



PALAEONTOLOGICAL IMPACT ASSESSMENT

PROPOSED BRONVILLE
132/11/6.6KV SUBSTATION IN
WELKOM, FREE STATE
PROVINCE

April 2023

COMPILED FOR
Royal Haskoning DHV (PTY) Ltd



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 favorable 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 favorable 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 realize that a false declaration is an offense 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: info@banzai-group.com

SIGNATURE:



The heritage impact assessment report has been compiled considering the National Environmental Management Act 1998 (NEMA) and Environmental Impact Regulations 2014 as amended, requirements for specialist reports, Appendix 6, as indicated in the table below.

<i>Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).</i>		
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii and Section 2 of Report – Contact details and company and Appendix A	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 2 – refer to 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	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 4 – Objective	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 5 – Geological and Palaeontological history	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9,	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 1 & 10	Desktop Assessment



Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 7 Approach and Methodology	-
(f) details of an assessment of the specifically 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 1;5 & 10	
(g) An identification of any areas to be avoided, including buffers	Section 1;5 & 10	
(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 – Geological and Palaeontological history	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1 – Assumptions and Limitation	-
(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	Section 1 and 10	
(k) Any mitigation measures for inclusion in the EMPr	Section 1 and 10	
(l) Any conditions for inclusion in the environmental authorisation	Section 1 and 10	



Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 1 and 10	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 & 11	
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		
(n)(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	Section 1 and 10	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	Not applicable. A public consultation process was handled as part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) process.



Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
(p) A summary and copies of any comments that were received during any consultation process	N/A	Not applicable. To date, no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(2) Where a government notice 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 3 compliance with SAHRA guidelines	



EXECUTIVE SUMMARY

Banzai Environmental was appointed by **Royal Haskoning DHV (PTY) Ltd** to conduct the Palaeontological Desktop Assessment (PDA) to assess the proposed Bronville 132/11/6.6kV Substation in Welkom, Free State Province. In accordance with the National Environmental Management Act 107 of 1998 (NEMA) and to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PDA is necessary to confirm if fossil material could potentially be present in the planned development area and to evaluate the potential impact of the proposed development on the Palaeontological Heritage of the area.

The proposed Bronville 132/11/6.6kV Substation in Welkom, Free State Province is underlain by Quaternary aeolian sand. The PalaeoMap of SAHRIS indicates the Palaeontological Sensitivity of the Quaternary superficial deposits is Moderate (Almond et al, 2013; SAHRIS website). Updated geology compiled by the Council of Geosciences (Pretoria) indicates that the proposed development is underlain by alluvium, colluvium, eluvium and gravel. A Low Palaeontological significance has thus been allocated to the development. **It is therefore considered that the development will not lead to detrimental impacts on the palaeontological resources of the area. The proposed development may be authorised, as the whole extent of the development footprint is not considered sensitive in terms of Palaeontological Heritage.**

If fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations ECO in charge of these developments must be notified immediately. 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) so that suitable mitigation (*e.g.* recording and collection) can be carry out by a paleontologist.



TABLE OF CONTENT

1	BACKGROUND	12
2	SPECILIST CREDENTIALS	15
3	LEGISLATION	15
4	OBJECTIVE	17
5	GEOLOGICAL AND PALAEONTOLOGICAL HISTORY	19
6	GEOGRAPHICAL LOCATION OF THE SITE.....	31
7	METHODS.....	32
7.1	Assumptions and Limitations.....	32
8	ADDITIONAL INFORMATION CONSULTED	32
9	ASSESSMENT METHODOLOGY	32
9.1	Method of Environmental Assessment.....	32
10	FINDINGS AND RECOMMENDATIONS.....	37
11	BIBLIOGRAPHY	38
	APPENDIX A : CURRICULUM VITAE.....	45



List of Figures

Figure 1: Locality Map..... 14

Figure 2: Close-up image of the proposed development. 15

Figure 3: Extract of the 1:250 000 Kroonstad 2726 (2000) and Winburg 2826 (1987) Geological Map (Council for Geosciences, Pretoria) indicating that the study area is underlain by the Quaternary aeolian sand (Qs, yellow). 20

Figure 4: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed development in blue. 22

Figure 5: Updated geology compiled by the Council of Geosciences (Pretoria) indicates that the proposed Bronville Substation near Welkom in the Free State is underlain by alluvium, colluvium, elluvium and gravel. 23

Figure 6: Vertebrate biozonation range chart for the Main Karoo Basin of South Africa. 24

Figure 7: Lateral and dorsal views of skull of the dicynodont *Daptocephalus leoniceps*, the main biozone defining fossil (Image taken from Viglietti, 2020) and dorsal views (Image taken from Viglietti, 2020). .. 27

Figure 8: Skulls of the biozone defining fossils of the *Dicynodon-Theriognathus* Subzone in lateral and dorsal views. *Dicynodon lacerticeps* (top), *Theriognathus microps* (bottom) (Image taken from Viglietti, 2020). 28

Figure 9: Biozone defining fossils of the *Lystrosaurus maccaigi*- *Moschorhinus* Subzone. The skulls of the *Lystrosaurus maccaigi* (top) and *Moschorhinus kitchingi* (bottom) in lateral..... 29

Figure 10: Lateral and dorsal views of the index taxa defining the *Lystrosaurus declivis* Assemblage Zone. (top) *Lystrosaurus declivis*, (centre) *Thrinaxodon liorhinus*, (bottom) *Procolophon trigoniceps* (Image taken from Botha and Smith, 2020). 30



List of Tables

<i>Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).....</i>	<i>iv</i>
<i>Table 2: Legend of the 1:250 000 Kroonstad 2726 (2000) Geological Map (Council for Geosciences, Pretoria).....</i>	<i>21</i>
<i>Table 3:Palaeontological Sensitivitie according tho the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website).....</i>	<i>22</i>
<i>Table 4: GPS coordinates.....</i>	<i>31</i>
<i>Table 5:Criteria to be used for the Rating of Impacts.....</i>	<i>33</i>
<i>Table 6: Criteria for the Rating of Classified Impacts.....</i>	<i>34</i>



1 BACKGROUND

For Eskom and Matjhabeng Local Municipality to be in a position to electrify the newly proposed and existing housing developments in the Thabong and Bronville area it is imperative for Bronville Substation to be upgraded to a capacity to enable it to supply the whole area as Urania Substation cannot be upgraded due to the following factors:

- environmental factors (wetland),
- possibility of contaminated soil (due to sewer leakage),
- theft (break-ins in the substation and the recent vandalism that took place),
- location of the substation (outskirts of the area which will result in theft and allot of material for reticulation) and,
- future SANRAL plans to build an interchange which takes half of the substation land.

In the Thabong and Bronville areas there are approximately 8076 electrical consumers that will benefit from the project and this will also assist the Municipality to generated income, small businesses will also open and illegal connections will also be reduced as the community will have access to proper electricity/ electrical infrastructure.

The existing Eskom Substations in the area do not have capacity and will take up to five (5) years to build a new substation for this purpose.

Urania substation had one 132kV/ 11kV 20MVA Transformer feeding Bronville and Thabong surrounding areas. This transformer was struck by lightning and caught fire during 2008. From the visual inspections performed at the time, the transformer appeared to be badly damaged although tests that were conducted on the transformer showed that the main damage was on the on-load tap changer. The transformer as well as the 132kV equipment at Urania Substation have since been badly vandalized and considering the factors mentioned above it is highly recommended that the Substation be built at Bronville.

The objective is to secure external funding to be in position to provide a sustainable electrical supply to 8 076 electrical consumers in the Bronville and Thabong town ships.

The Bronville residential area is supplied from the 6.6/11 kV Bronville Substation which is supplied from the Urania 1 x 20 MVA, 132/11 kV Substation. Unfortunately, the Urania Substation has been out of service since 2008 due to lightning failure as well as vandalism of both its 20 MVA power transformer, 4 x 11 kV vacuum breakers and its 132 kV, 240 mm², single core, XLPE, aluminium cable (situated between the Urania and Welkom Main Intake 132 kV Substations).



Since 2008, the Urania Substation's 11 kV switchboard had been supplied with 11 kV from a 95 mm², 3-core, XLPE, copper cable from the Industries Substation via the local Wastewater Treatment Works. The 2 x 2.5 MVA, 6.6/11 kV step-up transformers at Industries Substation provide a limited (and temporary) solution to the expansion of electrification projects in the Bronville area.

Further to this, Eskom has approached the Matjhabeng Municipality to consider a wheeling agreement for the Municipality to supply residential houses inside the Eskom's (traditional) supply area.

As a result of the (1) vandalism experienced at the Urania Substation and (2) the limited transformer capacity at Industries Substation (presently supplying power to Urania 11kV switchboard and Bronville substations), it is paramount that a new Substation be built at a location that does not have any environmental challenges.

High-Level Scope of Work

- **High Voltage Installation:**

- The completion and the extending of the existing HV overhead line to proposed new proposed position of the Bronville 132kV 20MVA Substation (incl. new 20MVA transformer installation)
- The provision and installation of the second transformer bay complete with compact switchgear, cabling and protection (excluding the 20MVA 132kV/11kV transformer unit for a firm connection)
- Connection of the existing 132kV overhead line to the Bulk Intake 132kV Substation

- **11kV Medium Voltage Switching Substation Installation:**

The provision and installation of a complete new switching station that consist of the following:

- Vacuum breakers and protection to connect the existing 11kV Bronville networks and to allow for the proposed future developments in the area
- Rerouting of the exciting Bronville 11kV cable networks so to connect to the indicated new switching station

- **6.6kV Medium Voltage Transformer and Switching Substation Installation:**

The provision and installation of a complete new switching station that consist of the following:

- Vacuum breakers and protection to connect the existing 6.6kV Bronville networks and to allow for the proposed future developments in the area
- Provision and installation of one (1) x 5MVA step-down 11kV /6.6kV transformer complete with NEC transformer
- Rerouting of the exciting Bronville 6.6kV cable networks so to connect to the indicated newly proposed transformer switching station

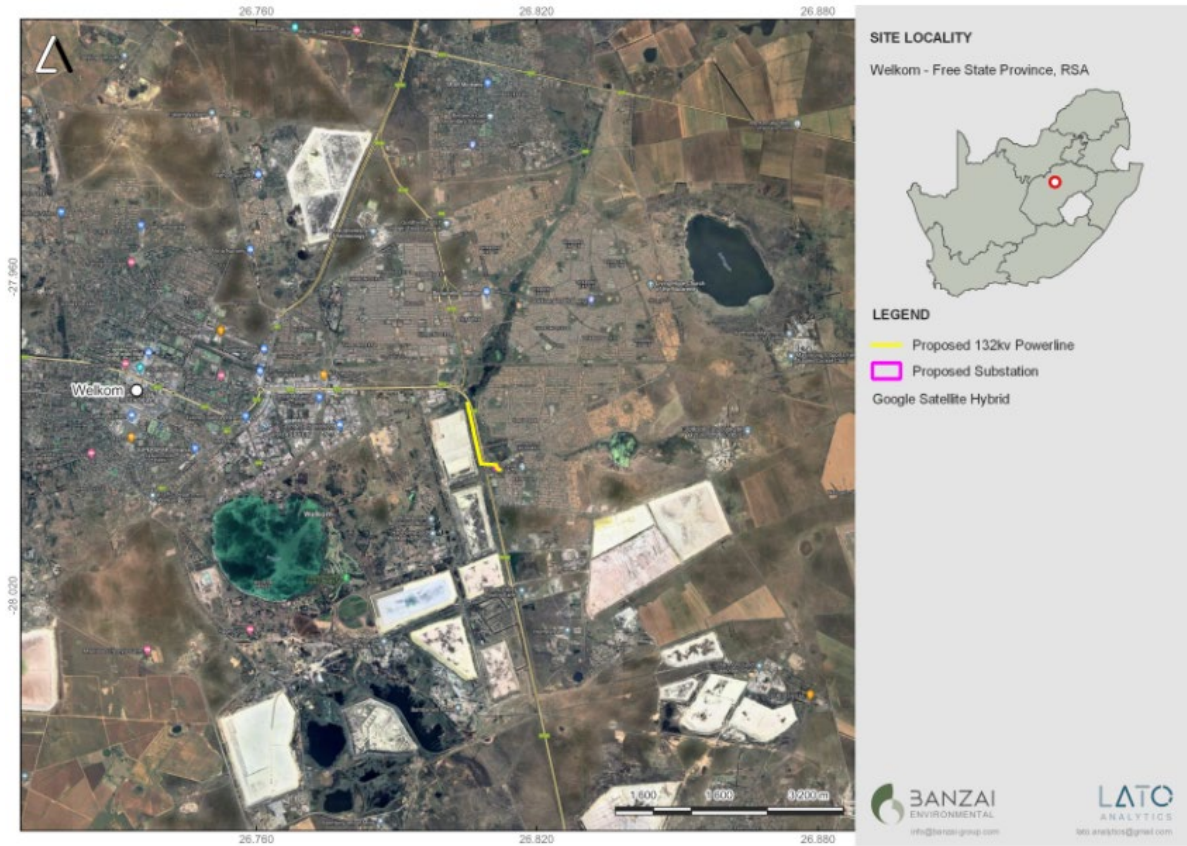


Figure 1: Locality Map.

