

**PALAEONTOLOGICAL IMPACT ASSESSMENT OF THE  
PROPOSED SPECTRA FOODS BROILER HOUSES AND  
ABATTOIR ON THE FARM MAIDEN MANOR 170 AND  
ASHBY MANOR 171, LUKHANJI MUNICIPALITY,  
QUEENSTOWN, EASTERN CAPE PROVINCE**

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an agency of the  
**Department of Arts and Culture**

## EXECUTIVE SUMMARY

Spectra Foods (Pty) Ltd proposes the construction and operation of seven poultry broiler units, a poultry abattoir and associated infrastructure. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is required to detect the presence of fossil material within the proposed development site.

The proposed development area in Queenstown is underlain by the Early to Middle Triassic Katberg and Burgersdorp Formation (*Lystrosaurus* Assemblage Zone (AZ) including the Palingkloof Member and *Cynognathus* (AZ), Tarkastad Subgroup, Beaufort Group, Karoo Supergroup).

Although the palaeontological sensitivity is rated high, the development area has **no steep river gulleys or sharp outcrops**. The lack of appropriate exposure at the proposed site indicates that the impact on palaeontological material is **negligible and regarded as insignificant**.

It is therefore recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development, pending the discovery or exposure of any fossil remains during the construction phase.

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## 1 INTRODUCTION

Spectra Foods (Pty) Ltd proposes to construct and operate seven poultry broiler units (15 m x 60 m) each housing 20 000 birds and a poultry abattoir with a slaughter capacity of 4 000 birds per day and associated infrastructure (e.g. farm sheds, will be constructed to house poultry feed, litter and feathers). These broiled houses will be constructed on the farms Maiden Manor 170 and Portion 5 of Ashby Manor 171 in the Lukhanji Municipality, Queenstown, Eastern Cape Province(Fig. 1). **Isi-Xwiba Consulting CC** was appointed as the independent Environmental Assessment Practitioners by Spectra Foods (Pty) Ltd.

The excavations will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock. These excavations will modify the existing topography and may disturb damage or destroy scientific valuable fossil heritage exposed at the surface or buried below ground. Palaeontological material is unique and non-renewable and is protected by the National Heritage Resources Act. A Palaeontological Impact Assessment of the proposed development is therefore necessary to certify that palaeontological material is either removed, or is not present.



**Figure 1.**The location of the proposed Spectra Foods Broiler Houses and Abattoir (bordered in white) in relation to Queenstown as indicated by a satellite image (modified from Google Earth 2015).

