APPENDIX 5

COPY OF THE PALAEONTOLOGICAL DESKTOP STUDY COMPILED BY DR ROSSOUW IN 2017

Palaeontological desktop study of a proposed new quarry extension on the Remaining extent of the farm Elands Spruit 5523 near Ladysmith, KZN Province.

Report prepared by Palaeo Field Services, PO Box 38806 Langenhovenpark 9330.

26 September 2017

Summary

The proposed development footprin is located within the outcrop area of palaeontologically significant Ecca Group sediments, and on palaeontologically insignificant dolerite intrusions in close proximity to a contact metamorphic zone with very low probability of fossil preservation. Given the position of the study area, the likelihood of impact on potential Quaternary fossil exposures is considered unlikely. The overall significance rating of the superficial component (Quaternary overburden) is regarded as low. There are no major palaeontological grounds to suspend the proposed development provided that all excavation activities are restricted to within the boundaries of the footprint.

Introduction

The report is a preliminary assessment of potential palaeontological impact with regard to planned extension of an existing quarry on the farm Elands Spruit 5523 near Ladysmith, KZN Province (**Fig. 1**). The total development footprint covers a 5 ha area located on open, sloping terrain 800 due west of the N11 National Road between Ladysmith and Dundee and about 3 km east of the Matiwane township. (**Fig. 2**).

1:50 000 scale topographic map 2829 BD Elandslaagte

Site coordinates:

A) 28°22'5.12"S 29°56'23.51"E

B) 28°22'0.49"S 29°56'25.05"E

C) 28°22'3.27"S 29°56'37.72"E

D) 28°22'7.29"S 29°56'37.35"E

Methodology

The assessment was carried out in accordance with National Heritage Resources Act 25 of 1999 with the aim to assess the potential impact on palaeontological heritage resources that may result from the proposed development. The palaeontological significance of the affected areas were evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature.

Assumptions and Limitations

The assessment provided within this report is based upon a desktop study without the benefit of a site visit. As such, the presentation of geological units present within the study area is derived from 1:1 Ma and 1:250 000 scale geological maps that may vary in their accuracy. It is also assumed, for the sake of prudence, that fossil remains are always uniformly distributed in fossil-bearing rock units, although in reality their distribution may vary significantly.

Geology

The study area is located in an outcrop area of the Early Permian, Vryheid Formation of the Ecca Group (Karoo Supergroup) (Lindstrom 1987) (**Fig. 3A**).

Palaeontology

The Vryheid Formation is well-known for the occurrence of coal beds and its rich variety of plant fossils (Anderson and Anderson 1985; Bamford *et al.* 2004). Vertebrate fossils are absent from the Vryheid Formation, although the aquatic reptile, *Mesosaurus,* as well as fish (*Palaeoniscus capensis*), have been recorded in equivalent-aged strata in the Whitehill Formation in the southern part of the Karoo basin (Oelofson and Aroujo 1987; MacRae, 1999; Modesto, 2006; Johnson *et al.* 2006). Invertebrate trace fossils have been described in some detail by Mason and Christie (1986). Dolerites in the form of dykes and sills are common in the region and are not palaeontologically significant. Geologically recent (Quaternary) and localized fossil-rich alluvial exposures, assigned to the Quaternary Cornelia Formation, are found about 160 km northwest of the study area. There is currently no record of Quaternary fossil remains or exposures from the study area.

Impact Statement

According to the 1:250 000 scale geological map of the area the proposed footprint is located within the outcrop area of palaeontologically significant Ecca Group sediments of the Vryheid Formation, and on palaeontologically insignificant dolerite intrusions in close proximity to a contact metamorphic zone with very low probability of fossil preservation (**Fig. 3B**). Given the position of the study area, the likelihood of impact on potential Quaternary fossil exposures is considered unlikely. The overall significance rating of the superficial component (Quaternary overburden) is regarded as low.