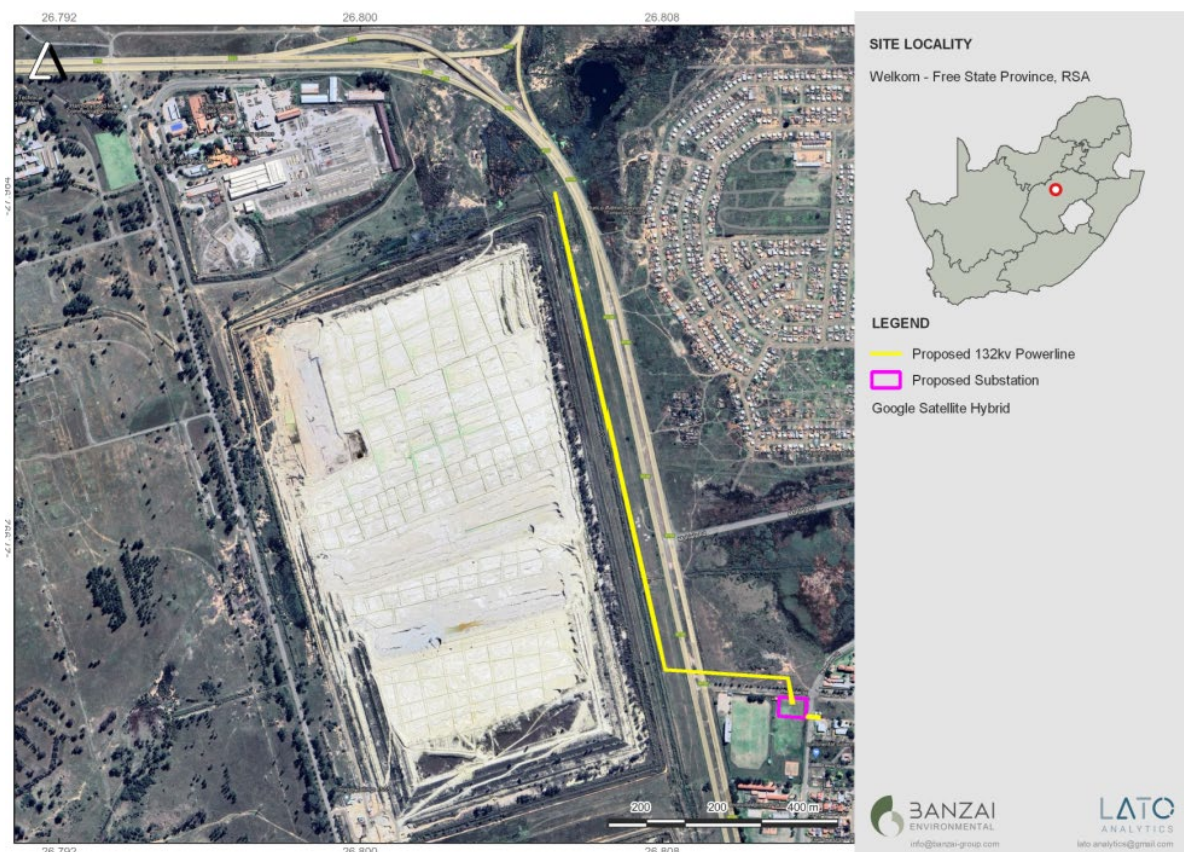


Figure 2: Close-up image of the proposed development.

2 SPECIALIST CREDENTIALS

This study has been conducted by Mrs Elize Butler. She has conducted approximately 400 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 the field of palaeontology for more than twenty-eight 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.

Her *Curriculum Vitae* is included in Appendix 1 of this specialist input report.

3 LEGISLATION

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”**.

The identification, evaluation and assessment of any cultural heritage site, artefact or finds in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA) Act 107 of 1998
- National Heritage Resources Act (NHRA) Act 25 of 1999
- Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified.

The next section in each Act is directly applicable to the identification, assessment, and evaluation of cultural heritage resources.

GNR 982 (Government Gazette 38282, 14 December 2014) promulgated under the National Environmental Management Act (NEMA) Act 107 of 1998

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impacts Assessment (EIA) – Regulation 23
- Environmental Scoping Report (ESR) – Regulation 21
- Environmental Management Programme (EMPr) – Regulations 19 and 23

National Heritage Resources Act (NHRA) Act 25 of 1999

- Protection of Heritage Resources – Sections 34 to 36
- Heritage Resources Management – Section 38

MPRDA Regulations of 2014

Environmental reports to be compiled for application of mining right – Regulation 48

- Contents of scoping report – Regulation 49
- Contents of environmental impact assessment report – Regulation 50
- Environmental management programme – Regulation 51
- Environmental management plan – Regulation 52

The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) *“...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”*.

In agreement with legislative requirements, EIA rating standards as well as SAHRA policies the following comprehensive and legally compatible PIA report have been compiled.



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 m² 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 m² in extent.
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

4 OBJECTIVE

The aim of a Palaeontological Impact Assessment (PIA) is to decrease the effect of the development on potential fossils at the development site.

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the purpose of the PIA is: 1) to identify the palaeontological importance of the rock formations in the footprint; 2) to evaluate the palaeontological magnitude of the formations; 3) to clarify the **impact** on fossil heritage; and 4) to suggest how the developer might protect and lessen possible damage to fossil heritage.

The palaeontological status of each rock section is calculated as well as the possible impact of the development on fossil heritage by a) the palaeontological importance of the rocks, b) the type of development and c) the quantity of bedrock removed.



When the development footprint has a moderate to high palaeontological sensitivity a field-based assessment is necessary. The desktop and the field survey of the exposed rock determine the impact significance of the planned development and recommendations for further studies or mitigation are made. Destructive impacts on palaeontological heritage usually only occur during the construction phase while the excavations will change the current topography and destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

Mitigation usually precede construction or may occur during construction when potentially fossiliferous bedrock is exposed. Mitigation comprises the collection and recording of fossils. Preceding excavation of any fossils 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 as possible because our knowledge of local palaeontological heritage may be increased

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/kml's) 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** 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).

5 GEOLOGICAL AND PALAEOLOGICAL HISTORY

The geology of the proposed Bronville Substation near Welkom in the Free State is depicted on the 1: 250 000 Kroonstad 2726 (2000) Geological Map (Council for Geosciences, Pretoria) (**Figure 3, Table 2**). This map indicate that the proposed development underlain is by the Quaternary aeolian sand (Qs, yellow) and is most probably underlain at depth by the Adelaide Subgroup (Pa, green) of the Beaufort Group, Karoo Supergroup. The PalaeoMap of SAHRIS indicates the Palaeontological Sensitivity of the Quaternary superficial deposits is Moderate (**Figure 4, Table 3**) (Almond *et al*, 2013; SAHRIS website). Updated geology compiled by the Council of Geosciences (Pretoria) indicates that the proposed Bronville Substation is underlain by alluvium, colluvium, elluvium and gravel (**Figure 5**).

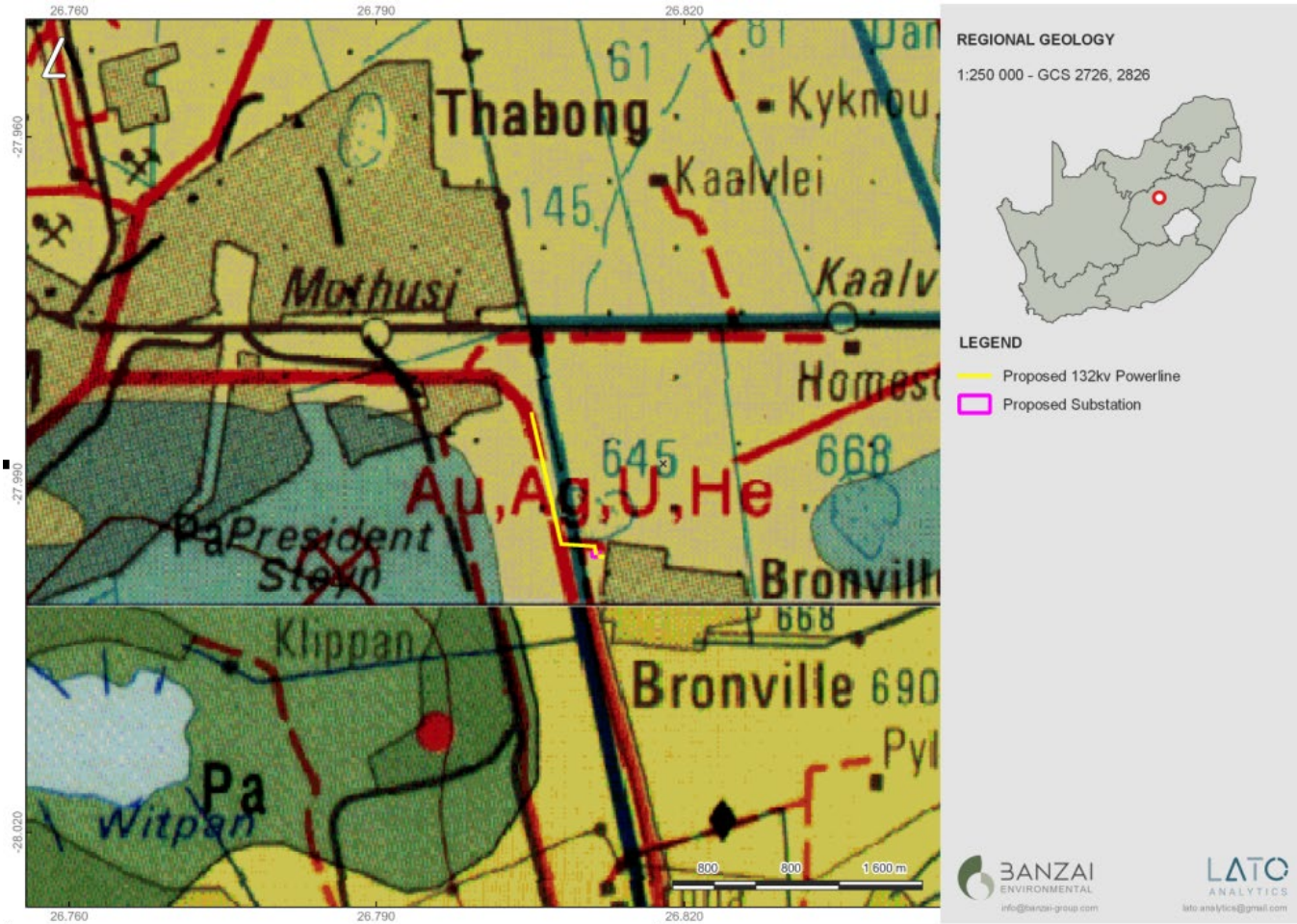
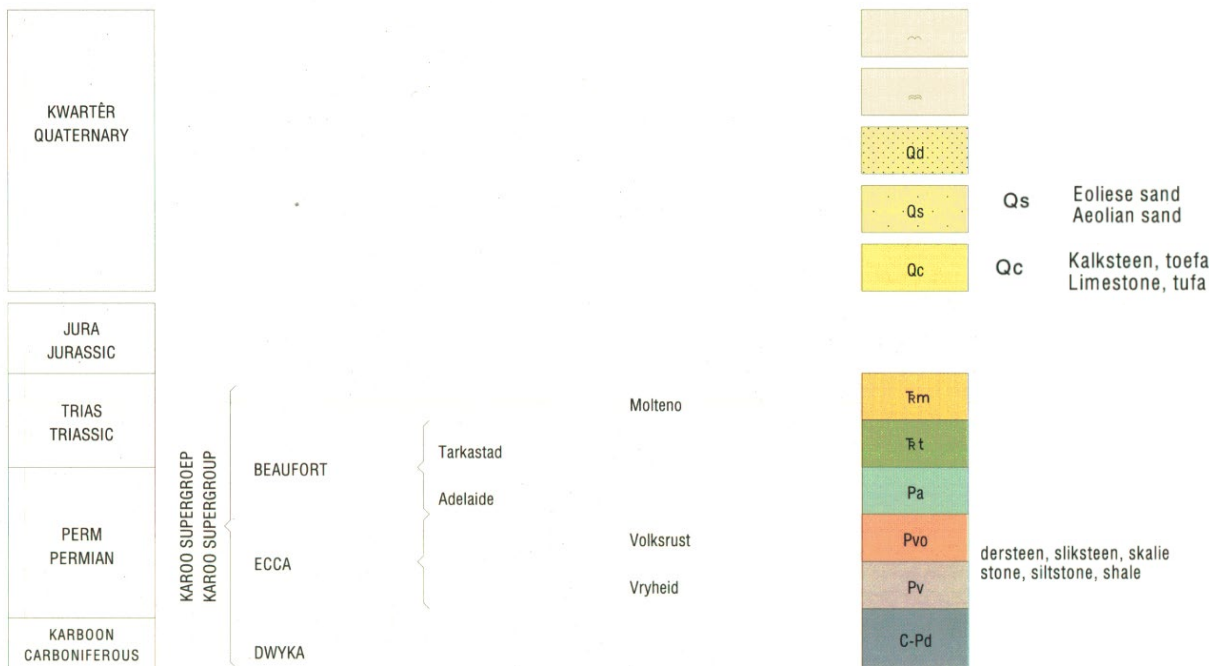


Figure 3. Extract of the 1:250 000 Kroonstad 2726 (2000) and Winburg 2826 (1987) Geological Map (Council for Geosciences, Pretoria) indicating that the study area is underlain by the Quaternary aeolian sand (Qs, yellow).



Table 2: Legend of the 1:250 000 Kroonstad 2726 (2000) Geological Map (Council for Geosciences, Pretoria)



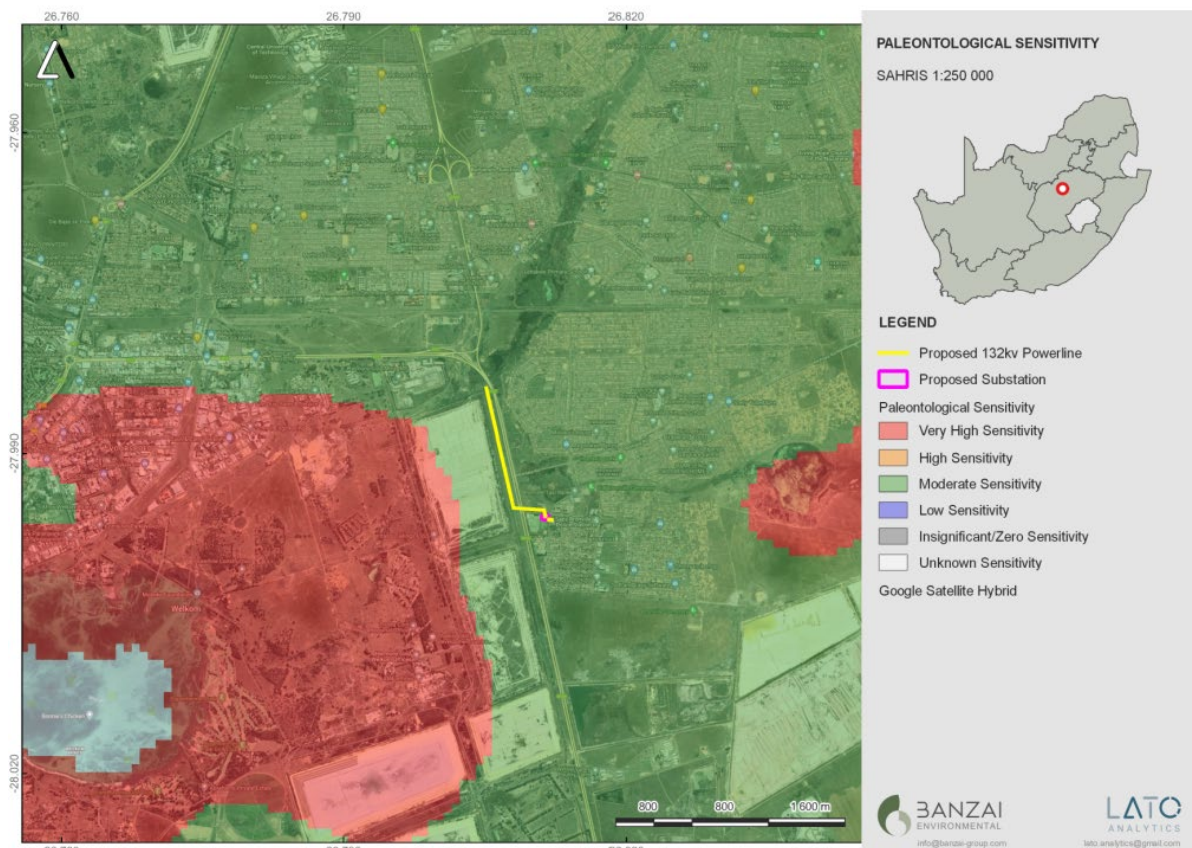


Figure 4: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed development in blue.

