



## **SiVEST (PTY) LTD**

**PROPOSED CONSTRUCTION OF 132 KV POWERLINES BETWEEN THE AUTHORISED LOERIESFONTEIN 3 PV SOLAR ENERGY FACILITY (12/12/20/2321/2/AM4) AND THE AUTHORISED DWARSRUG WIND ENERGY FACILITY (14/12/16/3/3/2/690/AM4), AND FROM THE DWARSRUG WIND ENERGY FACILITY TO THE AUTHORISED NAROSIES SUBSTATION (12/12/20/2049/3), LOCATED NEAR LOERIESFONTEIN IN THE HANTAM LOCAL MUNICIPALITY, NAMAKWA DISTRICT IN THE NORTHERN CAPE PROVINCE OF SOUTH AFRICA.**

### **PALAEONTOLOGICAL DESKTOP ASSESSMENT**

**DEA Reference:** 2020-09-0029  
**Report Prepared by:** Elize Butler (Banzai Environmental)  
**Issue Date:** 02-12-2020  
**Version No.:** 01

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### **PALAEONTOLOGICAL DESKTOP ASSESSMENT**

#### **EXECUTIVE SUMMARY**

**Banzai Environmental** has been commissioned by PGS Heritage Consultants (Pty) Ltd to conduct the Palaeontological Desktop Assessment as part of the Heritage Impact Assessment. PGS Heritage was in turn appointed by SiVEST (PTY) Ltd, on behalf of South Africa Mainstream Renewable Power Loeriesfontein 3 (Pty) Ltd. PGS Heritage was appointed to undertake the Heritage Impact Assessment for the proposed construction of 132 kV overhead powerlines between the proposed (and authorised) 100MW Loeriesfontein 3 Photovoltaic (PV) Solar Energy Facility (SEF) (12/12/20/2321/2/AM4) and proposed (and authorised) 140MW Dwarsrug Wind Energy Facility (WEF) (14/12/16/3/3/2/690/AM4); and between the Dwarsrug WEF and the proposed (and authorised) Narosies Substation (12/12/20/2049/3) located near Loeriesfontein in the Northern Cape Province of South Africa. Three power lines and two route alternatives are proposed for this project. The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA) states that a Palaeontological Desktop Assessment (PDA) is necessary to confirm if fossil material is present within the planned development. This Assessment is thus necessary to evaluate the effect of the construction on palaeontological heritage.

The grid connection is required to link the authorised 100MW Loeriesfontein PV SEF to the authorised 140MW Dwarsrug WEF to create a hybrid energy facility. The hybrid energy facility will ensure that electricity is constantly supplied to the national grid by at least one (1) or both technologies (namely solar PV and wind) at any given time. Separate BA processes to add battery energy storage systems (BESS) to both renewable energy facilities (Loeriesfontein) 3 BESS DEFF Reference number: 14/12/16/3/3/1/2263 and Dwarsrug BESS DEFF Reference number: 14/12/16/3/3/1/2262) are currently underway. The BESS will contribute to the hybrid renewable energy facility by storing and providing electricity for the national grid.

The proposed powerline development is underlain by Karoo dolerite and Dolerite rubble, the Tierberg Formation, the Whitehill Formation and Prince Albert Formation of the Ecca Group, Karoo Supergroup. The sediments in this area are covered by a layer of alluvium. According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Karoo dolerite and dolerite rubble is zero as it is igneous in origin while that of the Whitehill Formation is Very High, the Tierberg Formation has a High Palaeontological Sensitivity while the Prince Albert has a moderate Palaeontological Sensitivity. Quaternary Alluvium has a low Palaeontological sensitivity overall, but locally high. (Almond and Pether, 2009; Almond *et al.*, 2013).

Usually impacts on palaeontological heritage only occur during the construction phase of the development. As the authorised Loeriesfontein 3 Photovoltaic Solar Energy Facility and the approved substation at the authorised Dwarsrug Wind Energy was originally assessed in a Palaeontological Impact Assessment (Groenewald, 2014) and as the proposed project falls in the same area the Palaeontological Significance of the three power lines and two route alternatives is low. There is also no preference between the two route alternatives as the geology of the routes are the same. It is thus considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected (if possible, *in situ*) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: [www.sahra.org.za](http://www.sahra.org.za)) so that correct mitigation (recording and collection) can be carry out by a palaeontologist.

**Impact Summary: Layout Alternative 1 and 2 as well as the additional 3 km powerline.**

Mainstream Projects																					
ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE										RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER									
	MITIGATION											MITIGATION									
	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S	E		P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S		
<b>Construction Phase</b>																					
Loss of fossil heritage											Medium	Chance find Protocol									
	2	4	4	4	4	3	54						2	4	4	4	4	1	18		Low
<b>Operational Phase</b>																					
Loss of fossil heritage											Medium	Chance find Protocol									
	2	4	4	4	4	3	54						2	4	4	4	4	1	18		Low
<b>Decommissioning Phase</b>																					
Loss of fossil heritage											Medium	Chance find Protocol									
	2	4	4	4	4	3	54						2	4	4	4	4	1	18		Low
<b>Cumulative</b>																					
Loss of fossil heritage											Medium	Chance find Protocol									
	2	4	4	4	4	3	54						2	4	4	4	4	1	18		Low
<b>No Go Option</b>																					
Loss of fossil heritage											Low	None									
	2	4	4	4	4	1	18						2	4	4	4	4	1	18	0	Low

## COMPARATIVE ASSESSMENT OF TWO POWER LINE ALTERNATIVES

<b>PREFERRED</b>	No preferred alternative as both will result in a low impact
<b>FAVOURABLE</b>	The impacts will be low
<b>LEAST PREFERRED</b>	No preferred alternative
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
<b>POWER LINE CORRIDOR ROUTE ALTERNATIVES: LOERIESFONTEIN 3 PV SEF TO DWARSRUG WEF</b>		
Power Line Corridor Alternative 1 (Loeriesfontein 3 PV SEF to Dwarsrug WEF)	No Preference	The geology of the proposed alternatives is the same
Power Line Corridor Alternative 2 (Loeriesfontein 3 PV SEF to Dwarsrug WEF)	No Preference	The geology of the proposed alternatives is the same

It is thus considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

**NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)**

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 3 and Appendix 2
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page viii
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6.6
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Desktop Assessment
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.4
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 5
g) an identification of any areas to be avoided, including buffers;	N/A; Section 5
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5

i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 8
k) any mitigation measures for inclusion in the EMPr;	Section 6.1
l) any conditions for inclusion in the environmental authorisation;	Section 6.1
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6.1
n) a reasoned opinion- <ul style="list-style-type: none"> <li>i. (as to) whether the proposed activity, activities or portions thereof should be authorised; <ul style="list-style-type: none"> <li>(iA) regarding the acceptability of the proposed activity or activities; and</li> </ul> </li> <li>ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;</li> </ul>	Section 8
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice <i>gazetted</i> by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 4



## environmental affairs

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA

### DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

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

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

### PROJECT TITLE

Proposed Construction of 132 kV overhead powerlines between the proposed (and authorised) 100MW Loeriesfontein 3 Photovoltaic (PV) Solar Energy Facility (SEF) (12/12/20/2321/2/AM4) and proposed (and authorised) 140MW Dwarsrug Wind Energy Facility (WEF) (14/12/16/3/3/2/690/AM4); and between the Dwarsrug WEF and the proposed (and authorised) Narosies Substation (12/12/20/2049/3) located near Loeriesfontein in the Northern Cape Province of South Africa.

### Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.



5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

### Departmental Details

**Postal address:**

Department of Environmental Affairs  
Attention: Chief Director: Integrated Environmental Authorisations  
Private Bag X447  
Pretoria  
0001

**Physical address:**

Department of Environmental Affairs  
Attention: Chief Director: Integrated Environmental Authorisations  
Environment House  
473 Steve Biko Road  
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:

Email: [EIAAdmin@environment.gov.za](mailto:EIAAdmin@environment.gov.za)

## SPECIALIST INFORMATION

Specialist Company Name:	Banzai Environmental (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	Level 5	Percentage Procurement recognition	80%
Specialist name:	Elize Butler			
Specialist Qualifications:	MSc			
Professional affiliation/registration:	PSSA			
Physical address:	14 Eddie de Beer Street, Dan Pienaar, Bloemfontein			
Postal address:	14 Eddie de Beer Street, Dan Pienaar, Bloemfontein			
Postal code:	9301	Cell:	084 4478 759	
Telephone:		Fax:		
E-mail:	elizebutler002@gmail.com			

## DECLARATION BY THE SPECIALIST

I, \_\_\_\_\_ Elize Butler \_\_\_\_\_, declare that –

- 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 the specialist report relevant to this application, 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 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;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

---

Signature of the Specialist

Banzai Environmental (Pty) Ltd

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Name of Company:

09-12-2020

---

Date:

UNDERTAKING UNDER OATH/ AFFIRMATION

I, \_\_\_\_\_ Elize Butler \_\_\_\_\_, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

---

Signature of the Specialist

Banzai Environmental

---

Name of Company

09-12-2020

---

Date

---

Signature of the Commissioner of Oaths

---

Date

# SIVEST (PTY) LTD

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### List of Abbreviations

<b>Abbreviations</b>	<b>Description</b>
BA	Basic Assessment
BESS	
CA	Competent Authority
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DIA	Desktop Impact Assessment
EO	Environmental Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
GN	Government Notice
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
Ma	Million years ago
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PIA	Palaeontological Impact Assessment
PV	Photovoltaic
PSSA	Palaeontological Society of South Africa
RE	Renewable Energy
SAHRA	South African Heritage Resources Agency
SEF	Sun Energy Facility
ToR	Terms of Reference
WEF	Wind Energy Facility

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## **PROPOSED CONSTRUCTION OF 132 KV POWERLINES BETWEEN THE AUTHORISED LOERIESFONTEIN 3 PV SOLAR ENERGY FACILITY (12/12/20/2321/2/AM4) AND THE AUTHORISED DWARSRUG WIND ENERGY FACILITY (14/12/16/3/3/2/690/AM4), AND FROM THE DWARSRUG WIND ENERGY FACILITY TO THE AUTHORISED NAROSIES SUBSTATION (12/12/20/2049/3), LOCATED NEAR LOERIESFONTEIN IN THE HANTAM LOCAL MUNICIPALITY, NAMAKWA DISTRICT IN THE NORTHERN CAPE PROVINCE OF SOUTH AFRICA.**

### **1. INTRODUCTION**

South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as “Mainstream”) has appointed SiVEST SA (Pty) Ltd (hereafter referred to as “SiVEST”) to undertake a Basic Assessment (BA) Process for the proposed construction of a 32 kV overhead powerlines between the proposed (and authorised) 100MW Loeriesfontein 3 PV SEF (12/12/20/2321/2/AM4) and proposed (and authorised) 140MW Dwarsrug WEF (14/12/16/3/3/2/690/AM4); and between the Dwarsrug WEF and the proposed (and authorised) Narosies Substation (12/12/20/2049/3) located near Loeriesfontein in the Northern Cape Province of South Africa.

The powerline from the Loeriesfontein 3 PV SEF to the Dwarsrug WEF is proposed to link the SEF to the WEF in order to create a hybrid renewable energy facility, which will ensure that electricity is constantly supplied to the national grid by at least one or both technologies (namely solar PV and wind), at any given time. The powerline from the Dwarsrug WEF is proposed to tie the, above mentioned, hybrid renewable energy facility into the approved Narosies substation to feed the National grid.

