

**Phase 1 Palaeontological and Archaeological Impact
Assessment for the proposed extension of an existing
sand quarry on the Remaining Extent of the farm
Van Niekerk Rust 1782, Bloemfontein District.**



Report prepared for
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Executive Summary

- The affected area is situated within the Beaufort Group, Adelaide Subgroup (Karoo Supergroup), which is represented by late Permian sedimentary rocks.
- These sediments form the base on which younger, superficial deposits of Quaternary age have been deposited.
- The proposed development will impact on geologically recent (Holocene) alluvial sand deposits that are archaeologically sterile and not palaeontologically sensitive.
- The terrain is not considered palaeontologically or archaeologically vulnerable, and there are no major palaeontological or archaeological grounds to suspend the proposed development.

Introduction

EKO Environmental Consultants requested that the author of this report conduct a Phase 1 Palaeontological and Archaeological Impact Assessment for the proposed extension of an existing sand quarry on the Remaining Extent of the farm Van Niekerk Rust 1782 near Glen, 20 km north of Bloemfontein (**Fig. 1**). The survey is required as a prerequisite for new development in terms of the National Heritage Resources Act 25 of 1999. In terms of Section 38 of the National Heritage Resources Act 25 of 1999, the survey is required as a prerequisite for any development that will change the character of a site exceeding 5 000 m² in extent. An initial site visit took place in June 2013. The task involved identification of possible archaeological and paleontological sites or occurrences in the proposed zone, an assessment of their significance, possible impact by the proposed development and recommendations for mitigation where relevant.

Methodology

The palaeontological and archaeological 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.

Site Information

The affected area is located on the southern bank of the Modder River on the farm Van Niekerk Rust 1782, about 20 km north of Bloemfontein (**Fig. 2 & 3**). The total area, including the existing quarry, covers an approximately 4.5 ha area (**Fig. 4 & 5**).

1 to 50 000 topographical map: 2826 CD Glen

General site coordinates (Fig. 41782. 1):

A) 28.9376679°S 26.2912991°E

B) 28.9382673°S 26.29172°E

C) 28.938207°S 26.2915001°E

D) 28.940203°S 26.29205°E

E) 28.9394326° 26.2892622°E

Local Geology

The geology of the region has been described by Nolte (1995) and Johnson (2006). It is situated within the Beaufort Group, Adelaide Subgroup (Karoo Supergroup), and is primarily represented by late Permian, Balfour Formation sedimentary rocks, which are made up of alternating sandstone and mudstone layers (*Pa*, **Fig. 6**). These sedimentary rocks form the base on which younger, superficial deposits of Quaternary age have been deposited (Partridge *et al.* 2006). Superficial sediments consist mainly of well-developed, residual soils and alluvial deposits near river drainages (flying bird symbol, **Fig. 6**). Dykes and sills of resistant Jurassic dolerite intrusions (*Jd*) are present in the region.

Background

The local palaeontological footprint is primarily represented by Late Permian Karoo vertebrate fauna and Late Cenozoic (Quaternary Period, comprising the Pleistocene and Holocene Epochs) mammalian fossils.

The Karoo geological strata within the affected area are assigned to the *Dicynodon* Assemblage Zone (AZ). Therapsids from this biozone occur generally well-preserved in mudrock horizons and are usually found as dispersed and isolated specimens associated with an abundance of calcareous nodules (Kitching 1995). Other vertebrate fossils include fish, amphibians and amniotes. Molluscs, insects, plant (*Dadoxylon*, *Glossopteris*) and trace fossils (arthropod trails, worm burrows) are also occur in the biozone.

The Modder River is a southern tributary of the Vaal River and its alluvial deposits are associated with abundant Quaternary mammalian fossils. A number of palaeontological localities, such as the ones at Erfkroon and Mitasrust, have been found eroding out of Pleistocene alluvial terraces and dongas along the river (**Fig. 7**). The river's fossil-bearing potential has been known for almost 150 years, with a frontlet and horn cores of

Homoioceras qntiquus recovered as far back as 1839 (Cooke 1955) and the remains of *Megalotragus priscus* discovered around the turn of the previous century (Broom 1909).

