Appendix D-7: Palaeontological Desktop Assessment

Proposed development of a Solar PV Facility at Greenbushes, Eastern Cape

PALAEONTOLOGICAL DESKTOP REPORT

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For:

CEN IEM Unit

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8 October 2022

Table of Contents:

1. Executive Summary……....3
2. Introduction…….....4
3.Terms of reference for the report…….....5
4. Details of study site and the type of assessment..……...8
5. Geological setting of the study site..…….....9
6. Palaeontological potential of the study site..…… 11
7. Conclusion and Recommendations……..……..……..14
8. Declaration of independence..... 16

List of Figures:

Figure 1: Google Earth photo of study site…….8

Figure 2: Geological Map of the study area (adapted from the 3324 PORT ELIZABETH 1: 250 000 Geology Map, Council for Geoscience, 1991)…….9

Figure 3: Palaeosensitivity map (SAHRA, 2019) of the area where the planned development is going to take place……11

Figure 4: Example of eurypterid trackway…….……12

Figure 5: Coquina from Motherwell, Gqeberha……..……...12

1. Executive summary

There is a possibility of finding fossils in the study site. The study site is underlain by the Peninsula Formation of the Table Mountain Group that is considered to be of High Palaeosensitivity. This report supports this conclusion.

The fossils of this unit consist mostly of invertebrate trackways. The fossils of the Peninsula Formation are not distributed ubiquitously throughout the formation however and may vary greatly in density, quality and scientific value. The Chance Palaeontological Finds Procedure (pp. 14-15) should be followed if a significant fossil discovery is made during construction.

2. Introduction

The Heritage Act of South Africa stipulates that fossils and fossil sites may not be altered or destroyed. The purpose of this document is to detail the probability of finding fossils in the study area that may be impacted by the proposed development.

The palaeontological heritage of South Africa is unsurpassed and can only be described in superlatives. The South African palaeontological record gives us insight in inter alia the origin of dinosaurs, mammals and humans. Fossils are also used to identify rock strata and determine the geological context of the subregion with other continents and played a crucial role in the discovery of Gondwanaland and the formulation of the theory of plate tectonics. Fossils are also used to study evolutionary relationships, sedimentary processes and palaeoenvironments.

South Africa has the longest record of palaeontological endeavour in Africa. South Africa was even one of the first countries in the world in which museums displayed fossils and palaeontologists studied earth history. South African palaeontological institutions and their vast fossil collections are world-renowned and befittingly the South African Heritage Act is one of the most sophisticated and best considered in the world.

Fossils and palaeontological sites are protected by law in South Africa. Construction in fossiliferous areas may be mitigated in exceptional cases but there is a protocol to be followed.

This is a Palaeontological Desktop Study that was prepared in line with the South African Heritage Resources Act (Act 25 of 1999) and Appendix 6 of the Environmental Impact Assessment Regulations 2014 as amended and the General Assessment Protocol for Site Sensitivity Verification. This involved an overview of the literature on the palaeontology and associated geology of the area for a Desktop Report.

3. Terms of reference for the report

According to the South African Heritage Resources Act (Act 25 of 1999) (Republic of South Africa, 1999), certain clauses are relevant to palaeontological aspects for a terrain suitability assessment.

- **Subsection 35(4)** No person may, without a permit issued by the responsible heritage resources authority-
- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
- (c) trade in, sell for private gain, export or attempt to export from the republic any category of archaeological or palaeontological material or object, or any meteorite; or
- (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist with the detection or recovery of metals or archaeological material or objects, or use such equipment for the recovery of meteorites.
- **Subsection 35(5)** When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedures in terms of section 38 has been followed, it may-
- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
- (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
- (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
- (d) recover the costs of such investigation form the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

South Africa’s unique and non-renewable palaeontological heritage is protected in terms of the NHRA. According to this act, heritage resources may not be excavated, damaged, destroyed or otherwise impacted by any development without prior assessment and without a permit from the relevant heritage resources authority.