The SAHRIS Palaeosensitivity map (Figure 4) indicates that the proposed development is underlain by sediments with a Moderate (green) Palaeontological Sensitivity.

Table 3: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website)

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
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required



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.

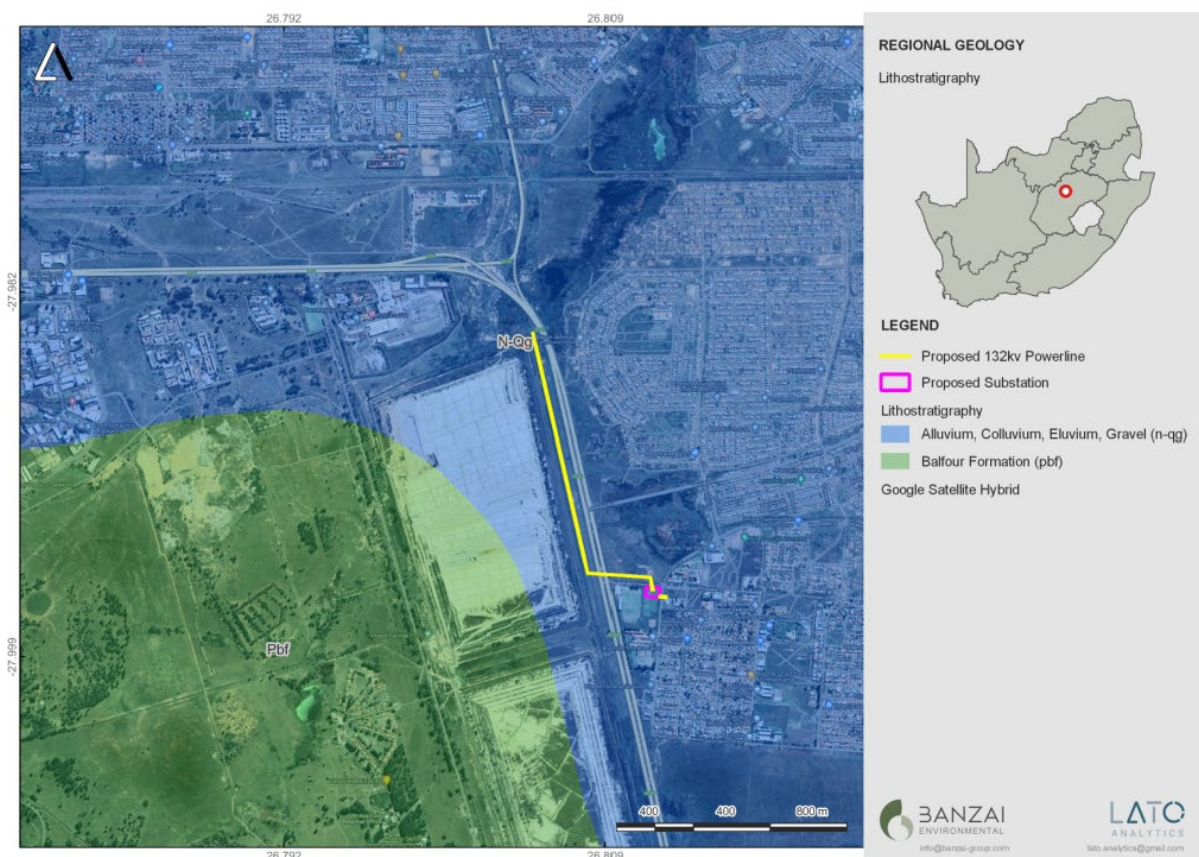


Figure 5: Updated geology compiled by the Council of Geosciences (Pretoria) indicates that the proposed Bronville Substation near Welkom in the Free State is underlain by alluvium, colluvium, elluvium and gravel.

The Virginia/Welkom District is known for the presence of fluvial deposits along the present river courses that are terrestrial sediments and includes diatomite (diatom deposits), calcareous tufa, pedocretes, peats, spring deposits, soils and gravel and other Tertiary clacrete deposits, that is very important for understanding the Early and Late Pliocene period in this region (De Ruiter et al, 2010). The late Cenozoic (Plio-Pleistocene) floodplain deposits (overbank sediments) found near the Sand-, Doring-, Vals- and Vet River systems including pan sites, contain confined but abundant mammal vertebrate fossil sites. In 1955, Meiring, described an *in situ* proboscidian fossil (mammoth), comprising of a lower molar, large part of a tusk as well as a proximal portion of an ulna from the Sand River near Virginia. This specimen



was found in pebbly channel-fill sediments about 40m above the current riverbed. This specimen was originally described as *Archidiskodon scotti* (Meiring 1955) but was later assigned to the Pliocene species *Mammuthus subplanifrons* (Coppens et al. 1978). Later investigations uncovered a diverse fauna that include amphibians, birds, fish, reptiles, as well as several proboscideans, perissodactyls and artiodactyls from the same site (De Ruiter 2010).

Terrace gravels above the Vet River, southwest of Welkom have uncovered Pliocene fossils while surveys along the Doring, Vals, Sand and Vet Rivers produced moderately fossiliferous overbank sediments and erosional gullies that comprise of a variety of Quaternary-aged mammals (Brink et al. 1999; De Ruiter et al. 2011) Ancient pan sites, for example near Whites produced rich Quaternary-aged mammal fossil remains.

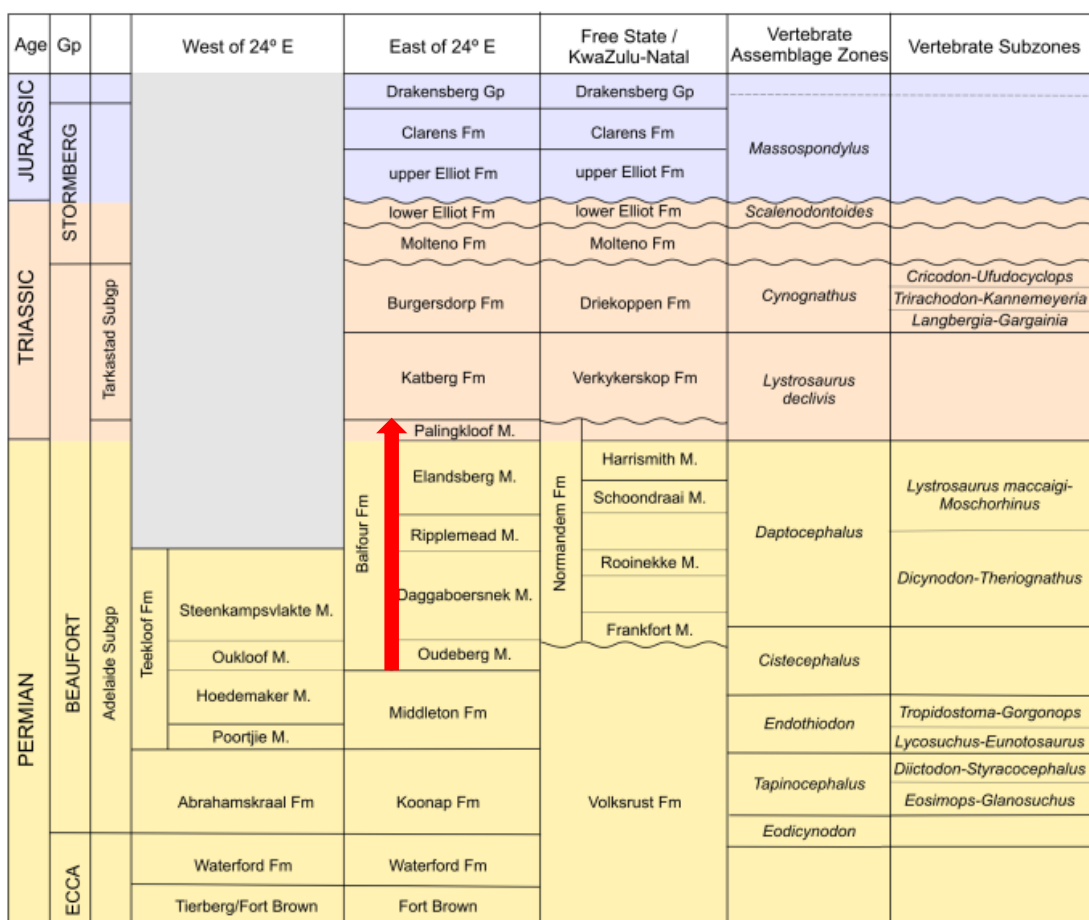


Figure 6: Vertebrate biozonation range chart for the Main Karoo Basin of South Africa.

Solid lines indicate known ranges, dotted lines indicate suspected but not confirmed ranges, single dot represents the stratigraphic position of the taxa that have only been recovered from a single bed. Wavy lines indicate unconformities. (PLYCSR=Pelycosauria and MAMMMFES+Mammaliaformes. Gp=group, Subgp=Subgroup, Fm=Formation, M=Member. The proposed cemetery development is indication by the blue arrow.



The Geological maps indicate that the development is most probably at depth underlain by the Adelaide Subgroup. The updated geology indicates the the Adelaide Subgroup is represented by the Balfour Formation in this area. The Adeliade Subgoup (Beaufort Group) comprise of a series of Karoo sandstones, mudstones, and shales, deposited under fluvial environments (**Figure 6**). The Beaufort Group is the third of the main subdivisions of the Karoo Supergroup. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods and was deposited on land through alluvial processes. The Beaufort Group covers a total land surface area of approximately 200 000 km² in South Africa and is the first fully continental sequence in the Karoo Supergroup and is divided into the Adelaide subgroup and the overlying Tarkastad subgroup. The Adelaide subgroup rocks are deposited under a humid climate that allowed for the establishment of wet floodplains with high water tables and are interpreted to be fluvio-lacustrine sediments. The Adelaide Subgroup is approximately 5 000m thick in the southeast, but this decreases to about 800m in the centre of the basin which decreases to about 100 to 200m in the north.

The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium-grained, grey lithofeldspathic sandstones. Thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and-fill features. The sandstones are characterized internally by horizontal lamination together with parting lineation and less frequent trough crossbedding as well as current ripple lamination. The bases of the sandstone units are extensive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units. The mudrocks of the Adelaide Subgroup usually have massive and blocky weathering. Sometimes desiccation cracks and impressions of raindrops are present. In the mudstones of the Beaufort Group calcareous nodules and concretions occur throughout.

The flood plains of the Beaufort Group (Karoo Supergroup) are internationally renowned for the early diversification of land vertebrates and provide the worlds' most complete transition from early "reptiles" to mammals. The Beaufort Group is subdivided into a series of biostratigraphic units based on its faunal content (Kitching 1977, 1978; Keyser *et al*, 1977, Rubidge 1995, Smith *et al*, 2020; Viglietti 2020). The south-western portion of the proposed development is underlain by the Balfour Formation which is divided in the *Daptocephalus* (DAZ) which in turn is divided in the upper (younger) *Lystrosaurus maccaigi* - *Moschorhinus* and lower (older) *Dicynodon-Theriognathus* Subzones (**Figure 8**, Viglietti, 2020).

The dicynodont, *Daptocephalus leoniceps* is the main biozone defining fossil of the *Daptocephalus Assemblage Zone* (**Figure 6**). The *Daptocephalus Assemblage Zone* (DaAZ) is characterised by the co-occurrence of the dicynodontoid *Daptocephalus leoniceps*, the therocephalian *Theriognathus microps*, and the cynodont *Procynosuchus delaharpeae*. The DaAZ comprise of two subzones representing the two distinct faunal assemblages in this assemblage zone. The *Dicynodon -Theriognathus* Subzone (**Figure 8**, in co-occurrence with *Daptocephalus*) is present in the lower *Daptocephalus* Assemblage Zone while the *Lystrosaurus maccaigi* – *Moschorhinus kitchingi* Subzone s present in the upper DaAZ. The



defining taxa of the latter subzone is *L. maccaigi*, *Daptocephalus* and *Moschorhinus*. This Zone is characterized by the co-occurrence of the two therapsids namely *Dicynodon* and *Theriognathus* (**Figure 9**). The *Daptocephalus* Assemblage Zone of the Beaufort Group shows the greatest vertebrate diversity and includes numerous well-preserved genera and species of dicynodonts, biarmosuchians, gorgonopsian, therocephalian and cynodont therapsid Synapsida. Captorhinid Reptilia are also present while eosuchian Reptilia, Amphibia and Pisces are rarer in occurrence. Trace fossils of vertebrates and invertebrates as well as *Glossopteris* flora plants have also been described.

The *Daptocephalus* Assemblage Zone (AZ) expands into the lower Palingkloof of the Upper Balfour Formation. The lower Palingkloof Member is of special importance as it precedes the Permo-Triassic Extinction Event which destroyed the vertebrate fauna and extinguished the diverse glossopterid plants. The lower *Lystrosaurus* declivis AZ forms part of the Katberg Formation. Fauna and flora from this assemblage zone is rare as few genera survived the Permo-Triassic Extinction Event. The *Lystrosaurus* declivis AZ (**Figure 10**) is characterized by the dicynodont, *Lystrosaurus*, and captorhinid reptile, *Procolophon*, biarmosuchian and gorgonopsian Therapsida that did not survive into the *Lystrosaurus* Assemblage Zone although the therocephalian and cynodont Therapsida are present in moderate quantities. Captorhinid Reptilia is reduced, but this interval is characterised by a unique diversity of oversized amphibians while fossil fish, millipedes and diverse trace fossils have also been recorded.