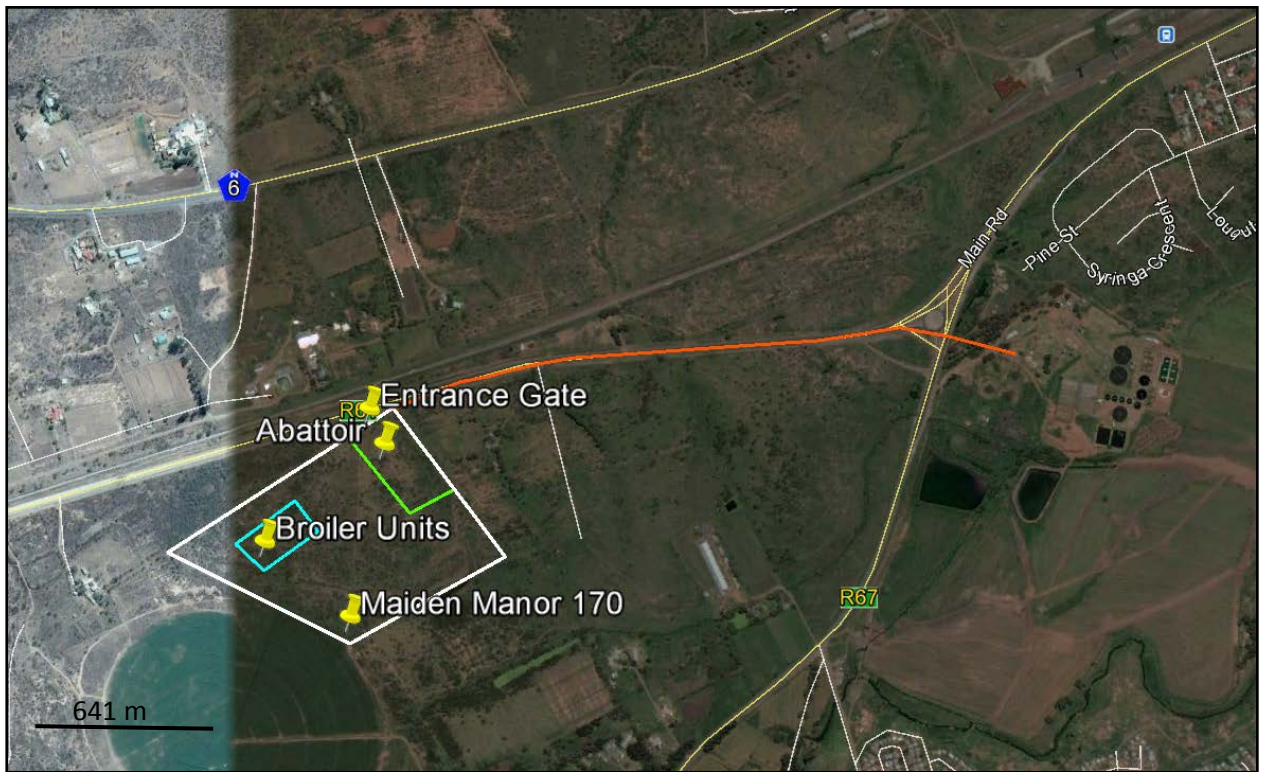


Figure 2. The location of the proposed Spectra Foods Broiler Houses and Abattoir (bordered in white) and the proposed pipeline route inside the R61 road reserve (orange) on the farms Maiden Manor 170 and Portion 5 of Ashby Manor 171, Lukhanji Municipality, Queenstown, Eastern Cape Province (modified from Google Earth 2015).

## **2 LEGISLATION**

Cultural Heritage in South Africa is dealt with by the National Heritage Resources Act (Act 25 of 1999). This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the above mentioned Act. In accordance with Section 38, a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

### **2.1 SECTION 25 OF THE NATIONAL HERITAGE RESOURCES ACT 1999**

The various categories of heritage resources are recognised as part of the National Estate in Section 3 of The National Heritage Resources Act. This include among others:

- geological sites of scientific or cultural importance;
- palaeontological sites;
- palaeontological objects and material, meteorites and rare geological specimens.

According to Section 25 of the National Heritage Resources Act 1999, dealing with archaeology, palaeontology and meteorites:

- The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
- All archaeological objects, palaeontological material and meteorites are the property of the State.
- Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

- No person may, without a permit issued by the responsible heritage resources authority—
  - destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
  - destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
  - trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
  - bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
  
- When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—
  - serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
  - carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary.



### 3 OBJECTIVE

According to the “SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports” the aims of the palaeontological impact assessment are: • to identify exposed and subsurface rock formations that are considered to be palaeontologically significant; • to assess the level of palaeontological significance of these formations; • to comment on the impact of the development on these exposed and/or potential fossil resources and • to make recommendations as to how the developer should conserve or mitigate damage to these resources. The objective is thus to conduct a desktop study to determine the impact on potential palaeontological material at this site.

When a palaeontological desktop study is conducted, the potentially fossiliferous rocks (i.e. groups, formations, members, etc.) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is collected from published scientific literature; Fossil sensitivity map; consultations with professional colleagues, previous palaeontological impact studies in the same region and the databases of various institutions may be consulted. This data is then used to assess the palaeontological sensitivity of each rock unit of the development area. The likely impact of the proposed development on local fossil heritage is subsequently established on the basis of

- the palaeontological sensitivity of the rocks and
- the nature and scale of the development itself (extent of new bedrock excavated)

When rocks of moderate to high palaeontological sensitivity are present within the development area, a field-based assessment by a professional palaeontologist is necessary. Based on this desktop data as well as a field examination of representative exposures of all major sedimentary rock present, the impact significance of the planned development is considered with recommendations for any further studies or mitigation.