Recommendations

It is expected that the proposed development will affect palaeontologically insignificant dolerite intrusions. It is highly unlikely that Karoo fossil remains will be encountered during excavation activities within the study area. There is also little chance of finding fossil material within the superficial overburden because of a lack of suitable Quaternary-aged alluvial deposits in the area. There are no major palaeontological grounds to suspend the proposed development provided that all excavation activities are restricted to within the boundaries of the footprint.

References

Anderson, J.M. and Anderson, H.M. 1985. Palaeoflora of Soutern Africa. Prodromus of SA Megafloras Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam.

Bamford, M. *et al.* 2004. Diversity of the Woody Vegetation of Gondwanan Southern Africa. Gondwana Research 7(1): 153 – 164.

Johnson, M.R. et. al. 2006. Sedimentary Rocks of the Karoo Supergroup. **In**: M.R. Johnson, *et. al.* (eds). The Geology of South Africa. Geological Society of South Africa, pp. 461 - 500.

Linstrom W. 1987. The Geology of the Dundee Area. Explanation Sheet 2830 (1:250 000). Geological Survey of. South. Africa.

MacRae, C. 1999. Life Etched in Stone. Geological Society of South Africa, Linden, South Africa.

Mason, T.R. and Christie, A.D.M. 1986. Palaeoevironmental significance of ichnogenus Diplocraterion torell from the Permian Vryheid Formation of the Karoo Supergroup, South Africa. *Palaeogeography, Palaeoclimatology, Palaeoecology* 53(3-4):249-265.

Modesto, S.P. 2006. The cranial skeleton of the Early Permian aquatic reptile Mesosaurus tenuidens : implications for relationships and palaeobiology. *Zoological Journal of the Linnean Society* 146: 345–368

Oelofsen, B. W. and Araujo, D. C. 1987. Mesosaurus tenuidens and Stereosternum tumidum from the Permian Gondwana of both southern Africa and South America. *South African Journal of Science* 83, 370-372.

DECLARATION OF INDEPENDENCE

I, Lloyd Rossouw, declare that I act as an independent specialist consultant. I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. I have no interest in secondary or downstream developments as a result of the authorization of this project.