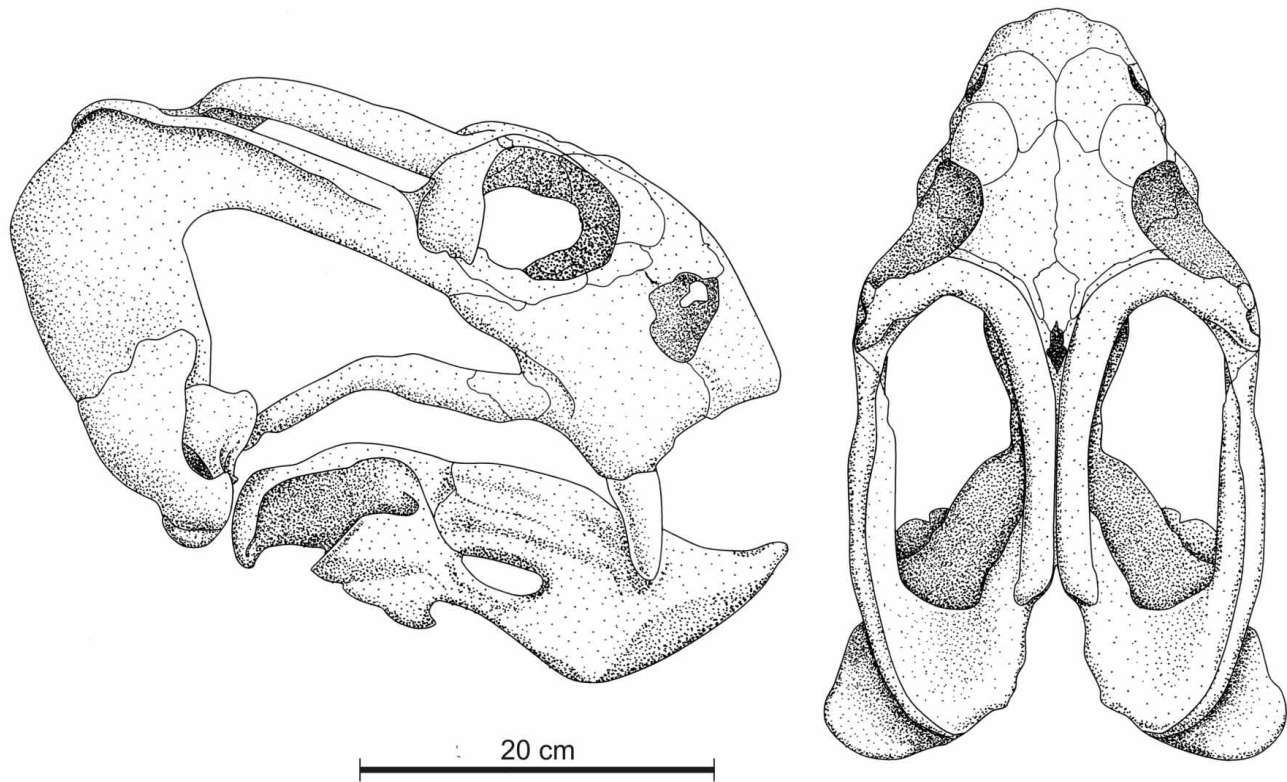


Figure 7: Lateral and dorsal views of skull of the dicynodont *Daptocephalus leoniceps*, the *main biozone defining fossil* (Image taken from Viglietti, 2020) and dorsal views (Image taken from Viglietti, 2020).

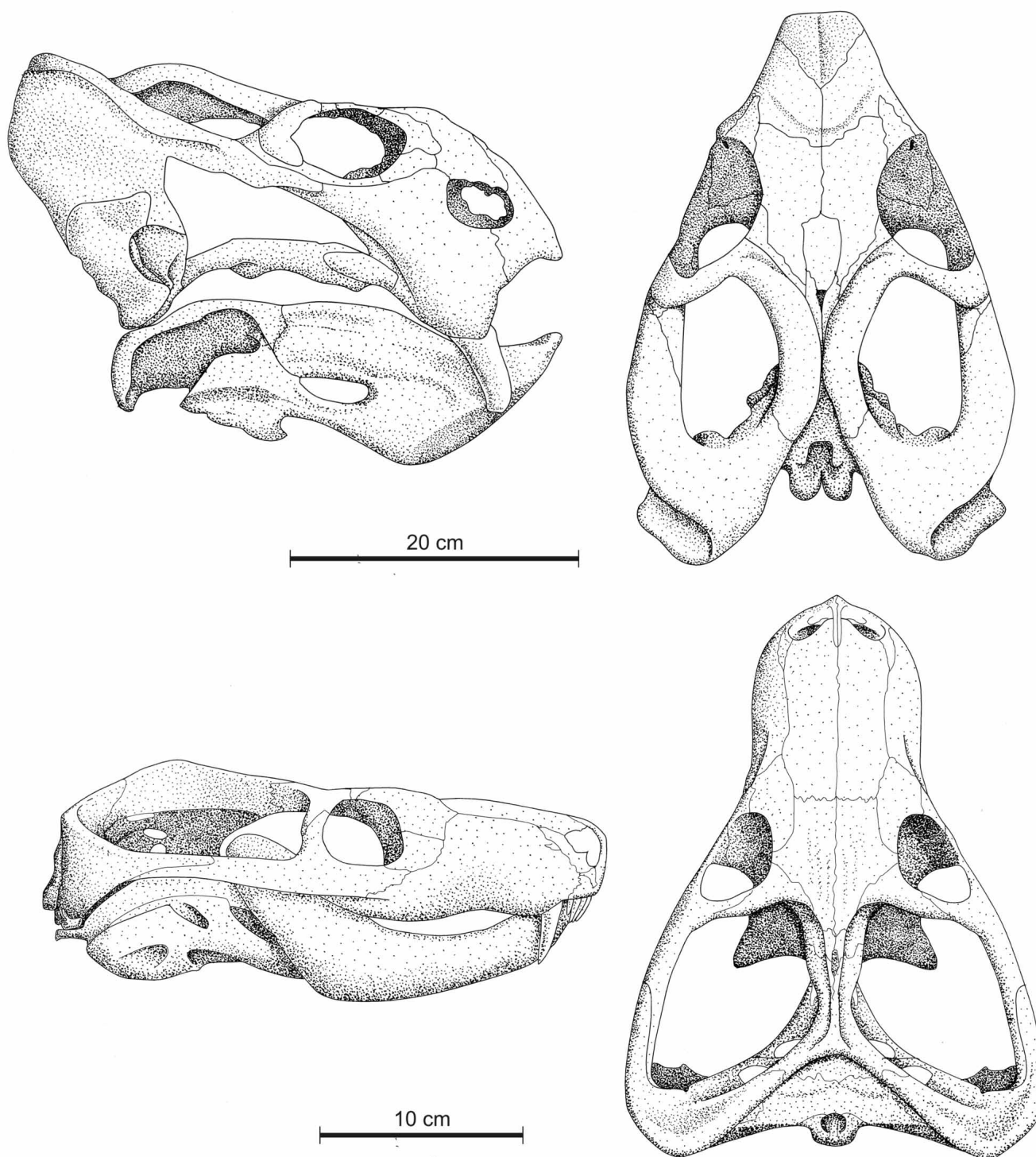


Figure 8: Skulls of the biozone defining fossils of the *Dicynodon-Theriognathus* Subzone in lateral and dorsal views. *Dicynodon lacerticeps* (top), *Theriognathus microps* (bottom) (Image taken from Viglietti, 2020).

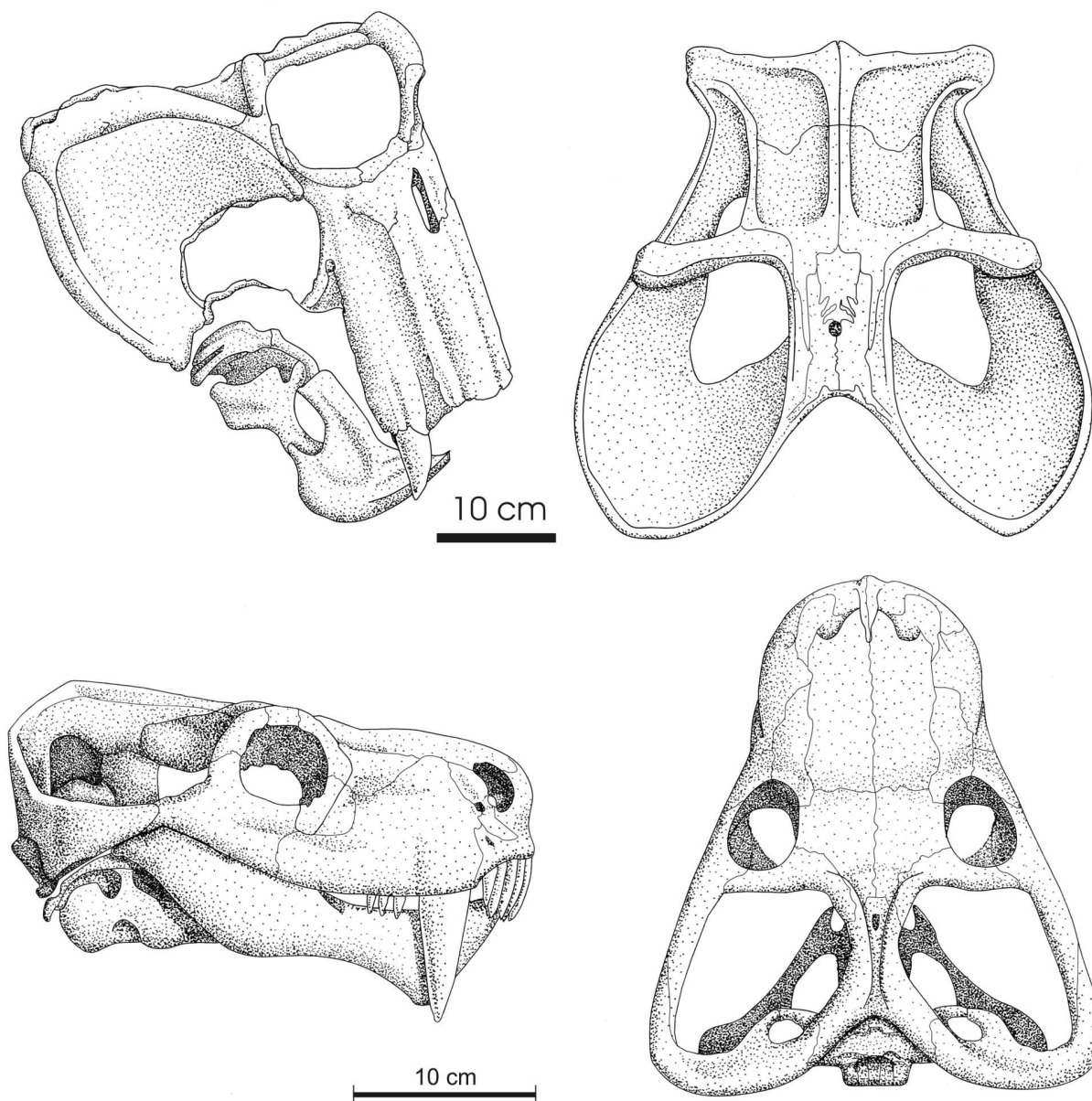


Figure 9. Biozone defining fossils of the *Lystrosaurus maccaigi*- *Moschorhinus* Subzone. The skulls of the *Lystrosaurus maccaigi* (top) and *Moschorhinus kitchingi* (bottom) in lateral.

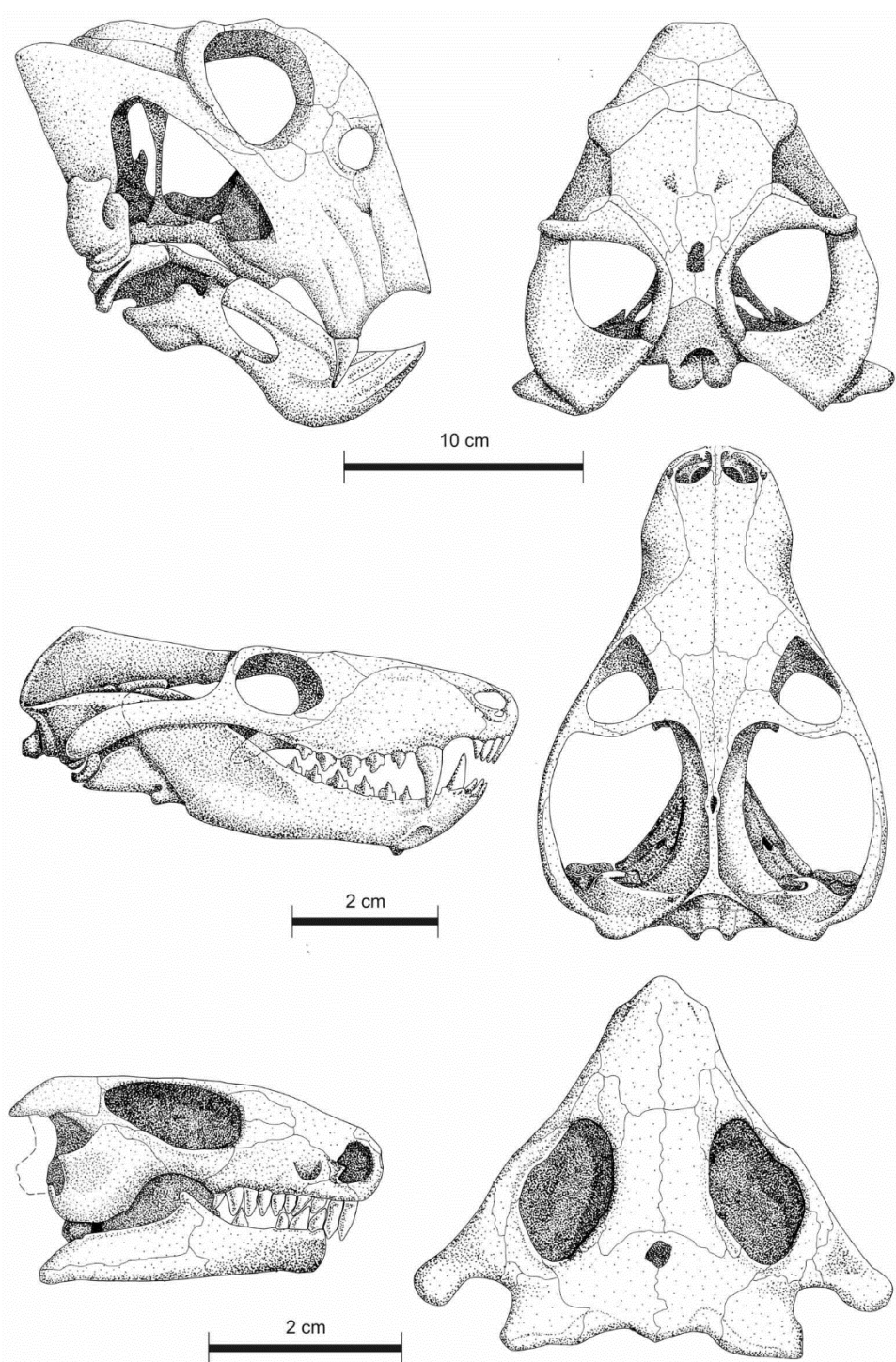


Figure 10. Lateral and dorsal views of the index taxa defining the *Lystrosaurus declivis* Assemblage Zone. (top) *Lystrosaurus declivis*, (centre) *Thrinaxodon liorhinus*, (bottom) *Procolophon trigoniceps* (Image taken from Botha and Smith, 2020).



Thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and-fill features. The sandstones are characterized internally by horizontal lamination together with parting lineation and less frequent trough crossbedding as well as current ripple lamination. The bases of the sandstone units are extensive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units. The mudrocks of the Adelaide Subgroup usually have massive and blocky weathering. Sometimes desiccation cracks and impressions of raindrops are present. In the mudstones of the Beaufort Group calcareous nodules and concretions occur throughout.

The Eccca Group (Karoo Supergroup) is a sedimentary rock sequence comprising of dark greenish-grey siltstone or shale and fine-grained sandstone. These shale and fine-grained sandstones of the Eccca are deeply weathered and rarely exposed. Weathered outcrops are usually scarce but if present the weathering expose thinly bedded, highly weathered shale with well-defined bedding planes. Botha and Botha (2002) came to the conclusion that these sediments are deep-water deposits accumulating in an off-shore marine environment. This Group is Early to Late Permian in age (~289–253 Ma).

Trace fossils and abundant plant fossils are known from the deep-water deposits of this Group. The plant fossils are especially abundant in the sandstone rich units in the northern parts of the Basin. The first occurrence of the bivalve *Megadesmus* is reported from the upper Volksrust Shale Formation in the north-eastern Karoo Basin. This genus is well-known in deposits in India, Siberia, Australia, and South America. This is the first reported occurrence of this bivalve genus in Africa. This fossil has both valves articulated, indicating minimal transport after death. This large fossil was enclosed in interbedded shale-siltstone indicating a deltaic deposition at the Beaufort -Eccca Boundary (Cairncross *et al*, 2005).

6 GEOGRAPHICAL LOCATION OF THE SITE

The Bronville Substation is located is located about 10km south east of Welcome Central Business Destrict (CBD) (Figure 1-2).

Table 4: GPS coordinates

	Latitude	Longitude
North westernpoint	27°59'42.06"S	26°48'38.14"E
North eastern point	27°59'42.21"S	26°48'40.16"E
Eastern point	27°59'43.04"S	26°48'41.68"E
South eastern point	27°59'43.74"S	26°48'41.62"E
South western point	27°59'43.51"S	26°48'37.83"E



7 METHODS

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

7.1 Assumptions and Limitations

The focal point of geological maps is the geology of the area and the sheet explanations of the Geological Maps were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. 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 also used to provide information on the existence of fossils in an area which has not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies it is generally **assumed** that exposed fossil heritage is present within the footprint. A field-assessment will thus improve the accuracy of the desktop assessment.

8 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- A Google Earth map with polygons of the proposed development was obtained from EIMS.
- 1:250 000 Winburg 2826 (1998) Geological Map (Council for Geosciences, Pretoria)
- 1:250 000 Kroonstad 2726 (2000) Geological Map (Council for Geosciences, Pretoria)
- Updated Geology (Council for Geosciences, Pretoria)

9 ASSESSMENT METHODOLOGY

9.1 Method of Environmental Assessment

Nature: A brief written statement of the environmental aspect being impacted upon by a particular action or activity;

- *Although minimal, the excavations and ground disturbance during the construction phase will involve excavations into the superficial sediment cover as well as locally into the underlying bedrock. These*



excavations will modify the current topography and may disrupt and destruct, or permanently seal-in fossils at or below the ground surface that are then no longer accessible for scientific research.

Extent: The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;

- *This impact is likely to occur only within the construction phase. No impacts are expected to occur during the operation phase. The extent of the area affected by this potential impact is restricted to the development footprint and therefore categorised as **local**.*

Duration: Indicates what the lifetime of the impact will be;

- *The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be **permanent**.*

Intensity: Describes whether an impact is destructive or benign;

*The intensity of the impact on fossil heritage is rated as **low**.*

Probability: Describes the likelihood of an impact actually occurring; and

- *Impacts on palaeontological heritage during the construction phase could potentially occur but are regarded as improbable.*

Cumulative: In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

- *Cumulative impacts: The cumulative effect of the proposed development is considered to be low.*

Table 5: Criteria to be used for the Rating of Impacts

Criteria	Description			
EXTENT	National (4) The whole of South Africa	Regional (3) Provincial and parts of neighbouring provinces	Local (2) Within a radius of 2 km of the construction site	Site (1) Within the construction site
DURATION	Permanent (4) Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient	Long-term (3) The impact 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. The only class of impact which will be non-transitory	Medium-term (2) The impact will last for the period of the construction phase, where after it will be entirely negated	Short-term (1) The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase



Table 5: Criteria to be used for the Rating of Impacts

Criteria	Description			
INTENSITY	Very High (4) Natural, cultural and social functions and processes are altered to extent that they permanently cease	High (3) Natural, cultural and social functions and processes are altered to extent that they temporarily cease.	Moderate (2) Affected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way.	Low (1) Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
PROBABILITY OF OCCURRENCE	Definite (4) Impact will certainly occur	Highly Probable (3) Most likely that the impact will occur	Possible (2) The impact may occur	Improbable (1) Likelihood of the impact materialising is very low

The total number of points scored for each impact indicates the level of significance of the impact

Table 6: Criteria for the Rating of Classified Impacts

Class	Description
Any positive value	Any positive / beneficial 'impact', i.e. where no harm will occur due to the activity being undertaken.
Low impact (1-5 points)	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction or operating procedure.
Medium impact (6-10 points)	Mitigation is possible with additional design and construction inputs.
Medium-High impact (11 -15 points)	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment
High impact (16 -20 points)	The design of the site may be affected. Mitigation and possible remediation are essential during the construction and/or operational phases. The effects of the impact may affect the broader environment.
Very high impact (21 - 25 points)	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status	Denotes the perceived effect of the impact on the affected area.
Positive (+)	Beneficial impact.
Negative (-)	Deleterious or adverse impact.



Table 6: Criteria for the Rating of Classified Impacts

Class	Description
Neutral (/)	Impact is neither beneficial nor adverse.
It is important to note that the status of an impact is assigned based on the status quo – i.e. should the project not proceed. Therefore, not all negative impacts are equally significant.	



PHASE: CONSTRUCTION								
No.	POTENTIAL ASPECT/ IMPACT	Mitigation	Extent	Duration	Intensity	Probability	Significance = E+D+I+P	Status Classification
1	ASPECT Incorrect design of bridges.	Without Mitigation						
			-1	-4	-1	-2	-8	Negative Medium
	IMPACT Although minimal, the excavations and ground disturbance during the construction phase will involve excavations into the superficial sediment cover as well as locally into the underlying bedrock. These excavations will modify the current topography and may disrupt and destruct, or permanently seal-in fossils at or below the ground surface that are then no longer accessible for scientific research	With Mitigation						
			-1	-4	-1	-1	-7	Negative Low
		In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO in charge of these developments ought to be informed immediately. These discoveries ought to be protected (preferably <i>in situ</i>) and the ECO must warn SAHRA so that appropriate mitigation (<i>e.g.</i> recording, sampling or collection) can be undertaken by a professional paleontologist.						
	MITIGATION MEASURE	The specialist would need to apply for collection permit from SAHRA. Fossil material must be curated in an approved collection						

The numbering included in the above tables came as a result of Table 1 and 2.



10 FINDINGS AND RECOMMENDATIONS

The proposed Bronville 132/11/6.6kV Substation in Welkom, Free State Province is underlain by Quaternary aeolian sand. The PalaeoMap of SAHRIS indicates the Palaeontological Sensitivity of the Quaternary superficial deposits is Moderate (Almond et al, 2013; SAHRIS website). Updated geology compiled by the Council of Geosciences (Pretoria) indicates that the proposed development is underlain by alluvium, colluvium, elluvium and gravel. A Low Palaeontological significance has thus been allocated to the development. **It is therefore considered that the development will not lead to detrimental impacts on the palaeontological resources of the area. The proposed development may be authorised, as the whole extent of the development footprint is not considered sensitive in terms of Palaeontological Heritage.**

If fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the **Chance Find Protocol** must be implemented by the 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) so that suitable mitigation (*e.g.* recording and collection) can be carry out by a paleontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.



11 BIBLIOGRAPHY

- Almond, J., Pether, J, and Groenewald, G. 2013. South African National Fossil Sensitivity Map. SAHRA and Council for Geosciences. Schweitzer *et al.* (1995) pp p288.
- Almond, J.E. & Pether, J. 2009. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp. Natura Viva cc., Cape Town.
- Anderson, J.M. and Anderson, H.M., 1985. Palaeoflora of Southern Africa: *Prodromus of South African megaflores, Devonian to Lower Cretaceous*. A.A. Balkema, Rotterdam. 423 pp.
- Backwell, L.R., T. S. McCarthy, L. Wadley, Z. Henderson, C. M. Steininger, B. De Klerk, M. Barré, M. Lamothe, B. M. Chase, S. Woodbourne, G.J. Susino, M.K. Bamford, C. Sievers, J.S. Brink, L. Rossouw, L. Pollarolo, G. Trower, L. Scott, F. D'errico. 2014. Multiproxy record of late Quaternary climate change and Middle Stone Age human occupation at Wonderkrater, South Africa. *Quaternary Science Reviews*. 99: 42–59.
- Bamford M. 1999. Permo-Triassic Fossil Woods from the South African Karoo Basin. *Palaeontologia Africana*, 35-36, p25.
- Barnosky, A.D. 2005. Effects of Quaternary Climatic Change on Speciation in Mammals. *Journal of Mammalian Evolution*. 12:247-264
- Beukes, N.J. 1983. Palaeoenvironmental setting of iron formations in the depositional basin of the Transvaal Supergroup, South Africa. In: Trendall, A.F. & Morris, R.C. (Eds.) *Iron-formation: facts and problems*, 131-210. Elsevier, Amsterdam.
- Beukes, N.J. 1986. The Transvaal Sequence in Griqualand West. In: Anhaeusser, C.R. & Maske, S. (Eds.) *Mineral deposits of Southern Africa, Volume 1*, pp. 819-828. Geological Society of South Africa.
- Beukes, N.J., Lowe, D.R., 1989. Environmental control on diverse stromatolite morphologies in the 3000 Myr Pongola Supergroup, South Africa *Sedimentology* 36, 383---397.
- Beukes, N.J. & Klein, C. 1990. Geochemistry and sedimentology of facies transition from the micro banded to granular iron-formation in the Early Proterozoic Transvaal Supergroup, South Africa. *Precambrian Research* 47, 99-139.
- Bordy, E.M., Sztanó, O., Rubidge, B.S. and Bumby, A., 2011. Early Triassic vertebrate burrows from the Katberg Formation of the south-western Karoo Basin, South Africa. *Lethaia*, 44, 33-45.
- Botha JF, Verwey JP, Van der Voort I, Vivier JJP, Buys J, Colliston WP and Looock JC, 1998. Karoo Aquifers – Their Geology, Geometry and Physical Properties, WRC Report No 487/1/98, August 1998.
- Botha R.C.N. and Botha GA. 2002. Geological Description of sheet 2930CB Pietermaritzburg. Council for Geoscience, Pretoria.
- Botha, J., and Smith, R.M.H., 2006. Rapid vertebrate recuperation in the Karoo Basin of South Africa following the end-Permian extinction. *Journal of African Earth Sciences*, 45, 502-514.
- Botha, J., and Smith, R.M.H., 2007. Lystrosaurus species composition across the Permo-Triassic boundary of South Africa. *Lethaia*, 40, 125-137.



- Botha, J., Huttenlocker, A.K., Smith, R.M.H., Prevec, R., Viglietti, P. And Modesto, S., 2020. New geochemical and palaeontological data from the Permo-Triassic boundary in the South African Karoo Basin test the synchrony of terrestrial and marine extinctions. *Palaeogeography, Palaeoclimatology, Palaeoecology*, DOI: 10.1016/j.palaeo.2019.109467
- Botha, J., 2020. Biostratigraphy of the *Lystrosaurus declivis* Assemblage Zone (Beaufort Group, Karoo Supergroup), South Africa. *South African Journal of Geology*. 123(2):207-216.
- Botha-Brink, J., 2017. Burrowing in *Lystrosaurus*: preadaptation to a post extinction environment? *Journal of Vertebrate Paleontology*, 37, (5): e1365080.
- Brink, J.S. 1987. The archaeozoology of Florisbad, Orange Free State. *Memoirs of the National Museum* 24: 1 – 151.
- Brink, J.S. 2012. The post-1.0 Ma evolution of large mammal endemism in southern Africa in relation to East Africa and subsequent biogeographic isolation of the Cape coastal region. *Quaternary International*/vol. 279–280: 69.
- Brink, J.S. 2016. Faunal evidence for mid- and late Quaternary environmental change in southern Africa. In: Knight, J. and Grab, S.W. (eds) *Quaternary environmental change in southern Africa: physical and human dimensions*. Cambridge University Press, pp. 286-307
- Brink, J.S., Berger, L.R., Churchill, S.E. 1999. Mammalian Fossils From Erosional Gullies (Dongas) In The Doring River Drainage, Central Free State Province, South Africa, pp. 79-90. In: Becker, C., Manhart, H., Peters, J., Schibler, J. (eds), *Historia Animalium ex Ossibus. Beiträge zur Paläoanatomie, Archäologie, Ägyptologie, Ethnologie und Geschichte der Tiermedizin: Festschrift für Angela Von Den Driesch zum 65. Geburtstag*. Rahden/Westf.: Verlag Marie Leidorf GmbH.
- Broom, R., 1906. On the Permian and Triassic faunas of South Africa. *Geological Magazine*, 5, 29-30.
- Cairncross, B., Beukes, N.J., Coetzee, L.L. and Rehfeld, U. 2005. The Bivalve *Megadesmus* from the Permian Volksrust Shale Formation (Karoo Supergroup), northeastern Karoo Basin, South Africa: implications for late Permian Basin development. *South African Journal of Geology* 108: 547-556.
- Catuneanu, O. & Eriksson, P.G. 1999. The sequence stratigraphic concept and the Precambrian rock record: an example from the 2.7-2.1 Ga Transvaal Supergroup, Kaapvaal craton. *Precambrian Research* 97, 215-251.
- Coppens, Y. et al. 1978. Proboscidea. In: V. Maglioiand and H.B.S. Cooke (eds). *Evolution of African Mammals*. Cambridge. Harvard University Press
- Council for Geoscience. 1998. Sheet 2826 Winburg, 1:250 000 Geological series. Council For Geoscience, Pretoria.
- Council for Geoscience. 2000. Sheet 2726 Welkom, 1:250 000 Geological series. Council For Geoscience, Pretoria.
- Cowan, R., 1995. *History of Life*. 2nd Edition. Blackwell Scientific Publications, Boston. 462pp.
- Damiani, R., Modesto, S., Yates, A. and Neveling, J., 2003. Earliest evidence of cynodont burrowing. *Proceedings of the Royal Society London B*, 270, 1747-1751.



