

**Desktop Palaeontological Assessment of a proposed
Solar Photovoltaic Facility near Springfontein, FS
Province.**

Report prepared for
CSIR Environmental Management Services
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Executive Summary

- The affected area is underlain by Late Permian Beaufort Group sediments of the lower Adelaide (*Pa*).
- These sediments form the base on which younger, weakly developed superficial deposits of Late Cenozoic age have been deposited and include pedocretes, colluvial slope deposits, sheet wash and alluvium.
- The proposed development will have a direct impact on fossil-bearing Adelaide Subgroup strata especially during the construction phase, if excavations into bedrock are required.
- Cumulative impacts are not considered here, unless the recommendations for mitigation are not followed, i.e. monitoring by a specialist during the construction phase of the project.
- There are no objections to the proposed development on palaeontological grounds provided that access by a specialist should be facilitated at the appropriate stage **during the construction phase** of the development and
- that newly uncovered objects of palaeontological significance, found during the course of excavation activities are reported to the appropriate heritage authorities

Introduction

The report is a preliminary assessment of potential paleontological impact with regard to the proposed development of a Solar Photovoltaic Facility at Valley Dora near Springfontein. The present study was commissioned by CSIR Environmental Management Services in March 2012 and the assessment was carried out in accordance with National Heritage Resources Act 25 of 1999.

Methodology

The palaeontological 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.

Site Information

1 to 50 000 topographical maps 3025 BC Springfontein and 3025 BD Bethulie

General site coordinates: 30°16'51.07"S, 25°45'33.86"E

The affected area is located on the farm Valley Dora (Knapdaar 14), immediately west of Springfontein (**Fig. 1**). The proposed development area itself represents approximately 600 ha of farmland (**Fig. 2**).

Local Geology

The geology of the region has been described by Le Roux (1993) and Johnson (2006) and is shown on the 1: 250 000 geological map 3024 Colesberg (Council for Geoscience, Pretoria 1997). The affected area is underlain by Late Permian Beaufort Group sediments of the lower Adelaide (*Pa*). These sedimentary rocks form the base on which younger, superficial deposits of Late Cenozoic age have been deposited (Partridge *et al.* 2006). This include pedocretes, colluvial slope deposits, sheet wash and alluvium. Dykes and sills of resistant Jurassic dolerites (*Jd*) determine the relief of the surrounding area to the south and southwest (**Fig. 2**). The igneous Jurassic dolerites are not fossiliferous and can be excluded from further consideration in the present palaeontological assessment.

Regional Palaeontology

The affected area is situated within the *Dicynodon* Assemblage Zone (AZ) near the latter's eastern boundary with the Early Triassic sediments of the younger *Lystrosaurus* AZ (Rubidge 1995) (**Fig. 2 & 3**).

The *Dicynodon* Assemblage represents the terminal phase of the Palaeozoic continental biota, that was dominated by therapsid “mammal-like reptiles” and *Glossopteris* Flora before it was largely wiped out by the end-Permian Mass Extinction Event (Ward *et al.* 2005). Fossil types from this biozone are listed in Keyser & Smith (1978-79) and Kitching (1995). 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 palaeoniscoid fish and crocodile-like temnospondyl amphibians.

Overlying Late Cenozoic valley fill deposits may occasionally contain much younger fossil biotas, including the skeletal remains of Quaternary mammals (Klein 1984) non-marine molluscs and a variety of other microfossils.

Impact Statement

The proposed development will impact mainly on fossil-bearing Adelaide Subgroup strata (**Fig. 4**) especially during the construction phase if excavations into bedrock are required (**Table 1**). Such fresh exposures may well be of palaeontological interest. Cumulative impacts are not considered here, unless the recommendations for mitigation are not followed.

Recommendation

There are no objections to the proposed development on palaeontological grounds provided that the following conditions are adhered to as part of site management policy:

- that access by a specialist should be facilitated at the appropriate stage during the construction phase of the development and

- that appropriate and effective mitigation measures such as inspection of fresh excavations are undertaken by a professional palaeontologist in order to determine whether, as is probable, palaeontological remains or features are exposed *in situ*.
- that newly uncovered objects of palaeontological significance, found during the course of excavation activities are reported to the appropriate heritage authorities and
- that such finds may require a Phase 2 rescue operation at the cost of the developer.

References

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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. Impact table for the proposed development.

