

## PALEONTOLOGICAL IMPACT ASSESSMENT

PROPOSED CONSTRUCTION OF  
CHICKEN BROILER HOUSES FOR  
THE PRODUCTION OF POULTRY  
WITHIN AMAHLATHI LOCAL  
MUNICIPALITY, AMATHOLE  
DISTRICT, EASTERN CAPE

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Version 02

COMPILED FOR:

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## **Declaration of Independence**

I, Elize Butler, declare that –

General declaration:

- I act as the independent Paleontological 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 Paleontological 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 consider, 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 Paleontological 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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**SIGNATURE:**



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This Paleontological Impact Assessment (as part of 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)**

<b>Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017</b>	<b>The relevant section in the report</b>	<b>Comment where not applicable.</b>
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 Paleontological history	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 8	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 1, 7 & 9	-
(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 – Methods and TOR	-
(f) details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 1 & 9	-
(g) An identification of any areas to be avoided, including buffers	Section 1 & 10	-



<b>Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017</b>	<b>The relevant section in the report</b>	<b>Comment where not applicable.</b>
(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 Paleontological history	-
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4. 1 – Assumptions and Limitation	-
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 1 & 9	-
(k) Any mitigation measures for inclusion in the EMPr	Section 10	-
(l) Any conditions for inclusion in the environmental authorisation	Section 10	-
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 10	-
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 1 & 9	-
(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 & 9	-
(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



Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	The relevant section in the report	Comment where not applicable.
		Management Plan (EMP) process.
(p) A summary and copies of any comments that were received during any consultation process	N/A	Not applicable. To date, no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	N/A	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Section 3 compliance with SAHRA guidelines	



## EXECUTIVE SUMMARY

Banzai Environmental was appointed by Indwe Environmental Consulting to conduct a **Paleontological Impact Assessment (PIA)** for proposed chicken broiler houses near Stutterheim, Amahlathi Local Municipality, Amathole District, Eastern Cape. In accordance with the National Environmental Management Act 107 of 1998 (NEMA) and to comply with the National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), this 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 Paleontological Heritage and to mitigate possible damage to fossil resources.

The proposed chicken broiler project is underlain by the **Bafour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup)**. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the **Paleontological Sensitivity** of the Balfour Formation (Adelaide Subgroup (Beaufort Group, Karoo Supergroup) is **Very High**. The suggested location is also classified as having a **Very High Paleontology Theme Sensitivity in the DFFE** (Department of Forestry, Fisheries and the Environment) Screening Report.

A site-specific field survey of the total development footprint was conducted on foot and by motor vehicle on 19 August 2025. **No fossiliferous outcrop** was identified during the site investigation. Combined desktop research (National Database and published data) and field observations indicate that fossils of scientific or conservation value in the area are rare, sporadic, and unpredictable. The development footprint was rated as **Very High significance pre-mitigation and Low post-mitigation**. This **contrasts** with the Very High Palaeontological Sensitivity assigned by SAHRIS and the DFFE Screening Report.

The construction phase will be the only development phase impacting Paleontological Heritage and **no significant impacts are expected to impact the Operational and Decommissioning phases**. The No-Go Alternative considers the option of 'do nothing' and maintaining the status quo, will have a Neutral impact on the Paleontological Heritage of the development. The **Cumulative impacts of the development are considered to be medium pre- mitigation and Low post mitigation and falls within the acceptable limits for the project**. It is therefore considered that the proposed development will not lead to damaging impacts on the Paleontological resources of the area. **The construction of the development may thus be permitted in its whole extent, as the development footprint is not considered sensitive in terms of Paleontological resources**. It is consequently recommended that no further Paleontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

### Recommendations:

- The ECO for this project must be informed that the Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup) has a **Very High Paleontological Sensitivity**.



- If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations, the **Chance Find Protocol** must be implemented by the ECO/site manager in charge of these developments. These discoveries ought to be protected (if possible, *in situ*). The ECO/site manager must **report to ECPHRA** (Contact details: 16 Commissioner Street, East London, EC Lungiswa Mzazi - lungiswam@ecphra.org.za / (043) 492 1942 / 081 434 3544 or Ayanda Mncwabe-Mama - ayanda.mncwabe-mama@ecsrac.gov.za / (043) 492 1370) so that a palaeontologist can carry out mitigation (collection and recording).
- 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 Paleontological impact studies proposed by SAHRA (2012).

These recommendations should be incorporated into the Environmental Management Programme (EMPr) for the proposed chicken broiler project in the Eastern Cape.

## Impact Statement

If the recommended mitigation measures are strictly implemented, the proposed chicken broiler Project is not expected to result in detrimental impacts on the Paleontological resources of the area. **From a Paleontological perspective, the construction of the development may therefore be authorised in its entirety.**





## TABLE OF CONTENT

<b>1</b>	<b>INTRODUCTION .....</b>	<b>2</b>
1.1	PROJECT DESCRIPTION .....	2
<b>2</b>	<b>QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR .....</b>	<b>2</b>
<b>3</b>	<b>LEGAL MANDATE.....</b>	<b>3</b>
3.1	NATIONAL HERITAGE RESOURCES ACT (25 OF 1999) .....	3
<b>4</b>	<b>METHODS AND TERMS OF REFERENCE.....</b>	<b>5</b>
4.1	ASSUMPTIONS AND LIMITATIONS .....	7
<b>5</b>	<b>GEOLOGICAL AND PALEONTOLOGICAL HISTORY.....</b>	<b>10</b>
<b>6</b>	<b>ADDITIONAL INFORMATION CONSULTED .....</b>	<b>21</b>
<b>7</b>	<b>SITE VISIT.....</b>	<b>21</b>
<b>8</b>	<b>IMPACT ASSESSMENT METHODOLOGY.....</b>	<b>23</b>
<b>9</b>	<b>CONCLUSION AND SUMMARY .....</b>	<b>27</b>
9.1	SUMMARY OF FINDINGS .....	27
<b>10</b>	<b>MITIGATION AND EMPR REQUIREMENTS.....</b>	<b>28</b>
10.1	LEGISLATION .....	29
10.2	CHANCE FIND PROCEDURE .....	29
<b>11</b>	<b>REFERENCES .....</b>	<b>30</b>