- Damiani, R.J., Neveling, J., Hancox, P.J. and Rubidge B.S., 2000. First trematosaurid temnospondyl from the Lystrosaurus Assemblage Zone of South Africa and its biostratigraphic implications. *Geological Magazine* 137, 659-665.
- Day M, Rubidge B, Almond J, Jirah S. 2013. Biostratigraphic correlation in the Karoo: The case of the Middle Permian parareptile *Eunotosaurus*. *S Afr J Sci.* 2013;109(3/4), Art. #0030, 4 pages. <http://dx.doi.org/10.1590/sajs.2013/20120030>
- De Ruiter, Darryl J.; Brophy, Juliet K.; Lewis, Patrick J.; Kennedy, Alicia M.; Stidham, Thomas A.; Carlson, Keely B.; Hancox, P. John. 2010. *Preliminary investigation of the Matjhabeng, a Pliocene fossil locality in the Free State of South Africa.* <http://hdl.handle.net/10539/13821>
- 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.
- Du Toit, A.L., 1918. The zones of the Karoo System and their distribution. *Proceedings of the Geological Society of South Africa*, 21, 17-37.
- Du Toit, A. 1954. *The geology of South Africa*. xii + 611pp, 41 pls. Oliver & Boyd, Edinburgh.
- Duncan, R.A., Hooper, P.R., Rehacek, J., Marsh J.S. and Duncan, A.R., 1997. The timing and duration of the Karoo igneous event, southern Gondwana. *Journal of Geophysical Research*, 102, 18127-18138.
- Eales, H.V., Marsh, J.S. and Cox, K.G. (1984). The Karoo Igneous Province: an introduction. In: Erlank, A.J. (Ed.), *Petrogenesis of the Volcanic Rocks of the Karoo Province*. *Spec. Publ. Geol. Soc. S. Afr.*, 13, 1-26
- Gastaldo, R.A., Kamo, S.L., Neveling, J., Geissman, W., Looy, C.V. and Martini, A.M., 2020. The base of the Lystrosaurus Assemblage Zone, Karoo Basin, predates the end-Permian marine extinction. *Nature Communications* 11, 1428. doi.org/10.1038/s41467-020-15243-7
- Fedorchuk, N.D., Dornbos, S.Q., Corsetti, F.A., Isbell, J.L., Petryshyn, V.A., Bowles, J.A., Wilmeth, D.T., 2016. Early non-marine life: Evaluating the biogenicity of Meso-proterozoic fluvial-lacustrine stromatolites. *Precambrian Research* 275, 105-118.
- Fernandez, V., Abdala, F., Carlson, K.J., Cook, D.C., Rubidge, B.S., Yates, A. and Tafforeau, P., 2013. Synchrotron reveals Early Triassic odd couple: Injured amphibian and aestivating therapsid share burrow. *PLoS ONE* 8, e64978. [doi:10.1371/journal.pone.0064978](https://doi.org/10.1371/journal.pone.0064978).
- Groenewald GH. 1989. Stratigrafie en sedimentology van die Groep Beaufort in die Noord-Oos Vrystaat. *Bull. Geol. Surv. S. Afr*, 96. 62pp.
- Groenewald GH. 1996. *Stratigraphy and Sedimentology of the Tarkastad Subgroup, Karoo Supergroup, South Africa.* Unpubl PhD Thesis, University of Port Elizabeth.
- Groenewald, G., And Groenewald, D., 2014. SAHRA Palaeotechnical Report: Palaeontological Heritage of the Free State. Pp1-20.
- Groenewald, G., 2019. Ichnoassociations of Permian and Triassic tetrapod footprints in the Karoo Basin of South Africa. *Gondwana Research* 72,139-168.
- Groenewald, G.H. and Kitching, J.W., 1995. Biostratigraphy of the Lystrosaurus Assemblage Zone. *South African Committee for Stratigraphy. Biostratigraphic Series* 1, 35-39.



- Hancox P.J. and Rubidge B.S., 1997. The role of fossils in interpreting the development of the Karoo Basin. *Palaeontologia Africana*, 33, 41-54.
- Hunter, D.R., Johnson, M.R., Anhaeusser, C. R. and Thomas, R.J. 2006. Introduction. (//r. Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J. (Eds), *The Geology of South Africa*. Geological Society of South Africa, Johannesburg/Council for Geoscience, Pretoria, 585-604.)
- Johnson M.R, Anhaeusser CR and Thomas RJ (Eds) (2006). *The Geology of South Africa*. GSSA, Council for Geoscience, Pretoria.
- Johnson, M.R., Visser, J.N.J., et al. 2006. Sedimentary rocks of the Karoo Supergroup In Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (eds). *The geology of South Africa*. 691 pp. Geological Society of South Africa, Johannesburg and Council for Geoscience, Pretoria.
- Kent, L. E., 1980. Part 1: Lithostratigraphy of the Republic of South Africa, South West Africa/Namibia and the Republics of Bophuthatswana, Transkei, and Venda. SACS, Council for Geosciences.
- Keyser, A.W. and Smith, R.H.M., 1979. Vertebrate biozonation of the Beaufort Group with special reference to the Western Karoo Basin. *Annals Geological Survey South Africa*, 12, 1-36.
- Keyser, A.W., 1979. A review of the biozonation of the Beaufort Group in the Karoo basin of South Africa. *Geological Society of South Africa, Abstracts 1979 Geological Congress 2*, 13-31.
- Kitching, J.W., 1970. A short review of the Beaufort zoning in South Africa. In: S.H. Haughton (Editor), *I.U.G.S., 2nd Gondwana Symposium Proceedings and Papers*, 309-312.
- Kitching, J.W., 1977. The distribution of the Karoo vertebrate fauna. *Bernard Price Institute for Palaeontological Research Memoir 1*, 1-131.
- Kitching, J.W., Collinson, J.W., Elliot, D.H. and Colbert, E.H., 1972. Lystrosaurus Zone (Triassic) fauna from Antarctica. *Science*, 175, 524-527.
- 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.
- Klein, C. & Beukes, N.J. 1989. Geochemistry and sedimentology of a facies transition from limestone to iron formation deposition in the early Proterozoic Transvaal Supergroup, South Africa. *Economic Geology* 84, 1733-1774.
- Lewis, Patrick J.; Brink, James S.; Kennedy, Alicia M.; Campbell, Timothy L. (2011). "Examination of the Florisbad microvertebrates". *South African Journal of Science*. **107**(7/8). MACRAE, C. 1999. Life etched in stone. *Fossils of South Africa*. 305 pp. The Geological Society of South Africa, Johannesburg.
- Lock, B.E., Paverd, A.L. and Broderick, T.J. (1974). Stratigraphy of the Karoo volcanic rocks of the Barkly East District. *Trans. Geol. Soc. S. Afr.*, 77, 117–129
- Lucas, S.G., 1998. Global Triassic tetrapod biostratigraphy and biochronology. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 143, 347-384.
- Macrae, C. 1999. Life etched in stone. *Fossils of South Africa*. 305 pp. The Geological
- Marchetti, L., Klein, H., Buchwitz, M., Ronchi, A., Smith, R.M.H., De Klerk, E., Sciscio, L. and Meiring, A.J.D. 1955. Fossil Proboscidean teeth and ulna from Virginia, OFS. *Navorsinge van die Nasionale Museum, Bloemfontein 1*, 187–201.
- Marshak, S., 2005. *Earth. Portrait of a Planet*. 2nd Edition. W.W. Norton & CO., New York. 748 p



- Maud, R. 2012. Macroscale Geomorphic Evolution. (In Holmes, P. and Meadows, M. Southern Africa Geomorphology, New trends and new directions. Bloemfontein: Sun Press. p. 7- 21)
- McCarthy, T. & Rubidge, B. 2005. The story of Earth and life: a southern African perspective on a 4.6-billion-year journey. 334pp. Struik, Cape Town
- Michaelsen, P., 2002. Mass extinction of peat-forming plants and the effect on fluvial styles across the Permian-Triassic boundary, northern Bowen Basin, Australia, *Palaeogeography Palaeoclimatology Palaeoecology*, 179, 173-188.
- Modesto, S.P. and Botha-Brink, J., 2010. A burrow cast with *Lystrosaurus* skeletal remains from the Lower Triassic of South Africa. *Palaaios*, 25, 274-281.
- Moore, J.M., Tsikos, H. & Polteau, S. 2001. Deconstructing the Transvaal Supergroup, South Africa: implications for Paleoproterozoic paleoclimate models. *African Earth Sciences* 33, 437-444.
- Neveling, J., 2004. Stratigraphic and sedimentological investigation of the contact between the *Lystrosaurus* and *Cynognathus* Assemblage Zones (Beaufort Group: Karoo Supergroup). *Council for Geoscience Bulletin* 137, 1-165.
- Neveling, J., Hancox, P.J. and Rubidge, B.S., 2004. Biostratigraphy of the lower Burgersdorp Formation (Beaufort Group; Karoo Supergroup) of South Africa – implications for the stratigraphic ranges of Early Triassic tetrapods. *Palaeontologia africana*, 41, 81-87.
- Nicolas, M.V.M., 2007. Tetrapod Biodiversity through the Permo Triassic Beaufort Group (Karoo Supergroup) of South Africa. Unpublished PhD thesis, University of the Witwatersrand, Johannesburg. 356pp
- Partridge, T.C. & Scott, L. 2000. Lakes and pans. In: Partridge, T.C. & Maud, R.R. (Eds.) *The Cenozoic of southern Africa*, pp.145 - 161. Oxford University Press, Oxford.
- Partridge, T.C., Botha, G.A. & Haddon, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) *The geology of South Africa*, pp. 585-604. Geological Society of South Africa, Marshalltown.
- Rubidge B.S., 1995 Biostratigraphy of the Beaufort Group (Karoo Supergroup). South African Committee for Stratigraphy Biostratigraphic Series 1: 1-46 Pretoria South African Committee for Stratigraphy and Biostratigraphy
- S.A.C.S. (South African Committee for Stratigraphy), 1980. Stratigraphy of South Africa. Part 1. Lithostratigraphy of the Republic of South Africa, South West Africa/Namibia, and the Republics of Bophuthatswana, Transkei, and Venda. *Handbook of the Geological Survey of South Africa*, 8, 690pp
- SAHRA 2012. Minimum standards: palaeontological component of heritage impact assessment reports, 15 pp. South African Heritage Resources Agency, Cape Town.
- Scott, L. & Rossouw, L. 2005 Reassessment of botanical evidence for palaeoenvironments at Florisbad, South Africa. *South African Archaeological Bulletin* 60: 96-102.
- Scott, L. & J.S. Brink. 1992. Quaternary palynology, palaeontology and palaeoenvironments in central South Africa. *South African Geographer* 19: 22-34.
- Scott, L. and Klein, R.G. 1981. A hyena-accumulated bone assemblage from Late Holocene deposits at Deelpan, Orange Free State. *Annals of the South African Museum* 86(6): 217 – 227.



- Smith R.M.H., 1990. A review of stratigraphy and sedimentary environments in the Karoo Basin of South Africa. *Journal of African Earth Sciences*, 10, 117-137
- Smith, R.M.H. and Botha-Brink, J., 2011. Anatomy of an extinction: End-Permian drought induced die-off in the Karoo Basin, South Africa. Abstracts SVP Annual Meeting Las Vegas *Journal Vertebrate Palaeontology*, SVP Program and Abstracts Book, 2011, 196.
- Smith, R.M.H. and Botha-Brink, J., 2014. Anatomy of an extinction: Sedimentological and taphonomic evidence for drought-induced die-offs during the Permo-Triassic mass extinction in the main Karoo Basin, South Africa. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 396, 99-118.
- Smith, R.M.H. and Ward, P.D., 2001. Pattern of vertebrate extinctions across an event bed at the Permian–Triassic boundary in the Karoo Basin of South Africa. *Geological Society of America Bulletin*, 29, 1147-1150.
- Smith, R.M.H., 1995. Changing fluvial environments across the Permian–Triassic boundary in the Karoo Basin, South Africa, and possible causes of the extinctions. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 117, 81-104.
- Smith, R.M.H., Rubidge, B.S. and van der Walt, M., 2012. Therapsid biodiversity patterns and paleoenvironments of the Karoo Basin, South Africa. In: A. Chinsamy (Editor), *The forerunners of mammals: radiation, histology, and biology*. Indiana University Press, Bloomington, 31-62.
- Smith, R.M.H., Rubidge, B.S., Day, M.O., Botha; J. 2020. Introduction to the tetrapod biozonation of the Karoo Supergroup. *South African Journal of Geology* 123 (2): 131–140. Doi: <https://doi.org/10.25131/sajg.123.0009>. Society of South Africa, Johannesburg.
- Sumner, D.Y. & Beukes, N.J. 2006. Sequence stratigraphic development of the Neoproterozoic Transvaal carbonate platform, Kaapvaal Craton, South Africa. *South African Journal of Geology* 109, 11-22.
- Thomas, M.J. 1981. The geology of the Kalahari in the Northern Cape Province (Areas 2620)
- Tooth, S. Brandt, D., Hancox P.J. And McCarthy, T. S. 2004. Geological controls on alluvial river behaviour: a comparative study of three rivers in the South African Highveld. *Journal of African Earth Sciences*, 38(2004): 79-97, 15 Aug.
- Van der Walt M., Day M. and Rubidge BS. 2010. A new GIS based biozone map of the Beaufort Group (Karoo Supergroup) South Africa. *Palaeontologia Africana* 45, 1-6.
- Van Zyl, W., S. Badenhorst & J.S. Brink. 2016. Pleistocene Bovidae from X Cave on Bolt's Farm in the Cradle of Humankind in South Africa. *Annals of the Ditsong National Museum of Natural History* 6: 39–73.
- Viglietti P.A., Smith R.M.H. and Compton J.S., 2013. Origin and palaeoenvironmental significance of Lystrosaurus bonebeds in the earliest Triassic Karoo Basin, South Africa. *Palaeogeography, Palaeoecology, Palaeoclimatology*, 392, 9-21.
- Viglietti P.A., 2020. The Daptocephalus Assemblage Zone (Lopingian), South Africa: A proposed biostratigraphy based on a new compilation of stratigraphic ranges. *South African Journal of Geology* 123 (2): 191-206. DOI: [10.1016/j.jafrearsci.2015.10.011](https://doi.org/10.1016/j.jafrearsci.2015.10.011)



Visser, D.J.L. (ed) 1984. Geological Map of South Africa 1:100 000. South African Committee for Stratigraphy, Council for Geoscience, Pretoria.