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 [GNR 982, 983, 984 and 985) and amended on 07 April 2017 [promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017], various aspects of the proposed development are considered listed activities under GNR 327 and GNR 324 which may have an impact on the environment and therefore require authorisation from the National Competent Authority (CA), namely the Department of Environment, Forestry and Fisheries (DEFF), prior to the commencement of such



activities. Specialist studies have been commissioned to assess and verify the power lines under the new Gazetted specialist protocols.

## 1.1 Scope and Objectives

The objective of a Palaeontological Impact Assessment (PIA) is to determine the impact of the development on potential palaeontological material at the site.

According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the aims of the PIA are: 1) to **identify** the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint 2) to estimate the **palaeontological importance** of the formations 3) to determine the **impact** on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

The terms of reference of a PIA are as follows:

### General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended;
- Adherence to all applicable best practice recommendations, appropriate legislation and authority requirements;
- Submit a comprehensive overview of all appropriate legislation, guidelines;
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study;
- Description and location of the proposed development and provide geological and topographical maps;
- Provide Palaeontological and geological history of the affected area;
- Identification sensitive areas to be avoided (providing shapefiles/kmls) in the proposed development;
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
  - a. **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
  - b. **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity.
  - c. **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.
- Fair assessment of alternatives (infrastructure alternatives have been provided);

- Recommend mitigation measures to minimise the impact of the proposed development; and
- Implications of specialist findings for the proposed development (such as permits, licenses etc).

### **Specific Requirements:**

- Describe and map the palaeontological heritage features of the site and surrounding area. This is to be based on desk-top reviews, fieldwork, available databases, findings from other palaeontological heritage studies in the area, where relevant. Include reference to the grade of heritage feature and any heritage status the feature may have been awarded.
- Assess the impacts and provide mitigation measures to include in the environmental management plan.
- Map palaeontological heritage sensitivity for the site. Clearly show any “no-go” areas in terms of heritage (i.e. “very high” sensitivity) and provide recommended buffers or set-back distances.
- Identify and assess potential impacts from the project on palaeontology, as required by heritage legislation (including cumulative impacts from other wind farms within a radius of 50 km).
- Provide an updated sensitivity map for the Kudusberg WEF project site.
- Assess the project alternatives provided, including the no-go alternative

## **1.2 Terms of Reference**

The terms of reference for the appointment has two elements (1), Site Verification Report and (2) a specialist study / compliance statement as per Government Notice 320 of 20 March 2020 and Government Notice 1150 of 30 October 2020. The specialist report must include an explanation of the Terms of Reference (ToR) applicable to the specialist study. In addition, if the report is written as per Appendix 6 of the EIA Regulations, 2014 (as amended), a table must be provided at the beginning of the specialist report listing the requirements for specialist reports in accordance with and cross referencing these requirements with the relevant sections in the report. An MS Word version of this table will be provided by SiVEST.

## **1.3 Specialist Credentials**

This present study has been conducted by Mrs Elize Butler. She has conducted approximately 300 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Central, and Northern Cape, Northwest, Gauteng, Limpopo, and Mpumalanga. She has an MSc (*cum laude*) in Zoology (specializing in Palaeontology) from the University of the Free State, South Africa and has been working in Palaeontology for more than twenty-five years. She has experience in locating, collecting, and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

## 1.4 Assessment Methodology

The aim of a desktop study is to evaluate the risk to palaeontological heritage in the proposed development. This includes all trace fossils and fossils. All available information is consulted to compile a desktop study and includes: Palaeontological impact assessment reports in the same area; aerial photos and Google Earth images, topographical as well as geological maps.

## 2. ASSUMPTIONS AND LIMITATIONS

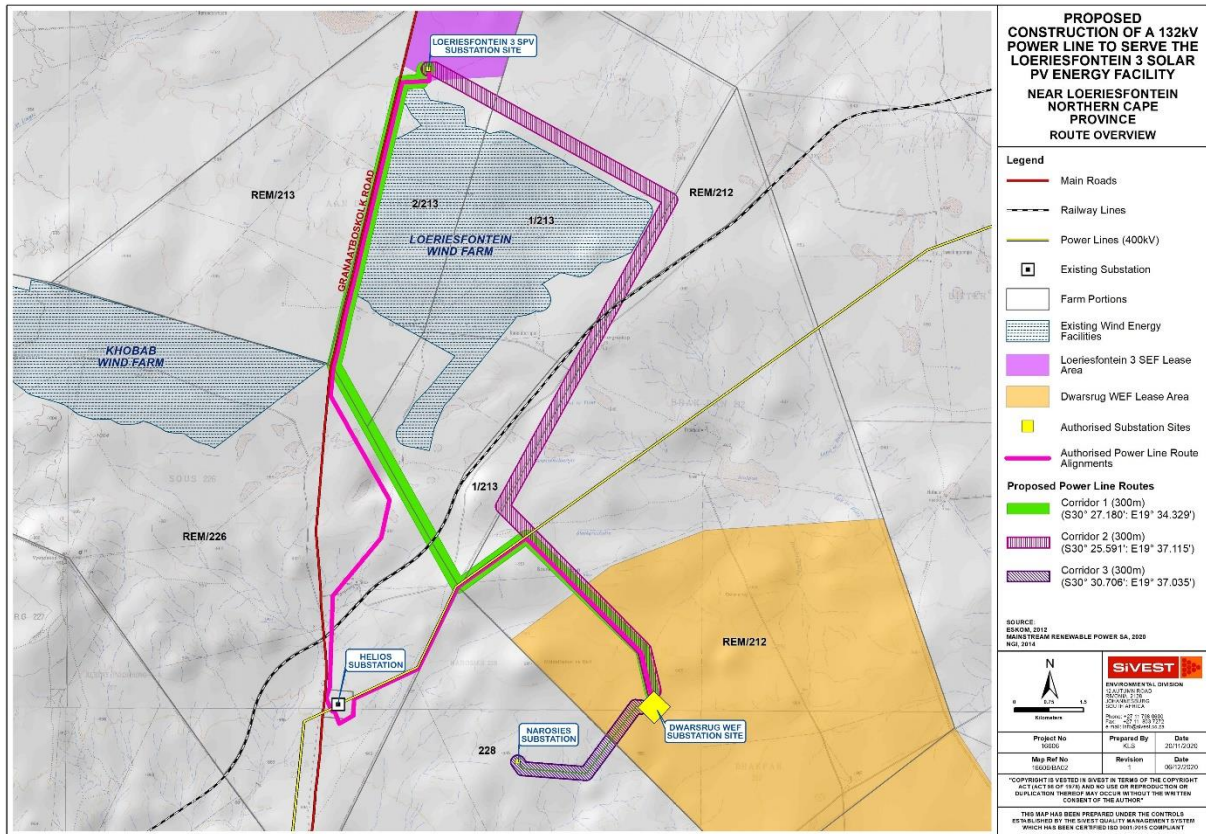
When conducting a Paleontological Impact Assessment (PIA) several factors can affect the accuracy of the assessment. The focal point of geological maps is the geology of the area and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have not been reviewed by palaeontologists and data is generally based on aerial photographs. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas is used to provide information on the existence of fossils in an area which was not yet been documented. When similar Assemblage Zones and geological formations for Desktop studies is used it is generally **assumed** that exposed fossil heritage is present within the footprint. A field-assessment is thus necessary to improve the accuracy of the desktop assessment.

## 3. TECHNICAL DESCRIPTION

### 3.1 Project Location

The proposed powerline alternatives are located near Loeriesfontein in the Hantam Local Municipality, Namakwa District Municipality, in the Northern Cape Province of South Africa.



**Figure 1:** Regional context of the proposed construction of a 132 KV powerline to serve the Loeriesfontein3 Solar PV Energy Facility near Loeriesfontein in the Northern Cape.

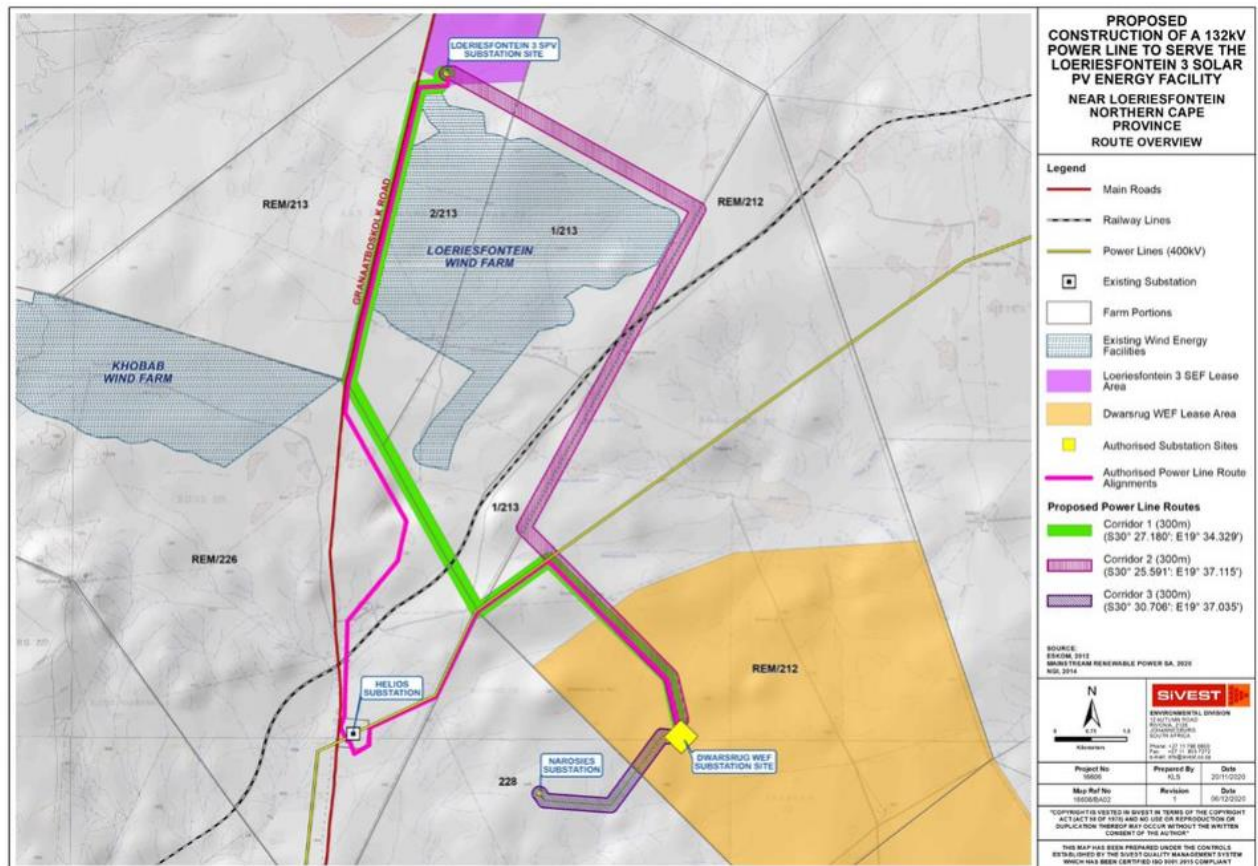
### 3.2 Project Description

Mainstream are proposing the construction of a 132 kV overhead powerlines between the proposed (and authorised) 100MW Loeriesfontein 3 PV SEF (12/12/20/2321/2/AM4) and proposed (and authorised) 140MW Dwarsrug WEF (14/12/16/3/3/2/690/AM4); and between the Dwarsrug WEF and the proposed (and authorised) Narosies Substation (12/12/20/2049/3) located near Loeriesfontein in the Northern Cape Province of South Africa.