## LIST OF FIGURES

Figure 1: Google Earth image of the site locality of the proposed chicken broiler project, near Stutterheim, Amahlathi Local Municipality, Eastern Cape Province. ....	8
Figure 2: Regional locality of the proposed chicken broiler houses near Stutterheim, Amahlathi Local Municipality, Amathole District, Eastern Cape. ....	9
Figure 3: Extract of the 1:250 000 King William's Town 3226 (1976) Geological map (Council for Geoscience, Pretoria) indicates that the proposed development is underlain by the Balfour Formation (Pub, green) of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup).....	12
Figure 4: : Extract of the SAHRIS PalaeoMap (Council for Geoscience, Pretoria) indicating the Very High (red) Palaeontological Sensitivity of the proposed study area in the Eastern Cape Province. ....	14
Figure 5: Vertebrate biozonation range chart for the Main Karoo Basin of South Africa. ....	16
Figure 6: Lateral and dorsal views of skull of the dicynodont <i>Daptocephalus leoniceps</i> , the main biozone defining fossil (Image taken from Viglietti, 2020) and dorsal views (Image taken from Viglietti, 2020). ....	17
Figure 7: Skulls of the biozone defining fossils of the <i>Dicynodon-Theriongnathus</i> Subzone in lateral and dorsal views. <i>Dicynodon lacerticeps</i> (top), <i>Theriongnathus microps</i> (bottom) (Image taken from Viglietti, 2020). ....	18
Figure 8: Biozone defining fossils of the <i>Lystrosaurus maccaigi</i> - <i>Moschorhinus</i> Subzone. The skulls of the <i>Lystrosaurus maccaigi</i> (top) and <i>Moschorhinus kitchingi</i> (bottom) in lateral view (Image taken from Viglietti, 2020). ....	19
Figure 9: Lateral and dorsal views of the index taxa defining the <i>Lystrosaurus declivis</i> Assemblage Zone (top) <i>Lystrosaurus declivis</i> , (centre) <i>Thrinaxodon liorhinus</i> , (bottom) <i>Procolophon trigoniceps</i> (Image taken from Botha and Smith, 2020). ....	20
Figure 10: General view over site 1 indicates evidence of agricultural activities. ....	22
Figure 11: View chicken broiler site 2 indicates vegetation with no surface rocky outcrops. ....	23



## LIST OF TABLES

<i>Table 1: Checklist for Specialist studies conformance with Appendix 6 of the EIA Regulations of 2014 (as amended)</i> .....	iv
<i>Table 2: Legend of the 1:250 000 King William's Town 3226 Geological map (1976) (Council of Geoscience, Pretoria).</i> .....	13
<i>Table 3: Paleontological Sensitivity according to the SAHRIS PalaeoMap (Almond et al, 2013; SAHRIS website).</i> .....	15
<i>Table 4: The rating system</i> .....	24
<i>Table 5: Summary of Impacts</i> .....	26

## APPENDIX A: CV



## 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 Paleontological 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.



## LIST OF ABBREVIATIONS

amsl	above mean sea level
BA	Basic Assessment
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DFFE	Department of Forestry, Fisheries and the Environment
CA	Competent Authority
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
ECO	Environmental Control Officer
ESO	Environmental Site Officer
EA	Environmental Authorisation
EMPr	Environmental Management Programme
HIA	Heritage Impact Assessment
Ma	Millions of years ago
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PIA	Paleontological Impact Assessment
PSSA	Paleontological Society of South Africa
PSP	Professional Service Provider
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
S&EIA	Scoping & Environmental Impact Assessment
ToR	Terms of Reference



## 1 INTRODUCTION

Indwe Environmental Consulting has been appointed by ANCA Foods (Pty) Ltd as the Professional Service Provider (PSP) to conduct an Environmental Impact Assessment in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998) for the proposed construction of the Chicken Broiler Houses for the production of poultry occurring within the Amahlathi Local Municipality, Amathole District, Eastern Cape. The project will include two sites with the construction of eight broiler houses per site.

### 1.1 Project Description

ANCA Foods (Pty) Ltd intends to expand their poultry production, necessitating the construction of new chicken broiler house facilities that are environmentally controlled. Two locations are planned, each comprising eight enclosed broiler houses inside a distinct walled operational zone that include ancillary structures, including a staff dining and washing facility, as well as essential services (e.g., stormwater management, water supply, and sewage). Each broiler house will encompass 1800 m<sup>2</sup> and accommodate a maximum of 42,000 chicks per house. The establishment of the broiler houses will need the clearing of around 12 hectares of agricultural land.

Existing 4 m gravel access roads will be used to provide access to the planned sites, and mitre drains will be built where needed. Three-phase power is accessible for the intended development.

The proposed chicken broiler houses will be situated 3.5 km southeast of Stutterheim in the Eastern Cape (Figures 1 & 2). The exact coordinates of two broiler sites are 32°35'34.79"S, 27°27'29.18"E and 32°36'18.26"S, 27°28'22.40"E, respectively, located within the Amahlathi Local Municipality. The planned broiler houses will be erected on properties 546, 547, 548, 549, 550, 551, 552, and 2235. Access to the planned sites is facilitated by existing dirt roads. The Kubusi River, a perennial watercourse, together with a non-perennial stream and other wetlands, is included within the project area.

## 2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Please refer to Appendix 1 (Specialist CV).

This study has been conducted by Mrs. Elize Butler of Banzai Environmental (Pty) Ltd. She has conducted approximately 900 Paleontological Impact Assessments (PIA) for developments in the Free State, KwaZulu-Natal, Eastern 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 Paleontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

### **3 LEGAL MANDATE**

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

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

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

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

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

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

- Basic Assessment Report (BAR) – Regulations 19 and 23
- Environmental Impact 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 (Act 107 of 1998) states that an integrated EMP should (23:2 (b)) “...*identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*”.

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

Paleontological heritage is exceptional and non-renewable and is protected by the NHRA. Paleontological 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 Paleontological 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 Paleontological heritage within the development footprint where:

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





## 4 METHODS AND TERMS OF REFERENCE

This Palaeontological Impact Assessment (PIA) assesses the development's potential impact on the fossil heritage. This Paleontological Assessment is part of the HIA Report. The PIA's goals are to: 1) identify the Paleontological significance of the rock formations in the footprint; 2) evaluate the Paleontological 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 Paleontological Components of Impact Assessment Reports".

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

The Provisional DFFE Screening Tool, the SAHRIS Palaeosensitivity map, all Paleontological 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 Paleontological sensitivity, a field-based assessment may be 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 Paleontological 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 Paleontologically 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 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 Paleontological 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

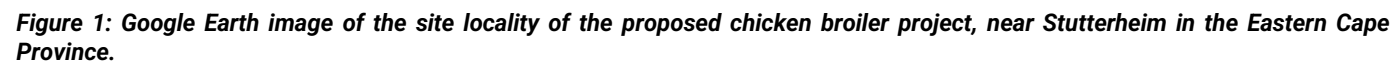
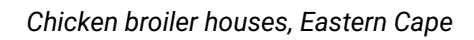


- Detail the implications of specialist findings for the proposed development (such as permits, licenses etc).

#### **4.1 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 Paleontological 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 different locations are utilised to furnish information on the presence of fossils in previously unrecorded areas. When analogous Assemblage Zones and geological formations are utilised for desktop studies, it is typically presumed that exposed fossils are present inside the footprint. A site investigation was conducted for this project to improve on the data of a desktop assessment.





