

PALAEONTOLOGICAL ASSESSMENT: PROPOSED EXEMPTION FROM FURTHER SPECIALIST
PALAEONTOLOGICAL STUDIES

Proposed integrated access road to authorised Scatec Solar photovoltaic energy facilities on Remaining Extent and Portion 4 of Onder Rugzeer Farm 168 near Kenhardt, Northern Cape Province

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

December 2020

EXECUTIVE SUMMARY

Scatec Solar SA 330 (Pty) Ltd, is proposing to construct an integrated access road for the six photovoltaic (PV) energy facilities that have been authorised on the Remaining Extent of Onder Rugzeer Farm 168, situated some 20 km to the northeast of Kenhardt, falling within the !Kheis and Kai !Garib Municipalities, Northern Cape Province.

The Scatec Solar PV project area lies within the Upington Renewable Energy Development Zone (REDZ7). The Kenhardt region in the south-western portion of REDZ7 has been assessed as of LOW palaeontological sensitivity in the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa. Based on desktop analysis of satellite imagery, geological maps, published scientific literature as well as several previous desktop palaeontological heritage studies for Scatec Solar PV facilities in the Kenhardt region, it is concluded that the integrated access road project area here is generally of LOW to Very LOW palaeosensitivity. However, the possibility of rare, unpredictable, very local pockets of HIGH sensitivity (e.g. due to mammalian bones, teeth) cannot be completely excluded. The access road corridors under consideration avoid crossing major drainage lines. Impacts on local fossil heritage preserved at or beneath the ground surface during the construction phase of the access road are anticipated to be NEGLIGIBLE TO VERY LOW significance. No fatal flaws or No-Go areas in terms of palaeontological heritage resources have been identified at a desktop level within the project footprint. This analysis applies equally to all three access road corridor options under consideration and there is no preference for any particular corridor on palaeontological heritage grounds.

There are no objections on palaeontological heritage grounds to authorization of the proposed integrated access road and no further specialist studies or mitigation for the development are recommended here, pending the potential discovery of scientifically important fossil material before or during the construction phase. Should substantial fossil remains - such as vertebrate bones and teeth, shells, trace fossils or subfossil wood - be encountered at surface or exposed during construction, the ECO should safeguard these, preferably *in situ*. They should then alert the South African Heritage Resources Agency (SAHRA) to ensure that appropriate action (*i.e.* recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the developer's expense. A tabulated Chance Fossil Finds Procedure is appended to this report (Appendix 1).

1. Project outline and brief

The applicant, Scatec Solar SA 330 (Pty) Ltd, is proposing to construct an integrated access road that will provide both construction and operational access to the six photovoltaic (PV) energy facilities that have been authorised on the Remaining Extent of Onder Rugzeer Farm 168, situated some 20 km to the northeast of Kenhardt. The access road project area falls within the !Kheis and Kai !Garib Municipalities, Northern Cape Province (Fig. 1). The authorised PV facilities on this property (indicated in white in Fig. 1) include:

- Kenhardt PV 1 (DEFF Reference: 14/12/16/3/3/2/837);
- Kenhardt PV 2 (DEFF Reference: 14/12/16/3/3/2/838);
- Kenhardt PV 3 (DEFF Reference: 14/12/16/3/3/2/836);
- Kenhardt PV 4 (DEFF Reference: 14/12/16/3/3/1/2125);
- Kenhardt Solar PV Project 5 (DEFF Reference: 14/12/16/3/3/1/2126); and
- Kenhardt Solar PV Project 6 (DEFF Reference: 14/12/16/3/3/1/2127).

The proposed access road would have a maximum width of 12 m (inclusive of side drains and gravel embankments). The access road is assessed here as a 50 m wide corridor in order to allow for micro-sighting during construction. Three access road alternatives are under investigation as part of this environmental process:

- **Access road alternative A**

Access road Alternative A utilises an existing Transnet service road from the R27 to the project site between Kenhardt PV1 and Kenhardt PV2 (thick red line in Fig. 1). This access is approximately 23 kilometres in length and will enter the projects sites at Kenhardt PV1 and Kenhardt PV2. From this point it will utilise the internal road network of the Kenhardt PV 2 project to access the projects to the south. Although this road is largely existing, it would have to be significantly upgraded, including widening, change of horizontal alignments and the formalisation of multiple watercourse crossings.

