Phase 1 Palaeontological Impact Assessment of an existing borrow pit on the farm Tsepong 836, District Thaba Nchu, Bloemfontein, FS Province.

Report prepared for
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Executive Summary

At the request of Greenmined Environmental Consultants, a Phase 1 Palaeontological Impact Assessment was carried out at an existing borrow pit on the farm Tsepong 836 in the Thaba Nchu district east of Bloemfontein. The pedestrian survey indicated that impact within the demarcated area is primarily restricted to bedrock that is exclusively doleritic and therefore not palaeontologically significant. There is no evidence for the accumulation and preservation of intact fossil material within the superficial Quaternary sediments in the immediate vicinity of the study area. There are no palaeontological grounds to halt the proposed development and it is considered unlikely that development will affect palaeontological heritage resources within the demarcated permit area in the future. The site is rated Generally Protected C (GP.C).

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Introduction

At the request of Greenmined Environmental Consultants, a Phase 1 Palaeontological Impact Assessment was carried out at an existing borrow pit on the farm Tsepong 836 in the Thaba Nchu district east of Bloemfontein (**Fig. 1**). A palaeontological impact 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 25 of 1999. A site visit and subsequent assessment took place in February 2015. 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.

Methodology

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 (incl. Google Earth) and site records were consulted and integrated with data acquired during the on-site inspection.

Field Rating

Site significance classification standards as prescribed by SAHRA were used for the purpose of this report (**Table 1**).

Description of the Affected Area

Details of area surveyed

Locality data

1:50 000 scale topographic map: 2926 BA Sannaspos

1:250 000 scale geological map 2926 Bloemfontein

Site coordinates (**Fig. 2**):

A) 29.173853°S; 26.616191°E

B) 29.174561°S; 26.618422°E

C) 29.176804°S; 26.617433°E

D) 29.176886°S; 26.616304°E

The site consists of an existing borrow pit mining area of about 5 ha on the farm Tsepong 836, which is located about 33 km east of the Bloemfontein CBD and next to the N8 between Sannaspos and Botshabelo (**Fig. 2 & 3**).

Geology

Sedimentary rocks in the region belong to potentially fossil – bearing sandstones, shales and mudstones of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) (Theron 1963; Johnson *et al*. 2006). Jurassic-age dolerite intrusions, in the form of sills and dykes, occur extensively in the area. Quaternary to recent residual deposits, made up of alluvial sediments and sheet wash deposits, cover the underlying sedimentary rocks and dolerite intrusions. The modern substrate is comprised of light brown to red calcareous soils of varying depth.

Background

The site is located within an area considered to be of high palaeontological sensitivity (SAHRIS Palaeontological Sensitivity Map 2015, **Fig. 4)**. The local palaeontological footprint is primarily represented by Late Permian Karoo vertebrate fauna and Late Cenozoic macrofossils produced by Quaternary catchments in the region (Broom 1909 a, b; Kitching 1977; Churchill *et al* 2000; Rossouw 1999, 2000, 2006). The underlying sedimentary rocks in the region belong to the Beaufort Group of fossil – bearing strata within the Karoo Supergroup. The sedimentary rocks are generally accepted to be Late Permian in age and are assigned to the *Dicynodon* Assemblage Zone (Kitching 1977, 1995). The *Dicynodon* AZ is characterized by the co-occurrence of two therapsids, *Dicynodon* and *Theriognathus* as well as a diversity of less dominant vertebrate taxa, while trace fossils of invertebrates and vertebrates as well as *Glossopteris* flora plants have also been described. Numerous Quaternary-age fossils, assigned to the Pleistocene Period, have been recorded from various localities along the banks of the Modder River between the historically significant Sannaspos and the study area (**Fig. 5**)**.** Capped, as well as surface scatters of Later Stone Age and Middle Stone Age artifacts are frequent archaeological components found within erosional gullies of the nearby Modder River and its tributaries.

Field Assessment

The study area is underlain by intrusive dolerite outcrop (**Fig. 6**). There is no evidence for the accumulation and preservation of intact fossil material within the superficial Quaternary sediments in the immediate vicinity of the study area.

Impact Statement and Recommendation

The pedestrian survey indicated that impact within the demarcated area is primarily restricted to bedrock that is exclusively doleritic and therefore not palaeontologically significant. There are no palaeontological grounds to halt the proposed development and it is considered unlikely that development will affect palaeontological heritage resources within the demarcated permit area in the future (**Table 2**). The site is rated Generally Protected C (GP.C).

References

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Tables and Figures

Table 1. Field rating categories for heritage sites as prescribed by SAHRA (2005).

Field Rating	**Grade**	**Significance**	**Mitigation**
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

Table 2. Summary of impacts at the Tsepong borrow pit.