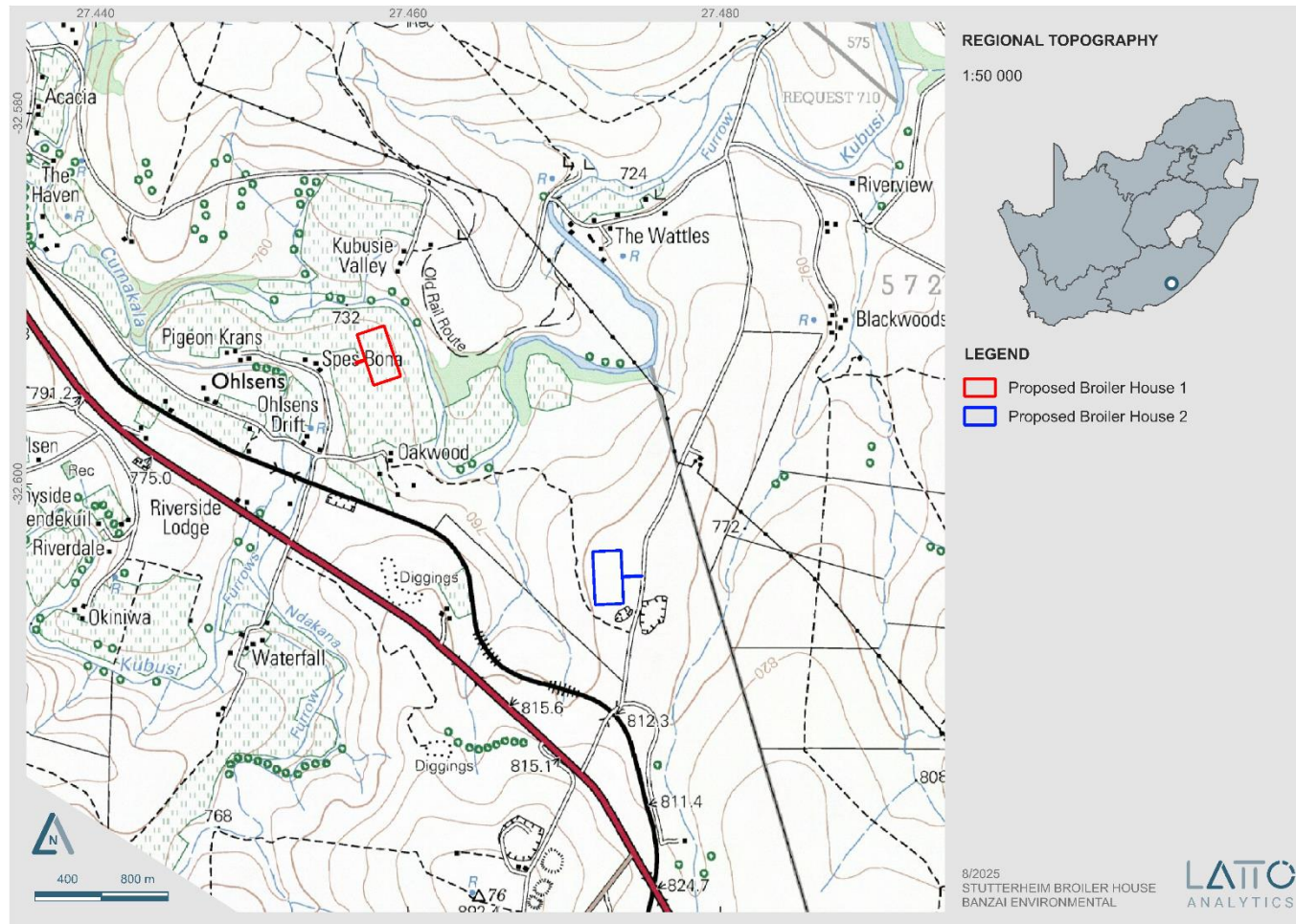


Figure 2: Regional locality of the proposed chicken broiler project near Stutterheim, in the Eastern Cape.



## 5 GEOLOGICAL AND PALEONTOLOGICAL HISTORY

The proposed Stutterheim Chicken broiler project, in the Amahlathi Local Municipality, Eastern Cape is depicted on the 1:250 000 King Williams Town 3226 Geological map (1976) (Council for Geoscience, Pretoria) (**Figure 3; Table 2**). The proposed Chicken broiler project development is underlain by the Late Permian Balfour Formation (Pub, green, Adelaide Subgroup, Beaufort Group, Karoo Supergroup). According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Paleontological Sensitivity of the Balfour Formation is Very High (**Figure 4, Table 3**; Almond and Pether, 2009; Almond *et al.*, 2013, Groenewald *et al* 2014). The suggested location is also classified as having a Very High Paleontology Theme Sensitivity in the DFFE Screening Report (**Figure 5**).

The Beaufort Group forms the third main subdivision of the Karoo Supergroup and overlies the Ecca Group. It was deposited in the Karoo Basin from the Middle Permian to the early Middle Triassic (Rubidge 1995; Smith *et al.* 2020) and represents the first fully continental sequence of the Supergroup. The Beaufort Group covers an area of approximately 200 000 km<sup>2</sup> in South Africa and is subdivided into the Adelaide Subgroup and the overlying Tarkastad Subgroup (Rubidge 1995).

The Adelaide Subgroup records deposition under humid conditions that supported wet floodplains and high-water tables, interpreted as fluvio-lacustrine environments (Smith *et al.* 2020). It reaches up to 5 000 m in thickness in the southeast of the basin, thinning to about 800 m in the centre and 100–200 m in the north (Rubidge 1995). The succession comprises of alternating greyish-red, bluish-grey, and greenish-grey mudrocks with very fine- to medium-grained lithofeldspathic sandstones. Sandstones are typically multi-storey channel bodies with cut-and-fill features, horizontal lamination, parting lineation, and less common trough cross-bedding or ripple lamination. Mudrocks generally weather blocky and may preserve desiccation cracks, raindrop impressions, and calcareous nodules or concretions (Smith *et al.* 2020).

The floodplains of the Beaufort Group are globally important for documenting the early diversification of land vertebrates and the most complete evolutionary transition from early reptiles to mammals (Kitching 1977, 1978; Keyser *et al.* 1977; Rubidge 1995; Smith *et al.* 2020; Viglietti 2020). The Beaufort has been subdivided into a series of biostratigraphic assemblage zones.

The Balfour Formation is present in the development footprint, specifically the *Daptocephalus Assemblage Zone* (DAZ) (Viglietti 2020). The DAZ is characterised by the co-occurrence of the dicynodont *Daptocephalus leoniceps*, the therocephalian *Theriognathus microps*, and the cynodont *Procynosuchus delaharpeae* (Viglietti 2020). It is further divided into two subzones:

- The **Dicynodon–Theriognathus Subzone**, dominated by *Dicynodon*, *Theriognathus*, and *Daptocephalus*.

