



# PGS HERITAGE

**PALAEONTOLOGICAL IMPACT 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.**

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**PGS  
HERITAGE**



+ 27 (0) 12 332 5305



+27 (0) 86 675 8077



contact@pgsheritage.co.za



PO Box 32542, Totiusdal, 0134

Offices in South Africa, Kingdom of Lesotho and Mozambique

Head Office:  
906 Bergarend Streets  
Waverley, Pretoria,  
South Africa

Directors: HS Steyn, PD Birkholtz, W Fourie

## **Declaration of Independence**

I, Elize Butler, declare that –

General declaration:

- I act as the independent palaeontological 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 palaeontological impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected a palaeontological specialist in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

## **Disclosure of Vested Interest**

I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

**PALAEONTOLOGICAL CONSULTANT:**

Banzai Environmental (Pty) Ltd

**CONTACT PERSON:**

Elize Butler

Tel: +27 844478759

Email: elizebutler002@gmail.com

**SIGNATURE:**



**ACKNOWLEDGEMENT OF RECEIPT**

<b>Report Title</b>	<b>Palaeontological Impact 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</b>		
<b>Control</b>	<b>Name</b>	<b>Signature</b>	<b>Designation</b>
<b>Author</b>	Elize Butler		Palaeontologist
<b>Reviewed</b>	Wouter Fourie		Principal Heritage Specialist
<b>Client</b>	Kristy Robertson		<b>Nemai Consulting</b>

**CLIENT:**

Nemai Consulting

**CONTACT PERSON:**

Kristy Robertson

Tel: +27 011 781 1730

E-mail: kristyr@nemai.co.za

**SIGNATURE:**

\_\_\_\_\_

The heritage impact assessment report has been compiled taking into account the NEMA Appendix 6 requirements for specialist reports as indicated in the table below.

NEMA Regs (2014) - Appendix 6	Relevant section in report
Details of the specialist who prepared the report	Page 2 of Report – Contact details and company
The expertise of that person to compile a specialist report including a curriculum vita	Section 2 – refer to <b>Appendix A</b>
A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report
An indication of the scope of, and the purpose for which, the report was prepared	Section 4
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 4
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 3 and 5.1
An identification of any areas to be avoided, including buffers	N/A
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;	No sensitive areas identified
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 9 1
Any mitigation measures for inclusion in the EMPr	Section 6
Any conditions for inclusion in the environmental authorisation	N/A
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	N/A
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised and	Section 9
If the opinion is that the proposed activity 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	
A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. A public consultation process was handled as part of the EIA and EMP process.
A summary and copies if any comments that were received during any consultation process	Not applicable. To date not comments regarding heritage resources that require input from a specialist have been raised.
Any other information requested by the competent authority.	Not applicable.

## EXECUTIVE SUMMARY

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Impact Assessment (PIA) for the proposed construction of a new 22 KV single wood pole structure power line to the proposed MTN tower, near Britstown, Northern Cape Province. According to the National Heritage Resources Act (No 25 of 1999, section 38), a PIA is key to detect the presence of fossil material within the proposed development footprint and it is thus necessary to evaluate the impact of the construction on the palaeontological resources.

The proposed development footprint is underlain by the Permian aged Tierberg Formation, (Ecca Group, Karoo Supergroup) and Jurassic Karoo Dolerite. The Tierberg Formation of the Ecca Group is well-known for the presences of several trace fossils, micro-vertebrates e.g. disarticulated fish fossils and fossilized leaves and wood. According to the SAHRIS PalaeoMap the sedimentary rocks of the Tierberg Formation has a moderate palaeontological sensitivity, while the Ecca has a very high palaeontological sensitivity. Drainage channels are present in the development footprint with a possibility that fossils could be present. The Karoo Dolerite is igneous rock and thus unfossiliferous.

During a field survey of the development footprint (on foot and by motor vehicle), no fossiliferous outcrops were found. For this reason, a **low palaeontological sensitivity** is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Britstown MTN tower and power line development will be of a low significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources. 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.

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## TERMINOLOGY AND ABBREVIATIONS

### Archaeological resources

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

### Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

### Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

### Early Stone Age

The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

### Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

### **Heritage**

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

### **Heritage resources**

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

### **Holocene**

The most recent geological time period which commenced 10 000 years ago.

### **Late Stone Age**

The archaeology of the last 30 000 years associated with fully modern people.

### **Late Iron Age (Early Farming Communities)**

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

### **Middle Stone Age**

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

### **Palaeontology**

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

<b>Abbreviations</b>	<b>Description</b>
AIA	Archaeological Impact Assessment

ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

## **1 INTRODUCTION**

The MTN service provider built a new cell phone tower in the Britstown district, Northern Cape Province (**Figure 1**) and consequently created a submission to Eskom to obtain electricity for the new tower. The new line will T-off from the existing Britstown-Volstruispoort 22kV line.

### **1.1 Project Description**

The proposed MTN tower and power line project will comprise of the construction of a new 2km, 22kV wood pole power line from the existing Britstown-Volstruispoort 22kV line up to the new MTN tower (**Figure 1**).



