BANZAI ENVIRONMENTAL

PALAEONTOLOGICAL IMPACT ASSESSMENT FOR THE RECTIFICATION APPLICATION FOR LAYER HOUSES ON FARM CHEZ NOUS 1775, KOPANONG LOCAL MUNICIPALITY, FREE STATE PROVINCE

Case ID: 27739

26 MAY 2026

Compiled for: Greenmined Environmental (Pty) Ltd

Declaration of Independence

I, Elize Butler, declare that –

General declaration:

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

- I realize that a false declaration is an offense in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

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

PALAEONTOLOGICAL CONSULTANT: Banzai Environmental (Pty) Ltd

CONTACT PERSON: Elize Butler

Tel: +27 844478759

Email: info@banzai-group.com

SIGNATURE: 

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

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).		
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**The relevant section in the report**	**Comment where not applicable.**
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 1	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 2 – refer to Appendix 1	-
(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 – Methods and Terms of Reference	-
(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 7	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Executive Summary, Section 6 and 8	
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 4 Approach and Methodology	-

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).		
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**The relevant section in the report**	**Comment where not applicable.**
(f) details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Executive Summary, and Section 8	
(g) An identification of any areas to be avoided, including buffers	Executive Summary, and Section 8	
(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 1.3 - Assumptions and Limitation	-
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Executive Summary, and Section 8	
(k) Any mitigation measures for inclusion in the EMPr	Section 9	
(l) Any conditions for inclusion in the environmental authorisation	Section 9	
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 9	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Executive Summary, and Section 8	

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).		
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**The relevant section in the report**	**Comment where not applicable.**
(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	Executive Summary, and Section 8	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study	N/A	Not applicable. A public consultation process was handled as part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) process.
(p) A summary and copies of any comments that were received during any consultation process	N/A	SAHRA (Case ID 27739; 25 March 2026) identified the study area as having VERY HIGH palaeontological sensitivity and requested

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended).		
Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**The relevant section in the report**	**Comment where not applicable.**
		a site investigation
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 3 compliance with SAHRA guidelines	

EXECUTIVE SUMMARY

Banzai Environmental was appointed by Greenmined Environmental (Pty) Ltd to undertake the Palaeontological Impact Assessment (PIA) for the Palaeontological Impact Assessment for the Rectification Application for layer houses on Farm Chez Nous 1775, Kopanong Local Municipality, Free State Province. In accordance with the National Environmental Management Act No 107 of 1998 (NEMA) and to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this PIA is necessary to confirm 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.

According to the 2924 Koffiefontein Geological Map published by the Council for Geoscience, the study area is underlain by undifferentiated rocks of the Adelaide Subgroup within the Beaufort Group of the Karoo Supergroup. More recent geological studies in the region indicate that the site is specifically underlain by the Balfour Formation of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). The PalaeoMap hosted on the South African Heritage Resources Information System (SAHRIS) indicates that the study area has a Very High to Moderate palaeontological sensitivity, a classification that is also supported by the DFFE (Department of Forestry, Fisheries and the Environment) Screening Tool. The presence of areas rated as Very High palaeontological sensitivity triggered the requirement for a field-based Palaeontological Impact Assessment.

A pedestrian survey of the full development footprint was conducted on 5 May 2026. The footprint is a long-established, fully operational farmyard: the entire fenced area containing both layer houses, the lean-to, water storage tanks, and associated service infrastructure is compacted, cleared, and in several places covered by concrete or gravel. No intact geological exposures were observed anywhere within the footprint, and no fossil material of any kind was detected during the survey.

The palaeontological impact of the existing development is assessed as LOW once standard mitigation is in place. The development may proceed, subject to adoption of a Chance Find Protocol that will govern any future ground disturbance beyond the currently disturbed footprint.

TABLE OF CONTENT

1 INTRODUCTION 0
1.2 Additional Information Consulted 0
1.3 Assumptions and Limitations 1
2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR 1
3 LEGISLATION 4
3.1 Supporting Legislation and Regulations 4
3.2 Heritage Screening – DFFE National Web-based Environmental Screening Tool 5
3.3 Section 38: Heritage Impact Assessments 5
3.4 Integration with Environmental Assessment 5
4 ASSESSMENT METHODOLOGY 6
5 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY 8
6 SITE VISIT 14
7 ASSESSMENT METHODOLOGY 19
7.1 Method of Environmental Assessment 19
7.2 Impact Rating System 20
8 FINDINGS AND RECOMMENDATIONS 25
9 MITIGATION AND EMPR REQUIREMENTS 26
9.1 Legislation 26
9.2 Chance Find Procedure 26
10 BIBLIOGRAPHY 27

LIST OF FIGURES

Figure 1: Regional locality of the Rectification Application for layer houses on Farm Chez Nous 1775, Kopanong Local Municipality, Free State Province. 2
Figure 2: Locality Map of the Rectification Application for layer houses on Farm Chez Nous 1775, Kopanong Local Municipality, Free State Province. 3
Figure 3. Extract of the 1:250 000 Koffiefontein 2924 and Bloemfontein 2926 Geological maps (Council for Geoscience, Pretoria) indicates that the study area is underlain by the Adelaide Subgroup (Beaufort Group, Karoo Supergroup; however, regional stratigraphic studies confirm the presence of the Balfour Formation specifically at this locality. 10
Figure 4: Extract of the SAHRIS PalaeoMap (Council for Geosciences) indicates that the study area is underlain with sediments with a Very High red), and Moderate (green) Palaeontological Sensitivity. 11
Figure 5: Palaeontological Sensitivity of the study site in by the National Environmental Web-based Screening Tool indicates a Very High (red) Palaeontological Sensitivity while areas with a Medium (orange) sensitivity is also crosses. 13
Figure 6: View looking north-west across the open grassland adjacent to the farmyard. The koppie on the horizon is characteristic of the dissected Karoo landscape; no bedrock is exposed at the surface in the foreground. 15
Figure 7: View looking east along the southern elevation of the layer houses. The ground immediately adjacent to the structures is compacted and heavily trafficked; no geological exposures are present. 16
Figure 8: Ground surface near the fence-line, showing sandy sediment with unfossiliferous Balfour mudstone and standing water in shallow depressions. Surface disturbance is evident throughout. 17
Figure 9: View looking south alongside the eastern layer house. The surface is a thin gravel and sand apron over compacted substrate. 18
Figure 10: General view of the farmyard looking towards the koppie, with the survey vehicle in the foreground. The established nature of the infrastructure is clearly visible. 19

