

**Palaeontological Impact Assessment for the  
proposed prospecting right application on  
Portion 2 of Farm Zalflager, Portion 1 and RE of  
Farm Ongemaakt and Portions 2, 8 and 13 of  
Farm Mademoiselle, east of Vryheid,  
KwaZulu Natal Province**

**Desktop Study (Phase 1)**

**For**

**JLB Consulting**

**13 April 2022**

**Prof Marion Bamford**

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## **Expertise of Specialist**

The Palaeontologist Consultant: Prof Marion Bamford  
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf  
Experience: 33 years research and lecturing in Palaeontology  
25 years PIA studies and over 300 projects completed

## **Declaration of Independence**

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by JLB Consulting, Durban, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision-making process for the Project.

Specialist: Prof Marion Bamford

A handwritten signature in blue ink, appearing to read 'MKBamford', with a horizontal line underneath it.

Signature:

## **Executive Summary**

A Palaeontological Impact Assessment was requested for the proposed prospecting right application (PRA) for coal on parts of Farms Zalflager 525 HU, Ongemaakt 301 HU and Mademoiselle 123 HU. This cluster is east southeast of Vryheid and south of Steilrand, KwaZulu-Natal.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed site lies on the non-fossiliferous Jurassic dolerite, on the moderately fossiliferous Dwyka Group diamictites and the potentially highly fossiliferous Vryheid Formation (Ecca Group, Karoo Supergroup). Therefore, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, environmental officer or other designated responsible person once excavations, drilling or box cutting activities have commenced. Since the impact will be low, as far as the palaeontology is concerned, the project should be authorised.

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# 1. Background

Coal Africa Mining Pty Ltd proposes to undertake prospecting activities for coal in Portion 02 of the Farm Zalflager No. 525-HU; Portion 01 and RE of Farm Ongemaakt No. 301-HU and Portions 02, 08 and 13 of the Farm Mademoiselle No. 123-HU No 8548 GT within the Jurisdiction of Zulu Land District Municipality in Kwa-Zulu Natal Province.

The proposed prospecting activities triggered listed activities in terms of the Environmental Impact Assessment (EIA) Regulations of 2017 gazetted in terms of the National Environmental Management Act (NEMA), No 107 of 1998. The EIA process must therefore be undertaken by an independent Environmental Assessment Practitioner (EAP). Colt Resources Pty Ltd has appointed Mielelani Consultancy, an independent consulting company, to conduct the Environmental Impact Assessment (EIA) process in terms of the EIA Regulations of 2017, to evaluate the potential impacts of the proposed project.

The proposed prospecting activities will be undertaken within the jurisdiction of AbaQulusi Local Municipality under the administrative district of Zululand District Municipality in KwaZulu-Natal Province. The proposed site is located approximately 22.40 km east of Vryheid Town, KwaZulu Natal (Figures 1-3).

Prospecting activities will be undertaken in different phases of which each is dependent on the preceding phase. Each phase will provide information that will determine whether the prospecting activities should be continued or abolished. The prospecting phases are as follows:

- Phase 1: Literature Review and Field Mapping;
- Phase 2: Geophysical Survey;
- Phase 3: Discovery Drilling and Sampling;
- Phase 4: Sample analysis/ Assaying;
- Phase 5: Preliminary economic assessment;
- Phase 6: Resource drilling and sampling;
- Phase 7: Pre-feasibility study.

Other activities associated with the proposed prospecting:

- Site Access
- Access roads
- Drill station establishment
- Core Drilling
- Project scheduling

A Palaeontological Impact Assessment was requested for the Prospecting Right Application (PRA). To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 1: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6).

	<b>A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:</b>	<b>Relevant section in report</b>
ai	Details of the specialist who prepared the report,	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A
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;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
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 4
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity 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	Sections 6, 8

	<b>A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:</b>	<b>Relevant section in report</b>
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies of any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A
2	Where a government notice gazetted 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.	N/A

