

**Palaeontological Impact Assessment for the proposed
Marataba Roads and Accommodation upgrade,
Marakalele National Park, Limpopo Province**

Desktop Study

For

Nuleaf Planning and Environmental

24 May 2018

Prof Marion Bamford

Palaeobotanist

P Bag 652, WITS 2050

Johannesburg, South Africa

Marion.bamford@wits.ac.za

Expertise of Specialist

The Palaeontologist Consultant is: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 30 years research; 22 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Nuleaf Planning and Environmental, Pretoria, 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

Signature: 

Executive Summary

The proposed development entails the establishment of approximately 15km of additional game viewing tracks, construction of a bridge and the construction of staff accommodation units (to replace the insufficient current staff accommodation), SALA at Marataba Trails Lodge, as well as a SALA at the Marataba Safari Lodge. The following activities will take place on the Marataba Section of the Marakele National Park.

For the proposed development the surface soils will be excavated to a depth of less than one metre for the building foundations and clearing for roads. Since there is no chance of finding fossils in the soils and various sandstones of the Sandriviersberg Formation of the Waterberg Group there would be no impact on the fossil heritage. There is no chance of finding fossils because the rocks are too old for body fossils. The depositional environment is low to high energy coarse sandstone from rivers, alluvial fans and dunes that are not conducive to the preservation of microfossils. Taking account of the defined criteria, the potential impact to fossil heritage resources is zero. As far as the palaeontology is concerned the project may proceed.

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1. Background

Nuleaf Environmental and Planning has been contracted to carry out the BAR for the upgrading of facilities at Marakele National Park and this report constitutes the Palaeontological Impact Assessment.

The proposed development will entail the following, within the Marataba Section of the Marakele National Park, Limpopo Province:

- Establishment of approximately 17 km of additional game viewing tracks.
 - o These proposed roads will be two-spool tracks.
 - o A 200m wide proposed road development corridor / envelope area was accessed in order to ensure sufficient space to avoid possible sensitive features such as protected trees, riparian habitats, etc.

- Upgrade of an existing low water river crossing (Tusk Road Crossing) to a bridge (200m²) over the Motlhabatsi (Matlabas) River.

- Construction of one (1) additional two (2) bed guest unit (50m²) at the existing Marataba Trails Lodge.
 - o This unit will be constructed in the same style as the existing guest units at the Lodge.
 - o The existing pedestrian pathway will be extended to this unit to allow access for guests.
 - o The guest unit will be 4.8m x 10.5m.

- Construction of one (1) SALA (Spa) (25m²) at the existing Marataba Trails Lodge.
 - o This will be constructed away from the Lodge, within 32m of a drainage line.
 - o A pedestrian footpath will be cleared to allow access to the SALA. This pedestrian footpath will cross a shallow drainage and a pedestrian footbridge will be constructed to allow ease of crossing for the guests.
 - o The SALA will be 4.65m x 5.05m

- Construction of one (1) SALA (Spa) (25m²) at the existing Marataba Safari Lodge.
 - o This will be constructed near the open plan lounge and dining area of the Lodge, within 32m of a watercourse.
 - o A wooden pedestrian footpath off the existing pedestrian footpath will be constructed to allow guest access to the SALA.
 - o The SALA will be 4.65m x 5.05m

- Construction of two staff accommodation units (60m² & 70m²) sleeping 6 people at the existing Marataba Trails Lodge.
 - o These 2 accommodation units will be split into 3 rooms each with on-suite bathrooms.
 - o These 2 units will be within the current Marataba Trails Lodge development footprint.
 - o They will be replacing the two existing staff tents currently on site and will be built on these existing tents footprints.

- o These units will be raised on stilts in order to minimise the impact on the environment.
- o The units will have sod roofs and stone clad walls to blend in with not only the existing buildings at Marataba Trails Lodge but also the surrounding environment.

The current staff accommodation at the Marataba Trails Lodge consists of only two tents. On average the lodge requires 6-8 staff member staying at the lodge. As such, the current staff tents pose a variety of problems; the split of genders between tents is difficult, only one bathroom is available per tent and certain staff member work very early hours whereas others work late into the evening. This has resulted in very little privacy and rest for the staff members sharing the current two tents. There is also a need for senior management to reside on site. Apart from daily duties, senior management is specifically needed to manage emergency situations that may arise such as fires and medical emergencies. As such, there is a dire need to establish 6 on-suite staff accommodation rooms, that will not only ensure that the staff get enough rest and privacy, but also that there is no need for different gender sharing or sharing of amenities, generally improving the living conditions of staff members greatly.

