



electrical infrastructure for the

**PALAEONTOLOGICAL
IMPACT
ASSESSMENT**

**ELECTRICAL
INFRASTRUCTURE FOR
THE WAG N BIETJIE
SOLAR FACILITY, NEAR
DE AAR,
NORTHERN CAPE
PROVINCE**

2022

COMPILED FOR:



Landscape Dynamics



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.

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Ltd

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SIGNATURE:



This Palaeontological 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.

Table 1: NEMA Table

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
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 10
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 1 and 11
(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 specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternative;	Section 1 and 11
(g) An identification of any areas to be avoided, including buffers	No buffers or areas of sensitivity identified Section 5
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 5 – 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	Section 1 and 11



Table 1: NEMA Table

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
such findings on the impact of the proposed activity, including identified alternatives, on the environment	
(k) Any mitigation measures for inclusion in the EMPr	Section 12
(l) Any conditions for inclusion in the environmental authorisation	Section 12
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 12
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 and 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 11
(o) A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable. A public consultation process will be conducted as part of the EIA and EMPr process. N/A
(p) A summary and copies if any comments that were received during any consultation process	N/A
(q) Any other information requested by the competent authority.	N/A
(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 Landscape Dynamics Environmental Consultants to conduct the Palaeontological Impact Assessment (PIA) to assess the proposed development of the Wag 'n Bietjie infrastructure associated with the authorised PV Facilities near De Aar. To comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PIA is necessary to verify if fossil material could potentially be present in the planned development area, to evaluate the potential impact of the proposed development on the Palaeontological Heritage and to mitigate possible damage to fossil resources.

The proposed Wag 'n Bietjie infrastructure project is underlain by Quaternary alluvium, the Karoo Dolerite Suite, the Tierberg Formation, Eccca Group as well as the Abrahamskraal Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup).

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 20 August 2022. No fossils were found in the development although trace fossils were identified. Sediments of the Karoo Supergroup in this area are deeply weathered and in places baked by Jurassic dolerite. Extensive excavations into deep bedrock during the construction phase is not anticipated and it is thus considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological reserves of the area. The construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

It is thus recommended that:

- The Environmental Control Officer (ECO), responsible for the development, should be aware of the possibility of finding fossils in the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) as well as in the Tierberg Formation (Eccca Group Karoo Supergroup). Quaternary fossil assemblages are normally rare and low in diversity and occur over a wide-ranging geographic area.
- If Palaeontological Heritage is uncovered during surface clearing and excavations the **Chance find Protocol** attached should be implemented 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 correct mitigation (recording and collection) can be carry out by a paleontologist.



- Before any fossil material can be collected from the development site, the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012). It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.



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1 INTRODUCTION

Mulilo Renewable Project Developments (Pty) Ltd appointed Landscape Dynamics to conduct an Environmental Authorisation (EA) Application for the proposed development of electrical infrastructure for the approved (EA has lapsed) solar facilities on the Wag 'n Bietjie Farm, near De Aar, Northern Cape Province. Banzai Environmental was appointed in turn to conduct the Palaeontological Impact Assessment for the Report.

The following activities are proposed:

- Construction of new 400kv main transmission substation (MTS),
- Loop in loop out lines,
- A 132kv powerline to connect the Wag 'n Bietjie MTS and the Vetlaagte MTS,
- 200 m grid corridor
- Existing access road.

1.1 Background

Prof Marion Bamford conducted the Palaeontological Desktop Assessment for this project in 2021.

Bamford, M. 2021. Palaeontological Impact Assessment for the proposed development of the Vetlaagte and Wag 'n Bietjie infrastructure associated with the authorised PV Facilities near De Aar, Northern Cape Province.

In the desktop the report the following were assessed.

The Vetlaagte Farm consists of 3x PV farms of which Environmental Authorisation was obtained in 2012/14

Vetlaagte Project and connections

- The 3x PV farms will each have a Switching Station as well as a grid connection connecting the PV farm to the new MTS
- The new MTS will connect via Loop in Loop Out (LILO) power lines to an existing 400kV power line
- 3x grid connections WITH A 200M CORRIDOR
- 3x switching stations (note that the Switching Stations fall within the 200m corridor)
- Main Transmission Substation – note that there are two site alternatives within the assessment area. These alternative sites need to be assessed and other sites recommended should these sites not be suitable.
- LILO lines to connect the MTS to the existing 400kV lines
- The entire assessment area (as per info provided for quoting purposes) needs to be investigated and no-go areas demarcated.
- General The grid connections connecting PV1 and PV2 are running adjacent to each other and to the direct east of an existing 132kV line



- The PV3 grid connection and switching station are situated within the assessment area.

In her report Prof Bamford found that the proposed development is underlain by non-fossiliferous Jurassic dolerite, Tierberg Formation (Ecca Group) as well as Quaternary alluvium. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) database, the Palaeontological Sensitivity of the Quaternary alluvium, is Moderate, that of the Tierberg Formations (Ecca Group, Karoo Supergroup) is High and the Palaeontological Sensitivity of the Karoo dolerite is Zero as it is igneous in origin (Almond and Pether, 2009; Almond et al., 2013).

