Phase 1 Palaeontological Impact Assessment of a proposed new river crossing at the Klein Modder River in Bothabelo, FS Province.

Report prepared for:

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by

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Summary

A Phase 1 Heritage Impact Assessment was carried out for a proposed new river crossing at the Klein Modder River in Botshabelo near Thaba Nchu in the Free State Province. The site is located on unconsolidated alluvial deposits of the Klein Modder River that unconformably overlies fine to medium-grained Adelaide Subgroup sandstones. The terrain has been extensively degraded by previous and ongoing human activities.

The proposed development will impact on a relatively small, flat and highly degraded/disturbed area where no fossils were observed during the Phase 1 assessment. Given the nature and scale of the development, any excavation within the development footprint larger than 1 m^2 that exceeds depths of >1 m into intact overbank sediments (Quaternary component) or unweathered/fresh Adelaide Subgroup sediments (Karoo component), will need further monitoring by a professional palaeontologist. It is therefore advised that, as part of a follow-up Phase 2 Palaeontological Impact Assessment, a professional palaeontologist should monitor exposures should large scale excavations into unweathered/fresh sediments be conducted during the construction phase of the development. The palaeontologist must apply for a valid collection / removal permit from SAHRA if fossil material is found during the construction phase of the development.

Introduction

A Phase 1 Heritage Impact Assessment was carried out for a proposed new river crossing at the Klein Modder River in Botshabelo near Thaba Nchu in the Free State Province (**Fig. 1**). The survey 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.

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 relevant to the proposed development are listed in Section 34 (1), Section 35 (4), Section 36 (3) and Section 38 (1) of the NHR Act and are as follows:

34. (1) No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

35 (4) No person may, without a permit issued by the responsible heritage resources authority—

- destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- *b)* destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

36 (3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph *(a)* or *(b)* any excavation equipment, or any equipment which assists in the detection or recovery of metals.

38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who

intends to undertake a development categorised as—

- 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).

Terms of Reference

The task involved the following:

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

Methodology

A pedestrian survey was conducted in the affected area. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera, were used to record relevant data. Relevant palaeontological information were assimilated for the report and integrated with data acquired during the on-site inspection.

Description of the Affected Area

1:50 000 scale topographic map 2926BA Sannaspos and 2926BC Meadows

1:250 000 scale geological map 2826 Bloemfontein

GPS coordinates: 29°15'17.11"S 26°42'1.56"E

The site is located on an open floodplain of the Klein Modder River, about 6.5km due south of the N8 national Road between Bloemfontein and Thaba Nchu in Botshabelo (**Fig. 2 & 3**).

Background

According to the 1:250 000 scale geological map of the area, sedimentary rocks underlying the proposed development footprint area belong to fossil – bearing sandstones, shales and mudstones of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup), while superficial sediments are made up of Quaternary deposits younger than two million years in age, comprising unconsolidated residual soils and alluvium (**Fig. 4A).** The Karoo geological strata are generally accepted to be Late Permian in age and are assigned to the *Dicynodon* Assemblage Zone (AZ) (**Fig. 4B**). This biozone is characterized by the presence of a distinctive and fairly common dicynodont genus. Therapsids and other vertebrate fossils from this biozone are are usually found as dispersed and isolated specimens in mudrock horizons, associated with an abundance of calcareous nodules. Sediments assigned to the *Dicynodon* AZ are associated with stream deposits consisting of floodplain mudstones and subordinate, lenticular channel sandstones.

Numerous Quaternary-age fossils, assigned to the late Pleistocene Period, have been recorded from various localities along the Honingspruit and Modder River near Sannaspos and include the extinct species *Equus capensis, Megalotragus priscus, Pelorovis antiquus, Antidorcas bondi* and *Equus lylei* **(Fig. 5).** 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. 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).

There is currently no record of Quaternary vertebrate fossils found within alluvial overbank sediments of the Klein –Modder River at Bothabelo.