Waste and Effluent

Solid waste will only be generated during construction for the proposed development. Little to no construction waste will be generated from the construction of the roads. The minimal waste that will be generated during the construction of the staff accommodation units will be transported to an existing central collection facility at the Matlabas Staff Village, located adjacent to the Marakele National Park, where refuse is stored for collection by a registered refuse removal company. The registered Refuse Removal Company, on contract to the Park, will then dispose of the construction waste at a registered landfill site in Thabazimbi.

Sewage infrastructure for the proposed staff accommodation at the existing Marataba Trails Lodge is already in place and so the existing infrastructure will be connected to and utilised.

This report is the palaeontological impact assessment for the project.

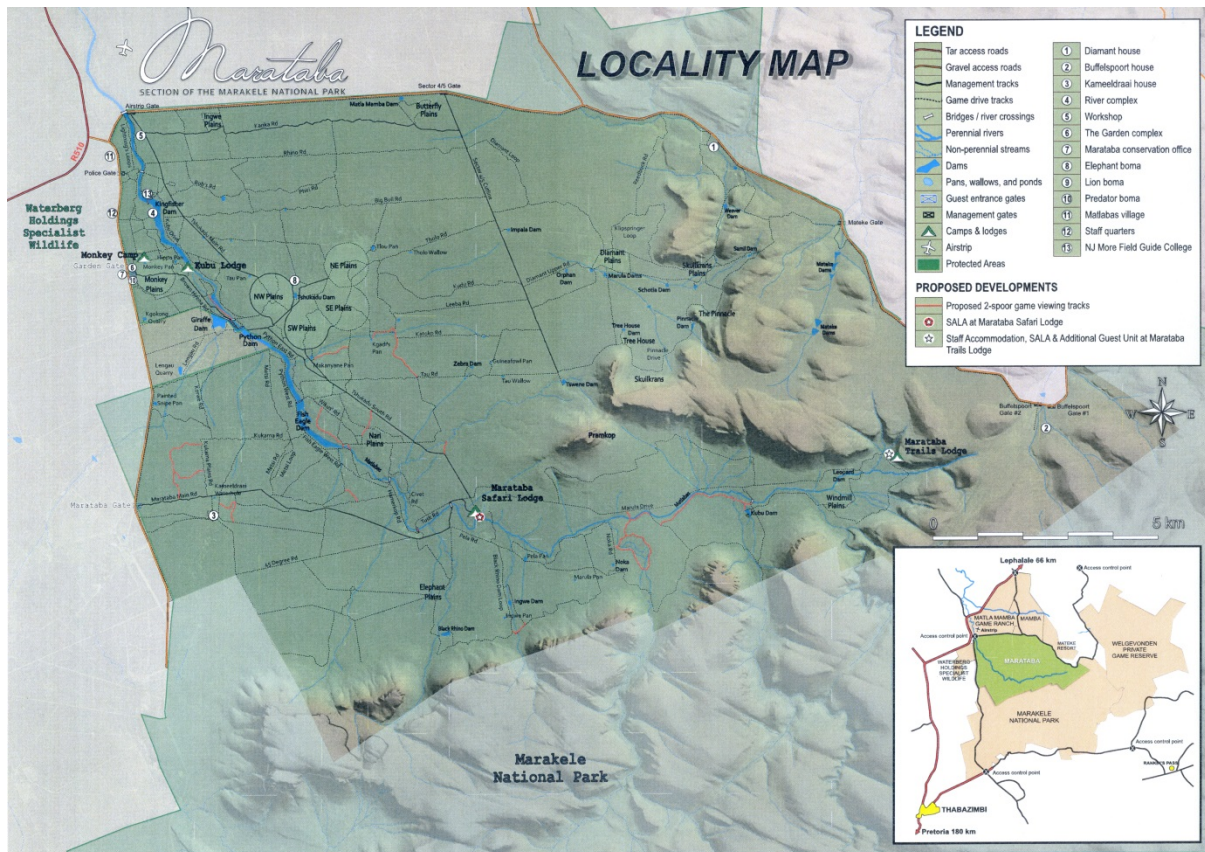


Figure 1: Detailed map from Nuleaf of the proposed new roads and staff accommodation at Marataba section, Marakelele National Park, Limpopo Province.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (2014)