- **Access road Alternative B**

Access road Alternative B utilises the existing farm track that runs from the R383 in a northerly direction to the Transnet service road (thick dark blue line in Fig. 1). Although this road is existing, it would have to be significantly upgraded from its current status as a farm track; upgrades would include the widening, change of horizontal alignments and the formalisation of multiple watercourse crossings.

- **Access road Alternative C (Preferred)**

Access road Alternative C (thick pale blue line in Fig. 1) is proposed to start at a new access point along the R383. From there it runs along the southern and eastern boundary of Kenhardt PV6 and between Kenhardt PV5 and PV 4, 3 and 2 before crossing the Transnet service road to access Kenhardt PV1. It also includes a short lateral link to access the substation on Kenhardt PV3.

Access road alternative C is the preferred access for the following reasons:

1. It provides access to all 6 project sites, without the need to cross the PV fields;
2. It avoids all sensitive watercourses, including the main watercourse and secondary drainage lines;
3. Other than the point where it crosses the Transnet service road, it remains within the affected property; and

4. The same access can be utilised for both the construction and operational access of the area.

Desktop palaeontological heritage assessments for all six of the authorised Scatec Solar PV energy facilities on the Remaining Extent of Onder Rugzeer Farm 168 and associated grid connections have been previously submitted by the present author (Almond 2016a-d, 2019a-c). The proposed integrated access road corridor for the Scatec Solar PV facilities will traverse potentially fossiliferous sedimentary rocks. Although a palaeontological heritage study has not been identified as a requirement for this development by the DEFF Screening Tool, the present desktop Palaeontological Heritage Comment has been commissioned by the EAP responsible for the relevant Basic Assessment Process, viz. Cape EAPrac, George (Contact details: Mr Dale Holder. Cape EAPrac. 17 Progress Street, George. PO Box 2070, George 6530. Tel: 044 874 0365. Fax: 044 874 0432. E-mail: dale@cape-eaprac.co.za).