The powerline from the Loeriesfontein 3 PV SEF to the Dwarsrug WEF is proposed to link the SEF to the WEF in order to create a hybrid renewable energy facility, which will ensure that electricity is constantly supplied to the national grid by at least one or both technologies (namely solar PV and wind), at any given time. The powerline from the Dwarsrug WEF is proposed to tie the, above mentioned, hybrid renewable energy facility into the approved Narosies substation to feed the National grid.

### 3.2.1 Layout Alternatives

Two (2) powerline alternatives will be assessed to link the Loeriesfontein 3 PV SEF to the Dwarsrug WEF and a single powerline is proposed to link these two (2) facilities to the National grid from the Dwarsrug WEF. All three (3) powerline route alignments will be assessed within a 300m wide assessment corridor (150m on either side of powerline). The powerline alternatives which are being proposed and assessed are shown in **Figure 2** below.



**Figure 2:** Powerline alternatives proposed to link Loeriesfontein 3 PV SEF to Dwarsrug WEF as well single power line proposed to link two (2) facilities to National grid from Dwarsrug WEF

The layout alternatives are being considered and assessed as part of the BA process and will be refined to avoid identified environmental sensitivities.

## 4. LEGAL REQUIREMENT AND GUIDELINES

### National Heritage Resources Act (25 of 1999)

Cultural Heritage includes all heritage resources and is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act comprise “**all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**”.

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

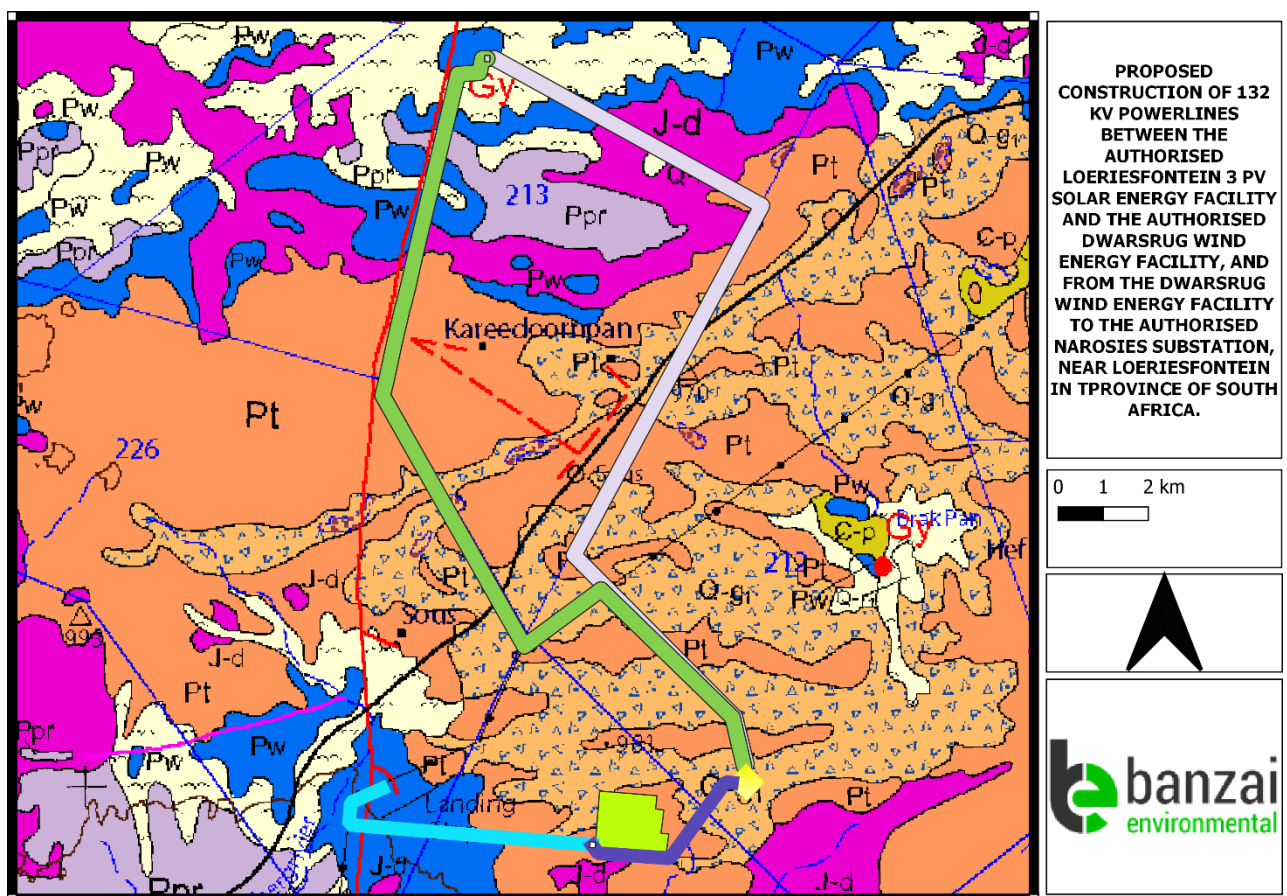
This Palaeontological Impact assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- the construction of a bridge or similar structure exceeding 50 m in length;
- any development or other activity which will change the character of a site—
- (exceeding 5 000 m<sup>2</sup> in extent; or
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m<sup>2</sup> in extent;
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

## 5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

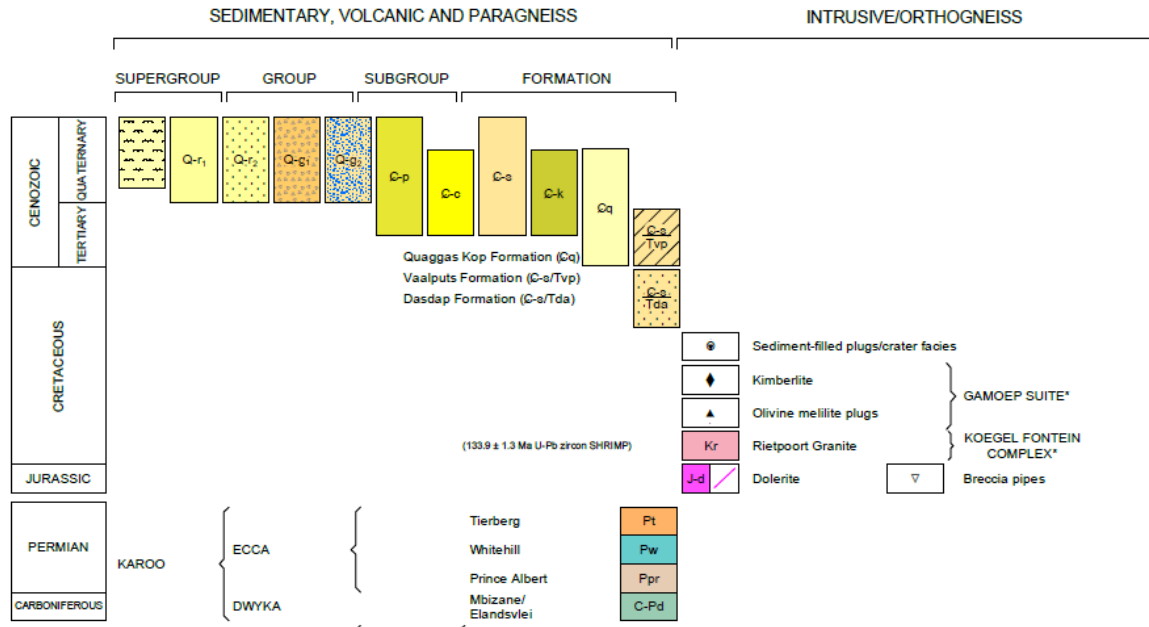
The construction of a 132 kV overhead powerlines between the proposed (and authorised) 100MW Loeriesfontein 3 PV SEF ([12/12/20/2321/2/AM4](#)) and proposed (and authorised) 140MW Dwarsrug WEF ([14/12/16/3/3/2/690/AM4](#)); and between the Dwarsrug WEF and the proposed (and authorised) Narosies Substation ([12/12/20/2049/3](#)) located near Loeriesfontein in the Northern Cape Province is depicted on the

1:250 000 3018 Loeriesfontein Geological Map (2010) (Council of Geosciences, Pretoria). (Figure 3). The proposed development is underlain by Karoo dolerite (Jd) and Dolerite rubble (Qg<sub>1</sub>), the Tierberg Formation (Pt), the Whitehill Formation (Pw) and Prince Albert Formation (Ppr) of the Ecca Group, Karoo Supergroup. The Ecca Group consist of 16 formations of which the Prince Albert and Whitehill formations is the most extensive. The sediments in this area are covered by a layer of alluvium. According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Karoo dolerite and dolerite rubble is zero as it is igneous in origin while that of the Whitehill Formation is Very High, the Tierberg Formation has a High Palaeontological Sensitivity while the Prince Albert has a moderate Palaeontological Sensitivity. Quaternary Alluvium has a low Palaeontological sensitivity overall, but locally it is high. (Almond and Pether, 2009; Almond *et al.*, 2013).



**Figure 3:** Extract of the 1:250 000 3018 Loeriesfontein Geological Map (2010) (Council of Geosciences, Pretoria) indicating the 132 kV overhead powerlines between the proposed (and authorised) 100MW Loeriesfontein 3 PV SEF (12/12/20/2321/2/AM4) and proposed (and authorised) 140MW Dwarsrug WEF (14/12/16/3/3/2/690/AM4); and between the Dwarsrug WEF and the proposed (and authorised) Narosies Substation (12/12/20/2049/3) located near Loeriesfontein in the Northern Cape Province.

## GEOLOGICAL LEGEND



### Legend

Q-g<sub>1</sub>- Dolerite rubble

Jd- Dolerite

Pt- Tierberg Formation; Ecca Group, Karoo Supergroup

Pw-Whitehill Formation, Ecca Group, Karoo Supergroup

Ppr-Prince Albert Formation, Ecca Group, Karoo Supergroup

The quaternary sediments contain fossils that represent terrestrial plants and animals with a close resemblance to living forms. Fossil assemblages include bivalves, diatoms, gastropod shells, ostracods and trace fossils. The palaeontology of the Quaternary superficial deposits has been relatively neglected in the past. Late Cenozoic calcrete may comprise of bones, horn corns as well as mammalian teeth (Klein, 1984). Tortoise remains have also been uncovered as well as trace fossils which includes termite and insect's burrows and mammalian trackways. Amphibian and crocodile skeletons have been uncovered where the depositional settings in the past were wetter.

The Gordonia dune sands are dated as Late Pliocene/Early Pleistocene to Recent times by the Middle to Later Stone Age stone tools recovered from them (Dingle *et al.*, (1983). The boundary of the Pliocene-Pleistocene has been extended back from 1.8 Ma to 2.588 Ma placing the Gordonia Formation almost entirely within the Pleistocene Epoch. The pan sediments of the area originated from the Gordonia Formation and



contains white to brown fine-grained silts, sands and clays. Some of the pans consist of clayey material mixed with evaporates that shows seasonal effects of shallow saline groundwaters (De Witt et al., 2000; Johnsen et al, 2006).