The upper calcretized layers of the Florisian fossil locality at Erfkroon, which is located 60 kilometers west and downstream from Van Niekerks Rust on the northern bank of the Modder River presumably represent palaeosols formed under semi-arid to arid conditions with ages ranging between 25 000 and 113 000 years ago (Churchill *et al.* 2000). The association between the age of the younger overbank sediments at Erfkroon and the fossiliferous overbank sediments at Mitasrust, as well as the likelihood of more arid environmental conditions indicated by these sediments, suggest a Last Glacial age (possibly between Isotope Stage 4 and Isotope Stage 2) for the Mitasrust fossils (Rossouw 2006).

The Stone Age archaeological record of Modder River catchment spans back to the early Middle Stone Age. Prehistoric archaeological remains previously recorded in the region include stone tools and mammal fossil remains from sealed and or exposed contexts. Along much of the course of the Modder River and its tributaries, alluvial deposits contain localized occurrences of *in situ* Middle and Later Stone Age material eroding out of the overbank sediments where they are often found in association with fossil mammal remains (Churchill *et al.* 2000; Rossouw 1999, 2000, 2006).

Field Assessment

The pedestrian survey of the terrain and investigation of exposed sections within the existing quarry revealed no evidence of *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape (**Fig. 8**). A singular LSA core and 5 sub-fossilized bone fragments were recorded above surface near the north-eastern boundary of the study area (coordinates 28°56'17.99"S 26°17'28.25"E, **Fig. 9**). Except for root casts and calcrete nodules, no evidence was found for the accumulation and preservation of intact fossil material within the sandy deposits (**Fig. 10**). There is no indication of prehistoric structures or historical buildings older than 60 years located within the boundaries of the affected area.

Impact Statement

The proposed development will impact on geologically recent (Holocene) alluvial sand deposits that are archaeologically sterile and not palaeontologically sensitive (**Table 1**). Basement rocks, made up of potentially fossil-bearing Adelaide Subgroup strata, will not be affected by the development.

Recommendation

In accordance with the types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act (No 25 of 1999) there is no above-ground evidence of building structures older than 60 years or material of cultural significance or archaeological and palaeontological sites within the demarcated area. The terrain is not considered palaeontologically or archaeologically vulnerable, and there are no major palaeontological or archaeological grounds to suspend the proposed development.

References

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Table 1. Summary of Impacts

Geological Unit	Rock types and Age	Potential Palaeontological / Archaeological heritage	Archaeological / Palaeontological Significance	Impact by Development	Heritage potential at the site
Regolith	Alluvium, residual soils (Superficial deposits) Quaternary to Recent	Large vertebrate skeletal remains; freshwater molluscs, coprolites, microfossils Stone tools Rock art Prehistoric structures (IA; Stone Age open sites) Historical structures	High	High	Low
Karoo Dolerite (<i>Jd</i>)	Intrusive igneous bedrock. Jurassic	None	Low	None	Low
Adelaide Subgroup (<i>Pa</i>) Balfour Formation	Fluvial and lacustrine mudstones and sandstones. Late Permian	<i>Dicynodon</i> Assemblage Zone Therapsids, amphibians, fish, amniotes, invertebrates, plant fossils, trace fossils.	High	None	Low