LIST OF TABLES

Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended). iv
Table 2: Site Information 0
Table 3: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website 12
Table 4:The rating system 20
Table 5: Summary of Impacts..... 24

APPENDIX 1: CURRICULUM VITAE

LIST OF ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
DEP	Department of Environmental Affairs and Nature Conservation (Free State)
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
HIA	Heritage Impact Assessment
Ma	Millions of years ago
NEMA	National Environmental Management Act (Act 107 of 1998)
NHRA	National Heritage Resources Act (Act 25 of 1999)
PIA	Palaeontological Impact Assessment
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

GLOSSARY OF TERMS

Fossil

A fossil is the conserved remains or vestiges of a long-dead organism, typically dating back millions of years. Fossils may consist of mineralised skeletons, shells, or other hard parts of ancient animals and plants, as well as impressions, moulds, and castings that were left in sedimentary rock when the organism's remains decomposed and left an impression. Fossils offer scientists valuable insights into the evolution and biodiversity of ancient species, enabling them to research and comprehend their evolution and biodiversity.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act No 25 of 1999).

Heritage resources

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

- places, buildings, structures, and equipment of cultural significance.
- places to which oral traditions are attached or which are associated with living heritage.

- historical settlements and townscapes.
- landscapes and natural features of cultural significance.
- geological sites of scientific or cultural importance.
- archaeological and palaeontological sites.
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa.

Palaeontology

Palaeontology is the scientific study of the history of life on Earth through the examination of fossilized remains of animals, plants, and other organisms. It helps us understand the evolution, behaviour, and environments of ancient life forms.

The term palaeontology derives from the Latin palaeontologia, which in turn originates from the Greek words palaios (παλαιός), meaning "ancient," and ontos (ὄντος), meaning "being" or "creature," combined with the suffix -logia, meaning "study of." The literal translation is therefore "the study of ancient beings." In English usage, the classical Latin, British and South African spelling is palaeontology, while the American spelling omits the a after the p, rendering paleontology. In this report the Latin, English and South African spelling of Palaeontology will be used.

1 INTRODUCTION

Tsiyon Boerdery (Pty) Ltd is applying for a Section 24G rectification in terms of Section 24F of the National Environmental Management Act (NEMA; Act 107 of 1998) for the unlawful commencement of activities on Farm Chez Nous No. 1775 in the Kopanong Local Municipality. The activities relate to the construction and operation of two-layer houses and associated service infrastructure within the Xhariep District of the Free State Province. Greenmined Environmental (Pty) Ltd was appointed as the Environmental Assessment Practitioner (EAP) for the application.

On 25 March 2026, South African Heritage Resources Agency (SAHRA) issued an interim comment on the application (Case ID: 27739), noting that the study area falls within a zone of VERY HIGH palaeontological sensitivity and directing that a field-based Palaeontological Impact Assessment (PIA) be undertaken. Banzai Environmental (Pty) Ltd was subsequently appointed by Greenmined Environmental to conduct the assessment, the findings of which are presented in this report.

Table 2: Site Information	
Farm Name	Farm Chez Nous No. 1775
Local Municipality	Kopanong Local Municipality
District Municipality	Xhariep District Municipality
Province	Free State Province
DEP Reference	24G/40(ii)/25/10
SAHRA Case ID	27739
Applicant	Tsiyon Boerdery (Pty) Ltd
EAP	Greenmined Environmental (Pty) Ltd
Palaeontological Specialist	Banzai Environmental (Pty) Ltd
Field Assessment Date	5 May 2026
Report date	26 May 2026

1.2 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);
- Palaeosensitivity map on SAHRIS (South African Heritage Resources Information System) website;

- A Google Earth map with polygons of the proposed development was obtained from Greenmined Environmental (Pty) Ltd as supplied by the developer.
- Google Earth© satellite imagery;
- 1:250 000 Koffiefontein 2924 Geological Map (Council for Geosciences, Pretoria);
- Fulcrum mobile data platform: GPS observation records and photographs
- A pedestrian site investigation was conducted on 5 May 2026. No fossiliferous outcrop was detected.

1.3 Assumptions and Limitations

The geology of the area is the focal point of geological maps, and the sheet explanations of the Geological Maps were not intended to focus on palaeontological heritage. Many inaccessible areas of South Africa have never been examined by palaeontologists, and data is typically dependent solely on aerial pictures. Locality and geological information in museums and university databases is out of date, and data acquired in the past is not always adequately documented.

Comparable Assemblage Zones in other places are also used to provide information on the existence of fossils in areas that have not before been recorded. When similar Assemblage Zones and geological formations are used for Impact studies, it is commonly assumed that exposed fossil exists within the footprint.

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

This study has been conducted by Mrs Elize Butler, palaeontologist of Banzai Environmental (Pty) Ltd. She has conducted approximately 950 palaeontological impact assessments for developments in the Free State, KwaZulu-Natal, Eastern, Western, 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 thirty years. She has experience in locating, collecting, and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

A short CV is attached in Appendix 1 while a detailed CV could be provided on request.

Figure 1: Regional locality of the Rectification Application for layer houses on Farm Chez Nous 1775, Kopanong Local Municipality, Free State Province.