As areas are developed and landscapes are modified, heritage resources, including palaeontological resources, are threatened. As such, both the environmental and heritage legislation require that development activities must be preceded by an assessment of the impact undertaken by qualified professionals. Palaeontological Impact Assessments (PIAs) are specialist reports that form part of the wider heritage component of:

- Heritage Impact Assessments (HIAs) called for in terms of Section 38 of the National Heritage Resources Act, Act No. 25, 1999 by a heritage resources authority.
- Environmental Impact Assessment process as required in terms of other legislation listed in s. 38(8) of NHRA;
- Environmental Management Plans (EMPs) required by the Department of Mineral Resources.

HIAs are intended to ensure that all heritage resources are protected, and where it is not possible to preserve them in situ, appropriate mitigation measures are applied. An HIA is a comprehensive study that comprises a palaeontological, archaeological, built environment, living heritage, etc specialist studies. Palaeontologists must acknowledge this and ensure that they collaborate with other heritage practitioners. Where palaeontologists are engaged for the entire HIA, they must refer heritage components for which they do not have expertise on to appropriate specialists. Where they are engaged specifically for the palaeontology, they must draw the attention of environmental consultants and developers to the need for assessment of other aspects of heritage. In this sense, Palaeontological Impact Assessments that are part of Heritage Impact Assessments are similar to specialist reports that form part of the EIA reports. The standards and procedures discussed here are therefore meant to guide the conduct of PIAs and specialists undertaking such studies must adhere to them. The process of assessment for the palaeontological (PIA) specialist components of heritage impact assessments, involves:

Scoping stage in line with African Heritage Resources Act (Act 25 of 1999) and Appendix 6 of the Environmental Impact Assessment Regulations 2014 as amended and the General Assessment Protocol for Site Sensitivity Verification. This involves an **initial assessment** where the specialist evaluates the scope of the project (based, for example, on NID/BIDs) and advises on the form and extent of the assessment process. At this stage the palaeontologist may also decide to compile a **Letter of Recommendation for Exemption from further Palaeontological Studies**. This letter will state that there is little or no likelihood that any significant fossil resources will be impacted by the development. This letter should present a reasoned case for exemption, supported by consultation of the relevant geological maps and key literature.

A **Palaeontological Desktop Study** – the palaeontologist will investigate available resources (geological maps, scientific literature, previous impact

assessment reports, institutional fossil collections, satellite images or aerial photos , etc) to inform an assessment of fossil heritage and/or exposure of potentially fossiliferous rocks within the study area. A Desktop studies will conclude whether a further field assessment is warranted or not. Where further studies are required, the desktop study would normally be an integral part of a field assessment of relevant palaeontological resources.

A **Phase 1 Palaeontological Impact Assessment** is generally warranted where rock units of high palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large-scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil remains in the proposed project area is unknown. In the recommendations of Phase 1, the specialist will inform whether further monitoring and mitigation are necessary. The Phase 1 should identify the rock units and significant fossil heritage resources present, or by inference likely to be present, within the study area, assess the palaeontological significance of these rock units, fossil sites or other fossil heritage, comment on the impact of the development on palaeontological heritage resources and make recommendations for their mitigation or conservation, or for any further specialist studies that are required in order to adequately assess the nature, distribution and conservation value of palaeontological resources within the study area.

A **Phase 2 Palaeontological Mitigation** involves planning the protection of significant fossil sites, rock units or other palaeontological resources and/or the recording and sampling of fossil heritage that might be lost during development, together with pertinent geological data. The mitigation may take place before and / or during the construction phase of development. The specialist will require a Phase 2 mitigation permit from the relevant Heritage Resources Authority before Phase 2 may be implemented.

A **'Phase 3' Palaeontological Site Conservation and Management Plan** may be required in cases where the site is so important that development will not be allowed, or where development is to co-exist with the resource. Developers may be required to enhance the value of the sites retained on their properties with appropriate interpretive material or displays as a way of promoting access of such resources to the public.

The assessment reports will be assessed by the relevant heritage resources authority, and depending on which piece of legislation triggered the study, a response will be given in the form of a Review Comment or Record of Decision (ROD). In the case of PIAs that are part of EIAs or EMPs, the heritage resources authority will issue a comment or a record of decision that may be forwarded to the consultant or developer, relevant government department or heritage practitioner and where feasible to all three.