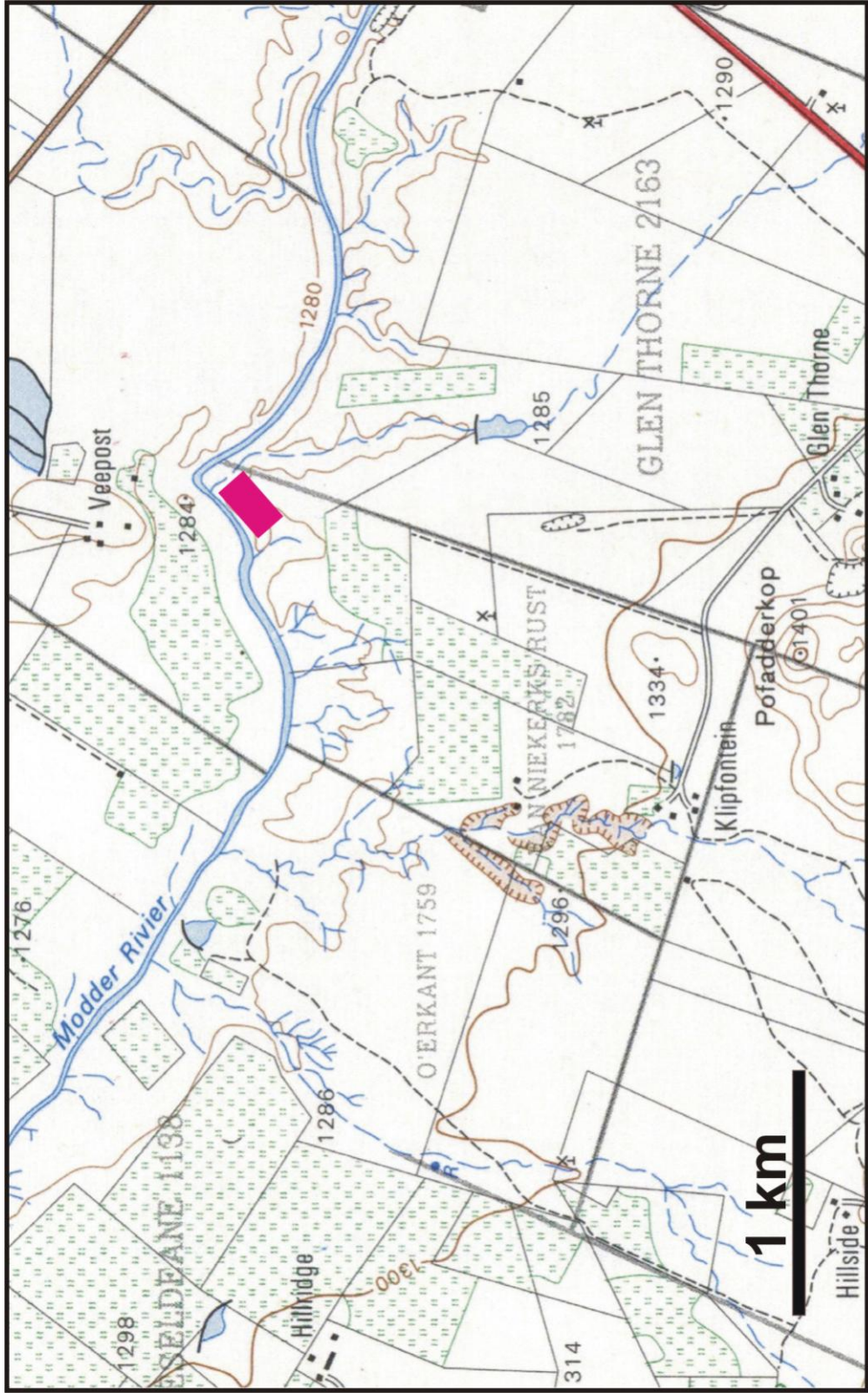


Figure 1. 1:50 000 scale topographic map (2826 CD Glen) of the sand quarry site on the farm Niekerks Rust 1782.



Figure 2. View of the Modder River, looking towards the northern bank from the existing sand quarry.



Figure 3. Aerial view of the sand quarry's position in relation to the Modder River.

