

Phase 1 Palaeontological Impact Assessment of a
proposed new sand mine development on Portion 1 of the
farm Hoffman's Rust 173 near Wepener, FS Province.

Report prepared by
Dr L Rossouw, PO Box 38806
Langenhovenpark 9330

27/02/2017

Summary

At the request of Proper Consulting Engineers a Phase 1 Palaeontological Impact Assessment was carried out over a 5 ha area covering an existing open pit sand mine on Portion 1 of the farm Hoffman's Rust 173. The site is located on the banks of the Caledon River, about 6 km west of Wepener, eastern Free State Province. It is situated within the outcrop area of the Beaufort Group (Karoo Supergroup), and is represented by Early Triassic sedimentary rocks of the palaeontologically significant Tarkastad Subgroup. The study area is underlain by well-developed overbank sediments made up of homogenous and geologically recent (< Holocene) river sand. A pedestrian survey of the terrain revealed no evidence of fossiliferous terrace gravels or paleo-donga (gully) infill deposits. No evidence was found for the accumulation and preservation of intact Quaternary fossil material within the geologically recent alluvial overburden covering the footprint. Basement rocks, made up of potentially fossil-bearing Tarkastad Subgroup strata, will not be affected by the development. As far as the palaeontological heritage is concerned, the proposed development may proceed with no further palaeontological assessments required, provided that all excavation activities are restricted to within the boundaries of the development footprint. In the unlikely event that fossils are exposed within the river sand overburden during the construction phase of the project, it is advised that a professional palaeontologist be called in to record and remove the material before further excavations takes place.

Table of Contents

Summary	2
Introduction	4
Terms of Reference	5
Methodology	5
Locality data	5
Background	6
Field Assessment and Impact Statement	6
Recommendations	7
References	7
Figures	9

Introduction

At the request of Proper Consulting Engineers a Phase 1 Palaeontological Impact Assessment was carried out over a 5 ha area covering an existing open pit sand mine on Portion 1 of the farm Hoffman's Rust 173. The site is located on the banks of the Caledon River, about 6 km west of Wepener, eastern Free State Province (**Fig. 1**). The assessment is required as a prerequisite for new development in terms of the National Environmental Management Act and is also called for in terms of the National Heritage Resources Act (NHRA) 25 of 1999. The region's unique and non-renewable palaeontological heritage sites are 'Generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. As many such heritage sites are threatened daily by development, both the environmental and heritage legislation require impact assessment reports that identify all heritage resources including palaeontological sites in the area to be developed, and that make recommendations for protection or mitigation of the impact of the sites.

The NHRA identifies what is defined as a heritage resource, the criteria for establishing its significance and lists specific activities for which a heritage specialist study may be required. In this regard, categories of development listed in Section 38 (1) of the NHR Act are:

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50m in length;
- Any development or other activity which will change the character of the site
 - a) exceeding 5000 m² in extent; or
 - b) involving three or more existing erven or subdivisions thereof; or
 - c) involving three or more subdivisions thereof which have been consolidated within the past five years;
- The rezoning of a site exceeding 10 000 m²; or
- Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).

A site visit and subsequent assessment took place in July 2016. The task involved identification of possible 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.

Terms of Reference

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

Methodology

The heritage significance of the affected area is evaluated using existing field data, database information and published literature. Geological maps were used to determine fossil-bearing rocks within the study area. 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.

Locality data

Maps: 1:50 000 scale topographical map 2926DB Jammerdrif.

Site Coordinates (**Fig 2**):

- A) 29°43'43.71"S 26°57'14.97"E
- B) 29°43'38.77"S 26°57'18.11"E
- C) 29°43'31.18"S 26°57'25.13"E
- D) 29°43'29.66"S 26°57'30.66"E
- E) 29°43'32.82"S 26°57'32.94"E
- F) 29°43'38.77"S 26°57'21.31"E
- G) 29°43'43.65"S 26°57'17.53"E

The study area is located next to an existing sand mine operation on top of overgrown overbank sediments of the Caledon River (**Fig. 3**).