Nature of impact	Status (Negative or positive)	Extent	Duration	Intensity	Probability	Reversibility	Irreplaceability	Significance (no mitigation)	Mitigation/Management Actions	Significance (with mitigation)	Confidence level
Construction Phase											
1.1 Impact of bedrock excavations on potential fossil-bearing Adelaide Subgroup strata.	Negative, potential destruction of in situ fossils	Local, i.e. within 5 km of the site	Permanent	High, since excavations could destroy in situ fossil remains.	Probable	Low, potential destruction of fossils is permanent	High, fossils considered irreplaceable	High, since negative impacts are to be expected	Monitoring by a specialist at the start and during the construction phase of the development in order to map, retrieve and rescue potential fossil remains.	Low, since monitoring by a specialist during the construction phase will reduce the impact.	High
1.2. Impact of excavations on superficial deposits	Negative, potential destruction of in situ fossils	Local, i.e. within 5 km of the site	Permanent	High, since excavations could destroy in situ fossil remains.	Improbable	Low, potential destruction of fossils is permanent	High, fossils considered irreplaceable	High, since negative impacts are to be expected	Monitoring by a specialist before the start of the construction phase of the development in order to map, retrieve and rescue potential Quaternary fossil remains.	Low, since monitoring by a specialist before the start of the construction phase will reduce the impact.	High
Operational Phase											
Impact of operational activities on potential fossil-bearing Adelaide Subgroup strata and superficial sediments	Neutral, no destruction of in situ fossils likely	Local, i.e. within 5 km of the site	Permanent	Low	Improbable	High, since there will be no impact on in situ fossils	Low, since there will be no impact on in situ fossils	Low, since status of impact considered neutral	No mitigation required	Low	High

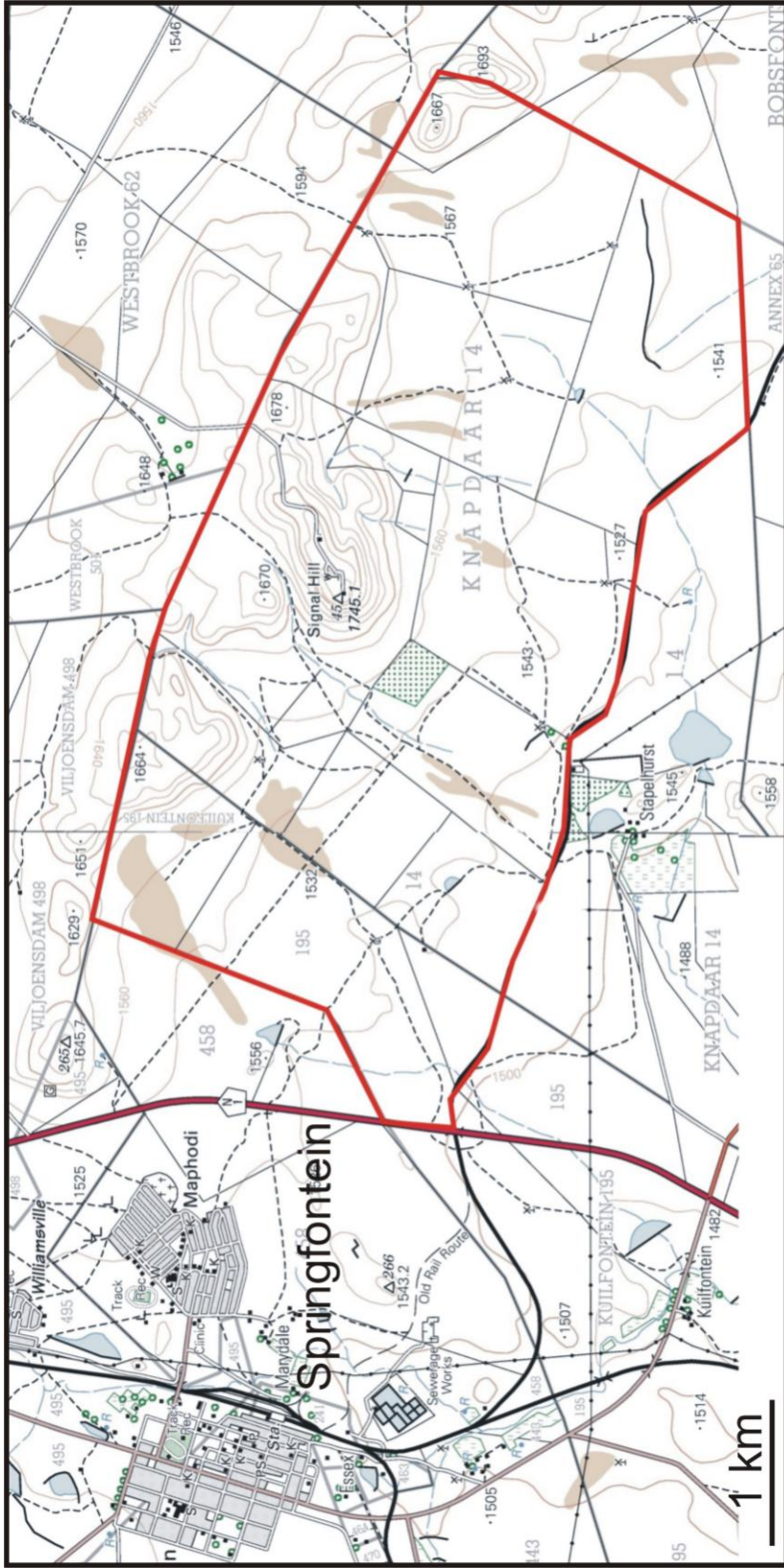


Figure 1. Portion of 1 : 50 000 scale topographic map of the affected area (red line).