Dolerite rubble (Qg<sub>1</sub>) covers almost all the sediment in the area. The dolerite present in the development belongs to the Karoo Igneous Province that is a classic continental flood basalt province formed during the Early Jurassic. This province occurs over a large area in southern Africa and comprises a widespread system well developed igneous bodies (dykes, sills) that invaded the sediments of the Main Karoo Basin. Flood basalts do not typically form any visible volcanic structures, but with a series of outbursts form a suite of fissures of sub-horizontal lava flows that may vary in thickness. The Karoo is an old flood basalt province and is preserved today as erosional remnants of a more extensive lava cap that covered much of southern Africa in the geological past. As this Suite consist of igneous rocks it is unfossiliferous. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Karoo Dolerite is zero.

The majority of the Tierberg Formation comprises of well-laminated, dark grey to black shale (Johnson et al 2006). Some yellowish tuffaceous beds up to 10cm thick occur in the lower part of the succession along the western and northern margins of the Basin. Calcareous concretions are common towards the top of the formation. Clastic rhythmites occur at various levels in the sequence (Cole, 2005). This formation is considered to be a deep-water deposit associated with event beds. The Tierberg formation is known for its rare trace fossils assemblages. Vascular plants (including petrified wood) and palynomorphs of *Glossopteris* flora have been found while crustaceans, shelly marine invertebrates, insects and fish fossils as well as microfossils have been identified.

The Whitehill Formation of the Ecca Group is a comparatively thin succession of well-laminated carbon-rich mudrocks. The mudstone weathers to a characteristic pale grey to creamy white color (Johnson et al, 2006). The Permian aged Whitehill Formation (high Palaeontological Sensitivity) is renowned for an abundance of body fossils as well as trace fossils. Almond (2011) described the main groups of Early Permian fossils found within the Whitehill Formation include as follows:

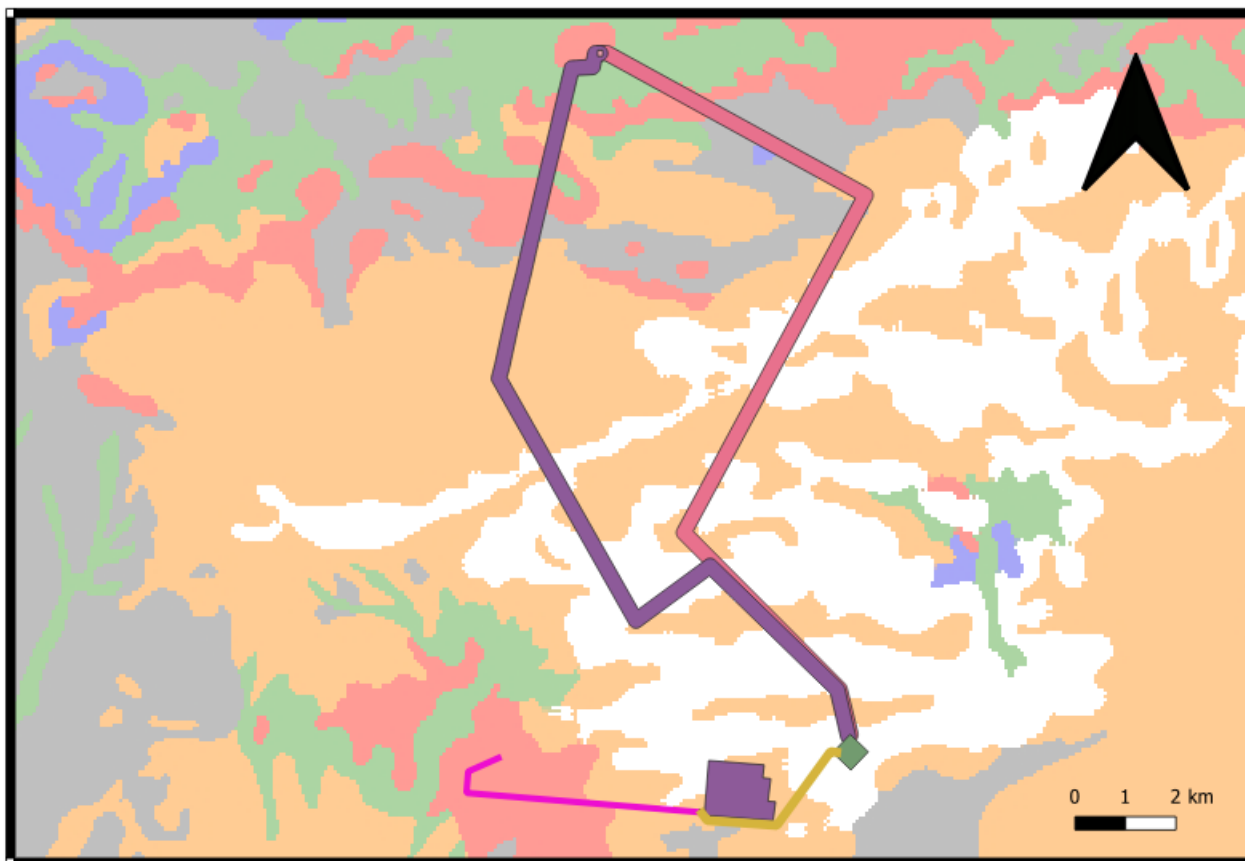
- A low diversity of trace fossils (possible shark coprolites / faeces and king crab trackways)
- Several palaeoniscoid fish species (primitive bony fish)
- Aquatic mesosaurid reptiles (the earliest known sea-going reptiles)
- Small eocarid crustaceans are very common (bottom-living shrimp-like forms)
- Insects (preserved as isolated wings, although some intact specimens has also been recovered)
- Other rare vascular plant remains (*Glossopteris* leaves, lycopods etc)".

- Palynomorphs (organic-walled spores and pollens)
- Petrified wood (mostly of primitive gymnosperms, silicified or calcified)
- Occasional cephalochordates (ancient relatives of the living lancets)

The Prince Albert Formation consists of marine to hyposaline basin plain mudrocks that occur with minor volcanic ashes, iron stones and phosphates. Post-glacial mudrocks is present at the base of the Prince Albert Formation.

The fossil assemblage of the Prince Albert Formation is known for its rich assemblages of plant fossils known as the *Glossopteris* flora. This includes petrified wood, roots and palynomorphs which include spores and acritarchs. Body fossils of insects have been recovered, but is rare. Moderately diverse trace fossil assemblages can be present of which many can be assigned to fish or non-marine arthropod groups like crustaceans, king crabs and predatory water scorpions which could have reached lengths of two meters or more.

This trace fossil assemblage of the non-marine *Mermia* Ichnofacies, is dominated by the ichnogenera *Umfolozia* (arthropod trackways) and *Undichna* (fish swimming trails). Fish coprolites have also been described from this formation. A low diversity of marine invertebrates (bivalves brachiopods, nautiloids), palaeoniscoid fish, sharks and protozoans have been uncovered. There is also a possibility that stromatolites and oolites are preserved. Well-preserved skeletons of the well-known aquatic mesosaurids have been uncovered while amphibians are also recorded from the uppermost Ecca beds (Almond, 2011).



**Figure 4:** Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences). Location of the proposed 132 KV powerline development is underlain by red (very high), orange (High) green (moderate, white (unknown) areas.

According to this map there is a very high chance of finding fossils in the red area, high chance in the orange area and a moderate chance of finding fossils in the green area of the development footprint and a low chance in the blue areas.

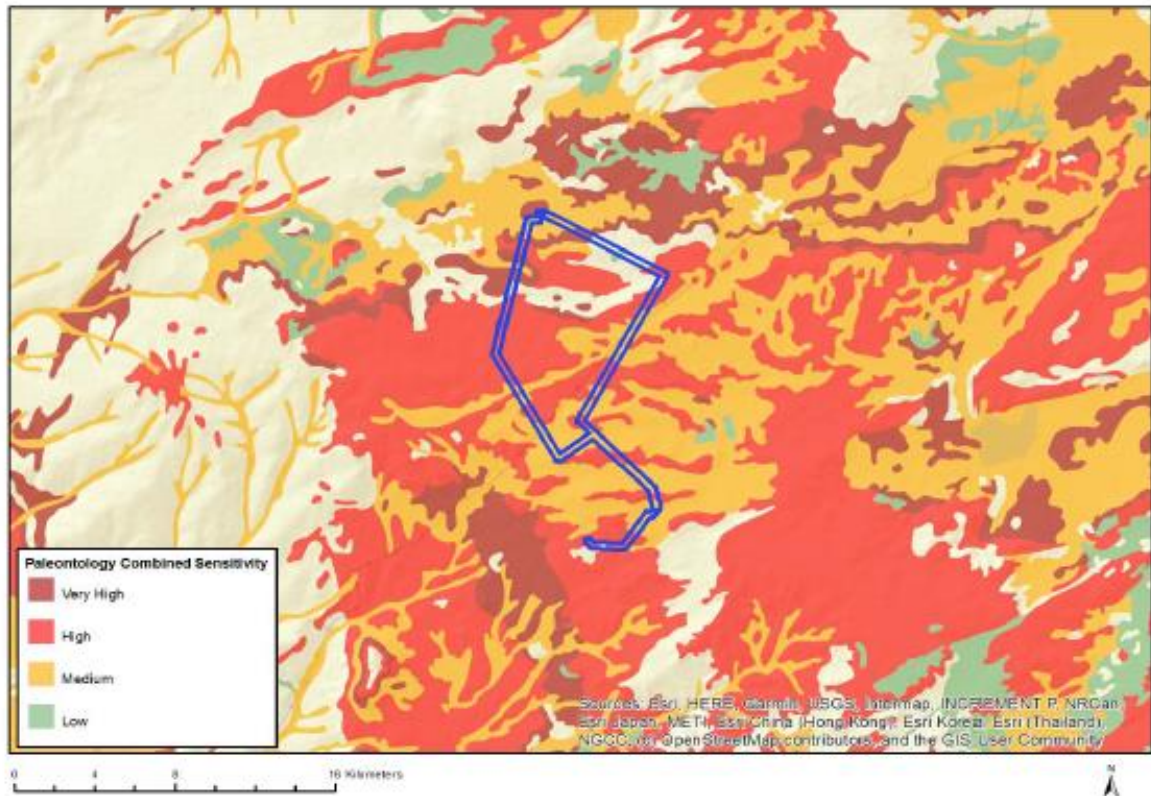
Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study; a field assessment is likely
<b>GREEN</b>	<b>MODERATE</b>	<b>desktop study is required</b>
<b>BLUE</b>	<b>LOW</b>	<b>no palaeontological studies are required however a protocol for finds is required</b>
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required

WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.
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However, according to the National Environmental Screening tool

(<https://screening.environment.gov.za/screeningtool> Accessed 6 November 2020) the sensitivity of the proposed 132 KV powerline between the approved substation at the authorised Loeriesfontein 3 Photovoltaic Solar Energy Facility and the approved substation at the authorised Dwarsrug Wind Energy Facility is low (green) (Figure 5).

## MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

### Sensitivity Features:

Sensitivity	Feature(s)
High	Features with a High paleontological sensitivity
Low	Features with a Low paleontological sensitivity
Medium	Features with a Medium paleontological sensitivity
Very High	Features with a Very High paleontological sensitivity

**Figure 5:** Environmental Screening tool indicating the Palaeontological Sensitivity of the development.

## 6. SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

The proposed development is underlain by Karoo dolerite (Jd) and Dolerite rubble (Qg<sub>1</sub>), the Tierberg Formation (Pt), the Whitehill Formation (Pw) and Prince Albert Formation (Ppr) of the Ecca Group, Karoo Supergroup. The Ecca Group consists of 16 formations of which the Prince Albert and Whitehill formations are

the most extensive. The sediments in this area are covered by a layer of alluvium. According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Karoo dolerite and dolerite rubble is zero as it is igneous in origin while that of the Whitehill Formation is Very High, the Tierberg Formation has a High Palaeontological Sensitivity while the Prince Albert has a moderate Palaeontological Sensitivity. Quaternary Alluvium has a low Palaeontological sensitivity overall, but locally it is high. (Almond and Pether, 2009; Almond *et al.*, 2013).