Background

The geology of the region has been described by Theron (1963) and Johnson (2006). It is situated within the outcrop area of the Beaufort Group (Karoo Supergroup), and is represented by Early Triassic sedimentary rocks of the Tarkastad Subgroup, characterized by alternating sandstone and mudstone layers and subdivided into the lower arenaceous Katberg Formation and the red argillaceous Burgersdorp Formation (Johnson et al, 2006) (green areas in **Fig. 4**). These sedimentary rocks form the base on which younger, superficial deposits of late Cenozoic age (*Qs*) has been deposited. Dykes and sills of resistant Jurassic dolerites largely determine landscape topography as indicated by the distinctive koppies and flat-topped inselbergs in the region (red areas in **Fig. 4**). Superficial deposits in the region consist mainly of and shallow to well-developed, alluvium, colluviums and residual soils of varying depth.

The sedimentary bedrock in the region is assigned to the *Cynognathus* and overlying *Lystrosaurus* Assemblage Zones (Kitching 1995; Groenewald & Kitching 1995). These biozones provide important insights into the evolutionary transition of mammal-like reptiles (therapsids) (Kitching 1977; McCrae 1999; McCarthy & Rubidge 2005). Several fossil localities have been recorded within the Wepener districts, including the farms Bokspoort, Welgevonden and Driefontein.

Another palaeontologically significant sequence not indicated by the SAHRIS palaeosensitivity map is represented by late Pleistocene floodplain deposits (overbank sediments containing old terrace gravels and a paleo-donga / gully infill deposits) associated with large river systems.

Field Assessment and Impact Statement

The study area is underlain by well-developed overbank sediments made up of homogenous and geologically recent (< Holocene) river sand. A pedestrian survey of the terrain revealed no evidence of fossiliferous terrace gravels or paleo-donga (gully) infill deposits. No evidence was found for the accumulation and preservation of intact fossil material within the geologically recent alluvial overburden covering the footprint. The proposed development will primarily affect geologically recent

(Holocene –Recent) alluvial overburden. The potential for disturbance or destruction of Quaternary palaeontological resources is considered negligible during the operational phase of the development project, but potentially high if mining activities are to be conducted outside the demarcated development footprint. Basement rocks, made up of potentially fossil-bearing Tarkastad Subgroup strata, will not be affected by the development.

Recommendations

As far as the palaeontological heritage is concerned, the proposed development may proceed with no further palaeontological assessments required, provided that all excavation activities are restricted to within the boundaries of the development footprint. In the unlikely event that fossils are exposed within the river sand overburden during the construction phase of the project, it is advised that a professional palaeontologist be called in to record and remove the material before further excavations takes place.

References

- Groenewald, G.H. & Kitching, J.W. Biostratigraphy of the Lystrosaurus Assemblage Zone. **In:** B.S. Rubidge, *Biostratigraphy of the Beaufort Group*. Biostrat. Ser. S.Afr. Comm. Strat. 35 – 39.
- Johnson *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.
- Kitching, J.W. 1977. The distribution of Karoo Vertebrate Fauna. *Bernard Price Institute for Palaeontological Research. Memoir 1*, 1 – 131.
- Kitching, J.W. 1995. Biostratigraphy of the Cynognathus AZ. **In:** B.S. Rubidge, *Biostratigraphy of the Beaufort Group*. Biostrat. Ser. S.Afr. Comm. Strat. 40 – 45..
- MacRae, C. 1999. *Life Etched in Stone*. Fossils of South Africa. The Geological Society of South Africa, Johannesburg.
- McCarthy, T. and Rubidge, B.S. 2005. *The Story of Earth and Life*. Struik Publishers, Cape Town.
- Theron, J.C. 1963. Geology of Bloemfontein area. Dept. of Mines. Government Printer, Pretoria.

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 and have no conflicting interests in the undertaking of the activity.

A handwritten signature in black ink, appearing to read 'L Rossouw', written in a cursive style.