4. Details of study area and the type of assessment:

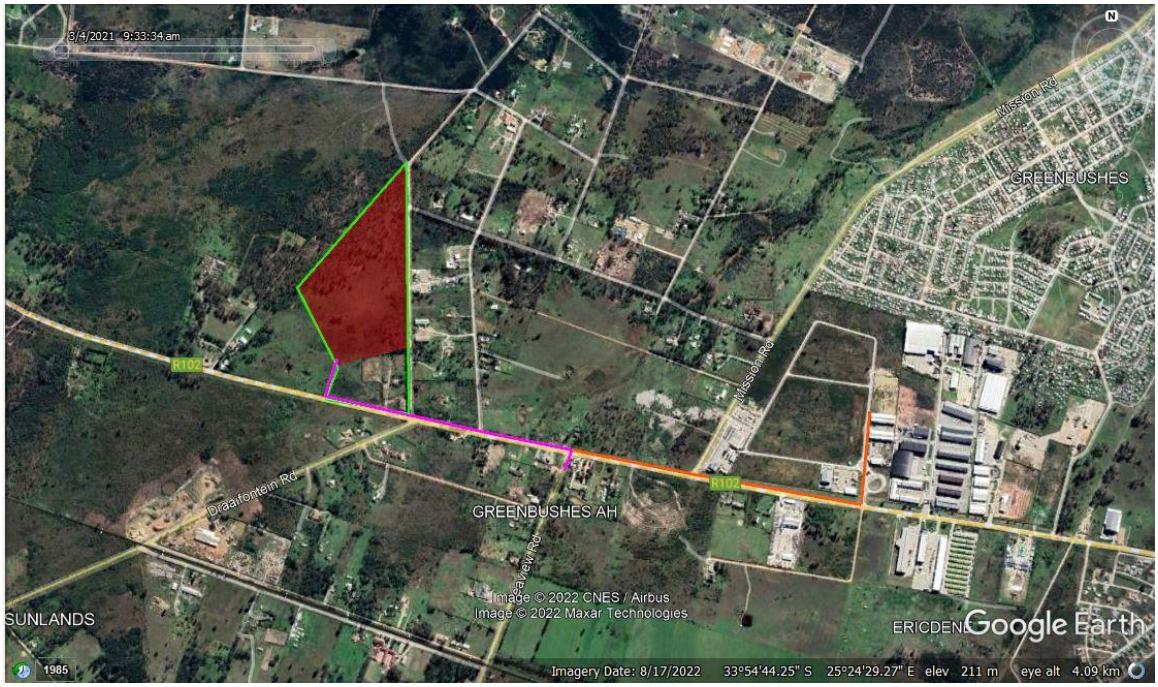

Figure 1: Google Earth photo of study site

The area earmarked for development is situated on the western periphery of the residential area of Greenbushes on the western urban edge of Gqeberha, Eastern Cape. The study site lies north of the R102 (see Fig. 1).

