

**Palaeontological Impact Assessment for the proposed
Development of Custodian Sites and Management
Infrastructure within Lapalala Wilderness, and
relocation of the school outside the southern park
border, Limpopo Province**

Desktop Study

For

Nuleaf planning and environmental

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Expertise of Specialist

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Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 30 years research; 20 year PIA studies

Declaration of Independence

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

Specialist: Prof Marion Bamford.....

Signature:



Executive Summary

The desktop Palaeontological Impact Assessment for the proposed development of Custodian Sites and Management Infrastructure within Lapalala Wilderness, and relocation of the school outside the northern park border, Limpopo Province, has been completed. The rocks in the area are the ancient Lebowa Granites and the various sandstones of the Kransberg and Matlabas subgroups, none of which contain fossils because they are too old and do not represent fossiliferous environments. There is no chance of finding fossils anywhere in the Lapalala Wilderness area or in the proposed site for the relocation of the Wilderness School. It is concluded that the project may continue as far as the paleontology is concerned and no further palaeontological assessments are required.

Palaeontological Impact Assessment for the proposed Development of Custodian Sites and Management Infrastructure within Lapalala Wilderness, and relocation of the school outside the northern park border, Limpopo Province.

1. Background

Nuleaf has been tasked with the Basic Assessment of the project and this report is the palaeontological assessment section. The proposed conservation initiative entails the establishment of 30 private lodges/ residences on 1500 Hectare Freehold Title Stands within the Lapalala Wilderness Area. A development envelope with an 80 m radius has been preselected for each site where development may take place. The final placement of the private lodges/ residences will be informed by specialist input. All associated civil infrastructure (water and waste treatment) will be included. Power to all of the sites will be supplied via solar power.

Another aspect to the project is to relocate the existing Lapalala Wilderness School to Portion 1 and 2 of the Farm Frischgewaagd 649LR, on the northern border outside Lapalala Wilderness area.

The Lapalala Wilderness School (LWS) is currently situated within the 45 000 ha Lapalala Wilderness Reserve (LWR). It has been ear-marked for relocation due to current proposed developments within the reserve. The proposal is to move the school, which has been running for more than 30 years, to a site immediately south of the reserve outside the LWR. Four areas are planned for development, a staff housing complex, the school itself, management housing area, as well as a gate site, including parking and a reception area. The proposed Lapalala Wilderness School entails the development of an environmental school facility to accommodate approximately 60 children. All associated civil infrastructure (water and waste treatment) will be included. Power to all of the sites will be supplied via solar power.

The total development footprint for the upgrades is not expected to be greater than 2 Ha and as such will not exceed 20 Ha

The National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998) requires that the proposed development must be preceded by the relevant impact assessment, in this case for palaeontology.

This report complies with the requirements of the NEMA and environmental impact assessment (EIA) regulations (GNR 982 of 2014). The table below provides a summary of the requirements, with cross references to the report sections where these requirements have been addressed.

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	Prof Marion Bamford
The expertise of that person to compile a specialist report including a curriculum vitae	Palaeontologist (PhD Wits 1990) CV attached
A declaration that the person is independent in a form as may be specified by the competent authority	Page 2
An indication of the scope of, and the purpose for which, the report was prepared	Section 1, page 3
The date and season of the site investigation and the relevance of the season to the outcome of the assessment	n/a Seasons make no difference to fossils
A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2, page 4
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	See table 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 6, page 9
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	n/a
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 and	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	Section 3 page5
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

1. In order to determine the likelihood of fossils occurring in the affected area geological maps, literature, palaeontological databases and published and unpublished records must be consulted.
2. If fossils are likely to occur then a site visit must be made by a qualified palaeontologist to locate and assess the fossils and their importance.
3. Unique or rare fossils should either be collected (with the relevant South African Heritage Resources Agency (SAHRA) permit) and removed to a suitable storage and curation facility, for example a Museum or University palaeontology department or protected on site.

4. Common fossils can be sacrificed if they are of minimal or no scientific importance but a representative collection could be made if deemed necessary.

The published geological and palaeontological literature, unpublished records of fossil sites, catalogues and reports housed in the Evolutionary Studies Institute, University of the Witwatersrand, and SAHRA databases were consulted to determine if there are any records of fossils from the sites and the likelihood of any fossils occurring there.