Results of Survey

The site is located on unconsolidated alluvial deposits of the Klein Modder River that unconformably overlies fine to medium-grained Adelaide Subgroup sandstones (**Fig. 6 & 7).** The terrain has been extensively degraded by previous and ongoing human activities. No visible traces of vertebrate, invertebrate or trace fossils were recorded in either of these exposures within the boundaries of the proposed impact area during the survey.

Impact Statement and Recommendations

The proposed development will impact on a relatively small, flat and highly degraded/disturbed area where no fossils were observed during the Phase 1 assessment. Given the nature and scale of the development, any excavation within the development footprint larger than 1 m^2 that exceeds depths of >1 m into intact overbank sediments (Quaternary component) or unweathered/fresh Adelaide Subgroup sediments (Karoo component), will need further monitoring by a professional palaeontologist. It is therefore advised that, as part of a follow-up Phase 2 Palaeontological Impact Assessment, a professional palaeontologist should monitor exposures should large scale excavations into unweathered/fresh sediments be conducted during the construction phase of the development. The palaeontologist must apply for a valid collection / removal permit from SAHRA if fossil material is found during the construction phase of the development.

References

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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.

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Figures

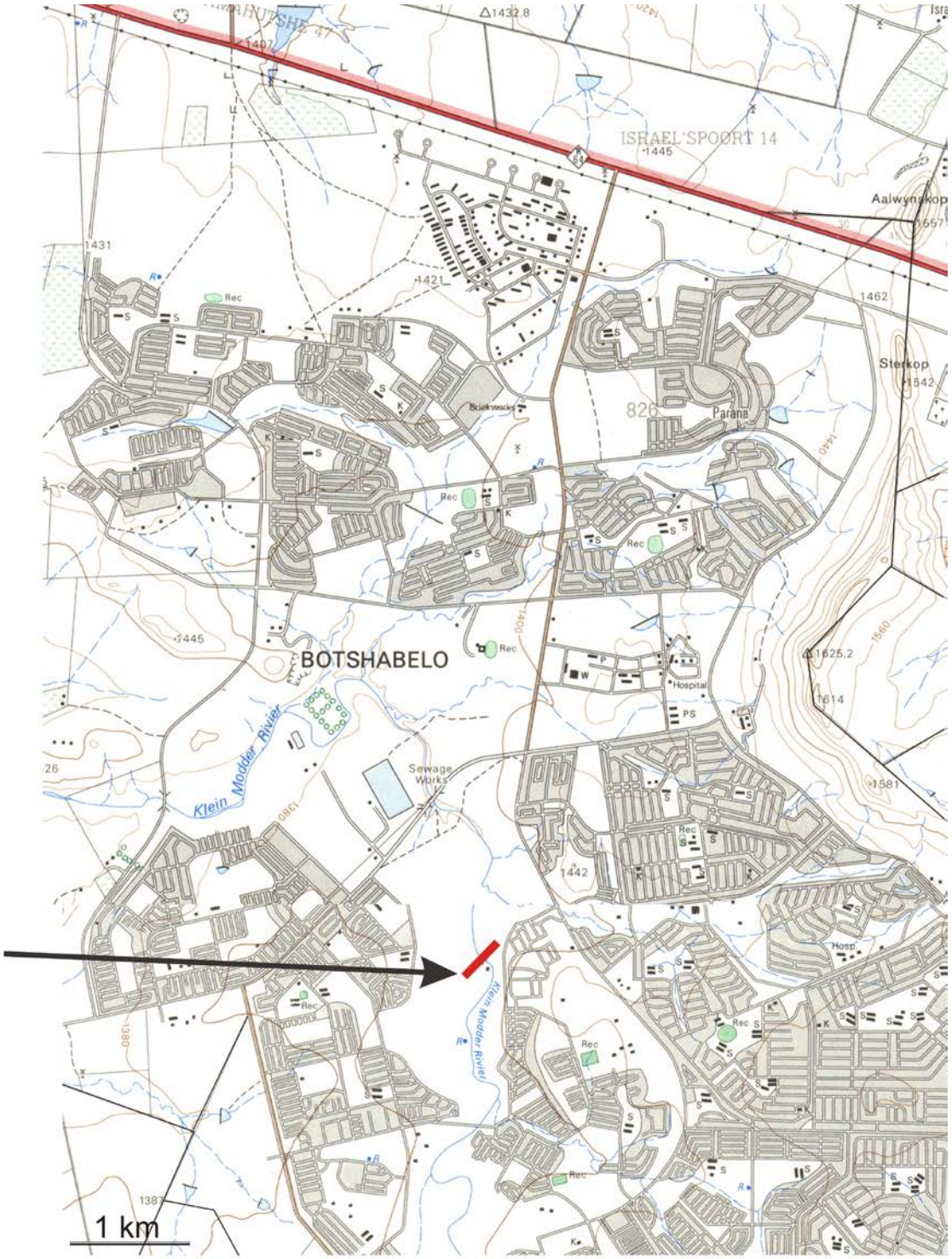

Figure 1 Map of the proposed development area (portion of 1:50 000 scale topographic 2926BA Sannaspos and 2926BC Meadows).