Figure 2. Portion of 1 : 250 000 scale geological map (3025 Colesberg) of the affected area. The geology in the area is represented by late Permian Adelaide (**Pa**) and early Triassic Tarkastad Subgroup sediments (**Trk**), and early Jurassic dolerite intrusions (**Jd**).



Figure 3. Geographical distribution of vertebrate biozones of the Beaufort Group around Springfontein (Rubidge 1995).

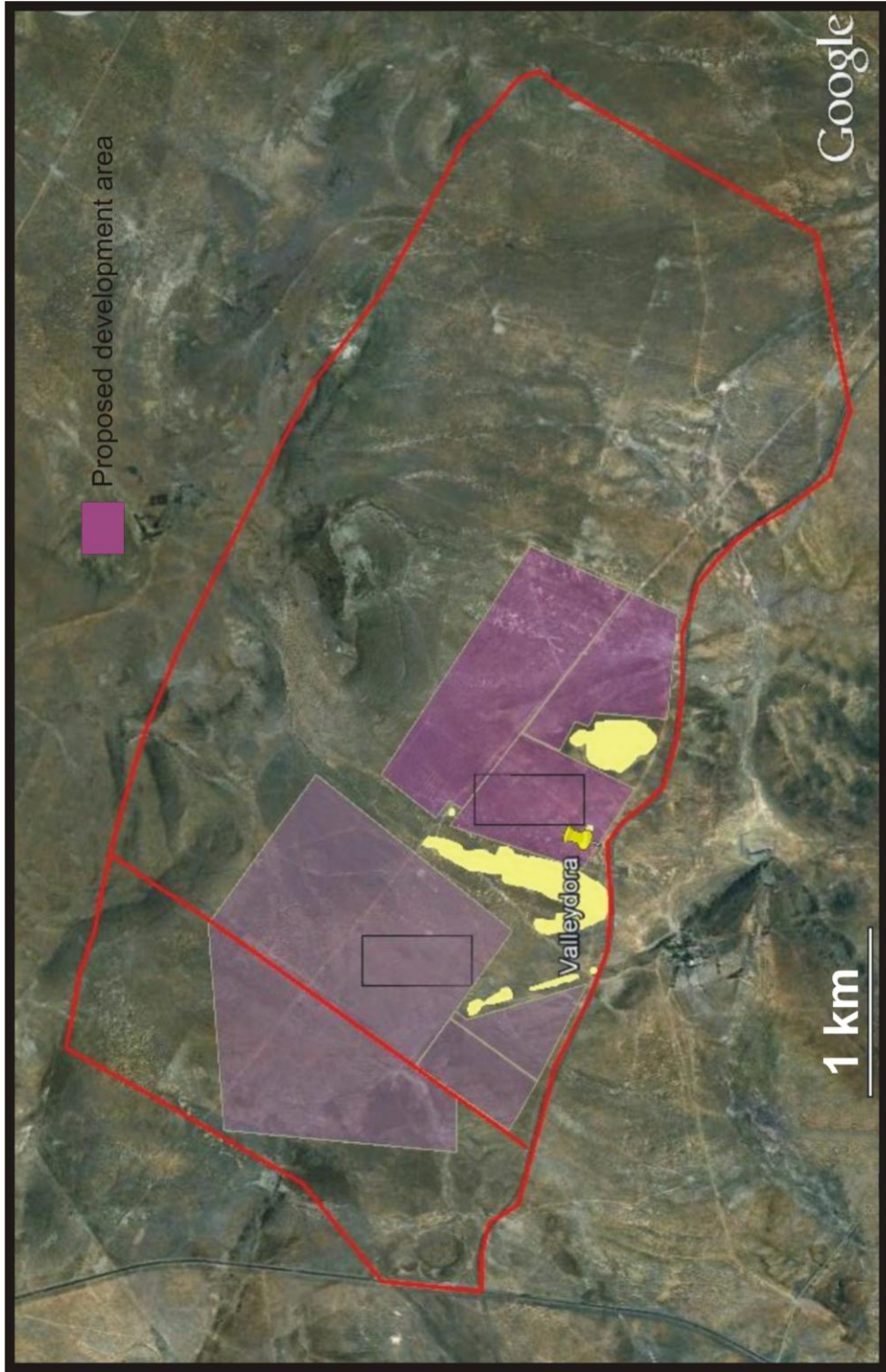


Figure 4. Aerial view of the affected area.