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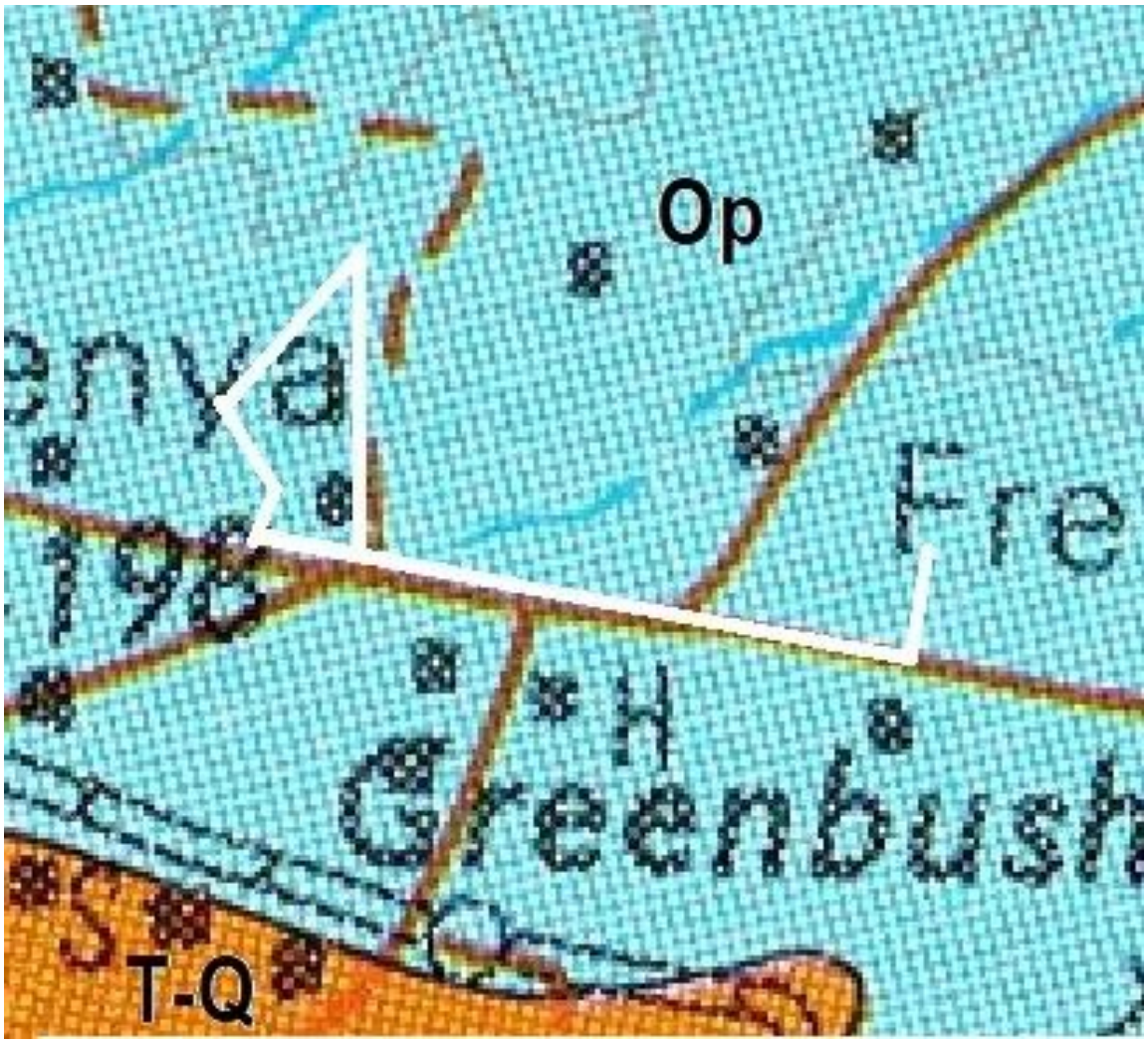
The relevant literature and geological maps for the region in which the development is proposed to take place, have been studied for a Desktop Report.

5. Geological setting of the study area



The white lines indicate the study site.

Figure 2: Geological Map of the study area (adapted from the 3324 PORT ELIZABETH 1: 250 000 Geology Map, Council for Geoscience, 1991)

LEGEND:

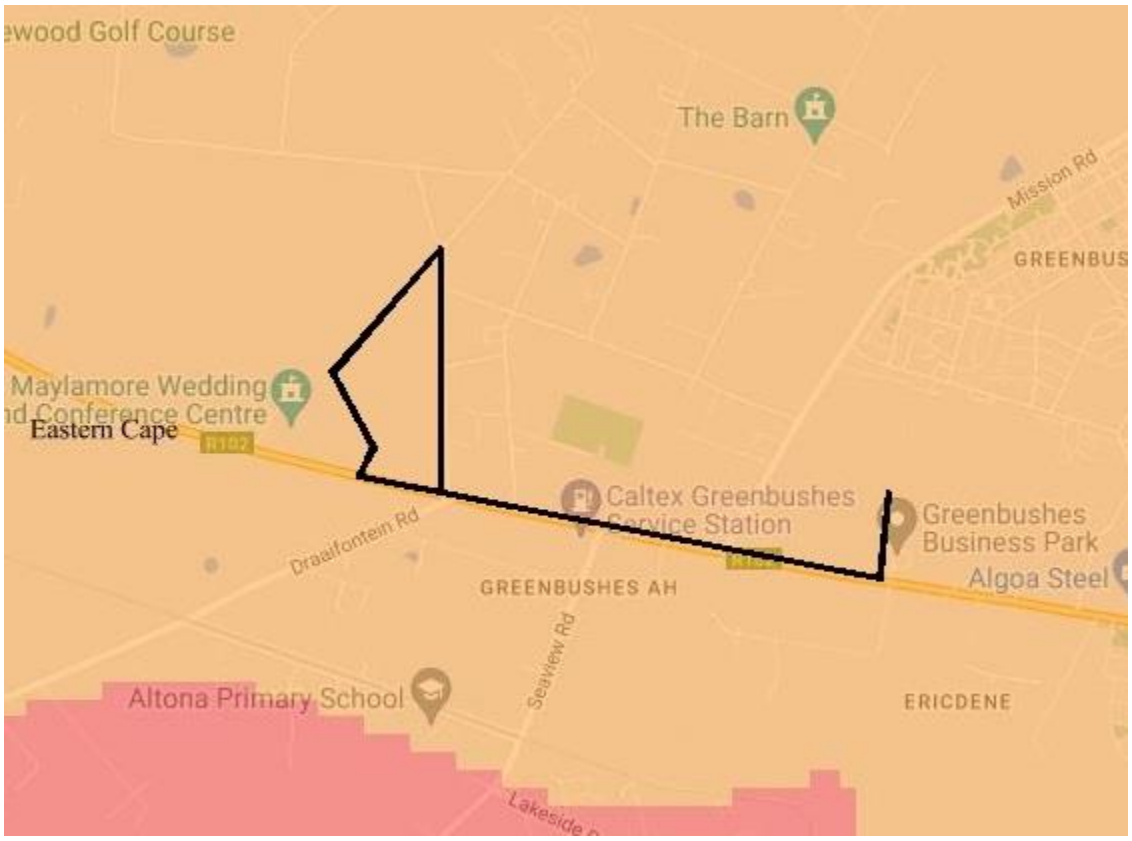
	Lithology	Stratigraphy	Age
T-Q	Calcareous sandstone, conglomerate, coquinite	Nanaga Formation of the Algoa Group	Pliocene to Pleistocene
Op	Quarzitic sandstone	Peninsula Formation of the Table Mountain Group of the Cape Supergroup	Ordovician

The geology of the study area is characterised by Jurassic – Quaternary sedimentary rocks consisting of fine-grained estuarine and marine shelf sediments and recent alluvium that were set down on the Ordovician aged Peninsula Sandstone Formation of the Table Mountain Group of the Cape Supergroup (see Fig. 2).

The Peninsula Formation forms the main unit of the Table Mountain Group and can reach maximum thicknesses of about 2 700 m in the Eastern Cape. The quartz arenite, minor shale and conglomerate that comprise the Peninsula Formation were set down as sand, mud, gravel and pebbles in fluvial braid-plain and shallow marine environments during the Ordovician (Thamm & Johnson, 2009).

The adjacent Nangana Formation of the Algoa Group comprises of coastal dune fields that were deposited during the Pliocene to the Early Pleistocene on the older Peninsula Formation. This unit of medium-grained, cross-bedded calcareous sandstone and calcretes may be up to 250 m thick in places (Roberts et al., 2009).

6. Palaeontological potential of the study area



Study site is indicated by the blue, dark red and orange lines

Figure 3: Palaeosensitivity map (SAHRA, 2022) of the area where the planned development is going to take place

KEY		
COLOUR	SENSITIVITY	REQUIRED ACTION
Red	Very High	Field assessment and protocol for finds are required.
Orange	High	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely.