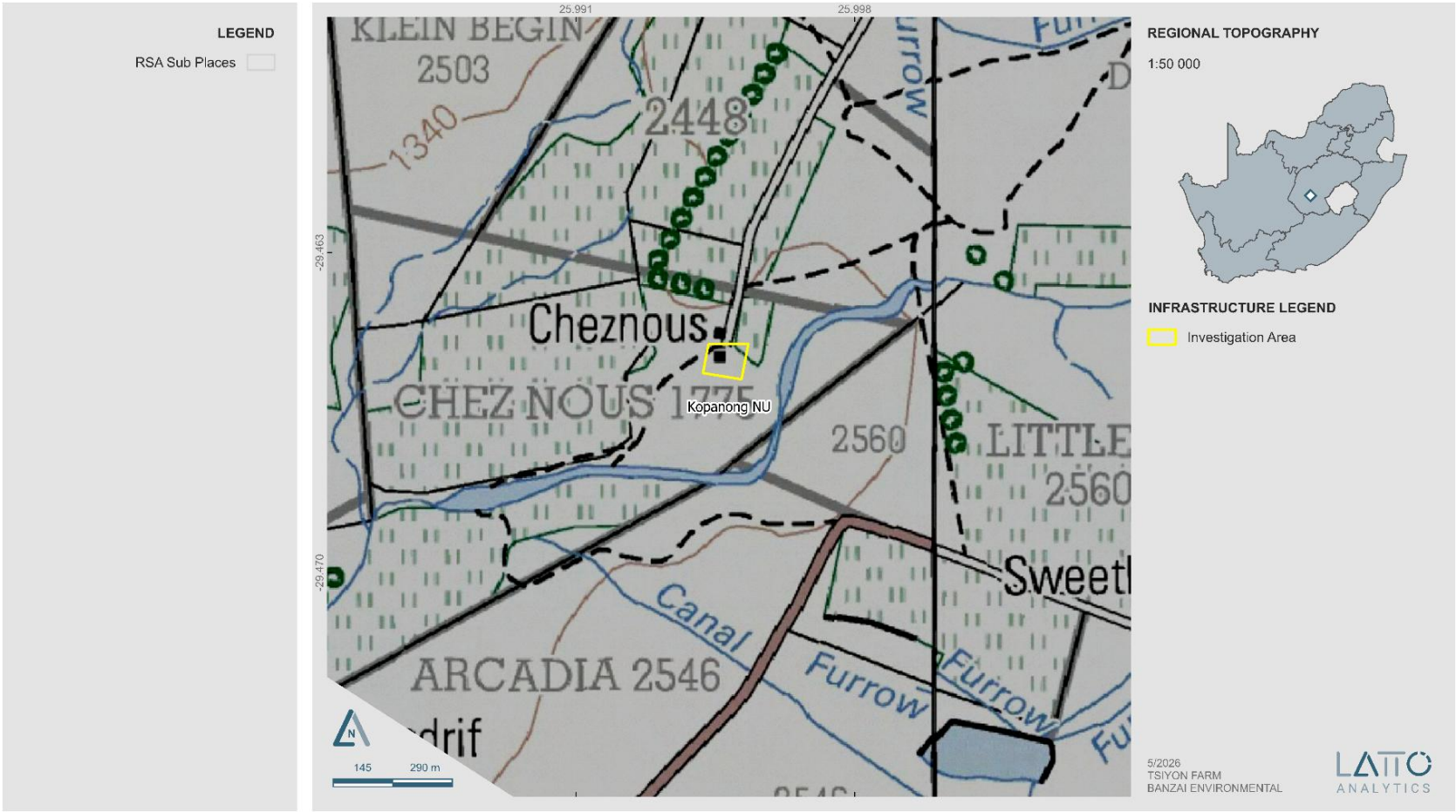

Figure 2: Locality Map of the Rectification Application for layer houses on Farm Chez Nous 1775, Kopanong Local Municipality, Free State Province.

3 LEGISLATION

The cultural and palaeontological heritage in South Africa is safeguarded by an extensive legal framework that facilitates the identification, assessment, and management of heritage resources. The National Heritage Resources Act (NHRA, Act 25 of 1999) serves as the foundation of this framework, delineating heritage resources as components of the national estate, which include cultural, historical, archaeological, palaeontological, and geological elements of importance. Section 3 of the NHRA explicitly encompasses "all items retrieved from the soil or waters of South Africa, including archaeological and palaeontological artefacts, meteorites, and rare geological specimens." Palaeontological heritage is non-renewable and safeguarded by Section 35, which prohibits the disturbance, destruction, or removal of fossils without a valid permit from SAHRA or the pertinent Provincial Heritage Resources Authority (PHRA). Fossil specimens must be gathered and preserved in a recognised institution in accordance with SAHRA's minimal standards.

The NHRA is governed nationally by SAHRA and provincially by PHRAs, establishing a three-tier system that reflects South Africa's cooperative governance framework. This method facilitates the identification, safeguarding, and preservation of heritage treasures for the advantage of current and future generations.

3.1 Supporting Legislation and Regulations

Heritage and palaeontological management are incorporated into the comprehensive environmental framework, specifically via the National Environmental Management Act (NEMA, Act 107 of 1998) and the Environmental Impact Assessment (EIA) Regulations (GN 982, 2014, updated by GN 326, 2017). Section 23(2)(b) of NEMA mandates integrated environmental management to "identify, predict, and assess the actual and potential impacts on the environment, socio-economic conditions, and cultural heritage."

Government Notice 320 (GN 320, Government Gazette 43110, 20 March 2020) delineates broad prerequisites for executing initial site sensitivity verification in the absence of a specific assessment process. GN 320 necessitates desktop analysis, first site inspections, verification of land usage, and the submission of corroborative documentation (e.g., photographs). Table 1 encapsulates these standards and their alignment within this report.