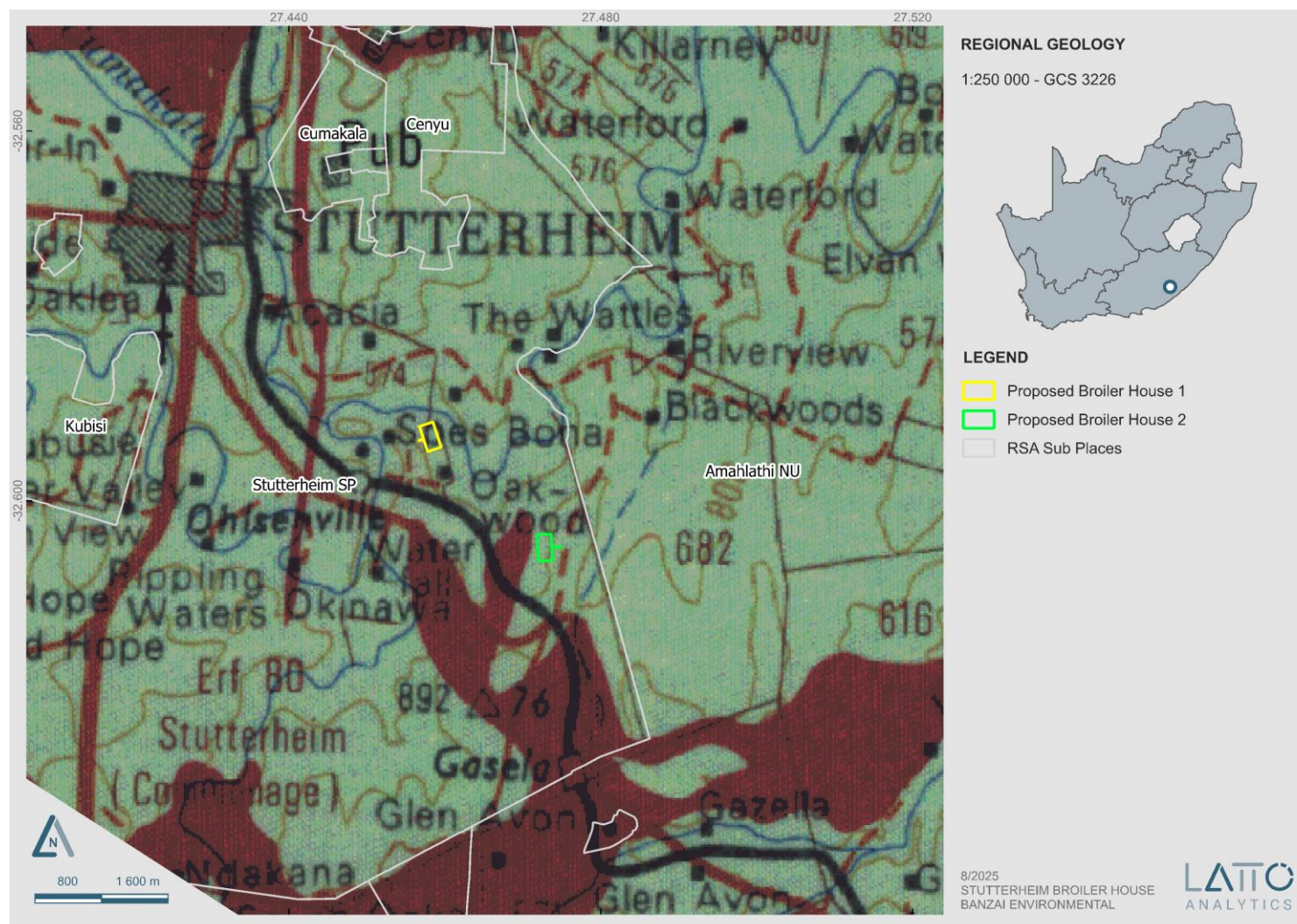


- The *Lystrosaurus maccaigi*–*Moschorhinus* Subzone, defined by *Lystrosaurus maccaigi*, *Daptocephalus*, and *Moschorhinus kitchingi* (Viglietti 2020).

The DAZ represents one of the most diverse vertebrate faunas of the Beaufort Group, including dicynodonts, biarmosuchians, gorgonopsians, therocephalians, and cynodonts, along with rarer captorhinid reptiles, amphibians, fish, and trace fossils. *Glossopteris flora* is also recorded (Kitching 1977; Rubidge 1995).

The DAZ extends into the lower Palingkloof Member of the Upper Balfour Formation, a horizon of special importance as it directly precedes the end-Permian mass extinction (Smith et al. 2020; Viglietti 2020). The overlying *Lystrosaurus declivis* Assemblage Zone (AZ) of the Katberg Formation records the post-extinction recovery fauna. It is characterised by the dicynodont *Lystrosaurus* and the reptile *Procolophon*, with decreased amount of captorhinids but a distinctive presence of oversized amphibians. Fossil fish, millipedes, and diverse trace fossils are also known, although overall diversity is much reduced compared to pre-extinction assemblages (Kitching 1978; Smith et al. 2020).





**Figure 3: Extract of the 1:250 000 King William's Town 3226 (1976) Geological map (Council for Geoscience, Pretoria) indicates that the proposed development is underlain by the Balfour Formation (Pub, green) of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup).**