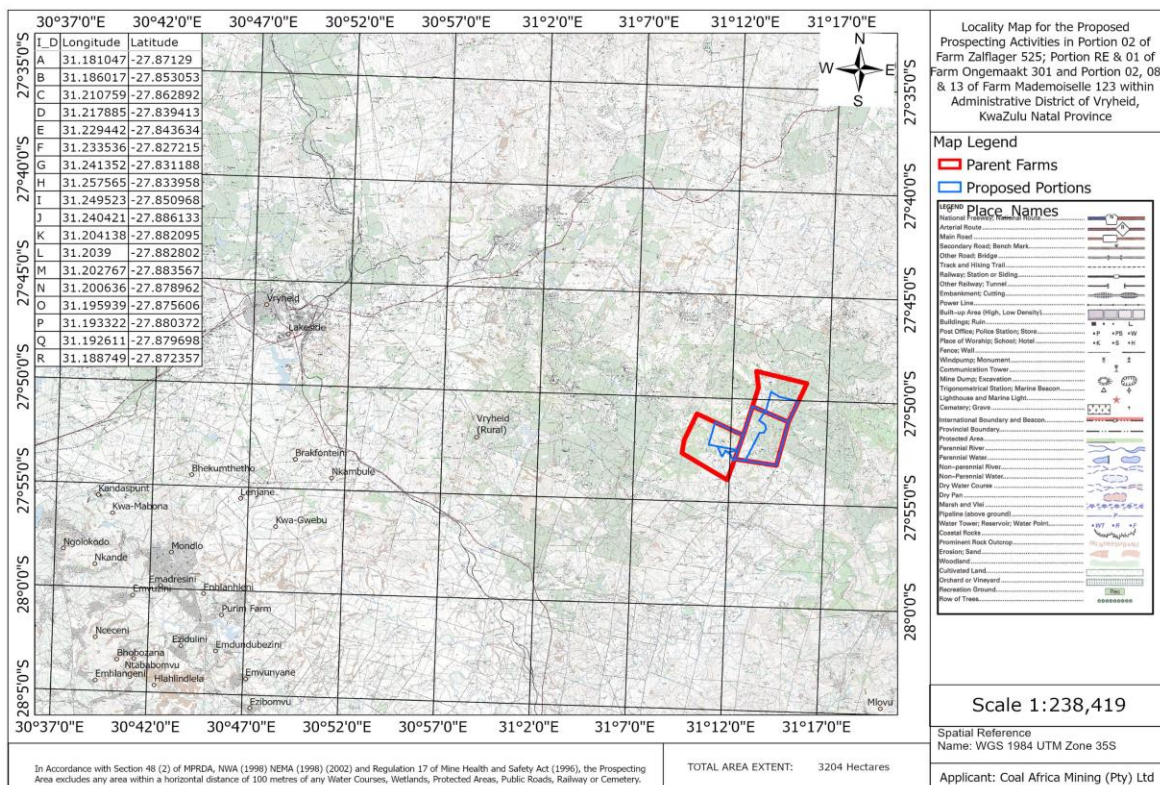


**Figure 1: Google Earth map of the general area to show the relative land marks. The PRA site is shown by the white polygons.**



**Figure 2: Google Earth Map of the proposed PRA farm boundaries with the sections shown by the white outline.**





**Figure 3: Topographic map showing the location of the farms that will be prospected.**

## 2. Methods and Terms of Reference

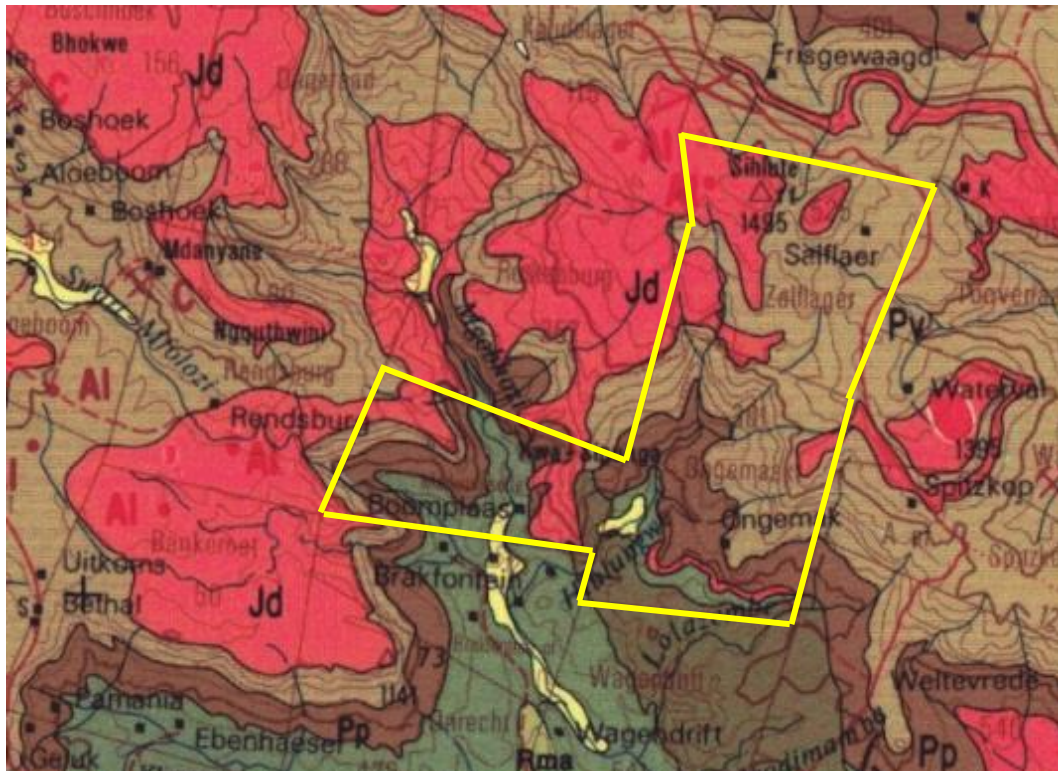
The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