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Table 1:GN 320 Reporting Requirements

GN 320	Relevant section in report
2.2(a) Desktop analysis using satellite imagery	Section 1
2.2(b) Preliminary on-site inspection	Executive Summary and Section 7
2.3(a) Confirm or dispute environmental sensitivity	Executive Summary and Section 7
2.3(b) Motivation and evidence	Executive Summary and Section 7

3.2 Heritage Screening – DFFE National Web-based Environmental Screening Tool

A heritage screening was performed utilising the DFFE National Web-based Environmental Screening Tool, as mandated by GN 982. The April 2025 standards state that thematic layers for cultural, archaeological, and paleontological resources encompass only a finite number of documented sites, which may be extensively dispersed and perhaps located at any development site. The directives specify:

A Heritage Impact Assessment is required for all developments, irrespective of the sensitivity indicated on the archaeological and cultural heritage theme layers. A Palaeontological Impact Assessment is required for all developments according to the SAHRIS PalaeoSensitivity Map, regardless of the indicated sensitivity.

According to the heritage screening report, the palaeontological sensitivity of the proposed development area is Very High, indicating that a detailed palaeontological desktop assessment is required with a Chance Find Protocol.

3.3 Section 38: Heritage Impact Assessments

Section 38 of the NHRA regulates the administration of heritage resources concerning development. Specific forms of development necessitate a Heritage Impact Assessment (HIA), including: Linear constructions including roads, pipelines, canals, or electricity lines that surpass 300 meters; Bridges or other constructions surpassing 50 meters; Changes that modify site characteristics, including those beyond 5,000 m², involving three or more properties, or rezoning exceeding 10,000 m².

Upon activation, SAHRA or the pertinent PHRA must be informed, and the HIA is required to: Identify and delineate heritage resources within the impacted region; Evaluate importance and possible effects; Evaluate viable alternatives; Propose suitable mitigation and management strategies.

3.4 Integration with Environmental Assessment

Section 38(8) of the NHRA permits the amalgamation of historic evaluations with NEMA EIA processes, thereby eliminating redundancy. Palaeontological Impact Assessments (PIAs) can be executed as a component of the Heritage Impact Assessment (HIA) under the overarching Environmental Impact Assessment (EIA) framework. This guarantees the prompt identification, safeguarding, and administration of fossil heritage throughout development planning.

If no environmental process is necessary, but the development activates Section 38(1) of the NHRA, SAHRA or the pertinent PHRA assumes the role of the authorising authority and may mandate a comprehensive HIA, encompassing public participation and stakeholder interaction.

4 ASSESSMENT METHODOLOGY

This PIA assesses the development's potential impact on the fossil heritage. This Palaeontological Assessment is part of the HIA Report. The PIA's goals are to: 1) identify the palaeontological significance of the rock formations in the footprint; 2) evaluate the palaeontological magnitude of the formations; 3) clarify the impact on fossil heritage; and 4) make recommendations for how the developer might protect and minimize potential harm to fossil heritage, according to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports".

Calculations of the palaeontological state of each rock segment and the potential impact of development on fossil history take into account the palaeontological status of the rocks, the type of development, and the amount of bedrock removed.

The Provisional DFFE Screening Tool, the SAHRIS Palaeosensitivity map, all Palaeontological Impact Assessment reports for the same area, Google Earth images, topographical and geological maps, as well as academic articles about specimens from the development area and Assemblage Zones, are all used to create scoping reports.

When the development footprint has a moderate to high palaeontological sensitivity, a field-based assessment is necessary. A desktop or field assessment of the exposed rock is used to evaluate the significance of the proposed development's impact, and recommendations for more research or mitigation are made. Excavations for the project often only take place during the building phase, changing the terrain and destroying or permanently encasing fossils at or below the ground surface. Then, access to Fossil Heritage will no longer be available for academic study.

When doing a site investigation, a palaeontologist examines the local development as well as the quantity and variety of fossils found there. This can be demonstrated by looking at representative fossiliferous rock exposures (most igneous and metamorphic rocks are not fossiliferous, whereas sedimentary rocks

contain fossil heritage). Examined rock exposures frequently contain a sizeable portion of the stratigraphic unit, which is primarily made up of recently exposed (unweathered) rock. These exposures may be man-made (such as quarries, open building excavations, even railway and road cuttings) or natural (such as cliffs, and dongas as well as rocky outcrops along stream or river banks). It is usual practice for palaeontologists to record well-preserved fossils (GPS, and stratigraphic data) during field assessment examinations.

Although mitigation is often done prior to construction, it may take place if potentially fossiliferous bedrock is revealed. Fossil collection and documentation are examples of mitigation. A permit from SAHRA must be obtained before beginning any fossil excavation, and the material must be stored at an authorized facility. When mitigation is properly used, it is possible to have a positive impact by raising awareness of the palaeontological past of the area.

By physically evaluating bedrock outcrops to determine their lithology and fossil richness and crisscrossing the development footprint, one can assess an area's fossil potential. Because the presence of fossils at the surface is so unexpected, an average sample size of the region is investigated. To be clear, however, the lack of fossils in a development footprint does not automatically suggest that there is no palaeontologically important material present on the site (on or below the ground surface).

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;
- Describe of the proposed project and provide information regarding the developer and consultant who commissioned the study;
- Describe location of the proposed development and provide geological and topographical maps
- Provide palaeontological and geological history of the affected area;
- Identify sensitive areas to be avoided (providing shapefiles/kmls) in the proposed development;
- Evaluate the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
    a. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
    b. Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity.

c. Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.

- Fair assessment of alternatives (infrastructure alternatives have been provided);
- Recommend mitigation measures to minimise the impact of the proposed development; and
- Detail the implications of specialist findings for the proposed development (such as permits, licenses etc).

5 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The proposed study area is shown on the 1:250,000 Koffiefontein 2924 (1992) Geological Map (Council for Geoscience, Pretoria) (Figure 3). The original geological map indicates that the development area is underlain by the undifferentiated Adelaide Subgroup (Beaufort Group, Karoo Supergroup). However, recent studies in the area have refined this interpretation, showing that the study area is entirely underlain by the Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup). The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the palaeontological sensitivity of the study area ranges from Very High (red) to Moderate (green) (Figure 4; Table 3), which is supported by the DFFE Screening Tool (Figure 5). The zones of moderate palaeontological sensitivity can be attributed to the presence of alluvium in close proximity to the river, where fossil preservation potential is generally lower.

