

**PALAEONTOLOGICAL FIELD ASSESSMENT FOR THE REZONING AND SUBDIVISION,
OF PORTION 10 OF FARM 809, EAST LONDON**

**Prepared for:
Imithi Services**

**Prepared by:
BANZAI ENVIRONMENTAL (PTY) LTD
7 February 2020**

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:

CONTACT PERSON:

Banzai Environmental (Pty) Ltd

Elize Butler

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Email: elizebutler002@gmail.com

SIGNATURE:

A handwritten signature in black ink, appearing to read 'Elize Butler', is positioned to the right of the 'SIGNATURE:' label.

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

Table 1:NEMA requirements

NEMA Regs (2014) - Appendix 6	Relevant section in report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page ii and iii of Report – Contact details and company and Appendix A
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page ii
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 4 – Objective
(cA) an indication of the quality and age of base data used for the specialist report;	Section 5 – Geological and Palaeontological history
(B) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10
d) the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1 and 9
e) a description of the methodology adopted in preparing the report or carrying out the specialized process inclusive of equipment and modeling used;	Section 7 Approach and Methodology
f) details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 1 and 5
g) an identification of any areas to be avoided, including buffers;	Not identified, Section 11
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	Section 7.1 –

NEMA Regs (2014) - Appendix 6	Relevant section in report
or gaps in knowledge;	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 or activities;	Section 11
k) any mitigation measures for inclusion in the EMPr;	Section 11
l) any conditions for inclusion in the environmental authorization;	Section 12
m) any monitoring requirements for inclusion in the EMPr or environmental authorization;	N/A
n) a reasoned opinion- <ul style="list-style-type: none"> i. as to whether the proposed activity, activities or portions thereof should be authorized; <ul style="list-style-type: none"> (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan; 	Section 11
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable.
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable.
q) any other information requested by the competent authority.	Not applicable.
2) Where a government notice <i>gazetted</i> 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 Imithi Services to conduct the Palaeontological Field Assessment to assess the proposed rezoning and subdivision of Portion 10 of Farm 809, East London. The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA) declares that a Palaeontological Impact Assessment (PIA) is key to verify the presence of fossil material within the planned development. This Assessment is thus necessary to evaluate the effect of the construction on palaeontological resources.

The proposed development, East London is underlain within the Late Permian sedimentary rocks of the Balfour Formation, Adelaide Subgroup, (Beaufort Group of the Karoo Supergroup). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Balfour Formation is Very High (Almond and Pether 2008, SAHRIS website).

A day site specific field survey of the development footprint was conducted on foot and by motor vehicle on 26 January 2020. No fossiliferous outcrop was found in the proposed development area and the development was covered by dense vegetation. For this reason, an overall low palaeontological sensitivity is allocated to the development footprint. The apparent rarity of fossil heritage at the proposed development footprint suggests that the impact of the development in East London will be of a low significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to damaging impacts on the palaeontological heritage 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 palaeontological resources.

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*) and the ECO/site manager must report to SAHRA [Contact details:

Eastern Cape Provincial Heritage Resources Authority (ECPHRA); Corner Scholl and Amalinda Drive, East London, 5247. Tel: 043 745 0888. Fax: 043 7450889, info@ecphra.org.za, Web: www.sahra.org.za) so that mitigation can be carry out by a paleontologist.

TABLE OF CONTENT

1	INTRODUCTION	1
2	QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR	2
3	LEGISLATION.....	4
3.1	National Heritage Resources Act (25 of 1999)	4
4	OBJECTIVE.....	4
5	GEOLOGICAL AND PALAEONTOLOGICAL HISTORY.....	6
6	GEOGRAPHICAL LOCATION OF THE SITE.....	12
7	METHODS.....	13
7.1	Assumptions and Limitations	13
8	ADDITIONAL INFORMATION CONSULTED	13
9	SITE VISIT	13
10	IMPACT ASSESSMENT METHODOLOGY.....	16
10.1	Summary of Impact Tables	21
11	FINDINGS AND RECOMMENDATIONS.....	22
12	CHANCE FINDS PROTOCOL.....	22
12.1	Legislation	22
12.2	Background	23
12.3	Introduction	23
12.4	Chance Find Procedure	23
13	REFERENCES	24

List of Figures

<i>Figure 1: Google Earth Image (2019) , East London, indicated in purple.</i>	<i>1</i>
<i>Figure 2: Close-up Google Earth Image (2019) , East London, indicated in purple.....</i>	<i>2</i>
<i>Figure 3: Extract of the 1: 50000, 3227 DD Cambridge topographical map indicating the location of the proposed development in purple. Map drawn by QGIS 2.18.28.</i>	<i>3</i>
<i>Figure 4: Extract of the 1:250 000 3226 King William’s Town Geological map (Council of Geoscience) of the proposed development in East London. The proposed development is indicated in orange. The proposed development is located within the Late Permian sedimentary rocks of the Balfour Formation, Adelaide Subgroup (Beaufort Group of the Karoo Supergroup).....</i>	<i>9</i>
<i>Figure 5: Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions of the Bea</i>	<i>10</i>
<i>Figure 6: Therapsid skulls known from the Daptocephalus AZ (Keyser & Smith 1977-1978) Cynosaurus and Rubidgea are carnivorous gorgonopsians while Whaitsia (renamed to</i>	

Theriognathus) is a predatory therocephalian and *Ictidosuchoides* is an insectivore. Dicynodont herbivores include *Diictodon*, *Oudenodon*, *Dicynodon* and *Diademodon*..... 11

Figure 7: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences). Approximate location of the proposed development is indicated in green. 12

Figure 8: Dense vegetation on the southern border of the development footprint. 14

Figure 9: Dense groundcover without any sign of outcrops. GPS coordinates 32° 56" 30'S 27° 57" 56'E 15

Figure 10: Dense groundcover and natural vegetation without any sign of outcrops..... 16

