

Phase 1 Palaeontological Impact Assessment of a
proposed new borrow pit near Ludeke, EC Province.



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by

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Executive Summary

- At the request of CSS Environmental Consultants a Phase 1 Palaeontological Impact Assessment was carried out for a proposed new borrow pit near Ludeke near Bizana in the EC Province..
- A pedestrian survey revealed a general lack of outcrop at the site, but laminated Ecca shales are exposed in an old borrow pit located nearby.
- The overlying residual deposits are made up of unconsolidated Quaternary sediments and are not fossiliferous.
- There is currently no record of Quaternary palaeontological exposures in the vicinity.
- The nature of the proposed development will have an adverse affect on the underlying bedrock that are more than likely made up of intact Ecca Group strata.
- The proposed development will not result in any significant palaeontological impact at the site. However, while exposure as a result of excavation activities and subsequent reporting of fossils could be seen as a beneficial for research purposes, any damage to, or loss of potential fossil material due to inadequate mitigation are considered a negative palaeontological impact.
- In the event of a possible fossil discovery during the operational phase of the project, it is advised that SAHRA and a professional palaeontologist should be notified immediately by the project's responsible Environmental Control Officer.

Introduction

At the request of CSS Environmental Consultants a Phase 1 Palaeontological Impact Assessment was carried out for a proposed new borrow pit at Nkantolo near Bizana in the Eastern Cape Province (**Fig. 1**). The study is required in terms of Section 38 of the National Heritage Resources Act 25 of 1999 as a prerequisite for any development which will change the character of a site exceeding 5 000 m² in extent. The task involved identification and mapping of possible paleontological heritage within the proposed project area, an assessment of their significance, related impact by the proposed development and recommendations for mitigation where relevant.

Terms of Reference

- Identify and map possible paleontological sites and occurrences using available resources.
- Determine and assess the potential impacts of the proposed development on potential paleontological resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

Study approach

The paleontological significance of the affected area was evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature. This was followed by a field assessment by means of a pedestrian survey. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant paleontological information, aerial photographs and site records were consulted and integrated with data acquired during the on-site inspection.

Description of the Affected Area

Locality data

1 : 50 000 scale topographic map: 3029 DC Magusheni

1 : 250 000 scale geological map 3028 Kokstad

General site coordinates: 30°47'58.82"S 29°43'18.61"E

The site is located off the R61 road to Bizana, and about 4 km north of the town of Ludeke (**Fig. 2**).

Geology

The underlying geology of the area between Kokstad and the Port Edward is represented by sedimentary rocks that range from Late Carboniferous to Early Permian or Early Triassic in age. The sedimentary sequence includes strata belonging to the Dwyka Formation, the Ecca Group and the Beaufort Group (Karoo Supergroup) (Johnson *et. al.* 2006). Conformably overlying the Dwyka tillites is a succession of shale and subordinate sandstone representing the Permian Ecca Group. The Ecca Group grades upward into the Permo-Triassic Beaufort Group, which in the region is represented by the Adelaide and Tarkastad Subgroups. Jurassic-age dolerites are represented by numerous dykes, sills and inclined sheets in the region.

Valley-sediments are made up of geologically recent alluvial deposits and reworked colluvium. Unconsolidated alluvial and overbank sediments represent the bulk of the Quaternary component in the region.

Field Assessment

There is a general lack of outcrop at the site, but laminated Ecca shales are exposed in an old borrow pit located nearby (**Fig 4**; GPS 30°47'58.07"S 29°43'22.67"E). The Ecca Group along the eastern flank of the Karoo basin has not been studied in detail because of poor exposures and repeated faulting. Fossils are relatively scarce in the Ecca beds in comparison with the underlying Dwyka Formation. Rare vertebrate fossil remains from the upper part of the Ecca Group include the mesosaurid reptile *Mesosaurus tenuidens* and *Stereosternum tumidum* (Oelofsen and Araujo 1987) as well as crustaceans (*Notocaris tapscotti*) and palaeoniscoid fish. Rare ichnofossils have been recorded in the central part of the Group. Plant and invertebrate fossils include wood and leaves (*Glossopteris*), sponge spicules and rare insect wings (Anderson and McLachlan 1976; McLachlan and Anderson 1977).

The overlying residual deposits are made up of unconsolidated Quaternary sediments and are not fossiliferous. There is currently no record of Quaternary palaeontological exposures in the vicinity. No Quaternary vertebrate fossils were recorded in geologically recent alluvial valley-sediments recorded in the vicinity of the proposed development.