The Balfour Formation is the uppermost unit of the Adelaide Subgroup. It consists predominantly of olive-green to dark red-brown mudstones and siltstones, interbedded with laterally discontinuous lenses and sheet bodies of fine- to medium-grained, grey to greenish-grey sandstone (Johnson et al., 2006; Smith, 1990). The mudstones represent overbank and floodplain deposition on a broad, low-gradient alluvial plain, while the sandstone bodies preserve the channels of a meandering to anastomosing fluvial system. Pedogenic modification is widespread throughout the formation, with calcareous nodules and red-brown mottling reflecting periodic soil development under semi-arid conditions.

The formation spans the Permian-Triassic boundary and is of exceptional scientific importance as it records this critical transition in Earth's history (Smith & Ward, 2001; Viglietti et al., 2020). In the Kopanong area, the present topographic surface corresponds broadly to the upper Balfour Formation, with shallow erosion exposing mudstone and siltstone sequences along the flanks of drainage lines and on koppies. The farmyard itself is situated on the alluvial plain where the underlying bedrock is generally obscured by a variable thickness of Quaternary colluvium and agricultural fill.

From a palaeontological perspective, the Balfour Formation is one of the most significant continental rock sequences on Earth. Its vertebrate fossil record spans the end-Permian mass extinction—the most

severe biotic crisis in the history of life, during which approximately 96% of marine species and 70% of terrestrial vertebrate species disappeared (Smith and Ward, 2001). The formation provides crucial terrestrial evidence for understanding the nature, timing, and ecological consequences of this catastrophic extinction event. The pre-extinction Balfour fauna is characterized by a diverse therapsid assemblage, including the dicynodonts *Oudenodon* and *Dicynodon*, the therocephalian *Moschorhinus*, and the cynodont *Procynosuchus*.

In contrast, post-extinction assemblages are dominated by *Lystrosaurus*, together with early cynodonts such as *Thrinaxodon* and the archosauriform *Proterosuchus*. The stratigraphic transition between these two distinct faunal assemblages is preserved within the Balfour Formation and has been the subject of intensive palaeontological research for over a century (Rubidge, 1995; Smith and Ward, 2001; Ward et al., 2005).

Fossil preservation within the formation varies considerably depending on depositional setting. Articulated and associated skeletal material occurs most commonly in the floodplain mudstones, where rapid overbank burial facilitated exceptional preservation. Isolated bones and teeth are also found in reworked lag deposits within channel sandstones. Additionally, trace fossils - including vertebrate trackways and invertebrate bioturbation structures - provide supplementary information about the ancient ecosystem (Marchetti et al., 2019).

Figure 3. Extract of the 1:250 000 Koffiefontein 2924 and Bloemfontein 2926 Geological maps (Council for Geoscience, Pretoria) indicates that the study area is underlain by the Adelaide Subgroup (Beaufort Group, Karoo Supergroup; however, regional stratigraphic studies confirm the presence of the Balfour Formation specifically at this locality.