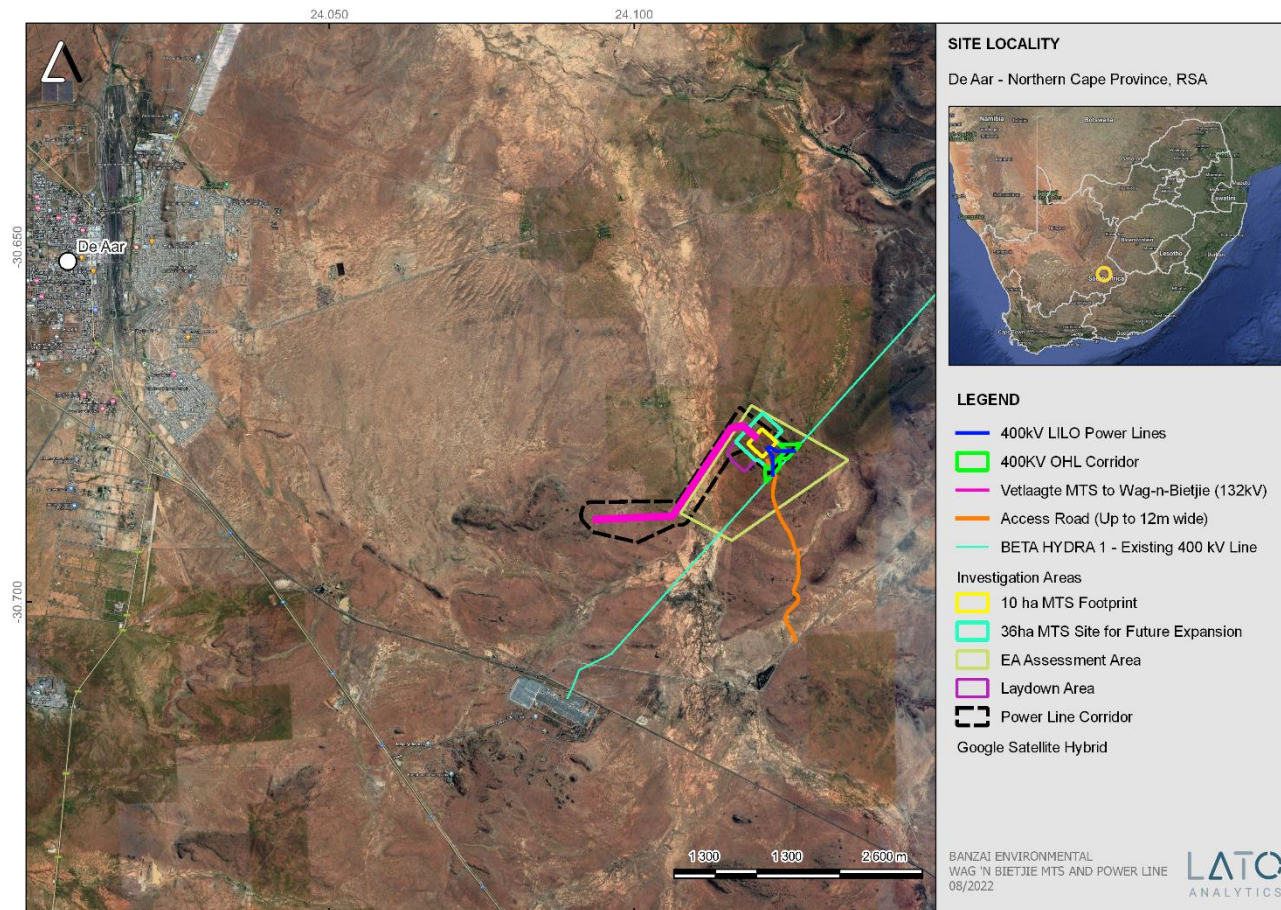


Figure 1: Google Earth Image (2022) of the location of the proposed Wag n Bietjie MTS and Power line Project, near De Aar in the Northern Cape Province.

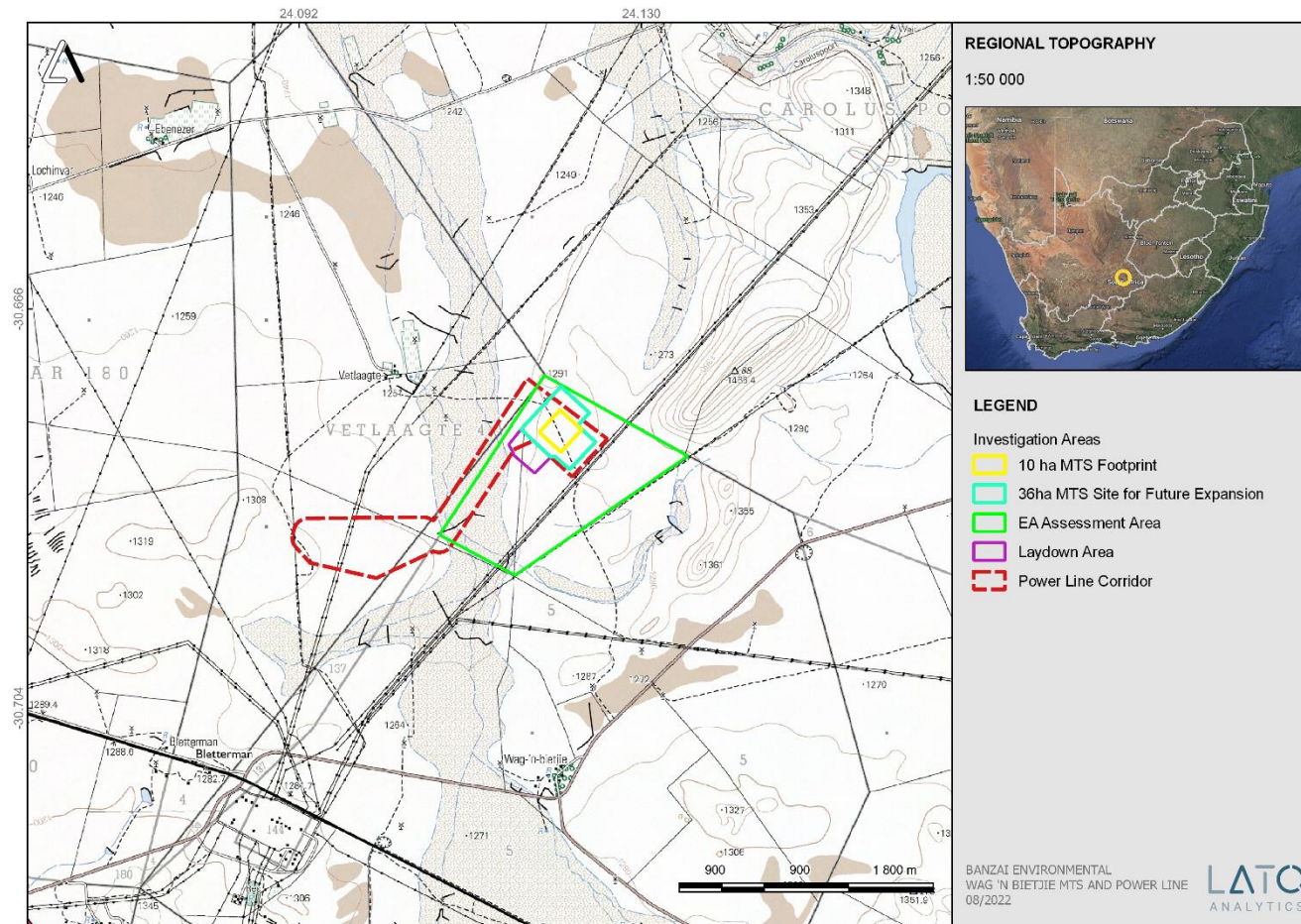


Figure 2: Topography of the proposed Wag n Bietjie MTS and Power line Project, near De Aar in the Northern Cape Province.



2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

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

3 LEGISLATION

3.1 National Heritage Resources Act (25 of 1999)

Cultural Heritage in South Africa, includes all heritage resources, and 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 following section in each Act are 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 has 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 adheres 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 minimise the effect of the development on potential fossils at the development site and to determine the potential impact on palaeontological resources.



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 precedes 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 is 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 of 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 Wag n Bietjie MTS and Power line Project, near De Aar in the Northern Cape Province is depicted on the 1:250 000 Colesberg 3024 (Le Roux, 1998) Geological map (Council of Geoscience, Pretoria) (**Figure 3, Table 2**). According to this map, the proposed development is underlain by quaternary alluvium (pale yellow; Quaternary), Jurassic dolerite (Jd, red), Tierberg Formation (Pt, yellow-brown; Eccla Group, Karoo Supergroup) and Adelaide Subgroup (Pa, light green, Beaufort Group, Karoo Supergroup). The geology has recently been updated (Council of Geosciences, Pretoria) and indicate that the proposed Wag 'n Bietjie Project is underlain by Quaternary alluvium, colluvium eluvium and gravel, the Karoo Dolerite Suite and the Tierberg Formation (Eccla Group) as well as the Abrahamskraal Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup) (**Figure 4**).

The PalaeoMap of the South African Heritage Resources Information System indicates that the Palaeontological Sensitivity of the Quaternary alluvium is Moderate, while that of the Tierberg Formation is High and that of the Jurassic Dolerite is Zero/Insignificant. The Palaeontological Sensitivity of the Abrahamskraal Formation (Adelaide Subgroup) is Very High (Almond and Pether, 2009; Almond *et al.*, 2013) (**Figure 5**).