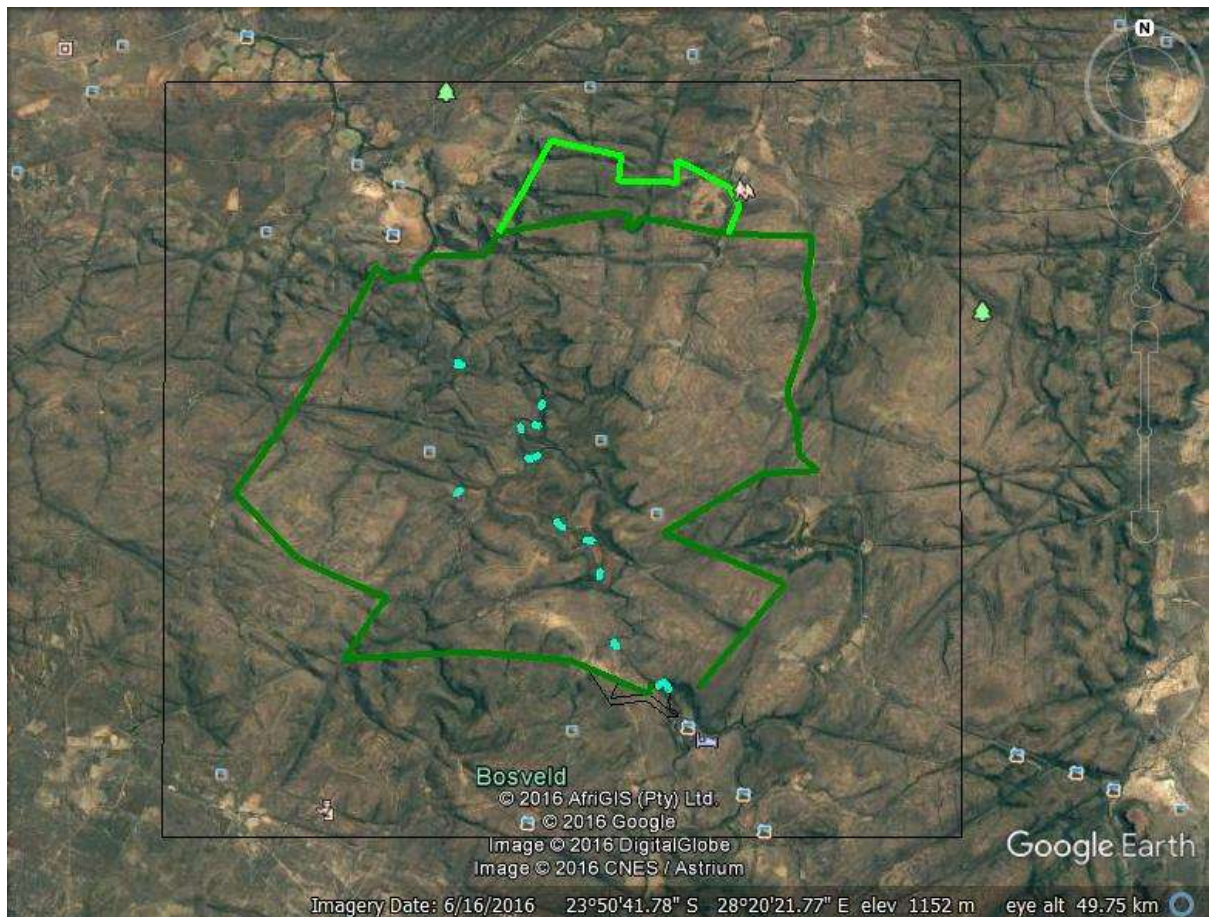


Figure 1: Outline (green) of the existing Lapalala Wilderness area and the area designated for the school (thin black outline, south of the park). This area is north of Vaalwater and west of Polokwane. Google Earth map supplied by Nuleaf.

3. Consultation Process

No consultations were carried out during the palaeontological desktop study.