List of Tables

Table 1:NEMA requirements iv

Table 2: Adelaide Subgroup (modified Johnson 2006)..... 7

Table 3: Significance Rating Table 17

Table 4:Impact Severity Rating..... 17

Table 5:Overall Significance Rating..... 18

Table 6:Impacts resulting from the Construction phase of the proposed activities and alternatives.20

Table 7: Impacts resulting from the Operation phase of the proposed activities and alternatives20

Appendix A: CV

1 INTRODUCTION

Wenah Trading (Pty) Ltd employed Imithi Services to begin the necessary Basic Assessment Report (BAR) to acquire Environmental Authorization for the rezoning and subdivision of Portion 10 of Farm 809, East London (Figure 1-3). Banzai Environmental was in turn appointed by Imithi Services to conduct the **Palaeontological Field Assessment (PIA)** to assess the Palaeontological Heritage on the proposed development footprint.

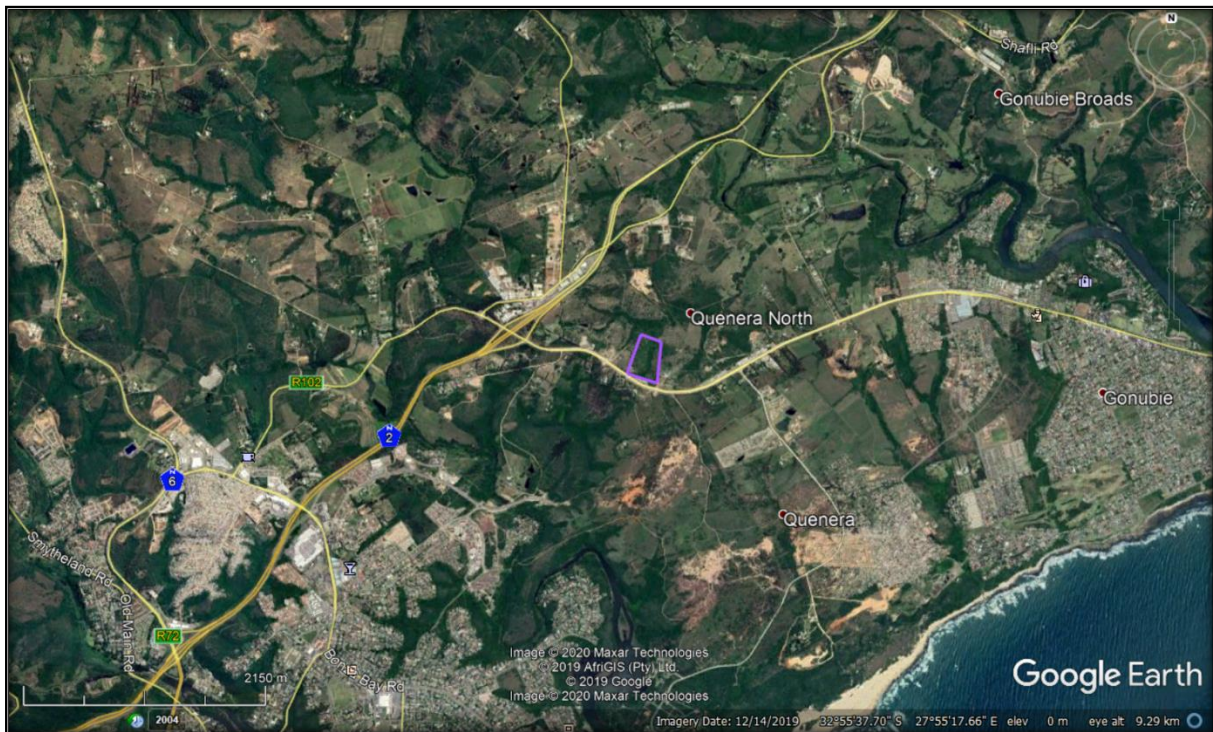


Figure 1: Google Earth Image (2019) of Portion 10 of Farm 809, East London, indicated in purple.

The client intends to subdivide the property into zones for business, residential and warehousing development. A related subdivision and rezoning application (change in land-use) for Portion 10 of Farm 809, was proposed in 2006 and was authorized on 17 May 2006 in accordance with the Environment Conservation Act, Act 73 of 1989 (Ref. No.: 1/7/2/3/05). The existing application will be submitted to obtain Environmental Authorization in terms of the National Environmental Management Act (Act 107 of 1998). The planned expansion complies with Land Use Restrictions as set forth in the Buffalo City Zoning Scheme Regulations.