The Quaternary superficial deposits (yellow, single bird figure and scree) are the youngest geological deposits formed during the most recent geological period (approximately 2.6 million years ago to present). Most of the superficial deposits are unconsolidated sediments and consist of clay, gravel, sand, silt, that form relatively thin, discontinuous patches of sediments or larger spreads onshore. These sediments comprise of channel, floodplain and stream deposits, talus gravels and glacial drift sediments. The Quaternary deposits are very important because palaeoclimatic changes are reflected in the different geological formations (Hunter *et al.*, 2006). During the climate fluctuations in the Cenozoic Era most geomorphologic features in southern Africa where formed (Maud, 2012). Barnosky (2005) indicated that various warming and cooling events occurred in the Cenozoic but states that climatic changes during the Quaternary Period, specifically the last 1.8 Ma, were the most drastic climate changes relative to all climate variations in the past. Climate variations that occurred in the Quaternary Period were both drier and wetter than the present and resulted in changes in river flow patterns, sedimentation processes and vegetation variation (Tooth *et al.*, 2004).

Quaternary fossil assemblages are normally rare and low in diversity and occur over a wide-ranging geographic area. These fossil assemblages may in some cases occur in extensive alluvial and colluvial deposits cut by dongas. In the past



palaeontologists did not focus on Caenozoic superficial deposits although they sometimes comprise of significant fossil deposits. These fossil assemblages resemble modern animals and may comprise of mammalian teeth, bones and horn horns, reptile skeletons and fragments of ostrich eggs. Microfossils, non-marine mollusc shells are also known from Quaternary deposits. Plant material such as foliage, wood, pollens and peats are recovered as well as trace fossils like vertebrate tracks, burrows, termitaria (termite heaps/ mounds) and rhizoliths (root casts). Quaternary scree comprises of rubble and will not contain fossils.

Prominent in the development area is the dolerite “koppies”. These outcrops form part of the Karoo Igneous Province is one of the world’s classic continental flood basalt (CFB) provinces that was formed during the Early Jurassic Period. This province occurs over a comprehensive area in southern Africa and comprises a widespread system of well-developed igneous bodies (dykes, sills) that invaded the sediments of the Main Karoo Basin. Flood basalts do not typically form any visible volcanic structures, but with a series of outbursts form a suite of fissures of sub-horizontal lava flows that may vary in thickness. The Karoo is considered to be an old flood basalt province and is preserved today as erosional remnants of a more extensive lava cap that covered much of southern Africa in the geological past. This Suite is unfossiliferous.

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 (**Figure 7**; Kitching 1977, 1978; Keyser *et al*, 1977, Rubidge 1995, Smith *et al*, 2020; Viglietti 2020).

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. In the northern Normandien formation the basin consists of coarse to very coarse sandstones and granulstones. Coarsening–upward cycles are present in the lower part of the Normandien Formation while the mudrocks and sandstone units usually form fining-upward cycles. These cycles are positioned on erosion surfaces which is overlain by thin intraformational mud-pellet conglomerate and vary in thickness from a few meters to tens of meters. Singular sandstone units could vary from 6 meters to 60 meters in the south thinning northwards.

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 cross-bedding as well as current ripple lamination. The bases of the sandstone units are massive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units. The mudrocks of the Adelaide Subgroup usually has 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 Adelaide Subgroup is approximately 5 000 m thick in the southeast, but this decreases to about 800m in the centre of the basin which thinness out to about 100 to 200m in the north. The Lower Adelaide Subgroup represented in the development consists of the Abrahamskraal Formation that comprises of transitional brackish lacustrine to fluvial, greenish-grey sandstones grading upwards into fine-grained siltstones and mudstones. The Abrahamskraal Formation is about 2 500 m thick.



The Biozone represented in the Wag 'n Bietjie Project area is represented by the *Tapinocephalus* Assemblage Zone (AZ). As the second oldest tetrapod biozone in the Karoo, the *Tapinocephalus* AZ is basically restricted to the Abrahamskraal Formation. The lower margin of the AZ is variable due to diachrony. This AZ comprises of the upper third of the *Abrahamskraal* Formation in the southwestern boundary of the basin, has an undefined span between Middleton in the south and Beaufort West. East of Middleton and north of Sutherland in the Cape Province the AZ comprises the whole of the *Abrahamskraal* AZ. In the southern Free State, it is present in the Lower Adelaide Subgroup (Groenewald *et al.*, 2019).

The *Tapinocephalus* AZ is a rich tetrapod assemblage zone that consists of basal members of therapsid clades Biarmosuchia, Anomodontia, Dicynodontia, Therocephalia, and Gorgonopsia; basal members of the parareptilian clade Pareiasauria; and rare varanopids as well as derived members of the therapsid clade Dinocephalia. The *Tapinocephalus* AZ is characterised by the tapinocephalid dinocephalian species *Tapinocephalus atherstonei* (**Figure 8**) and *Moschops capensis*, the dicynodont *Eosimops newtoni*, and *Robertia broomiana* and the pareiasaur *Bradysaurus baini*.

This AZ includes dinocephalians (*Moschops capensis*), basal pareiasaurs (*Bradysaurus*) that co-occur with pylaecephalid dicynodonts *Eosimops* and *Robertia* (**Figure 9**). This AZ has a maximum thickness of about 1500 m it comprises of the upper two thirds of the *Abrahamskraal* Formation. The Assemblage Zone can be subdivided into two subzones based on the absence of the dicynodont *Diictodon feliceps*: in the lower *Eosimops* - *Glanosuchus* Subzone and the presence of *Diictodon* in the upper *Diictodon* *Eosimops* - *Glanosuchus* Subzone. The contact between these subzones is the first appearance of *Diictodon felips* at the base of the Moordenaars Member. The upper part of the biozone reflects the Capitanian mass extinction and the low diversity post extinction. The first appearance of *Endothiodon bathystoma* terminates the zone

Fossilized bones are generally encrusted with calcareous material and sometimes smaller fossils are entirely concealed in micritic nodules. In the northern margin of the basin the calcitic crusts is grey to greenish in colour while in the southern margin of the basin the nodules are very hard and often grey with orange weathering due to of low-grade metamorphism related to the proximity of the Cape Fold Belt (Day and Rubidge, 2020).

The *Eosimops* - *Glanosuchus* Subzone is at its thickest 1 100 m. This subzone consists of siltstones, sandstones, and mudstones with erosively-based upward fining cycles (Paiva, 2015; Smith and Keyser, 1995, Wilson *et al.*, 2014). A 60 to 85 siltstone: mudstone ration is present in this succession with a greenish-grey to bluish-grey and less common greyish-red to purple colour. (Cole *et al.*, 2016).