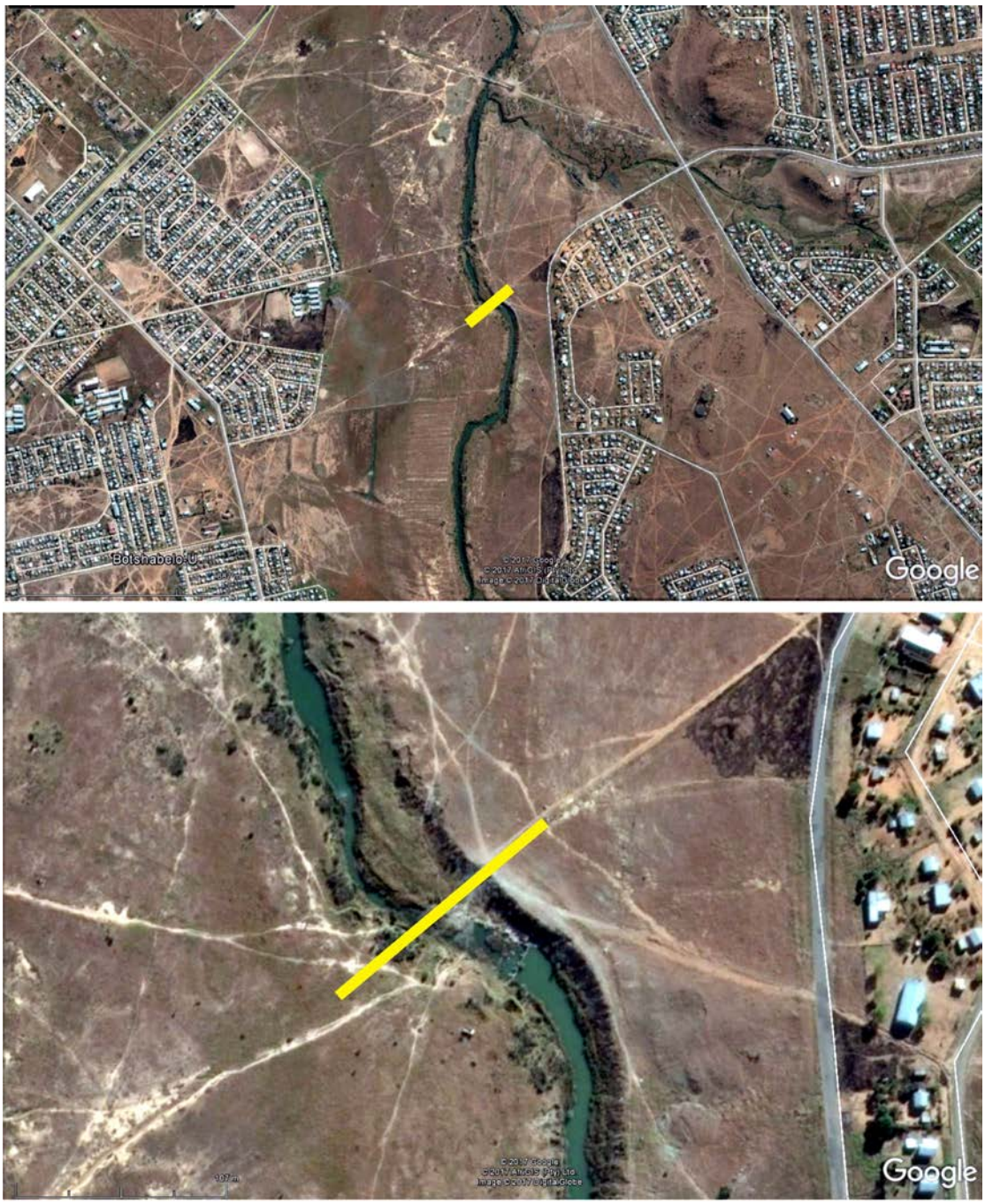

Figure 2. Aerial view of the proposed development footprint.

Figure 3. General view of the existing bridge crossing, looking southwest.

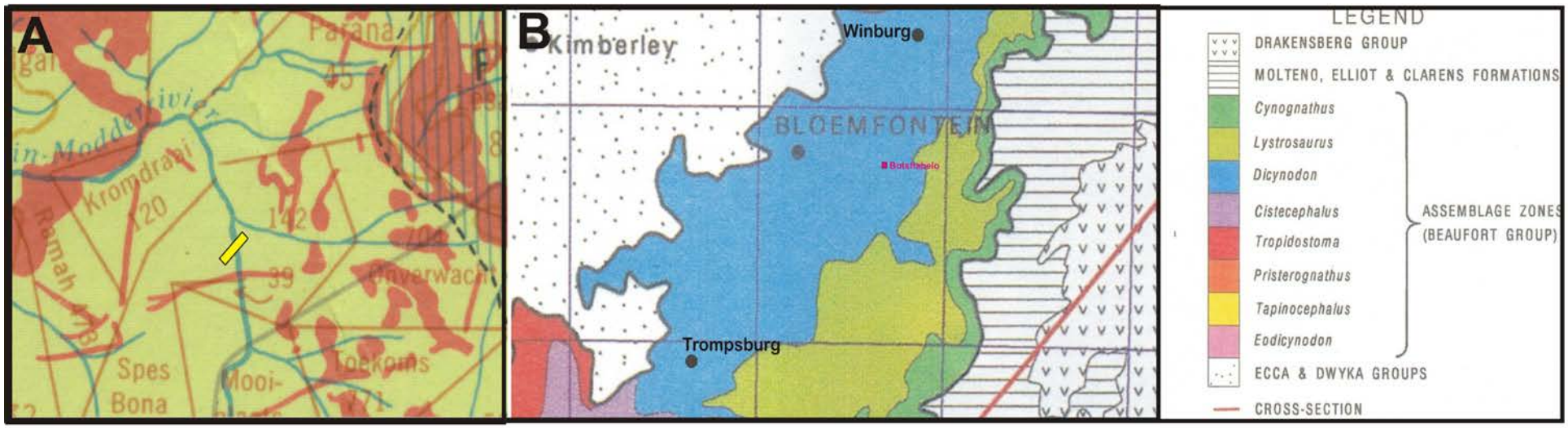

Figure 4. (**A**) Portion of the 1:250 000 scale geological map Bloemfontein 2926. The development footprint (yellow rectangle) is situated within the outcrop area of late Permian Adelaide Subgroup sedimentary rocks (Beaufort Group, Karoo Supergroup), made up of alternating sandstone and mudstone layers (*Pa*) that are intruded in places by weather-resistant Jurassic dolerites (*Jd*) and capped by geologically recent (Quaternary) alluvium. (**B**) Geographical distribution of vertebrate biozones of the Beaufort Group around Bloemfontein (Rubidge 1995).

