

RECOMMENDED EXEMPTION FROM FURTHER PALAEOLOGICAL STUDIES:

PROPOSED AMDA BRAVO SOLAR PV DEVELOPMENT ON PORTION 1 OF N'ROUGAS ZUID NO 121, KENHARDT REGISTRATION DIVISION, NORTHERN CAPE

John E. Almond PhD (Cantab.)
Natura Viva cc,
PO Box 12410 Mill Street,
Cape Town 8010, RSA
naturaviva@universe.co.za

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EXECUTIVE SUMMARY

The study area for the proposed AMDA Bravo Solar PV Development on Portion 1 of N'Rougas Zuid No 121 near Kenhardt, Northern Cape, is underlain by Precambrian high grade metamorphic rocks of the Namaqua-Natal Province (Sandnoute Formation). The bedrocks are extensively covered by Late Caenozoic superficial sediments such as alluvium, aeolian sands and surface gravels. Both the Precambrian bedrocks and the superficial sediments are of low palaeontological sensitivity. Significant impacts on local palaeontological heritage are therefore not expected as a consequence of the proposed PV solar development, including the c. 5.5 km long 132 kV overhead transmission line connection to the existing Nieuwehoop Substation. It is recommended that, pending the discovery of substantial new fossils remains during construction of the proposed solar energy facility and of the associated 132 kV transmission lines, exemption from further specialist palaeontological studies and mitigation be granted for this project.

Should any substantial fossil remains (e.g. mammalian bones and teeth) be encountered during construction, these should be safeguarded, preferably *in situ*, and reported by the ECO to the South African Heritage Resources Authority, as soon as possible (SAHRA contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za). This is to ensure that appropriate mitigation action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist. These recommendations should be incorporated into the Environmental Management Plan for the proposed solar energy facility.

1. OUTLINE OF THE PROPOSED DEVELOPMENT

The company AMDA Bravo (Pty) Ltd is proposing to develop a photovoltaic (PV) solar energy facility of 75 MWac net generating capacity - to be known as the AMDA Bravo Solar PV Development - on Portion 1 of N'Rougas Zuid No 121, Kenhardt Registration Division, Northern Cape. The project area is located 12 km to the east of the R27 tar road between Kenhardt and Keimoes and c. 30 km northeast of Kenhardt town centre (Fig. 1). The development site of the Bravo solar facility is approximately 900 Ha in area, and the solar PV development footprint is c. 185 Ha. Key infrastructural components of the development include:

- Solar PV field - solar PV panels on fixed tilt structures or single axis tracking technology;
- Project and collector substations (c. 1 Ha each), connected by a single 132 kV overhead transmission line;
- Buildings (1.5 Ha);
- Access roads – 22 km long, 6 m wide (total 13.2 Ha) including a new access road across the property from the Kenhardt – Louisvale district road;
- Permanent and construction laydown areas (7 Ha and 12 Ha respectively);
- Perimeter fence;
- Water supply from the Municipality or a borehole.

The solar PV development would be connected *via* a single 132 kV overhead transmission line (c. 5.5 km long) to the existing Eskom Nieuwehoop MTS Substation which situated on the farm Gemsbok Bult 120, c. 29 km northeast of Kenhardt (Fig. 2).

This palaeontological heritage assessment comment was commissioned as part of an EIA process for the proposed alternative energy development that is being co-ordinated by Cape EAPrac, George (Contact details: Mr Dale Holder. Cape EAPrac. 5 Progress Street, Eagle View Building, 1st floor. P.O. Box 2070, George, 6530. Tel: 044 874 0365. Fax: 044 874 0432).

