

Palaeontological Desktop Assessment of a 197 ha Solar Photovoltaic Facility located on a Portion of the farm Doornpoort 347, at the South Deep Gold Mine, Westonaria, Gauteng Province.

Report prepared by Palaeo Field Services, PO Box 38806 Langenhovenpark 9330.

04 August 2017

Summary

The proposed study area is underlain by potentially fossil-bearing, Transvaal Supergroup sedimentary strata (stromatolites) of the early Proterozoic Timeball Hill Formation (Pretoria Group), that are capped by superficial (Quaternary) deposits of low to very low palaeontological sensitivity, the latter being that the impact area is not situated within or near pan, well-developed alluvial or spring deposits. Impact by development on igneous rock mapped near the north-eastern boundary of the site will not affect palaeontological potential remains. As far as palaeontological heritage is concerned, removal of superficial overburden and excavation within the development footprint $> 1 \text{ m}^2$ and exceeding depths of $>1 \text{ m}$ into unweathered/fresh bedrock will need monitoring by a professional palaeontologist. It is therefore advised that, as part of a follow-up Phase 1 Palaeontological Impact Assessment, a professional palaeontologist should monitor fresh exposures should large scale excavations into unweathered sedimentary bedrock be conducted during the construction phase of the development.

Introduction

The report is an assessment of potential palaeontological impact with regard to the proposed construction of a 197 ha Solar Photovoltaic Facility on a Portion of the farm Doornpoort 347, at the South Deep Gold Mine, Westonaria, West Rand District Municipality, Gauteng Province (**Fig. 1 & 2**).

Maps

1:50 000 scale topographic 2627BC Westonaria

1:250 000 scale geological map 2626 Wes Rand

Site Coordinates (Fig. 2):

- A) 26°24'7.21"S 27°39'26.36"E
- B) 26°24'15.75"S 27°39'40.65"E
- C) 26°24'51.97"S 27°39'27.76"E
- D) 26°24'54.65"S 27°39'6.27"E
- E) 26°25'6.17"S 27°39'0.62"E
- F) 26°25'6.64"S 27°38'45.56"E
- G) 26°25'0.55"S 27°38'39.88"E
- H) 26°24'33.74"S 27°38'54.13"E

Methodology

The assessment was carried out in accordance with National Heritage Resources Act 25 of 1999 with the aim to assess the potential impact on palaeontological heritage resources that may result from the proposed development. The palaeontological significance of the affected areas were evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature.

Assumptions and Limitations

The assessment provided within this report is based upon a desktop study without the benefit of a site visit. The presentation of geological units present within the study area is derived from the 1:1 000 000 scale map of South Africa and the 1:250 000 scale geological map 2626 Wes-Rand, which may vary in their accuracy. It is also assumed, for the sake of prudence, that fossil remains are always uniformly distributed in fossil-bearing rock units, although in reality their distribution may vary significantly.

Background

According to the 1:250 000 scale geological map 2626 Wes Rand, the proposed development footprint is underlain by Precambrian sedimentary rocks of the Early Proterozoic Timeball Hill Formation (*Vt*, Pretoria Group, Transvaal Supergroup) with a palaeontologically insignificant diabase dyke (*Vdi*) intruding the north-eastern part of the footprint (**Fig. 3**). The Timeball Hill is ascribed to a fluvio-deltaic basin-fill sedimentation system and is composed of quartzite, lacustrine and fluvio-deltaic mudrocks, conglomerates and finely-laminated ferruginous shale with thin stromatolitic carbonate interbeds (Eriksson 1973;

Erikson *et al.* 2006; Cateneu and Erikson 2002). Stromatolites are >2.5 Ga old fossilized algal colonies (microbial mounds) made up of single-celled organisms that functioned as the earliest oxygen producers and is actually quite common in the underlying Malmani dolomites (subgroup at the base of the Transvaal Supergroup). There is currently no record of Quaternary vertebrate fossils or sites found in the area.

