

Palaeontological Desktop Assessment for Draaibosch Quarry near Komga

Prepared for: Algoa Consulting Engineers

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April 2022

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Background

It is the intention of USIBAIP (Pty) Ltd to obtain a mining permit for a dolerite quarry in the Komga district. This will constitute expansion of an existing quarry site. They approached Algoa Consulting Engineers to carry out an Environmental Impact Assessment for the development. Algoa Consulting Engineers subcontracted Rob Gess Consulting to conduct a Palaeontological Impact Assessment.

Regional Geology and Palaeontology

The district in which the quarry is situated is underlain by Upper Permian strata of the Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup). These are intruded by **dolerite dykes and sills** emplaced during the Jurassic.

The strata of the **Karoo Supergroup** were deposited within the Karoo sedimentary Basin, which resulted from shortening and thickening of the southern margin of Africa, with coeval folding and uplift of the Cape Supergroup strata along its southern margin. The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. During this interval the basin evolved from an inland sea flooded by a melting ice cap, to a giant lake (the Ecca Lake) fed by seasonal meandering (and at times braided) rivers. As the Ecca Lake silted up a subaerial (exposed) shoreline began to develop, initially in the south east of the basin. The lake steadily shrank towards the centre of the basin, leaving behind flat silty plains across which long rivers meandered from the Cape Mountains towards the much reduced lake. Sands were deposited along the river channels whereas periodic flooding deposited muds on the broad flood plains. These in time came to form the interbedded sandstones and mudstones of the Koonap, Middleton and **Balfour formations** of the Adelaide Subgroup, (Beaufort Group, Karoo Supergroup), which are overlain by strata of the Tarkastad Subgroup (Beaufort Group, Karoo Supergroup). During the Jurassic Period the subcontinent was inundated with basaltic lava that issued from widespread linear cracks within the crust. **Magma that cooled within the sub surface feeder systems of these basalt extrusions formed a network of dolerite intrusions that have been subsequently exposed by deep erosion of the subcontinent.**

The flood planes of the **Beaufort** Group provide an internationally important record of life during the early diversification of land vertebrates. During its deposition giant amphibians coexisted with diapsid reptiles (the ancestors of dinosaurs, birds and most modern reptiles), anapsids and synapsids, the dominant group of the time which included the diverse therapsids (including the ancestors of mammals). Rocks of the Beaufort Group provide the world's most complete record of the important transition from early reptiles to mammals.