### 3. Geology and Palaeontology

#### i. Project location and geological context



**Figure 4: Geological map of the area around the PRA farms. The location of the proposed project is indicated within the yellow rectangle. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2739 Vryheid.**

Table 2: Explanation of symbols for the geological map and approximate ages (Johnson et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, calcrete	Neogene, ca 2.5 Ma to present
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 180 Ma
Pv	Vryheid Fm, Ecca Group, Karoo SG	Shales, sandstone, coal	Early Permian, Middle Ecca
Pp	Pietermaritzburg Fm, Ecca Group, Karoo SG	Fine-grained grey/black shales	Early Permian, lower Ecca
C-Pd	Dwyka Group, Karoo SG	Diamictite, tillites, sandstones, mudstones	Late Carboniferous to Early Permian, ca 290 Ma

The project lies in the north eastern part of the main Karoo Basin where the lower Karoo Supergroup sediments are exposed (Figure 4). This is in the Vryheid Coalfield with fairly thick occurrences of the Fritz, upper Alfred and lower Alfred seams over 100m below the ground surface (Snyman, 1998, Fig. 21), in the Vryheid Formation only.

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu Natal south coast. It is bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

During the Carboniferous Period South Africa was part of the huge continental landmass known as Gondwanaland and it was positioned over the South Pole. As a result, there were several ice sheets that formed and melted, and covered most of South Africa (Visser, 1986, 1989; Isbell et al., 2012). Gradual melting of the ice as the continental mass moved northwards and the earth warmed, formed fine-grained sediments in the large inland sea. These are the oldest rocks in the system and are exposed around the outer part of the ancient Karoo Basin, and are known as the **Dwyka Group**. They comprise tillites, diamictites, mudstones, siltstones and sandstones that were deposited as the basin filled. This group has been divided into two formations with Elandsvlei Formation occurring throughout the basin and the upper Mbizane Formation occurring only in the Free State and KwaZulu Natal (Johnson et al., 2006).

Overlying the Dwyka Group rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. In the Free State and KwaZulu Natal, from the base upwards are the **Pietermaritzburg Formation**, **Vryheid Formation** and the Volksrust Formation. All of these sediments have varying proportions of sandstones, mudstones, shales and siltstones and represent shallow to deep water settings, deltas, rivers, streams and overbank depositional environments.