Impact Statement Recommendation

The desktop investigation indicates that the proposed study area is underlain by potentially fossil-bearing, Transvaal Supergroup sedimentary strata (stromatolites) of the early Proterozoic Timeball Hill Formation (Pretoria Group), that are capped by superficial (Quaternary) deposits of low to very low palaeontological sensitivity, the latter being that the impact area is not situated within or near pan, well-developed alluvial or spring deposits (considered to be potentially fossiliferous in the region). Palaeontologically sensitive cave breccias are not anticipated in the study area, as opposed to the more cave-rich karst environment provided by the underlying Malmani Subgroup dolomites outcropping about 6 km to the north (*Vmd*, see **Fig. 3**). Impact by development on igneous rock will not affect palaeontological potential remains (**Fig. 4**). However, visibility of Timeball Hill Formation outcrop will most likely be low given the generally low topography terrain and well-developed superficial overburden (**Fig. 5**), so it will be difficult to determine the potentially adverse effect of excavations into potentially fossil-bearing bedrock sediments underlying the area other than to emphasize that such impacts on fossil heritage are generally irreversible. Conversely, the recovery of new fossils as a result of industrial excavation activities can also be considered a positive impact, but only if the process is accompanied by appropriate scientific recording and retrieval methods. As far as palaeontological heritage is concerned, removal of superficial overburden and excavation within the development footprint $> 1 \text{ m}^2$ and exceeding depths of $>1 \text{ m}$ into unweathered/fresh bedrock will need monitoring by a professional palaeontologist. It is therefore advised that, as part of a follow-up Phase 1 Palaeontological Impact Assessment, a professional palaeontologist should monitor fresh exposures should large scale excavations into unweathered sedimentary bedrock 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. In the unlikely event of fossil discovery within the Quaternary overburden (i.e. modern-looking but more or less lithified animal bones and

teeth), elsewhere during the construction phase of the development, a professional palaeontologist must be called in immediately to confirm and record the finds. In the meantime, ex situ remains must be wrapped in paper towels or heavy duty tin foil and stored in a safe place. The material should not be washed or cleaned in any way. In *situ* material must be kept in place and protected from further damage by covering it with light but rigid object like a box, bucket or metal sheet until further confirmation by the palaeontologist.

References

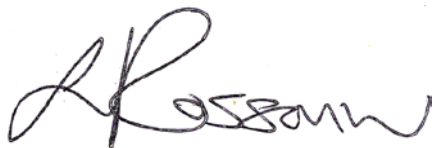
Catuneanu O. And Eriksson P.G. 2002. Sequence stratigraphy of the Precambrian Rooihogte–Timeball Hill rift succession, Transvaal Basin, South Africa. *Sedimentary Geology* 147:71–88.

Eriksson, K.A. 1973. The Timeball Hill Formation--A Fossil *Delta* *Journal of Sedimentary Petrology* (4): 1046-1053.

Eriksson, P.G. et al. 2006. The Transvaal Supergroup and its Precursors. **In:** Johnson, M.R, Anhaeusser, C.R. and Thomas, R.J. (Eds.) *The geology of South Africa*, pp. 237-260. Geological Society of South Africa, Johannesburg & the Council for Geoscience, 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.