## 4 BACKGROUND TO THE GEOLOGICAL AND PALAEOLOGICAL HISTORY

### 4.1 PALAEOLOGY

The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. During this period the basin developed from an inland sea flooded by a melting ice cap, to a giant lake (Ecca Lake) fed by seasonal meandering (and periodically braided) rivers. The lake progressively shrank as it filled with sediment and the basin's rate of subsidence stabilised.

The Beaufort group consists of largely fluvial sediments which were deposited on the floodplains of these rivers. In time the land became progressively more arid and was covered with windblown sand just before the end of the basin's cycle. Finally the subcontinent was inundated with basaltic lava to form the capping basalts of the Jurassic aged Drakensberg Group. During the Jurassic the volcanic Drakensberg were formed and cracks in the earth's crust were filled with molten lava that cooled to form dolerite dykes. Magma injected horizontally between sediments, cooled down and formed horizontal stills of dolerite.

The flood plains of the Beaufort Group (Karoo Supergroup) are internationally renowned for the early diversification of land vertebrates and provide the worlds' most complete transition from early "reptiles" to mammals.

The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content (Fig. 3). The proposed development area in Queenstown ( Fig.4) is underlain by the Early Triassic Katberg Formation (*Lystrosaurus* AZ, Tarkastad Subgroup, Beaufort Group, Karoo Supergroup) which also includes the Palingkloof Member (*Dicynodon* AZ, Adelaide Subgroup) (Groenewald and Kitching 1995, Rubidge 2005) as well as the Middle Triassic Burgersdorp Formations (*Cynognathus* AZ, Tarkastad Subgroup, Beaufort Group, Karoo Supergroup). The lower Palingkloof Member is palaeontologically important as it **precedes** the Permo-Triassic Extinction Event which is the contender for the greatest Mass Extinction in history. This extinction almost destroyed the vertebrate fauna and extinguished the diverse glossopterid plants. The fossil heritage of the Early Triassic Katberg Formation is thus