Usually impacts on palaeontological heritage only occur during the construction phase of the development. As the authorised Loeriesfontein 3 Photovoltaic Solar Energy Facility and the approved substation at the authorised Dwarsrug Wind Energy was originally assessed in a Palaeontological Impact Assessment and as the proposed project falls in the same area the Palaeontological Significance of both power lines alternatives is low. It is thus considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected (if possible, *in situ*) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: [www.sahra.org.za](http://www.sahra.org.za)) so that correct mitigation (recording and collection) can be carry out by a paleontologist.

## 6.1 CHANCE FINDS PROTOCOL

A following procedure will only be followed if fossils are uncovered during excavation.

### 6.1.1 Legislation

Cultural Heritage in South Africa (includes all heritage resources) is protected by the **National Heritage Resources Act (Act 25 of 1999) (NHRA)**. According to Section 3 of the Act, all Heritage resources include “**all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**”.

Palaeontological heritage is unique and non-renewable and is protected by the NHRA and are the property of the State. It is thus the responsibility of the State to manage and conserve fossils on behalf of the citizens of South Africa. Palaeontological resources may not be excavated, broken, moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

### 6.1.2 Background

A fossil is the naturally preserved remains (or traces) of plants or animals embedded in rock. These plants and animals lived in the geologic past millions of years ago. Fossils are extremely rare and irreplaceable. By studying fossils, it is possible to determine the environmental conditions that existed in a specific geographical area millions of years ago.

### 6.1.3 Introduction

This informational document is intended for workmen and foremen on construction sites. It describes the actions to be taken when mining or construction activities accidentally uncovers fossil material.

It is the responsibility of the Environmental Site Officer (ESO) or site manager of the project to train the workmen and foremen in the procedure to follow when a fossil is accidentally uncovered. In the absence of the ESO, a member of the staff must be appointed to be responsible for the proper implementation of the chance find protocol as not to compromise the conservation of fossil material.

### 6.1.4 Chance Find Procedure

- If a chance find is made the person responsible for the find must immediately **stop working** and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately **report** the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: [www.sahra.org.za](http://www.sahra.org.za)). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.
- A preliminary report must be submitted to the Heritage Agency within **24 hours** of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

- The site must be secured to protect it from any further damage. **No attempt** should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

## 6.2 Planning / Preconstruction

No Impacts will occur during the Planning, Pre-Construction, Operational and Decommissioning Phases.

## 6.3 Construction

Only the Construction phase will be affected

## 6.4 No go Impact

The 'no-go' alternative is the option of not constructing the powerline project, which would prevent the realization of the hybrid facility and thus prevent electricity generated from renewable sources being fed into the national grid. This alternative would result in no additional environmental impact other than that assessed during the BA for the Renewable Energy (RE) facilities.

The 'no-go' option is a feasible option; however, this would prevent the hybrid facility from contributing to the environmental, social and economic benefits associated with the development of the renewables sector.

## 6.5 Cumulative Impacts

Cumulative impact assessments must be undertaken for the proposed development in order to determine the cumulative impact that will materialize should other Renewable Energy Facilities (REFs) and large-scale industrial developments be constructed within 50km of the proposed development. A total of 10 Wind Energy Facilities and 3 Solar Energy Facilities are present within a 35 km radius of proposed power line development. Two is operational, 8 have been issued with EA, and 3 EIAs are underway. See table 1 below.



**Table 1: Loeriesfontein 3 PV: RE Projects within 35 km**

<b>Development</b>	<b>Current status of EIA/development</b>	<b>Proponent</b>	<b>Technology</b>	<b>Capacity</b>	<b>Farm details</b>
<b>Dwarsrug Wind Farm</b>	EA issued	Mainstream Renewable Power	Wind	140MW	Remainder of the Farm Brak Pan No 212
<b>Khobab Wind Farm</b>	Operational	Mainstream Renewable Power	Wind	140MW	Portion 2 of the Farm Sous No 226
<b>Loeriesfontein 2 Wind Farm</b>	Operational	Mainstream Renewable Power	Wind	140MW	Portions 1 & 2 of the Farm Aan de Karree Doorn Pan No 213
<b>Graskoppies Wind Farm</b>	EA Issued	Mainstream Renewable Power	Wind	235MW	<ul style="list-style-type: none"> <li>• Portion 2 of the Farm Graskoppies No. 176; and</li> <li>• Portion 1 of the Farm Hartebeest Leegte No. 216.</li> </ul>
<b>Hartebeest Leegte Wind Farm</b>	EA Issued	Mainstream Renewable Power	Wind	235MW	Remainder of the Farm Hartebeest Leegte No 216
<b>Ithemba Wind Farm</b>	EA Issued	Mainstream Renewable Power	Wind	235MW	<ul style="list-style-type: none"> <li>• Portion 2 of the Farm Graskoppies No. 176; and</li> <li>• Portion 1 of the Farm Hartebeest Leegte No. 216.</li> </ul>
<b>!Xha Boom Wind Farm</b>	EA Issued	Mainstream Renewable Power	Wind	235MW	Portion 2 of the Farm Georg's Vley No 217
<b>Loeriesfontein PV3 Solar Energy Facility</b>	EA issued	Mainstream Renewable Power	Solar	100MW	Portion 2 of the Farm Aan de Karree Doorn Pan No 213
<b>Hantam PV Solar Energy Facility</b>	EA issued	Solar Capital (Pty) Ltd	Solar	Up to 525MW	Remainder of the Farm Narosies No 228
<b>PV Solar Power Plant</b>	EA issued	BioTherm Energy	Solar	70MW	Portion 5 of the Farm Kleine Rooiberg No 227

<b>Kokerboom Wind Farm 1</b>	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	<ul style="list-style-type: none"> <li>• Remainder of the Farm Leeuwergrivier No. 1163; and</li> <li>• Remainder of the Farm Kleine Rooiberg No. 227.</li> </ul>
<b>Kokerboom Wind Farm 2</b>	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	<ul style="list-style-type: none"> <li>• Remainder of the Farm Leeuwergrivier No. 1163; and</li> <li>• Remainder of the Farm Kleine Rooiberg No. 227.</li> </ul>
<b>Kokerboom Wind Farm 3</b>	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	<ul style="list-style-type: none"> <li>• Remainder of the Farm Aan De Karree Doorn Pan No. 213;</li> <li>• Portion 1 of the Farm Karree Doorn Pan No. 214; and</li> <li>• Portion 2 of the Farm Karree Doorn Pan No. 214.</li> </ul>

## 6.6 Overall Impact Rating

The significance of the impact occurring will be negative medium high before mitigation and negative low after mitigation. Post mitigation the overall significance will be low as the superficial sediments has h low sensitivity but locally high. Excavations into bedrock will also not be deep and thus the overall significance of the development will be low. This will be applicable to both power line alternatives.

**Table 2:** Rating of impacts. Power line alternatives 1 and 2

Mainstream Projects																				
ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE										RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER								
	MITIGATION											MITIGATION								
	E	P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S	E		P	R	L	D	I/M	TOTAL	STATUS (+ OR -)	S	
<b>Construction Phase</b>																				
Loss of fossil heritage	2	4	4	4	4	3	54		Medium	Chance find Protocol	2	4	4	4	4	1	18		Low	
<b>Operational Phase</b>																				
Loss of fossil heritage	2	4	4	4	4	3	54		Medium	Chance find Protocol	2	4	4	4	4	1	18		Low	
<b>Decommissioning Phase</b>																				
Loss of fossil heritage	2	4	4	4	4	3	54		Medium	Chance find Protocol	2	4	4	4	4	1	18		Low	
<b>Cumulative</b>																				
Loss of fossil heritage	2	4	4	4	4	3	54		Medium	Chance find Protocol	2	4	4	4	4	1	18		Low	
<b>No Go Option</b>																				
Loss of fossil heritage	2	4	4	4	4	1	18		Low	None	2	4	4	4	4	1	18	0	Low	

## 6.7 Impact Summary

Loss of fossil heritage will have a negative impact. Only the affected properties (localities) will be affected by the proposed development. The expected duration of the impact is assessed as potentially permanent. In the absence of mitigation procedures, the damage or destruction of any palaeontological materials will be permanent. Impacts on palaeontological heritage during the construction phase could potentially occur and are regarded as having a high probability. The significance of the impact occurring will be medium before mitigation and Low after mitigation.

## 7. COMPARATIVE ASSESSMENT OF ALTERNATIVES

### COMPARATIVE ASSESSMENT OF TWO POWER LINE ALTERNATIVES

<b>PREFERRED</b>	No preferred alternative as both will result in a low impact
<b>FAVOURABLE</b>	The impacts will be low
<b>LEAST PREFERRED</b>	No preferred alternative
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
<b>POWER LINE CORRIDOR ROUTE ALTERNATIVES: LOERIESFONTEIN 3 PV SEF TO DWARSRUG WEF</b>		
Power Line Corridor Alternative 1 (Loeriesfontein 3 PV SEF to Dwarsrug WEF)	No Preference	The geology of the proposed alternatives is the same
Power Line Corridor Alternative 2 (Loeriesfontein 3 PV SEF to Dwarsrug WEF)	No Preference	The geology of the proposed alternatives is the same

### 7.1 No-Go Alternative

Consideration must be given to the 'no-go' option in the BA process. The 'no-go' option assumes that the site remains in its current state, i.e., there is no construction of a power line in the proposed project area and the 'status quo' would proceed.

## 8. CONCLUSION AND SUMMARY

### 8.1 Summary of Findings

The proposed development is underlain by Karoo dolerite (Jd) and Dolerite rubble (Qg<sub>1</sub>), the Tierberg Formation (Pt), the Whitehill Formation (Pw) and Prince Albert Formation (Ppr) of the Ecca Group, Karoo Supergroup. The Ecca Group consist of 16 formations of which the Prince Albert and Whitehill formations is the most extensive. The sediments in this area are covered by a layer of alluvium. According to the PalaeoMap on the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Karoo dolerite and dolerite rubble is zero as it is igneous in origin while that of the Whitehill Formation is Very High, the Tierberg Formation has a High Palaeontological Sensitivity while the Prince Albert has a moderate Palaeontological Sensitivity. Quaternary Alluvium has a low Palaeontological sensitivity overall, but locally it is high. (Almond and Pether, 2009; Almond *et al.*, 2013).

Usually impacts on palaeontological heritage only occur during the construction phase of the development. As the authorised Loeriesfontein 3 Photovoltaic Solar Energy Facility and the approved substation at the authorised Dwarsrug Wind Energy was originally assessed in a Palaeontological Impact Assessment (Groenewald, 2014) and as the proposed project falls in the same area the Palaeontological Significance of the three power lines and two route alternatives is low. There is also no preference between the two route alternatives as the geology of the routes are the same. It is thus considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected (if possible, *in situ*) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: [www.sahra.org.za](http://www.sahra.org.za)) so that correct mitigation (recording and collection) can be carry out by a palaeontologist.

### 8.2 Impact Statement

The significance of the impact occurring will be medium before mitigation and Low after mitigation.