The study site is underlain by the sedimentary rocks of the Peninsula Formation of the Table Mountain Group of the Cape Supergroup that is considered to have a High Palaeontological Sensitivity (SAHRA, 2022) (see Fig. 3). The fossils in this formation include shallow marine, coastal, estuarine to freshwater trace fossils, including scarce eurypterid trackways (see Fig. 4) (Almond et al, 2009).

Remnants of the Nangana Formation of the Algoa Group that is considered to be of Very High Palaeontological Sensitivity may occur in places in the study area. The Nangana Formation contain a diversity of microfossils, trace fossils (including prehistoric human and animal tracks, shark teeth, land snail shells, and

a rich diversity of marine and estuarine invertebrate fauna including mollusc and brachiopod shells, coquina (see Fig. 5) corals, remains of bryozoans, echinoids and crustaceans (Almond et al., 2009).

Fig. 4 Example of an eurypterid trackway
(https://www.fossilguy.com/gallery/invert/arthropod/eurypterid/index.htm)

Fig. 5 Coquina from Motherwell, Gqeberha

References:

Almond, J; De Klerk, B. & Gess, R. (2009) Palaeontological Heritage of the Eastern Cape. South African Heritage Resources Agency, Cape Town.

Roberts, D.L.; Botha, G.A.; Maud, R.R. & Pether, J. (2009). Coastal Cenozoic Deposits. In: Johnson, M.R.; Anhaeusser, C.R. & Thomas, R.J. (Eds.) *The geology of South Africa*. Johannesburg: GSSA. Pp. 605-628.

SAHRA (2021) Palaeosensitivity Map http://www.sahra.org.za/sahris/map/palaeo

Thamm, A.G. & Johnson, M.R. (2009). The Cape Supergroup. In: Johnson, M.R.; Anhaeusser, C.R. & Thomas, R.J. (Eds.) *The geology of South Africa*. Johannesburg: GSSA. Pp. 443-460.

7. Conclusion and recommendations:

The sandstone of the Peninsula Formation is potentially fossiliferous. The fossils of this unit consist mostly of trackways, of which some, like those of eurypterids, are scarce but of high scientific importance and for this reason the consideration of SAHRA that this unit is of High Palaeontological Sensitivity is supported.

There is a possibility of remnants of the Nangana Formation in the study area. The fossils of this unit vary from very common mollusc species such as *Perna perna* that form extensive fragmentary shell deposits or coquina to palaeosurfaces that may contain prehistoric human footprints. The coquina is not regarded as palaeontologically sensitive or as important from a scientific perspective whereas the fossil footprints are extremely rare and scientifically very important.

The Chance Palaeontological Finds Procedure has to be followed if fossiliferous rocks are exposed during the pre-construction phase and at any point during construction. The help of a palaeontologist should be called in if fossils are discovered during development to determine the scientific value of the fossils and the best procedure to follow.

PROCEDURE FOR CHANCE PALAEONTOLOGICAL FINDS

Extracted and adapted from the National Heritage Resources Act, 1999 Regulations Reg No. 6820, GN: 548.

The following procedure must be considered in the event that previously unknown fossils or fossil sites are exposed or found during construction of the road:

1. Surface excavations should continuously be monitored by the ECO and any fossil material be unearthed the excavation must be halted.

2. If fossiliferous material has been disturbed during the excavation process it should be put aside to prevent it from being destroyed.

3. The ECO then has to take a GPS reading of the site and take digital pictures of the fossil material and the site from which it came.

4. The ECO then should contact a palaeontologist and supply the palaeontologist with the information (locality and pictures) so that the palaeontologist can assess the importance of the find and make recommendations.

5. If the palaeontologist is convinced that this is a major find an inspection of the site must be scheduled as soon as possible in order to minimise delays to the development.

From the photographs and/or the site visit the palaeontologist will make one of the following recommendations:

a. The material is of no value so development can proceed, or:

b. Fossil material is of some interest and a representative sample should be collected and put aside for further study and to be incorporated into a recognised fossil repository after a permit was obtained from SAHRA for the removal of the fossils, after which the development may proceed, or:

c. The fossils are scientifically important and the palaeontologist must obtain a SAHRA permit to excavate the fossils and take them to a recognised fossil repository, after which the development may proceed.