Visser, D.J.L. (ed) 1989. *Toeligting: Geologiese kaart (1:100 000). Die Geologie van die Republieke van Suid Afrika, Transkei, Bophuthatswana, Venda, Ciskei en die Koningkryke van Lesotho en Swaziland.* South African Committee for Stratigraphy. Council for Geoscience, Pretoria, Pp 494.



APPENDIX A : CURRICULUM VITAE

PROFESSION: Palaeontologist
YEARS' EXPERIENCE: 30 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 1998–2022

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 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. 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 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. Savannah South Africa. Bloemfontein.
- Butler, E. 2016. Palaeontological Impact Assessment of the proposed upgrading of the main road MR450 (R335) from 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 Leeuwberg 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, Mhashe 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 Lephallale coal and power project, Lephallale, 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 Lephale Coal and Power Project, Lephale, 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 HQ, 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.
- Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Westrand Strengthening Project Phase II.
- Butler, E., 2019. Palaeontological Field Assessment for the proposed Sirius 3 Photovoltaic Solar Energy Facility near Upington, Northern Cape Province
- Butler, E., 2019. Palaeontological Field Assessment for the proposed Sirius 4 Photovoltaic Solar Energy Facility near Upington, Northern Cape Province
- Butler, E., 2019. Palaeontological Field Assessment for Heuningspruit PV 1 Solar Energy Facility near Koppies, Ngwathe Local Municipality, Free State Province.
- Butler, E., 2019. Palaeontological Field Assessment for the Moeding Solar Grid Connection, North West Province.
- Butler, E., 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.
- Butler, E., 2019. Recommended Exemption from further Palaeontological studies: of Proposed Agricultural Development, Plot 1178, Kakamas South Settlement, Kai! Garib Municipality
- Butler, E., 2019. Palaeontological Desktop Assessment for the Proposed Waste Rock Dump Project at Tshipi Borwa Mine, near Hotazel, Northern Cape Province:
- Butler, E., 2019. Palaeontological Exemption Letter for the proposed DMS Upgrade Project at the Sishen Mine, Gamagara Local Municipality, Northern Cape Province



- Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Integrated Environmental Authorisation process for the proposed Der Brochen Amendment project, near Groblershoop, Limpopo
- Butler, E., 2019. Palaeontological Desktop Assessment of the proposed updated Environmental Management Programme (EMPr) for the Assmang (Pty) Ltd Black Rock Mining Operations, Hotazel, Northern Cape
- Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Kriel Power Station Lime Plant Upgrade, Mpumalanga Province
- Butler, E., 2019. Palaeontological Impact Assessment for the proposed Kangala Extension Project Near Delmas, Mpumalanga Province.
- Butler, E., 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.
- Butler, E., 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.
- Butler, E., 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.
- Butler, E., 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.
- Butler, E., 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.
- Butler, E., 2019. Palaeontological Desktop Assessment of the proposed Vedanta Housing Development, Pella Mission 39, Khâi-Ma Local Municipality, Namakwa District Municipality, Northern Cape.
- Butler, E., 2019. Palaeontological Desktop Assessment for The Proposed 920 KWP Groenheuwel Solar Plant Near Augrabies, Northern Cape Province
- Butler, E., 2019. Palaeontological Desktop Assessment for the establishment of a Super Fines Storage Facility at Amandelbult Mine, Near Thabazimbi, Limpopo Province
- Butler, E., 2019. Palaeontological Impact Assessment for the proposed Sace Lifex Project, Near Emalahleni, Mpumalanga Province
- Butler, E., 2019. Palaeontological Desktop Assessment for the proposed Rehau Fort Jackson Warehouse Extension, East London
- Butler, E., 2019. Palaeontological Desktop Assessment for the proposed Environmental Authorisation Amendment for moving 3 Km of the Merensky-Kameni 132KV Powerline
- Butler, E., 2019. Palaeontological Impact Assessment for the proposed Umsobomvu Solar PV Energy Facilities, Northern and Eastern Cape
- Butler, E., 2019. Palaeontological Desktop Assessment for six proposed Black Mountain Mining Prospecting Right Applications, without Bulk Sampling, in the Northern Cape.
- Butler, E., 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
- Butler, E., 2019. Palaeontological Desktop Assessment of The Proposed Upgrade of The Vaal Gamagara Regional Water Supply Scheme: Phase 2 And Groundwater Abstraction
- Butler, E., 2019. Palaeontological Desktop Assessment of The Expansion of The Jan Kempdorp Cemetery on Portion 43 Of Farm Guldenskat 36-Hn, Northern Cape Province
- Butler, E., 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
- Butler, E., 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
- Butler, E., 2019. Palaeontological Protocol for Finds for the proposed 16m WH Battery Storage System in Steinkopf, Northern Cape Province



- Butler, E., 2019. Palaeontological Exemption Letter of the proposed 4.5WH Battery Storage System near Midway-Pofadder, Northern Cape Province
- Butler, E., 2019. Palaeontological Exemption Letter of the proposed 2.5ml Process Water Reservoir at Gloria Mine, Black Rock, Hotazel, Northern Cape
- Butler, E., 2019. Palaeontological Desktop Assessment for the Establishment of a Super Fines Storage Facility at Gloria Mine, Black Rock Mine Operations, Hotazel, Northern Cape:
- Butler, E., 2019. Palaeontological Desktop Assessment for the Proposed New Railway Bridge, and Rail Line Between Hotazel and the Gloria Mine, Northern Cape Province
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment of the Proposed Diamond Mining Permit Application Near Kimberley, Sol Plaatjies Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment of the Proposed Diamonds (Alluvial, General & In Kimberlite) Prospecting Right Application near Postmasburg, Registration Division; Hay, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment of the proposed diamonds (alluvial, general & in kimberlite) prospecting right application near Kimberley, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Phase 1 Impact Assessment of the proposed upgrade of the Vaal Gamagara regional water supply scheme: Phase 2 and groundwater abstraction. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment of the proposed seepage interception drains at Duvha Power Station, Emalahleni Municipality, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment letter for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Phase 1 Assessment for the Proposed PV Solar Facility at the Heineken Sedibeng Brewery, near Vereeniging, Gauteng. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological field Assessment for the Proposed Upgrade of the Kolomela Mining Operations, Tsantsabane Local Municipality, Siyanda District Municipality, Northern Cape Province, Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment of the proposed feldspar prospecting rights and mining application on portion 4 and 5 of the farm Rozynen 104, Kakamas South, Kai! Garib Municipality, Zf Mgcawu District Municipality, Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Phase 1 Field Assessment of the proposed Summerpride Residential Development and Associated Infrastructure on Erf 107, Buffalo City Municipality, East London. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Impact Assessment for the proposed re-commission of the Old Balgay Colliery near Dundee, KwaZulu Natal.
- Butler, E., 2019. Palaeontological Phase 1 Impact Assessment for the Proposed Re-Commission of the Old Balgay Colliery near Dundee, KwaZulu Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.



- Butler, E., 2019. Palaeontological Field Assessment for the Proposed Nigel Gas Transmission Pipeline Project in the Nigel Area of the Ekurhuleni Metropolitan Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment for five Proposed Black Mountain Mining Prospecting Right Applications, Without Bulk Sampling, in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E. 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Impact Assessment for the Proposed Sace Lifex Project, near Emalahleni, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Desktop Assessment for the proposed Golfview Colliery near Ermelo, Msukaligwa Local Municipality, Mpumalanga Province
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2019. Palaeontological Exemption Letter of the Proposed Mamatwan Mine Section 24g Rectification Application, near Hotazel, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Field Assessment for the Proposed Environmental Authorisation and Amendment Processes for Elandsfontein Colliery. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Field Assessment for the Proposed Piggery on Portion 46 of the Farm Brakkefontien 416, Within the Nelson Mandela Bay Municipality, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Choje Wind Farm between Grahamstown and Somerset East, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 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: Gordonia and Kenhardt, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 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. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Hartebeesthoek Residential Development. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Mooiplaats Educational Facility, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Impact Assessment for the Proposed Monument Park Student Housing Establishment. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Field Assessment for the Proposed Standerton X10 Residential and Mixed-Use Developments, Lekwa Local Municipality Standerton, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Field Assessment for the Rezoning and Subdivision of Portion 6 Of Farm 743, East London. Banzai Environmental (Pty) Ltd, Bloemfontein. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Field Assessment for the Proposed Matla Power Station Reverse Osmosis Plant, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.



- Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application Without Bulk Sampling for the Prospecting of Diamonds Alluvial near Bloemhof on Portion 3 (Portion 1) of the Farm Boschpan 339, the Remaining Extent of Portion 8 (Portion 1), Portion 9 (Portion 1) and Portion 10 (Portion 1) and Portion 17 (Portion 1) of the Farm Panfontein 270, Registration Division: Ho, North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application Combined with a Waste Licence Application for the Prospecting of Diamonds Alluvial, Diamonds General and Diamonds near Wolmaransstad on the Remaining Extent, Portion 7 and Portion 8 Of Farm Rooibult 152, Registration Division: HO, North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Application With Bulk Sampling combined with a Waste Licence Application for the Prospecting of Diamonds Alluvial (Da), Diamonds General (D), Diamonds (Dia) and Diamonds In Kimberlite (Dk) near Prieska On Portion 7, a certain Portion of the Remaining Extent of Portion 9 (Wouter), Portion 11 (De Hoek), Portion 14 (Stofdraai) (Portion of Portion 4), the Remaining Extent of Portion 16 (Portion Of Portion 9) (Wouter) and the Remaining Extent of Portion 18 (Portion of Portion 10) of the Farm Lanyon Vale 376, Registration Division: Hay, Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Prospecting Right Area and Mining Permit Area near Ritchie on the Remaining Extent of Portion 3 (Anna's Hoop) of the Farm Zandheuvell 144, Registration Division: Kimberley, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment of the Proposed Okapi Diamonds (Pty) Ltd Mining Right of Diamonds Alluvial (Da) & Diamonds General (D) Combined with a Waste Licence Application on the Remaining Extent of Portion 9 (Wouter) of the Farm Lanyon Vale 376; Registration Division: Hay; Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Field Assessment of the Proposed Prospecting Right Application for the Prospecting of Diamonds (Alluvial & General) between Douglas and Prieska on Portion 12, Remaining Extent of Portion 29 (Portion of Portion 13) and Portion 31 (Portion of Portion 29) on the Farm Reads Drift 74, Registration Division; Herbert, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Mining Permit Application Combined with a Waste License Application for the Mining of Diamonds (Alluvial) Near Schweitzer-Reneke on a certain Portion of Portion 12 (Ptn of Ptn 7) of the Farm Doornhoek 165, Registration Division: HO, North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for Black Mountain Koa South Prospecting Right Application, Without Bulk Sampling, in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Impact Assessment of the Proposed AA Bakery Expansion, Sedibeng District Municipality, Gauteng. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Boegoeberg Township Expansion, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Gariep Township Expansion, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Groblershoop Township Expansion, !Kheis Local Municipality, Zf Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Grootdrink Township Expansion, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Exemption Letter for the Proposed Opwag Township Expansion, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Exemption Letter for the Proposed Topline Township Expansion, !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.