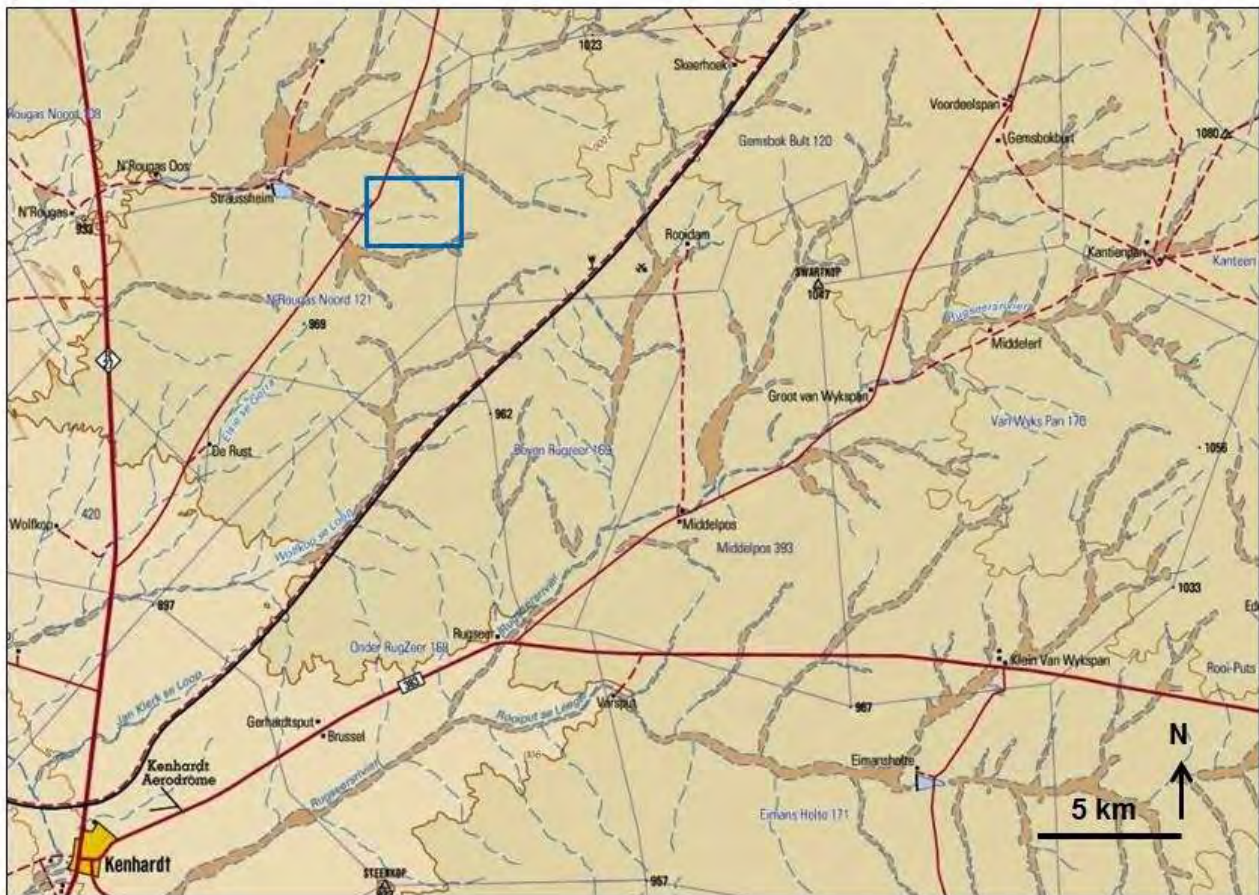


Figure 1. Extract from 1: 250 000 topographical map 2920 Kenhardt (Chief Directorate: National Geospatial Information, Mowbray) showing the approximate location of the AMDA Bravo Solar PV Development study area (blue rectangle) on Portion 1 of N'Rougas Zuid No 121, c. 30 km northeast of Kenhardt, Northern Cape

