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# Geological investigations for the future expansion of the SADC Gateway Port of Walvis Bay, Namibia: influence of terrestrial and marine sedimentology on Port development.

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During recent geotechnical investigations for further development of the Port of Walvis Bay, detailed information was obtained on the distribution of a unique combination of recent to late Quaternary sediments, indurated rudaceous river terrace sediments and Precambrian Damara Metamorphic Complex granitic rock. The distribution of the sediment and rock units relative to each other had a significant influence on port development layout, design and construction.

Northern portions of the bay are characterised by a surficial layer of very soft, diatomaceous silt. This layer is approximately 1 m thick along the coast and became gradually thicker until approximately 2000 m offshore where it reached a thickness of >3 m. In the southern parts of the bay an older deposit of higher density ooze reaching 10 m in thickness is overlain by recent marine sands. Such marine oozes have been studied along the Walvis Ridge [1] where they were seen to reach a total thickness of 200 m and include layers of foram-nano fossil ooze and deeper diatomaceous nano-fossil ooze.

The diamotaceous oozes are characterised by high void ratios of over 3, but are generally non-plastic. Their geotechnical properties are evaluated according to in-situ field tests (CPTu and vane shear testing) and laboratory consolidation and shear testing. Predictions of primary and secondary consolidation are discussed with reference to theoretical considerations and field loading trials.

In the northern part of the bay the rock basement is incised by conglomeratic deposits that were not previously identified in the Port. These materials are well-cemented river terrace gravels similar to the terrestrial equivalents associated with palaeochannels described by Heidbüchel [2] to the south of the current river Kuiseb channel. These channels are most likely to have developed during a period of low sea level during the late Tertiary after the deposition of the Tsondab Sandstone Formation.

The marine geotechnical investigation involved extensive geophysical investigation followed by a series of detailed geotechnical drilling campaigns. There is a strong correlation between electrical resistivity profiles and the observed unconsolidated sediment and rock profiles. This allowed for accurate extrapolation of point data for use in dredging calculations and the assessment of the engineering feasibility of various layout design options for the northern port.

*References:*

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[2] Heidbüchel I (2007) Thesis, Institute of Hydrology of Albert-Ludwigs-University of Freiburg .