The overall impact of the proposed construction of a 132 kV powerline between the approved substation at the authorised 100MW Loeriesfontein 3 Photovoltaic Solar Energy Facility and the approved substation at the authorised 140MW Dwarsrug Wind Energy Facility, located near Loeriesfontein on the paleontological resources, is seen as acceptably low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorized.

## 9. REFERENCES

- ALMOND, J.E. & PETHER, J. 2009. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp. Natura Viva cc., Cape Town.
- ALMOND, J., PETHER, J, and GROENEWALD, G. 2013. South African National Fossil Sensitivity Map. SAHRA and Council for Geosciences.
- ANDERSON, A.M. 1975. Turbidites and arthropod trackways in the Dwyka glacial deposits (Early Permian) of southern Africa. Transactions of the Geological Society of South Africa 78: 265-273.
- ANDERSON, A.M. 1976. Fish trails from the Early Permian of South Africa. Palaeontology 19: 397-409, pl. 54.
- ANDERSON, A.M. 1981. The *Umfolozia* arthropod trackways in the Permian Dwyka and Ecca Groups of South Africa. Journal of Paleontology 55: 84-108, pls. 1-4.
- BANGERT, B. & BAMFORD, M. 2001. Carboniferous pycnoxylic woods from the Dwyka Group of southern Namibia. Palaeontologia africana 37, 13-23.
- COLE, D.I. 2005. Catalogue of South African Lithostratigraphic Units 8: 33-36.
- DE WIT, M.C.J., MARSHALL, T.R. & PARTRIDGE, T.C. 2000. Fluvial deposits and drainage evolution. In: Partridge, T.C. & Maud, R.R. (Eds.) The Cenozoic of southern Africa, pp.55-72. Oxford University Press, Oxford.
- DINGLE, R.V., SIESSER, W.G. & NEWTON, A.R. 1983. Mesozoic and Tertiary geology of southern Africa. viii + 375 pp. Balkema, Rotterdam.
- GROENEWALD, G.D., 2014. Palaeontological Desktop Assessment for the construction of the Dwarsrug Wind Energy Farm on the farms Brakpan 212 and Stinkputs North 229, near Loeriesfontein, Namaqua District Municipality, Northern Cape Province
- 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.
- KLEIN, R.G. 1984. The large mammals of southern Africa: Late Pliocene to Recent. In: Klein, R.G. (Ed.) Southern African prehistory and paleoenvironments, pp 107-146. Balkema, Rotterdam.
- 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.
- SG 2.2 SAHRA APMHOB Guidelines, 2012. Minimum standards for palaeontological components of Heritage Impact Assessment Reports, Pp 1-15.
- VISSER, J.N.J. 1982. Upper Carboniferous glacial sedimentation in the Karoo Basin near Prieska, South Africa. Palaeogeography, Palaeoclimatology, Palaeoecology 38, 63-92.

VAN SCHALKWYK, J. 2011. Heritage Impact Assessment for the proposed establishment of a wind farm and PV facility by Mainstream Renewable Power in the Loeriesfontein Region, Northern Cape Province.

Visser, D.J.L., LOOCK, J.C., and COLLISTON., W.P. 1987. Subaqueous outwash fan and esker sandstones in the Permo-Carboniferous Dwyka Formation of South Africa. *J.Sed.Petrol.*, 57:467-478.

## APPENDIX 1

### IMPACT METHODOLOGY

Environmental impact assessment (EIA) methodology

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

Planning;

Construction;

Operation; and

Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

***The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).***



## Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

**Table 3:** Rating of impacts criteria

<b>ENVIRONMENTAL PARAMETER</b>		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
<b>ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE</b>		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
<b>EXTENT (E)</b>		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
<b>PROBABILITY (P)</b>		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
<b>REVERSIBILITY (R)</b>		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		

1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
<b>IRREPLACEABLE LOSS OF RESOURCES (L)</b>		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
<b>DURATION (D)</b>		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
<b>INTENSITY / MAGNITUDE (I / M)</b>		

Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
<b>SIGNIFICANCE (S)</b>		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:		
<b>Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.</b>		
The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
<b>Points</b>	<b>Impact Significance Rating</b>	<b>Description</b>
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.

24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The table below is to be represented in the Impact Assessment section of the report. The excel spreadsheet template can be used to complete the Impact Assessment.

Rating of impacts template and example

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
<b>Construction Phase</b>																				
Vegetation and protected plant species	Vegetation clearing for access roads, turbines and their service areas and other infrastructure will impact on vegetation and protected plant species.	2	4	2	2	3	3	39	-	Medium	Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. These measures will be detailed in the EMPr.	2	4	2	1	3	2	24	-	Low

## COMPARATIVE ASSESSMENT OF ALTERNATIVES

<b>PREFERRED</b>	The alternative will result in a low impact / reduce the impact / result in a positive impact
<b>FAVOURABLE</b>	The impact will be relatively insignificant
<b>LEAST PREFERRED</b>	The alternative will result in a high impact / increase the impact
<b>NO PREFERENCE</b>	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
<b>POWER LINE CORRIDOR ROUTE ALTERNATIVES: LOERIESFONTEIN 3 PV SEF TO DWARSRUG WEF</b>		
Power Line Corridor Alternative 1 (Loeriesfontein 3 to Dwarsrug WEF) PV SEF		Please detail reasons for preference provided / indicated (i.e. justify why you assigned certain preference rating to alternative)
Power Line Corridor Alternative 2 (Loeriesfontein 3 to Dwarsrug WEF) PV SEF		

## APPENDIX 2

### CURRICULUM VITAE

#### ELIZE BUTLER

**PROFESSION:** Palaeontologist  
**YEARS' EXPERIENCE:** 26 years in Palaeontology

**EDUCATION:** B.Sc Botany and Zoology, 1988  
University of the Orange Free State

B.Sc (Hons) Zoology, 1991  
University of the Orange Free State

Management Course, 1991  
University of the Orange Free State

M. Sc. *Cum laude* (Zoology), 2009  
University of the Free State

**Dissertation title:** The postcranial skeleton of the Early Triassic non-mammalian Cynodont *Galesaurus planiceps*: implications for biology and lifestyle

#### MEMBERSHIP

Palaeontological Society of South Africa (PSSA) 2006-currently

#### EMPLOYMENT HISTORY

Part time Laboratory assistant Department of Zoology & Entomology University of the Free State Zoology 1989-1992

Part time laboratory assistant Department of Virology University of the Free State Zoology 1992

Research Assistant National Museum, Bloemfontein 1993 – 1997

Principal Research Assistant and Collection Manager National Museum, Bloemfontein 1998–currently

## TECHNICAL REPORTS

**Butler, E. 2014.** Palaeontological Impact Assessment of the proposed development of private dwellings on portion 5 of farm 304 Matjesfontein Keurboomstrand, Knysna District, Western Cape Province. Bloemfontein.

**Butler, E. 2014.** Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoot, Northern Cape Province. 2014. Bloemfontein.

**Butler, E. 2015.** Palaeontological impact assessment of the proposed consolidation, re-division and development of 250 serviced erven in Nieu-Bethesda, Camdeboo local municipality, Eastern Cape. Bloemfontein.

**Butler, E. 2015.** Palaeontological impact assessment of the proposed mixed land developments at Rooikraal 454, Vrede, Free State. Bloemfontein.

**Butler, E. 2015.** Palaeontological exemption report of the proposed truck stop development at Palmiet 585, Vrede, Free State. Bloemfontein.

**Butler, E. 2015.** Palaeontological impact assessment of the proposed Orange Grove 3500 residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape. Bloemfontein.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Gonubie residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape Province. Bloemfontein.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Ficksburg raw water pipeline. Bloemfontein.

**Butler, E. 2015.** Palaeontological Heritage Impact Assessment report on the establishment of the 65 mw Majuba Solar Photovoltaic facility and associated infrastructure on portion 1, 2 and 6 of the farm Witkoppies 81 HS, Mpumalanga Province. Bloemfontein.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed township establishment on the remainder of portion 6 and 7 of the farm Sunnyside 2620, Bloemfontein, Mangaung metropolitan municipality, Free State, Bloemfontein.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Woodhouse 1 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse729, near Vryburg, North West Province. Bloemfontein.



**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Woodhouse 2 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. Bloemfontein.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Orkney solar energy farm and associated infrastructure on the remaining extent of Portions 7 and 21 of the farm Wolvehuis 114, near Orkney, North West Province. Bloemfontein.

**Butler, E. 2015.** Palaeontological Impact Assessment of the proposed Spectra foods broiler houses and abattoir on the farm Maiden Manor 170 and Ashby Manor 171, Lukhanji Municipality, Queenstown, Eastern Cape Province. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupport concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupport, Northern Cape. Prepared for Savannah Environmental. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed Woodhouse 1 Photovoltaic Solar Energy facility and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed Woodhouse 2 Photovoltaic Solar Energy facility and associated infrastructure on the farm Woodhouse 729, near Vryburg, North West Province. Bloemfontein.

**Butler, E. 2016.** Proposed 132kV overhead power line and switchyard station for the authorised Solis Power 1 CSP project near Upington, Northern Cape. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed Senqu Pedestrian Bridges in Ward 5 of Senqu Local Municipality, Eastern Cape Province. Bloemfontein.

**Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Modderfontein Filling Station on Erf 28 Portion 30, Founders Hill, City Of Johannesburg, Gauteng Province. Bloemfontein.

**Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Modikwa Filling Station on a Portion of Portion 2 of Mooihoek 255 Kt, Greater Tubatse Local Municipality, Limpopo Province. Bloemfontein.

**Butler, E. 2016.** Recommendation from further Palaeontological Studies: Proposed Construction of the Heidedal filling station on Erf 16603, Heidedal Extension 24, Mangaung Local Municipality, Bloemfontein, Free State Province. Bloemfontein.

**Butler, E. 2016.** Recommended Exemption from further Palaeontological studies: Proposed Construction of the Gunstfontein Switching Station, 132kv Overhead Power Line (Single Or Double Circuit) and ancillary infrastructure for the Gunstfontein Wind Farm Near Sutherland, Northern Cape Province. Savannah South Africa. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province. Bloemfontein.

**Butler, E. 2016.** Chris Hani District Municipality Cluster 9 water backlog project phases 3a and 3b: Palaeontology inspection at Tsomo WTW. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoort concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoort, Northern Cape. Savannah South Africa. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed upgrading of the main road MR450 (R335) from the Motherwell to Addo within the Nelson Mandela Bay Municipality and Sunday's river valley Local Municipality, Eastern Cape Province. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment construction of the proposed Metals Industrial Cluster and associated infrastructure near Kuruman, Northern Cape Province. Savannah South Africa. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment for the proposed construction of up to a 132kv power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces. PGS Heritage. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment of the proposed development of two burrow pits (DR02625 and DR02614) in the Enoch Mgijima Municipality, Chris Hani District, Eastern Cape.

**Butler, E. 2016.** Ezibeleni waste Buy-Back Centre (near Queenstown), Enoch Mgijima Local Municipality, Eastern Cape. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment for the proposed construction of two 5 Mw Solar Photovoltaic Power Plants on Farm Wildebeestkuil 59 and Farm Leeuwbosch 44, Leeudoringstad, North West Province. Bloemfontein.

**Butler, E. 2016.** Palaeontological Impact Assessment for the proposed development of four Leeuwerberg Wind farms and basic assessments for the associated grid connection near Loeriesfontein, Northern Cape Province. Bloemfontein.