Impact Statement and Recommendations

Significance of impacts is summarized in **Table 2**. The nature of the proposed development will almost certainly have an adverse affect on the underlying bedrock that are more than likely made up of intact Ecca Group strata. Fossils are relatively scarce in the Ecca beds and while it is unlikely that the proposed development will result in any significant palaeontological impact at the site, the palaeontological significance of these poorly explored areas should not be underestimated. While exposure as a result of excavation activities and subsequent reporting of fossils could be seen as a beneficial for research purposes, any damage to, or loss of potential fossil material due to inadequate mitigation are considered a negative palaeontological impact.

In the event of a possible fossil discovery during the operational phase of the project, it is advised that SAHRA and a professional palaeontologist should be notified immediately by the project's responsible Environmental Control Officer. It is also advised that possible intact finds may require a Phase 2 rescue operation at the cost of the developer.

References

- Anderson, A.M. and McLachlan I.R. 1976. The plant record of the Dwyka and Ecca Series of the southwestern half of the Great Karoo Basin. *Palaeont. Afr.* 19: 31 – 42.
SA Com Strat. 15: 1 – 9. 8
- 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.
- McLachlan,I.R. and Anderson, A.M. 1977. Fossil insect wings from the Early Permian White Band Formation, South Africa. *Palaeont. Afr.* 20: 83 – 86.
- Oelofsen, B.W. and Araujo, D. 1987. Mesosaurus tenuidens and Stereosternum tumidum from the Permian Gondwana of both Southern Africa and South America. *S.A.Jnl Sci.* 83: 370 – 372.

Declaration

L. Rossouw does independent specialist consulting and is in no way connected with the proponents of the development, other than delivery of consulting services.

Table 1. Significance and rating of potential impact.

Scope	Heritage	Significance	Rating
Development of new borrow pit at 30°47'58.82"S 29°43'18.61"E	Palaeontology	Low	General protection C (IV C)