04 / 08 / 2017

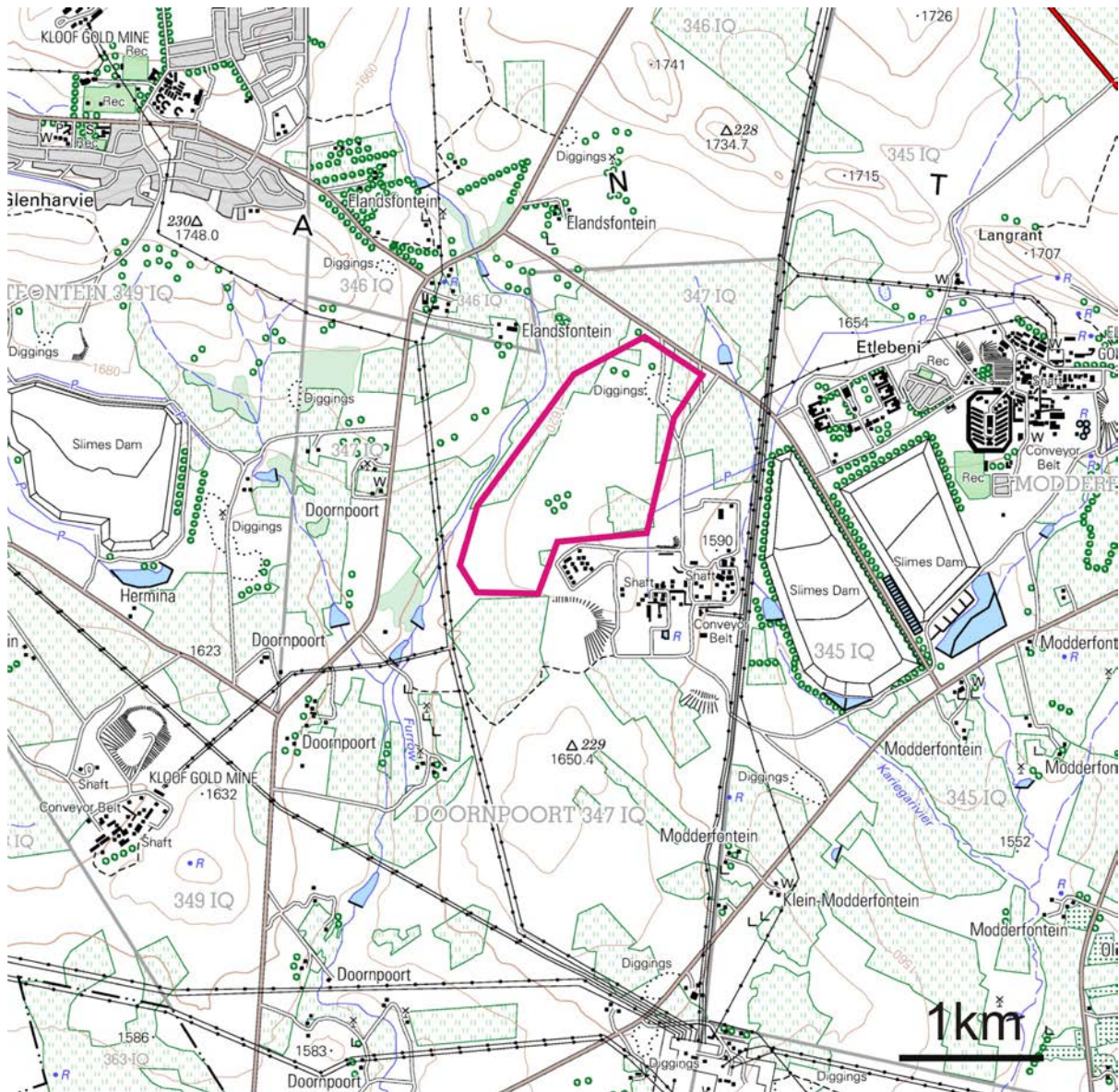


Figure 1. Map of the study area (portion of 1:50 000 scale topographic 2627BC Westonia).