Rock types and Age	Archaeology & Potential Fossils / Biostratigraphy	Palaeontological Significance	Archaeological Significance	Heritage Impact & Significance at site
Superficial deposits, river catchments Quaternary to Recent	Stone Age; vertebrate skeletal remains; freshwater molluscs, coprolites, microfossils	High	High	Low
Dolerite Jurassic	None	Low	Medium to Low	Low
Adelaide Subgroup (*Pa*) Balfour Formation. Fluvial and lacustrine mudstones and sandstones. Late Permian	*Dicynodon* Assemblage Zone Therapsids, amphibians, fish, amniotes, invertebrates, plant fossils, trace fossils	High	Low	Low

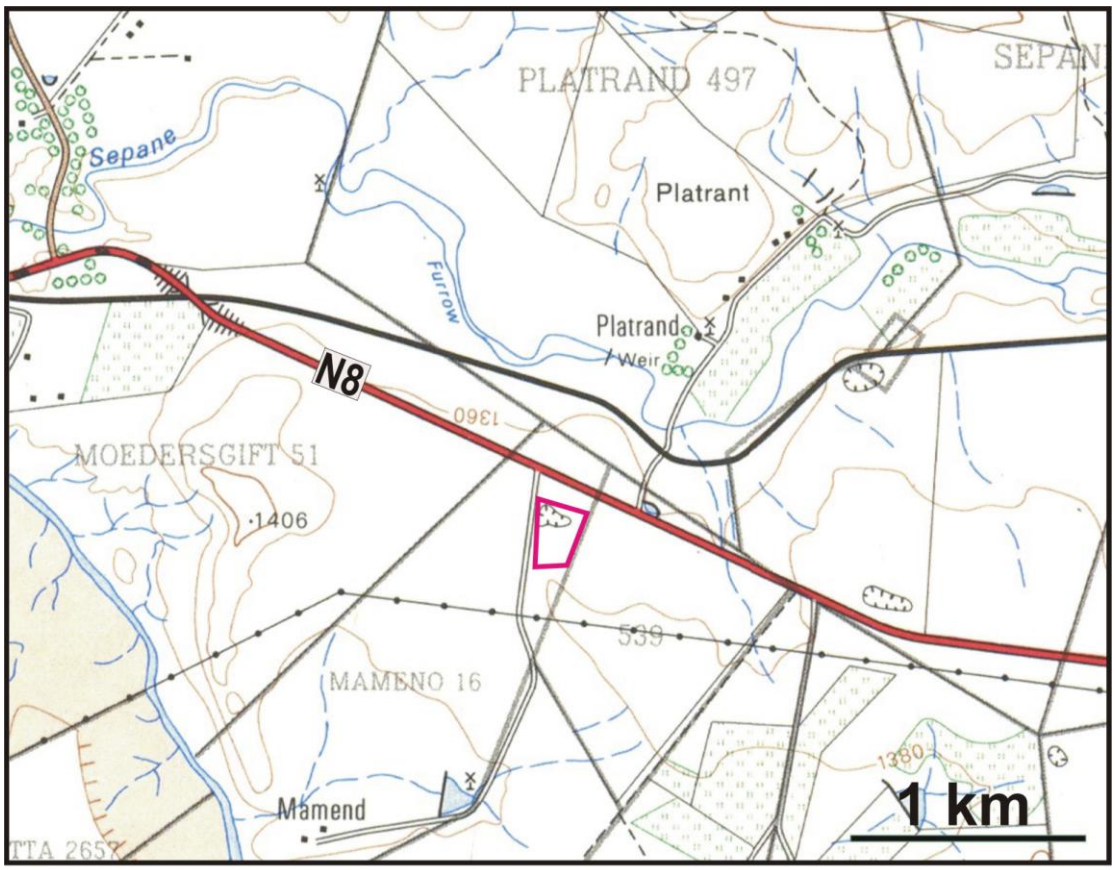

Figure 1. Map of the study area on farm Tsepong 836 (1:50 000 scale topographical map 2926 BA Sannaspos).

Figure 2. Aerial view of the study area.

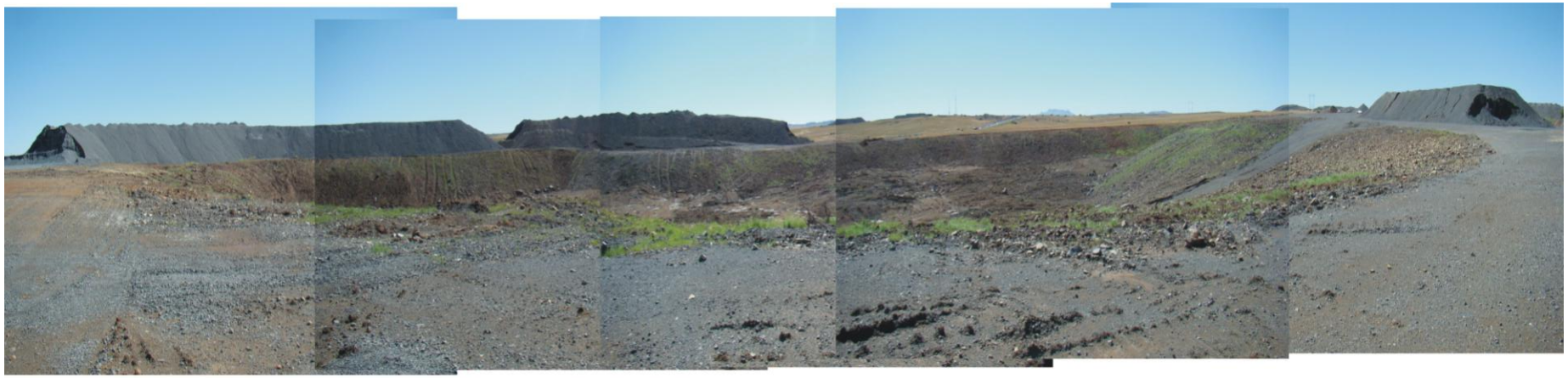

Figure 3. Panoramic view of the study area, looking northeast.