7. If any fossils are found then a schedule of monitoring will be set up between the developer and palaeontologist in case of further discoveries.

8. Declaration of Independence:

I, Jacobus Francois Durand declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development, 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.

Palaeontological specialist:
Dr JF Durand (Sci. Nat.)
BSc Botany & Zoology (RAU), BSc Zoology (WITS), Museology Dipl. (UP), Higher Education Diploma (RAU), PhD Palaeontology (WITS)

Province of the
EASTERN CAPE
ECONOMIC DEVELOPMENT, ENVIRONMENTAL AFFAIRS & TOURISM

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST IN TERMS OF REGULATIONS 12 AND 13 OF THE AMENDMENTS TO THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 AS AMENDED.

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for environmental authorization in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amendments to the Environmental Impact Assessment Regulations, 2014. This form is valid as of 6 January 2021.

PROJECT TITLE

PROPOSED GREENBUSHES SOLAR PV FACILITY, NELSON MANDELA BAY MUNICIPALITY, EASTERN CAPE

SPECIALIST [1]	Prof JF Durand		
Contact person:	Prof JF Durand		
Postal address:	PO Box 31517, Totiusdal, Pretoria		
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Project Consultant:	CEN IEM UNIT		
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Postal code:	6001	Cell:	082 922 1645
Telephone:	082 320 3111	Fax:	0865042549
E-mail:	lucille@environmentcen.co.za		

4.2 The SPECIALIST

I, Jacobus Francois Durand, declare that –

General declaration:

- I act as the independent Specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental impact assessments, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;.
- I will comply with the Act, regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in regulation **8** of the regulations when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will keep a register of all interested and affected parties that participated in a public participation process; and
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- all the particulars furnished by me in this form are true and correct;
- will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and

- I realise that a false declaration is an offence and is punishable in terms of section 24F of the Act.

Disclosure of Vested Interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Amendments to Environmental Impact Assessment Regulations, 2014 as amended.
- I have a vested interest in the proposed activity proceeding, such vested interest being:

N/a

Signature of the environmental assessment practitioner:

Sole Provider

Name of company:

23 November 2022

Date:

Signature of the Commissioner of Oaths:

Date: 2022-11-23

SERGEANT

Designation:

[1] Curriculum Vitae (CV) attached

Official stamp (below).

SUID-AFRIKAANSE POLISIEDIENS
CLIENT SERVICE CENTRE
2022 -11- 23
VILLIERIA
SOUTH AFRICAN POLICE SERVICE

Annexure 1

CV

CURRICULUM VITAE (CV)

Position Title and No.	Assistant Professor Palaeontologist
Name of Expert:	Francois Durand
Date of Birth:	13-Dec-1960
Country of Citizenship/Residence	South Africa

Education:

Institution	Degree(s) or Diploma(s) obtained	Date obtained
Rand Afrikaans University	BSc Botany & Zoology	1983
University of the Witwatersrand	BSc Honours Zoology	1984
University of the Witwatersrand	PhD Palaeontology	1990
University of Pretoria	Post-graduate Diploma in Museology	1993
Rand Afrikaans University	Higher Education Diploma	2001

Employment record relevant to the assignment:

Period	Employing organization and your title/position. Contact information for references	Country	Summary of activities performed relevant to the Assignment
1988-1998	Council for Geoscience (palaeontologist)	South Africa	Palaeontology
1998-present	Rand Afrikaans University. Lecturer (1998 – 2004) University of Johannesburg. Senior lecturer (2004 – 2017), Assistant professor (2017 – present)	South Africa	Teaching & Research (palaeontology, ecology)

Membership in Professional Associations:

- Professional Scientist, the South African Council for Natural Scientific Professions (Pr.Sci.Nat. Fields: Water Resources Science and Environmental Sciences), Registration number: 400095/05.
- Palaeontological Society of Southern Africa (1986-present)

Publications:

J.F. Durand (1991) A revised description of the skull of *Moschorhinus* (THERAPSIDA, THEROCEPHALIA), *Annals of the South African Museum*, 99(11): 381-413.

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