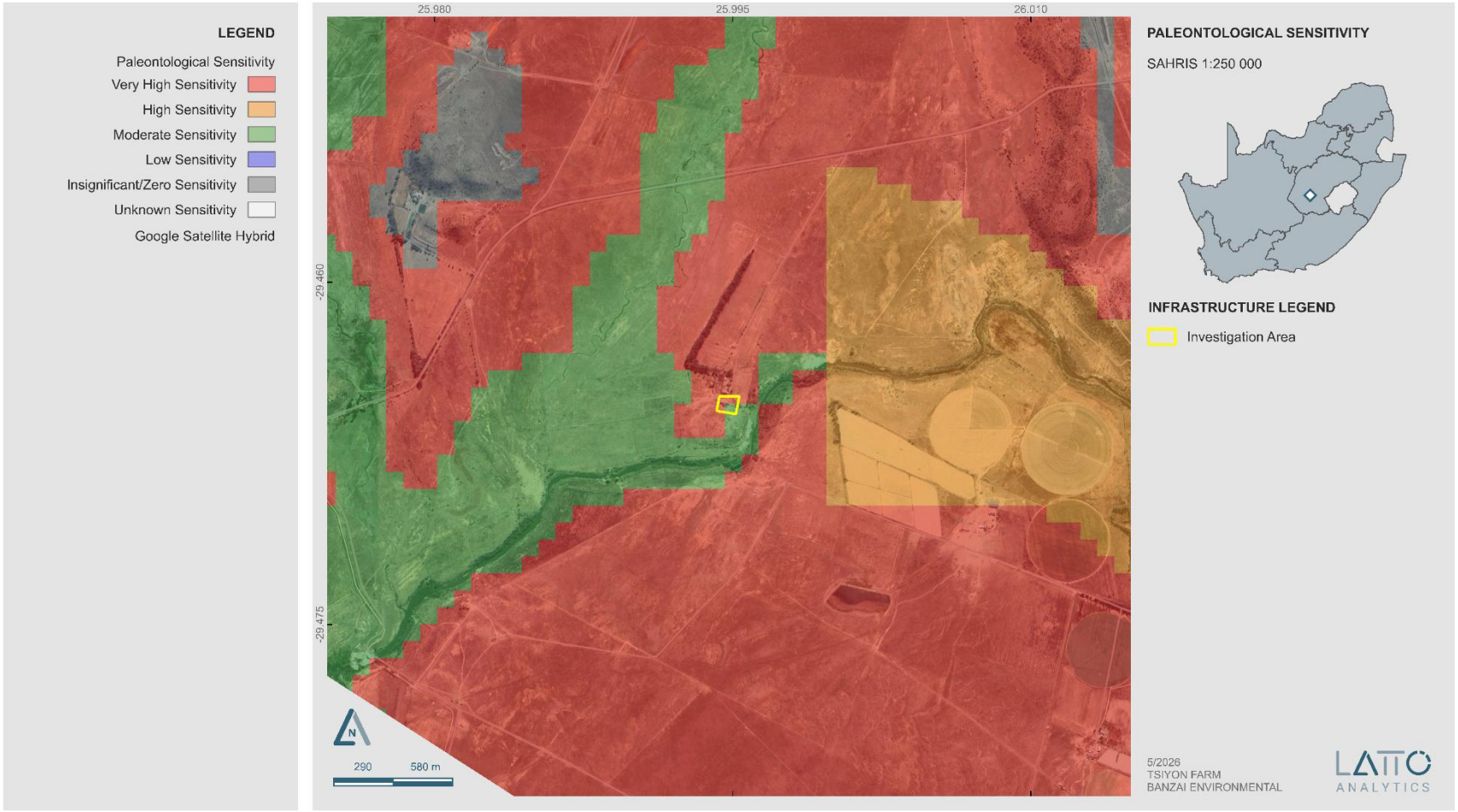
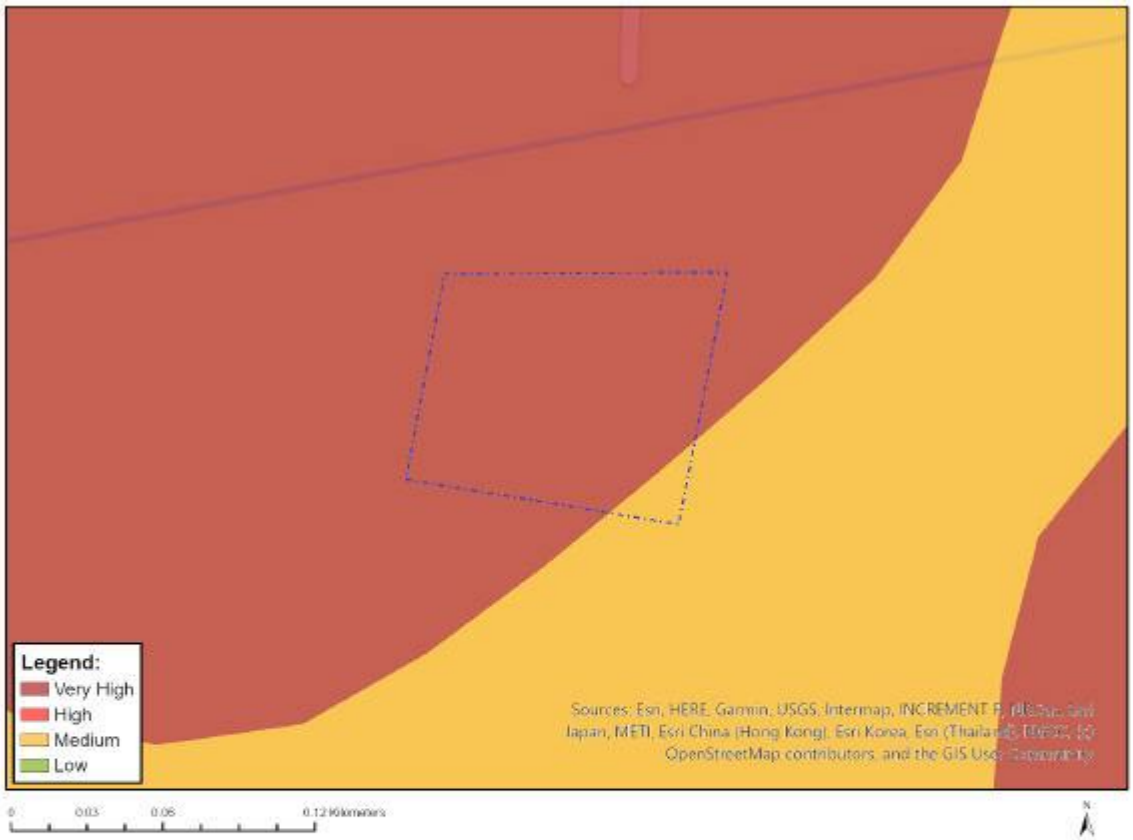


Figure 4: Extract of the SAHRIS PalaeoMap (Council for Geoscience) indicates that the study area is underlain with sediments with a Very High red), and Moderate (green) Palaeontological Sensitivity.

Table 3: Palaeontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website		
Colour	**Sensitivity**	**Required Action**
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

The PalaeoMap of SAHRIS (Figure 4; Table 3) indicates that the palaeontological sensitivity of the study area ranges from Very High (red) to Moderate (green). This sensitivity classification is corroborated by the National Environmental Web-based Screening Tool, which also indicates a Very High (red) sensitivity rating (Figure 5). The zones of moderate palaeontological sensitivity can be attributed to the presence of alluvium in close proximity to the river, where fossil preservation potential is generally lower due to reworking and depositional processes.

In response to the Very High palaeontological sensitivity rating, a site investigation was conducted on 5 May 2026. During this field assessment, no fossiliferous outcrops were detected within the proposed development area. The Very High sensitivity ratings indicated by both the SAHRIS PalaeoMap and the National Screening Tool are therefore not supported by the actual field observations made during the site visit on 5 May 2025. This discrepancy may be attributed to extensive surface cover (colluvium, soil, and vegetation), limited bedrock exposure, or the localized nature of fossil occurrences within the broader formation.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

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

Figure 5: Palaeontological Sensitivity of the study site in by the National Environmental Web-based Screening Tool indicates a Very High (red) Palaeontological Sensitivity while areas with a Medium (orange) sensitivity is also crosses.