A specialist report prepared in terms of the Environmental Impact Regulations of 2014 must contain:	Relevant section in report
Details of the specialist who prepared the report	Appendix A
The expertise of that person to compile a specialist report including a curriculum vitae	Appendix A
A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
An indication of the scope of, and the purpose for which, the report was prepared	Section 1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4 Figure 2

An identification of any areas to be avoided, including buffers	N/A
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
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
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
Any mitigation measures for inclusion in the EMPr	n/a
Any conditions for inclusion in the environmental authorisation	n/a
Any monitoring requirements for inclusion in the EMPr or environmental authorisation	n/a
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	N/A
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	N/A
A description of any consultation process that was undertaken during the course of carrying out the study	N/A
A summary and copies if any comments that were received during any consultation process	N/A
Any other information requested by the competent authority.	N/A

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;
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.

3. Geology and Palaeontology

i. Project location and geological context

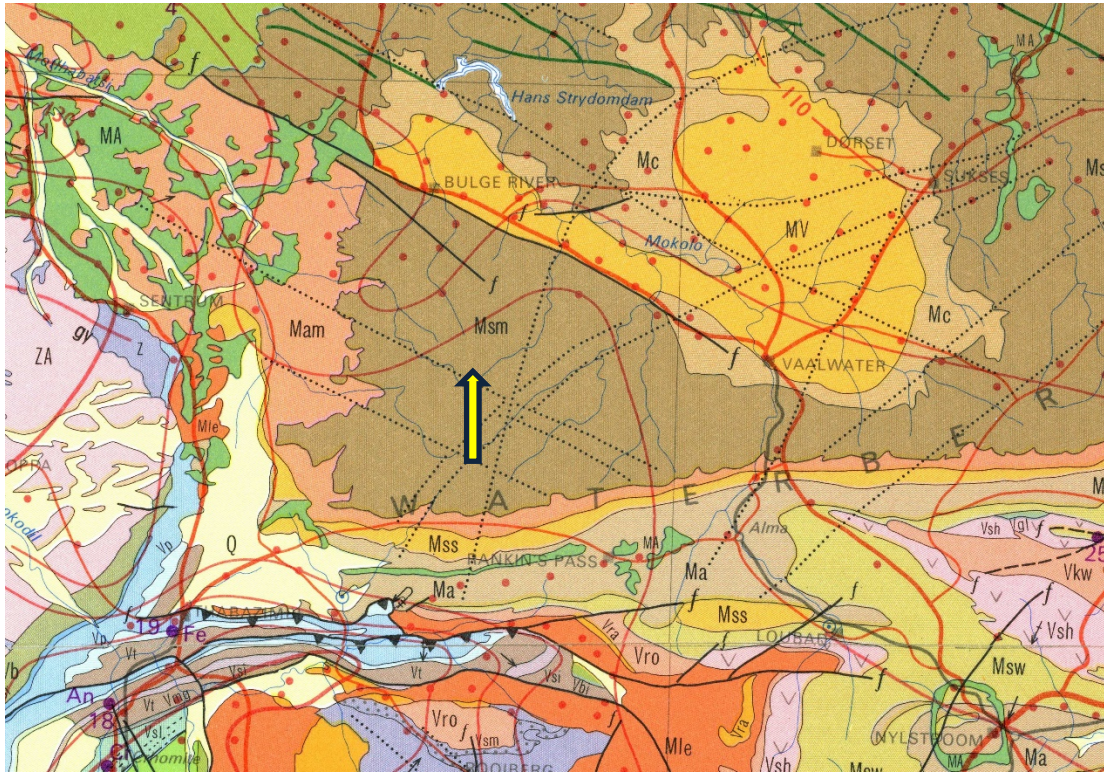


Figure 2: Geological map of the area around Marakale National Park, Limpopo Province. The proposed site is indicated by the yellow arrow. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 1 000 000 map 1984.