Figure 1. Google Earth Image of the location of the proposed MTN Tower and 22 KV power line near Britstown, Northern Cape Province (indicated in white). Scale bar represents 354 m.

## 2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-four years. She has extensive 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 for 12 years. She has been conducting PIAs since 2014.

## 3 LEGISLATION

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

Cultural Heritage in South Africa, includes all heritage resources, is protected by the National Heritage Resources Act (Act 25 of 1999) (NHRA). Heritage resources as defined in Section 3 of the Act 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. Palaeontological resources may not be unearthed, moved, broken 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 Desktop 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.

#### 4 OBJECTIVE

The objective of a Palaeontological Desktop Assessment 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 importance of the exposed and subsurface rock formations in the development footprint 2) to evaluate the palaeontological importance of the formations 3) to determine the impact of the development on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

When a palaeontological desktop study is compiled, the potentially fossiliferous rocks (i.e. groups, formations, etc.) present within the study area are established from 1:250 000 geological maps. The topography of the development area is identified using 1:50 000 topography maps as well as Google Earth Images of the development area. Fossil heritage within each rock section is obtained from previous palaeontological impact studies in the same region, the PalaeoMap from SAHRIS; and databases of various institutions (identifying fossils found in locations specifically in areas close to the development area). The palaeontological importance of each rock unit of the development area is then calculated. The possible impact of the proposed development footprint on local fossil heritage is established on the following criteria: 1) the palaeontological importance of the rocks and 2) the type and scale of the development footprint and 3) quantity of bedrock excavated.

In the event that rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a professional palaeontologist is required. Based on both the desktop data and field examination of the rock exposures, the impact significance of the planned development is measured with recommendations for any further studies or mitigation. In general, destructive impacts on palaeontological heritage only occur during construction. The excavations will transform the current topography and may destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

Mitigation comprises the sampling, collection and recording of fossils and may precede construction or, more ideally, occur during construction when potentially fossiliferous bedrock is exposed. Preceding the excavation of any fossil heritage a permit from SAHRA must be obtained and the material will have to be housed in a permitted institution. When mitigation is applied correctly, a positive impact is possible because our knowledge of local palaeontological heritage may be increased.

## 5 GEOLOGICAL AND PALAEOONTOLOGICAL HISTORY

The proposed Britstown MTN tower and power line is entirely underlain by Permian aged sedimentary rocks of the Tierberg Formation, (Ecca Group, Karoo Supergroup) and Jurassic Karoo Dolerite (Figure 2 & Figure 3).

### 5.1 Geology

#### 5.1.1 Tierberg Formation

The Tierberg Formation (Pt) (Ecca Group, Karoo Supergroup) is Lower to Mid Permian in age and is an argillaceous mudrock-dominated sequence. It comprises mainly of dark grey to greenish grey shale with interbedded siltstone and very fine to fine-grained sandstone near the top, forming coarsening upward cycles. This formation were deposited in offshore in calm water environments.

#### 5.1.2 Karoo Dolerite Suite.

The Karoo Dolerite Suite is a volcanic suite which consists of igneous rocks and was formed in the Early Jurassic Period. This Dolerite Suite characterises a superficial feeder system to the flood basalt eruptions which is the best developed in the Karoo Basin. Flood basalts do not usually form any noticeable volcanic structures but with a succession of eruptions form a suite of fissures of sub-horizontal lava flows that may vary in thickness from a couple of meters to hundreds and even thousands of meters. The Karoo Dolerite Suite is a widespread system of igneous bodies (dykes, sills) that encroached into the sediments of the Main Karoo Basin. Karoo lavas preserved today are erosional remnants of a more extensive lava cap that covered much of southern Africa

### 5.2 Palaeontology

#### 5.2.1 Tierberg Formation

The fossil record of the Tierberg Formation include disarticulated micro-vertebrates of which fish teeth and scales have been described while body fossils are uncommon. Rare fossil plant include leaves and fossilized wood which are more abundant in the upper proximal (prodeltaic) facies of the Tierberg Formation. Numerous plant impressions have also been recorded from this formation. The dark carbonaceous mudrocks most probably contain palynomorphs (e.g. pollens and spores). The Tierberg Formation is known for its variety, rare but locally concentrated assemblages of trace fossils that are often found in association with thin event beds. Approximately ten ichnogenera have been recorded from the Tierberg Formation which consists mostly of parallel bedding, epichnial and hypichnial traces, of which some are preserved as undertracks. Steep burrows are rarely found but horizontal epichnial furrows; arcuate, finely striated feeding excavations; beaded traces; sinusoidal surface

traces; small star-shaped feeding burrows; and zigzag horizontal burrows are documented in the Tierberg Formation.