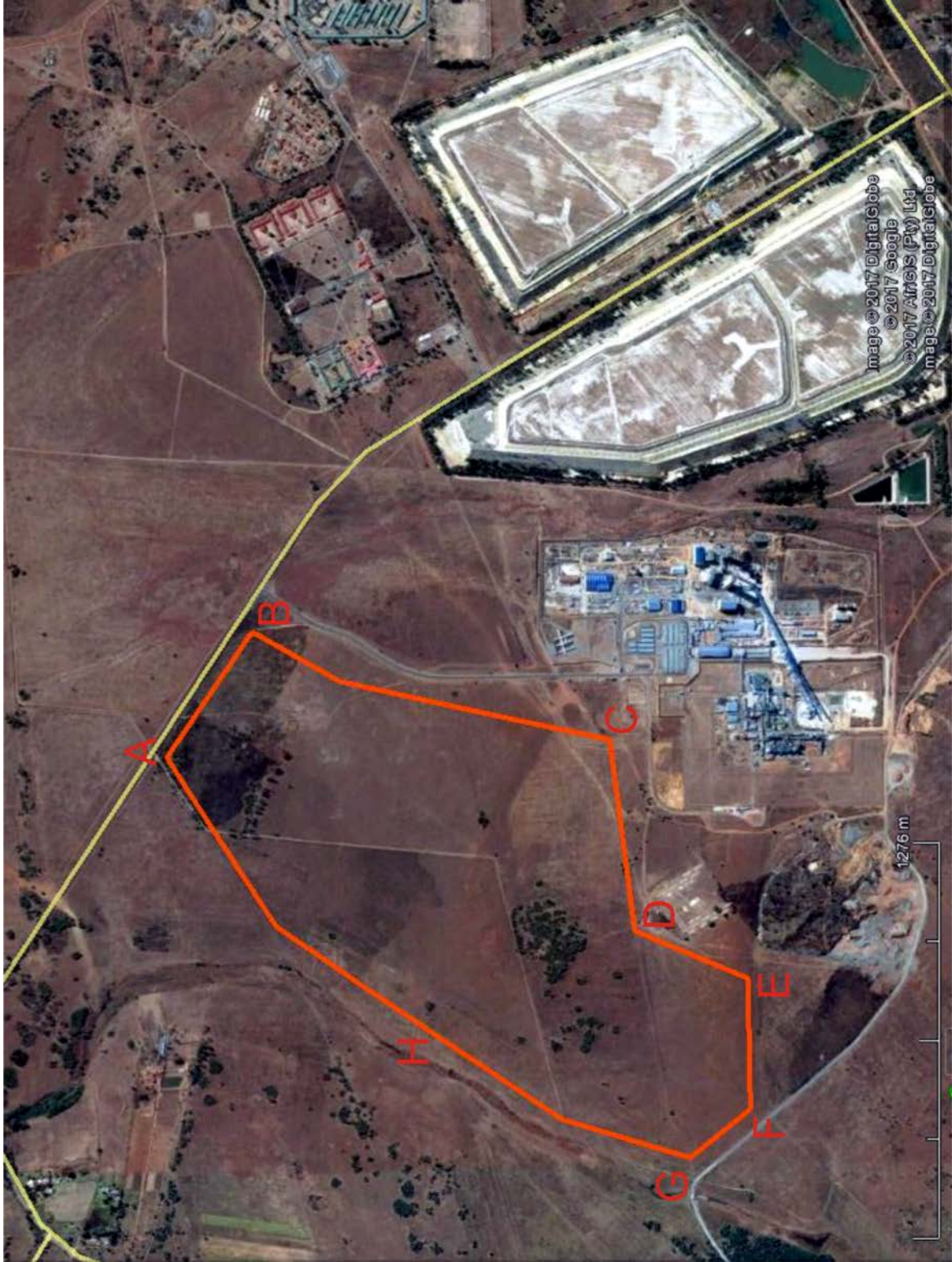


Figure 2. Aerial view of the study area.