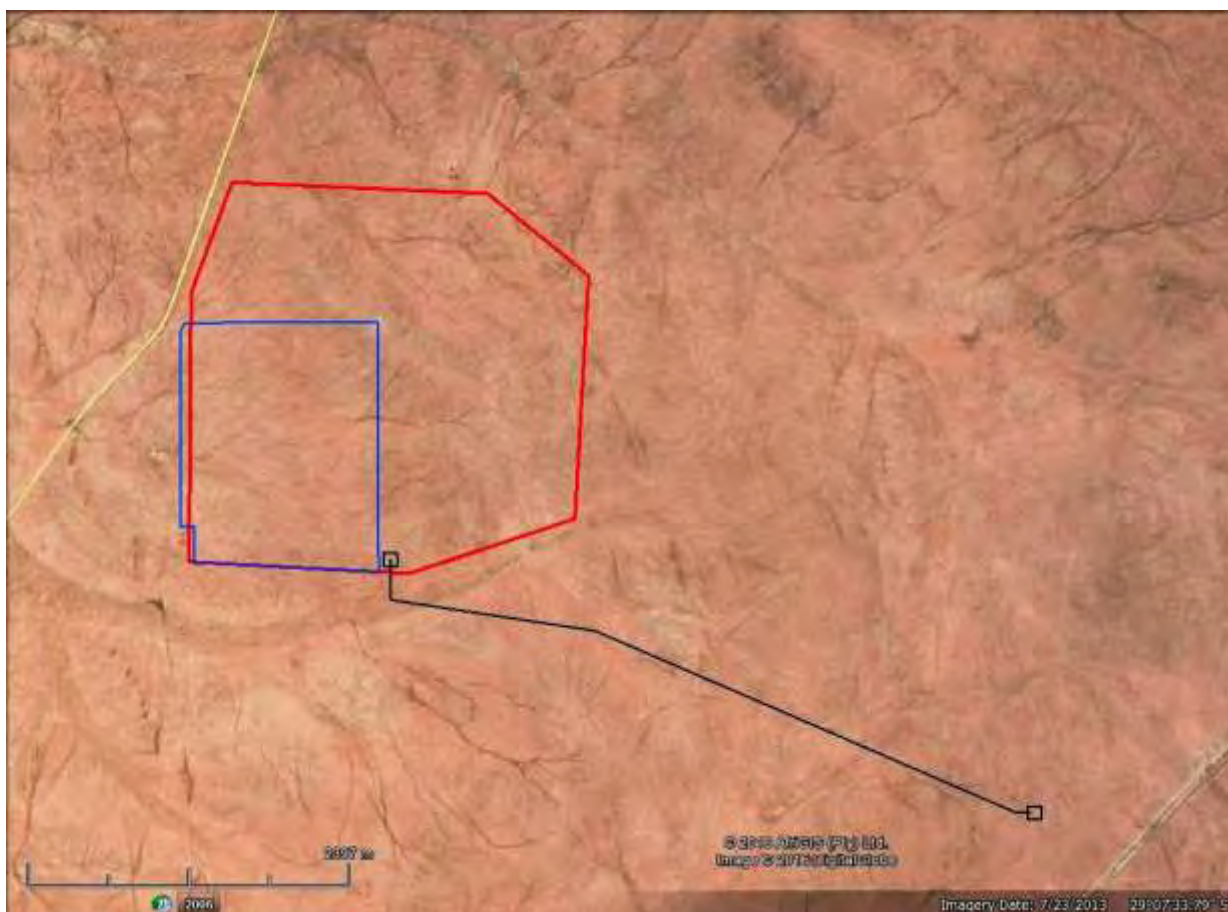


Figure 2: Google earth© satellite image showing the location of the proposed AMDA Bravo Solar PV Development study area on Portion 1 of N'Rougas Zuid No 121, c. 30 km northeast of Kenhardt, Northern Cape (blue polygon). The black line shows the proposed route of the 132 kV transmission line connection to the Nieuwehoop MTS Substation on Gemsbok Bult 120.

2. GEOLOGICAL BACKGROUND

The study area for the proposed AMDA Bravo Solar PV Development project on Portion 1 of N'Rougas Zuid No 121 near Kenhardt is situated in flat-lying terrain within the semi-arid Bushmanland region at elevations between c. 930 to 950 m amsl. It is drained by a dendritic network of shallow, westerly-flowing tributary streams of the Hartbeesrivier. The geology of the study area is shown on 1: 250 000 geology sheet 2920 Kenhardt (Council for Geoscience, Pretoria) (Figure 3) (See also Almond 2016). The entire area – including the proposed short 132 kV transmission line corridor between the solar project area and the existing Nieuwehoop Substation to the southeast - is underlain by a Precambrian basement rocks that are c. 2 billion years old and are assigned to the **Namaqua-Natal Province**. These ancient igneous and high-grade metamorphic rocks - mainly gneisses - crop out at surface as small patches and are entirely unfossiliferous. The basement rock units represented in the study area are assigned to the **Jacomyns Pan Group** and comprise gneisses of the **Sandnoute Formation**. These rock units are described in the Kenhardt 1: 250 000 sheet explanation by Slabbert *et al.* (1999) and placed in the context of the Namaqua-Natal Province by Cornell *et al.* (2006).