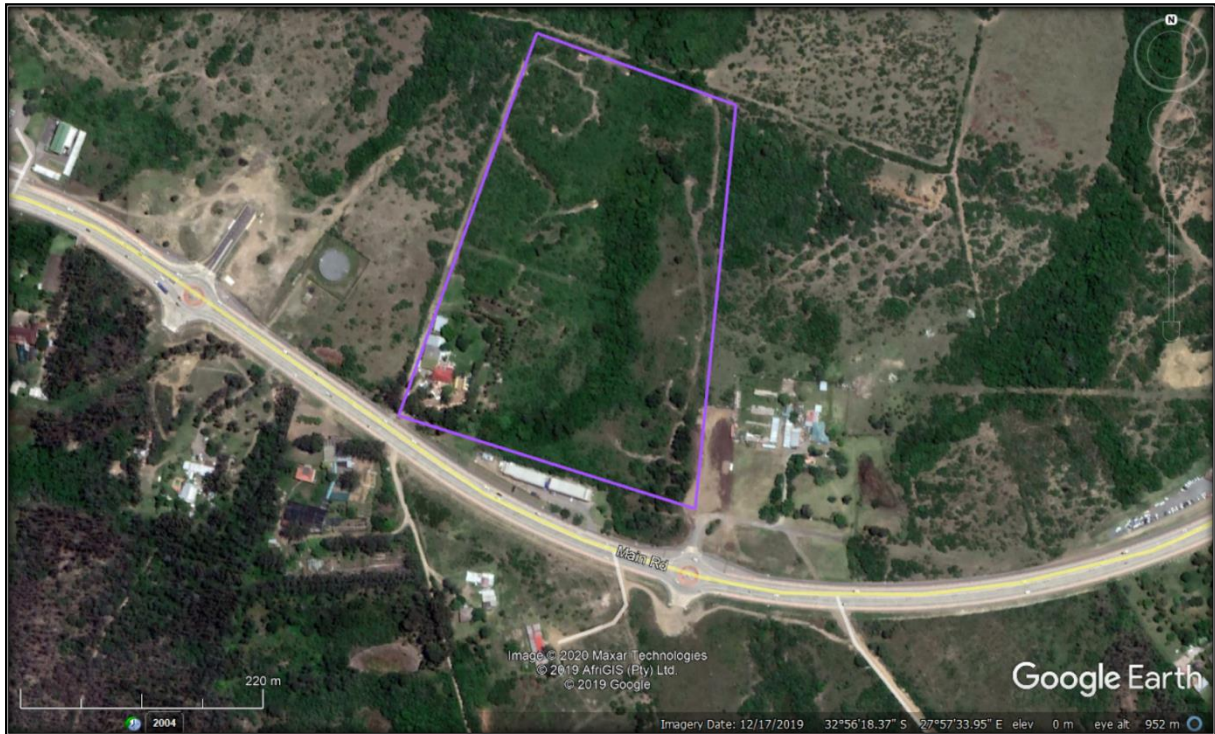


Figure 2: Close-up Google Earth Image (2019), of Portion 10 of Farm 809, East London, indicated in purple.

¹Information provided by Imithi Services

2 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty-six years. She has extensive experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the Karoo Basin. She has been a member of the Palaeontological Society of South Africa for 14 years and has been conducting PIAs since 2014.

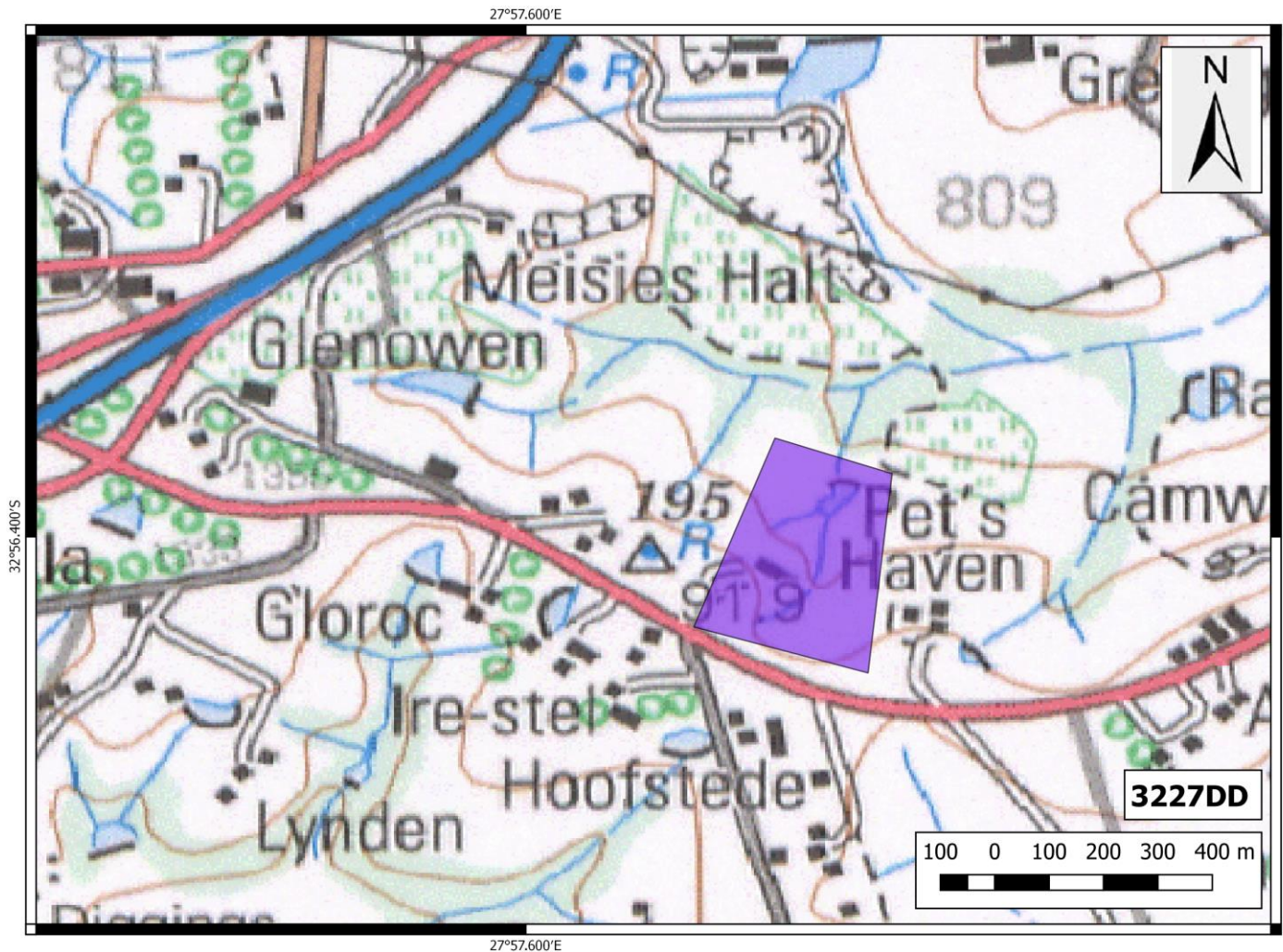


Figure 3: Extract of the 1: 50000, 3227 DD Cambridge topographical map indicating the location of the proposed development in purple. Map drawn by QGIS

2.18.28.