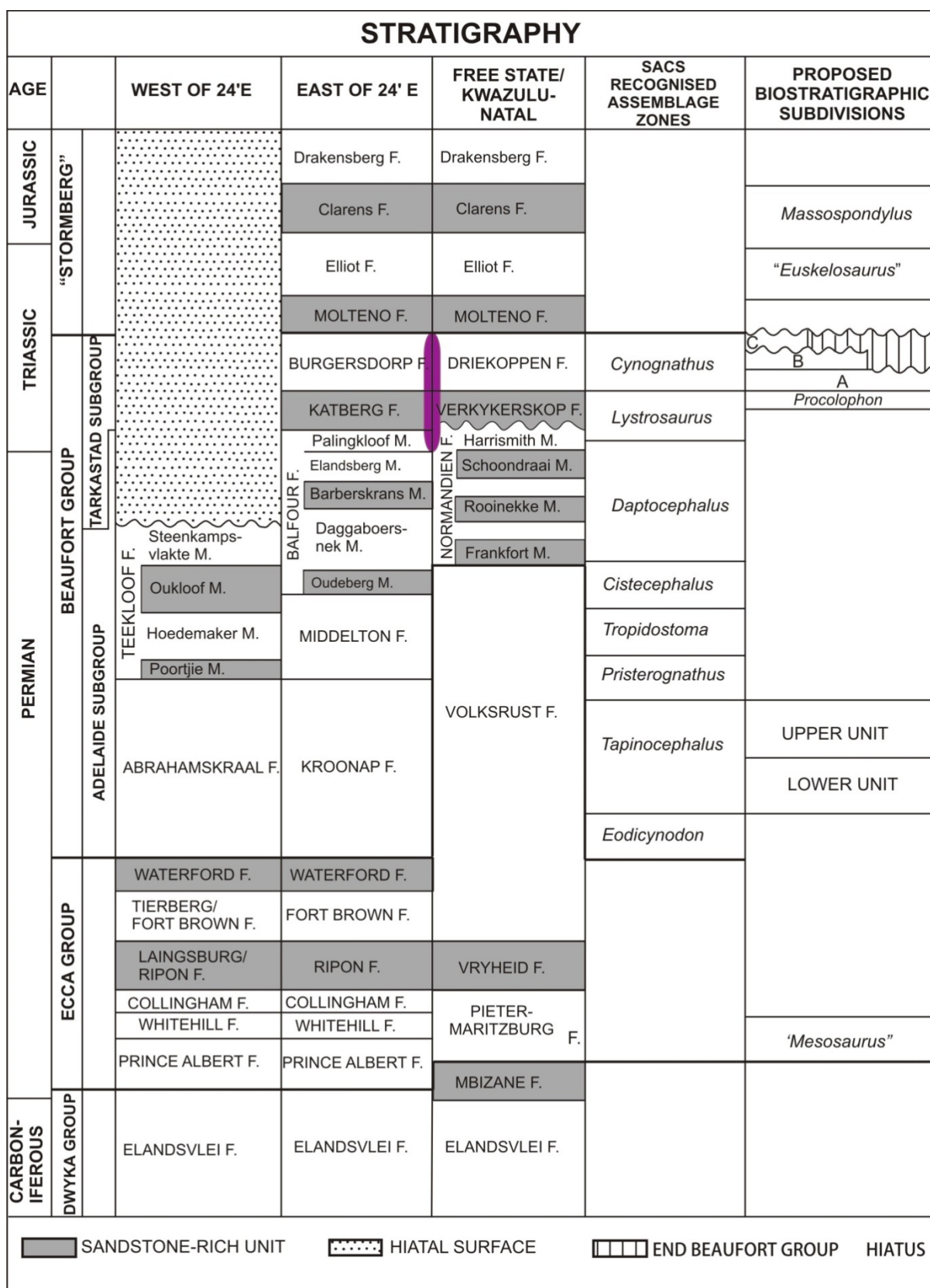
also palaeontological significant because they document the recovery of terrestrial biotas succeeding the catastrophic end-Permian Mass Extinction event (approximately 251 million years ago).

The *Lystrosaurus* AZ (Katberg Formation, approximately 250 million years old) is named after the dicynodont *Lystrosaurus* which contributes up to 95% of fossils found in this biozone (Botha & Smith 2007). The *Lystrosaurus* AZ is also known for the small captorhinid pareptiles *Procolophon* and a crocodile-like early archosaur, *Proterosuchus*. Armour-plated “labyrinthodont” amphibians (e.g. *Lydekkerina*) are also represented in this biozone as well as small true reptile owenettids, therocephalians, and early cynodonts (e.g. *Galesaurus*, *Thrinaxodon*). This biozone is also characterized by vertebrate and invertebrate burrows. Invertebrate burrows are represented by aquatic and land living organisms while tetrapod burrows include various cynodonts, procolophonids and *Lystrosaurus* (Groenewald 1991, Groenewald and Kitching, 1995, Damiani *et al.* 2003, Abdala *et al.* 2006). Vascular plants in this biozone are generally rare but petrified wood (“*Dadoxylon*”) and leaves of glossopterid progymnosperms and arthropyte ferns (*Schizoneura*, *Phyllothea*) are present.