6 SITE VISIT

A site-specific field survey of the development footprint was conducted on foot on 5 May 2026. The survey covered the full operational footprint: the fenced farmyard containing both layer houses (each approximately 70 m x 13 m), the lean-to on the northern side, water storage tanks, feed infrastructure, and the service yard to the south. Fifteen GPS observation points were recorded using the Fulcrum mobile data platform, with photographic documentation at each point.

The Chez Nous farm occupies part of the broad, gently undulating plains of the central Free State, at an elevation of approximately 1400-1500 m above sea level (asl). The landscape is characteristic of the subdued Karoo erosion surface, where long interfluves and shallow drainage lines reflect the low relief of the underlying mudstone-dominated succession. Isolated koppies, erosional remnants capped by more resistant sandstone, rise above the general plain and are visible in several of the field photographs. The farmyard itself occupies a flat to very gently sloping position on the plain.

The natural vegetation of this part of the Free State belongs to the Eastern Free State Clay Grassland (Gm8), a unit of the Grassland Biome (Mucina and Rutherford, 2006). This vegetation type is characterised by a short to medium-height grassland dominated by *Themeda triandra*, *Eragrostis* species, *Cymbopogon plurinodis*, and *Aristida* species on deep, dark clay soils derived from Balfour Formation mudstones. The surrounding farmland has been substantially modified by grazing, cultivation, and infrastructure, but remnant natural grassland persists on the less accessible slopes and koppie flanks.

The ground surface throughout the footprint has been substantially modified by long-term agricultural use. Immediately adjacent to and between the layer houses, the surface is heavily compacted by vehicle and livestock traffic and is in places covered by concrete aprons, gravel, or accumulated agricultural material. Along the fence-lines, the surface transitions to sandy to slightly gravelly apron with shallow depressions that pool water after rainfall. The material visible at the surface is unconsolidated or reworked: a small mudstone outcrop was detected southern side of the development but was unfossiliferous.

Six field photographs representative of site conditions are presented below.

Figure 6: View looking north-west across the open grassland adjacent to the farmyard. The koppie on the horizon is characteristic of the dissected Karoo landscape; no bedrock is exposed at the surface in the foreground (GPS (EXIF): 29.465828°S, 25.995198°E (29°27'56.98"S, 25°59'42.71"E); Field assessment: 5 May 2026; Banzai Environment).

Figure 7: View looking east along the southern elevation of the layer houses. The ground immediately adjacent to the structures is compacted and heavily trafficked; no geological exposures are present. GPS (EXIF): 29.465702°S, 25.995148°E (29°27'56.53"S, 25°59'42.53"E); Field assessment: 5 May 2026; Banzai Environmental).

Figure 8: Ground surface near the fence-line, showing sandy sediment with unfossiliferous Balfour mudstone and standing water in shallow depressions. Surface disturbance is evident throughout (GPS (EXIF): 29.465666°S, 25.994619°E (29°27'56.40"S, 25°59'40.63"E); Field assessment: 5 May 2026; Banzai Environmental).

Figure 9: View looking south alongside the eastern layer house. The surface is a thin gravel and sand apron over compacted substrate. GPS (EXIF): 29.465727°S, 25.995042°E (29°27'56.62"S, 25°59'42.15"E); Field assessment: 5 May 2026, Banzai Environmental).

Figure 10: General view of the farmyard looking towards the koppie, with the survey vehicle in the foreground. The established nature of the infrastructure is clearly visible. GPS (EXIF): 29.465107°S, 25.994402°E (29°27'54.39"S, 25°59'39.85"E); Field assessment: 5 May 2026., Banzai Environmental.)

7 ASSESSMENT METHODOLOGY

7.1 Method of Environmental Assessment

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

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

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

7.2 Impact Rating System

Impact assessment must take account of the nature, scale, and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 4:The rating system

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.

PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		

1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.

3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.

CUMULATIVE EFFECT

This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.

1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

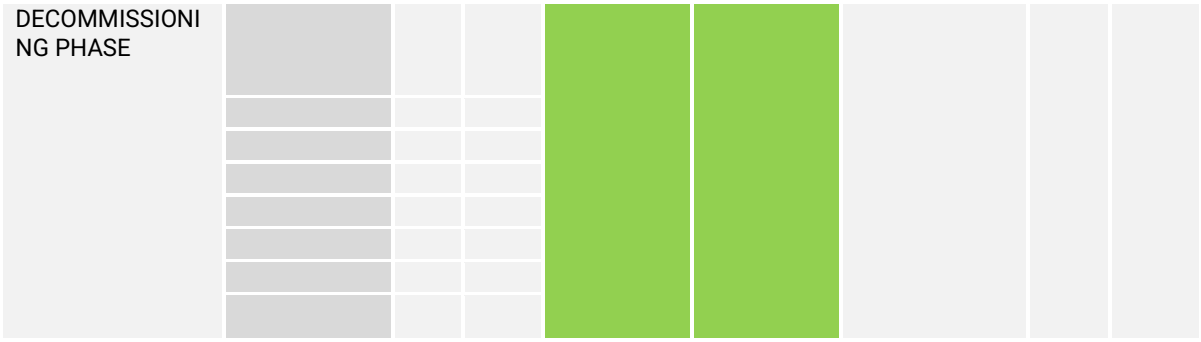
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.

74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity

Table 5: Summary of Impacts

PALAEONTOLOGICAL								
NATURE	LOSS OF FOSSIL HERITAGE BY DESTRUCTION, MOVEMENT OR SEALING IN OF FOSSIL HERITAGE IN OR BELOW THE EARTH'S SURFACE SITE(S):							
DEVELOPMENT PHASE	DEVELOPMENT IMPACT			IMPACT RATING		RECOMMENDED MITIGATION	IS IMPACT ACCEPTABLE?	
	CRITERIA	*BM	**AM	BEFORE MITIGATION	AFTER MITIGATION		*BM	**AM
PLANNING PHASE								
CONSTRUCTION PHASE	Extent	1	1	Negative High impact	Negative low impact	Chance Find Protocol	NO	YES
	Probability	2	1					
	Reversibility	4	4					
	Irreplaceability	4	4					
	Duration	4	4					
	Cumulative Effect	2	1					
	Magnitude	3	1					
	Impact Significance	45	15					
OPERATIONAL PHASE	Extent							
	Probability							
	Reversibility							
	Irreplaceability							
	Duration							
	Cumulative Effect							
	Magnitude							
	Impact Significance							



8 FINDINGS AND RECOMMENDATIONS

The study area is underlain by the Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup), rated as Very High palaeontological sensitivity by the SAHRIS PalaeoSensitivity Map (Almond et al., 2013). This rating correctly reflects the international significance of the formation's therapsid fauna and the importance of the Permian-Triassic boundary interval it records.