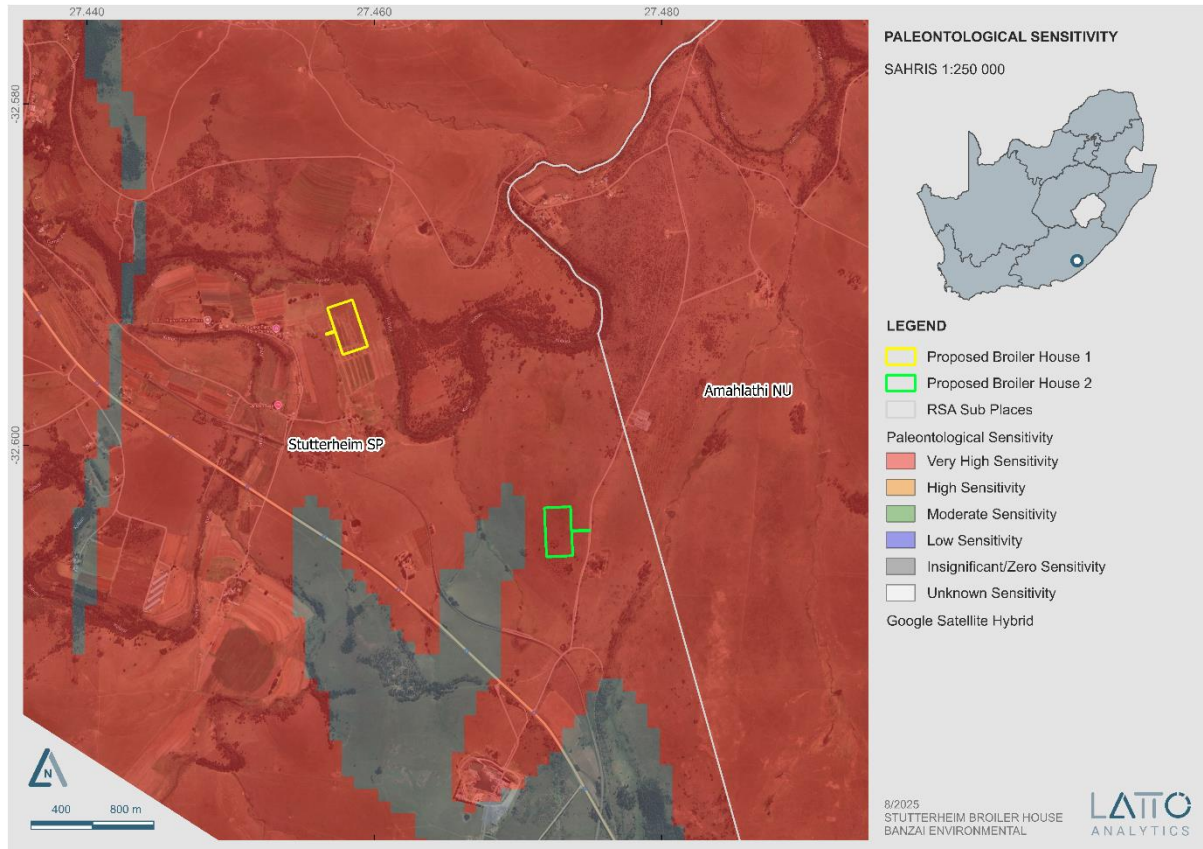




**Table 2: Legend of the 1:250 000 King William's Town 3226 Geological map (1976) (Council of Geoscience, Pretoria).**

**Relevant formation is indicated in a red polygon.**

GEOLOGIESE LEGENDE			GEOLOGICAL LEGEND		
SENOZOÏKUM CENOZOIC	KWATERNÊR QUATERNARY	Qa	Alluvium, kolluvium Alluvium, colluvium		
		Qs	Sand, duine en duingesteente Sand, dunes and dune rock		
MESOZOÏKUM MESOZOIC	JURA JURASSIC	Jd	Doleriet Dolerite		
	ONDER TRIAS LOWER TRIASSIC	Rib	"Rooi" en grys moddersteen, sandsteen "Red" and grey mudstone, sandstone	Formasie Burgersdorp Burgersdorp Formation	Subgroep Tarkastad Tarkastad Subgroup
		Rik	Sandsteen Sandstone	Formasie Katberg Katberg Formation	
PALEOZOÏKUM PALAEOZOIC	BO PERM UPPER PERMIAN	Pub	Grys moddersteen, skalie, sandsteen Grey mudstone, shale, sandstone	Formasie Balfour Balfour Formation	Subgroep Adelaide Adelaide Subgroup
		Pum	Grys en "rooi" moddersteen, sandsteen Grey and "red" mudstone, sandstone	Formasie Middleton Middleton Formation	
					GROEP BEAUFORT BEAUFORT GROUP



**Figure 4: Extract of the SAHRIS PalaeoMap (Council for Geoscience, Pretoria) indicating the Very High (red) Paleontological Sensitivity of the proposed study area in the Eastern Cape Province.**

The SAHRIS PalaeoMap (Figure 4) indicates a Very High (red) Paleontological Sensitivity which is in agreement with the DFFE Screening Tool (Figure 5). A site investigation was conducted for the project in August 2025. No fossiliferous outcrop was identified in the development footprint. The Very High Paleontological Sensitivity of the SAHRIS PalaeoMap (Figure 4) and DEFFE Screening Report (Figure 5) is thus in contested with the actual findings in the field.

**Table 3: Paleontological 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 Paleontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no Paleontological 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.



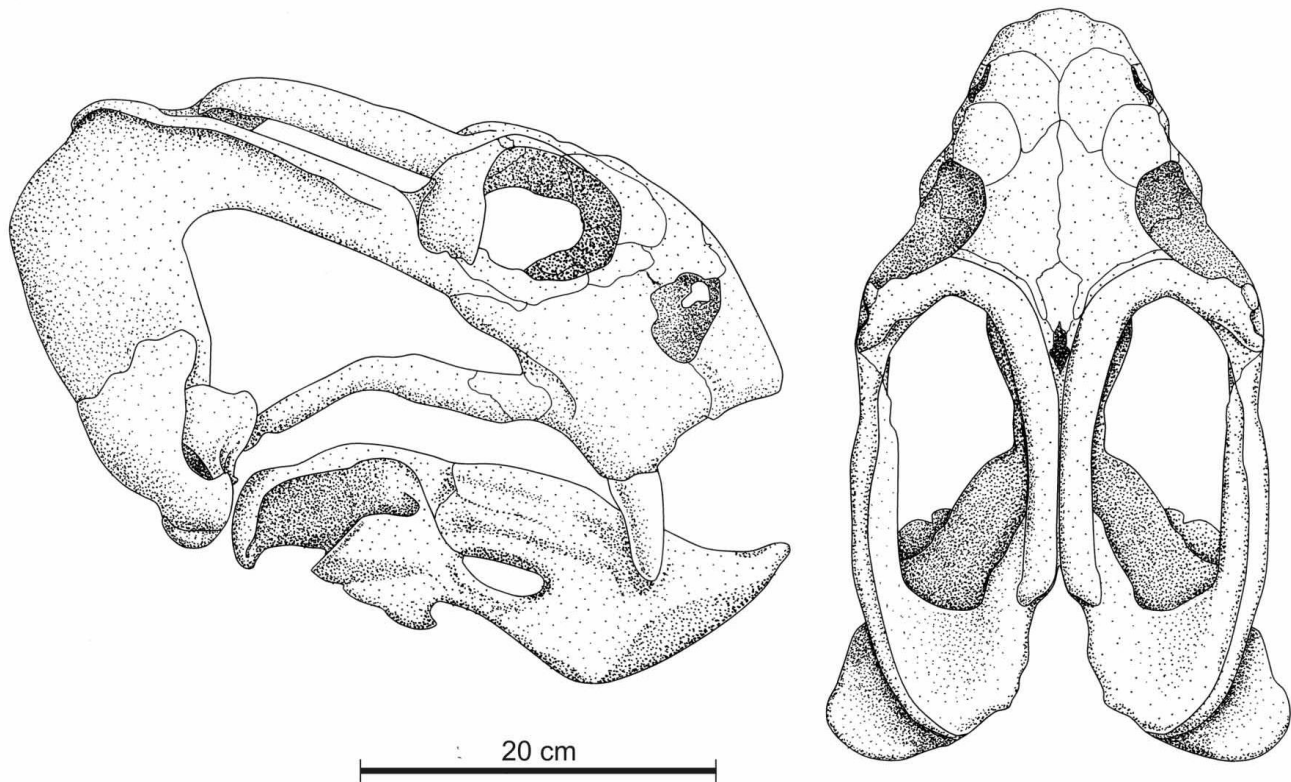
Age	Gp	West of 24° E		East of 24° E	Free State / KwaZulu-Natal	Vertebrate Assemblage Zones	Vertebrate Subzones
JURASSIC	STORMBERG			Drakensberg Gp	Drakensberg Gp	Massospondylus	
				Clarens Fm	Clarens Fm		
				upper Elliot Fm	upper Elliot Fm		
				lower Elliot Fm	lower Elliot Fm	Scalenodontoides	
TRIASSIC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

Figure 5: 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.

