

## RECOMMENDED EXEMPTION FROM FURTHER PALAEOLOGICAL MITIGATION:

### Proposed photovoltaic project at Black Mountain near Aggeneys, Northern Cape Province

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It is proposed to develop a photovoltaic installation of some 19.5 hectares in area to the south of the Black Mountain and southwest of Aggeneys, Northern Cape Province (DEA Ref: 12/12/20/2151). Two alternative sites (Sites A and C in Fig. 1) are currently under consideration.

The geology of the proposed development area is shown on 1: 250 000 geological map 2918 Pofadder (Council for Geoscience, Pretoria; Agenbacht 2007) (Fig. 2). Sites A and C are situated in flat-lying terrain surrounding the southern foothills of the main Black Mountain massif. The latter is built of highly metamorphosed Mid-Proterozoic (Late Precambrian) rocks of the **Aggeneys Subgroup (Bushmanland Group)** that will not be directly affected by the proposed development and that are not fossiliferous.

Sites A and C are underlain by **Quaternary to Recent sands and gravels** of probable fluvial origin (**Q-s2** in Fig. 2), although there may also be a colluvial component. In the area south of the Black Mountain these are locally overlain (and perhaps also underlain) near-surface by unconsolidated aeolian (*i.e.* wind-blown) sands of the Quaternary **Gordonia Formation (Kalahari Group)** (**Q-s1** in Fig. 2) whose thickness in this area is uncertain. All these sediments can be subsumed into the Late Cretaceous to Recent **Kalahari Group**, the geology of which is reviewed by Partridge *et al.* (2006). The Gordonia dune sands are considered to range in age from the Late Pliocene / Early Pleistocene to Recent, dated in part from enclosed Middle to Later Stone Age stone tools. Note that the recent extension of the Pliocene - Pleistocene boundary from 1.8Ma back to 2.588 Ma would place the Gordonia Formation almost entirely within the Pleistocene Epoch.

The fossil record of the Kalahari Group as a whole is generally sparse and low in diversity; no fossils are recorded here in the recent Pofadder geology sheet explanation by Agenbacht (2007). The Gordonia Formation dune sands were mainly active during cold, drier intervals of the Pleistocene Epoch that were inimical to most forms of life, apart from hardy, desert-adapted species. Porous dune sands are not generally conducive to fossil preservation. However, mummification of soft tissues may play a role here and migrating lime-rich groundwaters derived from the underlying Dwyka Group may lead to the rapid calcretisation of organic structures such as burrows and root casts. Occasional terrestrial fossil remains that might be expected within this unit include calcretized rhizoliths (root casts) and termitaria (*e.g.* *Hodotermes*, the harvester termite), ostrich egg shells (*Struthio*) and shells of land snails (*e.g.* *Trigonephrus*) (Almond 2008, Almond & Pether 2008). Other fossil groups such as freshwater bivalves and gastropods (*e.g.* *Corbula*, *Unio*) and snails, ostracods (seed shrimps), charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones) are associated with local watercourses and pans. Microfossils such as diatoms may be blown by wind into nearby dune sands. These Kalahari fossils (or subfossils) can be expected to occur sporadically but widely, and the overall palaeontological sensitivity of the Gordonia Formation is therefore considered to be low.

Underlying calcretes might also contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways. Mammalian bones, teeth and horn cores (also tortoise remains, and fish, amphibian or even crocodiles in wetter depositional settings) may be occasionally expected within Kalahari Group sediments and calcretes, notably those associated with ancient alluvial gravels. The younger fluvial and alluvial sands and gravels within the proposed development area are unlikely to contain any substantial fossil or subfossil remains.

The overall palaeontological sensitivity of the Kalahari Group and younger sediments mapped within the study region, including the sandy to gravely superficial sediments (alluvium, colluvium, soils) beneath both development sites under consideration, is low to very low (Almond & Pether 2008). The proposed development has a small footprint and deep excavations are not envisaged for photovoltaic installations. **For these reasons, no further palaeontological mitigation is recommended for this development.**