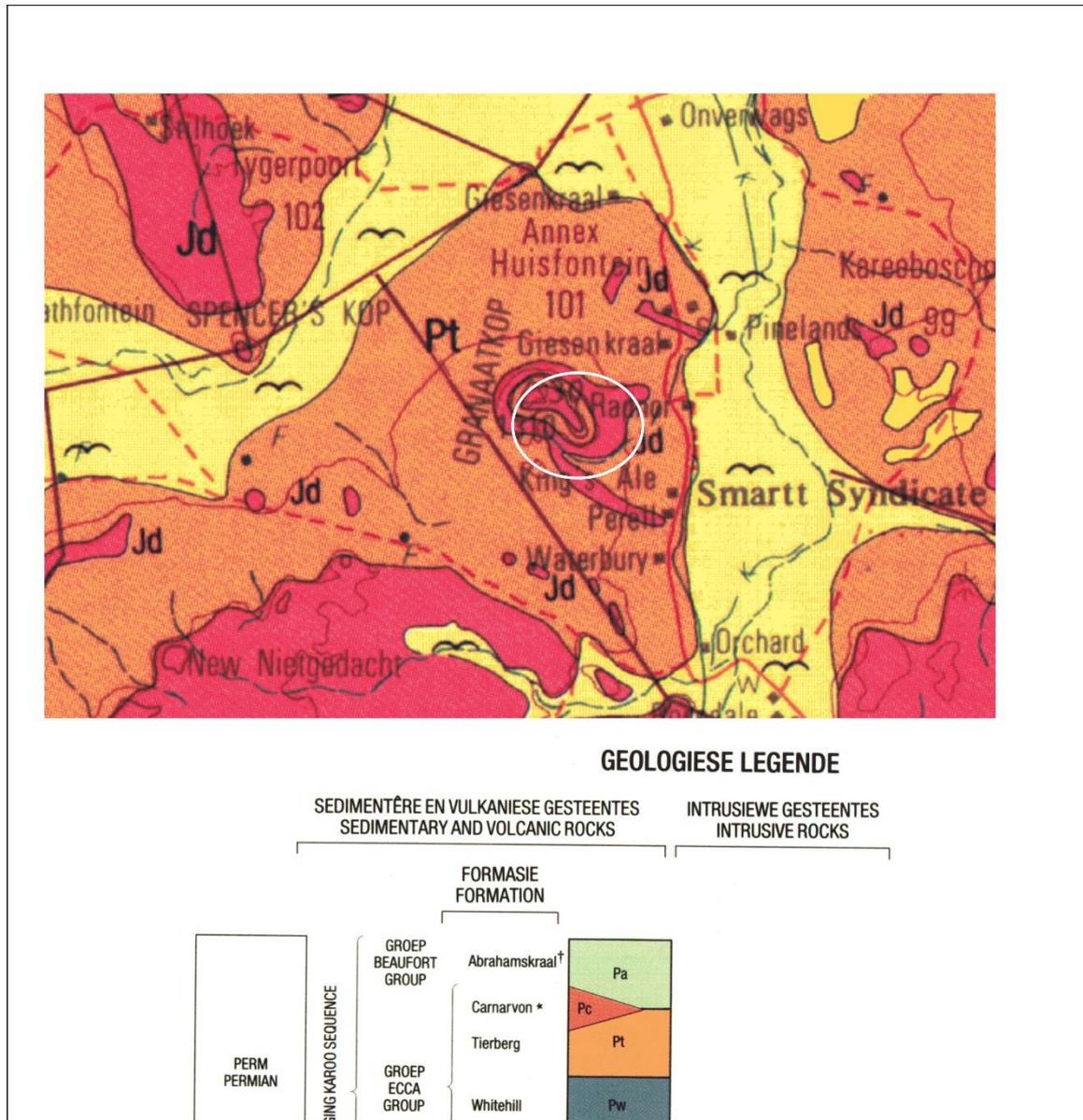
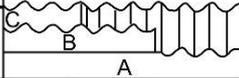


Figure 2. Approximate location of the proposed MTN Tower and 22 KV power line near Britstown. Northern Cape Province. The proposed development is underlain by the Tierberg Formation (Ecca Group, Karoo Supergroup). Extract from the 3022 Britstown 1: 250 000 Geological Map (Council of Geoscience, Pretoria)