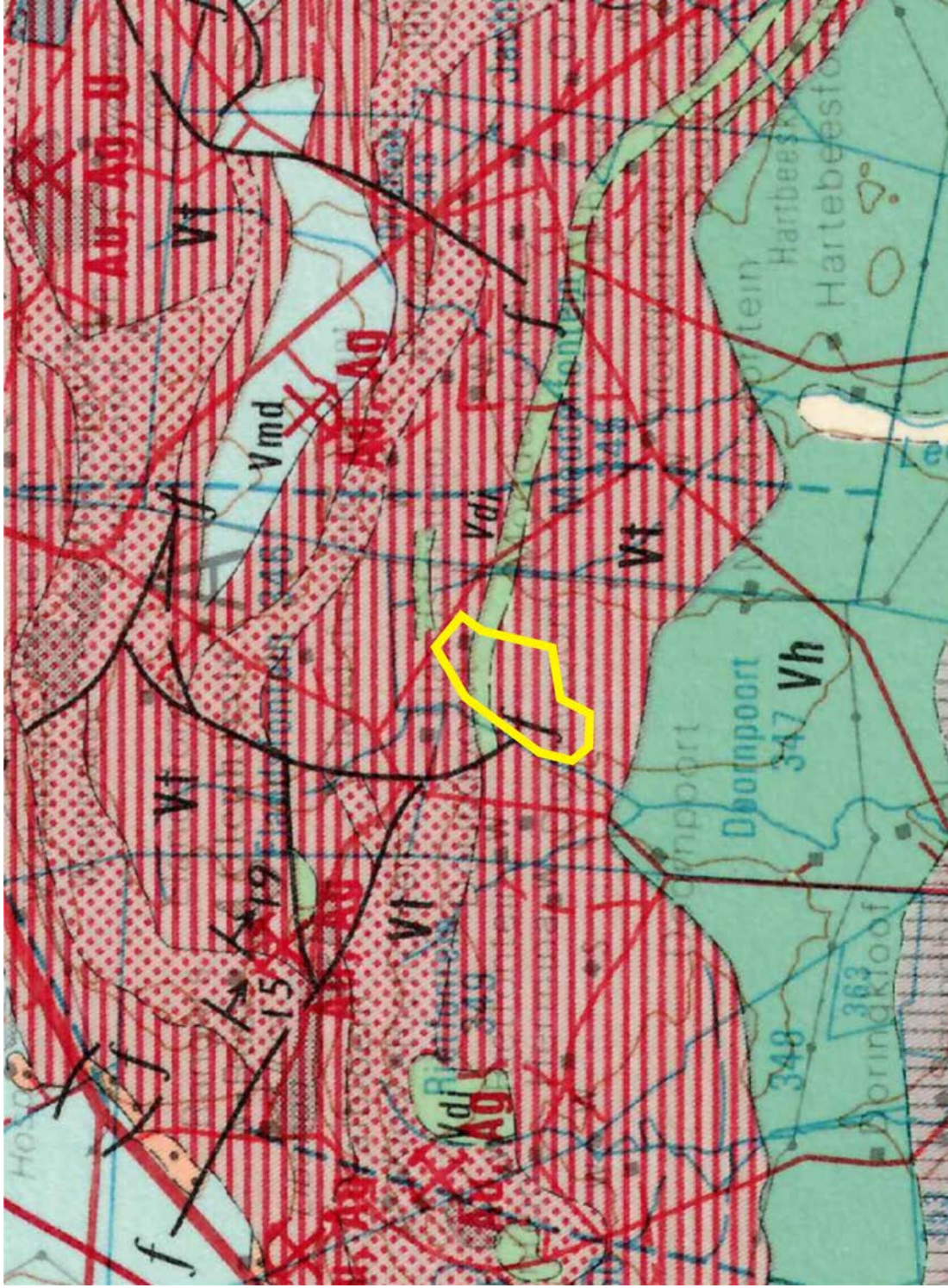


Figure 3. According to the 1:250 000 scale geological map 2626 Wes Rand, the proposed development footprint is underlain by Precambrian sedimentary rocks of the Early Proterozoic Timeball Hill Formation (*Vt*, Pretoria Group, Transvaal Supergroup) with a diabase dyke (*Vdi*) intruding the north-eastern part of the footprint.



Figure 4. Estimated position of diabase intrusion contact zone according to the 1:250 000 scale geological map 2626 Wes Rand.



Figure 5. General view of the study area, looking southwest.