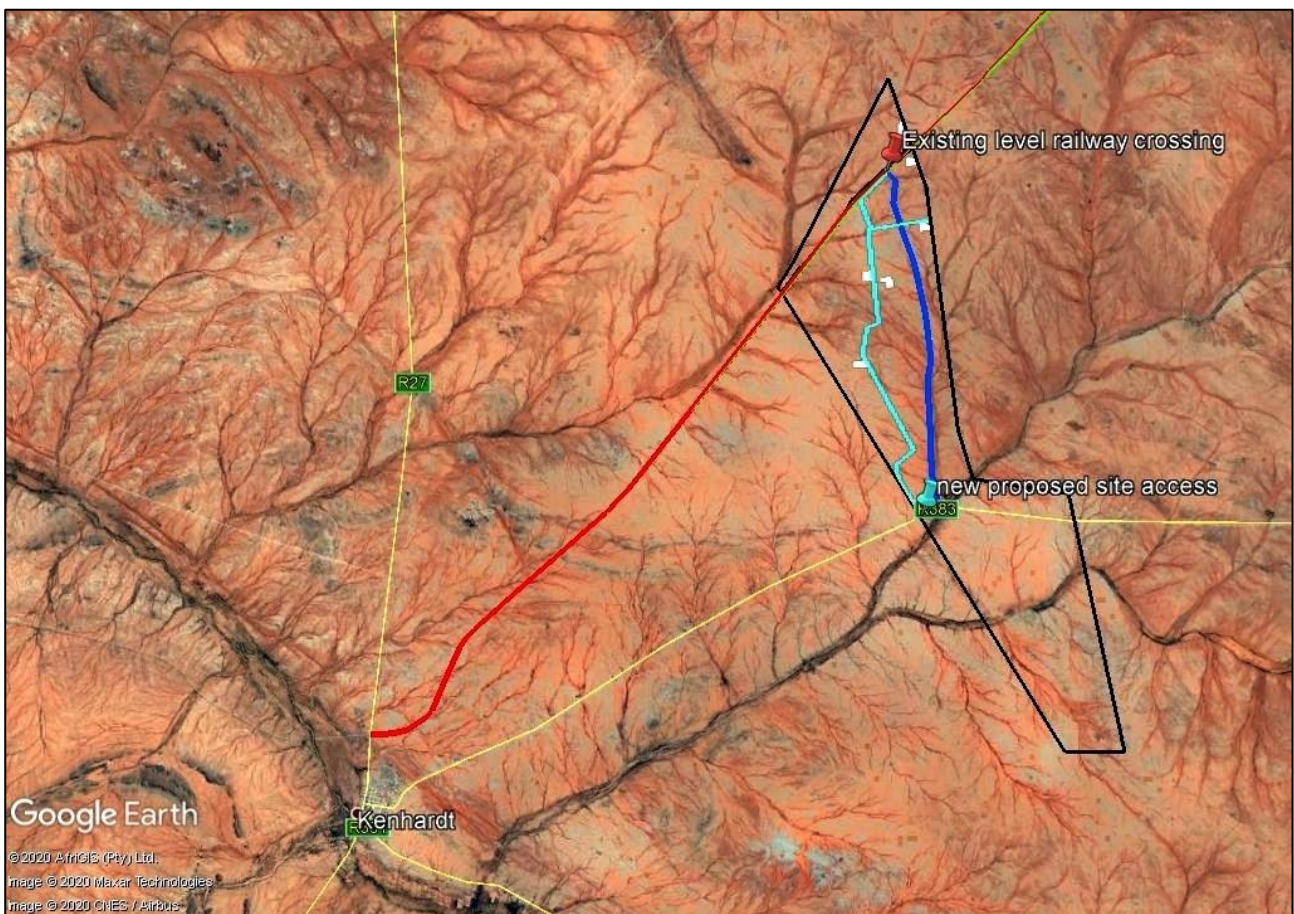


Figure 1: Google Earth© satellite image of the Scatec Solar access road project area on the Remaining Extent and Portion 4 of Onder Rugzeer Farm 168 (black polygon) situated c. 20 km to the northeast of Kenhardt, Northern Cape Province. Access road route Alternatives A (red), B (dark blue) and C (pale blue, preferred option) are indicated here. Note that the access road corridors under consideration avoid crossing major drainage lines.

1.1. Information sources

The present desktop palaeontological heritage report is primarily based on the following information sources:

1. A detailed project outline, kmz files, screening report and maps provided by Cape EAPrac;
2. Several previous desktop palaeontological heritage studies for the Scatec Solar PV facilities and grid connections by the author (Almond 2016a-d, 2019a-c).
3. A desktop review of (a) the relevant 1:50 000 and 1:250 000 scale topographic maps, (b) Google Earth© satellite imagery, (c) published geological and palaeontological literature, including 1:250 000 geological maps (2920 Kenhardt) and relevant sheet explanations (Slabbert *et al.* (1999) as well as (d) several previous fossil heritage (PIA) assessments in the Kenhardt region by the author and palaeontological colleagues (These are listed in the desktop PIAS for the Scatec Solar projects);
4. The author's field experience with the formations concerned and their palaeontological heritage (*cf* Almond & Pether 2008, Almond *in* Fourie *et al.* 2014 and PIA reports listed in the References).

2. Geological context

The geology of the Scatec Solar access road project area to the northeast of Kenhardt has been treated in previous desktop PIA reports by Almond (2016a-d, 2019a-c) who gives full references therein. The project area is situated within the semi-arid Bushmanland region and is drained by a dendritic network of shallow, southwest-flowing tributary streams of the Hartbeesrivier, such as the Rugseersrivier in the south and the Wolfkop se Loop in the north (Figure 1).

The geology of the project area is shown on 1: 250 000 geology sheet 2920 Kenhardt (Council for Geoscience, Pretoria) (Figure 2). The entire area is underlain at depth by a variety of Precambrian basement rocks that are c. 1-2 billion years old and are assigned to the **Namaqua-Natal Province**. These ancient igneous and high-grade metamorphic rocks - mainly granites and gneisses - crop out at surface as small patches and are entirely unfossiliferous. 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).

For the most part the basement rocks in the proposed project area are mantled by a range of superficial sediments of Late Cenozoic age, some of which are included within the **Kalahari Group**. 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). The geology of the Late Cretaceous to Recent Kalahari Group is reviewed by Thomas (1981), Dingle *et al.* (1983), Thomas & Shaw (1991), Haddon (2000) and Partridge *et al.* (2006).