STRATIGRAPHY							
AGE		WEST OF 24'E	EAST OF 24' E	FREE STATE/ KWAZULU- NATAL	SACS RECOGNISED ASSEMBLAGE ZONES	PROPOSED BIOSTRATIGRAPHIC SUBDIVISIONS	
JURASSIC	"STORMBERG"	[Dotted pattern]	Drakensberg F.	Drakensberg F.			
			Clarens F.	Clarens F.		<i>Massospondylus</i>	
TRIASSIC	TARKASTAD SUBGROUP	[Dotted pattern]	Elliot F.	Elliot F.		" <i>Euskelosaurus</i> "	
			MOLTENO F.	MOLTENO F.			
PERMIAN	BEAUFORT GROUP	[Dotted pattern]	BURGERSDORP F.	DRIEKOPPEN F.	<i>Cynognathus</i>		
			KATBERG F.	VERKYKERSKOP F.	<i>Lystrosaurus</i>	<i>Procolophon</i>	
			Palingkloof M.	Harrismith M.	<i>Daptocephalus</i>		
			Elandsberg M.	Schoondraai M.			
			Barberskrans M.	Rooinekke M.			
			TEEKLOOF F.	NORMANDIEN F.			
	Steenkamps- vlakte M.	Daggaboers- nek M.					
	Oukloof M.	Oudeberg M.		<i>Cistecephalus</i>			
	ADELAIDE SUBGROUP	[Dotted pattern]	Hoedemaker M.	MIDDELTON F.		<i>Tropidostoma</i>	
			Poortjie M.			<i>Pristerognathus</i>	
			ABRAHAMSKRAAL F.	KROONAP F.	VOLKSRUST F.	<i>Tapinocephalus</i>	UPPER UNIT
							LOWER UNIT
					<i>Eodicynodon</i>		
ECCA GROUP	[Dotted pattern]	WATERFORD F.	WATERFORD F.				
		TIERBERG/ FORT BROWN F.	FORT BROWN F.				
		LAINGSBURG/ RIPON F.	RIPON F.	VRYHEID F.			
		COLLINGHAM F.	COLLINGHAM F.	PIETER- MARITZBURG F.			
		WHITEHILL F.	WHITEHILL F.				
		PRINCE ALBERT F.	PRINCE ALBERT F.		<i>"Mesosaurus"</i>		
CARBON- IFEROUS	DWYKA GROUP	ELANDSVLEI F.	ELANDSVLEI F.	ELANDSVLEI F.			

 SANDSTONE-RICH UNIT    
  HIATAL SURFACE    
  END BEAUFORT GROUP    
  HIATUS

Figure 3. Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions of the Eccca and Beaufort Group of the Karoo Supergroup with rock units and fossil assemblage zones relevant to the present study marked in red (Modified from Rubidge 1995). The subdivisions of the Eccca Group include the Vryheid Formation which is Early Permian in age. Abbreviations: F. = Formation, M. = Member

## **6 GEOGRAPHICAL LOCATION OF THE SITE**

The proposed development site is located at 30°33'11.41"S 23°18'10.42"E near Britstown, Northern Cape Province on the 3023CB Smartt Syndicate 1:50 000 topographical map.

## **7 METHODS**

As part of the PIA, a field-survey of the development footprint was conducted in August 2018 to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed footprint of the development. A physical field-survey was conducted on foot within the proposed development footprint. The results of the field-survey, the author's experience, aerial photos (using Google Earth, 2018), topographical and geological maps and other reports from the same area were used to assess the proposed development footprint. No consultations were undertaken for this Impact Assessment.

### **7.1 Assumptions and Limitations**

The accurateness of PIA is reduced by old fossil databases that do not always include relevant locality or geological formations. The geology in various remote areas of South Africa may be less accurate because it is based entirely on aerial photographs. The accuracy of the sheet explanations for geological maps is inadequate as the focus was never intended to be on palaeontological material.

The entirety of South Africa has not been studied palaeontologically. Similar Assemblage Zones but in different areas, might provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations generally assume that unexposed fossil heritage is present within the development area. Thus, the accuracy of the PIA is improved by a field-survey.

## **8 SITE VISIT**

Exact GPS co-ordinates of the electricity poles were not provided at the time of the site visit and thus estimates of the locations were photographed, although the whole area was investigated. The site was found not to be fossiliferous.



Figure 4 - Proposed construction site of the MTN tower and power line. 30° 33' 11"S 23°11' 09"E



Figure 5: Two of the 6 electricity poles already constructed. 30°33'15"S 23°18'09"E



Figure 6: Drainage channel next to power line with no fossiliferous outcrop. 30°33'19.05"S 23°17'43.05"E



Figure 7: General topography of the development footprint. 30°33'19.56"S 23°17'38.80"E



Figure 8: General topography of the development footprint. Note the low vegetation cover.  
30°33'19.00"S 23°17'38.00"E



Figure 9: Drainage channel close to power line exhibiting no fossiliferous outcrop. 30° 33' 15"S 23° 17' 26"E



Figure 10: Surface gravel on the development footprint. 30°33'10.30"S 23°17'16.82"E



Figure 11: Surface gravel on the development footprint. 30°33'6.54"S 23°17'17.03"E



Figure 12: Surface gravel on the development footprint. 30°33'3.78"S 23°17'21.46"E



Figure 13: Surface gravel on the development footprint. 30° 33' 07"S 23° 17' 20"E



Figure 14: MTN Tower 30° 33' 06"S 23° 17' 35"E

## 9 METHODOLOGY FOR IMPACT ASSESSMENT

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria -

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summarised explanation of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 1**.