A large proportion of the basement rocks in the proposed project area are mantled by a range of superficial sediments of Late Caenozoic age. These predominantly thin, unconsolidated deposits include small patches of calcretes (soil limestones), gravelly to sandy river alluvium, pan sediments along certain watercourses, surface gravels, colluvium (scree) as well as – especially – Quaternary to Recent aeolian (wind-blown) sands of the **Gordonia Formation (Kalahari Group)** (Partridge *et al.* 2006).

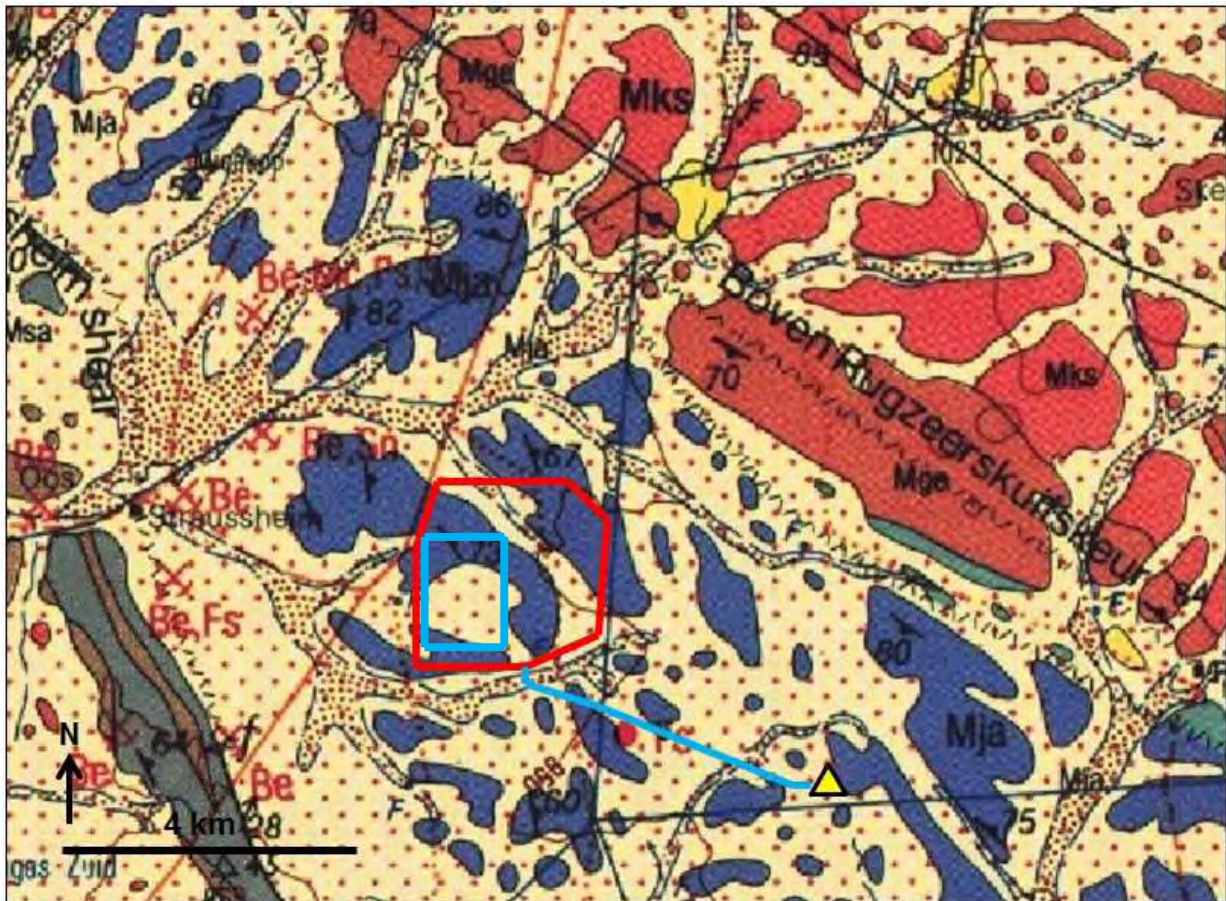


Figure 3. Figure 1. Extract from 1: 250 000 scale geological map sheet 2920 Kenhardt (Council for Geoscience, Pretoria) showing the geology of the AMDA Bravo Solar PV Development study area (blue rectangle) on Portion 1 of N'Rougas Zuid No 121, c. 30 km northeast of Kenhardt, Northern Cape. The pale blue line shows the proposed route of the 132 kV transmission line connection to the Nieuwehoop MTS Substation on Gemsbok Bult 120 (yellow triangle). The study area is underlain by Precambrian bedrocks of the Sandnoute Formation (Jacomyns Pan Group) (Mja, blue). The bedrocks are overlain in many areas by aeolian sands of the Gordonia Formation (Kalahari Group) (Qg, pale yellow with sparse red stipple) and Late Caenozoic alluvium (sands & gravels) (pale yellow with dense stipple).

3. PALAEOLOGICAL HERITAGE

The Precambrian basement rocks represented within the study area are high grade metamorphic rocks that were last metamorphosed some 1 billion years ago and are entirely unfossiliferous.

The fossil record of the Kalahari Group as a whole is generally sparse and low in diversity; no fossils are recorded here in the Kenhardt geology sheet explanation by Slabbert *et al.* (1999). 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 underlying lime-rich bedrocks 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*), tortoise remains and shells of land snails (*e.g. Trigonephrus*) (Almond in Macey *et al.* 2011, Almond & Pether 2008, Almond 2016). Other fossil groups such as freshwater bivalves and gastropods (*e.g. Corbula, Unio*), 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 (Pleistocene to Recent) fluvial and alluvial sands and gravels within the proposed development area are unlikely to contain many, if any, substantial fossil or subfossil remains.

It is concluded that both the bedrocks and superficial sediments underlying the study area are of low palaeontological sensitivity.