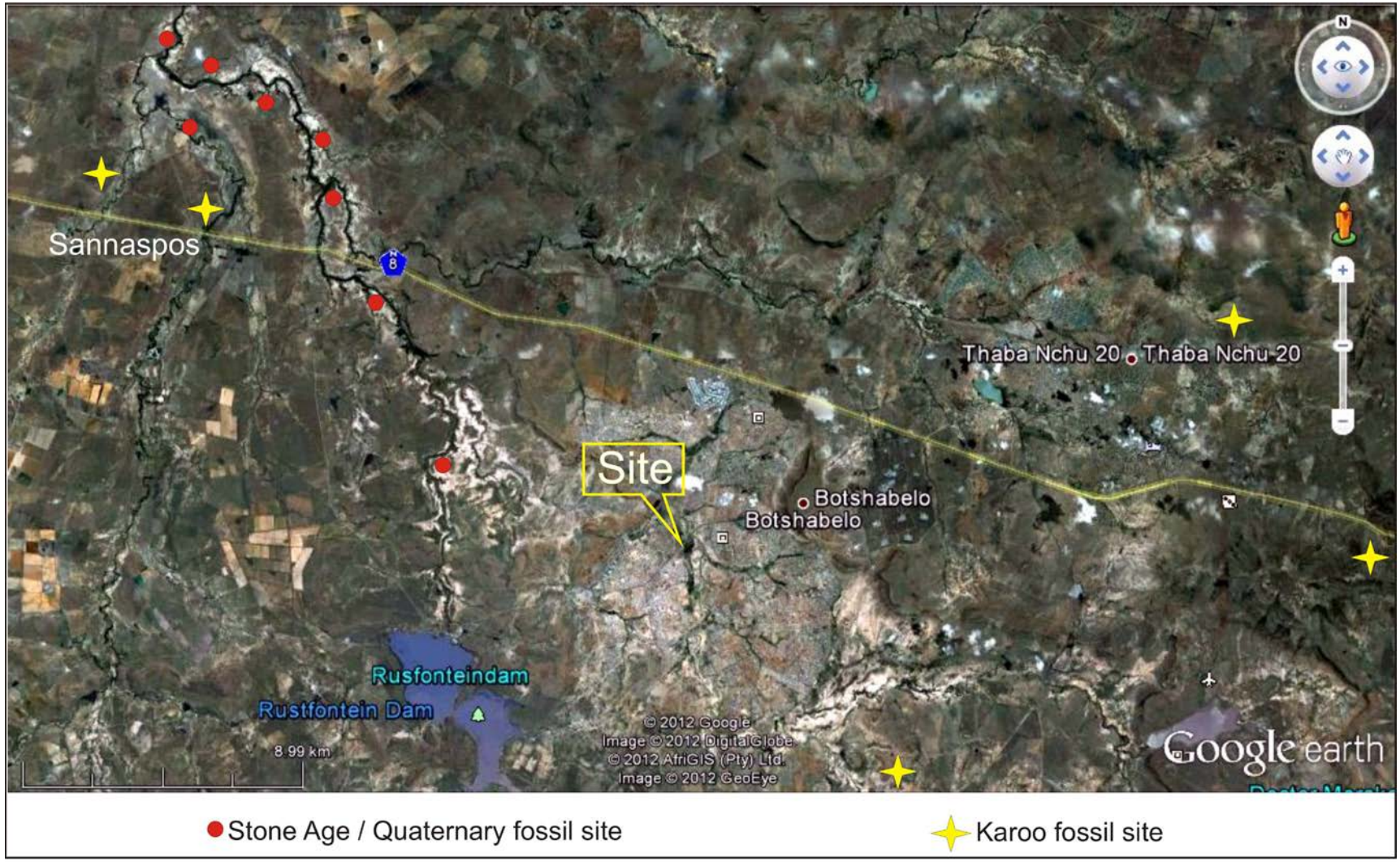

Figure 5. Distribution of palaeontological localities in the vicinity of the study area.

Figure 6. The site is capped by unconsolidated alluvial deposits of the Klein Modder River.
Scale 1 = 10 cm.