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

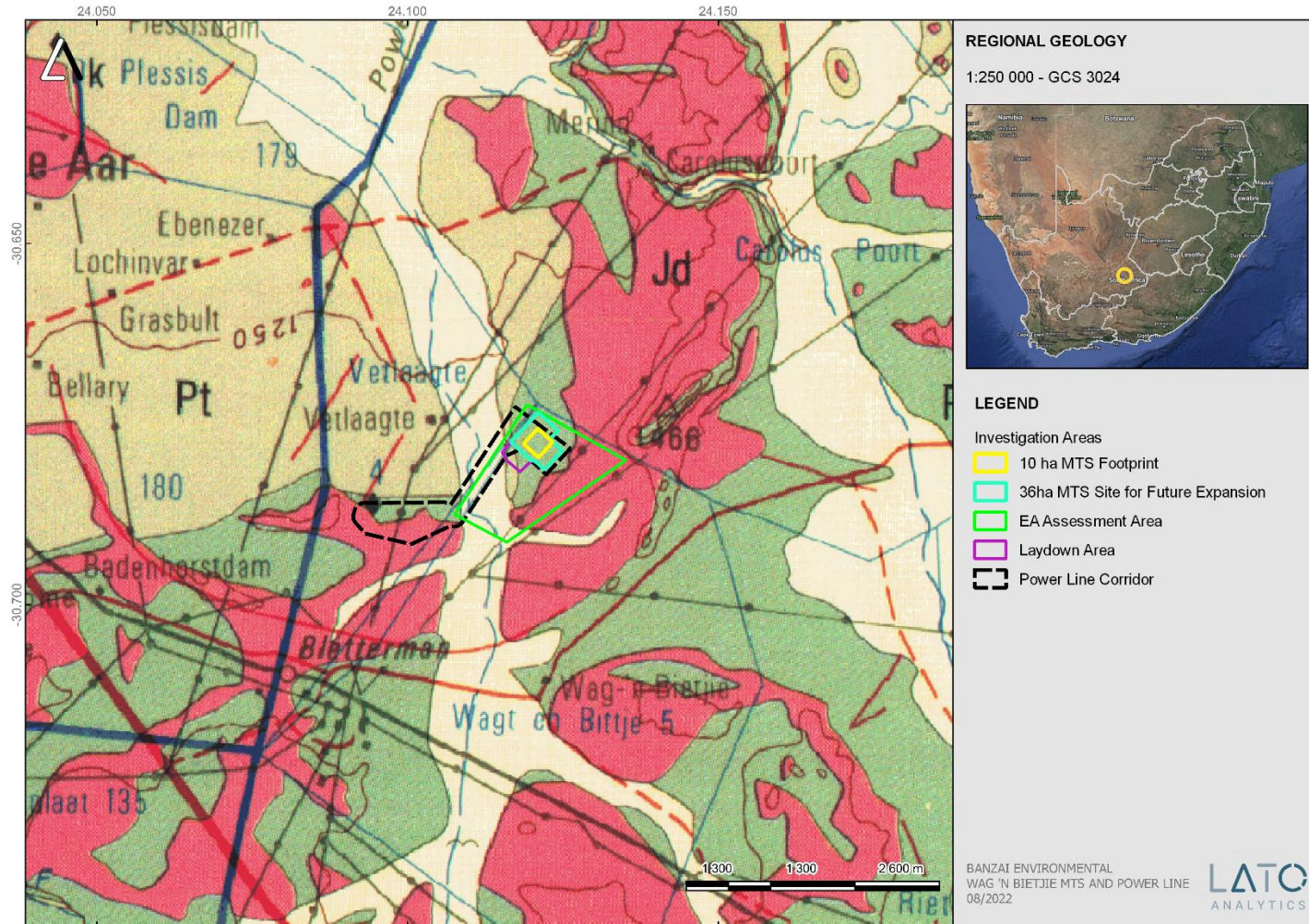


Figure 3: Extract of the 1:250 000 Colesberg 3024 (Le Roux, 1998) Geological map (Council of Geoscience, Pretoria) indicating the proposed grid connection underlain by quaternary alluvium (pale yellow; Quaternary), Jurassic dolerite (Jd, red), Tierberg Formation (Pt, yellow-brown; Eccca Group, Karoo Supergroup) and Adelaide Subgroup (Pa, light green, Beaufort Group, Karoo Supergroup).



Table 2: Legend of the 1:250 000 Colesberg 3024 (1998) Geological map (Council of Geoscience, Pretoria)

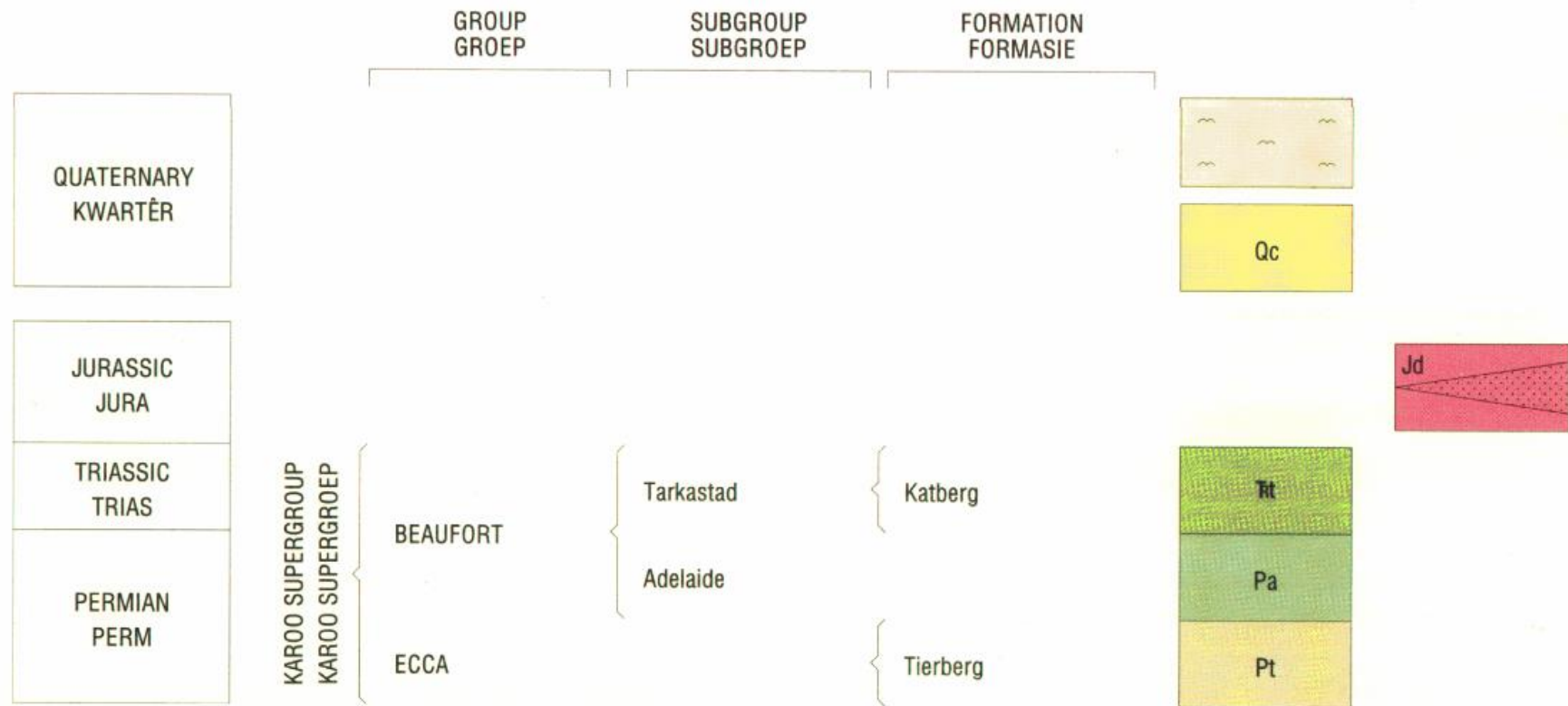




Table 3: Lithology of the 1:250 000 Colesberg 3024 (1998) Geological map (Council of Geoscience, Pretoria)

LITHOLOGY / LITOLOGIE

~	Alluvium and debris Alluvium en puin
Qc	Calcrete Kalkreet
Jd	Dolerite, granophyric (); dyke () Doleriet, granofiries (); gang ()
Rt	Yellowish-grey fine-grained sandstone with interbedded brownish-red to grey mudstone Gelerige grys fynkorrelrige sandsteen met tussengelaagde bruinerige tot grys moddersteen
Pa	Blue-grey silty mudstone, subordinate brownish-red mudstone; sandstone Blougrys slikkige moddersteen, ondergeskikte bruinerige rooi moddersteen; sandsteen
Pt	Blue-grey to black shale with carbonate-rich concretions; subordinate siltstone and sandstone in upper part Blougrys tot swart skalie met karbonaatryke konkresies; ondergeskikte sliksteen en sandsteen in boonste gedeelte