4. CONCLUSIONS & RECOMMENDATIONS

The AMDA Bravo Solar PV Development study area, including the solar power plant as well as the 132 kV transmission line corridor to the Nieuwehoop MTS Substation, is underlain by highly metamorphosed gneisses of the Namaqua-Natal Province (Sandnoute Formation) that are extensively covered by Late Caenozoic superficial sediments such as alluvium, aeolian sands and surface gravels. Both the Precambrian bedrocks and the superficial sediments are of low palaeontological sensitivity.

It is concluded that, with or without mitigation, the overall impact of the proposed solar energy facility on Portion 1 of N'Rougas Zuid No 121 is of **LOW SIGNIFICANCE** in palaeontological heritage terms; the proposed development, including the c. 5.5 km long 132 kV overhead transmission line connection to the existing Nieuwehoop MTS Substation, is unlikely to have significant impacts on local palaeontological heritage resources.

It is therefore recommended that, pending the discovery of substantial new fossils remains during construction of the proposed AMDA Bravo Solar PV Development on Portion 1 of

N'Rougas Zuid No 121 and of the associated 132 kV transmission lines, exemption from further specialist palaeontological studies and mitigation be granted for this project.

Should any substantial fossil remains (e.g. mammalian bones and teeth) be encountered during construction, these should be safeguarded, preferably *in situ*, and reported by the ECO to the South African Heritage Resources Authority, as soon as possible (SAHRA contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za). This is to ensure that appropriate mitigation action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist.

These recommendations should be incorporated into the Environmental Management Plan for the proposed solar energy facility.

5. KEY REFERENCES

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6. 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, Limpopo, Northwest, Gauteng, Mpumalanga and the Free State under the aegis of his Cape Town-based company *Natura Viva cc*. He has served as 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 APHP (Association of Professional Heritage 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.



Dr John E. Almond
Palaeontologist, *Natura Viva cc*