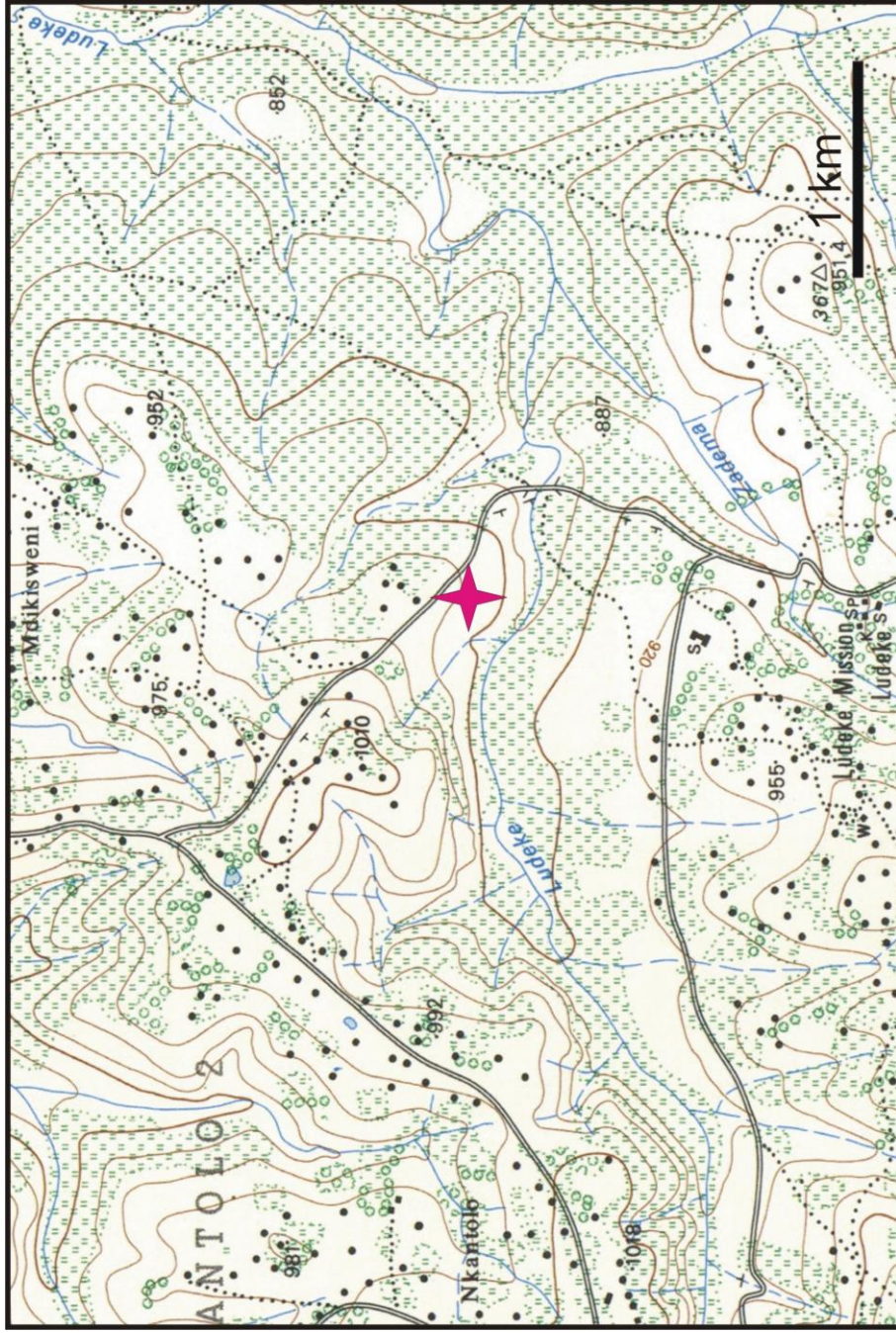


Figure 1. Locality of the proposed new borrow pit (portion of 1:50 000 scale topographic map 3029 DC Magusheni).

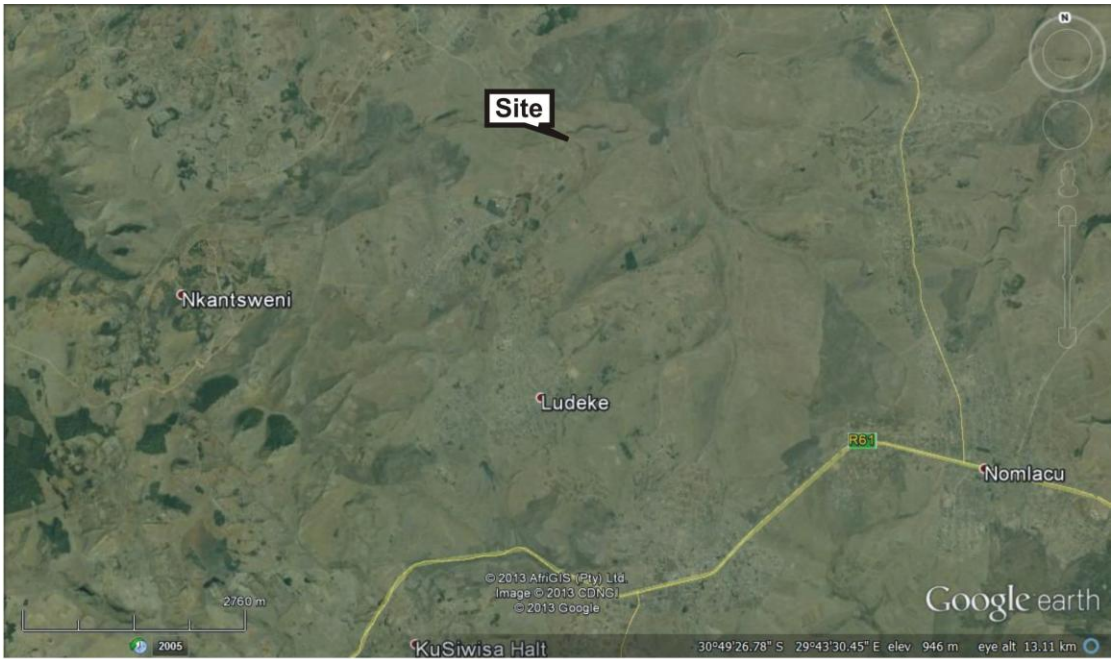


Figure 2. Aerial view of the affected area.



Figure 3 Panoramic view of the proposed borrow pit site, looking south
(GPS30°47'58.07"S 29°43'22.67"E).



Figure 4. Laminated shales and sandstone partially exposed in an old borrow pit located nearby (GPS 30°47'58.07"S 29°43'22.67"E).