**Butler, E. 2016.** Palaeontological impact assessment for the proposed Aggeneys south prospecting right project, Northern Cape Province. Bloemfontein.

**Butler, E. 2016.** Palaeontological impact assessment of the proposed Motuoane Ladysmith Exploration right application, Kwazulu Natal. Bloemfontein.

**Butler, E. 2016.** Palaeontological impact assessment for the proposed construction of two 5 MW solar photovoltaic power plants on farm Wildebeestkuil 59 and farm Leeuwbosch 44, Leeudoringstad, North West Province. Bloemfontein.

**Butler, E. 2016:** Palaeontological desktop assessment of the establishment of the proposed residential and mixed use development on the remainder of portion 7 and portion 898 of the farm Knopjeslaagte 385 Ir, located near Centurion within the Tshwane Metropolitan Municipality of Gauteng Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological impact assessment for the proposed development of a new cemetery, near Kathu, Gamagara local municipality and John Taolo Gaetsewe district municipality, Northern Cape. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment Of The Proposed Development Of The New Open Cast Mining Operations On The Remaining Portions Of 6, 7, 8 And 10 Of The Farm Kwaggafontein 8 In The Carolina Magisterial District, Mpumalanga Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Development of a Wastewater Treatment Works at Lanseria, Gauteng Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Scoping Report for the Proposed Construction of a Warehouse and Associated Infrastructure at Perseverance in Port Elizabeth, Eastern Cape Province.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Establishment of a Diesel Farm and a Haul Road for the Tshipi Borwa mine Near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the Proposed Changes to Operations at the UMK Mine near Hotazel, In the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment for the Development of the Proposed Ventersburg Project-An Underground Mining Operation near Ventersburg and Henneman, Free State Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological desktop assessment of the proposed development of a 3000 MW combined cycle gas turbine (CCGT) in Richards Bay, Kwazulu-Natal. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment for the Development of the Proposed Revalidation of the lapsed General Plans for Elliotdale, Mbhashe Local Municipality. Bloemfontein.

**Butler, E. 2017.** Palaeontological assessment of the proposed development of a 3000 MW Combined Cycle Gas Turbine (CCGT) in Richards Bay, Kwazulu-Natal. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed development of the new open cast mining operations on the remaining portions of 6, 7, 8 and 10 of the farm Kwaggafontein 8 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed mining of the farm Zandvoort 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed Lanseria outfall sewer pipeline in Johannesburg, Gauteng Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of open pit mining at Pit 36W (New Pit) and 62E (Dishaba) Amandelbult Mine Complex, Thabazimbi, Limpopo Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological impact assessment of the proposed development of the sport precinct and associated infrastructure at Merrifield Preparatory school and college, Amathole Municipality, East London. PGS Heritage. Bloemfontein.

**Butler, E. 2017.** Palaeontological impact assessment of the proposed construction of the Lehae training and fire station, Lenasia, Gauteng Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the new open cast mining operations of the Impunzi mine in the Mpumalanga Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the construction of the proposed Viljoenskroon Munic 132 KV line, Vierfontein substation and related projects. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed rehabilitation of 5 ownerless asbestos mines. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the Lephale coal and power project, Lephale, Limpopo Province, Republic of South Africa. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of a 132KV powerline from the Tweespruit distribution substation (in the Mantsopa local municipality) to the Driedorp rural substation (within the Naledi local municipality), Free State province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed development of the new coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of a Photovoltaic Solar Power station near Collett substation, Middelburg, Eastern Cape. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment for the proposed township establishment of 2000 residential sites with supporting amenities on a portion of farm 826 in Botshabelo West, Mangaung Metro, Free State Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed prospecting right project without bulk sampling, in the Koa Valley, Northern Cape Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed Aroams prospecting right project, without bulk sampling, near Aggeneys, Northern Cape Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed Belvior aggregate quarry II on portion 7 of the farm Maidenhead 169, Enoch Mgijima Municipality, division of Queenstown, Eastern Cape. Bloemfontein.

**Butler, E. 2017.** PIA site visit and report of the proposed Galla Hills Quarry on the remainder of the farm Roode Krantz 203, in the Lukhanji Municipality, division of Queenstown, Eastern Cape Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of Tina Falls Hydropower and associated power lines near Cumbu, Mthlontlo Local Municipality, Eastern Cape. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed construction of the Mangaung Gariep Water Augmentation Project. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed Belvoir aggregate quarry II on portion 7 of the farm Maidenhead 169, Enoch Mgijima Municipality, division of Queenstown, Eastern Cape. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed construction of the Melkspruit-Rouxville 132KV Power line. Bloemfontein.

**Butler, E. 2017** Palaeontological Desktop Assessment of the proposed development of a railway siding on a portion of portion 41 of the farm Rustfontein 109 is, Govan Mbeki local municipality, Gert Sibande district municipality, Mpumalanga Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed consolidation of the proposed Ilima Colliery in the Albert Luthuli local municipality, Gert Sibande District Municipality, Mpumalanga Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed extension of the Kareerand Tailings Storage Facility, associated borrow pits as well as a storm water drainage channel in the Vaal River near Stilfontein, North West Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed construction of a filling station and associated facilities on the Erf 6279, district municipality of John Taolo Gaetsewe District, Ga-Segonyana Local Municipality Northern Cape. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed of the Lephalale Coal and Power Project, Lephalale, Limpopo Province, Republic of South Africa. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed Overvaal Trust PV Facility, Buffelspoort, North West Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed development of the H2 Energy Power Station and associated infrastructure on Portions 21; 22 And 23 of the farm Hartebeestspruit in the Thembisile Hani Local Municipality, Nkangala District near Kwamhlanga, Mpumalanga Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed upgrade of the Sandriver Canal and Klippan Pump station in Welkom, Free State Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed upgrade of the 132kv and 11kv power line into a dual circuit above ground power line feeding into the Urania substation in Welkom, Free State Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.

**Butler, E. 2017.** Palaeontological Impact Assessment of the proposed diamonds alluvial & diamonds general prospecting right application near Christiana on the remaining extent of portion 1 of the farm Kaffraria 314, registration division HO, North West Province. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Hartebeesfontein, near Panbult, Mpumalanga. Bloemfontein.

**Butler, E. 2017.** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Rustplaas near Piet Retief, Mpumalanga. Bloemfontein.

**Butler, E. 2018.** Palaeontological Impact Assessment for the Proposed Landfill Site in Luckhoff, Letsemeng Local Municipality, Xhariep District, Free State. Bloemfontein.

**Butler, E. 2018.** Palaeontological Impact Assessment of the proposed development of the new Mutsho coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Impact Assessment of the authorisation and amendment processes for Manangu mine near Delmas, Victor Khanye local municipality, Mpumalanga. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed Mashishing township establishment in Mashishing (Lydenburg), Mpumalanga Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the Proposed Mlonzi Estate Development near Lusikisiki, Ngquza Hill Local Municipality, Eastern Cape. Bloemfontein.

**Butler, E. 2018.** Palaeontological Phase 1 Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed electricity expansion project and Sekgame Switching Station at the Sishen Mine, Northern Cape Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological field assessment of the proposed construction of the Zonnebloem Switching Station (132/22kV) and two loop-in loop-out power lines (132kV) in the Mpumalanga Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Field Assessment for the proposed re-alignment and de-commissioning of the Firham-Platrand 88kv Powerline, near Standerton, Lekwa Local Municipality, Mpumalanga province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

**Butler, E. 2018.** Palaeontological field Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. Bloemfontein.

**Butler, E. 2018.** Palaeontological desktop assessment of the proposed Mookodi – Mahikeng 400kV line, North West Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the proposed Thornhill Housing Project, Ndlambe Municipality, Port Alfred, Eastern Cape Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological desktop assessment of the proposed housing development on portion 237 of farm Hartebeestpoort 328. Bloemfontein.

**Butler, E. 2018.** Palaeontological desktop assessment of the proposed New Age Chicken layer facility located on holding 75 Endicott near Springs in Gauteng. Bloemfontein.

**Butler, E. 2018** Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Field Assessment of the proposed Megamor Extension, East London. Bloemfontein

**Butler, E. 2018.** Palaeontological Impact Assessment of the proposed diamonds Alluvial & Diamonds General Prospecting Right Application near Christiana on the Remaining Extent of Portion 1 of the Farm Kaffraria 314, Registration Division HO, North West Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Impact Assessment of the proposed construction of a new 11kV (1.3km) Power Line to supply electricity to a cell tower on farm 215 near Delpoortshoop in the Northern Cape. Bloemfontein.

**Butler, E. 2018.** Palaeontological Field Assessment of the proposed construction of a new 22 kV single wood pole structure power line to the proposed MTN tower, near Britstown, Northern Cape Province. Bloemfontein.



**Butler, E. 2018.** Palaeontological Exemption Letter for the proposed reclamation and reprocessing of the City Deep Dumps in Johannesburg, Gauteng Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Exemption letter for the proposed reclamation and reprocessing of the City Deep Dumps and Rooikraal Tailings Facility in Johannesburg, Gauteng Province. Bloemfontein.

**Butler, E. 2018.** Proposed Kalabasfontein Mine Extension project, near Bethal, Govan Mbeki District Municipality, Mpumalanga. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological Desktop Assessment of the proposed Mookodi – Mahikeng 400kV Line, North West Province. Bloemfontein.

**Butler, E. 2018.** Environmental Impact Assessment (EIA) for the Proposed 325mw Rondekop Wind Energy Facility between Matjiesfontein And Sutherland In The Northern Cape Province.

**Butler, E. 2018.** Palaeontological Impact Assessment of the proposed construction of the Tooverberg Wind Energy Facility, and associated grid connection near Touws River in the Western Cape Province. Bloemfontein.

**Butler, E. 2018.** Palaeontological impact assessment of the proposed Kalabasfontein Mining Right Application, near Bethal, Mpumalanga.

**E. Butler. 2019.** Palaeontological Desktop Assessment of the proposed Westrand Strengthening Project Phase II.

**E. Butler. 2019.** Palaeontological Field Assessment for the proposed Sirius 3 Photovoltaic Solar Energy Facility near Upington, Northern Cape Province

**E. Butler. 2019.** Palaeontological Field Assessment for the proposed Sirius 4 Photovoltaic Solar Energy Facility near Upington, Northern Cape Province

**E. Butler. 2019.** Palaeontological Field Assessment for Heuningspruit PV 1 Solar Energy Facility near Koppies, Ngwathe Local Municipality, Free State Province.

**E. Butler. 2019.** Palaeontological Field Assessment for the Moeding Solar Grid Connection, North West Province.

**E. Butler. 2019.** Recommended Exemption from further Palaeontological studies for the Proposed Agricultural Development on Farms 1763, 2372 And 2363, Kakamas South Settlement, Kai! Garib Municipality, Mgcawu District Municipality, Northern Cape Province.

**E. Butler. 2019.** Recommended Exemption from further Palaeontological studies: of Proposed Agricultural Development, Plot 1178, Kakamas South Settlement, Kai! Garib Municipality

**E. Butler. 2019.** Palaeontological Desktop Assessment for the Proposed Waste Rock Dump Project at Tshipi Borwa Mine, near Hotazel, Northern Cape Province:

**E. Butler. 2019.** Palaeontological Exemption Letter for the proposed DMS Upgrade Project at the Sishen Mine, Gamagara Local Municipality, Northern Cape Province

**E. Butler. 2019.** Palaeontological Desktop Assessment of the proposed Integrated Environmental Authorisation process for the proposed Der Brochen Amendment project, near Groblershoop, Limpopo

**E. Butler. 2019.** Palaeontological Desktop Assessment of the proposed updated Environmental Management Programme (EMPr) for the Assmang (Pty) Ltd Black Rock Mining Operations, Hotazel, Northern Cape

**E. Butler. 2019.** Palaeontological Desktop Assessment of the proposed Kriel Power Station Lime Plant Upgrade, Mpumalanga Province

**E. Butler. 2019.** Palaeontological Impact Assessment for the proposed Kangala Extension Project Near Delmas, Mpumalanga Province.

