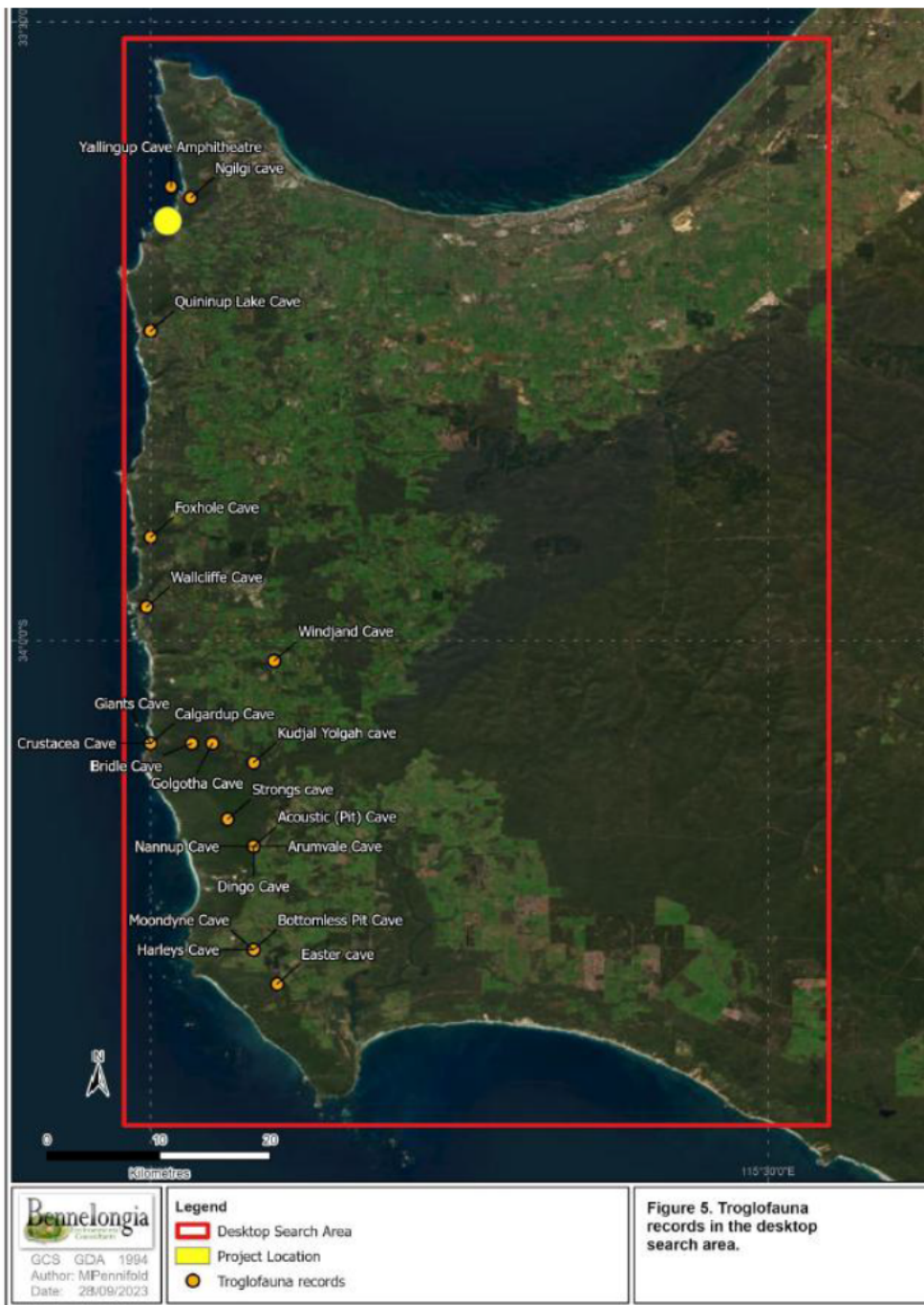
Based on the above and in line with the EPA Guidelines for sampling subterranean fauna for environmental impact assessment (EPA 2021), sampling was not required and a desktop was considered suitable. While lack of sampling in the area was identified as a reason for paucity of records (Bennelongia 2023), this can be argued because there is a lack of habitat. In the context of Smiths Beach, suitable habitat for subterranean fauna was

considered low and the potential impacts from the Proposal were also considered unlikely to be significant. This aligns with the EPA (2021)

The risk to the factor Subterranean Fauna from the Proposal is considered unlikely. The EPA's objective for this factor can be met, additionally, the Proposal does not impact the four TECs which occur south of the Development Envelope and therefore is not at variance to the interim recovery plan for these TECs.



**Figure 1 Location of caves on the Leeuwin-Naturaliste Ridge containing records of stygofauna. Easter, Strongs, Kudjal Yolghah and Budjar are TECs (source: Bennelongia 2023)**



**Figure 2 Location of caves on the Leeuwin-Naturaliste Ridge containing records of troglofauna. Easter, Strongs, Kudjal Yolgah and Caldargup are TECs (source: Bennelongia 2023)**