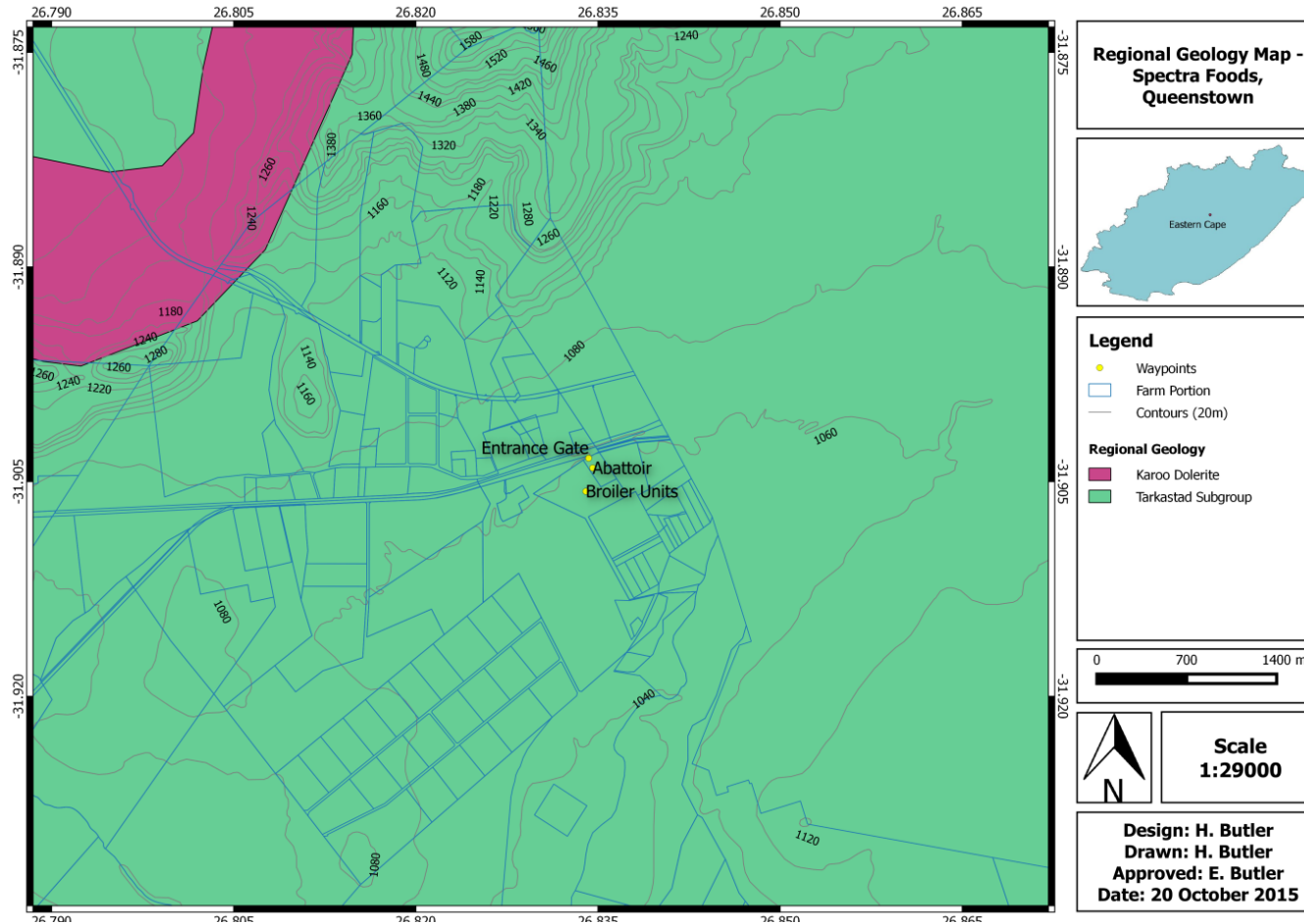
The *Cynognathus* AZ (Burgersdorp Formation is approximately 249 to 237 million years old [(Kitching 1995, Rubidge 2005]) and document the recovery of life on land following the catastrophic end-Permian mass extinction event (Benton 2003). The Burgersdorp fauna is dominated by amphibians, reptiles and therapsids (“mammal-like reptiles”). The Burgersdorp biotas include a rich freshwater vertebrate fauna, with a range of fish groups as well as large capitosaurid and trematosuchid amphibians. The reptile fauna includes lizard-like sphenodontids, rhynchosaurs, and primitive archosaurs. Therapsids include *Kannemeyeria* and numerous small to medium-sized carnivorous and herbivorous therocephalians and advanced cynodonts. Tetrapod trackways and burrows are also present