27 / 02 / 2017

Figures

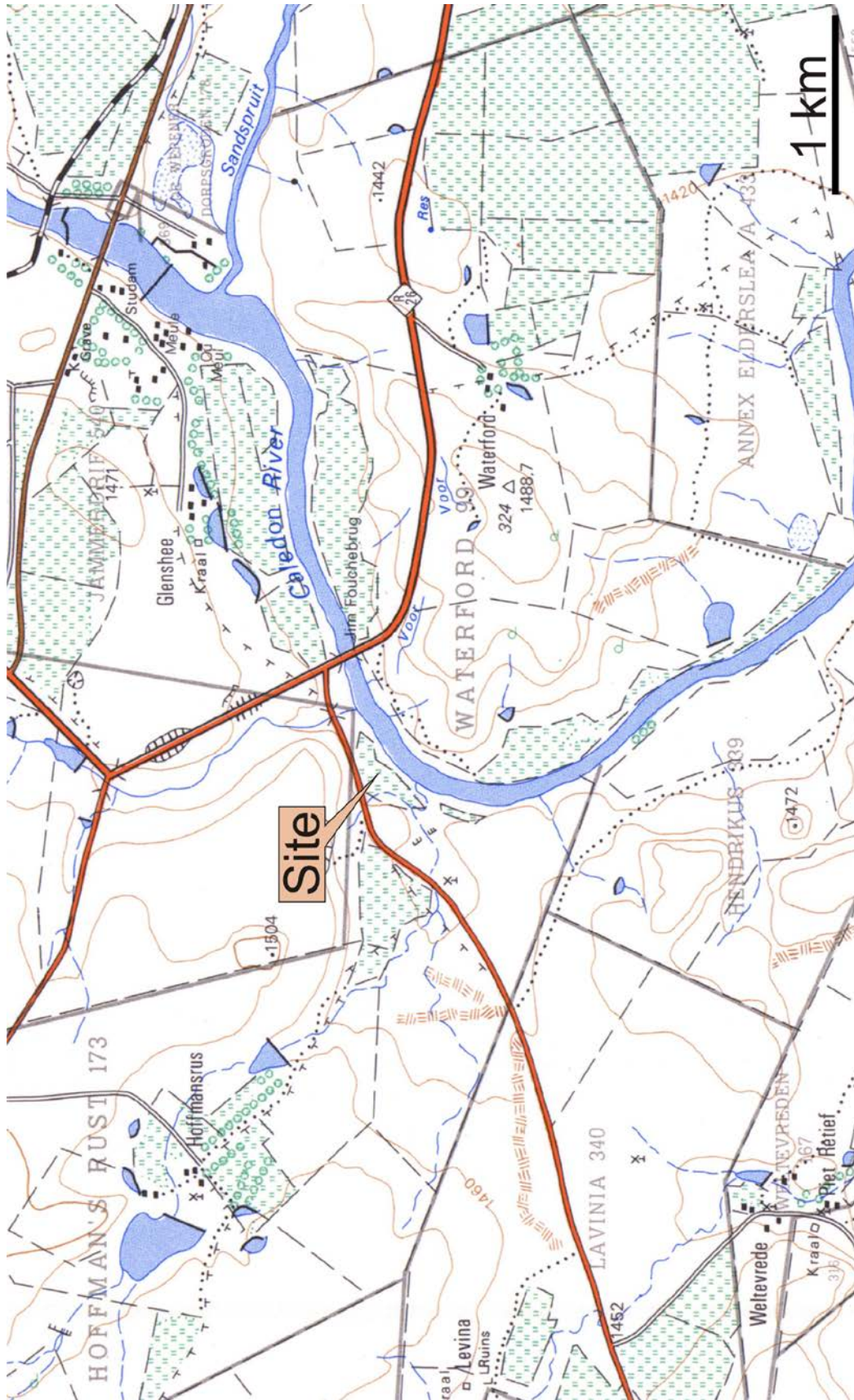


Figure 1. Map of the study area (portion of 1:50 000 scale topographic 2926DB Jammerdrif).



Figure 2. Aerial view of the study area.



Figure 3. General view of the study area, looking southwest (left). The terrain is underlain by well-developed overbank sediments made up of homogenous and geologically recent river sand (right).
Scale 1 = 10cm.