*Table 1: Impact Assessment Criteria*

CRITERIA	CATEGORIES	EXPLANATION
Overall nature	<b>Negative</b>	Negative impact on affected biophysical or human environment.
	<b>Positive</b>	Benefit to the affected biophysical or human environment.
Type	<b>Direct</b>	Are caused by the action and occur at the same time and place.
	<b>Indirect or Secondary</b>	Are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. May include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
	<b>Cumulative</b>	Is the impact on the environment, which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Spatial Extent over which impact may be experienced	<b>Site</b>	Immediate area of activity incorporating a 50m zone which extends from the edge of the affected area.
	<b>Local</b>	Area up to and/or within 10km of the 'Site' as defined above.
	<b>Regional</b>	Entire community, drainage basin, landscape etc.
	<b>National</b>	South Africa.
Duration of impact	<b>Short-term</b>	Impact would last for the duration of activities such as land clearing, land preparation, fertilising, weeding, pruning and thinning. Quickly reversible.
	<b>Medium-term</b>	Impact would after the project activity such as harvesting. Reversible over time.

	<b>Long-term</b>	Impact would continue beyond harvesting/ extraction of the trees.
	<b>Permanent</b>	Impact would continue beyond decommissioning.
<b>Severity</b>	<b>Low, Medium, High Negative</b>	Based on separately described categories examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning or slightly alters the environment itself.
	<b>Low, Medium, High Positive</b>	
<b>Reversibility</b>	<b>Completely Reversible</b>	The impact can be completely reversed with the implementation of correct mitigation and rehabilitation measures.
	<b>Partly Reversible</b>	The impact can be partly reversed providing mitigation measures are implemented and rehabilitation measures are undertaken
	<b>Irreversible</b>	The impact cannot be reversed, regardless of the mitigation or rehabilitation measures.
<b>Irreplaceable Loss</b>	<b>Resource will not be lost</b>	The resource will not be lost or destroyed provided mitigation and rehabilitation measures are implemented.
	<b>Resource may be partly destroyed</b>	Partial loss or destruction of the resource will occur even though all management and mitigation measures are implemented.
	<b>Resource cannot be replaced</b>	The resource cannot be replaced no matter which management or mitigation measures are implemented.
<b>Probability of occurrence</b>	<b>Unlikely</b>	<40% probability.
	<b>Possible</b>	40% probability.
	<b>Probable</b>	>70% probability.
	<b>Definite</b>	>90% probability.
<b>Mitigation Potential</b> [i.e. the ability to manage or	<b>High or Completely Mitigable</b>	Relatively easy and cheap to manage. Specialist expertise or equipment is generally not required.  The nature of the impact is understood and may be mitigated through the implementation of a management plan or through 'good housekeeping'. Regular monitoring needs to be undertaken to ensure that any negative consequences remain

mitigate an impact given the necessary resources and feasibility of application.]		<p>within acceptable limits.</p> <p>The significance of the impact after mitigation is likely to be low or negligible.</p>
	<b>Moderate or Partially Mitigatable</b>	<p>Management of this impact requires a higher level of expertise and resources to maintain impacts within acceptable levels. Such mitigation can be tied up in the design of the Project.</p> <p>The significance of the impacts after mitigation is likely to be low to moderate.</p> <p>May not be possible to mitigate the impact entirely, with a residual impact(s) resulting.</p>
	<b>Low or Unmitigatable</b>	<p>Will not be possible to mitigate this impact entirely regardless of the expertise and resources applied.</p> <p>The potential to manage the impact may be beyond the scope of the Project.</p> <p>Management of this impact is not likely to result in a measurable change in the level of significance.</p>
Impact Significance	<b>Negligible</b>	-
	<b>Low</b>	Largely of HIGH mitigation potential, <u>after</u> considering the other criteria.
	<b>Moderate</b>	Largely of MODERATE or partial mitigation potential <u>after</u> considering the other criteria.
	<b>Substantial</b>	Largely of LOW mitigation potential <u>after</u> considering the other criteria.

POTENTIAL IMPACTS (in order of impact as described in Impact Matrix)	ASPECT (refer to Impact Matrix)	Nature	Type	Extent	Duration	Severity	Reversibility	Irreplaceable Loss	Probability	MITIGATION POTENTIAL	IMPACT SIGNIFICANCE		MITIGATION MEASURES
											Without Mitigation	With Mitigation	
<b>CONSTRUCTION PHASE</b>													
Impacts on palaeontological resources	Heritage Resources	<b>Negative</b>	Direct	Site	Permanent	<b>Low</b>	Irreversible	Resource cannot be replaced	Unlikely	High	<b>Low</b>	<b>Low</b>	Refer to Section 9

## 10 FINDINGS AND RECOMMENDATIONS

The proposed development footprint is underlain by the Permian aged Tierberg Formation, (Ecca Group, Karoo Supergroup). This Formation of the Ecca Group is well-known for the presences of trace fossils, micro-vertebrates and fossilized leaves and wood.