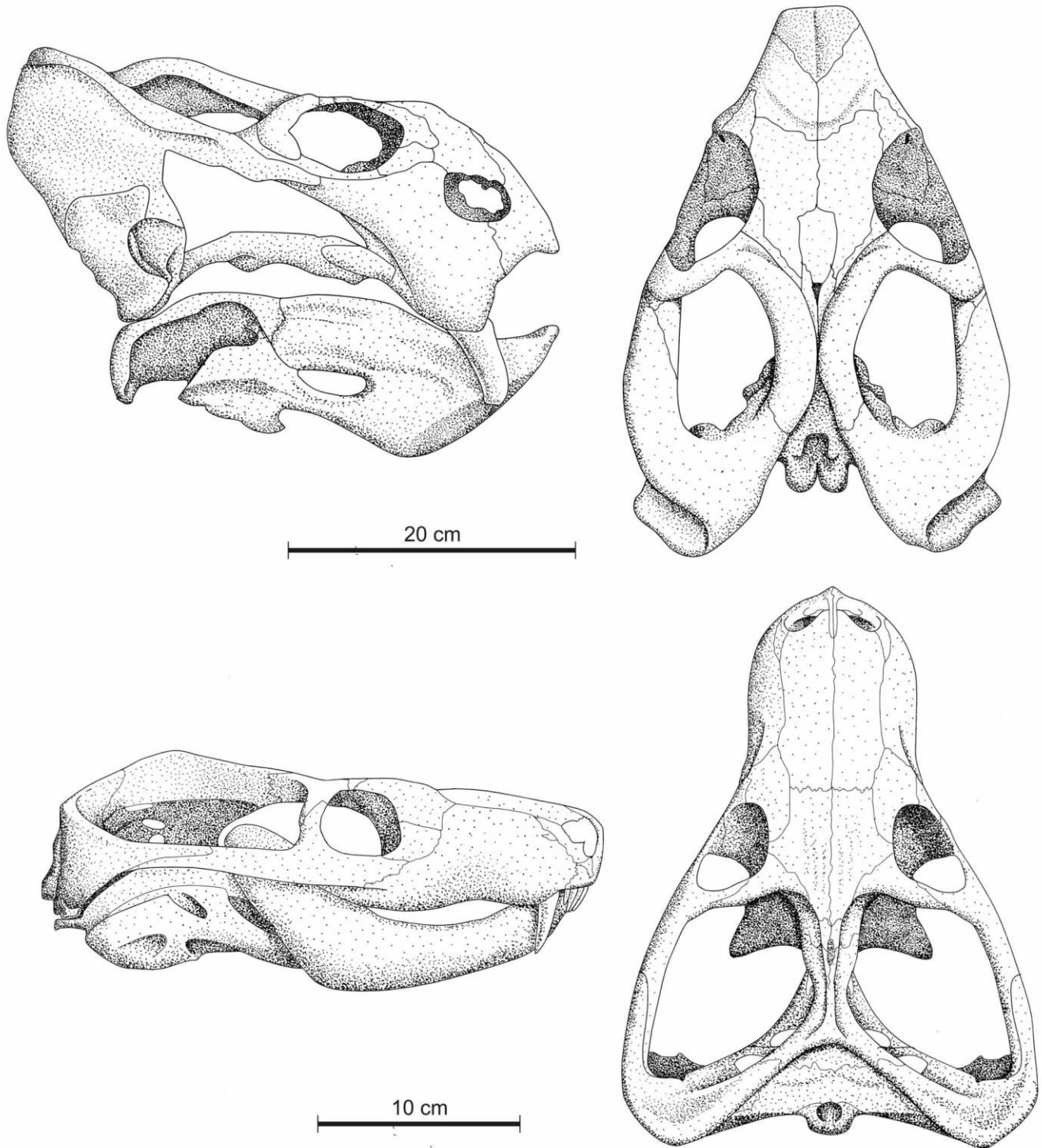
Wavy lines indicate unconformities. (PLYCSR=Pelycosauria and MAMMFES+Mammaliaformes. Gp=group, Subgp=Subgroup, Fm=Formation, M=Member)

The proposed broiler development is indicated by the red polygon

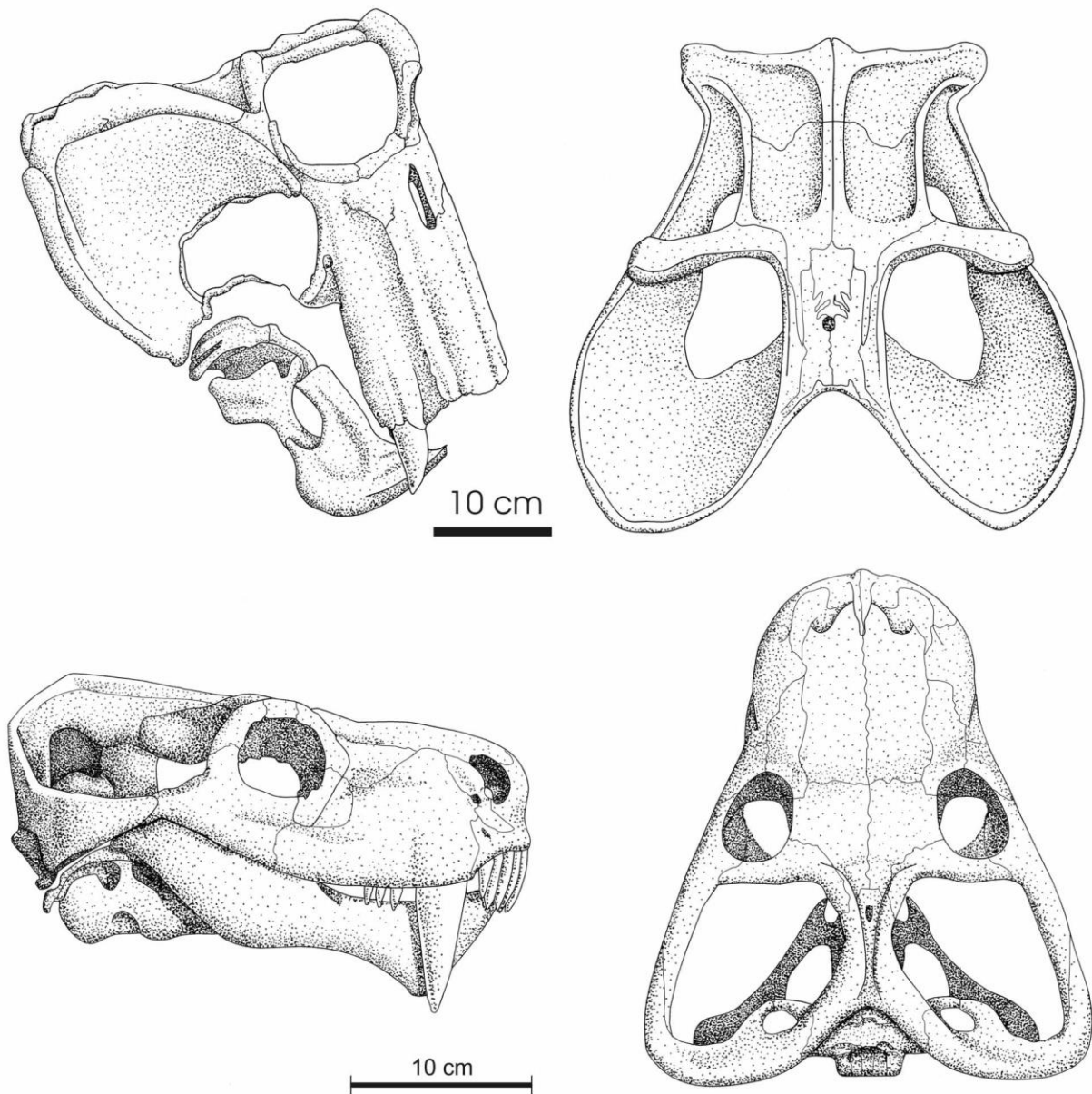


**Figure 6: Lateral and dorsal views of skull of the dicynodont *Daptocephalus leoniceps*, the main biozone defining fossil (Image taken from Viglietti, 2020) and dorsal views (Image taken from Viglietti, 2020).**