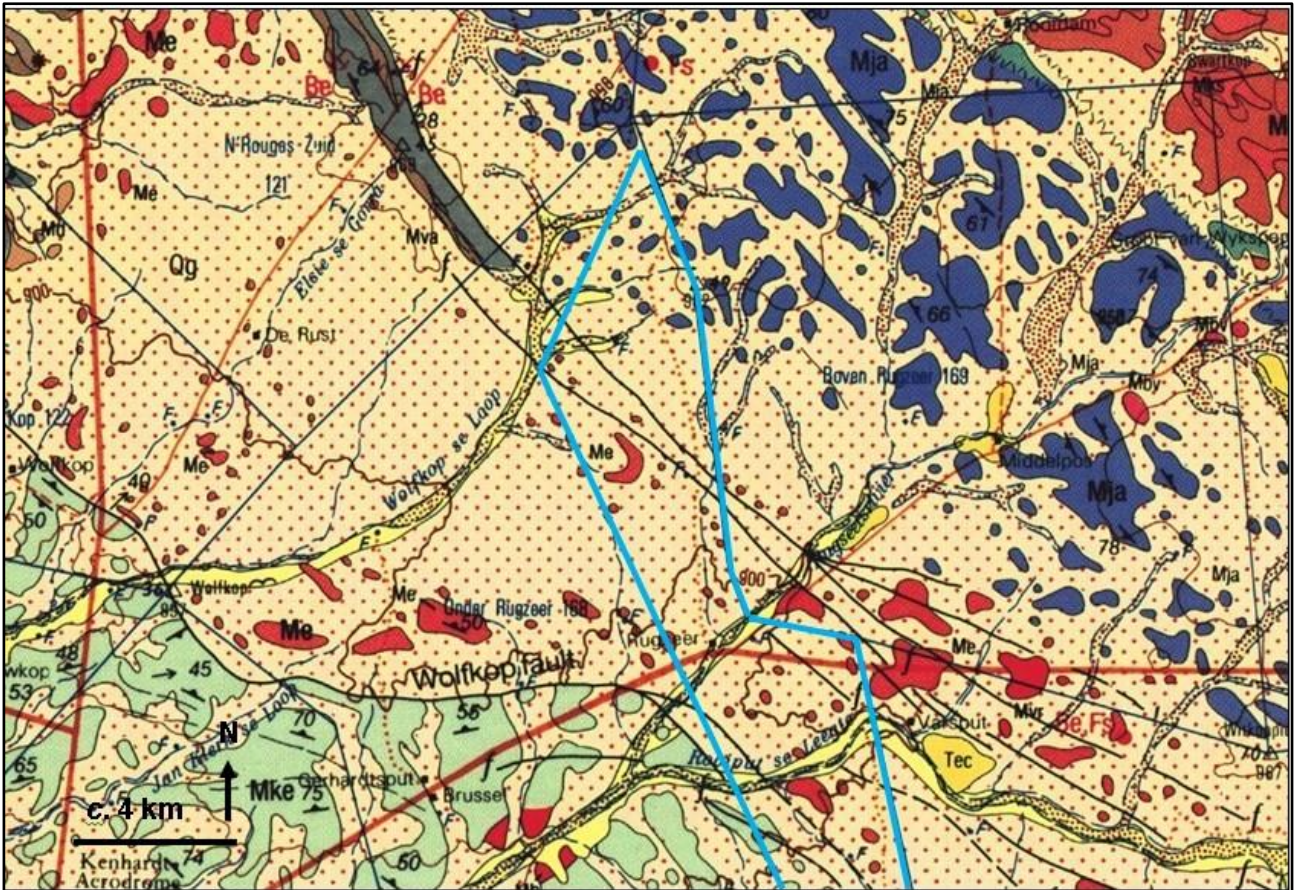


Figure 2: Extract from 1: 250 000 scale geological map sheet 2920 Kenhardt (Council for Geoscience, Pretoria) showing the geology of the Scatec Solar PV Facility access road project area to the northeast of Kenhardt, Northern Cape. The northern sector of Farm Onder Rugzeer 168, where the authorised PV solar facilities are located is indicated by the pale blue polygon. The main geological units represented within the broader Scatec Solar access road project area include:

PRECAMBRIAN KEIMOOES SUITE:

- Red (Me) = Elsie se Gorra Granite

PRECAMBRIAN KORANNALAND SUPERGROUP:

- Brown (Mva) = Valsvlei Formation, Biesje Poort Group
- Grey (Msa) = Sandputs Formation, Biesje Poort Group
- Blue (Mja) = Sandnoute Formation, Jacomyns Pan Group

VYFBEKER METAMORPHIC SUITE:

- Pale blue-green (Mke) = Kenhardt Migmatite

LATE CAENOZOIC SUPERFICIAL SEDIMENTS:

- Pale yellow with sparse red stipple (Qg) = aeolian sands of the Gordonia Formation (Kalahari Group)
- Pale yellow with dense red stipple = alluvial and pan sediments
- Dark yellow (Tec) = calcrete

The inferred palaeosensitivity of the entire access road project area is LOW to VERY LOW.