Figure 4. Position of the study area on the SAHRIS Palaeontological Sensitivity Map (red = very high, field assessment and protocol for finds is required; grey = insignificant, no palaeontological studies required).

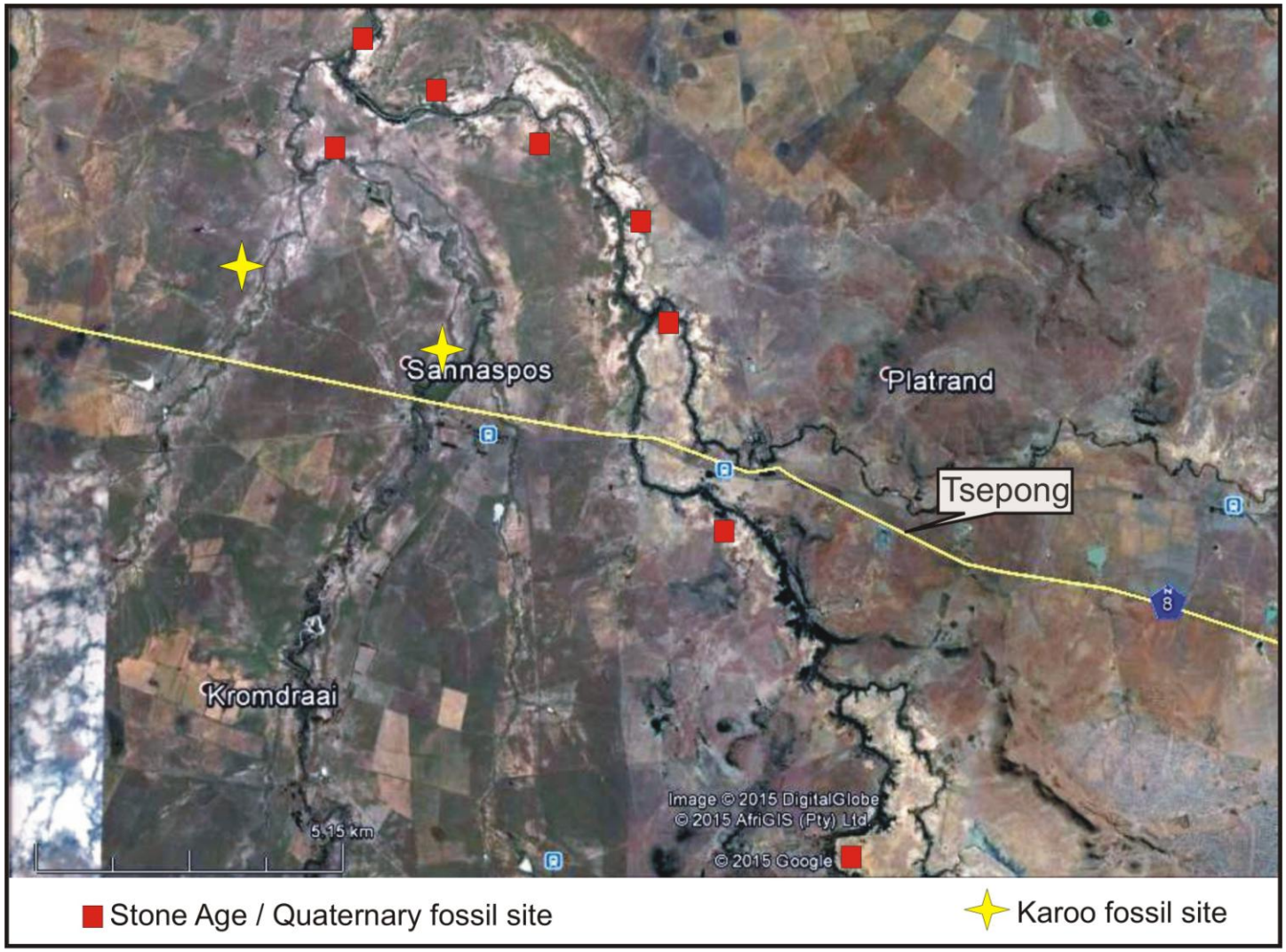

Figure 5. Distribution of palaeontological localities in the vicinity of the study area.

Figure 6. The study area is underlain by intrusive dolerite outcrop (scale: 1 = 10 cm).