4. Geology and Palaeontology

Project location and geological setting

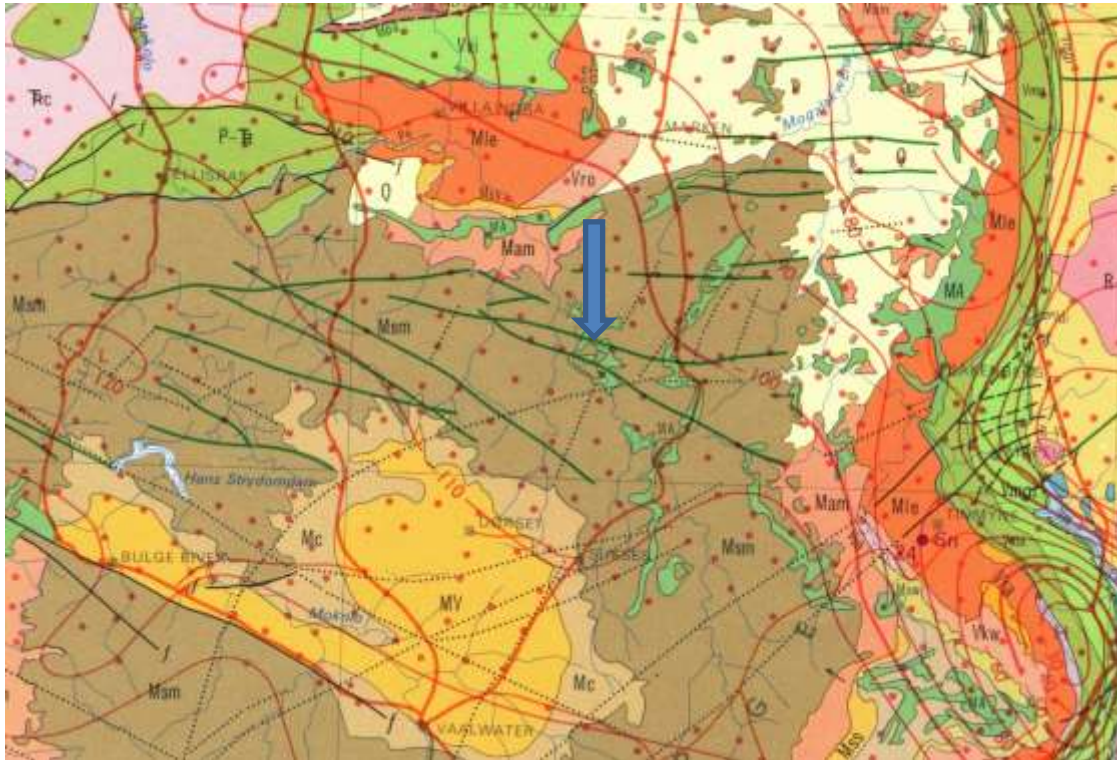


Figure 2: Geological map of the area around Lapalala Wilderness reserve in Limpopo Province. The approximate location of the proposed project is indicated with the arrow. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 1 000 000 map 1984.

Table 2: Explanation of symbols for the geological map and approximate ages (Cawthorn, et al., 2006; Barker et al., 2006; Schweitzer et al., 1995). SG = Supergroup; Fm = Formation. The shaded symbols represent the geological units that are most relevant to the project.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Aeolian sands	Last 2.5 Ma
MA	Basic intrusive rocks	Metanorite, metagabbro	1879-1872 Ma
Mv	Vaalwater Fm, Kransberg subgroup, Waterberg Group	Feldspathic sandstone and shales,	>2000 Ma
Mc	Cleremont Fn, Kransberg subgroup, Waterberg Group	sandstone	>2000 Ma
Msm	Sandriversberg and Mogalakwena Fms, Kransberg subgroup, Waterberg Group	Sandstone, conglomerate	>2000 Ma
Mam	Aasvoelkop and Makabeng Fms, Matlabas subgroup, Waterberg Group	Sandstone, mudstone	>2000 Ma
Mle	Lebowa Granite Suite, Bushveld Complex	Hornblende and biotite granites	2052 Ma

Geology

The proposed development in the Lapapala Wilderness area is in the Waterberg Basin. The rocks of the Waterberg Group unconformably overlie the Transvaal Supergroup, mafic rocks and granites of the Bushveld Complex and Archean granites and gneisses of the Kaapvaal Craton. The Waterberg Group rocks have not been dated but the intrusive dykes have been and they are dated at 1879-1872 Ma (Barker et al., 2006), therefore the majority of the rocks in this area must be over 2000 Ma.

The site lies on the sandstones and conglomerates of the Sandriviersberg and Mogalakwena Formations. Other rocks of the same Group (Table 2) are predominantly sandstones too. These all show some fining upward pattern of grain sizes, ripple marks and trough cross bedding which suggests that they were deposited by large braided rivers flowing from the highlands in the north-northeast to a distant sea in the southwest. The Cleremont Formation implies a similar palaeoenvironment with higher energy and distal subaqueous setting but slightly different flow direction, while the Vaalwater Formation in the result of a lower energy littoral or shelf environment (Barker et al., 2006).