Table 2: Explanation of symbols for the geological map and approximate ages (Cornell et al., 2006; Duncan and Marsh, 2006; Erikssen et al., 2006. Johnson et al., 2006; Partridge et al., 2006). SG = Supergroup; Fm = Formation.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Sands, alluvium, calcrete	Last 2.5 Ma
MA	Basic intrusive rocks	Metanorite, metagabbro	
Mv	Vaalwater Fm, Kransberg subgroup, Waterberg Group	Feldspathic sandstone, shale	>1879 Ma
Mc	Cleremont Fm, Kransberg subgroup, Waterberg Group	Sandstone	2060 – 1700 Ma
Msm	Sandriversberg Fm and Mogalakwena Fm, Kransberg subgroup, Waterberg Group	Sandstone, conglomerate	2060 - 1700 Ma
Mam	Assvoelkop Fm and	Sandstone, mudstone	

Symbol	Group/Formation	Lithology	Approximate Age
	Makgabeng Fm, Matlabas subgroup, Waterberg Group		
Mss	Skilpadkop Fm and Setlaole Fm, Matlabas subgroup, Waterberg Group	Grit, conglomerate, sandstone	
Ma	Alma Fm, Nylstroom subgroup, Waterberg Group	Sandstone, grit, conglomerate, mudstone, siltstone	
Msw	Swaershoek Fm, Matlabas subgroup, Waterberg Group	Sandstone, trachyte	
Mwi	Wilge River Fm, Matlabas subgroup, Waterberg Group	Sandstone, conglomerate	

The Marakalele National Park lies on the ancient rocks of the Sandriviersberg Formation which is in the Kransberg Subgroup of the Waterberg Group. The rocks of the Waterberg Group are mostly dark greyish-red sandstones of various types and the three subgroups represent three crude upward-fining sequences (Barker et al., 2006), the lowermost Nylstroom Subgroup, the middle Matlabas Subgroup and the upper Kransberg Subgroup. The sandstones of the Sandriviersberg Formation are medium to coarse-grained arenite, granule-rich arenite and granule rudite, with interbedded pebble-rudites (Barker et al., 2006). Large-scale cross-bedding is easy to see as well as ripples and ripple cross-lamination. The depositional environment has been interpreted as that of large braided rivers flowing from highlands in the north northeast to a distant sea in the southwest.

The Matlabas Subgroup comprises four formations and indicates deposition in a narrow braidplain or braided river, to proximal fluvial deposits and dunes and playa lakes. The lowermost Nylstroom Subgroup represents alluvial fan and reworking on beach and inter-fan delta tidal flats (Barker, et al., 2006).