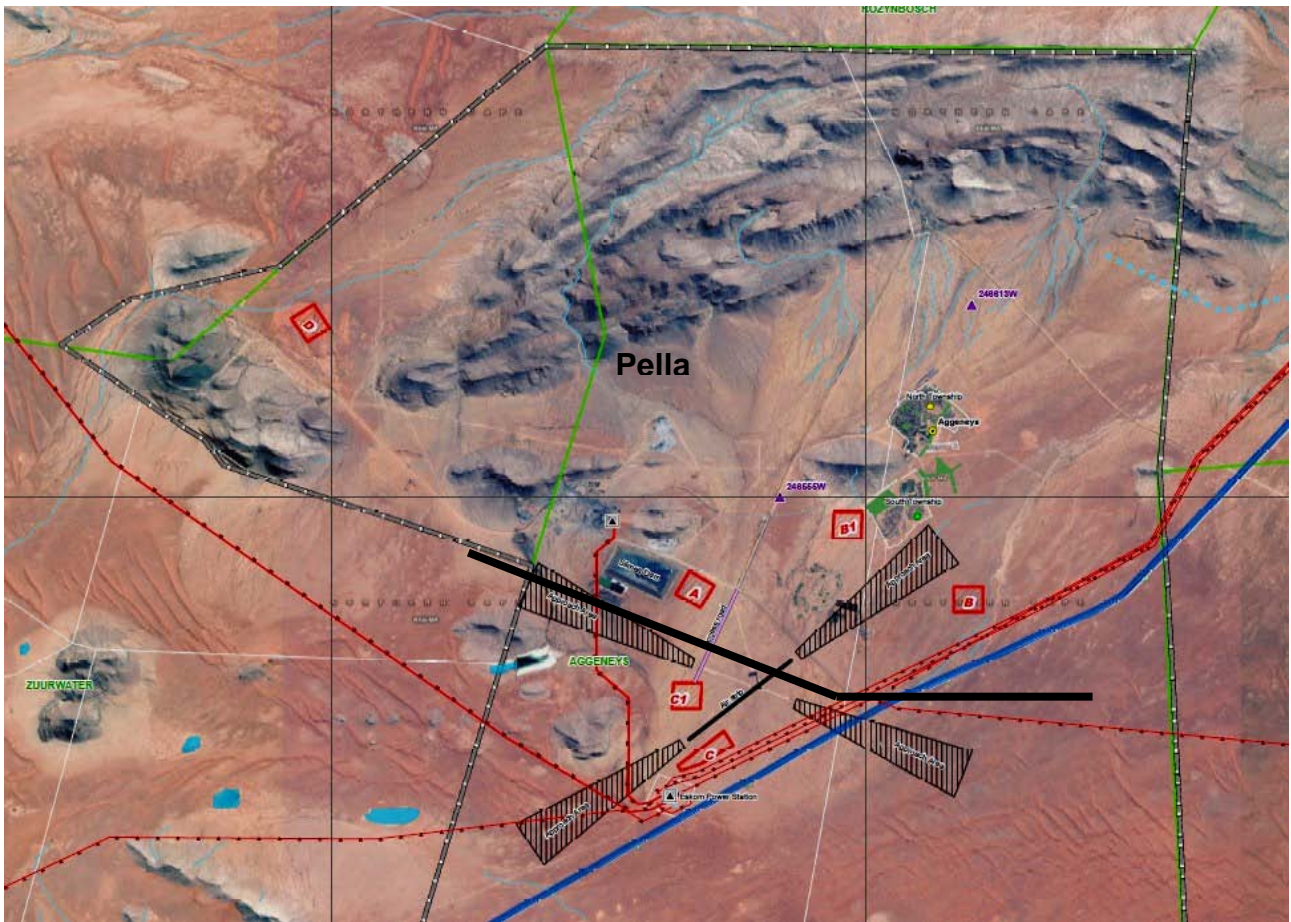
Should substantial fossil remains be exposed during construction, however, the ECO should safeguard these, preferably *in situ*, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.



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## REFERENCES

- AGENBACHT, A.L.D. 2007. The geology of the Pofadder area. Explanation of 1: 250 000 geology sheet 2918. 89 pp. Council for Geoscience, Pretoria.
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- PARTRIDGE, T.C., BOTHA, G.A. & HADDON, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 585-604. Geological Society of South Africa, Marshalltown.



