

# **PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE INTIBANE COLLIERY NEAR THE TOWN OF DELMAS IN MPUMALANGA PROVINCE**

**For:**

**HIA CONSULTANTS**



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**By**

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## EXECUTIVE SUMMARY

Gideon Groenewald was appointed by PSG Heritage and Grave Relocation Consultants to undertake a desktop survey, assessing the potential palaeontological impact of the proposed Intibane Coalliery project near the town of Delmas, Delmas Local Municipality, Nkangala District Municipality, Mpumalanga Province.

This report forms part of the Environmental Impact Assessment and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the development.

The Intibane Coalliery will involve the development of an open cast mine and stockpile area, offices, crushing and screening plant, overburden dumps and a pollution control dam.

The Intibane Coalliery is underlain by Permian aged sedimentary rocks of the Vryheid Formation, Ecca Group of the Karoo Supergroup. The Vryheid Formation is known for containing an abundant assemblage of plant fossils and the mining of coal is by definition the mining of fossil plant material.

Due to the fact that the Vryheid Formation sediments and coal beds will only be exposed during the mining operations, it is unlikely that fossils will be observed before the mining and associated infrastructure development takes place. For this reason a medium palaeontological sensitivity is allocated to the study area.

It is recommended that:

1. The developer and the ECO of the mining project be made aware of the fact that coal mining is by definition the mining of fossil plant material.
2. That the developer applies for a destruction permit for plant fossils encountered during the mining operation.
3. That the developer will look out for exceptionally well preserved fossils and appoint a palaeontologist to collect representative samples of these fossils for further study at an appropriate institute such as the Bernard Price Institute for Palaeontology at WITS University.

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## 1. INTRODUCTION

### 1.2. Background

Gideon Groenewald was appointed by PSG Heritage and Grave Relocation Consultants to undertake a desktop survey, assessing the potential palaeontological impact of the proposed Intibane Coalliery project near the town of Delmas, Delmas Local Municipality, Nkangala District Municipality, Mpumalanga Province.

This report forms part of the Environmental Impact Assessment and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the development.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

### 1.3. Aims and Methodology

Following the *"SAHRA APM Guidelines: Minimum Standards for the Archaeological & 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.

In preparing a palaeontological desktop study the potential fossiliferous rock units (groups, formations etc.) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is inventoried from the published scientific literature and previous palaeontological impact studies in the same region.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1.1 below.

**Table 1.1** Palaeontological Sensitivity Analysis Outcome Classification

<b>Sensitivity</b>	<b>Description</b>
<b>Low Sensitivity</b>	Areas where a negligible impact on the fossil heritage is likely. This category is reserved largely for areas underlain by igneous rocks. However, development in fossil bearing strata with shallow excavations or with deep soils or weathered bedrock can also form part of this category.
<b>Moderate Sensitivity</b>	Areas where fossil bearing rock units are present but fossil finds are localised or within thin or scattered sub-units. Pending the nature and scale of the proposed development the chances of finding fossils are moderate. A field-based assessment by a professional palaeontologist is usually warranted.
<b>High Sensitivity</b>	Areas where fossil bearing rock units are present with a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops and the chances of finding fossils during a field-based assessment by a professional palaeontologist are very high. Palaeontological mitigation measures need to be incorporated into the Environmental Management Plan

#### 1.4. Scope and Limitations of the Desktop Study

The study will include: i) an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units; ii) a review of all relevant palaeontological and geological literature, including geological maps, and previous palaeontological impact reports; iii) data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged) and iv) where feasible, location and examination of any fossil collections from the study area (e.g. museums).

The key assumption for this scoping study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing. There is also an inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologists carrying out fieldwork in RSA. Most development study areas have never been surveyed by a palaeontologist.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and without supporting field assessments may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by weathering, or are buried beneath a thick mantle of unfossiliferous "drift" (soil, alluvium etc.).

## 2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The Intibane Colliery will involve the development of an open cast mine and stockpile area, offices, crushing and screening plant, overburden dumps and a pollution control dam (Figure 2.1).