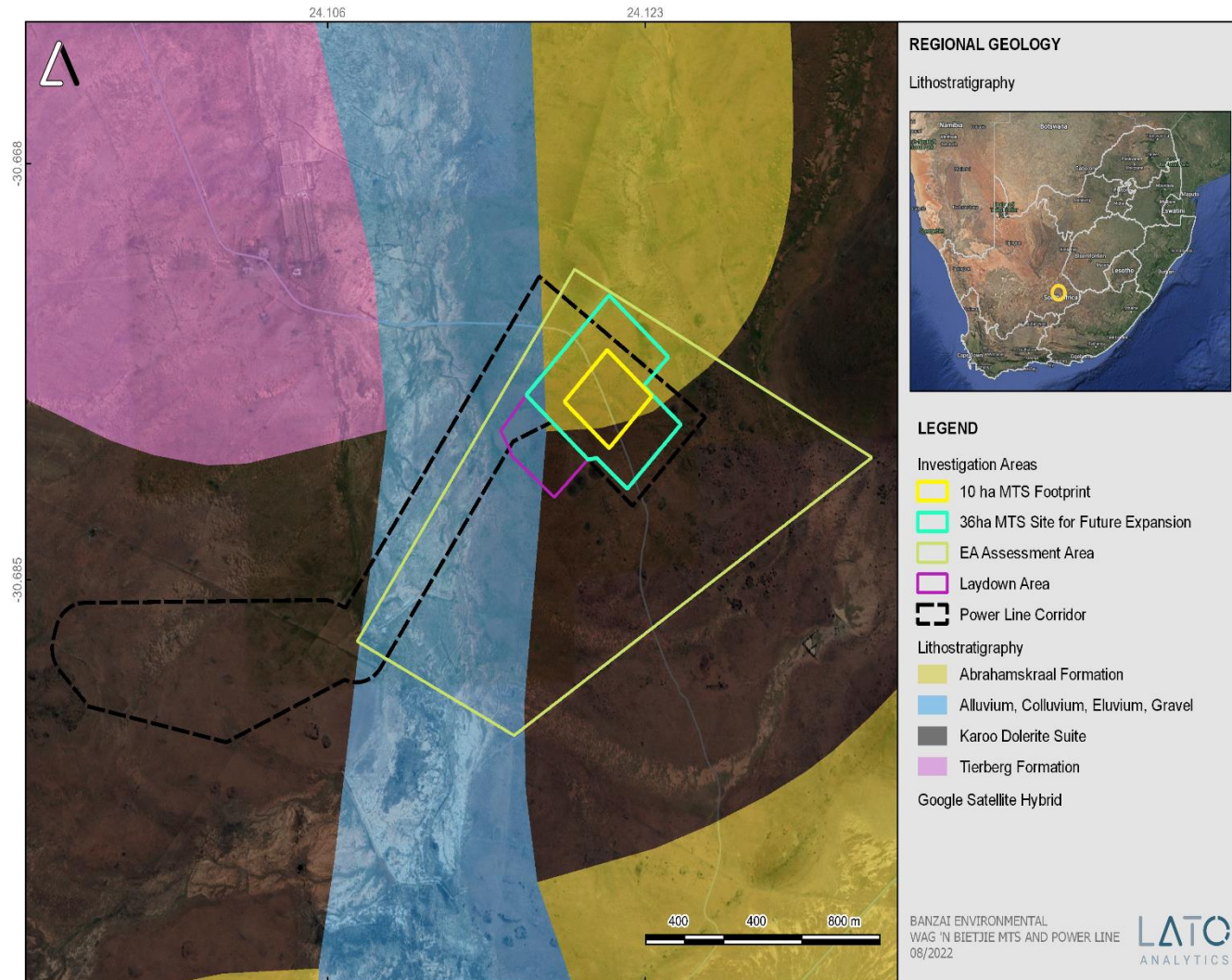


Figure 4: Updated Geology (Council of Geosciences, Pretoria) of the proposed Wag'n Bietjie infrastructure Project indicates that the proposed development is underlain by the Quaternary alluvium, colluvium eluvium and gravel, the Karoo Dolerite Suite as well as the Tierberg Formation, Eccca Group as well as the Abrahamskraal Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup).

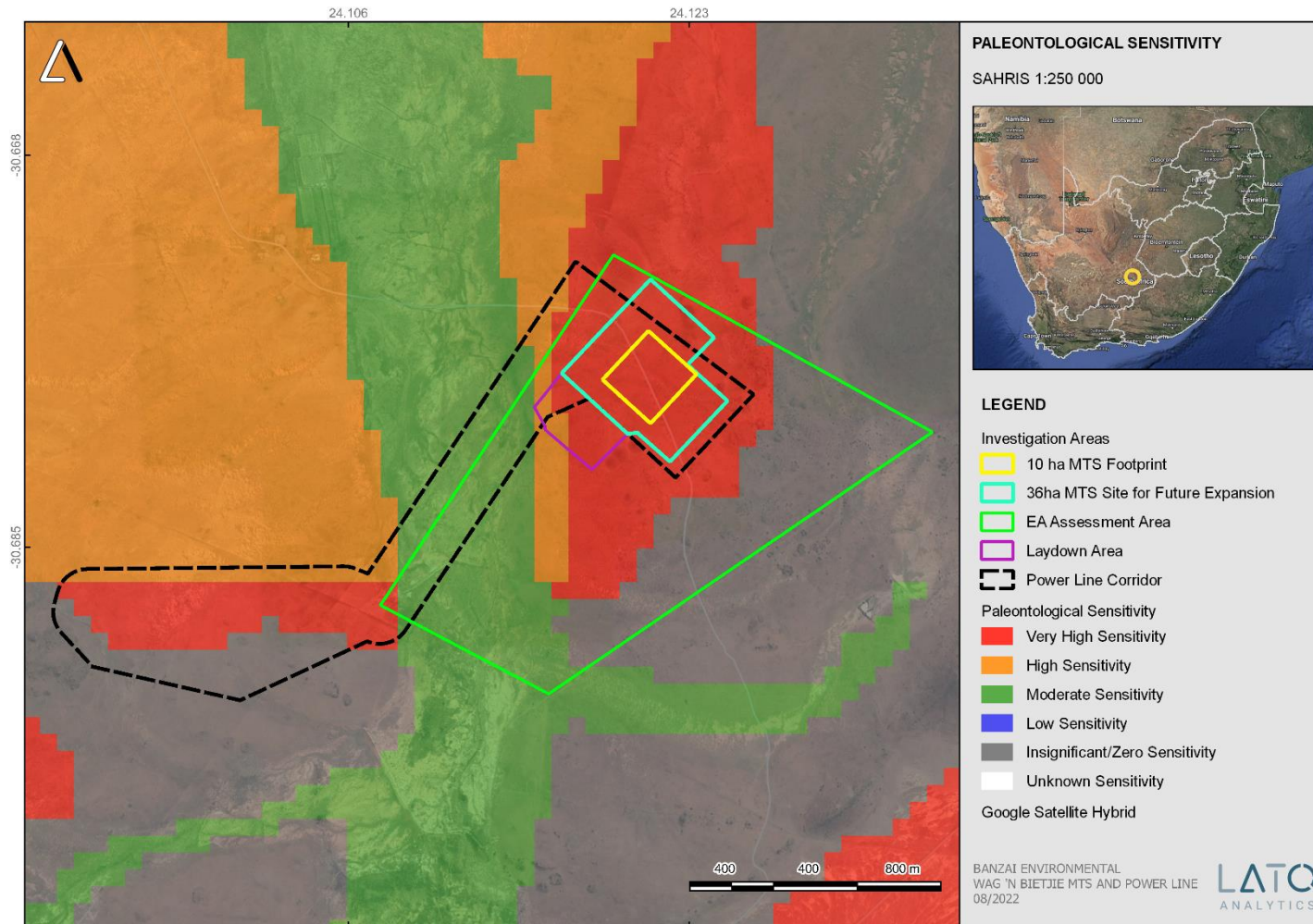


Figure 5: Extract of the 1:250 000 SAHRIS PalaeoMap map (Council of Geosciences, Pretoria) indicating the Palaeontological Sensitivity of the proposed Wag n Bietjie infrastructure Project near De Aar in the Northern Cape.