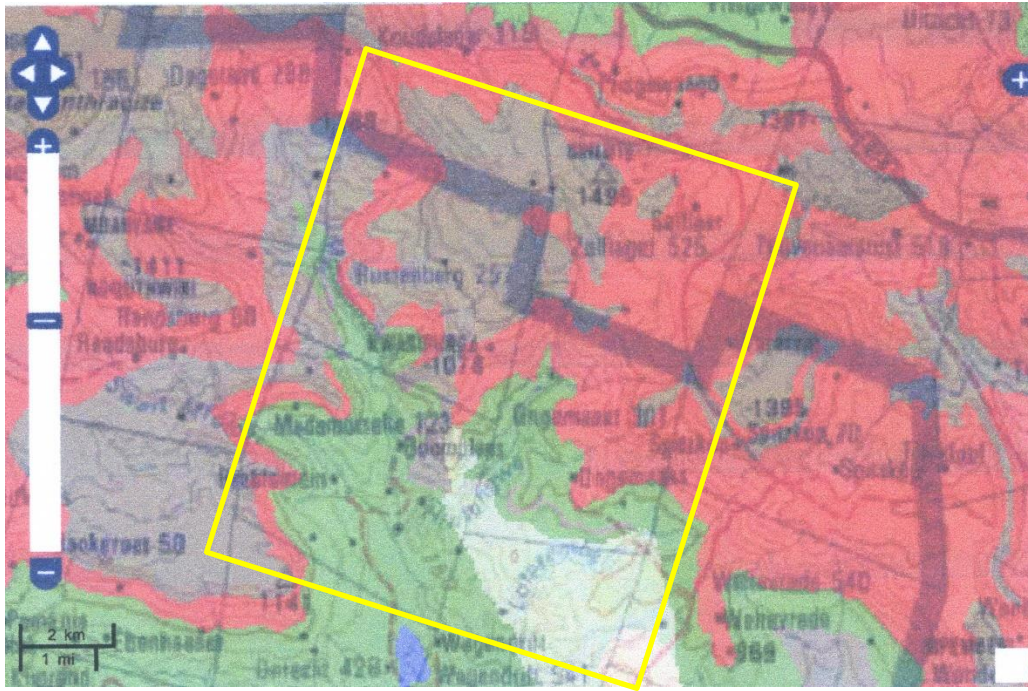
Overlying the Ecca Group are the rocks of the Beaufort Group that has been divided into the lower Adelaide Subgroup for the Upper Permian strata, and the Tarkastad Subgroup for the Early to Middle Triassic strata. As with the older Karoo sediments, the formations vary across the Karoo Basin.

Large exposures of Jurassic dolerite dykes occur throughout the area. These intruded through the Karoo sediments around 183 million years ago at about the same time as the Drakensberg basaltic eruption.

## ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figure 5. The site for prospecting is in the very highly sensitive Vryheid Formation (red), the moderately sensitive Dwyka Group and Pietermaritzburg Formation (green). There are also exposures of non-fossiliferous dolerite (grey) that does not preserve fossils because it is of volcanic origin.





**Figure 5: SAHRIS palaeosensitivity map for the site for the proposed PRA area shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.**

From the SAHRIS map above the area is indicated as very highly sensitive (red) for the Vryheid Formation (coal) on the western part of Farm Zalflager 525 and the northwestern part of Farm Mademoiselle. It is moderately sensitive (green) for the Dwyka Group on the western part of Ongemaakt 301 and most of Mademoiselle 123. The rest of the areas are on dolerite so there are no fossils there. This is assuming that the geological map is correct but the prospecting activities will confirm this.

Dolerite does not preserve fossils. The Dwyka Group diamictites and mudstones might have fragments of the early *Glossopteris* flora and some invertebrates that were caught up by the ice sheets, transported and later dropped as the ice melted (Plumstead, 1969). In this part of the main Karoo Basin, in Vryheid Coalfield, there are about six recognised coal seams with Eland being the uppermost and Dundas the lowermost (Snyman, 1998). Although coal is formed from the accumulation of peat and dead plant matter the coal is so altered by temperature and pressure that no original plant material is recognisable. Coal is of economic rather than scientific importance, but in the carbonaceous lenses associated with the coal seams, it is possible to find lenses of plant impressions. These plants belong to the glossopteris flora and include different parts of *Glossopteris* especially the leaves, as well as lycopods, sphenophytes, ferns and early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985, Bamford, 2004). Bones require different conditions for preservation, oxidizing, rather than the reducing environment required for the preservation of plants. Therefore, the two types of fossils seldom occur together.

## 4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

**Table 3a: Criteria for assessing impacts**

<b>PART A: DEFINITION AND CRITERIA</b>		
<b>Criteria for ranking of the SEVERITY/NATURE of environmental impacts</b>	<b>H</b>	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	<b>M</b>	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	<b>L</b>	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	<b>L+</b>	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	<b>M+</b>	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	<b>H+</b>	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
<b>Criteria for ranking the DURATION of impacts</b>	<b>L</b>	Quickly reversible. Less than the project life. Short term
	<b>M</b>	Reversible over time. Life of the project. Medium term
	<b>H</b>	Permanent. Beyond closure. Long term.
<b>Criteria for ranking the SPATIAL SCALE of impacts</b>	<b>L</b>	Localised - Within the site boundary.
	<b>M</b>	Fairly widespread – Beyond the site boundary. Local
	<b>H</b>	Widespread – Far beyond site boundary. Regional/ national
<b>PROBABILITY (of exposure to impacts)</b>	<b>H</b>	Definite/ Continuous
	<b>M</b>	Possible/ frequent
	<b>L</b>	Unlikely/ seldom