**E. Butler. 2019.** Palaeontological Desktop Assessment for the proposed construction of an iron/steel smelter at the Botshabelo Industrial area within the Mangaung Metropolitan Municipality, Free State Province.

**E. Butler. 2019.** Recommended Exemption from further Palaeontological studies for the proposed agricultural development on farms 1763, 2372 and 2363, Kakamas South settlement, Kai! Garib Municipality, Mgcawu District Municipality, Northern Cape Province.

**E. Butler. 2019.** Recommended Exemption from further Palaeontological Studies for Proposed formalisation of Gamakor and Noodkamp low cost Housing Development, Keimoes, Gordonia Rd, Kai !Garib Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.

**E. Butler. 2019.** Recommended Exemption from further Palaeontological Studies for proposed formalisation of Blaauwskop Low Cost Housing Development, Kenhardt Road, Kai !Garib Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province.

- E. Butler. 2019.** Palaeontological Desktop Assessment of the proposed mining permit application for the removal of diamonds alluvial and diamonds kimberlite near Windsorton on a certain portion of Farm Zoelen's Laagte 158, Registration Division: Barkly Wes, Northern Cape Province.
- E. Butler. 2019.** Palaeontological Desktop Assessment of the proposed Vedanta Housing Development, Pella Mission 39, Khâi-Ma Local Municipality, Namakwa District Municipality, Northern Cape.
- E. Butler. 2019.** Palaeontological Desktop Assessment for The Proposed 920 Kwp Groenheuwel Solar Plant Near Augrabies, Northern Cape Province
- E. Butler. 2019.** Palaeontological Desktop Assessment for the establishment of a Super Fines Storage Facility at Amandelbult Mine, Near Thabazimbi, Limpopo Province
- E. Butler. 2019.** Palaeontological Impact Assessment for the proposed Sace Lifex Project, Near Emalaheni, Mpumalanga Province
- E. Butler. 2019.** Palaeontological Desktop Assessment for the proposed Rehau Fort Jackson Warehouse Extension, East London
- E. Butler. 2019.** Palaeontological Desktop Assessment for the proposed Environmental Authorisation Amendment for moving 3 Km Of the Merensky-Kameni 132KV Powerline
- E. Butler. 2019.** Palaeontological Impact Assessment for the proposed Umsobomvu Solar PV Energy Facilities, Northern and Eastern Cape
- E. Butler. 2019.** Palaeontological Desktop Assessment for six proposed Black Mountain Mining Prospecting Right Applications, without Bulk Sampling, in the Northern Cape.
- E. Butler. 2019.** Palaeontological field Assessment of the Filling Station (Rietvlei Extension 6) on the Remaining Portion of Portion 1 of the Farm Witkoppies 393JR east of the Rietvleidam Nature Reserve, City of Tshwane, Gauteng
- E. Butler. 2019.** Palaeontological Desktop Assessment Of The Proposed Upgrade Of The Vaal Gamagara Regional Water Supply Scheme: Phase 2 And Groundwater Abstraction
- E. Butler. 2019.** Palaeontological Desktop Assessment Of The Expansion Of The Jan Kempdorp Cemetry On Portion 43 Of Farm Guldenskat 36-Hn, Northern Cape Province
- E. Butler. 2019.** Palaeontological Desktop Assessment of the Proposed Residential Development On Portion 42 Of Farm Geldunskat No 36 In Jan Kempdorp, Phokwane Local Municipality, Northern Cape Province

**E. Butler.** 2019. Palaeontological Impact Assessment of the proposed new Township Development, Lethabo Park, on Remainder of Farm Roodepan No 70, Erf 17725 And Erf 15089, Roodepan Kimberley, Sol Plaatjies Local Municipality, Frances Baard District Municipality, Northern Cape

**E. Butler.** 2019. Palaeontological Protocol for Finds for the proposed 16m WH Battery Storage System in Steinkopf, Northern Cape Province

**E. Butler.** 2019. Palaeontological Exemption Letter of the proposed 4.5WH Battery Storage System near Midway-Pofadder, Northern Cape Province

**E. Butler.** 2019. Palaeontological Exemption Letter of the proposed 2.5ml Process Water Reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape

**E. Butler.** 2019. Palaeontological Desktop Assessment for the Establishment of a Super Fines Storage Facility at Gloria Mine, Black Rock Mine Operations, Hotazel, Northern Cape:

**E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed New Railway Bridge, and Rail Line Between Hotazel And The Gloria Mine, Northern Cape Province

**E. Butler.** 2019. Palaeontological Exemption Letter Of The Proposed Mixed Use Commercial Development On Portion 17 Of Farm Boegoeberg Settlement Number 48, !Kheis Local Municipality In The Northern Cape Province

**E. Butler.** 2019. Palaeontological Desktop Assessment of the Proposed Diamond Mining Permit Application Near Kimberley, Sol Plaatjies Municipality, Northern Cape Province

**E. Butler.** 2019. Palaeontological Desktop Assessment of the Proposed Diamonds (Alluvial, General & In Kimberlite) Prospecting Right Application near Postmasburg, Registration Division; Hay, Northern Cape Province

**E. Butler.** 2019. Palaeontological Desktop Assessment of the proposed diamonds (alluvial, general & in kimberlite) prospecting right application near Kimberley, Northern Cape Province.

**E. Butler.** 2019. Palaeontological Phase 1 Impact Assessment of the proposed upgrade of the Vaal Gamagara regional water supply scheme: Phase 2 and groundwater abstraction

**E. Butler.** 2019. Palaeontological Desktop Assessment of the proposed seepage interception drains at Duvha Power Station, Emalaheni Municipality, Mpumalanga Province

**E. Butler.** 2019. Palaeontological Desktop Assessment letter for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng.

**E. Butler.** 2019. Palaeontological Phase 1 Assessment letter for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng.

**E. Butler.** 2019. Palaeontological field Assessment for the Proposed Upgrade of the Kolomela Mining Operations, Tsantsabane Local Municipality, Siyanda District Municipality, Northern Cape Province, Northern Cape

**E. Butler.** 2019. Palaeontological Desktop Assessment of the proposed feldspar prospecting rights and mining application on portion 4 and 5 of the farm Rozyne 104, Kakamas South, Kai! Garib Municipality, Zf Mgcawu District Municipality, Northern Cape

**E. Butler.** 2019. Palaeontological Phase 1 Field Assessment of the proposed Summerpride Residential Development and Associated Infrastructure on Erf 107, Buffalo City Municipality, East London.

**E. Butler.** 2019. Palaeontological Desktop Impact Assessment for the proposed re-commission of the Old Balgray Colliery near Dundee, Kwazulu Natal.

**E. Butler.** 2019. Palaeontological Phase 1 Impact Assessment for the Proposed Re-Commission of the Old Balgray Colliery near Dundee, Kwazulu Natal.

**E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery.

**E. Butler.** 2019. Palaeontological Impact Assessment and Protocol for Finds of a Proposed New Quarry on Portion 9 (of 6) of the farm Mimosa Glen 885, Bloemfontein, Free State Province

**E. Butler.** 2019. Palaeontological Impact Assessment and Protocol for Finds of a proposed development on Portion 9 and 10 of the Farm Mimosa Glen 885, Bloemfontein, Free State Province

**E. Butler.** 2019. Palaeontological Exemption Letter for the proposed residential development on the Remainder of Portion 1 of the Farm Strathearn 2154 in the Magisterial District of Bloemfontein, Free State

**E. Butler.** 2019. Palaeontological Field Assessment for the Proposed Nigel Gas Transmission Pipeline Project in the Nigel Area of the Ekurhuleni Metropolitan Municipality, Gauteng Province

**E. Butler.** 2019. Palaeontological Desktop Assessment for five Proposed Black Mountain Mining Prospecting Right Applications, Without Bulk Sampling, in the Northern Cape.

**E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed Environmental Authorisation and an Integrated Water Use Licence Application for the Reclamation of the Marievale Tailings Storage Facilities, Ekurhuleni Metropolitan Municipality - Gauteng Province.

**E. Butler.** 2019. Palaeontological Impact Assessment for the Proposed Sace Lifex Project, near Emalaheni, Mpumalanga Province.

**E. Butler.** 2019. Palaeontological Desktop Assessment for the proposed Golfview Colliery near Ermelo, Msukaligwa Local Municipality, Mpumalanga Province

**E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed Kangra Maquasa Block C Mining development near Piet Retief, in the Mkhondo Local Municipality within the Gert Sibande District Municipality

**E. Butler.** 2019. Palaeontological Desktop Assessment for the Proposed Amendment of the Kusipongo Underground and Opencast Coal Mine in Support of an Environmental Authorization and Waste Management License Application.

**E. Butler.** 2019. Palaeontological Exemption Letter of the Proposed Mamatwan Mine Section 24g Rectification Application, near Hotazel, Northern Cape Province

**E. Butler.** 2020. Palaeontological Field Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery

**E. Butler.** 2020. Palaeontological Desktop Assessment for the Proposed Extension of the South African Nuclear Energy Corporation (Necsa) Pipe Storage Facility, Madibeng Local Municipality, North West Province

**E. Butler.** 2020. Palaeontological Field Assessment for the Proposed Piggery on Portion 46 of the Farm Brakkefontien 416, Within the Nelson Mandela Bay Municipality, Eastern Cape

**E. Butler.** 2020. Palaeontological field Assessment for the proposed Rietfontein Housing Project as part of the Rapid Land Release Programme, Gauteng Province Department of Human Settlements, City of Johannesburg Metropolitan Municipality

**E. Butler.** 2020. Palaeontological Desktop Assessment for the Proposed Choje Wind Farm between Grahamstown and Somerset East, Eastern Cape

**E. Butler.** 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application for the Prospecting of Diamonds (Alluvial, General & In Kimberlite), Combined with A Waste License Application, Registration Division: Gordonias And Kenhardt, Northern Cape Province

**E. Butler.** 2020. Palaeontological Impact Assessment for the Proposed Clayville Truck Yard, Ablution Blocks and Wash Bay to be Situated on Portion 55 And 56 Of Erf 1015, Clayville X11, Ekurhuleni Metropolitan Municipality, Gauteng Province

**E. Butler.** 2020. Palaeontological Desktop Assessment for the Proposed Hartebeesthoek Residential Development

**E. Butler.** 2020. Palaeontological Desktop Assessment for the Proposed Mooiplaats Educational Facility, Gauteng Province

**E. Butler.** 2020. Palaeontological Impact Assessment for the Proposed Monument Park Student Housing Establishment

**E. Butler.** 2020. Palaeontological Field Assessment for the Proposed Standerton X10 Residential and Mixed-Use Developments, Lekwa Local Municipality Standerton, Mpumalanga Province

**E. Butler.** 2020. Palaeontological Field Assessment for the Rezoning and Subdivision of Portion 6 Of Farm 743, East London

**E. Butler.** 2020. Palaeontological Field Assessment for the Proposed Matla Power Station Reverse Osmosis Plant, Mpumalanga Province