Additionally, the proposed development footprint is underlain by the Permian aged Tierberg Formation, (Ecca Group, Karoo Supergroup) and Jurassic Karoo Dolerite. The Tierberg Formation of the Ecca Group is well-known for the presences of several trace fossils, micro-vertebrates e.g. disarticulated fish fossils and fossilized leaves and wood. According to the SAHRIS PalaeoMap the sedimentary rocks of the Tierberg Formation has a moderate palaeontological sensitivity, while the Ecca has a very high palaeontological sensitivity. Drainage channels are present in the development footprint with a possibility that fossils could be present. The Karoo Dolerite is igneous rock and thus unfossiliferous.

During a field survey of the development footprint (on foot and by motor vehicle), no fossiliferous outcrops were found. For this reason, a **low palaeontological sensitivity** is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Britstown MTN tower and power line development will be of a low significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources. 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.

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## Appendix A – Elize Butler CV

### CURRICULUM VITAE

#### ELIZE BUTLER

**PROFESSION:** Palaeontologist  
**YEARS' EXPERIENCE:** 25 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

Registered as a PhD fellow at the Zoology Department of the UFS

2013 to current

**Dissertation title:** A new gorgonopsian from the uppermost *Daptocephalus Assemblage Zone*, in the Karoo Basin of South Africa

#### 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 National Museum, Bloemfontein  
and Collection Manager 1998–currently

#### TECHNICAL REPORTS

1. **PIA desktop:** Palaeontological Impact Assessment of the proposed development of private dwellings on portion 5 of farm 304 Matjesfontein Keurboomstrand, Knysna District, Western Cape Province. 2014.
2. **PAI site visit and report:** Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoort, Northern Cape Province. 2014.

3. **PIA desktop:** Palaeontological impact assessment of the proposed consolidation, re-division and development of 250 serviced erven in Nieu-Bethesda, Camdeboo local municipality, Eastern Cape. 2015.
4. **PAI site visit and report:** Palaeontological impact assessment of the proposed mixed land developments at Rooikraal 454, Vrede, Free State. 2015.
5. **PIA exemption report:** Palaeontological exemption report of the proposed truck stop development at Palmiet 585, Vrede, Free State. 2015.
6. **PAI site visit and report:** Palaeontological impact assessment of the proposed Orange Grove 3500 residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape. 2015
7. **PAI site visit and report:** Palaeontological Impact Assessment of the proposed Gonubie residential development, Buffalo City Metropolitan Municipality East London, Eastern Cape Province. 2015.
8. **PAI site visit and report:** Palaeontological Impact Assessment of the proposed Ficksburg raw water pipeline. 2015
9. **PAI site visit and report:** 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. 2015.
10. **PAI site visit and report:** 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. 2015.
11. **PIA desktop:** Palaeontological Impact Assessment of the proposed Woodhouse 1 photovoltaic solar energy facilities and associated infrastructure on the farm Woodhouse729, near Vryburg, North West Province. 2015.
12. **PIA desktop:** 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. 2015.
13. **PIA desktop:** 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. 2015.
14. **PIA desktop:** 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. 2015.
15. **PIA desktop:** Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoot 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 Noupoot, Northern Cape. Prepared for Savannah Environmental. 2016.
16. **PIA site visit and report:** 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. 2016.

17. **PIA site visit and report:** 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. 2016.
18. **PIA Desktop:** Proposed 132kV overhead power line and switchyard station for the authorised Solis Power 1 CSP project near Upington, Northern Cape. 2016.
19. **PIA site visit and report:** of The Proposed Senqu Pedestrian Bridges in Ward 5 of Senqu Local Municipality, Eastern Cape Province. 2016.
20. **Recommended Exemption** From Further Palaeontological Studies: Proposed Construction Of The Modderfontein Filling Station On Erf 28 Portion 30, Founders Hill, City Of Johannesburg, Gauteng Province. 2016.
21. **Recommended Exemption** 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. 2016.
22. **Recommended Exemption** From Further Palaeontological Studies: Proposed Construction Of The Heidedal Filling Station On Erf 16603, Heidedal Extension 24, Mangaung Local Municipality, Bloemfontein, Free State Province. 2016.
23. **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. 2016.
24. **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. 2016.
25. **PIA monitoring:** Chris Hani District Municipality Cluster 9 water backlog project phases 3a and 3b: Palaeontology inspection at Tsomo WTW. 2016.
26. **PIA Site visit and Report:** 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. 2016.
27. **PIA site visit and report:** 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. 2016.
28. **PIA site visit and report:** Palaeontological Impact Assessment construction of the proposed Metals Industrial Cluster and associated infrastructure near Kuruman, Northern Cape province. 2016.
29. **PIA site visit and report:** 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. 2016.

30. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed development of two burrow pits (DR02625 and DR02614) in the Enoch Mgijima Municipality, Chris Hani District, Eastern Cape. 2016.
31. **PIA desktop:** Ezibeleni waste Buy-Back Centre (near Queenstown), Enoch Mgijima Local Municipality, Eastern Cape. 2016
32. **PIA desktop:** 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. 2016.
33. **PIA desktop:** Palaeontological Impact Assessment for the proposed development of four Leeuwberg Wind farms and basic assessments for the associated grid connection near Loeriesfontein, Northern Cape Province. 2016.
34. **PIA desktop:** Palaeontological impact assessment for the proposed Aggeneys south prospecting right project, Northern Cape Province. 2016.
35. **PIA desktop:** Palaeontological impact assessment of the proposed Motuoane Ladysmith Exploration right application, Kwazulu Natal. 2016.
36. **PIA desktop :** 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. 2016.
37. **PIA desktop:** 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 jr, located near Centurion within the Tshwane Metropolitan Municipality of Gauteng Province. 2016.
38. **PIA desktop:** Palaeontological impact assessment for the proposed development of a new cemetery, near Kathu, Gamagara local municipality and John Taolo Gaetsewe district municipality, Northern Cape. 2017.
39. **PIA desktop:** 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. 2017.
40. **PIA desktop:** Palaeontological Desktop Assessment for the Proposed Development of a Wastewater Treatment Works at Lanseria, Gauteng Province. 2017.
41. **PIA desktop:** Palaeontological Scoping Report for the Proposed Construction of a Warehouse and Associated Infrastructure at Perseverance in Port Elizabeth, Eastern Cape Province. 2017.
42. **PIA desktop:** 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. 2017.
43. **PIA desktop:** 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. 2017.

44. **PIA site visit and report:** Palaeontological Impact Assessment for the Development of the Proposed Ventersburg Project-An Underground Mining Operation near Ventersburg and Henneman, Free State Province. 2017.
45. **PIA desktop:** Palaeontological desktop assessment of the proposed development of a 3000 mw combined cycle gas turbine (CCGT) in Richards Bay, Kwazulu-Natal. 2017.
46. **PIA site visit and report:** Palaeontological Impact Assessment for the Development of the Proposed Revalidation of the lapsed General Plans for Elliotdale, Mbhashe Local Municipality. 2017.
47. **PIA site visit and Report:** Palaeontological assessment of the proposed development of a 3000 MW Combined Cycle Gas Turbine (CCGT) in Richards Bay, Kwazulu-Natal. 2017.
48. **PIA site visit and Report:** 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. 2017.
49. **PIA site visit and Report:** Palaeontological Impact Assessment of the proposed mining of the farm Zandvoort 10 in the Albert Luthuli Local Municipality, Gert Sibande District Municipality, Mpumalanga Province. 2017.
50. **PIA desktop:** Palaeontological Desktop Assessment for the proposed Lanseria outfall sewer pipeline in Johannesburg, Gauteng Province. 2017.
51. **PIA desktop:** 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. 2017.
52. **PIA site visit and Report:** Palaeontological impact assessment of the proposed development of the sport precinct and associated infrastructure at Merrifield Preparatory school and college, Amathole Municipality, East London. 2017.
53. **PIA site visit and Report:** Palaeontological impact assessment of the proposed construction of the Lehae training and fire station, Lenasia, Gauteng Province. 2017.
54. **PIA desktop:** Palaeontological Desktop Assessment of the proposed development of the new open cast mining operations of the Impunzi mine in the Mpumalanga Province.2017.
55. **PIA desktop:** Palaeontological Desktop Assessment of the construction of the proposed Viljoenskroon Munic 132 KV line, Vierfontein substation and related projects. 2017.
56. **PIA desktop:** Palaeontological Desktop Assessment of the proposed rehabilitation of 5 ownerless asbestos mines. 2017.
57. **PIA desktop:** Palaeontological Desktop Assessment of the proposed development of the Lephale coal and power project, Lephale, Limpopo Province, Republic of South Africa. 2017.
58. **PIA site visit and report:** 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. 2017.
59. **PIA desktop:** Palaeontological Desktop Assessment of the proposed development of the new coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. 2017.
  60. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed construction of a Photovoltaic Solar Power station near Collett substation, Middelberg, Eastern Cape. 2017.
  61. **PIA site visit and report:** 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. 2017.
  62. **PIA desktop:** Palaeontological Desktop Assessment for the proposed prospecting right project without bulk sampling, in the Koa Valley, Northern Cape Province. 2017.
  63. **PIA desktop:** Palaeontological Desktop Assessment for the proposed Aroams prospecting right project, without bulk sampling, near Aggeneys, Northern Cape Province. 2017.
  64. **PIA site visit and report:** 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. 2017.
  65. **PIA site visit and report:** 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. 2017.
  66. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed construction of Tina Falls Hydropower and associated power lines near Cumbu, Mthlontlo Local Municipality, Eastern Cape. 2017.
  67. **PIA site visit and report:** Palaeontological Desktop Assessment of the proposed construction of the Mangaung Gariep Water Augmentation Project. 2017.
  68. **PIA site visit and report:** 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.
  69. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed construction of the Melkspruit-Rouxville 132KV Power line. 2017.
  70. **PIA report:** 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. 2017.
  71. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed consolidation of the proposed Ilima Colliery in the Albert Luthuli local municipality, Gert Sibande District Municipality, Mpumalanga Province. 2017.
  72. **PIA report:** 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. 2017.
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73. **PIA report:** 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. 2017.
74. **PIA site visit and report:** Palaeontological Desktop Assessment of the proposed of the Lephalale Coal and Power Project, Lephalale, Limpopo Province, Republic of South Africa. 2017
75. **PIA report:** Palaeontological Desktop Assessment of the proposed Overvaal Trust PV Facility, Buffelspoort, North West Province. 2017.
76. **PIA site visit and report:** 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.
77. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed upgrade of the Sandriver Canal and Klippan Pump station in Welkom, Free State Province. 2017.
78. **PIA site visit and report:** 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. 2017.
79. **PIA desktop:** Palaeontological Desktop Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. 2017.
80. **PIA desktop:** 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. 2017.
81. **PIA desktop:** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Hartebeesfontein, near Panbult, Mpumalanga. 2017.
82. **PIA desktop:** Palaeontological Desktop Assessment for the proposed development of Wastewater Treatment Works on Rustplaas near Piet Retief, Mpumalanga. 2017.
83. **PIA site visit and report:** Palaeontological Impact Assessment for the Proposed Landfill Site in Luckhoff, Letsemeng Local Municipality, Xhariep District, Free State. 2018.
84. **PIA site visit and report:** Palaeontological Impact Assessment of the proposed development of the new Mutsho coal-fired power plant and associated infrastructure near Makhado, Limpopo Province. 2018.
85. **PIA site visit and report:** Palaeontological Impact Assessment of the authorisation and amendment processes for Manangu mine near Delmas, Victor Khanye local municipality, Mpumalanga. 2018.
86. **PIA desktop:** Palaeontological Desktop Assessment for the proposed Mashishing township establishment in Mashishing (Lydenburg), Mpumalanga Province. 2018.
87. **PIA desktop:** Palaeontological Desktop Assessment for the Proposed Mlonzi Estate Development near Lusikisiki, Ngquza Hill Local Municipality, Eastern Cape. 2018.