**Table 3b: Impact Assessment**

<b>PART B: Assessment</b>		
<b>SEVERITY/NATURE</b>	<b>H</b>	-
	<b>M</b>	-
	<b>L</b>	Dolerites and soils do not preserve fossils; so far there are no records from the Vryheid Fm of plant or animal fossils in this region so it is very unlikely that fossils occur on the site. The impact would be negligible
	<b>L+</b>	-
	<b>M+</b>	-
	<b>H+</b>	-
<b>DURATION</b>	<b>L</b>	-

<b>PART B: Assessment</b>		
	<b>M</b>	-
	<b>H</b>	Where manifest, the impact will be permanent.
<b>SPATIAL SCALE</b>	<b>L</b>	Since the only possible fossils within the area would be fossil plants of the <i>Glossopteris</i> flora in the shales or mudstones, the spatial scale will be localised within the site boundary.
	<b>M</b>	-
	<b>H</b>	-
<b>PROBABILITY</b>	<b>H</b>	-
	<b>M</b>	It is extremely unlikely that any fossils would be found in the loose soils and sands that cover the area or in the dolerites. There is a chance that Vryheid Fm shales occur below ground and will be disturbed by drilling, therefore, a Fossil Chance Find Protocol should be added to the eventual EMPr.
	<b>L</b>	

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that except for the dolerite, the rocks are the correct type and age to contain fossils. The overlying soils will not have fossils but there is a chance that fossils from the Vryheid Formation occur below ground and may be disturbed so a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources during prospecting is low.

## 5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and some do contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils.

## 6. Recommendation

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the dolerites or in the overlying soils of the Quaternary. There is a very small chance that fossils may occur below ground in the shales of the early Permian Vryheid Formation so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found in the core by the contractor, environmental officer, or other responsible person once drilling has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low for the prospecting phase, so as far as the palaeontology is concerned, the prospecting right should be granted.

## 7. References

Anderson, J.M., Anderson, H.M., 1985. Palaeoflora of Southern Africa: Prodrum of South African megaflores, Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam. 423 pp.

Bamford, M.K. 2004. Diversity of the woody vegetation of Gondwanan southern Africa. *Gondwana Research* 7, 153-164.

Isbell, J.L., Henry, L.C., Gulbranson, E.L., Limarino, C.O., Fraiser, F.L., Koch, Z.J., Ciccio, P.I., Dineen, A.A., 2012. Glacial paradoxes during the late Paleozoic ice age: Evaluating the equilibrium line altitude as a control on glaciation. *Gondwana Research* 22, 1-19.

Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

Smith, R.M.H., Rubidge, B.S., Day, M.O., Botha, J., 2020. Introduction to the tetrapod biozonation of the Karoo Supergroup. *South African Journal of Geology* 123, 131-140.

Snyman, C.P., 1998. Coal. In: Wilson, M.G.C., and Anhaeusser, C.P., (Eds). *The Mineral Resources of South Africa: Handbook*, Council for Geosciences 16, 136-205.

Visser, J.N.J., 1986. Lateral lithofacies relationships in the glaciogene Dwyka Formation in the western and central parts of the Karoo Basin. *Transactions of the Geological Society of South Africa* 89, 373-383.

Visser, J.N.J., 1989. The Permo-Carboniferous Dwyka Formation of southern Africa: deposition by a predominantly subpolar marine icesheet. *Palaeogeography, Palaeoclimatology, Palaeoecology* 70, 377-391.

## 8. Chance Find Protocol

### **Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.**

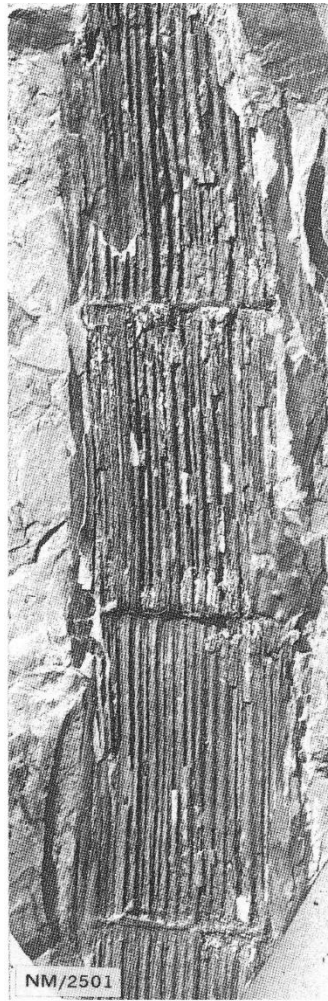
1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (wood, plants, insects, bone or coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 6). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site an AMAFA or SAHRA permit must be obtained. Annual reports must be submitted to AMAFA and SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to AMAFA and SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.