3 LEGISLATION

3.1 National Heritage Resources Act (25 of 1999)

National Heritage Resources Act (25 of 1999)

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

Palaeontological heritage is exceptional and non-renewable and is protected by the NHRA. Palaeontological resources and may not be unearthed, broken moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

This Palaeontological Impact assessment forms part of the Heritage Impact Assessment (HIA) and adhere to the conditions of the Act. According to **Section 38 (1)**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint where:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- the construction of a bridge or similar structure exceeding 50 m in length;
- any development or other activity which will change the character of a site—
- (exceeding 5 000 m² in extent; or
- involving three or more existing erven or subdivisions thereof; or
- involving three or more erven or divisions thereof which have been consolidated within the past five years; or
- the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority
- the re-zoning of a site exceeding 10 000 m² in extent;
- or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

4 OBJECTIVE

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

According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the purpose of the PIA are: 1) to **identify** the palaeontological importance of the rock formations in the footprint; 2) to evaluate the palaeontological magnitude of the formations; 3) to determine the **impact** on fossil heritage; and 4) to **recommend** how the property developer should guard against and lessen damage to fossil heritage.

The terms of reference of a PIA are as follows:

General Requirements:

- Adherence to the content requirements for specialist reports in accordance with Appendix 6 of the EIA Regulations 2014, as amended.
- Adherence to all applicable best practice recommendations, appropriate legislation and authority requirements.
- Submit a comprehensive overview of all appropriate legislation, guidelines.
- Description of the proposed project and provide information regarding the developer and consultant who commissioned the study.
- Description and location of the proposed development and provide geological and topographical maps.
- Provide Palaeontological and geological history of the affected area.
- Identification sensitive areas to be avoided (providing shapefiles/kml's) in the proposed development.
- Evaluation of the significance of the planned development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:
 - a. **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity.
 - b. **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity.
 - c. **Cumulative impacts** result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities.
- Fair assessment of alternatives (infrastructure alternatives have been provided):
- Recommend mitigation measures to minimise the impact of the proposed development; and

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

5 GEOLOGICAL AND PALAEOLOGICAL HISTORY

The geology in East London area is recorded on the 1: 250 000 3226 King William's Town Geological Map (Council for Geoscience, Pretoria). The proposed development of Portion 10 of Farm 809, East London is underlain by the Late Permian sedimentary rocks of the Balfour Formation (Fm), Adelaide Subgroup (Beaufort Group of the Karoo Supergroup, Table 2) (Fig. 4-5). The Balfour Fm is represented by the *Daptocephalus Assemblage Zone* (AZ). In the proposed development the Balfour Formation is very poorly exposed. According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Balfour Formation is Very High (Almond and Pether 2008, SAHRIS website).

The planned development is underlain by a series of Karoo mudstones, sandstones and shales, which were deposited under fluvial environments of the Adelaide Subgroup. The Adelaide Subgroup forms part of the Beaufort Group. The Beaufort Group is the third of the main subdivisions of the Karoo Supergroup. This group overlays the Ecca (Figure 5) and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods. The Beaufort Group was deposited on land through alluvial processes. This Group covers a total land surface area of approximately 200 000 km² in South Africa and is the first fully continental sequence in the Karoo Supergroup. The Beaufort Group is divided into the Adelaide and the overlying Tarkastad Subgroup. The Adelaide subgroup rocks are deposited under a humid climate that allowed for the establishment of wet floodplains with high water tables and are interpreted to be fluvio-lacustrine sediments (Johnson *et al* 2006).

In the south eastern portion of the Karoo Basin the Adelaide Subgroup consists of the Koonap, Middleton and Balfour Formations. West of 24° the Adelaide Subgroup is represented by the Abrahamskraal and Teekloof Formations and in the north the Group is represented by the Normandien Formation (Table 1). The Adelaide Subgroup is approximately 5 000 m thick in the southeast, but this decreases to about 800m in the centre of the basin which thins out to about 100 to 200m in the north. The Balfour Formation is approximately 200 m thick. The Abrahamskraal Formation is about 2 500 m thick and the Teekloof Formation 1 000 m. The Normandien Formation is only about 320 m thick.

The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content (Figure 5) (Kitching 1977, 1978; Keyser *et al*, 1977, Rubidge 1995). The formation present in the proposed development is the *Daptocephalus Assemblage Zone* (DAZ) (Rubidge 1995, Smith 2012; Viglietti *et al* 2015).

Table 2: Adelaide Subgroup (modified Johnson 2006)

Period	Supergroup	Group	Subgroup	Formation West of 24° E	Formation East of 24° E	North
Middle Permian - Middle Triassic	Karoo Supergroup	Beaufort Group	Adelaide Subgroup		Balfour Formation	Normandien
				Teekloof Formation	Middleton Formation	
				Abrahamskraal Formation	Koonop Formation	

The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish-grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium grained, grey lithofeldspathic sandstones. In the northern Normandien formation the basin consists of coarse to very coarse sandstones and granulstones. Coarsening-upward cycles are present in the lower part of the Normandien Formation while the mudrocks and sandstone units usually form fining-upward cycles. These cycles are positioned on erosion surfaces which are overlain by thin intraformational mud-pellet conglomerate and vary in thickness from a few meters to tens of meters. Singular sandstone units could vary from 6 meters to 60 meters in the south thinning northwards but thick sandstone units are also present in the northern Normandien Formation (Groenewald 1989, 1990).

The thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and fill features. The sandstones are characterized internally by horizontal lamination together with parting lamination and less frequent trough crossbedding as well as current ripple lamination. The bases of the sandstone units are massive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units. The mudrocks of the Adelaide Subgroup usually has massive and blocky weathering apart from in the Normandien and Daggaboersnek Member (Groenewald 1989, 1990). Sometimes desiccation cracks and impressions of raindrops are present. In the mudstones of the Beaufort Group calcareous nodules and concretions occur throughout.