**Fig. 1. Satellite image of the Black Mountain area near Aggeneys, Northern Cape Province, indicating the location of the two sites (A, C) under consideration for the proposed photovoltaic project (Image kindly provided by SRK Consulting).**

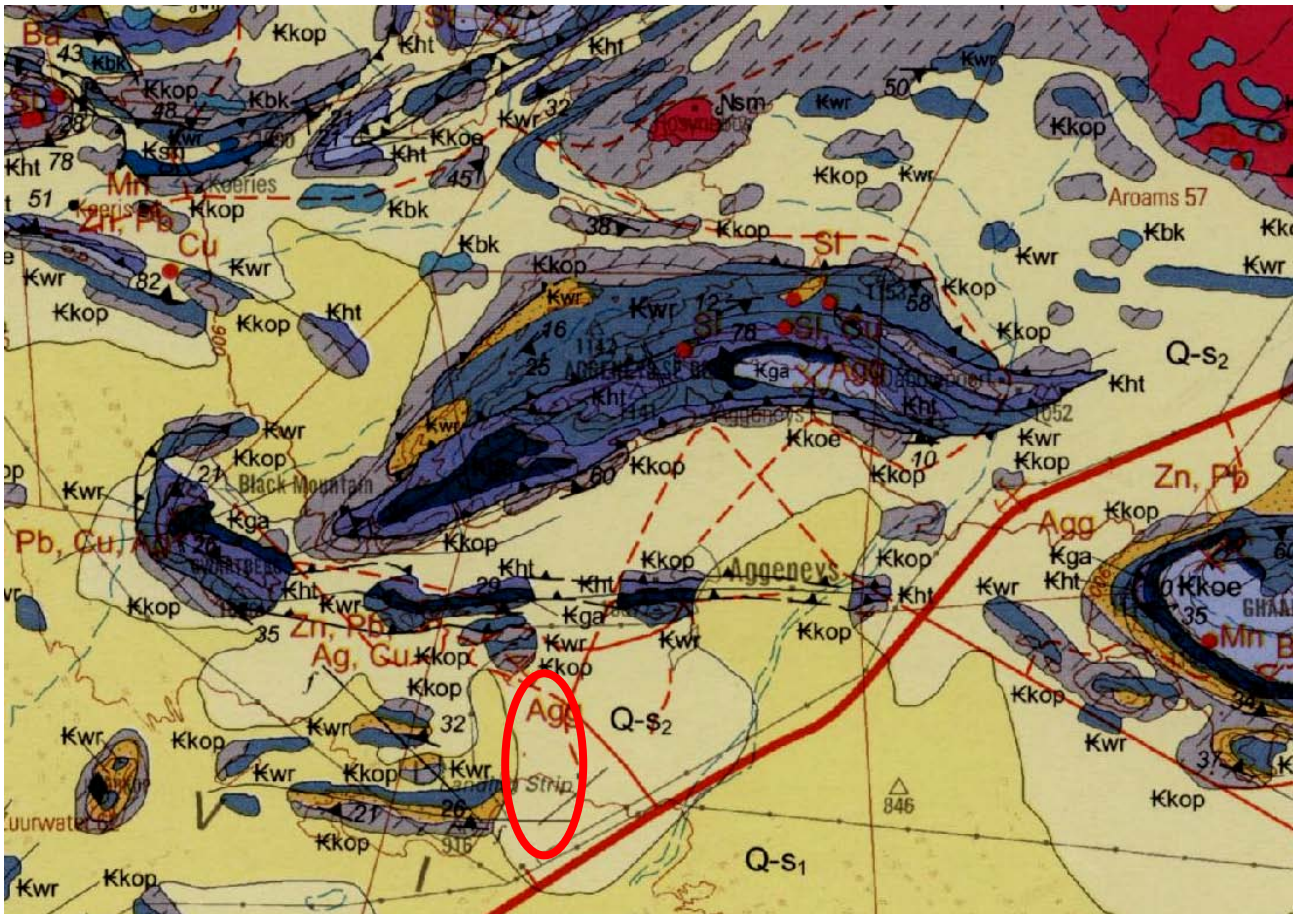


Fig. 2. Extract from 1: 250 000 geological map 2918 Pofadder (Council for Geoscience, Pretoria) showing general area under consideration for the proposed photovoltaic project south of the Black Mountain near Aggeneys (red ellipse).

Geological units mapped in the low-lying study area include Q-s1 (medium yellow) = red aeolian sands of the Gordonia Formation (Kalahari Group) and Q-s2 (pale yellow) = sand, scree, rubble and sandy soil.

## QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape under the aegis of his Cape Town-based company *Natura Viva cc*. He is a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHAP (Association of Professional Heritage Assessment Practitioners – Western Cape).

### Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



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