26 / 09 / 2017

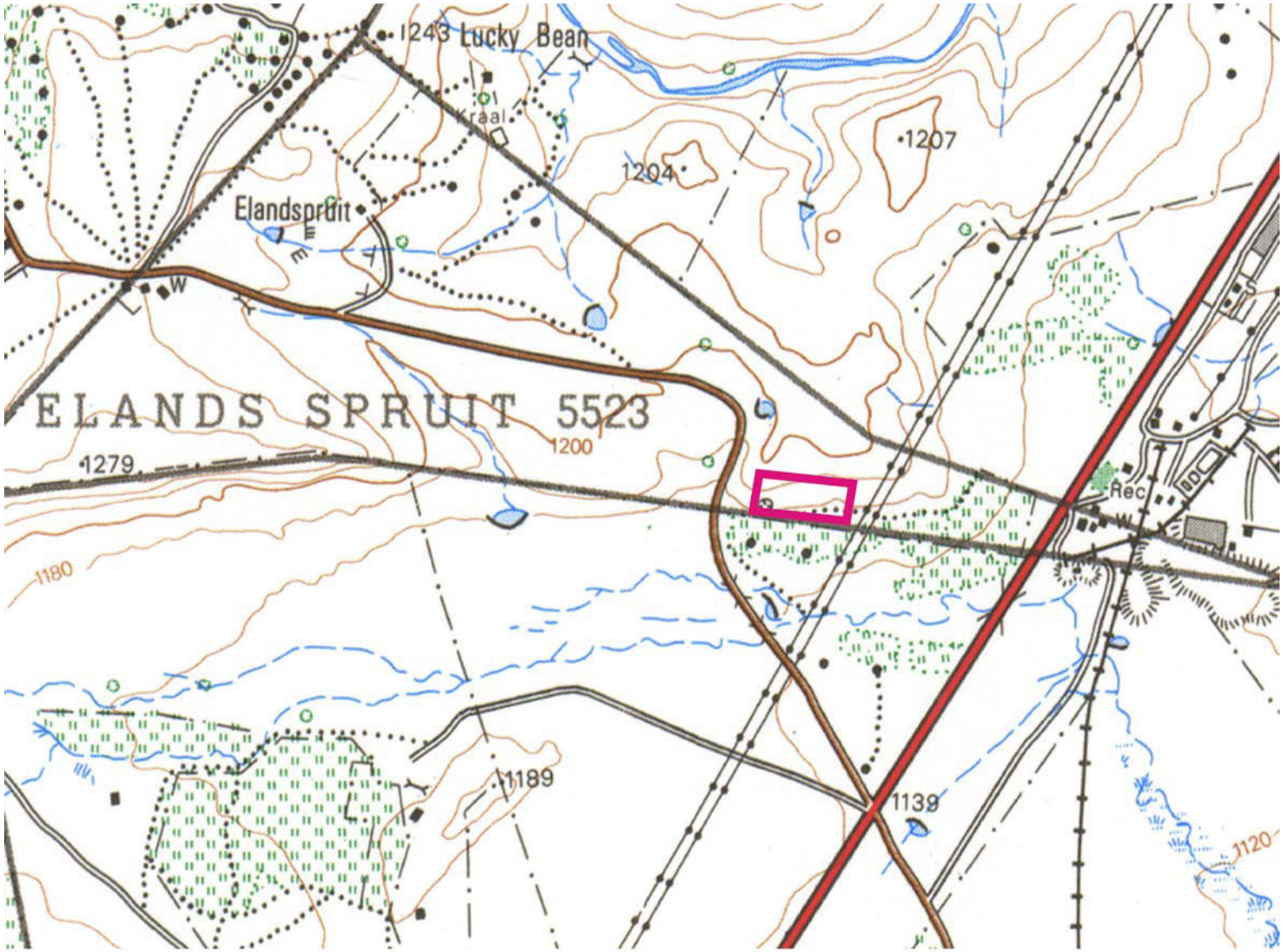

Figure 1. Map of the proposed development footprint (1:50 000 scale topographic 2829 BD Elandslaagte).

Figure 2. Aerial view of the study area.