3. Potential palaeontological issues

The palaeontological heritage recorded within the rock units represented within the Scatec Solar access road project area has been covered, with references, in previous PIA reports by Almond (2016a-d, 2019a-c) (See also Table 1 below). The **Precambrian basement rocks** represented within the study area are igneous granitoids or high grade metamorphic rocks such as gneisses of the Namaqua-Natal Province that were last metamorphosed some 1 billion years ago and are entirely unfossiliferous. The fossil record of Late Caenozoic superficial sediments of the **Kalahari Group** in the Bushmanland region is very sparse and these deposits are generally considered to be of low palaeosensitivity. To the author's knowledge, there are no fossil records from the broader Scatec Solar project area itself and no palaeontological fieldwork has been undertaken here. The Scatec Solar PV project area lies within the Upington Renewable Energy Development Zone (REDZ7). The Kenhardt region in the south-western portion of REDZ7 was assessed as of LOW palaeontological sensitivity in the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa (Almond *in* Fourie *et al.* 2014).

Table 1: Fossil heritage recorded from the major rock units that are represented within the broader Scatec Solar project area to the northeast of Kenhardt, Northern Cape

GEOLOGICAL UNIT	ROCK TYPES AND AGE	FOSSIL HERITAGE	PALAEONTOLOGICAL SENSITIVITY
LATE CAENOZOIC SUPERFICIAL SEDIMENTS, especially ALLUVIAL AND PAN SEDIMENTS	fluvial, pan, lake and terrestrial sediments, including diatomite (diatom deposits), pedocretes (e.g. calcrete), colluvium (slope deposits such as scree), aeolian sands (Gordonia Formation, Kalahari Group) LATE TERTIARY, PLEISTOCENE TO RECENT	bones and teeth of wide range of mammals (e.g. mastodont proboscideans, rhinos, bovids, horses, micromammals), fish, reptiles (crocodiles, tortoises), ostrich egg shells, fish, freshwater and terrestrial molluscs (unionid bivalves, gastropods), crabs, trace fossils (e.g. calcretised termitaria, horizontal invertebrate burrows, stone artefacts), petrified wood, leaves, rhizoliths, stromatolites, diatom floras, peats and palynomorphs.	GENERALLY LOW BUT LOCALLY HIGH (e.g. Tertiary alluvium associated with old river courses)
Basement granites and gneisses NAMAQUA-NATAL PROVINCE	Highly-metamorphosed sediments, intrusive granites MID-PROTEROZOIC (c.1-2 billion years old)	None	ZERO

4. Conclusions and recommendations

Based on desktop analysis of satellite imagery, geological maps, published scientific literature as well as several previous desktop palaeontological heritage studies for Scatec Solar PV facilities in the Kenhardt region, it is concluded that the integrated access road project area here is generally of LOW to Very LOW palaeosensitivity. However, the possibility of rare, unpredictable, very local pockets of HIGH sensitivity (e.g. due to mammalian bones, teeth) cannot be completely excluded. The access road corridors under consideration avoid crossing major drainage lines. Impacts on local fossil heritage preserved at or beneath the ground surface during the construction phase of the access road are anticipated to be NEGLIGIBLE TO VERY LOW significance. No fatal flaws or No-Go areas in terms of palaeontological heritage resources have been identified at a desktop

level within the project footprint. This analysis applies equally to all three access road corridor options under consideration and there is no preference for any particular corridor on palaeontological heritage grounds.

There are no objections on palaeontological heritage grounds to authorization of the proposed integrated access road and no further specialist studies or mitigation for the development are recommended here, pending the potential discovery of scientifically important fossil material before or during the construction phase. Should substantial fossil remains - such as vertebrate bones and teeth, shells, trace fossils or subfossil wood - be encountered at surface or exposed during construction, the ECO should safeguard these, preferably *in situ*. They should then alert the South African Heritage Resources Agency (SAHRA) to ensure that appropriate action (*i.e.* recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the developer's expense. A tabulated Chance Fossil Finds Procedure is appended to this report (Appendix 1).

5. Key references

ALMOND, J.E. & PETHER, J. 2008. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp. Natura Viva cc., Cape Town.

