Memo

To:	Rebecca Mason
From:	David Barrett
Subject:	**Smiths Beach Development, Yallingup. Commentary on landform systems.**
Our ref:	2043509-MEM-005 Rev1
Date:	**26 March 2024**

1. INTRODUCTION

This memorandum provides commentary on geotechnical aspects of the Smiths Beach Development in Yallingup, Western Australia.

Specifically, this memorandum addresses the following scope items as requested by JBS&G:

- Characterise the landform systems including limestone karst (as part of the Leeuwin Naturaliste Ridge), granite outcrop communities and any dune system within the Development Envelope
- Undertake the required level of assessment to determine the presence of karst and karst communities within the Development Envelope.

This memorandum has been developed based on review of previous geotechnical and hydrogeological reports prepared for the development by Golder Associates (now WSP), (Golder report ref. 20435097-001-R-Rev0 and 20435097-003-R-Rev0), as well as review of publicly available information.

2. LOCATION AND GEOMORPHOLOGY

2.1 Regional Setting

The development envelope is located on the gently undulating north-south trending Leeuwin-Naturaliste Ridge which runs between- Cape Naturaliste in the north and Cape Leeuwin in the south. The ridge is formed by Archaean Age gneissic and granitic basement rocks which are overlain by Quaternary Age sedimentary soils and rocks.

The Yallingup sheet of the 1:50,000 scale Environmental Geology series map published by GSWA indicates that the development area is predominately underlain by granitic/gneissic igneous basement rocks that are associated with the Leeuwin Complex. These basement rocks may be overlain locally by calcareous wind-blown dune sands of varying thickness, that are derived from weathering of the Tamala Limestone.

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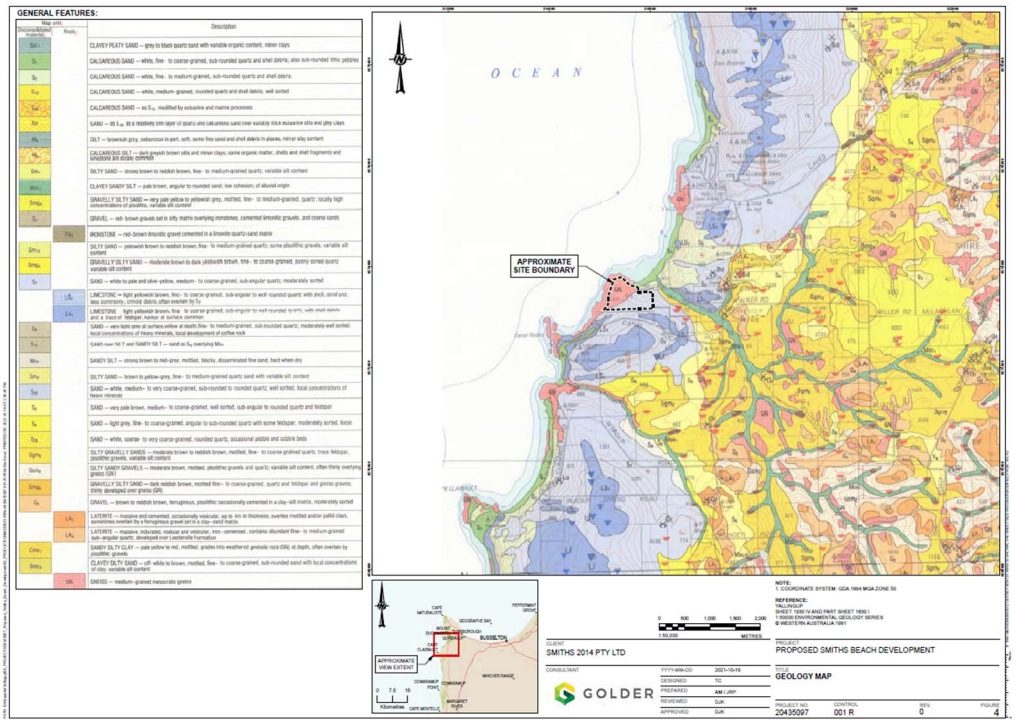

2.1.Regional geology map extract

2.2 Site Conditions

The Development Envelope is located on the western side of the gently undulating north-south trending Leeuwin-Naturaliste Ridge, and comprises/abuts a portion of the Leeuwin-Naturaliste Ridge coastline. The development area is dominated by elevated topography and outcropping of Leeuwin Complex rock across the western portion of the site, with the topography dropping to the east and north towards Smiths Beach and Gunyulgup Brook to the east.

The geological conditions encountered during the previous investigations are generally consistent with the conditions described in the regional geology maps, however with a sandy dune associated with Tamala Sand encountered across the centre of the site, and the topography reducing to the east and granitic rock being encountered across the eastern portion of the site below the surficial soils.

Minor outcropping of the granite/gneiss was encountered across the western portion of the site, however is well exposed and visible along coastal areas to the north and to the west of the Development Envelope boundaries.

3. KARST RISK

Karst is terrain or topography with distinctive hydrology and landforms formed by dissolution of carbonate rocks such as limestone. In the vicinity of the Development Envelope, the only geological unit that is known to contain karst features is the Tamala Limestone unit.

Numerous caves associated with karst have been documented throughout the Yallingup region within this geological unit and are typically encountered in areas of elevated limestone ridges and in areas where limestone is thick enough to develop karst features. Karst can be described in terms of four main features:

- Surface landforms such as dolines, swallow holes, sink holes and solution pipes in limestone terrain.

- Subterranean landforms such as pores, caves, shafts, pipes.
- Cave deposits (speleothems) stalactites and stalagmites.
- Collapse structures in caves due to continued solution of carbonate at groundwater level.

However, no karst features have been documented to be present within 1 km of the Development Envelope.

Tamala Limestone was not encountered during the previous geotechnical investigation within the Development Envelope. The regional geological map indicates that the limestone unit known to contain karstic features is not present within the footprint of the Development Envelope, however is shown present near the southern site boundary.

As Tamala Limestone is not anticipated to be present underlying the Development Envelope, and no karst features have been identified near the Development Envelope, the risk of encountering karst is anticipated to be low.

4. REFERENCES

- Golder Associates Pty Ltd (2021), Report on Smiths Beach Development, Preliminary Geotechnical and Pavement Investigation, 20435097-001-R-Rev0, October 2021
- Golder Associates Pty Ltd (2021), Report on Smiths Beach Development, Groundwater Investigation, 20435097-003-R-RevA, December 2021

5. CLOSING

We trust this meets your current requirements. Please contact the undersigned if you wish to discuss further.

David Barrett
Principal Geotechnical Engineer