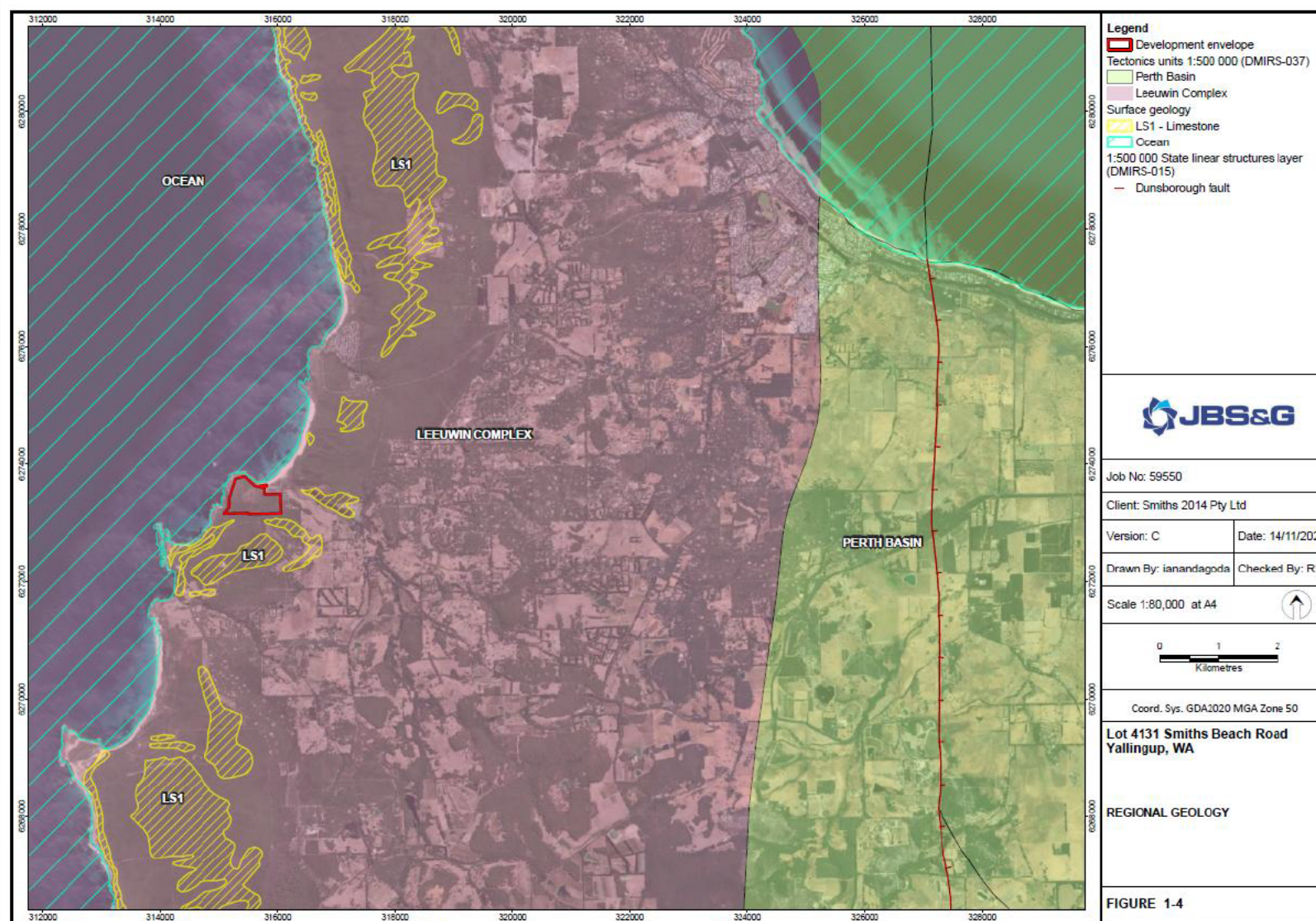


Figure 3 Location of limestone (source: JBS&G 2024).

## References

- ATA Environmental. (2007). *Sussex Location 413 Yallingup – Smiths Beach Strategic Environment Assessment*. Report No: 2006/175. Version 4.
- Bennelongia. (2023). *Smiths Beach Subterranean Fauna Desktop Assessment*. Prepared for Smiths 2014 Pty Ltd, Bennelongia Environmental Consultants Pty Ltd. 2023.
- Eberhard, S. M. (2004). Ecology and hydrology of a threatened groundwater-dependent ecosystem: The Jewel Cave karst system in Western Australia. PhD thesis, Murdoch University, School of Environmental Science. 321 pp.
- Eberhard, S. M. and Davies, S. (2010) Impacts for a drying climate on aquatic cave fauna in Jewel Cave and other caves in the southwest Western Australia. Report prepared for Augusta Margaret River Tourism Association.
- Environmental Protection Authority. (EPA). (2021). *Technical Guidance – Subterranean fauna surveys for environmental impact assessment*. EPA, Perth.
- Golder Associates (Golder). (2021). *Smiths Beach Development, Preliminary Geotechnical and Pavement Investigation, October 2021*. Report prepared for Smiths 2014 Pty Ltd.
- Grimes, K. G. (2006). Syngenetic karst in Australia: A review. *Helictite* 39: 27-38.
- Invertebrate Solutions. 2024a. *Pilot Survey and Desktop Assessment of Subterranean Fauna for the Gnarabup Tourism Development Project, Western Australia*. Unpublished report prepared for Emerge Associates Pty Ltd.
- Invertebrate Solutions. 2024b. *Gnarabup Tourism Development Project – Subterranean Fauna Impact Assessment*. Unpublished report prepared for Emerge Associates Pty Ltd.
- JBS&G. (2024). *Smiths Beach Coastal Tourism Development Environmental Review Document*. Unpublished report prepared for Smiths 2014 Pty Ltd.
- Jasinska, E. J. (1997). Fauna of aquatic root mats in caves of southwestern Australia:
- WSP. (2024). *Smiths Beach Development, Yallingup. Commentary on landform systems*. Unpublished memorandum prepared for JBS&G.