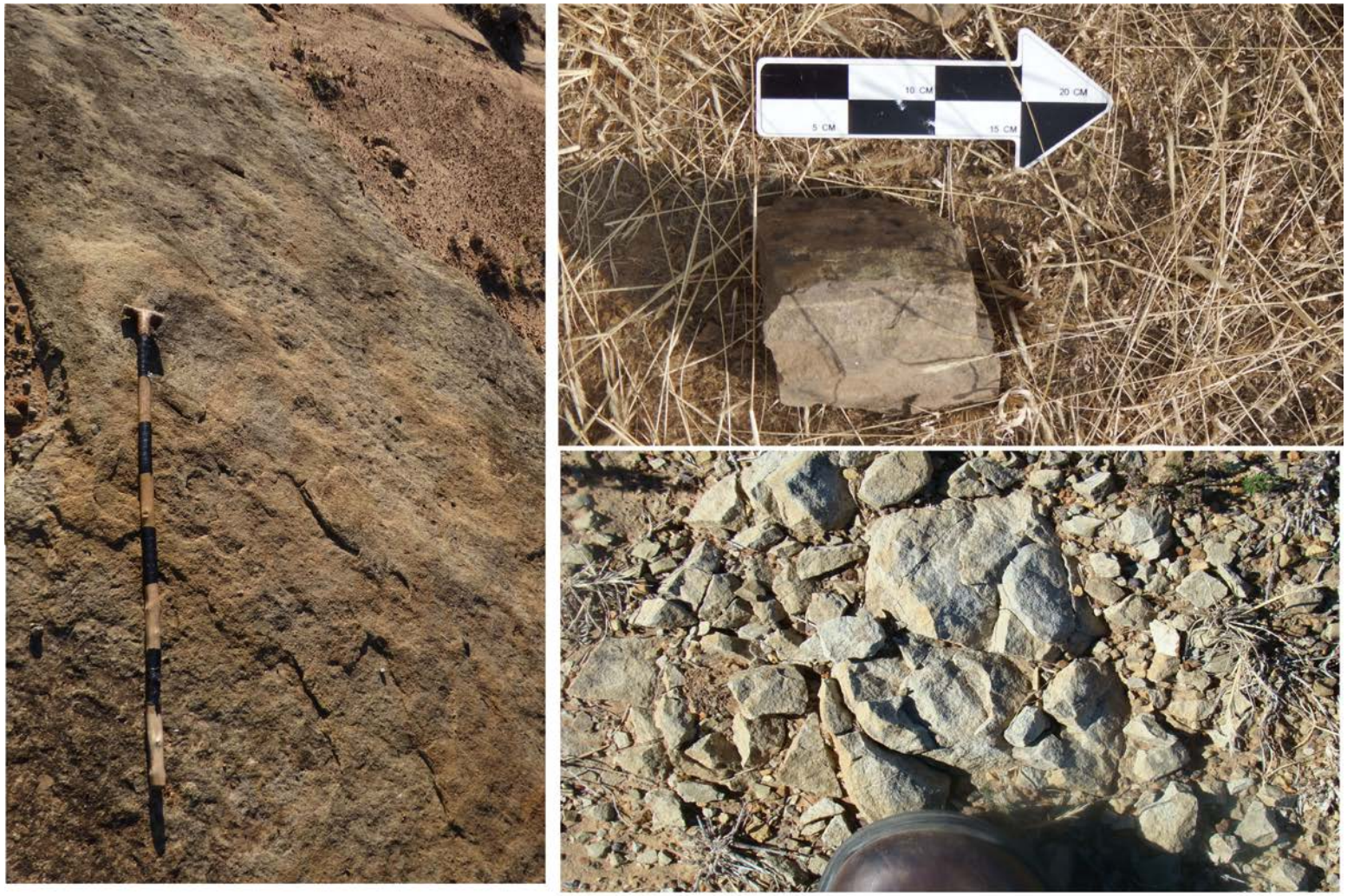

Figure 7. The site is underlain by fine to medium-grained Adelaide Subgroup sandstones. Scale left: 1 = 10 cm.