- Butler, E., 2020. Palaeontological Desktop Assessment for the Proposed Wegdraai Township Expansion, IKheis Local Municipality, Zf Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological field Assessment for the Proposed Establishment of an Emulsion Plant on Erf 1559, Hardustria, Harrismith, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, 2020. Part 2 Environmental Authorisation (EA) Amendment Process for the Kudusberg Wind Energy Facility (WEF) near Sutherland, Western and Northern Cape Provinces- Palaeontological Impact Assessment. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment Proposed for the Construction and Operation of the Battery Energy Storage System (BESS) and Associated Infrastructure and inclusion of Additional Listed Activities for the Authorised Droogfontein 3 Solar Photovoltaic (PV) Energy Facility Located near Kimberley in the Sol Plaatje Local Municipality, Francis Baard District Municipality, in the Northern Cape Province of South Africa. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Impact Assessment for the Proposed Development of a Cluster of Renewable Energy Facilities between Somerset East and Grahamstown in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the Proposed Amaoti Secondary School, Pinetown, eThekweni Metropolitan Municipality KwaZulu Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Proposed an Inland Diesel Depot, Transportation Pipeline and Associated Infrastructure on Portion 5 of the Farm Franshoek No. 1861, Swinburne, Free State Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed erosion control gabion installation at Alpine Heath Resort on the farm Akkerman No 5679 in the Bergville district Kwazulu-Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed Doornkloof Residential development on portion 712 of the farm Doornkloof 391 Jr, City of Tshwane Metropolitan Municipality in Gauteng, South Africa. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the Proposed Expansion of the Square *Kilometre* Array (SKA) Meerkat Project, on the Farms Mey's Dam RE/68, Brak Puts RE /66, Swartfontein RE /496 & Swartfontein 2/496, in the Kareeberg Local Municipality, Pixley Ka Seme District Municipality, and the Farms Los Berg 1/73 & Groot Paardekloof RE /74, in the Karoo Hoogland Local Municipality, Namakwa District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for De Beers Consolidated Mines: Proposed Drilling on Portion 6 of Scholtzfontein 165 and Farm Arnotsdale 175, Herbert District in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for De Beers Consolidated Mines: Proposed Drilling on the Remaining Extent of Biessie Laagte 96, and Portion 2 and 6 of Aasvogel Pan 141, Near Hopetown in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for De Beers Consolidated Mines: Proposed Drilling in the North West Province: on Portions 7 (RE) (of Portion 3), 11, 12 (of Portion 3), 34 (of Portion 30), 35 (of Portion 7) of the Farm Holfontein 147 IO and Portions 1, 2 and the RE) of the Farm Kareeboschbult 76 Ip and Portions 1, 2, 4, 5, 6, (of Portion 3), 7 (of Portion 3), 13, 14, and the Re of the farm Oppaslaagte 100IP and portions 25 (of Portion 24) and 30 of the farm Slyphsteen 102 IP. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the Proposed Expansion of the Cavalier Abattoir on farm Oog Van Boekenhoutskloof of Tweefontein 288 JR, near Cullinan, City of Tshwane Metropolitan Municipality, Gauteng. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Proposed Doornkloof Residential Development on Portion 712 of the Farm Doornkloof 391 JR, City of Tshwane Metropolitan Municipality in Gauteng, South Africa. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed High Density Social Housing Development on part of the Remainder of Portion 171 and part of Portion 306 of the farm Derdepoort 326 JR, City of Tshwane. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Red Rock Mountain Farm activities on Portions 2, 3 and 11 of the Farm Buffelskloof 22, near Calitzdorp in the Western Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.



- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Mixed-use Development on a Part of Remainder of Portion 171 and Portion 306 of the farm Derdepoort 326 JR, City of Tshwane. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Proposed Realignment of the D 2809 Provincial Road as well as the Mining Right Application for the Glisa and Paardeplaats Sections of the NBC Colliery (NBC) near Belfast (eMakhazeni), eMakhazeni Local Municipality, Nkangala District Municipality, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed construction of Whittlesea Cemetery within Enoch Mgijima Local Municipality area, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the establishment of a mixed-use development on Portion 0 the of Erf 700, Despatch, Nelson Mandela Bay Municipality, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed East Orchards Poultry Farm, Delmas/Botleng Transitional Local Council, Mpumalanga. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed East Orchards Poultry Farm, Delmas/Botleng Transitional Local Council, Mpumalanga. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment to assess the proposed Gariep Road upgrade near Groblershoop, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Ngwedi Solar Plant which forms part of the authorised Paleso Solar Powerplant near Viljoenskroon in the Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Noko Solar Power Plant and power line which forms part of the authorised Paleso Solar Powerplant near Orkney in the North West. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Proposed Power Line as part of the Paleso Solar Power Plant near Viljoenskroon in the Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Thakadu Solar Plant which forms part of the authorised Paleso Solar Powerplant near Viljoenskroon in the Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the proposed Farming Expansions on Portions 50 of the Farm Rooipoort 555 JR, Portion 34 of the Farm Rooipoort 555 JR, Portions 20 and 49 of the Farm Rooipoort 555 JR and Portion 0(RE) of the Farm Oudou Boerdery 626 JR, Tshwane Metropolitan Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the proposed Saselamani CBD on the Remainder of Tshikundu's Location 262 MT, and the Remainder of Portion 1 of Tshikundu's Location 262 MT, Collins Chabane Local Municipality, Limpopo Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed expansions of the existing Molare Piggery infrastructure and related activities on Portion 0(Re) of the farm Arendsfontein 464 JS, Portion 0(Re) of the farm Wanhoop 443 JS, Portion 0(Re) of the farm Eikeboom 476 JS and Portions 2 & 7 of the farm Klipbank 467 JS within the jurisdiction of the Steve Tshwete Local Municipality, Mpumalanga Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Nchwaning Rail Balloon Turn Outs at Black Rock Mine Operations (BRMO) near Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Black Rock Mining Operations (BRMO) new rail loop and stacker reclaiming Project at Gloria Mine near Hotazel in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2020. Palaeontological Desktop Assessment for the proposed Nchwaning Rail Balloon Turn Outs at Black Rock Mine Operations (BRMO) near Hotazel in the John Taolo Gaetsewe District Municipality in the Northern Cape.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed utilization of one Borrow Pit for the planned Clarkebury DR08034 Road Upgrade, Engcobo Local Municipality, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.



- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Kappies Kareeboom Prospecting Project on Portion 1 and the Remainder of the farm Kappies Kareeboom 540, the Remainder of Farm 544, Portion 5 of farm 534 and Portion 1 of the farm Putsfontein 616, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Kameel Fontein Prospecting Project on the Remainder of the farm Kameel Fontein 490, a portion of the farm Strydfontein 614 and the farm Soetfontein 606, ZF Mgcawu District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Lewis Prospecting Project on Portions of the Farms Lewis 535, Spence 537, Wright 538, Symthe 566, Bredenkamp 567, Brooks 568, Beaumont 569 and Murray 570, John Taolo Gaetsewe District Municipality in the Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the Construction of the Ganspan Pering 132kV Powerline, Phokwane Local Municipality, Frances Baard District Municipality in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the Longlands Prospecting Project on a Portion of the farm Longlands 350, Frances Baard District Municipality, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed development of 177 new units in the northern section of Mpongo Park in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Qhumanco Irrigation Project, Chris Hani District Municipality Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Raphuti Settlement Project on Portions of the Farm Weikrans 539KQ in the Waterberg District Municipality of the Limpopo Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Senqu Rural Project, Joe Gqabi District Municipality, Senqu Local Municipality, in the Eastern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed new Township development on portion of the farm Klipfontein 716 and farm Ceres 626 in Bloemfontein, Mangaung Metropolitan Municipality, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the ECDOT Borrow Pits and WULA near Sterkspruit, Joe Gqabi District Municipality in the Eastern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed SANRAL Stone Crescent Embankment Stabilisation Works along the N2 on the farm Zyfer Fonteyn 253 (Portion 0, 11 and 12RE) and Palmiet Rivier 305 (Portion 34, 36) near Grahamstown in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the Klein Rooipoort Trust Citrus Development, in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed Victoria West water augmentation project in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Campbell Sewer, Internal Reticulation, Outfall Sewer Line and Oxidation Ponds, located on ERF 1, Siyancuma Local Municipality in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed Development and Upgrades within the Great Fish River Nature Reserve, Eastern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for proposed Parsons Power Park a portion of Erf 1. within the Nelson Mandela Bay Municipality in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the proposed expansion of the farming operations on part of portions 7 and 8 of farm Boerboonkraal 353 in the Greater Tubatse Local Municipality of Sekhukhune District, Limpopo Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment to assess the proposed low-level pedestrian bridge, in Heilbron, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.



- Butler, E., 2021. Palaeontological Desktop Assessment to assess the proposed township developments in Hertzogville, Malebogo, in Heilbron, Free State. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment for the proposed construction of Malangazana Bridge on Farm No.64 Nkwenkwana, Engcobo Local Municipality, Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment to assess the proposed Construction of Middelburg Integrated Transport Control Centre on Portion 14 of Farm 81 Division of Middelburg, Chris Hani District Municipality in the Eastern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment for the Witteberge Sand Mine on the remainder of farm Elandskrag Plaas 269 located in the Magisterial District of Laingsburg and Central Karoo District Municipality in the Western Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Impact Assessment (PIA) to assess the proposed Agrizone 2, Dube Trade Port in KwaZulu Natal Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2021. Palaeontological Desktop Assessment assessing the proposed Prospecting Right application without bulk sampling for the prospecting of Chrome ore and platinum group metals on the Remaining Extent of the farm Doornspruit 106, Registration Division: HO; North West Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment for the proposed Ennerdale Extension 2 Township Establishment on the Undeveloped Part of Portion 134 of the Farm Roodepoort 302IQ, City of Johannesburg Metropolitan Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment for the Construction of the ESKOM Mesong 400kV Loop-In Loop-Out Project, Ekurhuleni Municipality, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment for the Proposed Vinci Prospecting Right Application on the Remainder of the Farm Vinci 580, ZF Mgcawu District Municipality, in the Northern Cape Province, Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment for the proposed Farm 431 Mining Right Application (MRA), near Postmasburg, ZF Mgcawu District Municipality, in the Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Impact Assessment for the Leeuw Braakfontein Colliery Expansion Project (LBC) in the Amajuba District Municipality, KwaZulu-Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment for the proposed reclamation of the 5L23 TSF in Ekurhuleni, Gauteng Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment for the Proposed Mogalakwena Mine Infrastructure Expansion (near Mokopane in the Mogalakwena Local Municipality, Limpopo Province). Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment for the proposed 10km Cuprum to Kronos Double Circuit 132kV Line and Associated Infrastructure in Copperton in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Impact Assessment for the proposed Hoekplaas WEF near Victoria West in the Northern Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment (PDA) assessing the proposed Prospecting Right Application without bulk sampling for the Prospecting of Diamonds Alluvial (DA), Diamonds General (D), Diamonds in Kimberlite (DK) & Diamonds (DIA) on the Remaining Extent of the Farm Goede Hoop 547, Remaining Extent of the Farm 548, Remaining Extent of Portion 2 and Portion 3 of the Farm Skeyfontein 536, Registration Division: Hay, Northern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Impact Assessment for the proposed extension of Duine Weg Road between Pellsrus and Marina Martinique as well as a Water Use Authorisation (WUA) for the project. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Proposed Mimosa Residential Development and Associated Infrastructure on Fairview Erven, in Gqeberha (Port Elizabeth), Nelson Mandela Bay Metropolitan Municipality, Eastern Cape Province. Banzai Environmental (Pty) Ltd, Bloemfontein.



- Butler, E., 2022. Palaeontological Impact Assessment for the Witteberge Sand Mine on the remainder of farm Elandskrag Plaas 269 located in the Magisterial District of Laingsburg and Central Karoo District Municipality in the Western Cape. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment to assess the Palaeontology for the Somkhele Anthracite Mine's Prospecting Right Application, on the Remainder of the Farm Reserve no 3 No 15822 within the uMkhanyakude District Municipality and the Mtubatuba Local Municipality, KwaZulu Natal. Banzai Environmental (Pty) Ltd, Bloemfontein.
- Butler, E., 2022. Palaeontological Desktop Assessment to assess the proposed Altina 120 MW Solar Photovoltaic (PV) Project near Orkney in the Free State
- Butler, E., 2022. Palaeontological Desktop Assessment to assess the proposed SERE Solar Photovoltaic Plant Phase 1A and associated infrastructure in the Western Cape Province.
- Butler, E., 2022. Palaeontological Impact Assessment for the proposed development of a 10 MW Solar Photovoltaic (PV) Plant and associated grid connection infrastructure on Portion 9 of the Farm Little Chelsea 10, Eastern Cape Province.
- Butler, E., 2022. Palaeontological Desktop Assessment to assess the proposed Dominion 1 Solar Park, located on the Remaining Extent of Portion 18 of Farm 425, near Klerksdorp within the North-West Province.
- Butler, E., 2022. Palaeontological Desktop Assessment to assess the proposed Dominion 2 Solar Park, located on the Remaining Extent of Portion 8 of Farm 425, near Klerksdorp within the North-West Province.
- Butler, E., 2022. Palaeontological Desktop Assessment to assess the proposed Dominion 3 Solar Park, located on the Remaining Extent of Portion 11 of Farm 425, and Remaining Extent of Portion 31 of Farm 425 near Klerksdorp within the North-West Province
- Butler, E., 2022. Palaeontological Impact Assessment to assess the Delta Solar Power Plant on the remaining extent of the farm Kareefontein No. 340, Dr Ruth Segomotsi Mompati District Municipality, Lekwa-Teemane Local Municipality near Bloemhof in the North West Province
- Butler, E., 2022. Palaeontological Impact Assessment to assess the Sonneblom Solar Power Plant (SPP) on Portion 1 of the farm Blydschap No. 504 within the Mangaung Metropolitan Municipality, southeast of Bloemfontein in the Free State.
- Butler, E., 2022. Palaeontological Impact Assessment for the proposed Naos Solar PV One Project near Viljoenskroon in the Free State.
- Butler, E., 2022. Palaeontological Impact Assessment for the proposed Naos Solar PV Two Project near Viljoenskroon in the Free State.
- Butler, E., 2022. Palaeontological Impact Assessment for the proposed Naos Solar PV Two Project near Viljoenskroon in the Free State
- Butler, E., 2022. Palaeontological Impact Assessment for the Ngwedi Solar Power near Viljoenskroon in the Free State.
- Butler, E., 2022. Palaeontological Impact Assessment for the Noko Solar Power Plant and power line near Orkney in the North West.
- Butler, E., 2022. Palaeontological Impact Assessment for the Proposed Power Line as part of the Paleso Solar Power Plant near Viljoenskroon in the Free State
- Butler, E., 2022. Palaeontological Impact Assessment for the Thakadu Solar Plant which near Viljoenskroon in the Free State
- Butler, E., 2022. Palaeontological Impact Assessment of the Kentani, Braklaagte, Klipfontein, Klipfontein 2, Leliehoek and Sonoblomo PV Facilities located near Dealsville in the Free State Province
- Butler, E., 2022. Palaeontological Impact Assessment for the proposed Harvard 1 Solar Photovoltaic (PV) facility on Portion 5 of Farm Spes Bona no 2355, Mangaung Metropolitan Municipality in the Free State.
- Butler, E., 2022. Palaeontological Impact Assessment for proposed Harvard 2 Solar Photovoltaic (PV) facility on Portion 8 of Farm Spes Bona No 2355, Mangaung Metropolitan Municipality in the Free State.
- Butler, E., 2022. Palaeontological Impact Assessment for the proposed Doornrivier Solar 1, southwest of Matjhabeng (formerly Virginia) in the Free State
- Butler, E., 2022. Palaeontological Desktop Assessment for the proposed Leeuwbosch PV solar photovoltaic (PV) plant and associated infrastructure on Portion 37 of the Farm Leeuwbosch No. 44 near Leeudoringstad within the Maquassi Hills Local Municipality in the Dr Kenneth Kaunda District Municipality in the North West Province.