The flood plains of the Beaufort Group (Karoo Supergroup) are internationally renowned for the early diversification of land vertebrates and provide the worlds' most complete transition from early "reptiles" to mammals. Biotas of the varied *Daptocephalus* Assemblage Zone are of special interest because they provide some of the best information on terrestrial ecosystems immediately preceding the catastrophic end-Permian mass extinction (Gastaldo *et al.* 2005, Rubidge 2005; Smith *et al.* 1993, 2001, 2012). Vertebrate fossils are abundantly found in the sediments of the Beaufort Group {Kitching in Rubidge (1995), and Smith *et al.* (2012)}. The *Daptocephalus* Assemblage Zone is characterized by the presence of the two therapsids namely *Dicynodon* and *Theriongnathus* (Figure 6) and may also include the following specimens: Articulated (as well as

isolated bones and bone fragments) of reptiles like the small millerettids and large pareiasaurs. Examples of dicynodonts include *Aulacephalodon*, *Diictodon*, *Dicynodon* and *Oudenodon*. A few Gorgonopsians and Therocephalians (*Therionathus*) specimens have also been uncovered as well as primitive cynodonts like *Procynosuchus*, and biarmosuchians. Even aquatic vertebrates are represented by temnospondyl amphibians (usually disarticulated *Rhinesuchus*). Palaeoniscoid bony fish (*Atherstonia*, *Namaichthys*) have been uncovered as well as freshwater bivalves. Various trace fossils include coprolites, tetrapod burrows and trackways. Vascular plants are rare compared to the vertebrates but include leaves, roots and petrified woods (“*Dadoxylon*”) of the Glossopteris Flora (Bamford 2000, 2004).



Figure 4: Extract of the 1:250 000 3226 King William's Town Geological Map (Council of Geoscience) of the proposed development of Portion 10 of Farm 809, East London. The proposed development is indicated in orange. The proposed development is located within the Late Permian sedimentary rocks of the Balfour Formation (Pub, green) Adelaide Subgroup (Beaufort Group of the Karoo Supergroup).

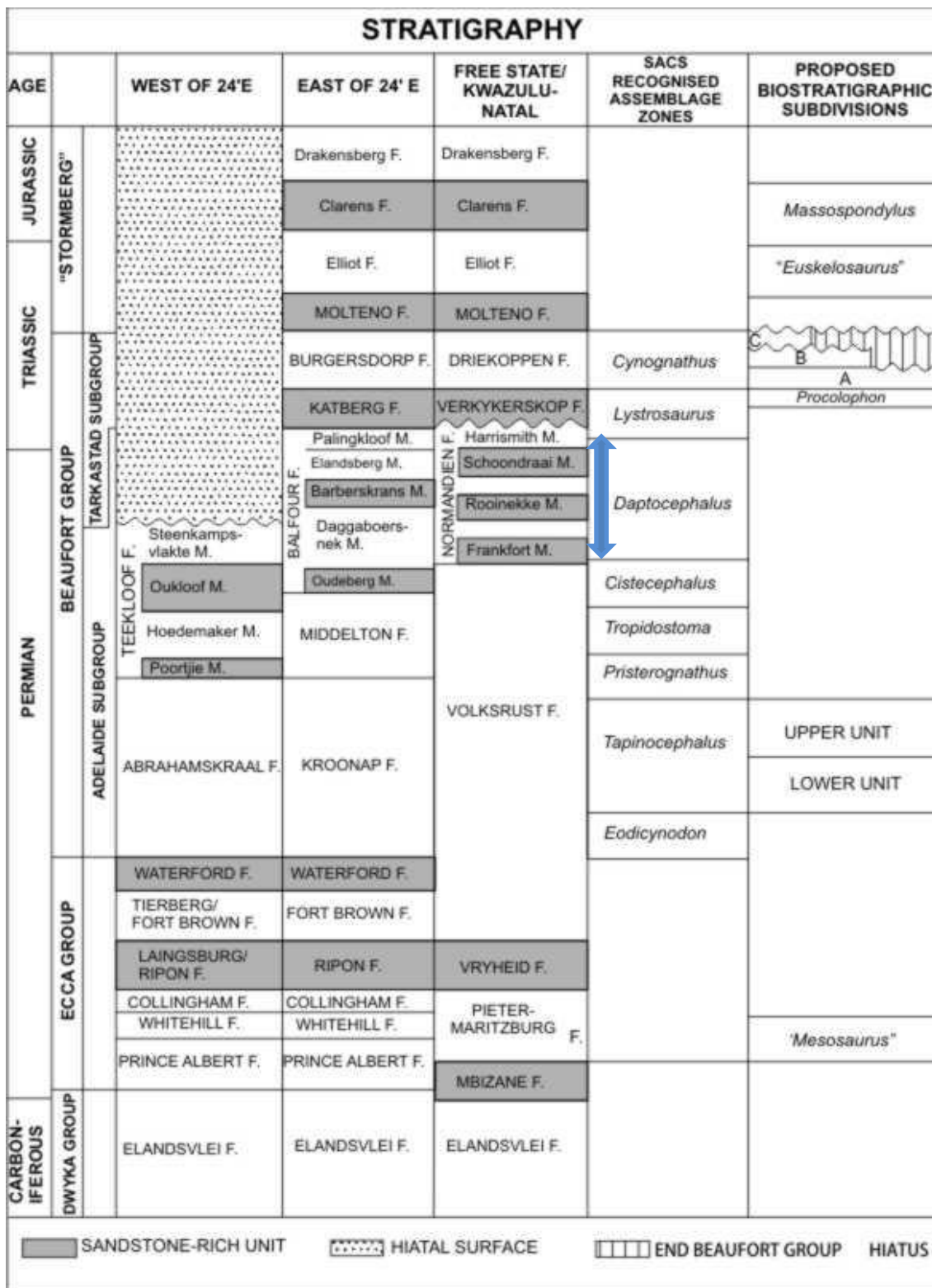


Figure 5: Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions of the Beaufort Group with rock units and fossil assemblage zones relevant to the present study marked in blue (Modified from Rubidge 1995). The subdivisions of the Beaufort Group include the Adelaide and Tarkastad Subgroups and range in age from Late Permian to Middle Triassic. Abbreviations: F. = Formation, M. = Member.