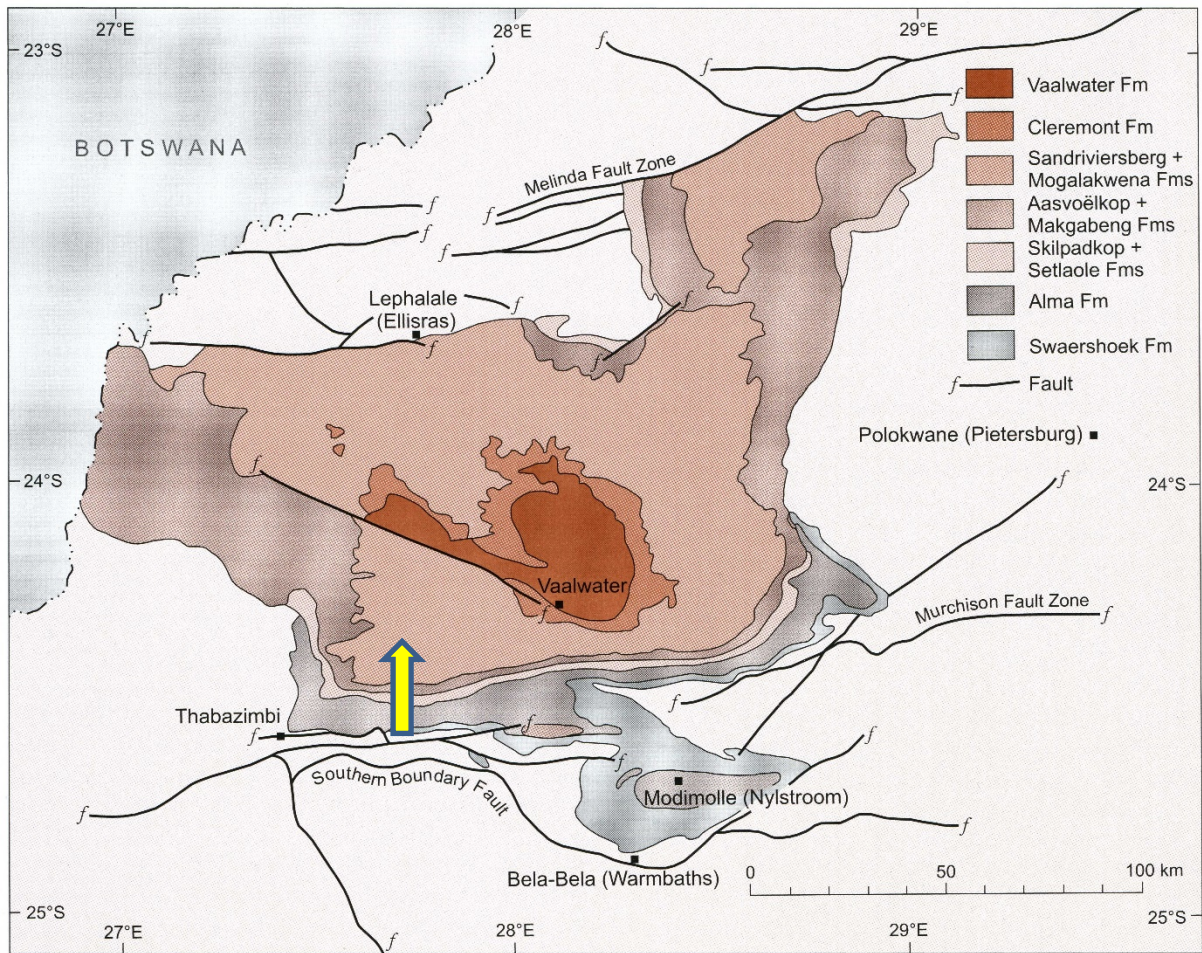


Figure 3: Map showing the updated and simplified geological groups in the Waterberg Group (from Barker et al., 2006, figure 10, page 310) with a focus on the formation types. Marakalele National Park, arrow, is in the southwest part.

ii. Palaeontological context

No fossils have been reported from the Waterberg Group. The rocks are too old for body fossils and the low to high energy, rather coarse sandstone substrate is not conducive to the preservation of microfossils. No fossils have been reported from this area. The SAHRIS palaeosensitivity map indicates that the whole of the Park falls into the green area and so is moderately sensitive and palaeontological desktop assessment is required.

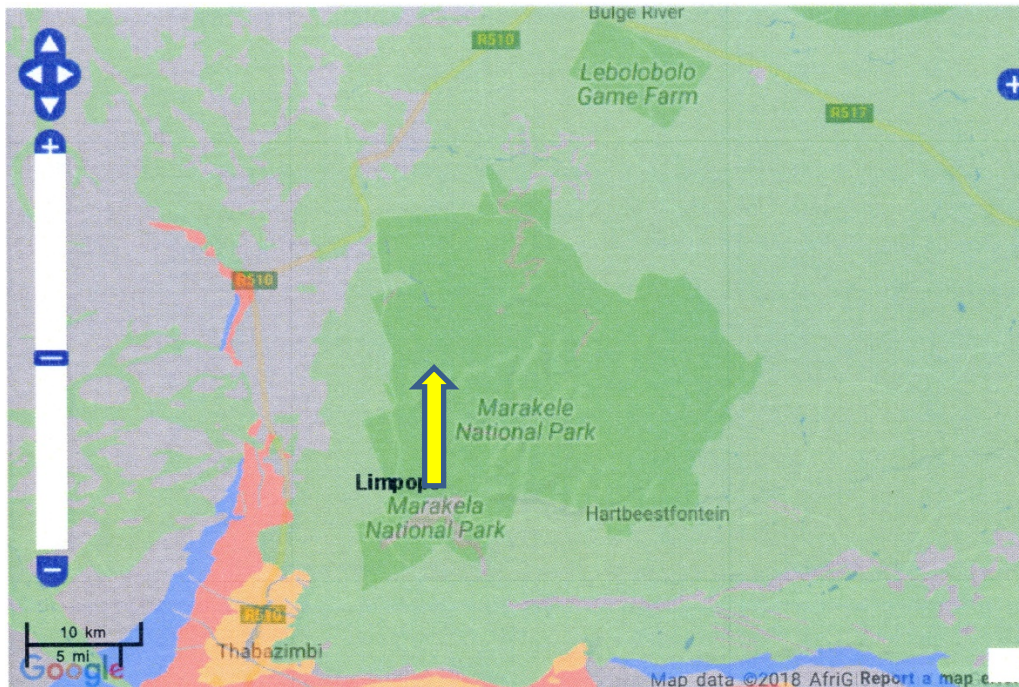


Figure 3: SAHRIS palaeosensitivity map of the Marakale National Park. The Marataba section is in the western part of the park, indicated by the yellow arrow. The site is in the green area. Colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