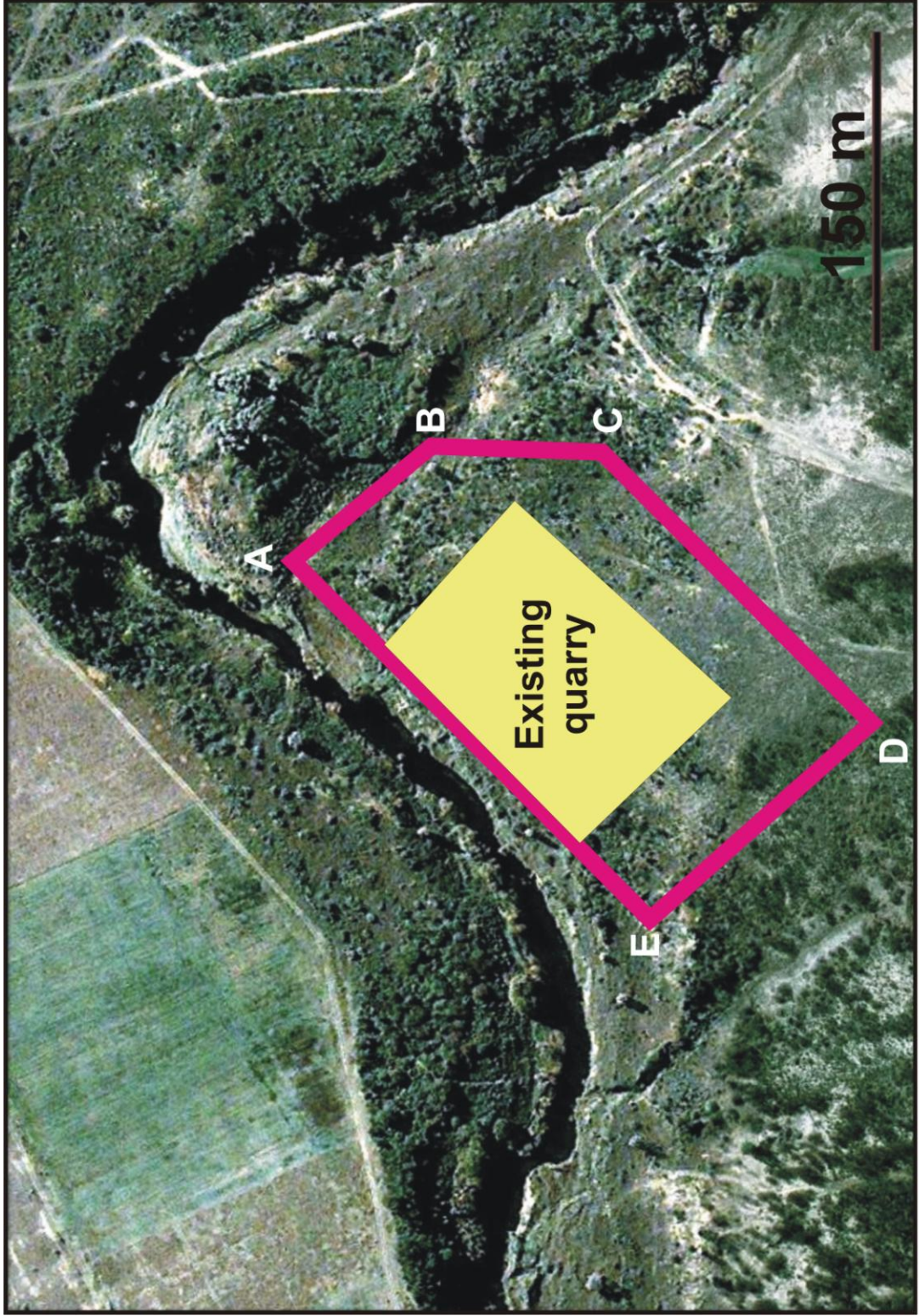


Figure 4. Layout of the proposed new mining site.