## 4.2 GEOLOGY

The sandstone-rich Katberg Formation, forms the basal subunit of the Tarkastad Subgroup, while the mudrock-rich Burgersdorp Formation is the youngest subunit of the Permo-Triassic Beaufort Group (Karoo Supergroup). The latter is overlain by the Molteno and Elliot Formations of the Stormberg Group (Johnson *et al.* 2006)



**Figure 3:** Karoo stratigraphy and biostratigraphy (after Smith *et al.*, 2012). Pink line indicates the stratigraphic interval impacted by the proposed development.



**Figure 4.** The surface geology of the Queenstown development area on Maiden Manor 170 and Portion 5 of Ashby Manor 171 in the Lukhanji Municipality, Queenstown, Eastern Cape Province. The development area is underlain by Early to Middle Triassic Katberg Formation (Tarkastad Subgroup, Beaufort Group, Karoo Supergroup) Geological Survey data was superimposed on the topographic map and the development area added.

## 5 GEOGRAPHICAL LOCATION OF THE SITE

Location: 31° 54' 15.09" S and 26° 50' 04.31"

The proposed development area of Spectra Foods is located on the R61 (Queenstown/Tarkastad) and approximately 1km from the Queenstown-Tarkastad-Whittlesea intersection (Fig 1 -2). Google Earth Images show the proposed development site as an area of low lying relief with no potentially fossiliferous gulleys and appropriate exposures.

## 6 METHODS

A Palaeontological Impact Assessment was conducted to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed areas of development. The author's experience, aerial photos (using Google, 2015), topographical and geological maps and other reports from the same were used to assess the proposed area of development.

### 6.1.1 Assumptions and Limitations

The accuracy and reliability of desktop Palaeontological Impact Assessments as components of heritage impact assessments are normally limited by the following restrictions:

- Old fossil databases that have not been kept up-to-date or are not computerized. These databases do not always include relevant locality or geological information. South Africa has a limited number of professional palaeontologists that carry out fieldwork and most development study areas have never been surveyed by a palaeontologist
- The accuracy of geological maps where information may be based solely on aerial photographs and small areas of significant geology have been ignored. The sheet

explanations for geological maps are inadequate and little to no attention is paid to palaeontological material.

- Impact studies and other reports (*e.g.* of commercial mining companies) - is not readily available for desktop studies.

Large areas of South Africa have not been studied palaeontologically. Fossil data collected from different areas but in similar Assemblage Zones might however provide insight on possible occurrence of fossils in an unexplored area. Desktop studies of this nature therefore usually assume the presence of unexposed fossil heritage within study areas of similar geological formations. Where considerable exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a palaeontological impact assessment may be significantly improved through field assessment by a professional palaeontologist.

## 7 FINDINGS AND RECOMMENDATIONS

The **low-lying relief** and **absence of potentially fossiliferous gulleys** and **appropriate exposures** on the development site in Queenstown strongly suggest that fossils are absent from this site. The impact on paleontological material is thus **negligible and regarded as insignificant**. It is therefore recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required for the commencement of this development, pending the discovery or exposure of any fossil remains during the construction phase.

Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional paleontologist.

The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved collection (*e.g.* museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.



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## 9 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Elize Butler has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working at the National Museum since 1993 and currently holds the position of Collection Manager of the Karoo Vertebrate Collection of the Palaeontology Department at the National Museum in Bloemfontein. Her current research interests comprise of Permo-Triassic vertebrate palaeobiology, with a special focus on gorgonopsians at the End-Permian Mass Extinction.

### 9.1 DECLARATION OF INDEPENDENCE

I, Elize Butler, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise my objectivity in this work.

Sincerely

A handwritten signature in black ink that reads "Butler." The signature is written in a cursive style with a large initial 'B'.

Mrs. Elize Butler