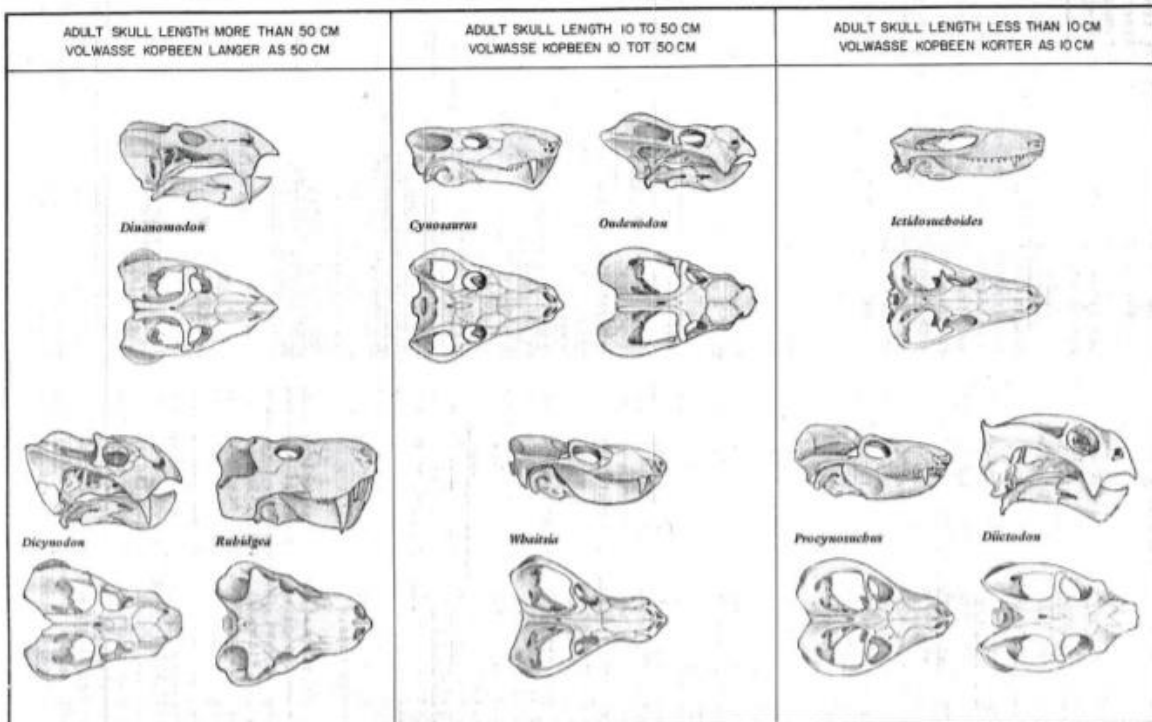


Figure 6: Therapsid skulls known from the *Daptocephalus* AZ (Keyser & Smith 1977-1978) *Cynosaurus* and *Rubidgea* are carnivorous gorgonopsians while *Whaitsia* (renamed to *Theriognathus*) is a predatory therocephalian and *Ictidosuchoides* is an insectivore. Dicanodont herbivores include *Diictodon*, *Oudenodon*, *Dicanodon* and *Diademodon*.