88. **PIA site visit and report:** Palaeontological Phase 1 Assessment of the proposed Swaziland-Mozambique border patrol road and Mozambique barrier structure. 2018.
89. **PIA desktop:** Palaeontological Desktop Assessment for the proposed electricity expansion project and Sekgame Switching Station at the Sishen Mine, Northern Cape Province. 2018.
90. **PIA site visit and report:** 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. 2018.
91. **PIA site visit and report:** Palaeontological Field Assessment for the proposed re-alignment and de-commissioning of the Firham-Platrand 88kv Power line, near Standerton, Lekwa Local Municipality, Mpumalanga province. 2018.
92. **PIA desktop:** Palaeontological Desktop Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. 2018.
93. **PIA site visit:** Palaeontological field Assessment of the proposed Villa Rosa development In the Buffalo City Metropolitan Municipality, East London. 2018.
94. **PIA desktop:** Palaeontological desktop assessment of the proposed Mookodi – Mahikeng 400kV line, North West Province. 2018.
95. **PIA desktop:** Palaeontological Desktop Assessment for the Proposed Thornhill Housing Project, Ndlambe Municipality, Port Alfred, Eastern Cape Province
96. **PIA desktop:** Palaeontological desktop assessment of the proposed housing development on portion 237 of farm Hartebeestpoort 328. 2018.
97. **PIA desktop:** Palaeontological desktop assessment of the proposed New Age Chicken layer facility located on holding 75 Endicott near Springs in Gauteng. 2018.
98. **PIA desktop:** Palaeontological Desktop Assessment for the development of the proposed Leslie 1 Mining Project near Leandra, Mpumalanga Province. 2018.
99. **PIA site visit:** Palaeontological field assessment of the proposed development of the Wildealskloof mixed use development near Bloemfontein, Free State Province.

## **CONFERENCE CONTRIBUTIONS**

### **NATIONAL PRESENTATION**

Butler, E., Botha-Brink, J., and F. Abdala. A new gorgonopsian from the uppermost *Dicynodon Assemblage Zone*, Karoo Basin of South Africa. 18 the Biennial conference of the PSSA 2014. Wits, Johannesburg, South Africa.

### **INTERNATIONAL**

Attended the Society of Vertebrate Palaeontology 73<sup>th</sup> Conference in Los Angeles, America. October 2012.

## **CONFERENCES: POSTER PRESENTATION**

### **NATIONAL**

Butler, E., and J. Botha-Brink. Cranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle. University of the Free State Seminar Day, Bloemfontein. South Africa. November 2007.

Butler, E., and J. Botha-Brink. Postcranial skeleton of *Galesaurus planiceps*, implications for biology and lifestyle. 14<sup>th</sup> Conference of the PSSA, Matjesfontein, South Africa. September 2008:

Butler, E., and J. Botha-Brink. The biology of the South African non-mammaliaform cynodont *Galesaurus planiceps*. 15<sup>th</sup> Conference of the PSSA, Howick, South Africa. August 2008.

#### **INTERNATIONAL VISITS**

Natural History Museum, London

July 2008

Paleontological Institute, Russian Academy of Science, Moscow

November 2014