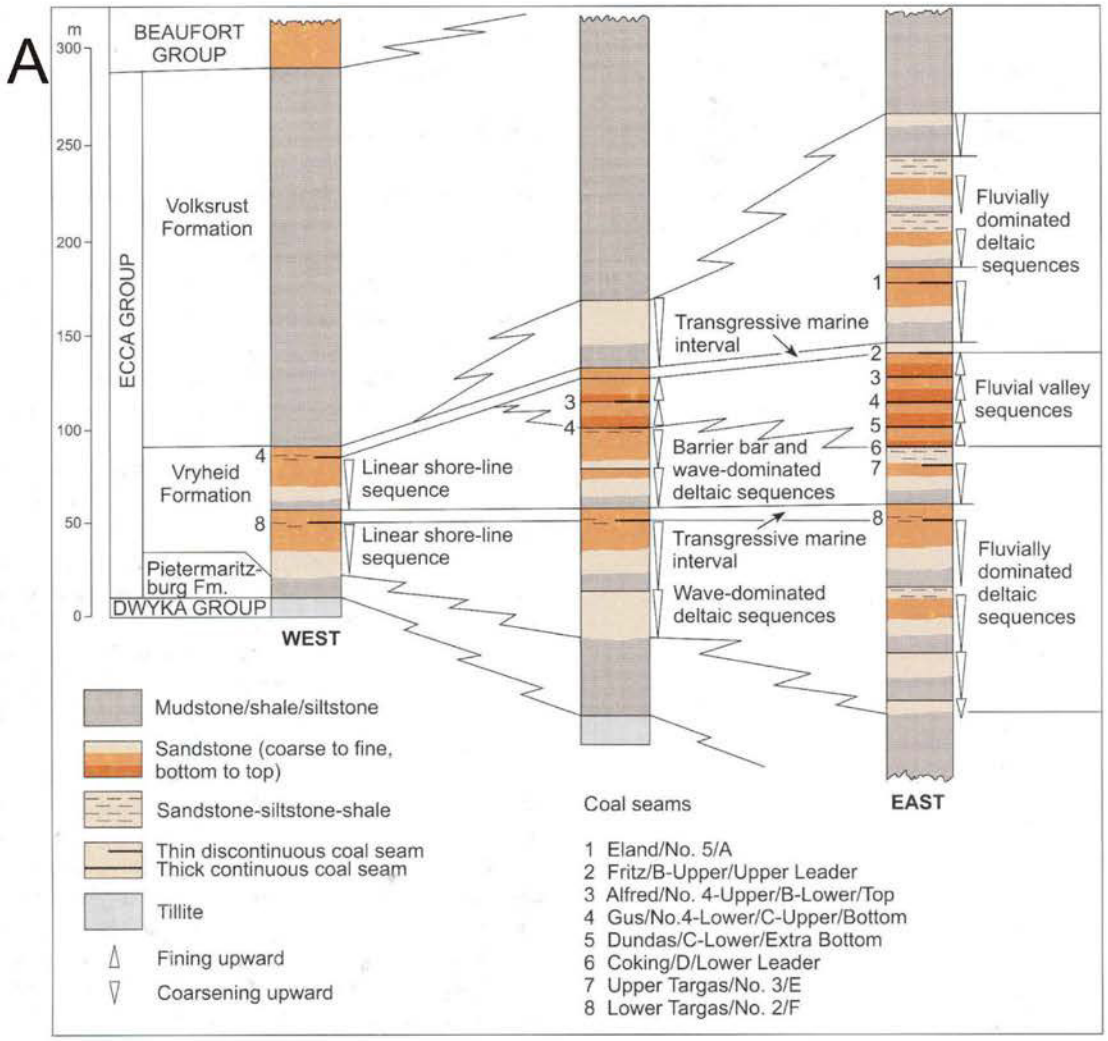

Fig. 15 *Schematic west-east section through the Ecca Group in the northeastern part of the Main Karoo Basin (after Van Vuuren, 1983).*

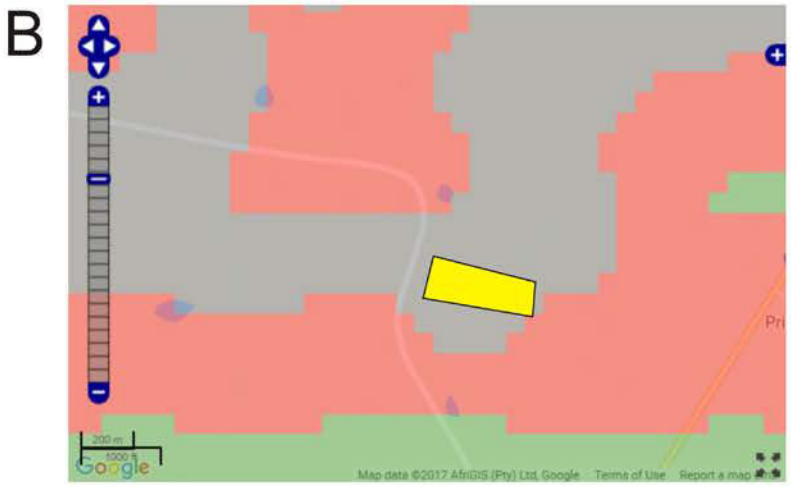

Figure 3. The site is located on palaeontologically insignificant dolerite intrusions (grey area) in close proximity to a contact metamorphic zone with very low probability of fossil preservation.