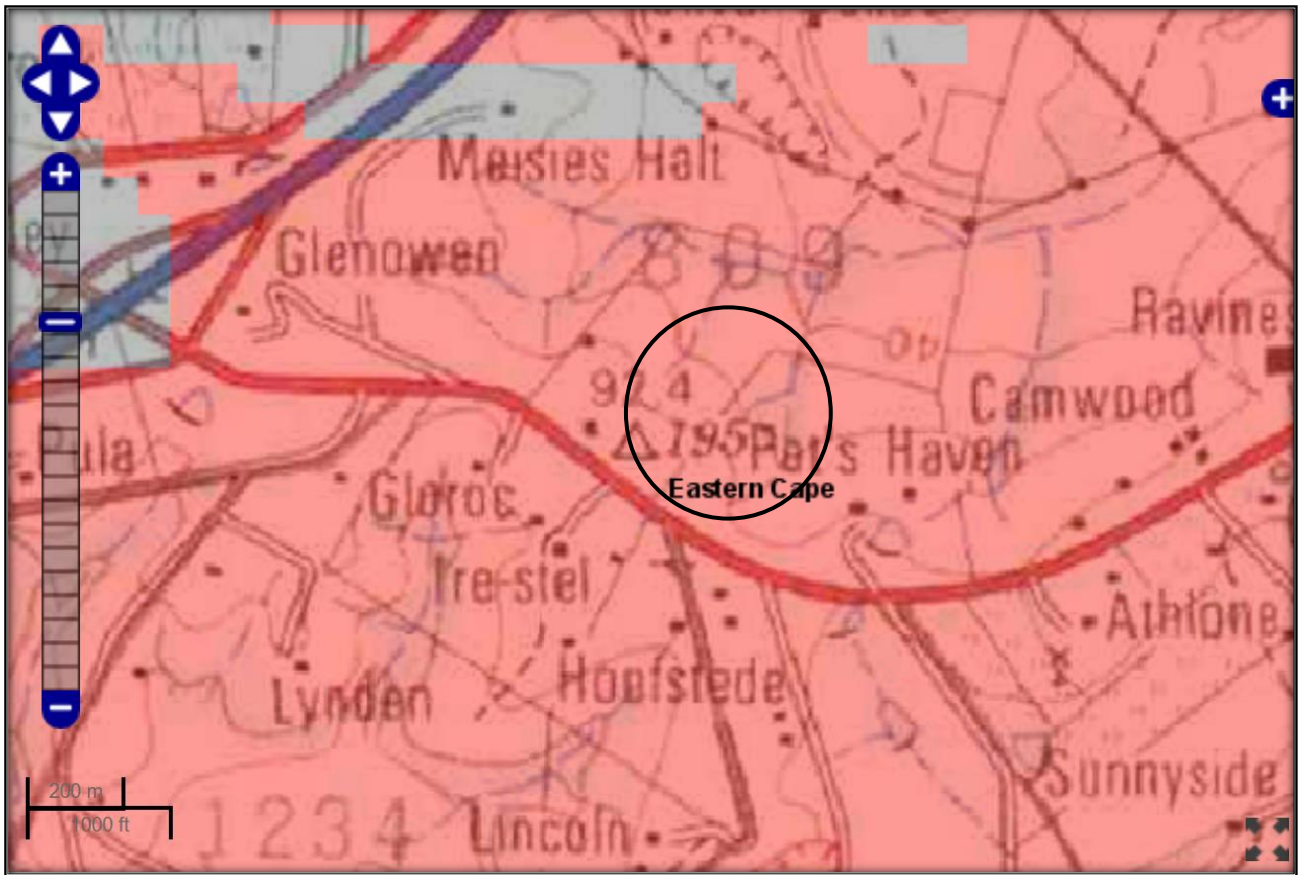


Figure 7: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences). Approximate location of the proposed development is indicated in green.

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.

According to the SAHRIS palaeo sensitivity map (Figure 7) there is a very high chance of finding fossils in this area.

6 GEOGRAPHICAL LOCATION OF THE SITE

The property can be accessed from the second circle on the Gonubie Main Road (See Figure 3).

The approximate centre coordinate is 32°56'25.84"S 27°57'52.77"E

7 METHODS

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

7.1 Assumptions and Limitations

When conducting a desktop assessment several factors can affect the accuracy of the assessment. The focal point of geological maps is the geology of the area and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have not been reviewed by palaeontologists and data is generally based on aerial photographs. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.

Comparable Assemblage Zones in other areas is used to provide information on the existence of fossils in an area which was not yet been documented. When similar Assemblage Zones and geological formations for Desktop studies is used it is generally **assumed** that exposed fossil heritage is present within the footprint. A field-assessment is thus necessary to improve the accuracy of the desktop assessment.

8 ADDITIONAL INFORMATION CONSULTED

In compiling this report the following sources were consulted:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser 1984)
- 1: 250 000 3226 King William's Town Geological map (Council of Geoscience)
- A Google Earth map with polygons of the proposed development was obtained from Imithi Services.
- 1:50 000 Topographical Map 3227 DD Cambridge.
- PIAs near the development site consulted include: Almond 2011a, 2011b, 2014, 2015a, 2015b, 2016, 2017a, 2017b, Almond, 2017; Butler 2015a, 2015b; Butler 2018a, Butler 2018b, Gess 2011a, 2011b, 2012, Groenewald 2011, Prevec 2014). (See references).

9 SITE VISIT

A one-day site specific field survey of the development footprint of Portion 10 of Farm 809, East London was conducted on foot and by motor vehicle on 25 January 2020. No fossiliferous outcrops were identified during the site visit. However, it is important to note that although no surface outcrops were identified in the

development area fossil heritage could be embedded within rocks beneath the surface or covered by surface deposits and vegetation cover. It is thus possible that fossil heritage could be present in the development footprint. The following photographs were taken during the site visit to the proposed development. No fossiliferous outcrop was found on the proposed development.



Figure 8: Dense vegetation on the southern border of the development footprint.

GPS Coordinates 32° 56' 32" S 27° 57' 55"E



Figure 9: Dense groundcover without any sign of outcrops. GPS coordinates 32° 56' 30"S 27° 57' 56"E



Figure 10: Dense groundcover and natural vegetation without any sign of outcrops

10 IMPACT ASSESSMENT METHODOLOGY\

Impacts on Palaeontological Heritage are only likely to happen within the construction phase. No impacts are expected to occur during the operation phase or decommissioning phase.

Methodology for Assessing Impacts

Identified impacts will be assessed against the following criteria:

- Temporal scale
- Spatial scale
- Degree of confidence or certainty
- Severity or benefits
- Significance

The relationship of the issue to the temporal scale, spatial scale and the severity are combined to describe the overall importance rating, namely the significance.

Description of criteria

Table 3: Significance Rating Table

Significance Rating Table	
Temporal Scale (The duration of the impact)	
<u>Short term</u>	Less than 5 years (Many construction phase impacts are of a short duration).
<u>Medium term</u>	Between 5 and 20 years.
<u>Long term</u>	Between 20 and 40 years (From a human perspective almost permanent).
Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.
Spatial Scale (The area in which any impact will have an affect)	
Individual	Impacts affect an individual.
Localised	Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
Project Level	Impacts affect the entire project area.
Surrounding Areas	Impacts that affect the area surrounding the development including Gonubie etc.
Municipal	Impacts affect BCMM.
Regional	Impacts affect the wider district municipality or the province as a whole.
National	Impacts affect the entire country.
International/Global	Impacts affect other countries or have a global influence.
Degree of Confidence or Certainty (The confidence with which one has predicted the significance of an impact)	
<i>Definite</i>	More than 90% sure of a particular fact. Should have substantial supportive data.
Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
<i>Possible</i>	Only over 40% sure of a particular fact or of the likelihood of an impact occurring.
<i>Unsure</i>	Less than 40% sure of a particular fact or of the likelihood of an impact occurring.