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

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

SPATIAL SCALE of impacts	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	H	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

TABLE 3B: IMPACT ASSESSMENT

PART B: ASSESSMENT		
SEVERITY/NATURE	H	-
	M	-
	L	There is no chance of fossils being found here
	L+	-
	M+	-
	H+	-
DURATION	L	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	L	The spatial scale is extremely small.
	M	-
	H	-
PROBABILITY	H	-
	M	-
	L	There is no chance of finding fossils in the various sandstones of this formation..

Based on the nature of the project, the surface soils will be excavated to a depth of less than one metre for the building foundations and clearing for roads. Since there is no chance of finding fossils in the soils and various sandstones there would be no impact on the fossil heritage. There is no chance of finding fossils because the rocks are too old for body fossils. The depositional environment is low to high energy coarse sandstone from rivers, alluvial fans and dunes that are not conducive to the preservation of microfossils. Taking account of the defined criteria, the potential impact to fossil heritage resources is zero.

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 sandstones are typical for the country and do not contain any fossil plant, insect, invertebrate and vertebrate material. There is no chance of finding fossils in this area and no fossils have been reported to date.

6. Recommendation

Based on the age of the sediments and type of rocks there is no chance of finding fossils so there would be no impact on the fossil heritage. As far as the palaeontological heritage is concerned the proposed development can proceed.

7. References

Barker, O B., Brandl, G., Callaghan, C.C., Erikssen, P.G., van der Neut, M., 2006. The Soutspanberg and Waterberg Groups and the Blouberg Formation. 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 301-318.

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.

Appendix A – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD January 2018

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-
Telephone : +27 11 717 6690
Fax : +27 11 717 6694
Cell : 082 555 6937
E-mail : marion.bamford@wits.ac.za ; 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.

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	5	2
Masters	6	3
PhD	9	3
Postdoctoral fellows	5	3

viii) Undergraduate teaching

Geology II – Palaeobotany GEOL2008 – average 65 students per year
 Biology III – Palaeobotany APES3029 – average 25 students per year
 Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology;
 Micropalaeontology – average 2-8 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 –
Cretaceous Research: 2014 -

Review of manuscripts for ISI-listed journals: 25 local and international journals

x) Palaeontological Impact Assessments

Selected – list not complete:

- Thukela Biosphere Conservancy 1996; 2002 for DWAF
- Vioolsdrift 2007 for Xibula Exploration
- Rietfontein 2009 for Zitholele Consulting
- Bloeddrift-Baken 2010 for TransHex
- New Kleinfontein Gold Mine 2012 for Prime Resources (Pty) Ltd.
- Thabazimbi Iron Cave 2012 for Professional Grave Solutions (Pty) Ltd
- Delmas 2013 for Jones and Wagener
- Klipfontein 2013 for Jones and Wagener
- Platinum mine 2013 for Lonmin
- Syferfontein 2014 for Digby Wells
- Canyon Springs 2014 for Prime Resources
- Kimberley Eskom 2014 for Landscape Dynamics

- Yzermyne 2014 for Digby Wells
- Matimba 2015 for Royal HaskoningDV
- Commissiekraal 2015 for SLR
- Harmony PV 2015 for Savannah Environmental
- Glencore-Tweefontein 2015 for Digby Wells
- Umkomazi 2015 for JLB Consulting
- Ixia coal 2016 for Digby Wells
- Lambda Eskom for Digby Wells
- Alexander Scoping for SLR
- Perseus-Kronos-Aries Eskom 2016 for NGT
- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klipportjie and Finaalspan 2017 for Delta BEC

xi) Research Output

Publications by M K Bamford up to January 2018 peer-reviewed journals or scholarly books: over 120 articles published; 5 submitted/in press; 8 book chapters.

Scopus h index = 22; Google scholar h index = 24;

Conferences: numerous presentations at local and international conferences.

xii) NRF Rating

NRF Rating: B-2 (2016-2020)

NRF Rating: B-3 (2010-2015)

NRF Rating: B-3 (2005-2009)

NRF Rating: C-2 (1999-2004)