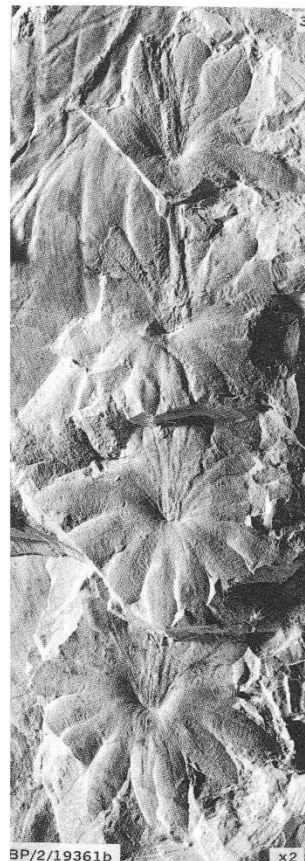
9. Appendix A – Examples of fossils from the Vryheid Formation



Fern: *Asterotheca* sp.



Sphenophytes: whorls of leaves on a striated stem



**Figure 6: Photographs of fossil plants from the Vryheid Formation.**



**Figure 7: Photograph of *Glossopteris* leaves from the Vryheid Formation. They also occur in the Dwyka Group mudstones but are rare.**

## 10. Appendix B – Details of specialist

### **Curriculum vitae (short) - Marion Bamford PhD**

**January 2022**

#### **I) Personal details**

Surname : **Bamford**  
First names : **Marion Kathleen**  
Present employment: Professor; Director of the Evolutionary Studies Institute.  
Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa  
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[marionbamford12@gmail.com](mailto:marionbamford12@gmail.com)

#### **ii) Academic qualifications**

Tertiary Education: All at the University of the Witwatersrand:

1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.

1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.

1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.

1986-1989: PhD in Palaeobotany. Graduated in June 1990.

NRF Rating: C-2 (1999-2004); B-3 (2005-2015); B-2 (2016-2020); B-1 (2021-2026)

#### **iii) Professional qualifications**

*Wood Anatomy Training (overseas as nothing was available in South Africa):*

1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps

1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer

1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

#### **iv) Membership of professional bodies/associations**

Palaeontological Society of Southern Africa

Royal Society of Southern Africa - Fellow: 2006 onwards

Academy of Sciences of South Africa - Member: Oct 2014 onwards

International Association of Wood Anatomists - First enrolled: January 1991

International Organization of Palaeobotany – 1993+

Botanical Society of South Africa

South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016

SASQUA (South African Society for Quaternary Research) – 1997+

PAGES - 2008 –onwards: South African representative

ROCEEH / WAVE – 2008+

INQUA – PALCOMM – 2011+onwards

### **vii) Supervision of Higher Degrees**

All at Wits University

Degree	Graduated/completed	Current
Honours	13	0
Masters	11	3
PhD	11	6
Postdoctoral fellows	15	1

### **viii) Undergraduate teaching**

Geology II – Palaeobotany GEOL2008 – average 65 students per year

Biology III – Palaeobotany APES3029 – average 45 students per year

Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology;

Micropalaeontology – average 12-20 students per year.

### **ix) Editing and reviewing**

Editor: *Palaeontologia africana*: 2003 to 2013; 2014 – Assistant editor

Guest Editor: *Quaternary International*: 2005 volume

Member of Board of Review: *Review of Palaeobotany and Palynology*: 2010 –

Associate Editor *Open Science UK*: 2021 -

Review of manuscripts for ISI-listed journals: 30 local and international journals

Reviewing of funding applications for NRF, PAST, NWO, SIDA, National Geographic,

Leakey Foundation

### **x) Palaeontological Impact Assessments**

Selected from the past five years only – list not complete:

- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lielifontein N&D 2019 for EnviroPro
- Skeerpoort Farm Mast 2020 for HCAC

- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for EnviroPro
- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe

#### **xi) Research Output**

Publications by M K Bamford up to January 2022 peer-reviewed journals or scholarly books: over 160 articles published; 5 submitted/in press; 10 book chapters.

Scopus h-index = 30; Google scholar h-index = 35; -i10-index = 92

Conferences: numerous presentations at local and international conferences.