According to the SAHRIS Palaeosensitivity map (**Figure 5**) the proposed development is underlain by sediments of Very High (red), High (orange) and Moderate (green) and Zero (grey) Palaeontological Sensitivity.

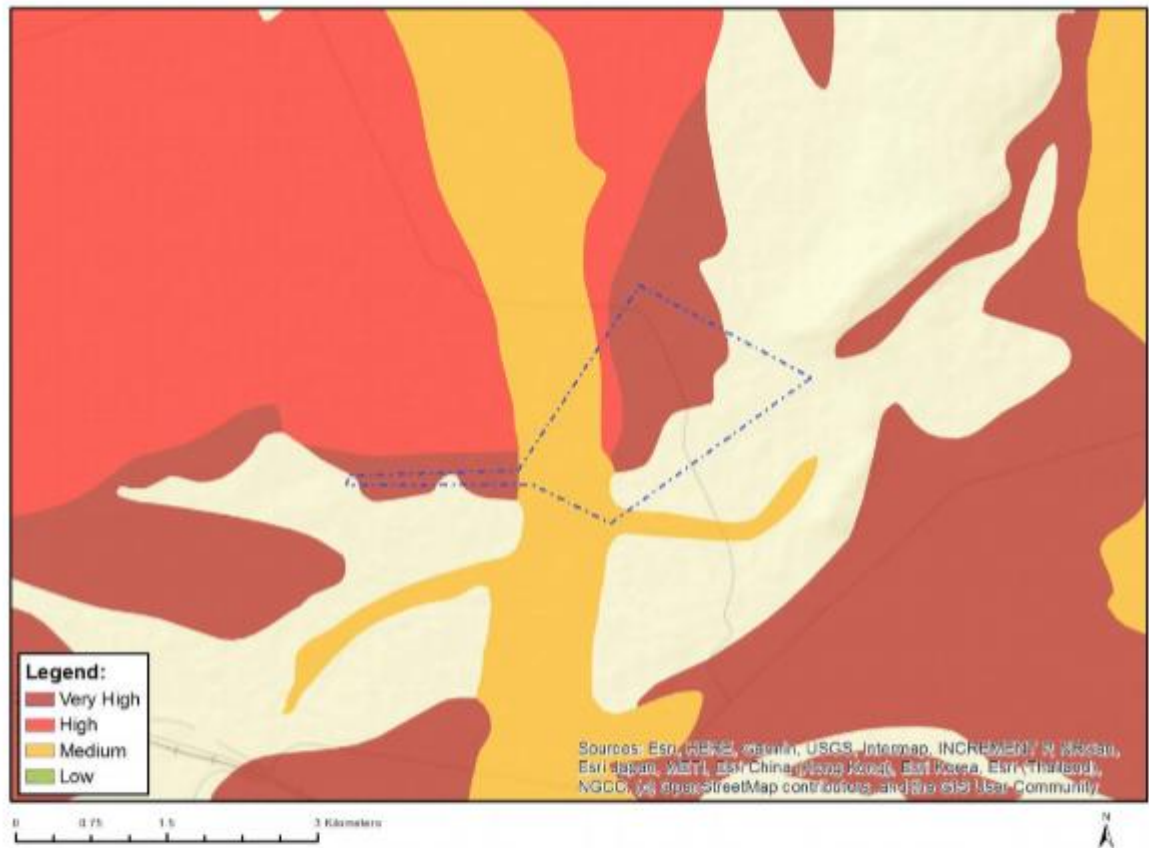
Table 4:Palaeontological Significance

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.

The colours on the PalaeoMap indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero



MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

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

Figure 6: Environmental Screening Report

The Environmental Screening Tool indicates that the Palaeontological Sensitivity of the proposed Wag n Bietjie Infrastructure, near De Aar is Very High, High, Medium, and Low. This is in contrast to that of the Palaeosensitivity Map.



Age	Gp	West of 24° E	East of 24° E	Free State / KwaZulu-Natal	Vertebrate Assemblage Zones	Vertebrate Subzones						
JURASSIC	STORMBERG		Drakensberg Gp	Drakensberg Gp	Massospondylus							
			Clarens Fm	Clarens Fm								
			upper Elliot Fm	upper Elliot Fm								
			lower Elliot Fm	lower Elliot Fm								
TRIASSIC	Tarkastad Subgp		Molteno Fm	Molteno Fm	Scalenodontoides							
			Burgersdorp Fm	Driekoppen Fm	Cynognathus	Cricodon-Ufudocyclops Trirachodon-Kannemeyeria Langbergia-Gargainia						
			Katberg Fm	Verkykerskop Fm	Lystrosaurus declivis							
			Palingkloof M.	Harrismith M.	Daptocephalus	Lystrosaurus maccaigi-Moschorhinus						
Elandsberg M.	Schoondraai M.	Dicynodon-Theriognathus										
Ripplemead M.	Rooinekke M.											
Daggaboersnek M.	Frankfort M.											
PERMIAN	BEAUFORT	Adelaide Subgp	Teekloof Fm	Balfour Fm	Normandem Fm	Volksrust Fm	Cistecephalus					
									Steenkampsvlakte M.	Oudeberg M.		
									Oukloof M.	Middleton Fm		
			Hoedemaker M.	Abrahamskraal Fm			Koonap Fm	Endothiodon	Tropidostoma-Gorgonops Lycosuchus-Eunotosaurus			
			Poortjie M.									
			Abrahamskraal Fm							Koonap Fm	Tapinocephalus	Diictodon-Styracocephalus Eosimops-Glanosuchus
Tierberg/fort Brown	Fort Brown											
ECCA												

Figure 7: 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 MAMMFMES+Mammaliaformes. Gp=group, Subgp=Subgroup, Fm=Formation, M=Member (Taken from Smith et al, 2020)