Palaeontology

(Refer to Figure 4 for SAHRIS palaeosensitivity)

The oldest rocks in the area are those of the Lebowa Granite Suite but would not preserve any fossils as it is igneous in origin. The various sandstones of the formations of the Matlabas and Kransberg subgroups are too old for the preservation of any body fossils,

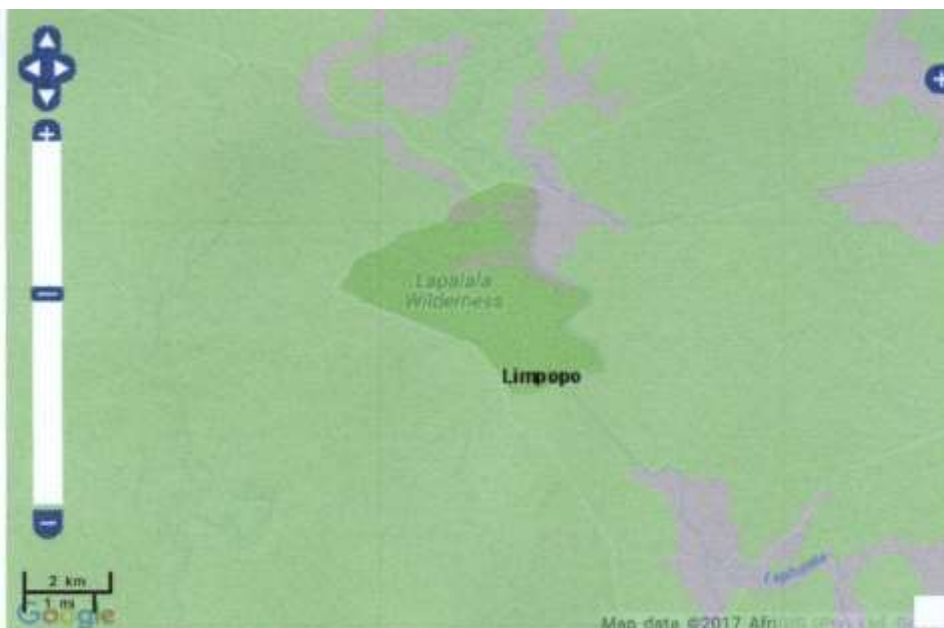


Figure 4: SAHRIS palaeosensitivity map. Colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

however they can contain geological structures of pans or lunettes (Simpson et al., 2004). These however, are not fossils, just environmental indicators. Ripple marks and cross bedding are commonly found in the rocks in this area but they are not fossils.

5. Impact assessment

Using the criteria in the table below, the impact of the development, construction of buildings and sewerage pits, as well as the relocation and building of a school with its infrastructure, have been assessed.

TABLE 3: 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 SPATIAL SCALE of impacts	L	Localised - Within the site boundary.
	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

The surface activities would not impact on the fossil heritage as the rocks are ancient and volcanic so there are no fossils present. The IMPACT is nil (according to the scheme in Table 3).

Excavation for the roads, foundations, sewerage, buildings of lodges, school buildings or Eskom powerlines if required, would penetrate only a few metres below ground surface so there would be minor deterioration of the surface of sites and no impact on fossils as there are none. Therefore the SEVERITY/NATURE of the environmental impact would be L.

DURATION of the impact would be permanent: H.

Since only the possible geological or environmental features and ripple marks would be affected – and they are not fossils - the SPATIAL SCALE will be localised within the site boundary: L.

There is no chance of finding fossils anywhere on the Lapalala Wilderness area or on the new school site, either on the surface or below surface, the PROBABILITY of affecting any fossils is unlikely or seldom: L

6. 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 volcanic rocks, basement rocks, dolomites, sandstones, shales, quartzites, basalts and gabbros are typical for the country and do not contain any fossil material.

7. Recommendation

It is extremely unlikely that any fossils occur in the sites for the proposed developments anywhere on the Lapalala Wilderness area or new school site because mostly the rocks are much too old and volcanic in origin or are ancient sandstones representing braided rivers, nearshore or more distal seas.

As far as the palaeontology is concerned the proposed development can go ahead. Any further palaeontological assessment would not be required.

8. 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.

Cawthorn, R.G., Eales, H.V., Walraven, F., Uken, R., Watkeys, M.K., 2006. The Bushveld Complex. 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 261-281.

Simpson, E.I., Eriksson, K.A., Kuklisa, C.A., Eriksson, P.G., Bumby, A.J., van Jaarsveld, C.F., 2004. Saline pan deposits from the 1.8 Ga Makgabeng Formation, Waterberg Group, South Africa. *Sedimentary Geology* 163, 279–292.