Table 4: Impact Severity Rating

Impact severity (The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party)	
Very severe	Very beneficial
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.
Severe	Beneficial
Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.

example, the clearing of forest vegetation.	For example an increase in the local economy.
Moderately severe	Moderately beneficial
Medium to long term impacts on the affected system(s) or party(ies), which could be mitigated. For example constructing the sewage treatment facility where there was vegetation with a low conservation value.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality.
Slight	Slightly beneficial
Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.
No effect	Don't know/Can't know
The system(s) or party(ies) is not affected by the proposed development.	In certain cases it may not be possible to determine the severity of an impact.

Table 5: Overall Significance Rating

Overall Significance (The combination of all the above criteria as an overall significance)	
VERY HIGH NEGATIVE	VERY BENEFICIAL
These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects. Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance. Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.	
HIGH NEGATIVE	BENEFICIAL
These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light. Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated. Example: The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH.	
MODERATE NEGATIVE	SOME BENEFITS
These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial. Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.	
LOW NEGATIVE	FEW BENEFITS
These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect. Example: The temporary change in the water table of a wetland habitat, as these systems is adapted to fluctuating water levels. Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.	
NO SIGNIFICANCE	
There are no primary or secondary effects at all that are important to scientists or the public. Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.	
DON'T KNOW	

In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information.

Example: The effect of a particular development on people's psychological perspective of the environment.

Table 6: The assessment of impacts identified in the Design and Planning Phase
 NOPalaeontological Impact

Table 6: Impacts resulting from the Construction phase of the proposed activities and alternatives.

Activity	Issue	Nature of impact	Description of impact resulting from proposed activities	"No-go" Alternative No Associated Impact (NAI)
Direct	The excavations and clearing of vegetation during the construction phase will consist of digging into the superficial sediment cover as well as underlying deeper bedrock. These excavations will change the existing topography and may possibly destroy or even permanently close-in fossils at or below the surface of the ground. These fossils will then be lost for research.	Potentially negative	Inappropriate construction techniques will lead to damage to the Palaeontological resources.	NAI

Table 7: Impacts resulting from the Operation phase of the proposed activities and alternatives
 NOPalaeontological Impact

10.1 Summary of Impact Tables

The proposed development of Portion 10 of Farm 809, East London is underlain by the Late Permian sedimentary rocks of the Balfour Formation, Adelaide Subgroup, (Beaufort Group of the Karoo Supergroup). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Balfour Formation is Very High (Almond and Pether 2008, SAHRIS website).

Only the development site will be affected. The expected duration of the impact is assessed as potentially permanent. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent and irreversible. It is probable that the impact will occur as the Palaeo Sensitivity of the area is Very high. Impacts on palaeontological heritage during the construction phase could potentially occur but are regarded as having a low possibility. The significance of the impact occurring pre-mitigation will be low.

11 FINDINGS AND RECOMMENDATIONS

The proposed development of Portion 10 of Farm 809, East London is underlain within the Late Permian sedimentary rocks of the Balfour Formation, Adelaide Subgroup, (Beaufort Group of the Karoo Supergroup). According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Normandien Formation is Very High (Almond and Pether 2008, SAHRIS website).

A day site specific field survey of the development footprint was conducted on foot and by motor vehicle on 26 January 2020. No fossiliferous outcrop was found in the proposed development area. For this reason, an overall low palaeontological sensitivity is allocated to the development footprint. The apparent rarity of fossil heritage at the proposed development footprint suggests that the impact of the development in East London will be of a low significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to damaging impacts on the palaeontological heritage 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 palaeontological resources.

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 achievable, *in situ*) and the ECO/site manager must report to SAHRA [Contact details: Eastern Cape Provincial Heritage Resources Authority (ECPHRA); info@ecphra.org.za, Corner Scholl and Amalinda Drive, East London, 5247). Tel: 043 745 0888. Fax: 043 7450889. Web: www.sahra.org.za) so that mitigation can be carry out by a paleontologist.

12 CHANCE FINDS PROTOCOL

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

12.1 Legislation

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

Palaeontological heritage is unique and non-renewable and is protected by the NHRA and 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. Palaeontological resources may not be excavated, broken, moved, or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority as per section 35 of the NHRA.

12.2 Background

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

12.3 Introduction

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 uncover fossil material.

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

12.4 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 EO or site manager. The EO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Contact details:

- Eastern Cape Provincial Heritage Resources Authority (ECPHRA); info@ecphra.org.za, Corner Scholl and Amalinda Drive, East London, 5247). Tel: 043 745 0888. Fax: 043 7450889. Web: www.sahra.org.za)

The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates.

- A preliminary report must be submitted to the Heritage Agency within **24 hours** of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.
- Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.

Upon receipt of the preliminary report, the Heritage Agency will inform the EO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.

- The site must be secured to protect it from any further damage. **No attempt** should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.
- In the event that the fossil cannot be stabilized the fossil may be collected with extreme care by the ECO/site manager. Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.
- Once Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area.

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Appendix A – Elize Butler CV

CURRICULUM VITAE

ELIZE BUTLER

PROFESSION: Palaeontologist
YEARS' EXPERIENCE: 26 years in Palaeontology

EDUCATION: B.Sc Botany and Zoology, 1988
University of the Orange Free State

B.Sc (Hons) Zoology, 1991
University of the Orange Free State

Management Course, 1991
University of the Orange Free State

M. Sc. *Cum laude* (Zoology), 2009
University of the Free State

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

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

2013 to current

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

MEMBERSHIP

Palaeontological Society of South Africa (PSSA) 2006-currently

EMPLOYMENT HISTORY

Part-time Laboratory assistant Department of Zoology & Entomology
University of the Free State Zoology
1989-1992

Part-time laboratory assistant Department of Virology
University of the Free State Zoology
1992

Research Assistant	National Museum, Bloemfontein 1993 – 1997
Principal Research Assistant and Collection Manager	National Museum, Bloemfontein 1998–currently

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July 2008
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