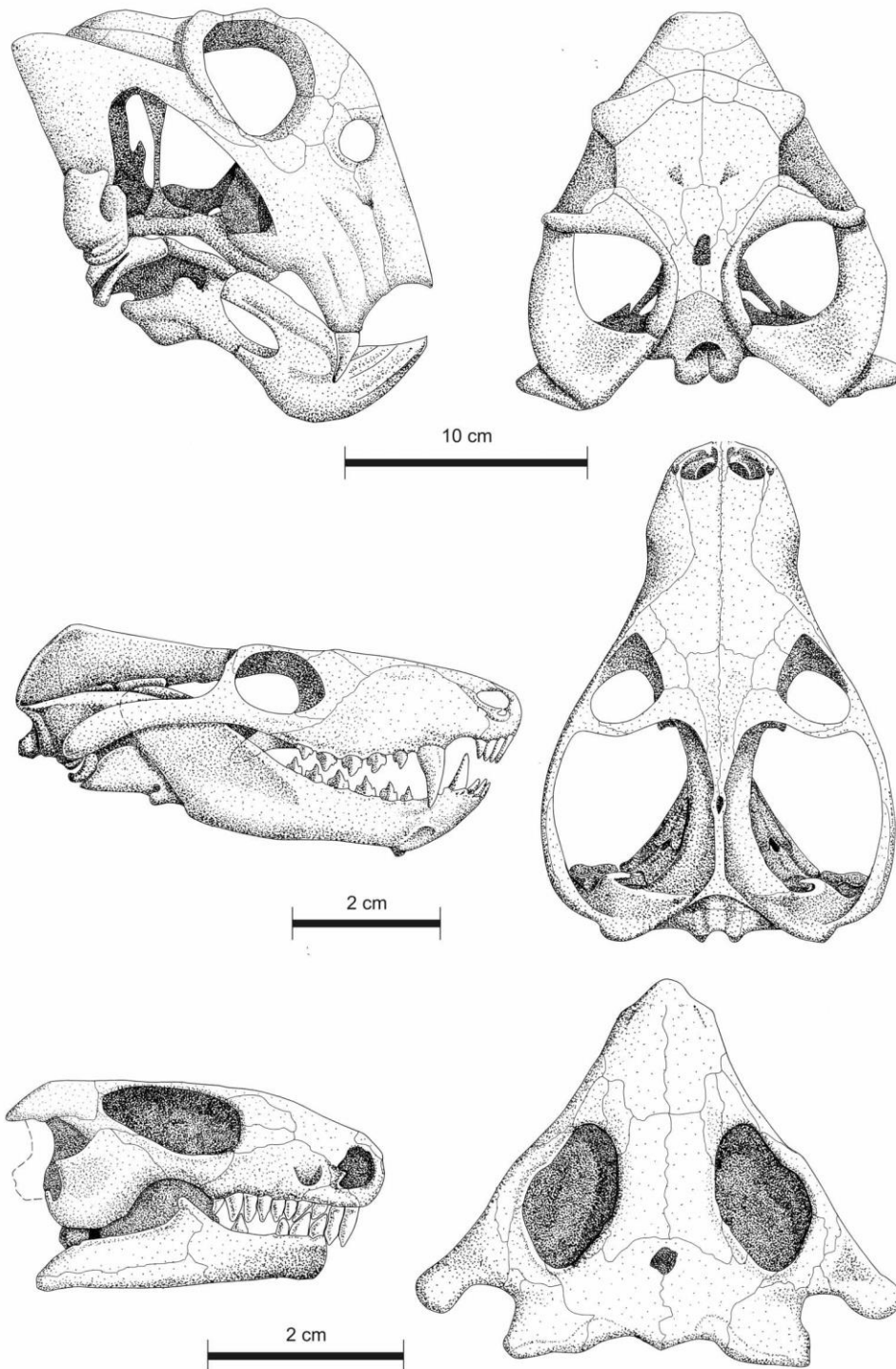


**Figure 7: Skulls of the biozone defining fossils of the Dicynodon-Theriognathus Subzone in lateral and dorsal views. *Dicynodon lacerticeps* (top), *Theriognathus microps* (bottom) (Image taken from Viglietti, 2020).**



**Figure 8: Biozone defining fossils of the *Lystrosaurus maccaigi*- *Moschorhinus* Subzone. The skulls of the *Lystrosaurus maccaigi* (top) and *Moschorhinus kitchingi* (bottom) in lateral view (Image taken from Viglietti, 2020).**





**Figure 9: Lateral and dorsal views of the index taxa defining the *Lystrosaurus declivis* Assemblage Zone (top) *Lystrosaurus declivis*, (centre) *Thrinaxodon liorhinus*, (bottom) *Procolophon trigoniceps* (Image taken from Botha and Smith, 2020).**





## 6 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- A Google Earth map with polygons of the proposed development was obtained from Indwe Environmental Consulting.
- Palaeosensitivity map on SAHRIS (South African Heritage Resources Information System) website
- The DFFE's National Environmental Web-based Screening Tool Report.
- A 1-day site-specific field survey of the development footprint for the project was conducted on foot and motor vehicle on 19 August 2025.
- 1: 250 000 King William's Town 3226 Geological map (1976) (Council of Geoscience, Pretoria)
- Impact Assessments in the area include the following:
  - Almond, J. E. (2010). Palaeontological Heritage Assessment of the Coega IDZ, Eastern Cape Province. In: Cape Town: Natura Viva cc, pp. 41-111.
  - Almond, J. E. (2014). Palaeontological Heritage Basic Assessment: Desktop Study: Proposed RE Capital 3 Solar Development on the property Dyason's Klip near Upington, Northern Cape. Cape Town: Natura Viva.
  - Nel, R. 2024. Palaeontological Impact Assessment of the Proposed Chicken Layer and Hatchery Facility on the Farm Grassdale 729, Stutterheim, Eastern Cape.

## 7 SITE VISIT

A one-day non-intrusive field survey of the development footprint was conducted on 19 August 2025 by foot and vehicle. Dense vegetation and limited bedrock exposure restricted observation and access. The site was located using GPS data from Google Earth, and survey coordinates were mapped to document palaeontological resources. No fossiliferous outcrops were observed. Site 1 shows evidence of agricultural activity, while Site 2 is densely vegetated.