The proposed development is indicated by the blue

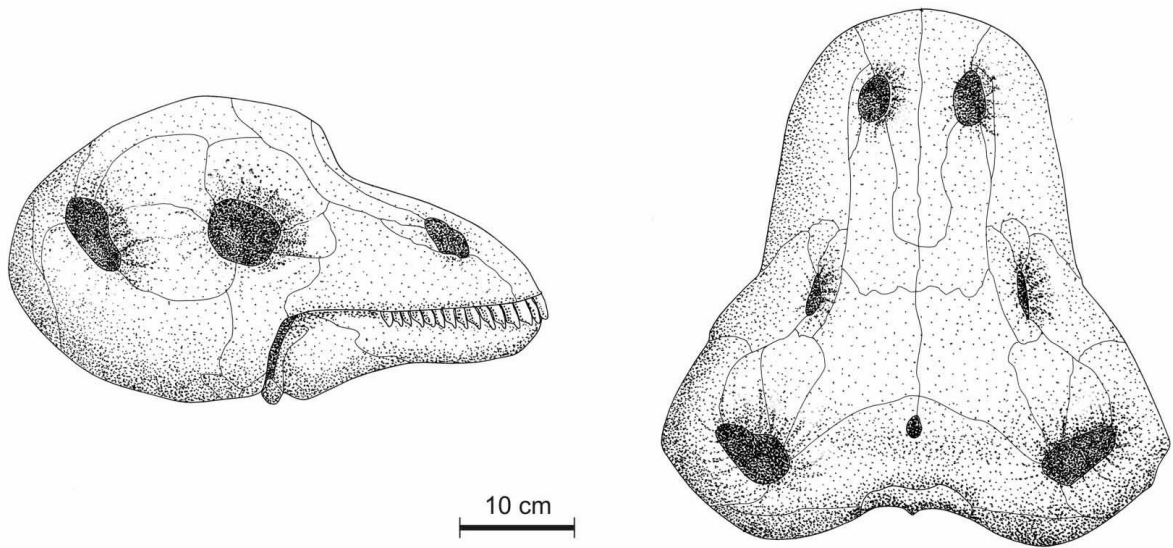


Figure 8: *Tapinocephalus atherstonei*, the index taxon of the Tapinocephalus Assemblage Zone, in lateral and dorsal view (Taken from Day and Rubidge, 2020).

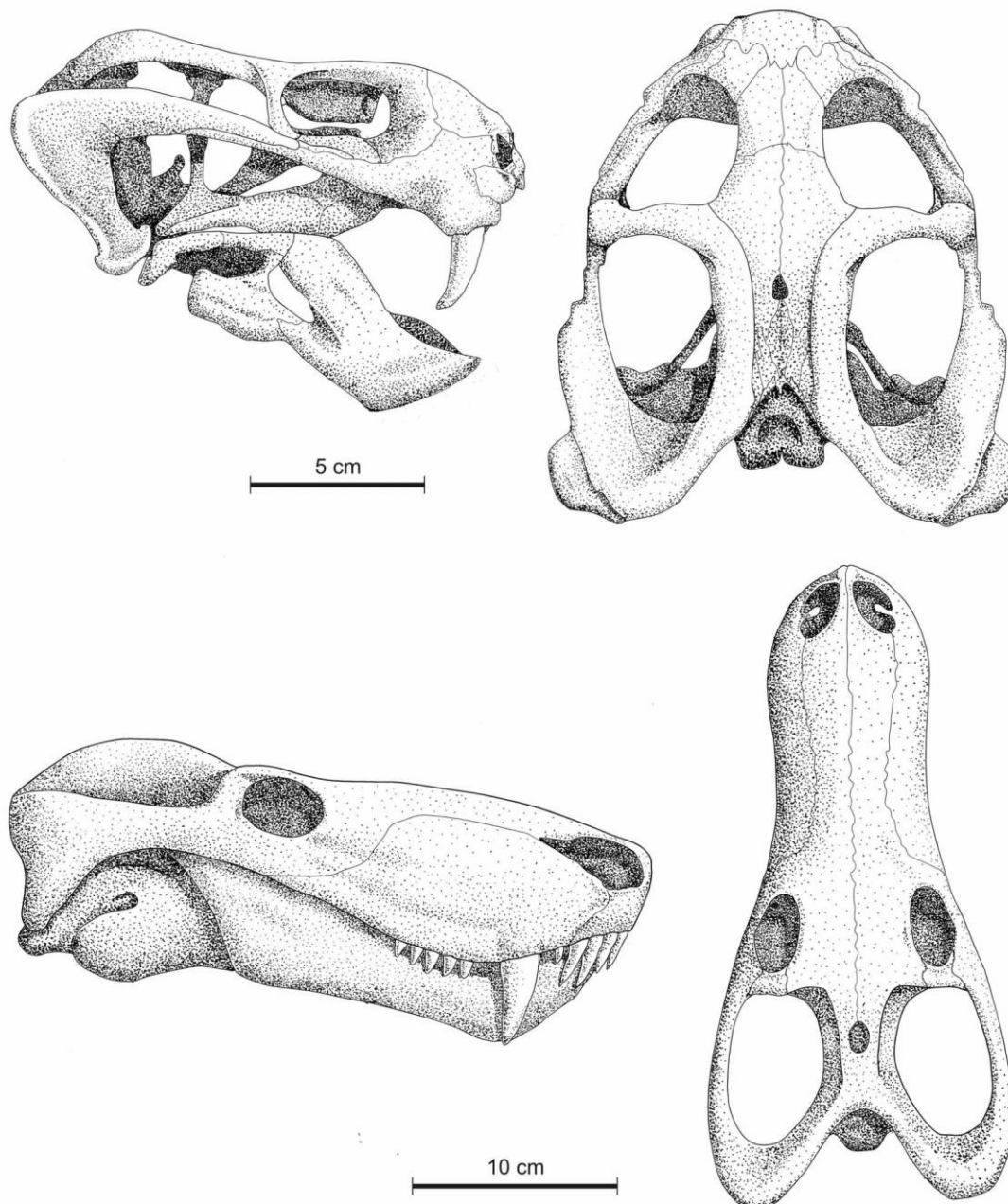


Figure 9: Lateral and dorsal view of the index taxa of the Eosimops - Glanosuchus Subzone in (top) *Eosimops newtoni*; (bottom) *Glanosuchus macrops*. (Image taken from Day and Rubidge, 2020).

6 GEOGRAPHICAL LOCATION OF THE SITE

The proposed Wag 'n Bietjie infrastructure Project is located about 12 km east of the town of De Aar in the Northern Cape.



7 METHODS

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

7.1 Assumptions and Limitations

When conducting a PIA several factors can affect the accuracy of the assessment. The focal point of geological maps is the geology of the area, and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have not been reviewed by palaeontologists and data is generally based on aerial photographs. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented. Comparable Assemblage Zones in other areas is used to provide information on the existence of fossils in an area which was not yet been documented. When similar Assemblage Zones and geological formations for Desktop studies is used it is generally **assumed** that exposed fossil heritage is present within the footprint.

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 Holland and Associates Environmental Consultants
- 1:250 000 Colesberg 3024 (Le Roux, 1998) Geological map (Council of Geoscience, Pretoria).
Shape files produced by the Council of Geosciences (Pretoria).
- Various other renewable Energy facilities have been developed in the area (Almond, J.E. 2010a; Almond, J.E. 2010b.; Almond, J.E. 2010c; Almond, J.E. 2012a; Almond, J.E. 2012b; Almond, J.E. 2012c).

9 SITE VISIT

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 20 August 2022. The proposed development is located on flat lying terrain without any outcrops other than Jurassic dolerite “koppies”. Large areas of the development are underlain by these koppies which are igneous in origin and thus unfossiliferous. No fossils were detected in the development footprint, although weathered ripple trace fossils were found.



Figure 10: View over the proposed Wag 'n Bietjie infrastructure Project, indicating a flat topography with Quaternary sands.



Figure 11: Quaternary sands mantling the underlying bedrocks.



Figure 12: Well-joined dolerite outcrop. Surrounding sediments of the Eccca Group and Adelaide Subgroup have been baked.



Figure 14: Shallow ripple marks

GPS Coordinates -30.672950, 24.120503



10 ASSESSMENT METHODOLOGY AND IMPACT ASSESSMENT FORMAT

10.1 IMPACT ASSESSMENT TABLES:

Table 5: Impact Assessment

IMPACT ON PALAEOLOGICAL RESOURCES DURING THE CONSTRUCTION PHASE
<p>Impact Description</p> <p>Destruction of Fossil Heritage</p> <p>.</p>
<p>Cumulative impact description</p> <p>If the correct mitigation measures are followed the cumulative impact will be LOW.</p>
<p>Mitigation</p> <p>Damage to fossil Heritage will usually only happen during the construction phase.</p> <p>If Fossils are recovered from the site the Chance Finds Procedure must be implemented immediately</p> <ul style="list-style-type: none"> • If a chance find is made the person responsible for the find must immediately stop working and all work that could impact that finding must cease in the immediate vicinity of the find. • The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates. • A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates. • Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found. • Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary. • The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by



a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.

- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on Palaeontological Resources	Site	Permanent	Possible	Low	Moderate	None
Impact on Irreplaceable Resources (after mitigation) If yes, please explain					Yes	NO
Cumulative impact rating (after mitigation) If high, please explain				LOW	Medium	High

11 FINDINGS AND RECOMMENDATIONS

The proposed Wag ‘n Bietjie infrastructure project is underlain by Quaternary alluvium, the Karoo Dolerite Suite, the Tierberg Formation, Ecca Group as well as the Abrahamskraal Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup).

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 20 August 2022. No fossils were found in the development although trace fossils were identified. Sediments of the Karoo Supergroup in this area are deeply weathered and in places baked by Jurassic dolerite. Extensive excavations into deep bedrock during the construction phase is not anticipated and it is thus considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological reserves of the area. The construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

It is thus recommended that:



- The Environmental Control Officer (ECO), responsible for the development, should be aware of the possibility of finding fossils in the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) as well as in the Tierberg Formation (Ecca Group Karoo Supergroup). Quaternary fossil assemblages are normally rare and low in diversity and occur over a wide-ranging geographic area.
- If Palaeontological Heritage is uncovered during surface clearing and excavations the **Chance find Protocol** attached should be implemented 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 correct mitigation (recording and collection) can be carry out by a paleontologist.
- Before any fossil material can be collected from the development site, the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012). It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.



12 CHANCE FINDS PROTOCOL

The following procedure will only need to be followed if fossils are uncovered during excavation.

12.1 Legislation

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

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

12.2 Background

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

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

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

12.3 Chance Find Protocol

- If a chance find is made the person responsible for the find must immediately **stop working** and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately **report** the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.

- A preliminary report must be submitted to the Heritage Agency within **24 hours** of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.
- Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.
- The site must be secured to protect it from any further damage. **No attempt** should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO (site manager). Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

13 BIBLIOGRAPHY

- Almond, J.E. 2010a. Eskom Gamma-Omega 765kV transmission line: Phase 2 palaeontological impact assessment. Sector 1, Tanqua Karoo to Omega Substation (Western and Northern Cape Provinces), 95 pp + appendix. Natura Viva cc, Cape Town.
- Almond, J.E. 2010b. Proposed photovoltaic power generation facility at De Aar, Northern Cape Province. Palaeontological impact assessment: desktop study, 17 pp. Natura Viva cc, Cape Town.
- Almond, J.E. 2011. Proposed Mainstream Solar Park at De Aar, Northern Cape Province. Desktop study, 17 pp. Natura Viva cc, Cape Town.
- Almond, J.E. 2012a. Proposed Mulilo Renewable Energy PV2, PV3 and PV4 photovoltaic energy facilities on Farms Paarde Valley, Badenhorst Dam and Annex Du Plessis Dam near De Aar, Northern Cape Province. Palaeontological specialist study: combined desktop and field-based assessments, 45 pp. Natura Viva cc, Cape Town.
- Almond, J.E. 2012b. Proposed solar power generation facilities on the remaining extent of the farm Vetlaagte No. 4, De Aar, Northern Cape Province. Palaeontological specialist study: combined desktop and field-based assessments, 33 pp. Natura Viva cc, Cape Town.
- Almond, J.E. 2012c. Two wind energy facilities on the Eastern Plateau near De Aar, Northern Cape Province proposed by Mulilo Renewable Energy (Pty) Ltd. Palaeontological specialist study: combined desktop and field-based assessments, 55 pp. Natura Viva cc, Cape Town.
- ALMOND, J.E. & PETHER, J. 2009. Palaeontological heritage of the Northern Cape. Interim SAHRA technical report, 124 pp. Natura Viva cc., Cape Town.
- Barnosky, A.D. 2005. Effects of Quaternary Climatic Change on Speciation in Mammals. *Journal of Mammalian Evolution*. 12:247-264
- Almond, J., Pether, J, and Groenewald, G. 2013. South African National Fossil Sensitivity Map. SAHRA and Council for Geosciences.

- Cole, D.I. (2016). Lithostratigraphy of the Abrahamskraal Formation (Karoo Supergroup), South Africa. *South African Journal of Geology*. 119 (2), 415-424.
- Dingle, R.V., Siesser, W.G. & Newton, A.R. 1983. Mesozoic and Tertiary geology of southern Africa. viii + 375 pp. Balkema, Rotterdam.
- Hunter, D.R., Johnson, M.R., Anhaeusser, C. R. And Thomas, R.J. 2006. Introduction. (*In: 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., Visser, J.N.J., et al.2006. Sedimentary rocks of the Karoo Supergroup In JOHNSON, M.R., 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.
- 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 Groenewald, G., 2019. Ichnoassociations of Permian and Triassic tetrapod footprints in the Karoo Basin of South Africa. *Gondwana Research* 72,139-168.
- 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
- 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
- SCOTT, L. & J.S. BRINK. 1992. Quaternary palynology, palaeontology and palaeoenvironments in central South Africa. *South African Geographer* 19: 22-34.
- SG 2.2 SAHRA APMHOB Guidelines, 2012. Minimum standards for palaeontological components of Heritage Impact Assessment Reports, Pp 1-15.
- SG 2.2 SAHRA APMHOB Guidelines, 2012. Minimum standards for palaeontological components of Heritage Impact Assessment Reports, Pp 1-15.
- 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>.
- Tankard, A.J., Jackson, M.P.A., Eriksson, K.A., Hobday, D.K., Hunter, D.R. & Minter, W.E.L. 1982. *Crustal evolution of southern Africa – 3.8 billion years of earth history*, xv + 523pp. Springer Verlag, New York.
- 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 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 Koningryke van Lesotho en Swaziland*. South African Committee for Stratigraphy. Council for Geoscience, Pretoria, Pp 494.

Appendix 1: -

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION: Palaeontologist

YEARS' EXPERIENCE: 29 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. Zoology (*Cum laude*), 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 National Museum, Bloemfontein and Collection Manager 1998–currently

TECHNICAL REPORTS

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

Butler, E. 2014. Palaeontological Impact Assessment for the proposed upgrade of existing water supply infrastructure at Noupoort, 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 Noupoort concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoort, Northern Cape. Prepared for Savannah Environmental. Bloemfontein.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Butler, E. 2018. Palaeontological Impact Assessment of the proposed construction of a new 11kV (1.3km) Power Line to supply electricity to a cell tower on farm 215 near Delportshoop 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 letter 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 Brakkefontein 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, !Kheis 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 Slypsteen 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 of the 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 Gariiep 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 reclaimer 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 Mgcauw 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 Mgcauw 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.

ANNEXURE 2: Assessment Methodology and Impact Assessment Format Table

IMPACT ON PALAEOLOGICAL RESOURCES DURING THE CONSTRUCTION PHASE						
Impact Description						
Cumulative impact description						
Mitigation						
Impact Assessment						
Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Impact on Palaeontological Resources						
Impact on Irreplaceable Resources <i>(after mitigation)</i>					Yes	NO
If yes, please explain						
Cumulative impact rating <i>(after mitigation)</i>				LOW	Medium	High
If high, please explain						