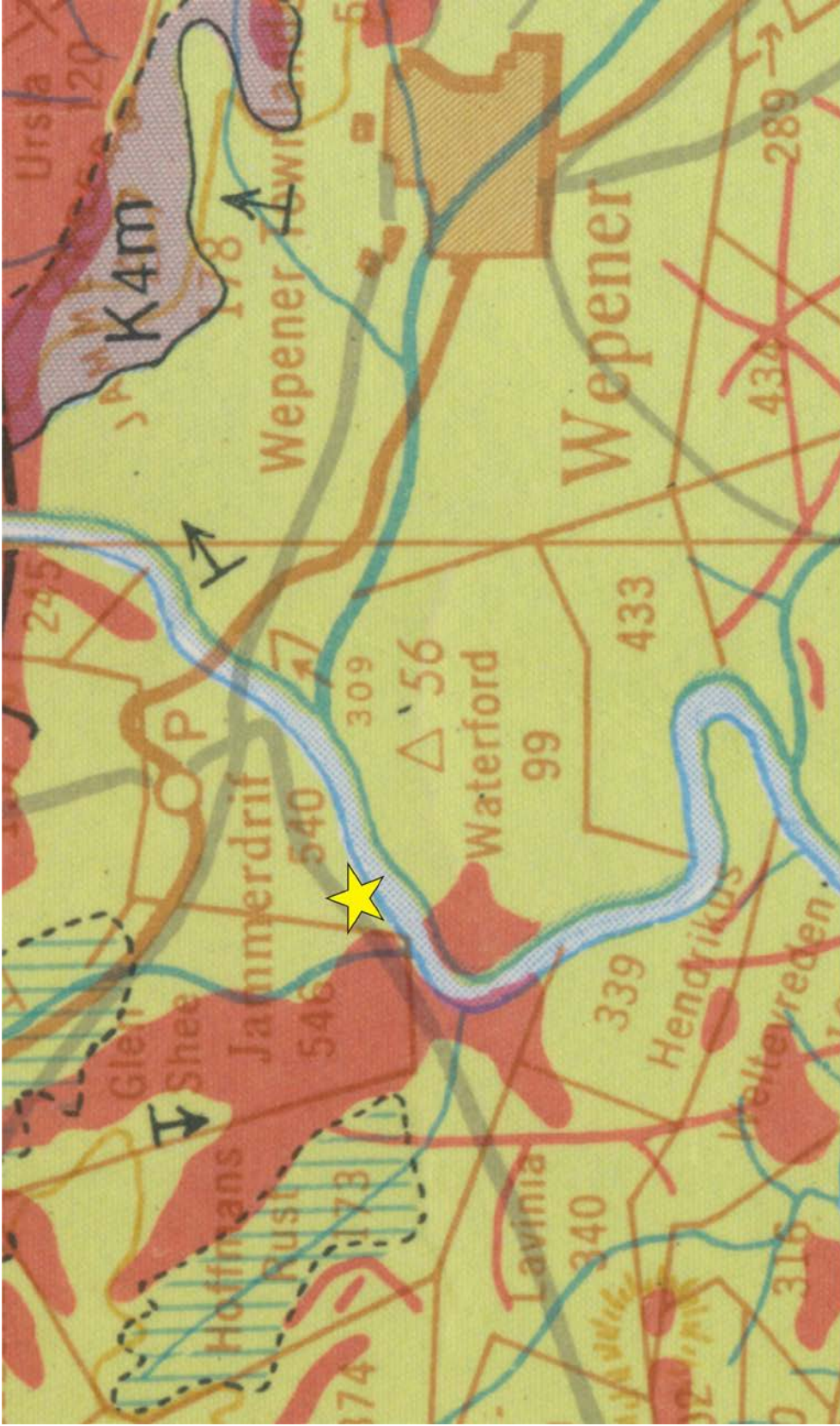


Figure 4. Portion of 1:250 000 scale geological map 2926 Bloemfontein showing the geology in and around the study area (yellow star). The site is underlain by Early Triassic sedimentary rocks of the Tarkastad Subgroup (green area).