Figure 2.1 location and layout of the proposed Intibane Colliery

## 3. GEOLOGY

The study area is underlain by sedimentary rocks of the Permian aged Vryheid Formation (PV), Ecca Group, Karoo Supergroup (Figure 3.1). The Vryheid Formation Consists predominantly of grey sandstone with interbedded prominent coal beds and lenses of shale and grit. The sediments are interpreted as having been deposited on a sandy shoreline, beyond which lay vast swamplands. The plant material that accumulated within these swamps formed the coal deposits that are mined today (Johnson et al, 2009).





Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described in some detail by Mason and Christie (1986). It should be noted, however, that the aquatic reptile, *Mesosaurus*, which is the earliest known reptile from the Karoo Basin, as well as fish (*Palaeoniscus capensis*), have been recorded in equivalent-aged strata in the Whitehill Formation in the southern part of the basin (MacRae, 1999). Indications are that the Whitehill Formation in the main basin might be correlated with the mid-Vryheid Formation. If this assumption proves correct, there is a possibility that *Mesosaurus* could be found in the Vryheid Formation.

The late Carboniferous to early Jurassic Karoo Supergroup of South Africa includes economically important coal deposits within the Vryheid Formation of Natal. The Karoo sediments are almost entirely lacking in body fossils but ichnofossils (trace fossils) are locally abundant. Modern sedimentological and ichnofaunal studies suggest that the north-eastern part of the Karoo basin was marine. In KwaZulu-Natal a shallow basin margin accommodated a prograding fluviodeltaic complex forming a broad sandy platform on which coal-bearing sediments were deposited. Ichnofossils include U-burrows (formerly *Corophioides*) which are assigned to ichnogenus *Diplocraterion* (Mason and Christie, 1986).

## 5. PALAEOONTOLOGICAL SENSITIVITY



Figure 4.1 Palaeontological sensitivity of the study area



The sedimentary rocks of the Vryheid Formation will contain fossils. Although these rock sequences will have a high palaeontological sensitivity, the chances of finding fossils before actual mining of the rocks take place is very low. For this reason a medium palaeontological sensitivity is allocated to the areas underlain by the Vryheid Formation (Figure 5.1). The mining of coal will by definition be the mining of fossil plant material and it is recommended that the developer apply for a destruction permit for all fossil material encountered during the mining operations. If well preserved examples of plant, vertebrate, invertebrate or ichno fossils are recorded it would be of scientific value if these examples can be recorded by a palaeontologist and representative samples provided to a registered institution such as the Bernard Price Institute for Palaeontology at WITS University, for further studies.

## 6. CONCLUSION AND RECOMMENDATIONS

The Intibane Colliery is underlain by Permian aged sedimentary rocks of the Vryheid Formation, Ecca Group of the Karoo Supergroup. The Vryheid Formation is known for containing an abundant assemblage of plant fossils and the mining of coal is by definition the mining of fossil plant material.

Due to the fact that the Vryheid Formation sediments and coal beds will only be exposed during the mining operations and associated infrastructure development, it is unlikely that fossils will be observed before the mining takes place. For this reason a medium palaeontological sensitivity is allocated to the study area.

It is recommended that:

1. The developer and the ECO of the mining project be made aware of the fact that coal mining is by definition the mining of fossil plant material.
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## 7. REFERENCES

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**Johnson MR, Anhausser CR and Thomas RJ. 2009.** The Geology of South Africa. Geological Society of South Africa.

**MacRae C. 1999.** Life Etched in Stone. Geological Society of South Africa.

**Mason TR and Christie ADM 1986.** Palaeoenvironmental significance of ichnogenus *Diplocraterion* torell from the Permian Vryheid Formation of the Karoo Supergroup, South Africa. Palaeogeography, Palaeoclimatology, Palaeoecology 53(3-4):249-265.

## **8. QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR**

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

## **9. DECLARATION OF INDEPENDENCE**

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

A handwritten signature in black ink, appearing to read 'G. Groenewald', with a stylized flourish at the end.

**Dr Gideon Groenewald**  
**Geologist**