**Figure 10: General view over site 1 indicates evidence of agricultural activities.**





**Figure 11: View chicken broiler site 2 indicates vegetation with no surface rocky outcrops.**

## 8 IMPACT ASSESSMENT METHODOLOGY

The impact assessment and mitigation identify and evaluates the significance of potential impacts according to the assessment criteria. The impact assessment methodology will furthermore describe the factors involved in assessing the significance of impacts and the standard rating scale that has been defined. Notably, the scale is defined since impacts have a number of parameters that need to be assessed.

Nevertheless, the nature of impact on the environment is also important in understanding the interaction between a planned project activity and the receiving environment. Table below outlines the type or nature of impact as well as its definition

**Table 4: The rating system**

<b>NATURE</b>		
The Nature of the Impact is the possible destruction of fossil heritage		
<b>GEOGRAPHICAL EXTENT</b>		
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.
<b>PROBABILITY</b>		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
<b>DURATION</b>		
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.
<b>INTENSITY/ MAGNITUDE</b>		
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 are 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 results 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: <b>(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity = X.</b> The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
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 is 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

**Table 5: Summary of Impacts**

PALEONTOLOGICAL								
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	Extent	1	1	Positive low impact	Positive low impact	NONE	YES	YES
	Probability	1	1					
	Reversibility	1	1					
	Irreplaceability	1	1					
	Duration	1	1					
	Cumulative Effect	1	1					
	Magnitude	1	1					
	Impact Significance	6	6					
CONSTRUCTION PHASE	Extent	1	1	Negative Very High impact	Negative low impact	NONE	NO	YES
	Probability	4	1					
	Reversibility	4	4					
	Irreplaceability	4	4					
	Duration	4	4					
	Cumulative Effect	1	1					
	Magnitude	4	1					





	Impact Significance	72	15					
OPERATIONAL PHASE	Extent	1	1	Positive low impact	Positive low impact	NONE	YES	YES
	Probability	1	1					
	Reversibility	1	1					
	Irreplaceability	1	1					
	Duration	1	1					
	Cumulative Effect	1	1					
	Magnitude	1	1					
	Impact Significance	6	6					
DECOMMISSIONING PHASE	Extent	1	1	Positive low impact	Positive low impact	NONE	YES	YES
	Probability	1	1					
	Reversibility	1	1					
	Irreplaceability	1	1					
	Duration	1	1					
	Cumulative Effect	1	1					
	Magnitude	1	1					
	Impact Significance	6	6					

## 9 CONCLUSION AND SUMMARY

### 9.1 Summary of findings

The proposed chicken broiler project is underlain by the **Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup)**. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the **Paleontological Sensitivity** of the Balfour Formation (Adelaide Subgroup (Beaufort Group, Karoo Supergroup) is **Very High**. The suggested location is also classified as having a **Very High Paleontology Theme Sensitivity in the DFFE** (Department of Forestry, Fisheries and the Environment) Screening Report.

A site-specific field survey of the total development footprint was conducted on foot and by motor vehicle on 19 August 2025. **No fossiliferous outcrop** was identified during the site investigation. Combined desktop research (National Database and published data) and field observations indicate that fossils of scientific or conservation value in the area are rare, sporadic, and unpredictable. The development footprint was rated as **Very High significance pre-mitigation and Low post-mitigation**. This **contrasts** with the Very High Palaeontological Sensitivity assigned by SAHRIS and the DFFE Screening Report.

The construction phase will be the only development phase impacting Paleontological Heritage and **no significant impacts are expected to impact the Operational and Decommissioning phases**. The No-Go Alternative considers the option of 'do nothing' and maintaining the status quo, will have a Neutral impact on the Paleontological Heritage of the development. The **Cumulative impacts of the development are considered to be medium pre- mitigation and Low post mitigation and falls within the acceptable limits for the project**. It is therefore considered that the proposed development will not lead to damaging impacts on the Paleontological resources of the area. **The construction of the development may thus be permitted in its whole extent, as the development footprint is not considered sensitive in terms of**



**Paleontological resources.** It is consequently recommended that no further Paleontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

**Recommendations:**

- The ECO for this project must be informed that the Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup) has a **Very High Paleontological Sensitivity**.
- If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations, the **Chance Find Protocol** must be implemented by the ECO/site manager in charge of these developments. These discoveries ought to be protected (if possible, *in situ*). The ECO/site manager must **report to ECPHRA** (Contact details: 16 Commissioner Street, East London, EC Lungiswa Mzazi - lungiswam@ecphra.org.za / (043) 492 1942 / 081 434 3544 or Ayanda Mncwabe-Mama - ayanda.mncwabe-mama@ecsrac.gov.za / (043) 492 1370) so that a palaeontologist can carry out mitigation (collection and recording).
- 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 Paleontological impact studies proposed by SAHRA (2012).

These recommendations should be incorporated into the Environmental Management Programme (EMPr) for the proposed chicken broiler project in the Eastern Cape.

## Impact Statement

If the recommended mitigation measures are strictly implemented, the proposed chicken broiler Project is not expected to result in detrimental impacts on the Paleontological resources of the area. **From a Paleontological perspective, the construction of the development may therefore be authorised in its entirety.**

## 10 MITIGATION AND EMPr REQUIREMENTS

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 construction sites. It describes the actions to be taken when mining or construction activities accidentally uncovers fossil material.





It is the responsibility of the Environmental Control Officer (ECO) or site manager, with the guidance of the Environmental Control Officer (ECO), 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 ECO, 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.

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

## 10.1 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 Paleontological objects and material, meteorites and rare geological specimens"*.

Paleontological heritage is unique and non-renewable and is protected by the NHRA, and are the property of the State. It is thus the responsibility of the State to manage and conserve fossils on behalf of the citizens of South Africa. **Paleontological 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.**

## 10.2 Chance Find Procedure

- If a chance find is made, the person responsible for the find must immediately **stop working** and all work that could impact that finding must cease in the immediate vicinity of the find.
- The person who made the find must immediately **report** the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or site manager. The ECO must report the find to **ECPHRA** (Contact details: 16 Commissioner Street, East London, EC Lungiswa Mzazi - lungiswam@ecphra.org.za / (043) 492 1942 / 081 434 3544 or Ayanda Mncwabe-Mama - ayanda.mncwabe-mama@ecsrac.gov.za / (043) 492 1370) so that a palaeontologist can carry out mitigation (collection and recording). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS coordinates.
- 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 ECO whether a rescue excavation or rescue collection by a palaeontologist is necessary. The ECO will communicate the need for a rescue excavation or rescue collection by a palaeontologist to the ESO or site manager.
- 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 ECO. 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 the Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

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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

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

Elize Butler has conducted approximately **850** Paleontological 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 Paleontological Society of South Africa (PSSA) since 2006 and has been conducting PIAs since 2014.

#### MEMBERSHIP

Paleontological Society of South Africa (PSSA) 2006-currently.

A full CV is available on request.