The field survey of 5 May 2026 found no intact geological exposures and no fossil material anywhere within the development footprint. The entire footprint has been modified by long-term agricultural use: the ground surface is compacted, cleared, and in many areas covered by concrete, gravel, or agricultural material. The absence of fossils is a direct consequence of this disturbance, not an indication that the Balfour Formation beneath lacks palaeontological potential.

On this basis, the following recommendations are made:

- The development may proceed. The existing footprint has been so thoroughly disturbed that no recoverable fossil material remains within the area affected by continued operations. A Very High sensitivity rating does not preclude authorisation; it requires that appropriate investigation be completed, which has now been done.
- A Chance Find Protocol must be adopted and implemented. Any future ground disturbance outside the currently disturbed footprint, including any expansion of structures, new earthworks, or servitude establishment, must be preceded by notification to the palaeontological specialist. All construction personnel must be briefed. Should fossil material be encountered, all work in the affected area must stop immediately and the specialist contacted.
- The development footprint must not be extended without prior palaeontological assessment. Any new ground-disturbing activity outside the current fenced area requires a fresh field assessment before it can proceed.
- No fossil collection permit is required for this phase of work. No material was encountered during the survey and nothing needs to be collected or curated.

In the professional opinion of the specialist, the continued operation of the existing layer houses and associated infrastructure does not pose an unacceptable risk to the palaeontological heritage of the Balfour Formation within the affected footprint, provided the above conditions are met.

9 MITIGATION AND EMPR REQUIREMENTS

The naturally preserved remnants (or traces) of plants or animals imbedded in rock are known as fossils. These plants and animals existed millions of years ago in the geologic past. Fossils are incredibly valuable and difficult to replace. It is possible to identify the environmental conditions that occurred in a certain geographical area millions of years ago by analysing fossils.

This fact sheet is intended for construction workers and foremen. It describes what to do if fossil material is discovered accidently during construction.

It is the responsibility of the project's Environmental Site Officer (ESO) or site manager to train the workers and foremen on what to do if a fossil is accidently discovered. In the absence of the ESO, a member of staff must be designated to be accountable for the effective application of the chance discovery protocol so that the conservation of fossil material is not jeopardized.

If fossils are discovered during excavation, the following method shall be followed.

9.1 Legislation

Cultural Heritage in South Africa (includes all heritage resources) is protected by the National Heritage Resources Act (Act No 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".

The NHRA protects and owns the state's palaeontological legacy, which is unique and non-renewable. It is consequently the responsibility of the state to manage and protect fossils on behalf of South African citizens. According to Section 35 of the NHRA, palaeontological resources may not be excavated, broken, transferred, or destroyed by any development without previous assessment and a permit from the relevant heritage resources authority.

9.2 Chance Find Procedure

- If a chance find is made, the person responsible for the find must immediately stop working, and all work in the immediate vicinity of the find must stop as well.
- The individual who discovered the item must immediately notify his or her direct supervisor, who must then notify his or her management and the ESO or site manager. The ECO or site manager must notify the relevant Heritage Agency (South African Heritage Resources Agency, SAHRA) of the discovery. (Contact information: SAHRA, 111 Harrington Street, Cape Town, South Africa. PO

Box 4637, Cape Town 8000, South Africa. Fax: +27 (0)21 462 4509. Tel: 021 462 4502. Web address: www.sahra.org.za). Photographs of the find from various perspectives, as well as GPS coordinates, must be submitted to the Heritage Agency.

- Within 24 hours of the discovery, a preliminary report must be sent to the Heritage Agency, which must include the following: 1) the date of finding; 2) a description of the discovery; and 3) a description of the fossil and its context (depth and position of the fossil), as well as GPS coordinates.
- Photographs of the discovery (the more the merrier) must be of high quality, in focus, and accompanied by a scale. Photographs of the vertical part (side) where the fossil was discovered are also required.
- Upon receipt of the preliminary report, the Heritage Agency will notify the ESO (or site manager) whether a palaeontologist rescue excavation or collection is required.
- The place must be guarded to prevent future damage. There should be no attempt to remove material from their environment. Stabilize the exposed items and cover them with a plastic sheet or sand bags. The Heritage organization will also be able to advise on the best way to protect the find.
- If the fossil cannot be stabilized, the ESO (site manager) may carefully collect the fossil.
- Once the Heritage Agency has received the written authorization, the developer may continue with the development on the affected area.
- Fossil finds must be placed in tissue paper and in an appropriate box while necessary care must be taken to remove any fossil material from the rescue site.

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APPENDIX 1

CURRICULUM VITAE: E. Butler

PROFESSION:	Palaeontologist
YEARS' EXPERIENCE:	30 years in Palaeontology
EDUCATION:	University of the Orange Free State
	B.Sc Botany and Zoology, 1988
	University of the Orange Free State
	B. Sc (Hons) Zoology, 1991
	University of the Free State
	M. Sc. *Cum laude* (Zoology), 2009

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

EMPLOYMENT HISTORY

Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant	National Museum, Bloemfontein
and Collection Manager	1998–2022
Banzai Environmental	2016 to present

Elize Butler has conducted approximately 900 Palaeontological Impact Assessments for developments in the Free State, KwaZulu-Natal, Eastern, Northern and Western 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. 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.