ALMOND, J.E. 2016a. Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 1) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province: palaeontological impact assessment, 31 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2016b. Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 2) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province: palaeontological impact assessment, 31 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2016c. Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province: palaeontological impact assessment, 31 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2016d. Basic Assessment for three proposed 132 kV transmission lines connecting Kenhardt Solar Photovoltaic Facilities PV1, PV2 and PV3 on Onder Rugzeer Farm 168 to the Nieuwehoop Substation on Gemsbok Bult 120, north-east of Kenhardt, Northern Cape Province: palaeontological impact assessment, 32 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2019a. Basic Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (KENHARDT PV4) on Onder Rugzeer Farm 168 and associated electrical infrastructure, north-east of Kenhardt, Northern Cape Province. Palaeontological impact assessment, 35 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2019b. Basic Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (KENHARDT PV5) on Onder Rugzeer Farm 168 and associated electrical infrastructure, north-east of Kenhardt, Northern Cape Province. Palaeontological impact assessment, 35 pp. Natura Viva cc, Cape Town.

ALMOND, J.E. 2019c. Basic Assessment for the Proposed Development of a 100 MW Solar Photovoltaic Facility (KENHARDT PV6) on Onder Rugzeer Farm 168 and associated electrical infrastructure, north-east of Kenhardt, Northern Cape Province. Palaeontological impact assessment, 35 pp. Natura Viva cc, Cape Town.

CORNELL, D.H., THOMAS, R.J., MOEN, H.F.G., REID, D.L., MOORE, J.M. & GIBSON, R.L. 2006. The Namaqua-Natal Province. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 461-499. Geological Society of South Africa, Marshalltown.

DINGLE, R.V., SIESSER, W.G. & NEWTON, A.R. 1983. Mesozoic and Tertiary geology of southern Africa. viii + 375 pp. Balkema, Rotterdam.

DU TOIT, A. 1954. The geology of South Africa. xii + 611pp, 41 pls. Oliver & Boyd, Edinburgh.

FOURIE, W., ALMOND, J. & ORTON, J. 2014. Strategic environmental assessment for wind and solar photovoltaic energy in South Africa. Appendix A3: Heritage Scoping Assessment Report, 79 pp. CSIR.

HADDON, I.G. 2000. Kalahari Group sediments. In: Partridge, T.C. & Maud, R.R. (Eds.) The Cenozoic of southern Africa, pp. 173-181. Oxford University Press, Oxford.

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.

SAHRA 2013. Minimum standards: palaeontological component of heritage impact assessment reports, 15 pp. South African Heritage Resources Agency, Cape Town.

SLABBERT, M.J., MOEN, H.F.G. & BOELEMA, R. 1999. Die geologie van die gebied Kenhardt. Explanation to 1: 250 000 geology Sheet 2920 Kenhardt, 123 pp. Council for Geoscience, Pretoria.

THOMAS, M.J. 1981. The geology of the Kalahari in the Northern Cape Province (Areas 2620 and 2720). Unpublished MSc thesis, University of the Orange Free State, Bloemfontein, 138 pp.

THOMAS, D.S.G. & SHAW, P.A. 1991. The Kalahari environment, 284 pp. Cambridge University Press.

6. Acknowledgements

Mr Dale Holder of Cape EAPrac, George is thanked for commissioning this study and for providing the necessary background project information.

7. 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 Province,

Mpumalanga, Gauteng, KwaZulu-Natal 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 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)

APPENDIX 1 - CHANCE FOSSIL FINDS PROCEDURE: Integrated access road for Scatec Solar PV Facilities near Kenhardt	
Province & region:	NORTHERN CAPE: !Kheis and Kai !Garib Municipalities
Responsible Heritage Resources Agency	SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za).
Rock unit(s)	Kalahari Group, including Gordonia Formation aeolian sands and Late Caenozoic alluvium.
Potential fossils	Vertebrate bones, teeth, plant material, freshwater molluscs and calcretised trace fossils in the Kalahari Group superficial sediments.
ECO protocol	1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (<i>N.B.</i> safety first!), safeguard site with security tape / fence / sand bags if necessary.
	2. Record key data while fossil remains are still <i>in situ</i> : <ul style="list-style-type: none"> • Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo • Context – describe position of fossils within stratigraphy (rock layering), depth below surface • Photograph fossil(s) <i>in situ</i> with scale, from different angles, including images showing context (e.g. rock layering)
	3. If feasible to leave fossils <i>in situ</i> : <ul style="list-style-type: none"> • Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation • Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency for work to resume
	3. If <i>not</i> feasible to leave fossils <i>in situ</i> (emergency procedure only): <ul style="list-style-type: none"> • <i>Carefully</i> remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock) • Photograph fossils against a plain, level background, with scale • Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags • Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist • Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.
5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency	
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.