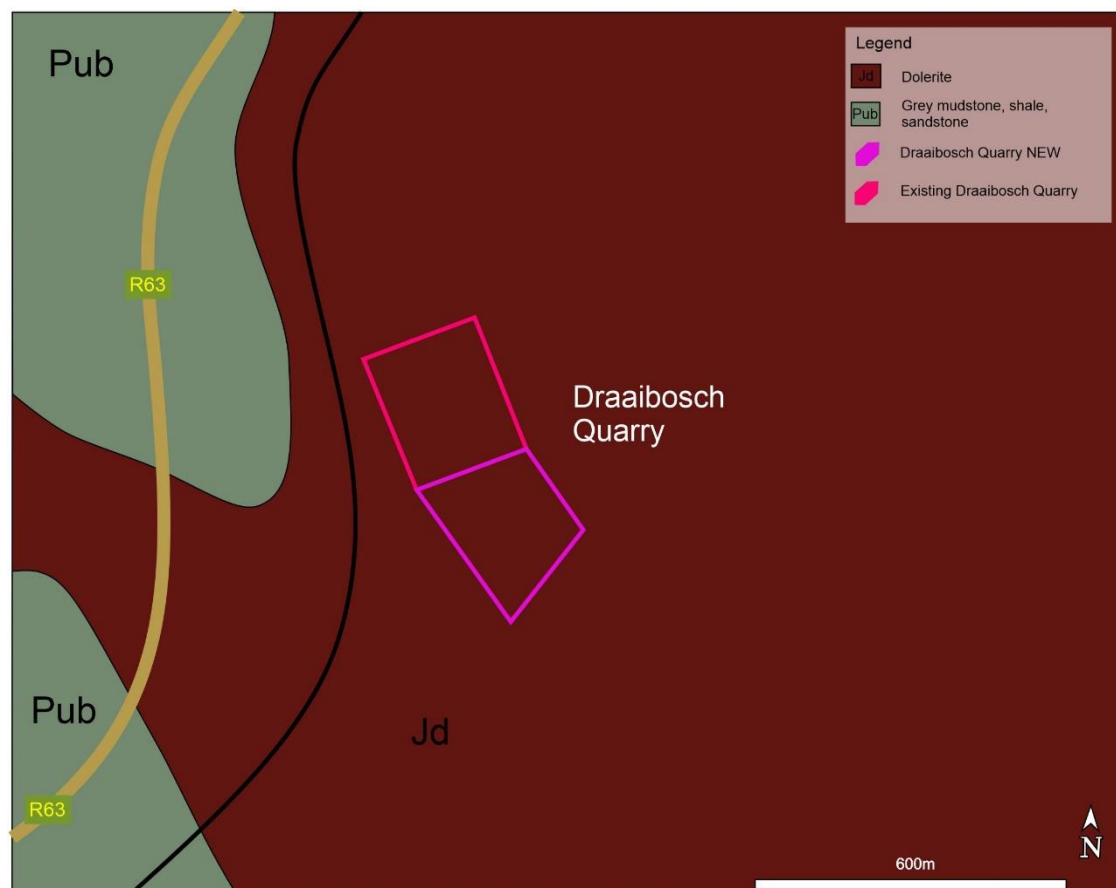
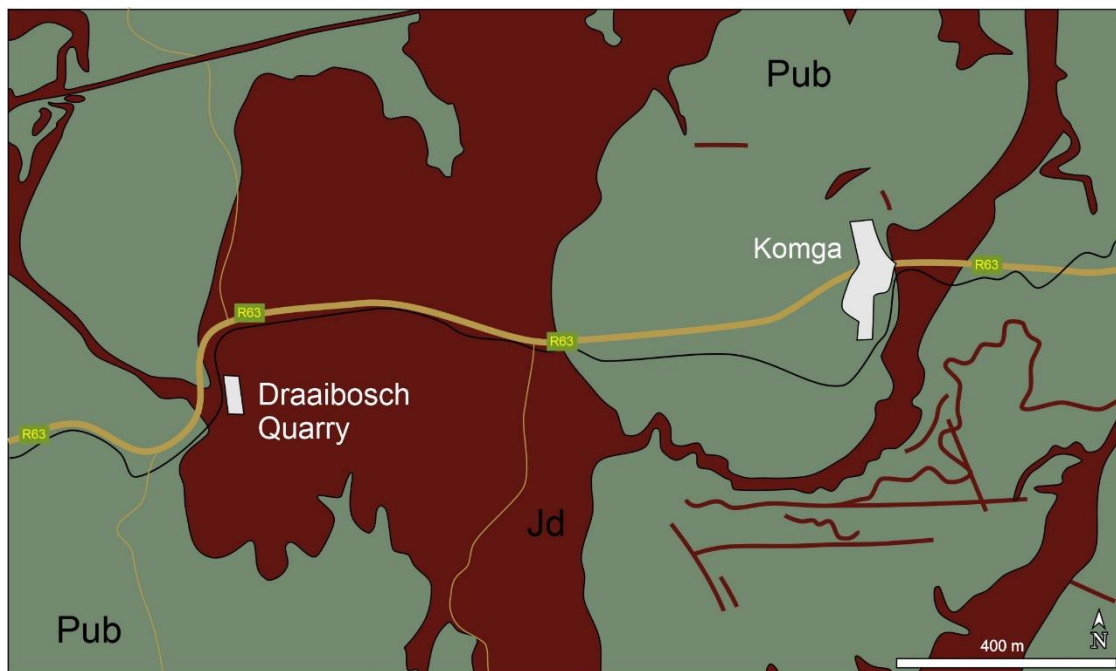


Figure 1: Maps showing the proposed position of the development superimposed onto South African Geological Survey data mapped for the area. Blue – grey (Pub) represents Permian strata of the Balfour Formation whilst maroon (Jd) represents dolerite intrusions implaced during the Jurassic Period.

The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content. The middle (predominant) portion of the **Balfour Formation** is host to the ***Daptocephalus* Assemblage Zone**. Characterised by the co-occurrence of two therapsids, *Daptocephalus* and *Theriongnathus*, this zone demonstrates the Beaufort Groups greatest diversity of vertebrate taxa, including numerous genera and species of dicynodont, biarmosuchian, gorgonopsian and therocephalian and cynodont therapsid Synapsida, together with diverse captorhinid Reptilia and less well represented eosuchian Reptilia, Amphibia and Fishs. Trace fossils of invertebrates and vertebrates as well as *Glossopteris* flora plants have also been described.

The location of the proposed quarry is however within an extensive horizontal **dolerite sill** (Fig.1). Such sills were intruded at high pressure into the buried strata of the host mudstones Dolerite, being an igneous rock that crystallised at depth records no palaeontological record.

Desktop Assessment

It is the experience of the consultant that Geological Survey maps are often not precisely correct, and that a site visit to confirm the geology is generally necessary. In this case however the consultant is familiar with the Komga district having done a number of other surveys in the area. Furthermore, Algoa Consulting Engineers provided abundant photographs of the proposed developmental area, showing the natural and artificial outcrops of rock in the area as well as its geomorphological character (which reflects underlying geology).

These were deemed adequate to confirm the accuracy of the Geological Survey map in this regard and to therefore conclude that the entire area, with reasonable buffer zones, is situated within the dolerite sill landscape. It was therefore concluded that there was no need to conduct a site visit.

Conclusions and Recommendations

The area is entirely underlain by dolerite, forming part of an extensive sill, (which is to be partially exploited by the quarry). This was emplaced within the host rocks as molten basaltic lava. As such it contains no palaeontological material.

As a result no mitigation or site monitoring required.

Should however any petrified (turned to stone) bones be encountered at any time during construction of access roads to the site ECPHRA or a professional palaeontologist should immediately be contacted.

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