Figure 5. The sand quarry looking west (above) and south (below).

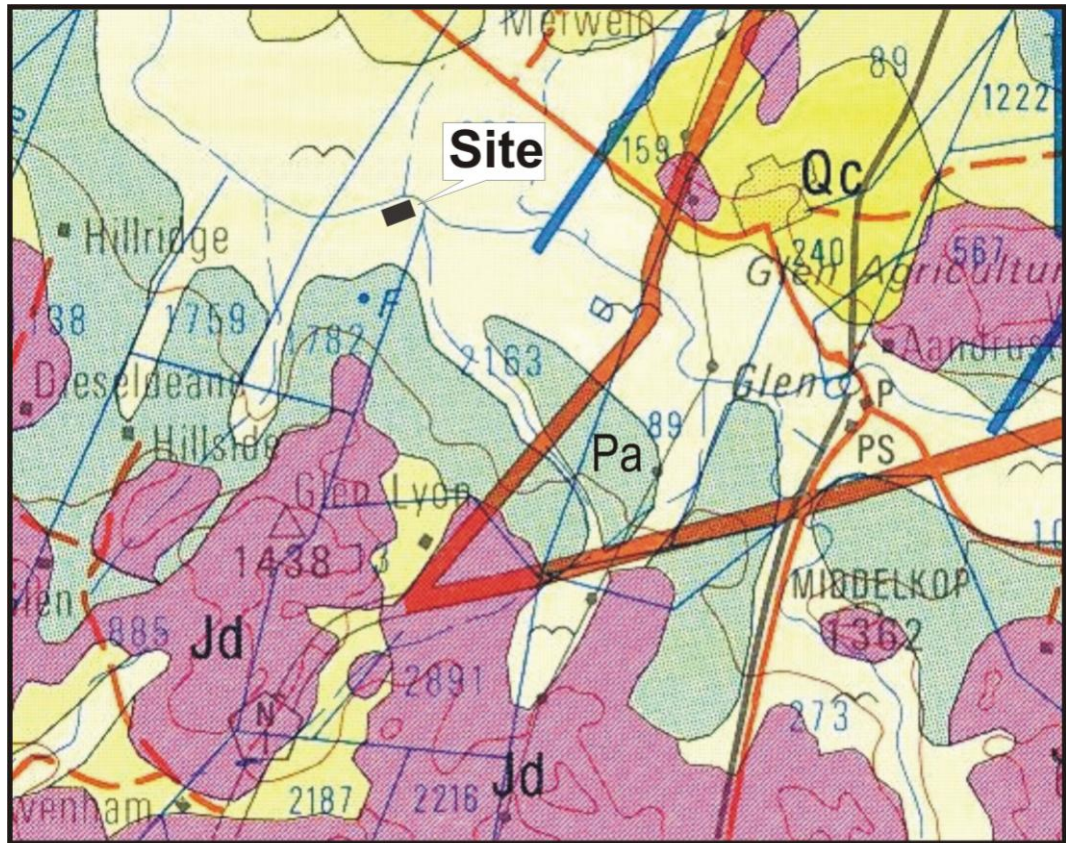


Figure 6. Portion of the 1:250 000 scale geological map Winburg 2826. The affected area is completely underlain by Quaternary-aged alluvium (flying bird symbol).



Figure 7. The palaeontologically and archaeologically important alluvial terraces and dongas at Mitasrust (above) and Erfkroon (below).



Figure 8. The access road to the site (left), terrain around the existing quarry (middle); residual soils with caliche nodule inclusions (right).



Figure 9. A singular LSA core and 5 sub-fossilized bone fragments were recorded above surface near the north-eastern boundary of the study area (coordinates 28°56'17.99"S 26°17'28.25"E).



Figure 10. The alluvial sandy deposits with root casts and calcarous nodules present..